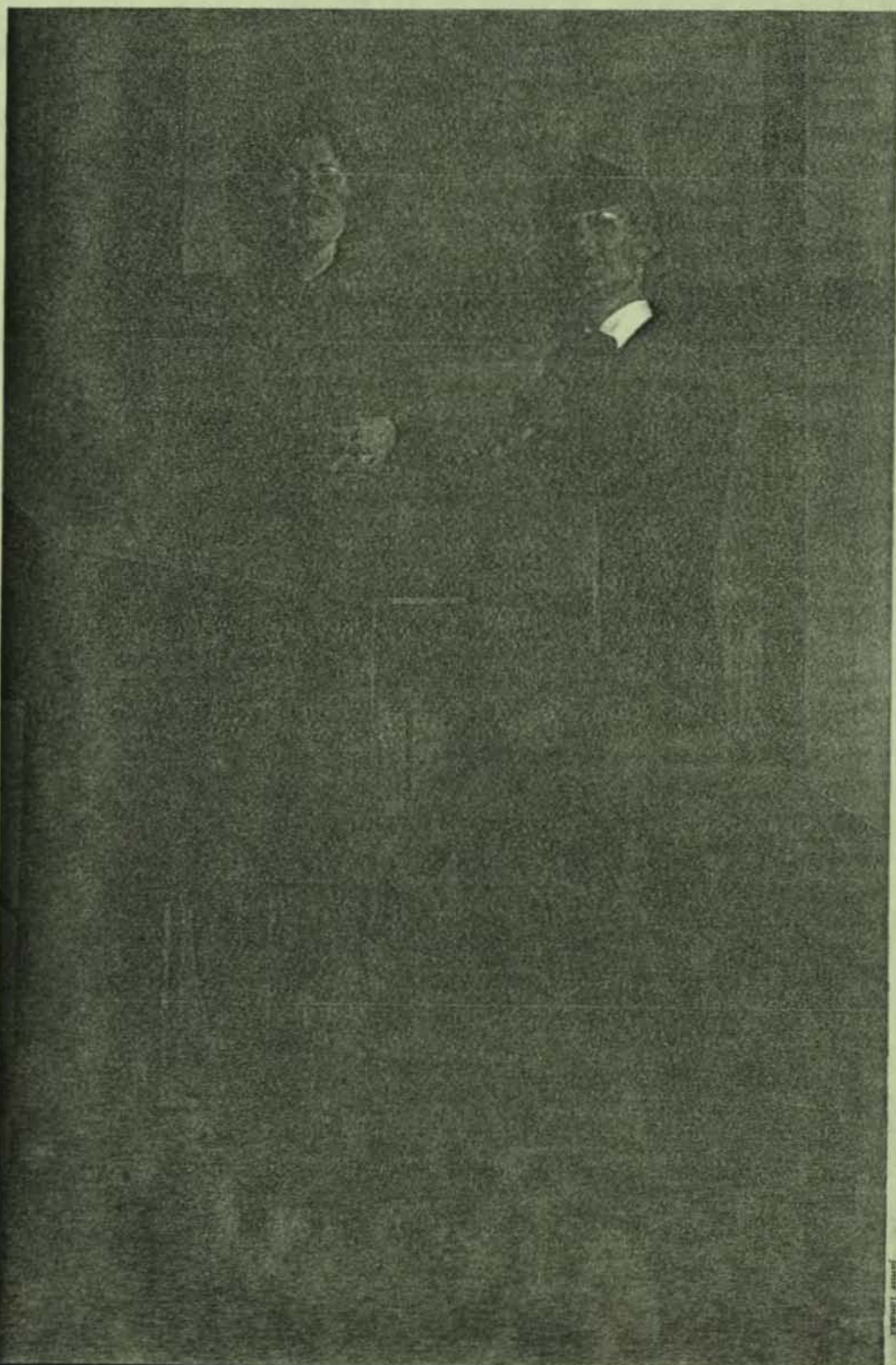


Women in Computing: Caught in the Middle

"Stress just comes with the territory," says Excelan product marketing manager Mary Gardner (left). According to Linda Stewart (right), product manager at Excelan, "The old-boy networks still determine who gets where."



Janice Tomack

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Although more and more professional women are thriving in the computer industry, men still hold the fort—and the cashbox.

Shoshana Tembeck
and Lynn Meisch

Women are entering the computer industry in increasing numbers—and they're here to stay. But personnel managers needn't begin dismantling their affirmative action programs; inequities in pay, position, and opportunity remain.

The surge of women entering the work force has coincided with the astonishing growth of the computer industry. But are women ascending the corporate ladder in hardware and software companies? Are they optimistic about their potential for advancement? Do they enjoy wages equal to those of their male colleagues?

Instead of focusing on the few privileged women at the top or the many who work in manufacturing and data entry positions, *PC World* examined the situation and experiences of midlevel professional women—product managers, programmers, and engineers—who

could conceivably become tomorrow's CEOs. And the good news is that many of them feel the industry offers them unparalleled opportunities to use their talents and education and is paying them well to do so.

Jumping on the Bandwagon

"We're seeing many more high-powered, well-educated, forceful women now than in 1979," says headhunter Penny Horowitz of EDP World, a national agency that places computer professionals. "Our placement of engineers is still fairly low because not many women have engineering degrees. But we place female sales and marketing professionals, programmers, and systems analysts in numbers equal to men."

Because the young computer industry urgently needed bright, creative employees, many women trained in the humanities and social sciences were able to move laterally into the computer field and learn technical skills on the job. Elizabeth Young, an anthropology Ph.D. who did fieldwork on Balinese dance and theater and later coauthored *The Brady Guide to CD ROM* (Brady Books, New York, 1987), exemplifies a generation of women who successfully achieved technical proficiency while employed in the industry.

Since those early days of microcomputing, more and more women have majored in technical disci-

plines. Between 1971 and 1982, the percentage of degrees in computer science awarded to women in the United States more than doubled at the undergraduate and master's levels and more than tripled for doctorates; increases in engineering degrees awarded to women are even more remarkable (see Figure 1).

Not surprisingly, this new cadre of technically trained women has made significant inroads into the work force. Although women are still clearly in the minority in technical professions, the number of women working as computer scientists, systems analysts, and programmers had swelled by 1980 (see Figure 2). Tandem programmer Carol Shaw, creator of the adventure game *River Raid* and the first woman to be a game designer at Atari, considers the gains a major triumph. "When I went to college in the early 1970s, I was the only woman in most of computer science classes," she notes. "And when I started my career, I was often the only woman programmer on the job."

Nonetheless, women in the computer industry haven't outpaced their professional peers in other fields. Although in 1984 28.5 percent of systems analysts were women, female banking

Tandem programmer Carol Shaw: "I hope that eventually we won't need to write articles on the status of women in this industry."



and advertising professionals constituted 37.1 percent and 46.9 percent of the work force, respectively, according to *Working Woman* magazine's 1984 *Working Woman Report*.

Environmental Hazards
 Female professionals face a host of barriers—both social and biological—to prospering in the work force that their male peers never contend with. The difficulties begin early, when a child's chances of becoming a programmer or engineer are influenced by cultural norms. "Computer science is still viewed as man's work, and unfortunately, that stereotype is reinforced in many ways," says Barbara Simon, research scientist at IBM in San Jose, California.

"How often do you see girls playing video arcade games? What movies have you seen in which the computer whiz is a woman? We're lacking role models."

From kindergarten through MIT, boys are claiming computers as their province in far greater numbers than girls. Organizations such as the Math/Science Network based in Berkeley, California, hope to redress the imbalance by encouraging girls to study science and technology. Linda Dalton, who contributes time to the Math/Science Network in Salt Lake City, Utah, is executive assistant to the CEO at Iomega, maker of the Bernoulli Box. As one of a pioneering group of women who majored in electrical engineering at the University of Utah, Dalton had to fight off the pressure to conform: "I remember being pointed toward teaching and secretarial work in college."

Channeling women into "feminine" fields is still common, and hostility toward women who pursue technical degrees sometimes takes surprising forms. Graduate computer science students at MIT issued a report in 1983 detailing discriminatory acts against women; in one case a student was physically yanked out of her seat in front of a computer by a male student who wanted to use the machine.

Although social pressures are largely intangible, they may help to explain women's reluctance to pursue technical degrees beyond the master's level. Less than 10 percent of computer science Ph.D.'s were awarded to women in 1984, compared to 29.3 percent of master's degrees. "There are vacancies in R&D computer engineering positions nationwide," says Sheila Humphreys, academic coordinator for the electrical engineering and computer science department of the University of California at Berkeley. "But women who don't get a Ph.D. aren't even in the running for these top positions." And until more women pursue advanced studies in engineering and computer science, they're not going to snap up those choice industry positions.

Biology 101
 Even in the best of all possible worlds, women face a career-stopping choice that men don't—bearing children. With the computer industry changing so fast, a woman who takes time off to have a baby may have trouble getting

back on track. Celeste Baril, now a software engineer at Equatorial Communications in Mountain View, California, struggled to balance private life with career when she decided to have a child. While employed at Tymnet, she set a company precedent by negotiating to work at home for four months after a three-month maternity leave. Says Baril: "I was granted the extra four months because Tymnet couldn't afford to lose me at the time. I don't think I would have had that option a year later when the staff had been beefed up."

Paid maternity leave and job protection during leave—a given in 117 countries—are considered luxuries in the United States. The lack of these benefits is part of a larger problem: Both male and female professionals are expected to devote all their waking hours to their careers, and that leaves little time to raise a family. And because most women traditionally perform more than their share of child rearing—even if employed full-time—they carry a heavier burden overall than men.

Furthermore, the high divorce rate leaves many mothers raising children entirely on their own. "Having a family has been a conflict for me," says Iomega's Linda Dalton. "People work here until midnight three or four nights a week, but I have to get home to my kids. Being a single parent certainly influences the type of position a woman will opt for." Clearly, until society makes greater allowances for men and women who decide to have children, and until both sexes share child rearing tasks equally, the de-

cision to have families will impede women's career advancement.

Meanwhile, other long-established obstacles persist. "Even if you're willing to put in what it takes to work your way up, you might not get there," notes 20-year industry veteran Linda Stewart, a product manager at Excelan, a manufacturer of local area network hardware and software in San Jose, California. "I think the old boy networks still determine who gets where."

Some women simply sidestep this problem by starting their own companies. "Being a woman in someone else's company was a barrier to moving toward the top, so I went out on my own," says Barbara Wallace, president and founder of KDS Corporation, an expert systems software company in Wilmette, Illinois. Peggy Zientera, who is writing a book about

women who have launched their own computer-related businesses, contends their overriding motivation is to dodge discrimination and other career roadblocks. "All of these women insist that in dealing with their male counterparts, they don't encounter sexism. For them, it's an open industry," says Zientera.

Other women simply choose not to pursue the highest positions. "I'm satisfied with my job as a programmer; I have no interest in becoming a manager," says Tandem's Carol Shaw. Advancement is sometimes viewed as a mixed blessing—for good reason. "Women who aim for the top know they're subject to the same stress-related diseases and problems as men. It just comes with the territory," says Mary Gardner, Excelan's product marketing manager.



Pat Becker, director of marketing at Tandem: "The winning combination is an electrical engineering degree with an MBA."

Photograph by John Harding

Is Bigger Better?

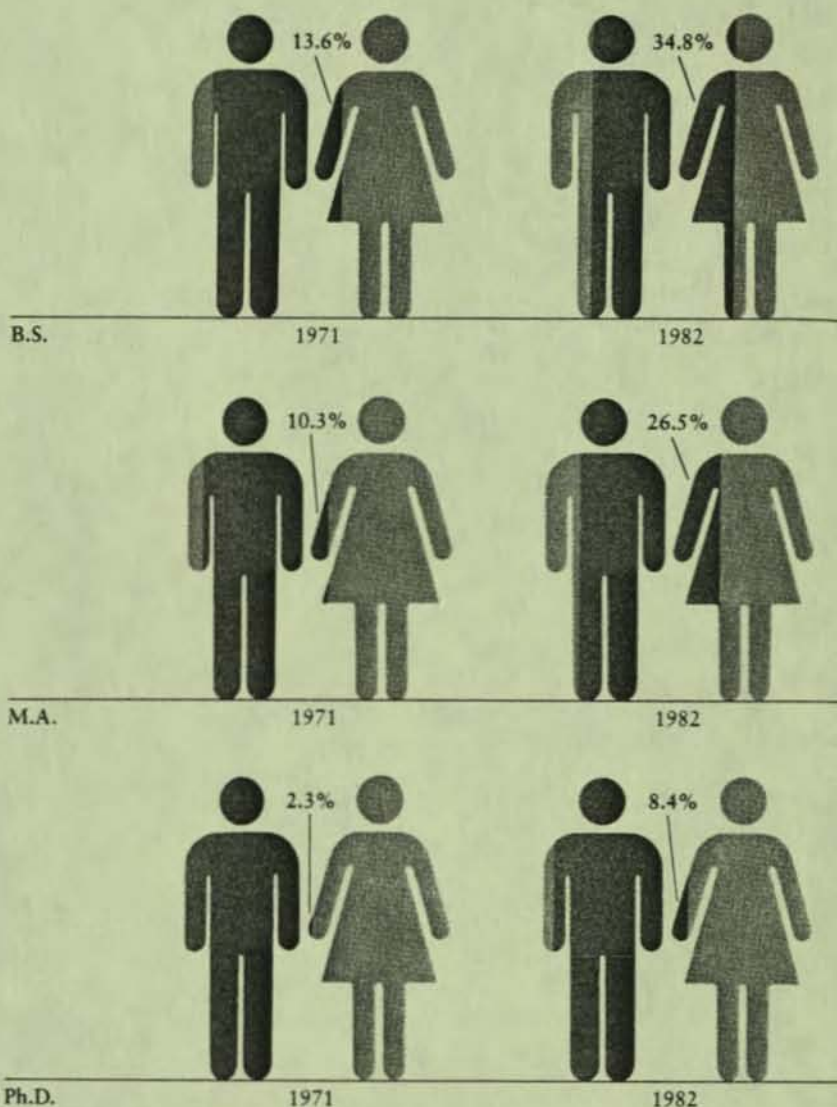
Despite the difficulties that impede professional women, those who have the right education and experience *are* making great strides. "It's selective at the top for both men and women," points out Pat Becker, a 15-year veteran of the industry, now director of marketing at Tandem. "If you look at the profile of any male CEO, president, or senior executive, you'll find he has extensive technical skills and business experience. I hope companies won't use any other criteria to promote women to those top positions."

Not surprisingly, smaller firms have provided better opportunities for women than have large corporations. "The organization of smaller companies is more fluid; the hierarchical mentality isn't as entrenched," says Elizabeth Young, a software specialist at Thomson Computer Products in Los Angeles.

Excelan is a good example. At this small company, women are making great strides: Four out of five senior product managers and half the marketing staff are women. By contrast, industry giants IBM and Hewlett-Packard employ less than 30 percent of their professional female workers in programming, systems analysis, personnel, public relations, and sales and marketing. And according to company statistics for 1985 and 1986, only 16 percent of female employees at IBM and 25 percent of female employees at Hewlett-Packard were managers in any area. Despite its reputation as "good for women," the PC industry hasn't opened its arms as wide to female professionals as have other fields.

Women and Technical Degrees: Big Increases, Little Equality

Source: U.S. Department of Education



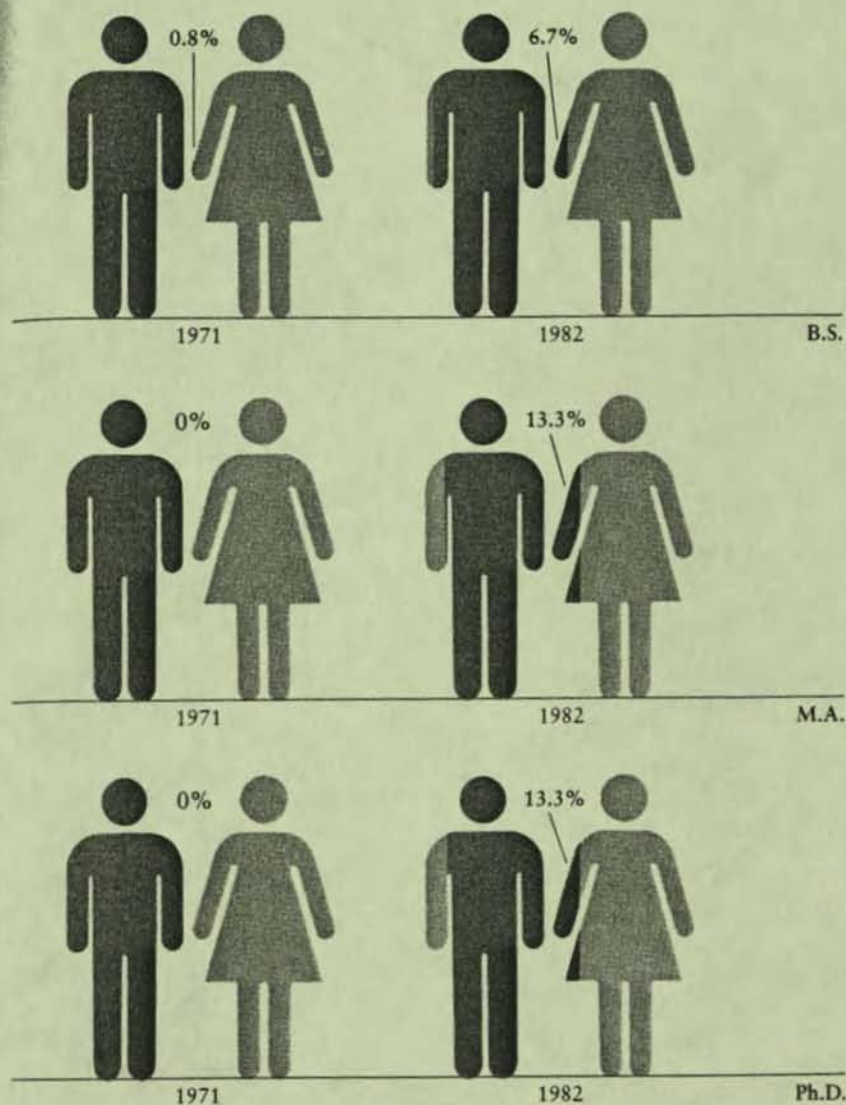
Money Talks

Although most of the women we spoke with agreed that discrimination is largely covert, men still bring home the lion's share of the bacon. Nationally, from housekeepers to CEOs, women earn 64 cents on the dollar compared to men, a figure that has held firm for 50 years.

Even in the computer industry, where many female professionals

make just as much as men, pay inequities abound. A 1984 Stanford Education Policy Institute report on women in computer-related occupations, *Integrated Circuits/Segregated Labor*, found that among computer scientists, systems analysts, and programmers, women's hourly wages were consistently

Figure 1: The percentage of women earning degrees in computer and information sciences (left) and engineering and related technologies (right) has climbed, but the figures are still relatively low.



lower than men's, even when age and educational levels were the same.

Nonetheless, the second-highest-paying occupation in the United States for women is systems analyst; programmer ranks seventeenth. Because 82 percent of American women earned less than \$20,000 annually in 1982, a woman who lands a job today in

the computer industry for \$35,000 a year might consider herself lucky. What she might not realize is that a man with an identical job has probably bargained for more money.

Perhaps because they earn higher salaries than most other female workers, many female professionals in computing assume that no pay discrimination exists in their companies. But Nancy Lanning, who works at Lotus De-

velopment Corporation in quality assurance and documentation, says unequivocally, "Salary discrimination is definitely a problem. In the past nine years I've worked mainly for smaller companies, and I've seen telling payroll and personnel records."

A surprising—but likely—explanation for pay inequities comes from Paula Hawthorne, vice president of software engineering at Britton Lee, a data base software vendor in Berkeley, California. "Overt discrimination is not prevalent; it's just that women don't know how to fight for higher pay. When I began working in the industry, I didn't realize how amenable the system was to negotiation. Women need to be feistier in bargaining for better wages."

■ The Long Haul

"If I were giving advice to my 12-year-old daughter, I'd tell her the winning combination is to get an electrical engineering degree with an MBA," says Pat Becker of Tandem. Without a technical background, it's extremely difficult for women to reach the highest organizational levels. But most of the women interviewed felt that they and their female colleagues will eventually break into top positions, once they've gained the requisite experience.

Women who try to join the industry in the near future will discover more stringent requirements for entry-level positions. Dataquest, a market research firm in San Jose, projects that the growth rate in the hardware industry will stabilize at 11 to 13 percent over the next decade. As the industry

No Parity in Sight for Female Workers

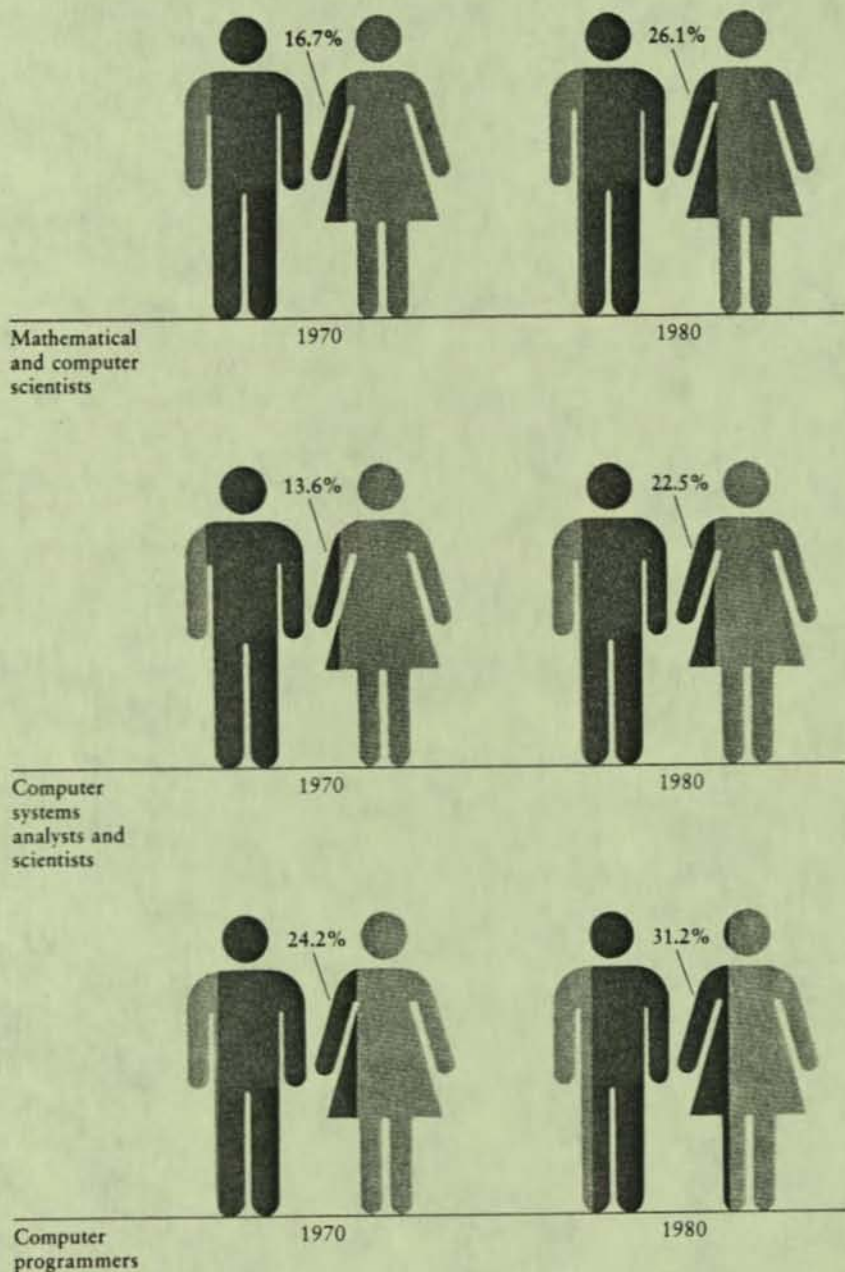


Figure 2: Although the percentage of women working in technical fields jumped significantly in the 1970s, women are clearly underrepresented.

Source: U.S. Census Bureau

matures, training in technical fields will become mandatory for would-be employees.

At the same time, the male-dominated computer industry will have to adjust to a new generation of female workers who won't take no for an answer. "Women in their twenties have a much better attitude and a lot more knowledge about how to get the jobs they deserve—more so than older women," says Excelan's Linda Stewart. But these women, like those who have been in the industry for years, can't expect to achieve their goals overnight. "The world changes slowly," Stewart observes. "An elephant has a large turning radius."

Most women look forward to the day when gender is not a crucial factor in employment. "I hope that eventually we won't need to write articles on the status of women in this industry," says Carol Shaw. If that hope is to be realized, women who want to climb the computer industry ladder had better pack up their portable PCs, head for the computer science department of the nearest university, and prepare themselves to give battle in the corporate arena. ●

Shoshana Tembeck is a freelance writer and former managing editor of the Morrow Owners Review, a magazine for CP/M computer owners. Lynn Meisch is an anthropologist and the author of a travel guide to South America.

BUSINESS

BUSINESS INSIDER

Vlae Kershner and Kathleen Pender



STOCKS
2,640.18
Dow Jones Industrial Average



INTEREST
9.79%
30-year government bond



DOLLAR
146.65 Yen
Unchanged from 146.65 Yen

View From the Mark Hopkins

The Montgomery Securities Investment Conference that began yesterday at the Mark Hopkins in San Francisco had plenty of swelter, but little sizzle so far. No big surprises, but a few executives saw their stocks rise moderately following presentations to some 750 money managers attending the four-day event.

The highlight came when an executive of IDB Communications, a Los Angeles company that supplies satellite transmission services, conversed live with another official in Shanghai. IDB was providing satellite transmission for NBC News in China last week and persuaded the government to leave the link open so IDB could demonstrate its wares at the conference. Following is a roundup of other events:

Tandem Tops \$1 Billion

Tandem Computer was up 1 3/4 to 36 1/2 on the New York Stock Exchange yesterday in heavy volume. Chief Financial Officer David Rynne announced that the Cupertino company just topped \$1 billion in sales for the year ended September 30, compared with \$768 million in 1986. He added that he was "very comfortable" with analysts' earnings estimates. Montgomery analyst John Jones predicted that Tandem will earn \$1.08 per share in fiscal 1987, up 50 percent over last year.

Trade Pact Shows

By John Eckhouse

The landmark U.S.-Canadian free trade pact reached over the weekend could create a sharp boost in California jobs and exports, trade experts said yesterday.

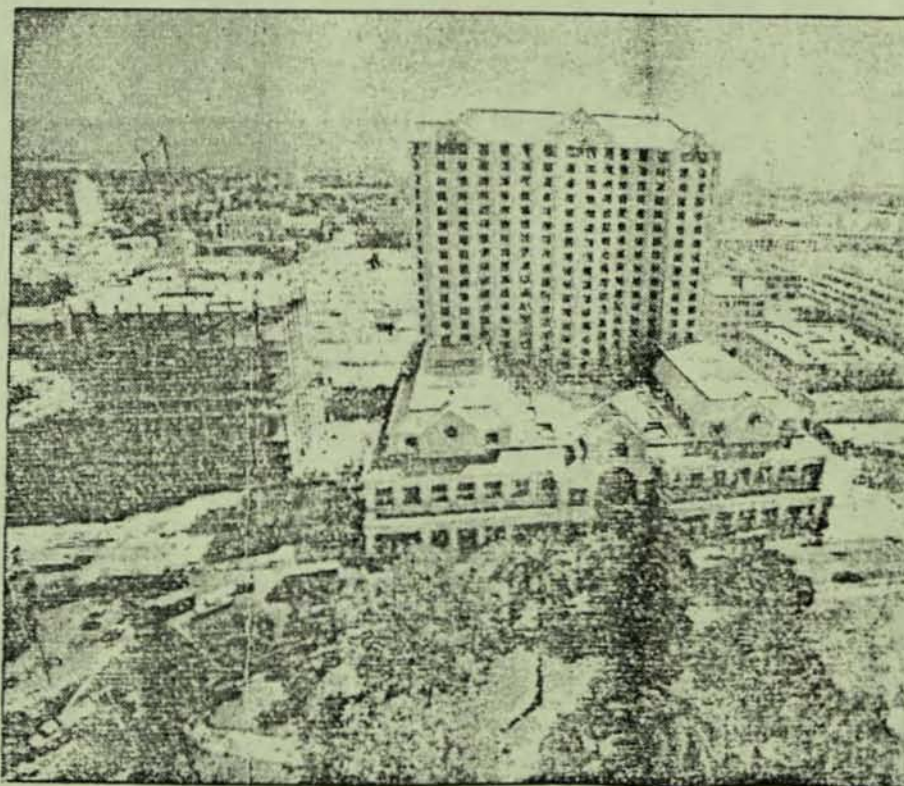
Canada already is California's fourth-largest trading partner with two-way trade of about \$5.4 billion last year. About 93,000 jobs in the state depend on exports to Canada, which reached \$3.2 billion in 1986.

Trade experts in California say the new agreement — if ratified — should

help the state's huge electronics, agriculture and film industries. It's also possible the pact could lower PG&E's energy rates and the price of building a new home, although details still remain quite sketchy.

"If rhetoric turns into reality, this should lead to increased trade for California winemakers," said John De Luca, president of the Wine Institute. Despite heavy tariffs and restrictions on the distribution of wine, Canada is the largest foreign market for California wineries "so if we had true free trade, the potential would be very sizable for us," he said.

Bill Krist, vice president of interna-



The new Fairmont Hotel in San Jose opened yesterday

San Jose Spends Hands

BUSINESS TECHNOLOGY

How the Exchanges' Computers Got By

By CALVIN SIMS

LAST week's frenzied activity in the nation's stock markets has focused new attention on the computers that processed and recorded the hundreds of thousands of transactions each day on the New York Stock Exchange and the American Stock Exchange.

There are many ways to measure the sophistication of computer systems like those deployed on Wall Street. An advanced system, for example, can be especially speedy or efficient in the way it handles memory.

The kind of sophistication that was most important to the exchanges' 200 linked computers in their electronic moment of truth last week is known as "fault tolerance." The computers have been designed with redundant programs and components so that glitches and faults that popped up during the flood of orders resulted in a shift to a different processing path rather than a breakdown.

Self-diagnosis programs allow the computers to make such switches nearly instantaneously without help from human operators. In addition,

the computers keep track of when a sell order and a buy order have been matched so that processing automatically starts from the beginning on another computer if a fault has interrupted it.

The minicomputers that run the two exchanges were manufactured by Tandem Computers Inc. of Cupertino, Calif. Tandem is the leading manufacturer of fault-tolerant computers widely used for operations, like those of the stock exchanges, that have huge numbers of transactions that must be processed while customers are connected to the system. Other important applications include electronic banking and airline reservations.

About 28 stock and futures exchanges around the world use Tandem computers, including the Chicago Mercantile Exchange and Nasdaq's over-the-counter trading system as well as exchanges in Hong Kong and New Zealand. Major brokerage firms that use the machines include Nomura Securities of Japan, the First Boston Corporation, the Advest Group Inc., Merrill Lynch

& Company and Cowen & Company.

Analysts estimate that computer companies sold \$20 billion worth of computers for transaction-processing applications, including the fault-tolerant machines. While the fault-tolerant segment accounts for a little more than \$1 billion, or 5 percent, of the market, it is the fastest-growing part. Analysts expect it to grow by 15 to 20 percent in the next five years.

Tandem's computer systems start at about \$50,000 and can cost as much as several million dollars. The 200 processors in the New York Stock Exchange's NonStop TXP can perform up to 900 standard debit and credit transactions a second. The exchange plans to install soon Tandem's newest product, the Nonstop VLX, which will process 1,300 transactions a second.

Before Tandem's Nonstop was introduced in 1975, most users who needed fail-safe computers had to resort to an expensive practice known as "hot standby," in which a duplicate computer was kept ready to replace one that failed.

Tandem has one major competitor in this market, Stratus Computer Inc. of Marlboro, Mass. Stratus uses a somewhat different redundancy

strategy. It has two pairs of processors to perform each task. If there is a malfunction, the processors in a pair do not agree on the answer to a problem and both shut down, allowing another pair to take over.

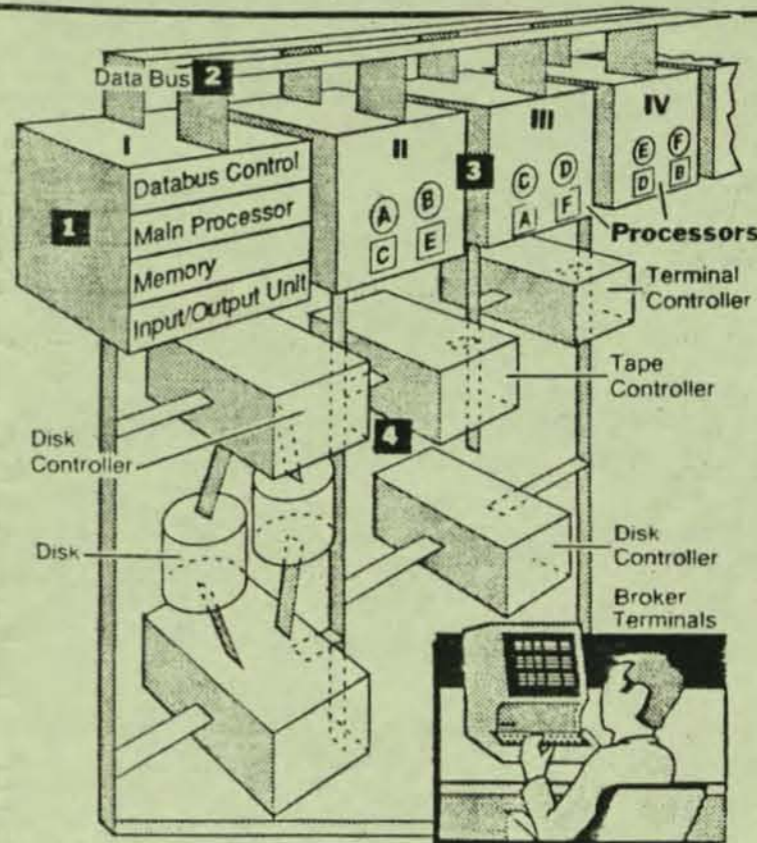
This so-called lock-step architecture runs as well as Tandem's design in terms of hardware, but it does not offer the same program protection. Stratus supplies I.B.M., which has been seeking to enter this market, with most of its fault-tolerant machines. But most industry analysts prefer the Tandem approach.

"A processing system that is not fully redundant in terms of hardware and software is more open to the possibility of failure," said George Weiss, an analyst with the Gartner Group, a market research firm in Stamford, Conn.

Last week, Tandem reported that it earned \$105.6 million on revenues of \$1.04 billion for its 1987 fiscal year, which ended Sept. 30. Stratus reported net income of \$12.8 million on \$128.9 million in revenues for the first nine months of the year.

Although Tandem's machines were in the limelight last week for withstanding the heavy trading, its stock did not escape unscathed. During Oct. 19's collapse, Tandem's shares dropped \$6.50, to \$23.25, on the New York Stock Exchange. They closed yesterday at \$19.875, down 75 cents.

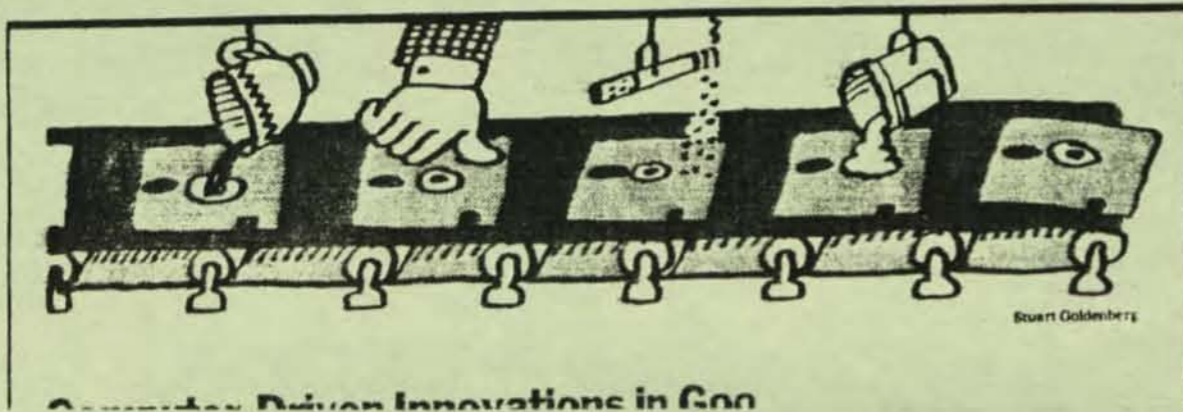
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Redundancy Helps Computers At Stock Exchanges Stay On Line

- 1 Processors each have their own memory and software. A fault in I doesn't stop II, or any other.
- 2 Two data buses connect each processor to the network.
- 3 Processors store and update work of neighbors. Thus, processor II maintains record of work by III on deal C and IV on deal E while working on A and B.
- 4 Duplicated peripherals, such as disk files and terminal controllers, are each linked to more than one processor.

At Granting, The New York Times, Oct. 28, 1987



Computer-Driven Innovations in Goo

Advances

John Holusha

Tandem, future

LEVEL 1 - 2 OF 6 STORIES

PAGE 3

Proprietary to the United Press International 1987

CORPORATE
INFORMATION CENTER

October 6, 1987, Tuesday, BC cycle

ADVANCED-DATE: October 2, 1987, Friday, BC cycle

SECTION: Standing Feature

LENGTH: 571 words

HEADLINE: Tandem deals in large change as yearly sales approach \$1 billion

BYLINE: By MICHAEL MOLINSKI

DATELINE: CUPERTINO, Calif.

KEYWORD: Bizday

BODY:

Jim Treybig has had six offices in the 13 years since he founded Tandem Computers Inc.

The latest is a modest room at the back of a small building in Cupertino, across the street from the place where his next office is being built.

Change is a way of life at Tandem, which has grown to one of Silicon Valley's largest companies and hopes to break the billion-dollar mark in sales this year.

"I gave my last office away because they needed it for client meetings," Treybig said. "It's a lot different to run a \$1 billion company than a \$10 million company."

Breaking the billion-dollar mark would be a hard-won milestone for Tandem, which has spent the last two years battling back from four years of flat earnings. From 1976 to 1981, Tandem's profits and revenues doubled annually.

"It's very clear, as this company crosses the threshold of the \$1 billion mark, that it is no longer a niche player," said Jeffrey Canin, of Hambrecht & Quist Inc. in San Francisco. "Tandem has built a terrific record of turning over their product line."

Tandem's latest line is a group of high-performance computer workstations based on Intel Corp.'s powerful 80286 and 80386 microprocessor chips.

"Products are good, and reception ... has been very strong," said David Wu of S.G. Warburg and Co. in New York.

Tandem's income for the first nine months of fiscal 1987 rose to 75.1 million, or 77 cents a share, up 78 percent from the \$42.1 million, or 48 cents a share, recored in the same period last year. Nine-month sales rose 36 percent to \$744 million.

Canin projected Tandem's sales at \$1.02 billion for the fiscal year that ended Sept. 30, up 33 percent from 1986.

LEXIS NEXIS LEXIS NEXIS

Proprietary to the United Press International, October 6, 1987

But even if Tandem breaks the billion-dollar mark, analysts said, it will have little time to rest on its laurels.

"I think they need to continue to have a broad product line, increased price performance and software applications, and they need to keep two steps ahead of Digital Equipment Corp. and International Business Machines Corp.," Wu said.

Tandem is best known for anti-glitch computer systems that can quickly process crushing loads of data.

Banks, airlines and stock exchanges are among Tandem's customers, but its fault-proof systems, capable of linking dozens of far-flung users, have also won government clients, including the Royal Canadian Mounted Police.

The company is also participating in a project to develop an electronic train control system, aimed at boosting railroad safety and efficiency.

"Our whole society is moving toward systems that tie everything together and run things," Treybig said. "Systems are not going to be designed that fail in the year 2000."

Tandem has also attempted to broaden its reputation for designing unbreakable machines by offering an expanded line of computer programs to support them.

"They've got a broader set of critical application software, and software is going to be more important to Tandem's success than hardware," Canin said.

"We've grown to a full-function computing company," said Chris Erickson, Tandem's director of software product management. "When we were very young, we had a reputation for doing one thing: fault tolerance."

Unlike other Silicon Valley entrepreneurs, Treybig, a 46-year-old Texan who jogs five miles at lunchtime, remains at the company he founded more than a dozen years ago. Most of his original management team is still at Tandem.

TO:

Jim Treybig
Bob Marshall
Dave Rynne
Jerry Peterson
Larry Laurich
Dennis McEvoy
Bob Jolls
Joe Oliver
Ray Villareal
Bill Duhamel
John Kane
Pat Ridgway
Corinne DeBra
Joyce Strand
Tom Waldrop
Leslie Stull
Sally Smith
Glenn LaFrank
Judy Zimbelman
Carolyn Garbarino
Claudia Hudson
Paul Pedersen
Sue Sweeley
Bobbi Blake
Linda Chin

FR:

Jeri Eaton Flinn

RE:

NYSE and TANDEM PRESS CLIPPINGS

Attached are some press clippings, resulting from interviews conducted last week. More should appear in near future. In addition to what you see here, interviews were conducted with UPI, Reuters, PC Week, Industry Week, Information Week, the Peninsula Times Tribune and a few others. (We've also had a very preliminary discussion with Business Week.) Channel 7, the ABC affiliate, covered Tandem's involvement with the exchanges and our earnings, as did KCBS radio.

I think it has been a great team effort, resulting in some nice coverage for Tandem.

10F2

BUSINESS TECHNOLOGY

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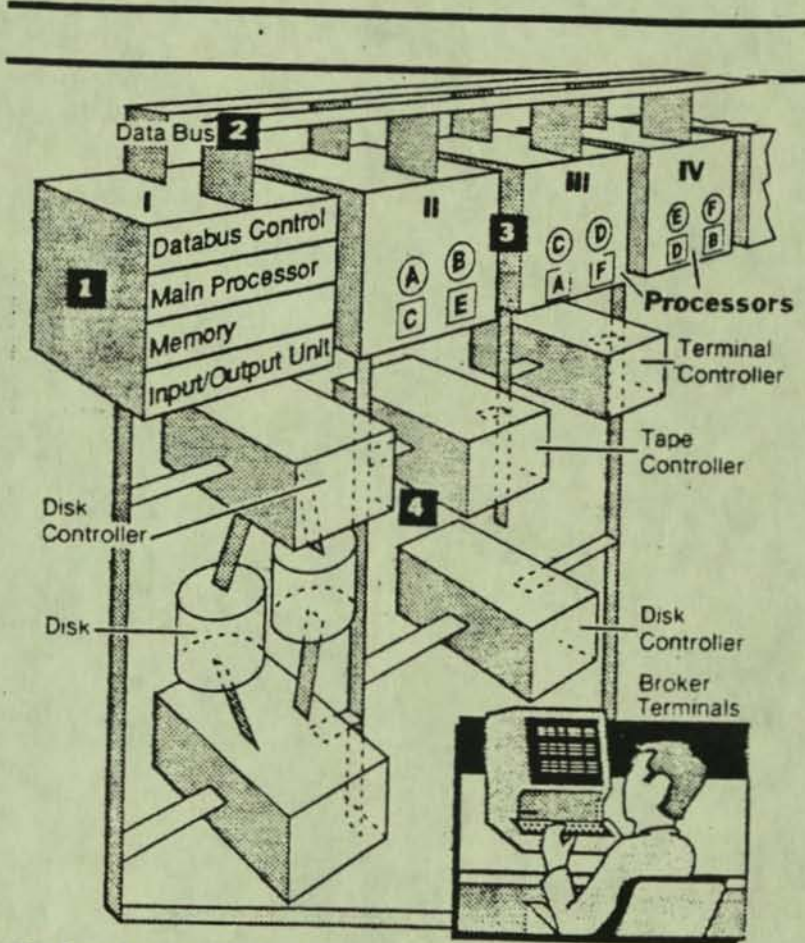
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"Our computers have kept the stock market's system from failing since 1978, and it's nice to have people finally recognize that," said Robert Jolls, Tandem's director of industry marketing. "I just wish we had a fault-tolerant stock price."



Redundancy Helps Computers At Stock Exchanges Stay On Line

- 1** Processors each have their own memory and software. A fault in I doesn't stop II, or any other.
- 2** Two data buses connect each processor to the network.
- 3** Processors store and update work of neighbors. Thus, processor II maintains record of work by III on deal C and IV on deal E while working on A and B.
- 4** Duplicated peripherals, such as disk files and terminal controllers, are each linked to more than one processor.

Big Challenge For Computers

When the market plunged last week, commentators pointed out that the New York Stock Exchange's ticker was running hours behind. The implication was that the exchange's computers could not keep up with the volume. But the real problem, the exchange said yesterday, is that investors can not read fast enough.

"We sped the ticker up a long time ago, and someone made the mistake of calling it the high-speed ticker," said Charles McQuade, president of the Securities Industry Automation Corporation. The ticker shows 900 characters a minute. If it went faster, the Big Board says, nobody could read it.

Traders rarely watch the ticker; they watch computer screens that show the last trade for any stock. "That's instantaneous," Mr. McQuade said. "In our worst moments, that rarely fell behind."

Mr. McQuade's comments came during a rare briefing in the S.I.A.C. computer center, a room in downtown Manhattan full of Tandem fault-tolerant computers. In the form of whizzing electronics, 75 to 85 percent of trades on the New York Stock Exchange and the American Stock Exchange course through the computer center.

Apparently the center was opened to alleviate fears that its equipment was overtaxed. Mr. McQuade said the system had encountered no severe difficulties since the day the Dow industrials fell 508 points and disk drives, printers and the processors themselves were taxed to the limit by 1.6 million transactions. "We saw peak rates of 86 messages a second," Mr. McQuade said. The system, he estimated, can handle 95 a second. He added:

"People are getting used to handling the volume now. But we are always looking to see if we are overloading things."

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NYTIMES

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Limits Set on Program Trades

By DAVID E. SANGER

The New York Stock Exchange placed sharp restrictions on program trading yesterday, in the first major regulatory effort to curb the explosion in computer-assisted buying and selling that many believe accelerated the market's drop on Monday.

Stock market officials insisted that they acted solely to avoid overloading the exchange's swamped computer system, which was stretched to the limit again yesterday by a trading volume of 606.1 million shares, topping Monday's record of 604.8 million.

But many Wall Street professionals speculated that the exchange's motives were as much political as practical and that the move was intended to quell the market's volatility and restore investor confidence. Some predicted that it was a prelude to a total ban on the practice.

Temporary Halt in Chicago

Separately, the Chicago Mercantile Exchange yesterday temporarily halted trading of Standard & Poor's 500 stock index options and futures, key elements in most program trading strategies that use stock-index arbitrage. The New York Futures Exchange also briefly suspended trading.

At the New York Stock Exchange, officials said that the restrictions on program trading would not become permanent.

"It's possible that they will be eliminated tomorrow, or possibly in two days," Robert J. Birnbaum, the exchange's president, said at midday.

But after the market closed, John J. Phelan Jr., the chairman, predicted that "we are going to continue to get volatility for some time to come," a comment that many interpreted as meaning the restrictions may be prolonged.

Most Techniques Allowed

Mr. Phelan stressed that brokerage firms are free to continue to use most program-trading techniques, which typically involve taking advantage of discrepancies in prices between stock-index futures and the underlying stocks.

But they are barred from automatically executing those trades through the high-speed computer-to-computer links that connect brokerage houses to the floor of the exchange. As a practical matter, the speed and efficiency of those links are essential to making stock-index arbitrage work on a large scale. Thus a ban on executing the trades through the exchange's computer system forced many program traders to stand down yesterday.

"It didn't really harm us, it just eliminated some opportunities to make money," said Elliot K. Wolk, managing director and head of index arbitrage at Bear, Stearns & Company. "But it's worth leaving a few dollars on the table if the exchange believes that will help the market."

Other traders, however, charged that the exchange and the Securities and Exchange Commission were seeking a convenient explanation for Monday's unprecedented decline, and they found it in program trading.

"It wraps everything up in a nice package, and it's politically expedient," said Robert N. Gordon, president of the Twenty-First Securities Corporation, which has executed about \$50 million in program trades this year. "And because program

traders cannot honestly say they had nothing to do with the sell-off, we are vulnerable."

Exactly how much of Monday's decline — or yesterday's partial recovery — can be attributed to program trading is a matter of considerable debate.

Those who believe that such trading accelerates market volatility — by automatically sensing opportunities in the price discrepancies between two markets, Chicago and New York — said that Monday's collapse was a prime example. While any kind of large trading can move stock prices, they say, programs that "kicked in" during the deluge worsened the situation because they involved large baskets of stocks, worth hundreds of millions of dollars. As each sell program was tripped, it triggered two or three additional programs.

On the other hand, some experts argued that program trading had little to do with the plunge. Accurate market data ran so far behind actual trading, they said, that the programs were basically useless.

"The big opportunities were really last Friday," said Mr. Gordon. "And today everyone has shot their bullets."

Trading in Futures Index

Nonetheless, there was active trading yesterday in the Standard & Poor's 500 stock futures index, which program traders frequently buy or sell while taking an opposite position in the actual stocks on which the index is based. At one point in the late morning, trading in the index was suspended for 50 minutes because many of the underlying stocks — in-

cluding heavily weighted issues like the International Business Machines Corporation — were not trading in New York as a result of order imbalances.

If the exchange intended yesterday to relieve the burden on its overworked computer system — never intended to handle the magnitude of trading seen over the last two days — it largely failed in that effort.

On Monday, with no program trading restrictions in effect, the system handled about 600,000 transactions, nearly three times its proven limit. Richard E. Leyh, executive vice president of the Securities Industry Automation Corporation, said that yesterday "we did another 100,000 or so," bringing the total number of transactions — each involving from one to thousands of shares — to 700,000.

Despite the increased load, computer operators ran into far fewer problems than they did as the market fell on Monday.

"We were able to pace ourselves better," Mr. Leyh said, noting that orders were not sent to the floor so fast that they overwhelmed the card printers that send instructions to specialists and traders. Still, the computer that stores limit orders — to buy or sell a stock at a specific price — ran out of memory and stopped taking new orders at 3:30 P.M., a half-hour before the market closed.

"Tandem is wheeling some additional disk drives in here tonight," said Mr. Leyh, referring to the company that manufactures the exchange's 200 "fault-tolerant" computers. "We should have them up and running by the opening."

ZOFZ

ration reportedly will lift further the trade sanctions further levied last April after Tokyo failed to conduct an agreement. [34.]

Columns

Number of employers are cutting their payments to labor organizations. Business and Health. [30.]

Investors in Wall Street are selling actively, after conking money into the bull market. Market Place. [36.]

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Remember Financial District

OWAN

Some of the big stock exchanges in the Financial District, it was said to be a day of memories for

panic rippling reflected in the streets as investors stopped to inquire into the stony-faced rumors had he exhausted employees' orderly trad-

for Jacee de of the yesterday at eclipsed the sweat

30 years," a bonium set was assassinated anything could be a But this is and fear.

er for the

Lasher Group, expressed similar thoughts. "The declines we're seeing are unbelievable," he said. "I've lost a sizable amount of money, and others have had losses that have left them speechless. This is the most staggering thing I've seen. My guess is that many investors will wipe their noses and disappear from the market for some time, maybe years."

Normally calm offices needed lessons in crowd control. Investors lined up outside the Fidelity Investments office in Boston to redeem their shares, and passers-by stood in front of Fidelity Investments' Park Avenue investors center in midtown Manhattan with their faces pressed against the glass even though there was nothing to see. The branch's ticker tape had been broken for several days and the electronic bulletin board that had been flashing market quotes jammed at 1:56 p.m.

Mood Mostly Grim

Outside the branch, the mood of the crowd was grim — with the exception of one fellow who was trying to suppress a broad smile.

"I'm glad," said Joseph Jaegar, an assistant vice president of finance at L'Oréal Cosmetics, "because I got out of the stock market. I have my money in a money fund." Calling him-

Continued on Page 49

just beginning. Many are kicking themselves that they did not do so, but most are not tempted to sell now and suffer huge losses.

"I'm not selling anything," said Richard Feeney, who was rushing to catch a train at Grand Central Terminal in New York. "The only way for people to stop something like this is to stop the panic and hold their stock."

But many investors did just that last week, and they now feel that the faith they showed in the market has been betrayed. For them, the joy of

Continued on Page 50

Computers Strained By Deluge

By DAVID E. SANGER

The computers and communications links that bind the nation's stock markets strained — and in some cases cracked — under a deluge of trading that computer designers did not expect until the early 1990's.

At brokerage firms across the country yesterday, some traders saw their flickering green screens covered with question marks, while others watched helplessly as their terminals fell blank or hopelessly behind as more than 600 million shares were traded on the New York Stock Exchange.

The Pacific Stock Exchange, overloaded by volume, closed early and appeared unlikely to release its closing prices before this morning. Its chairman, Maurice Mann, blamed "inhuman machines and inexperienced humans" for the selloff.

'It Was a Rugged Day'

The American Stock Exchange narrowly averted disaster in the last five minutes of trading, when the disk drives that record trades on the exchange's computers ran out of space for more data.

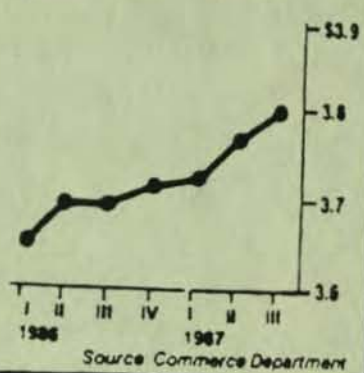
At the New York Stock Exchange, computer engineers watched in amazement while the system largely kept up with a volume of trading that it was never designed to handle.

"It was a rugged day and we were a little bruised, but we did it," said Richard E. Leyh, executive vice president of the Securities Industry Automation Corporation, which runs hundreds of computers that are the electronic backbone of the market.

What tripped up the New York

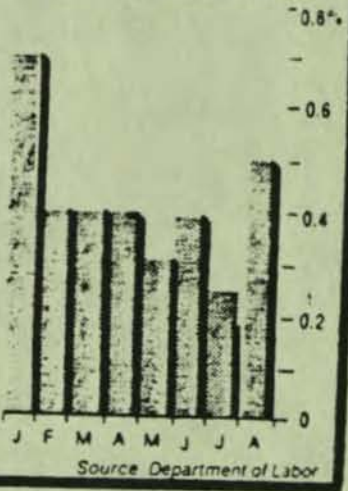
Continued on Page 50

Seasonally adjusted by quarter.



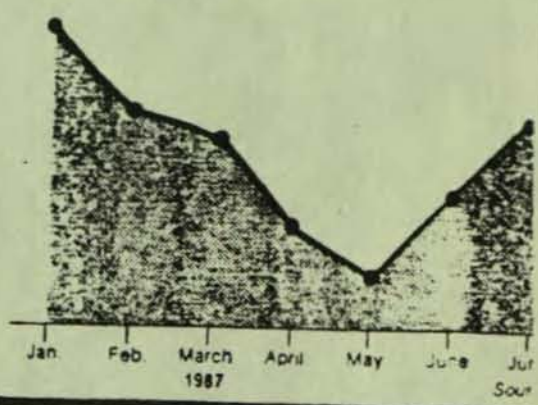
Inflation Picks Up...

Changes in consumer prices, seasonally adjusted. Percent change from previous month



While the Dollar Stumbles

Index of the weighted average of the dollar against 10 industrial countries. March 1973=100.

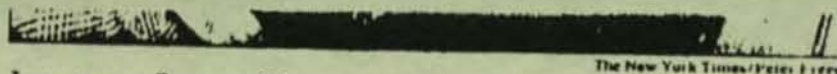


As a result of the bull market, many pension funds had become "overfunded" and some companies were able to skim the excess off the top and include that amount in their profits.

Although most pension funds are guaranteed by the Federal Government, the labor movement is concerned about the drop in their values because the companies contributing to them will be less profitable.

Labor Official Comments

"Overfunding gives labor bargaining room to seek more," said Henry Schechter, deputy director of the department of economic research at the American Federation of Labor and



The New York Times/Peter F. Reed

Investors at Spencer-Winston, a discount brokerage in Manhattan.

Congress of Industrial Organizations. But the greatest fear by far is the psychological effect the stock market's plunge might exact.

"We've been expecting a trigger mechanism that was going to scare consumers into pulling in their spending horns to produce the next recession, and this could do it," said A. Gary Shilling, who heads his own New York economic consulting firm.

If stock prices remain at or below their closing levels of yesterday, "it

will undoubtedly lead to a recession because it depletes confidence," said Irwin L. Kellner, chief economist for the Manufacturers Hanover Trust Company. "People who own stocks are obviously less wealthy than before."

Benjamin E. Friedman, professor of economics at Harvard University fears that the plunge in stock values may extend to similar declines in other assets that have risen sharply in value, particularly housing.

Deluge Strains Market's Computers

Continued From First Business Page

Stock Exchange throughout the day was not its advanced technology but some of its oldest: the card printers that spit out buy and sell orders on the floor of the exchange. At times the printers ran more than an hour behind, and the exchange was unable to guarantee that any trade made after 3 P.M. yesterday could be executed by the time the market closed.

For a market system that has come to depend entirely on the wonders of "real-time" technology, it was a day to test the limits of the computer industry's inventions.

'Useless Garbage'

At Gruntal & Company, for example, traders were forced to basically ignore all the prices that flashed up on their screens. "Useless garbage," concluded Jack A. Barbanel, the firm's director of futures trading. "The delays played havoc with us for most of the day. In a market like this, being even a minute out of date can be deadly. And we could not rely on the computers." As a result, Gruntal's traders kept an open telephone line with the floor of the exchange.

Other traders said that because everyone's pricing data were so far

behind, they found themselves at little competitive disadvantage in executing orders. "Our quotes turned out to be pretty accurate," said Gordon Smith, the managing director of listed trading at Alex. Brown & Company in Baltimore.

At the market's close, the screen in front of Mr. Smith showed the Dow Jones industrial average down 178 points. The Dow actually fell 508 points, according to preliminary figures. "I have no idea why that happened," he said.

Those who watched the New York Stock Exchange tape, a listing of all transactions that harkens back to ticker machines, found it of little use. When the market closed at 4 P.M., the tape was more than two hours behind.

A Miracle on Wall Street

At the Boston Stock Exchange, which just installed a new computer system, William G. Morton, the chairman, complained of difficulties in communicating with the New York Stock Exchange. "We just couldn't get a response on whether trades were executed," Mr. Smith said.

In New York, it seemed like a miracle that the Big Board's computers kept working at all. The system is

A Cutback in Spending

"When people see a selloff like this, they tend to panic even if they don't own stock," said Paul Getman, director of United States financial services for the WEFA Group, an economics consulting firm in Philadelphia. "My 55-year-old mother called me twice today to ask if we're going into a depression, and she doesn't own a share."

The stock market's decline, Mr. Getman said, has reduced his mother's confidence and will cause a retrenchment in her spending. "That insures that bad times are ahead," he said.

Businesses will also cut spending

composed of about 200 Tandem "fault-tolerant" minicomputers, each of which monitors others in the network and picks up the the work of any that fails.

For the operators of the exchange's computer system, the important number were not the number of shares traded, but the number of transactions executed — it takes far more computer power to process 10 one-share transactions than one 10,000 share transaction.

The system had never executed more than about 250,000 transactions in a day, though experts guessed yesterday that it handled 500,000 to one million by the end of trading.

Some of the "fault-tolerant" Tandem systems did drop out in mid-trading yesterday, leaving a few trading posts on the floor of the exchange stranded for three to five minutes. But other computers kicked in.

The backup system also worked when the American Stock Exchange overloaded the disk drive that stores trade data, causing another five-minute pause while systems operators frantically rushed to get backup storage without losing any trading information.

new issues of stock will be sensitive, said Mr. Kellner of Manufacturers Hanover. "Product

Does 1980 Economy

Continued From Page 1

Depression

"I think it is safer than asking a question about it," said Kavesh, professor of financial economics at the New York School of Business. "In 1929, we have insurance of bank deposits. We didn't have the Securities and Exchange Commission, you know. We have less knowledge of how the market worked."

Another important difference between today and 1929 is that the Government now takes on more responsibility for macroeconomy and keeping it stable. "All governments, liberal or conservative, have assumed that responsibility, which wasn't the case then," said John Kenneth Galbraith, retired professor of economics at Harvard and author of "The Great Crash."

The Federal Reserve would play an important role if the financial system began to falter. "If necessary, we don't think it will be — the Federal Reserve could provide bank reserves and other things to make sure any loans that are made because of what's happened in the market wouldn't result in a crisis," said Charles L. Schuler, director of the economic studies program at the Brookings Institution.

Following the crash, history suggests the Federal Reserve did the wrong thing and tightened credit, putting further pressure on institutions that had suffered losses.

In general, the Federal Reserve plays a far greater role

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San Francisco Chronicle

Thursday, October 22, 1987

Tandem Pleasing NYSE

By Don Clark

While the Pacific Stock Exchange conceded that it had computer problems, a Cupertino company was crowing about keeping the New York Stock Exchange electronically afloat handling record trading volumes.

Tandem Computer Inc. also celebrated passing the \$1 billion mark in annual sales for the first time.

The company makes specialized "fault-tolerant" computers, which reduce interruptions by using redundant processors that take over if one breaks down.

About 200 Tandem systems handle all buying and selling on the New York exchange.

To meet demand expected by 1989, exchange officials had expanded the current system to be able to handle daily trading volume of 450 million shares, said Ray Villareal, Tandem's security industry marketing manager.

Volume exceeded 600 million shares on Monday.

The Tandem installation was able to cope because it was designed to handle about 90 transactions per second.

Though large trades swelled the total volume of shares exchanged, the frequency of trades

never exceeded about 88 per second, Villareal said.

To make doubly sure the system is adequate, the exchange installed another batch of Tandem disk drives last night, Villareal said.

Tandem's earnings, released yesterday, included a 41 percent gain in fourth quarter net income to \$30.4 million (31¢ a share) compared with \$21.5 million (23¢) in the year-earlier quarter. Sales increased 32 percent to \$291.1 million from \$220.5 million.

For the fiscal year, net income increased 66 percent to \$105.6 million. Sales increased 35 percent to \$1.03 billion.

1 & Poor's 500 stock index will be in the next 10 days. Anyone who sold a contract at its high of \$35,500 and bought it back at the low of 198 later that day would have made \$35,500. The contracts often are worth \$100.

“It makes the 1930s look like a picnic. It will put an end to the trade war rapidly. No one will be rushing to buy a new BMW.”

— Gayla Dobson, manager
Kemper International Fund

IS' SHOCK: Conventioneers at the American Association conclave in Dallas were as nervous as a room full of rockers. They stood four deep to get quotes on a computer terminal at the Merplay booth. The number of emergency messages to the office doubled to 200 Monday from Sunday. Half of them were stock market-related. I'm in line ten deep to phone home to check on my kids. “I called my trust officer. He’s in a state of shock,” says Theodore Thoburn, executive vice president of the National Bank in Jacksonville.

“I’m taking lunch today. That’s all I can do. I hope that the market comes out of this.”

— George Rogers, Wall Street analyst

SEATS: Bottom fishers might want to buy some of the regional stock exchanges. Prices are as hard-hit as traders are forced to sell. The Dow Jones on the Pacific Stock Exchange fell to \$86,000 a week ago. A seat on the Chicago Mercantile Exchange and options market fell to \$111,000 from \$125,000 Friday. Seymour Persky, head of a Chicago firm, tried to buy five seats Monday. “The time has come when there’s blood on the streets,” he said.

David Landis, Marie Morelli, Dan Kadlec, Mark Lewyn, Dennis Cauchon, Kevin Fetterman and Mary Rowland

Computers keep pace with record volume

By John Hillkirk
USA TODAY

Except for a glitch or two, Wall Street's computers handled everything traders threw at them Monday.

“They’ve done a Herculean job,” said Paul Stevens, an executive vice president at the American Stock Exchange. “The strain is as much or more on people than on systems.”

Monday, New York Stock Exchange volume exceeded 804 million shares vs. Friday's record 338.5 million; AMEX volume topped 35 million shares, vs. 23.8 million on Jan. 7, 1986. But exchange officials, who won't reveal the capacity of the computers, didn't seem worried. “Whatever volume we have this afternoon, we can handle it,” said NYSE Vice President Richard Torrezano.

Some members of the National Association of Securities

Dealers experienced computer-related delays in feeding orders into the system, said NASDAQ President Joseph Hardiman. But “our computer is handling the action (222.83 million shares Monday) well.”

Because of the huge volume, the NYSE ticker was running two hours, 10 minutes behind when the market closed. The computer-run ticker — displayed on thousands of screens across the USA — can't flash stock prices and other market indicators faster than observers can read. The exchanges were flooded by an enormous number of sell orders from small investors.

The AMEX and NYSE computers are run by the Security Industries Automation Corp., a jointly owned subsidiary. The system includes IBM mainframes, plus models made by Tandem Computers Inc., Stratus Computer Inc. and others.

Boeing	\$56 1/2
Chrysler	\$12 1/2
Chevron	\$64 1/4
Exxon	\$50 1/2
General Motors	\$32 1/2
IBM	\$175 1/2
Merck	\$22 1/2
AT&T	\$53 1/2
Primerica	\$53 1/2
United Fruit	\$20 1/2
Exxon	\$50 1/2
Walt Disney	\$11 1/2
Alcoa	\$64 1/4
GM	\$34 1/2
GM	\$34 1/2
DuPont	\$11 1/2
IBM	\$175 1/2
Coca-Cola	\$39 1/2
Allied Signal	\$49 1/4
Int'l Paper	\$37 1/2
GM	\$34 1/2
National	\$38 1/2
Eastman Kodak	\$108
Westinghouse	\$75
P&G	\$103 1/2
Goodyear Tire	\$76 1/2

Market historians see parallels

By Anne Kates
USA TODAY

Make that Black Monday, 1987, not 1929. Historians will rewrite the books after Monday's stock market plunge.

The 22.6% drop in the Dow Jones industrial average eclipsed by far the 12.8% drop on Oct. 28, 1929.

Some market historians said you could have seen it coming by looking at a chart of the Dow Jones industrial average from 1921 through 1929.

Other experts see a similarity to the selloff that lopped 28% off the Dow in the spring of 1962.

The basis for comparison: steepness

of the preceding rallies and the abruptness of the declines. Other similarities:

■ In 1929 the dollar was sagging, trade worries aroused protectionist sentiment in Congress, Mexico had a debt crisis and the Federal Reserve Board was tightening credit. But the economy, unlike ours, had been weakening the summer before stocks cracked. The crash of '29 "can't be traced to any single factor," says analyst Ricky Harrington at First Interstate Securities in Charlotte, N.C. The combination led to "a loss of confidence. When it's lost, the structure of the market breaks down."

■ The 1962 selloff came after stock prices climbed — as they had this year

— way above value, suggesting growth but not inflation. Proposed Kennedy prices the chairman month to month in the dis... What can bear plus launched: Dow topped 9, 1966, up it turned out basts in ec

10/21/87

San Jose Mercury

10-22-87

High-technology stocks bounce back

By David Sylvester
Mercury News Business Writer

High-technology stocks recovered some of the value Wednesday that they lost early in the week.

But investors, still shaken by the earlier chaos in Over-the-Counter stocks, were choosy. They invested mostly in larger, more secure high-tech companies.

Apple Computer Inc. of Cupertino, battered earlier in the week, gained \$6 a share

Wednesday to close at \$40.50 a share. Genentech, a South San Francisco biotechnology company, rose \$6.25 to \$37.50. And Microsoft Corp., a Redmond, Wash., software firm, jumped \$8.63 to \$56.63.

An index of technology growth stocks maintained by Hambrecht & Quist Inc., a San Francisco investment firm, soared nearly 12 percent to close Wednesday at 516.85. That was just above its close after the Monday crash but still 18 percent lower than last Friday.

"We're in for a continued period of up and down," said Jeffry Canin, a technology analyst at Hambrecht & Quist of San Francisco. "What the market does today doesn't mean it will do the same tomorrow."

Some technology companies were lifted by strong earnings announcements. Tandem Computers Inc., a Cupertino company that makes "fault-tolerant" computers, reported soaring profits and sales Wednesday. Its stock rose \$3.38 a share to close at \$25.38 in

trading on the New York Stock Exchange.)

Right now, Tandem's computers are busy. One of Tandem's biggest customers is the New York Stock Exchange, where the machines are used to handle the flood of stock orders.

Several technology companies recovered only a portion of their Tuesday losses. Chips and Technologies Inc. of Milpitas, which lost \$3.25 on Tuesday, gained \$2.75 a share Wednesday to \$18.75.

Power tools

Brokers asked to curb computer trading

By G. Pascal Zachary
Mercury News Business Writer

Powerful computers and sophisticated programs have given Wall Street traders the tools to turn the stock market topsy-turvy.

Those tools are so powerful, moving multibillion-dollar blocks of stock with automatic and almost instantaneous electronic reflexes, that alarmed stock market officials pulled the plug

Tuesday.

The New York Stock Exchange asked brokerages to restrict the use of program trading, a technique that has received much of the blame for Monday's market crash and the sudden, wild swings in the Dow Jones industrial average over the past week.

See COMPUTERS, Page 14A

Computer trading fed crash

COMPUTERS, from Page 1A

Separately, the Chicago Mercantile Exchange temporarily halted the trading of Standard & Poor's 500 stock index options and futures, a key element in most program trading strategies.

And even as harried stock exchange managers were trying to curb the computer-driven fluctuations in the market, they were moving to buy more equipment from Cupertino-based Tandem Computers Inc. to keep up with trading that has escalated to 600 million shares a day.

Monday's "crash wasn't a computer-created phenomenon," said Pavan Sahgal, editor-in-chief of the Wall Street Computer Review, a New York publication. "Computers simply allowed people to give vent to their hysteria."

John Phelan, chairman of the New York Stock Exchange, blamed program trading for much of Monday's 508-point collapse in the Dow. "This will put an end to those esoteric studies people have done saying the markets are not more volatile today than they used to be," he said.

Program trading enables traders to make a profit from minute discrepancies between the prices of individual stocks and futures contracts tied to those stocks.

The idea is to turn a profit equal to the momentary differences in price between the stocks and the futures contracts. This is done by simultaneously selling one and buying the other. The price changes are so rapid and complex that investors use computer programs to tell them when to give the appropriate buy and sell orders, which typically hit the exchange floor in multibillion-dollar waves.

Phelan said the stock exchange

‘Computers simply allowed people to give vent to their hysteria.’

— Pavan Sahgal,
computer publication
editor

request to curb program trading would remain in force today "and until the volatility calms down."

Nonetheless, some experts argued that program trading had little to do with the plunge. Accurate market data ran so far behind actual trading, they said, that the programs were basically useless.

Program trading is only one way, albeit the most controversial, in which computers have come to dominate the stock market's workings over the past five years.

Computerized automation has linked stockbrokers and exchanges around the world. That has created enormous efficiency and made traders much more dependent on technology.

"We depend on our computers more than our phones," said one San Jose broker. "Without a computer, we don't exist."

In today's high-volume markets, computers do everything from recording millions of individual trades to executing orders.

Stock exchanges, which provide the machinery to conduct trading, have a huge appetite for computer power. In the wake of Monday and Tuesday's record trading volume, the New York Stock Exchange decided to increase the amount of

memory and processors in its system, which just last week it thought would carry the exchange until 1989.

That will mean increased business for Tandem, which provides "fault-tolerant" computers to the New York Stock Exchange and 27 others around the world. Those computers record every stock transaction as it occurs. Fault-tolerant systems are designed with redundant processors so that the flow of transactions won't be interrupted in the event that one breaks down.

Away from the trading room floor, more conventional computers provide traders with countless "what if" scenarios to assist them in making buy or sell decisions.

Computers also enable investment professionals to quickly obtain useful data. On Tuesday, Ralph Shaw, a Portland, Ore., money manager, wanted to know which companies had the most cash in their corporate coffers on a per-share basis. With so much cash, these firms might still be a good buy, Shaw figured.

To find the information, Shaw turned to stock market data bases and in minutes had a list of 12 companies bulging with cash.

"For me, computers aren't a decision-making tool," says Shaw, "but they are excellent data base tools."

Wall Street didn't always have a love affair with computers. In the early 1970s, for instance, when the Over-the-Counter market went electronic, "there was tremendous resistance," Sahgal said. "It wasn't until the introduction of the IBM PC that computers really caught on."

Mercury News wire services contributed to this report.

San Jose Mercury
10-21-87

San Jose Mercury News
10/20/87

Black Monday: The Crash of '87

Trading deluge strains computers

New York Times

NEW YORK — The computers and communications links that bind the nation's stock markets strained — and in some cases cracked — under a deluge of trading that computer designers did not expect until the early 1990s.

At brokerage firms across the country on Monday, some traders saw their flickering green screens covered with question marks, while others watched helplessly as their terminals fell blank or hopelessly behind as more than 600 million shares were traded on the New York Stock Exchange.

The Pacific Stock Exchange, overloaded by volume, closed early and appeared unlikely to release its closing prices before Tuesday morning. Its chairman, Maurice Mann, blamed "inhuman machines and inexperienced humans" for the sell-off.

The American Stock Exchange narrowly averted disaster in the last five minutes of trading, when the disk drives that record trades on the exchange's computers ran out of space for more data.

At the New York Stock Exchange, computer engineers watched in amazement while the system largely kept up with a volume of trading that it was never designed to handle.

"It was a rugged day and we were a little bruised, but we did it," said Richard E. Leyh,

executive vice president of the Securities Industry Automation Corp., which runs hundreds of computers that are the electronic backbone of the market.

What tripped up the New York Stock Exchange throughout the day was not its advanced technology but some of its oldest: the card printers that spit out buy and sell orders on the floor of the exchange. At times the printers ran more than an hour behind, and the exchange was unable to guarantee that any trade made after 3 p.m. Monday could be executed by the time the market closed.

For a market system that has come to depend entirely on the wonders of technology, it was a day to test the limits of the computer industry's inventions.

At Gruntal & Co., for example, traders were forced to basically ignore all the prices that flashed up on their screens. "Useless garbage," concluded Jack A. Barbanel, the firm's director of futures trading. "The delays played havoc with us for most of the day. In a market like this, being even a minute out of date can be deadly. And we could not rely on the computers." Gruntal's traders kept an open telephone line with the floor of the exchange.

Other traders said that because everyone's pricing data were so far behind, they found themselves

at little competitive disadvantage in executing orders. "Our quotes turned out to be pretty accurate," said Gordon Smith, the managing director of listed trading at Alex. Brown & Co., in Baltimore.

At the market's close, the screen in front of Smith showed the Dow Jones industrial average down 178 points. The Dow actually fell 508 points, according to preliminary figures. "I have no idea why that happened," he said.

Those who watched the New York Stock Exchange tape, a listing of all transactions that harkens back to ticker machines, found it of little use. When the market closed at 4 p.m., the tape was more than two hours behind.

At the Boston Stock Exchange, which just installed a new computer system, William G. Morton, the chairman, complained of difficulties in communicating with the New York Stock Exchange. "We just couldn't get a response on whether trades were executed," Smith said.

In New York, it seemed like a miracle that the Big Board's computers kept working at all. The system is composed of about 200 Tandem "fault-tolerant" minicomputers, each of which monitors others in the network and picks up the work of any that fails.

Systems get a breather

The stock exchanges closed two hours early Friday and will do so Monday and Tuesday as well, according to Richard Leyh, executive vice-president and chief administrative officer of Securities Industry Automation Corp. (SIAC).

SIAC will work this weekend to clear operations. "The system can handle the load, but the people are getting a little weary," Leyh said.

SIAC has already added Tandem Computers, Inc. processors to the almost 200 processors that keep the system running and plans to add more, according to Leyh.

STANLEY GIBSON

OCTOBER 26, 1987

Network loads soar while stocks plunge

BY KATHY CHIN LEONG
CW STAFF

Wall Street investors were not the only ones thrown into a panic when the stock market plunged 508 points last Monday. Across the nation, managers of voice and data networks at stock exchanges and financial service companies scrambled to ensure that their computers would pass the acid test.

Most systems held up amazingly well under the unprecedented barrage of trading activity, according to users.

The public obsession with in-

levels we thought wouldn't come until the 1990s," remarked Dick Levine, vice-president of information services at Dow Jones News Retrieval Service.

Vendors of on-line stock quote services were faced with difficult decisions when the level of computer traffic skyrocketed to astronomic proportions.

Sweating it out

Tony Cronin, president of Wang Financial Information Services, was sweating it out when, at 10 a.m., he made the decision to separate the two backup Tandem Computers, Inc. machines

at the data processing center and use them with the other five Tandem Non-stop systems. "I knew it was risky, but it was a gut decision that I felt I had to make," he said.

New York-based Wang Financial, which has an installed base of 2,200 terminals nationwide at customer sites, provides current stock trading quotes to brokerage houses such as Merrill Lynch & Co., Shearson Lehman Brothers, Inc. and E. F. Hutton & Co. Cronin was lucky.

Competitor Quotron Systems, Inc., a Los Angeles service that boasts of holding more than 65% of the stock quotation market, survived the day virtually unscathed. According to George Levine, Quotron vice-president of marketing, the Quotron 800 and 1000 minis based in New York are already capable of handling 600-million-share days.

There were concerns at Chicago-based PC Quote when its Securities Industry Automation Corp. (SIAC) computers fell behind. The SIAC computers

maintain information on equity exchanges for the Dow Jones industrial index, for instance.

"When those computers fell behind, we did too," noted David George, PC Quote executive vice-president. "When you see data suddenly stopping on the terminal, you wonder who dropped out." Unlike other stock quote services, PC Quote does not use large systems. Data from the exchanges is transmitted via 9.6K bit/sec. lines to 10 IBM Personal Computers at the Chicago site. From there, infor-



AP/WIDE WORLD PHOTOS

Traders on the floor of the New York Stock Exchange stare at monitors as the Dow Jones industrial average took its sharpest loss in history.

formation triggered the overload. "People acted crazy because they wanted to know what their net worth was, and they couldn't find out because the [voice and data] lines were busy," one communications manager observed. "It seemed as though everyone on Wall Street picked up their phones at the same time. People's desire for information that day was insatiable."

For commercial computer systems that support the stock exchanges, Black Monday was a

Computer -
World

10/26/87

Stock crash thrashes CPUs, operators

BY JEAN S. BOZMAN
CW STAFF

As stock exchanges throughout the country struggled to cope with record volumes of shares traded last week, computer operators fought exhaustion, hunger and glitches to keep pace

After the fall

• Network managers scramble; slowdown could crimp rebounding computer industry; MIS ponders impact. Pages 144, 145.

with the work load. Tickers ran one to two hours late and confirmation orders were missing in action for 24 hours or more — but most stock exchange CPUs kept on running.

The fundamental problem was that with computers straining under the burden of processing hundreds of millions of shares, their I/O devices simply could not keep up. Stock exchange MIS managers agreed that there was insufficient space in the output queues and insufficient capacity in aging front-end processors. These factors combined to make stock tickers maddeningly slow — and output to brokers' terminals wildly inaccurate.

The frenzied trading pace prompted the New York and American Stock Exchanges to halt trading two hours earlier than usual from last Friday through tomorrow to give all affected companies time to process and execute the enormous volume of transactions.

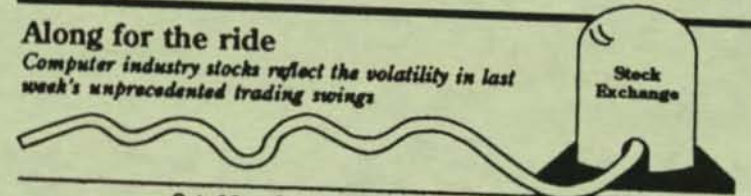
It was often people, not com-

puters, who could not cope with the increase in volumes at the regional exchanges. In Boston, last Monday's volume doubled to five million shares; in California, the

Pacific Stock Exchange volume on Monday jumped from 10 million shares to more than 17 million shares; and in New York, the volume on Monday was 1.7 billion shares. *Continued on page 145*

Along for the ride

Computer industry stocks reflect the volatility in last week's unprecedented trading swings



	Oct. 16	Oct. 19	Oct. 20	Oct. 21	Oct. 22	Oct. 23
IBM	135	103-1/4	115	122-3/4	120	120-3/4
DEC	172-1/4	130	134-1/4	144-7/8	133-1/2	127
Microsoft	64-1/2	45-1/4	48	56-5/8	53-1/4	48
Lotus	32-1/4	26-1/4	26-1/4	30	26-1/4	24-3/4
Apple	48-1/4	36-1/2	34-1/2	40-3/4	36-3/4	35-1/4
Compaq	62-1/4	49-1/4	50	55-1/2	52	49-1/2
Unisys	38	30-1/2	32	33-5/8	29-7/8	30-1/4
Computer Associates	28-1/4	21-1/4	20	26-1/8	22-7/8	21-3/4
AT&T	30	25-3/8	27-1/2	29-1/2	28-3/4	28-7/8

CW CHART: MITCHELL J. HAYES

Stock crash

FROM PAGE 1

York, a record volume of 608 million shares on Tuesday overshadowed normal levels of 200 million, for which the system was designed.

Wrinkle in time

"In many cases, the information that stockbrokers wanted simply did not exist," said Dan McGuire, corporate manager of systems and programming at the Midwest Stock Exchange. "The specialists on the floor did not have time to react to the overflow of information, and the prices they saw on-screen in many cases did not reflect reality because of the delays in the systems." Floor traders at some exchanges had to resort to manual record keeping as systems lagged behind.

Most exchanges had to reprogram the size of their output files

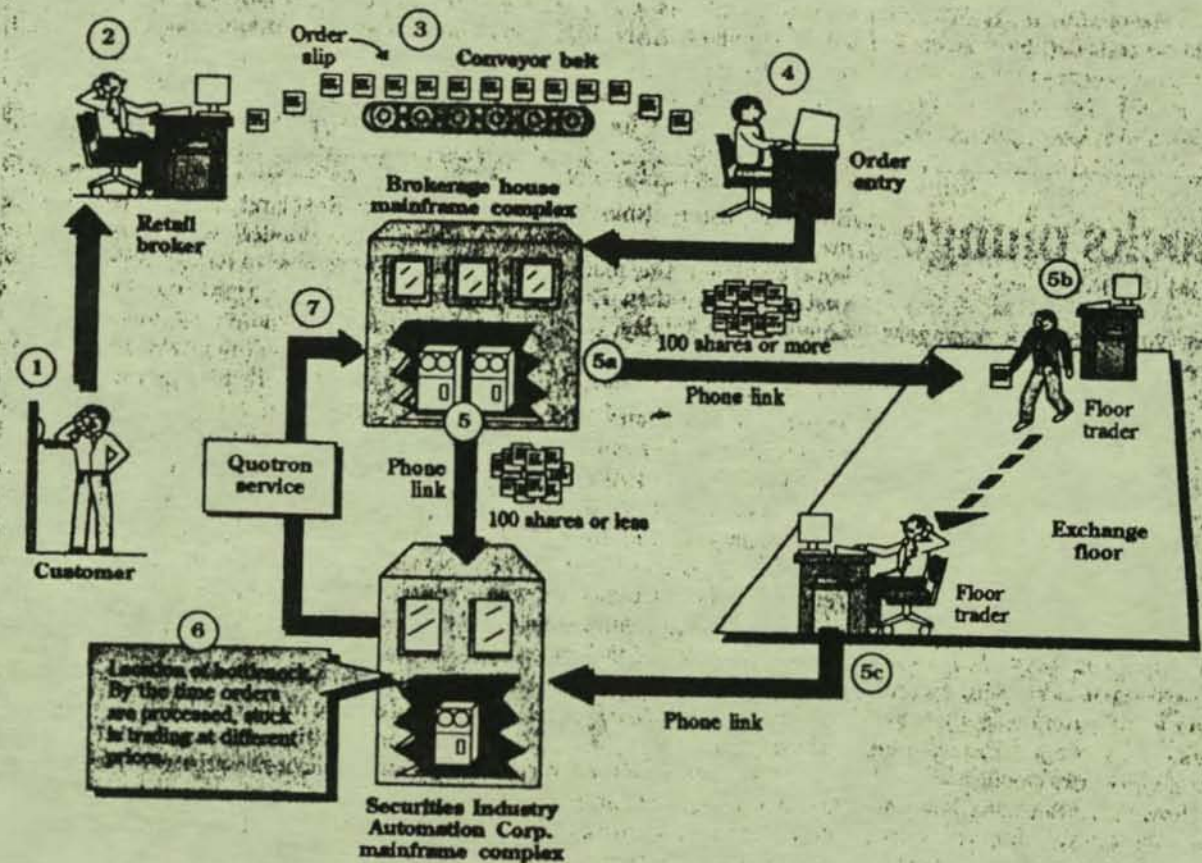
to contain the data. Often, reprogramming was done on the fly, between trading sessions. At most exchanges, however, order clearing stretched into the early morning hours.

From New York to Chicago to San Francisco, stock exchange computers ran uncomfortably close to their limits. "The computer systems creaked a little bit at 95% of capacity, but they kept running," reported Bob Andrews, senior vice-president of the Boston Stock Exchange, which runs three Stratus Computer, Inc. systems. The Midwest Stock Exchange's twin Digital Equipment Corp. VAX 8650s and the Philadelphia Stock Exchange's three IBM System/88s also kept running.

In many cases, MIS managers said, it was the I/O devices and the people that could not cope with record-high transaction volumes.

Anatomy of a trade

In typical New York Stock Exchange transactions, small orders go directly to exchange computers, while larger orders first go to the trading floor



"The computers held up pretty well," said W.

H. Anderson, chief information officer and senior vice-president of Prudential-Bache Securities, Inc. in New York. "The hard parts were when you had orders that did not match, phones that were not answered and a workday that did not end until 1 a.m."

The new workday began just six hours later, at 7 a.m. The Midwest Stock Exchange's McGuire said, "We were glued to our control room day and night. We ate so much pizza that I never want to see another slice again."

Breakdowns were, indeed, reported. At the close of the high-pressure week, New York's Securities Industry Automation Corp. (SIAC) announced that it would close trading at 2 p.m. —

two hours early — on Friday and today to process backlogged orders for the NYSE and Amex.

The troubles at SIAC began Monday, when several of its 200 Tandem Computers, Inc. processors halted during the market surges. But the Tandem system's fault-tolerant design allowed SIAC systems operators to extract the incomplete transactions from backup processors, according to Jim Squyres, vice-president of SIAC. "We did something we did not think would be possible," he said. "Files might have overloaded, and the tickers ran late, but we were handling up to one [million] to two million computer transactions per second."

Upgrades to many systems

were already planned when last week's stock deluge hit. The Pacific Stock Exchange's 8-year-old Scorex trading system, designed to handle 25,000 transactions per day, was handling 40,000, according to John Parady, president of the exchange's Data Processing, Inc. subsidiary. Two months after arriving at the exchange, Parady was in the process of upgrading the system, a project planned for completion more than a year from now. "I was anticipating the problem," he said. "Now, I'm tuning systems on the fly."

20/20 hindsight

In view of last week's activity, each exchange is reexamining its capacity planning.

Some exchanges just could not wait until this week to install new machines. At the Midwest Stock Exchange, several new Tandem processors were snapped into place within existing Tandem cabinets. Two new disk drives were wheeled in Wednesday night.

The experience of last week, said Prudential-Bache's Anderson, was something akin to marching into battle.

"It is kind of like going to war," he said. "Now that we've been there at levels of 600 million shares or more traded in New York, we're never going to be unprepared again. Now, we're going to decide what kind of armaments we'll need for the next time."

► N.Y. STOCK EXCHANGE

Trading system's ups, downs

BY JOSH GONZE

Staff Writer

NEW YORK — The computer and communications systems used to support the New York Stock Exchange withstood the strain of record trading volumes set in the frenzied stock market last week, although computers used by investment houses were blamed for accelerating the market's drop last Monday.

A spokesman for Securities Industry Automation Corp. (SIAC), the data processing subsidiary of the New York and American Stock Exchanges, disputed reports that the computers supporting the exchange lagged behind trading.

A record volume of

stocks, 604.8 million shares, traded hands on Monday, and another record number, 608.1 million shares, was traded on Tuesday. More than 600,000 separate transactions were made on both days.

A two-hour transaction-processing time lag widely reported in the news last week existed only on ticker tape machines deliberately slowed to allow reading by the human eye, according to SIAC Vice-President James Squires. "For Wall Street, the system as a whole worked very, very well," Squires said.

At least part of Monday's market bedlam has been attributed to computer trading, the prac-

tice common to large institutional investors of programming computers, who use it to buy or sell stocks at a predetermined price.

SIAC, located a few blocks from the exchange, has roughly 200 Tandem Computers, Inc. NonStop and TXP fault-tolerant processors.

Those processors handle four fundamental applications, Squires explained. They electronically route orders from brokers to the exchange floor, operate the ticker tape machines, run a data base used by the two exchanges to monitor illegal trading practices and electronically clear and settle transactions for all stock exchanges in the U.S. □

SMALL COMPUTER SYSTEMS

File: **Companies**
C-906-594.1
Date: **October 28, 1987**

Title: **Tandem's Five-Year Strategy and Outlook**

Summary: **Rather than continue to defend its OLTP position, Tandem is taking the offensive by positioning itself to become a major mainstream midrange systems player by the end of the decade.**

Key Issue:

Can Tandem implement a broader strategy so as to become a leading midrange systems supplier?

It took Tandem two years longer than it originally planned to reach the \$1 billion revenue level it reported in its fourth fiscal quarter (see Figure 1). Tandem again is devising an ambitious plan, setting sights on the next milestones of \$5 billion and \$10 billion. We believe Tandem is soundly investing in the future and by the end of the decade will move into the ranks of a top-tier midrange systems vendor behind IBM and DEC. We are encouraged by the strategies Tandem is implementing.

Figure 1

Tandem Financial Results - FY 87
(\$M)

	Total	4Q87	3Q87	2Q87	1Q87	1986
Revenues	1035.5	291.1	264.0	242.4	238.0	767.8
Net income	105.6	30.4	25.6	22.4	27.1	63.8

The major cornerstones in Tandem's plans toward a broader customer and revenue base are: 1) developing the best functional and performing online transaction processing platform in the midrange and high end; 2) diminishing association with special fault-tolerant markets and attaching greater importance to new mission-critical applications; 3) broadening beyond proprietary platforms to include Unix, Pick, SQL, and de facto communications standards such as SNA, OSI, DECnet and TCP/IP; 4) reaching into organizations to the departmental systems level; 5) emphasizing network management, capacity planning and operatorless remote site control (a future Research Note will address this issue).

Nearly all of the above strategies required difficult corporate decisions because they represent non-routine departures from Tandem's traditional approach. For example, the CLX, announced in April, was the first Guardian-based system that could be configured without fault tolerance. The LXN, announced at the same time, was the first Unix-based system without fault tolerance or an OLTP platform (Altos 68020 relabeled system) designed to help Tandem sell to end-user departments. These systems should be viewed as a nucleus on which Tandem will build future strategies.

The CLX, which will begin shipping in volume in January 1988, will extend Tandem's reach to remote site processing. Tandem has strong potential to add many more nodes to its existing networks, where it already



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generates 85 percent of its revenues. As its product and networking strength improves, Tandem should penetrate new application areas in large corporate 100 accounts such as the shop floor, branch banking, insurance agents and department store retail operations.

Tandem has "depopulated" the CLX to a minimum base configuration of one processor, a smaller disk storage form factor using 5-1/4-inch disk drives and office-level power and cooling requirements. Consequently, it will cut entry-level pricing further (now in the \$50,000-\$100,000 range) while maintaining upward software compatibility. Users should beware that the EXT 10, the previous low end, will be affected as CLX performance improves and overlaps the EXT line. Tandem will artificially attempt to differentiate the systems on configurability and capacity.

Tandem's Unix strategy still is diffuse and requires further clarification. Only 5 percent of Tandem's business comes from the government (compared to 32 percent from financial -- see Figure II), while Unisys has enjoyed significant success with the Arete system. Unix is also becoming a more significant force in manufacturing where Tandem has been surprisingly successful (21 percent of revenues). Equally important, all of the regional holding companies have installed Tandem systems and are fertile ground for Unix deliverables. Even in the brokerage business, Unix is getting a closer look because of Sun's and Apollo's high-performance, multitasking workstations.

We believe Tandem wants to field an array of Unix systems to broaden market coverage. We also believe Tandem is developing limited fault-tolerance features for the LXN. But Unix OLTP is technically no match for Guardian's capability. Tandem must be cautious about an OLTP Unix strategy, keeping the focus on departmental data capture and office automation while avoiding technical transaction processing hurdles.

On balance, Tandem appears in excellent position to gain further inroads into the transaction marketplace. The strategies (see Figure III) being implemented now will have strong payoffs in two to three years. For the past two years, Tandem has steered its sales force toward general-purpose OLTP. Its nearest competitors in the midrange still lack Tandem's expertise. By 1990, Tandem will be a mainstream player to reckon with.

Figure II

Tandem's Industry Market Coverage

- Banking (incl. brokerage and insurance) - 32%
- Manufacturing (auto., aerospace, elect., food, drug) - 21%
- Telecommunications - 12%
- Transportation - 6%
- Retail - 5%
- Government - 5%
- Service and other - 19%

Figure III

Tandem's Competitive Edge Over Stratus and IBM

- Wider performance range
- Better positioning at the low end
- Improved network management
- Superior, higher-performance relational DBMS
- Superior third-party applications program
- Movement to industry-standard platforms
- More financial leverage and critical mass
- Heterogeneous connectivity strategy
- Expanded market strategy (Pick, Unix, etc.)

Cover Story

AMERICA'S MOST COMPETITIVE COMPANIES

In essence, business hasn't changed since the days of Adam Smith. Success still consists of using capital and labor to carry out a process more efficiently than the competition. BUSINESS WEEK'S editors have used that standard in determining the most competitive companies in America.

Beginning with the BUSINESS WEEK 1000—the nation's publicly owned companies with the highest market values—the editors measured efficiency in using labor. They took sales per employee from 1982 through 1986 and adjusted the numbers for inflation to get a rough equivalent of a company's volume of output per worker.

The ability to use labor profitably was measured by examining inflation-adjust-

ed operating income per employee, where available. The editors also compared each company's sales and profits per employee with those of the other companies in the BW 1000 industry groups. That provided a list of the companies in the top tier of each industry in terms of labor productivity and improvement in productivity over the past five years. The list was narrowed further by selecting the companies with a 1986 return on equity at least equal to the 11% earned by the BW 1000 as a group.

In arriving at the final list, the editors studied the trends in the variables to be sure that a company's results are at, or near, its most efficient year in the five-year period. Where a company has shown dramatic results from progress in

less than five years, the company has been included in the list and the figures footnoted. Some BW 1000 companies with insufficient data to establish a trend were eliminated.

The screening process was rigorous, but no tougher than the conditions that have buffeted the companies over the past five years. Those years included a recession, sharp swings in the dollar and inflation, and a wave of acquisitions and restructuring.

Some of the listed companies are just a notch below the top tier but are showing strong progress. Others are still among the most efficient in their industry but have slipped just a tad. Together, they're the most competitive companies in America.

THE TOP TIER

COMPANY	SALES MILLIONS OF DOLLARS	INDEX RELATIVE TO INDUSTRY		PERCENT CHANGE IN SALES/EMPLOYEE		PERCENT CHANGE IN OPER. INC./EMPL.		RETURN ON EQUITY		PROJECTED EARNINGS CHANGE BY PERCENT	
		SALES	PROFITS	1981-86	1985-86	1981-86	1985-86	1981	1986	1987	1988
AGENCY RENT-A-CAR	161.1	128	592	-1.1 ⁴	12.3	2.0 ²	6.9 ²	24.5	21.8	23.1	23.5
ALCO STEELMAKING	4314.5	267	113	10.2	23.7	4.7	8.0	18.9	16.3	9.4	22.6
AMERSON - MESCO	7677.2	203	198	8.1 ⁴	2.5	7.8 ⁴	12.8	18.0	21.3	18.5	16.8
APPLE COMPUTER	2196.6	334	393	17.0	-25.1	9.8	40.4	22.2	18.9	28.9	37.5
ARMSTRONG WORLD	1920.3	106	118	5.4	7.6	18.6	22.4	7.9	15.2	19.7	10.9
ASHTRON - TATI	210.8	124	106	9.9 ³	36.1	15.6 ³	42.6 ³	109.9	24.6	29.5	19.2
BAHNS & LOMB	696.9	100	225	7.9	9.4	6.6	0.5	19.8	15.2	12.6	15.1
BOSTON - BYERS	4835.9	151	141	0.4	9.2	4.7	17.5	20.0	20.8	15.6	16.0
CRS	4646.3	230	121	8.3	37.4	7.5	15.3	15.3	20.4	-2.9	30.1
CIRCUIT CITY STORES	1010.7	190	213	0.8	-0.6	20.5	25.9	9.6	23.6	40.7	30.9
CLARIBOND (LIZ)	813.5	407	935	0.9	6.5	2.0	2.3	38.0	34.8	32.8	25.8
CLOROX	1101.5	144	270	6.0	1.1	15.0	4.7	15.2	17.2	8.8	15.7
COCA-COLA	8668.5	234	364	4.0	1.2	6.5	17.0	19.7	26.6	26.0	15.4
COMPAQ COMPUTER	625.2	280	279	14.7 ³	3.3	70.4 ³	37.1	NA	23.4	83.8	18.9
CONNING GLASS WORKS	1856.3	90	135	4.7	5.6	26.6	18.8	10.1	12.0	7.8	13.8
CRAY RESEARCH	596.7	147	446	6.9	22.8	11.0	26.0	19.1	26.9	21.3	18.5
CROWN CORN & SEAL	1618.9	114	128	4.5	9.7	6.4	11.4	11.4	13.8	16.7	13.7
DEAN FOODS	1434.6	225	140	1.6	11.9	7.7	17.8	20.9	18.1	37.1	19.2
DIGITAL EQUIPMENT	8896.0	95	155	8.5	16.8	10.2	73	13.1	15.9	77.0	27.4
DUNN (WALIT)	2896.1	88	185	17.4	17.2	26.3	31.6	10.4	21.5	53.6	16.7
DOW CHEMICAL	11113.0	147	206	2.2	1.0	10.8	111.4	11.5	14.3	42.9	16.4
DOW JONES	1134.9	145	301	-0.5	4.9	1.5	4.3	26.5	25.2	11.7	21.6
FIRST BANK SYSTEM	2930.2	160	169	7.3	14.5	14.6 ²	19.3 ²	11.4	14.9	-60.6	232.3
FORD MOTOR	62715.8	123	175	8.9 ²	11.4	27.1 ²	39.3	Loss	22.1	36.4	-8.1

LIST CONTINUED ON PAGE 98

Cover Story

THE TOP TIER

COMPANY	SALES MILLIONS OF DOLLARS	INDEX RELATIVE TO INDUSTRY		PERCENT CHANGE IN SALES/EMPLOYEE		PERCENT CHANGE IN OPER. INC./EMPL.		RETURN ON EQUITY		PROJECTED EARNINGS CHANGE IN PERCENT	
		SALES	PROFITS	1981-86	1985-86	1981-86	1985-86	1981	1986	86-87	87-88
BAJ	753.8	120	270	-0.9 ³	5.2	61.8 ²	32.0	Loss	13.4	32.4	27.2
GEORGIA-PACIFIC	7223.0	137	117	6.0	1.2	10.7	31.5	1.9	12.6	42.2	14.3
BARTFORD NATIONAL	1025.9	84	142	4.6	20.1	29.8 ²	37.1 ²	14.8	15.4	6.5	15.1
BRIZ (IL. I.)	4639.5	92	153	2.2	4.4	7.8	5.7	18.7	24.3	15.7	13.4
INTRILAKI	736.0	115	349	5.9	8.5	10.8	82.4	13.0	12.3	20.7	18.1
KAPLAN & BROAD	1137.7	223	143	16.9	22.5	66.0 ²	43.4 ²	6.5	14.3	20.6	16.3
KELLOGG	3340.7	183	404	8.3	10.0	12.5	11.9	25.4	35.5	21.7	18.0
KRAFT	8742.2	162	167	5.6	23.4	7.4	15.6	12.8	21.7	27.7	17.4
LIMITED	3142.7	89	207	3.6	-23.5	9.7	-7.9	26.9	29.2	38.7	35.0
LOWE'S	8221.0	102	140	11.8	21.7	13.9	13.8	19.0	18.7	26.1	20.2
MARION LABORATORIES	528.0	147	179	11.9	30.7	37.0	59.5	11.7	29.7	69.0	73.4
MERCK	4128.9	127	184	1.4	14.9	6.1	22.4	19.9	26.3	31.2	21.0
3M	8602.0	128	200	6.1	12.3	4.2	20.4	19.5	17.5	16.1	12.6
MORGAN (J. P.)	6671.7	250	498	-6.5	-3.1	14.1 ²	17.4 ²	14.5	17.7	-79.4	476.5
DUKILL	438.8	154	277	4.4	3.9	9.2	2.9	19.9	20.8	15.7	23.3
PPG INDUSTRIES	4687.1	157	182	5.0	8.7	12.5	11.7	13.0	16.0	13.2	11.8
PRICE	2648.6	461	330	15.4	8.3	14.8	-3.4	43.2	19.5	20.0	3.4
QUAKER OATS	4190.0	119	130	4.0	12.9	5.3	20.5	16.4	21.1	8.3	35.3
RAYTSON	7307.9	119	142	3.1	9.2	2.1	7.2	21.1	20.1	18.1	16.3
ROBERTS-LAID	795.2	159	241	3.3	3.4	6.8	6.5	16.5	19.5	22.5	16.8
SQUBS	1784.6	100	131	3.1	19.9	22.7	72.6	4.1	19.4	70.7	24.2
TARGEM COMPUTERS	767.8	132	159	9.1	16.2	1.9	99.9	18.3	16.4	49.9	32.3
TOTS 'N' US	2444.9	145	291	6.8	22.7	8.4	30.4	23.8	16.9	33.0	31.9
VULCAN MATERIALS	957.8	152	185	1.0	1.0	2.4	18.6	19.3	18.4	25.5	8.5
WASHINGTON POST	1215.1	190	172	-0.4	-0.4	16.3	8.3	15.3	22.9	29.0	21.9
WESTINGHOUSE ELECTRIC	10731.0	112	155	4.9	5.4	11.6	23.0	15.5	22.4	17.3	10.9
WISLEY (WHL) JR	699.0	121	215	2.2	12.7	9.8	30.6	11.6	18.4	22.5	10.9

COMING ON STRONG

FEDERAL PAPER BOARD	948.6	122	90	4.5	20.9	7.2	75.1	20.3	10.2	84.3	36.4
GOODRICH (R. F.)	2553.3	250	80	16.5	75.4	31.5	154.2	8.0	1.5	3747.4	39.9
GULF & WESTERN	2093.8	177	476	21.0	4.0	30.8	97.7	13.6	12.0	50.6	12.8
BOEING (CO. A.)	1960.2	313	144	9.7	50.3	14.7	6.7	12.0	11.5	11.2	34.4
K INDUSTRIES	4222.4	121	Loss	4.1	5.7	6.6	29.4	10.5	Loss	462.0	21.9
HIGSON-L-RAND	2799.5	108	281	12.4	22.1	5.0	35.1	15.2	9.2	6.5	32.9
INLAND STEEL INDUSTRIES	3173.2	109	NM	6.3	16.1	21.3	452.1	4.4	2.8	951.3	40.8
KEMPER CARE	292.8	22	133	5.7 ²	14.7	2.9 ²	3.7	17.6	14.0	68.7	39.7
OWENS CORNING FIBERGLAS	3644.4	120	8	4.2	31.8	26.2	78.0	6.4	1	527.7	8.7
STYVENS (J. P.)	1671.9	110	77	5.1	16.7	18.9	34.3	Loss	10.7	10.5	22.3
UNION PACIFIC	6574.0	131	NM	4.1 ⁴	NM	19.3 ⁴	NM	13.3	Loss	20.5	20.3

STRONG, BUT SLIPPING

CHRYSLER	22586.3	148	248	6.9 ⁴	2.3	86.9 ⁴	-11.3	Loss	26.3	-5.1	12.7
EXXON	68888.0	173	355	3.7	99.4	12.0	91.8	19.5	16.7	-11.7	10.1
GENERAL ELECTRIC	35211.0	120	188	5.0	3.8	4.4	-13.1	18.1	16.5	16.9	15.0
HASBRO	1344.7	197	305	19.0	-4.0	34.1	-16.5	16.1	17.3	12.5	16.5
IBM	51250.0	125	170	6.4	1.3	0.2	-30.8	19.0	14.5	14.7	22.5
INCO	755.2	134	NM	3.9	-10.1	4.8	-27.7	16.4	12.1	15.4	10.2
PK 'N' SHIP	303.3	128	592	3.5	-2.5	3.9	-13.9	24.5	21.8	33.6	32.6
REPUBLIC NEW YORK	1407.1	268	432	-0.8	7.2	11.4 ²	15.4 ²	21.4	14.6	-69.6	273.5

(1) Negative net worth

(2) Net income

(3) Most recent three years

(4) Most recent four years

NA=Not available

NM=Not measurable. Loss in prior period or loss for industry group.

NOTES: Use of labor relative to the industry is sales and profits per employee as a percent of the industry average. For companies with fiscal years ending in June-November, 1986 numbers are for the most recent 12-month period.

DATA: BY, STANDARD & POOR'S COMPUSTAT SERVICES, BRIDGE INFORMATION SYSTEMS INC.

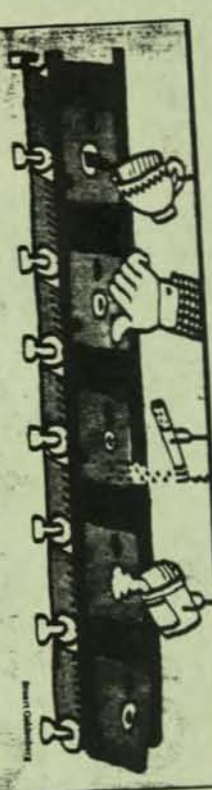
BUSINESS TECHNOLOGY

How the Exchanges' Computers Got By

By CALVIN SIMS

LAST week's frenzied activity in the nation's stock markets has focused new attention on the computers that processed and recorded the hundreds of thousands of transactions each day on the New York Stock Exchange and the American Stock Exchange.

There are many ways to measure the sophistication of computer systems, but those deployed on Wall Street. An advanced system, for example, can be especially speedy or efficient in the way it handles inquiries. The kind of sophistication that is most important to the electronic markets is the speed with which the computers can process information. The computers have been designed with redundant programs and components so that glitches and faults that popped up during the flood of orders resulted in a shift to a different processing path rather than a breakdown.



Computer-Driven Innovations In Goo

Floor covering companies often throw messy jobs here and there to advertise the stain resistance of new products. Delinquent makers frequently show off by dabbing, dropping or dirt on clothing. But when the Verbatim Corporation recently introduced a new Teflon-coated floppy disk for computers, a corporate American purchased the depths of quick Verbatim, an Eastman Kodak subsidiary, said its new disk, a recording surface and coating offered unprecedented protection against stains.

In readying its product for market, Verbatim's testing team in Sunnyvale, Calif., covered disks with foods ranging from peaches to peanut butter. It doused them with diverse beverages and motor oil. It scrubbed them with model airplane glue, nail polish, and cleaners, scrawled on them with felt pens and lipsticks, and took scores of fingerprints.

The breakthrough, though, came when Verbatim invented a new erasing agent — Carlson Koo goo. Named after the chemical engineer who developed it, Koo goo is a mixture of indole, linalol (a lily acid) and eugenol (a tarry oil) that is warmed and shocked with a dash of Ultrax 450. The goo simulates the most common hazards to disk data — fingerprints. When applied by a mechanical device that Verbatim built, Koo goo gave the company a scientific test of file, disk, and its competitors.

“Our fingerprints were just too variable,” said Marilyn Weisheit, who oversaw the testing. “We needed a standardized substance that could be applied in a consistent way.”

BARBARA J. FEEDER

The monocomputers that run the two exchanges were manufactured by Tandem Computers Inc., the leading manufacturer of 41-bit parallel computers widely used for operations, data processing and for operations. The number of transactions that have to be processed while custom orders are connected to the system. Other important applications include electronic banking and airline reservations.

About 28 stock and futures exchanges around the world use Tandem computers, including the Chicago Board of Trade, the New York Mercantile Exchange and Nasdaq, over-the-counter trading system as well as exchanges in Hong Kong and New Zealand. Major brokerage firms that use the computers include Nomura Securities, Inc. of Japan, the First Interstate Bancorp, the Alameda Group Inc., Merrill Lynch

and Company and Cowi & Company. Analysts estimate that computer companies sold \$20 billion worth of computers for transaction processing applications, including the fault-tolerant machines accounts for a little over \$1 billion, or 5 percent, of the market. It is the fastest-growing part. Analysts expect it to grow by 15 to 20 percent in the next five years.

Tandem's computer systems start at about \$50,000 and can cost as much as several million dollars. The processors in the New York Stock Exchange's trading system cost up to 900 stars a second. The exchange plans to install soon Tandem's newest product, the Nematos VLX, which will process 1,200 transactions a second.

Before Tandem's Nematos was introduced in 1975, most users also needed fault-tolerant computers. The reason was that the system was so expensive that it was not worth the risk of a crash. Tandem has one major competitor in this market, Stratus Computer Inc. of Marlboro, Mass. Stratus uses a somewhat different redundancy

strategy. It has two pairs of processors to perform each task. If there is a problem, the processors in a pair do not agree on the answer to a problem and both shut down, allowing another pair to take over.

This so-called lock-step architecture runs as well as Tandem does in terms of hardware gain protection, offer the same for B.M., which has been most of its fault-tolerant machines. But most industry analysts prefer the Tandem approach.

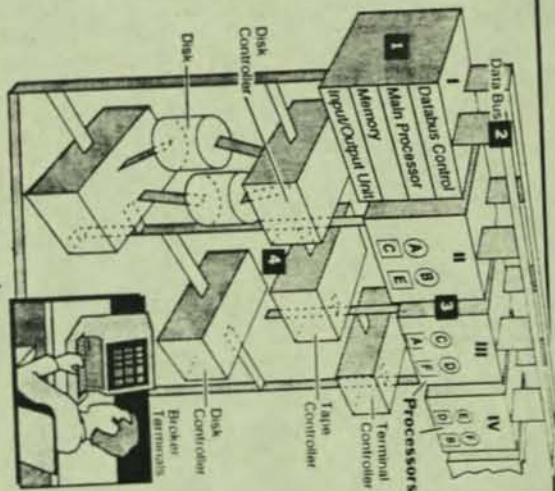
“A processing system that is not fully redundant in terms of hardware and software is more open to the possibility of failure,” says the Gartner Group, an analyst research firm in Stamford, Conn.

Stratus at work, Tandem reported that it earned \$105.6 million on revenues of \$104 billion for its 1987 fiscal year, which ended Sept. 30. Stratus reported net income of \$112.3 million in revenue for the first nine months. Tandem's machines were also in the spotlight last week for withstanding the heavy trading, its stock did not escape unscathed. During Oct. 19's collapse, Tandem's shares dropped \$6.50, to \$23.25, on the New York Stock Exchange. They closed yesterday at \$19.75, down 20 percent.

“Our competitors are coming from falling stock prices and it's nice to have people who are not recognizing that,” said Robert Jull, Tandem's director of industry marketing. “Just with us, we had a fault-tolerant disk price.”

At Stock Exchanges Slay On Line

Processors each have their own memory and software. A fault in doesn't stop it, or any other. Two data buses connect each processor to the network. Processors store and update work of neighborhoods. Thus, processor terminals on A and B on data C and IV on data E while working on A and B. Duplicated peripherals, such as disk files and terminal controllers, are each linked to more than one processor.



Advances | John Holusha

Infrared Rays May Improve Night Driving

NIGHT vision systems similar to the military devices used on such missions as tracking the main warship and make driving safer. The device is called an infrared sensor. In the 1960's, only night vision sensors to the driver beyond the range of their headlights to see dangers ahead. Their systems could also peer through rain, fog, snow and smoke better than any human eye.

But heat reflects off their surfaces. But heat pictures are usually good enough to present a general overview. The equipment is sensitive enough to detect temperature differences as little as one-tenth of a degree Centigrade.

“It all depends on the temperature and emissivity of the objects involved,” said Harry A. Barry, an engineer in C.M.'s advanced product engineering group. “Differences in the temperature and emissivities of the objects to form relatively detailed pictures of what is in front of a car driving down a road, the engineer says. “The road, the grass beside the road, the light poles alongside the road are all slightly different when you image.” Mr. Barry said.

G.M.'s night vision system is a long way from being put into use. The main reason is that the driver can't see what is in front of the car. One reason is that the sensor is mounted in a box that is attached to a car's roof. One reason is that the sensor is too expensive to use.

A Rise in No-Fault Systems

CHANGING BUSINESSES FIND NEED FOR 24-HOUR COMPUTERS

■ By Clinton Wilder

IN A WORLD of round-the-clock securities trading and other activities that demand a constant flow of data, a computer that operates continuously without faltering is clearly desirable. As a result, businesses are turning to what is called fault-tolerant computing. Increased interest in fault-tolerant machines is part of the market for on-line transaction processing, which delivers such services as bank withdrawals or airline reservations to the user on demand. The more automated a business becomes, the more transactions it generates that need on-line processing.

Although only two computer manufacturers have really tapped the market potential of fault-tolerant computing, both have exhibited the storybook growth of the proverbial high-tech high flyer.

Tandem Computers of Cupertino, Calif., and Stratus Computer of Marlboro, Mass., are competitors with a lot in common. Although Tandem is older and larger, both companies have grown up fast. Most important, both companies sell a technology that is extremely well suited to computing needs in an increasing number of industries.

In the fault-tolerant technology pioneered by Tandem's Non-Stop computer in the mid-1970s, the computer system contains backup systems in case hardware or software should fail. Before fault tolerance, a large computer user's hedge against downtime often involved time-consuming software re-writing, or buying a second computer as a backup.

Tandem built its successful business selling mainly to banks, retailers, transportation companies, and manufacturers. Founded in 1974, the company has grown at breakneck speed to become

the 12th largest U.S. computer maker in 1986, according to the *Fortune* 500. Most industry analysts estimate that Tandem will pass the milestones of \$1 billion in revenue and \$100 million in profits in its 1987 fiscal year, which ended September 30.

The 1980s saw the emergence of Stratus, a startup company that approached fault tolerance in a new way. Whereas

Hambrecht & Quist, a market-research company that tracks the industry.

In 1985, Stratus signed a landmark agreement in which IBM agreed to resell three Stratus units as the IBM System/88 series. In addition to providing revenue, this agreement has helped boost Stratus' technology in the minds of prospective buyers.

"The System/88 was the real coup for the future of fault-tolerant computers," says Jeffrey Canin, who follows Tandem and Stratus for Hambrecht & Quist. "IBM, despite its claims for its own hardware, clearly showed the interest in that technology, and also signaled that there was no proprietary fault-tolerant design imminent from them."

Although Tandem and Stratus have dominated the market for fault-tolerant systems, newer companies are trying to find a niche. The two market leaders sell mostly to end-users, but Tolerant Systems of San Jose, Calif., sells its Unix-based systems only to other manufacturers for resale. Its customers include France's Groupe Bull, Denmark's RC Computers, and the systems-integration unit of Control Data.

Parallel Computers of Santa Cruz, Calif., has chosen a different route. Late last year, Parallel was acquired by General Automation, a company based in Anaheim, Calif., that sells manufacturing minicomputers. General hopes to use its larger size and distribution network to sell Parallel's systems.

"Most commercial systems will soon be doing on-line transaction processing," says Omri Serlin, a consultant and editor of a newsletter on fault-tolerant computing. "That trend will continue for the foreseeable future." ■

Clinton Wilder is a senior editor and columnist for the computer-industry section of Computerworld.



Tandem systems were built around proprietary Tandem hardware and operating-system software, Stratus used commercially available microprocessor chips from Motorola and a version of the Unix operating system developed by AT&T.

Using such industry standards, Stratus carved out a big enough chunk of Tandem's market to achieve revenues of \$125 million in 1986. In the first six months of this year, Stratus earned a profit of \$7.6 million on sales of \$80.2 million.

Although its typical growth rates of 50 percent or better have slowed in recent quarters, Stratus remains a highly profitable operation. But its business has not grown at Tandem's expense; the overall market for fault-tolerant systems will grow 25 percent annually over the next five years, according to

TOM LUEWITCH

LEVEL 1 - 3 OF 6 STORIES

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October 13, 1987, Tuesday

DISTRIBUTION: Business Editors

LENGTH: 451 words

HEADLINE: TANDEM/ATALLA; (TDM) Tandem Computers to acquire Atalla Corp.

DATELINE: CUPERTINO, Calif.

BODY:

Tandem Computers Inc. (NYSE:TDM) Tuesday announced it has reached an agreement in principle to acquire ~~Atalla Corp.~~, a privately held San Jose, Calif., company specializing in secure transaction systems for financial and retail markets.

The 15-year old Atalla Corp. is a leader in security system solutions for customer identification, card management, electronic payments, network interchange and computer security. Atalla has more than 1500 customers worldwide and holds numerous patents on its security products. Atalla will operate as a wholly owned subsidiary of Tandem Computers in its present location.

Financial terms of the proposed merger were not disclosed.

In making the announcement, James G. Treybig, president and chief executive officer of Tandem, said, "Tandem and Atalla have complementary product strengths and market strategies, and together we can meet the needs of a wide range of on-line transaction processing users. Security, like fault-tolerance, is required for many OLTP systems users who manage critical business information. "Secure systems are especially important to the banking and retail/point-of-sale industries, where both Tandem and Atalla have a strong presence. Other organizations, such as government agencies and health care providers, are also very concerned with protecting business records," Treybig added.

Dr. John M. Atalla, founder of Atalla Corp., will serve as a vice president at Tandem. Atalla is an internationally recognized expert in solid state electronics and secure electronic banking and business systems. He is named in many patents from his work at Bell Telephone Laboratories, and was a key developer of the industry's first metal oxide semiconductor devices.

He also worked at Hewlett-Packard and Fairchild Camera and Instrument before founding Atalla Corp. in 1972.

Tandem Computers Inc. manufactures and markets computer systems and networks for the on-line transaction processing market. The company has offices worldwide. Headquarters are located at 19333 Vallco Parkway, Cupertino, Calif. 95014. Phone number is 408/725-6000.

Atalla Corp. is a leader in providing secure transaction systems to data processing users worldwide. Atalla has offices in the United States, Canada, South America, Europe, Australia and New Zealand. Company headquarters are

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located at 2304 Zanker Rd., San Jose, Calif. 95131. Phone number is 408/435-8850.

Note: Tandem is a trademark of Tandem Computers Inc.

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LEVEL 1 - 7 OF 8 STORIES

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Network World

October 12, 1987

SECTION: FEATURES; Open Systems: How Open are they?; Pg. 1

LENGTH: 2772 words

HEADLINE: Tandem: Link to IBM now, expand OSI connectivity later

BYLINE: By Paula Musich, Senior Editor

BODY:

Unlike the general-purpose computer vendors highlighted thus far in Network World's Open Systems series, Tandem Computers, Inc. serves a market for a tightly focused application: on-line transaction processing.

Despite this narrow focus, Tandem is actively pursuing a multivendor connectivity strategy. While that strategy currently focuses primarily on IBM systems and X.25 networking, it will eventually include high-level, standards-based links to other systems and nets.

Although Tandem is committed to providing its customers with connectivity to processors from other vendors, as well as to different standards-based networking schemes (see Chart 1 on Page 36), the company definitely does not intend to replace its proprietary networking system, Expand, with a standards-based architecture. Tandem views Expand as an essential extension of the Guardian message-based operating system for its line of NonStop parallel processors (see Figure 1 on Page 37).

"Tandem's intersystem networking architecture is closed and proprietary, but, since we own both ends of the communication, that's OK," says Roger Mathews, Tandem's manager of networking software product management.

"We've integrated that intersystem communications with our operating system, which is a parallel processing architecture that involves multiple processors in the same system," Mathews says. "That's the key to our main benefits -- fault tolerance and modular expandability.

"We use Expand intersystem networking so that a program in a processor in one Tandem system can access programs or data in another system across the network in exactly the same way. That's why people buy us -- because we've integrated our intersystem communications with our basic system process," he explains.

At the same time, however, Tandem recognized that its processors had to connect to a wide variety of terminal devices from different vendors, and it developed a downstream communications architecture that allows its processors to capture transactions from different device types.

This requirement in the on-line transaction processing environment is what is driving Tandem's increasing support of networking standards, including the International Standards Organization's (ISO) Open Systems Interconnect (OSI) protocols. "There are two kinds of capabilities in the network, and in one area we have always used standards and never used our own proprietary standard,"

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Mathews says. "That area is in communications outward from Tandem to the devices that provide the transactions that come into the system."

The two primary standards Tandem supports are IBM's Systems Network Architecture networking protocols and the CCITT/ISO X.25 standard. "Tandem's position is that there are two strategic networking architectures: OSI, for multivendor networking, and SNA," says Andrew Poupart, Tandem's OSI products manager. "We see these architectures coming to dominate the market for corporate business communications through the end of the century."

Connecting to IBM

Of the two architectures, Tandem's product implementation of SNA protocols is more extensive -- a strategy driven by today's market requirements. Mathews says, "We put a tremendous amount of development effort into the SNA environment because there is a tremendous marketplace of SNA systems out there. The OSI area, within five to 10 years, will be on par with SNA in terms of the customer's implementation of that set of standards. In that time frame, we need to be absolutely positioned with a well-proven OSI product set. But we have, more than many other vendors, devoted resources to the SNA marketplace, because that's where the bucks are today and in the near future."

Mike Braude, a corporate vice-president at market research firm Gartner Group, Inc. in Stamford, Conn., calls Tandem's SNA connectivity claim a bit modest. "Tandem has the best connectivity to IBM outside of IBM," he says. "The only requirement that they haven't met yet is for cooperative processing between their machines and IBM's."

Mathews attributes Tandem's extensive implementation of SNA protocols to its need to connect to a wide range of IBM SNA intelligent controllers used by industries such as banking and retail. Others at Tandem, such as Dennis McEvoy, vice-president of software, attribute the company's extensive SNA support to the priorities of Tandem customers, who have asked for IBM links even before they wanted Tandem-to-Tandem links. "Our first communications product, which came out in 1977, implemented an IBM [BSC] access method."

Current SNA connectivity is provided under the SNA Access Services Software (SNAX) product umbrella, which in itself is an access method similar to IBM's Virtual Telecommunications Access Method in SNA. SNAX was first delivered in 1983 and now supports SNA communications for more than 400 customers.

SNAX allows SNA devices to be configured on Tandem systems and allows applications in an SNA network to communicate with applications in Expand networks. The physical connection is provided via SNA/Synchronous Data Link Control lines.

Higher level software products in the SNAX family include SNAX/ High Level Services (HLS), which provides a high-level application program interface for LU 0, 2, 3 and 4. "HLS interfaces to procedures that let you build applications without having to worry about lower layer protocols," explains Tandem user Robin Dennell, software manager for the Mediat insurance network project at British Telecommunications plc in London.

The Mediat network allows agents using personal computers equipped with terminal-emulation software to access information in an IBM 8100 over X.25

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public data networks (PDN). The Tandem TXP processor strips off the SNA protocols coming from the 8100 and sends a 3270 data stream over the X.25 connection. "All of this is invisible to the agents," Dennell says.

Tandem also supports IBM's LU 6.2 peer-to-peer protocol in its SNAX/Advanced Program Communications (APC), which provides an LU 6.2 application program interface. This program does not implement the PU 2.1 protocol, which would add the ability to manage conversations over multiple parallel sessions.

According to Mathews, Tandem decided not to include PU 2.1 support initially in the software because SNAX already had downstream connectivity, thanks to its LU 0 implementation, and because Tandem wanted to allow its customers to begin developing peer-to-peer applications, rather than wait for a full implementation.

Other SNAX software includes Exchange, a remote batch emulation system that allows Tandem systems to operate as remote job entry terminals in an IBM Job Entry System.

At the application level, Tandem offers a bevy of software products dubbed Wordlink, which support IBM's Document Content Architecture (DCA). Tandem's Transfer information delivery software and PS Mail electronic mail products include document translation technology licensed from Soft-Switch, Inc., allowing users with different word processing systems connected to Tandem processors to send revisable-form documents to each other.

On the hardware side, Tandem recently introduced a communications subsystem that provides a direct, high-speed channel attachment between SNA hosts and Tandem systems. Because the link, dubbed SNAXLink, uses standard SNA interfaces, applications don't have to be modified to use the link. Frank Gens, International Data Corp.'s (IDC) vice-president of technology assessment, says he believes that is one of Tandem's strengths. "You don't want the users to have to do any programming to make the communications link. That's where Tandem's done a good job."

Future support for SNA advanced architectures is expected for SNA Distribution Services. "We're working on a gateway implementation as an interface between our PS Mail system for the Expand networking facility and IBM's DISOSS," Mathews says.

PC connections

Much to the surprise of some industry observers, Tandem has also trained its connectivity sights on IBM's family of personal computers as well as the networking protocols intended to allow personal computer applications to communicate.

"Two years ago, I read an article that said the one area where PCs will never really be important is in on-line transaction processing. We absolutely disagree," says Jeri Edwards, Tandem's manager of information management technology products. "We believe in the utilization of the resources that are in the company. The ability of the PC to create an end-user environment that is far more friendly, productive and efficient than a terminal environment is key, we believe, in on-line transaction processing."

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In November of last year, Tandem became one of the first larger system vendors to support IBM's Network Basic I/O System protocol, implemented in a product set called Multilan. The family of hardware and software products allows Tandem NonStop systems to be linked to personal computer networks that support NETBIOS. The Multilan family also includes software that allows Tandem processors to be used as fault-tolerant file servers for personal computers, which can access files using DOS commands.

Multilan user Chip Fox, director of operations planning with Telaction Corp. in Schaumburg, Ill., hopes to make use of Tandem's file server software, although he originally opted to use personal computer-based networking software. "We're pleased enough with Multilan to use it beyond our original plan," Fox says. "It's doing everything that it's supposed to do."

Toward OSI

IDC's Gens says he believes Tandem's strategy of providing extensive IBM connectivity now is a pragmatic one. "Why invest a lot of money and resources into a standard that no one's buying today," he asks. Following that pragmatic bent, however, should soon lead Tandem to shift its emphasis to OSI support, which currently exists only in lower layer products. "We expect 1988 to be a very important year for OSI and for Tandem in OSI development," Tandem's Poupart says.

Existing OSI offerings include X.25 networking products, which have been available since 1979, and an implementation of the OSI transport layer specification, which has been available for more than a year and has a small but committed number of users.

"People say our record is spotty toward open systems, but we've not been all that aggressive in promoting our open systems products. However, we were the second vendor to certify with Telenet Communications Corp. in 1979 for our X.25 networking, which is our most widely distributed communications product next to Expand," Poupart points out.

Tandem's X.25 product, dubbed X.25AM, is now an implementation of the 1980 version of the standard that provides process-to-process communications across an X.25 packet-switched network. Because the 1980 version doesn't completely conform to the OSI network service standard specified by the OSI Transport Protocol, Tandem implemented interim procedures to meet Transport requirements.

Despite the limitations of a 1980 implementation, Fred Lauber, manager of telecommunications system engineering at the On-line Computer Library Center in Dublin, Ohio, says he believes Tandem's implementation is the "best we've seen on a larger system." Compared with implementations from IBM and Convergent Technologies, Inc., Tandem's X.25 product is "easier to work with, handles higher throughput, has the capacity for a significant number of virtual circuits and is easy to configure," he says.

Lauber says he has interfaced Tandem systems to four different X.25 wide-area networks with little trouble on the Tandem side. Those networks included offerings from Tymnet/McDonnell Douglas Network Systems Co., Telenet, CompuServe, Inc. and PSS, a PDN in the UK.

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Tandem plans to upgrade to the 1984 version of the X.25 standard in stages, beginning early next year with the extended addressing feature added to the standard. Poupart says Tandem intends to implement most of the extensions added into the 1984 revision.

Lauber says he is also currently testing Tandem's OSI4AM Transport Protocol implementation for commercial interoperability but says it is too soon to comment on test results. This implementation is bundled with the X.25AM product in one I/O process.

Although it's not yet commercially available, Lauber also has Tandem's OSI session layer protocol implementation in-house, but he has not run the software yet.

Tandem opted to implement four of the five classes of service in the transport protocol, which defines how to provide reliable, end-to-end data delivery across different subnetworks. The four classes -- 1, 2, 3 and 4 -- are for wide-area networks, while the fifth class is designed for local nets. An implementation of the local-area network capabilities of the transport layer should be available in early 1988. "Part of our future product plan is to allow our Expand intersystems networking to run over other physical networks such as Ethernet," Mathews says.

In addition to supporting Ethernet -- or, rather, the IEEE 802.3 standard -- Tandem will also allow its OSI4AM product to operate over IEEE 802.4 networks, intended primarily for factory environments. In allowing its transport product to operate over local net standards, Tandem will "decouple" the product from X.25AM, according to Poupart.

The session layer product referred to by Lauber will likely include support for the X.400 messaging standard. "We feel X.400 will be a major market. We'll be very aggressive there," Poupart says. Currently, X.400 support in Tandem systems is provided by vendors that are a part of Tandem's Alliance program for third-party Tandem developers. The X.400 products include Sydney Development Corp.'s Messenger 400 and Telenet's Telemail 400.

Tandem, which purposely avoided implementing a Manufacturing Automation Protocol 2.1 product set, will also support MAP 3.0. "We watched the marketplace for MAP and saw lots of hyperbole and unrealistic expectations," Poupart explains. "Now there's no demand for the expensive products others developed and rushed to market. MAP 3.0 is the preferred version. We've kept tabs on it to meet the early part of the market window."

Tandem is working on support for other standards, including Transmission Control Protocol/Internet Protocol, which will be supported in the next 12 to 18 months.

"We will have a number of options at the application layer building on an implementation architecture developed for Tandem systems that gives customers the ability to mix and match products at various layers," Poupart says.

Tandem's Alliance program, which was designed to encourage third-party application developers to create on-line transaction processing applications, is also focused on the "application layer." Although the program emphasizes on-line transaction processing applications, it has also yielded a number of

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third-party communications programs that provide access from the Tandem environment to other vendors' systems (see Chart 2 on Page 36). Such links include an Easylink Gateway, a gateway to IBM's Professional Office System (PROFS) and products that connect Tandem to Apple Computer, Inc.'s Macintosh. Tandem licenses software code to third-party vendors that implement Tandem-developed protocols.

Another aspect of Tandem's open systems connectivity strategy is its involvement in standards-making and standards-supporting bodies. Many Tandem employees are currently working on standards committees in ANSI, ISO, Consultative Committee on International Telephony and Telegraphy, Corporation for Open Systems (COS), the National Bureau of Standards, the European Computer Manufacturers Association, the MAP/TOP Users Group and a TCP/IP committee.

That Tandem was one of COS' founding members attests to the firm's OSI commitment. In addition, a Tandem vice-president, Tom Chun, was the first chair on the board of directors for COS. "Tandem's reason for being a COS member is the development of OSI testing capabilities. We fully expect customers will require conformance testing for interoperability. Tandem has already done bilateral testing with some competitors," Poupart says.

"The product set we're going to build in the OSI area is going to be a very complete and modular implementation," Mathews says. "It's going to take us longer to build it that way, but we will very quickly be able to address a tremendous range of OSI connectivity options needed to bring transactions to Tandem."

GRAPHIC: Chart 1, Multivendor connectivity provided by Tandem Computers, Inc., Source: Tandem Computers, Inc., Cupertino, Calif.; Chart 2, Multivendor connectivity provided by third-party vendors, Source: Tandem Computers, Inc., Cupertino, Calif.; Figure 1, Tandem Computers, Inc. networking architectures, Source: Tandem Computers, Inc., Cupertino, Calif.

file SQL

Printed By: DAVID_JANET @MKT
SENT: 87-10-29 15:05
FROM: WEINER_KATHY
TO: DL.ALL_TANDEM @MKT
SUBJECT: 2:GARTNER REPRINT RECALL- INCORRECT
Forward of: 87-10-29 14:51 FROM CLUGAGE_FRANK
Gartner recall message attached

----- ORIGINAL ATTACHMENT -----

SENT: 87-10-29 14:51
FROM: CLUGAGE_FRANK
TO: WEINER_KATHY @MKT
SUBJECT: Gartner recall message attached

----- TEXT ATTACHMENT -----

SENT: 87-10-29 14:51
FROM: CLUGAGE_FRANK
SUBJECT: ERRORS in Gartner Gp reprint on SQL
The April 17th Gartner Group article on NonStop SQL sent to the field the middle of this month contains serious errors. We seemed to have ordered the wrong reprint! Please destroy this reprint! It is numbered P-906-530.1 and is titled - Tandems Non-Stop SQL: A Strategic Shift. The errors contained in an otherwise very favorable article are:

- Performance Benchmarks:
- | | |
|--------|---------------------|
| 8 VLXs | 58 TPS (and not 52) |
| EXT10 | 2 TPS/Processor |
| TXP | 4.5 TPS/Processor |

Paragraph 2:
Data can be partitioned but NOT replicated.
2nd page - 1st paragraph:
Enscribe and SQL can coexist on the same system with no difficulty.
The Convert utility will migrate Enscribe data to SQL (and vice versa), but there is no "utility" to convert Cobol code to SQL.

Because of these inconsistencies, it would be better to throw out the reprint than to try to explain it. Please pass this message on to all analysts and sales reps who you think have this erroneous information.

Regards, Frank
NonStop SQL Product Manager

Title: **Tandem's Five-Year Strategy and Outlook**

Summary: **Rather than continue to defend its OLTP position, Tandem is taking the offensive by positioning itself to become a major mainstream midrange systems player by the end of the decade.**

Key Issue:

Can Tandem implement a broader strategy so as to become a leading midrange systems supplier?

It took Tandem two years longer than it originally planned to reach the \$1 billion revenue level it reported in its fourth fiscal quarter (see Figure 1). Tandem again is devising an ambitious plan, setting sights on the next milestones of \$5 billion and \$10 billion. We believe Tandem is soundly investing in the future and by the end of the decade will move into the ranks of a top-tier midrange systems vendor behind IBM and DEC. We are encouraged by the strategies Tandem is implementing.

Figure 1

Tandem Financial Results - FY 87
(\$M)

	Total	4Q87	3Q87	2Q87	1Q87	1986
Revenue	1035.5	291.1	264.0	242.4	238.0	787.8
Net income	105.6	30.4	25.6	22.4	27.1	63.8

The major cornerstones in Tandem's plans toward a broader customer and revenue base are: 1) developing the best functional and performing online transaction processing platform in the midrange and high end; 2) diminishing association with special fault-tolerant markets and attaching greater importance to new mission-critical applications; 3) broadening beyond proprietary platforms to include Unix, Pick, SQL, and de facto communications standards such as SNA, OSI, DECnet and TCP/IP; 4) reaching into organizations to the departmental systems level; 5) emphasizing network management, capacity planning and operatorless remote site control (a future Research Note will address this issue).

Nearly all of the above strategies required difficult corporate decisions because they represent non-routine departures from Tandem's traditional approach. For example, the CLX, announced in April, was the first Guardian-based system that could be configured without fault tolerance. The LXN, announced at the same time, was the first Unix-based system without fault tolerance or an OLTP platform (Altos 68020 relabeled system) designed to help Tandem sell to end-user departments. These systems should be viewed as a nucleus on which Tandem will build future strategies.

The CLX, which will begin shipping in volume in January 1988, will extend Tandem's reach to remote site processing. Tandem has strong potential to add many more nodes to its existing networks, where it already



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SMALL COMPUTER SYSTEMS

File: **Companies**
C-918-592.1
Date: **October 28, 1987**

Title: **Stratus: In Transition**

Summary: **Stratus has achieved significant inroads into the fault-tolerant market. But the more important issue is whether it can position itself for the general OLTP market and avoid limited growth as a niche vendor.**

Stratus Profile

Number of employees: 1,070
Third-party reseller program: 87
Number of VARs: 28
IBM's share of revenue: 25%
Direct sales: 85%-70%
International sales: 40%

Within the next one to two years, Digital Equipment Corp. will enhance its VAX systems for online transaction processing (OLTP). Tandem is adding high-performance SQL and low-end data capture systems. Unix vendors like Sequent and Pyramid are jostling for position with multiprocessing and third-party relational database systems with enhanced performance (a new Oracle port for Sequent and Sybase on Pyramid). As relational systems increasingly move into OLTP markets, Stratus will incur greater risk as a narrowly focused niche vendor. Its recent lower-than-expected 14 percent revenue growth (see Figure I) may be an early warning. It is not surprising then that Stratus is currently making significant changes in marketing and distribution.

Figure I

Stratus Financials (\$M)

	FY (12/86)	1Q87	2Q87	3Q87
Revenue	\$124.6	37.4	42.7	48.8
Net income	13.5	3.71	3.86	5.28

Whereas Tandem has bolstered its Alliance third-party software program in a variety of industries, and has announced new low-end products (i.e., CLX and LXN), Stratus has encountered difficulties in its own "Star" program and took nearly three years to upgrade its first-generation family. It is now placing renewed emphasis on strategic alliances, in part due to IBM's greater share of Stratus revenues (25 percent of the total in the last quarter). Combined with Olivetti's 10 percent share in Europe, indications are that direct sales of Stratus hardware took a downturn. We anticipated this possibility (see Research Note C-918-505, 3/4/87) due to product transition delays. But further difficulties could arise due to weak distribution channel focus and not enough breadth in market coverage by its direct sales force (see Figure II).

Figure II

Industry Breakdown of Stratus Sales

Brokerage - 27%
Banking - 25%
Manufacturing - 14%
Telecom - 12%
Health Care 7%
Services - 7%
Government - 3%
Retail - 3%
Other - 2%

Although IBM's rising share is of potential concern, we do not anticipate IBM will back away from its relationship with Stratus and announce a competitive alternative in the next two years (the midrange is confusing enough for IBM, and IBM has lacked success in several prior attempts at a midrange OLTP design). There is virtually no difference between Stratus and IBM label systems at the CPU level; however, IBM offers its own disk and tape drives, and its own 600-LPM

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LEVEL 1 - 1 OF 1 STORY

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The Magazine of Bank Administration

October, 1987

SECTION: SYSTEMS AND EQUIPMENT; Pg. 100

LENGTH: 84 words

HEADLINE: Tandem Enhancements for EXT10 and EXT25

BODY:

Tandem Computers Inc. has announced enhancements for its mid-range NonStop EXT10 and EXT25 systems, which address the demand for distributed on-line transaction processing. The new options include a low-cost input/output add-on cabinet, which accommodates 16 additional input/output slots, up to two internal cartridge tape drives and up to four disk drives. A new asynchronous communications option increases to 144 from 96 the number of communications lines a two-processor EXT system can support.

LEVEL 1 - 9 OF 10 STORIES

Proprietary to the United Press International 1987

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October 5, 1987, Monday, BC cycle

SECTION: Financial

DISTRIBUTION: California

LENGTH: 482 words

BYLINE: By BEATRICE MOTAMEDI, UPI Business Writer

DATELINE: SAN FRANCISCO

KEYWORD: Computers

BODY:

Representatives of Tandem Computers Inc. and Digital Equipment Corp. said Monday they see each other as increasingly strong rivals in the burgeoning market for on-line transaction processing systems.

"We've been seeing DEC more and more often," said David Rynne, chief financial officer of Tandem, a Cupertino, Calif.-based manufacturer of fault-proof, multi-user systems used in banking, retailing and manufacturing.

"It's becoming a bigger part of our competitive environment," he said.

Meanwhile, Digital executives on Monday announced an ambitious \$1.4 billion capital spending plan to build and expand DEC manufacturing plants around the country and to upgrade equipment.

The announcement was made during an investment conference sponsored by Montgomery Securities, a San Francisco brokerage. The transaction processing market is "an area (where) Tandem obviously has set the pace," said Mark Steinkrauss, DEC's director of investor relations.

But, he added, DEC is "also quite big, and we have a very strong, quality image as well."

Digital, a Maynard, Mass.-based company known for scientific developments, wants to gain a share of the commercial demand for transaction processing, a rapidly growing market with annual sales estimated at as much as \$35 billion.

Transaction processing systems, highly secure networks capable of hundreds of computations per second, are appearing in an increasing variety of places, from automated teller machines in banks to check-out monitors in grocery stores, as businesses automate more of their routine activities.

"There were 10 million file cabinets delivered this year," said Paul R. Low, an vice president for International Business Machines Corp. "I wouldn't mind having a part of that business."

Tandem's Rynne said he expects sales for the fiscal year ended in September to break the \$1 billion mark for the first time.

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Proprietary to the United Press International, October 5, 1987

Tandem was among the 10 most active companies in over-the-counter trading Monday, closing up \$1.25 to \$36.375 a share on volume of 1.5 million shares. DEC's stock closed up \$5.50 to \$197.75 a share on the New York Stock Exchange.

Analysts were skeptical that Digital will be able to wrest away a significant part of Tandem's sales in the short term.

'We don't focus on DEC yet as a real threat in that marketplace,' said John Jones, an analyst for Montgomery Securities.

Jones said Digital has strong ties in manufacturing, where an increasing number of factories and managers are turning to computers to automate everything from billing to production counts.

But he said Digital's machines are slower than Tandem's, and have not yet approached them in terms of durability or software support.

'DEC is making significant investments in on-line transaction processing, but in our opinion, it will be a number of years before there is an opportunity to create an equality,' Jones said.

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beer and wine license from Maria & Vahid Akbarzadeh

Roberto Amaya
7243 Monterey St., Gilroy 95020
Action: Withdrawal of type 48 license

Michael A. Wayman
13771 Branham Lane, San Jose
Action: Reinstatement of license after automatic revocation

Pommard Corp., John H. Heller, Emily Marshall Heller, d/b/a Pommard Corp.
3163 Middlefield Road, Palo Alto 94306
Action: Stock transfer of off-sale general license

Robin Renee Cameron, d/b/a Hickory Farms
10123 N. Wolfe Road, Cupertino 95014
Action: To be relisted in Salinas District

Chuong B. & Thuy Thu Ha, d/b/a Les Amis
118 E. Santa Clara St., San Jose 95112
Seeking: On-sale beer and wine license for public eating place (premises not now licensed)

Armida Abina, d/b/a La Paisana Restaurant
411 E. Arques Ave., Sunnyvale 94086
Seeking: On-sale beer and wine license for public eating place (premises not now licensed)

Carol R. & Charles R. Marchbank, d/b/a Hickory Farms
10123 N. Wolfe Road, Cupertino 95014
Seeking: Off-sale beer and wine license (premises not now licensed)

Macy's California Inc., d/b/a Macy's Valley Fair
2801 Stevens Creek Road, San Jose 95128
Action: Corporate merger with R.H. Macy Co.

Macy's California Inc., d/b/a Macy's Stanford
300 Stanford Shopping Center, Palo Alto 94304
Action: Corporate merger with R.H. Macy Co.

Macy's California Inc.
2210 Tully Road, San Jose 95112
Action: Corporate merger with R.H. Macy Co.

Macy's California Inc., d/b/a Macy's Valley Fair
5411 Thornwood Dr., San Jose 95123
Action: Corporate merger with R.H. Macy Co.

Macy's California Inc., d/b/a Macy's Sunnyvale
200 W. Washington Ave. (Town Cntr.), Sunnyvale 94086
Action: Corporate merger with R.H. Macy Co.

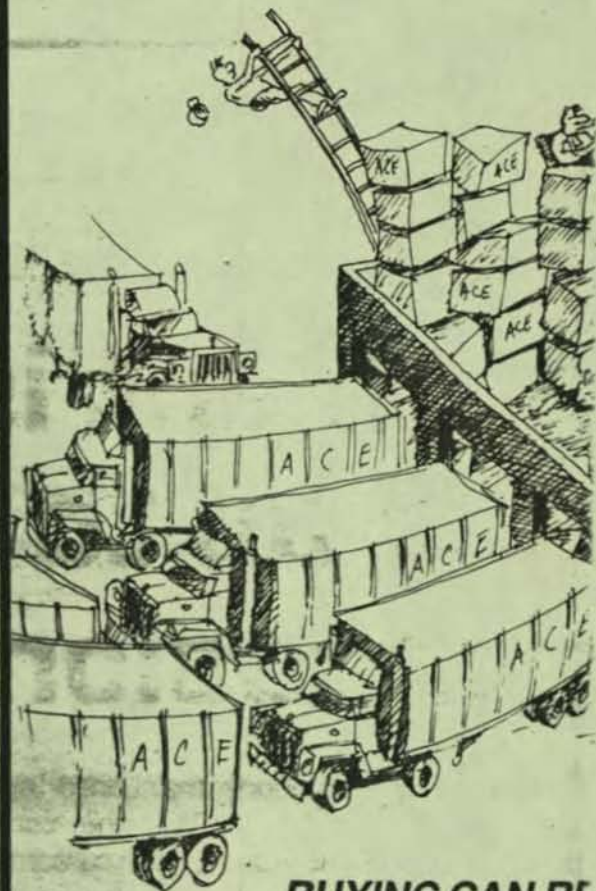
Mergers & Alliances

Tandem Computers Inc. of Cupertino and The Ultimate Corp. of East Hanover, N.J. announced the signing of a value-added reseller agreement under which Ultimate will be the exclusive reseller of Tandem NonStop systems with Ultimate's Pick relational database operating system. Ultimate will package a Tandem NonStop computer system with software, originally developed by Ever-On Corp. of Houston that will enable those systems to run application software packages based on the Pick operating system.

Syntelligence Inc. of Sunnyvale announced a complementary marketing agreement with International Business Machines Corp. of Armonk, N.Y. for finance industries under IBM's industry marketing assistance program. The agreement allows the two companies to employ a team marketing approach that packages the

made by Spectra-Physics in Mountain View.

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San Jose Business Journal
Oct 5, 1987 p 37

LEVEL 1 - 2 OF 6 STORIES

Proprietary to the United Press International 1987

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October 6, 1987, Tuesday, BC cycle

ADVANCED-DATE: October 2, 1987, Friday, BC cycle

SECTION: Standing Feature

LENGTH: 571 words

HEADLINE: Tandem deals in large change as yearly sales approach \$1 billion

BYLINE: By MICHAEL MOLINSKI

DATELINE: CUPERTINO, Calif.

KEYWORD: Bizday

BODY:

Jim Treybig has had six offices in the 13 years since he founded Tandem Computers Inc.

The latest is a modest room at the back of a small building in Cupertino, across the street from the place where his next office is being built.

Change is a way of life at Tandem, which has grown to one of Silicon Valley's largest companies and hopes to break the billion-dollar mark in sales this year.

"I gave my last office away because they needed it for client meetings," Treybig said. "It's a lot different to run a \$1 billion company than a \$10 million company."

Breaking the billion-dollar mark would be a hard-won milestone for Tandem, which has spent the last two years battling back from four years of flat earnings. From 1976 to 1981, Tandem's profits and revenues doubled annually.

"It's very clear, as this company crosses the threshold of the \$1 billion mark, that it is no longer a niche player," said Jeffrey Canin, of Hambrecht & Quist Inc. in San Francisco. "Tandem has built a terrific record of turning over their product line."

Tandem's latest line is a group of high-performance computer workstations based on Intel Corp.'s powerful 80286 and 80386 microprocessor chips.

"Products are good, and reception ... has been very strong," said David Wu of S.G. Warburg and Co. in New York.

Tandem's income for the first nine months of fiscal 1987 rose to 75.1 million, or 77 cents a share, up 78 percent from the \$42.1 million, or 48 cents a share, recored in the same period last year. Nine-month sales rose 36 percent to \$744 million.

Canin projected Tandem's sales at \$1.02 billion for the fiscal year that ended Sept. 30, up 33 percent from 1986.

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Proprietary to the United Press International, October 6, 1987

But even if Tandem breaks the billion-dollar mark, analysts said, it will have little time to rest on its laurels.

'I think they need to continue to have a broad product line, increased price performance and software applications, and they need to keep two steps ahead of Digital Equipment Corp. and International Business Machines Corp.,' Wu said.

Tandem is best known for anti-glitch computer systems that can quickly process crushing loads of data.

Banks, airlines and stock exchanges are among Tandem's customers, but its fault-proof systems, capable of linking dozens of far-flung users, have also won government clients, including the Royal Canadian Mounted Police.

The company is also participating in a project to develop an electronic train control system, aimed at boosting railroad safety and efficiency.

'Our whole society is moving toward systems that tie everything together and run things,' Treybig said. 'Systems are not going to be designed that fail in the year 2000.'

Tandem has also attempted to broaden its reputation for designing unbreakable machines by offering an expanded line of computer programs to support them.

'They've got a broader set of critical application software, and software is going to be more important to Tandem's success than hardware,' Canin said.

'We've grown to a full-function computing company,' said Chris Erickson, Tandem's director of software product management. 'When we were very young, we had a reputation for doing one thing: fault tolerance.'

Unlike other Silicon Valley entrepreneurs, Treybig, a 46-year-old Texan who jogs five miles at lunchtime, remains at the company he founded more than a dozen years ago. Most of his original management team is still at Tandem.

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System workstations come in seven configurations

A series of seven workstations ranges from an 80386-based system with a 70-Mbyte hard disk drive to a low-cost 80286-based diskless workstation for connection to a LAN. All workstations function as either stand-alone units or fully integrated terminals and are designed to connect to the company's Nonstop

and LCN systems.

The 80386-based PSX/300 models are available in two versions: the PSX/370 with a 70-Mbyte disk drive and the PSX/340 with a 40-Mbyte disk drive. Both models feature a 16-MHz 80386 and contain a 5¼-in., 1.2-Mbyte floppy disk drive.

Five models compose the 80286-

based PSX/200 series. At the low-cost end, the diskless PSX/200 and the single floppy PSX/201 serve LAN environments. These units use an 80286 running at 8 MHz and can be easily upgraded. Three hard disk versions are available: the 40-Mbyte PSX/240, the 20-Mbyte PSX/220 and an entry-level 20-Mbyte version, the PSX/220E, which also uses a low-cost 8-MHz 80286 processor. Both the PSX/240 and PSX/220 use 12.5-MHz 80286s. All three hard disk systems include a 5¼-in., 1.2-Mbyte floppy disk drive as well.

Each system offers eight option slots, one of which is used for the plug-in processor. There are six 16-bit slots and two 8-bit slots. The systems also include the MS-DOS 3.2 operating system, GW-Basic 3.2, and host integration software. Additional features include 1 Mbyte of RAM, an enhanced IBM PC AT-style keyboard and a choice of either a monochrome or color 14-in. monitor. The PSX series ranges in price from \$1,195 to \$3,795. The PSX/300 workstations are priced at \$4,895 and \$5,695.

Tandem Computers, 19191 Vallco Pkwy, Location 4-40, Cupertino, CA 95014. **Circle 122**



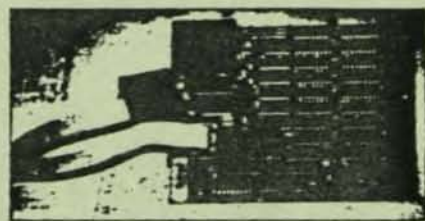
Mother board offers 80386 power

Providing the power of an 80386-based system on a small IBM PC XT format, the MSC 386 PC XT and PC AT mother board implements AT compatibility, 16-MHz capability and up to 8 Mbytes of on-board memory. Holes are provided for both XT and AT mounting standards. The board includes a 16-MHz 80386 processor and a socket for an 80387 coprocessor. Memory is 32-bit zero-wait-state RAM and can be configured as 1, 2, 4 or 8 Mbytes. With 256-kbit devices, the on-board memory is either 1 or 2 Mbytes. Using 1-Mbit parts, the on-board memory can range up to 8 bytes. The

mother board's Chips & Technology's chip set offers configuration flexibility for options to set wait states, change bus speeds and addressing, and alter RAM maps. Enhanced Graphics Adapter and ROM basic I/O system can be moved to 32-bit shadow RAM to implement faster execution times. Price is \$1,995. **Monolithic Systems**, 84 Inverness Circle E, Englewood, CO 80112. **Circle 123**

Card upgrades PS/2 models

The 386 Eagle upgrades an IBM PS/2 Model 50 or 60 to a 16-MHz 80386-based Model 80. It also pro-



vides upgrading for IBM PC ATs. The card includes an 80384 clocking chip, 512 kbytes of RAM and an 80-pin connector for an additional 2 Mbytes of memory. When mounted, the card side saddles the floppy hard disk controller without taking up a PC slot and without depending on the PC bus. Price is \$1,695. **Application Engineering & Associates**, 3420 E Shea Blvd, Phoenix, AZ 85028. **Circle 124**

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IDB ONLINE--THE COMPUTING INDUSTRY DAILY
Wednesday October 14, 1987

TANDEM SET TO SECURE ATALLA

Tandem Computers has proposed a 100% acquisition of Atalla Corp, a San Jose, California, specialist manufacturer of secure systems for financial online transactions. Tandem, which will not disclose how much it is paying for Atalla, expects the deal to be concluded before the end of the year, when Atalla will become a wholly owned subsidiary. It will remain at its present base in San Jose however, while its products are integrated with Tandem's own security offerings. Tandem will have access to Atalla's 1500 customers worldwide. A Tandem spokeswoman said the chief attraction of Atalla was its prestigious reputation. John Atalla, company president and founder, is credited with the discovery of Mos technology during his time at Bell Laboratories.

LEVEL 1 - 2 OF 4 STORIES

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INFORMATION CENTER

October 14, 1987, Wednesday

DISTRIBUTION: Business Editors

LENGTH: 410 words

HEADLINE: TANDEM-COMPUTERS; (TDM) Scandinavian stock exchanges install
Tandem Computers for on-line trading

DATELINE: CUPERTINO, Calif.

BODY:

Tandem Computers Inc. (NYSE:TDM) announced Wednesday that the Stockholm Stock Exchange, Sweden Options and Futures Exchange and the Helsinki Stock Exchange are installing Tandem NonStop computer systems for trading and information applications.

With these three separate agreements, all the major Scandinavian stock exchanges, Oslo, Copenhagen, Stockholm, Helsinki and Sweden Options and Futures Exchange, will have installed Tandem NonStop systems.

The Stockholm Stock Exchange, founded in 1864, is the largest stock market in the Scandinavian countries. A Tandem NonStop VLX system will be used to implement new automated trading and information distribution systems for this stock market. This system is scheduled to go on-line by the end of 1988.

Established in 1912, the Helsinki Stock Exchange handles all stock and bond trading in Finland. Its 1986 volume was more than \$3 billion (U.S.). Installed in January, a Tandem NonStop EXT10 system, with software by Tietotehdas Oy, Helsinki, Finland, provides a booking system and automated matching system for this exchange.

The Sweden Options and Futures Exchange, a new exchange, is using a Tandem NonStop TXP system to control both on-floor and off-floor automated trading and information distribution systems for stock options, index options and futures. This system has been operating since March.

The Stockholm agreement raises the number of major exchanges worldwide using Tandem NonStop systems to 27, including the Securities Industry Automation Corp., a wholly owned subsidiary of the New York Stock Exchange and American Stock Exchange; the Chicago Board of Trade; the Chicago Mercantile Exchange; NASDAQ/NASD; the Stock Exchange of Hong Kong; and the New Zealand Stock Exchange.

In addition, a large number of securities and commodities firms, brokerage information and service providers, banking, insurance and investment firms use Tandem systems for securities-related applications.

Tandem Computers Inc. manufactures and markets computer systems and networks for the on-line transaction processing marketplace. The company is headquartered at 19333 Vallco Parkway, Cupertino, Calif. 95014. Telephone: 408/725-6000.

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CONTACT: Tandem Computers Inc., Cupertino
Glenn LaFrank, 408/725-6435

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Proprietary to the United Press International 1987

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October 14, 1987, Wednesday, BC cycle

SECTION: Financial

LENGTH: 267 words

HEADLINE: Scandanavian stock traders to use Tandem computers

DATELINE: CUPERTINO, Calif.

KEYWORD: Tandem

BODY:

Tandem Computers Inc. Wednesday said that two stock exchanges in Sweden and one in Finland have begun to install Tandem systems to trade securities and exchange information.

The Cupertino, Calif.-based company said Tandem systems are being installed at the Stockholm Stock Exchange and the Sweden Options and Futures Exchange, and in the Helsinki Stock Exchange.

Twenty-seven financial exchanges worldwide now use Tandem computers to conduct transactions, Tandem said, including the Chicago Board of Trade, the Stock Exchange of Hong Kong and the National Association of Security Dealers Automated Quotation system, which lists U.S. over-the-counter stocks. Tandem systems are also in use at exchanges in Oslo, Norway, and Copenhagen, Denmark.

The 123-year-old Stockholm exchange is the largest stock market in Scandanavia, Tandem said. The company's computer system is expected to be ready for use by the end of 1988.

The Helsinki Stock Exchange, established in 1912, handles all stock and bond trading in Finland, with volume of more than \$3 billion last year, Tandem said. Tandem computers will be part of a booking and automated matching system at the Helsinki exchange.

The new Sweden Options and Futures Exchange has been using a Tandem system since March to control automated trading and information systems for stock and index options and futures, Tandem said.

Tandem executives recently announced that the company has surpassed \$1 billion in sales for the fiscal year ending in September. Tandem is expected to fully disclose its financial performance in fiscal 1987 later this month.

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LEVEL 1 - 3 OF 6 STORIES

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Business Wire**CORPORATE
INFORMATION CENTER**

October 13, 1987, Tuesday

DISTRIBUTION: Business Editors

LENGTH: 451 words

HEADLINE: TANDEM/ATALLA; (TDM) Tandem Computers to acquire Atalla Corp.

DATELINE: CUPERTINO, Calif.

BODY:

Tandem Computers Inc. (NYSE:TDM) Tuesday announced it has reached an agreement in principle to acquire Atalla Corp., a privately held San Jose, Calif., company specializing in secure transaction systems for financial and retail markets.

The 15-year old Atalla Corp. is a leader in security system solutions for customer identification, card management, electronic payments, network interchange and computer security. Atalla has more than 1500 customers worldwide and holds numerous patents on its security products. Atalla will operate as a wholly owned subsidiary of Tandem Computers in its present location.

Financial terms of the proposed merger were not disclosed.

In making the announcement, James G. Treybig, president and chief executive officer of Tandem, said, "Tandem and Atalla have complementary product strengths and market strategies, and together we can meet the needs of a wide range of on-line transaction processing users. Security, like fault-tolerance, is required for many OLTP systems users who manage critical business information. "Secure systems are especially important to the banking and retail/point-of-sale industries, where both Tandem and Atalla have a strong presence. Other organizations, such as government agencies and health care providers, are also very concerned with protecting business records," Treybig added.

Dr. John M. Atalla, founder of Atalla Corp., will serve as a vice president at Tandem. Atalla is an internationally recognized expert in solid state electronics and secure electronic banking and business systems. He is named in many patents from his work at Bell Telephone Laboratories, and was a key developer of the industry's first metal oxide semiconductor devices.

He also worked at Hewlett-Packard and Fairchild Camera and Instrument before founding Atalla Corp. in 1972.

Tandem Computers Inc. manufactures and markets computer systems and networks for the on-line transaction processing market. The company has offices worldwide. Headquarters are located at 19333 Vallco Parkway, Cupertino, Calif. 95014. Phone number is 408/725-6000.

Atalla Corp. is a leader in providing secure transaction systems to data processing users worldwide. Atalla has offices in the United States, Canada, South America, Europe, Australia and New Zealand. Company headquarters are

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located at 2304 Zanker Rd., San Jose, Calif. 95131. Phone number is 408/435-8850.

Note: Tandem is a trademark of Tandem Computers Inc.

CONTACT: Tandem Computers Inc., Cupertino
Corinne DeBra, 408/725-7574 (press)
Bobbi Blake, 408/725-2362 (financial)

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LEVEL 1 - 4 OF 6 STORIES

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October 13, 1987, Tuesday, BC cycle

CORPORATE
INFORMATION CENTER

SECTION: Financial Report.

LENGTH: 65 words

HEADLINE: TANDEM COMPUTERS <TDM> TO ACQUIRE ATALLA CORP

DATELINE: CUPERTINO, CALIF., OCT 13

BODY:

Tandem Computers Inc said it would acquire Atalla Corp, a privately held designer of software security systems.

Terms were not disclosed.

Atalla, based in San Jose, develops software used by banks and retailers to safeguard confidential transactions.

Tandem said Atalla would operate as a wholly owned subsidiary. Atalla founder Dr. John M. Atalla was named a Tandem vice president.

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LEVEL 1 - 5 OF 6 STORIES

Proprietary to the United Press International 1987

October 13, 1987, Tuesday, BC cycle

SECTION: Financial

DISTRIBUTION: California

LENGTH: 309 words

DATELINE: CUPERTINO, Calif.

KEYWORD: Bizbriefs-Calif

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INFORMATION CENTER**

BODY:

Tandem Computers Inc. Tuesday said it has reached an agreement in principle to buy Atalla Corp., a privately held company in San Jose, Calif., that specializes in high-security transaction systems for use in the financial and retailing industries.

Financial details of the transaction, including the sale price, were not disclosed.

Cupertino, Calif.-based Tandem called Atalla 'a leader' in the field of providing customer identification, electronic payments, network interchange and computer security systems.

The company has offices in Canada, South America, Europe, Australia and New Zealand in addition to the United States.

Tandem, known for its fault-proof, high-speed computer systems, recently announced it had passed the \$1 billion mark in sales for the fiscal year ending Sept. 30.

The company is expected to fully disclose its financial performance in the past year later this month.

The Atalla buyout comes on the heels of another Tandem investment disclosed Sept. 22 in an Omaha, Neb. venture aimed at developing an automated train control system.

Tandem President and Chief Executive Officer said the Atalla purchase will boost Tandem's ability to provide solid systems to its financial and retail customers.

'Secure systems are especially important to the banking and retail/point of sale industries, where both Tandem and Atalla have a strong presence,' said James G. Treybig, president and chief officer of Tandem, in a statement released by the company.

'Security, like fault tolerance, is required for many (on-line transaction processing) system users who manage critical business information.'

John M. Atalla, who founded the 15-year-old company, will serve as a vice president at Tandem. Atalla is a former Bell Telephone scientist who has also

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Proprietary to the United Press International, October 13, 1987

worked at Hewlett-Packard Co. and Fairchild Camera and Instrument.

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LEVEL 1 - 8 OF 8 STORIES

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Japan Economic Journal**CORPORATE
INFORMATION CENTER**

October 10, 1987

SECTION: FROM NIKKEI NEWSPAPERS; Industries; Information; Pg. 19

LENGTH: 106 words

HEADLINE: Mitsui to sell software for non-stop computer

BODY:

Mitsui & Co. and Mitsui Knowledge Industry Co. will begin to sell computer software for non-stop computers in a tie-up with Tandem Computers Japan Ltd., a non-stop computer maker. In its first joint effort, the Mitsui group will sell an automatic banking settlement system developed by DAI, a Massachusetts-based computer company.

Sales of Tandem's non-stop computers have increased sharply, intensifying competition with other makers. Mitsui plans to develop its electronics sector into a mainstay business. The company also expects to sell software together with Tandem's non-stop computers.

(The NIKKEI-M, Sept. 29, P9)

LEVEL 1 - 6 OF 6 STORIES

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Defense Electronics

October, 1987

CORPORATE
INFORMATION CENTER

SECTION: RANDOM BITS; Pg. 39

LENGTH: 182 words

HEADLINE: Tandem Computers Ada Compiler Validated

BODY:

Validation of the Tandem Ada compiler by the DOD Ada Joint Program Office has been announced by Tandem Computers Inc., Cupertino, Calif. Ada will be available for Tandem NonStop computer systems in the fourth calendar quarter of 1987. "Tandem Ada provides a powerful programming language for the Department of Defense and other government agencies," said Dennis L. McEvoy, Tandem vice president of software. "For the first time, Ada programmers can take advantage of parallel processing benefits and distributed database capabilities of the wide range of Tandem systems," he said. Tandem makes computer systems and networks for on-line transaction processing. Four programming tools are provided with Tandem Ada: a compiler, a library manager, a binder and a symbolic debugger. Tandem Ada supports large programs that can have up to four megabytes of instruction code and can manipulate up to 128 megabytes of data per single process with a NonStop system. The Ada language is mandated by DOD for mission-critical computer systems and is gaining wider use in the business sector.

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LOSS FOR FCA: Financial Corporation of America reported on Monday a loss of \$75.8 million, or \$2.20 per share, for the quarter ended Sept. 30, compared with a profit of \$11.6 million, or 24 cents per share, for the third quarter of 1986. Irvine-based FCA owns American Savings and Loan Association, the nation's largest thrift. Federal regulators have been trying to restructure FCA.

FACTORY OPERATING RATE FLAT: The operating rate at America's factories, mines and utilities remained unchanged in September at 81.2 percent of capacity, the highest level in three years, the government said Monday. The Federal Reserve said that the

Mark Brennan, an attorney from Denver on business in San Jose, said, "It would be foolish to sell before the market turns around. It's too late now anyway."

However, some investors who wanted out of the sliding market were

ments.

One example is investment in 401(k) plans. Participants in these retirement plans, which became popular in the past few years, defer receiving a portion of their salary and determine where it is invested. But 401(k) plans

San Jose Mercury

Oct 20, 1987 p1F

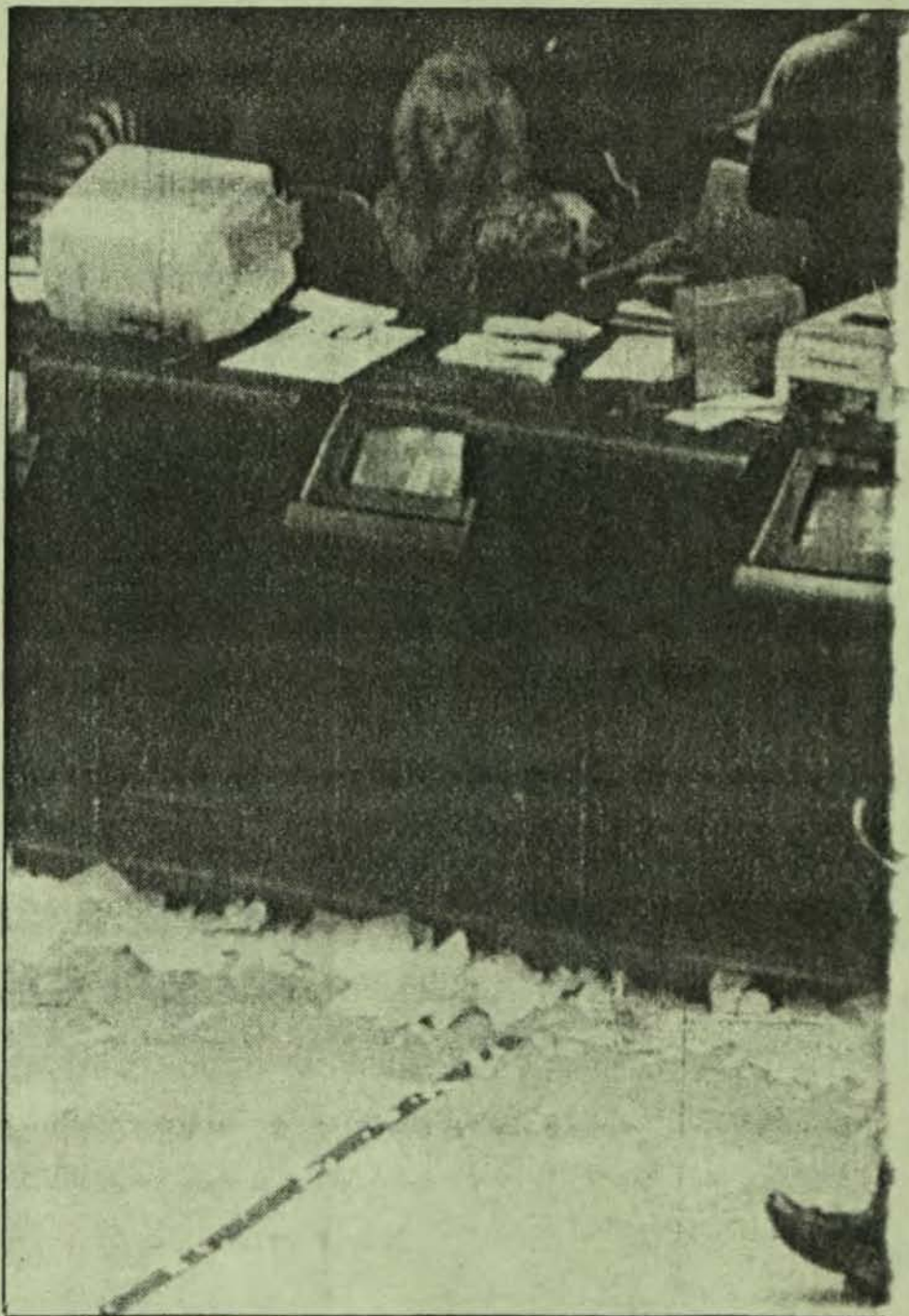
CORPORATE
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Chicago.

TANDEM OFFERS LIBRARY SYSTEM: Tandem Computers Inc. introduced on Monday its first optical storage product, an optical disk library system for use with the company's minicomputer systems. The 5200 Optical Storage Facility contains two disk drives and an automatic changer for up to 32 disk cartridges. The Cupertino company said the system, costing about \$155,000, would be shipped this quarter. Tandem said the system, which will hold about as much data as 3,000 four-drawer file cabinets, would replace microfiche, computer tape and paper as a medium for storing archival data.

GENENTECH TO DEVELOP CLOT SYSTEM: NeoRx Corp., a privately held biotechnology company based in Seattle, said it had entered an agreement with Genentech Inc. of South San Francisco to develop a product that can be injected into the body for the purpose of imaging blood clots. Under the terms of the agreement, each company would manufacture its own proprietary component of the product, with Genentech responsible for marketing and NeoRx receiving a royalty on sales. The proposed product, which is expected to enter preclinical trials soon, would use a proprietary NeoRx method to attach a radioisotope to Genentech's blood-clot dissolving drug, tissue plasminogen activator, which is currently awaiting approval from the Food and Drug Administration.

AT&T PREDICTS RATE DROP: American Telephone & Telegraph Co. said Monday its long-distance rates would most likely drop if government regulators capped rates and lifted limits on the company's profits. In comments filed with the Federal Communications Commission, AT&T supported the agency's proposal to replace traditional profits limits on the nation's largest long-distance carrier with price ceilings but suggested several refinements to the plan. AT&T said the FCC should set price caps at current rates and adjust them annually to reflect inflation and






World markets drop i



New York Times

LONDON — Just how markets still take their cue was brutally demonstrated

In reaction to the plunge Street on Friday and week Reagan administration of may let the dollar fall, inve and Asia dumped shares wave of distress selling. Fr and Tokyo to Frankfurt, P London to Toronto and M

 0.81	 .11%	 No Change
STOCKS 2,640.18 <i>Dow Jones Industrial Average</i>	INTEREST 9.79% <i>30-year government bond</i>	DOLLAR 146.65 Yen <i>Unchanged from 146.65 Yen</i>

View From the Mark Hopkins

The Montgomery Securities Investment Conference that began yesterday at the Mark Hopkins in San Francisco had plenty of swelter, but little sizzle so far. No big surprises, but a few executives saw their stocks rise moderately following presentations to some 750 money managers attending the four-day event.

The highlight came when an executive of IDB Communications, a Los Angeles company that supplies satellite transmission services, conversed live with another official in Shanghai. IDB was providing satellite transmission for NBC News in China last week and persuaded the government to leave the link open so IDB could demonstrate its wares at the conference. Following is a roundup of other events:

Tandem Tops \$1 Billion

Tandem Computer was up 1 3/8 to 36 1/2 on the New York Stock Exchange yesterday in heavy volume. Chief Financial Officer David Rynne announced that the Cupertino company just topped \$1 billion in sales for the year ended September 30, compared with \$768 million in 1986. He added that he was "very comfortable" with analysts' earnings estimates. Montgomery analyst John Jones predicted that Tandem will earn \$1.08 per share in fiscal 1987, up 50 percent over last year.

Measurex, Prime on the Prowl

LEVEL 1 - 5 OF 10 STORIES

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INFORMATION CENTER

October 5, 1987, Monday

DISTRIBUTION: Business Editors

LENGTH: 289 words

HEADLINE: TANDEM-COMPUTERS; (TDM) Tandem Computers appoints Gargus
controller, Stoecker treasurer

DATELINE: CUPERTINO, Calif.

BODY:

Tandem Computers Inc. (NYSE:TDM) announced Friday that it has appointed Robert G. Gargus, 36, corporate controller and Gerd Stoecker, 44, treasurer.

Both report to Tandem Vice President and Chief Financial Officer David J. Rynne.

As corporate controller, Gargus replaces Jeanne D. Wohlers, who left in August to pursue personal interests. Wohlers is continuing her association with Tandem on a consulting basis.

Gargus joined Tandem in 1984 as controller for manufacturing. In 1985, he was named a director in manufacturing and his responsibilities were broadened to include the controller function for Tandem's U.S. service organization. Recently, he had been serving as treasurer, replacing Richard A. Lamb, who joined Tandem's manufacturing group as director of finance and MIS.

Prior to Tandem, Gargus spent 13 years in finance positions at Burroughs Corp. Gargus holds an M.B.A. from the University of Detroit.

Stoecker has been appointed treasurer. Prior to joining Tandem in 1984 as marketing controller, Stoecker was vice president of international finance for Atari Corp. From 1965 to 1981, he held various finance and management positions in Europe and the United States with The Bendix Corp., Robert Bosch Corp. and Classic Bekleidungswerke. Stoecker holds an M.B.A. from Ruhr University in Bochum, West Germany.

Tandem Computers Inc., a Fortune 500 company, manufactures and markets computer systems and networks for the on-line transaction processing marketplace. Company headquarters are in Cupertino.

Note to Editors: Tandem is a trademark of Tandem Computers Inc.

CONTACT: Tandem Computers, Cupertino
Jeri Eaton Flinn, 408/725-5462

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LEVEL 1 - 8 OF 10 STORIES

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October 5, 1987, Monday, BC cycle

CORPORATE
INFORMATION CENTER

SECTION: Financial Report.

LENGTH: 389 words

HEADLINE: WALL STREET STOCKS/ TANDEM COMPUTERS <TNM.O>

DATELINE: SAN FRANCISCO, OCT 5

BODY:

The stock of Tandem Computers Inc was among the most actively traded stocks as investors anticipated the company will announce record annual and fourth quarter earnings within the next several weeks, analysts said.

In early afternoon trading, the Cupertino-based company's stock rose 1-1/4 to 36-3/8 with 892,400 shares traded.

"We expect they will be reporting their best quarter in history," said analyst Jeffrey Canin of Hambrecht and Quist.

For the fourth quarter ended September 30, Canin predicts the company will report 30 cts per share earnings on revenues of 282 mln dlrs.

Analyst Canin also said Tandem for the first time in its history likely will reach the one billion dlr revenue mark for the year. He expects the company will report 1.03 billion dlrs in revenues, up 34 pct, and earnings per share of 1.08 dlrs, up 49 pct.

"The growth rate is attracting attention," analyst David Wu of S.G. Warburg said about the active trading of the company's stock. "I think the activity is reflecting that people want to buy technology stocks and Tandem is one of the first names that comes to mind," Wu said. "And they are looking for stocks that have not hit new highs yet."

Analyst Wu predicts Tandem's fourth quarter earnings per share will be 28 cts versus 24 cts last year. Also, he said the earnings per share for the year ended September 30 will be 1.06 dlrs versus 72 cts last year.

He forecast earnings per share for next year will reach 1.55 dlrs. "I have pretty aggressive assumptions about the company for next year," Wu said.

The favorable reaction by investors also may signal the end of speculation in the industry that Digital Equipment Company (DEC) may move into "Tandem's turf" -- the transaction processing area, said Canin of Hambrecht and Quist.

"I think there is recognition that earlier concerns about the competitive issue with (Digital Equipment) and its VAX line have been dispelled," analyst Canin said.

Tandem announced it has appointed a new controller, Robert Gargus, who formerly served as the company's treasurer. Gerd Stoecker is the new treasurer at Tandem.

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Company spokeswoman Jeri Flin said the company no other announcements that would spur the heaving trading of its stock. She said the quarterly and annual earnings likely will be announced within three weeks.

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LEVEL 1 - 7 OF 11 STORIES

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Computerworld

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INFORMATION CENTER

October 26, 1987

SECTION: NETWORKING; Bit Blast; Pg. 54

LENGTH: 777 words

HEADLINE: Timeplex adds service; Paradyne, Unisys team

BODY:

Timeplex, Inc. in Woodcliff Lake, N.J., recently announced its Full Service Maintenance Programs, which come standard with seven-day-a-week, 24-hour protection of voice/data communications networks. Standard features offered include network problem isolation, installation of engineering changes and flexible installation hours for network upgrades.

There are three levels of service: A Level is fully comprehensive, providing seven-day-a-week, 24-hour coverage and enhanced support features such as installation of engineering changes or expansion modules at no additional cost; B Level is a modified version of the A Level, limited to between Monday and Friday, 8 a.m. to 5 p.m.; and C Level provides basic maintenance coverage only.

Paradyne Corp. in Largo, Fla., and Unisys Corp. in Blue Bell, Pa., recently announced two agreements: a project to jointly develop an advanced network management system and a deal allowing Unisys to incorporate Paradyne modems, multiplexers and network management products into custom networks to be sold under the Unisys Alliance program.

Under the first agreement, Unisys is scheduled to supply personnel and funding. Both vendors will have rights to the system and to any future enhancements to that product.

Ungermann-Bass, Inc. has signed a Memorandum of Understanding with the National Security Agency to develop a special version of its Net/One local-area network (LAN) that will meet requirements protecting classified U.S. government information. It reportedly will allow users working in classified government facilities to securely exchange information over conventional LAN media.

American Airlines recently announced plans to implement Lenexa, Kan.-based Consumer Software, Inc.'s The Network Courier electronic-mail package on American's Sabre Travel Information Network. Under the terms of the agreement, The Network Courier will be installed on more than 12,000 local-area networks utilizing IBM Personal System/2 workstations during the next four years. Later this year, Consumer Software said, it will release links to Digital Equipment Corp.'s All-In-1 and MCI Telecommunications Corp.'s public E-mail system as well as a Microsoft Corp. Windows-compatible version of its mail package.

Telco Systems, Inc. in Norwood, Mass., and Fiberlan, Inc., a Bellsouth/ Siecor company, have announced an agreement for a high-speed ring product based on Telco's 560M bit/sec. fiber-optic terminal equipment, called M560. Fiberlan will gain access to Telco's transmission equipment software technology. In turn, it will allow Telco to market its M560 system utilizing Fiberlan's patented Ring System software.

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© 1987 Computerworld, October 26, 1987

Tandem Computers, Inc. in Cupertino, Calif., recently announced it has validated Santa Clara, Calif.-based 3Com Corp.'s 3+ network operating software and Etherlink network adapters for use with Tandem's Multilan products, used to link local-area networks (LAN) to Tandem systems. Tandem has already validated IBM's Token-Ring (Models 1 and 2) and PC Network, Sytek Corp.'s 6110 and 6120 LANs and Ungermann-Bass, Inc.'s PC-NIU and NIU-PC adapters.

Micom-Interlan in Boxboro, Mass., recently announced its largest OEM contract ever, a multimillion-dollar, two-year agreement with Philips Information Systems Ltd. in Montreal, on behalf of the Philips Telecommunication and Data Systems Division and all Philips' affiliates worldwide. Micom-Interlan will supply intelligent and data link Ethernet and token-ring controllers for integration into the Philips line of personal computer-based products. Volume product shipment of the resulting products will begin in first-quarter 1988.

Joiner Associates, Inc. in Madison, Wis., recently added support for IBM's Systems Network Architecture (SNA) to its Jnet software. Jnet reportedly allows Digital Equipment Corp. VAXs to communicate with IBM's bisynchronous networking environment. The Jnet-S SNA Option will run in conjunction with either DEC's Decnet SNA Gateway or VMS/SNA software.

OST, Inc., a wholly owned subsidiary of OST SA in Rennes, France, has announced plans to expand into the U.S. market. OST, a supplier of telecommunications technology such as wide-area networking and Integrated Services Digital Network technology products, has established U.S. headquarters in Bohemia, N.Y., and a technical support center in Washington, D.C.

OST also announced its U.S. management team: Barry Oliver, president; Ben Khowong, vice-president of finance; John Pugh, director of marketing and sales support; Gene Szlatenyi, director of support services; and Todd Krautkremer, national sales manager.

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Computerworld

October 26, 1987

SECTION: NEWS; Pg. 16

LENGTH: 198 words

HEADLINE: Tandem eyes optical disk

DATELINE: NEW ORLEANS

BODY:

Tandem Computers, Inc. introduced an optical disk archival storage and retrieval system last week for use with its family of transaction processing systems.

Introduced at Tandem's international users group meeting here, the 5200 optical storage facility represents Tandem's first embrace of write-once read-many optical storage technology. The system uses a jukebox mechanism containing up to 32 2.6G-byte cartridges to offer more than 836 bytes of storage capacity. Tandem is purchasing the optical storage subsystem from Hitachi Ltd. and has incorporated its own very large-scale integration controller for attachment to its EXT10, EXT25, Nonstop II, TXP and VLX systems.

The optical subsystem is aimed at organizations that require large amounts of archival data that is readily accessible on-line from the host, according to Derek Ginger, product manager of storage products.

"One of our beta-test sites -- a medical testing firm -- is replacing its microfiche system with the 5200," Ginger said. Tandem expects to begin shipping the 5200 Nov. 30. The subsystem lists for \$155,000, including controller, jukebox, two optical disk drives, two cartridges and cable.

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PAGE 1

LEVEL 1 - 1 OF 7 STORIES

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Financial Times

October 27, 1987, Tuesday

SECTION: SECTION I; International Companies & Finance; Pg. 30

LENGTH: 53 words

HEADLINE: North American Quarterly Results

BODY:

Tandem Computers ***
Fail-safe computers

Fourth quarter

Revenues 291.1 m 220.5 m

Net income 30.4 m 21.6 m

Net per share 0.31 0.23

Year

Revenues 1.03 bn 767.7 m

Net income 105.6 m 63.8 m

Net per share 1.08 0.72

***Corrects agency errors in
Friday's table

	1987	1986
	Dollars	Dollars

GRAPHIC: Table, no caption

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LEVEL 1 - 2 OF 7 STORIES

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The New York Times

October 27, 1987, Tuesday, Late City Final Edition

SECTION: Section D; Page 12, Column 1; Financial Desk

LENGTH: 281 words

HEADLINE: MARKET TURMOIL;
Big Challenge For Computers

BODY:

When the market plunged last week, commentators pointed out that the New York Stock Exchange's ticker was running hours behind. The implication was that the exchange's computers could not keep up with the volume. But the real problem, the exchange said yesterday, is that investors can not read fast enough.

'We sped the ticker up a long time ago, and someone made the mistake of calling it the high-speed ticker,' said Charles McQuade, president of the Securities Industry Automation Corporation. The ticker shows 900 characters a minute.

If it went faster, the Big Board says, nobody could read it.

Traders rarely watch the ticker; they watch computer screens that show the last trade for any stock. 'That's instantaneous,' Mr. McQuade said. 'In our worst moments, that rarely fell behind.'

Mr. McQuade's comments came during a rare briefing in the S.I.A.C. computer center, a room in downtown Manhattan full of Tandem fault-tolerant computers. In the form of whizzing electronics, 75 to 85 percent of trades on the New York Stock Exchange and the American Stock Exchange course through the computer center.

Apparently the center was opened to alleviate fears that its equipment was overtaxed.

Mr. McQuade said the system had encountered no severe difficulties since the day the Dow industrials fell 508 points and disk drives, printers and the processors themselves were taxed to the limit by 1.6 million transactions. 'We saw peak rates of 86 messages a second,' Mr. McQuade said. The system, he estimated, can handle 95 a second. He added:

'People are getting used to handling the volume now. But we are always looking to see if we are overloading things.'

SUBJECT: Terms not available

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LEVEL 1 - 1 OF 8 STORIES

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Los Angeles Times

**CORPORATE
INFORMATION CENTER**

October 22, 1987, Thursday, Home Edition

SECTION: Business; Part 4; Page 2; Column 5; Financial Desk

LENGTH: 79 words

HEADLINE: EARNINGS

BODY:

Tandem Computers' earnings rose 66% to \$105.6 million for the fiscal year ended Sept. 30. Revenue for the year was up 35% to \$1.035 billion, a record for the Cupertino, Calif.-based computer manufacturer. For the fourth quarter, income increased 41% to \$30.4 million, compared to a year ago. Quarterly revenue was up 32% to \$291 million, compared to the 1986 quarter. The company attributed the gains to healthy international business and strengthening domestic demand.

TYPE: Column; Corporate Earnings

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LEVEL 1 - 2 OF 8 STORIES

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The New York Times**CORPORATE
INFORMATION CENTER**

October 22, 1987, Thursday, Late City Final Edition

SECTION: Section D; Page 5, Column 5; Financial Desk

LENGTH: 52 words

HEADLINE: TANDEM COMPUTERS reports earnings for Qtr to Sept 30

BODY:

	** COMPANY REPORTS **	
	TANDEM COMPUTERS (NYSE)	
Qtr to Sept 30	1987	1986
Revenue	291,114,000	220,552,000
Net inc	30,446,000	21,584,000
Share earns	.31	.23
Yr rev	1,035,495,000	767,793,000
Net inc	105,604,000	63,766,000
Share earns	1.08	.72

TYPE: Statistics

SUBJECT: COMPANY REPORTS

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INFORMATION CENTER

October 21, 1987, Wednesday, BC cycle

SECTION: Financial Report.

LENGTH: 38 words

HEADLINE: TANDEM COMPUTERS INC <TDM> 4TH QTR SEPT 30 NET

DATELINE: CUPERTINO, CALIF., OCT 21

BODY:

Shr 31 cts vs 23 cts

Net 30.4 mln vs 21.6 mln

Revs 241.5 mln vs 182.5 mln

Avg shrs 99.6 mln vs 92.5 mln

Year

Shr 1.08 dlrs vs 72 cts

Net 105.6 mln vs 63.8 mln

Revs 861.0 mln vs 632.3 mln

Avg shrs 97.7 mln vs 88.4 mln

LEVEL 1 - 7 OF 8 STORIES

Proprietary to the United Press International 1987

October 21, 1987, Wednesday, BC cycle

CORPORATE
INFORMATION CENTER

SECTION: Financial

DISTRIBUTION: California

LENGTH: 309 words

HEADLINE: Tandem Computers earnings up

DATELINE: SAN FRANCISCO

KEYWORD: Earn-Tandem

BODY:

Tandem Computers Inc. Wednesday confirmed that its sales for the fiscal year ending in September surpassed \$1 billion for the first time in the 13-year-old computer company's history.

Cupertino-based Tandem, which makes fault-proof transaction processing systems used by a variety of businesses, including the New York Stock Exchange, said earnings rose 65.6 percent in the year ended Sept. 30 to \$105.6 million or \$1.08 a share, compared to \$63.76 million or 72 cents a share in the previous year.

Tandem executives earlier this month had said they expected the company's sales to break the billion-dollar mark.

Revenues rose to \$1.035 billion in the year ended in September, up 34.1 percent from the \$767.79 million reported for the previous 12-month period.

For the fourth fiscal quarter, Tandem reported earnings of \$30.44 million or 31 cents a share on sales of \$291.11 million for the fourth quarter. Earnings were up 41.0 percent compared to earnings of \$21.58 million or 23 cents a share on revenue of \$220.55 million in the same quarter a year ago.

Company President James G. Treybig expressed pleasure at the company's performance and said Tandem has responded to its rising revenues by "aggressively" investing in its sales force and product development.

"As we pass through a billion dollars, we are also proud of the success of our customers whose businesses depend on the reliability and expandability of Tandem systems," Treybig said.

Tandem is best known for anti-glitch computer systems that can quickly process crushing loads of data.

Banks, airlines and stock exchanges are some of Tandem's customers, as well as the New York Stock Exchange, which uses approximately 200 Tandem computers to transact trades.

In April, Tandem took advantage of an industry rebound to announce a two-for-one split in the company's stock.

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Data Communications

October, 1987

SECTION: NEW PRODUCTS; Pg. 332

LENGTH: 272 words

HEADLINE: Channel-attach unit provides fiber optic link to IBM SNA

BODY:

The SNAXlink, from Tandem Computers Inc., is a direct channel-attach unit that provides a flexible, high-speed communications link between Tandem and IBM networks.

SNAXlink replaces multiple communications lines with a high-speed fiber optic link attached to the input/output channel to IBM or IBM-compatible computers. The device does not require a front-end communications processor. It serves as a communication path between SNAX (Tandem's SNA access software) and VTAM. Standard SNA interfaces enable Tandem-based applications or Tandem-owned SNA devices to communicate with applications on IBM equipment using either SNAXlink or SNAX-supported communications facilities without changes to the Tandem or IBM applications.

Channel attachment allows data transfer up to 1 Mbit/s in each direction simultaneously (full duplex). SNAXlink attaches to both block- and byte-multiplexer channels.

The device supports batch, interactive, or application-to-application data communications. Each unit handles up to 1,020 sessions concurrently.

SNAXlink runs on Tandem NonStop II, TXP, EXT, and VLX. It consists of a communications interface unit, a rackmount channel attachment unit, and a high-speed fiber optic connection that links the two units. The fiber optic link allows a distance of up to 500 meters (1,640 feet).

Price of SNAXlink is \$49,550 for a single unit and \$79,676 for two units. Basic monthly maintenance charge is \$88 for one unit and \$176 for two units. Software monthly license fee is \$125 per unit.

Tandem Computers Inc., 19191 Vallco Pkwy., Location 4-40, Cupertino, Calif.
95014-2599

LEVEL 1 - 10 OF 12 STORIES

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Data Communications

October, 1987

SECTION: NEW SOFTWARE; Pg. 351

LENGTH: 317 words

HEADLINE: Managing networks

BODY:

Distributed Systems Management (DSM) software, from Tandem Computers Inc., lets users manage large, dispersed networks having NonStop implementations. It allows the consolidation of previously isolated configurations and network management functions into a single view of a distributed on-line network.

DSM features software that can be tailored to user-specific needs, supporting either centralized or decentralized management of operations. It also provides the foundation for automated operations at remote sites.

Events or problems occurring in a Tandem network having DSM are highlighted on a computer terminal for the operator. Additional information, including the probable cause of the difficulty and recommended action, can be displayed.

DSM is being offered in an Operations Management (OM) package. It includes four elements: Viewpoint, Measure, NSS (Network Statistics Systems), and DNS (Distributed Name Service).

Viewpoint is a multifunction console facility that can be used as a status monitor, even display, and command and control center for DSM. It provides a single-system view of overall operations. One Viewpoint station can monitor and control the whole network; multiple Viewpoint consoles can be designated to monitor and control a selected set of functions, systems, or components. Data collected by the existing Tandem products called Measure and NSS can be displayed by Viewpoint.

DNS provides a single source for sorting and retrieving information about multiple names used to identify system and network components. One application for DNS databases would be to support programs that automate operations functions.

The OM package has an initial license fee of \$3,200. There is a monthly license fee of \$320 per each NonStop VLX or NonStop TXP machines.

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95014-2599

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CORPORATE
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October 20, 1987, Tuesday, Late City Final Edition

SECTION: Section D; Page 17, Column 5; Financial Desk

LENGTH: 110 words

HEADLINE: Tandem Offers Library System

BYLINE: Special to the New York Times

DATELINE: SAN FRANCISCO, Oct. 19

BODY:

Tandem Computers Inc. today introduced its first optical storage product, an optical disk library system for use with the company's minicomputer systems.

The 5200 Optical Storage Facility contains two disk drives and an automatic changer for up to 32 disk cartridges. The Cupertino, Calif., company said the system, costing about \$155,000, would be shipped this quarter.

Tandem said the system, which will hold about as much data as 3,000 four-drawer file cabinets, would replace microfiche, computer tape and paper as a medium for storing archival data.

The company said the system would speed recovery of records while saving space and labor costs.

SUBJECT: Terms not available

LEVEL 1 - 4 OF 10 STORIES

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INFORMATION CENTER

October 19, 1987, Monday

DISTRIBUTION: Business Editors

LENGTH: 709 words

HEADLINE: TANDEM-COMPUTERS; (TDM) Tandem Computers introduces its first optical storage system

DATELINE: NEW ORLEANS

BODY:

Tandem Computers Inc. (NYSE:TDM) Monday announced an 84-gigabyte, write-once, read-many-times, optical disk library subsystem called the 5200 Optical Storage Facility, for use with Tandem NonStop systems.

The announcement was made at the 1987 International Tandem Users' Group Fall Conference held in New Orleans.

The 5200 Optical Storage Facility contains two read/write disk drives, a formatter and an automatic changer for up to 32 disk cartridges. Each 12-inch cartridge holds 2.62 gigabytes of data.

One Tandem 5200 can hold as much data as about 3,000 four-drawer file cabinets.

The 5200 Optical Storage Facility can be used with Tandem NonStop VLX, TXP, NonStop II, EXT25 and EXT10 systems.

As a new method for storing massive amounts of data, optical disk subsystems are particularly important to the on-line transaction processing market served by Tandem.

Generally, archival data, such as bank statements or medical records, have been stored off-line on microfiche, computer tape, or paper, making it expensive and difficult to recover.

Because the Tandem optical disk subsystem is on-line, and available to any node in a network, information is easily filed or retrieved by any authorized user on the system.

'Banks will now have much faster access to back customer statements than with earlier archival methods. Medical centers can easily retrieve patients' records. Historical data can even be selected according to demographics, which is very important to retailers as well as other organizations,' stated Gerald L. Peterson, vice president of marketing.

'The 5200 will enable Tandem users to improve the services they offer their customers as well as their own internal operations. The very large capacity and low cost per megabyte of storage also make this unit an ideal storage facility for image data.'

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The 5200 Optical Storage Facility automates the entire archival process, so the high labor costs associated with paper, microfiche or tape archives are either substantially reduced or eliminated. The same applies to media management.

Automation also makes the retrieval and delivery of data much faster. The 5200 provides average access time of 250 milliseconds for data on an optical disk cartridge that is already mounted, and an average of 17 seconds when a cartridge must be changed.

This compares to hours or even days for paper, microfiche or tape archival methods.

In addition, paper or microfiche can easily be misfiled, making them impossible to retrieve. Because the data on the 5200 is managed using standard disk techniques, the information it holds cannot be misfiled.

Also contributing to savings are the disk cartridges, which have a lifespan of 10 years or more with no maintenance or special environmental requirements. This compares to tape, which must be rewound periodically and stored in a controlled environment.

The complete jukebox-like subsystem measures a compact 28 inches by 50 inches by 50 inches high and contains a control unit, an optical disk library, and other necessary hardware and software.

The control unit uses VLSI technology and dual lock-stepped microprocessors for data integrity. Sustained read data transfer rate is 300 kilobytes per second. Sustained write rate is 150 kilobytes per second.

Deliveries will begin this quarter. The 5200, including the automatic changer, two disk drives, control unit and cables, is priced at \$155,000. The software initial license fee (ILF) is \$5,300 and the monthly license fee (MLF) is \$100 with the NonStop VLX, TXP, II and EXT25 systems. The ILF is \$2,650 and the MLF is \$50 with NonStop EXT10 systems. All prices are in U.S. dollars.

Tandem Computers Inc. manufactures and markets computer systems and networks for the on-line transaction processing market. The company's headquarters are at 19333 Vallco Parkway, Cupertino, Calif. 95014. The telephone number is 408/725-6000

Note to Editors: Tandem, NonStop, VLX, TXP, NonStop II, EXT25 and EXT10 are trademarks of Tandem Computers Inc.

CONTACT: Tandem Computers, Cupertino, Calif.
Tom Waldrop, 408/725-7191

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LEVEL 1 - 9 OF 10 STORIES

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October 19, 1987, Monday, BC cycle

CORPORATE
INFORMATION CENTER

SECTION: Financial Report.

LENGTH: 153 words

HEADLINE: TANDEM <TDM> HAS OPTICAL DISK SUBSYSTEM

DATELINE: NEW ORLEANS, OCT 19

BODY:

Tandem Computers Inc said it has introduced an 84-gigabyte write-once, read-many-times optical disk library subsystem called the 5200 Optical Storage Facility for use with Tandem NonStop computer systems VLX, TXP, NonStop II, EXT25 and EXT10.

The company said the facility contains two read/write disk drives, a formatter and an automatic changer for up to 32 disk cartridges, each holding 2.62 gigabytes of data. It said the 5200 provides an average access time of 250 milliseconds for data on an optical disk cartridge already mounted and 17 seconds when a cartridge must be changed.

Tandem said deliveries will start this quarter. It said the 5200 is priced at 155,000 dlr.

It said the software initial license fee is 5,300 dlr and the monthly license fee is 100 dlr with the NonStop VLX, TXP, NonStop II and EXT25 systems and the fees are 2,650 dlr and 50 dlr respectively with the EXT10 system.

LEVEL 1 - 1 OF 6 STORIES

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October 15, 1987, Thursday

SECTION: Pg. 14

LENGTH: 188 words

HEADLINE: Tandem Computers Plans to Buy Atalla

DATELINE: CUPERTINO, Calif.

BODY:

Tandem Computers Inc. announced an agreement in principle to acquire Atalla Corp., a producer of secure transaction systems for banks and other companies.

Based in San Jose, Calif., Atalla is a 15-year-old privately held firm, which claims more than 1,500 customers among financial institutions and retailers in the United States and abroad. Its products provide security in the areas of customer identification, card management, electronic payments, network interchange, and computers.

Terms of the deal were not disclosed. Atalla will become a wholly owned subsidiary of Tandem, which makes fault-tolerant computers that are widely used for on-line transaction processing.

John M. Atalla, company founder, will become a Tandem vice president.

"Secure systems are especially important to the banking and retail point-of-sale industries, where both Tandem and Atalla have a strong presence," said James G. Treybig, Tandem president and chief executive officer.

"Other organizations, such as government agencies and health care providers, are also very concerned with protecting business records," Mr. Treybig said.

LEVEL 1 - 2 OF 6 STORIES

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October 14, 1987, Wednesday, Late City Final Edition

SECTION: Section D; Page 5, Column 6; Financial Desk

LENGTH: 82 words

HEADLINE: COMPANY NEWS;
Tandem Agrees To Acquire Atalla

BYLINE: Special to the New York Times

DATELINE: SAN FRANCISCO, Oct. 13

BODY:

Tandem Computers Inc. said it had agreed to acquire the Atalla Corporation, a privately held company that make transaction systems for financial concerns and retailers. Terms of the deal were not disclosed. Atalla, of San Jose, Calif., will operate as a subsidiary of Tandem, a manufacturer based in Cupertino, Calif.

Atalla has more than 1,500 customers worldwide and holds several patents. John M. Atalla, who founded the company 15 years ago, will become a vice president at Tandem.

SUBJECT: Terms not available

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LEVEL 1 - 11 OF 11 STORIES

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Network World

October 26, 1987

CORPORATE
INFORMATION CENTER

SECTION: TOP NEWS; N.Y. Stock Exchange; Pg. 6

LENGTH: 286 words

HEADLINE: Trading system's up, downs

BYLINE: By Josh Gonze, Staff Writer

DATELINE: NEW YORK

BODY:

The computer and communications systems used to support the New York Stock Exchange withstood the strain of record trading volumes set in the frenzied stock market last week, although computers used by investment houses were blamed for accelerating the market's drop last Monday.

A spokesman for Securities Industry Automation Corp. (SIAC), the data processing subsidiary of the New York and American Stock Exchanges, disputed reports that the computers supporting the exchange lagged behind trading.

A record volume of stocks, 604.8 million shares, traded hands on Monday, and another record number, 608.1 million shares, was traded on Tuesday. More than 600,000 separate transactions were made on both days.

A two-hour transaction-processing time lag widely reported in the news last week existed only on ticker tape machines deliberately slowed to allow reading by the human eye, according to SIAC Vice-President James Squires. "For Wall Street, the system as a whole worked very, very well," Squires said.

At least part of Monday's market bedlam has been attributed to computer trading, the practice common to large institutional investors of programming computers, who use it to buy or sell stocks at a predetermined price.

SIAC, located a few blocks from the exchange, has roughly 200 Tandem Computers, Inc. NonStop and TXP fault-tolerant processors.

Those processors handle four fundamental applications, Squires explained. They electronically route orders from brokers to the exchange floor, operate the ticker tape machines, run a data base used by the two exchanges to monitor illegal trading practices and electronically clear and settle transactions for all stock exchanges in the U.S.

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LEVEL 1 - 2 OF 4 STORIES

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InfoWorld

October 26, 1987

CORPORATE
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SECTION: NETWORKING; Pg. 14

LENGTH: 241 words

HEADLINE: Packet-Switched Network Updates Fax Technology

BYLINE: By Mark Stephens

BODY:

Now that facsimile modem boards are all the rage for PCs, a company called U.S. Fax Inc. has come along with the first X.25 packet-switched public communications network dedicated to fax transmission.

According to U.S. Fax marketing vice president Donna Murdoch, the network called U.S. Faxsys, offers several advantages over conventional fax technology. Network users with regular fax machines or PCs equipped with fax transmissions through a local U.S. Faxsys node to a Tandem Computers Inc. network controller, which retransmits the fax image to one or many recipient fax machines or PCs.

Sending the same fax image to multiple recipients requires only a single outgoing transmission, Murdoch said. Busy signals are handled by the network controller, which redials until a connection is made or stores the fax image in an electronic mailbox for later retrieval. Fax recipients are not required to be U.S. Faxsys subscribers.

U.S. Fax says the cost of transmission over the network averages 8 cents per average CCITT page. The network will be operating for a limited number of users by the end of December, with full-scale operation scheduled for the end of January 1988, the firm said. The cost of the service, exclusive of transmission charges, is \$ 2.00 per month through December, with service charges increasing to \$ 10.00 per month in January.

U.S. Fax Inc., 100 N. 17th St., Philadelphia, PA 19103; (215) 496-8000.

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message format to indicate that the order can be filled but not exactly in the manner requested by the buyer.

Currently, many large airlines as well as large parts and equipment suppliers have linked their mainframes to share information. The new personal computer-based network will allow smaller suppliers and smaller airlines to communicate electronically.

Moreover, until the advent of Specification 2000, there was no centralized data base available for even the large airlines and suppliers.

The network will allow airlines to cut down on their "protection stocks" of spare parts, according to Sturman. "In the U.S., we have efficient communications and shipment systems," he said. "It does not take long for United, for example, to get a part from General Electric Co. But many airlines around the world need to have large protection stocks on hand."

Sturman cited the example of an airline in Africa that would create a purchase order and send it by airmail to GE. "By the the time it gets to GE, 10 days have gone by," Sturman said. "Then GE sends a message saying they can supply the part. By the time the airline gets the part, 30 days have passed. This means the airline has to keep protection stock on hand for 30 days."

In contrast, according to Sturman, Specification 2000 will allow parts suppliers to receive and acknowledge orders within seconds and ship the parts the same day. "Literally millions of dollars will be saved by cutting down on protection stock," he said. "On top of that, the airlines will gain operational efficiencies because they use a simple menu-driven program and standard message formats that will cut down on incorrect orders." The network will also save money by eliminating telephone inquiries for spare parts.

According to John Curphey, manager of inventory analysis at United in San Francisco, Specification 2000 will help the major airlines deal with smaller suppliers that do not employ electronic data interchange techniques. "In dealing with smaller suppliers, Specification 2000 will help us eliminate our paper purchasing, which will reduce our order lead time, which in turn will reduce our protection stocks."

Curphey said smaller companies supply 40% of United's parts.

In addition, he said, the catalog available through Specification 2000 provides the airline industry with a single source of parts and equipment. "We have a single source of buying information, and the suppliers have to update only one data base while getting a great deal of visibility."

Pat Weiss, manager of provisioning for Sunstrand Aviation, Inc., an aviation equipment manufacturer based in Rockford, Ill., agreed that Specification 2000 will provide exposure for suppliers' products.

Weiss said Specification 2000 will allow suppliers to distribute their shopping lists electronically, and in some cases, cut the parts procurement process from a month to milliseconds.

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LEVEL 1 - 4 OF 11 STORIES

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INFORMATION CENTER

October 26, 1987

SECTION: NEWS; Pg. 144

LENGTH: 918 words

HEADLINE: Network loads soar while stocks plunge

BYLINE: By Kathy Chin Leong, CW Staff

BODY:

Wall Street investors were not the only ones thrown into a panic when the stock market plunged 508 points last Monday. Across the nation, managers of voice and data networks at stock exchanges and financial service companies scrambled to ensure that their computers would pass the acid test.

Most systems held up amazingly well under the unprecedented barrage of trading activity, according to users.

The public obsession with information triggered the overload. "People acted crazy because they wanted to know what their net worth was, and they couldn't find out because the [voice and data] lines were busy," one communications manager observed. "It seemed as though everyone on Wall Street picked up their phones at the same time. People's desire for information that day was insatiable."

For commercial computer systems that support the stock exchanges, Black Monday was a day on which all the cliches about memory, manpower, backup, power protection and extra trunk lines came too close to home. "We experienced usage levels we thought wouldn't come until the 1990s," remarked Dick Levine, vice-president of information services at Dow Jones News Retrieval Service.

Vendors of on-line stock quote services were faced with difficult decisions when the level of computer traffic skyrocketed to astronomic proportions.

Sweating it out

Tony Cronin, president of Wang Financial Information Services, was sweating it out when, at 10 a.m., he made the decision to separate the two backup Tandem Computers, Inc. machines at the data processing center and use them with the other five Tandem Nonstop systems. "I knew it was risky, but it was a gut decision that I felt I had to make," he said.

New York-based Wang Financial, which has an installed base of 2,200 terminals nationwide at customer sites, provides current stock trading quotes to brokerage houses such as Merrill Lynch & Co., Shearson Lehman Brothers, Inc. and E. F. Hutton & Co. Cronin was lucky.

Competitor Quotron Systems, Inc., a Los Angeles service that boasts of holding more than 65% of the stock quotation market, survived the day virtually unscathed. According to George Levine, Quotron vice-president of marketing, the Quotron 800 and 1000 minis based in New York are already capable of handling

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600-million-share days.

There were concerns at Chicago-based PC Quote when its Securities Industry Automation Corp. (SIAC) computers fell behind. The SIAC computers maintain information on equity exchanges for the Dow Jones industrial index, for instance. "When those computers fell behind, we did too," noted David George, PC Quote executive vice-president. "When you see data suddenly stopping on the terminal, you wonder who dropped out." Unlike other stock quote services, PC Quote does not use large systems. Data from the exchanges is transmitted via 9.6K bit/sec. lines to 10 IBM Personal Computers at the Chicago site. From there, information is transferred to users over satellite links.

As MIS managers struggled to maintain computer operations, voice network managers were keeping a close watch on their switches. Surprisingly, New York Telephone reported that Monday represented business as usual. No major lines went down as a result of the frenzied trading activity. "A lot of people were asking us about the work load, but it was normal, as it always is in the financial market," a New York Telephone spokeswoman said. "Our technicians were monitoring the networks here very closely, but things were very smooth."

However, telephone lines at stock brokerage houses were busier than ever. At Charles Schwab & Co. in San Francisco, callers to the main office got an almost constant busy signal. "The trunks were all maxed out," said Mike Ryan, Schwab's manager of network services. But the three Rolm central branch exchange voice switches bore up under the load, which sustained more than 125 simultaneous calls that day.

'Worn out'

While the machines did not break, the people manning them nearly did. Nearly 100 stock brokers and quotation personnel were pushed to the limit in responding to trading and quote requests. "The switchboard was so crowded with callers wanting to make trades that our staff couldn't keep up," Ryan said. "People were worn out like never before."

The desperation for information got so out of hand that people waited on the line as long as half an hour to talk to a broker. On Tuesday, the phone lines were busy at 5:30 a.m. -- an hour ahead of the usual gridlock.

The same held true for callers waiting to get through to Automated Data Processing, Inc. (ADP) in Roseland, N.J. "The PBXs were flooded with calls, but we were able to handle 99% of the traffic," reported Joe Gallo, ADP manager of voice networks and tariff analysis, referring to the firm's private branch exchanges.

Anxious investors' calls flooded the lines at Dow Jones News Retrieval Service as well as the Dowphone voice quote service, Levine of Dow Jones noted. While the previous Friday's unusual stock activity was a precursor of things to come, Levine and his team were unprepared for the Monday shock.

The multivendor computer systems dedicated to the service were slowed by the number of callers trying to access it. "As soon as one port opened up, it would get filled," Levine explained. "And not only did it get filled, once people finally got into the system, they did not want to let go. Their need for information seemed to be like a lifeline."

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LEVEL 1 - 2 OF 11 STORIES

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October 26, 1987

CORPORATE
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SECTION: News; Pg. 1

LENGTH: 887 words

HEADLINE: Stock crash thrashes CPUs, operators

BYLINE: By Jean S. Bozman, CW Staff

BODY:

As stock exchanges throughout the country struggled to cope with record volumes of shares traded last week, computer operators fought exhaustion, hunger and glitches to keep pace with the work load. Tickers ran one to two hours late and confirmation orders were missing in action for 24 hours or more as straining under the burden of processing hundreds of millions of shares, their I/O devices simply could not keep up. Stock exchange MIS managers agreed that there was insufficient space in the output queues and insufficient capacity in aging front-end processors. These factors combined to make stock tickers maddeningly slow -- and output to brokers' terminals wildly inaccurate.

The frenzied trading pace prompted the New York and American Stock Exchanges to halt trading two hours earlier than usual from last Friday through tomorrow to give all affected companies time to process and execute the enormous volume of transactions.

It was often people, not computers, who could not cope with the increase in volumes at the regional exchanges. In Boston, last Monday's volume doubled to five million shares; in California, the Pacific Stock Exchange volume on Monday jumped from 10 million shares to more than 17 million shares; and in New York, a record volume of 608 million shares on Tuesday overshadowed normal levels of 200 million, for which the system was designed.

Wrinkle in time

"In many cases, the information that stockbrokers wanted simply did not exist," said Dan McGuire, corporate manager of systems and programming at the Midwest Stock Exchange. "The specialists on the floor did not have time to react to the overflow of information, and the prices they saw on-screen in many cases did not reflect reality because of the delays in the systems." Floor traders at some exchanges had to resort to manual record keeping as systems lagged behind.

Most exchanges had to reprogram the size of their output files to contain the data. Often, reprogramming was done on the fly, between trading sessions. At most exchanges, however, order clearing stretched into the early morning hours.

From New York to Chicago to San Francisco, stock exchange computers ran uncomfortably close to their limits. "The computer systems creaked a little bit at 95% of capacity, but they kept running," reported Bob Andrews, senior vice-president of the Boston Stock Exchange, which runs three Stratus Computer, Inc. systems. The Midwest Stock Exchange's twin Digital Equipment Corp. VAX 8650s and the Philadelphia Stock Exchange's three IBM System/88s

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also kept running.

In many cases, MIS managers said, it was the I/O devices and the people that could not cope with record-high transaction volumes. "The computers held up pretty well," said W. H. Anderson, chief information officer and senior vice-president of Prudential-Bache Securities, Inc. in New York. "The hard parts were when you had orders that did not match, phones that were not answered and a workday that did not end until 1 a.m."

The new workday began just six hours later, at 7 a.m. The Midwest Stock Exchange's McGuire said, "We were glued to our control room day and night. We ate so much pizza that I never want to see another slice again."

Breakdowns were, indeed, reported. At the close of the high-pressure week, New York's Securities Industry Automation Corp. (SIAC) announced that it would close trading at 2 p.m. -- two hours early -- on Friday and today to process backlogged orders for the NYSE and Amex.

The troubles at SIAC began Monday, when several of its 200 Tandem Computers, Inc. processors halted during the market surges. But the Tandem system's fault-tolerant design allowed SIAC systems operators to extract the incomplete transactions from backup processors, according to Jim Squyres, vice-president of SIAC. "We did something we did not think would be possible," he said. "Files might have overloaded, and the tickers ran late, but we were handling up to one [million] to two million computer transactions per second."

Upgrades to many systems were already planned when last week's stock deluge hit. The Pacific Stock Exchange's 8-year-old Scorex trading system, designed to handle 25,000 transactions per day, was handling 40,000, according to John Parady, president of the exchange's Data Processing, Inc. subsidiary. Two months after arriving at the exchange, Parady was in the process of upgrading the system, a project planned for completion more than a year from now. "I was anticipating the problem," he said. "Now, I'm tuning systems on the fly."

20/20 hindsight

In view of last week's activity, each exchange is reexamining its capacity planning.

Some exchanges just could not wait until this week to install new machines. At the Midwest Stock Exchange, several new Tandem processors were snapped into place within existing Tandem cabinets. Two new disk drives were wheeled in Wednesday night.

The experience of last week, said Prudential-Bache's Anderson, was something akin to marching into battle.

"It is kind of like going to war," he said. "Now that we've been there at levels of 600 million shares or more traded in New York, we're never going to be unprepared again. Now, we're going to decide what kind of armaments we'll need for the next time."

GRAPHIC: CW Chart 1, by Mitchell J. Hayes, Along for the ride, Computer industry stocks reflect the volatility in last week's unprecedented trading swings; CW Chart 2, Anatomy of a trade, In typical New York Stock Exchange transactions,

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small orders go directly to exchange computers, while larger orders first go to the trading floor, by Mitchell J. Hayes.

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LEVEL 1 - 4 OF 8 STORIES

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INFORMATION CENTER

October 21, 1987, Wednesday

DISTRIBUTION: Business Editors

LENGTH: 1183 words

HEADLINE: TANDEM-COMPUTER; (TDM) Tandem Computers reports financial results

DATELINE: CUPERTINO, Calif.

BODY:

Tandem Computers Inc. (NYSE:TDM) Wednesday announced record results for the 1987 fiscal year, which ended Sept. 30.

The California-based computer manufacturer, whose computers have handled massive transaction volumes at the New York Stock Exchange without incident, reported annual revenue of \$1,035,495,000, a 35 percent gain over the \$767,793,000 posted in fiscal 1986.

This represents the first time the company has achieved annual revenue in excess of \$1 billion.

Net income for the fiscal year grew 66 percent to \$105,604,000 compared with net income in fiscal 1986 of \$63,766,000. Annual earnings per share stood at a record \$1.08 compared with 72 cents reported in fiscal 1986, a 50 percent increase.

For the fourth quarter of fiscal 1987, ended Sept. 30, the company achieved revenue of \$291,114,000, a 32 percent increase over the \$220,552,000 reached in the same three month period a year ago.

Net income for the quarter grew 41 percent to \$30,446,000, compared with net income of \$21,584,000 reported in the fourth quarter of fiscal 1986. Earnings per share stood at 31 cents compared with 23 cents earned in the same three month period of the previous year.

Commenting on the company's results, President James G. Treybig said, "We are pleased with the company's performance in fiscal 1987. Throughout the year, international business remained healthy and domestic business strengthened.

"In the fourth fiscal quarter, U.S. revenue grew 28 percent over the same quarter of 1986. In order to support the growth we experienced this year, we aggressively invested in our sales force, industry programs and solutions capability.

"As we pass through a billion dollars, we are also proud of the success of our customers whose businesses depend on the reliability and expandability of Tandem systems," Treybig continued.

"For example, the New York Stock Exchange has been a Tandem customer since 1977. Their transaction processing strategy implemented on Tandem systems successfully handled two successive days of transactions in excess of 600

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million shares. Over 25 other stock exchanges around the world rely on Tandem systems for similar performance.

'New customers in targeted industries will also help take us beyond a billion dollars,' Treybig said. 'For example, we continued to win key customers in telecommunications. In the fourth quarter, NYNEX Corp. joined the other six regional Bell operating companies as a Tandem customer.

'To provide solutions to customers in the transportation industry, we embarked on a joint venture with Union Pacific Railroad and SEL Canada,' Treybig continued. The new company, AMCI, will jointly develop and market electronic monitoring and control systems for railroads.

'During the fourth quarter we further enhanced our product leadership in network management, communications and security,' Treybig added. 'With the introduction of Distributed Systems Management, customers can more efficiently manage large, dispersed networks of Tandem systems.

'To further strengthen integration with IBM networks, we introduced SNAXLINK, a direct channel connection which facilitates flexible, high-speed communications between Tandem systems and IBM systems,' Treybig said.

'In addition, we made an equity investment in Netlink, a privately held North Carolina company which specializes in connectivity with IBM. We also announced our intention to acquire Atalla Corp., a leader in security products used with Tandem systems in a variety of industries.

'We begin the new fiscal year with good momentum,' Treybig concluded. 'As we move beyond a billion dollars, our product strategy, market position and financial strength are excellent. We will continue to pursue opportunities for growth. We are optimistic about the future.'

Tandem Computers Inc. manufactures and markets computer systems and networks for the on-line transaction processing market. The company is headquartered at 19333 Vallco Parkway, Cupertino, Calif. 95014. The telephone number is 408/725-6000 Tandem and SNAXLINK are trademarks of Tandem Computers Inc.

Tandem Computers Inc. and Subsidiaries
Financial Highlights
(In thousands except per share amounts)
(unaudited)

	Three Months Ended Sept.30		Twelve Months Ended Sept.30	
	1987	1986	1987	1986
Revenue				
Product revenue	\$ 241,469	\$ 182,514	\$ 861,042	\$ 632,277
Service and other revenue	49,645	38,038	174,453	135,516
Total revenue	291,114	220,552	1,035,495	767,793
Costs and expenses				
Cost of product	61,283	46,998	226,804	175,239
Cost of service and				

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other	37,362	30,186	131,424	104,685
Research and development	30,876	23,553	108,474	87,024
Marketing, general and administrative	112,763	83,751	398,105	294,867
Total costs and expenses	242,284	184,488	864,807	661,815
Operating income	48,830	36,064	170,688	105,978
Interest income, net	4,209	2,415	14,223	8,504
Income before income taxes	53,039	38,479	184,911	114,482
Provision for income taxes	22,593	16,895	79,307	50,716
Net income	\$ 30,446	\$ 21,584	\$ 105,604	\$ 63,766
Earnings per share	\$ 0.31	\$ 0.23	\$ 1.08	\$ 0.72
Weighted average shares outstanding	99,550	92,474	97,711	88,402

Certain prior period amounts have been reclassified to conform with the current period presentation.

--BALANCE SHEET AVAILABLE UPON REQUEST FROM BUSINESS WIRE--

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LEVEL 1 - 1 OF 12 STORIES

Proprietary to the United Press International 1987 CORPORATE
INFORMATION CENTER

October 29, 1987, Thursday, BC cycle

ADVANCED-DATE: October 27, 1987, Tuesday, BC cycle

SECTION: Standing Feature

LENGTH: 686 words

HEADLINE: Wall Street crashed but the computers didn't

BYLINE: By BEATRICE MOTAMEDI, UPI Business Writer

DATELINE: SAN FRANCISCO

KEYWORD: Bizday

BODY:

Black Monday may have depressed investors everywhere, but it prompted a sigh of relief in Silicon Valley.

Tandem Computers Inc., an hour south of San Francisco in Cupertino, Calif., made the 200 mini-computers that channel data and transact trades at the New York and American stock exchanges.

On Oct. 19 Tandem's 'Non-Stop' computers were put to the test as a then-record 604 million shares changed hands on the NYSE in one of Wall Street's busiest, if bleakest, trading sessions. The Dow Jones industrial average lost 508 points on what became known as Black Monday.

The market crashed, but Tandem's computers didn't.

'I have to admit I'm pretty happy,' said Tandem President Jim Treybig. 'Not because of the stock market but because we did do well.'

'We were all relieved,' Treybig said. 'Transactions weren't lost. We handled the volume.'

For International Business Machines Corp., the test came Oct. 26, the settlement day for trades transacted five business days before on Black Monday. The Big Board uses an IBM 3084 mainframe to oversee the process by which buyers pay for stock and sellers deliver it.

Last week 'the process got a little pinched,' said James G. Squyers, vice president for advanced systems at the Securities Industry Automation Corp., which oversees computer systems at the NYSE and Amex.

'We were able to use the weekend to catch up on a lot of little things.'

Not that there haven't been problems.

As trading volume swelled Oct. 19, a handful of Tandem computers at the Big Board and one at the Amex failed, though they automatically recovered intact within moments.

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Traders at the Amex began running out of file space in their computers, causing orders to back up. A similar problem Oct. 20 at the NYSE forced it to temporarily stop taking limit orders.

BEACON, a two-month-old, \$2.5 million integrated quote and trading system intended to become the electronic heart of the Boston Stock Exchange successfully endured a baptism of fire as traders scrambled for data.

"The capacity planning that everyone has done has just been shot out the window because of this crazy market," said Jim Crofwell, executive vice president of the 210-member exchange.

"I don't think anybody's plans have called for more than 500 million shares a day," Crofwell said. "They're going to have to go back to the drawing board."

At the Pacific Stock Exchange in San Francisco, traders were sent home early most of last week when the NYSE's ticker tape fell behind in recording transactions.

Problems worsened when a computerized trading system called SCOREX began buckling under a deluge of orders, prompting exchange officials to shut it down for most of Oct. 21 and Oct. 22.

The decision to close down the system, which executes trades of 1,099 shares or less, hit hard at high-volume houses such as San Francisco-based Charles Schwab & Co., the nation's largest discount brokerage.

"We're doing the best we can. That's all we can do. This is a novelty situation," said Hugo Quackenbush, Schwab's senior vice president.

But customers reported delays as stock prices seesawed.

"I couldn't get through," said Bill McKenney, 27, gazing at an illuminated ticker tape in the Schwab lobby last week. "I was a little furious."

Pacific Exchange Chairman Maurice Mann blamed the "mess" in the stock market on "inhuman computers and inexperienced humans."

"The system cannot stand these exceptional volumes and volatility," Mann said. "People and machines can't take it."

Large or small, the thousands of deals that take place every day in the stock market make Wall Street the Olympics of on-line transaction processing, a rapidly growing segment of the computer business.

Tandem recently announced it will supply computers to three Scandinavian stock exchanges, bringing to 28 the number that use Tandem systems.

Far from deterring it from the world of finance, the stock market debacle has made the company even more eager to crunch Wall Street's numbers.

"We love all these transactions," Treybig said. "Our business is good."

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