

STRATEGIES

Amex Eyes Tandem, Stratus For New Market Data System

Digital Equipment Corporation (DEC) will lose an important customer when the American Stock Exchange converts to Tandem and Stratus computers in first quarter 1987 as it rewrites its Market Data System (MDS). The change is part of a series of automation moves that are taking the Amex into the 21st century.

Though DEC is among the most actively traded 130 stock options listed on the Amex, the leading computer company based in Maynard, Mass. does not offer fault-tolerant architecture, deemed critical to the future development of the MDS—a centralized computer system that captures quotes and last-sale figures for 900 listed stocks, 130 stock options, and stock index options.

The availability of computer facilities during trading hours is the standard by which the securities industry measures computer departments. Fault-tolerant architecture includes redundant components within the computer to serve as a back-up should any element fail. To the data processing professional, this is an insurance against system failure.

"We consider automation and technology to be one or two of the most critical things in terms of competing, certainly for the next century," says Mark T. Smith, Amex's new vice president, technology.

Amex relies on the MDS to feed live market data to financial quote systems, among them Quotron, ADP, Bunker Ramo and Bridge Data, for worldwide dissemination.

The MDS presently runs on a DEC PDP 11/70 with a CC80 disk drive. DEC no longer manufactures the model and the disk drive is at least 10 years old, estimates Smith.

The Amex is choosing to follow Merrill Lynch, Goldman Sachs, and Salomon Brothers, major brokerage houses using Tandem and Stratus computers.

"It's sort of their lifeblood that their systems have to be up during trading hours to deliver orders and prices and reports," explains Smith.

The entire investment community is rallying around Tandem in Cupertino, Calif. and Stratus, in Marlboro, Mass., because the industry cannot



Amex's hand-held keypads for quote updates are courtesy of Kiel Corp., Amherst, N.H.

afford to risk computer breakdowns during a hectic trading session.

"The industry trend has nothing to do with hardware compatibility, but everything to do with system availability," says Smith.

The use of standardized communications packages has brought in an element of compatibility between machines by allowing data to be moved from one computer to another, he adds.

Despite Wall Street's megabuck purchases of Stratus and Tandem, Amex continues to purchase computers from a smorgasbord of hardware manufacturers, and is on the lookout for systems that may address its unique needs.

Specialized Demands

Exchanges around the world number not in the hundreds, but dozens, hence there are no firms specializing in hardware and software solely for them.

Hardware variety certainly spices up a stock exchange. Just running through a list of current systems at the Amex sounds like a Who's Who of computer manufacturing.

• Quick Quote, a computerized touch-sensitive screen for pricing multiple options series, is made by the Fluke Manufacturing Co., Everett, Wash. The software, which runs on an Intel minicomputer, lets specialists compute prices for 18 options series—actually six contracts each of

which three have expiration dates.

• A prototype of the new electronic book meant to replace the specialist's limit-order book, runs on an IBM AT with a touch-sensitive screen. The software was developed by Amex and SIAC—the automation corporation jointly owned by Amex and the New York Stock Exchange. An electronic book helps the specialists organize their opening and cancel-and-replace orders. But the exchange is not locked into a decision on using ATs when the electronic book is widely introduced on the floor.

• Hand-held keypads for updating quotes and last sales on the Major Market stock index option are made by Kiel Corp., Amherst, N.H.

• Market surveillance systems to monitor stocks and options trading for detecting irregularities operate on an IBM 4341—a small main-frame. There are two surveillance systems: Stock Watch Automated Techniques (SWAT) monitors trading activity; Options Watch monitors the options market.

• A voice synthesizer made by Votrax, Troy, Mich. alerts the SWAT team when an irregular trading pattern occurs in a stock. The voice spells out the name of the stock symbol while a red light flashes on the monitor as a back-up.

Though Smith's background is data processing, he isn't enamored with technology unless it's appropriate for the trading floor. "Our focus is not pure R&D," he says.

Even though the New York Stock Exchange is using voice technology on the trading floor, Amex is not. "Voice technology is not where it needs to be," he insists, "but that doesn't mean I'm not watching it."

Smith, 35, whose ice-blue eyes radiate a maverick quality, joined the Amex in February, 1986, from its arch rival the Chicago Board Options Exchange (CBOE), where he was vice president for strategic planning—a job that included watching strategic moves at the Amex. The native Iowan left Chicago because "The New York market is the place to be in the securities business."

Over the past seven months, Smith has worked at a furious pace, evaluating, developing and planning auto-

mated trading systems and trading-support systems on his \$5 million annual budget, a third of the \$15 million Amex data processing systems budget.

Traders Tango With Quote Device

One consistent thread across a broad sweep of automation projects is the use of touch-screens. By early June he selected Tango—a hand-held quote display device—made by the Kiel Corp., Amherst, N.H. The U.S. subsidiary of a Belgian computer company, makes electronic keypad displays using a proprietary touch-screen technology.

"One Nirvana that people (at exchanges) always talk about is getting a hand-held terminal into the hands of the trader or the broker. This is the first device that I've seen that makes this a probability," states Smith.

Tango is aimed at market makers who trade among the 900 stocks and 130 options listed on Amex for their own accounts. They could input orders, keep track of positions, and send data to a remote host computer located at the home office.

A specialist who wants to know his position can call it up on the same mini-device he uses for recording or maybe on a different terminal. "It doesn't matter," says Smith. "The idea is that data is transmitted through a centralized computer and is then available for access either through Tango or a standard CRT device."

Tango solves the two biggest problems: weight and the trade-off between keypad and the liquid crystal display (LCD) area. A touch-screen eliminates the need for a keyboard, which competes with the LCD for the same hand-held area.

Smith is looking at wrist straps in case a trader wants both hands free to do other things, though the unit's back is flat enough to be used as a writing surface.

"It's just the niftiest device," beams Smith, holding up the infant prototype. The \$600 touch pad is cheap compared with a \$3,000 full-sized quote machine. Price is important since hand-held gadgets wear out after a few years due to perspiration, body heat and skin moisture.

"We're working as fast as we can to get it down on the (trading) floor," says Smith.

The first batch will go to quote reporters and last sale reporters in the options pit where the Major Market Index—XMI—is traded. This broad

market index of 20 blue chip stocks, includes names like American Express, General Motors, IBM, and Eastman Kodak.

The Amex is working closely with Investor's Co.-Spear, Leeds & Kellogg, a partnership making markets in the XMI Index. The firm will give its 10 specialists touch pad devices to comply with Rule 191, which requires specialists to keep a record of all trading.

The major market index has become Amex's flagship product because it tracks the movement of the Dow Jones Industrial Average and is popular in computerized buy and sell programs.

In 1985 XMI accounted for 25 percent of Amex's overall trading volume. Amex regards it as its strongest suit against the CBOE's Standard & Poor's 100 stock index option—known as OEX—which tracks the S&P 500 index.

By attaching Tango to a Spear, Leeds host computer, senior managers can examine the trades that specialists make during the day, and periodically check their positions. This eliminates the problem of collecting

Just running through a list of current systems at the Amex sounds like a who's who of computer manufacturing.

all trades at the end of the day and having to key them into a computer for trade match and comparison.

"This type of system will reduce the number of errors that are part of any transcription process," Smith asserts. The impact is going to be felt by institutional brokers who execute orders through Amex specialist posts, he contends.

Existing systems, like AutoPer for stocks and AutoAmos for options, relay transaction reports back to the broker 30 seconds after the member firm electronically transmits the order (WSCR July, 1984). Specialists execute the order by touching the appropriate section of a touch screen. After a few seconds, they send out confirmation reports by touching squares which display price and brokerage information about the opposite side of the trade.

Touch Screens Galore

Touch screen technology is new to Amex specialists who make markets in heavily traded equity options. "This is the Renaissance period of

trading options as compared to the Stone Age of three or four years ago," says Andrew Schwartz, who runs Drexel Burnham Lambert's Amex specialist booth.

Amex is resourceful with technology, reserving it for the most active specialist booths. For example, Schwartz is fully automated because he makes a market in three of the most active equity options, Apple Computer, Adolph Coors, and Cetus Corp. These OTC options are traded on multiple exchanges since March, 1986. Statistics show Amex is attracting a high percentage in OTC stock options—the only option contracts allowed to trade on more than one exchange.

Drexel's Schwartz updates his own prices using Quick Quote—a touch screen manufactured by the Fluke Manufacturing Co. Quick Quote is a master computer system installed at specialists' booths on the trading floor.

A specialist normally updates five or six options series at a time since each one has three expiration dates. Quick Quote is currently used to update prices for a total of 17 options classes, including 16 equity options and the XMI contract.

Smith plans to expand Quick Quote by another 21 terminals, shooting for one at every specialist station. Right now, 28 stations have Quick Quotes.

"We believe in implementing technology where it's needed," he states. He's even considered wheeling out Quick Quotes on a crash cart so that he can apply hardware when heavy trading suddenly breaks out in an option or its underlying stock. This frequently happens in takeover situations.

To go one step better than Quick Quote, Amex is developing an automated quote system, dubbed AutoQuote. It automatically updates options quotes based on an algorithm entered by the specialist. The significance of AutoQuote is that it lets a specialist maintain a current quote in options he does not trade often. These options are typically spread off of the options that trade actively for which quotes are on hand.

The idea is for the specialist to concentrate on trading the active series, while AutoQuote—jointly developed with SIAC—automatically updates the inactive options series based on complex parameters set by the specialist daily, weekly, monthly or however often he wants. ■

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upment Project Area, Street Improvements/Beautification
exceed \$176,235.20 to the County of Santa Clara for its cost
order to the Segment C102 project for library entrance

7; 6/18/87)

\$20,000 or more occurring during the Board recess.

DIRECTOR

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20020 Stevens Creek Blvd., Cupertino 95014
Action: Exchange type 48 license to type 47
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Pizza Hut West Inc., d/b/a Pizza Hut

20770 Stevens Creek Blvd., Cupertino 95014

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**Tak-Wah Kwan, Cecilia Q. Yuen, Siltex P.
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2673 Cropley Ave., San Jose 95132

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lic eating place (premises not now licensed)

Almaden Vineyards Inc.

2055 S. Seventh St., San Jose 95112

Action: Withdrawal of types 2, 10 & 22 licenses

Almaden Vineyards Inc.

1530 Blossom Hill Road, San Jose 95118

Action: Withdrawal of types 2, 5, 10 & 12 licen-
ses

Quen Thi Cao, d/b/a Queen's

1686 Lafayette St., Santa Clara 95050

Action: Cancellation of license

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304 E. Santa Clara St., San Jose 95113

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ises not now licensed)

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Seeking: Person-to-person transfer of off-sale
beer and wine license from Ke Sim & Kyu Chul
Hwang

Mergers & Alliances

San Jose-based **Plexus Computers** will sup-
ply Hilz Computer with its recently introduced P/
90, as well as the entire Plexus family of depart-
mental computer systems. Hilz has already
taken delivery of 25 P/90 units.

Cupertino-based **Tandem Computers Inc.**
and **GTE-Northwest, Everett, Washington**
announced they have signed a memorandum to
develop a business relationship for the integra-
tion of each company's products into a com-
prehensive product for the management of
telecommunications.

GE/RCA Solid State Division and San Jose-
based **VLSI Technology, Inc.**, signed an agree-
ment for GE to become an alternative source for
two families of VLSI Technology's high perfor-
mance CMOS gate arrays, the VGT10 and
VGT100.

Cupertino-based **Cal-Star Financial Ser-
vices, Inc.** has acquired **Drake Financial Ser-
vices** in Marin County. Cal-Star will sell the
loans originated by Drake while retaining the
rights to service the loans on a permanent basis.
Drake is being acquired in a stock-for-stock
exchange which will increase Cal Star's book
value by almost 35 percent. The company's
book value after acquisition will be \$.29 per
share.

San Jose-based **Wyse Technology** has com-
pleted the acquisition of **Link Technologies** in
Fremont in exchange for shares of common
stock.

Santa Clara-based **Ridge Computers**
announced a new version of its low-end
reduced-instruction set computing (RISC)-based
superminicomputer. The new system, the Ridge
32 Turbo/RX, features Ridge's version of
AT&T's System V, Release 2 operating system
called RX/V. The new Unix operating system-

SJ Business Journal 8/2/87
P22

LEVEL 1 - 3 OF 3 STORIES

PAGE 6

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August 31, 1987, Monday, BC cycle

CORPORATE
INFORMATION CENTER

SECTION: Financial Report.

LENGTH: 89 words

HEADLINE: TANDEM <TDM> INTRODUCES COMMUNICATIONS DEVICE

DATELINE: CUPERTINO, CALIF., AUG 31

BODY:

Tandem Computers Inc said it introduced the SNAXLINK subsystem, which will provide a high-speed communications link between Tandem computers and International Business Machines Corp <IBM> computers.

Tandem said SNAXLINK replaces multiple communications lines with a high-speed fiber-optic link, which lowers communications costs and increases data transfer rates.

The company said the device will be available in the fourth calendar quarter of 1987, and is priced at 49,550 dlrs for a single unit and 79,676 dlrs for two units.

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LEVEL 1 - 2 OF 3 STORIES

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August 31, 1987, Monday

CORPORATE
INFORMATION CENTER

DISTRIBUTION: Business Editors

LENGTH: 580 words

HEADLINE: TANDEM; (TDM) Tandem announces SNAXLINK communications subsystem

DATELINE: CUPERTINO, Calif.

BODY:

Tandem Computers Inc. (NYSE:TDM) Monday announced the SNAXLINK communications subsystem, a direct channel attach unit that provides a flexible, high-speed communications link between Tandem systems and IBM systems.

Designed for use in the IBM systems network architecture environment, SNAXLINK replaces multiple communications lines with a high-speed fiber-optic link attached to the input/output channel of an IBM or IBM-compatible system, lowering communications costs and greatly increasing data transfer rates.

Since it does not require a front-end communications processor or the large number of cables associated with multiple communications lines, SNAXLINK is easier to install and manage. SNAXLINK also uses standard SNA interfaces, eliminating the need to modify application programs.

Dennis L. McEvoy, vice president of software, stated, "SNAXLINK makes it even easier to connect large Tandem and IBM systems and networks and to create new applications that require data access and transfers between systems. In this way, SNAXLINK extends Tandem's leadership and underscores our continuing commitment to providing connectivity with IBM systems."

SNAXLINK serves as a communication path between SNAX, Tandem's SNA access software and VTAM, IBM's Virtual Telecommunications Access Method. Standard SNA interfaces enable Tandem-based applications or Tandem-owned SNA devices to communicate with applications on IBM systems using either SNAXLINK or SNAX-supported communications facilities without changes to the Tandem or IBM applications.

Channel attachment allows data transfer up to one million bits per second in each direction simultaneously (full duplex), compared to the 19,200 bps or 56,000 bps rates common to communications lines. SNAXLINK attaches to both block-and byte-multiplexor channels.

Batch, interactive or application-to-application data communications are supported. Each SNAXLINK unit handles up to 1,020 sessions concurrently.

SNAXLINK runs on Tandem NonStop II, TXP and EXT systems, and is especially well-suited to Tandem's high-end NonStop VLX system.

SNAXLINK components include a communications interface unit which attaches to a Tandem system's I/O channel; a standard rack-mountable channel attachment unit which attaches to an IBM system's channel; and a high-speed fiber-optic

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@ 1987 Business Wire, August 31, 1987

connection that links the two units. The fiber-optic link allows Tandem and IBM systems to be physically separated by up to 500 meters.

SNAXLINK is available in the fourth calendar quarter of 1987 for use in IBM and IBM-compatible system environments certified by Tandem.

SNAXLINK is priced at \$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. All prices shown are in U.S. dollars.

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

Note to editors: Tandem, NonStop, VLX, TXP, EXT, NonStop II, SNAX, and SNAXLINK are trademarks of Tandem Computers Inc.

IBM is a trademark of International Business Machines Corp.

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

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firm, CIE Terminals is the second largest vendor of VT220-compatible terminals in the U.S., with 8.9% of the market.

Wyse Technology holds a 13.6% market share, and DEC accounts for 49.8% of the market.

CXI card ties PS/2s, nets to IBM hosts

MOUNTAIN VIEW, Calif. — CXI, Inc., the data communications division of Novell, Inc., introduced a micro-to-mainframe communications board last week for Models 50 and above of IBM's Personal System/2 family.

The Pcox/Coax-P coaxial board reportedly works with the PS/2 Micro Channel bus. In addition, it is said to provide connectivity to IBM or IBM-compatible mainframes for individual PS/2 computers as well as for PS/2s on Novell's Netware-based local-area networks (LAN). Netware is a network operating system.

The new board can function as a gateway to a Netware-based LAN. When the board is installed in one PS/2 on the network along with Pcox/GW-3270 gateway software, each personal computer on the network that has Pcox LAN workstation software can gain access to mainframe resources through the gateway, CXI said.

The Pcox/Coax-P also features compatibility with existing coaxial versions of CXI's Pcox software. Pcox/Coax-P provides PS/2 users with a connection to an IBM cluster controller over coaxial cable and can provide the following features: single and multiple host sessions, support for windowing and file transfer and emulation of expensive mainframe printers by PC printers.

Scheduled for availability in October for \$545, Pcox/Coax-P will be demonstrated at PC Expo in New York this week.

the firm said.

Like the PC/Focus package, Ramis/PC was developed to allow fourth-generation language applications development, which often occurs on mainframes and minicomputers, to take place on less expensive microcomputers.

Applications can also run on microcomputers and can reportedly simply pull data from the fourth-generation language run-

Ramis/PC now includes a menu-based transaction processing feature based on the Data Maintenance Facility found in the mainframe version, according to the company.

This feature can use files from 1-2-3, Dbase and other personal computer packages while maintaining the original file structure and programming syntax, the firm claimed.

The Ultimate Pick: Deal clears way for Tandem

BY ROSEMARY HAMILTON
CW STAFF

IRVINE, Calif. — The lawsuit between Pick Systems and a small Houston-based company over a Pick look-alike operating system called Epic was resolved recently when The Ultimate Corp. acquired Epic and agreed to pay royalties to Pick Systems for it.

Pick Systems announced its \$100,000 settlement last week from Ever-On Corp., maker of the Epic operating system.

Ever-On officials were not available for comment.

According to an Ultimate official, the operating system was acquired this month and will be officially announced under a new name in the middle of next month.

The introduction will coincide with Ultimate's announcement of an OEM deal with Tandem Computers, Inc. the week of Sept. 14.

Epic was designed as a Pick-like operating system for Tandem hardware. Ultimate said Epic will run under the Tandem Guardian operating system, allowing applications written for Pick to run on Tandem hardware.

Exclusive rights

The \$100,000 settlement was not a license fee from Ever-On but rather constituted "additional considerations" beyond the undisclosed amount Ever-On paid for Pick Systems' legal fees,

said William Mitchell, general counsel at Pick Systems.

Ultimate, which already licenses the Pick operating system from Pick Systems, now has exclusive rights to Epic.

"Ultimate rolled Epic into an existing licensing agreement with us," Mitchell said. "Epic is not considered a separate operating system."

ULTIMATE rolled Epic into an existing licensing agreement with us. Epic is not considered a separate operating system."

WILLIAM MITCHELL
PICK SYSTEMS

Pick Systems filed suit against Ever-On in October 1986 to prevent the company from licensing Epic to customers without having paid Pick Systems a licensing fee.

The Epic operating system is said to look enough like Pick that it violates Pick Systems' proprietary rights to the operating system, Mitchell said.

According to Mitchell, Ever-On has licensed the product to about two customers.

"The problem was solved when Ultimate stepped in," Mitchell added. "It was really a three-party agreement."

Symbolics reels under \$25M loss

BY CLINTON WILDER
CW STAFF

CAMBRIDGE, Mass. — Ending a fiscal year that the company would probably like to forget, Symbolics, Inc. last week reported a \$25.5 million loss for the 12 months ended June 30.

The maker of artificial intelligence platforms reported that revenue dropped 9% from the previous year to \$103.8 million. In fiscal 1986, Symbolics concluded a stellar growth year with a profit of \$10.7 million, or 41 cents per share, on sales of \$114.2 million.

The 1987 loss included \$14.9 million in one-time charges. A \$13.7 million charge was announced in September 1986 to cover a 17% work force reduction, management reorganization and consolidation of office and manufacturing space.

Symbolics added a \$1.2 million charge in the fourth quarter because of unsuccessful attempts to lease some of its office space. Symbolics recently moved back to Cambridge from what had been planned as its new corporate headquarters in suburban Concord, Mass.

Symbolics' financial slowdown typifies a trend among AI vendors. Analysts have attributed the downturn to the saturation of demand for specialized AI systems in markets such as education and to vendors' failure to succeed in the commercial mainstream because of a lack of industry-standard platforms.

Symbolics executives, however, claimed that the company has turned the corner. Noting that the firm increased revenue by 18% between the third and fourth quarters and reduced its quarterly loss by 25%, they predicted that Symbolics will return to profitability in fiscal 1988.

The firm reported a fourth

Tandem builds SNA link

Multiple lines replaced by single channel tie-in

BY KATHY CHIN LEONG
CW STAFF

CUPERTINO, Calif. — Tandem Computers, Inc. this week is expected to announce an IBM Systems Network Architecture (SNA) offering that locally attaches Tandem computers directly to IBM mainframes.

The Snaxlink product is the latest device in Tandem's SNA war chest. It is scheduled to ship in the fourth quarter.

Customers currently link Tandem computers to IBM systems via multiple communications lines to a front-end communications controller. With Snaxlink, users reportedly will be able to attach a single fiber-optic link to an I/O channel of an IBM host running VTAM.

Fast times

The key advantage for corporate users will be a significant improvement in transaction speeds, said Tom Anderson, a Tandem product manager. Instead of using multiple lines running at 56K bit/sec., users can achieve speeds of up to 1M bit/sec. with a direct connection to the mainframe.

With prices starting at \$49,550, Snaxlink consists of a communications interface unit for Tandem's Nonstop TXP, EXT and VLX models; a channel unit for IBM hosts; and a fiber-optic link that allows attached systems to be physically apart by up to 1,640 ft. The product has been tested with IBM 4381, 3083 and 3090 computers.

Anderson said Snaxlink will use standard SNA interfaces to the hosts, eliminating the need to modify existing applications. To use the new offering, users are required to install Snax, Tandem's SNA access software.

Experts watching the SNA market gave Snaxlink a thumbs up. Steve Randesi, vice-president of Gen2 Ventures in Saratoga, Calif., said, "Whenever you connect directly to the channel, you obtain higher speeds. It is beneficial to users who have had to use front-end processor lines to get to the host."

While other third-party vendors have developed similar connections that allow Digital Equipment Corp. computers to tap into the SNA environment, no one has introduced such a product for Tandem machines.

NCR

FROM PAGE 1

application or special-purpose processors, also scored poorly in the May benchmark tests by Neal Nelson & Associates in Chicago. The firm said the original 32/800 scored no better than the older and less expensive Tower 32/600.

Aggelakos said NCR worked with the testing firm and the complaining customers and accelerated a planned file processor upgrade. That upgrade, which had been planned for 1988, will be tested by select customers soon and will be phased into general availability during the fourth quarter.

16.7-MHz 68020 and enhancing NCR's Unix implementation to support the 68020 and general optimization of the operating system code.

Aggelakos added that the multiprocessor design of the 32/800 machine makes it easier to provide such a retrofit than a monolithic architecture would permit.

He also said many customers may not want the retrofit because they have experienced no problems with the file processor, which handles much of the system's I/O and other tasks.

Meanwhile, Neal Nelson, president of the Chicago-based testing firm, said a recent retesting of the 32/800 with the en-

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IDB ONLINE--THE COMPUTING INDUSTRY DAILY
Tuesday August 25, 1987

TANDEM TAKES WYSE PCS AS NONSTOP-LINKED
WORKSTATIONS

Tandem has announced a range of seven Wyse-sourced workstations for use with its NonStop and LNX range of fault-tolerant computer systems. The 286- and 386-based MS-Dos PSX/200 and PSX/300 series can be used stand-alone PCs or as fully integrated systems terminals with the NonStop and LNX systems. The 80386-based PSX/300 series comes in two models: the 70Mb hard disk PSX/370, and the 40Mb PSX/340. Both use 16MHz processors and have a 5.25" 1.2Mb disk drive; they cost \$5695 and \$4895 respectively. There are five models in the PSX/200 range; the diskless PSX/200, at \$1195 and the single-floppy PSX/201 at \$1395, run at 8MHz and are designed to be low-cost networking workstations. The 40Mb PSX/240, 20Mb PSX/220 and entry-level PSX/220E each have a 5.25" 1.2Mb disk drive, with the PSX/240 and /220 running at 12.5MHz and the /220E running at 8MHz. They cost \$3795, \$2995 and \$2395 respectively. Tandem is accepting orders now for the PSX/200 series, with delivery in the fourth quarter. The PSX/300 family will ship in the first quarter 1988. Each workstation has six 16-bit and two 8-bit expansion slots and will support 3.5" 1.44Mb disk drives. All are upgradeable and come with MS-Dos 3.2, GW-Basic 3.2, host integration software, Tandem's PC6530 terminal emulation and file transfer program and support for Tandem Multilan software. The workstations can access MS-Dos, Guardian, Unix or IBM 370 applications and are designed, says Tandem, to support Microsoft's OS/2 operating system in future. Monitors are optional at \$225 for 14" amber monochrome or high-resolution 14" colour at \$775; an analogue colour monitor for VGA graphics will be available in Q1 1988 at \$775. Tandem says it has no plans to offer the workstations beyond its existing customers at present.

LEVEL 1 - 2 OF 8 STORIES

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DISTRIBUTION: Business Editors

LENGTH: 902 words

HEADLINE: TANDEM; (TDM) Tandem Computers announces seven new system workstations

DATELINE: CUPERTINO, Calif.

BODY:

Tandem Computers Inc. (NYSE:TDM) Monday announced a new family of seven MS-DOS workstations that function as either stand-alone units or as fully integrated system terminals for Tandem NonStop and LXN systems. The new PSX/300 and PSX/200 series range from high-performance workstations, based on the Intel 80386 microprocessor with a 70-megabyte hard disk drive, to a low-cost diskless workstation, based on the Intel 80286 microprocessor, for connection to a local area network. The compact design of the system chassis -- 15 inches wide, 16 inches deep and 6 inches tall -- accommodates any PSX configuration. Barry Young, vice president of the Tandem Micro Products Division stated, "PSX workstations save customers time and expense by being fully configured for host integration. Their modular, upgradeable processor design allows extension of performance and product life. PSX workstations are designed to provide outstanding price/performance when connected to a Tandem system or network." A wide range of standard hardware configurations and components are available, allowing users to customize the PSX workstation to suit their processing requirements. The 80386-based PSX/300 series is available in two models: the PSX/370 with a 70-megabyte hard disk drive, and the PSX/340 with a 40-megabyte hard disk drive. Both models use 16-megahertz processors and contain a 5.25-inch, 1.2-megabyte disk drive. The PSX/200 series is available in five models. Two models, the diskless PSX/200 and the single-floppy PSX/201, provide low-cost workstations for high-performance operations in a LAN environment. These LAN workstations have 80286-based processing power running at 8-megahertz and can be upgraded with all PSX options to increase their power and performance. Additionally, three PSX/200 workstations are available in hard disk models -- the 40-megabyte PSX/240, the 20-megabyte PSX/220, and an economical 20-megabyte, entry-level PSX/220E. All contain a 5.25-inch, 1.2-megabyte disk drive. The PSX/220E has an 8-megahertz processor. The PSX/220 and PSX/240 models have 12.5-megahertz processors. Each PSX workstation contains eight option slots, one of which is used for the plug-in processor. Six 16-bit and two 8-bit slots are provided. Available in the first calendar quarter of 1988, all PSX workstations will support 3.5-inch, 1.44-megabyte disk drives. All PSX workstations can be upgraded. The 8-megahertz processor can be upgraded to a 12.5-megahertz processor which can be further upgraded to a 16-megahertz processor. All PSX workstations include an MS-DOS 3.2 operating system, GW-BASIC 3.2, and host integration software; a terminal emulation and file transfer program; and support for Tandem MULTILAN software. The PSX workstations have the ability to access MS-DOS, GUARDIAN, UNIX or IBM system applications. The PSX family of workstations is designed for future support of Microsoft's OS/2 operating system. The family includes 1 megabyte of random access memory, and an enhanced AT-style keyboard with 16 Tandem function keys is standard. The

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keyboard supports nine languages: U.S. English, French, German, Swedish, Spanish, U.K. English, Danish, Norwegian and Italian. The hard disk versions of the PSX series, except the economical PSX/220E, include a serial/parallel/current-loop card and an enhanced graphics array card. Users can select either RS-232C or current-loop interface with this card. The serial/parallel card and EGA card are options on the PSX/200, PSX/201 and PSX/220E. Monitors, which are optional, are available in either a 14-inch monochrome amber model, or a high-resolution, 14-inch color model. EGA or video graphics array (VGA)-compatible graphics, and digital or analog monitors, will be offered on all models. The PSX workstation is designed so that customers can install and support it. On-site service and support is available. Users can also call toll-free to the Tandem National Support Center for telephone assistance. A one-year warranty is standard with all PSX workstations. The PSX/200 series can be ordered now, for delivery in the fourth calendar quarter of 1987. The PSX/300 series, PSX/340 and PSX/370, will be available in the first calendar quarter of 1988. Prices are in U.S. dollars. The PSX/200 series is priced as follows: PSX/200 is \$1195; PSX/201 is \$1395; PSX/220E is \$2395; PSX/220 is \$2995 and PSX/240 is \$3795. The PSX/300 series is priced as follows: PSX/340 is \$4895 and PSX/370 is \$5695. Quantity discounts are available. Monochrome and color monitors are optional. The monochrome monitor is \$225, and the high-resolution color monitor is \$775. An analog color monitor, for use with VGA graphics, will be available in the first calendar quarter of 1988 for \$775. Tandem Computers manufactures and markets computer systems and networks for on-line transaction processing. The company is headquartered at 19333 Vallco Parkway, Cupertino, CA 95014. The telephone number is 408/725-6000. Note to editors: Tandem, GUARDIAN, NonStop, MULTILAN and PSX are trademarks of Tandem Computers Inc. IBM is a trademark of International Business Machines Corp. Microsoft, MS-DOS and GW-BASIC are trademarks of Microsoft Corp. UNIX is a registered trademark of AT&T.

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the IBM 9370 is to compete with Digital Equipment Corp.'s VAX, Boyle said.

The anonymous source agreed with Boyle's view of the importance of a Unix version for IBM's mid-range processors. For example, said the source, a Fortune 500 company which, in the past, has bought all its processors from IBM, may realize that its engineering department wants Unix and consider another vendor's equipment. "There's the temptation there to buy a VAX, but now IBM can offer 9370 running IX/370 with the same price/performance as a VAX 8600," he said.

The source contended that the number of IX/370 licenses IBM has sold to date is quite small. "The best information I've obtained is that IBM has sold only 40 IX/370 licenses (overall 90 IX-System/370 licenses)," said the source, "but IBM expects to sell quite a few with the 9370."

Ironically, noted Boyle, the announcement means that the only operating system that will run on all IBM processors from top to bottom is Unix.

9370 mid-range processors.

According to IBM, IX/370 supports the IBM 9370 when executing as a guest under VM/SP. As a prerequisite the support of the 9370 requires V/SP Release 4 or later.

IX/370 support for the 9370s also includes the ASCII Subsystem Controller, which provides both full duplex ASCII operation and ASCII/3270 conversion capability. With the ASCII Subsystem Controller, IX/370 can support full duplex ASCII terminals on IBM 9370 processors without a requirement for a Series/1 with the IX/370 ASCII Control Feature.

The 9370 Wordstation Subsystem Controller is supported as part of the 3270 display station support of IX/370.

In addition, IX/370 provides full screen editing of IX/370 files via Xedit. This support, announced in January 1987, as a service update to IX/370 Version 1.1.3 is now available and is included in IX/370 Version 1.1.4.

One-time charge for IBM IX/370 Version 1.1.4 is \$10,000 to \$75,000. Planned availability date is September.

might be spun off surfaced following the recent sale of D&B's Nomad line of Relational database software to a French electronics conglomerate, Thomson SA, for \$17 million.

Charles W. Moritz, chairman and chief executive officer of D&B will be the keynote speaker at the meeting. According to a draft of his speech, Moritz will tell the assembled users, "McCormack & Dodge is one of the leading growth organizations within our business information services segment. In fact, since our two companies joined forces back in 1983, M&D's revenues have grown on average by more than 30 percent per year."

The draft adds, "As our customers, it is extremely important for you to know that the D&B management is committed to continuing our investment in M&D to insure that its application products and services are

nas installed several IBM 9370 series machines and has several more on order. M&D will be able to utilize these machines, as required, to move its applications to these machines in the future."

Moritz's message will follow reassurance previously given by D&B to M&D customers. At the time that D&B dropped its Nomad line, and speculation began that the company might be getting out of the software business, Volney Taylor, executive vice president of D&B, sent a letter to the customers. In it, he said, "Let me state that McCormack & Dodge's business does fit with Dun & Bradstreet's definition of information services and that ownership of McCormack & Dodge is consistent with Dun & Bradstreet's information services strategy."

Taylor added that that the company was pleased with M&D's performance and that M&D "has

Tandem Tells Plan To Boost Mfg. Use

CUPERTINO, Calif.—Tandem Computers Inc. has developed a framework within which the company and its third-party developers can expand the use of Tandem systems in manufacturing organizations.

The maker of NonStop fault-tolerant computer systems will seek to expand its presence in factory workplaces through TIME, the Tandem Integrated Manufacturing Environment.

Tandem's chief line of business currently is on-line transaction processing and its systems are typically deployed in financial institutions. However, as much as 21 percent of the company's revenues came from the manufacturing industry in fiscal 1986, ended Sept. 30.

Key market segments that the TIME strategy will address are the automotive, aerospace, electronics, food and drug industries.

TIME, according to a Tandem spokesman, represents a definition of guidelines and directions to be followed in developing and

specifying a development environment for integrated factory systems. This undertaking is a complex and major one for Tandem or any vendor entering the manufacturing environment in this manner.

Tandem will rely, through its Alliance program, on Tandem's third-party software developers, to provide applications which conform to TIME specifications, the spokesman explained.

TIME, he added, addresses two elements. First is the systems environment. There, Tandem has the primary responsibility for assuring that system components can interconnect with each other and can be integrated. Second are third-party applications which conform to Tandem specifications.

Standards and mechanisms for integrating three critical business functions with manufacturing control are provided by TIME.

Polaroid Buys MDS to Become

CAMBRIDGE, Mass.—In a move that makes Polaroid Corp. the largest single-source software duplicator in the world, the firm has recently acquired the assets of Media Duplication Services Inc. of Hopkinton, Mass.

The new company is called Media Duplication Services Ltd., a Polaroid subsidiary.

In a game played quietly and efficiently along the edge of a bustling data processing world, Polaroid has adapted its picture-making techniques for coating thin film to the production of floppy disk drives, using its production skills to provide a complete manufacturing, packaging and distribution service for original software programs.

The software duplication industry is becoming a \$250- to \$300-million-per-year business and is picking up steam, particularly with recent introduction of new 3.5-inch diskette-based systems. A Polaroid spokesman said, "The long-term growth prospects for this business segment are excellent, due to the voracious appetite for new software among PC users."

Rapid Rise

"Our growth rate was 400 percent in 1984 and 300 percent in 1985-86," said Joseph G. Parham Jr., Polaroid's software dupli-

cation business manager.

"Polaroid's strategy in software duplication," said Parham, "is based on the belief that many software developers focus their energy on software engineering rather than maintaining large-scale manufacturing operations. That's where Polaroid steps in. We bring technical and economic efficiency to the manufacturing process for customers."

"Software developers come to us with a single master disk and see their product fully packaged and read for the retail shelf," Parham emphasized. "They don't have to deal with multiple vendors at every step of the duplication process, thus reducing the cost of overseeing quality control for so many suppliers."

The company takes the master disk, assembles the product, manufactures the copies—using techniques similar to those involved in the manufacture of Polaroid's thin film—packages the software, then distributes it to the locations specified by its customers. The packaging process includes handling the burdensome details of labels, graphics, layout, slipcases and even the binders.

For example, the company may produce software for an insurance firm that needs diskettes shipped to 1,400 regional offices.

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THE SUGAR RAY STORY, CHAPTER TWO — IF HP HAS IT SOON . . .

While Digital Equipment Corporation may be the company that "has it now," the Yankee Group believes that two middleweights will emerge as contenders for the title of plant-floor computer vendor to the major manufacturing corporations. The June issue of the *Yankee Conveyor* predicted that HP's star will rise *soon* against that of Digital Equipment Corporation on the plant floor. The next article in this issue looks at Tandem Computers, and outlines the reasons why the Yankee Group believes that Tandem may be the one to watch *next*.

. . . TANDEM COMPUTERS MAY HAVE IT NEXT

Like Sugar Ray Leonard on the eve of the Hagler bout, Tandem computers is, on the one hand, a congenial competitor with a good track record in other battles. On the other hand, the question remains: Is the underdog really ready for tomorrow's big fight?

The Yankee Group believes Tandem will be able to muster the applications software needed to break into the big time as a major vendor to large manufacturing corporations. This belief is based on the following:

- *Fact:* Tandem is the pre-eminent distributed database management system vendor.
- *Premise:** Distributed relational database management systems provide the path of least resistance for developing plant floor monitoring and control systems.
- *Hypothesis:* Commercial applications software will follow system-level software down the path of least resistance.

The Importance of Distributed R/DBMS

Why are distributed relational database management systems so important on the plant floor? First, since 50% or more of all application code is typically devoted to data access and manipulation, a relational DBMS benefits software developers by improving both the *productivity* of the programmer and the *flexibility* of the finished application code. Whether the developer is a "roll-your-own" user or a commercial vendor, these are material advantages in terms of time and money in both application development and maintenance. While performance of R/DBMS software is sometimes called into question (and often incorrectly relative to user needs), where there is no one "best" physical data structure (as may be the case should a user want to track stock both by lot and by contract), a relational DBMS can be the ideal solution, especially when the following benefits are considered:

- additional day-to-day operating decision support to plant-floor personnel;
- flexibility to accommodate changing business needs by recombining existing data for new uses or by restructuring databases without having to alter applications software.

Going one step further from relational to distributed DBMS (D-DBMS) brings additional advantages. A D-DBMS shields applications from the requirement to know the location of data on the network for read and write purposes. This means that the user can distribute data, yet have the *logical* equivalent of a single, centralized system. On the plant floor, a D-DBMS allows users to distribute processors for optimum performance, yet retain a single-system view of the plant as a whole, which means no more waiting for end-of-shift updates. The D-DBMS user can also add or rearrange processors as the plant's needs change without changing applications software. This flexibility is especially important in CIM implementations because of the difficulty of estimating the processing requirements of new plant-floor applications in advance.

- *Manufacturing Database Management Systems*, the Yankee Group, Manufacturing Automation Planning Service, June 1986.

A D-DBMS is also a boon for corporations that need to coordinate farflung company sites — and for their customers. For example, through its D-DBMS, the German railroad can confirm, in the Bonn office, a sleeping car reservation from Amsterdam to Vienna. Try this in Amsterdam, and while one's money is accepted, one must take one's chances that the reserved berth is not *also* reserved by a party boarding at Munich.

Tandem in Manufacturing

The Yankee Group believes that Tandem now has a customer base in manufacturing of 250 *in-plant* installations around the world.

When the Yankee Group last reported on Tandem (June 1986), the conclusion was that leadership in the D-DBMS arena had won the company its foothold among leading-edge manufacturing users. Yankee Group survey data indicates that DBMS will continue to be a strong selling point to Manufacturing America. (See this month's *Data Brief* for details.)

While the company had little commercial applications software for manufacturers, Tandem's position in DBMS was unique. First, although purists could argue that its ENCOMPASS DBMS was minimally faithful to the relational model as prescribed by Dr. E.F. Codd, Tandem was "more relational" than most, and *also* provided speed and throughput competitive with non-relational architectures. Second, Tandem was not only the only vendor to have a distributed DBMS, but also, since ENCOMPASS has been shipping since 1981, a *proven* vendor.

However, the 1986 report also noted the emergence of the Structured Query Language (SQL) as a *standard* relational database language and the emergence of SQL-based distributed database management systems. (Oracle Corporation is particularly threatening because of its plans to move beyond distributed DBMS to a *heterogenous-host* distributed DBMS.) The report on Tandem concluded with the suggestion that the company might neglect SQL to its peril. With the introduction of NonStop SQL nine months later, Tandem was able to prove that it had *not* been neglecting SQL after all.

Update on Tandem

Tandem's **NonStop SQL**, to ship this fall, is an ANSI SQL-compliant distributed DBMS. It is a new DBMS, written from the ground up, not a SQL interface to Tandem's existing DBMS — although it is integrated with Tandem's transaction monitoring utilities. NonStop SQL's data dictionary is fully active, which means among other things that the system acts as an automatic "data location and access broker" so that these functions need not be performed in applications code. The system has a conversational (interpretive) interface for ad-hoc queries and applications prototyping.

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Tandem has plans to integrate NonStop SQL with its PATHMAKER fourth-generation applications development language.

NonStop SQL runs on the NonStop line of processors under the GUARDIAN 90 operating system, which has been extended to support SQL. Non-Stop is a scalable, multiple-processor architecture that can be modularly expanded from two to 16 processors in a single system or to a distributed network of 255 locations. According to Tandem, audited benchmarks show that NonStop SQL performance ranges from 4.3 debit/credit transactions per second (TPS) on a two-processor configuration, to more than 200 debit/credit TPS on a 32-processor configuration — or higher as more processors are added. (The Yankee Group observes that manufacturing users may find performance slower to the extent that a typical transaction is more complicated than a simple debit/credit transaction.)

NonStop SQL prices range from:

- \$3,000 initial license fee and \$300 per processor per month for NonStop CLX and EXT10 systems;
- \$4,000 and \$375 per processor per month for NonStop-II, TXP and EXT25 systems;
- \$4,000 initial license fee and \$500 per processor per month for NonStop VLX systems.

As is the case with Tandem's ENCOMPASS, NonStop SQL users can read data from *and* write data to any node in the network with full rollback and recovery across the network. As is also the case with ENCOMPASS, data managed by NonStop SQL is distributed by means of the partitioning approach. This means that local operations are unaffected if another node on the network (or the network itself) goes down, *but* it implies that NonStop SQL performs best in environments characterized by high locality of reference.

Speaking of ENCOMPASS, concurrent with the first release of NonStop SQL, Tandem will provide facilities for migrating ENCOMPASS data to NonStop SQL. NonStop SQL and ENCOMPASS can also *run concurrently on the same system*. Both systems use the same transaction log for journalling and recovery purposes. A program can mix SQL statements with ENSCRIBE calls, even within a single transaction, as long as: SQL statements are directed against data managed by NonStop SQL; and ENSCRIBE calls are directed against data managed by ENCOMPASS. Although this may not mean much to the *new* Tandem buyer or software developer, it means that existing customers and third-party software houses can start using SQL for new applications and new data while continuing to run existing ENSCRIBE applications, again, as long as a *new program* that needs to access *existing data* does so using ENSCRIBE statements.

The Yankee Group understands that Tandem is planning to introduce an Enscribe-to-SQL Transparency in 1989. This would allow customers that migrate all data to NonStop SQL to:

- maintain existing applications code unchanged;
- move to a "single-language" programming environment.

Tandem has also made progress on the applications software front. While the company developed its own applications software for its circuit board facility in Watsonville, California and its assembly operation in Austin, Texas, Tandem is committed to *not* marketing internally-developed applications. Instead, through the 40+ members of its marketing alliance program, Tandem offers a selection of third-party developed manufacturing applications. Third-party applications software providers for Tandem systems include:

- Oriole Software Inc., Midec Inc., System Dynamics Corporation and System Solution Technologies — production planning and control systems;
- Factorial, Inc., Thomas-Laguban & Associates and Dynamac Corporation — shop-floor control systems;
- Transcomm Data Systems Incorporated, Signorum, Inc. and Flagship Technology, Inc. — distribution management systems; and
- Aaron-Ross Corporation — configuration control system.

What Does Tandem Have Up its Sleeve?

On June 23, 1987, Tandem introduced the "Tandem Integrated Manufacturing Environment," or T.I.M.E., which the company describes as a "new, strategic framework for implementing integrated, on-line manufacturing systems." T.I.M.E. defines manufacturing control functions in three application areas:

- **product and process document management** will provide the CAD-to-manufacturing data interface for and allow revision-level control of released designs;
- **factory control and management** will provide minute-to-minute support of plant floor operations from incoming material receipt through shipping, and will provide the linkage to existing MRP/ MRP-II systems;
- **device control and management** will connect factory devices to the factory control system (above), and monitor and collect data from devices and processes.

Huh?! Is Tandem announcing Vaporware?

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Not exactly, the Yankee Group believes. What Tandem is doing is letting the world know that a company with its reputation in data management does *not* intend to follow the hardware vendor's customary route of allowing the laws of supply and demand to govern applications software development and subsequent integration.

The Yankee Group observes that hardware vendors typically wait until certain applications can be identified as big sellers, and then step in to oversee the development of batch-mode interfaces between them, often with heavy subsidization by brave (or desperate) customers. Users foolish enough to have installed applications that *do not* end up selling in volume must either write and maintain their own interfaces or pray hard for a miracle.

Tandem's concept, however, is not revolutionary. Mapping out the linkages between functional area application suites is the approach that Cullinet and other MRP vendors took to ensure that their production planning and control software would "play together" with their financial/accounting packages. The key difference in Tandem's strategy, and the reason why it presents so refreshing a contrast to that of most other hardware vendors, is that the company intends to document the data interfaces between applications and manage the process of applications development by independent software houses.

When will Tandem's dream of an integrated software suite become a reality? The Yankee Group believes that more has been accomplished than readily meets the eye. While Tandem's business partners in its T.I.M.E. venture have not yet been announced, the most elementary deduction would suggest that **Boeing Computer Systems** and **Coopers & Lybrand**, heretofore working with Tandem only on mysterious, unspecified collaborations, will be involved. And when can commercial software be expected? The Yankee Group believes that year-end 1988 would not be unreasonable. Until then, based on the evidence presented in this month's *Data Brief*, Tandem should be able to increase its penetration in the factory by virtue of its strength in distributed database management.

TOP INTEGRATION PRIORITIES: INSTALLED SYSTEMS MUST BRANCH OUT VIA DBMS

Established vendors, batten down the hatches! Data from the most recent national survey conducted by the Yankee Group's Manufacturing Automation Planning Service indicates that more than three-quarters of U.S. industrial sites consider links to MRP/MRP-II or production planning systems as one of their top two integration priorities. Links to software used in the front office are a close second overall — over half of U.S. industrial sites see this area as one of their top two integration priorities. Further, survey results indicate that most sites ready to act are looking for data integration implemented via a common database management system (DBMS).

The Big Picture

Table 1 shows the #1 and #2 application integration priorities of U.S. industrial sites. Integration between MRP/MRP-II or other production planning systems and the *shop floor* is the #1 priority for action by the largest group of survey respondents. Almost 20% see this area as the top priority; 30% see it as one of the top two priorities for integration. Within the MRP/production planning world, the next largest group sees integration to *inventory accounting systems* as a priority. Over 9% see this area as the top priority; 20% see it as one of the top two priorities for integration. Further, almost 15% see integration to *purchasing* as one of the top two integration priorities. These results reinforce one of the major findings of the national survey of industrial sites conducted by the Yankee Group in 1985: There is much room for improvement in traditional MRP.

A relatively large number of survey respondents sees integration between the MRP/production planning area and process control systems as a priority. Almost 15% of survey respondents indicated that integration between these applications was one of their top two integration priorities. In contrast, last month's *Data Brief* showed that less than 6% of the survey respondents listed a traditional process control system among their top three priorities for implementation. *Traditional process control vendors, a point worth remembering:* More than twice as many U.S. industrial sites see integration between process control systems and MRP/MRP-II or other production planning systems as an integration priority as see traditional process control systems as an implementation priority.

Note: Data presented in this article were collected using a weighted, or disproportionate, sampling technique to improve accuracy. All data have been corrected to reflect U.S. demographic proportions. Readers with questions on survey methodology should call Nina Lytton or Randy Russell.

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Table 1
Application Integration Priorities

<i>Applications/Applications Areas To Be Integrated</i>	<i>Priority #1</i>	<i>Priority #2</i>
MRP/MRP-II or Production Planning to Shop Floor	19.8%	10.4%
MRP/MRP-II or Production Planning to Inventory Accounting	9.1%	11.7%
MRP/MRP-II or Production Planning to Process Control	9.0%	5.7%
MRP/MRP-II or Production Planning to Purchasing	5.7%	8.9%
<i>MRP/MRP-II Subtotal</i>	43.6%	36.7%
Customer-Order Processing to Manufacturing	15.5%	11.1%
Customer-Order Processing to Distribution	4.0%	4.5%
Costing to Manufacturing	5.1%	11.8%
<i>Front Office Subtotal</i>	24.6%	27.4%
Engineering Bills of Material to Production Bills of Material	5.5%	4.6%
Other CAD to Manufacturing Integration Needs	2.4%	1.6%
<i>CAD to Manufacturing Subtotal</i>	7.9%	6.2%
Quality Control to Manufacturing/ Processing	6.5%	7.5%
Other Application Integration Needs	0.8%	0.5%
Uncertain	16.5%	21.8%

Source: the Yankee Group, February 1987 data

Results indicate that there is also much room for improvement in software supporting the front office. More than 25% of the survey respondents see integration between customer-order processing and manufacturing in the top two integration priorities. Almost 10% feel similarly regarding order processing and distribution. Almost 17% see costing to manufacturing integration in the top two integration priorities.

Looking at the big picture, the CAD-to-manufacturing interface is the integration priority of the third-largest group of respondents. Overall, 7.9% of survey respondents see it as the #1 integration priority; 14.1 see it as one of the top-two integration priorities. Of course, this area is of greater interest to discrete manufacturers than it is to U.S. industrial sites overall. This is explored further below.

Finally, a relatively large percentage of survey respondents see integration between quality control and manufacturing as one of the top-two integration priorities. As next month's *Data Brief* will show, this area is of significantly greater interest to certain industry groups.

Priorities Differ by Site Size

Table 2 shows the difference in the perception of the #1 integration priority by size of manufacturing site, measured by the number employed. Three size categories are considered: sites with 100 to 249 employees; sites with 250 to 499 employees; and sites with more than 500 employees. Differences shown in Table 2 are statistically significant. (The "significance" figure of 99.20% means that it is almost certain that the data reflects a true difference between the groups; conversely, there is a .8% probability that there is no true difference between the groups.)

Sites with more than 250 employees are more concerned with integration between the MRP/production planning area and the *shop floor* than are sites with fewer than 250 employees. About 22% of sites with more than 250 employees see MRP/production planning to the shop floor as the #1 integration priority while only 15% of sites with fewer than 250 employees see this area as the #1 integration priority. This pattern of responses is also true of the perceived need to integrate MRP/production planning and *purchasing*. About 7% of sites with more than 250 employees see MRP/production planning to purchasing as the #1 integration priority while less than 4% of sites with fewer than 250 employees see this area as the #1 integration priority.

In the other applications areas shown on Table 2, sites with 250 to 499 employees exhibit perceptions closer to smaller sites than to larger sites.

Table 2
#1 Applications Integration Priority:
Size of Industrial Site

<i>Applications/Applications Areas To Be Integrated</i>	<i>Size of Industrial Site</i>		
	<i>100-249 Employees</i>	<i>250-499 Employees</i>	<i>500 or More Employees</i>
MRP/MRP-II or Production Planning to Shop Floor	15.0%	21.9%	22.2%
MRP/MRP-II or Production Planning to Inventory Accounting	13.7%	10.2%	4.0%
MRP/MRP-II or Production Planning to Process Control	7.0%	6.9%	12.7%
MRP/MRP-II or Production Planning to Purchasing	3.8%	7.0%	6.4%
<i>MRP/MRP-II Subtotal</i>	39.5%	46.0%	45.3%
Customer-Order Processing to Manufacturing	16.8%	18.1%	12.0%
Customer-Order Processing to Distribution	5.6%	1.8%	4.5%
Costing to Manufacturing	3.9%	6.9%	4.5%
<i>Front Office Subtotal</i>	26.3%	26.8%	21.0%
Engineering Bills of Material to Production Bills of Material	4.0%	6.0%	6.5%
Other CAD to Manufacturing Integration Needs	2.9%	0.7%	3.6%
<i>CAD to Manufacturing Subtotal</i>	6.9%	6.7%	10.1%
Quality Control to Manufacturing/ Processing	7.7%	5.7%	6.3%
Other Application Integration Needs	0.0%	0.9%	1.5%
Uncertain	19.7%	13.9%	16.0%

(Significance = 99.20%)

Source: the Yankee Group, February 1987 data

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Sites with more than 500 employees are more concerned with integration in the following two areas than their mid-sized counterparts:

- MRP/production planning to process control;
- the CAD-to-manufacturing interface.

More than 12% of sites with 500 or more employees see MRP/production planning to process control as the #1 integration priority — almost double the corresponding percentage for sites with fewer than 500 employees. Ten percent of sites with more than 500 employees see the CAD-to-manufacturing interface as the #1 integration priority while less than 7% of mid-sized sites feel the same way.

Sites with fewer than 500 employees are more concerned with integration in the following two areas than are large sites:

- MRP/production planning to inventory accounting;
- integration of software supporting the front office with other areas.

More than 10% of sites with fewer than 500 employees see MRP/production planning to inventory accounting as the #1 integration priority — well over double the corresponding percentage for sites with more than 500 employees. More than 26% of sites with fewer than 500 employees see the widened integration of the front office as the #1 integration priority while 21% of large sites feel similarly.

Production Environment Is Also a Factor

Table 3 shows the differences in perception of the #1 integration priority by type of production environment. Three types of production environments are considered: predominantly process; predominantly discrete; and "hybrid," or a combination of process and discrete.

Far more discrete and hybrid manufacturers are concerned with integration between MRP/production planning and the shop floor than are process industries. One-quarter of discrete manufacturers and 20% of hybrid manufacturers see this as the #1 integration priority, while 10% of process industries feel the same. Process industries, not surprisingly, have the largest percentage of respondents interested in integration between MRP/production planning and traditional process control systems: Almost 14% of process respondents cited this area as the #1 integration priority — more than twice the corresponding figure for those engaged primarily in discrete manufacturing.

Table 3
#1 Applications Integration Priority:
Production Environment

<i>Applications/Applications Areas To Be Integrated</i>	<i>Production Environment</i>		
	<i>Process</i>	<i>Discrete</i>	<i>"Hybrid" *</i>
MRP/MRP-II or Production Planning to Shop Floor	10.2%	25.2%	20.6%
MRP/MRP-II or Production Planning to Inventory Accounting	6.2%	9.1%	11.0%
MRP/MRP-II or Production Planning to Process Control	13.7%	6.1%	9.0%
MRP/MRP-II or Production Planning to Purchasing	6.9%	5.5%	5.3%
<i>MRP/MRP-II Subtotal</i>	37.0%	45.9%	45.9%
Customer-Order Processing to Manufacturing	16.3%	14.7%	15.9%
Customer-Order Processing to Distribution	4.3%	2.9%	5.0%
Costing to Manufacturing	7.1%	4.6%	4.3%
<i>Front Office Subtotal</i>	27.7%	22.2%	25.2%
Engineering Bills of Material to Production Bills of Material	1.4%	7.2%	6.4%
Other CAD to Manufacturing Integration Needs	1.0%	5.7%	0.3%
<i>CAD to Manufacturing Subtotal</i>	2.4%	12.9%	6.7%
Quality Control to Manufacturing/Processing	9.8%	6.0%	5.2%
Other Application Integration Needs	0.5%	0.9%	1.0%
Uncertain	22.7%	12.1%	16.1%

(Significance = 99.97%)

Source: the Yankee Group, February 1987 data

* combination process and discrete

A relatively large percentage of respondents from the *process industries* consider better integration of quality control systems the top priority than do other respondents. Almost 10% of process respondents see this as the #1 integration priority, while 6% or fewer of discrete and hybrid respondents feel the same way.

Respondents with *hybrid* manufacturing environments stand out from the others in two areas:

- MRP/production planning to inventory accounting (11% see this as the #1 integration priority);
- customer-order processing to distribution (5% see this as the #1 integration priority).

Not surprisingly, *discrete* manufacturers stand out from the pack in their interest in integration of the CAD-to-manufacturing interface. Almost 13% of this group sees this area as the #1 integration priority. It is also noteworthy that discrete manufacturers stand virtually alone in their interest in integrating areas *other than* bills of material in engineering to bills of material in production. Almost 6% expressed an interest in "other" areas of CAD-to-manufacturing integration (for example, graphics on the shop floor), while 1% or less of respondents from other areas saw a similar need.

We Need Integration, But How?

There are two dimensions to the integration problem:

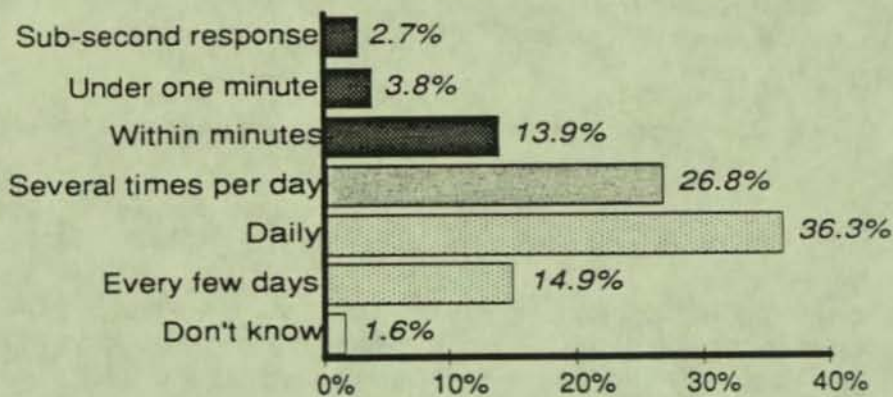
- time-sensitivity of the need for current information;
- means of data integration — common DBMS or file transfer.

Results of the survey indicate that a common DBMS is perceived as mandatory by far more respondents at U.S. industrial sites than would appear to be strictly necessary according to timing needs alone. The Yankee Group believes this reflects a growing understanding by Manufacturing America of other advantages of a common DBMS, such as improved accuracy of information, and reduction of effort required to maintain accurate information.

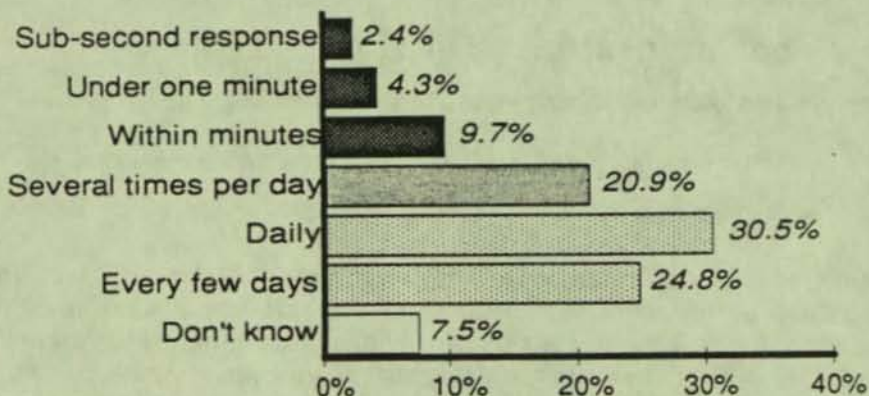
Figure 1 illustrates survey respondents' perceptions of the time-sensitivity of the need for integration in their top two integration priority areas. Results indicate that a healthy but not overwhelming percentage of respondents require "on-line" response times in the implementation of their #1 integration priorities. Note that more than one-third of survey respondents need updated information on only a daily basis. More than one-quarter need updated information several times per day (and thus, while they might prefer on-line

Figure 1
Top Integration Priorities:
Perceived Time-Sensitivity of Updates

A. #1 Integration Priority



B. #2 Integration Priority



= "On-Line"
 = "Gray Area"
 = "Batch"

*Source: the Yankee Group
 February 1987 Data*

systems for the sake of convenience, they might be able to make do with batch systems). In contrast, 20% require updated information within minutes or sooner in implementing their #1 integration priority. Less than 4% of survey respondents see a need for update response times under one minute; less than 3% require sub-second response times for their top integration priority area.

Figure 2 illustrates survey respondents' perceptions of the need for data integration implemented via a DBMS common to their top integration priority areas. Results are overwhelmingly in favor of a common DBMS. Only 14% believe that file transfer is an adequate means of implementing data integration for the site's #1 integration priority. In contrast, two-thirds of the respondents indicated that a common DBMS is, according to the wording used on the survey instrument, a "must-do" for their #1 integration priorities. Sixteen percent more believe that a common DBMS is an "ideal, but probably too difficult." Reasons given by this group of respondents explaining the difficulty they see included the following:

- technical complexity, 22.9%;
- multiple, incompatible installed systems, 16.7%;
- costs would exceed benefits, or additional hardware would be required, 14.5%;
- difficulty in gaining cooperation within the organization or lack of support by top management, 10.3%.

A Closer Look

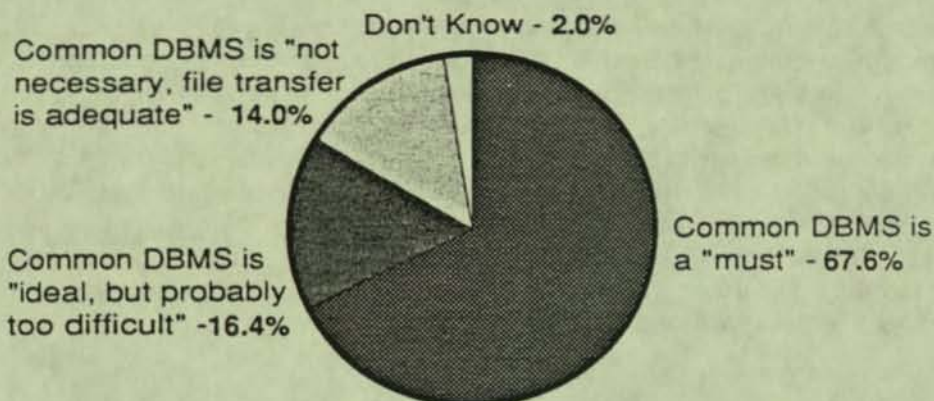
Tables 4 and 5 take a closer look at desired implementation of the #1 and #2 integration priorities by breaking out the percentage of respondents requiring on-line updates and a common DBMS for each of the individual areas of integration. Statistically significant differences in desired implementation exist between areas to be integrated. (Two "significance" figures are shown because separate analyses were required to derive each column.)

Certain areas stand out as having a higher-than-average number of respondents that require updates to be reflected within minutes or sooner. For the #1 integration priority, the percentage of respondents expressing this view exceeds the average of 20.4% in the following areas:

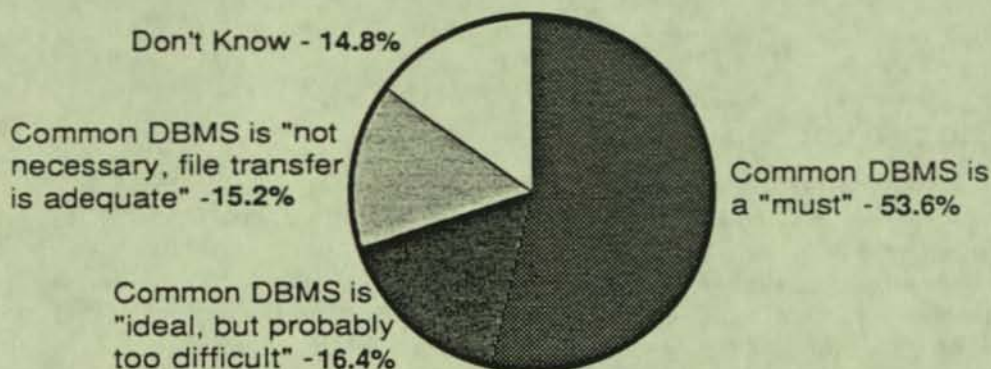
- MRP/production planning to the shop floor, 27.2%;
- MRP/production planning to process control, 30.5%;
- customer-order processing to distribution, 28.3%;
- quality control to manufacturing, 31.4%.

Figure 2
Top Integration Priorities:
Perceived Need for Common DBMS

A. #1 Integration Priority



B. #2 Integration Priority



*Source: the Yankee Group
 February 1987 Data*

Table 4
Implementation Desiderata:
#1 Application Integration Priority

<i>Applications/Applications Areas To Be Integrated</i>	<i>#1 Priority</i>	<i>Update Frequency: "On-line"</i>	<i>Common DBMS: "a Must"</i>
MRP/MRP-II or Production Planning to Shop Floor	19.8%	27.2%	74.1%
MRP/MRP-II or Production Planning to Inventory Accounting	9.1%	4.5%	69.7%
MRP/MRP-II or Production Planning to Process Control	9.0%	30.5%	59.6%
MRP/MRP-II or Production Planning to Purchasing	5.7%	14.1%	74.2%
Customer-Order Processing to Manufacturing	15.5%	14.4%	72.4%
Customer-Order Processing to Distribution	4.0%	28.3%	62.1%
Costing to Manufacturing	5.1%	14.6%	61.6%
Engineering Bills of Material to Production Bills of Material	5.5%	16.2%	76.9%
Other CAD to Manufacturing Integration Needs	2.4%	8.7%	37.1%
Quality Control to Manufacturing/ Processing	6.5%	31.4%	58.0%
Other Application Integration Needs	0.8%	46.1%	5.2%
Average for all areas (for comparison)	n/a	20.4%	67.6%
Significance	n/a	99.99%	99.99%

Source: the Yankee Group, February 1987 data

Note: *This table is correctly read as follows: 19.8% of all respondents cited "MRP/MRP-II to Shop Floor" as the site's #1 integration priority.*

OF THIS GROUP, 27.2% believe that "on-line" performance is required (that is, updates should be reflected within minutes or sooner), and 74.1% believe that a common DBMS between the two areas is "a must."

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Table 5
Implementation Desiderata:
#2 Application Integration Priority

<i>Applications/Applications Areas To Be Integrated</i>	<i>#2 Priority</i>	<i>Update Frequency: "On-line"</i>	<i>Common DBMS: "a Must"</i>
MRP/MRP-II or Production Planning to Shop Floor	10.4%	18.1%	57.6%
MRP/MRP-II or Production Planning to Inventory Accounting	11.7%	16.8%	49.7%
MRP/MRP-II or Production Planning to Process Control	5.7%	13.1%	36.9%
MRP/MRP-II or Production Planning to Purchasing	8.9%	4.2%	60.0%
Customer-Order Processing to Manufacturing	11.1%	15.8%	66.8%
Customer-Order Processing to Distribution	4.5%	24.3%	53.5%
Costing to Manufacturing	11.8%	5.8%	48.4%
Engineering Bills of Material to Production Bills of Material	4.6%	25.6%	59.9%
Other CAD to Manufacturing Integration Needs	1.6%	15.5%	20.7%
Quality Control to Manufacturing/ Processing	7.5%	38.0%	47.8%
Other Application Integration Needs	0.5%	0.0%	100.0%
Average for all areas (for comparison)	n/a	16.3%	53.6%
Significance	n/a	99.99%	99.93%

Source: the Yankee Group, February 1987 data

Note: *This table is correctly read as follows: 10.4% of all respondents cited "MRP/MRP-II to Shop Floor" as the site's #2 integration priority.*

OF THIS GROUP, 18.1% believe that "on-line" performance is required (that is, updates should be reflected within minutes or sooner), and 57.6% believe that a common DBMS between the two areas is "a must."

With two exceptions, results are similar for the #2 integration priority: first, the group for whom integration between MRP and process control is the top priority is *below* average in terms of the percentage requiring on-line response times; second, the group for whom integration between engineering bills of material and production bills of material is *above* average.

Four areas stand out as higher than average in terms of the percentage of respondents that believe a common DBMS is mandatory for the #1 integration priority:

- MRP/production planning to the shop floor, 74.1%;
- MRP/production planning to purchasing, 74.2%;
- customer-order processing to manufacturing, 72.4%;
- engineering bills of material to production bills of material, 76.9%.

These same four areas stand out for the #2 integration priorities.

Implications

The results in a nutshell:

- MRP/production planning and the front office are ripe for integration with other areas.
- Most sites ripe for action, regardless of whether they need on-line response times, see data integration via a common DBMS as a must.

For established vendors, these results foreshadow both opportunities and challenges. The **newfound marketability of DBMS** means software vendors like IBM and Cullinet have an opportunity to sell additional modules integrating manufacturing to the front office. However, the *shop floor* poses a data integration challenge yet to be solved. Established MRP/production planning vendors must face the data integration issue or leave themselves open to competition from new entrants.

The material in this publication was excerpted from the August 1987 *Yankee Conveyor* newsletter, part of the Yankee Group's Manufacturing Automation Planning Service. For more information call Barry Winans at 617-367-1000.

LEVEL 1 - 2 OF 2 STORIES

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Data Communications

August, 1987

**CORPORATE
INFORMATION CENTER**

SECTION: ECONOMIC NEWSLETTER; Pg. 33

LENGTH: 104 words

HEADLINE: Tandem's coffers are bursting

BODY:

Tandem Computers Inc. (Cupertino, Calif.) is so flush with profits that it is looking at perhaps 10 companies to put money into on top of its latest investment in Netlink Inc. (Raleigh, N.C.), says Kimball Brown, analyst with Dataquest, the San Jose research house. It makes more sense to put its soaring profits into a company such as Netlink, which has the technology and research skills that Tandem needs, rather than parking the funds in the bank, Brown says. Netlink will help Tandem develop products for use with IBM's System Network Architecture, he adds. Tandem will also jointly market Netlink's products.

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LEVEL 1 - 2 OF 2 STORIES

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Business Month
(formerly Dun's Business Month)

CORPORATE
INFORMATION CENTER

August, 1987

SECTION: PERSONAL FINANCE; On Wall Street; Pg. 75

LENGTH: 1012 words

HEADLINE: TUDOR'S MICKEY STRAUS: TECHNOLOGY BULL

BYLINE: LEAH NATHANS

BODY:

"No one is enjoying this bull market," says Melville "Mickey" Straus, the cheerful, 48-year-old manager of the Tudor Fund. No one, that is, except Straus himself. While others fret about bloated P/Es and inflation, he is as optimistic as ever. Straus is sure that the graying bull market still has 15%-to-25% left to go -- which would mean 2700 to 3000 on the Dow Jones industrial average. Some stocks, he adds, could rise another 50%.

Mickey Straus, president of Weiss, Peck & Greer, Tudor Fund's sponsor, has been enjoying the 1980s bull market from the very beginning. In 1982 and 1983 Tudor, which specializes in small companies and special situations, outperformed the rising market by a wide margin. It lagged a bit (but not badly) in the Dow-dominated 1985-86 leg of the bull market. But in this year's first-half advance, with technology and other cyclical stocks sharing market leadership with the blue chips, Tudor Fund's 30% gain comfortably outran the S&P 500's 24% advance. And Straus is convinced that the party isn't over; he thinks that technology, capital goods and basic industry stocks will continue to whoop it up. "The economy and corporate profits will surprise people over the next eighteen months," he says. He cites a C.J. Lawrence & Co. index that shows the price performance of consumer and interest-sensitive stocks at 130 versus 100 for cyclical basic industry stocks. To reach parity, Straus concludes, "Cyclicals still have a way to go."

Technology stocks are Straus' favorite cyclicals, and he correctly forecasted their re-awakening in 1987. "Last year nobody was saying technology would be a leader," he observes. "People forget that computers are part of industry's capital spending program."

In the market's spring lull, many of the first-quarter technology stars dimmed, declining as much as 20%-to-40%. That was to be expected, explains Straus. "Many just got ahead of themselves. Over the next month or two they will continue to correct. But then they will rebound, into early next year." So now is the time to buy, advises Straus.

Which are his top choices? After taking profits during the second quarter, Straus is reinvesting in companies specializing in super-minicomputers. His favorite is Tandem Computers, the leader in transaction processing for the financial services industry. Tandem is developing applications for other industries in an effort to keep growing by 20% a year. Straus thinks the stock, recently below 30, can recover to at least 37.

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Straus also likes two small companies dealing in systems software for mainframe computers, Duquesne Systems and VM Software. Both are getting a lift from the start-up of deliveries of the new IBM 9370 mainframe. Straus thinks the pair can grow by at least 25% annually: VM (now 23) to 40 and Duquesne (now 20) to 30 or so.

In communications, Straus' top pick is Digital Communications Associates, whose products allow personal computers, minis and mainframes to communicate with each other. Uncertainty over whether IBM will incorporate DCA's capabilities into its new PCs has hurt the stock recently. But Straus thinks the company has enough other products on the market and nearing introduction to take the stock from under 30 currently to around 40.

Straus is especially gung ho on car and portable telephones, with 10% of his portfolio invested in cellular telephone companies. "We're convinced this is the electronic product of the Eighties," he says. There are only about 700,000 U.S. subscribers, but analysts foresee a 2%-to-4% nationwide market penetration. Straus is predicting 5% or higher, with an eventual total of ten million-to-fifteen million cellular phones. He favors small independent franchises most of all, viewing them as purer plays than the regional telephone companies with whom the independents share local cellular markets. "These franchises are incredibly valuable," says Straus, amounting in effect to semi-monopolies. So while cellular stocks are currently selling at all-time highs, Straus is buying in the belief that they can double within three years.

His favorite is LIN Broadcasting, a cellular franchise that also owns network television affiliates. The lack of cellular purity in LIN's case is offset by the fact that its TV activities are generating the cash flow to fund its cellular growth. LIN has teamed up with Metromedia and may one day buy out its partner's cellular franchises. But Straus also likes Affiliated Publications, which owns the Boston Globe as well as cellular operations.

His choicest pure plays are Cellular Communications and Metro Mobile CTS, both of which are losing money now but could, Straus believes, report earnings as early as 1988. American Cellular Network Corp. is another intriguing company that has a New Jersey franchise, including the heavily traveled corridor surrounding New York City. To carry on a conversation on a car telephone while driving through New Jersey, the caller must use American Cellular's service.

As for basic industry cyclical, Straus likes the aluminums best. "Aluminum is in the same position as paper stocks were last year," he says, with productive capacity and inventories cut to the bone. Straus believes the weaker dollar and an improving U.S. economy can lift aluminum prices from around 70 cents to at least 80 cents a pound. This, in turn, could boost shares of Reynolds Metals and AMAX by 50% and Alcoa by perhaps 30%.

Straus is also starting to buy financial stocks after avoiding the sector for the past year; a large correction and low relative multiples have won him over. His top pick: the newly traded shares of Shearson Lehman Brothers, which he calls "the best large brokerage firm" due to its good mix of retail and institutional businesses. He is also buying bank stocks, encouraged by their Third World loan write-offs. His main choices: Republic National Bank of New York, Citicorp and J.P. Morgan & Co. He's looking for a 25% move in bank shares during the next six months.

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GRAPHIC: Picture, Straus: Technology stocks cooled off during the market's spring lull, but will take off again soon and rally into early 1988, KAREN KUEHN

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TANDEM COMP'T'RS

NYSE-TOM RECENT PRICE **29** P/E RATIO **25.0** (Trading: 28.6 Median: NMF) RELATIVE P/E RATIO **1.55** DIV'D YLD **Nil** **VALUE LINE** **1113**

Tandem Computers, incorporated in November 1974, is a leading producer of modular, expandable multiple processor computer systems designed so that failure of no one module can substantially affect system operations. Key applications are in businesses in which computer "down time" can have serious consequences: back office transaction processing for financial institutions, verification of credit information, on-line order entry and inventory control, electric power monitoring, and emergency vehicle dispatching. Company produces its systems from components manufactured by others. Has major production facilities in Cupertino, Santa Clara, and Watsonville, CA; Reston, VA; Neufahrn, West Germany.

Tandem went public on December 14, 1977, with an initial offering of 4.6 million shares (adjusted for subsequent splits) at \$1.92 (adjusted) through L.F. Rothschild, Unterberg, Towbin and Robertson, Colman, Siebel & Weisel. First shipments of NonStop 1 systems were in May 1976.

CAPITAL STRUCTURE as of 3/31/87
Total Debt \$10.0 mill. Due in 5 Yrs \$6.0 mill.
LT Debt \$8.4 mill. LT Interest \$.9 mill.
Incl. \$3.2 mill. capitalized leases.
(Total interest coverage: 59x)

Leases, Uncapitalized Annual rentals \$38.6 mill.
Pension Liability None in '86 vs. None in '85
Pfd Stock None

Common Stock 91,523,196 shs. (99% of Cap'l)

CURRENT POSITION	1985	1986	3/31/87
(SMALL)			
Cash Assets	128.7	239.8	285.5
Receivables	163.4	197.7	234.8
Inventory(FIFO)	79.0	64.2	77.2
Other	14.3	17.5	22.5
Current Assets	385.4	519.2	620.0
Accts Payable	33.4	50.8	65.7
Debt Due	7.1	6.0	1.6
Other	46.3	77.2	104.2
Current Liab.	86.8	134.0	171.5

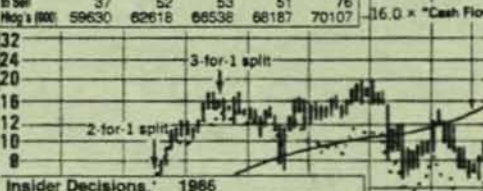
ANNUAL RATES of change (per sh)	Past 10 Yrs	Past 5 Yrs	Est'd '84-'86 to '90-'92
Sales	—	43.0%	18.0%
"Cash Flow"	—	46.0%	24.5%
Earnings	—	50.0%	28.0%
Dividends	—	—	Nil
Book Value	—	54.5%	21.0%

QUARTERLY SALES (\$ mill.)	Dec. 31	Mar. 31	June 30	Sept. 30	Full Fiscal Year
1984	126.4	111.2	141.9	153.1	532.6
1985	159.6	146.5	144.2	173.8	624.1
1986	170.1	176.3	200.9	220.5	767.8
1987	238.0	242.4	264.0	295.6	1040
1988	300	300	330	370	1300

EARNINGS PER SHARE	Dec. 31	Mar. 31	June 30	Sept. 30	Full Fiscal Year
1984	.12	.03	.12	.14	.41
1985	.17	.08	.03	.13	.41
1986	.14	.15	.20	.23	.72
1987	.29	.23	.26	.32	1.10
1988	.35	.30	.35	.45	1.45

QUARTERLY DIVIDENDS PAID	Mar. 31	June 30	Sept. 30	Dec. 31	Full Year
1983					
1984					
1985					
1986					
1987					

(A) Fiscal year ends September 30th of calendar year. (B) Based on average common and common equivalent shares outstanding.



Insider Decisions	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Buy	.55	1.12	1.81	2.86	4.15	5.29	6.56	7.54	8.74	11.20	13.90	
Sell	.06	.13	.22	.42	.53	.63	.69	.85	1.22	1.60	2.15	
Net	.05	.10	.18	.36	.38	.38	.41	.41	.72	1.10	1.45	

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
.55	1.12	1.81	2.86	4.15	5.29	6.56	7.54	8.74	11.20	13.90	
.06	.13	.22	.42	.53	.63	.69	.85	1.22	1.60	2.15	
.05	.10	.18	.36	.38	.38	.41	.41	.72	1.10	1.45	
.05	.12	.17	.36	.85	.53	.88	.82	.74	.75	.85	
.35	.63	1.17	2.81	3.33	3.93	4.62	5.08	6.09	8.50	10.10	
44.11	50.04	60.15	72.82	75.27	79.11	81.23	82.77	87.84	93.00	93.50	
35.0	23.9	25.8	35.8	33.2	37.8	33.3	23.2	18.4			
4.77	3.46	3.43	4.35	3.66	3.20	3.10	1.88	1.25			

BUSINESS: Tandem Computers, Inc., designs, assembles, and sells fault-tolerant computer systems under the trademark NonStop, for on-line transaction processing. Also designs and sells terminal and communications controller products. About 93% of sales are to end-users; 7% to software and systems developers and original equipment manufacturers. Foreign sales, 40% of total.

Tandem remains one of the strongest performers in the computer industry. Earnings comparisons have moderated since the December quarter, when share profits more than doubled over the prior year's tally. That's largely because December-period results reflected the payoff from several new product offerings. And more recent comparisons were affected by additional expenditures on marketing, service, and software development intended to support the expanding volumes. Notwithstanding the relative slowdown, however, the company's 30% year-to-year earnings advance in the June period still outpaced almost all of its competitors. We expect similar profit gains through fiscal 1988 (which begins October 1st).

The company is a leading player in a rapidly growing market. Even in 1985 and 1986, when most of the computer industry was slumping, demand for on-line transaction-processing (OLTP) systems remained healthy. With a technology-sector rebound apparently underway, we think the growth of the OLTP segment will accelerate. Key developments include the following:

- The globalization and increasing com-

1990 1991 1992 120 100 80 60 40

August 7, 1987 Value Line
TIMELINESS (Relative Price Performance Next 12 Mos.) 1 Highest 4 Below Average
SAFETY (Scale: 1 Highest to 5 Lowest) 4
BETA 1.55 (1.00 = Market)

1990-92 PROJECTIONS	Price	Gain	Ann'l Total Return
High	60	(+105%)	20%
Low	35	(+20%)	5%

1980-87 PROJECTIONS	Price	Gain	Ann'l Total Return
High	60	(+105%)	20%
Low	35	(+20%)	5%

1980-87 PROJECTIONS	Price	Gain	Ann'l Total Return
High	60	(+105%)	20%
Low	35	(+20%)	5%

total. R&D, 11.3% of sales; payroll costs, estimated 25%. '86 depreciation rate: 15.3%. Estimated plant age: 2 years. Has 5,700 employees; 7,000 shareholders. Insiders control 4.9% of stock. Chairman: Thomas J. Perkins. President: James G. Treibig. Incorporated: Delaware. Address: 19333 Valico Parkway, Cupertino, California 95014. Tel.: 408-725-6000.

plexity of securities markets is creating more need for transaction-processing capability.

• Deregulation in the banking industry, coupled with greater customer sophistication, is boosting demand for OLTP-based automatic teller machine networks.

• In coming years, the increasing use of electronic payment and credit authorization systems in the retail sector is likely to create another important market for OLTP systems.

• Since the break-up of AT&T, the Bell Operating Companies and independent telecommunications firms have offered numerous value-added services based on OLTP systems.

• In the manufacturing sector, U.S. companies are increasingly turning to integrated, on-line systems to control and monitor production.

We recommend this stock both as a year-ahead and a 3- to 5-year investment. Conservative investors, however, should exercise caution in view of Tandem's below-average Safety rank (which primarily reflects the stock's low price stability).

Blaine Snyder

Company's Financial Strength	B+
Stock's Price Stability	5
Price Growth Persistence	70
Earnings Predictability	60

VALUE LINE 8/7/87

in Tandon would grant.

he said, with his primary focus on developing a plan to spin off Tandon's customer service division.

He said he expects to submit a proposal to the board in the next eight weeks, adding that if a new entity is formed, he would like to be its CEO. He said the customer service division of Tandon's business generates about \$18 million annually. However, he said it could grow to \$100

WILKIE said the company has increased the yield of its 3.5-inch disk drive line, is now getting more drives out of the same space and soon will have room for the 85-Mbyte drives.

Tandon has been seeking more manufacturing space for some time. In late July, talks with Century Data Inc. on a \$45 million contract broke down. Proposed terms called for Century Data to use its Singapore facility to make 100,000 85-Mbyte Tandon drives over a three-year period.

As Tigera's Head

ment Partners International, a Redondo Beach, Calif., management and financial consulting firm.

He was not available for comment. In a prepared statement, he said the completion of the sale of Fortune's assets enabled him to leave.

He appointed Isaac Gilin as chairman. He said he will continue to head Industries, a Colombian manufacturing and distributing

with chief operating of-

Software on

directly with at all." The former vice president, formerly of NCR's Personal Division. That position has not yet been filled.

The division's priority is application software for NCR hardware that uses proprietary operating systems. Those products include the 9800 supermini and intelligent terminals, cash registers and terminals, he said.

The former vice president said NCR will continue to have a strong presence in the vertical markets where it already has a strong presence: banking, manufacturing, concrete processing.

His replacement is Allan May, formerly Tigera's vice president and general counsel. He continues in the latter role. Gregg Anderson retains his post as chief financial officer, and Susan Espy still heads Tigera Corp., a software subsidiary responsible



Campbell: Tigera says his departure wasn't caused by loss.

for developing office automation software for Unix platforms.

Tigera Group's new business direction has not been determined, according to Anderson. "We're left immediately with a holding company," Anderson said. "The strategy here is to proceed with acquisitions both inside and outside the high-tech industry."

The board also will be taking an active role in the company, effectively filling the position of chief executive, according to Anderson.

cautious. CDC's stock was inching down Friday morning as some speculators began wondering whether a story that started out looking good might just be another tall tale.

—Robert Hertzberg

Straight For The Juggler

This week's MacWorld Expo in Boston is expected to be the site of several product announcements by **Apple Computer Inc.** Chief among them will be an extension to its Macintosh operating system, Juggler, which provides some multitasking capabilities. The company also is expected to release some data communication products, including new modems and a faster version of its AppleTalk LAN.

—Eric Nee

The Ultimate Fault

Tandem Corp. reportedly is negotiating an OEM deal for **The Ultimate Corp.** to resell its fault-tolerant machines with Ultimate's version of the Pick operating system. Under the proposed agreement, Tandem will foot most of the bill for implementing the Ultimate software on its systems, sources said. Ultimate also is expected to announce soon an OEM agreement for **IBM's** 9370 machines.

—Maura McEnaney

Not A Lot Of Bull

Honeywell Bull Inc. will introduce a line of personal computer products from partner **NEC Corp.** at the end of the year, said CEO Jerome Meyer. NEC prefers to keep a low profile in the Honeywell Bull organization to avoid confusion with American-based **NEC Information Systems**, but the Japanese conglomerate is "very, very involved" in offering its products and technology to the new company, according to Meyer. "It is still our call as to how we want to use" the PCs, Meyer said.

—Maura McEnaney

A Very Gould Deal

Gould Inc. this week will announce an OEM agreement to sell **Encore Computer Corp.'s** Annex terminal server with its Unix-based systems. The server has been a popular product for Encore, whose main line is its Multimax parallel processing systems.

—Maura McEnaney

Going With The Multiflow

Minisupercomputer maker **Multiflow Computer Inc.** today will announce a joint marketing agreement with **Apollo Computer Corp.** The agreement will allow Apollo to market Multiflow gear with its Domain workstations. The pact will be announced at a meeting of the American Society of Mechanical Engineers (ASME) in New York.

—Maura McEnaney

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Computer Systems
News 8/16/87 p3

said William Minichap, general partner with Charleston Investors, the syndication that owns the building. "We had to do some work on the building to get it into a leasable condition." The other principals in the partnership are Silicon Valley real estate executives George Marcus and Dennis Chambers.

"In this market, developers can't lease old buildings with old interior designs in the property," said Jerry Moison, a Coldwell Banker broker who helped close the lease deal. Valley Electric signed a 10-year lease to occupy the site.

About \$1 million worth of construction has been earmarked to fix up the newly leased Mountain View buildings, according to estimates provided by brokers and owners involved with the property. That

Tandem gets OK to list on two exchanges

By MARGARET YOUNG

Tandem Computers Inc. of Cupertino has been granted permission by the Securities and Exchange Commission to have multiple listings on the Midwest and Pacific Stock Exchanges.

Tandem began trading on the New York Stock Exchange in April. The multiple listings are expected to begin sometime this month. They are not expected to have a strong effect on Tandem's stock, which has been hovering around \$31 a share.

"It's really being done as a convenience to our shareholders," said Bobbi Blake, investor relations director. "The Pacific market closes an hour later than the others." Blake added the additional listings also would give Tandem greater visibility.

Blake added that Tandem had previously been traded unlisted on both exchanges, as are many other companies.

Tandem's sales for the year ended Sept. 30 were \$768 million. Earnings were \$64 million, or \$1.44 a share. During the first nine months of fiscal 1987, Tandem's sales rose to a record \$744 million with a profit of 77 cents a share.

Tandem is best known as a maker of no-fault computers and networking systems. The computers have duplicate processors. If one processor breaks down, the other takes over, thereby reducing the risk of "crashing." Banks, retailers, and other users of on-line transactional processing are Tandem's target clientele.



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LEVEL 1 - 3 OF 3 STORIES

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August 19, 1987, Wednesday

DISTRIBUTION: Business Editors

LENGTH: 460 words

HEADLINE: TANDEM/VICORP; (TDM) Tandem Computers announces agreement with
VICORP to jointly market Betex videotex software

DATELINE: CUPERTINO, Calif.

BODY:

Tandem Computers Inc. (NYSE:TDM) Wednesday announced it has signed an agreement with VICORP Interactive System Inc., Boston, a member of the VICORP group of companies headquartered in Switzerland, to jointly market BETEX videotex information software in North America.

VICORP Videotex Corp. AG, has been an associate of the Tandem Alliance program since 1985. BETEX videotex information software, currently operating on more than 40 Tandem NonStop computer systems in Europe and Australia, provides its users with a means to easily access timely information critical to business functions.

BETEX information software products are used for applications such as financial delivery, order-entry, travel reservation and electronic messaging systems.

BETEX is currently running on Tandem NonStop systems which serve numerous industries including finance, manufacturing, transportation and insurance.

Stuart Patterson, managing director of VICORP Interactive System Inc., said "The Tandem system architecture offers continuous operation, ease of growth and superior communications capability. BETEX builds on Tandem's strengths. Our users can easily add additional software modules as their requirements grow."

Michael Bateman, Tandem vice president third party marketing stated, "Our users require a reliable, easy-to-use information system that can be distributed to a wide audience. BETEX is easy to learn, easy to use and easy to implement. We are pleased to offer the combination of Tandem NonStop system reliability and ease of use of VICORP's BETEX information system software."

Under the terms of the agreement, VICORP will license BETEX software directly to Tandem NonStop system users in North America under the sponsorship of the Tandem Alliance.

VICORP is a leader in the public and private videotex system market. VICORP Interactive System Inc. is headquartered at 14 Bond St., Boston, Mass. 02118, phone 617/542-9233.

The Tandem Alliance is a program which encourages application designers to develop software for Tandem NonStop systems. Tandem Computers Inc. manufactures and markets computer systems and networks for the on-line

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transaction processing market.

Tandem is headquartered at 19333 Vallco Parkway, Cupertino, Calif. 95014, telephone 408/725-6000.

Note to editors: Tandem and NonStop are trademarks of Tandem Computers Inc. BETEX is a trademark of VICORP Videotex Corp. AG.

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INVESTEX/COMPUTERS AND OFFICE EQUIPMENT
August 24, 1987

Tandem Computers Inc. - Company Report
FIRST BOSTON CORPORATION (THE) - Peterson, S.
07-21-87 (RN=712627)

Tandem Computers Inc. TDM

Reports Third Quarter in Line with Expectations; Opinion: HOLD

Price (1) 7/20/87	Earnings (2) Per Share	P/E Ratios	Div'd Yield	52-Week Price Range
28 3/4	1988E \$1.40	20.5X	-	37 5/8-13 7/8
	1987E 1.06	27.1	-	
	1986A 0.72			

Common Shares	99.7 mil.	L.T. Debt as % Total Capital	1.5%
Market Value	\$2.9 bil.	Return on Average Equity	13.4%
Book Value/Share	\$6.28	Est. Future EPS 5 Yr. Growth Rate	19%

(1) On 7/20/87 the DJIA closed at 2487.7 and the S&P 400 at 364.8.

(2) Fiscal year ends September 30.

Tandem reported its third fiscal quarter on July 16, with earnings per share of \$0.26 versus last year's \$0.20, a 30% gain. This result was basically in line with our expectations of a \$0.24 quarter. These were the areas where the income statement differed from our expectations:

Revenues were modestly higher at \$264 million, a 31% increase over last year. We had expected \$7 million less for a 28% increase, with the surplus adding \$2 million to equipment revenues and \$5 million to service revenues. Tandem is expanding its consulting services and these results reflect that push.

Domestic revenues grew only 18%, but international efforts kept the company on plan with 55% growth in Europe and 42% growth elsewhere. This brings international sales to 44% of Tandem's total. End-markets that were particularly strong were the communications area -- the regional Bell operating companies -- and retailing, where Tandem added six major clients.

Equipment gross margins rose once again, but the decline in service gross margins more than offset that gain. Equipment gross margins gained another percentage point over last quarter to 74%, enjoying the benefits of increasing large system sales, improving manufacturing efficiencies at Tandem's plant in Austin, Texas, and strong sales abroad of dollar-denominated systems. However, service gross margins dropped five percentage points over last quarter to 20% because Tandem prices consulting services to reflect business

development opportunities.

Other items were in line with our expectations as a percentage of sales -- including marketing expenses, which last quarter worried investors with a precipitous \$10 million quarter-over-quarter rise to outstrip revenue growth. This quarter, MG&A increased only \$5 million to \$102.3 million to match 31% revenue growth.

The number of shares increased 1.6 million less than we had projected, to a total of 99.6 million. We had expected to see more options exercised after the spectacular run the stock has had since the beginning of the year, but employees are evidently optimistic about the longer-term outlook for the company.

Where do we go from here? For next quarter, we are looking for \$0.30 versus \$0.24 for a fiscal 1987 total of \$1.06 versus \$0.72. The Street range for the year stands at \$1.05-1.12. Tandem has several new products coming onstream in the September quarter, including the new low-end LNX system and SQL database package, which could produce upside surprises. However, worries about Tandem's growing dependence on international sales could be aggravated by Europe's summer siesta.

The fundamental story at Tandem -- a gain in market share from mainframes with a distributed processing approach -- is not changed by anything we see in the June quarter's results. Although we rate the stock a Hold, we would buy it below \$30 as an attractive accumulation level. However, we do not expect the stock to outperform the market over the next six months, because we see a group of investors poised to lock in some profits on good-news rallies. This selling pressure could create a plateau in the low \$30s for a while, but we believe Tandem's ability to compete profitably over time will reward the longer-term investor.

Table 1
Possible Fiscal 1987 Results by Quarter
\$ in millions, except per share data

[Part 1 of 3]

	Q1A F1986	Q2A F1986	Q3A F1986	Q4A F1986
	(\$)	(\$)	(\$)	(\$)
Equipment Sales	140.3	146.2	163.3	182.6
Service Revenues	29.8	30.2	37.6	37.9
Net Sales	170.1	176.4	200.9	220.5
Less:				
Cost of equipment	43.3	41.5	43.4	47.0
Cost of service	22.8	24.8	26.9	30.2
Marketing, general & admin.	64.8	68.8	77.5	83.8
Research & development	19.8	21.3	22.3	23.6
Interest income (net)	1.7	2.4	2.1	2.4
Pretax income	21.1	22.4	32.9	38.3
Income tax	-9.3	-10.0	-14.5	-16.9
Effective tax rate	44.5	44.5	44.5	44.5
Net income	11.6	12.4	18.1	21.6
Earning per share	0.14	0.15	0.20	0.24
Average shares outstanding	83.2	85.6	90.6	91.8
Percent of Sales				
Equipment sales	82.5	82.9	81.3	82.8
Service revenues	17.5	17.1	18.7	17.2
Cost of equipment	30.9	28.4	26.6	25.7
Cost of service	76.5	82.1	71.5	79.7
Marketing, general & admin.	38.1	39.0	38.6	38.0
Research & development	11.6	12.1	11.1	10.7
Interest	1.0	1.4	1.0	1.1
Pretax income	12.4	12.7	16.4	17.4
After-tax income	6.8	7.0	9.0	5.8

Note: Fiscal Year Ends September 30.

Tandem declared a 2-for-1 stock in May, 1987. These numbers represent pre-split numbers.

Table 1
Possible Fiscal 1987 Results by Quarter
\$ in millions, except per share data

[Part 2 of 3]

	Q1A F1987	Q2A F1987	Q3A F1987	Q4E F1987
	(\$)	(\$)	(\$)	(\$)
Equipment Sales	198.7	202.4	218.5	237.5
Service Revenues	39.3	40.0	45.5	42.5
Net Sales	238.0	242.4	264.0	280.0
Less:				
Cost of equipment	53.6	54.9	57.0	66.7
Cost of service	27.8	30	36.3	30.4
Marketing, general & admin.	86.8	96.3	102.3	104.5
Research & development	24.3	25.8	27.4	29.0
Interest income (net)	2.8	3.2	3.9	3.4
Pretax income	48.3	38.6	45.0	52.8
Income tax	21.3	16.1	19.3	21.8
Effective tax rate	44.0	41.6	43.0	41.3
Net income	27.0	22.5	25.7	31.0
Earning per share	0.29	0.23	0.26	0.30
Average shares outstanding	93.6	98.0	99.7	104.0
Percent of Sales				
Equipment sales	83.5	83.5	82.8	84.8
Service revenues	16.5	16.5	17.2	15.2
Cost of equipment	27.0	27.1	26.1	28.1
Cost of service	70.7	75.0	79.8	71.5
Marketing, general & admin.	36.5	39.7	38.8	37.3
Research & development	10.2	10.6	10.4	10.4
Interest	1.2	1.3	1.5	1.2
Pretax income	20.3	15.9	17.0	18.9
After-tax income	11.3	9.3	9.7	11.1

[Part 3 of 3]

	Q1 versus Q1	% Q1 versus Q2	Change Q3 versus Q3	Q4 versus Q4
	(%)	(%)	(%)	(%)
Equipment Sales	41.6	38.4	33.8	30.1
Service Revenues	31.9	32.5	21.0	12.1
Net Sales	39.9	37.4	31.4	27.0
Less:				
Cost of equipment	23.8	32.3	31.3	41.9
Cost of service	21.9	21.0	34.9	0.7
Marketing, general & admin.	34.0	40.0	32.0	24.7
Research & development	22.7	21.1	22.9	22.9
Interest income (net)	64.7	33.3	85.7	41.7
Pretax income	128.9	72.3	36.8	37.9
Income tax	129.0	61.0	33.1	29.0
Effective tax rate				
Net income	132.8	81.5	42.0	43.5
Earning per share	107.1	58.6	30.0	27.7
Average shares outstanding	12.5	14.5	10.0	13.3
Percent of Sales				
Equipment sales	1.2	0.7	1.8	2.4
Service revenues	-5.7	-3.6	-7.9	-11.7
Cost of equipment	-12.6	-4.4	-1.8	9.1
Cost of service	-7.5	-8.7	11.5	-10.2
Marketing, general & admin.	-4.3	1.9	0.5	-1.8
Research & development	-12.3	-11.9	-6.5	-3.2
Interest	17.7	-3.0	41.3	11.6
Pretax income	63.6	25.4	4.1	8.6
After-tax income	66.4	32.0	8.1	90.9

Note: Fiscal Year Ends September 30.

Tandem declared a 2-for-1 stock in May, 1987. These numbers represent pre-split numbers.

Table 2
Possible Fiscal 1987 and Fiscal 1988 Results
\$ in millions, except per share data

[Part 1 of 2]

	Estimated		Actual	
	F1988	F1987	F1986	F1985
Equipment Sales	\$1,080.0	\$854.6	\$632.3	\$523.4
Service Revenues	195.0	162.8	135.5	100.7
Net Sales	1,275.0	1,017.4	767.8	624.1
Less:				
Cost of equipment	\$300.0	\$235.9	\$175.2	\$185.6
Cost of service	142.0	117.7	104.7	83.0
Marketing, general & admin	478.0	387.1	294.9	231.6
Research & development	130.0	106.6	87.0	73.8
Interest income (net)	15.0	12.6	8.5	6.3
Pretax income	240.0	182.7	114.5	56.4
Income tax	\$89.0	\$77.7	\$50.7	\$22.0
Effective tax rate	37.1%	42.5%	44.3%	39.0%
Reversal of deferred taxes on DISC				
Net income	\$151.0	\$105.0	\$63.8	\$34.4
Earnings per share before DISC	\$2.80	\$2.12	\$1.44	\$0.82
Earnings per share after DISC				
Average shares outstanding	54.0	49.6	44.2	41.8
Earnings per share post split	\$1.40	\$1.06	\$0.72	\$0.41
Average shares outstanding post split	108.0	99.2	88.4	83.6
Percent of Sales				
Equipment sales	84.7%	84.0%	82.4%	83.9%
Service revenues	15.3	16.0	17.6	16.1
Cost of equipment	27.8	27.6	27.7	35.5
Cost of service	72.8	72.3	77.3	82.4
Marketing, general & admin	37.5	38.0	38.4	37.1
Research & development	10.2	10.5	11.3	11.8
Interest	1.2	1.2	1.1	1.0
Pretax income	18.8	18.0	14.9	9.0
After-tax income				

before DISC

11.8

10.3

8.3

5.5

[Part 2 of 2]

	% Change		
	F1988 versus F1987	F1987 versus F1986	F1986 versus F1985
Equipment Sales	26.4%	35.2%	20.8%
Service Revenues	19.8	20.1	34.6
Net Sales	25.3	32.5	23.0
Less:			
Cost of equipment	27.2%	34.6%	-5.6%
Cost of service	20.6	12.4	26.1
Marketing, general & adminin	23.5	31.3	27.3
Research & development	22.0	22.5	17.9
Interest income (net)	19.0	48.2	34.9
Pretax income	31.4	59.6	103.0
Income tax	14.5%	53.3%	130.5%
Effective tax rate	(12.8)	(4.0)	13.5
Reversal of deferred taxes on DISC			
Net income	43.8	64.6	85.5
Earnings per share before DISC	32.1	47.2	75.0
Earnings per share after DISC			
Average shares outstanding	8.9	12.2	5.7
Earnings per share post split	32.1	47.2	75.6
Average shares outstanding post split	8.9	12.2	5.7

Note: Fiscal Year Ends Sept. 30.

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LEVEL 1 - 1 OF 1 STORY

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**CORPORATE
INFORMATION CENTER**

August 24, 1987, Monday

SECTION: NOTEBOOK; Vol. 7, No. 163; Pg. 4

LENGTH: 24 words

BODY:

Tandem Computers and VICORP Interactive System have reached agreement to jointly market BETEX videotex information software in N. America.

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INVESTEX/COMPUTERS AND OFFICE EQUIPMENT
August 24, 1987

Tandem Computers, Inc. - Company Report
DONALDSON, LUFKIN & JENRETTE, INC. - Rooney, T.T.
07-27-87 (RN=713494)

July 27, 1987
DJIA: 2485.33
SP11: 361.92

TANDEM COMPUTERS, INC. (TDM - 28)

Third-Quarter Earnings In Line At \$0.26 Versus \$0.20;
Business Remains Strong, But The Valuation Appears Full

52-Week Range	Earnings Per Share			P/E Ratio		Dividend
	1986	1987E	1988E	1987E	1988E	
38-14	\$0.72	\$1.05-1.10	\$1.40	26.2	20.0	Nil

Shares outstanding: 99.7 million
Market capitalization: \$2,891.3 million

In July 14, TDM reported third-quarter earnings of \$0.26 a share, an increase of 27.7% over the \$0.21 earned last year. For the nine months, earnings are up an even more impressive 59.7% to \$0.77 per share, and on 12% more shares outstanding. Key points about the quarter are as follows:

- * Revenues of \$264.0 million were in line with expectations and were up 31.4% over the same quarter of 1986, spurred by demand in foreign markets and demand for TDM's high-end VLX.

- * International growth of 54% was nearly three times that domestically, causing international to rise to 43.9% of total from 38.9% last year.

- * TDM added 45 new customers in the quarter, with seven buying TDM's largest processor, the VLX. One customer, a travel agency in New York, actually purchased a nine-processor VLX system. In terms of markets, TDM's new-account success was greatest in retail where the company added six new accounts, including two of the three largest retailers in Japan.

- * TDM's balance sheet remains strong, with cash totaling \$296 million, or \$3.00 per share. At its current rate of growth, TDM is a modest consumer of cash, however, employee stock purchases have contributed over \$50 million over in the last six months.

- * Selling at 20.7 times our fiscal-1988 estimate of \$1.40 per share, the shares of TDM appear to be fully valued at \$28. On the basis of our valuation model, the shares are worth \$32 off 1988 earnings and

the implied ROE (excluding cash). Having said that we note that, we believe that TDM is in an extremely attractive position for the next few years. Thus, a correction of 10% would, in our opinion, be a good opportunity to get into the stock.

Table 1
Tandem Computer
Consolidated Statement of Income
[Dollars in millions, except per share amounts]

[Part 1 of 2]

	Third Quarter 6/30		
	1987	1986	% Chg.
Equipment	\$218,838	\$163,361	34.0%
Service & other	45,140	37,492	20.4
Total revenues	263,978	200,853	31.4
CGS	93,192	70,355	32.5
Gross profit	170,786	130,498	30.9
R&D	27,416	22,337	22.7
SGA	102,346	77,560	32.0
Total	129,762	99,897	29.9
Operating profit	41,024	30,601	34.1
Net interest	3,934	2,054	91.5
Pretax profit	44,958	32,655	37.7
Taxes	19,341	14,531	33.1
Net profit	25,617	18,124	41.3
EPS	\$0.28	\$0.20	27.7
Shares out.	99,652	90,006	10.7
% of Revenue			
Gross profit	64.7%	65.0%	
R&D expense	10.4	11.1	
SG&A expense	38.8	38.6	
Operating profit	15.5	15.2	
Pretax profit	17.0	16.3	
Tax rate	43.0	44.5	
Net profit	9.7	9.0	

[Part 2 of 2]

Nine months 6/30
1987 1986 % Chg.

Equipment	\$619,573	\$449,763	37.8%
Service & other	124,808	94,478	28.0
Total revenues	744,381	547,241	36.0
CGS	259,583	202,740	28.0
Gross profit	484,798	344,501	40.7
R&D	77,598	63,471	22.3
SGA	285,342	211,116	35.2
Total	362,940	274,587	32.2
Operating profit	121,858	69,914	74.3
Net interest	10,014	6,089	64.5
Pretax profit	131,872	76,003	73.5
Taxes	56,714	33,821	67.7
Net profit	75,158	42,182	78.2
EPS	\$0.77	\$0.48	59.7
Shares out.	97,098	87,044	11.6
% of Revenue			
Gross profit	65.1%	63.0%	
R&D expense	10.4	11.6	
SG&A expense	38.3	38.6	
Operating profit	16.4	12.8	
Pretax profit	17.7	13.9	
Tax rate	43.0	44.5	
Net profit	10.1	7.7	

Third-Quarter Results (See Table 1)

TDM reported a 27.7% increase for its third-quarter earnings to \$0.26 per share on revenue of \$264.0 million, an increase of 31.4%. For the nine months, per-share earnings were up 59.7% on a 36% increase in revenues. The per-share results are understated because nearly 12% more shares are outstanding in fiscal 1987. Net income was up an even more impressive 41.3% in the third quarter and 78.2% for the nine months. International revenue grew 54% in the quarter, reaching 43.9% of total. Even on a sequential basis, international revenue growth was impressive, rising 12.7%, and, while Japan remained strong, its growth did slow from the unusually healthy rate of the second quarter. During the quarter, TDM signed major contracts with two of the three largest retailers in Japan. The third is already a customer of TDM. Other major international contracts included the British Post Office and Euroclear, a Eurobond clearing house in Brussels. Major domestic wins included St. Joseph's Hospital of New Jersey; Allegheny-Ludlum; and a

New York travel agency, which ordered a nine-processor VLX system. Also included in revenue was about \$1.5 million of contract-manufacturing revenue related to TDM's production of personal computers for PC Limited, Inc. This was down from \$2.5 million in the previous quarter.

Table 2
Tandem Computers
Revenue Breakdown by Industry

	Year 1986	Third Quarter 1987
Finance	32%	27%
Manufacturing	21	12
Communications	12	17
Transportation	6	5
Government	5	5
Distribution	5	11
Services	18	18
Other	2	5
Total	100%	100%

Table 2 depicts the third-quarter revenue breakdown by industry segment compared with fiscal 1986. The biggest changes on the plus side are communications (17% versus 12% in 1986) and distribution (11% versus 5%). On the negative side are finance (27% versus 32%) and manufacturing (12% versus 21%). The shifts occurring are a reflection of the maturing of TDM's Alliance program, something that management has targeted over the last year as it has emphasized the quality rather than quantity of third-party software houses. Today, Alliance members participate in more than 70% of sales, and, in the third quarter, half of TDM's new accounts were spurred by Alliance members not previously active. During the third quarter in retail, TDM signed six new accounts, three of which were driven by the "Storelink," a third-party software package that allows TDM processors to attach to NCR cash registers. Clearly, TDM's efforts and spending in the third-party software area have been highly successful, something that should become even more true as newer members market their applications more actively.

Costs continued to be well controlled in the quarter. The gross margin declined modestly from its level in the previous quarter and from the year-earlier level. Nevertheless, the erosion was overstated somewhat because TDM floated nearly 100% of the costs of some software consulting that it did through the cost of service and other. Adjusted for this, the gross margin would have been about flat with that over the first half. For the quarter, operating expenses grew 29.9%, which was less than the rate of revenue growth, though the disparity between the two did narrow from what it had been running over the first half. This narrowing reflects the conscious efforts of management to manage the business between a 16% and 18% pretax margin, reinvesting when profitability moves higher as it did in the first quarter. There are currently 666 quota-carrying salespeople, an increase of 22% for the third quarter of fiscal 1986. The tax rate held constant at 43%, and it's expected to fall to at least 38% in fiscal 1988.

The company's balance sheet remains strong with cash and marketable securities of \$296 million, or \$3.00 per share. Despite a 9% increase in sequential revenue, receivables actually declined by \$2.0

million in the quarter and are now at 80 days' sales. Inventory increased by \$4.0 million from March, but remains a low 28 days' sales. Shareholders' equity increased at an annualized rate of 25% in the quarter and now stands at \$675 million, or \$6.75 per share. During the quarter, employees contributed \$13 million through their stock purchases, and, though down from the \$38 million in the preceding quarter, it remains a very healthy flow.

Third-Quarter Product Moves Leave TDM Well Off

During its third quarter, TDM strengthened its product position further by extending its price points down to less than \$40,000 with introduction of the CLX and up to \$8.5 million with the VLX model 804. Both systems are based on TDM's proprietary CMOS microprocessor, thus demonstrating the highly scalable nature of the product offering. Table 3 highlights TDM's product line after recent additions and repricings. This processor line, together with the company's highly regarded NON-STOP SQL, a truly distributed relational data base that adheres to the Structured Query Language (SQL) standard, leaves TDM in an attractive position in the outline-transaction processing (OLTP) market, which is growing almost three times faster than the traditional computer market. The fact that TDM has a scalable, microprocessor-based architecture and the ability to truly share data in a distributed, multiprocessor environment places it in a highly competitive position as the world moves more toward downsizing. Evidence of this was TDM's benchmarking of its VLX system running NON-STOP SQL against IBM's (**) 3090 running DB2 and CICS, a benchmark that showed TDM having nearly a fourfold price/performance advantage over the five-year life of a system. In short, over the last year, TDM has demonstrated its clear drive for leadership in OLTP through hardware (VLX, CLX), systems software (NON-STOP SQL), and applications (Alliance Program). Although we expect heightened competitive responses by IBM and particularly by DEC, we nonetheless believe that TDM is moving forward fast enough to ensure a place among the leaders in the OLTP market.

Table 8
Tandem Computers
Current Product Line

System	No. of Processors	Operating System	Entry Price (a)	TPS (b)
LNX	1-3	UNIX 5.0	\$18,000	NA
CLX	1-6	Guardian	39,900	8-15
EXT 10	1-2	Guardian	59,200	4-8
EXT 25	1-2	Guardian	250,000	9-18
TXP	2-4	Guardian	300,000	9-18
VLX	2-32	Guardian	585,000	13-200

(a) Entry price for volume purchases.

(b) Transactions per second.

Investment Conclusion

Selling at 20.7 times our 1988 estimate of \$1.40 per share, 4.3 times book value, and 2.27 times projected fiscal-1988 revenues, the shares of TDM appear to be fully valued. On the basis of our 1988 earnings and the implied ROE (exclusive of cash and interest), the shares are worth \$32, which means that a buy point of \$25-26 is necessary in order to see 25-30% appreciation. Therefore, while we view TDM's position in the market favorably, and while we recognize that its shares have declined nearly 25% from their recent high, we do not feel that the current price is compelling enough to warrant purchase.

Table 4
Tandem Computer
Income Statement

[Part 1 of 2]

	1987				
	1Q 13	2Q 13	3Q 13	4QE 13	Year-End 52
Revenues					
Equipment	\$198,725	\$202,010	\$218,838	\$235,000	\$854,573
Service & support	39,310	40,358	45,140	48,000	172,808
Total	238,035	242,368	263,978	283,000	1,027,381
CGS	81,418	84,973	93,192	100,465	360,048
Gross income	156,617	157,395	170,786	182,535	667,333
R&D	24,315	25,867	27,416	29,000	106,598
SG&A	88,761	96,235	102,346	106,691	392,033
Total	111,076	122,102	129,762	135,691	498,631
Operating income	45,541	35,293	41,024	46,844	168,702
Interest & other income	2,847	3,233	8,934	4,000	14,014
Interest & other expense	0	0	0	0	0
Net interest	2,847	3,233	8,934	4,000	14,014
Pretax income	48,388	38,526	44,958	50,844	182,716
Taxes	21,291	16,082	18,341	21,863	78,577
Income before extra.	27,097	22,444	25,617	28,981	104,139
Extra.	0	0	0	0	0
Net income	27,097	22,444	25,617	28,981	104,139
EPS	\$0.29	\$0.23	\$0.26	\$0.29	\$1.06
Shares Out.	94,000	98,056	99,652	100,000	98,000
%					
Gross income	65.80%	64.94%	64.70%	64.50%	64.95%
R&D	10.21%	10.67%	10.39%	10.25%	10.38%
SG & A	36.45%	39.71%	38.77%	37.70%	38.16%
Operating inc.	19.13%	14.56%	15.54%	16.55%	16.42%
Pretax income	20.33%	15.90%	17.03%	17.97%	17.78%
Rate	44.00%	41.74%	43.02%	43.00%	43.00%
Net income	11.38%	9.26%	9.70%	10.24%	10.14%

Table 4
Tandem Computer
Income Statement

[Part 2 of 2]

	1988E				
	1Q 13	2Q 13	3Q 13	4Q 13	Year-End 52
Revenues					
Equipment	\$238,470	\$236,352	\$258,229	\$277,300	\$1,010,351
Service & support	47,172	48,430	54,168	57,600	207,370
Total	285,642	284,781	312,397	334,900	1,217,720
CGS	101,403	101,097	110,901	118,890	432,291
Gross income	184,239	183,684	201,496	216,011	785,429
R&D	29,992	29,902	32,802	35,165	127,861
SG&A	105,688	111,065	118,711	123,913	459,376
Total	135,680	140,967	151,512	159,078	587,237
Operating income	48,559	42,717	49,983	56,933	198,193
Interest & other income	4,000	4,000	4,000	4,000	16,000
Interest & other expense	0	0	0	0	0
Net interest	4,000	4,000	4,000	4,000	16,000
Pretax income	52,559	46,717	53,983	60,933	214,193
Taxes	19,972	17,753	20,514	23,155	81,393
Income before extra.	34,587	28,965	33,470	37,778	132,800
Extra.	0	0	0	0	0
Net income	32,587	28,965	33,470	37,778	132,800
EPS	\$0.33	\$0.29	\$0.33	\$0.38	\$1.33
Shares Out.	100,000	100,000	100,000	100,000	100,000
% SALES					
Gross income	64.50%	64.50%	64.50%	64.50%	64.50%
R&D	10.50%	10.50%	10.50%	10.50%	10.50%
SG & A	37.00%	39.00%	38.00%	37.00%	37.72%
Operating inc.	17.00%	15.00%	16.00%	17.00%	16.28%
Pretax income	18.40%	16.40%	17.28%	18.19%	17.59%
Rate	38.00%	38.00%	38.00%	38.00%	38.00%
Net income	11.41%	10.17%	10.71%	11.28%	10.91%

Table 5

TANDEM COMPUTERS INC. (TDM)

[Part 1 of 5]

FY SEP	SALES	PRETAX INCOME	NET INCOME	EPS (P) EXCL. ADJUSTED	STOCK- HOLDERS' EQUITY	BK. VALUE PER SHARE ADJUSTED
77	7.7	0.3	0.2	0.01	2.7	0.36
78	24.3	4.4	2.2	0.05	15.5	0.35
79	56.0	10.1	4.9	0.10	31.5	0.63
80	109.0	21.1	10.7	0.18	70.3	1.17
81	208.4	51.1	26.5	0.36	204.8	2.81
82	312.1	46.7	29.9	0.38	251.0	3.33
83	418.3	50.5	30.8	0.38	311.0	3.93
84	532.6	56.3	33.2	0.41	375.1	4.62
85	624.1	56.4	34.4	0.41	420.4	5.08
86	767.8	114.5	63.8	0.72	534.7	6.09
87(E)	1,027.4	182.7	104.1	1.06	638.8	6.52
88(E)	1,281.5	228.4	141.6	1.42	780.4	7.80

(*) Current quarter

(A) Actual

(E) = Estimate

[Part 2 of 5]

FY SEP.	COMMON SHARES ADJUSTED	PRICE DEC. 31st ADJUSTED	REVENUE GROWTH %YA	PRETAX MARGIN %	AFTERTAX MARGIN %	EPS GROWTH % YA
77	7.5	1.313		4.3%	2.1%	-
78	44.1	2.063	216.0%	18.1%	8.9%	900.0%
79	50.0	3.542	130.3%	18.1%	8.8%	96.7%
80	60.2	12.667	94.7%	19.3%	9.8%	79.7%
81	72.8	13.875	91.2%	24.5%	12.7%	103.8%
82	75.3	12.688	49.8%	15.0%	9.6%	5.6%
83	79.1	17.563	34.0%	12.1%	7.4%	0.0%
84	81.2	9.750	27.3%	10.6%	6.2%	6.6%
85	82.8	11.125	17.2%	9.0%	5.5%	1.2%
86	87.8	17.125	23.0%	14.9%	8.3%	75.6%
87(E)	98.0	29.125	33.8%	17.8%	10.1%	47.6%
88(E)	100.0	29.125	24.7%	17.8%	11.0%	33.3%

[Part 3 of 5]

FY SEP.	P/E x	P/B x	P/S x	ROE %	ROE/(P/B) %
77	262.5	3.6	1.3	5.8%	1.6%
78	41.3	5.9	3.7	23.6%	4.0%
79	36.0	5.6	3.2	20.9%	3.7%
80	71.7	10.8	7.0	21.0%	1.9%
81	38.5	4.9	4.8	19.3%	3.9%
82	33.4	3.8	3.1	13.1%	3.4%
83	46.2	4.5	3.3	11.0%	2.5%
84	24.1	2.1	1.5	9.7%	4.6%
85	27.1	2.2	1.5	8.6%	3.9%
86	23.8	2.8	2.0	13.4%	4.7%
87E	27.4	4.5	2.8	17.7%	4.0%
88E	20.6	3.7	2.3	20.0%	5.3%

* Dollars in millions except per share amounts.

* Data restated. Fiscal 1984 excludes DISC benefit of \$9.7 million or \$0.12 per share.

* Adjusted for stock splits.

* F87e & F88e stock price as of 07/28/87.

RELATIVE ANALYSIS

[Part 4 of 5]

FY	P/E TDM/SPIN	P/B TDM/SPIN	ROE TDM/SPIN	ROE/(P/B) TDM/SPIN	RVA TDM/SPIN
77	NM	282.6%	40.0%	14.1%	NH
78	501.7%	487.9%	155.0%	31.8%	323.7%
79	484.8%	458.5%	120.7%	26.3%	401.8%
80	748.3%	760.2%	134.8%	17.7%	555.1%
81	470.5%	417.6%	129.4%	31.0%	363.7%
82	279.6%	286.3%	116.4%	40.7%	240.1%
83	366.5%	283.4%	89.4%	30.5%	409.9%
84	233.9%	140.5%	65.8%	46.9%	355.4%
85	177.5%	117.8%	70.5%	59.8%	251.8%
86	129.3%	136.5%	117.1%	85.7%	110.4%
87(E)	133.5%	168.8%	134.1%	79.5%	99.6%
88(E)	116.0%	151.2%	138.5%	91.6%	83.7%

RVA = (REL. P/E)/(REL. ROE)

EARNINGS PERSPECTIVE

[Part 5 of 5]

FY	EARNINGS PER SHARE				YEAR
	1	2	3	4(*)	
1984	\$0.12	\$0.03	\$0.12	\$0.15	\$0.41
1985	\$0.17	\$0.08	\$0.03	\$0.14	\$0.41
%YA	41.7%	220.0%	-73.9%	-6.9%	1.1%
1986	\$0.14	\$0.15	\$0.20	\$0.24	\$0.72
%YA	-17.6%	81.3%	566.7%	74.1%	75.8%
1987(E)	\$0.29(A)	\$0.23(A)	\$0.26(A)	\$0.29	\$1.07
%YA	107.1%	58.6%	30.0%	23.4%	48.6%
1988(E)	\$0.36	\$0.30	\$0.35	\$0.40	\$1.41
%YA	24.1%	30.4%	34.6%	37.9%	31.8%

(*) Current quarter

(A) Actual

(E) = Estimate

Table 6

ANALYSIS OF OPERATIONS

(Part 1 of 3)

TANDEM COMPUTERS
(SEP)
(\$Thousands)

	1981	1982	1983	1984	1985	1986
Revenues	208,397	312,143	418,282	532,620	624,138	767,793
Operating income	40,391	40,708	49,771	51,101	50,081	105,978
Other income	10,707	6,033	730	5,183	6,269	8,504
Pretax income	51,098	46,741	50,501	56,284	56,350	114,482
Taxes (+)	24,549	16,885	19,696	23,076	21,976	50,716
Net income	26,549	29,856	30,805	33,208	34,374	63,766
(+) F84 excludes DISC benefit (\$9.7 million.)						
Cash	89,806	24,816	93,501	106,862	128,676	239,819
Accounts receivable	70,671	98,810	119,558	146,342	163,378	197,658
Inventory	54,543	101,335	85,920	92,375	78,962	64,229
Gross plant	44,339	107,466	132,772	191,755	241,344	282,125
Depreciation	8,434	18,080	33,991	50,253	80,746	107,103
Net plant	35,905	89,386	98,781	141,502	160,598	175,022
Other	5,046	23,019	17,765	14,792	20,730	28,297
Total operating assets	161,119	289,531	304,259	380,219	402,938	436,909
Total assets	255,971	337,366	415,525	501,873	552,344	705,025
Short term debt	682	2,060	3,335	15,025	7,049	5,969
Long term debt	2,054	21,102	23,957	17,155	12,412	6,526
Deferred taxes	8,143	18,063	23,966	20,422	32,718	29,828
Total debt	10,879	41,225	51,258	52,602	52,179	42,323
Stockholders' equity	204,810	250,988	310,993	375,122	420,408	534,680
Employees	2,730	3,821	4,396	5,223	5,494	5,719

[Part 2 of 3]

	1981	1982	1983	1984
Operating Margin	19.4%	13.0%	11.9%	9.6%
Pretax Margin	24.5%	15.0%	12.1%	10.6%
Operating asset turn	1.75	1.39	1.41	1.56
Net asset turn	1.19	1.05	1.11	1.16
Return on operating assets	33.9%	18.1%	16.8%	14.9%
Return on net assets	29.1%	15.8%	13.4%	12.3%
Receivable turnover	3.68	3.68	3.83	4.01
Inventory turnover	5.52	4.00	4.47	5.97
Net plant turns	8.35	4.98	4.45	4.43
Depreciation/Gross plant	19.0%	16.8%	25.6%	26.2%
Tax rate	48.0%	36.1%	39.0%	41.0%
Debt/Equity	5.9%	11.4%	16.5%	15.1%
Operating assets/Equity	0.87	0.99	1.06	1.00
Net assets/Equity	1.28	1.30	1.34	1.34
Return on equity	19.3%	13.1%	11.0%	9.7%
Revenue/Employee	101.24	95.30	101.81	110.74
Operating profit/Employee	19.62	12.43	12.11	10.63
Total assets/Employee	124.35	103.00	101.14	104.35

[Part 3 of 3]

	1985	1986	3-YR MOVING AVERAGE '84-'86	TDM 4-QTR. MOVING AVERAGE
Operating Margin	8.0%	13.8%	10.47%	17.17%
Pretax Margin	9.0%	14.9%	11.50%	18.52%
Operating asset turn	1.59	1.83	1.66	1.83
Net asset turn	1.18	1.22	1.19	1.15
Return on operating assets	12.8%	25.2%	17.65%	31.45%
Return on net assets	10.7%	18.2%	13.72%	21.23%
Receivable turnover	4.03	4.25	4.10	4.05
Inventory turnover	7.29	10.72	7.99	12.72
Net plant turns	4.13	4.58	4.38	4.54
Depreciation/Gross plant	33.5%	38.0%	32.54%	37.47%
Tax rate	39.0%	44.3%	41.43%	43.21%
Debt/Equity	13.2%	9.9%	12.73%	6.55%
Operating assets/Equity	0.98	0.88	0.95	0.83
Net assets/Equity	1.33	1.32	1.33	1.33
Return on equity	8.6%	13.4%	10.56%	16.01%
Revenue/Employee	116.48	136.95	121.39	Incl. Jun. Qtr.
Operating profit/Employee	9.35	18.90	12.96	
Total assets/Employee	103.08	125.75	111.06	

(**) DONALDSON, LUFKIN & JENRETTE SECURITIES CORPORATION MAKES A MARKET IN THIS SECURITY, HAS PERIODIC POSITIONS IN THIS SECURITY IN CONNECTION WITH THIS ACTIVITY AND MAY BE ON THE OPPOSITE SIDE OF PUBLIC ORDERS EXECUTED ON THE P. S. E. IN THE STOCK.

Tandem Adds Line Of Workstations

By LESLIE GOFF

CUPERTINO, Calif.—Tandem Computers Inc. is expanding its microcomputer offerings with a new family of seven Microsoft Corp. MS-DOS workstations, ranging in performance from an Intel Corp. 80286-based diskless personal computer to an 80386-based machine with a 70-Mbyte hard disk drive.

Jim Pawlik, product manager for workstations at Tandem's Micro Products division in Austin, Texas, said the workstations are primarily aimed at Tandem NonStop and LXX system users for both terminal emulation applications and dedicated stand-alone use.

"These are designed to be extensions of a Tandem system," Pawlik said. Tandem is targeting a range of applications for the new line, including using the machines as desktop productivity tools and as computers dedicated to a specific task.

Pawlik said that the new PSX/300 and PSX/200 series augment the company's existing 6AX line of 80286-based microcomputers and that the company plans to continue supporting the older line "for the foreseeable future."

"The new ones are smaller and a little bit less expensive versions of basically the same product," he said, "but also go beyond the 6AX line in performance and storage capacity."

Only 15-inch Wide

While the older line is configured in a PC/AT-like chassis, Pawlik said the new machines are only 15-inch wide, 16-inch deep and 6-inch tall.

"We feel like these are important machines for us from the standpoint that they span a wider performance range than our earlier offerings," Pawlik added.

Moreover, Tandem hopes to increase its account control by providing customers with its own solution to terminal and workstation needs.

"Tandem has a fairly open philosophy about attaching other vendors' equipment to our systems," he added. "We even sell IBM PC and compatible emulator cards."

The PSX/300 and PSX/200 have built-in emulation software for Tandem's NonStop fault-tolerant processors and LXX Unix-based processors, allowing users connected to each system to toggle back and forth between system terminal emulation and dedicated MS-DOS applications, Pawlik said.

For instance, a workstation attached to a LXX system will use the emulator software to appear to the operating system as an ANSI 5.64 terminal. A PC connected to a NonStop will emulate Tandem's 6530 terminal.

He added that connection to the Unix-based systems is a new feature for Tandem, and expands the focus of the Micro Products division.

The workstations also have resident software allowing users to connect their machines to Tandem's MultiLAN, a LAN gateway to NonStop systems.

Pawlik said the seven new workstations fall into three performance categories.

At the high end, the 16-MHz 80386-based PSX/300 series is available in two models. The PSX/370 has a 70-Mbyte hard disk drive, while the PSX/340 is configured with a 40-Mbyte disk drive. Both models have standard 5.25-inch, 1.2-Mbyte floppy disk drives.

The 80286-based PSX/200 series encompasses both the mid-range and low-end performance levels.

Two Mid-range Workstations

In the mid-range, Tandem is offering two 12.5-MHz workstations, one with a 40-Mbyte hard-disk drive, dubbed the PSX/240, and one with a 20-Mbyte drive, the PSX/220. The company also has a mid-range entry-level configuration, the PSX/220E, which runs at 8 MHz and has a 20-Mbyte hard disk drive. All three include a 1.2-Mbyte floppy disk drive.

Two low-end workstations, the PSX/201 and PSX/200, are based on 8-MHz processors and are designed to be low-cost workstations for a LAN environment. The PSX/201 has a single 1.2-Mbyte floppy disk drive and the PSX/200 is diskless.

Pawlik said Tandem will upgrade each processor to the next performance level if users need more power. An 80286-based system can upgrade from 8 MHz to 12.5 MHz, or from 12.5 MHz to a 16 MHz 80386 system, by swapping motherboards.

The hard-disk models PSX models, except the PSX/220E, include a serial/parallel/current-loop card, which allows users to choose either RS-232C or current-loop interfaces, and an enhanced graphics array (EGA) card. Both cards are optional on the other workstations.

Standard features on all seven workstations include six 16-bit and two 8-bit expansion slots, 1 Mbyte of RAM, an enhanced AT-style keyboard with 16 function keys, support for nine languages (including both U.S. and U.K. English) and all software. Monochrome and color monitors are not included in the basic configuration.

Tandem said it will support Microsoft's OS/2 on the new workstations when it becomes available. It also plans to add support for 1.44-Mbyte 3.5-inch floppy disk drives in January 1988.

The PSX/370 is \$5,695 and the PSX/340 is \$4,895. Both will be available in the first quarter of 1988, the company said.

The PSX/200 series will begin shipping in the fourth quarter of this year. Prices are \$3,795 for the PSX/240; \$2,995 for the PSX/220; \$2,395 for the PSX/220E; \$1,395 for the PSX/201 and \$1,195 for the PSX/200.

A monochrome monitor lists for \$225 and a color monitor is \$775. In the first quarter of 1988, Tandem said, an analog color monitor for use with IBM's new Video Graphics Array (VGA) graphics standard will be available for \$775.

Upgrades vary in price, but typically the company offers a \$200 exchange for the board being replaced, Pawlik said. For example, the cost to upgrade from an 8-MHz board to a 12-MHz board is \$825, but users get a \$200 exchange credit.

GTE Phone Companies Aim At Systems Integrator Role

CONTINUED FROM PAGE 1

for testing a market laden with competition and strewn with casualties.

"We are attempting through prototypes to understand what it's going to take in terms of training, equipment sales and technology to be successful in an integration environment," said Todd Eliason, director of sales operations for large business segments, GTE Telephone Operations. "We want to garner more knowledge on the customer's environment, products and service selection."

Going Forward Cautiously

The plan to deploy the three teams was hatched about a year ago by this parent division of GTE's seven regional operating companies. After an investment of several million dollars, it still faces another year of evaluation and modification before the fate of the plan will be decided, Eliason said.

Last year, in reaction to customer trends, "We identified a gap between traditional telecommunications businesses to some degree and data communications businesses," Eliason said. "When you look at integrating it all together, and adding office automation, GTE was not a major player. In looking at that, in looking at the merging of technologies, between those areas of information, data and telecommunications, recognizing where we wanted to be in the future, we felt it was necessary to combine our forces to become an end-to-end systems integrator for our customers."

Asked who were potential competitors of the prototype systems integration teams, Eliason responded, "Everybody. AT&T Information Systems, RBOC agencies like US West Information Systems and PacTel Information Systems."

Stiff Competition

Indeed, several large companies have begun systems integration efforts, including International Business Machines Corp. and Telenet, a unit of US Sprint Communications. These and other vendors plan to exploit traditional account strongholds to expand business opportunities. In the case of Telenet, the company hopes its in-place network design expertise will enable it to create a new profit center. IBM, of course, dominates corporate data centers.

For its part, GTE hopes to leverage its local-exchange presence through its operating companies to gain new systems integration business.

"The key attributes that GTE entities have is account presence and account management in these areas, and a ubiquitousness in telephone operations," Eliason said.

According to Dennis Foster, GTE Telephone Operations assistant vice president of marketing and sales operations, the prototype teams could independently focus on business systems for small and medium-size businesses, while also aligning with GTE national account organizations that service government and branch offices of large companies that require large communications systems.

Of the seven GTOCs, the three hosting the prototype teams are GTE of the Northwest, GTE of the Southwest and Midwestern Telephone Operations. The teams are based, respectively, in a Seattle suburb; Research Triangle Park, N.C.; and Sun Prairie, Wisc., Eliason said.

Initially, the teams will use off-the-shelf software for purchasing, sales and administration applications, Eliason said. Each of the teams is staffed by 10, in squads that focus on sales, service and technical support, he said.

"One of the things we uncovered is the need to focus on somewhat of a product specialist approach," he said. "It's asking people a lot to understand complex networks and CPE (customer premises equipment). The prototype offices are designed to put together a team of a sales and technical service force, to pull together diverse elements for a customer and work together."

Vendors Not Named

Eliason and Foster frequently alluded to "multivendor" communications, but declined to identify individual vendors whose equipment the teams would distribute.

"We have distribution agreements that have been in place for some time," Eliason said. "Typically, they are local area networks, voice mail and PCs as well as software to support all that."

He emphasized, "We are not selling stand-alone hardware. We are selling integrated solutions."

The teams will not bundle inter-LATA transmission, he noted, as such an arrangement is precluded by a Department of Justice consent decree with GTE Corp.

Equipment prices in the three prototype locations will be standardized, according to Foster.

In multisite installations, the prototype teams may interface with GTE national account representatives, Foster said.

"I think it's an issue of support and customer fulfillment," he said. "If we had a national account with branch and secondary locations, it (prototype) would be another support arm."

The prototype teams could partner with third-party organizations as well, Eliason said. Value-added resellers (VARs), which often bundle application-specific software with hardware, have the potential to supply departmental solutions in a pervasive office-automation job won

by the teams.

Yet another opportunity for the prototype teams may be an outward-bound approach from retail storefronts.

In the GTOCs' areas are telephone stores called Phone Marts, which Foster likened to AT&T's Telephone Centers. Depending on the GTOC region, some Phone Marts already sell "small-business solutions," he said. However, by first-quarter 1988 some of these operations in "bedroom communities" will be transformed into "small, specialized business stores."

Industry analysts expressed guarded optimism over the GTE venture. They credited GTE for its caution in defining the prototype program, but cited the business unit's expected uphill struggle for credibility in a market that has eluded both established and upstart players.

Gary Arlen, president of Arlen Communications Inc., a Washington, D.C., market research firm, observed that other divisions within GTE are anxious to further exploit the Phone Marts.

"The people who are running the Phone Mart stores have been trying to come out with other folks at (GTE in) Stamford to see how they can sell a number of other products, how to take advantage of the storefronts," according to Arlen.

Big Potential Seen

GTE's approach to the systems integration venture impressed Arlen. "You see someone who has the wherewithal to do something that brings into play a company that can find niches and make them big."

Although a business plan may initiate corporate approval, in the marketplace GTE must quickly gain credibility as a systems integrator, observed Alan Fross, a consultant affiliated with Telesis Inc. in Somerset, N.J.

"It will be a tough climb for GTE to establish themselves (as systems integrators)," Fross said. "People hear 'GTE' and think phone service. They need a SWAT team, more or less, of systems integrators that can solve complex problems."

The "perception problem," Fross said, can be overcome through marketing. However, "they have to cut their teeth on some problems, do them right, and take it from there," he said.

Both marketing and "word of mouth" referrals "do take time," Fross said. "Reinforcement is the key word in this game."

Harris New Hercules CEO

BERKELEY, Calif.—Hercules Computer Technology, a maker of graphics cards for IBM microcomputers, has appointed Jim Harris president and chief executive officer.

Harris replaces former president and company co-founder Kevin Jenkins, who recently left the company to pursue other interests. Jenkins continues to be a stockholder in Hercules and sits on the company's board of directors.

Van Suwannukul, also a company co-founder, will remain chairman of the board of directors. He will return to his duties as director of research and development after serving as interim president and CEO.

Harris has served as a tax and financial consultant to Hercules since the company's inception in 1982. He was formerly a partner and director of entrepreneurial services at Arthur Young and Co., Dallas, Texas.

LEVEL 1 - 1 OF 3 STORIES

PR Newswire

August 6, 1987, Thursday

**CORPORATE
INFORMATION CENTER**

DISTRIBUTION: TO BUSINESS DESK

LENGTH: 292 words

HEADLINE: TANDEM COMPUTERS TO LIST ON PACIFIC STOCK EXCHANGE

DATELINE: SAN FRANCISCO, Aug. 6

KEYWORD: TANDEM COMPUTERS TO LIST ON PACIFIC STOCK EXCHANGE

BODY:

SAN FRANCISCO, Aug. 6 /PRN/ -- The Pacific Stock Exchange today announced the listing of Tandem Computers Inc. under the ticker symbol TDM.

Trading is currently under way. Today the company also announced its new listing on the Midwest Stock Exchange; Tandem is traded on the New York Stock Exchange as well.

"Through multiple listings of our securities, Tandem will enjoy increased visibility among potential shareholders," said James G. Treybig, Tandem's president and chief executive officer. "This action is in keeping with our philosophy of broadening and diversifying our ownership base, and creating as much investor awareness as possible. We are pleased that we can offer our shareholders the convenience and advantage of multiple listings on the New York, Midwest and Pacific Stock exchanges."

For the fiscal year ended Sept. 30, 1986, Tandem reported record revenues of \$768 million and earnings per share of \$.72, increases of 23 percent and 76 percent, respectively, over fiscal 1985.

Revenues for the first nine months (ended June 30, 1987) of fiscal 1987 increased to a record \$744 million -- a 36 percent increase over the first nine months of 1986. Earnings per share increased 60 percent to \$.77, compared with \$.48 per share in the same period of fiscal 1986. Per-share figures reflect a 2-for-1 stock split effective May 22, 1987.

The Fortune 500 company, headquartered in Cupertino, Calif., is a leading supplier of mainframes and computer networks for the on-line transaction processing market.

CONTACT -- Pat Ridgway, 408-725-6035 (media), or Bobbi Blake, 408-725-2362 (analysts), both of Tandem Computers; or Don Alexander of the Pacific Stock Exchange, 415-393-4220

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LEVEL 1 - 1 OF 2 STORIES

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INFORMATION CENTER**

August 6, 1987, Thursday

DISTRIBUTION: Business Editors

LENGTH: 283 words

HEADLINE: TANDEM-COMPUTERS; (TDM) Tandem Computers to list on Midwest and Pacific Stock exchanges

DATELINE: CUPERTINO, Calif.

BODY:

Tandem Computers Inc. (NYSE:TDM) announced Thursday that the Securities and Exchange Commission has approved the company's request for the listing of its securities on the Midwest and Pacific Stock exchanges.

Trading is expected to begin by the middle of August.

"Through multiple listings of our securities, Tandem will enjoy increased visibility among potential shareholders," said James G. Treybig, president and chief executive officer of Tandem.

"This action is in keeping with our philosophy of broadening and diversifying our ownership base and creating as much investor awareness as possible. We are pleased that we can offer our shareholders the convenience and advantage of multiple listings on the New York, Midwest and Pacific Stock exchanges."

For the 1986 fiscal year, which ended Sept. 30, 1986, Tandem reported record revenue and earnings. Compared to fiscal 1985, revenue grew 23 percent to \$768 million, and earnings per share grew 76 percent to 72 cents.

Revenue for the first nine months of fiscal 1987, ended June 30, increased to a record \$744 million, a 36 percent increase over the first nine months of 1986.

Earnings per share increased 60 percent to 77 cents, compared to 48 cents per share in the like period of fiscal 1986. Per share figures reflect a two-for-one stock split effective May 22.

Tandem Computers Inc., a Fortune 500 company, is a leading supplier of mainframes and computer networks for the on-line transaction processing market.

Contact: Tandem Computers Inc., Cupertino
Pat Ridgway, 408/725-6035 (media)
Bobbi Blake, 408/725-2362 (analysts)

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**CORPORATE
INFORMATION CENTER**

August 3, 1987

SECTION: COMPUTER INDUSTRY; Pg. 60

LENGTH: 552 words

HEADLINE: Mergers target connectivity;
Recent focus fuels marriages of 3Com-Bridge, Tandem-NAS

BYLINE: By Patricia Keefe

BODY:

An industrywide focus on connectivity has fueled a rash of strategic alliances and mergers in data communications during the past two years, as vendors strive to position themselves as providers of communications capabilities.

The ideal marriage is one between partners of equal and complementary strengths that combine to expand their impact on the market, said Richard Kimball, an analyst with Montgomery Securities in San Francisco. A good example is the recent announcement by 3Com Corp. in Santa Clara, Calif., and Bridge Communications, Inc. in Mountain View, Calif., of their intent to merge. 3Com will provide Bridge with personal computer networking while gaining gateways into larger networks (see story page 59).

Two CPU hardware vendors, Tandem Computers, Inc. and National Advanced Systems Corp. (NAS), recently jumped on the connectivity bandwagon by announcing strategic relationships designed to broaden their offerings.

Tandem branches out

Cupertino, Calif.-based Tandem leads the way with two investments: a minority interest in Netlink, Inc., a privately held developer of enhanced IBM Systems Network Architecture (SNA) hardware and software located in Raleigh, N.C.; and GTE Corp. subsidiary General Telephone Co. of the Northwest, Inc. in Everett, Wash.

Netlink and Tandem have agreed to jointly develop and market products to enhance integration between Tandem's Nonstop systems and IBM systems through the use of Netlink's SNA products.

"Our products will operate with Tandem systems serving as processors of transactions in distributed, often heterogeneous networks," said Paul Wood, Netlink's chief executive officer.

Tandem's pact with GTE-Northwest involves integrating each company's products into a comprehensive offering for the management of telecommunications within large organizations. Tandem said it plans to evaluate GTE-Northwest's Network Management Control Center system as a possible product for joint marketing.

Focus on turnkey products

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Joint development of turnkey connectivity products is the goal behind a five-year agreement between NAS, a subsidiary of National Semiconductor Corp., and gateway vendor Interlink Computer Sciences, Inc., based in Fremont, Calif. NAS has taken a minority position in privately held Interlink, gaining the right to develop, design, market, lease or sell products based on Interlink technology for installation on NAS systems.

NAS sells Hitachi Ltd. mainframes on an OEM basis and has developed a product incorporating Interlink's software, which links Hitachi mainframes to Digital Equipment Corp. systems. Interlink's software links DEC and IBM MVS and VM systems and is ported to DEC PDP-11s and VAXs, which function as black boxes.

Separately, Counterpoint Computers, Inc. in San Jose, Calif., a manufacturer of multiuser workstations, and Italtel Societa Italiana Telecomunicazioni, Italy's largest manufacturer of telecommunications equipment, formed a strategic alliance to spur integration of their data communications and telecommunications products.

The alliance involves an OEM contract, joint product development and a future equity investment. Under the OEM contract, the state-owned Italtel will purchase \$5 million to \$10 million in Counterpoint equipment during the next three years.

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...their nominal duties on data processing machines to off-

legal dissertation by Mr. Roth. He rejected the arguments that

Net Jumps 25% In Marietta Qtr.

BETHESDA, Md. — Martin Marietta Corp. recorded a second-quarter profit increase of 25 per cent to \$71.58 million, or \$1.31 a share, from the year-earlier net of \$57.32 million, or \$1.04 a share.

The firm also noted that sales for the latest 3-month period ended June 30 increased 11 per cent to \$1.37 billion from \$1.22 billion in the second 1986 period.

Thomas G. Pownall, chairman, attributed the results to "strong contributions from all major business areas" and added that an

\$8.8 billion backlog "bodes well for future years."

Results for the first half of 1987 were up 9 per cent with earnings at \$115.64 million, or \$2.11 a share, on sales of \$2.51 billion. This compares with the 1986 first-half net of \$105.73 million, or \$1.92 a share, on sales of \$2.31 billion.

Separately, Marietta directors raised the quarterly common stock dividend 2-1/2 cents to 27-1/2 cents a share. Payment of the new rate will be made Sept. 30 to holders as of record Sept. 8.

Tandem, GTE-Northwest Eye Joint Mktg. Options

CUPERTINO, Calif. — Tandem Computers has signed an agreement with GTE-Northwest to study the possibility of integrating Tandem CPUs with GTE's telecommunications products.

The agreement calls for the firms to evaluate GTE-Northwest's Network Management Control Center, a telecommunications system, for a possible joint marketing venture. The companies would not release additional details of the agreement.

GTE Northwest is a GTE Corp. subsidiary based in Everett, Wash.

Northwest Bell's provision of private network services to the Oregon state government. In that ruling, the four regionals noted, the court held that BOCs could offer certain switching and routing service performed at the direction of an "end user" — in that case the state government.

"In an effort to avoid that holding, AT&T claims that Martin Marietta, not GSA, would control the FTS 2000 network, and further that Martin Marietta, as prime contractor, would be an interexchange carrier," the Bell companies said.

But that view should be dismissed, they contended, pointing out that Martin Marietta "is not an interexchange carrier but rather a systems integrator managing the network on behalf of, and under the supervision of GSA, the end user customer."

The companies also said that even though Martin Marietta is not an interexchange carrier, that issue "is irrelevant to the regional companies right under the decree to provide exchange access routing to interexchange circuits chosen by private network customers."

They maintained that the services being challenged by AT&T "consist predominantly of switching originating and terminating traffic among dedicated interLATA circuits at the express direction of a private network customer."

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Ada OK'd for Tandem line

Firm to offer language, compiler for Nonstop series

BY JEFFRY BEELER
CW STAFF

CUPERTINO, Calif. — Tandem Computers, Inc. recently announced that it plans to offer the Ada programming language and associated programming tools for its Nonstop series of computers late this year.

Tandem said it has successfully tested an Ada compiler for compliance to federal standards.

The tests performed by the U.S. Department of Defense's Ada Joint Program Office have validated the Tandem compiler as conforming to both the ANSI/MIL-STD-1815A and ISO/8652-1987 standards, according to Richard Vnuk, Tandem's manager of languages and tools.

Language requirement

The Defense Department mandates the structured development language for mission-critical systems projects. Ada is also widely used in government agencies such as the National Aeronautics and

Space Administration, where "many contracts specify the language as a requirement," Vnuk said.

In addition to the Ada language and a compiler, Tandem said it will provide an Ada library manager, a binder and a symbolic debugger.

The Tandem Ada language, which the vendor said runs on all the Nonstop systems, supports programs that have up to 4M bytes of instruction code. It can also manipulate up to 128M bytes of data per single process within a Nonstop system, Tandem said.

Available by year's end

The Tandem Ada language is scheduled to become available for shipment during the fourth quarter.

Tandem Ada for the Nonstop VLX, TXP and Nonstop II systems is priced at \$20,900 with a monthly license fee of \$800.

A license for the Tandem Nonstop EXT and CLX systems is \$10,475 per system, and the monthly license fee is \$400.

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