

Copyright
INVESTEXT/COMPUTERS AND OFFICE EQUIPMENT
MARCH 24, 1986

Tandem Computers - Company Report
PRUDENTIAL BACHE SECURITIES INC. - Muratore, C.E., et al
02-28-86 (RN=602999)

Tandem Computers

- * Company repositioning nearly complete.
- * New high-end product expected in April.
- * E.P.S. estimates raised to \$1.20 in FY86 and \$1.70 in FY87.
- * Rating raised to 1-2.

TNDM (24 7/8) -- NYSE

Earnings Per Share			P/E	Ind.	Yield	Opinion		Shares O/S (mil.)	52- Week Range
Fiscal Year	Ending					N	L		
9/85	9/86E	9/87E	1986E	Div.	--	1	2	42.2	26-13
\$0.82	\$1.20	\$1.70	20.7X	--	--				

DJIA: 1713.99 Priced as of the close, January 27, 1986.
S&P 400: 250.18

Opinion Legend: N = Up to 6 Months, L = 6 to 18 Months
1 = Aggressive Purchase, 2 = Accumulate, 3 = Average Performer
4 = Swap, 5 = Sell

INVESTMENT CONCLUSION

The internal dynamics for improved profitability at Tandem are in place. After three years of repositioning the company for a more competitive environment, Tandem is about to emerge in a strong product position and with a more effective sales strategy.

We have raised our rating to 1-2 from 2-2 and increased our earnings estimates to \$1.20 for FY86 and \$1.70 for FY87 from our previous estimates of \$1.05 and \$1.50. Calendar E.P.S. estimates are \$1.40 and \$1.90. This is our strongest short-term purchase recommendation along with Digital Equipment Corporation (DEC - 172). It is the next product cycle and repositioned company story since Digital's and it is about to bloom.

The March quarter, traditionally difficult for Tandem, is likely to benefit from the company's new focus. We have increased our March quarter E.P.S. estimate to \$0.20, up from \$0.12, and versus \$0.16 a year ago.

Tandem's new high-end processor, expected to have 50% more performance at about 30% higher price, will be introduced in April. First customer shipment for revenue will occur prior to the

introduction, in the current quarter.

Company Focus Sharpened

The company is focused on strategic markets and has gathered independent software houses as well as a few third party alliances to support these markets. Its new products roll-out, which began with its new disks and operating system release last fiscal year, will continue for the next twelve months with new high-end and low-end processors and more software releases. Tandem is increasing its transaction per second throughput dramatically this year. This is in synch with its targeted market of high-performance transaction processing applications.

The sales reorganization and reorientation mark the beginning of a new sophistication and effectiveness in marketing and selling Tandem solutions. We would expect the tangible benefits of this to be more predictable quarterly growth and better margins in FY86. By FY87, revenue growth above our current projection of 22% should result; visibility on Tandem's progress in this area will grow over the next six months.

Margins Will Continue To Expand

Structural improvements in sales and marketing, new product benefits on gross margins and service costs, and continued emphasis on cost-containment will result in steady improvement in margins over the next several quarters.

TANDEM COMPUTERS INC. Revenue and Earnings Projections

	Q1	Q2	Q3	Q4	FY86	FY87
Revenues (\$M)	\$170	\$170	\$190	\$210	\$740	\$905
Gross Margin	65.4%	65.5%	65.0%	65.0%	65.2%	65.5%
Pretax Margin	12.3%	9.0%	12.4%	15.0%	12.3%	14.7%
Tax Rate	44.5%	44.5%	44.5%	44.5%	44.5%	44.5%
E.P.S.	\$0.28A	\$0.20	\$0.30	\$0.40	\$1.18	\$1.71
Prior Year E.P.S.	\$0.34A	\$0.16A	\$0.06A	\$0.27A	\$0.82A	\$1.18

Source: Prudential-Bache Securities, Inc.

Prudential-Bache Securities makes a primary over-the-counter market in the shares of Tandem Computers.

Copyright
INVESTTEXT/DATA PROCESSING
DECEMBER 16, 1985

Tandem Computers Inc. - Company Report
DREXEL BURNHAM LAMBERT INCORPORATED - Labe, P.
11-26-85 (RN=513108)

~~TANDEM COMPUTERS INC.~~ (*)

(TNM - \$18 5/8)

Analyst Meeting Encouraging for the Longer Term

Rating:	NEUTRAL-1	Shares outstanding:	41,623,000
52-Week Range:	28 5/8-12 7/8	Dividend:	None
	FROM TO	P/E 1984A:	23.2x
EPS 1984A:	\$0.80 -	1985A:	22.7x
1985A:	\$0.82 -	1986E:	19.6x
1986E:	\$1.00 \$0.95		
Projected 5-year growth rate:	25.5%	Operating return on tangible assets:	14.2%
Market Proxy ROR1:	13.6%	Total debt/equity:	5.4%
Company ROR1:	-6.4%	Return on equity:	8.9%
Market cycle beta:	1.71	Reinvestment rate:	8.9%

(*) Fiscal year ends September 30. DBL makes a market in this security.

POINT OF VIEW

Tandem's lightly attended analyst meeting in Cupertino was of above-average interest. A picture of a company very strong technically with a strong balance sheet came through loud and clear. Financially, the implications of the meeting were for some moderation in estimates. Finally, note was made of the marketing reorganization in October. We believe this is of major significance, partly because it addresses the major issue before the company. We are maintaining our Neutral-1 rating.

TECHNOLOGY

Tandem reinforced what we think we already knew. The company has good hardware, complemented by the well regarded Fujitsu-built disks. Programs are in place that will improve hardware still more, and drive the price-performance curve nicely. We guess a new VLSI processor will be coming out in early 1986.

Similarly, the company has a strong suite of system software and the third party application software program is coming along quite well.

We were not surprised, since we have felt these areas were in good shape for some time.

FINANCIAL

The balance sheet is powerful. Cash of \$129 million on September 30, versus short-term debt of \$7 million and total current liabilities of \$87 million speak for themselves. There is only \$4 million in long-term debt and \$420 million in equity.

The company's view of the earnings picture is as follows:

1. The company expects December quarter revenues and earnings to be sequentially down from the surprisingly strong fiscal fourth quarter ended September 30.

2. The first half of fiscal 1986 (through March) is likely to be down versus the first half of fiscal 1985.

3. The second half should be up, based partly on product plans; in part, on expectations of improving market conditions.

4. The company expects an up year for earnings on "moderate" revenue growth.

We are not bound by the company's news in any way, but feel the basic message is probably correct. We are going to moderate our \$1.00 estimate for fiscal 1986 (September) on an 18% revenue growth assumption to \$0.95 on slightly over 15%. This is admittedly non-significant. The company has \$1.50 per share earning power under more normal industry conditions now.

MARKETING

We have commented favorably before on the appointment of Gerald Peterson to head worldwide marketing in October. Not only did we think well of Mr. Peterson in his role as head of international marketing, we also thought well of the new marketing concepts.

Without going into a plethora of detail, the company's view of the market is that it is going in the direction of a single or integrated environment (presumably with multiple vendors) and those companies that do well will be those who have a systems approach and can help in this process. Tandem is organizing to address this need for their own, relatively blue chip, 1,000 or so customers, but new ones as well.

As we see it, this is right on. In fact, without this approach we think Tandem would stagnate or stultify. We are now more confident of Tandem's growth (at same rate) than before.

The crucial limiting factor on Tandem's growth, namely IBM, is not, however, going to go away. We believe growth expectations of investors generally have been too high and are compatible with rates like 15% to 20% (we are using 16%). We consider the stock moderately undervalued and maintain our Neutral-1 rating.

Last Research Abstract on Tandem Computer, Inc.: October 29, 1985.

DBL makes a market in this security.

Copyright
INVESTEXT/COMPUTERS AND OFFICE EQUIPMENT
JANUARY 20, 1986

Tandem Computers - Company Report
PRUDENTIAL BACHE SECURITIES INC. - Muratore, C.E., et al
12-13-85 (RN=513708)

Tandem Computers

* Company repositing for better profitability and growth nearly complete.

* E.P.S estimates \$1.05 in FY86 and \$1.50 in FY87.

* Negative E.P.S. comparisons likely in the first half FY86.

* Rating raised to 2-2 from 3-3.

TNDM (21 3/4) -- OTC

Earnings Per Share		P/E		Ind.	Opinion		Shares	52-	
Fiscal Year Ending				Div.	Yield	N	L	O/S	Week
9/85	9/86E	9/87E	1986E	--	--	2	2	(mil.)	Range
\$0.82	\$1.05	\$1.50	20.7X	--	--	2	2	41.6	29-13

DJIA: 1511.24 Priced as of the close, December 12, 1985.
S&P 400: 229.56

Opinion Legend: N = Up to 6 Months, L = 6 to 18 Months
1 = Aggressive Purchase, 2 = Accumulate, 3 = Average Performer
4 = Swap, 5 = Sell

INVESTMENT CONCLUSION

We have raised our rating on Tandem stock to 2-2 from 3-3. There are still risks in Tandem's earnings during the next six months, but we believe they are already reflected in the stock's price. Tandem has spent three years grappling with its own coming-of-age problems and a more competitive IBM. The company has made significant progress in three of four critical areas. The progress made to date will improve its earnings performance in fiscal 1986. Our FY86 E.P.S. estimate of \$1.05, recently increased from \$0.80 per share, is based on these factors:

* Margins have bottomed. Financial controls have already improved gross margins; operating costs are management's fiscal 1986 target. We expect operating margins to improve to 9.3% in FY86 from 8.0% in FY85.

* New product introductions -- both recently announced and expected through fiscal 1986 -- reassert the company's leadership position in the high performance on-line transaction processing market. New disks, operating system and high-end processor will increase transactions per second performance to four to five times that of the TXP when it was introduced. A new high-end processor is expected in Q1, 1986.

* More applications software will facilitate new business. Tandem has finally forged a productive relationship with its growing number of third-party software houses. The new applications will help Tandem close more business.

Tandem needs to create a forceful marketing and sales program to deliver its product message more effectively. This is the major unmet challenge of 1986. It is also the difference between the company's growing at 17%-20% in revenues, which is reflected in our estimates, and 30% per year, as it could with proper implementation.

Management is appropriately cautious and spending will be under tight control throughout fiscal 1986. The first quarter of fiscal 1986 (December, 1985) earnings per share are projected at \$0.21, almost 40% below fiscal 1985's first quarter. The March quarter has been a "black hole" for earnings the last few years; we are projecting \$0.14 E.P.S. in second quarter FY86, 12% below prior year. A new high-end processor will buoy revenues beginning in the first quarter of calendar 1986. Its major contribution will be to increase the predictability of shipments rather than dramatically accelerate revenue growth. More stable quarterly revenues, however, will lead directly to higher earnings per share.

Our earnings per share estimates are \$1.05 for fiscal 1986 and \$1.50 for fiscal 1987. Our calendar 1986 E.P.S. estimate is \$1.15. Our earnings per shares estimates are based on our increased confidence that Tandem's cost controls and improved product margins are sustainable.

Tandem's Progress Has Been Significant In Most Key Areas

We have been chronicling Tandem's progress in repositioning its products and the company for a more competitive environment for three years. Tandem faced a particularly difficult transition: the company needed to respond to IBM's increased product and marketing aggressiveness (for Tandem, the IBM 308X mainframe series and 3380 disks, first shipped in volume in 1982), as did every other vendor. Tandem, however, faced all of the problems of a high growth company in adolescence at the same time: poor controls, overspending, R&D bottlenecks and lack of direction in the field organization.

Since then Tandem has:

* Enhanced and broadened its product line. Recent products include a new version of its operating system, Guardian 90, which doubles transactions per second and improves batch performance four to five times. Very sophisticated high performance disk drives, manufactured to Tandem's design by Fujitsu and Hitachi, catapult Tandem into the lead for fast access, high density storage. This is critical to Tandem's on line transaction processing customers and alleviates a performance bottleneck in Tandem's systems.

More products are planned for fiscal 1986, including a new high-end early in the year. We expect that the new processor, along

with the recent operating system and disk introductions, will improve overall system performance four to five times. The TXP and EXT will migrate downward in packaging and price, which will give Tandem strong price/performance across its product line. This aggressive price/performance adjustment in the TXP and FXT lines should alleviate a problem Tandem encountered when it introduced the TXP in September, 1983. TXP shipments grew very rapidly, but Tandem was surprised by the fall-off in demand for its older systems as customers unexpectedly viewed the TXP as a replacement for earlier products. This time, new packaging and significant price/performance improvements should position all models well for continued growth.

Tandem gained good control over the productizing of R&D last year; new products will be introduced on a more timely schedule than in the past.

* Inaugurated financial controls and planning in most key areas. The first to show improvement was manufacturing; fourth-quarter fiscal 1985 gross margins climbed to 63% from fiscal 1984's average of 59%. Because of improved efficiencies in assembly and test, the company anticipates that the higher gross margins are sustainable.

The field organization is now the chief target for better efficiency. Two layers of field management have been eliminated; at the same expenditure level, therefore, Tandem will have 20% to 30% more direct salespeople in fiscal 1986. There is considerable effort on instituting better sales forecasting for improved predictability.

We are optimistic that structural changes in the field can improve Tandem's profitability while increasing its effectiveness. Tandem has spent about 40% of revenues on S, G & A; this is 10 percentage points higher than almost every competitor and, we believe, unnecessary. Structural changes can reduce S, G & A as a percent of revenues by two or three percentage points fairly quickly. Our estimates assume a three percentage point decline by fiscal 1987. One structural change which should help both expenses and revenues is the creation of a custom software group at headquarters. In the past, Tandem's local sales offices have taken on sophisticated projects for customers which have absorbed local resources for months, destroying sales productivity. These projects will now be managed by a centralized, revenue-generating group at headquarters, leaving the local sales offices free for selling.

* Established a productive rapport with independent software houses. After a slow start in early 1985, Tandem has taken the initiative to leverage its expanding third-party software house roster with equipment grants, investments and national marketing support where appropriate. It is seeking independents in targeted markets. This is a breakthrough for Tandem, whose actions toward the software houses have been ambivalent until recently. Now, these relationships are getting high level, consistent attention. Applications software is critical to Tandem's ability to quickly and therefore profitably enter new markets. In the next six to 12 months, many new applications packages should be available.

Marketing And Sales The Remaining Unmet Challenge

Whether Tandem's revenues grow at 17%-20%, as in our model, or at 30% depends on how the company directs its sales efforts. The salesforce worldwide will be retrained in the first quarter of calendar 1986 to sell Tandem's existing unique ability to integrate distributed transaction processing with IBM mainframe data bases on-line. Tandem needs a salesforce capable of differentiating its products and targeting appropriate applications.

Whether Tandem is particularly successful at this challenge will be more apparent in the second half of fiscal 1986, when other problem areas have been resolved, the new high-end is shipping and more applications software is available. Tandem's products and their price/performance in on-line transaction processing maintained the company's revenue growth at 27% in fiscal 1984 and 17% in fiscal 1985 despite the changes of direction at the company and a weak economy in 1985. A more focused and disciplined sales organization should be able to do better.

Tandem is emerging from this three-year hiatus in a strong product position:

- * Its proprietary solution for the on-line transaction processing market remains the best one for applications requiring over 50 transactions per second.

- * Tandem's existing hardware and software platforms will be able to support 1,000 transactions per second, deliverable within the next two years.

Tandem Computers - Company Report
(continued)

* Competition, whether from IBM or Stratus, is not functionally equivalent and has not inhibited Tandem's growth. Tandem's own limitations in marketing and selling efficiently have hindered its revenue growth more than competition.

* The value-added in the high performance segment of the transaction processing market is expected to remain high for the rest of this decade at least. The market itself has been validated by IBM, both with its OEM arrangement with Stratus and its own TPF2 operating system software for IBM mainframes.

IBM will continue to win bids against Tandem at IBM shops. But Tandem's higher performance solutions and IBM's own customers' demands for OLTP have forced IBM to span a performance range of 15 to 150 transactions per second with four different, incompatible mainframe software environments. This will ensure Tandem sales growth and protect its product margins.

IBM's marketing of Stratus machines will help IBM in distributed environments -- automated branch banking, retail point-of-sale -- with Stratus processors front-ending IBM mainframes. We expect IBM to win business with this solution. Tandem, however, has a larger performance range with one operating system and more communications and applications software. As IBM begins national marketing of the Stratus processors in first quarter, 1986, we expect Stratus' direct selling efforts within the IBM customer base to diminish. In this context, the selling cycle for Tandem may actually be shortened. Instead of competing with Stratus, then IBM selling IBM equipment, and finally, as a last effort, IBM selling Stratus processors, Tandem may find that it is competing only with IBM. This does not mean that Tandem will win any more bids, but that the decision-making process may be shorter.

Tandem's management has made many of the typical mistakes in the last three years -- missed revenue and earnings targets and over-optimism, for example -- and its credibility with investors has suffered. Tandem's management is bright but young and new to the IBM mainframe world. The areas which the company has improved -- cost controls, product development, software availability -- required a few tries before Tandem found the right solutions. We expect that the marketing and sales direction resolution may also take some time. For this reason, our fiscal 1986 and 1987 revenue projections are not based on a revenue acceleration. We would hope, however, that by fiscal 1987, Tandem's revenue growth would benefit from a more effective sales effort.

Our fiscal 1986 quarterly projections, included in Table 1, reflect a weak first half in revenue gains and a rebound in the second

half from new high-end processor shipments and more applications software. Fiscal 1986 revenue growth is projected at 17.4%. Gross margin is 62.5% for the full year. Our projections include strong R&D spending, up 30%, and S,G, & A growth limited to 13%. Pretax margin, at 10.4%, is a substantial improvement over fiscal 1985's 9.0%. The company's cash position is solid at nearly \$130 million with less than \$5 million in long-term debt and \$8 million in long-term capitalized lease obligations.

Table 1
TANDEM COMPUTERS, INC.
Quarterly Income Statement Projections
Fiscal Year Ending September 1986
(\$ Millions)

Part 1 of 3

	1Q 86E	Percent of Revenue	Percent Change Prior Year	2Q 86E	Percent of Revenue	Percent Change Prior Year
TOTAL REVENUE	\$168	100.0%	5.2%	\$165	100.0%	12.6%
Product	136	81.0%	1.4%	132	80.0%	9.9%
Service	32	19.0%	25.4%	33	20.0%	25.0%
COST OF REVENUES	64	38.1%	3.2%	63	38.2%	9.2%
Gross Margin	61.9%			61.8%		
RESEARCH and DEVELOPMENT	21	12.5%	38.8%	22	13.3%	28.8%
S,G, and A	70	41.7%	16.7%	72	43.6%	16.1%
OPERATING INCOME	13	7.7%	-42.2%	8	4.8%	-17.6%
INTEREST, Net	2	1.2%	5.9%	2	1.2%	27.1%
PRETAX INCOME	15	8.9%	-38.5%	10	6.1%	-11.3%
TAXES	6.0	3.6%	-42.1%	4.0	2.4%	-9.8%
Tax Rate	42.0%			40.0%		
NET INCOME	9.0	5.4%	-35.8%	6.0	3.6%	-12.3%
EARNINGS PER SHARE	\$0.21		-37.0%	\$0.14		-12.6%
Average Number of Shares Outstanding	42.0		1.7%	42.3		0.3%

Part 2 of 3

	3Q 86E	Percent of Revenue	Percent Change Prior Year	4Q 86E	Percent of Revenue	Percent Change Prior Year
TOTAL REVENUE	\$190	100.0%	31.8%	\$210	100.0%	20.8%
Product	155	81.6%	32.6%	173	82.4%	20.1%
Service	35	18.4%	28.2%	37	17.6%	24.1%
COST OF REVENUES	70	36.8%	24.7%	78	37.1%	21.3%
Gross Margin	63.2%			62.9%		
RESEARCH and DEVELOPMENT	24	12.6%	33.1%	26	12.4%	21.8%
S,G, and A	75	39.5%	7.9%	80	38.1%	12.9%
OPERATING INCOME	21	11.1%	NM	26	12.4%	50.0%
INTEREST, Net	2	1.1%	54.1%	2	1.0%	32.5%
PRETAX INCOME	23	12.1%	NM	28	13.3%	48.6%
TAXES	9.2	4.8%	NM	11.2	5.3%	45.0%
Tax Rate	40.0%			40.0%		
NET INCOME	13.8	7.3%	477.9%	17	8.0%	51.1%
EARNINGS PER SHARE	\$0.32		465.7%	\$0.39		45.6%
Average Number of Shares Outstanding	42.8		2.2%	43.2		3.8%

Part 3 of 3

	FY 86E	Percent of Revenue	Percent Change Prior Year
TOTAL REVENUE	\$733	100.0%	17.4%
Product	596	81.3%	15.7%
Service	137	18.7%	25.7%
COST OF REVENUES	275	37.5%	14.5%
Gross Margin	62.5%		
RESEARCH and DEVELOPMENT	93	12.7%	29.9%
S,G, and A	297	40.5%	13.2%
OPERATING INCOME	68	9.3%	35.8%
INTEREST, Net	8.0	1.1%	27.6%
PRETAX INCOME	76	10.4%	34.9%
TAXES	30.4	4.1%	38.3%
Tax Rate	40.0%		
NET INCOME	46	6.2%	32.7%
EARNINGS PER SHARE	\$1.07		30.2%
Average Number of Shares Outstanding	42.6		1.9%

Source: Prudential-Bache Securities, Inc.

Copyright
 INVESTEXT/COMPUTERS AND OFFICE EQUIPMENT
 JANUARY 20, 1986

Tandem Computers - Company Report
 (continued)

Table 2
 TANDEM COMPUTERS, INC.
 Quarterly Income Statement Projections
 Fiscal Year Ending September
 (\$ Millions)

Part 1 of 2

	FY84A	Percent of Revenue	Percent Change Prior Year	FY85A	Percent of Revenue	Percent Change Prior Year
TOTAL REVENUE	\$532.6	100.0%	27.3%	\$624.1	100.0%	17.2%
Product	448.6	84.2%	24.6%	515.1	82.5%	14.8%
Service	84.0	15.8%	44.5%	109.0	17.5%	29.8%
COST OF REVENUES	218.8	41.1%	29.7%	240.1	38.5%	9.8%
Gross Margin	58.9%			61.5%		
RESEARCH and Development	52.5	9.9%	34.1%	71.6	11.5%	36.3%
S,G, and A	210.2	39.5%	30.9%	262.3	42.0%	24.8%
OPERATING INCOME	51.1	9.6%	2.7%	50.1	8.0%	-2.0%
INTEREST, Net	5.2	1.0%	610.0%	6.3	1.0%	20.6%
PRETAX INCOME	56.3	10.6%	11.5%	56.4	9.0%	0.1%
INCOME TAXES	23.1	4.3%	17.2%	22.0	3.5%	-4.9%
Tax Rate	41.0%			39.0%		
NET INCOME	33.2	6.2%	7.8%	34.4	5.5%	3.5%
EARNINGS PER SHARE \$0.80(*)			6.2%	\$0.82		2.5%
Average Number of Shares Outstanding	41.4		1.5%	41.8		1.0%

(*) Does not include \$0.24 accumulated DISC tax reversal.

PERFORMANCE RATIOS FY84A

FY85A

Pretax Profitability	0.106	0.090
Asset Turnover	1.161	1.184
Pretax Return on Assets	0.123	0.107
Leverage	1.337	1.325
Pretax Return on Average Equity	0.164	0.142
Tax Retention Rate	0.590	0.610
Implied Growth Rate	0.097	0.086
Inventory Turnover	2.5x	2.8x
Inventories in Weeks	21.2 Weeks	18.6 Weeks
Receivables in Days	91.1 Days	90.6 Days

Source: Tandem Computers, Inc.
Prudential-Bache Securities, inc.

Source: Tandem Computers, Inc.
Prudential-Bache Securities, Inc.

Table 2
TANDEM COMPUTERS, INC.
Quarterly Income Statement Projections
Fiscal Year Ending September
(\$ Millions)

Part 2 of 2

	FY86E	Percent of Revenue	Percent Change Prior Year	FY87E	Percent of Revenue	Percent Change Prior Year
TOTAL REVENUE	\$733	100.0%	17.4%	\$880	100.0%	20.1%
Product	596	81.3%	15.7%	710	80.7%	19.1%
Service	137	18.7%	25.7%	170	19.3%	24.1%
COST OF REVENUES	275	37.5%	14.5%	326	37.0%	18.5%
Gross Margin	62.5%			63.0%		
RESEARCH and Development	93	12.7%	29.9%	106	12.0%	14.0%
S,G, and A	297	40.5%	13.2%	343	39.0%	15.5%
OPERATING INCOME	68	9.3%	35.8%	105	11.9%	54.4%
INTEREST, Net	8	1.1%	27.6%	4	0.5%	-50.0%
PRETAX INCOME	76	10.4%	34.9%	109	12.4%	43.4%
INCOME TAXES	30.4	4.1%	38.3%	43.6	5.0%	43.4%
Tax Rate	40.0%			40.0%		
NET INCOME	45.6	6.2%	32.7%	65.4	7.4%	43.3%
EARNINGS PER SHARE	\$1.07		30.2%	\$1.51		40.8%
Average Number of Shares Outstanding	42.6		1.9%	43.4		1.9%

(*) Does not include \$0.24 accumulated DISC tax reversal.

PERFORMANCE RATIOS	FY86E	FY87E
Pretax Profitability	0.104	0.124
Asset Turnover	1.226	1.254
Pretax Return on Assets	0.127	0.155
Leverage	1.333	1.367

Pretax Return on		0.212
Average Equity	0.170	0.600
Tax Retention Rate	0.600	
Implied Growth Rate	0.102	0.127
Inventory Turnover	3.4x	3.5x
Inventories in Weeks	15.5 Weeks	14.8 Weeks
Receivable in Days	86.2 Days	83.6 Days

Source: Tandem Computers, Inc.
Prudential-Bache Securities, Inc.

Prudential-Bache Securities makes a primary over-the-counter market in the shares of Tandem Computer.

Jeffrey Canin
November 8, 1985

TANDEM COMPUTERS INCORPORATED (OTC-TNDM) \$18 7/8

52-Week Range	Market Val. (mil.)	Fiscal EPS			Calendar P/E		Trend-Line Growth Rate
		1984A	1985A	1986E	1985	1986	
\$13-29	\$786	\$0.80	\$0.82	\$0.90	29	21	25%

Year Ends: September 30 DJIN: 1404.36 SPIN: 214.90 Note: a

- o Company reports relatively strong fourth fiscal quarter.
- o Significant improvement in balance sheet is demonstrated.
- o Cautious fiscal 1986 outlook and recent share price appreciation effects neutral investment opinion.

	Fourth Quarter Results				Year to Date: 12 Months		
	9/30/85	9/30/84	% Chg	H&Q Est	9/30/85	9/30/84	% Chg
Revenues (mil.)	\$173.8	\$153.1	14%	\$169.0	\$624.1	\$532.6	17%
Pretax income (mil.)	18.8	19.6	(4)	16.8	56.4	56.3	0
Net income (mil.)	11.1	11.9	(7)	10.5	34.4	33.2	4
Earnings per share	\$0.27	\$0.29	(8)	\$0.25	\$0.82	\$0.80	3
Average shares (mil.)	41.6	40.9	2	42.0	41.8	41.4	1
Gross margin	63.0%	60.8%		61.5%	61.5%	59.5%	
Operating margin	10.0	11.7		9.1	8.0	9.6	
Pretax margin	10.8	12.8		10.0	9.0	10.6	
Tax rate	41.0	39.1		37.5	39.0	41.0	
Net margin	6.4	7.8		6.2	5.5	6.2	

Fourth Quarter Results

Tandem is the originator and leading supplier of fault-tolerant computers, marketing its line of NonStop systems for use in on-line transaction processing applications. As expected, the company recovered significantly from its exceptionally poor third quarter performance, reporting fourth quarter earnings, in line with projections, on record-level revenues. Quarterly sales of \$174 million (of which \$144 million represented product sales, and the balance represented service and other) grew 21% sequentially and 13.5% from one year earlier. Gross margins of 63.0%, a 2% improvement over Q3 (and our expectations), represented the highest levels since 1982. Operating expenses, while at record levels in absolute terms, were below either of the previous two quarters in proportion to sales, reflecting the cost-cutting measures imposed during Q4, which included a hiring freeze, a three-month deferral of salary increases and a one-week nonelective companywide vacation. Year-end headcount of 5,494 was effectively unchanged relative to one quarter earlier. For the year, revenues increased 17.2% to \$624 million and gross margins improved 2% to 61.5%, countering any speculation on widespread list price discounting to encourage sales. Marketing and development expenses budgeted in line with an overly optimistic growth assumption,

however, effected a contraction in operating margins from the 9.6% reported in fiscal 1984 to 8.0% in fiscal 1985.

The company demonstrated substantial improvement in asset management during Q4. Tandem's cash position increased from three months earlier by nearly \$20 million to record levels of \$129 million, while accounts receivable of \$163 million and inventories of \$79 million represented 85 and 110 days-sales outstanding, respectively, impressive 10- and 41-day reductions over corresponding results reported at the end of Q3.

Approximately one third of quarterly revenues represented sales outside the United States, proportionally consistent with results for the last two years. While international sales have held up reasonably well through all of fiscal 1985, management notes a long-awaited pickup in domestic bookings recently. Although disclosing no specific number, the company indicates a relatively high level of new account activity, with significantly more new customers added during Q4 than the incremental 38 resulting from the immediately preceding Q3; the company's customer base now exceeds 1000. During the quarter, high-end TXP system sales were particularly strong, generating approximately 80% of total revenues. Twenty-two new third parties were added in Q4 to the company's Tandem Alliance program, which now includes 132 participants. Last week, a fourth Alliance category—the Independent Software Vendor (ISV) program—was announced, which now joins Tandem's existing roster of OEMs, system integrators, and direct-selling software houses, which together generate approximately one third of corporate revenues. Under the ISV program, Tandem itself will directly sell and support selected third-party software products.

In October, Tandem announced several new products, including a high-performance tape subsystem, ergonomic terminal models, a family of data encryption/security products, and a cost-effective, large-capacity, high-performance disk storage system. We anticipate the introduction of a high-end processor (the replacement for the TXP) during the first half of calendar 1986, with a low-end system announcement scheduled perhaps six months later.

Management is taking a conservative tack regarding 1986 expectations, suggesting that the relatively strong performance of 4Q85 is not indicative of a clear trend in improved business momentum. We are assuming, pending evidence to the contrary, that the current year's top-line growth will, at best, equal 1985's 17% increase relative to 1984 and more likely will fall short by 2-3%—the continuation of the company's as-yet-unbroken trend in decelerating annual revenue growth comparisons. While we expect Tandem to garner substantial continued add-on revenue from its existing customer base and to present a viable alternative to IBM for large-scale transaction-intensive applications, we anticipate an increasingly competitive environment at the low end—particularly represented by the Stratus/32 processor family, sold directly by Stratus or through its recently enhanced joint marketing agreement with IBM. Our estimates for fiscal 1986 remain unchanged—EPS of \$0.90 on sales of \$715 million. We view the one-month 22% appreciation in Tandem as fully discounting the better-than-expected 4Q85 finish, and, in light of the significant negative bottom-line year-to-year comparisons expected for the first half of 1986 (followed by a strong projected second half), we retain a neutral investment opinion.

Copyright
INVESTEXT/COMPUTERS AND OFFICE EQUIPMENT
NOVEMBER 4, 1985

Tandem Computers - Company Report
PAINE WEBBER INC. - Smith, S.K.
10-08-85 (RN=511120)

Tandem Computers

\$13 7/8 (OTC -- TNDM) 52-week range: \$14-29

Rating: Unattractive
FY 9/30

	1984	1985E	1986E
Q1	\$0.24	\$0.34A	\$0.22
Q2	0.05	0.16A	0.06
Q3	0.23	0.06A	0.19
Q4	0.29	0.18	0.34
Year	0.81	0.74	0.80
P/E	17.2-35.8	18.7	17.3
Div	--	--	--
Yield		--	--
Secular Growth Rate			15-20%

OPINION: DOWNGRADE TO UNATTRACTIVE

Reliable industry sources suggest that IBM (IBM - \$124 1/4) is poised to significantly upgrade its assault on Tandem's (*) market through its relationship with Status (*) (STRA - \$16 1/4). The IBM action could create a freeze in the market similar to that created by IBM's new database DB2 on Applied Data Research (ADR - \$18 1/8). This means that at a minimum, Tandem's sales cycle would lengthen, possibly depressing fiscal 1986 sales and earnings significantly. Even though we are raising our Q4 EPS estimate from \$0.11 to \$0.18 per share to reflect management's recent indication of a better than expected quarter, we are consequently lowering our FY 86 EPS estimate from \$1.10 to \$0.80 per share and downgrading the stock from attractive (2) to unattractive (4). It is conceivable that the IBM action could result in even further cuts to our FY 86 EPS estimates if it is favorably received in the marketplace.

THE GROWING IBM/STRATUS THREAT

Buoyed by its initial success with the Stratus product despite its "limited availability", we now believe that IBM is likely to elevate the System 88 (its name for the Stratus product family) from an RPQ (request for price quotation) to a fully fledged member of the IBM product line, marketed by the entire IBM marketing organization instead of by a special group. We also believe that IBM might consider in-house manufacture of the system. While this provides even further evidence that Tandem's long-term market opportunity is considerable, the applications addressed by TNDM are often so critical to its customers that they not only require a system that is fault-tolerant,

but they also require a vendor that is fault-tolerant.

DOMESTIC SALES VP RESIGNS

We were disappointed to discover that although the expected reorganization of Tandem's sales and service organization (which was announced October 7) should provide longer-term benefits, it does not provide any significant near-term cost savings. Also it was announced today that founder and VP of domestic sales David Mackie resigned to join a start-up. Jerry Peterson, VP of international sales and former VP of headquarters marketing, will take over Mackie's responsibilities.

MANAGEMENT INDICATES STRONGER THAN ANTICIPATED FOURTH FISCAL QUARTER

Management also announced today that Q4 revenues will reach record levels. (This announcement was timed so that the reorganization would not be construed negatively.) Since this announcement was made so soon after the end of the quarter, we believe that Q4 revenues could significantly exceed the previous record of \$159.6 million. (Our recent estimate was \$152 million.) We are consequently raising our Q4 EPS estimate from \$0.11 to \$0.18 per share. However, reflecting the likelihood of growing competition from IBM, we are lowering our FY 86 EPS estimate from \$1.10 to \$0.80 per share, with considerable further downside risk. However, this downside would be limited by the strong growth that TNDM can continue to expect from its captive customer base (On-line TP applications are among the fastest growth areas within most organizations.) Even in the worst case, therefore, we would expect TNDM to be able to sustain profitable growth.

Tandem Computers

Quarterly Income Statement Model

(Dollars in millions, except percentages and per share data)

[Part 1 of 4]

Revised 10/7/85	1982A	Q1	Q2	1983A Q3	Q4	Year
Product	\$272.59	\$81.76	\$82.31	\$94.55	\$101.51	\$360.13
Service	\$39.55	\$12.38	\$13.70	\$15.74	\$16.34	\$58.15
Total Revenues	\$312.14	\$94.14	\$96.01	\$110.29	\$117.85	\$418.28
Costs and Expenses:						
Cost of Revenues	\$109.31	\$37.96	\$37.86	\$45.12	\$47.78	\$168.71
Production						
Development	\$33.64	\$9.00	\$9.81	\$9.96	\$10.41	\$39.17
Marketing, G&A	\$128.49	\$35.55	\$37.95	\$41.56	\$45.58	\$160.64
Total Expenses	\$271.44	\$82.50	\$85.61	\$96.64	\$103.77	\$368.52
Operating Income	\$40.71	\$11.64	\$10.40	\$13.65	\$14.08	\$49.77
Interest, Net	\$6.03	\$0.05	(\$0.18)	\$0.25	\$0.62	\$0.73

Pretax Income	\$46.74	\$11.68	\$10.22	\$13.90	\$14.70	\$50.50
Tax Rate	0.36	0.39	0.37	0.39	0.40	0.39
Taxes	\$16.88	\$4.56	\$3.77	\$5.46	\$5.91	\$19.69
Net Income	\$29.86	\$7.13	\$6.45	\$8.44	\$8.79	\$30.81
Shares outstanding	39	40	41	41	41	41
EPS	\$0.76	\$0.18	\$0.16	\$0.21	\$0.21	\$0.76
DISC						
EPS incl. DISC						

Growth rates (% year-year)						32
product revenue	46	NA	NA	NA	NA	47
service revenue	84	NA	NA	NA	NA	34
Total revenue	50	33	30	38	35	-1
EPS	6	-11	0	7	1	

Growth rates (% Qtr-Qtr)						
Revenue		8	2	15	7	
EPS		-17	-10	30	4	
Ratios (%):-						
Gross Margin	64.98	59.68	60.57	59.09	59.46	59.67
Product dev: sales	10.78	9.56	10.21	9.03	8.83	9.37
Mkt, G&A: sales	41.16	37.76	39.52	37.68	38.68	38.40
Operating Margin	13.04	12.36	10.83	12.38	11.95	11.90

Tandem Computers
Quarterly Income Statement Model
(Dollars in millions, except percentages and per share data)

[Part 2 of 4]

Revised 10/7/85			1984A		
	Q1	Q2	Q3	Q4	Year
Product	\$108.47	\$91.22	\$119.06	\$129.85	\$448.61
Service	\$17.90	\$20.01	\$22.86	\$23.24	\$84.01
Total Revenues	\$126.37	\$111.24	\$141.93	\$153.09	\$532.62
Costs and Expenses:					
Cost of Revenues	\$50.44	\$47.25	\$57.79	\$63.34	\$218.81
Production Development	\$10.85	\$12.85	\$13.51	\$15.30	\$52.51
Marketing, G&A	\$48.21	\$49.13	\$56.28	\$56.58	\$210.20
Total Expenses	\$109.49	\$109.23	\$127.58	\$135.22	\$481.52
Operating Income	\$16.88	\$2.01	\$14.34	\$17.88	\$51.10
Interest, Net	\$1.08	\$1.14	\$1.24	\$1.72	\$5.18
Pretax Income	\$17.95	\$3.15	\$15.59	\$19.60	\$56.28
Tax Rate	0.44	0.37	0.41	0.39	0.41
Taxes	\$7.90	\$1.17	\$6.34	\$7.67	\$23.08

Net Income	\$10.05	\$1.97	\$9.25	\$11.93	\$33.20
Shares outstanding	42	42	41	41	41
EPS	\$0.24	\$0.05	\$0.23	\$0.29	\$0.81
DISC				\$0.24	\$0.24
EPS incl. DISC				\$0.53	\$1.05

Growth rates (% year-year)

product revenue	33	11	26	28	25
service revenue	45	46	45	42	44
Total revenue	34	16	29	30	27
EPS	36	-70	10	36	7

Growth rates (% Qtr-Qtr)

Revenue	7	-12	28	8
EPS	12	-80	377	29

Ratios (%):-

Gross Margin	60.09	57.53	59.28	58.62	58.92
Product dev: sales	8.59	11.55	9.52	9.99	9.86
Mktg, G&A: sales	38.15	44.17	39.66	36.96	39.46
Operating Margin	13.36	1.80	10.11	11.68	9.59

Tandem Computers

Quarterly Income Statement Model

(Dollars in millions, except percentages and per share data)

[Part 3 of 4]

Revised 10/7/85	Q1A	Q2A	1985E Q3A	current quarter Q4E	Year
Product	\$134.14	\$120.09	\$116.87	\$135.00	\$506.09
Service	\$25.52	\$26.40	\$27.29	\$30.00	\$109.21
Total Revenues	\$159.65	\$146.49	\$144.16	\$165.00	\$615.30
Costs and Expenses:					
Cost of Revenues	\$62.02	\$57.71	\$56.12	\$64.68	\$240.53
Production Development	\$15.13	\$17.08	\$18.03	\$18.50	\$68.73
Marketing, G&A	\$60.00	\$62.00	\$69.48	\$71.00	\$262.48
Total Expenses	\$137.14	\$136.79	\$143.63	\$154.18	\$571.74
Operating Income	\$22.51	\$9.70	\$0.54	\$10.82	\$43.57
Interest, Net	\$1.89	\$1.57	\$1.30	\$1.60	\$6.36
Pretax Income	\$24.40	\$11.28	\$1.84	\$12.42	\$49.93
Tax Rate	0.43	0.39	NM	0.38	0.38
Taxes	\$10.37	\$4.44	(\$0.55)	\$4.72	\$18.97
Net Income	\$14.03	\$6.84	\$2.39	\$7.70	\$30.95
Shares outstanding	41	42	42	42	42
EPS	\$0.34	\$0.16	\$0.06	\$0.18	\$0.74
DISC					
EPS incl. DISC					

Growth rates (% year-year)

product revenue	24	32	-2	4	13
service revenue	43	32	19	29	30
Total revenue	26	32	2	8	16
EPS	41	244	-75	-37	-9

Growth rates (% Qtr-Qtr)

Revenue	4	-8	-2	14
EPS	16	-52	-65	220

Ratios (%):-

Gross Margin	61.15	60.60	61.07	60.80	60.91
Product dev: sales	9.47	11.66	12.50	11.21	11.17
Mktg, G&A: sales	37.58	42.32	48.20	43.03	42.66
Operating Margin	14.10	6.62	0.37	6.56	7.08

Tandem Computers

Quarterly Income Statement Model

(Dollars in millions, except percentages and per share data)

[Part 4 of 4]

Revised 10/7/85

	Q1E	Q2E	1986E Q3E	Q4E	Year	1987E
Product	\$139.50	\$126.09	\$137.90	\$155.25	\$558.75	\$670.50
Service	\$30.62	\$29.04	\$33.57	\$36.90	\$130.13	\$156.16
Total Revenues	\$170.12	\$155.13	\$171.47	\$192.15	\$688.88	\$826.65
Costs and Expenses:						
Cost of Revenues	\$67.37	\$62.05	\$68.07	\$75.90	\$273.40	\$322.40
Production						
Development	\$18.00	\$18.50	\$19.00	\$19.50	\$75.00	\$84.73
Marketing, G&A	\$71.00	\$72.00	\$73.00	\$75.00	\$291.00	\$330.66
Total Expenses	\$156.37	\$152.55	\$160.07	\$170.40	\$639.40	\$737.79
Operating Income	\$13.75	\$2.58	\$11.40	\$21.75	\$49.48	\$88.87
Interest, Net	\$1.40	\$1.40	\$1.40	\$1.40	\$5.60	\$5.00
Pretax Income	\$15.15	\$3.98	\$12.80	\$23.15	\$55.08	\$93.87
Tax Rate	0.38	0.38	0.38	0.38	0.38	0.40
Taxes	\$5.76	\$1.51	\$4.86	\$8.80	\$20.93	\$37.55
Net Income	\$9.40	\$2.47	\$7.94	\$14.35	\$34.15	\$56.32
Shares outstanding	43	43	43	43	43	45
EPS	\$0.22	\$0.06	\$0.19	\$0.34	\$0.80	\$1.25
DISC						
EPS incl. DISC						

Growth rates (% year-year)

product revenue	4	5	18	15	10	20
service revenue	20	10	23	23	19	20
Total revenue	7	6	19	16	12	20
EPS	-35	-64	228	85	9	56

Growth rates (% Qtr-Qtr)

Revenue	3	-9	11	12
EPS	21	-74	222	81

Ratios (%):-

Gross Margin	60.40	60.00	60.30	60.50	60.31	61.00
Product dev: sales	10.58	11.93	11.08	10.15	10.89	10.25
Mktg, G&A: sales	41.73	46.41	42.57	39.03	42.24	40.00
Operating Margin	8.08	1.66	6.65	11.32	7.18	10.75

(*) PaineWebber Incorporated and/or Rotan Mosle Inc., an affiliated corporation of PaineWebber Incorporated, makes a market in this security.

Copyright
INVESTEXT/COMPUTERS AND OFFICE EQUIPMENT
October 28, 1985

Tandem Computer Inc, - Company Report
SMITH BARNEY, HARRIS UPHAM & CO., INC. - Labe, P.
10-01-85 (RN=510911)

~~TANDEM COMPUTER INC.~~ (*)
(TNDM - \$14 3/8)

Lowering Estimates

Rating: NEUTRAL 1 Shares outstanding: 27,659,000
52-Week Range: 28 5/8 - 13 1/8 Dividend: None Yield: None

	From	To		
EPS 1984A:	\$0.80		P/E 1984A:	17.5x
1985E:	\$0.70	\$0.60	1985E:	23.3x
1986E:	\$1.20	\$0.75	1986E:	18.7x

Projected 5-year growth rate:	26.3%	Operating return on tangible assets:	16.5%
Market proxy ROR1:	16.0%	Total debt/equity:	5.2%
Company ROR1:	0.4%	Return on equity:	11.4%
Market cycle beta:	1.71	Reinvestment rate:	11.4%

(*) DBL makes a market in this security. Sept. fiscal year.

POINT OF VIEW

Tandem rather consistently in each quarter of 1985 has been coming in at the lower end of expectations and we believe the current quarter is likely to be no exception. We are lowering again the quarter and year estimates and adopting a more cautious stance regarding fiscal 1986. There is some suspicion the easy applications for transaction processing have been skimmed off already, but mostly we prefer to watch for awhile.

The Fourth Fiscal Quarter

The quarter ended September 30 started out with a revenue range of \$145 to \$160 million and perhaps an earnings range of \$0.05-\$0.15. We had been at the upper end of the range and reasonably comfortable, but we don't believe the quarter has been all that good. We are now inclined to \$149 million and \$0.04-\$0.05 earnings per share - a year ago, the company reported \$153 million and \$0.29, respectively.

If this assessment is correct, Tandem's fiscal 1985 results will be around \$0.60 per share rather than \$0.70 we have been carrying.

Approach to Fiscal 1986

We see no signs of a "turn" at Tandem any more than we do at any other computer company. Nevertheless, we expect seasonal improvement in the December quarter, if nothing else, but probably not powerful. Allowing for the now customary March quarter lull, the "growth burden" for the year will fall on the final two quarters. We assume business will be pretty good then, exiting the year at a \$1.20 per share annual rate, but \$1.20 for the fiscal year now looks to be unattainable. If we assume a 15-16% revenue growth rate and reasonable overhead controls, earnings could be around \$0.75.

Stock Market Prospects

With a book value of nearly \$10, Tandem has earning power in the \$1.50-plus per share area. This indicated earning power, and very large cash position, give the stock defensive strength and we maintain our Neutral-1 rating. The long string of disappointments, and failure to capitalize on the transaction processing market potential as we (and others) had hoped, leads us to a wait-and-see attitude for now.

Last Research Abstract on Tandem Computers: July 30, 1985.

(*) DBL makes a market in this security.

Copyright
TRENDVEST RATINGS
Monday August 12, 1985

LOWEST COMMON STOCK RATINGS

August 12, 1985
<< System Guide Is In Latest Issue >>

COMPANY NAME	TRENDEX	SYMBOL	PRICE
Data General	-175	DGN	\$36.75
Katy Ind	-173	KT	\$15.00
Manhattan Ind	-162	MHT	\$12.38
Mohawk Data Sciences	-159	MDS	\$2.13
Fin'l Corp Amer	-148	FIN	\$6.50
Kulicke & Soffa	NMS-147	KLIC	\$14.50
Teradyne	-147	TER	\$22.25
Texas Oil & Gas	-146	TXO	\$15.50
Advanced Micro Dev	-140	AMD	\$27.75
Applied Data Res	-137	ADR	\$24.63
Fabri Centers	-137	FCA	\$10.63
Amerada Hess	-136	AHC	\$27.38
Reading & Bates	-136	RB	\$7.88
Varian Assoc	-134	VAR	\$30.38
Sykes Datatronic	NMS-132	SYKE	\$0.56
Zenith Electronics	-129	ZE	\$19.38
DuPont	-128	DD	\$57.38
Apple Computer	NMS-127	AAPL	\$15.00
Tyler	-127	TYL	\$14.13
Petro Lewis	ASE-126	PTL	\$2.50
Farah Mfg	-125	FRA	\$18.38
Armstrong Rubber	-124	ARM	\$14.75
Beker Ind	-123	BKI	\$3.25
Int'l Paper	-123	IP	\$49.50
Tandem Computers	NMS-123	TNDM	\$15.63
GenRad	-122	GEN	\$14.13
Galveston Houston	-121	GHX	\$3.38
Milton Roy	-121	MRC	\$11.13
Parker Drilling	-121	PKD	\$5.00
Consol Oil & Gas	ASE-120	CGS	\$5.63
Global Marine	-120	GLM	\$2.50
Intel	NMS-120	INTC	\$28.25
Union Camp	-120	UCC	\$38.00
Control Data	-119	CDA	\$25.13
Arrow Electronics	-118	ARW	\$14.50
Cleveland Cliffs	-117	CLF	\$19.75
Gen'l Motors	-117	GM	\$68.00
Tracor	-117	TRR	\$20.25
Brown Tom	NMS-116	TMBR	\$1.50
Mission Ins Group	-116	MEQ	\$6.13
Myers L E Group	-116	MYR	\$2.13
Paradyne	-116	PDN	\$10.25
Coachmen Ind	-115	COA	\$12.75
Swift Independ't	ASE-115	SFT	\$21.00

United Technologies	-115	UTX	\$41.75
Amer Maize A	ASE-114	AZE/A	\$14.25
Blair John	-114	BJ	\$17.00
Coherent	NMS-114	COHR	\$16.50
Panhandle Eastern	-114	PEL	\$33.75
Avnet	-113	AVT	\$32.88
Hesston	-113	HES	\$7.25
Fairfield Communit	-112	FCI	\$11.38
Kenai	-111	KEN	\$0.47
Litton Ind	-111	LIT	\$76.63
Motorola	-111	MOT	\$35.63
Wang Labs B	ASE-111	WAN/B	\$17.88
CLC of Amer	-110	CLC	\$3.00
Jamesway	-110	JMY	\$19.50
Seibels Bruce	NMS-110	SBIG	\$16.75
Towle Mfg	-110	TOW	\$10.13
Unitrode	-109	UTR	\$24.00
Gen'l Houseware	-108	GHW	\$9.63
Steiger Tractor	NMS-108	STGR	\$4.50
United Inns	-108	UI	\$42.75
AMP	-107	AMP	\$32.13
AVX	-107	AVX	\$13.63
Springs Ind	-107	SMI	\$32.75
Analog Devices	-105	ADI	\$21.88
Integrated Resources	-105	IRE	\$19.75
CNW	-104	CNW	\$21.13
Crystal Oil	ASE-104	COR	\$1.75
First City Ind	-104	FCY	\$8.63
Pic N Save	NMS-104	PICN	\$25.88
Quick & Reilly Group	-104	BQR	\$22.25
Tacoma Boatbuilding	-104	TBO	\$2.25
Western Co No Amer	-104	WSN	\$3.75
Wyle Labs	-104	WYL	\$12.38
Carl Karcher Ent	NMS-103	CARL	\$15.13
Gates Learjet	ASE-103	GLJ	\$8.63
Hutton Group E F	-103	EFH	\$31.50
GCA	-102	GCA	\$17.00
Halliburton	-102	HAL	\$28.13
Hilton Hotels	-102	HLT	\$60.75
Minnesota Mining Mfg	-102	MMM	\$79.13
Stop & Shop	-102	SHP	\$37.88
Newpark Resources	-101	NP	\$1.63
Rouse	NMS-101	ROUS	\$22.00
GF	-100	GFB	\$5.88
Gap	-100	GPS	\$26.88
La Quinta Motor Inns	-100	LQM	\$13.63
Lear Petroleum	-100	LPT	\$11.75
Santa Fe So Pacific	-100	SFX	\$31.63
Staley Continental	-100	STA	\$21.63
Alleghany Bever	NMS -99	ABEV	\$18.63
Farm House Foods	NMS -99	FHFC	\$3.63
Macy R H	-99	MZ	\$46.25
Oxford Ind	-99	OXM	\$12.13
Reeves Communic	NMS -99	RVCC	\$10.13

wait for
newest
one

Copyright
INVESTTEXT/DATA PROCESSING
August 12, 1985

Tandem Computers - Company Report
PAINE WEBBER INC. - Smith, S.K.
07-25-85 (RN=508100)

Tandem Computers
(\$16 1/2 (OTC - TNDM) 52-week range: \$13-29

Rating: Attractive

FY 9/30	1984	1985E	1986E
Q1	\$0.24	\$0.34A	\$0.19
Q2	0.05	0.16A	0.27
Q3	0.23	0.06A	0.30
Q4	0.29	0.11	0.35
Year	0.81	0.66	1.10
P/E	16.0-35.8	25.0	15.0
Div	-	-	-
Yield	-	-	-

Secular Growth Rate 30%

OPINION: ATTRACTIVE

Third quarter EPS of \$0.06 per share were even worse than our recent \$0.13 estimate. Nevertheless, we are maintaining our attractive rating on Tandem. (*) Not all the news in the quarter was bad. Revenues were flat with a year ago, no worse than seen in the industry overall. New customer activity was strong, suggesting that Tandem is continuing to hold its own against Stratus (*) (STRA - OTC - \$17 1/2). However, SG&A expenses jumped sharply and are likely to continue to put further pressure on earnings over the next few quarters, especially in the current economic environment. We are consequently lowering our FY 85 estimate from \$0.88 to \$0.66 and our FY 86 estimate from \$1.35 to \$1.10 per share.

WHY CAN'T TANDEM CONTROL EXPENSES?

Tandem reported third quarter EPS to \$0.06 per share, vs. \$0.23 in the same period a year ago. Product revenues declined by 2% and service revenues increased 19% over Q3 84. Although gross margin improved by almost a half a percentage point over Q2 (due to product mix), a huge increase in SG&A expenses led operating margin to fall from 6.6% in Q2 to 0.4%. SG&A expenses grew from 37.6% of revenues in Q1 85 to 48.2% in the quarter just ended.

The revenue shortfall alone does not appear sufficient to justify the jump in SG&A expenses. Expenses continue to outgrow revenues, despite repeated "freezes". We believe that this is not only due to

poor forecasting. Tandem's move away from fault-tolerance into selling sophisticated on-line transaction processing systems (a lucrative market in which Tandem has already made considerable progress) is placing heavy up-front demands upon its sales and support staff. Furthermore, the sales cycle on these larger bids is longer. However, the market opportunity for Tandem is considerable. As a result we believe that it would be a mistake for Tandem to cut back in this critical area at this time. However, this means that we do not anticipate a rapid rebound in EPS in Q4.

NEW CUSTOMER ACTIVITY BODES WELL FOR THE FUTURE

Nearly 40 new customers signed up in the quarter, most for Tandem's new low-end NonStop EXT processor, suggesting that Tandem's more aggressive move in the low-end of the market is beginning to pay off. The strength at the low-end suggests that, although clearly having some impact, Stratus was not the primary reason for Tandem's revenue shortfall. The weak areas in the quarter were those most likely to be affected by the current capital spending squeeze -- big ticket TXP sales and quantity orders for the EXT by large customers.

Tandem Computers- Quarterly Income Statement Model
(Dollars in millions, except percentages and per share data)

[Part 1 of 4]

Revised 7/11/85

	1982A	1983A				Year
		Q1	Q2	Q3	Q4	
Product	\$272.59	\$81.76	\$82.31	\$94.55	\$101.51	\$360.13
Service	\$39.55	\$12.38	\$13.70	\$15.74	\$16.34	\$58.15
Total Revenues	\$312.14	\$94.14	\$96.01	\$110.29	\$117.85	\$418.28
Costs and Expenses:						
Cost of Revenues	\$109.31	\$37.96	\$37.86	\$45.12	\$47.78	\$168.71
Product Development	\$33.64	\$9.00	\$9.81	\$9.96	\$10.41	\$39.17
Marketing, G&A	\$128.49	\$35.55	\$37.95	\$41.56	\$45.58	\$160.64
Total Expenses	\$271.44	\$82.50	\$85.61	\$96.64	\$103.77	\$368.52
Operating Income	\$40.71	\$11.64	\$10.40	\$13.65	\$14.08	\$49.77
Interest, Net	\$6.03	\$0.05	(\$0.18)	\$0.25	\$0.62	\$0.73
Pretax Income	\$46.74	\$11.68	\$10.22	\$13.90	\$14.70	\$50.50
Tax rate	0.36	0.39	0.37	0.39	0.40	0.39
Taxes	\$16.88	\$4.56	\$3.77	\$5.46	\$5.91	\$19.69
Net Income	\$29.86	\$7.13	\$6.45	\$8.44	\$8.79	\$30.81
Shares outstanding	39	40	41	41	41	41
EPS	\$0.76	\$0.18	\$0.16	\$0.21	\$0.21	\$0.76
DISC						
EPS incl. DISC						
Growth rates (% year-year)						
product revenue	46	NA	NA	NA	NA	32
service revenue	84	NA	NA	NA	NA	47
Total revenue	50	33	30	38	35	34
EPS	6	-11	0	7	1	-1
Growth rates (% Qtr-Qtr)						
Revenue	-	8	2	15	7	-
EPS	-	-17	-10	30	4	-
Ratios (%):-						
Gross Margin	64.98	59.68	60.57	59.09	59.46	59.67
Product dev: sales	10.78	9.56	10.21	9.03	8.83	9.37
Mktg, G&A: sales	41.16	37.76	39.52	37.68	38.68	38.40
Operating Margin	13.04	12.36	10.83	12.38	11.95	11.90

[Part 2 of 4]
Revised 7/11/85

	Q1	Q2	1984A Q3	Q4	Year
Product	\$108.47	\$91.22	\$119.06	\$129.85	\$448.61
Service	\$17.90	\$20.01	\$22.86	\$23.24	\$84.01
Total Revenues	\$126.37	\$111.24	\$141.93	\$153.09	\$532.62
Costs and Expenses:					
Cost of Revenues	\$50.44	\$47.25	\$57.79	\$63.34	\$218.81
Product Development	\$10.85	\$12.85	\$13.51	\$15.30	\$52.51
Marketing, G&A	\$48.21	\$49.13	\$56.28	\$56.58	\$210.20
Total Expenses	\$109.49	\$109.23	\$127.58	\$135.22	\$481.52
Operating Income	\$16.88	\$2.01	\$14.34	\$17.88	\$51.10
Interest, Net	\$1.08	\$1.14	\$1.24	\$1.72	\$5.18
Pretax Income	\$17.95	\$3.15	\$15.59	\$19.60	\$56.28
Tax rate	0.44	0.37	0.41	0.39	0.41
Taxes	\$7.90	\$1.17	\$6.34	\$7.67	\$23.08
Net Income	\$10.05	\$1.97	\$9.25	\$11.93	\$33.20
Shares outstanding	42	42	41	41	41
EPS	\$0.24	\$0.05	\$0.23	\$0.29	\$0.81
DISC				\$0.24	\$0.24
EPS incl. DISC				\$0.53	\$1.05
Growth rates (% year-year)					
product revenue	33	11	26	28	25
service revenue	45	46	45	42	44
Total revenue	34	16	29	30	27
EPS	36	-70	10	36	7
Growth rates (% Qtr-Qtr)					
Revenue	7	-12	28	8	-
EPS	12	-80	377	29	-
Ratios (%):-					
Gross Margin	60.09	57.53	59.28	58.62	58.92
Product dev: sales	8.59	11.55	9.52	9.99	9.86
Mktg, G&A: sales	38.15	44.17	39.66	36.96	39.46
Operating Margin	13.36	1.80	10.11	11.68	9.59

Copyright
 INVESTEXT/DATA PROCESSING
 [Part 3 of 4]

Revised 7/11/85	current quarter				
	Q1	Q2	1985E Q3	Q4	Year
Product	\$134.14	\$120.09	\$116.87	\$123.00	\$494.09
Service	\$25.52	\$26.40	\$27.29	\$29.00	\$108.21
Total Revenues	\$159.65	\$146.49	\$144.16	\$152.00	\$602.30
Costs and Expenses:					
Cost of Revenues	\$62.02	\$57.71	\$56.12	\$59.28	\$235.13
Product Development	\$15.13	\$17.08	\$18.03	\$17.50	\$67.73
Marketing, G&A	\$60.00	\$62.00	\$69.48	\$69.50	\$260.98
Total Expenses	\$137.14	\$136.79	\$143.63	\$146.28	\$563.84
Operating Income	\$22.51	\$9.70	\$0.54	\$5.72	\$38.47
Interest, Net	\$1.89	\$1.57	\$1.30	\$1.60	\$6.36
Pretax Income	\$24.40	\$11.28	\$1.84	\$7.32	\$44.83
Tax rate	0.43	0.39	NM	0.38	0.38
Taxes	\$10.37	\$4.44	(\$0.55)	\$2.78	\$17.04
Net Income	\$14.03	\$6.84	\$2.39	\$4.54	\$27.79
Shares outstanding	41	42	42	42	42
EPS	\$0.34	\$0.16	\$0.06	\$0.11	\$0.66
DISC					
EPS incl. DISC					
Growth rates (% year-year)					
product revenue	24	32	-2	-5	10
service revenue	43	32	19	25	29
Total revenue	26	32	2	-1	13
EPS	41	244	-75	-63	-18
Growth rates (% Qtr-Qtr)					
Revenue	4	-8	-2	5	
EPS	16	-52	-65	89	
Ratios (%):-					
Gross Margin	61.15	60.60	61.07	61.00	60.96
Product dev: sales	9.47	11.66	12.50	11.51	11.25
Mktg, G&A: sales	37.58	42.32	48.20	45.72	43.33
Operating Margin	14.10	6.62	0.37	3.76	6.39

[Part 4 of 4]

Revised 7/11/85

	Q1	Q2	1986E Q3	Q4	Year	1987E
Product	\$134.14	\$144.11	\$148.42	\$153.75	\$580.41	\$725.52
Service	\$30.62	\$32.21	\$33.57	\$35.67	\$132.07	\$165.09
Total Revenues	\$164.76	\$176.31	\$181.99	\$189.42	\$712.48	\$890.60
Costs and Expenses:						
Cost of Revenues	\$65.08	\$69.29	\$71.34	\$73.31	\$279.02	\$347.34
Product Development	\$18.00	\$18.50	\$19.00	\$19.50	\$75.00	\$89.06
Marketing, G&A	\$70.00	\$71.00	\$72.00	\$73.50	\$286.50	\$338.43
Total Expenses	\$153.08	\$158.79	\$162.34	\$166.31	\$640.52	\$774.83
Operating Income	\$11.68	\$17.52	\$19.65	\$23.11	\$71.97	\$115.78
Interest, Net	\$1.50	\$1.50	\$1.50	\$1.50	\$6.00	\$5.00
Pretax Income	\$13.18	\$19.02	\$21.15	\$24.61	\$77.97	\$120.78
Tax rate	0.40	0.40	0.40	0.40	0.40	0.42
Taxes	\$5.27	\$7.61	\$8.46	\$9.85	\$31.19	\$51.21
Net Income	\$7.91	\$11.41	\$12.69	\$14.77	\$46.78	\$69.57
Shares outstanding	43	43	43	43	43	45
EPS	\$0.19	\$0.27	\$0.30	\$0.35	\$1.10	\$1.55
DISC						
EPS incl. DISC						
Growth rates (% year-year)						
product revenue	0	20	27	25	17	25
service revenue	20	22	23	23	22	25
Total revenue	3	20	26	25	18	25
EPS	-45	65	424	223	66	41
Growth rates (% Qtr-Qtr)						
Revenue	8	7	3	4		
EPS	73	44	11	16		
Ratios (%):-						
Gross Margin	60.50	60.70	60.80	61.30	60.84	91.00
Product dev: sales	10.93	10.49	10.44	10.29	10.53	10.00
Mktg, G&A: sales	42.49	40.27	39.56	38.80	40.21	38.00
Operating Margin	7.09	9.94	10.80	12.20	10.10	13.00

(* PaineWebber Incorporated and/or Rotan Mosle Inc., an affiliated corporation of PaineWebber Incorporated, makes a market in this security.

SWIS 2-26

Tandem

REC'D JUL 1 1985

Prudential-Bache
Securities

Tandem Computers Inc.

Software House Survey

Tandem Business
Information Center

JUL 10 1985

Carol E. Muratore, CFA
Susan J. Griffiths

- Software houses pleased with Tandem products but uncertain of its commitment to cooperative marketing.
- Benefits to revenues and earnings of larger software library 12 months in future.

June 18, 1985

TNDM (16 1/8) -- OTC

Earnings Per Share			P/E	Ind.	Opinion	Shares 52-			
Fiscal Year Ending						O/S	Week		
9/84	9/85E	9/86E	1985E	Div.	Yield	N	L	(mil.)	Range
\$0.81	\$0.97	\$1.26	16.6	--	--	3	3	42.2	29-13

DJIA: 1301.76 Priced as of the close, June 17, 1985.
S&P 400: 187.04

SUMMARY AND CONCLUSION

Even with Tandem's limited software library in fiscal 1984, 50% of total revenues were generated from new applications and half of Tandem's new customers were obtained because of specific applications software, many of which were supplied by third-party software houses.

To get a better reading of the future impact on Tandem, we conducted a survey of its third-party software houses. The survey results were generally positive, but it will take time for the positive steps Tandem has taken to influence fundamentals.

While we would like to be more positive on the stock, we are maintaining our 3-3 rating. As our survey results indicate, there is still execution risk in Tandem's strategy. If Tandem can implement its plans successfully, it should mean sustainable and profitable growth, but 12 months away. In the meantime, Tandem stock has a ceiling in the low 20s.

SURVEY SUMMARY

We surveyed software houses participating in the company's Alliance program for cooperative marketing during the first quarter of 1985. The results were generally positive:

Opinion Legend: N = Up to 6 Months, L = 6 to 18 Months
 1 = Aggressive Purchase, 2 = Accumulate, 3 = Average Performer
 4 = Swap, 5 = Sell

Research

- Tandem received extraordinarily high marks for its products.
- Ninety-three percent of respondents stated they were not planning to change vendors.
- Most respondents described their potential markets as big and largely untapped.
- Almost all respondents believed the slower revenue growth Tandem has been experiencing is due to management actions. The consensus that a slowing growth rate is not due to any limitations dictated by market potential is encouraging.

On the negative side:

- 50% of respondents believed that Tandem was not committed to third-party software houses.
- Many complained about a lack of guidance from Tandem regarding product direction.
- Few of the software houses participating in our survey have large marketing staffs or nationwide coverage.

MANAGEMENT'S RESPONSES TO OUR SURVEY

Management stated in response to our survey results:

- The Alliance program, initiated about one year ago, is still experiencing growing pains. The commitment at headquarters has not been transmitted to the field in a consistent manner. Management stated it has addressed these issues and perceptions should be improving.
- Product direction has not been clearly articulated because the company has not had its product priorities in focus. The company is currently in the process of explaining its plans to its field organization and customers.
- Management stated that all products and features described by our survey respondents as desirable future products would become Tandem products during the next 24 months.
- Tandem's management agreed that its slower than expected revenue growth is of its own doing and believes that applications software for its targeted market segments-- Manufacturing, Banking, Telecommunications, Point-of-sale, Airlines and Federal Government--will be key to generating higher revenue growth.

RESPONDENTS PROFILE

Fifty-three percent of the 47 software houses listed in Tandem's Alliance Directory (October 1984) responded to our survey. Five of the respondents were not actively marketing software for Tandem. Our responses are tallied from the 20 software houses (43% of total) that completed our written questionnaire. In most cases, we followed-up with in-depth telephone interviews.

TANDEM ALLIANCE PROGRAM
SURVEY OF PARTICIPANTS

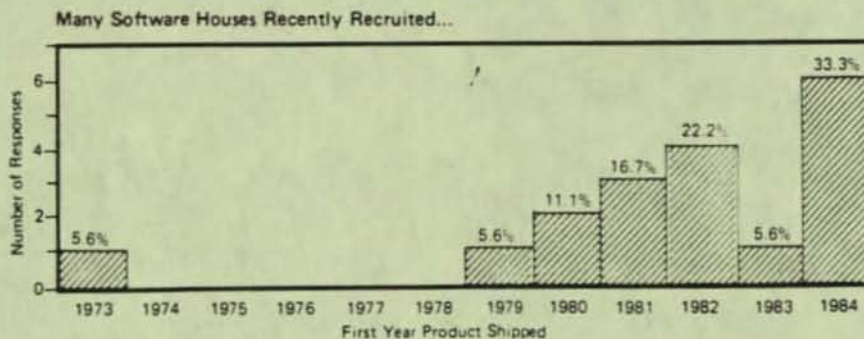
PRODUCT DESCRIPTION

Responding software vendors by industry:

	<u>Number of Vendors</u>
Banking/Finance	8
Manufacturing	5
Non-Financial Service	1
Communications	1
Cross Industry, General and Miscellaneous	5
Total	20

NOTE: All but one of five vendors in Manufacturing has packages installable at customer sites now.

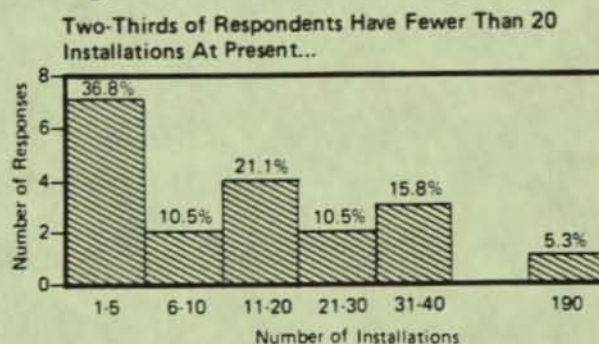
QUESTION: How long have you been shipping your product?



Total Responses: 18

Conclusion: Assuming 6 to 12 months for selling cycle, there could be more market impact in 1986 than 1985 from newer packages.

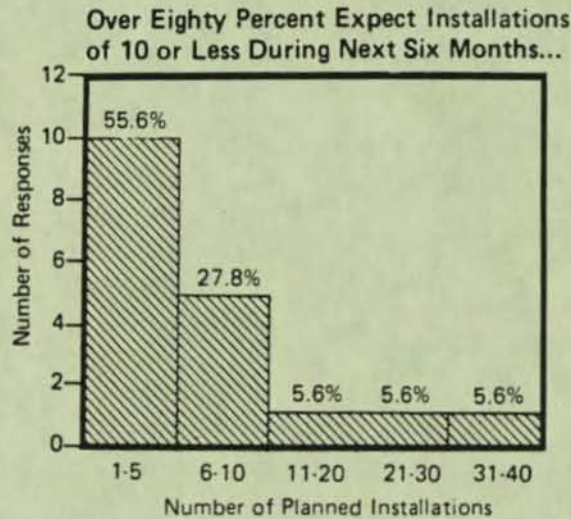
QUESTION: How many installations do you have currently?



Total Responses: 19

Conclusion: This is an indication of the newness of some software recruits as well as their limited marketing resources. Tandem will need to increase the number of software houses and help existing ones broaden their markets.

QUESTION: How many installations are planned for the next six months?

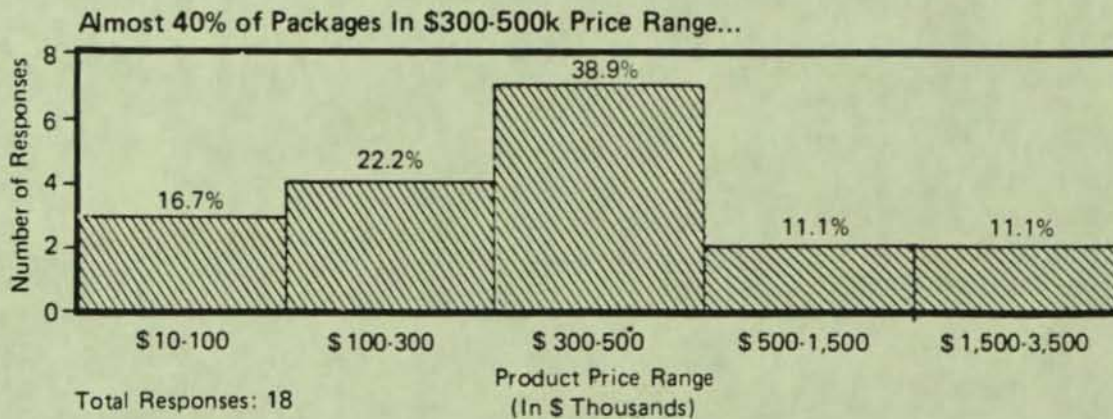


Total Responses: 18

Note: The number of packages can be misleading as some vendors have several modules for a given application environment and each is counted as a separate package. Other vendors may sell one large package.

Conclusion: Tandem's revenue boost from software houses still modest; more and larger software is required; more and better Tandem support to maximize their geographic penetration.

QUESTION: What is the price range of the product?

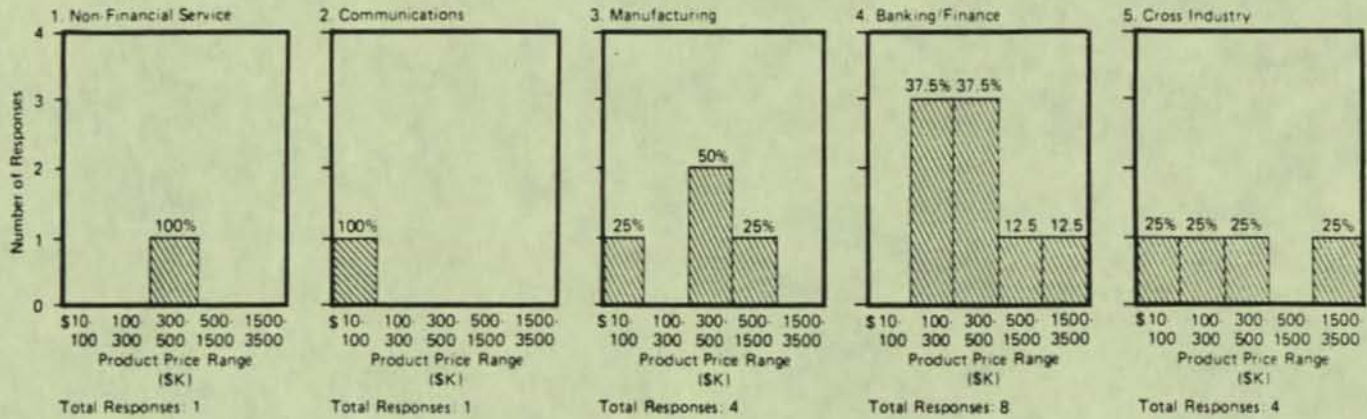


Total Responses: 18

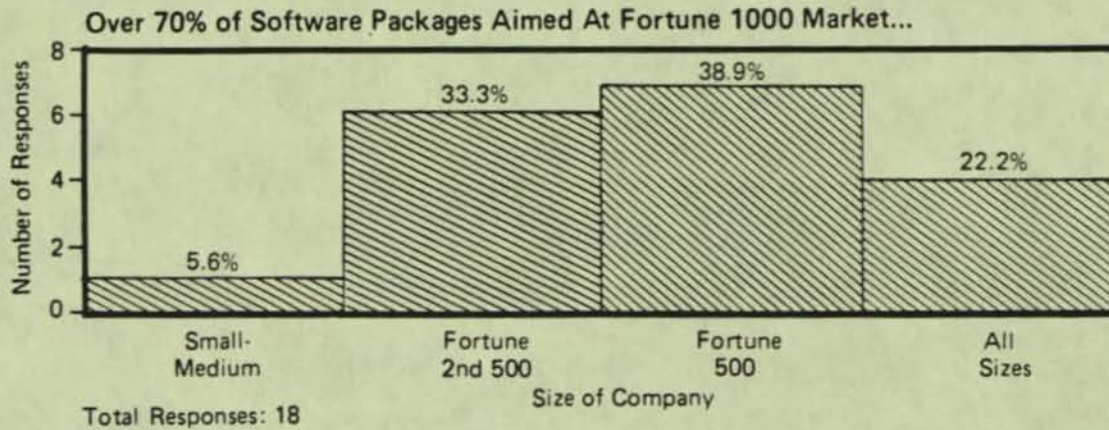
Conclusion: Expensive packages, concentrated in Banking/Finance and Manufacturing, are important strategic sales for Tandem; the applications are critical to the end users.

RESPONSES BY INDUSTRY:

Banking/Finance Packages Most Expensive ...



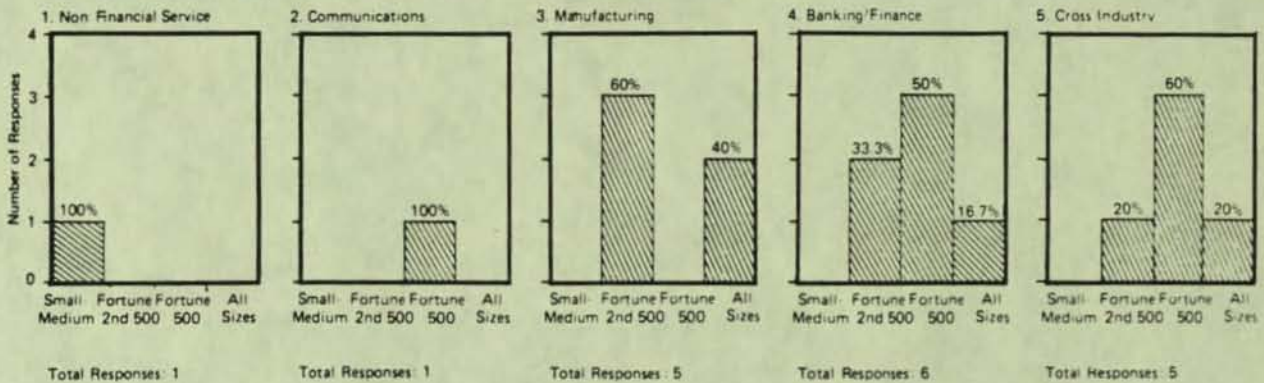
QUESTION: What size company or organization would use your software?



Conclusion: Tandem's focus is on the Fortune 1000 market, with the greatest revenue potential and also the stiffest competition.

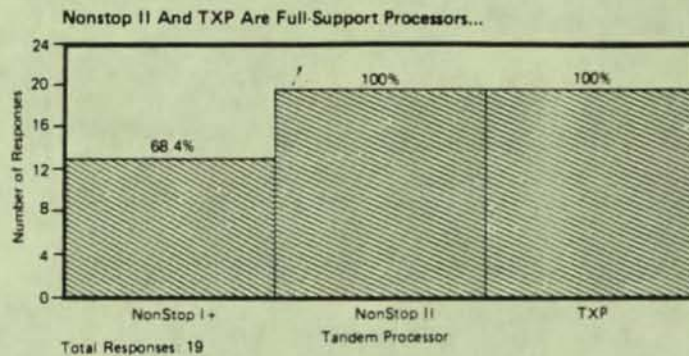
RESPONSES BY INDUSTRY:

Banking/Finance Packages Aimed At Largest Customers; Manufacturing At Second Fortune 500...



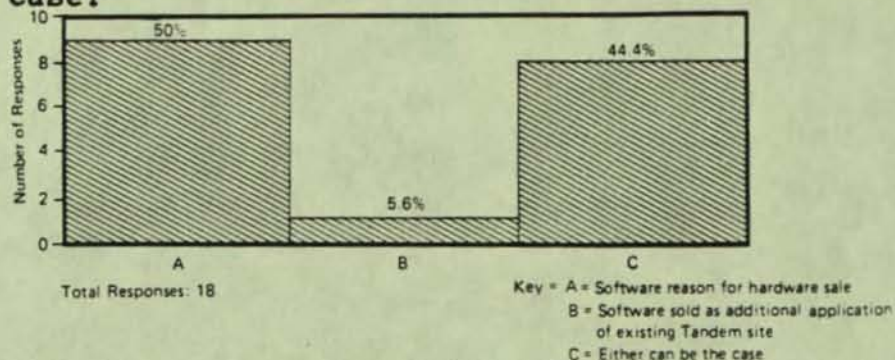
Conclusion: Newer markets for Tandem less focused than Banking/Finance on very large users; but will require more resources and skill to penetrate.

QUESTION: Does your program run on NonStop I+? NonStop II? TXP?



Conclusion: Tandem needed the recently introduced EXT system, capable of running all Tandem software, to plug gap at low-end of processor range.

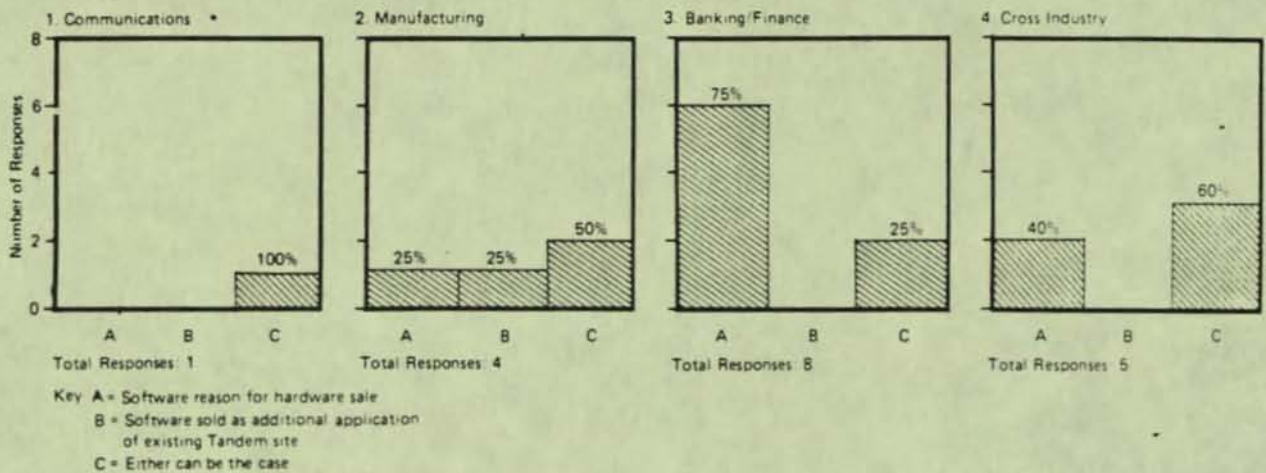
QUESTION: Is your product (A) typically the reason for the hardware sale, (B) sold as an additional application at existing Tandem sites, or (C) either can be the case?



Conclusion: Tandem sales support is critical to sales.

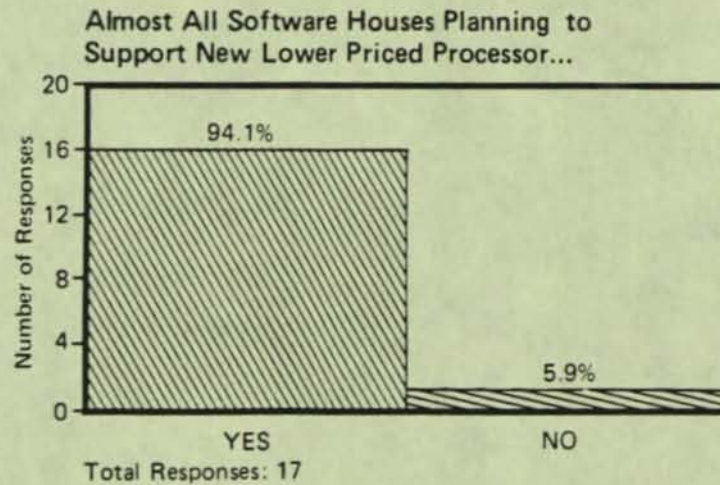
RESPONSES BY INDUSTRY:

Banking/Finance Software Is The Reason For Tandem Sales; Other Areas Are More Joint Sales



Conclusion: More selling of Tandem systems required outside of Banking/Finance, where there is an obvious fit. This underscores need for more effective sales and marketing.

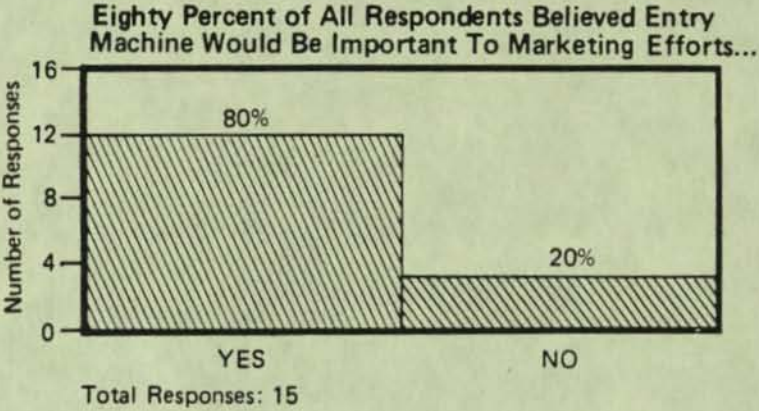
QUESTION: Do you intend to offer your program on an entry level Tandem processor?



NOTE: Only 1 of 6 in Banking/Finance did not intend to use entry level Tandem processor.

Conclusion: Lower priced machines access more potential customers. For software houses with fixed costs for software development, lower entry level prices are always important.

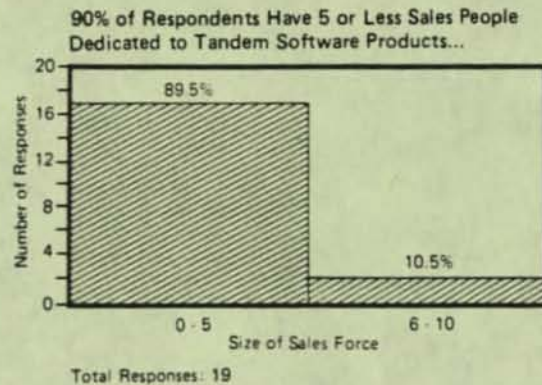
QUESTION: If yes, will this be important to your marketing?



NOTE: 1 of 4 Cross Industry and 1 of 1 Communications companies responded negatively.

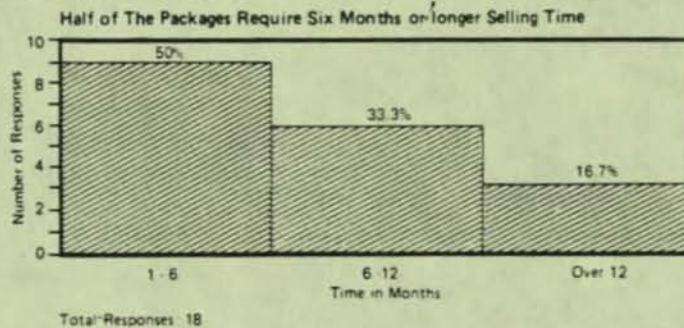
SOFTWARE HOUSE PROFILE

QUESTION: What is the size of the salesforce for the product mentioned?



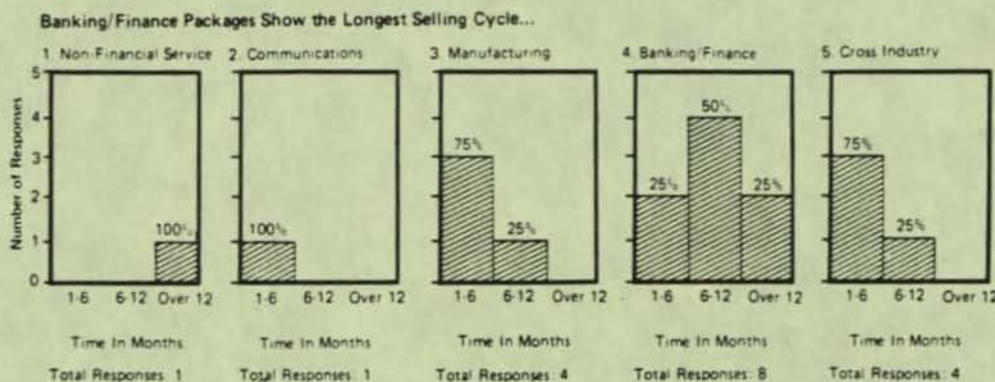
Conclusion: Tandem needs more and bigger software houses to leverage applications. It also must devise ways to help the smaller software houses reach the entire installed base.

QUESTION: What is the average amount of time required to sell your product?



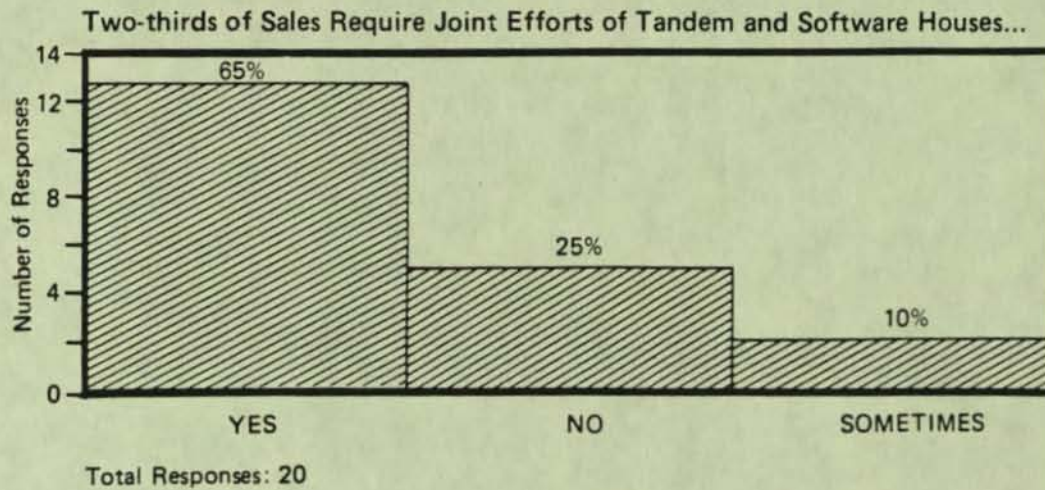
Conclusion: Benefits to Tandem of additional software houses not immediate; may be 1986 or 1987.

RESPONSES BY INDUSTRY:



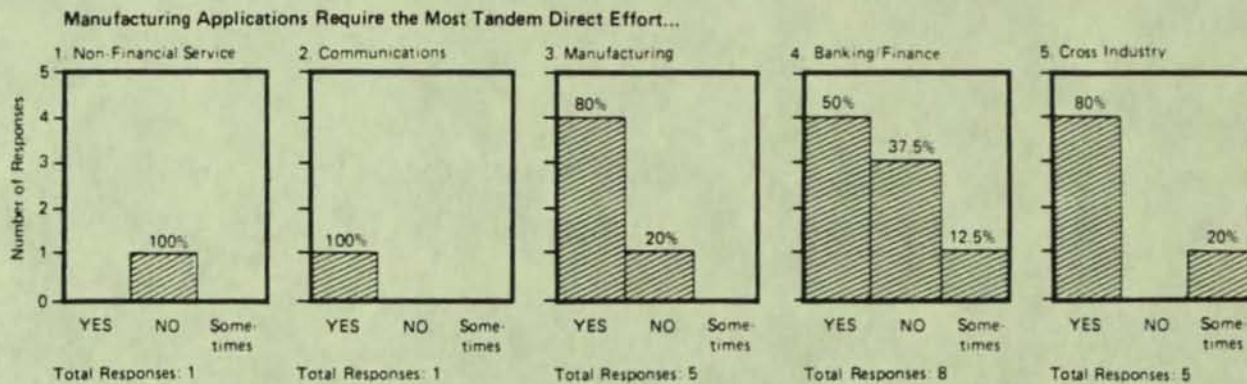
Conclusion: Selling cycle longest in Banking/Finance; Tandem's diversification efforts into Manufacturing and other areas may shorten selling cycle.

QUESTION: Does a sale require cooperative customer sales efforts with Tandem?



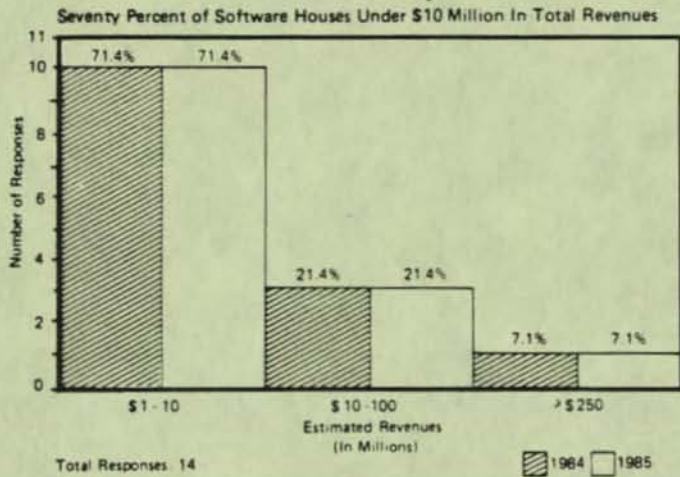
Conclusion: Tandem must have an effective sales and marketing program for third-party software to be successful.

RESPONSES BY INDUSTRY:



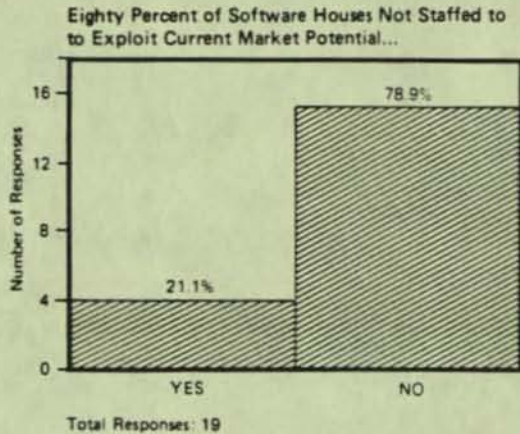
Conclusion: Manufacturing newest market for Tandem and most competitive; it requires most direct sales effort from Tandem.

QUESTION: What are your estimated total revenues for 1984 and projected revenues for 1985?

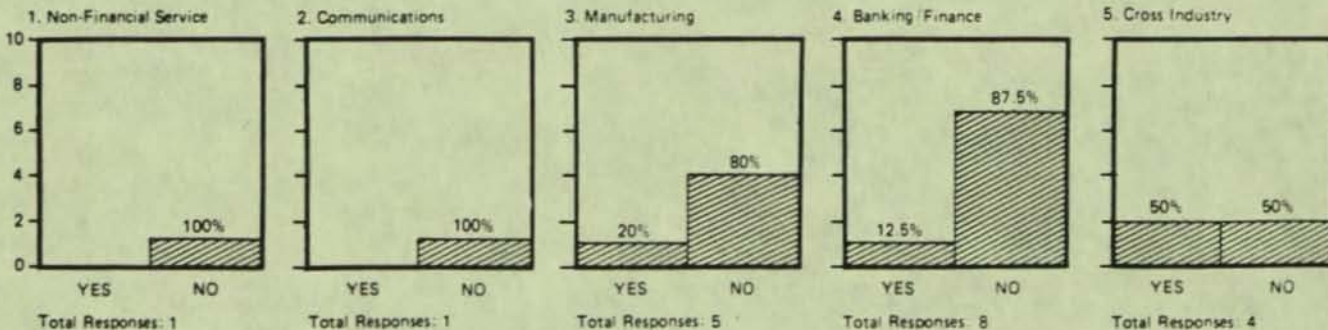


Conclusion: Tandem software houses are small and will require Tandem support to leverage their applications to a broad base of customers.

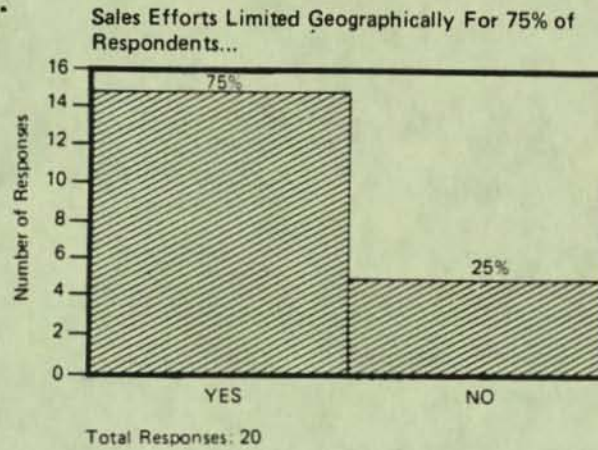
QUESTION: Are you staffed to exploit your total market domestically and internationally?



RESPONSES BY INDUSTRY:



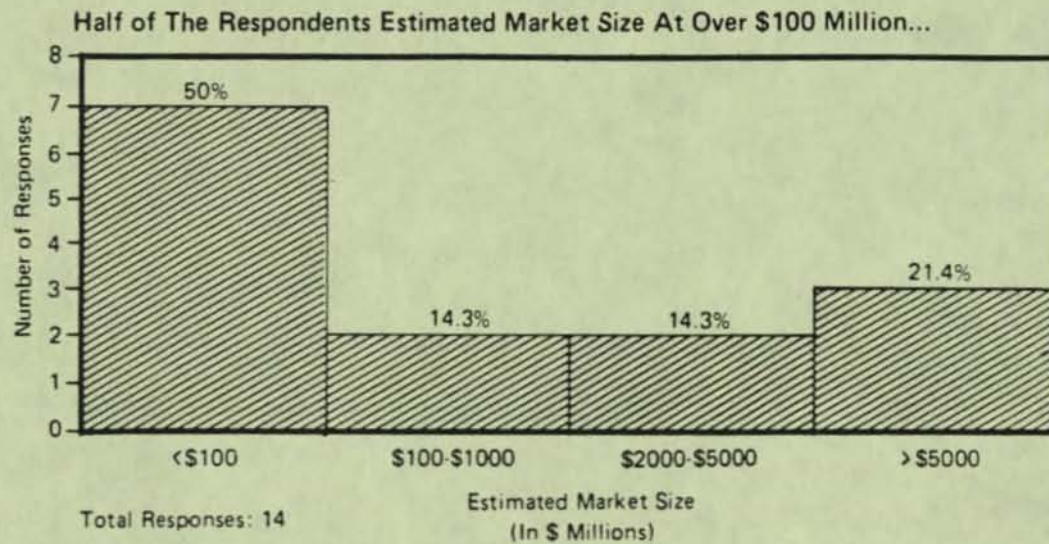
QUESTION: Are your sales and sales efforts focused in certain geographic areas?



Conclusion: Sales efforts limited by resources of small software houses and often focused on Tandem's installed base, which are potentially easier sales, rather than on new customers. Good management of marketing effort needed by Tandem to gain maximum advantage from applications availability.

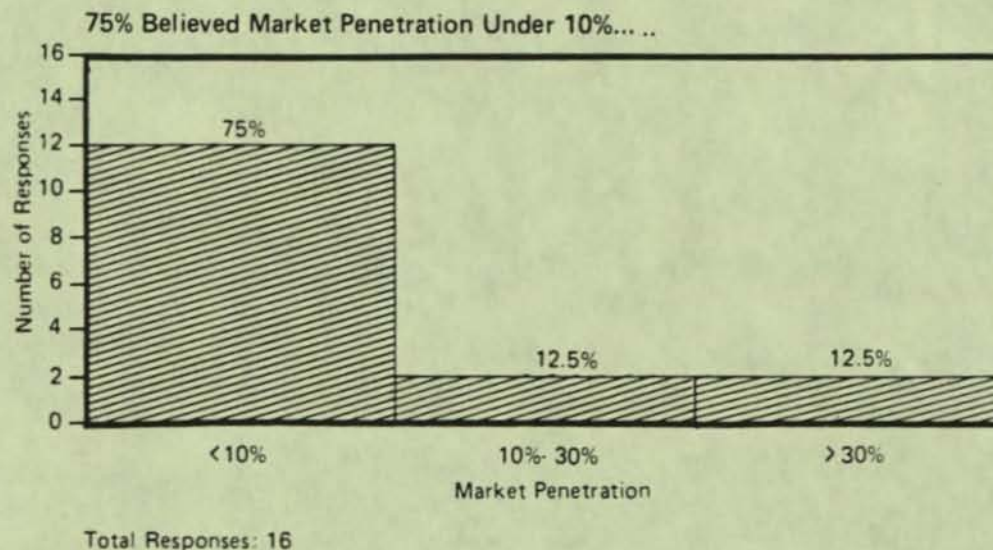
MARKET INFORMATION

QUESTION: How large do you estimate the market for your product to be?



Conclusion: Market size not a constraining factor in any of Tandem's markets. Critical path is Tandem's learning how to exploit markets most effectively.

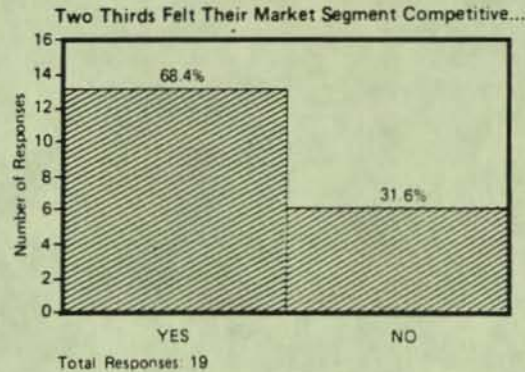
QUESTION: How much of this estimated market has been penetrated?



NOTE: No material industry differentiation in responses.

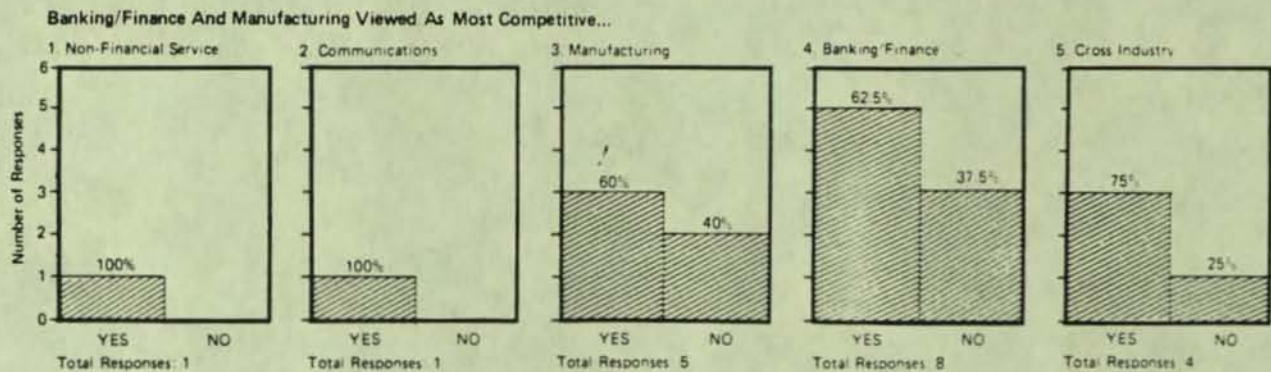
Conclusion: There is large growth potential for Tandem.

QUESTION: Is there much competition?

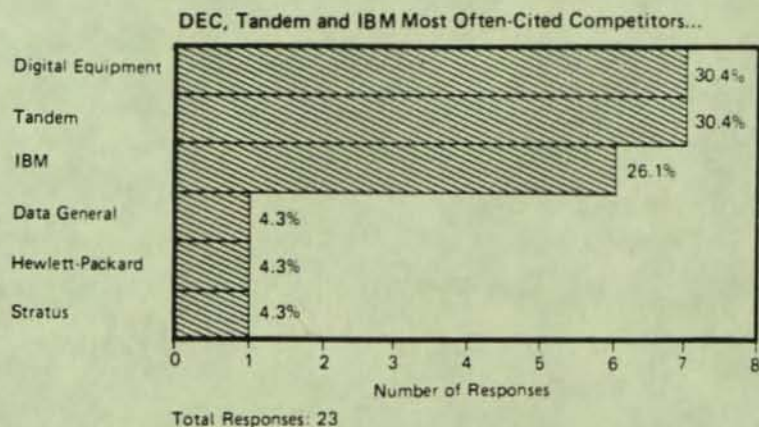


Conclusion: Much of Tandem's success will depend on how well it deals with competitive pressures as it moves out of niche markets into broader areas like manufacturing.

RESPONSES BY INDUSTRY:

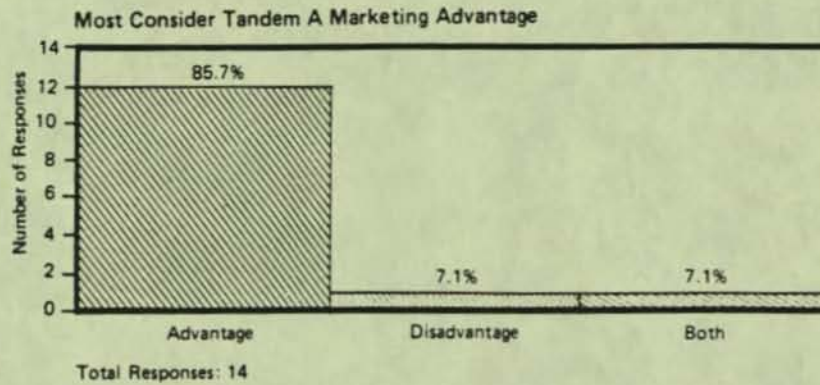


QUESTION: What hardware does the competition uses?



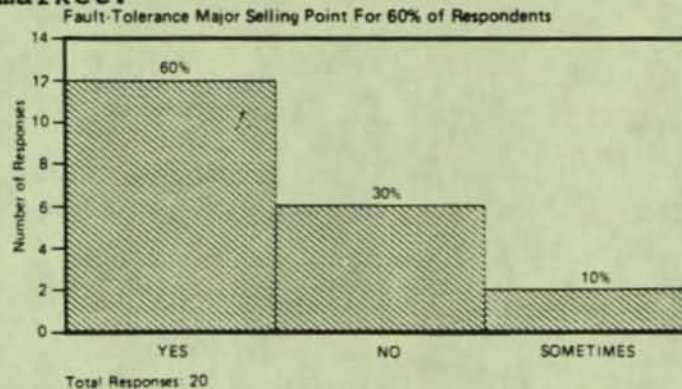
Conclusion: In many areas, Tandem software houses compete with one another. Otherwise, Tandem must compete with marketshare leaders IBM and DEC.

QUESTION: Do you consider Tandem processors an advantage or disadvantage?



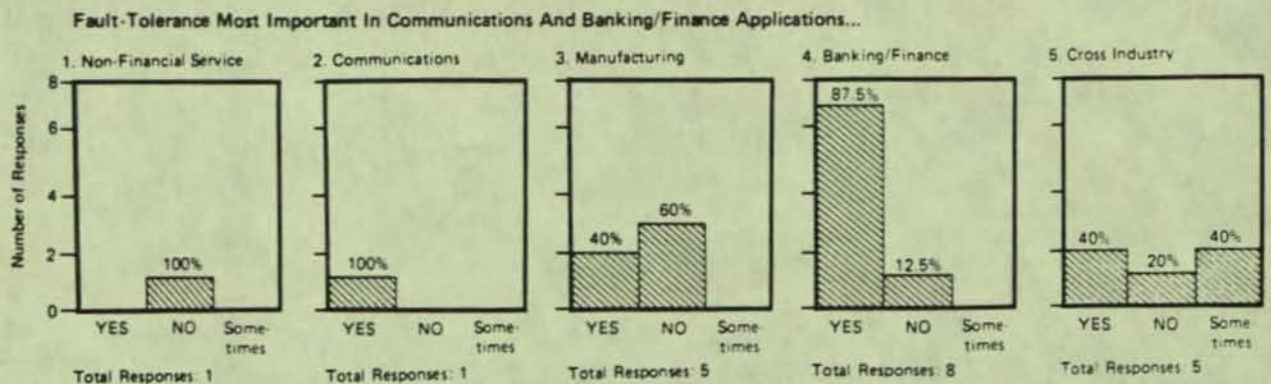
Conclusion: Software houses have chosen Tandem as a superior technical solution for their specific applications.

QUESTION: Is fault-tolerance a major selling point in your market?



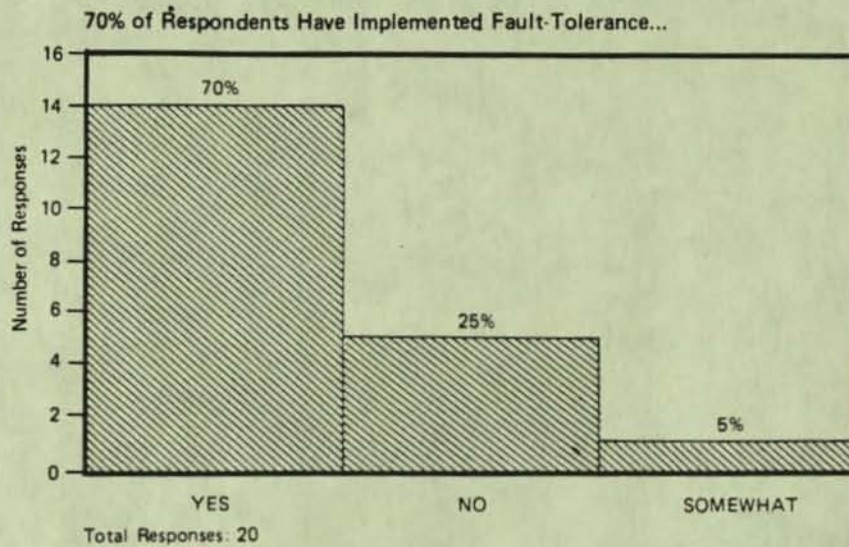
Conclusion: Signs of niche market applications in high percentage of respondents seeing fault-tolerance as major selling point.

RESPONSES BY INDUSTRY:



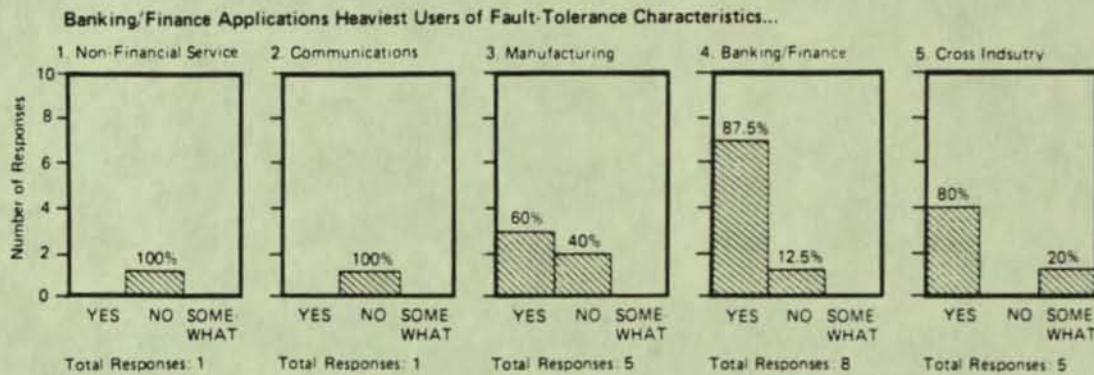
Conclusion: Tandem needs to compete on other system attributes beside fault-tolerance outside of Banking/Finance.

QUESTION: Have you implemented fault-tolerance in your application?



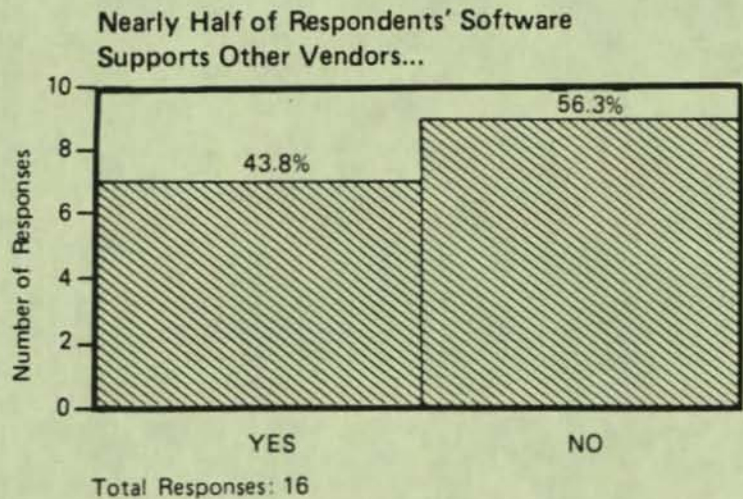
Conclusion: High percentage of fault-tolerance implementation reinforces niche characteristics of software houses.

RESPONSES BY INDUSTRY:

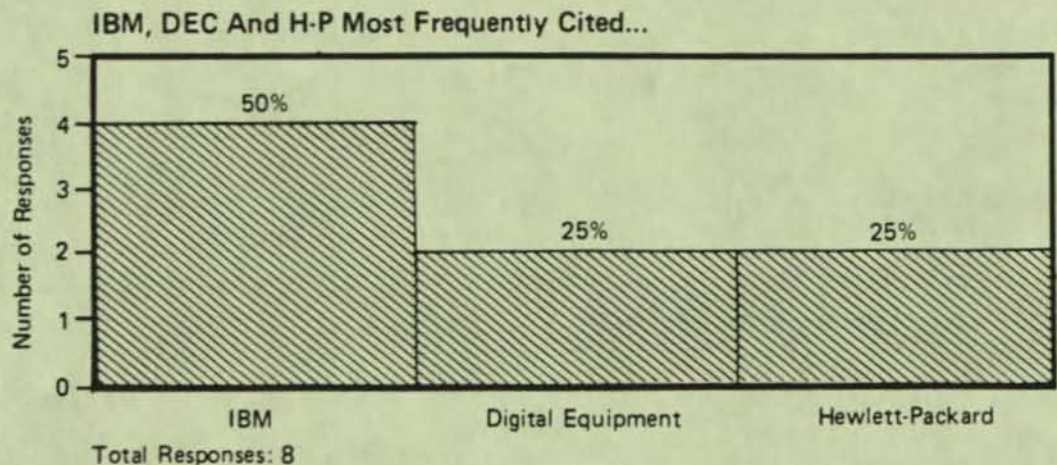


OTHER HARDWARE PLATFORM INFORMATION

QUESTION: Does your program run on equipment other than Tandem's?

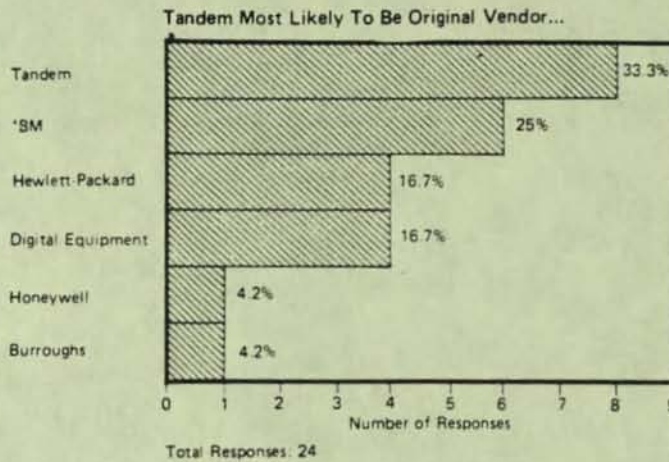


Equipment other than Tandem's mentioned in response to previous question:

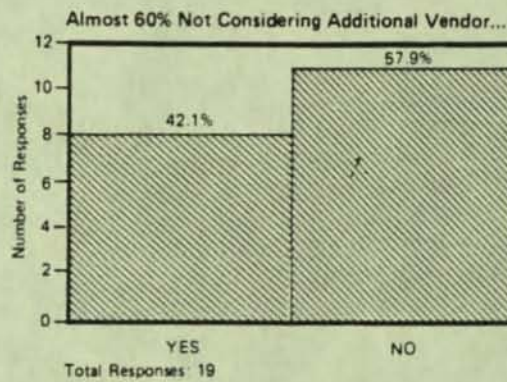


Conclusion: Tandem's competition is not Stratus, but marketshare leaders IBM, DEC and H-P. Although Tandem's system is better suited for certain applications it must be competitive with these broad-based suppliers to grow in the general transaction processing market.

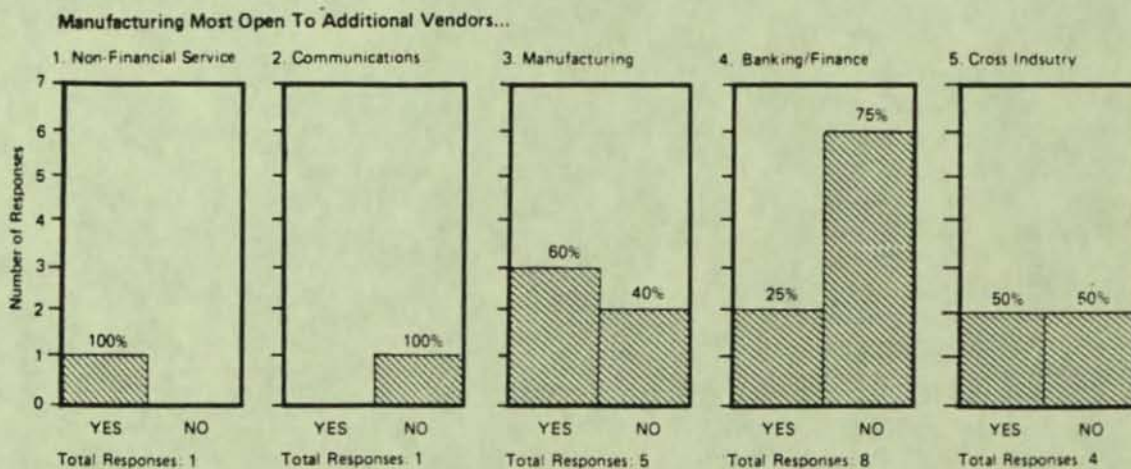
QUESTION: Which vendor was your original hardware platform?



QUESTION: Are you considering additional vendors?



RESPONSES BY INDUSTRY:

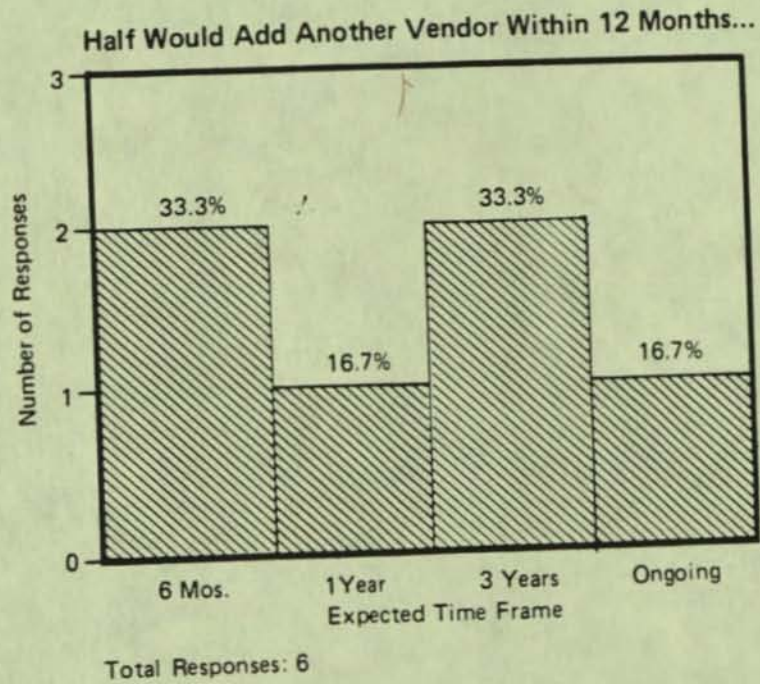


Conclusion: There is more competition in Tandem's newer targeted markets than in Banking/Finance.

Additional vendors mentioned in response to previous question:

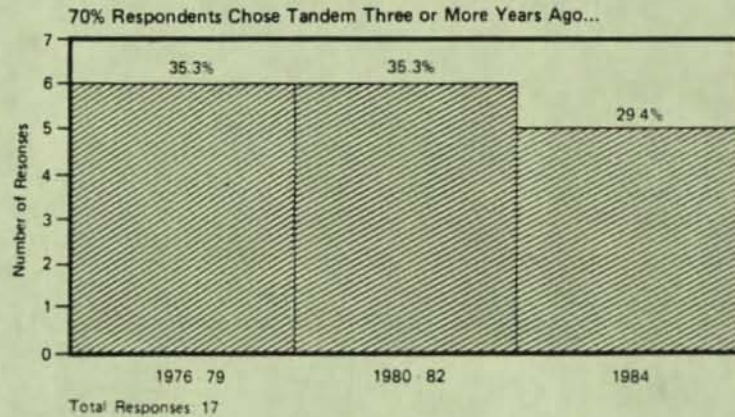
<u>Mentioned Vendors</u>	<u>Number of Responses</u>	<u>Percent of Total</u>
IBM	4	50.0%
Data General	1	12.5%
Digital Equipment	1	12.5%
Hewlett-Packard	1	12.5%
INTEL	1	12.5%

QUESTION: Expected time frame?

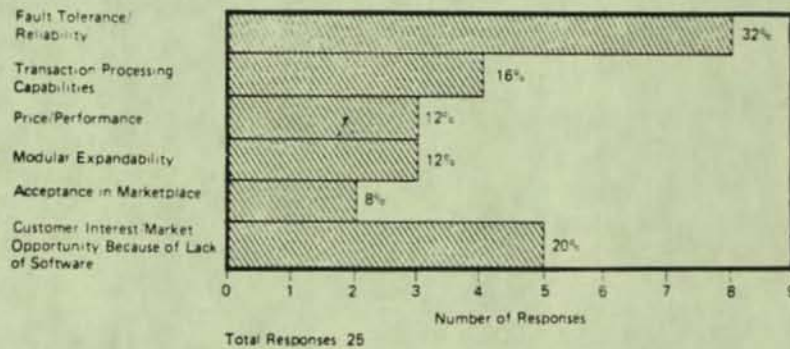


EXPERIENCE WITH TANDEM

QUESTION: When did you choose Tandem as a hardware vendor?

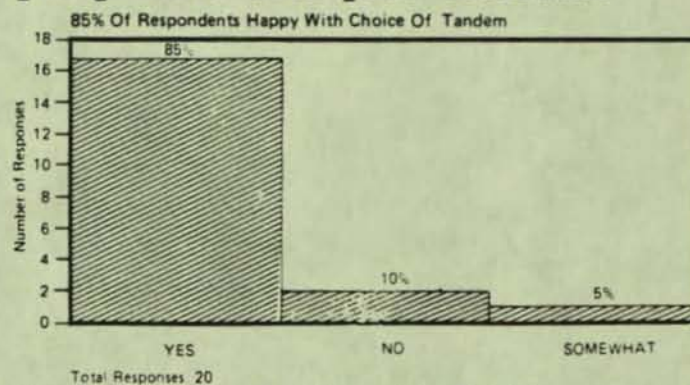


Reasons mentioned for choosing Tandem as a hardware vendor -- in response to previous question:



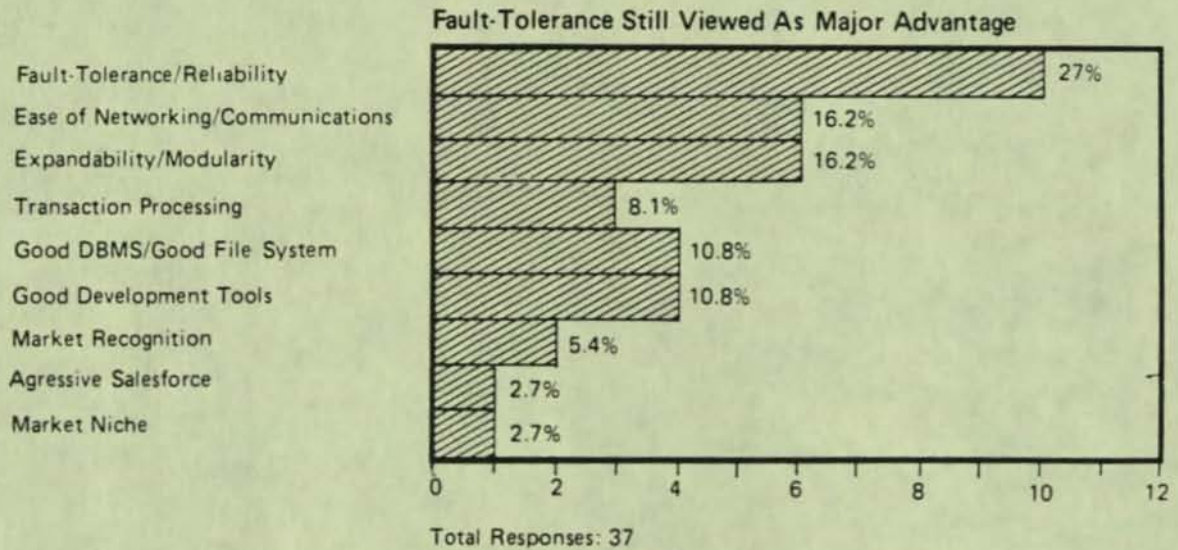
Conclusion: Many software houses chose Tandem over 3 years ago when emphasis was on fault-tolerance; these are niche market applications. Company is currently stressing transaction processing and modularity, which was the reason for choosing Tandem in fewer cases.

QUESTION: Are you pleased with your decision?

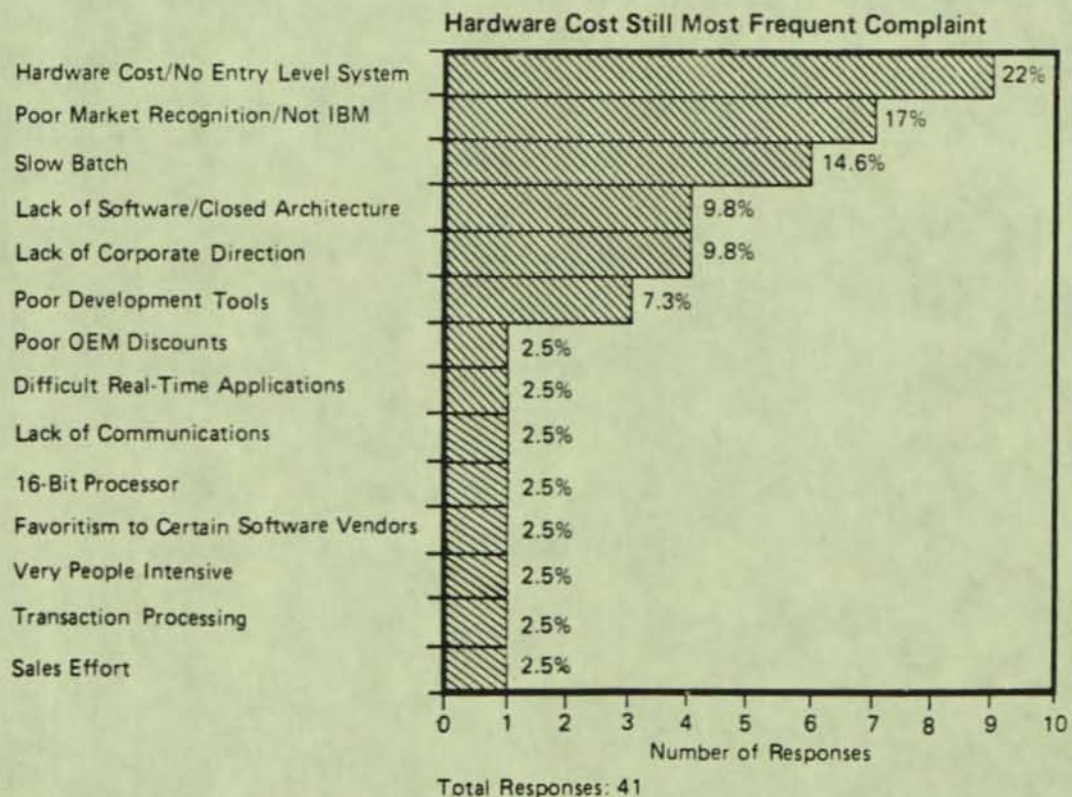


Conclusion: This is a very high satisfaction level. The complex tasks Tandem's software houses are trying to accomplish are well-suited to the capabilities of the Tandem products.

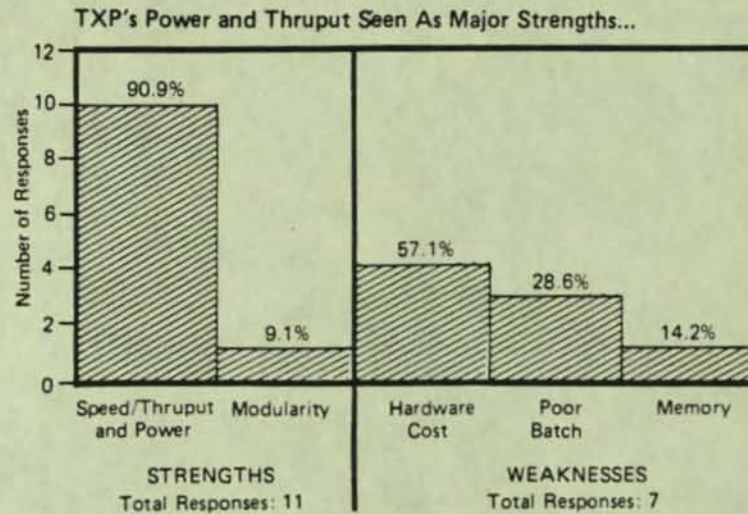
QUESTION: What are the major advantages of using Tandem?



QUESTION: What are the disadvantages of using Tandem?

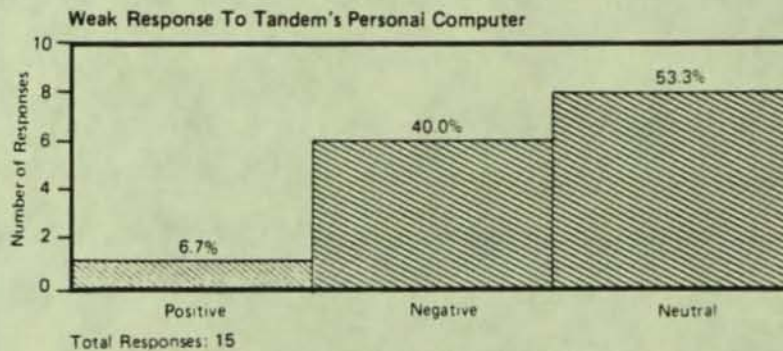


QUESTION: What is your opinion of Tandem's TXP processor?

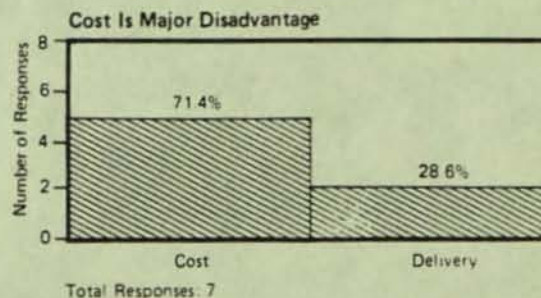


Conclusion: With TXP, Tandem has not altered historical trade-offs of good transaction processing versus weaker batch and the frequent complaint of higher cost. As Tandem pursues more mainstream and more competitive markets, it will need to improve on its weaknesses.

QUESTION: What is your opinion of Tandem's new personal computer?



Reasons mentioned for negative opinion of Tandem's personal computer:



Conclusion: Tandem's PCs will meet same fate as other non-IBM systems vendors. Beating IBM in a high-volume product like PC will not be possible.

QUESTION: What products are you most interested in seeing Tandem release? Scale of 1 - 5 (1 = high degree of interest, ... 5 = no interest).

A Low-priced Processor and Better Programming Aids Most Desired New Products

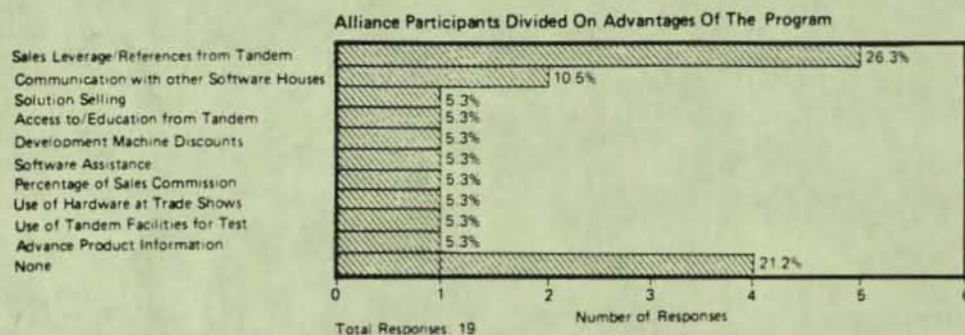
	Average	1's	% of Total	2's	% of Total	3's	% of Total	4's	% of Total	5's	% of Total	TOTAL
HARDWARE:												
low-priced, entry-level processors	1.6	13	72.2%	1	5.6%	2	11.1%	1	5.6%	1	5.6%	18
communications controllers	2.4	7	41.2%	2	11.8%	3	17.6%	3	17.6%	2	11.8%	17
disks	2.6	4	23.5%	4	23.5%	4	23.5%	2	11.8%	3	17.6%	17
high-end processors	2.8	4	23.5%	1	5.9%	7	41.2%	2	11.8%	3	17.6%	17
terminals	3.1	3	17.6%	3	17.6%	1	5.9%	5	29.4%	5	29.4%	17
SOFTWARE:												
batch processing capabilities	2.1	6	40.0%	3	20.0%	3	20.0%	2	13.3%	1	6.7%	15
programming aids	1.9	7	46.7%	4	26.7%	2	13.3%	1	6.7%	1	6.7%	15
more/better IBM compatibility	2.2	6	37.5%	5	31.3%	2	12.5%	0		3	18.8%	16
network management	2.3	6	37.5%	3	18.8%	4	25.0%	1	6.3%	2	12.5%	16
changes/enhancements to operating system	2.3	4	30.8%	3	23.1%	2	15.4%	3	23.1%	1	7.7%	13
changes to data base	2.5	3	21.4%	3	21.4%	5	35.7%	2	14.3%	1	7.1%	14
new languages	2.8	4	33.3%	2	16.7%	1	8.3%	3	25.0%	2	16.7%	12
C	4	44.4%										
ADA	2	22.2%										
PL/I	2	22.2%										
office automation software	3.5	0		4	30.8%	1		2		6	46.2%	13
UNIX	3.2	4	36.4%	0		0		4	36.4%	3	27.3%	11

Total Responses: 18

Conclusion: Tandem needs to beef up the mundane parts of its product line to compete effectively with entrenched vendors as more than a niche company.

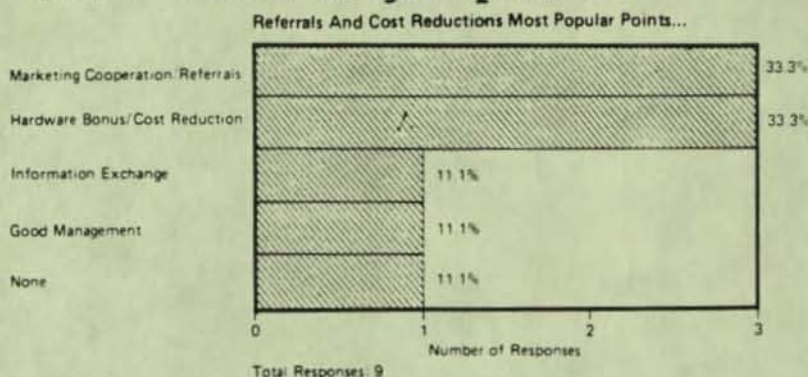
TANDEM ALLIANCE PROGRAM

QUESTION: What advantages does the Alliance program offer?



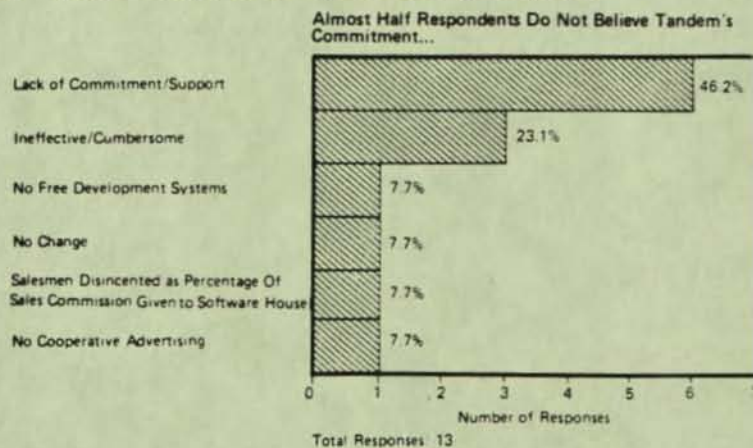
Conclusion: Tandem is in early stages of implementing an effective software house strategy. Much more support and consistency is needed.

QUESTION: What are its strongest points?

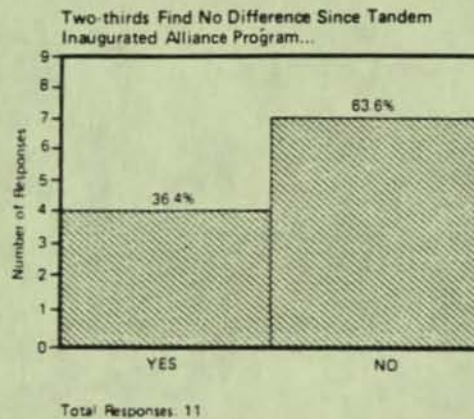


Conclusion: Tandem has made some progress by setting up mechanisms for referrals and hardware discounts. But follow through, measured by responses to the following two questions, not yet effective.

QUESTION: What are its weakest points?

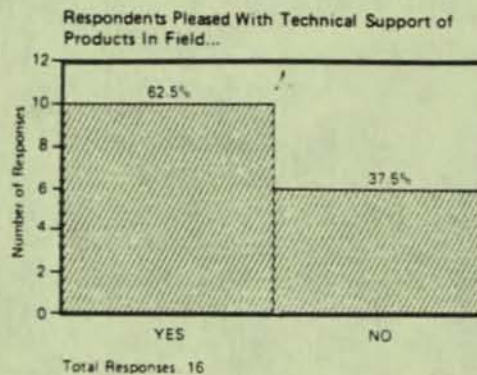


QUESTION: If you were a Tandem software house before the Alliance program, has Alliance changed things?



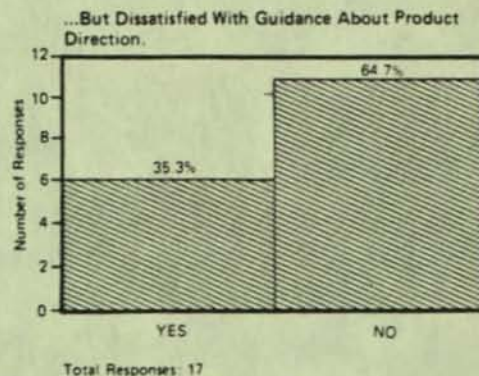
NOTE: Eleven of 15 respondents were Tandem software houses before Alliance program.

QUESTION: Does Tandem offer you adequate support in technical/development areas?



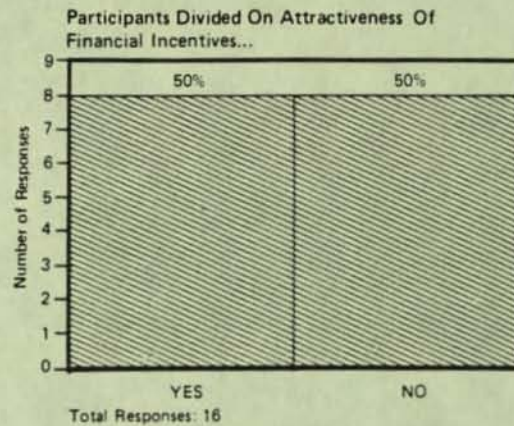
Conclusion: Tandem's strengths are its products; market and market planning are more of a challenge.

QUESTION: Does Tandem offer you adequate access to new product plans and direction?



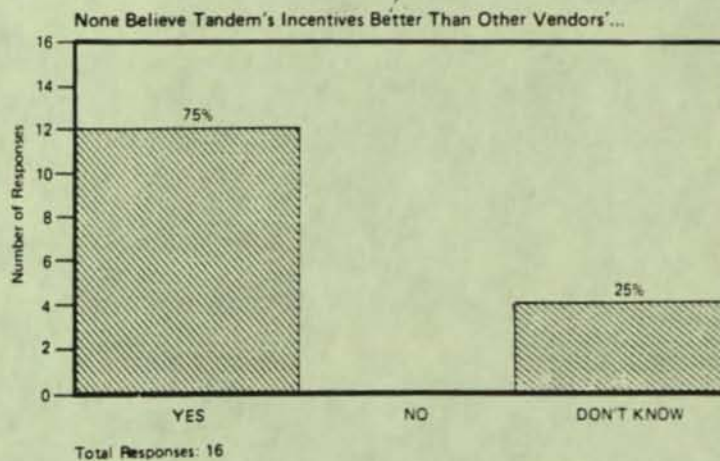
Conclusion: Tandem has confused customers over the last two years; clearer product direction is needed.

QUESTION: Does Tandem offer you adequate discounts and financial support/incentives?

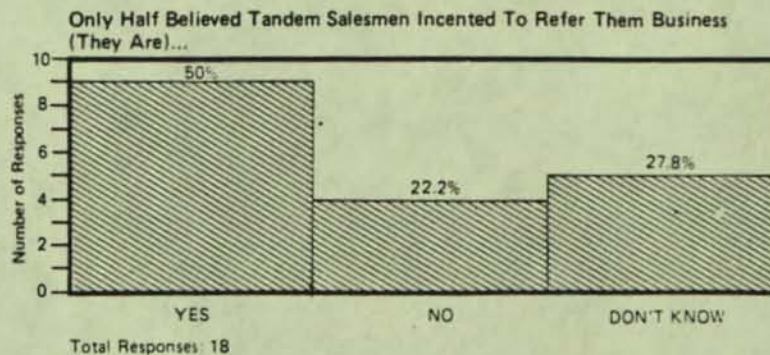


Conclusion: To attract software houses, Tandem will need to be competitive with IBM and DEC. The following response indicates that it is not there yet.

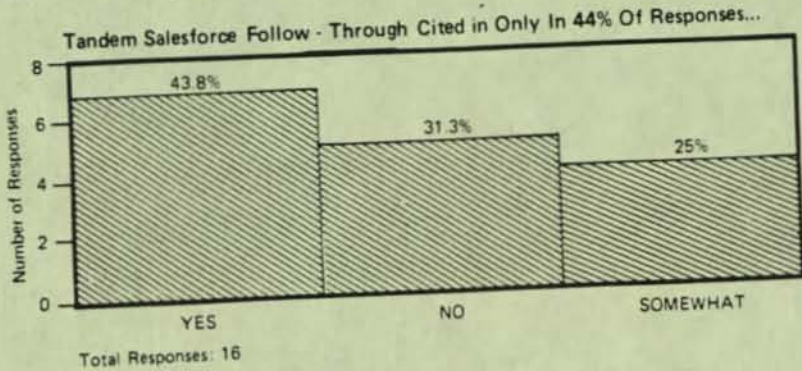
QUESTION: Do other vendors offer better discounts and/or commissions?



QUESTION: Have Tandem Salesmen an incentive to refer business to you?

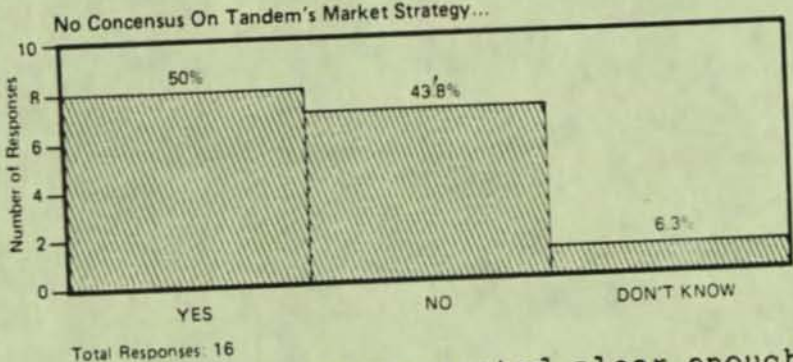


QUESTION: Do they do so?



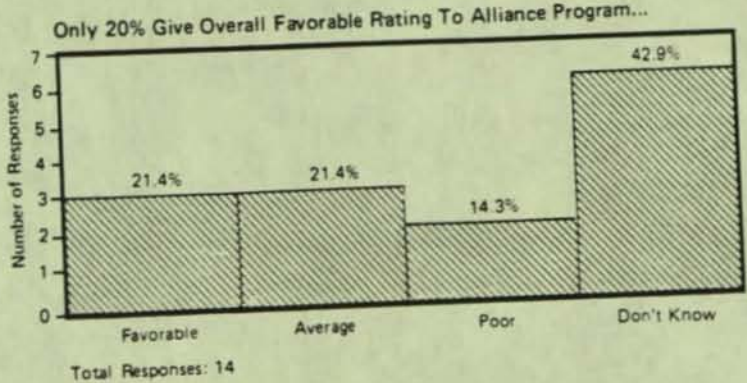
Conclusion: Geographic consistency and better management needed to exploit available software.

QUESTION: Is Tandem's current market organization and direction helpful to you?



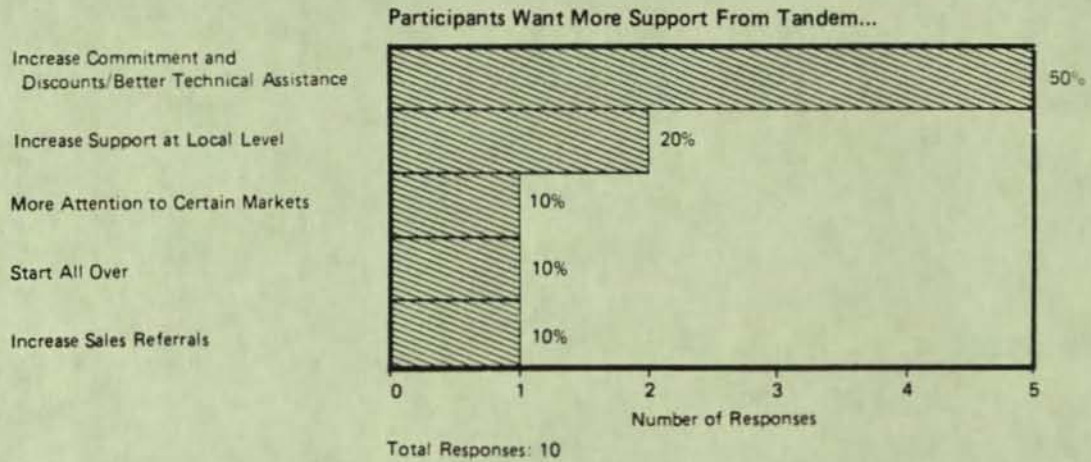
Conclusion: Tandem has not generated clear enough signals over last two years for a consensus of opinion to have been reached.

QUESTION: How does Tandem's Alliance program compare to other hardware vendors' arrangements?

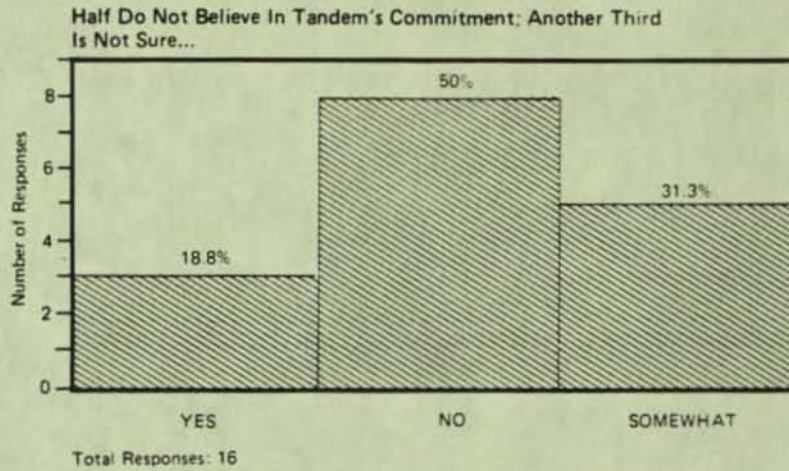


Conclusion: Tandem must compete with larger vendors for software houses efforts; the Alliance program needs to become more competitive in its incentive, support and execution.

QUESTION: Are there any aspects of Alliance you would like to see changed or improved?

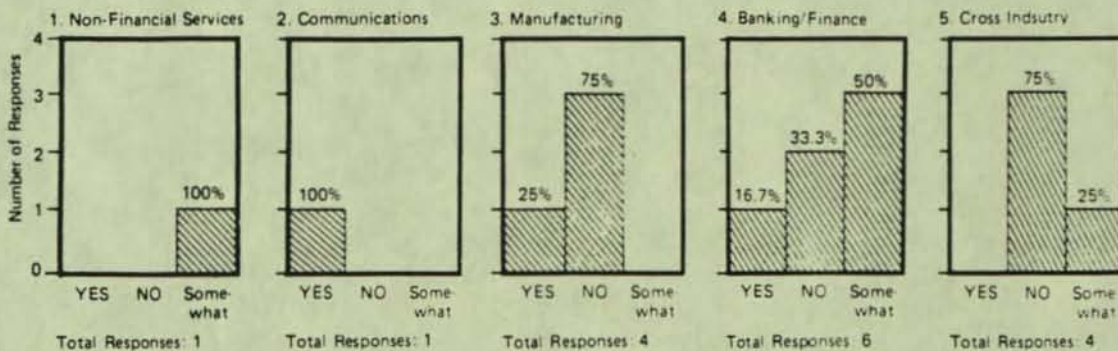


QUESTION: Do you think Tandem's management is committed to supporting third-party software vendors?



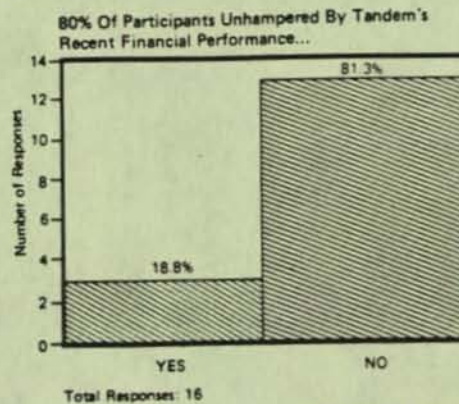
RESPONSES BY INDUSTRY:

Manufacturing Software Houses Most Skeptical of Tandem's Commitment to Third Party Vendors...



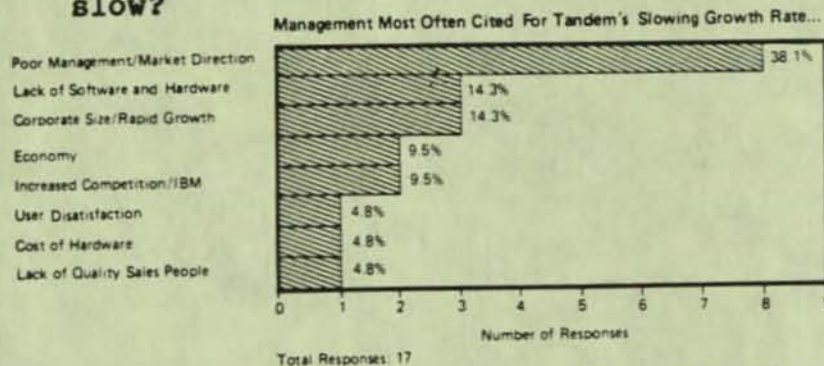
OBSERVATIONS ON TANDEM

QUESTION: Have Tandem's recent disappointing revenues and earnings impacted your sales?



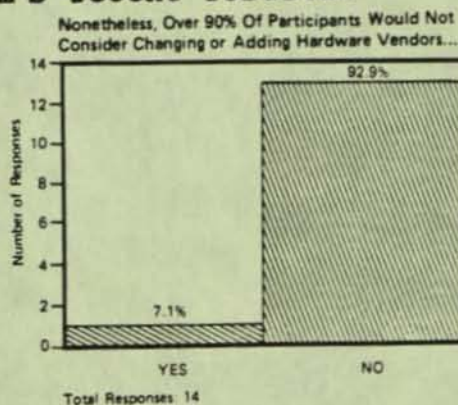
Conclusion: Real-world issues of making Alliance program work and new products most important to gaining new business.

QUESTION: What do you think caused Tandem's growth rate to slow?



Conclusion: Encouraging that no market limitation heading the list. Revenue slowdown is of Tandem's own doing and can be corrected.

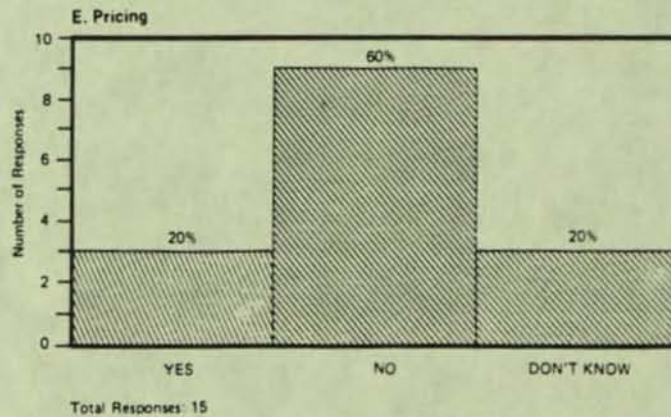
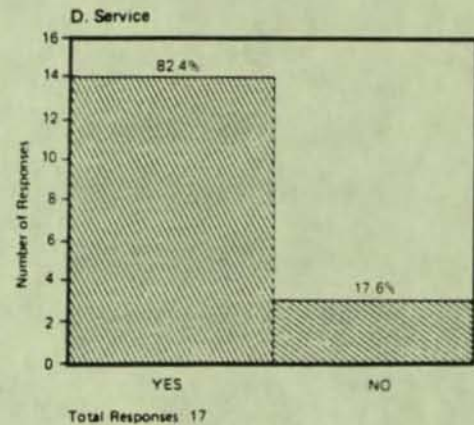
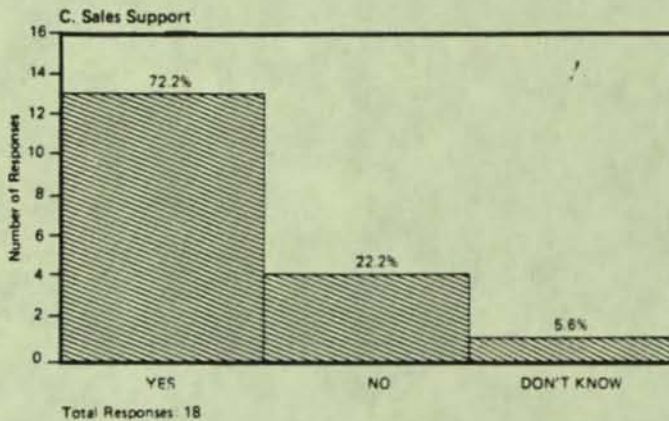
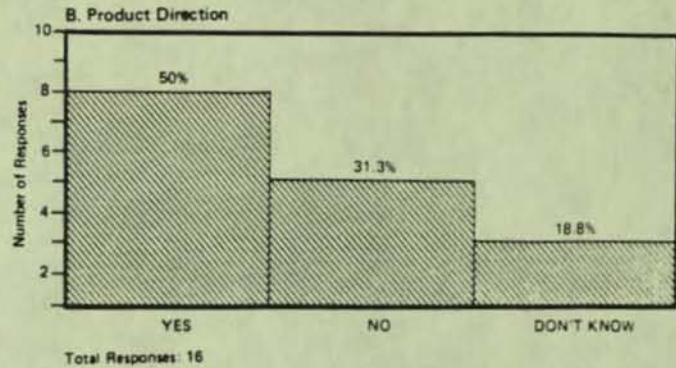
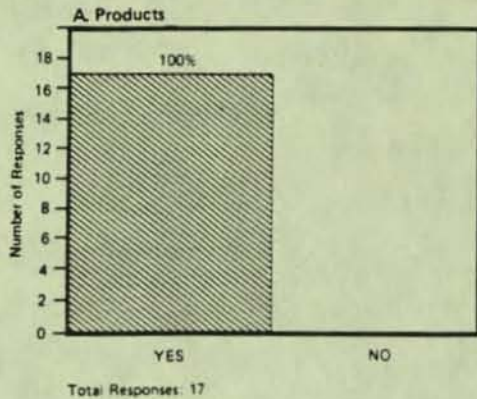
QUESTION: Are you considering changing vendors because of Tandem's recent results?



Conclusion: Tandem has a loyal group of software houses whose products it should exploit more aggressively.

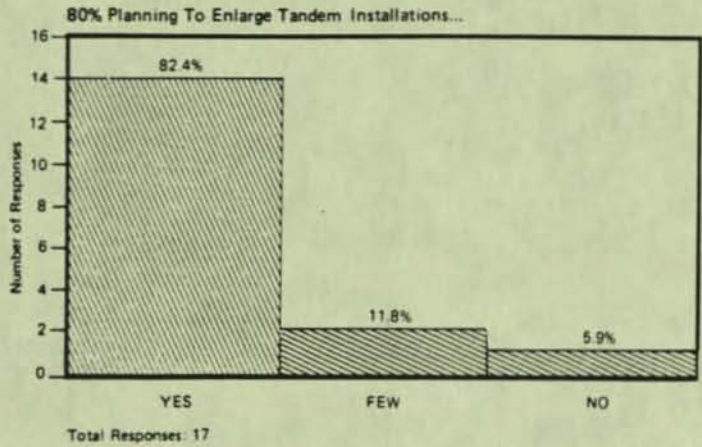
QUESTION: Are Tandem customers that you know happy with Tandem's
A) Products, B) Product Direction, C) Sales Support,
D) Service, E) Pricing?

Customers Very, Very Happy With Products, Sales Support And Service, Less So With Product Direction And Pricing...



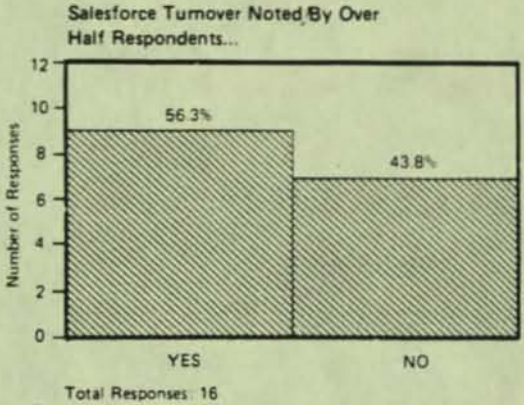
Conclusion: Same set of strengths and weaknesses reconfirmed. Tandem needs to be more aggressive in pricing especially when competing in its newer targeted markets.

QUESTION: Are these customers planning to enlarge their Tandem installations and/or add new applications?



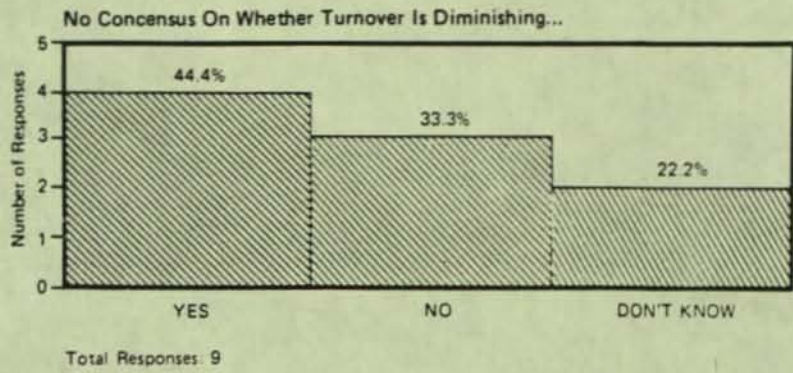
Conclusion: Easy expandability of Tandem systems encourages customer upgrades. Additional Tandem products would encourage more multi-application customer expansions.

QUESTION: Have you observed much turnover in the Tandem salesforce?

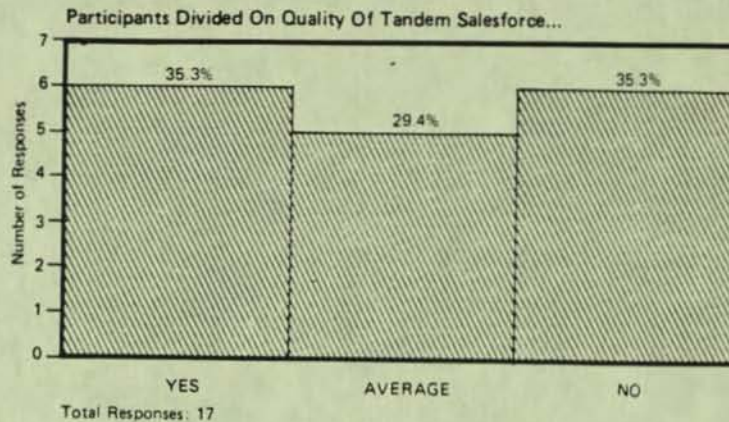


Conclusion: Salesforces and sales management issues are often a problem for companies in transition from one market focus to another. There was no clear indication that the turnover has slowed or that there has been any noticeable improvement in the quality of the salesforce.

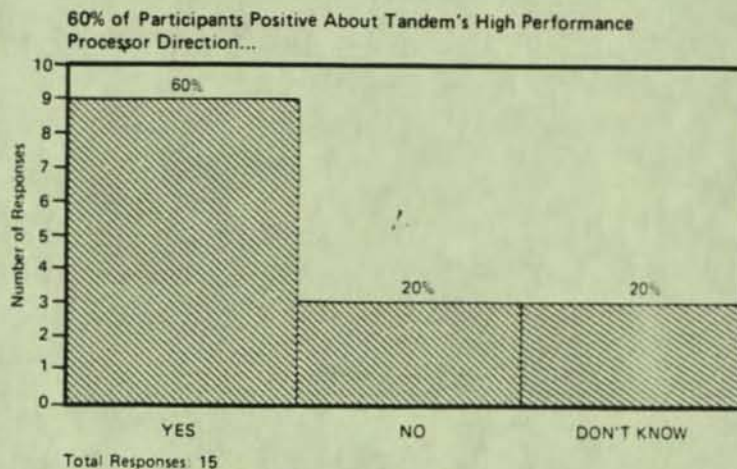
QUESTION: Is this turnover slowing?



QUESTION: Does Tandem have a good, well trained salesforce now?

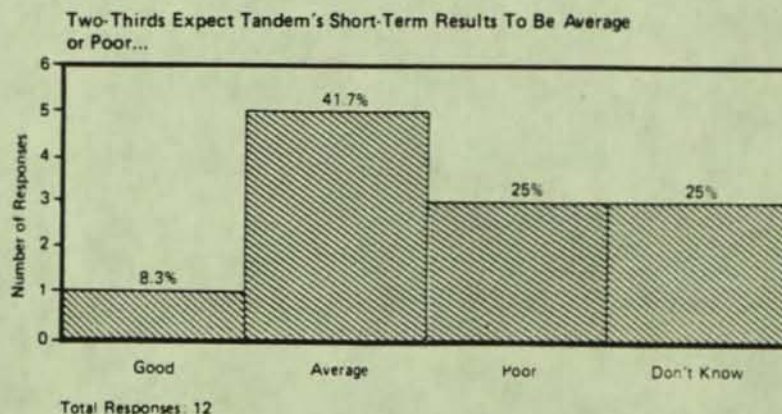


QUESTION: Do you agree with management's decision to concentrate on high-performance business?



Conclusion: The high-performance transaction processing market segment demands fast (and faster) processors. Tandem will continue to increase performance at the high end.

QUESTION: What are your expectations for Tandem short term?



Conclusion: There is no sense that Tandem has accomplished all that is required for it to rebound short term.

Prudential-Bache Securities makes a primary over-the-counter market in the shares of Tandem Computers, Inc.

Carol E. Muratore, CFA
(212) 214-1430
Susan J. Griffiths
(212) 214-1472

85-602

Copyright
 INVESTEXT/COMPUTERS AND OFFICE EQUIPMENT
 August 19, 1985

Tandem Computers - Company Report
 DREXEL BURNHAM LAMBERT INCORPORATED - Labe, P.
 07-30-85 (RN=508317)

TANDEM COMPUTERS (*)
 (TNDM - \$15 5/8)

The Concept Has Changed

Rating:	BUY	Shares outstanding:	41.9 million
52-Week Range:	29-13	Dividend:	None
		Yield	None
	From	To	
EPS 1984A:	\$0.80	-	P/E 1984E: 19.5x
1985E:	\$0.95	\$0.70	1985E: 22.3x
1986E:	\$1.45	\$1.20	1986E: 13.0x
Projected 5-year			Operating return on
growth rate:	39.6%		tangible assets:
Market proxy ROR1:	12.3%		Total debt/equity:
			16.5%
			5.2%
Company ROR1:	22.1%		Return on equity:
			11.4%
Market cycle beta:	2.22		Reinvestment rate:
			11.4%

Note: Fiscal year ends September 30.
 (*) DBL makes a market in this security.

POINT OF VIEW

The stock's price action during July suggested that the unreported quarter would be worse than the \$0.18 EPS we have been predicting. While we didn't know this for a fact, we were not that surprised by the weak quarter reported July 27.

The character of investing in Tandem has changed from when we recommended it six months ago. At that time we suggested a growth stock thesis based on the secular growth and proprietary position in transaction processing.

Subsequent developments have tended to disprove this thesis. No one is immune from an economic recession, including Tandem. But if the secular growth story was valid, the company should be doing better than it is. There would be diminished growth, not declines.

At this point, and at this price, Tandem is an investment in two developments: 1) A cyclical recovery in the computer business, like all the others; and, 2) financial strength.

Tandem has \$109 million in cash and practically no debt. At least \$80 million is not needed as far as we can see. We think Tandem should be buying its own stock at these prices. Whether such a sensible idea has occurred to them or not we can't say, but sooner or later this thinking could develop. In the alternative, the company could do something constructive with the cash.

The Quarter

Revenues were slightly up year-over-year but sequentially down - not a typical computer company pattern for the June quarter. With SG&A up \$7.5 million and revenues down \$2 million sequentially, it is not surprising that a minuscule operating profit was reported. Only with a tax credit could reported EPS reach \$0.06, versus our expectations of \$0.18.

Domestic vs. International

We have no exact figures but the U.S. has been weak and Europe strong. Tandem appears to have had special weakness toward the end of the quarter and some "firm" orders deferred. There was no particular change in the pattern of customers by industry type.

The best part of the quarter was that the new customer count was high. While Tandem no longer releases these figures, we believe it was in the mid-thirties.

Products

A lot of the revenue shortfall was new high-end TXP systems. Presumably this is a big ticket item most affected by budget-restrictions of customers. However, the new low-end EXT is off to a slower than expected start. Its early yet, and it may be Tandem hasn't learned enough yet about a new segment of the market.

Estimates

The fourth fiscal quarter ending September 30 should show some revenue gain and better expense ratios. Our preliminary estimate is that under these conditions the company could earn \$0.14 per share (plus or minus). There is no way that we can see last year's \$0.29 surmounted. On this basis, our new estimate is \$0.70 per share for fiscal 1985, versus our earlier estimate of \$0.95.

For the next fiscal year, there are no real yardsticks. On a revenue growth expectation of 16.5% and assuming tight expense controls, we come up with \$1.20 per share, which includes a down first fiscal quarter and easy compares thereafter. Pending better evidence, this is what we will open with -- more conservative than our previous \$1.45.

The Balance Sheet

On June 30, Tandem had \$109 million cash and the likelihood some part of the \$150 million receivables would turn into cash soon (revenues in the quarter were only \$144 million). Total long and short debt is under \$10 million, and cash exceeds all current liabilities. There are no major capital spending plans with excess capacity.

Our hope is that this impressive war chest can be utilized to the benefit of shareholders.

Data

The comparative income statement is shown below.

Third Fiscal Quarter to June 30

(Data in \$mill.)	1985	1984	% Change
Product Revenues	\$116.9	\$119.1	(1.8)
Service & Other	27.3	22.9	19.2
Total Revenues	114.2	141.9	1.6
Ratios:			
Cost of Rev.	38.9%	48.5%	
R&D	12.5%	9.5%	
SG&A	48.2%	39.7%	
Operating Profit	0.4%	10.1%	
Pretax Income	1.8	15.6	(88.5)
Pretax Margin	1.3%	11.0%	
Income Taxes	(0.6)	6.3	
Effective Tax Rate	credit	40.6%	
Net Income	2.4	9.3	(74.2)
Avg. Shares (mill.)	41.9	41.0	2.2
E.P.S.	\$0.06	\$0.23	(73.9)

Source: Company reports.

Last Research Abstract on Tandem Computers: May 28, 1985.

(*) DBL makes a market in this security.

Copyright
INVESTEXT/DATA PROCESSING
August 19, 1985

Tandem Computers, Inc. - Company Report
DONALDSON, LUFKIN & JENRETTE, INC. - Rooney, T.T.
07-26-85 (RN=508343)

TANDEM COMPUTERS, INC. (TNDM - 16 1/4)(*)

Sharply Lower Third Quarter Causes Reduction in FY 85 Estimates,
Strong Hold Recommendation Maintained

52-Week Range	Earnings Per Share			P/E Ratio		Dividend
	1984	1985E	1986E	1985E	1986E	
29-13	\$0.81	\$0.75	\$1.10	21.7	14.8	Nil

Shares outstanding: 41.9 million Market capitalization: \$680 million

July 26, 1985
DJIA: 1353.61
SPII: 213.97

Summary

The sharp variability that has characterized Tandem's quarterly results in the past was again evident in June as final numbers came in well below Street estimates. For the quarter, revenues rose to \$144.2 million, or only 1.6% over the revenues for the corresponding period a year ago (\$141.9 million) and declined 1.6% sequentially. The shortfall and budgeted-for increases in marketing substantially reduced operating profit, which totaled only \$540,000. Interest income of \$1.3 million and a \$550,000 tax credit made reported net income \$2.4 million, or \$0.06 per share. This per-share figure compares with \$0.23 a year ago and \$0.16 in the preceding period. Because this quarter was \$0.15-0.20 below our estimate and prospects for the fourth quarter are more restrained, we are lowering our FY 1985 estimate to \$0.75-0.80 per share from \$1.10. On the basis of our outlook for a cyclical pickup in the economy and Tandem's relative valuation, however, we are maintaining our strong hold recommendation on the shares.

Comments:

1. Revenues of \$160.2 million were about \$12.0 million of our estimate with most of the shortfall attributable to lower-than-projected sales of high-end TXPs and low-end EXTs. Product revenues totaled \$116.9 million, down 1.9% from levels of a year ago, and about \$15 million short of estimate. Service and support of \$27.3 million were up 19.7% from a year ago generally in line.

2. Gross margins were 61.1% compared with 59.3% a year earlier and 60.6% in the previous quarter.

3. R&D at \$18.0 million was up 33.4% from the corresponding period in FY 1984 and because of the revenue shortfall totaled 12.5% of revenues. The sequential increase here was only about \$0.4 million and again was generally in line.

4. SG&A posted the biggest surge, rising 23.5% year over year and 12.1% sequentially. For the period, SG&A represented an inflated 48.2% of revenues. Contributing to this surge in SG&A were new-product programs and the addition of new marketing personnel. Total employment has increased about 6.3% since the first of the year, with the most of that marketing related.

5. Liquidity further improved in the quarter, with cash rising by \$1.3 million to \$109.0 million. The driving factor here was a \$12.4-million decrease in accounts receivable, which went from 100 days in March to 94 days in June. Inventories rose by \$3.3 million principally because of the shipment shortfall; however, at 59 days, it remains well under control. Also noteworthy is that prepaid expenses rose by \$20.8 million from March, while payables held even; book value as of June 30 was \$9.73 per share.

Clearly, the June quarter has caused the variability issue to re-emerge at Tandem, but we believe that the shares at current levels reflect much of this concern. Furthermore, like most of the minicomputer manufacturers, Tandem's current ills will be quickly remedied by a cyclical pickup in the economy. Longer term, the company must become more competitive in the under-\$50,000 price segment, something that may not be an easy task given Tandem's architecture. Despite those issues, we nonetheless recommend that investors hold the shares at current levels. Our FY 1985 estimate is now \$0.75-0.80, while FY 1986 is now \$1.10.

Table 1
Tandem Computers, Inc.
Consolidated Statement of Income
(Dollars in thousands)

	Third Quarter 6/30			Nine Months 6/30		
	1985	1984	% Change	1985	1984	% Change
Revenues	\$144,165	\$141,925	+1.6%	\$450,307	\$379,530	+18.7%
CGS	56,116	57,787	-2.9	175,850	155,469	+13.1
Gross profit	\$88,049	\$84,138	+4.6%	\$274,457	\$224,061	+22.5%
R&D	18,027	13,514	+33.4	50,229	37,216	+35.0
SG&A	69,482	56,282	+23.5	191,476	153,619	+24.6
Total	87,509	69,796	+25.4	241,705	190,835	+26.7
Operating profit	\$540	\$14,342	-96.2%	\$32,752	\$33,226	+1.4%
Interest, net	1,298	1,243	+4.4	4,759	3,461	+37.5
Pretax profit	\$1,838	\$15,585	-88.2%	\$37,511	\$36,687	+2.2%
Taxes	(550)	6,335	NM	14,254	15,409	-7.5
Net profit	\$2,388	\$9,250	-74.2%	\$23,257	\$21,278	+9.3%
EPS	\$0.06	\$0.23	-73.9%	\$0.56	\$0.52	+7.7%
Shares out. (000)	41,896	41,039	+2.1%	41,530	40,919	+1.5%
% Sales						
Gross profit	61.1%	59.3%		60.9%	59.0%	
R&D expense	12.5	9.5		11.2	9.8	
SG&A expense	48.2	39.7		42.5	40.5	
Operating profit	0.4	10.1		7.3	8.8	
Pretax profit	1.3	11.0		8.3	9.7	
Tax rate	NM	40.7		38.0	42.0	
Net profit	1.7	6.5		5.2	5.6	

(*) DONALDSON, LUFKIN & JENRETTE SECURITIES CORPORATION MAKES A MARKET IN THIS SECURITY AND HAS PERIODIC POSITIONS IN THIS SECURITY IN CONNECTION WITH THIS ACTIVITY.

Jeffry Canin
August 9, 1985TANDEM COMPUTERS INCORPORATED (OTC-TNDM) \$15 7/8

52-Week Range	Mkt. Val. (mil.)	Year Ends September 30			Calendar P/E			Trend-Line Growth Rate
		1984A	1985E	1986E	1984	1985	1986	
\$13-29	\$665	\$0.80*	\$0.65	\$0.95	17	28	16	25%

* Excluding \$0.24/share DISC credit

DJIN: 1320.79 SPIN: 209.43

- Third quarter reported well below projections.
- Near-term expectations effect neutral investment rating.

	Third Quarter Results				Year to Date: 9 Months		
	6/30/85	6/30/84	% Chg	H&Q Estimate	6/30/85	6/30/84	% Chg
Revenues (mil.)	\$144.2	\$141.9	2%	\$155.0	\$450.3	\$379.5	19%
Pretax income (mil.)	1.8	15.6	(88)	12.0	37.5	36.7	2
Net income (mil.)	2.4	9.3	(74)	7.0	23.3	21.3	9
Earnings per share	\$0.06	\$0.23	(75)	\$0.16	\$0.56	\$0.51	9
Average shares (mil.)	41.9	41.0	2	42.4	41.8	41.5	1
Gross margin	61.1%	59.3%		60.0%	60.9%	59.0%	
Operating margin	0.4	10.1		6.8	7.3	8.8	
Pretax margin	1.3	11.0		7.7	8.3	9.7	
Tax rate	(29.9)	40.6		42.0	38.0	42.0	
Net margin	1.7	6.5		4.5	5.2	5.6	

Third Quarter Results

Tandem is the originator and leading supplier of fault-tolerant computers, marketing its line of **NonStop** systems for use in on-line transaction processing applications. The company reported disappointing results for its third fiscal quarter, the second quarter of sequentially down revenues, and one in which Tandem barely broke even on operations. Total sales of \$144 million were up marginally on a year-to-year basis (sales increased only as a result of higher service income) but fell 2% from the immediately preceding quarter. Gross margins of 61.1% were near record levels but were more than offset by a sharp ramp-up in operating expenses, both in absolute terms and in proportion to revenues, yielding an operating margin of only 0.4%. Tandem's sharp increase in operating expenses stemmed in part from the addition of 148 net new employees in the third quarter (following 181 new hires in the second quarter), bringing Tandem's total headcount to over 5,500. The excessive level is a result of both low manufacturing attrition and hiring in line with an overly ambitious top-line growth objective. The company's cash position at quarter-end was \$109 million, up slightly from the second quarter; accounts receivable of \$151 million represented 95 days outstanding, while inventory levels of \$95 million, or 151 days, were reported (a six-day improvement and seven-day extension, respectively, from the preceding quarter levels). EPS of \$0.06 were produced with the aid of a negative effective tax (owing to a partial reversal of first half taxes); a full tax rate of 40% would have yielded EPS of \$0.03.

The company attributed poor sales, significantly below levels indicated by management when we visited Tandem only two weeks before quarter end, to the impact of a strong dollar overseas and industrywide weak domestic bookings. Although Tandem

does not release revenue composition by product line, management suggests that the sales shortfall resulted principally from a fairly slow start in deliveries of the low-cost **NonStop EXT** system and from below-plan shipments of high-end **NonStop TXPs**. (However, **NonStop II-to-TXP** upgrades apparently were marginally ahead of plan.) One bright note in an otherwise lackluster quarter was the significant uptick in the number of new accounts (38) the company added to its installed base. In addition, as part of the "**Tandem Alliance**" program, 21 third-party software houses with industry-specific application packages were added, bringing the cumulative total to nearly 100.

During the quarter, Tandem announced several new products: the low-end, compact **NonStop EXT**; an enhanced performance version of the company's **GUARDIAN** operating system; and a set of networking and office automation software packages. Tandem's **EXT** offers equivalent performance to and compatibility with the company's **NonStop II**, but it doesn't require a computer room environment. Unit priced at \$120,000 (roughly 30% below a comparable **NonStop II**), the **EXT** will be sold both by Tandem directly and through a newly created vertical market reseller program. **GUARDIAN 90**, representing an estimated 60% rewrite of the Tandem operating system, offers significantly enhanced performance, estimated by management to be a four- to fivefold throughput improvement for batch applications and at least a 50% improvement for on-line programs utilizing Tandem's **Transaction Monitor Facility**. In June, the company announced its **Information Management Technology** offerings, five software packages designed to enable Tandem users to interconnect and network among Tandem host processors and various terminals, personal computers, and facsimile machines. Concurrently, the company announced an OEM and technology licensing agreement with Sytek to offer broadband local area networking to Tandem accounts. Other recent product announcements include color versions of the company's **Dynamite** workstation and reduced-price **NonStop** memory boards. We expect a series of near-term enhanced peripheral announcements and, more importantly, replacement models (presumably based on CMOS gate array technology) to be introduced over the next twelve months for both the low and high ends of Tandem's processor line.

Financial Expectations and Investment Opinion

In light of its poor third quarter performance, Tandem has taken a number of measures to reign in expenses, including a one-week paid vacation in the fourth quarter for all employees, a hiring freeze, and a three-month deferral on salary increases. Additionally, in response to its historically poor ability to project quarterly business, Tandem will adopt new statistical analysis techniques that it hopes will result in improved forecasting. Although we believe Tandem will retain its position as the predominant vendor of fault-tolerant computers, benefiting from the recent demise of several private would-be contenders and, to an extent, from the IBM/Stratus liaison (which we believe has eliminated the specter of a near-term competitive IBM proprietary offering), we do not envision a business turnaround in the next couple of quarters. We are anticipating flat year-to-year revenues in the fourth quarter (of \$153 million), with a 65% decrease in EPS to \$0.10; our fiscal 1986 estimates assume only a 20% annual increase in sales and operating margins that will remain below 10% of revenues. Given the company's current operating plan, we expect the fourth quarter to be cash-flow positive; additionally, we anticipate modest improvements in receivables and inventory levels. In 1984, Tandem reported \$0.80 in EPS on sales of \$533 million. Our revised estimates call for sales of \$603 million, yielding EPS of \$0.65 in fiscal 1985 (a down bottom line after four relatively flat years) and fiscal 1986 revenues of \$725 million and EPS of \$0.95. We believe Tandem shares are fully valued at present price levels and advise investors to defer purchase, pending greater business visibility.

NOTE a

MARTIN SIMPSON & COMPANY FOCUS LIST

Company	Date Added	Price 6/28/85	Potential 3-5 Yr. Sec. Growth Rate	Earnings Per Share Calendar Years			1987 Price Earnings Multiples	Target Two-Year Price Objectives	Two-Year Potential Appreciation
				1985E	1986E	1987E			
C.R. Bard	5/30/85	\$ 35	14%	\$ 2.70	\$ 3.05	\$ 3.50	15x	\$ 53	51%
Cray Research	4/1/85	85	27	4.00	5.00	6.25	22	138	62
IBM	2/1/84	124	15	10.80	12.75	15.00	15	225	81
Intergraph	10/1/84	31	30	1.50	2.05	2.65	20	53	71
Norsk Data	1/31/85	39	35	2.40	3.00	3.80	18	68	75
Stratus Computer	5/30/85	15	50	0.45	0.75	1.10	25	28	83

Additional information for companies on the Focus List is available on request.

Techviews July 1, 1985

Technivews 7/1/85

SUMMARY OF EARNINGS ESTIMATE CHANGES

	<u>Fiscal Year</u> <u>Ending</u>	<u>Previous Estimates</u>		<u>Revised Estimates</u>		<u>Previous</u> <u>Recommendation</u>	<u>Current</u> <u>Recommendation</u>
		<u>FY 1985</u>	<u>FY 1986</u>	<u>FY 1985</u>	<u>FY 1986</u>		
<u>Computer Systems</u>							
Burroughs	12/31	\$ 6.00	\$ 7.15	\$ 5.60	\$ 6.60	B	B
Honeywell	12/31	6.65	7.25	5.90	6.50	H	H
IBM	12/31	11.00	13.00	10.80	12.75	B	B
<u>Minicomputers & Peripherals</u>							
Data General	9/30	2.00	3.00	1.00	2.00	B	B
Digital Equipment	6/30	6.25	7.95	6.15	6.50	H	H
Norsk Data	12/31	2.25	2.80	2.40	3.00	B	B
Tandem	9/30	1.00	1.35	0.90	1.20	H	H
<u>Microcomputers & Workstations</u>							
Altos	6/30	0.79	1.05	0.77	1.00	B	B
Apollo	12/31	1.10	1.40	0.95	1.25	B	H
Apple	9/30	1.05	1.25	0.75	NC	H	H
<u>Specialty Electronics</u>							
Vicon Industries	9/30	0.85	1.05	0.60	0.90	B	B
<u>Telecommunications</u>							
General Datacomm	9/30	1.05	1.30	0.90	1.20	B	B
Paradyne	12/31	0.60	1.00	0.40	0.90	B	B
<u>Computer Graphics</u>							
Auto-trol	12/31	(0.10)	0.30	(0.50)	0.25	H	H
Valid Logic	12/31	0.55	0.80	0.50	0.75	H	H
<u>Business Forms & Checks</u>							
Moore Corporation	12/31	1.70	1.85	1.65	NC	H	H
<u>Hospital Supplies</u>							
Johnson & Johnson	12/31	3.40	3.85	3.35	NC	B	B
<u>Hospital Management</u>							
American Hospital Supply	8/31	2.20	2.55	2.25	2.60	H	B

A: Actual
NC: No change in estimate

Techviews 7/1/85

ANNUAL EARNINGS PER SHARE

	Analyst	Quality Rating	1 Yr. Rec.	Price 6/28/85	Fiscal Year	1982	1983	1984	1985E	1986E	P/E	
											1985	1986
COMPUTER SYSTEMS												
Burroughs	FH	III	Buy	\$59	12/31	\$2.80	\$4.60	\$5.40	\$5.60	\$6.60	11 x	9 x
Cray Research	FH	II	Buy	85	12/31	1.38	1.77	2.65	4.00	5.00	21	17
Honeywell	FH	III	Hold	62	12/31	4.61	5.46	6.29	5.90	6.50	11	10
IBM	FH	I	Buy	124	12/31	7.39	9.04	10.77	10.80	12.75	11	10
NCR	FH	III	Hold	31	12/31	2.19	2.64	3.00	3.15	3.50	10	9
Sperry	FH	III	Hold	53	3/31	5.25	2.65	3.86	4.66 A	5.60	11	9
MINICOMPUTERS & PERIPHERALS												
Data General	LES	II	Buy	37	9/30	0.92	0.97	2.60	1.00	2.00	37	19
Dataproducts	RSA	III	Buy	13	3/31	0.37	0.70	1.26	1.32 A	0.15	10	87
Digital Equipment	MS/LES	II	Hold	94	6/30	7.53	5.00	5.73	6.15	6.50	15	14
Norsk Data	LES	III	Buy	39	12/31	0.94	1.52	1.90	2.40	3.00	16	13
Prime Computer	LES	II	Hold	19	12/31	0.99	0.68	1.09	1.15	1.50	17	13
Printronix	RSA	III	Hold	11	3/31	1.34	1.52	1.70	1.26 A	0.25	9	44
Stratus Computer	LES	IV	Buy	15	12/31	(\$0.30)	0.10	0.22	0.45	0.75	33	29
Tandem Computers	LES	II	Hold	18	9/30	0.76	0.76	0.81	0.90	1.20	20	15
Wang Laboratories B	LES	II	Hold	18	6/30	0.88	1.16	1.52	0.38	1.00	47	18
MICROCOMPUTERS & WORKSTATIONS												
Altos Computer Systems	PR	IV	Buy	11	6/30	0.50	0.58	0.65	0.77	1.00	14	11
Apollo Computer	PR	III	Hold	20	12/31	0.01	0.37	0.75	0.95	1.25	21	16
Apple Computer	LES	IV	Hold	18	9/30	1.06	1.28	0.97	0.75	1.25	24	14
Convergent Technologies	PR	IV	Hold	7	12/31	0.42	0.40	(\$0.02)	0.20	0.60	35	12
COMPUTER SERVICES & SOFTWARE												
Automatic Data Processing	RSA	II	Hold	53	6/30	1.71	1.86	2.14	2.45	2.80	22	19
Cullinet Software	RFR	II	Hold	27	4/30	0.28	0.40	0.54	0.81	1.05	33	26
Quotron Systems	RSA	III	Hold	11	12/31	0.52	0.69	0.78	0.90	1.20	12	9
Reynolds & Reynolds	RSA	III	Sell	42	9/30	1.66	2.50	3.61	4.00	3.75	11	11
CONNECTORS												
AMP	CMB	I	Hold	32	12/31	1.10	1.52	1.87	1.25	1.70	26	19
Augat	CMB	III	Sell	22	12/31	1.26	1.50	1.37	0.95	1.20	23	18
Burndy	CMB	III	Sell	12	12/31	1.27	1.01	1.07	0.95	1.05	13	11
Thomas & Betts	CMB	II	Hold	35	12/31	1.52	1.74	2.45	2.45	2.85	14	12
INSTRUMENTS												
John Fluke Manufacturing	MS	III	Hold	25	9/30	0.95	1.16	1.71	1.95	2.25	13	11
Hewlett-Packard	PR	I	Hold	35	10/31	1.52	1.69	2.13	2.05	2.40	17	15
Tektronix	RFR	II	Hold	61	5/31	4.25	2.57	4.44	4.50	4.75	14	13
SPECIALTY ELECTRONICS												
...V. Philips (i)	MS	II	Buy	15	12/31	1.50	1.42	1.74	1.80	2.00	8	8
Sensormatic	MS	III	Buy	8	5/31	0.67	0.92	0.65	0.25	0.45	32	18
Times Fiber Communications	MS	III	Hold	12	12/31	0.78	0.56	(\$0.11)	0.50	0.80	24	15
Vicon Industries	RSA	III	Buy	6	9/30	0.34	0.56	0.61	0.60	0.90	10	7
Xerox Corporation	MS/RSA	III	Hold	53	12/31	4.34	4.68	3.42	3.90	4.25	14	12

Techviews 7/1/85

QUARTERLY EARNINGS PER SHARE

	Fiscal Year Ending	First Quarter Act.	Quarter Act.	Second Quarter Act.	Quarter Est.	Third Quarter Act.	Quarter Est.	Fourth Quarter Act.	Quarter Est.	Fiscal Year Act.	Year Est.
COMPUTER SYSTEMS											
Burroughs	Dec./84-85	\$0.95	\$1.03	\$1.26	\$1.00	\$1.11	\$1.10	\$2.08	\$2.47	\$5.40	\$5.60
Cray Research	Dec./84-85	0.39	2.05	0.27	0.38	0.92	0.87	1.07	0.70	2.65	4.00
Honeywell	Dec./84-85	0.96	1.00	1.70	1.00	1.28	1.25	2.35	2.65	6.29	5.90
IBM	Dec./84-85	1.97	1.61	2.65	2.35	2.60	2.45	3.55	4.39	10.77	10.80
NCR	Dec./84-85	0.43	0.43	0.73	0.73	0.65	0.66	1.23	1.33	3.00	3.15
Sperry	Mar./85-86	0.77	0.95 E	0.68	0.85	1.32	1.50	1.89	2.30	4.66	5.60
MINICOMPUTERS & PERIPHERALS											
Data General	Sep./84-85	0.40	0.87	0.55	0.34 A	0.71	(\$0.21)	0.85	0.00	2.60	1.00
Dataproducts	Mar./85-86	0.42	(\$0.40)E	0.26	(\$0.05)	0.52	0.25	0.12	0.35	1.32	0.15
Digital Equipment	June/85-86	1.38	1.00 E	1.81	1.50	1.52	1.60	1.44 E	2.40	6.15 E	6.50
Prime Computer	Dec./84-85	0.21	0.25	0.27	0.26	0.30	0.29	0.31	0.35	1.09	1.15
Printronic	Mar./85-86	0.44	(\$0.15)E	0.46	(\$0.10)	0.26	0.20	0.10	0.30	1.26	0.25
Stratus Computer	Dec./84-85	0.04	0.08	0.04	0.09	0.06	0.12	0.08	0.16	0.22	0.45
Tandem Computers	Sep./84-85	0.24	0.34	0.05	0.16 A	0.23	0.18	0.29	0.22	0.81	0.90
Wang Laboratories B	June/85-86	0.36	0.00 E	0.40	0.20	0.12	0.35	(\$0.50)E	0.45	0.38 E	1.00
MICROCOMPUTERS & WORKSTATIONS											
Altos Computer Systems	June/85-86	0.25	0.21 E	0.12	0.23	0.18	0.26	0.22 E	0.30	0.77 E	1.00
Apollo Computer	Dec./84-85	0.13	0.26	0.17	0.22	0.20	0.22	0.25	0.25	0.75	0.95
Apple Computer	Sep./84-85	0.10	0.75	0.15	0.16 A	0.30	(\$0.24)	0.42	0.08	0.97	0.75
Convergent Technologies	Dec./84-85	0.09	0.01	0.11	0.02	0.07	0.06	(\$0.26)	0.11	(\$0.02)	0.20
COMPUTER SERVICES & SOFTWARE											
Automatic Data Processing	June/85-86	0.44	0.50 E	0.57	0.65	0.73	0.85	0.71 E	0.80	2.45 E	2.80
Cullinet Software	Apr./85-86	0.18	0.22 E	0.20	0.25	0.21	0.27	0.22	0.31	0.81	1.05
Quotron Systems	Dec./84-85	0.20	0.17	0.20	0.22	0.19	0.25	0.19	0.26	0.78	0.90
Reynolds & Reynolds	Sep./84-85	0.77	0.88	0.88	1.02 A	0.94	1.00	1.01	1.10	3.61	4.00
CONNECTORS											
AMP	Dec./84-85	0.50	0.29	0.54	0.30	0.46	0.27	0.37	0.39	1.87	1.25
Augat	Dec./84-85	0.43	0.22	0.42	0.22	0.27	0.20	0.25	0.31	1.37	0.95
Burndy	Dec./84-85	0.27	0.17	0.27	0.23	0.24	0.25	0.29	0.30	1.07	0.95
Thomas & Betts	Dec./84-85	0.63	0.53	0.69	0.64	0.61	0.61	0.52	0.67	2.45	2.45
INSTRUMENTS											
John Fluke Manufacturing	Sep./84-85	0.36	0.47	0.41	0.47 A	0.47	0.50	0.48	0.51	1.71	1.95
Hewlett-Packard	Oct./84-85	0.39	0.45	0.57	0.51 A	0.52	0.48	0.65	0.61	2.13	2.05
Tektronix	May /84-85	0.71	0.92	0.66	1.14 A	1.34	1.38 A	1.73	1.06	4.44	4.50
SPECIALTY ELECTRONICS											
Sensormatic	May /84-85	0.28	0.10	0.20	0.07	0.06	0.05 A	0.12	0.03	0.65	0.25
Times Fiber Communications	Dec./84-85	0.10	0.13	0.02	0.12	(\$0.28)	0.10	0.05	0.15	(\$0.11)	0.50
Vicon Industries	Sep./84-85	0.16	0.18	0.13	0.19 A	0.18	0.08	0.14	0.15	0.61	0.60
Xerox Corporation	Dec./84-85	1.24	1.06	0.91	1.10	0.76	0.90	0.51	0.84	3.42	3.90

Minicomputers & Peripherals

Le-ellen Spelman (212) 406-5212

Company	Symbol	Price 6/28/85	Estimated E.P.S.		One-Year Recommendation
			FY 1985	FY 1986	
Norsk Data	NORKZ	\$39	\$2.40	\$3.00	BUY
Stratus	STRA	15	0.45	0.75	BUY
Prime	PRM	19	1.15	1.50	HOLD
Data General	DGN	37	1.00	2.00	BUY

While most of the minicomputer vendors have experienced a sharp drop-off in demand, Norwegian-based Norsk Data continues to build momentum. On a preliminary basis, it appears that orders were up 70% in the first half versus the comparable period last year. Unlike its U.S. counterparts, Norsk sees no signs of a recession in the European computer industry - an observation confirmed by Nixdorf and Olivetti as well. Revenues and profits appear to be well ahead of plan (Norsk will report first half results in August) and thus we have raised our estimates to \$2.40 and \$3.00, from \$2.25 and \$2.80, for 1985 and 1986 respectively. We continue to recommend purchase of the shares.

Incoming business at Stratus continues to be very strong, with the company unaffected by the current computer industry slowdown. Orders from IBM are building momentum and should account for 10-20% of total revenues this year, and possibly as high as 40% in 1986. The current quarter should come in on plan, at \$0.09 in earnings per share, versus \$0.04 a year ago. We continue to believe that Stratus has an excellent franchise in the fault-tolerant market. The recent collapse of Auragen and Synapse, two start-ups in this area, underscores Stratus' achievement. Our estimate for the year is unchanged at \$0.45 per share and we recommend purchase of the shares.

Prime's minicomputer business is holding up comparatively better than many of its peers, largely due to a strong product cycle and end-user orientation. The company is continuing to hire quite aggressively at a time when many vendors have instituted lay-offs. The sales force was expanded by 8% this quarter, following gains of 10%, 12% and 9% in the three preceding periods. While this expansion will benefit Prime when orders rebound, it could result in significant margin pressure if the industry remains in a slump. Prime's international business continues to be very strong, with no slowing in sight, while the domestic side is still sluggish, with the sales cycle still lengthening. The top-end 9955 is doing very well, and is making up for the slump in the mid-range. Second quarter earnings should be slightly ahead of the \$0.25 per share reported in the first quarter, but no higher than the \$0.27 earned in the year earlier period. Our estimate for the full year remains at \$1.15, versus \$1.09. We expect the stock to be an average performer in coming months.

For the first time as a public company, Data General is expected to report a loss from operations. Weak incoming orders which, if anything, have deteriorated recently, have forced the company to dismiss 7% of its work force, or 1,300 employees. While severance benefits will result in a one-time cost to the company of \$4-5 million, in our estimation, employment reductions will save about \$35 million, or more than \$1.00 per share, in annual

Tandem Business Information Center

**CORPORATE
INFORMATION CENTER**

Copyright
INVESTTEXT/DATA PROCESSING
June 10, 1985

Tandem Computers - Company Report
PRUDENTIAL BACHE SECURITIES INC. - Muratore, C.E., et al
05-13-85 (RN=505433)

Tandem Computers

* Company visit encouraging: management actions constructive.

* Accelerated growth rate and predictable earnings may still be 6-12 months away.

* Rating unchanged at 3-3. E.P.S. estimates \$1.10 for FY85 and \$1.40 for FY86.

TNDM (22 7/8) -- OTC

Earnings Per Share			P/E	Ind.	Yield	Opinion		Shares O/S (mil.)	52- Week Range
Fiscal Year Ending						N	L		
9/84	9/85E	9/86E	1985E	Div.					
\$0.81	\$1.10	\$1.40	20.8X	--	--	3	3	42.2	29-13

DJIA: 1274.18
S&P 400: 184.28

Priced as of the close, May 10, 1985.

Opinion Legend:

- N = Up to 6 Months
- L = 6 to 18 Months
- 1 = Aggressive Purchase
- 2 = Accumulate
- 3 = Average Performer
- 4 = Swap
- 5 = Sell

While we are not changing our 3-3 rating, our visit last week with Tandem management was encouraging. We have been concerned that the steps necessary to regain lost momentum in product introductions and revenue growth were not being taken. Tandem has tremendous value-added in its technology for on-line transaction processing and a happy if small (900 customers) customer base. To take advantage of its still unique strengths in transaction processing, networking and database management, however, Tandem needed to address some basics: broaden the product line; expand applications software library; become more price competitive to gain new customers and maximize revenues from existing ones.

Implementation is still a risk; another 6-12 months may be required for product line and applications software deficiencies to be remedied. We do not think that revenue growth above the current 25%-30% level or more predictable quarterly earnings can be achieved before then. Our earnings-per-share estimates are \$1.10 for fiscal 1985 and \$1.40 for fiscal 1986. We are hopeful that Tandem can become a long-term player as a profitable company. The market potential for on-line transaction processing is largely untapped; Tandem has a solid technology base and is clearly not a "me-too" vendor. Its future will not be market or competitor constrained; it will depend on the company's own actions.

Management appears to be tackling the issues which have been constraining its growth. While it is too early to declare the transition completed, Tandem has made progress identifying areas for action. Their assessment is realistic and their plans appropriate.

Among actions already instigated:

- * Formal financial controls, planning and forecasting, which are described by the company as still at a rudimentary level. Continuing effort is being expended in this area.

- * R&D efforts productized for next two years:

- Low-end, entry-level system: a departmental computer.

- High-end processor.

- Standard interfaces: enhanced SNA, including Document Interchange and Document Content architectures for supporting IBM office systems protocols; European and American local and wide area communications standards; gateways to other vendors; General Motors' MAPS standard for factory automation.

- Network management and control software.

- Additional languages: C, PASCAL, and ADA.

- Data base enhancements for improved system performance.

- Fourth generation languages for easier program creation.

- By June: new release of operating system with improved performance in batch and TMF (fault-tolerant) operations; professional support services software (IBM PC connectivity to Tandem mail and message products).

- * Third-party software houses doubled in last 15 months; expected to double again.

- * Identification of strategic market segments and penetration plans by segment.

* Efforts to improve quality of sales and sales management.

* A constructive focus on competitive pressures.

Tandem will be organizing its product development and marketing efforts around targeted market segments: manufacturing; banking; telecommunications; point-of-sale; airlines; and Federal government. The company is identifying product, marketing and support requirements for each segment. There has been solid progress on elementary level; successful execution is needed over the next year. The new awareness at Tandem headquarters needs to be transmitted effectively to its field organization.

Prudential-Bache Securities makes a primary over-the-counter market in the shares of Tandem Computer.

Tandem Business Information Center

CORPORATE
INFORMATION CENTER

Copyright
INVESTEXT/DATA PROCESSING
June 17, 1985

Tandem Computers, Inc. - Company Report
DREXEL BURNHAM LAMBERT INCORPORATED - Labe, P.
05-28-85 (RN=505949)

POINT OF VIEW

Tandem is gradually getting its product house in order, both hardware and software, and does not face an exceptional degree of competition. While there will be more spending for the future in the next two quarters, the outlook for fiscal 1986 as the fruition of these programs occur looks good, as well as the longer-term outlook. We are maintaining our BUY rating on the stock.

Hardware

Tandem is today a three product company: the high-end TXP processor, the mid-range NonStop II, and the newly (last month) announced EXT. It is too early to accurately predict the EXT, but there are several multiple-hundred order programs in the mill and we expect very big business from existing Tandem users who could buy these as cheap network nodes. Right now, we feel optimistic on this program. The V8 disk program, announced several months back, has been a major success. The terminal/workstation area seems to be progressing, even though the new Dynamite workstation is probably four months behind plan. The software to work it is now available and we expect better results in the months ahead.

This is a good lineup of products and the entry level EXT is important - both in Europe, which is more price-sensitive, and as a VAR (valued-added remarketer) product here quite apart from the user base.

In early 1986, we expect the first Tandem processor built with gate array technology (some components, like tape controllers, are already implemented in LSI gate arrays) which will help, although a new truly high-end machine appears to be more like 1987.

Software

The most important near-term development expected is the B-double zero release of the operating system, expected to be free of existing customers with prerequisite software and priced in a package for new users, which should enhance Tandem processor performance very significantly in some applications.

We are also expecting over the next several months more office automation software, including remote facsimile support and new electronic mail packages.

In the applications area, several things are happening. The third-party software development program is moving ahead. Six new

software houses were added last quarter and three systems integrators. Tandem now has a total of 68 software houses, 17 OEMs, and three systems integrators in its program. Over the next 12 months, we should be seeing more and more applications packages from this group. The second thing has been that Tandem has focused on lines of business and is making decisions as to what will be developed internally, what externally, and of the external pieces, trying to be selective and select only larger prestigious organizations to do the software writing. These are more readily identifiable to customers and easier to sell.

The two areas where Tandem perceives itself not be fully up to snuff is in application generators or tools, and in gateways in the office environment. The customer wants to know he can interface into Ethernet, Starlan, etc. whether or not he has any present intention to do so. We believe Tandem is moving rapidly to plug these holes but we doubt if these will be in place before fiscal 1986.

Competition

The IBM System 88 so far has not been much of a factor. This is the Stratus FT 250 repackaged and sold under the IBM label. IBM sells it for a higher price than Stratus, and does not claim IBM SNA compatibility. It has been bid, usually as a last resort, by IBM in a few identifiable places so far without success. The IBM agreement adds credibility to Stratus, but Tandem should win competitions on the merits. This was true in the past as well, when Tandem consistently won the bulk of competitions.

The recent announcement of ACI, a major Tandem software house, that it would write programs for Stratus, should not be viewed with alarm but more in the context it would be a prudent thing to do for a software firm specializing in transactions - in case Stratus should be quite successful.

Financials

Tandem is not going overboard on cost controls but is selectively hiring -- what we call "careful hiring." High-growth areas need more people and some modest buildup is needed. Near-term, the key is volume. The company needs \$175 million this quarter to make a consensus-type \$0.30 per share estimate factoring in cost expectations. This would be a nice rebound from the \$0.16 reported last quarter and well up from last year's \$0.23 per share. It is simply too early to make this determination, especially with sluggish conditions throughout the computer industry, but we remain optimistic. We are not making any changes in our \$1.20 EPS estimate for fiscal 1985 nor in our \$1.70 for fiscal 1985.

Stock Performance/Opinion

Tandem stock has rebounded nicely from the excessive lows as last quarter's expectation were reduced. We expect the stock to basically mill around for awhile until the current quarter can be perceived more

clearly, and investors get greater confidence of the prospects for fiscal 1986 and beyond. We are maintaining our Buy rating on the stock.

This article originally appeared in Computer Talk dated May 20, 1985

Last Research Abstract on Tandem Computers: May 7, 1985

(M) - DBL makes a market in this security.

Tandem Business Information Center

CORPORATE
INFORMATION CENTER

Copyright
INVESTTEXT/DATA PROCESSING
June 10, 1985

Tandem Computers - Company Report
DREXEL BURNHAM LAMBERT INCORPORATED - Labe, P.
05-07-85 (RN=505292)

TANDEM COMPUTERS (M)
(TNDM - \$20 3/8)

Reducing Estimates Slightly,
Maintain BUY Rating

Rating:	BUY	Shares outstanding:	41.4 million
52-Week Range:	29-13	Dividend:	None Yield None

	From	To	
EPS 1984A:	\$0.80	-	P/E 1984A: 25.5x
1985E:	\$1.25	\$1.20	1985E: 17.0x
1986E:	\$1.75	\$1.70	1986E: 12.0x

Projected 5-year growth rate:	32.7%	Operating return on tangible assets:	16.5%
Market proxy ROR1:	12.5%	Total debt/equity:	5.2%
Company ROR1:	1.3%	Return on equity:	11.4%
Market cycle beta:	2.22	Reinvestment rate:	11.4%

Fiscal Year Ends September.

POINT OF VIEW

Quarter as generally expected, but revenues a bit light. Shaving estimates slightly but consider product positioning now to be quite strong. Maintain our BUY rating.

DISCUSSION

Tandem's operating results for the second fiscal quarter ended March 31, 1985 were released recently. Earnings per share of \$0.16 were in agreement with our most recent expectations, although below our early line on the quarter. We were, however, moderately disappointed with \$146 million in revenues; early on, we had been hoping for \$8-10 million higher.

The revenue picture reflects, we believe, a shortfall in upgrades to the high-end TXP processor and a slow start in the Dynamite series of workstations/terminals in a product sense, and the strength of the dollar and a little bit of weakness attributable to the general computer industry environment. We cannot help but feel there was some shortfall at the NonStop II and low-end product level due to the widely leaked expectations of a new Tandem low-end product; the early April introduction of the EXP system probably held up some orders.

The profit margin picture was affected by a net new hiring of 181 people, the costs associated with new product introductions, and increased advertising expense.

The balance sheet remains very strong, with \$108 million cash, about \$18 million in total debt including capitalized leases, and \$403 million in equity.

Although Tandem no longer releases new customer count, we believe the quarter was strong and above a year ago and the quality of customer was also good.

The hardware product line is now well set with the EXT announcement, with three processor lines and the V8 disk, with appropriate terminals. What remains is the major operating systems software release, which we expect shortly and which should enhance the performance of all Tandem systems. Over the next 12-18 months, the fruits of the third-party software development program begun some 18 months ago should bear fruit in more application software availability. The stage should be well set for growth. We have tried to take account of the current slower spending environment against these positives and have only slightly moderated our forecast for fiscal 1985. We are now at \$670 million in revenue and \$1.20 per share in earnings (versus our earlier estimate of \$1.25).

The company appears to be more cautious and gearing down expenses for a more conservative growth rate, like 25%. We believe a lot of analysts will be gearing down accordingly and probably winding up with \$1.40-\$1.50 per share forecasts. In our view, the company gearing down to lower volume levels is a positive, because all the signs of exceeding the volume target are there while the expenses will be low. We believe revenue can be up close to 30% in fiscal 1986 and are using a figure of \$855 million, with EPS likely to be up over 40%. We are now using \$1.70 per share as a single-point figure rather than \$1.75 as before.

We feel good about Tandem and retain our Buy rating. The stock has over-reacted, in our view. Moreover, we consider the IBM System/88 announcement extremely positive. The more people IBM tells that Tandem has been right for the past 10 years the better, and on the merits, Tandem should have no problems dealing with a fault-tolerant minicomputer.

Last Research Abstract on Tandem Computers: April 23, 1985

(M) DBL makes a market in this security.

<<>>

Tandem Business Information Center

Copyright
INVESTEXT/DATA PROCESSING
February 4, 1985

Tandem Computers Inc. - Company Report
DREXEL BURNHAM LAMBERT INCORPORATED - Labe, P.
01-04-85 (RN=500586)

Tandem Computers Inc. (*)
TNDM - OTC - BUY

Outlook Improving

Price	52-Week Range	Earnings Per Share (**)			P/E Ratio	
		1984	1985E	1986E	1985E	1986E
\$18	\$40.13	\$0.80	\$1.25	\$1.75	14.4	10.2
	Yield			Return on Equity		
	None			9.7%		

(*) Drexel Burnham Lambert Incorporated makes a market in this security.
(**) Fiscal year ends September 30th.

POINT OF VIEW

Tandem, the world's largest vendor of fault-tolerant systems optimized for transaction processing, was a disappointing stock in early 1980s due to a combination of too-high valuation and not enough growth, and more recently, due to erratic operating performance. The stock, now half its high last year, appears to us to have overreacted. We believe the following:

- (1) The potential market is large and growing, with very limited direct competition.
- (2) The company has greatly improved its product line and competitiveness.
- (3) Drastic improvement is in evidence in financial controls, and more recently, in cost control.
- (4) Investors appear to have given up on a 30% growth rate, and could be surprised over the next few years.
- (5) We recommend purchase of Tandem stock for intermediate-term investors who can withstand above average volatility.

BACKGROUND

In the fiscal year ended September 30, 1984, Tandem had revenues of \$533 million, divided 84% equipment sales, and 16% service and other. The company announced its first computer system product, the NonStop I, in 1975, after having been founded in 1974 by a group that previously had been associated with Hewlett-Packard Corporation. The company became publicly-owned in December 1977 and through fiscal 1981 reported spectacular growth, practically doubling every year. Operating margins in the 16%-20% range were customarily reported, reflecting the relatively proprietary nature of the company's product and strong acceptance by users.

Since then, a variety of problems overtook the company. Apparently encouraged by early success, the company expanded too rapidly and even today has significant overcapacity. Far too much of the business was done in the closing weeks of a quarter, with tremendous pressure on orders and shipments. Inventories and receivables typically were high, and the company consumed cash. The turnover of executives accelerated, and overall personnel turnover increased. Revenue growth slowed to 50%, then 34% and last year, 27%. Margins declined, and earnings flattened.

One result has been virtually no earnings growth for the last three consecutive fiscal years. Perhaps more than any other single event though, the unexpectedly disastrous March quarter a year ago hurt investors. In the December quarter, Tandem had earned \$0.24 per share and in October introduced a hot new product, the TXP, and most investors expected that the following quarter would be sequentially up -- not the \$0.05 per share that was reported. The explanation that the company was seeing "mainframe" seasonal-type spending patterns by users didn't sit that well with investors, who were unprepared. Not only were estimates marked down, but longer-term growth rate assumptions were reexamined and reduced. From a peak of \$40 1/4, the stock was marked down to a low of 13.

Tandem still doesn't operate with any backlog to speak of, but then neither does anyone else in the industry these days. However, there are reasons to expect stronger performance, without any guarantees everything will be smooth. If we look at today versus five years ago, it may be more apparent.

	5 Years Ago	Today
Processors	One Product: Nonstop I	Three products: NonStop I Nonstop II TXP
Disk	Ampex/CDC Conventional drives	Fujitsu high reliability drives plus standard drives
Terminals	any	any plus self-manufacture Tandem 65xx line, incl. recent "Dynamite" with IBM-PC compatibility
Software	operating system	operating system high level languages report writers networking SNA compatibility distributed data base
Inventories	high	low
Receivables	fair	good
Cash	poor	outstanding
User perception	product aging	product leadership
User awareness	growing	established
Strategy	sell/sell/sell	market

In short, we think we see a very different company today, one that is more disciplined and more controlled and one that understands not only the opportunities but also the problems.

So much for a thumbnail background. We turn next to the opportunities, and the risks as well.

Opportunities

Tandem's computer architecture has some peculiar features. It is optimized for rapid processing of "transactions," which are typically described in a limited number of data fields with relatively streamlined instruction sets; Tandem primarily uses 16-bit wordlength though its more recent products have 32-bit internal structure. This is not a drawback in this market, and in fact most studies conclude Tandem has a performance advantage over other equipment in these types of applications. Tandem also has parallel processors connected by a high-speed bus to checkpoint back and forth, so that a high degree of fault tolerance is achieved; moreover, this duality is carried through to disk controllers and disk. While this is a catchy idea, it is not really worth much in today's environment, but nonetheless handy to have. Data processing managers do, however, love the high degree of data integrity that Tandem systems provide. And, the painless and easy modular expansion -- truly linear -- up to 16 processors is very advantageous.

On top of this still-unchallenged architecture, Tandem over the years has developed as broad a range of operating system software and utility programs as most people might want. A typical Tandem sale in the old days was a pair of processors to a user, who would then spend 9-12 months developing his application, and then purchase more units the following year to implement his application and continue to grow over time. The modularity of the product got around the argument that Tandem was a one-product company.

The difficulty that Tandem eventually ran into was several fold:

1. Competition, even with vastly less sophisticated solutions, improved their transaction performance.
2. Users, partly unsold by competitors, became less willing to devote enough programmer support to do the applications unless the case was overwhelming.
3. High-performance products carried a higher initial sale price and a higher ultimate commitment, leaving a void at the bottom.

Tandem's response was to offer a leadership product (TXP) and regain image with users, and broaden the product line with lower level entry points. Anywhere in the computer business, getting installed is always a step in selling more to an account. Ancillary product support in the peripherals was stepped up. And, most of all, the company finally began to strongly encourage third-party software support. This is the key to the 1980s in the industry since the more applications

that can be written on Tandem, the greater the potential market. A single application can be ported to a large number of users rather than one of a kind, and the user is much more easily sold if a "canned" packaged is readily observable and referenceable.

The computer world has been moving from "batch" to "on-line" for more than a decade. Studies suggest that we have moved from maybe 10% on-line to 60-70% today. What portion of this is "transaction" oriented is anybody's guess, but it is clearly a multi-billion dollar market. We do not consider Tandem at its present size in any way limited by size of market.

Problems

We have already alluded to the principal problem. Most every entity has a computer today. The installed vendor is always going to resist any intrusion, and fight for any new applications. This is true even though in every case involving transactions Tandem has a better solution. The only two companies really worth worrying about are IBM and DEC; it is quite clear that neither is going to confront Tandem head-on in a product sense. In fact, in IBM's case, transaction processing is the weakest part of IBM software. Moreover, IBM has serious architectural restraints.

To deal with this problem, Tandem has to change from a sales company to a marketing company. There are signs this is underway. In addition, Tandem needs to become a software purveyor, not just hardware. There are signs this too is underway. If we are correct in our assessment, Tandem could grow 30% a year for the next few years, which would be an upside surprise for investors.

Copyright
INVESTEXT/DATA PROCESSING
February 4, 1985

Tandem Computers Inc. - Company Report
(continued)

Recent Development

Tandem has revamped its product pricing in recent months, by (1) raising the price of the high-end TXP processor 4%; (2) reducing old low-end NonStop I prices from 12% to 45% (these have been out of new production for years but a number of low-end systems are in inventory); (3) reducing prices 24% on the mid-range NonStop II; and (4) establishing a trade-in program to enable customers to get TXP processors in exchange for NonStop I and II processors at credits ranging from 60% of their list price.

The goal is to lower the entry price to get into the Tandem product line, and relieve user anxiety over selecting the wrong system for this need since he can always trade up.

We are very bullish on these changes. Moreover, over the next 12 months, we expect the following:

1. New additions to system software, particularly in disk handling.
2. A new-low end system (code named "Checkmate") -- probably for January or February introduction.
3. A continuing stream of third-party software agreements and announcements.
4. No adverse surprises in the numbers

The latter is of more than passing interest. The quarterly earnings risks began with the September quarter, already reported, and which came out above investor expectations. (See Volume I, Issue 1 of "Computer Talk," P.14 discussing the quarter's 30% revenue gain and 38% earnings gain.) We attribute this to the TXP trade-in program. The December quarter also poses some risks, but we believe earnings will be at least flat with the September quarter and roughly 25% up from last year. While there is a risk revenues could be a little light, we do not believe investors will be disappointed by earnings. The real key is the upcoming March quarter. This is the quarter Tandem fell down last year. Our expectation is that earnings will be flat with the December quarter - some six times those of a year ago and an upside surprise. If Tandem can do this, investor confidence in estimates should increase dramatically and with it, we believe, renew expectations of rapid growth.

Finance

Few areas of operations are as clear as finance. At the end of fiscal 1982, Tandem's inventory of \$101.3 million was 93% of 1982's cost of revenues. Receivables were more than 36% of revenues. Cash of \$24.8 million was 9% of revenues. At the end of fiscal 1984, by contrast, inventories were 42% of cost of revenues, receivables were 27% of revenues, and cash of \$106.9 million was 20% of revenues. Tandem was then, and is now, essentially debt-free.

Previously, revenue recognition was typically made on anything that moved off the loading dock at the end of the quarter regardless of when it was to be installed. Now, revenue is recognized only on equipment that is installed within 15 days of shipment domestically or 30 days internationally, the most conservative policy in the industry. Operating margins, 17.7% and 19.4% in fiscal 1980 and 1981, respectively, had declined to 9.6% in fiscal 1984. We believe these can recover to 12.5% or more in fiscal 1985, and over 14% in fiscal 1986. Combined with revenue growth, the earnings dynamics become exceptional. In fiscal 1985, we believe EPS can fall in a range of \$1.25 to \$1.35, and in fiscal 1986, from \$1.75 to \$1.85. Calendarizing these numbers gets to \$1.40 or so in 1985, and approaching \$2.00 in calendar 1986. By our calculations, 30% revenue growth in 1985 would not draw down cash very greatly -- improving margins should increase profitability and there are low capital spending needs with an overcapacity situation.

Part of the improved profitability comes with volume and a higher portion of new high-margin products in the mix; part comes from a hiring freeze (except sales) and reexamination and cost control of the overhead accounts. The emphasis on profitability and asset management are (in broad terms) something new at Tandem.

The balance sheet is, in a word, powerful. Summary data is shown in a table in the appendix. Also attached in the appendix are (1) our "optimistic" model for Tandem's quarterly earnings, not our official or more conservative numbers, and (2) a brief financial summary.

Prices of securities mentioned in this report:

Hewlett-Packard Company - HWP (NYSE-34)

International Business Machines Corporation - IBM (NYSE-121)

Digital Equipment Corporation - DEC (NYSE-109)

Table i
Tandem Computers Inc.
Balance Sheet Data
(\$ in millions)

	9/30/84	9/30/83
Cash & Equivalents	\$106.9	\$93.5
Accounts Receivable	146.3	119.6
Inventories	92.4	85.9
Prepaid Expenses	7.0	11.8
Total Current Asset	\$352.6	\$310.8
Short-term Debt	\$15.0	\$3.3
Other Current Liabilities	74.1	53.3
Total Current Liabilities	\$89.2	\$56.6
Net Working Capital	\$263.4	\$254.2
Gross Plant, Property and Equipment	191.7	132.8
Accum. Depreciation	50.3	34.0
Net Plant	\$141.4	\$98.8
Other Assets	7.8	6.0
Total Net Assets	\$412.6	\$359.0
Long-term Debt	5.4	8.5
Capitalized Leases	11.7	15.5
Deferred Taxes	20.4	24.0
Shareholders' Equity	375.1	311.0
Total Net Capital	\$412.6	\$359.0

Table ii

TANDEM COMPUTERS INC.

(Data in \$000)
Years to 9/30

[Part 1 of 3]

	Actual 1Q84 12/31/83	Actual 2Q84 3/31/84	Actual 3Q84 6/30/84	Actual 4Q84 9/30/84	Actual Year 84 9/30/84
Product Revenue	\$108,474	\$91,223	\$119,064	\$129,850	\$448,611
Service & Other	17,895	20,012	22,861	23,240	84,009
Total Revenue	126,369	111,236	141,925	153,090	532,620
Cost of Revenue	50,437	47,245	57,787	63,341	218,810
% of Revenue	39.9%	42.5%	40.7%	41.4%	41.1%
R&D	10,849	12,853	13,514	15,298	52,514
% of Revenue	8.6%	11.6%	9.5%	10.0%	9.9%
SG&A	48,205	49,032	56,282	56,576	210,195
% of Revenue	38.1%	44.2%	39.7%	37.0%	39.5%
Operating Costs	109,491	109,230	127,583	135,215	481,519
Operating Profit	16,878	2,006	14,342	17,875	51,101
Oper. Profit Margin	13.4%	1.8%	10.1%	11.7%	9.6%
Other Income, Net	1,076	1,142	1,243	1,722	5,183
Pretax Income	17,954	3,148	15,585	19,597	56,284
Pretax Margin	14.2%	2.8%	11.0%	12.8%	10.6%
Income Taxes	7,900	1,174	6,335	7,667	23,076
Tax Rate	44.0%	37.3%	40.6%	39.1%	41.0%
Net Rate	10,054	1,974	9,250	11,930	33,208
Avg. Shares (000)	41,841	41,794	41,039	40,923	41,399
E.P.S.	\$0.24	\$0.05	\$0.23	\$0.29	\$0.80

[Part 2 of 3]

	Estimate 1Q85 12/31/84	Estimate 2Q85 3/31/85	Estimate 3Q85 6/30/85	Estimate 4Q85 9/30/85	Estimate Year 85 9/30/85
Product Revenue	\$137,500	\$144,000	\$155,000	\$166,000	\$602,500
Service & Other	24,000	25,000	26,500	26,500	103,000
Total Revenue	161,500	169,000	181,500	193,500	705,500
Cost of Revenue	66,538	69,628	72,963	75,852	284,981
% of Revenue	41.2%	41.2%	40.2%	39.2%	40.4%
R&D	15,989	16,900	17,787	18,963	69,639
% of Revenue	9.9%	10.0%	9.8%	9.8%	9.9%
SG&A	59,755	63,375	67,155	71,595	261,880
% of Revenue	37.0%	37.5%	37.0%	37.0%	37.1%
Operating Costs	142,281.5	149,903	157,905	166,410	616,499.5
Operating Profit	19,218.5	19,097	23,595	27,090	89,000.5
Oper. Profit Margin	11.9%	11.3%	13.0%	14.0%	12.6%
Other Income, Net	1,630	1,590	1,400	1,300	5,920
Pretax Income	20,848.5	20,687	24,995	28,390	94,920.5
Pretax Margin	12.9%	12.2%	13.8%	14.7%	13.5%
Income Taxes	8,443.6	8,378.2	10,123.0	11,498.0	38,442.8
Tax Rate	40.5%	40.5%	40.5%	40.5%	40.5%
Net Rate	12,404.9	12,308.8	14,872.0	16,892.1	56,477.7
Avg. Shares (000)	41,100	41,200	41,400	41,600	41,325
E.P.S.	\$0.30	\$0.30	\$0.36	\$0.41	\$1.37(*)

[Part 3 of 3]

	Estimate 1Q86 12/31/85	Estimate Year 86 9/30/86
Product Revenue	\$172,000	\$780,000
Service & Other	284,00	120,000
Total Revenue	200,400	900,000
Cost of Revenue	78,356.4	348,300
% of Revenue	39.1%	38.7%
R&D	20,040	90,000
% of Revenue	10.0%	10.0%
SG&A	74,148	333,000
% of Revenue	37.0%	37.0%
Operating Costs	172,544.4	771,300
Operating Profit	27,855.6	128,700
Oper. Profit Margin	13.9%	14.3%
Other Income, Net	1,200	4,600
Pretax Income	29,055.6	133,300
Pretax Margin	14.5%	14.8%
Income Taxes	11767.5	53,986.5
Tax Rate	40.5%	40.5%
Net Rate	17,288.1	79,313.5
Avg. Shares (000)	41,750	42,700
E.P.S.	\$0.41	\$1.86(*)

(*) This is our "optimistic" model, our official estimates are \$1.25 in fiscal 1985 and \$1.75 in fiscal 1986.

(*) Drexel Burnham Lambert Incorporated makes a market in this security.

Table iii
Tandem Computers Inc.
Financial Summary

[Part 1 of 2]

Years to 9/30	Revenues (\$000)	Pretax Income (\$000)	Pretax Profit Margin	Effective Tax Rate	Net Income (\$000)
1984	\$532,620	\$56,284	10.6%	41.0%	\$33,208
1983	412,282	50,501	12.2	39.0	30,805
1982(R)	312,143	46,741	15.0	36.1	29,856
1981	208,397	51,098	24.5	48.0	26,549
1980	108,989	21,082	19.3	49.3	10,687
1979	55,974	10,104	18.1	51.3	4,920
1978	24,305	4,490	18.5	52.0	2,153
1977	7,692	329	4.3	52.0	158
1976	581	(2,169)	Def.	--	(2,169)
1975	--	(646)	Def.	--	(646)

[Part 2 of 2]

Per Share Data (a)

Years to 9/30	% Return on Yearend Equity	EPS	Div	Stock Price Range (b)	P/E Range (b)
1984	8.8%	\$0.80	--	40-13	50-16
1983	9.9	0.76	--	40-24	53-32
1982(R)	11.9	0.76	--	33-14	43-19
1981	13.0	0.72	--	35-20	48-28
1980	15.2	0.35	--	33-14	43-19
1979	15.6	0.20	--	7-1	32-19
1978	13.9	0.10	--	6-2	60-22
1977	5.8	0.01	--	3-2(c)	N.C.
1976	Def.	(0.72)	--	--	--
1975	Def.	(0.25)	--	--	--

Notes:

- (a) Adjusted for stock splits
- (b) Calendar year for stock prices; P/E based on fiscal year earnings and calendar year prices
- (c) Range since initial public offering 12/14/77
- (R) Restated

HAMBRECHT & QUIST INCORPORATED

AUG 20 1984

Institutional Research

235 MONTGOMERY STREET
SAN FRANCISCO,
CA 94104
415-986-5500
CABLE HAMBQUIST
TELEX: 278392 HQ (RCA)

277 PARK AVENUE
38th FLOOR
NEW YORK, NY 10172
212-207-1400
TELEX 237258 HQ UR (RCA)

Marc G. Schulman
August 13, 1984

TANDEM COMPUTERS (OTC-TNDM)

Price	52-Week Range	Mkt. Val. (mil.)	FYE	Fiscal E.P.S.			Calendar P/E		Code
				1983A	1984E	1985E	1984	1985	
\$17	\$13-\$40	\$682	Sept.	\$0.76	\$0.83*	\$1.15	20	13	4

(*) Inclusive of \$0.07 per share of DISC benefits accrued in the fourth quarter.

Summary and Investment Conclusion

Tandem's equipment sales showed no growth between the second half of 1983 and the first half of 1984. The company's inability to generate growth occurred despite a production buildup of the TXP processor, a product that offers far more performance and substantially better price-performance than the predecessor NonStop II, and within the context of a very rapidly growing economy, strengthening capital spending, and surging corporate profits. Given these factors, along with Tandem's historically strong position in the rapidly growing transaction processing market, it is truly stunning that the company's equipment sales have not grown.

In our view, the sources of Tandem's revenue problem are as follows:

1. The TXP was conceived as a replacement for the less powerful NonStop II, rather than as an upward extension and, therefore, as a broadening of the product line. The early implementation of a trade-in program can be viewed as an attempt by the company to quickly deplete its installed base of NonStop IIs, as well as a mechanism for stimulating TXP demand.
2. Given the substantially higher price and performance of the TXP, it does not represent a migration path for Tandem's smaller users. Tandem's refocusing of the marketing effort to major accounts substantiates this view. In effect, Tandem has intentionally implemented a product and marketing strategy that insures that its existing base of smaller users will generate a steadily declining revenue stream.
3. Thus far, Tandem's new product and marketing strategies, as measured by the revenue they have produced, have failed. That they have not produced their intended consequence can, we think, be attributed to three factors, in addition to the drying up of revenues from small accounts.
 - The focus on major accounts and on transaction processing applications (Tandem no longer describes itself as a manufacturer of fault-tolerant computers) means that Tandem now squares off against IBM in virtually every competitive bidding situation. Because the competing machine is

normally a 308X mainframe, Tandem has, by choice, decided to take on the very heart of IBM. IBM salesmen who lose 308X orders tend not to have very successful careers and can avail themselves of SWAT teams from Armonk to aid them in maintaining their upward mobility.

- While Tandem's product and marketing strategies have been revamped, its selling organization has not. Tandem, which now describes itself as a mainframe company, has a salesforce composed of individuals with minicomputer backgrounds. They therefore do not have experience closing orders with the senior corporate-level executives who control the purse strings for the applications upon which Tandem is now focusing. IBM's salesmen do not lack such experience.
- More problematically, some major accounts may view the TXP as an interim product and may be concerned about Tandem's ability to maintain compatibility in the future. The TXP is a dual 16-bit processor, not a 32-bit processor. As we stated last October when the TXP was introduced, the fact that it is not a 32-bit machine tells us that Tandem could not develop a compatible 32-bit successor to the 16-bit NonStop II. Some of our sources tell us that an effort to develop such a machine, called Rainbow, was disbanded several months ago, while other sources tell us that the compatibility issue has since been solved. We should know the answer by the end of next year.

Management now recognizes the need to revamp the sales organization by hiring salesmen with mainframe backgrounds. While this is constructive in the longer term, it risks ungluing an organization that is already showing signs of strain.

1. In the June quarter, gross additions to the salesforce were over 40 but net additions were only 13. This high turnover rate is suggestive of declining morale. Stratus Computer was able to lure away several of Tandem's salesmen when it opened its United Kingdom subsidiary.
2. If Tandem does succeed in attracting a number of salesmen with mainframe backgrounds, they will presumably be assigned to cover the choicest major account opportunities. The resulting disgruntlement could act to increase further the turnover rate.
3. If mainframe salesmen are needed, it follows that sales management will need to be restructured along similar lines, resulting in turnover at the highest levels of the sales organization.

While management is willing to take on the risks associated with the revamping of the sales organization, it evidently is not willing to implement measures, such as a refocusing on smaller accounts, that might boost near-term revenues. Tandem is not changing a strategy that has produced disappointing results. From this observation, we conclude that management believes that the strategy has been poorly implemented, that the strategy is sound and, consequently, that the short-term risks are worth taking.

We are not so sure:

1. Historically, taking on IBM on a head-to-head basis has been a losing proposition. Other minicomputer companies have consistently avoided the

implementation of strategies requiring them to do battle against IBM mainframes. The inherent risk in such a strategy seems particularly great at the present moment because of the anticipated introduction, within the next 6-9 months, of IBM's next mainframe generation, the Sierra.

2. We question the soundness of Tandem's decision to virtually turn its back on smaller users in its zeal to take on IBM in large accounts. This decision means that the company is not planting seeds that can be harvested later and that it is leaving the door open for Stratus Computer and other smaller start-ups.
3. Tandem may have painted itself into a corner. At the low-end, it is at a price-performance disadvantage. Conceivably, the decision to de-emphasize smaller accounts may have stemmed, in part, from a recognition that architectural limitations would hurt its competitive position. By shifting to the high-end, major account strategy, Tandem avoids this issue. At the high-end, its competition is IBM, not the start-ups, and Tandem has a clear-cut price/performance advantage relative to IBM. At the high-end, Tandem has the product but not the marketing; at the low-end, it has the marketing, but not the product.

What Is The Problem?

In this section, we will use data provided by Tandem to determine why the company's revenues have fallen below plan. Because some March quarter revenues spilled over into the June quarter, we'll focus on six-month periods. The data is summarized in Table 1.

Table 1
Revenue, Processor, and Customer Statistics

	<u>Rev.</u> <u>(\$MM)⁽¹⁾</u>	<u>Net</u> <u>Processors</u> <u>Shipped⁽²⁾</u>	<u>Active</u> <u>Custs.⁽³⁾</u>	<u>New</u> <u>Custs.</u>	<u>Revenue</u> <u>per Net</u> <u>Processor</u>	<u>Rev. per</u> <u>Active</u> <u>Customer</u>	<u>Net Procs.</u> <u>Shipped per</u> <u>Active Cust.</u>
9/82	\$75.8	374	132	40	\$202,700	\$574,200	2.83
12/82	81.8	396	116	35	206,600	705,200	3.41
2H82	<u>\$157.6</u>	<u>770</u>	<u>248</u>	<u>75</u>	<u>\$204,700</u>	<u>\$635,500</u>	<u>3.10</u>
3/83	\$82.3	370	119	25	\$222,400	\$691,600	3.11
6/83	94.6	386	115	19	245,100	822,600	3.36
1H83	<u>\$176.9</u>	<u>756</u>	<u>234</u>	<u>34</u>	<u>\$234,000</u>	<u>\$756,000</u>	<u>3.23</u>
9/83	\$101.5	621	159	47	\$163,400	\$638,400	3.91
12/83	108.5	573	158	33	189,400	686,700	3.63
2H83	<u>\$210.0</u>	<u>1194</u>	<u>317</u>	<u>80</u>	<u>\$175,900</u>	<u>\$662,500</u>	<u>3.77</u>
3/84	\$91.2	463	133	25	\$197,000	\$685,700	3.48
6/84	119.1	569	171	39	209,300	696,500	3.33
1H84	<u>\$210.3</u>	<u>1032</u>	<u>304</u>	<u>64</u>	<u>\$203,800</u>	<u>\$691,800</u>	<u>3.39</u>

(1) Equipment sales only.

(2) Gross shipments minus trade-ins.

(3) Number of customers shipped to.

5. Increased marketing focus on new customers. After having steadily fallen for three quarters, Tandem's new account generation surged in the 9/83 quarter. Two quarters later, the revenue disappointments began. A decreased focus on existing accounts, perhaps stemming from their product saturation in 1H83, may be a contributing factor. However, a sharp increase in new accounts in the 9/82 quarter did not lead to a flattening of revenues during a period corresponding to the depths of the recession.

From this analysis, we conclude that the primary factors contributing to Tandem's revenue shortfall are as follows:

1. A below-plan average selling price. We believe that the typical TXP is less richly configured than it was supposed to be and that the average discount from list price is greater than it was supposed to be.
2. A greater than expected revenue contribution from OEMs and systems houses. Because such customers have a greater tendency to buy stripped systems than do end-users and because they buy in quantity, unlike the small end-users that have been de-emphasized by Tandem, an increase in their revenue contribution would result in a shift toward plain-vanilla systems and in a greater average discount.
3. Below-plan penetration of major accounts. While management now readily admits that the acquisition of major accounts is taking longer than expected, the trend in revenue generation per active customer indicates that Tandem's accounts are installing equipment at a slower than anticipated rate.

What Can Be Done About It?

We can think of five actions that management might take in order to stimulate revenue growth. Each of them, including the first two, which apparently represent the path that will be taken, entails significant risk.

1. Strengthen the major account effort by hiring salesmen with mainframe selling experience. The product cycle transition to the TXP was accompanied by a marketing transition to a focus on large accounts and, therefore, to a higher incidence of head-to-head competition with IBM. It was not accompanied by a salesforce transition from individuals with a minicomputer background to individuals with a mainframe background. Accordingly, management believes that the hiring of a substantial number of people with such a background is the primary way to solve the revenue problem. In the long run, this may be true. In the short run, it risks the intensification of the salesforce turnover problem that surfaced in the June quarter, and, hence, further revenue shortfalls. We say this because if new salesmen with a mainframe background are viewed as the key salesmen, then it follows that (a) key accounts will be taken away from current salesmen, and (b) the current sales management, with its minicomputer background, needs to be replaced with sales management with a mainframe background. If this path is followed, we think that Tandem's problems will get worse before they get better.
2. Develop more relationships with third party software firms. Management's indication that this tactic is being pursued indicates that competing against IBM

has revealed that the TXP needs to support more application software. If this effort is successful before the positive effects of the sales organization are felt, Tandem's mix will shift even more heavily toward simply-configured, heavily discounted systems, resulting in lower revenues per shipped system and lower gross margins. In any event, management indicates that it will be several quarters before a substantial amount of new application software will be available.

3. Implement a renewed focus on small end-user accounts. This tactic, which could be implemented through changes in salesforce incentives, has been ruled out by management because support costs would be too high. The TXP would probably be overkill for most small users, while the NonStop II is an obsolescent product.
4. Introduce a lower-priced replacement for the NonStop II. It is rumored that such a product is on the way. If it is, and if Tandem continues to de-emphasize small users, then its strategic importance would be to heighten the appeal of the TXP to major accounts. While we think that a broader product line would be helpful, the offset is that smaller processors almost invariably carry lower gross margins than do larger processors.
5. Cut the TXP's price. Management says that price is not the problem, but, as already noted, we think that Tandem has already found it necessary to discount a product that is still in volume buildup mode.

Table 2
Estimated Fiscal 1984/1985 Annual Results
(\$ in millions, except earnings per share)

	<u>F82A</u>	<u>F83A</u>	<u>F84E</u>	<u>F85E</u>	<u>F83/F82</u>	<u>F84/F83</u>	<u>F85/F84</u>
Sales	\$272.6	\$360.1	\$443.8	\$563.0	32.1%	23.2%	26.9%
Service	\$39.6	\$58.1	\$86.3	\$127.0	46.7%	48.5%	47.2%
Revenue	<u>\$312.1</u>	<u>\$418.3</u>	<u>\$530.0</u>	<u>\$690.0</u>	<u>34.0%</u>	<u>26.7%</u>	<u>30.2%</u>
COGS	\$109.3	\$168.7	\$215.9	\$276.0	54.3%	28.0%	27.8%
-% Revenue	35.0%	40.3%	40.7%	40.0%	—	—	—
R&D	\$33.6	\$39.2	\$51.2	\$65.0	16.7%	30.6%	26.9%
-% Revenue	10.8%	9.4%	9.7%	9.4%	—	—	—
SG&A	\$128.5	\$160.6	\$213.6	\$271.4	25.0%	33.0%	27.0%
-% Revenue	41.2%	38.4%	40.3%	39.3%	—	—	—
Oper. Inc.	<u>\$40.7</u>	<u>\$49.8</u>	<u>\$49.2</u>	<u>\$77.7</u>	<u>22.4%</u>	<u>-1.3%</u>	<u>58.0%</u>
-% Revenue	13.0%	11.9%	9.3%	11.3%	—	—	—
Int. Income	\$6.0	\$0.7	\$4.5	\$3.4	-88.3%	542.9%	-24.4%
Ptx. Income	<u>\$46.7</u>	<u>\$50.5</u>	<u>\$53.8</u>	<u>\$81.1</u>	<u>8.1%</u>	<u>6.4%</u>	<u>50.8%</u>
-% Revenue	15.0%	12.1%	10.1%	11.7%	—	—	—
Tax Rate	36.1%	39.0%	36.0%	42.0%	—	—	—
Net Income	<u>\$29.9</u>	<u>\$30.8</u>	<u>\$34.4</u>	<u>\$47.0</u>	<u>3.0%</u>	<u>11.7%</u>	<u>36.7%</u>
Avg. Shares	39.2	40.8	41.4	41.0	4.1%	1.5%	-1.0%
EPS	\$0.76	\$0.76	\$0.83	\$1.15	0.0%	9.7%	37.5%

Table 3
Estimated Fiscal 1984/1985 Quarterly Results
 (\$ in millions, except earnings per share)

	<u>Q1:P84A</u>	<u>Q2:P84A</u>	<u>Q3:P84A</u>	<u>Q4:P84E</u>	<u>Q1:P85E</u>	<u>Q2:P85E</u>	<u>Q3:P85E</u>	<u>Q4:P85E</u>
Sales	\$108.5	\$91.2	\$119.1	\$125.0	\$132.5	\$130.0	\$147.5	\$153.0
Service	\$17.9	\$20.0	\$22.9	\$25.5	\$28.0	\$30.5	\$33.0	\$35.5
Revenue	\$126.4	\$111.2	\$141.9	\$150.5	\$160.5	\$160.5	\$180.5	\$188.5
COGS	\$50.4	\$47.2	\$57.8	\$60.5	\$64.2	\$64.2	\$72.2	\$75.4
-% Revenue	39.9%	42.5%	40.7%	40.2%	40.0%	40.0%	40.0%	40.0%
R&D	\$10.8	\$12.9	\$13.5	\$14.0	\$14.9	\$15.7	\$16.8	\$17.5
-% Revenue	8.6%	11.6%	9.5%	9.3%	9.3%	9.8%	9.3%	9.3%
SG&A	\$48.2	\$49.1	\$56.3	\$60.0	\$63.4	\$65.0	\$70.2	\$72.8
-% Revenue	38.1%	44.2%	39.7%	39.9%	39.5%	40.5%	38.9%	38.6%
Oper. Inc.	\$16.9	\$2.0	\$14.3	\$16.0	\$18.0	\$15.6	\$21.3	\$22.8
-% Revenue	13.4%	1.8%	10.1%	10.6%	11.2%	9.7%	11.8%	12.1%
Int. Income	\$1.1	\$1.1	\$1.2	\$1.1	\$1.0	\$0.9	\$0.8	\$0.7
Ptx Income	\$18.0	\$3.1	\$15.6	\$17.1	\$19.0	\$16.5	\$22.1	\$23.5
-% Revenue	14.2%	2.8%	11.0%	11.3%	11.8%	10.3%	12.2%	12.5%
Tax Rate	44.0%	37.3%	40.7%	23.5%	42.0%	42.0%	42.0%	42.0%
Net Income	\$10.1	\$2.0	\$9.3	\$13.0	\$11.0	\$9.6	\$12.8	\$13.6
Avg. Shares	41.8	41.8	41.0	41.0	41.0	41.0	41.0	41.0
EPS	\$0.24	\$0.05	\$0.23	\$0.32	\$0.27	\$0.23	\$0.31	\$0.33
Prior year	\$0.18	\$0.16	\$0.21	\$0.21	\$0.24	\$0.05	\$0.23	\$0.32
% Change	33.3%	-68.8%	7.4%	51.5%	11.9%	365.9%	38.6%	4.5%

Code 4 Fully valued. This recommendation will be used when a stock appears likely to underperform the market over an extended period. This can occur when the valuation or multiple is excessive compared to the market or when the company's projected earnings growth is expected to be below average.

The revenue shortfall could have resulted from one or more of the following:

1. A netting problem stemming from too many trade-ins of NonStop IIs. If this were true, it would show up as too low a ratio of net processor shipments to active customers. While this ratio was lower in 1H84 (3.39) than in 2H83 (3.77), when the NonStop I-for-NonStop II program was over and the NonStop II-for-TXP program was barely underway, it was higher than in 2H82 (3.10) and 1H83 (3.23), during the heyday of the I-for-II program. We conclude that netting is not the core problem.
2. Too few active customers. The number of active customers was 4% less in 1H84 (304) than in 2H83 (317). A similar pattern prevailed in the prior 12 months, as the number of active customers in 1H83 (234) was 6% less than in 2H82 (248). However, revenues in 1H83 (\$176.9 million) were 12% higher than in 2H82 (\$157.6 million). So, while a larger number of active customers would obviously have helped, we conclude that the length of the active customer list is not a primary factor.
3. Revenue generation per net processor shipped is too low. In 1H83, at the height of the I-for-II trade-in program, this number surged at \$234,000. In 2H83, when trade-ins were minimal, revenues per net processor shipped plummeted by 25% to \$175,900. This fact, which is exactly the opposite of what should happen when a trade-in program ends, suggests that Tandem shipped a disproportionately large number of fully configured systems in order to achieve its 1H83 revenue target. Revenue growth was maintained in 2H83 because the surge in net processor shipments stemming from the low level of trade-ins more than offset the plunge in revenues per net processor. That plunge suggests one or more of the following: (a) a mix shift toward the \$100,000 NonStop I+ and away from the NonStop II; (b) an increase in the contribution of stripped (i.e., no peripherals) systems shipped to OEMs and systems houses; and/or (c) heavier discounting. In 1H84, revenue generation per net processor rose modestly, but was still 13% below its 1H83 level. This cannot be attributed to heavier trade-ins because net processor shipments were 37% higher in 1H84 than in 1H83. In view of the ongoing shift to the TXP (which accounted for a majority of systems shipped in the June quarter and which has an average list system selling price of about \$700,000, more than triple that of the NonStop II), the fact that revenues per net processor is lower than a year ago is very disturbing and forces us to conclude that revenue realization per shipped TXP is far below plan due to heavy discounting and/or a very high content of stripped systems in the shipment stream. For example, we are aware of a major OEM that paid about \$3 million for 40 discounted stripped systems in the June quarter. That's \$75,000 each.
4. Revenue per active customer is too low. This statistic surged in 1H83, when the I-for-II trade-in program was in full force, and dropped by 12% in 2H83, when trade-in activity was minimal. This pattern is the same as that of revenue per net processor; taken together, this says to us that Tandem milked the customer base in 1H83 (each customer purchased a lot of high value systems), that the price was not paid in 2H83 because trade-ins and, therefore, netting were minimal, and that the price was paid in 1H84 because trade-in activity moved back toward the level of 1H83. We are very concerned by the fact that the revenue per active customer has not moved up despite (a) a transition to a more powerful, higher-priced product, and (b) the increased marketing focus on major accounts, which theoretically should result in greater revenue per active customer.

Tandem Business
Information Center

PaineWebber®

Summary and Recommendation

1983 was a disappointing year for fault-tolerant computers. Except Tandem, vendors have promised much but have delivered little since the publication of our 1/20/83 *Status Report*—"Fault-tolerant Computers: Fast Growing Computer Markets Increasingly Demand Very Reliable Systems." Nevertheless, we continue to believe that demand for fault-tolerant systems will grow rapidly throughout this decade, driven by the development of on-line applications for which computer downtime is increasingly unacceptable, such as ATM networks, POS systems, "paperless" factories and home information systems.

- *Much promised, little delivered.* Although the list of companies planning to market fault-tolerant systems continued to grow in 1983, Stratus, with 1983 revenues of \$20 million, was the only vendor other than Tandem to ship more than a handful of systems. Many of the other players faced disappointments and slippages; developing and marketing these sophisticated computer systems is more complex than some had anticipated.
- *Demand for fault-tolerant systems continues to grow.* The major breakthrough in 1983 was in user awareness. Besides all the publicity given to the new entrants, IBM, Digital Equipment, NCR and Hewlett-Packard introduced their customers to new systems with some fault-tolerant features. Computer users are beginning to realize that they can minimize the cost of downtime for their critical on-line applications through fault-tolerant systems.
- *Tandem is in a strong competitive position.* We continue to recommend purchase of TNDM (see our 5/2/84 *Update*). Despite its recent problems, Tandem continues to dominate the fault-tolerant area. It has done a tremendous job of establishing its credibility in large corporations as the NonStop company. Tandem's proven product, track record and marketing strengths present a significantly greater obstacle to its competitors than do technical barriers. (After all, companies generally use fault-tolerant computers for their most critical applications).
- *Traditional vendors continue to move slowly.* Constrained by enormous investment in their existing computer systems, traditional mini and mainframe vendors have been slow to add fault-tolerant capabilities. Nevertheless, most of them now appear to have accepted the need to add fault-tolerant capabilities. However, this represents a sizeable development effort and is not going to happen overnight.
- *UNIX provides biggest opportunity for new players.* The anticipated rapid growth of UNIX-based systems (see our 1/6/84 *Status Report*, "UNIX—Breaking Down Barriers in the Computer Industry") presents the biggest potential opportunity for the new entrants. Although in 1976 Tandem had little option but to build its own operating system, it is now unnecessary to "reinvent the wheel." Despite this, both Synapse and (to a lesser extent) Stratus elected to do so, putting them at a potential disadvantage against the anticipated rapid growth in applications software for UNIX-based fault-tolerant vendors such as AT&T, Auragen, Computer Consoles, Parallel Computers, Sequoia and Tolerant. Which of these succeeds is more likely to be determined by effective marketing than by which has a "better mousetrap."
- *Tandem, Stratus and (of the new entrants) Tolerant Systems are likely winners.* We are impressed by the marketing focus of these three companies; Tandem's credibility stands it in good stead in addressing very large scale applications. However, Tandem's focus on the high end leaves a significant opportunity for Stratus to address smaller applications. Although we are impressed by Stratus' progress (coverage will be added later this year), the limited amount of third party applications software built for its proprietary system may force it to switch to UNIX. Neither TNDM nor STRA are focusing on the OEM community, leaving a significant opportunity for a third player. Of the new players, we are most impressed with (privately held) Tolerant's OEM-oriented product strategy.

Much Promised, Little Delivered

In some ways, 1983 was a very significant year in the fault-tolerant area. *Stratus*, the first of the new breed of fault-tolerant vendors, went public in August 1983 at a valuation of \$210 million. New startups continued to attract the attention of the venture capitalists, and institutional investors began to participate in a growing number of private placements. *Auragen* (formerly known as Parallel Computer Systems) introduced its system with great fanfare at the National Computer Conference in May 1983, and *Synapse* advertised heavily in the trade press. Charlie Ryle and Mike Green, both former key executives at Tandem, joined existing start-up *Parallel Computers*, and shortly thereafter attracted a major infusion of venture capital. A few new players have emerged, such as *No-Halt Computers*, *Autech* and *Encore* (founded by former Prime CEO Ken Fisher).

Traditional vendors such as IBM, DEC, Wang, NCR and Hewlett-Packard began to take the subject seriously. IBM announced some fault-tolerant features on the Series/1 and 8100 systems. DEC introduced its VAX Cluster system. *Trilogy* went public on a plan to build systems based on wafer-scale semiconductor technology that would feature on-chip fault-tolerant circuitry. Amdahl suggested it was planning to compete against Tandem with an IBM-compatible system designed specifically for on-line transaction processing (code named Aspen). IPL Systems announced an IBM-compatible fault-tolerant system—the 4480.

However, very few of the players are today shipping product. Many of the vendors have found it more difficult than they had anticipated to develop a mature, stable product. (What is the point of a fault-tolerant system, unless all the wrinkles are worked out?) Many of the players are still in development, or early Beta-test (i.e., initial customer trials).

Even those vendors who have begun to ship products have found it more difficult than they had anticipated. Only *Stratus* has made much progress so far, with \$20 million in shipments in 1983. However, we believe that this also was somewhat of a disappointment. Both a shortage of applications software for STRA's proprietary operating system and the slow buildup of its end-user marketing organization were factors constraining its growth in 1983. Nevertheless, STRA should be commended for its excellent marketing job, which leaves it well positioned for future growth providing it can attract third party software.

Although *August Systems* began to ship its fault-tolerant process control systems in 1981, 1983 revenues of less than \$5 million were disappointing. Although hindered by the economic situation, August found that marketing its sophisticated systems to large corporations such as Mobil, Dow, Conoco and GE was an expensive and time consuming task. Nevertheless, the company has now established a track record and has the potential for considerably faster growth.

Synapse was another disappointment in 1983. Although it shipped its first system on December 31, 1982, the company had 1983 revenues of only \$3 million and is now significantly behind its original plan. The company has made its share of mistakes. First, it not only developed a very sophisticated hardware design, but also chose to build its own operating system and database management system—compounding the risks of technical problems, which it faced through most of 1983. Second, unlike *Stratus* which decided to undercut Tandem in price, *Synapse* positioned the product more directly against Tandem. Third, it marketed the product before it was ready and has spent \$20 million to reach its present stage. Nevertheless, *Synapse* now claims that the product is stable and can deliver high price/performance (a medium-sized, \$600,000 system recently benchmarked 150 users at 9 transactions per second, with an average response time of 1.3 seconds), although the system has not yet been used in a live environment.

Like *Synapse*, *Auragen* is also probably guilty of launching its product too early. Although it has shipped a number of systems to its European partner, Nixdorf (which recently launched a repackaged and simplified version of the *Auragen* system in Europe as the Nixdorf 8832), it only has one Beta test site in the US. Although it now has three orders, first customer shipments are still a few months away and we estimate that the company is about a year behind its earlier projections. (Although its system is based on UNIX, *Auragen* found it necessary to rewrite major portions in 1983 in order to implement its "message-based fault-tolerance"). We also understand that the hardware is still performing below its target goals. *Auragen* has modified its marketing strategy, shifting from end-users to OEMs. Its relationship with Nixdorf may prove to be a mixed blessing; Nixdorf has manufacturing rights and non-exclusive worldwide marketing rights, which could put the two companies head-to-head in the U.S. market.

Demand for FT systems continues to grow: downtime can mean lost revenues.

Contrary to the current wave of doubt over the market potential for fault-tolerant systems following Tandem's weak second quarter, we are even more convinced than we were a year ago of the necessity of fault-tolerance for the on-line, computerized applications of the 1980s. Despite significant improvements in the reliability of traditional systems, particularly disks, the number of applications requiring the degree of reliability only achievable on a fault-tolerant system continues to grow rapidly.

Demand for fault-tolerant systems is driven by the increasing dependence of companies on computer systems. Today the computer system is no longer just a "back-office" system; it is increasingly a key aspect of a company's design, manufacturing and/or marketing functions. Companies are developing new products based on on-line computer systems—such as ATM networks, cellular radio

systems, electronic mail services, home information systems. Here the computer is part of the product itself, a *key component in the revenue generation process.*

Fault-tolerance: Not a Market

Fault-tolerance (FT) is often wrongly perceived as a market. It is a feature, one that is increasingly important in all types of computer systems from micros to mainframes. As we stated in our 1/20/83 *Status Report*, we believe that the best way to examine the markets for FT computers is to examine the traditional markets for computer systems. In each of these markets it is possible to identify certain groups of applications that are increasingly moving online, demanding very high reliability. For example, the paperless factory is unlikely to become a reality without very reliable systems. Similarly, electronic mail necessitates a dependable computer system.

There are opportunities for FT vendors to challenge non-FT players in virtually every market where computers are sold today. For this reason when TNDM says that if it meets STRA in a competitive situation one of the two companies is after the wrong customer, it is largely correct. Whereas Tandem addresses very large, geographically distributed applications (typical multi-module system costs \$1-5 million), STRA addresses smaller, minicomputer applications (a typical system costs \$200,000-\$500,000).

Transaction processing: the Largest Potential Market

Rapid growth is likely in the use of fault-tolerant transaction processing systems, particularly in revenue generating applications. First, new TP applications continue to emerge (one of the latest is the use of oil company debit cards by gas stations). Second, once installed, the use of TP systems, and therefore transaction volumes, usually grow rapidly (consider the explosive growth in the use of ATMs). Third, as usage increases, reliability and modular expandability become increasingly important factors. Infocorp, a market research firm has estimated that the transaction processing market is growing at a 35% compound annual growth rate. We believe that fault-tolerant systems will grow at an even faster 40-60% rate over the next three to five years.

Tandem Remains Well Positioned: "Better the Devil You Know . . ."

Fault-tolerant computers typically address the most critical applications within an organization. This raises a paradox. Proven products from traditional "quality" vendors, such as IBM and DEC, are presently not fault-tolerant. The new startups, on the other hand, typically have unproven products, limited marketing and support and little or no credibility in the marketplace. Tandem is the only established vendor presently marketing fault-tolerant systems and has done a remarkable job in establishing its credibility in large corporations as "*the NonStop company*". (For further discussion of Tandem see our April 8, 1983 *Basic Analysis* and subsequent *Updates*). This repre-

sents a formidable obstacle for the newer entrants to overcome (and may hamper traditional vendors' efforts to market fault-tolerant systems).

Whereas we normally expect computer companies that sell primarily to an existing customer base (base churning) to be unlikely to sustain rapid growth, the same is not true of Tandem. The "seeds" that Tandem has planted in an impressive list of major corporations worldwide are likely to provide it with considerable growth over the next few years. In many such cases, Tandem has installed pilot systems or systems to handle a single specific application. Tandem is most likely to benefit as demand for critical new applications and transaction volumes in existing applications continue to grow within these corporations.

Traditional Vendors Continue to Move Slowly

Although all the computer vendors have an ongoing commitment to improved hardware and software reliability, they have so far stopped short of moving to the radically different multiprocessor architectures embodied in fault-tolerant systems. The problem continues to be one of software, not hardware. IBM or DEC have the resources to build such a system. The problem is in adding fault-tolerance to their existing mainstream product lines in such a way as to preserve their (and their customers) enormous investment in software (to ignore this software compatibility problem and offer an incompatible new system would suggest that their mainstream products were outdated).

However, although a few vendors, e.g Data General and Datapoint, still believe the sizable investment needed to make their mainstream systems fault-tolerant is not yet warranted, most other traditional vendors are beginning to sit up and take notice. The *growing number of major orders*, such as Tandem's \$400 million share of the Navy's "Splice" contract, demand their attention. Furthermore, *the cost differential between conventional and fault-tolerant systems continues to fall*. We expect most major vendors to add fault-tolerant capabilities to their systems gradually over the next few years.

IBM has embarked on R&D efforts in the fault-tolerant area, including System D, a prototype distributed transaction processing system with both high availability and modular growth, the two key features of virtually all fault-tolerant systems. We understand that this effort, which was based on Series/1 minicomputers in a ring network, has now been superseded by a newer project. We believe that IBM supports the concept of fault-tolerance, and may be working toward all its larger systems eventually being fault-tolerant. So far, however, it has only announced limited high availability options for the Series/1 and 8100 (This latter announcement was significant inasmuch as it supported the need for fault-tolerant communications and file servers in an office environment).

In 1983, DEC introduced its VAXcluster system—loosely coupled VAX processors sharing intelligent disk storage,

the HSC 50. The system is designed eventually to provide both modular growth and high availability. However, at the present time the software (VMS V3.4) does not support many of the planned features, including recovery and data integrity, necessary to make it "fault-tolerant". DEC is decidedly vague when questioned on the likely availability of "fault-tolerant" features. Furthermore, VAXclusters are presently limited to high-end VAX processors (750 and above), which would make a fault-tolerant VAXcluster (if the software existed) expensive relative to most competitive products.

NCR has recently introduced its "Incremental Architecture," which forms the basis of a loosely coupled fault-tolerant system based on NCR's mainframe processors. Hewlett-Packard has already announced a number of high availability options for applications such as process control on the HP 1000, including Systemsafe/1000 and Datasafe/1000. We believe that HWP is examining the broader application of fault-tolerance to its products.

Loosely Coupled vs. Tightly Coupled: the Argument Continues

Tightly coupled systems, such as offered by Synapse and Sequoia, promise greater price/performance and flexibility than loosely coupled systems. However, the jury is still out. Two key concerns center on whether contention among processors will degrade performance in large configurations. For simplicity and maximum reliability, we lean towards the proven (i.e., by Tandem) loosely coupled approach. Tightly coupled systems bring more potential for error. For example, the single operating system or shared memory of a tightly coupled system can represent areas where a failure could crash the entire system. However, for superior price/performance, the tightly coupled systems could potentially have an edge if the contention problems referred to in our earlier report on fault-tolerant systems can be successfully overcome.

UNIX: A Major Opportunity for the New Players

While the traditional vendors are struggling to add fault-tolerance to their well-established systems, a new opportunity is emerging that offers startups a way to reduce some of the marketing obstacles discussed earlier. The vehicle for this is UNIX—the new "standard" operating environment developed by Bell Labs.

Although small today, the catalogue of UNIX-based applications software is likely to grow rapidly over the next few years. (For a more detailed discussion on the significance of UNIX see our 1/6/84 *Status Report*, "UNIX—Breaking Down Barriers in the Computer Industry"). UNIX has broad applicability, and mirroring the non-UNIX world, demand for fault-tolerant UNIX systems is also likely to grow rapidly.

From the perspective of the small startup, UNIX has tremendous benefits. First, it *reduces the software development effort* necessary to bring a product to market—and

thereby avoids the pitfalls that Synapse has had to face. Second, it is likely to provide the vendor with a *fast growing range of applications software*. This advantage is not shared by vendors with proprietary operating systems, such as Stratus and Synapse, whose growth is likely to be constrained by the availability of third party software. Third, and perhaps most significantly, neither Tandem nor the traditional vendors (with the possible exception of AT&T) appear likely to pursue the UNIX market for fault-tolerant systems, at least in the near term. The projected explosive growth of the UNIX market in 1984-86 creates a *significant opportunity for at least one of the UNIX-based fault-tolerant vendors*.

The perceived advantages of being the first of the new breed of fault-tolerant vendors may be quickly eroded if UNIX takes off rapidly. Some of the most interesting players that will soon be shipping UNIX-based products in this area are Auragen, Computer Consoles, Sequoia and Tolerant Systems. Other players include AT&T, No-Halt (which arose out of the now defunct DOSC Inc.) and Parallel Computers. However, this area is attracting considerable interest today and the list continues to change. (Encore, the start-up founded by former Prime chief Ken Fisher, is likely to enter the market in 1985).

AT&T

AT&T recently introduced a fault-tolerant machine, the 3B20D. Priced around \$400,000, this machine is essentially a redundant version of its 3B20 minicomputer. Although marketed by the might of AT&T, we find that the 3B20D is one of the least interesting of the fault-tolerant systems available today. First, its relatively high price suggests the system should be applicable for large scale applications and less interesting to OEM customers. Nevertheless, lacking an experienced computer marketing organization or a large installed base of customers, AT&T appears to have decided to market this system primarily through OEMS. There is little or no application software today for large scale UNIX based transaction processing applications, which will be considerably more of a factor for AT&T than small startups whose growth will parallel the growth in UNIX software. Whereas most other UNIX-based fault-tolerant vendors have made significant modifications within UNIX to handle commercial transaction processing applications, AT&T's vanilla version of UNIX is unsuitable for transaction processing applications.

Auragen

Auragen changed its name from Parallel Computer Systems on April 1, 1983 to avoid confusion with Parallel Computers Inc., of Santa Cruz, CA (which is headed by Charlie Ryle, formerly VP Marketing at Tandem). About six to twelve months behind schedule, we understand Auragen now has three orders (including one from a Tandem OEM), one system in Beta test and has shipped a number of additional systems to its European partner, Nixdorf.

PaineWebber.

An Auragen System 4000 comprises from two to 32 loosely-coupled clusters. A two cluster system has an entry price of \$138,000. (A non-fault-tolerant single cluster is also available at \$68,000). The product is targeted at large transaction processing applications.

Each cluster includes three Motorola 68010 microprocessors tightly coupled with its own memory (up to 8Mb) and operating system (Auros—Auragen's adaptation of UNIX System III). Two micros share the cluster's applications workload, while the third, the executive processor, handles core operating systems functions including fault-tolerance. A cluster can also include other micros to support terminals and disks. Clusters are coupled together across a very high speed (dual 16Mb/sec) bus. (For a comparative description of the approaches used by Tandem, Stratus and Synapse see our 1/20/83 *Status Report*).

Every program running in an Auragen system has a backup copy on standby on another cluster. Whenever a message is input, a duplicate copy is sent to the backup. The backup also keeps count of each time the primary application processor writes to a disk. If a failure occurs (detected by the absence of an "I'm alive" signal), the backup processor takes over and begins to reprocess the input message. However, it does not necessarily write data to disk. The count tells the backup how many writes the primary had initiated before the failure occurred. Therefore to avoid a double update, the backup only actually writes to the disk after it has discarded writes already effected by the primary. The recovery delay after a fault could be considerably longer than on some of the alternative approaches—perhaps 5-10 seconds.

One of the risks of the Auragen approach we feel, and a factor in the delays it has faced, is its relatively complex approach to fault-tolerance. The project is already falling behind schedule. (Partly as an attempt to regain some lost ground, Auragen has recently shifted from end-user to OEM marketing).

Computer Consoles

Computer Consoles (See our 6/22/83 *Basic Analysis* and subsequent *Updates*) is a leading supplier of fault-tolerant systems to the telephone industry, with 1983 revenues of approximately \$100 million. It has recently added a range of UNIX-based systems to its telephone industry products. These include a 32-bit supermicro (the Power 5/20), a fault-tolerant supermini (the Power 5/55) and a sophisticated office automation system for UNIX environments (OfficePower). Revenues from these new products reached \$5 million in 1983 and are projected to grow rapidly in 1984 and 1985.

The fault-tolerant 5/55 was launched last August, probably a little too early. We believe that first production shipments are now underway, slightly behind CCS' original schedule. Early customers include Hale and Doore, British Telecom, Rochester Telephone and Merrill Lynch. Following some independent benchmark studies, CCS appears to

be pleased with the performance of the product. Its architecture has some unique characteristics which may make it particularly suitable for applications with heavy information retrieval requirements, and less suitable for update-intensive applications such as electronic banking. (The 5/55's architecture is described in our 6/22/83 *Basic Analysis*). For this reason, we believe that the federal government may represent one of the larger potential markets for the 5/55.

Parallel Computers

Parallel has recently introduced a \$75,000 fault-tolerant system. The Parallel 300 Model 30, which is targeted at "operational information system applications". With a low price (its price for a *redundant* configuration is one half that of its nearest competitors, Tolerant and Auragen), Parallel is targeting the OEM market. However, the system only delivers the effective power of a single Motorola 68010 processor (using an architecture somewhat similar to Stratus), considerably less than its competitors, most notably, Tolerant Systems. Even more significantly, like the AT&T product, the Parallel system also does not possess the modular expandability necessary for many transaction processing applications—it is a much simpler, fault-tolerant minicomputer.

Nevertheless, we believe that Parallel's product is likely to fill a significant need for simpler, lower priced but *reliable* systems in many traditional minicomputer markets.

Sequoia

Although we had recently all but written off Sequoia as a potential high-flyer, we are now far less negative about its prospects. Despite having one of the most innovative fault-tolerant architectures that we have seen, Sequoia has focused little on marketing—vital in this increasingly crowded area. A combination of problems led to the departure of two founders in 1983, including former president Allen Burgess.

However, the company appears now back on track. We are impressed with the new management team, headed by Warren Tyler, former president of Data Terminal Systems. Jack Stiffler, who has considerable experience in the design of fault-tolerant systems for the space program, is an original founder. Tyler has added Phil Bernstein (formerly an associate professor of computer science at Harvard, an expert in operating systems and database, and codeveloper of CCA's Model 204 database system) as VP of Software, Herb Spivak (formerly with Prime and Honeywell) in charge of manufacturing, and two former Tandem marketing executives, Al Deimaggi and Bruce Karlson. The product's technical problems appear to have been resolved and Sequoia is now close to a deliverable product. Delays at many of the other startups mean that Sequoia has not lost much ground from its problems in 1983. Sperry has recently invested \$2 million into Sequoia, and may be planning to market its product to the federal government.

Sequoia's system combines many of the key features of the Stratus and Synapse approaches described in our January 20, 1983 *Status Report*. Like Stratus, Sequoia uses a comparator approach—"hardware based fault-tolerance" as it has come to be known. However, whereas in a Stratus system modules are loosely coupled together, Sequoia has adopted a tightly coupled (shared memory) approach similar to Synapse's. The net result, however, could be a *more expensive* solution than some of the other approaches.

Tolerant Systems

Despite being one of the later entrants (it was founded in July 1982, with Fred Adler as the primary backer), Tolerant has made rapid progress, having learned from the mistakes of others. It has already shipped its first (though not yet fault-tolerant) UNIX-based system to General Instrument. Tolerant has the potential to move quickly into a prominent position, with an exciting product and an established salesforce already in the field (mainly ex Tandem and Stratus).

We are particularly impressed with Tolerant's strategy, which is geared to limit risks more effectively than most of its competitors. Its choice of a loosely coupled fault-tolerant architecture provides a number of benefits. First, it is a more proven technique than tightly coupled systems. Second, it allows Tolerant to enter the market with a competitive system, adding fault-tolerance later. (It does not have to deliver everything on day one). Tolerant has also hired individuals experienced in the development and marketing of these systems, including some from Tandem (most notably Jim and Shirley Henry, who were formerly Manager of Competitive Marketing and Manager of Product Marketing at Tandem) and even from newer competitors such as Synapse.

Based on the powerful National 16000 microprocessor family, Tolerant will be one of the first vendors to deliver hardware based on the new generation of full 32-bit microprocessors. (Vendors using 68000 microprocessors are likely to have to redesign their hardware to move to the full 32-bit 68020, expected in 1985). The Tolerant system is based on System Building Blocks (SBBs) that are loosely coupled together by two coaxial cables. Each SBB will include two NS32032 microprocessors (one for applications processing and one for operating systems functions) and up to 16Mb of memory.

Early benchmarks indicate that the system should offer significantly greater price/performance than fault-tolerant

systems based on the Motorola 68000 family. The system will be priced aggressively (Tolerant claim \$25,000 per MIP) and marketed primarily to OEMs. Despite its late start, Tolerant has already surpassed Synapse, with over \$7 million of orders now signed.

Like Tandem, Tolerant realizes that fault-tolerance is an increasingly necessary but insufficient condition for success in the transaction processing market. It has therefore invested heavily in software development, and is building a comprehensive set of development tools geared to help its OEM customers to rapidly build fault-tolerant transaction processing applications in a UNIX environment.

Prices of Companies Mentioned:

Amdahl Corp. (\$12³/₈)
AT&T² (\$15³/₄)
Computer Consoles (\$18¹/₈)
Data General² (\$43⁵/₈)
Datapoint Corp. (\$22³/₄)
Digital Equipment (\$87⁷/₈)
Dow (\$37³/₈)
Dupont (Conoco)² (\$47¹/₈)
General Electric (\$52¹/₂)
General Instrument (\$217¹/₈)
Hewlett Packard (\$33³/₈)
IBM² (\$107⁵/₈)
Merrill Lynch (\$22³/₄)
Mobil² (\$28¹/₂)
Motorola (\$106⁵/₈)
NCR Corp. (\$26)
Rochester Telephone (\$28¹/₈)
Sperry Corp.^{2, 3} (\$38)
Stratus Computer (\$10¹/₄)
Tandem^{1, 2} (\$19³/₄)
Trilogy Ltd. (\$2³/₈)
Wang² (\$25⁷/₈)

¹Paine, Webber, Jackson & Curtis, Inc. and/or Rotan Mosle Inc., affiliated corporations of Paine Webber Mitchell Hutchins Inc., makes a market in this security.

²Blyth Eastman Paine Webber Inc. and/or Rotan Mosle Inc., affiliated corporations of Paine Webber Mitchell Hutchins Inc., has acted in an investment banking capacity for this company.

³An officer of Paine, Webber, Jackson & Curtis Inc., Paine Webber Mitchell Hutchins Inc., Blyth Eastman Paine Webber Inc. or Rotan Mosle Inc. is a director of the company being reported upon.

May 24, 1984

Stephen K. Smith (212) 437-7540

The information contained herein has been obtained from sources we believe to be reliable, but its accuracy is not guaranteed. Paine Webber Mitchell Hutchins Inc. and/or Paine, Webber, Jackson & Curtis Incorporated and/or Blyth Eastman Paine Webber Incorporated and/or Rotan Mosle Inc., affiliated companies and/or their officers, directors, employees or stockholders may at times have a position, including an arbitrage or option position, in the securities described herein and may sell or buy them to or from customers. These companies may from time to time act as a consultant to a company being reported upon. Copyright © 1984 by Paine Webber Mitchell Hutchins Inc., all rights reserved.

Tandem Computers

Company Update

- Tandem realizes our worst fears concerning receivables.
- Long-term fundamentals still strong.
- Raising our rating to 3-1 from 3-3.*

TANDEM LIBRARY

Donald Brown

December 10, 1982

		Earnings Per Share		P/E Multiple		Last 12 Mos. Price Range	
		1984E:	1983E:	1984E:	1983E:	High	Low
TNDM (OTC):	23 3/4	\$1.75	1.30	13.6X	18.3	32 3/4	14 1/4
Ind. Div.:	-						
Yield:	-						
DJIA:	1047.09	0.72					

Fiscal year ends September. R - Restated.
Shares outstanding: 39.1 million.
Priced as of the close, December 8, 1982.

Tandem announced that revenues would be restated for the latest fiscal year from \$335.9 million to \$312.1 million, a \$23.8 million downward revision. Net per share will be reduced to \$0.72 from \$0.95.

The issue is one of "revenue recognition." Stricter standards are now being enforced, as discussed in detail below. It came as no surprise to us that Tandem's aggressive marketing group ran afoul of the accountants. What surprised us is that the accountants forced the issue, rather than allowing a longer period of time to work down an extended receivables position.

Our view is that the internal impact will be a healthy one, because we have felt that the receivables were too stretched in any case. So we like the result but are not as happy about the means to achieve the ends.

A good portion -- but not all -- of the revision simply represents a deferral into the future.

- We are, therefore, revising our earnings estimate for fiscal 1983 -- up by a dime from \$1.20 to \$1.30.
- Although the impact on the current quarter remains uncertain, our best estimate is \$0.29, revised up from \$0.24, versus \$0.23 last year. (Tandem may restate last year's quarterly income statement.)
- There is no change in our 1984 preliminary estimate of \$1.75.

* Opinion Legend: 1st Number = Next 6 Months, 2nd Number = 6 to 18 Months
1 = Aggressive Purchase, 2 = Accumulate, 3 = Average Performer,
4 - Swap, 5 - Sell

Research

The shares at current prices represent above average investment potential -- a "1" rating -- over the long term. Eventually, the company will improve its financial ratios, although they will still not be satisfactory even after the change in accounting. But nothing that has happened changes the fact that Tandem has a strong product position in multiprocessor systems which offers the best potential for growth in medium to large-scale systems over the coming five years.

Near term, we continue to regard the shares as no better than average potential -- a "3" rating for the next six months. Over the next several weeks, our technicians suggest heavy supply in the high 20's, with the next area of support in the \$14-\$17 range. This analyst would view a price of under \$20 as an outstanding opportunity to load up on the shares.

	<u>Quarterly Earnings</u>				
	<u>First Quarter</u>	<u>Second Quarter</u>	<u>Third Quarter</u>	<u>Fourth Quarter</u>	<u>Year</u>
1983E:	\$0.29	\$0.31	\$0.33	\$0.37	\$1.30
1982R:	0.23	0.25	0.23	0.01	0.72*

* May be restated on a quarterly basis.

THE EARNINGS HIT

We have been concerned about the extended receivables position at Tandem, which was equivalent to 124 days outstanding at the end of September before restatements. In our view, the level of receivables reflected aggressive marketing practices and/or inadequate internal financial controls. High interest rates raised the risk of a write-off in the summer months. The sharp subsequent decline had reduced the risk of a write-off, and theoretically provided Tandem management with the time to improve the internal controls at a leisurely pace.

However, Tandem's accountants put their collective foot down just when it looked to us like the company would "get by."

Beating the Midnight Deadline

Roughly half of the readjustment relates to shipments that took place after 12 o'clock of the last day of the latest quarter. Assuming that \$14 million was involved, or 15% of the latest quarter's volume, we would guess that up to an additional week's activity was included in the period. In the past many other companies in the industry held a quarter open beyond the official closing date to include "last minute" activity. This isn't surprising; Arthur Anderson's enforcement of a stricter discipline is.

If the company successfully motivates its people during the current Christmas holiday season, then a large portion of the \$14 million will simply be shifted into the current quarter on a net basis. That is, \$14 million already was pushed into the current period which was already shipped from the September period. A tough discipline or high internal esprit de corps regarding shipments might succeed in shipping the existing schedule for the current December period on time -- i.e., without slipping any volumes beyond midnight of the last day of the

quarter. Our best guess is that Tandem's people are likely to rally, and the current quarter will be bumped by \$14 million.

Closing the
"Paperwork" Gap

The other half of the revision reflects Arthur Anderson's concern over the paperwork backing up the shipment of systems. As an illustration, at least several million dollars of the revision related to the policy of installation deadlines on purchase orders. Traditionally, a purchase order was deemed valid if it called for shipment within 60 days. With the P/O in hand, the salesman could ship and bill the customer. If the customer then responded that he wasn't expecting the shipment so soon, Tandem's marketing force would simply extend the payment period. Until the accountant showed up, both parties were happy. Arthur Anderson feels more comfortable with 30 days.

Tandem will probably make up a good portion -- say half -- of the additional \$9.8 million through the balance of the current year. The rest might be permanently deferred into backlogs. First, however, the marketing force has to become accustomed to more stringent contract terms. Thus, it is late in the current quarter to accomplish much by way of short-term results.

Competitive Aspects
A Short-Term Negative

Tandem is rightfully concerned about the impact of new practices internally and on customer relations. Competitive salesmen will certainly "make hay" over the development, and at least cause some deferrals over the short-term.

We expect any adverse customer reaction to be short-lived. Tandem remains in solid financial shape with only \$6.7 million in debt compared to \$245 million in equity on the balance sheet. No one in the industry will be overly surprised that Tandem's aggressive marketing efforts ran headlong into the accountants. In short, the customers will continue to make their decisions, once the dust settles, on the merits of the product.

Balance Sheet Impact

The revision in the income statement will probably also result in a \$23.8 million reduction in receivables.

- On an adjusted basis, receivables would represent roughly \$100 million, equivalent to a still-high 98 days on a 365 day year, but below the originally reported \$123.7 million which represented 124 days at the end of September.
- Inventories would be raised to an estimated \$101 million, from the reported \$93 million in September. On an adjusted basis, the revised inventory figure represents an inventory turn ratio of roughly 1.22X's -- which would equate with very poor performance for an unintegrated manufacturer in this industry.

In short, Tandem will still have a long way to go in tightening up on its financial position, even though the most recent event suggests that the company will henceforth attach a higher priority to improving financial controls.

Prudential-Bache makes a primary market in the shares of Tandem.

Additional information is available on request.

82-592

Donald Brown
(212) 791-2946

Tandem Computers*

(TNDM-OTC)

Improving Earnings Outlook

Gordon Casey

March 14, 1983

Price	52-Week Range	Earnings Per Share			P/E Ratio			Return on Ave. Equity	Dividend	Yield	Shares Outstanding
		1982A	1983E	1984E	1982A	1983E	1984E				
\$26	\$33-14	\$0.76	\$0.93	\$1.40	34.2	28.0	18.6	19.3%	—	—	38,018,000

Fiscal year ends September.
* Drexel Burnham Lambert Inc. makes a market in this security.

POINT OF VIEW

- Tandem holds a strong position in the computer marketplace as the leading supplier of fault-tolerant systems. High demand for Tandem's NonStop systems has built an excellent user base in major corporations. Adding to the company's position in data processing is growing strength in computer networking.
- We expect improving economic conditions to benefit Tandem with increased order rates. Accelerating revenue growth is expected to bring production levels in line with manufacturing capacity thus improving margins in fiscal 1983. We estimate earnings of \$0.93 per share in fiscal 1983, a gain of 22% over a restated \$0.76 last year. We expect a further strong gain to the range of \$1.30 to \$1.50 per share in fiscal 1984.
- The recently reported results for the first quarter of fiscal 1983 remove much of the uncertainty which previously clouded the company's outlook.
- We believe Tandem has an excellent potential for long-term growth. The company's leading position in fault-tolerant systems and growing strength in computer networking position Tandem to be a key player in the rapidly converging data processing and communications marketplace. We project earnings growth in the 1982 to 1987 period averaging approximately 35% annually.
- Tandem is currently in a period of transition and reassessment within the financial community. This positions the stock at a level which we believe is particularly attractive. We expect the stock to make strong gains in the further recovery of the market.

TABLE OF CONTENTS

	<u>PAGES</u>
OUTLOOK.....	1
BACKGROUND.....	4
STRATEGIC DIRECTION.....	5
PRODUCTS.....	7
SOFTWARE.....	8
FUTURE PRODUCT DIRECTIONS.....	9
COMPETITION.....	10
FISCAL 1982 RESULTS.....	12
EARNINGS RESTATEMENT, 1982.....	13
RECENT RESULTS.....	14
MANAGEMENT.....	16
FINANCIAL.....	17

This report was prepared from data believed reliable but not guaranteed by us, without further verification or investigation and does not purport to be complete. It is not to be considered as an offer to sell or a solicitation of an offer to buy the securities of the companies covered by this report. Opinions expressed are subject to change without notice. Drexel Burnham Lambert Incorporated, or one or more of its officers, may have a position in the securities discussed herein and Drexel Burnham Lambert Incorporated will be pleased to furnish specific information in this regard at any time upon request. Drexel Burnham Lambert Incorporated may act as a principal for its own account or as agent for another person, in connection with the sale or purchase of any security which is subject of this report.
© 1983 Drexel Burnham Lambert Incorporated

OUTLOOK

We expect Tandem to continue to demonstrate important business strengths in fault tolerant systems and in computer networking. With systems installed in over 600 large enterprises, the company has a strong base for future growth. Increasingly competitive activities are not expected to constrain Tandem's potential. We believe Tandem has an excellent outlook for long-term growth. We estimate earnings growth in the 1982-1987 period averaging 35% annually.

We expect Tandem Computers to successfully pass through the present period of transition to renewed earnings growth. Currently, the company's growth outlook, and indeed, Tandem's basic image, are under serious scrutiny. During fiscal 1982, the realities of a difficult economic environment began to constrain Tandem's virtually unbounded growth. In addition, following the end of fiscal 1982, a basic change in revenue recognition practices necessitated a complete restatement of the year's results. We have reassessed Tandem in light of these new considerations and have concluded that the stock is particularly attractive. We expect Tandem to make important new gains moving well ahead of the market as economic recovery continues.

To date, Tandem has not yet experienced improving order patterns. Ongoing results still reflect weakness in the economic environment. We expect this picture to change in coming months as economic recovery takes hold. Our view of the economy assumes continued improvement throughout calendar year 1983 with real economic growth approaching 3%. We expect these improving conditions to begin to benefit Tandem during the second half of fiscal 1983. The company recorded a 32.6% revenue gain in the first quarter without benefit of economic improvement. On this basis, we are projecting an improving pattern of revenue gains in fiscal 1983 with the full year totalling \$430 million, a gain of 38% over fiscal 1982. We also expect gradual improvement of gross margins with increasing business volumes. On this basis, we expect pretax margins to improve to the range of 15% to 16% by the fourth quarter. We estimate earnings in fiscal 1983 of \$0.93 per share versus \$0.76 in the previous year.

Tandem currently has sufficient cash to meet fiscal 1983 needs. The company projects interest income essentially equal to interest expense for the remainder of the year. A factor of increasing importance in financing growth is the role of employee stock options and the stock purchase plan. These sources are expected to provide an increasing share of new capital requirements. Our analysis assumes a \$70 million equity offering later in calendar year 1983. This is believed to be adequate to meet Tandem's need through fiscal 1984. Although we have assumed 2 million additional shares associated with this offering, the company has the option of using debt to meet funding needs. Currently, the company has a strong balance sheet with negligible long-term debt.

We expect further business gains continuing into fiscal 1984. Improving economic conditions are expected to support revenue growth in the 30% to 35% range. We estimate earnings in fiscal 1984 in the range of \$1.30 to \$1.50 per share.

TABLE 1

SUMMARY FINANCIAL STATISTICS
(\$ millions)

	<u>1980A</u>	<u>1981A</u>	<u>1982A</u>	<u>1983E</u>	<u>1984E</u>
Revenue (\$)	109.0	208.4	312.1	430.0	580.0
Rev. Increase (%)	94.7	91.2	49.8	37.8	34.6
Operating Income	19.3	40.4	40.7	61.4	95.6
Operating Margin (%)	17.7	19.4	13.0	14.3	16.5
Interest Income (Net)	1.8	10.7	6.0	0.0	4.0
Pretax Income	21.1	51.1	46.7	61.4	99.6
Pretax Margin (%)	19.3	24.5	15.0	14.3	17.2
Tax Rate (%)	49.3	48.0	36.1	39.0	40.0
Net Income	10.7	26.5	29.9	36.8	59.7
Earnings Per Share	0.35	0.72	0.76	0.93	1.40

Note: Fiscal year ends September.

TABLE 2

ESTIMATED RESULTS
(\$ millions)

	1982				1982
	1Q	2Q	3Q	4Q	Total
Revenue (\$)	71.0	74.1	79.8	87.2	312.1
Rev. Increase (%)	74.8	56.3	42.9	35.2	49.8
Operating Income	11.4	8.4	10.5	10.4	40.7
Operating Margin (%)	16.0	11.4	13.1	11.9	13.0
Interest Income (Net)	2.3	1.3	1.5	0.9	6.0
Pretax Income	13.7	9.7	12.0	11.4	46.7
Pretax Margin (%)	19.2	13.1	15.0	13.0	15.0
Tax Rate (%)	43.0	36.1	37.3	26.7	36.1
Net Income	7.8	6.2	7.5	8.3	29.9
Earnings Per Share (\$)	0.20	0.16	0.19	0.21	0.76

	1983				1983E
	1QA	2QE	3QE	4QE	Total
Revenue (\$)	94.1	102.0	112.0	123.0	430.1
Rev. Increase (%)	32.6	37.7	40.4	41.1	37.8
Operating Income	11.6	13.9	16.5	19.3	61.4
Operating Margin (%)	12.4	13.6	14.7	15.7	14.3
Interest Income (Net)	0.0	0.0	0.0	0.0	0.0
Pretax Income	11.7	13.9	16.5	19.3	61.4
Pretax Margin (%)	12.4	13.6	14.7	15.7	14.3
Tax Rate (%)	39.0	39.0	39.0	39.0	39.0
Net Income	7.1	8.5	10.1	11.8	36.8
Earnings Per Share (\$)	0.18	0.21	0.25	0.29	0.93

	1984E				1984E
	1Q	2Q	3Q	4Q	Total
Revenue (\$)	130.0	140.0	150.0	160.0	580.0
Rev. Increase (%)	38.2	37.3	33.9	30.1	34.6
Operating Income	20.4	22.7	25.0	27.5	95.6
Operating Margin (%)	15.7	16.2	16.7	17.2	16.5
Interest Income (Net)	1.5	1.2	0.8	0.5	4.0
Pretax Income	21.9	23.9	25.8	28.0	99.6
Pretax Margin (%)	16.8	17.1	17.2	17.5	17.2
Tax Rate (%)	40.0	40.0	40.0	40.0	40.0
Net Income	13.1	14.3	15.5	16.8	59.7
Earnings Per Share (\$)	0.31	0.34	0.36	0.39	1.40

Note: Fiscal year ends September.

BACKGROUND

The Tandem story begins with the company's pioneering work in fault tolerant systems. An outstanding record of business growth has been achieved by targeting a key need of data processing, high reliability. The company has outstanding products which in many respects are unique. High levels of system availability are achieved with multiple processor based systems. Operating system software has been designed to perform a wide range of system monitoring and management functions and to automatically perform corrective actions in the event of a system failure. The result is a set of products that continue to function effectively in the event of failure without loss or alteration of data.

Tandem has established an outstanding record of user satisfaction. Surveys consistently rate Tandem at the highest levels of product satisfaction and user loyalty. A key factor in these exceptional ratings is excellent software. The company's research and product development program includes a major commitment to software. The result has been a family of products which have significant advantages in initial installation and ease of expansion as well as high reliability.

Tandem has concentrated upon the requirements for transaction processing systems in a variety of business oriented environments. Systems are in use in a wide range of critical applications. The introduction of the computer to key business functions generally requires major changes in working procedures and the tasks that employees perform. The system becomes an integral part of the business function. Typical examples of transaction processing systems are airline reservations, on-line banking and credit authorization. In these situations, continuous system availability is critical. The organization cannot function without access to the system.

In Tandem's short seven year history, the company has installed systems in over 600 customer enterprises. In general, these installations represent the customer's first steps in automating vital business functions with on-line systems. Tandem's fault-tolerant NonStop systems were chosen to provide improved reliability and availability. In many instances, these early installations were essentially experimental. The key point, in our view, is that these initial systems have been successful and customers are now committed to Tandem as they enter a phase of widespread implementation. Rates of repeat business are climbing and we expect this factor to contribute strongly to future business growth.

Tandem's expertise in addressing the requirement for fault-tolerant systems has also yielded a strong competitive position in computer networking. The company's emphasis on communications has intensified over the past two years with a series of important hardware and software announcements. Tandem's focus is increasingly oriented toward meeting the needs of large enterprise users with massive networks employing thousands of terminals and hundreds of communications lines.

We expect Tandem to continue its progress in computer networking leading to an expanded role in this field in the mid-1980s. We view the Infosat joint announcement with the American Satellite Corporation as an important step in this direction. The Infosat move positions Tandem in the network services arena, currently an area of major focus. The fast growing area of communications and computer networking may prove to be Tandem's most important competitive battleground. Today's massive demand for data processing solutions centers upon the critical need for connecting the many dispersed locations of large enterprises. The company is building a strong base for continued leadership in this important business area. We expect Tandem to be a key participant in the rapid convergence of data processing and communications in the mid-1980s.

Tandem is currently enunciating its role in the marketplace as a key supplier of large scale integrated information systems. Tandem provides a backbone network and on-line transaction processing facilities to meet the needs of large corporate customers. This concept goes well beyond basic hardware to include the company's increasing depth of software and extensive field support services. Viewed in this light, Tandem is positioned as a major vendor with a role similar to that of the large mainframe companies.

STRATEGIC DIRECTION

Tandem's primary focus has been on transaction processing systems in the large enterprise marketplace. This continues to be an area of strong demand as major corporations seek productivity improvement by the automation of vital information processing functions. Tandem's concentration on fault-tolerant systems has provided an important competitive edge relative to conventional data processing solutions. As a result, Tandem is positioned at the leading edge of customers' efforts to automate key functions.

Tandem's customers are typically major corporations with considerable data processing experience. Tandem has compiled an excellent record in satisfying customers' needs. As noted previously, user surveys consistently rate Tandem systems at the highest levels. The company's success in automating vital business functions has gained Tandem an important foothold in over 600 major corporations worldwide.

Tandem's strategy is to extend the initial customer foothold by broadening the available array of products and services. Communications and computer networking are being emphasized. Although Tandem's original orientation and basic concept is on fault-tolerant systems, this approach also yields significant advantages in computer networking. In many respects, the basic Tandem system functions as a computer network. The operating system performs the critical role of controlling messages passing between the individual processors. Applying the same concepts to geographically dispersed systems has produced an excellent computer networking product.

The recent joint announcement with a leading satellite company extends Tandem's commitment to the area of communications. Tandem will participate in a joint venture in a new satellite communications network. Initial services are planned to begin in 1983. Tandem's partner in Infosat, American Satellite Company, (ASC), was established in 1972 and is jointly owned by Fairchild Industries and Continental Telecom Inc.* The Infosat offering is directed toward large enterprise users who require long distance leased line service. The communications service will be marketed jointly by Tandem and ASC. New low cost earth stations to be supplied by ASC will transmit and receive data over dual 56 kilobits per second transmission paths. For long distance users, the service is expected to provide significant savings relative to conventional terrestrial links.

The significance of these developments to Tandem, in our view, lies in the company's position in the Infosat joint venture at the ground floor of ASC's expanded undertaking. Tandem will provide the data processing side of the system. This new role, we believe, provides an opportunity for participation in a new business area with reasonably contained risks. It promises a broader scope for Tandem's business while ASC assumes the major investment in the satellite facilities.

* An officer of Drexel Burnham Lambert is a director of Continental Telecom Inc. Drexel Burnham Lambert Incorporated from time to time provides investment banking and other services to Continental Telecom.

Tandem's current strategic direction accords equal emphasis to networking and the depth of available software as it does to fault tolerance. The focus is on broad corporate issues and Tandem's ability to provide integrated information systems. Tandem's aim is to ultimately become the customer's principal supplier. In this context, we expect the emphasis to continue to shift toward communications and networking. The satellite communications services are a further extension of Tandem's range of offerings. In our opinion, the company is well positioned to become a major contender in the convergence of data processing and communications in the mid-1980s.

PRODUCTS

Tandem's NonStop system architecture has been designed to provide continuous system availability. It is intended for on-line transaction processing applications. High availability is ensured by hardware redundancy and software which provides the ability to automatically reconfigure the system in the event of component failure. In addition, the NonStop design includes features to guard against loss or alteration of data.

The Tandem system is a multiprocessor design which can accommodate any combination of two to 16 individual processors. A modular approach is used which provides a wide range of processing power and allows incremental growth as the user's needs increase. Modular upgrades can be made in the field without the need for a disruptive conversion.

The heart of the Tandem system, the NonStop processor, includes two microcoded processing units, one for central processing and bus control and a second for input/output control. This separation of function frees the central processor of the burden of heavy input/output activity characteristics of transaction processing applications. In its present NonStop II form, a 32-bit data access architecture is used providing ample capacity to support the needs of the largest users. A dual bus structure is used for interprocessor connection. Throughout the system, multiple components and multiple data paths are provided. This includes multiple power supplies, input/output ports and controllers for peripherals.

An operations and service processor (OSP) is used with each main processor. The OSP monitors the system providing system status and diagnostic functions, as well as facilities for unattended remote operation of the system. These functions are vital in the operation of large computer networks which frequently have unattended equipment in remote sites.

SOFTWARE

Tandem's fundamental business orientation toward transaction processing applications places great emphasis on software. Tandem offers a wide range of software products to support basic operation of systems, to facilitate application development and to support advanced data base management and communications needs. We believe Tandem's strengths in software are becoming a key differentiating factor in the marketplace. User surveys consistently give Tandem high marks for quality of software and general ease of use. We expect this to become an important strength as Tandem builds toward its objective of meeting all of an organization's information management needs.

Tandem's strength in software is exemplified by the key products which are an important factor in maintaining the company's competitive edge. Tandem's relational data base product, ENCOMPASS, performs a key role in enabling users to rapidly define and implement new applications. A key factor in this process is data base structure and ease of access to key data elements. This process is difficult enough in a stand-alone system, but becomes particularly complex when data elements reside in different distributed systems. Conventional data base management systems are inadequate in this environment, in our opinion. Tandem has addressed these requirements with ENCOMPASS, an advanced data base management system. ENCOMPASS incorporates advanced relational data base features and a query/report writer. These capabilities provide an important assist to application development and greatly facilitate program changes and system expansion.

Tandem's basic computer networking product, EXPAND, offers key advantages in reliability of network nodes and in management of communications lines. Network nodes have multiple processor Tandem systems which ensure continuous availability of nodes. In the event of a line outage, the network has the ability to retransmit over an alternate path. A further safeguard is provided by continuous monitoring of message traffic to guard against loss or alteration of data. These features ensure high availability and integrity of the network. Basic

networking capabilities are further advanced by Transfer which provides comprehensive information management facilities. Transfer is a message storage and delivery system which provides electronic mail capabilities including not only text but facsimile communication.

FUTURE PRODUCT DIRECTIONS

We expect Tandem to continue the basic strategic aim of becoming a key supplier of large scale integrated information systems. Emphasis is expected to be on enhancement of existing hardware and software with key product additions which support the basic strategic direction. As mentioned previously, Tandem has made substantial headway in initial system installations in over 600 major corporations. We expect the business to be characterized by further penetration of these enterprises, building upon the established base. The key words will be compatibility and enrichment of Tandem's offerings.

Emphasis on research and product development has been a key factor in establishing Tandem's unique position of leadership in the marketplace. From its founding, the company has committed to high levels of research and development spending which have consistently exceeded 8% of revenue. Currently, R&D is targeted at 9% to 10% of revenue and is balanced between hardware and software activities. Tandem's management has consistently worked to create an environment that would attract and retain exceptional research and development talent.

Tandem's system design has sought to avoid imposing arbitrary hardware dependent constraints on users. User programming and application development have been supported only in higher level languages. The company has not supported an assembler language. This approach gives Tandem considerable flexibility. Architectural or hardware changes can be made with minimal conversion problems for users. In this way, Tandem can utilize improved hardware technologies and price/performance advances as they become available. We expect future hardware changes to be introduced in a nondisruptive fashion without the need for users to make difficult conversions.

Tandem has indicated that several new processors are under development. The company has discussed development work aimed at applying gate array semiconductor technology to a new series of processors. This will provide the next price/performance step to maintain Tandem's competitiveness. We expect the announcement of a new series of processors based upon this work later in 1983. Longer-term, we expect Tandem to introduce further hardware changes as new technologies be-

come available. However, our basic view is that Tandem will adhere to a policy of upward compatibility and will avoid changes that might complicate user conversions.

COMPETITION

Tandem has established a unique competitive situation by emphasizing fault-tolerant systems. The NonStop concept originated with Tandem and has been the key factor in differentiating the company's products. The concentration on transaction processing requirements and fault-tolerance has established a strong niche in the marketplace. User attitudes appear to favor fault-tolerant systems in an ever wider range of applications. In our opinion, fault-tolerance will ultimately be expected in any advanced on-line application.

The strong demand for Tandem's systems and the growing user acceptance of fault-tolerant concepts has not gone unnoticed by competitors. A widening array of computer suppliers have announced fault-tolerant systems or have indicated the intent to soon make announcements. The past two years have seen the entry of several new start-up companies with similar business objectives and indications of interest by established firms.

The competitive response to Tandem has evolved along two basic paths. New start-up companies are proposing new architectural approaches to fault-tolerance. In contrast to this, existing companies are typically advocating a computer networking, or software based approach which maintains compatibility with existing hardware. However, in every instance, the competitive approaches are significantly different from Tandem's products. In the field of fault-tolerant systems, the customer is facing a steadily growing array of alternatives. The following paragraphs outline the three fault-tolerant competitors which, in our opinion, are the most significant. Stratus Computers is the leading competitor among an array of new companies and IBM and DEC need no introduction.

The new start-up companies have several advantages. They are not constrained by an existing product line or customer support requirements. They are free to choose a unique systems architecture. In addition, they benefit from the availability of a growing array of standardized low cost microprocessors. In the current environment, product development times are significantly shorter. In turn, however, the start-up company's advantages are offset by the need to catch up in software development and in building a user base.

Tandem's initial start-up challenger, and the most visible new company, is Stratus Computers of Natick, Massachusetts, a privately financed corporation. This new contender has indicated that it will target the same transaction processing marketplace with similar fault-tolerant characteristics. Initial efforts will focus on business and commercial applications and will use independent systems houses for marketing. The first shipments were made in early 1982 and by year end approximately 35 systems had been shipped. Stratus has taken a significantly different architectural approach. Extensive use has been made of currently available microprocessors emphasizing a high degree of redundancy. The low hardware cost of these new products has allowed Stratus to emphasize a hardware solution to fault-tolerance.

An October, 1982 introduction by IBM provides new capabilities for the Series 1 minicomputer. New operating software is available which will allow up to 16 Series 1 processors to operate in parallel with the appearance to the operator of a single system. This provides several advantages in non-disruptive system growth, improved reliability and redundancy in case of failure of an individual processor. However, in our opinion, the choice of the Series 1 raises questions regarding ease of installation of this new offering. The Series 1 has been marketed by IBM as a conventional minicomputer and does not have the broad array of software and installation aids which are available for other IBM products. Series 1 installations typically require significant customer effort or the services of a third party system integrator. Eventual success of this new IBM offering, in our view, will be dependent upon the level of commitment the company is willing to make in marketing emphasis and installation aids.

IBM has chosen the software approach to improved reliability. The company is marketing several systems in the small and intermediate systems marketplace. In contrast to Tandem, these processors were designed to minimize the cost of single processor installations. We believe IBM would be reluctant to introduce a completely new series of processors without first rationalizing the conflicts and overlaps between existing products. However, longer term, we expect the concept of fault-tolerance to become a key consideration in systems design. By the mid-1980's we expect IBM and other established companies to offer new hardware incorporating these considerations.

Digital Equipment is also expected to shortly announce a networking software solution based upon existing hardware. The company recognizes the opportunity for fault-tolerant systems. DEC is committed to broader participation in the business oriented systems marketplace. Originally identified as the redundant VAX, the concept has been described as a network of small VAX 32 bit processors. This approach offers the advantages of load sharing, backup in case of failure and modular growth without requiring completely new hardware.

On balance, we believe the demand for highly reliable transaction processing systems is massive and capable of supporting many suppliers. In our view, Tandem's lead in software development provides a substantial advantage relative to the new contenders. The small start-up companies not only must catch up with Tandem's lead in products, but starting from a zero base, must also become established with users. In building a 600+ user customer base, Tandem has created an important position for future growth with many major corporations. In some respects, these customer commitments can preempt the entry of new suppliers. The customer's investment in application software and growing familiarity with Tandem's concepts tend to confine a new entrant to completely new situations. We do not expect these new competitors to threaten Tandem's continued strong business growth.

Tandem's competitive posture relative to the established companies focuses more directly on communications and computer networking. In our opinion, fault-tolerant characteristics, relative ease of installation and an open ended design that facilitates network expansion are plus factors for Tandem. The Tandem networking solution is particularly attractive for new applications that have not previously been on-line.

Tandem is making a major commitment to providing compatibility features that will enable NonStop systems to coexist with IBM mainframes. A Tandem network can function as a subsystem within an IBM SNA hierarchical network. A customer's commitment to IBM in large mainframe systems does not preclude the use of a Tandem network to perform a specialized function.

An added competitive plus for Tandem is the Infosat satellite communications services, discussed previously. We consider the ability to offer a comprehensive network including both data processing and communications links a unique competitive offering.

FISCAL 1982 RESULTS

Fiscal 1982 was a pivotal year for Tandem. The company closed out fiscal 1981 with revenue growth almost double that of the previous year. Results in early fiscal 1982, as originally reported, indicated a continued strong rate of revenue growth exceeding 80% in the first half. Expectations for fiscal 1982 indicated a year of exceptional growth constrained only by Tandem's ability to add resources and supply products.

The outlook changed significantly at mid-year with the company's announcement that weak economic conditions had caused a fall-off of order rates. Weakness was noted in some key market areas including the North Central U.S., Canada and West Germany. Weak order patterns were reported from manufacturing customers while banking customers were holding up well. In general, this pattern has continued through the end of the first quarter of fiscal 1983.

The company is still adjusting to the major changes brought about by the new growth direction established in fiscal 1982. The expectations of slower business growth have required Tandem to reduce spending in numerous areas. This is in sharp contrast to the previous situation in which the only apparent constraint to Tandem's growth was the ability to rapidly put new resources in place. The final quarters of fiscal 1982 were characterized by runaway cost growth and slipping margins. Understanding Tandem's new business direction has been further complicated by the need to completely restate fiscal 1982 results following the year end.

EARNINGS RESTATEMENT, 1982

Although Tandem's restatement of fiscal 1982 results is now history, we believe it is important to review this critical event. In our opinion, the runaway cost growth in fiscal 1982 and the company's commitment to major capacity increases are partly attributable to the false signals conveyed by Tandem's prior revenue recognition practices. In addition, the need to restate results revealed both an overly aggressive approach to financial reporting and the inadequacy of Tandem's financial controls. We believe this seriously damaged Tandem's image in the financial community.

A December 8, 1982 press release announced that Tandem would restate fiscal 1982 results. The restatement became necessary to satisfy the objections of Tandem's outside auditors in their review of year-end results. The specific area of concern was revenue recognition practices.

By way of background, it should be explained that Tandem recognizes equipment revenue at the time of shipment. This is in contrast to the practice of some of the mainframe computer companies that recognize revenue at installation. However, the shipment basis is by far the most widely used practice in the industry.

Tandem's auditors raised two basic issues. The company had credited shipments actually made after the September 30, 1982 year end as well as crediting shipments which in the judgment of the auditors did not have adequate documentation. The auditors did not question the validity of the orders and shipments involved, but merely the timing of revenue recognition. Tandem has subsequently tightened procedures regarding revenue recognition and will adhere to these new practices in the future. The first quarter of fiscal 1983 was the first period to be reported under the new ground rules.

In implementing the new revenue recognition practices, Tandem restated results for fiscal 1982. The restated results reveal a different view of Tandem's business than had been originally reported. The most significant change is the timing of the onset of weaker results. Weakening earnings actually began in the second quarter ended in March, 1982. This is in sharp contrast to the original report of record earnings in the second quarter. The restatement also reveals a significant erosion of operating margins. Costs continued to increase at higher rates than revenues throughout the year. The following outlines some of the principal contrasts:

<u>As Originally Reported</u>	<u>Fiscal Year Ended Sept. 1982</u>				
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>Year</u>
Revenue (\$ mils)	\$74.7	\$85.6	\$84.4	\$91.2	\$335.9
Operating Margin (%)	18.3	18.2	15.9	14.2	16.5
Earnings Per Share	\$0.23	\$0.25	\$0.23	\$0.24	\$0.95

Restated

Revenue (\$ mils)	\$71.0	\$74.1	\$79.8	\$87.2	\$312.1
Operating Margin (%)	16.0	11.4	13.1	12.0	13.0
Earnings Per Share	\$0.20	\$0.16	\$0.19	\$0.21	\$0.76

RECENT RESULTS

Tandem's first quarter of fiscal 1983 is the first quarter to be reported under the new set of revenue recognition practices which were applied at the end of fiscal 1982. For this reason, the first quarter results are significant as the first step on a new path of revenue and earnings gains. Tandem's earnings of \$0.18 per share in the quarter were down from \$0.20 per share in fiscal 1982. Although revenue of \$94.1 million gained 7.9% over \$87.2 million in the preceding quarter,

there was no growth of inventories in the first quarter. This produced pressure on unit costs and margins as production volumes failed to keep pace with cost growth. First quarter operating margins slipped to 12.4%. This is below a restated 16.0% last year and significantly lower than the 18% to 20% margins which prevail on the old basis prior to restatement. An additional factor in lower first quarter results was the wash-out of net interest income caused by higher interest. These factors resulted in pretax margin of 12.4%, well down from 19.2% last year on a restated basis.

Weak margins in the first quarter are largely attributable to cost growth resulting from the substantial new capacity added in fiscal 1982. Tandem entered fiscal 1982 with an ambitious plan of capital spending to essentially double property, plant and equipment. By year end, further additions to the capital spending plan increased the total gain to 144%. This significantly exceeded the 50% revenue gain during the year. The resulting cost increases attributable to this new capacity significantly impacted first quarter results. Depreciation alone was up 122% in the quarter.

An important positive feature of Tandem's first quarter report was the progress made in reducing product development costs and marketing, general and administrative costs. Both of these categories were significantly reduced from fourth quarter 1982 levels. Product development costs were held to 9.6% of revenue in the first quarter. This falls within the company's targeted range of 9% to 10% of revenue. Marketing, general and administrative costs were held to 37.8% of revenue which is comparable to the levels in effect prior to fiscal 1982. The company plans to target these costs in the mid-to-high 30% range.

The cost reduction evident in the first quarter results is due to Tandem's implementation of numerous austerity measures. These include a virtual freeze on hiring, suspension of salary increases, a 2½ day unpaid vacation during the first quarter and a six month hold on construction of the new Austin, Texas plant. The only exception to the hiring freeze is in key marketing situations where any addition can be justified by additional sales.

TABLE 3

RECENT RESULTS
FISCAL 1982 (RESTATED) 1Q1983
(\$ millions)

	1982				1983
	1Q	2Q	3Q	4Q	1Q
Revenue (\$)	71.0	74.1	79.8	87.2	94.1
Rev. Increase (%)	74.8	56.3	42.9	35.2	32.6
Cost and Expenses					
Cost of Revenue (\$)	25.2	26.7	27.0	30.5	38.0
Product Devel. (\$)	6.8	7.7	9.2	9.9	9.0
Marketing, G&A (\$)	27.6	31.3	33.2	36.4	35.5
Total (\$)	59.6	65.7	69.3	76.8	82.5
Cost and Expenses as a % of Revenue					
Cost of Revenue (%)	35.5	36.0	33.8	35.0	40.3
Product Devel. (%)	9.6	10.4	11.5	11.3	9.6
Marketing, G&A (%)	38.9	42.2	41.5	41.7	37.8
Operating Income (\$)	11.4	8.4	10.5	10.4	11.6
Operating Margin (%)	16.0	11.4	13.1	11.9	12.4
Interest, Net (\$)	2.3	1.3	1.5	0.9	0.1
Pretax Income (\$)	13.7	9.7	12.0	11.4	11.7
Pretax Margin (%)	19.2	13.1	15.0	13.0	12.4
Tax Rate (%)	43.0	36.1	37.3	26.7	39.0
Net Income (\$)	7.8	6.2	7.5	8.3	7.1
Earnings Per Share (\$)	0.20	0.16	0.19	0.21	0.18

Note: Fiscal year ends September.

MANAGEMENT

From the company's founding in 1974, Tandem has worked to create a strong base for future growth. Long range planning has been a key area of focus in building an organization capable of propelling Tandem into the billion dollar class. New employees have been selected with a view to their ability to perform in higher positions as the company grows. The concentration on planning extends to new employees who are made thoroughly aware of Tandem's objectives and the individual's role in their accomplishment.

The company's founding management, including the President, James G. Treybig and his three cofounders, received their basic grounding at Hewlett-Packard. They brought with them a philosophy based upon "people-oriented" management. The company is committed to a wide variety of advanced and unorthodox management and personnel practices. The Tandem style emphasizes informality, open communication and respect for the individual employee and his role in the company. The Tandem philosophy is based upon the belief that the individual's effort is key to good products and a successful business. Self management and peer pressure are emphasized. Responsibility and decision making are pushed down to the working level.

The fiscal 1982 experience revealed some of the weaknesses of Tandem's management approach. The practices put in place in the company's early fast growth period were found to be inadequate when order rates faltered. In our opinion, the company must now impose tighter financial controls and improved planning procedures to avoid the runaway cost growth that characterized fiscal 1982 results.

Tandem is currently operating under a program of relative austerity in comparison to the previous period. The challenge is to maintain the company's strengths while imposing additional controls. We expect the company to undergo some changes in this process of maturing. Some losses have occurred in management ranks. The loss of key personnel is clearly a risk to any small fast growing company. Tandem's ability to retain key people has been an outstanding strength of the company. The company's low 7% turnover rate is in sharp contrast to many of its Silicon Valley neighbors with 30% to 40% rates. We believe Tandem has the ability to attract the management talent needed to maintain strong business growth. We view the loss of some key management personnel as inevitable in this period of reorientation of the company. We do not view these factors as a constraint to Tandem's growth.

FINANCIAL

Tandem's business has grown rapidly following shipment of the first NonStop system in May, 1976. Through the first quarter of fiscal 1983, the company has shipped 4,447 processors and has pushed its revenue level to a current annual rate approaching \$400 million. This dramatic growth has required a steady build-up of resources. Employment has grown to over 3,800 and total assets reached \$356 million at the end of December 1982.

Looking to the future, we expect further excellent business growth. We believe the company has the proven product leadership and the strong user base necessary to ensure future growth. We expect Tandem to rapidly recover from the setback of fiscal 1982. Margins and return on investment are expected to improve, once again approaching historic levels. We estimate earnings growth in the 1982 to 1987 period averaging 35% annually.

Tandem's rapid growth has required frequent infusions of new capital. The company has pursued a conservation approach to financing, relying entirely upon additions to equity. Tandem has avoided the use of debt to finance growth. Prior to the initial public stock offering in December, 1977, financing had been obtained privately. From this initial offering to date, the company has had three additional major stock offerings. A further source of additional funds is employee stock purchases. These include both stock option plans and an employee stock purchase plan. During fiscal 1982, these sources provided \$12.2 million of new capital. The company is currently positioned with adequate cash on hand to finish fiscal 1983 without additional funding.

We are conservatively estimating a 35% revenue gain in fiscal 1984 to \$580 million. We expect Tandem to seek additional funding during calendar year 1983. Our analysis assumes a \$70 million equity offering. However, Tandem has the option of long-term debt or convertible securities. In our opinion, Tandem's ability to grow is not constrained by the ability to obtain additional funding.

TABLE 4

TANDEM COMPUTERS
REVENUE GROWTH 1977 THROUGH 1982
(\$ millions)

	United States		International		World-Wide	
	Revenue	% Increase	Revenue	% Increase	Revenue	% Increase
1977	\$ 5.9	---	\$ 1.8	---	\$ 7.7	---
1978	16.8	185%	7.5	317%	24.3	216%
1979	41.3	146	14.7	96	56.0	131
1980	78.8	91	30.2	105	109.0	95
1981	144.4	83	64.0	112	208.4	91
1982	215.2	49	96.9	51	312.1	50

Note: Fiscal year ends September.

TABLE 5

CAPITAL EXPENDITURES 1977 TO 1983P
(\$ thousands)

	Property, Plant & Equipment At Cost At End of Previous Year	Additions to Property, Plant & Equipment	Increase (Percent)
1977	NA	\$ 534	---
1978	\$ 936	2,387	255%
1979	3,168	5,433	172
1980	8,519	9,966	117
1981	18,365	25,974	141
1982	44,339	63,677	144
1983 (Planned)	107,466	50,000E	47

Note: Fiscal year ends September.

TABLE 6

OPERATING RETURNS
(\$ millions)

	<u>1978A</u>	<u>1979A</u>	<u>1980A</u>	<u>1981A</u>	<u>1982A</u>	<u>1983E</u>	<u>Average Percent Increase</u>
<u>Operating Return on Tangible Assets* (%)</u>	34.3	32.6	30.8	25.3	17.2	21.0	---
Current Assets	19.5	39.3	81.7	220.1	242.0	33.0	76.1
Net Plant & Equipment	2.6	6.6	14.1	35.9	89.4	130.0	118.7
Operating Income							
Before Depreciation	4.7	11.1	21.8	44.5	50.9	79.4	76.0
Interest Expense	0.1	0.1	0.3	0.3	1.0	3.0	97.0
<u>Interest Expense/Operating Income Before Depreciation (%)</u>	1.4	0.8	1.3	0.6	1.9	3.8	---
<u>Debt Leverage** (%)</u>	5.9	7.9	7.8	5.3	16.5	23.6	---
Long-term Debt***	0.7	1.1	1.7	2.1	21.1	35.0	118.7
Debt in Current Liabilities	0.2	0.4	0.5	0.7	2.1	15.3	138.1
Deferred Taxes	--	1.0	3.3	8.1	18.1	25.0	---
Total Equity	15.5	31.5	70.3	204.8	251.0	317.8	83.0
<u>Return on Equity (%)</u>	37.4	20.9	21.0	19.3	13.1	12.9	---

* (Operating income + depreciation)/Average tangible assets

** (Short-term debt + long-term debt + deferred taxes)/Total equity.

*** Long-term debt + capitalized lease obligations.

Note: Fiscal year ends September.

TABLE 7

COMMON STOCK SALES
(\$ thousands)

	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>
Sale Prior To Public Offering*	1,000	---	---	---	---
PUBLIC OFFERINGS					
Date	(12-77)	(12-78)	(11-79)	(11-80)	
Net Proceeds	7,888	10,075	24,279	96,033	
EMPLOYEE SALES					
Options	---	354	2,042	7,396	5,050
Purchase Plan	---	408	950	2,273	7,199
Total Employee Sales	<u>310</u>	<u>762</u>	<u>2,992</u>	<u>9,669</u>	<u>12,249</u>
TOTAL STOCK SALES	8,198	10,837	27,271	105,702	12,249

* Sold as preferred stock subsequently converted to common stock at initial public offering. Equity sales prior to fiscal year 1978 totalled \$5,225,260.

Note: Fiscal year ends September.

TABLE 8

TANDEM COMPUTERS
SOURCES AND APPLICATIONS OF FUNDS 1980-1984
(\$ millions)

<u>Sources of Funds</u>	1980A	1981A	1982A	1983E	1984E
Net Income	10.7	26.5	29.9	36.8	59.7
Depreciation	2.5	4.1	10.2	18.0	22.0
Other	<u>2.3</u>	<u>4.8</u>	<u>9.9</u>	<u>12.0</u>	<u>16.0</u>
Total From Operations	15.5	35.5	50.0	66.8	97.7
<u>Applications of Funds</u>					
Accounts Receivable	22.7	28.1	28.1	35.0	45.0
Inventory	9.6	33.6	46.8	20.0	40.0
Prepaid Expenses	0.6	3.1	12.0	15.0	20.0
Other Current Liabilities	<u>(8.2)</u>	<u>(20.5)</u>	<u>(6.2)</u>	<u>(10.0)</u>	<u>(15.0)</u>
Total Used	24.7	44.3	80.7	60.0	90.0
Sources minus Applications	(9.2)	(8.8)	(30.7)	6.8	7.7
Additions to Property, Plant and Equipment	10.0	26.0	63.7	45.0	70.0
<u>Net Funds Used</u>	19.2	34.8	94.4	38.2	62.3
<u>Funds Provided</u>					
<u>By Financing Sources</u>					
Misc. Debt	0.4	0.5	13.1	13.2	15.0
New Financing	<u>28.1</u>	<u>108.0</u>	<u>16.3</u>	<u>25.0</u>	<u>100.0</u>
Total From Financing Sources	28.5	108.5	29.4	38.2	115.0
Total Funds Used	(9.3)	(73.7)	65.0	0.0	(52.7)
Cash - Beginning of Year	6.8	16.2	89.8	24.8	24.8
Cash - End of Year	16.2	89.8	24.8	24.8	77.5

Note: Fiscal Year Ends September.

TABLE 9

TANDEM COMPUTERS
CONSOLIDATED BALANCE SHEETS
(\$ millions)

	<u>September 30</u> <u>1981</u>	<u>September 30</u> <u>1982</u>	<u>December 31</u> <u>1982</u>
<u>Assets</u>			
Current Assets			
Cash and Investments	\$ 89.8	\$ 24.8	\$ 24.1
Accounts Receivable (Net)	70.7	98.8	115.2
Inventories	54.5	101.3	101.5
Other	<u>5.0</u>	<u>17.0</u>	<u>13.2</u>
Total Current Assets	\$220.1	\$242.0	\$254.0
Property, Plant and Equipment (AT Cost)	44.3	107.5	117.6
Less Depreciation	<u>(8.4)</u>	<u>(18.1)</u>	<u>(22.0)</u>
Net	\$ 35.9	\$ 89.4	\$ 95.7
Other Assets	<u>--</u>	<u>6.0</u>	<u>6.3</u>
Total Assets	\$256.0	\$337.4	\$356.0
<u>Liabilities and Net Worth</u>			
Current Liabilities	\$ 41.0	\$ 47.2	\$ 43.4
Capitalized Lease Obligations	2.1	10.4	12.1
Long-Term Debt	---	10.7	14.5
Deferred Income Taxes	<u>8.1</u>	<u>18.1</u>	<u>17.2</u>
Total Liabilities	\$ 51.2	\$ 86.4	\$ 87.2
Net Worth	<u>\$204.8</u>	<u>\$251.0</u>	<u>\$268.8</u>
Total Liabilities and Net Worth	\$256.0	\$337.4	\$356.0

Note: Fiscal year ends September.

FROST & SULLIVAN DISTRIBUTES THIS
REPORT FOR BACKGROUND INFORMATION AND
MARKETING RESEARCH PURPOSES AND NOT FOR
INVESTMENT CONSIDERATIONS. F & S HAS NOT
PREPARED THIS REPORT NOR VERIFIED THE
ACCURACY OF THE INFORMATION HEREIN.

**HAMBRECHT
&
QUIST**
INCORPORATED

REG 20 1984

Institutional Research

235 MONTGOMERY STREET
SAN FRANCISCO,
CA 94104
415-986-5500
CABLE HAMBQUIST
TELEX 276397 HQ (RCA)

277 PARK AVENUE
38th FLOOR
NEW YORK, NY 10172
212-207-1400
TELEX 237258 HQ UR (RCA)

Marc G. Schulman
August 13, 1984

TANDEM COMPUTERS (OTC-TNDM)

Price	52-Week Range	Mkt. Val. (mil.)	FYB	Fiscal E.P.S.			Calendar P/E		Code
				1983A	1984E	1985E	1984	1985	
\$17	\$13-\$40	\$682	Sept.	\$0.76	\$0.83*	\$1.15	20	13	4

(*) Inclusive of \$0.07 per share of DISC benefits accrued in the fourth quarter.

Summary and Investment Conclusion

Tandem's equipment sales showed no growth between the second half of 1983 and the first half of 1984. The company's inability to generate growth occurred despite a production buildup of the TXP processor, a product that offers far more performance and substantially better price-performance than the predecessor NonStop II, and within the context of a very rapidly growing economy, strengthening capital spending, and surging corporate profits. Given these factors, along with Tandem's historically strong position in the rapidly growing transaction processing market, it is truly stunning that the company's equipment sales have not grown.

In our view, the sources of Tandem's revenue problem are as follows:

1. The TXP was conceived as a replacement for the less powerful NonStop II, rather than as an upward extension and, therefore, as a broadening of the product line. The early implementation of a trade-in program can be viewed as an attempt by the company to quickly deplete its installed base of NonStop IIs, as well as a mechanism for stimulating TXP demand.
2. Given the substantially higher price and performance of the TXP, it does not represent a migration path for Tandem's smaller users. Tandem's refocusing of the marketing effort to major accounts substantiates this view. In effect, Tandem has intentionally implemented a product and marketing strategy that insures that its existing base of smaller users will generate a steadily declining revenue stream.
3. Thus far, Tandem's new product and marketing strategies, as measured by the revenue they have produced, have failed. That they have not produced their intended consequence can, we think, be attributed to three factors, in addition to the drying up of revenues from small accounts.
 - The focus on major accounts and on transaction processing applications (Tandem no longer describes itself as a manufacturer of fault-tolerant computers) means that Tandem now squares off against IBM in virtually every competitive bidding situation. Because the competing machine is

normally a 308X mainframe, Tandem has, by choice, decided to take on the very heart of IBM. IBM salesmen who lose 308X orders tend not to have very successful careers and can avail themselves of SWAT teams from Armonk to aid them in maintaining their upward mobility.

- While Tandem's product and marketing strategies have been revamped, its selling organization has not. Tandem, which now describes itself as a mainframe company, has a salesforce composed of individuals with minicomputer backgrounds. They therefore do not have experience closing orders with the senior corporate-level executives who control the purse strings for the applications upon which Tandem is now focusing. IBM's salesmen do not lack such experience.
- More problematically, some major accounts may view the TXP as an interim product and may be concerned about Tandem's ability to maintain compatibility in the future. The TXP is a dual 16-bit processor, not a 32-bit processor. As we stated last October when the TXP was introduced, the fact that it is not a 32-bit machine tells us that Tandem could not develop a compatible 32-bit successor to the 16-bit NonStop E. Some of our sources tell us that an effort to develop such a machine, called Rainbow, was disbanded several months ago, while other sources tell us that the compatibility issue has since been solved. We should know the answer by the end of next year.

Management now recognizes the need to revamp the sales organization by hiring salesmen with mainframe backgrounds. While this is constructive in the longer term, it risks ungluing an organization that is already showing signs of strain.

1. In the June quarter, gross additions to the salesforce were over 40 but net additions were only 13. This high turnover rate is suggestive of declining morale. Stratus Computer was able to lure away several of Tandem's salesmen when it opened its United Kingdom subsidiary.
2. If Tandem does succeed in attracting a number of salesmen with mainframe backgrounds, they will presumably be assigned to cover the choicest major account opportunities. The resulting disgruntlement could act to increase further the turnover rate.
3. If mainframe salesmen are needed, it follows that sales management will need to be restructured along similar lines, resulting in turnover at the highest levels of the sales organization.

While management is willing to take on the risks associated with the revamping of the sales organization, it evidently is not willing to implement measures, such as a refocusing on smaller accounts, that might boost near-term revenues. Tandem is not changing a strategy that has produced disappointing results. From this observation, we conclude that management believes that the strategy has been poorly implemented, that the strategy is sound and, consequently, that the short-term risks are worth taking.

We are not so sure:

1. Historically, taking on IBM on a head-to-head basis has been a losing proposition. Other minicomputer companies have consistently avoided the

implementation of strategies requiring them to do battle against IBM mainframes. The inherent risk in such a strategy seems particularly great at the present moment because of the anticipated introduction, within the next 6-9 months, of IBM's next mainframe generation, the Sierra.

2. We question the soundness of Tandem's decision to virtually turn its back on smaller users in its zeal to take on IBM in large accounts. This decision means that the company is not planting seeds that can be harvested later and that it is leaving the door open for Stratus Computer and other smaller start-ups.
3. Tandem may have painted itself into a corner. At the low-end, it is at a price-performance disadvantage. Conceivably, the decision to de-emphasize smaller accounts may have stemmed, in part, from a recognition that architectural limitations would hurt its competitive position. By shifting to the high-end, major account strategy, Tandem avoids this issue. At the high-end, its competition is IBM, not the start-ups, and Tandem has a clear-cut price/performance advantage relative to IBM. At the high-end, Tandem has the product but not the marketing; at the low-end, it has the marketing, but not the product.

What Is The Problem?

In this section, we will use data provided by Tandem to determine why the company's revenues have fallen below plan. Because some March quarter revenues spilled over into the June quarter, we'll focus on six-month periods. The data is summarized in Table 1.

Table 1
Revenue, Processor, and Customer Statistics

	<u>Rev.</u> <u>(\$MM)⁽¹⁾</u>	<u>Net</u> <u>Processors</u> <u>Shipped⁽²⁾</u>	<u>Active</u> <u>Custs.⁽³⁾</u>	<u>New</u> <u>Custs.</u>	<u>Revenue</u> <u>per Net</u> <u>Processor</u>	<u>Rev. per</u> <u>Active</u> <u>Customer</u>	<u>Net Procs.</u> <u>Shipped per</u> <u>Active Cust.</u>
9/82	\$75.8	374	132	40	\$202,700	\$574,200	2.83
12/82	81.8	396	116	35	206,600	705,200	3.41
2H82	<u>\$157.6</u>	<u>770</u>	<u>248</u>	<u>75</u>	<u>\$204,700</u>	<u>\$635,500</u>	<u>3.10</u>
3/83	\$82.3	370	119	25	\$222,400	\$691,600	3.11
6/83	94.6	386	115	19	245,100	822,600	3.36
1H83	<u>\$176.9</u>	<u>756</u>	<u>234</u>	<u>34</u>	<u>\$234,000</u>	<u>\$756,000</u>	<u>3.23</u>
9/83	\$101.5	621	159	47	\$163,400	\$638,400	3.91
12/83	108.5	573	158	33	189,400	686,700	3.63
2H83	<u>\$210.0</u>	<u>1194</u>	<u>317</u>	<u>80</u>	<u>\$175,900</u>	<u>\$662,500</u>	<u>3.77</u>
3/84	\$91.2	463	133	25	\$197,000	\$685,700	3.48
6/84	119.1	569	171	39	209,300	696,500	3.33
1H84	<u>\$210.3</u>	<u>1032</u>	<u>304</u>	<u>64</u>	<u>\$203,800</u>	<u>\$691,800</u>	<u>3.39</u>

(1) Equipment sales only.

(2) Gross shipments minus trade-ins.

(3) Number of customers shipped to.

The revenue shortfall could have resulted from one or more of the following:

1. A netting problem stemming from too many trade-ins of NonStop IIs. If this were true, it would show up as too low a ratio of net processor shipments to active customers. While this ratio was lower in 1H84 (3.39) than in 2H83 (3.77), when the NonStop I-for-NonStop II program was over and the NonStop II-for-TXP program was barely underway, it was higher than in 2H82 (3.10) and 1H83 (3.23), during the heyday of the I-for-II program. We conclude that netting is not the core problem.
2. Too few active customers. The number of active customers was 4% less in 1H84 (304) than in 2H83 (317). A similar pattern prevailed in the prior 12 months, as the number of active customers in 1H83 (234) was 6% less than in 2H82 (248). However, revenues in 1H83 (\$176.9 million) were 12% higher than in 2H82 (\$157.6 million). So, while a larger number of active customers would obviously have helped, we conclude that the length of the active customer list is not a primary factor.
3. Revenue generation per net processor shipped is too low. In 1H83, at the height of the I-for-II trade-in program, this number surged at \$234,000. In 2H83, when trade-ins were minimal, revenues per net processor shipped plummeted by 25% to \$175,900. This fact, which is exactly the opposite of what should happen when a trade-in program ends, suggests that Tandem shipped a disproportionately large number of fully configured systems in order to achieve its 1H83 revenue target. Revenue growth was maintained in 2H83 because the surge in net processor shipments stemming from the low level of trade-ins more than offset the plunge in revenues per net processor. That plunge suggests one or more of the following: (a) a mix shift toward the \$100,000 NonStop I+ and away from the NonStop II; (b) an increase in the contribution of stripped (i.e., no peripherals) systems shipped to OEMs and systems houses; and/or (c) heavier discounting. In 1H84, revenue generation per net processor rose modestly, but was still 13% below its 1H83 level. This cannot be attributed to heavier trade-ins because net processor shipments were 37% higher in 1H84 than in 1H83. In view of the ongoing shift to the TXP (which accounted for a majority of systems shipped in the June quarter and which has an average list system selling price of about \$700,000, more than triple that of the NonStop II), the fact that revenues per net processor is lower than a year ago is very disturbing and forces us to conclude that revenue realization per shipped TXP is far below plan due to heavy discounting and/or a very high content of stripped systems in the shipment stream. For example, we are aware of a major OEM that paid about \$3 million for 40 discounted stripped systems in the June quarter. That's \$75,000 each.
4. Revenue per active customer is too low. This statistic surged in 1H83, when the I-for-II trade-in program was in full force, and dropped by 12% in 2H83, when trade-in activity was minimal. This pattern is the same as that of revenue per net processor; taken together, this says to us that Tandem milked the customer base in 1H83 (each customer purchased a lot of high value systems), that the price was not paid in 2H83 because trade-ins and, therefore, netting were minimal, and that the price was paid in 1H84 because trade-in activity moved back toward the level of 1H83. We are very concerned by the fact that the revenue per active customer has not moved up despite (a) a transition to a more powerful, higher-priced product, and (b) the increased marketing focus on major accounts, which theoretically should result in greater revenue per active customer.

5. Increased marketing focus on new customers. After having steadily fallen for three quarters, Tandem's new account generation surged in the 9/83 quarter. Two quarters later, the revenue disappointments began. A decreased focus on existing accounts, perhaps stemming from their product saturation in 1H83, may be a contributing factor. However, a sharp increase in new accounts in the 9/82 quarter did not lead to a flattening of revenues during a period corresponding to the depths of the recession.

From this analysis, we conclude that the primary factors contributing to Tandem's revenue shortfall are as follows:

1. A below-plan average selling price. We believe that the typical TXP is less richly configured than it was supposed to be and that the average discount from list price is greater than it was supposed to be.
2. A greater than expected revenue contribution from OEMs and systems houses. Because such customers have a greater tendency to buy stripped systems than do end-users and because they buy in quantity, unlike the small end-users that have been de-emphasized by Tandem, an increase in their revenue contribution would result in a shift toward plain-vanilla systems and in a greater average discount.
3. Below-plan penetration of major accounts. While management now readily admits that the acquisition of major accounts is taking longer than expected, the trend in revenue generation per active customer indicates that Tandem's accounts are installing equipment at a slower than anticipated rate.

What Can Be Done About It?

We can think of five actions that management might take in order to stimulate revenue growth. Each of them, including the first two, which apparently represent the path that will be taken, entails significant risk.

1. Strengthen the major account effort by hiring salesmen with mainframe selling experience. The product cycle transition to the TXP was accompanied by a marketing transition to a focus on large accounts and, therefore, to a higher incidence of head-to-head competition with IBM. It was not accompanied by a salesforce transition from individuals with a minicomputer background to individuals with a mainframe background. Accordingly, management believes that the hiring of a substantial number of people with such a background is the primary way to solve the revenue problem. In the long run, this may be true. In the short run, it risks the intensification of the salesforce turnover problem that surfaced in the June quarter, and, hence, further revenue shortfalls. We say this because if new salesmen with a mainframe background are viewed as the key salesmen, then it follows that (a) key accounts will be taken away from current salesmen, and (b) the current sales management, with its minicomputer background, needs to be replaced with sales management with a mainframe background. If this path is followed, we think that Tandem's problems will get worse before they get better.
2. Develop more relationships with third party software firms. Management's indication that this tactic is being pursued indicates that competing against IBM

has revealed that the TXP needs to support more application software. If this effort is successful before the positive effects of the sales organization are felt, Tandem's mix will shift even more heavily toward simply-configured, heavily discounted systems, resulting in lower revenues per shipped system and lower gross margins. In any event, management indicates that it will be several quarters before a substantial amount of new application software will be available.

3. Implement a renewed focus on small end-user accounts. This tactic, which could be implemented through changes in salesforce incentives, has been ruled out by management because support costs would be too high. The TXP would probably be overkill for most small users, while the NonStop II is an obsolescent product.
4. Introduce a lower-priced replacement for the NonStop II. It is rumored that such a product is on the way. If it is, and if Tandem continues to de-emphasize small users, then its strategic importance would be to heighten the appeal of the TXP to major accounts. While we think that a broader product line would be helpful, the offset is that smaller processors almost invariably carry lower gross margins than do larger processors.
5. Cut the TXP's price. Management says that price is not the problem, but, as already noted, we think that Tandem has already found it necessary to discount a product that is still in volume buildup mode.

Table 2
Estimated Fiscal 1984/1985 Annual Results
($\$$ in millions, except earnings per share)

	<u>F82A</u>	<u>F83A</u>	<u>F84E</u>	<u>F85E</u>	<u>F83/F82</u>	<u>F84/F83</u>	<u>F85/F84</u>
Sales	\$272.6	\$360.1	\$443.8	\$563.0	32.1%	23.2%	26.9%
Service	\$39.6	\$58.1	\$86.3	\$127.0	46.7%	48.5%	47.2%
Revenue	\$312.1	\$418.3	\$530.0	\$690.0	34.0%	26.7%	30.2%
COGS	\$109.3	\$168.7	\$215.9	\$276.0	54.3%	28.0%	27.8%
-% Revenue	35.0%	40.3%	40.7%	40.0%	—	—	—
R&D	\$33.6	\$39.2	\$51.2	\$65.0	16.7%	30.6%	26.9%
-% Revenue	10.8%	9.4%	9.7%	9.4%	—	—	—
SG&A	\$128.5	\$160.6	\$213.6	\$271.4	25.0%	33.0%	27.0%
-% Revenue	41.2%	38.4%	40.3%	39.3%	—	—	—
Oper. Inc.	\$40.7	\$49.8	\$49.2	\$77.7	22.4%	-1.3%	58.0%
-% Revenue	13.0%	11.9%	9.3%	11.3%	—	—	—
Int. Income	\$6.0	\$0.7	\$4.5	\$3.4	-88.3%	542.9%	-24.4%
Ptx. Income	\$46.7	\$50.5	\$53.8	\$81.1	8.1%	6.4%	50.8%
-% Revenue	15.0%	12.1%	10.1%	11.7%	—	—	—
Tax Rate	36.1%	39.0%	36.0%	42.0%	—	—	—
Net Income	\$29.9	\$30.8	\$34.4	\$47.0	3.0%	11.7%	36.7%
Avg. Shares	39.2	40.8	41.4	41.0	4.1%	1.5%	-1.0%
EPS	\$0.76	\$0.76	\$0.83	\$1.15	0.0%	9.7%	37.5%

Table 3
Estimated Fiscal 1984/1985 Quarterly Results
 (\$ in millions, except earnings per share)

	<u>Q1:F84A</u>	<u>Q2:F84A</u>	<u>Q3:F84A</u>	<u>Q4:F84E</u>	<u>Q1:F85E</u>	<u>Q2:F85E</u>	<u>Q3:F85E</u>	<u>Q4:F85E</u>
Sales	\$108.5	\$91.2	\$119.1	\$125.0	\$132.5	\$130.0	\$147.5	\$153.0
Service	\$17.9	\$20.0	\$22.9	\$25.5	\$28.0	\$30.5	\$33.0	\$35.5
Revenue	<u>\$126.4</u>	<u>\$111.2</u>	<u>\$141.9</u>	<u>\$150.5</u>	<u>\$160.5</u>	<u>\$160.5</u>	<u>\$180.5</u>	<u>\$188.5</u>
COGS	\$50.4	\$47.2	\$57.8	\$60.5	\$64.2	\$64.2	\$72.2	\$75.4
-% Revenue	39.9%	42.5%	40.7%	40.2%	40.0%	40.0%	40.0%	40.0%
R&D	\$10.8	\$12.9	\$13.5	\$14.0	\$14.9	\$15.7	\$16.8	\$17.5
-% Revenue	8.6%	11.6%	9.5%	9.3%	9.3%	9.8%	9.3%	9.3%
SG&A	\$48.2	\$49.1	\$56.3	\$60.0	\$63.4	\$65.0	\$70.2	\$72.8
-% Revenue	38.1%	44.2%	39.7%	39.9%	39.5%	40.5%	38.9%	38.6%
Oper. Inc.	<u>\$16.9</u>	<u>\$2.0</u>	<u>\$14.3</u>	<u>\$16.0</u>	<u>\$18.0</u>	<u>\$15.6</u>	<u>\$21.3</u>	<u>\$22.8</u>
-% Revenue	13.4%	1.8%	10.1%	10.6%	11.2%	9.7%	11.8%	12.1%
Int. Income	\$1.1	\$1.1	\$1.2	\$1.1	\$1.0	\$0.9	\$0.8	\$0.7
Ptx Income	<u>\$18.0</u>	<u>\$3.1</u>	<u>\$15.6</u>	<u>\$17.1</u>	<u>\$19.0</u>	<u>\$16.5</u>	<u>\$22.1</u>	<u>\$23.5</u>
-% Revenue	14.2%	2.8%	11.0%	11.3%	11.8%	10.3%	12.2%	12.5%
Tax Rate	44.0%	37.3%	40.7%	23.5%	42.0%	42.0%	42.0%	42.0%
Net Income	<u>\$10.1</u>	<u>\$2.0</u>	<u>\$9.3</u>	<u>\$13.0</u>	<u>\$11.0</u>	<u>\$9.6</u>	<u>\$12.8</u>	<u>\$13.6</u>
Avg. Shares	41.8	41.8	41.0	41.0	41.0	41.0	41.0	41.0
EPS	\$0.24	\$0.05	\$0.23	\$0.32	\$0.27	\$0.23	\$0.31	\$0.33
Prior year	\$0.18	\$0.16	\$0.21	\$0.21	\$0.24	\$0.05	\$0.23	\$0.32
% Change	33.3%	-68.8%	7.4%	51.5%	11.9%	365.9%	38.6%	4.5%

Code 4 Fully valued. This recommendation will be used when a stock appears likely to underperform the market over an extended period. This can occur when the valuation or multiple is excessive compared to the market or when the company's projected earnings growth is expected to be below average.

Tandem Computers
Company Update

Tandem Business
Information Center

- Tandem realizes our worst fears concerning receivables.
- Long-term fundamentals still strong.
- Raising our rating to 3-1 from 3-3.*

Donald Brown

December 10, 1982

		Earnings Per Share	P/E Multiple	Last 12 Mos. Price Range	
TNDM (OTC):	23 3/4	1984E: \$1.75	1984E: 13.6X	High	Low
Ind. Div.:	-	1983E: 1.30	1983E: 18.3	32 3/4	14 1/4
Yield:	-	1982R: 0.72			
DJIA:	1047.09				

Fiscal year ends September. R - Restated.
Shares outstanding: 39.1 million.
Priced as of the close, December 8, 1982.

Tandem announced that revenues would be restated for the latest fiscal year from \$335.9 million to \$312.1 million, a \$23.8 million downward revision. Net per share will be reduced to \$0.72 from \$0.95.

The issue is one of "revenue recognition." Stricter standards are now being enforced, as discussed in detail below. It came as no surprise to us that Tandem's aggressive marketing group ran afoul of the accountants. What surprised us is that the accountants forced the issue, rather than allowing a longer period of time to work down an extended receivables position.

Our view is that the internal impact will be a healthy one, because we have felt that the receivables were too stretched in any case. So we like the result but are not as happy about the means to achieve the ends.

A good portion -- but not all -- of the revision simply represents a deferral into the future.

- We are, therefore, revising our earnings estimate for fiscal 1983 -- up by a dime from \$1.20 to \$1.30.
- Although the impact on the current quarter remains uncertain, our best estimate is \$0.29, revised up from \$0.24, versus \$0.23 last year. (Tandem may restate last year's quarterly income statement.)
- There is no change in our 1984 preliminary estimate of \$1.75.

* Opinion Legend: 1st Number = Next 6 Months, 2nd Number = 6 to 18 Months
1 = Aggressive Purchase, 2 = Accumulate, 3 = Average Performer,
4 - Swap, 5 - Sell

Research

The shares at current prices represent above average investment potential -- a "1" rating -- over the long term. Eventually, the company will improve its financial ratios, although they will still not be satisfactory even after the change in accounting. But nothing that has happened changes the fact that Tandem has a strong product position in multiprocessor systems which offers the best potential for growth in medium to large-scale systems over the coming five years.

Near term, we continue to regard the shares as no better than average potential -- a "3" rating for the next six months. Over the next several weeks, our technicians suggest heavy supply in the high 20's, with the next area of support in the \$14-\$17 range. This analyst would view a price of under \$20 as an outstanding opportunity to load up on the shares.

	<u>Quarterly Earnings</u>				
	<u>First Quarter</u>	<u>Second Quarter</u>	<u>Third Quarter</u>	<u>Fourth Quarter</u>	<u>Year</u>
1983E:	\$0.29	\$0.31	\$0.33	\$0.37	\$1.30
1982R:	0.23	0.25	0.23	0.01	0.72*

* May be restated on a quarterly basis.

THE EARNINGS HIT

We have been concerned about the extended receivables position at Tandem, which was equivalent to 124 days outstanding at the end of September before restatements. In our view, the level of receivables reflected aggressive marketing practices and/or inadequate internal financial controls. High interest rates raised the risk of a write-off in the summer months. The sharp subsequent decline had reduced the risk of a write-off, and theoretically provided Tandem management with the time to improve the internal controls at a leisurely pace.

However, Tandem's accountants put their collective foot down just when it looked to us like the company would "get by."

Beating the Midnight Deadline

Roughly half of the readjustment relates to shipments that took place after 12 o'clock of the last day of the latest quarter. Assuming that \$14 million was involved, or 15% of the latest quarter's volume, we would guess that up to an additional week's activity was included in the period. In the past many other companies in the industry held a quarter open beyond the official closing date to include "last minute" activity. This isn't surprising; Arthur Anderson's enforcement of a stricter discipline is.

If the company successfully motivates its people during the current Christmas holiday season, then a large portion of the \$14 million will simply be shifted into the current quarter on a net basis. That is, \$14 million already was pushed into the current period which was already shipped from the September period. A tough discipline or high internal esprit de corps regarding shipments might succeed in shipping the existing schedule for the current December period on time -- i.e., without slipping any volumes beyond midnight of the last day of the

quarter. Our best guess is that Tandem's people are likely to rally, and the current quarter will be bumped by \$14 million.

Closing the
"Paperwork" Gap

The other half of the revision reflects Arthur Anderson's concern over the paperwork backing up the shipment of systems. As an illustration, at least several million dollars of the revision related to the policy of installation deadlines on purchase orders. Traditionally, a purchase order was deemed valid if it called for shipment within 60 days. With the P/O in hand, the salesman could ship and bill the customer. If the customer then responded that he wasn't expecting the shipment so soon, Tandem's marketing force would simply extend the payment period. Until the accountant showed up, both parties were happy. Arthur Anderson feels more comfortable with 30 days.

Tandem will probably make up a good portion -- say half -- of the additional \$9.8 million through the balance of the current year. The rest might be permanently deferred into backlogs. First, however, the marketing force has to become accustomed to more stringent contract terms. Thus, it is late in the current quarter to accomplish much by way of short-term results.

Competitive Aspects
A Short-Term Negative

Tandem is rightfully concerned about the impact of new practices internally and on customer relations. Competitive salesmen will certainly "make hay" over the development, and at least cause some deferrals over the short-term.

We expect any adverse customer reaction to be short-lived. Tandem remains in solid financial shape with only \$6.7 million in debt compared to \$245 million in equity on the balance sheet. No one in the industry will be overly surprised that Tandem's aggressive marketing efforts ran headlong into the accountants. In short, the customers will continue to make their decisions, once the dust settles, on the merits of the product.

Balance Sheet Impact

The revision in the income statement will probably also result in a \$23.8 million reduction in receivables.

- On an adjusted basis, receivables would represent roughly \$100 million, equivalent to a still-high 98 days on a 365 day year, but below the originally reported \$123.7 million which represented 124 days at the end of September.
- Inventories would be raised to an estimated \$101 million, from the reported \$93 million in September. On an adjusted basis, the revised inventory figure represents an inventory turn ratio of roughly 1.22X's -- which would equate with very poor performance for an unintegrated manufacturer in this industry.

In short, Tandem will still have a long way to go in tightening up on its financial position, even though the most recent event suggests that the company will henceforth attach a higher priority to improving financial controls.

Prudential-Bache makes a primary market in the shares of Tandem.

Additional information is available on request.

82-592

Donald Brown
(212) 791-2946

102659453

Prudential-Bache Securities Inc., 100 Gold Street, New York, N.Y. 10292

©Copyright 1982

Information contained herein is based on data obtained from recognized statistical services, issuer reports or communications, or other sources, believed to be reliable. However, such information has not been verified by us, and we do not make any representations as to its accuracy or completeness. Any statements non-factual in nature constitute only current opinions, which are subject to change. Prudential-Bache Securities Inc. (or one of its affiliates) or their officers and directors may have positions in securities or commodities referred to herein, and may, as principal or agent, buy and sell such securities or commodities. Neither the information, nor any opinion expressed, shall be construed to be, or constitute an offer to sell or a solicitation of an offer to buy any securities or commodities mentioned herein. Opinions based on technical factors are suited primarily for the trader. Our fundamental opinions, however, are geared for the longer term investor. Therefore, there may be instances when these opinions may not be in concert. This firm (or one of its affiliates) may from time to time perform investment banking or other services for, or solicit investment banking or other business from, any company mentioned in this report.

The Research Department



Kidder, Peabody & Co.
INCORPORATED

Tandem Business March 22, 1983
Information Center

BRUCE L. McPHERSON
KIDDER PEABODY & CO.
Incorporated

555 California Street, Suite 3200
San Francisco, CA 94104
(415) 398-6400

Tandem Computers, Inc. §
(OTC-TNDM)

Price		EPS (Sep.)		P/E Ratio	Dividend Rate	Yield
(3/18/83)	26	1984(Est)	\$1.30	20.00	Nil	—
Range—52 week	31—24	1983(Est)	0.94	27.66		
1982	34—15	1982	0.76			

Common Stock		Five-Year Growth Rates				Valuation		
Market value (mil)	\$1,047.80	Past		Future		Est ret on '83 avg eqty	20.6%	
Shares outstanding (mil)	40.3	Act	Norm	Est	Norm	Reinvestment rate(Δ)	22.9	
Avg daily vol (Feb.)	551,474	108%	80%	45%	40%	P/E rel to S&P 500:		
Institutional holdings	51.5%	Sales or rev				1978-82 avg range	5.20—2.76	
Equity as % of '82 capital	89.5%	Per share:				Current	2.73	
Book value (12/31/82)	\$6.67	Earnings	123	60	40	35	Expected return	20.48%
Options traded:	None	Dividend	NA	NA	NA	NA	Alpha	2.90%

(Δ) The reinvestment rate is the internally financed growth rate, calculated on beginning-of-year equity, for 1983.
NA Not applicable.

Dow Jones Industrial Average: 1117.74
Standard & Poor's 500 Index: 149.94

- Revenue and order trends show no turn.
- Major shift in cost structure occurred in the first quarter.
- Fiscal 1983 and 1984 earnings-per-share estimates reduced to 94 cents and \$1.30, respectively.
- We expect Tandem shares to trade in a narrow range (mid-twenties to low thirties) until better fundamental trends become evident.

Recent released financial results for the first (December) quarter of Tandem's 1983 fiscal year confirm that the company is working to stabilize a volatile situation resulting from the modification of certain business practices and continued "weak" demand. After reviewing what we believe are some of the pertinent statistics for the first quarter (both pluses and minuses), we would call it a draw. Most of the encouraging news in the quarter was offset by developments that suggest continued caution. In addition, orders effectively tracked shipments, thereby indicating 30% order growth, or the lack of a turn in orders. Our scoreboard is as follows:

Positive: On the spending side of the ledger, in the first quarter of fiscal 1983 discretionary

expenditures were held tight, finishing lower in aggregate than in the fourth quarter of fiscal 1982. Both selling, general, and administrative and research and development expenditures were lower quarter to quarter. **Negative:** Discretionary margin improvement was more than offset by deterioration of gross margin resulting from significant overcapacity and relatively low demand. **Positive:** New-customer data for the first quarter revealed that Tandem was successful in attracting a solid percentage of first-time users (30% of the total). **Negative:** This glimmer of hope was offset by the fact that the total number of customers during the quarter was only 116, versus a quarterly average of 120 for the 1982 fiscal year and of 135 in the fourth

Company Follow-Up

quarter of fiscal 1982. **Positive:** Tandem was able to limit cash utilization during the first quarter. In fact, cash and marketable security balances at the close of the first quarter of fiscal 1983 were essentially unchanged from the fiscal 1982 year-end level. **Negative:** This positive was offset by the fact that cash retention was a function more of slower capital spending than of more effective working-capital utilization. Tandem was able to reverse a negative trend in inventory financing (measured in terms of days' sales) that had endured for the better part of two years. However, accounts-receivable funding (which had shown relatively consistent improvement during the last 18 months) reverted to higher levels, offsetting the entire inventory gain.

The bottom line for us after reviewing first-quarter fiscal 1983 results is that we see no need to change our investment stance toward Tandem shares. We continue to believe that Tandem stock has an upside potential of 15% given our current earnings expectations for calendar 1983 and the valuation we believe should be attributed to those earnings. However, a combination of continued "slower" revenue growth in the short term, continued restructuring of financial controls, and our belief that Tandem will need additional external capital in the short term keep us from suggesting purchase at this time.

FIRST-QUARTER RESULTS — REVENUES AS EXPECTED; COSTS SHIFT DRAMATICALLY

As shown by the data in Table 1, the operating statistics for Tandem's first quarter of fiscal 1983 revealed no change from the demand trend that has prevailed for the last nine months. Total revenues in the quarter increased approximately 33% from the restated revenues of the first quarter of fiscal 1982. This revenue growth of 33% was slightly below the average growth rate over the last nine months (37%) and well below the average revenue growth rate for either the first half of fiscal 1982 (66%) or fiscal 1982 in total (50%). In terms of mix of revenues during the quarter, product sales accounted for approximately 87% of the total, with the remaining 13% derived from service and related activities.

Product shipments advanced 29.8% from the restated year-earlier total. Service revenues grew

55% in the same period. Total revenues were up 8% from the restated revenues of the fourth quarter of fiscal 1982. We highlight this fact because it means that, after allowance for the restatement, Tandem has increased revenues sequentially in every quarter since its inception. On an as originally reported basis this string was broken in the third quarter of fiscal 1982.

In the first quarter of fiscal 1983 there was a significant shift in cost structure from that which was typical of Tandem over the preceding five quarters. In the most recent quarter there was a significant deterioration of gross profitability both year to year (by 4.9 percentage points) and sequentially (by 5.4 percentage points). This was caused by lower-than-expected demand at a time when significant additions to capacity came on line. Interestingly, the absolute dollar amount of production costs in the first quarter of 1983 was greater than the aggregate of selling, general, and administrative expenses. This is the first such pattern since the third quarter of fiscal 1981.

To Tandem's credit, discretionary expenditures (both SG&A and R&D) were kept under tight control in the first quarter. Although year-to-year growth of SG&A and R&D expenditures measured 28.1% and 32.4%, respectively, expenditures in both categories were lower than in the fourth quarter of fiscal 1982. In fact, we believe this is the first quarter in Tandem's history in which both selling, general, and administrative expenditures and research and development expenditures declined quarter to quarter.

Although these results suggest that Tandem has been effective in controlling costs, *they also lead us to believe that the company is setting the stage for "slow" (30%-to-40% year to year) revenue growth over at least the next few quarters.* Analysis of discretionary expenditures by another method leads us to this conclusion. Tandem's quarterly research and development expenditures grew year to year at an average rate of 103% between the first quarter of fiscal 1978 and the final quarter of fiscal 1982. The average quarterly year-to-year increase in fiscal 1982 was 91%. As mentioned earlier the first-quarter 1983 increase was only 32%. Over the same time period selling, general, and administrative expenditures increased at average quarterly rates of 94% between

Kidder, Peabody & Co. Incorporated usually makes a market in these securities and accordingly may have a position in them which may be increased or decreased from time to time.

The information contained in this report has been taken from trade and statistical services and other sources which we deem reliable. We do not represent that it is accurate or complete and it should not be relied upon as such. Any opinions expressed herein reflect our judgment at this date and are subject to change.

Additional information on the securities mentioned is available.

No part of this report may be reproduced in any manner without the written permission of Kidder, Peabody & Co. Inc.
Copyright © 1983 Kidder, Peabody & Co. Incorporated

Tandem Computers, Inc. 5

Table 1
Sequential and Year-to-Year Quarterly Earnings Performance
Fiscal First Quarter(a)
(Dollars in millions)(b)

	4 Qtr 1982		1 Qtr 1983		1 Qtr 1982	
	Amt	% of Revenues	Amt	% of Revenues(c)	Amt	% of Revenues
Product sales	\$76.3(E)	—	\$81.8	29.8%	\$63.0	—
Service and other	10.9(E)	—	12.3	53.8	8.0	—
Total revenues	87.2	—	84.1	32.5	71.0	—
Cost of sales	30.5	35.0%	38.8	40.4	25.2	35.5%
S.G. & A.	36.4	41.7	35.5	37.7	27.6	38.9
R&D	9.9	11.4	9.0	9.6	6.8	9.6
Operating profit	10.4	11.9	11.8	12.3	11.4	16.1
Net interest	1.0	1.1	0.1	0.1	2.3	3.2
Pretax profit	11.4	13.1	11.7	12.4	13.7	19.3
Taxes	3.1	—	4.8	—	5.9	—
Tax rate	26.7%	—	39.3%	—	42.9%	—
Net income(\$)	\$8.3	9.5	\$7.1	7.5	\$7.8	11.0
Shares (millions)	39.2	—	40.3	—	39.3	—
Earnings per share	\$0.21	—	\$0.18	—	\$0.20	—

(E) Kidder, Peabody & Co. Incorporated estimates.

(a) Fiscal year-end September.

(b) Except per-share data.

(c) Except revenue data, which are year-to-year percent changes.

fiscal 1978 and 1982, 75% in fiscal 1982, and 28.6% in the first quarter of fiscal 1983. Both results suggest a slowing trend.

**THE REMAINDER OF FISCAL 1983 —
 CONTINUED SLOW GROWTH IN SHORT
 TERM**

We expect the remainder of Tandem's fiscal 1983 year to be a period of slower-than-trend-line revenue growth. Notwithstanding slow growth, the operating profit margin should expand from its current relatively low level as cost controls implemented over the last quarter begin to take hold. Historically, Tandem has been a company that relied on sequential as well as year-to-year revenue growth to remain on the trend line. In the company's fiscal 1979 year sequential revenue gains averaging 20% quarterly provided for year-to-year revenue gains of better than 100%. In fiscal 1980 and 1981 the rate of quarterly sequential revenue growth slowed slightly from the fiscal 1979 pace but remained a very respectable 17% on average. Year-to-year gains settled in the 90%-to-100% range during this period. Then in the first quarter of fiscal 1982 the sequential revenue gain dropped to 10%, and it has never

attained a double-digit level since that quarter. The average sequential revenue gain was 8% in fiscal 1982 and did not change in the first quarter of fiscal 1983. Resulting year-to-year revenue gains slowed continually during this period from 75% to the most recent 33%. Given the order activity so far in Tandem's 1983 fiscal year, we believe this pattern of "slow" growth will persist through at least the fiscal third quarter. Accordingly, we have made some adjustments in our published earnings projections, which had been based on a slightly more aggressive revenue-growth estimate.

After evaluating Tandem's results in the first quarter of fiscal 1983, we are lowering our full-year fiscal 1983 and 1984 earnings-per-share estimates to 94 cents and \$1.30, respectively, from the previous levels of \$1.10 and \$1.55. Our fiscal 1983 and 1984 earnings models are presented in full in Tables 2 and 3. Table 2 presents our expectations for sequential growth, while Table 3 provides a more complete analysis of the individual line items that make up these models on a full-year basis.

As shown by the data in Table 3, we are currently projecting full-year fiscal 1983 revenues of \$470 million, an increase of 41% from fiscal 1982. This

Tandem Computers, Inc. 5

Table 2
Selected Operating Statistics(a)
(Dollars in millions)(b)

	Revenues		Operating Profit (Loss)	Operating Margin	Pretax Profit (Loss)	Tax Rate	Net Profit (Loss)	EPS	
	Amnt	Yr-to-Yr % Chg						Amnt	Yr-to-Yr % Chg
1976	\$0.58	—	\$(2.21)	NM	\$(2.17)	NM	\$(2.17)	\$(0.72)	—
1977	7.69	1,275.9%	0.37	4.8%	0.33	51.5%	0.16	0.01	NM
1978									
Dec	3.91	—	0.70	17.9	0.70	51.4	0.34	0.02	—
Mar	5.26	—	1.01	19.2	1.11	52.3	0.53	0.02	—
Jun	6.70	—	1.05	15.7	1.17	51.3	0.57	0.03	—
Sep	8.44	—	1.47	17.4	1.52	53.3	0.71	0.03	—
Year	24.31	216.1	4.23	17.4	4.50	52.2	2.15	0.10	900.0%
1979									
Dec	10.40	186.0	2.00	19.2	2.06	53.9	0.95	0.04	100.0
Mar	12.47	137.1	2.05	16.4	2.27	50.7	1.12	0.05	150.0
Jun	14.99	123.7	2.56	17.1	2.61	50.2	1.30	0.05	66.7
Sep	18.11	114.6	3.10	17.1	3.17	51.1	1.55	0.06	100.0
Year	55.97	130.2	9.71	17.3	10.11	51.3	4.92	0.20	100.0
1980									
Dec	20.83	100.3	4.02	19.3	4.32	50.0	2.16	0.08	100.0
Mar	24.88	99.5	4.25	17.1	4.83	50.1	2.41	0.08	60.0
Jun	29.19	94.7	5.09	17.4	5.55	50.1	2.77	0.09	80.0
Sep	34.09	88.2	5.96	17.5	6.39	47.7	3.34	0.10	66.7
Year	108.99	94.7	19.32	17.7	21.09	49.4	10.68	0.35	75.0
1981									
Dec	40.61	95.0	7.52	18.5	9.33	50.1	4.66	0.14	75.0
Mar	47.42	90.6	9.01	19.0	12.74	49.1	6.48	0.17	112.5
Jun	55.87	91.4	11.47	20.5	14.18	49.3	7.19	0.19	111.1
Sep	64.51	89.2	12.39	19.2	14.85	44.6	8.22	0.22	120.0
Year	208.41	91.2	40.39	19.4	51.10	48.0	26.55	0.72	105.7
1982									
Dec	70.99	74.8	11.35	16.0	13.65	42.9	7.79	0.20	42.9
Mar	74.10	56.3	8.43	11.4	9.74	36.1	6.22	0.16	(5.8)
Jun	79.82	42.9	10.49	13.1	11.98	37.3	7.51	0.19	0.0
Sep	87.23	35.2	10.43	12.0	11.37	26.7	8.33	0.21	(4.4)
Year	312.14	49.8	40.70	13.0	46.74	36.1	29.85	0.76	5.6
1983									
Dec	94.10	32.6	11.60	12.3	11.70	39.3	7.10	0.18	(9.9)
Mar(E)	101.00	36.3	13.50	13.4	13.50	39.3	8.20	0.20	25.0
Jun(E)	110.00	37.8	16.80	15.3	16.70	38.9	10.20	0.25	31.6
Sep(E)	135.00	54.8	21.60	16.0	21.00	39.0	12.80	0.31	47.6
Year(E)	440.10	41.0	63.50	14.4	62.90	39.1	38.30	0.94	23.7
1984(E)	615.00	39.7	92.00	15.0	95.00	39.5	57.50	1.30	38.3

NM Not meaningful
(E) Kidder, Peabody & Co. incorporated estimates
() Parentheses denote loss or decline
(a) Fiscal year end September
(b) Except per-share data

estimate is \$30 million lower than the revenue model published in our January 25, 1983, *Company Analysis*. Slower revenue growth has caused a major shift in Tandem's cost structure, particularly between the

fourth quarter of fiscal 1982 and the first quarter of fiscal 1983. As mentioned in the previous section of this report, production costs accelerated materially in the first quarter of fiscal 1983 and accounted for

SOME MOVEMENTS ON THE COMPETITIVE FRONT

Over the past few weeks there have been two interesting developments related to Tandem's competitive situation. First, at a general meeting of the Boston Society of Security Analysts, Digital Equipment Corporation President Kenneth Olsen acknowledged that demand has been strong for his company's Hierarchical Storage Controller (HSC), a clustered controller product that essentially enables Digital's System 10 and 20 installations to operate in a redundant, parallel, or independent mode. The HSC is a disk control system that allows multiple processors to be "tied" together to provide data integrity.

We should make two points at this juncture. First, Digital's System 10 and 20 lines are essentially mainframe-class, or very large, timesharing machines. They are much more expensive and less modular than a Tandem system. Second, the HSC approach is still not the most cost-efficient approach given the redundancy of hardware components. However, we expect that Digital will supply a similar

capability for its VAX (32-bit) product line shortly, thereby bringing this function to a product more in the Tandem performance class. We believe the fact that Digital is making an effort in this area may be cause for new customers to lengthen their product-evaluation cycle simply to gather the proper information on Digital's system.

The second interesting development on Tandem's competitive front is the intention of Nixdorf Computer Corp., the U.S. subsidiary of Nixdorf A. G., to enter the "fault-tolerant" computer business with a prototype expected to be announced by mid-year. Nixdorf has signed a nonexclusive licensing agreement with Parallel Computer Systems of Englewood Cliffs, New Jersey, to build and market microprocessor-based (Motorola 68000) systems designed by Parallel. Nixdorf's initial target market, technically oriented and manufacturing applications, seems to be different from Tandem's. Nevertheless, this is probably a good situation to keep an eye on.

J. Terence Carleton (617) 357-6762
Judy J. Miller, Research Assistant

TECHNOLOGY RESEARCH GROUP

(New York)

William D. Easterbrook
Mainframe Computers/Peripheral Equipment
Melody M. Johnson
Office Systems/Word Processing
Joan A. McKay, CFA
Small Computer Systems
John C. Furlan
Semiconductors
Mark Rosenblatt
Research Assistant
Fred A. Kuehndorf
Research Assistant

(Boston)

William R. Becklean, CFA
Telecommunications
J. Terence Carleton
Minicomputers/Computer Services/Interactive Graphics
Charles L. Hill, CFA
Defense Electronics/Instrumentation/Connectors
Judy J. Miller
Research Assistant

Tandem Computers*

(TNDM-OTC)

Exceptional Growth Outlook

- Fault Tolerant Systems
- Computer Networking

Gordon Casey

June 22, 1982

Price	52-Week Range	Earnings Per Share			P/E Ratio			Return on Ave. Equity	Dividend	Yield	Millions of Shares Outstanding
		1981A	1982E	1983E	1981A	1982E	1983E				
\$22 $\frac{1}{4}$	\$35-20	\$0.72	\$1.05	\$1.50	31.6	21.7	15.2	19.3%	—	—	37,195,808

Fiscal year ends September.
* Drexel Burnham Lambert Inc. makes a market in this security.

POINT OF VIEW

- The need for data processing systems with high reliability created an opportunity that Tandem has addressed in a unique way. The company's success in satisfying these requirements has yielded dramatic business growth and a strong position in the marketplace.
- Tandem's on-going results are excellent. To date, economic uncertainties have had no noticeable adverse effects upon results. We expect strong growth to continue in fiscal 1982 with revenues reaching \$372 million, a 79% gain. We estimate earnings of \$1.05 per share in fiscal 1982 versus \$0.72 last year. In fiscal 1983, we estimate earnings of \$1.50 per share and expect earnings gains to average 37% through 1986.
- Tandem's expertise in addressing the requirements for fault-tolerant systems has also yielded a strong competitive position in computer networking. We expect Tandem to be a major participant in the rapidly converging data processing and communications marketplace. The recent announcement of the InforSat satellite network adds to Tandem's uniqueness by confirming the company's commitment to communication services.
- The stock is well positioned to rebound in a recovering market. At current levels, the stock is available at price/earnings ratios below the fiscal 1981 trading range. We believe Tandem is particularly attractive for appreciation potential over the next 12 months with a potential rate of return in excess of 40%.

TABLE OF CONTENTS

	<u>PAGES</u>
OUTLOOK	1
BACKGROUND	6
MARKET	8
PRODUCTS	8
SOFTWARE	11
COMMUNICATIONS	12
SATELLITE COMMUNICATIONS	15
MARKETING	16
COMPETITION	17
MANAGEMENT	19
PRODUCT DEVELOPMENT AND MANUFACTURING	20
FINANCIAL	22

This report was prepared from data believed reliable but not guaranteed by us, without further verification or investigation and does not purport to be complete. It is not to be considered as an offer to sell or a solicitation of an offer to buy the securities of the companies covered by this report. Opinions expressed are subject to change without notice. Drexel Burnham Lambert Incorporated, or one or more of its officers, may have a position in the securities discussed herein and Drexel Burnham Lambert Incorporated will be pleased to furnish specific information in this regard at any time upon request. Drexel Burnham Lambert Incorporated may act as principal for its own account or as agent for another person, in connection with the sale or purchase of any security which is the subject of this report.

© 1982 Drexel Burnham Lambert Incorporated

OUTLOOK

We believe Tandem Computers is well positioned to become one of the leading contenders in the rapid convergence of data processing and communications. The company has established an impressive record of business growth with an excellent set of well differentiated products. Building upon its unique position as the pioneer in fault-tolerant systems, Tandem is rapidly becoming established as a major participant in computer networking. We expect sustained strength of demand in these business areas to ensure continued strong earnings growth.

A key factor in the strength of the data processing marketplace is the continued demand for user oriented systems. The promise of significant productivity improvements is sustaining demand in an otherwise weak economic environment. It is our conclusion that Tandem's focus on transaction processing systems positions the company at the crest of this wave of demand.

Tandem has successfully withstood pressures of a weak economy and high interest rates with little or no discernible effect upon the company's on-going operations. We attribute much of this business strength to excellent user acceptance of Tandem's products and a particularly favorable customer mix.

Tandem's customers are predominantly large enterprises in the Fortune 500 class. These users have generally held automation plans in place regardless of economic pressures. This is particularly true of commitments for transaction processing systems and computer networking. Tandem is benefiting from this favorable orientation of its business. An additional factor working to Tandem's benefit is a favorable industry mix weighted toward financially oriented customers such as banks and insurance companies.

In Tandem's short six year history, the company has installed systems in over 500 customer enterprises. In general, these installations represented the customer's first steps in automating vital business functions with on-line systems. Tandem's fault-tolerant NonStop systems were chosen to provide improved reliability and availability. In many instances, these early installations were essentially experimental. The key point, in our view, is that these initial systems have been successful and customers are now committed to Tandem as they enter a phase of widespread implementation. Rates of repeat business are climbing and we expect this factor to contribute strongly to future business growth.

Tandem has established an outstanding record of user satisfaction. Surveys consistently rate Tandem at the highest levels of product satisfaction and user loyalty. A key factor in these exceptional ratings is excellent software. The company's research and product development program includes a major commitment to software. The recently announced comprehensive information management effort provides an overall focus for the growing array of key software offerings. We believe Tandem's relational data base management system and the recently announced electronic mail software position the company at the forefront of this critical area.

Tandem's concept and original focus is on requirements for fault-tolerant systems. However, this approach also yields significant advantages in computer networking. This fast growing area may prove to be Tandem's most important competitive battleground. Today's massive demand for data processing solutions centers upon the critical need for connecting the many dispersed locations of large enterprises. Tandem's peer-to-peer networking offering is well positioned to function as a full enterprise network or, using available compatibility features, to exist with an IBM SNA (Systems Network Architecture) network.

We expect Tandem to continue its progress in computer networking leading to an expanded role in this field in the mid-1980s. We view the Infosat joint announcement with the American Satellite Corporation as an important step in this direction. The Infosat move positions Tandem in the network services arena, currently an area of major focus. This serves to continue the strong momentum Tandem has established over the past year with a series of excellent communications oriented offerings. Tandem is well on track toward its announced aim of \$1 billion in revenues by 1985, in our judgment. We believe this announcement begins to build the case of a continuation of Tandem's momentum well beyond this target.

Tandem's on-going results are excellent. To date, as we have stated, economic uncertainties and high interest rates have had no noticeable adverse effects upon results. We expect strong growth to continue in fiscal 1982 with revenues reaching \$372 million, a 79% gain. Accelerating shipments of the new NonStop II processors and continued high rates of repeat business are expected to keep operating margins at high levels. Improved tax rates are expected to continue to benefit Tandem. The estimated fiscal 1982 rate of 43% is significantly improved from 48% in 1981. This reflects a reduced negative impact of start-up losses of foreign subsidiaries and the effect of research and development tax credits. We estimate earnings of \$1.05 per share in fiscal 1982 versus \$0.72 last year.

Cash usage during the first half of fiscal 1982 has proceeded at a high rate. The company has raised research and development spending and is proceeding with two new plant construction programs at Watsonville, California and Austin, Texas. We expect the company to make an additional stock offering during fiscal 1982. Tandem has tended to seek additional financing in advance of actual requirements. Our analysis assumes a \$100 million equity offering in late 1982.

We expect a continuation of strong business trends in fiscal 1982. Tandem has largely been insulated from economic uncertainties. The principal constraints on growth have been the company's ability to efficiently expand employment and facilities. High levels of employee productivity, as illustrated in Table 1, have been an important factor in Tandem's success. Strong business growth in international markets has resulted as the company expands its market presence. We expect these favorable trends to continue to benefit results in fiscal 1983. We project revenue growth of 64% in the year raising revenue above \$600 million. Based upon this strong growth, we estimate earnings of \$1.50 per share in fiscal 1983, a 43% gain.

Longer term, we believe Tandem is well positioned to continue its outstanding business growth. Commitments being made in facilities expansion, research and development and employment gains are building a strong base for future growth. We reiterate our view that Tandem's aim of reaching the \$1 billion revenue level by 1985 is achievable and note that it is consistent with the business growth experience of other leading data processing companies. Strong revenue gains are expected with annual percentage growth moderating to approximately 40% in the mid-1980s. Earnings growth over this period should average 37%, in our opinion.

One of the outstanding characteristics of Tandem's performance in the market has been the high earnings multiples commanded by the stock. In fiscal 1981, multiples ranged from 28 to a peak of 48 reached in mid-1981 when the stock traded at 34 5/8. This strength resulted from the company's dramatic growth and success in carving out its niche as the pioneer of fault-tolerant systems.

Over the past year since attaining its all time high, the stock price has made no further headway. It has generally traded in the \$25 to \$30 range. We believe that in part this represents a re-evaluation of Tandem's earnings multiple. At current prices, the multiple is in the mid-20s, half its peak level, and also below the

trading range in fiscal 1981. We believe the outlook for continued strong earnings growth makes the stock particularly attractive at current prices. We see considerable potential for a strong rebound in a recovering market. Our analysis of appreciation potential over the next 12 months indicates a potential rate of return in excess of 40%.

Table 1

	<u>EMPLOYEE PRODUCTIVITY</u>		
	<u>Revenue</u> (\$ millions)	<u>Employment</u> (Year End)	<u>Revenue Per Employee</u> (\$ Thousands)
1977	7.7	137	74.0
1978	24.3	446	83.4
1979	56.0	828	87.9
1980	109.0	1,387	98.4
1981	208.4	2,730	101.2

TABLE 2

	<u>SUMMARY FINANCIAL STATISTICS</u> (\$ millions)				
	<u>1980A</u>	<u>1981A</u>	<u>1982E</u>	<u>1983E</u>	<u>1984E</u>
Revenue (\$)	109.0	208.4	372.3	609.0	900.0
Rev. Increase (%)	94.7	91.2	78.6	64.0	48.0
Operating Income	19.3	40.4	67.6	110.0	162.0
Operating Margin (%)	17.7	19.4	18.2	18.1	18.0
Interest Income (Net)	1.8	10.7	4.9	4.0	4.0
Pretax Income	21.1	51.1	72.5	114.0	166.0
Pretax Margin (%)	19.3	24.5	19.5	18.7	18.4
Tax Rate (%)	49.3	48.0	43.0	43.0	43.0
Net Income	10.7	26.5	41.2	65.0	95.0
Earnings Per Share (\$)	0.35	0.72	1.05	1.50	2.10

Note: Fiscal year ends September.

TABLE 3

ESTIMATED RESULTS
(\$ millions)

	1981				1981
	1Q	2Q	3Q	4Q	Total
Revenue (\$)	40.6	47.4	55.9	64.5	208.4
Rev. Increase (%)	95.0	90.6	91.4	89.2	91.2
Operating Income	7.5	9.0	11.5	12.4	40.4
Operating Margin (%)	18.5	19.0	20.5	19.2	19.4
Interest Income (Net)	1.8	3.7	2.7	2.5	10.7
Pretax Income	9.3	12.7	14.2	14.8	51.1
Pretax Margin (%)	23.0	26.8	25.4	23.0	24.5
Tax Rate (%)	50.0	49.2	49.3	44.6	48.0
Net Income	4.7	6.5	7.2	8.2	26.5
Earnings Per Share (\$)	0.14	0.17	0.19	0.21	0.72
	1982				1982E
	1QA	2QA	3QE	4QE	Total
Revenue (\$)	74.7	85.6	99.0	113.0	372.3
Rev. Increase (%)	83.9	80.5	77.0	75.0	78.6
Operating Income	13.7	15.6	17.9	20.4	67.6
Operating Margin (%)	18.3	18.2	18.1	18.1	18.2
Interest Income (Net)	2.3	1.3	0.8	0.5	4.9
Pretax Income	16.0	16.9	18.7	20.9	72.5
Pretax Margin (%)	21.4	19.7	18.9	18.5	19.5
Tax Rate (%)	44.0	42.1	43.0	43.0	43.0
Net Income	8.9	9.8	10.6	11.9	41.2
Earnings Per Share (\$)	0.23	0.25	0.27	0.30	1.05
	1983E				1983E
	1Q	2Q	3Q	4Q	Total
Revenue (\$)	127.0	143.0	160.0	179.0	609.0
Rev. Increase (%)	70.0	67.0	62.0	58.0	64.0
Operating Income	23.0	26.0	29.0	32.0	110.0
Operating Margin (%)	18.1	18.1	18.1	18.1	18.1
Interest Income (Net)	1.8	1.0	0.7	0.5	4.0
Pretax Income	24.8	27.0	29.7	32.5	114.0
Pretax Margin (%)	19.5	18.9	18.6	18.2	18.7
Tax Rate (%)	43.0	43.0	43.0	43.0	43.0
Net Income	14.0	15.0	17.0	19.0	65.0
Earnings Per Share (\$)	0.33	0.35	0.39	0.43	1.50

Note: Fiscal year ends September.

BACKGROUND

A dramatic transformation is occurring in the data processing marketplace. Major advances in semiconductors and integrated circuit technologies have substantially reduced costs of computer hardware. The resulting improvements in data processing price/performance have opened a broad range of new applications. Users now can justify the computer as an everyday tool in a variety of productivity enhancing roles.

User oriented data processing found its initial focus in engineering and scientific areas with a variety of manufacturing, process control and problem solving applications. These uses proved the viability of the minicomputer as an alternative to large central site mainframe computers. Subsequent evolution of these concepts has broadened the use of small computers into business and commercial applications. The addition of communications capabilities has resulted in the currently exploding growth of distributed data processing.

The potential productivity gains offered by distributed data processing lie in a variety of business areas. Initial applications focused upon support of central site mainframe computers and the requirements of data entry and basic inquiry and response. These early business uses of distributed data processing were generally adjuncts to a basically batch oriented philosophy of computing.

The further evolution of user oriented systems brings data processing into areas that are fundamental to the functioning of the user's business. Many of the most valuable computer applications involve automation of critical user tasks. The introduction of the computer in these situations generally requires major changes in working procedures and the tasks that employees perform. The system becomes an integral part of the business function. Typical examples of transaction processing systems are airline reservations, on-line banking and credit authorization. In these situations, continuous system availability is critical. The organization cannot function without access to the system.

The vital need to ensure continued system access imposes stringent requirements upon the design, installation, operation and maintenance of the system. The classic data processing solution to the need for high system availability has been redundancy. Duplex systems are used to provide a back-up capability in the event of failure of the primary system. In use, these systems require close operator attention and special procedures are needed for switch-over in case of failure.

The concept of redundant systems runs contrary to the mainstream of computer development. Until recently, it was difficult enough to justify the cost of a basic single processor installation. System design efforts concentrated upon producing simple systems at minimum cost. In general, reliability improvements have been gained as an indirect by-product of technology advances. The equally important requirement to rapidly recover from failure has received little if any attention in conventional system design. The result of this concentration on simple systems places the burden of system integration and specialized software development on the user if a transaction processing system is required. For this reason, systems of this kind have only been developed by large users for specialized high value applications.

The growing need for systems with high reliability and availability created an opportunity that Tandem has addressed in a unique way. The company was organized in late 1974 with the objective of producing an advanced system to meet these needs. Concentrating upon the growing need for transaction processing systems, Tandem developed the NonStop system which was shipped to the first users in May 1976. The company's focus has been on advanced user oriented business and commercial applications. Tandem introduced a unique approach to system architecture which emphasizes reliability, system availability and recovery from failure. Tandem's success in satisfying these requirements has yielded a strong position in the marketplace and dramatic business growth.

TABLE 4

	<u>CUSTOMER BASE AND PROCESSORS INSTALLED</u>						
	<u>CUMULATIVE TOTALS</u>						
	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>6 Mo.</u> <u>1982</u>
Customer Base	6	30	73	160	290	460	540
Processors Installed	12	81	257	646	1,299	2,509	3,400

NOTE: Fiscal year ends September.

MARKET

The market for transaction processing systems is not clearly delineated either in terms of specific types of hardware or specific applications. Data processing is continuing to undergo a transformation as new applications are increasingly implemented on an interactive basis. This is in contrast with earlier batch applications. In the business and commercial environment, new interactive transaction processing applications are becoming pervasive. As a result, transaction processing applications are found on a wide range of system sizes from minicomputers to giant mainframes.

The portion of the transaction processing market requiring fault tolerant characteristics is even less well defined. Prior to Tandem's appearance fault tolerant characteristics were available only in custom designed systems in which software development and system integration tasks were performed by the user or by a third party. We believe the growing trend toward transaction processing systems places them in increasingly critical business functions. Few of these important user oriented applications can tolerate system outages. We expect demand for fault tolerant systems to continue at strong levels and to assume an increasing share of advanced transaction processing systems.

A principal factor in the growth of distributed data processing (DDP) is the trend toward business and commercial transaction processing applications. In a recent analysis of DDP, the International Data Corporation (IDC) identified a market of \$2.5 billion in 1981 and estimated to grow 34% annually reaching \$8.1 billion in 1985. Measured relative to this market, Tandem's market share was 8% in 1981. Based upon the company's planned \$1 billion revenue target for 1985, as noted earlier, market share is expected to increase to 12%.

PRODUCTS

The Tandem NonStop systems architecture has been designed to provide continuous system availability. It is intended for on-line transaction processing applications. High availability is ensured by hardware redundancy and software which provides the ability to automatically reconfigure the system in the event of component failure. In addition, the NonStop design includes features to guard against loss or alteration of data. In our opinion, the Tandem NonStop system represents an outstanding balance of both hardware and software efforts resulting in an integrated system design.

The Tandem system is a multiprocessor design which can accommodate any combination of two to 16 individual processors. A modular approach is used which provides a wide range of processing power and allows incremental growth as the user's needs increase. Modular upgrades can be made in the field without the need for a disruptive conversion.

Individual main processors utilize advanced circuit technologies providing excellent system performance. In the original NonStop systems, 16-bit architecture is used. Each processor includes two microcoded processing units, one for central processing and bus control and a second for input/output control. This separation of function frees the central processor of the burden of heavy input/output activity characteristics of transaction processing applications. A dual bus structure is used for interprocessor connection. Throughout the system, multiple components and multiple data paths are provided. This includes multiple power supplies, input/output ports and controllers for peripherals.

Tandem uses an advanced virtual memory operating system with functional characteristics that we consider comparable to the best of the competition. In addition to the performance of fundamental computing functions, the operating system is also responsible for monitoring and controlling the unique NonStop features. These special considerations in operating system design include the ability to shift work load and remain operational after an individual module failure, provision for on-line replacement and reintegration of a failed component and the ability to support a wide range of possible system configurations. These special NonStop functions are performed automatically without the need for operator intervention.

In normal operation, all data paths and modules are active. Generally, each module will have some excess capacity available. In the event of a failure, functions are shifted to the remaining operating modules within the system. This shift of work load is generally performed within a preprogrammed priority sequence to give preference to more important programs. The switch from a failed module to the remaining system is accomplished by a combination of hardware and operating system software. The overall result is continued system operation with some degradation of response time and job throughput.

Numerous safeguards are included to ensure data validity and integrity, as indicated previously. Sophisticated error checking and correcting is provided to guard against alteration of data. Disk storage is managed on a mirrored basis in which duplicate copies are maintained

on separate disks. In case of a failure of external power, the system will shut down without loss of data. When power is restored, it will automatically restart.

The end result of these efforts has been an outstanding set of products. User surveys consistently rate Tandem systems at the highest level. User comment generally centers upon excellent usability features and flexibility in expanding and reconfiguring the system.

During the five years following Tandem's first shipment in May 1976, the company produced only one basic processor model. The initial NonStop system compiled an impressive record of user satisfaction and business growth by concentrating on the basics of transaction processing. However, over this period, the expanding needs of users created an opportunity for a more advanced version of the NonStop system.

The principal factor in defining Tandem's second generation system, the NonStop II, is the company's increasing concentration on communications and computer networking. Recognizing the need to support large dispersed networks, the NonStop II provides greatly expanded addressing and more advanced diagnostic and control functions.

The principal change in NonStop II is the use of a 32-bit data access architecture which greatly expands memory addressability. This change is accomplished without sacrificing program compatibility with earlier NonStop systems. The approach is designed to ensure ease of migration for earlier customers. NonStop II provides the added capacity needed to support the largest computer networks incorporating thousands of terminals and hundreds of communications lines.

A major additional feature of NonStop II is the inclusion of an operations and service processor (OSP) with each main processor. The OSP monitors system operation and provides system status and diagnostic functions, as well as facilities for unattended remote operation of the system. These functions are vital in the operation of large computer networks which frequently have unattended equipment in remote sites.

Tandem offers a full range of system peripherals including disk drives, printers and terminals. The company's basic strategy is to source these products from leading OEMs, a customary approach used by companies of Tandem's size. However, a specific exception to this rule has been made with terminals.

Tandem's recent announcement of a new line of proprietary terminals reflects the critical importance of these products in influencing the user's perception of the overall system. Particularly critical are the many subtle characteristics of the terminal that are evident only to an operator using it on a day-in day-out basis. Human factors considerations such as keyboard location or glare from the display screen can seriously influence user productivity. The Tandem 6530 terminal, which the company manufactures in Austin, Texas, has been designed to provide improved usability and exceptional human factors characteristics. In a transaction processing environment the terminal performs a particularly critical role. As the user to machine interface, the characteristics of the terminal are a key factor in overall user productivity. Tandem has concluded that it is vital to fully control the terminal's design, operating characteristics and quality.

SOFTWARE

Tandem's fundamental business orientation toward transaction processing applications places great emphasis on software. We believe its accomplishment in this critical area is becoming a key differentiating factor in the marketplace. User surveys consistently give Tandem high marks for quality of software and general ease of use.

Tandem offers a wide range of software products to support basic operation of systems to facilitate application development and to support communication with IBM mainframes. However, of particular interest is Tandem's solution to the problem of data base management in distributed data processing.

A principal concern in the transaction processing environment is the ability to rapidly define and implement new applications. A key factor in this process is data base structure and ease of access to key data elements. This process is difficult enough in a stand-alone system, but becomes particularly complex when data elements reside in different distributed systems. Conventional data base management systems are inadequate in this environment, in our opinion. Tandem has addressed these requirements with ENCOMPASS, an advanced data base management system. ENCOMPASS incorporates advanced relational data base features and a query/report writer. These capabilities provide an important assist to application development and greatly facilitate program changes and system expansion.

Tandem's commitment to information management has been further extended with the recent announcement of an advanced information distribution system providing electronic mail and facsimile transmission

capabilities. These offerings are important additions, we feel, as Tandem builds toward their objective of meeting all of an organization's information management needs. We expect this thrust to continue resulting in further consolidation of Tandem's strong position in advanced software.

COMMUNICATIONS

Tandem's primary focus on transaction processing applications positions the company's products at the vital juncture of data processing and communications. The industry is experiencing its strongest demand in user areas where automation promises significant benefits in productivity improvement. In large enterprises, the realization of these benefits is contingent upon the ability to communicate.

The ability of large corporations to design, install and operate computer networks is becoming a key factor in the rate of growth of data processing. The few giant corporations that pioneered computer networking were largely on their own.

Networks in large enterprises evolved through the 1970s largely using star configurations in which a large central site host communicates with many dispersed nonintelligent terminals. These networks are largely dedicated to a single application and tend to be inflexible and difficult to change or expand. Typically, each new application spawned its own communications network and special terminals. The important change in the late 1970s was the growing acceptance of distributed data processing and increasing demand for large multi-application networks.

Currently installed systems tend to be fragmented and have little or no ability to communicate and share common data. Throughout the industry, the focus is on expanding user oriented systems and providing interconnections among these systems and existing large mainframe locations. The realization of these complex networks is presently constrained by the availability of effective networking software. However, this situation is improving as better networking software becomes available. The use of standardized networking products has many advantages over the earlier customized solutions. Principal among these are lower total cost and faster implementation.

Two basic approaches are being pursued to meet the demand for large enterprise networks. Currently, the leading products exemplifying the two approaches are IBM's Systems Network Architecture (SNA), basically a hierarchical network and Digital Equipment Corporation's Decnet, a peer-to-peer concept. In a hierarchical network, control resides in a single large processor. All network operations are dictated by this central authority. The peer-to-peer concept enables processors at individual nodes of the network to function autonomously. The choice between these alternative approaches is usually dictated by evolutionary considerations as the customer increases his use of data communications. We believe both approaches will continue to find wide use. Enterprises with already installed star networks are likely to consolidate these into large hierarchical networks. Peer-to-peer networks are expected to be used both for enterprise-wide requirements and as specialized subsystems nested within large hierarchical networks.

Although Tandem's original orientation and basic concept is on fault-tolerant systems, this approach also yields significant advantages in computer networking. In many respects the basic Tandem system functions as a computer network. The operating system performs the critical role of controlling messages passing between the individual processors. Applying the same concepts to geographically dispersed systems has produced an excellent peer-to-peer networking offering.

In our view, Tandem's basic computer networking product, EXPAND, offers key advantages in reliability of network nodes and in management of communications lines. Network nodes have multiple processor Tandem systems which ensure continuous availability of nodes. In the event of a line outage, the network has the ability to retransmit over an alternate path. A further safeguard is provided by continuous monitoring of message traffic to guard against loss or alteration of data. These features ensure high availability and integrity of the network.

A further major advantage of Tandem's networking approach is generally excellent flexibility. The network is essentially open ended, allowing for ease of installation and subsequent network expansion. Unlike conventional computer networks, it is not necessary to reconfigure the network when adding new terminals or systems. The enhancements introduced with NonStop II enable network expansion to satisfy requirements of the largest enterprises with thousands of terminals and as many as 255 system nodes.

EXPAND is intended for system locations that are geographically dispersed. Tandem also offers hyperchannel, an advanced local network, in cooperation with Network Systems Corporation.* Conceptually, local networks offer an attractive means of connecting systems within a building or an office or department. In this environment, the user is freed of the constraints imposed by communications common carriers. A local network employing coaxial cable avoids the bandwidth constraints and other problems associated with communications facilities that were not originally intended for data transmission.

Hyperchannel is an advanced high performance local network which supports high data transfer rates. It provides a means of connecting Tandem systems, large mainframes and other high performance systems. Tandem also offers TIL (Tandem to IBM link) which provides a high-speed connection to IBM mainframes.

Communications have become an area of major focus in large enterprises. It is critical to provide connection between the many locations in an enterprise to facilitate the transfer of information and to ensure proper management and concurrency of data. However, achieving this connection through use of current communications facilities is no simple matter; communications represents the weakest link in today's large enterprise systems. Technological advances in communications have occurred at significantly slower rates than improvements in data processing. Conventional communications line costs generally are increasing over time. Users have focused on improving the utilization of communications facilities by careful management.

Computer networks for large enterprises require a variety of communications links to connect the many outlying locations. Typically, leased telephone lines are used for locations requiring continuous connection. These links are available in a wide range of carrying capacities to suit the data traffic being transmitted. Although some very high capacity terrestrial services are becoming available the largest currently in widespread use for computer applications carries 56,000 bits per second (56kbs). These high speed data links are provided by grouping conventional voice telephone channels to meet the necessary bandwidth requirements. The facilities used include a variety of terrestrial land lines and microwave links. The principal supplier is ATT, although MCI, Southern Pacific and other new carriers are playing an increasingly more important role. A further factor in this field is the growing availability of satellite transmission promising high volume, low cost communications facilities.

*Network Systems Corporation (NSCO - 18 5/8 - OTC).

SATELLITE COMMUNICATIONS

In a May 1982 joint statement, Tandem in conjunction with a leading satellite company announced a new satellite communications network. Called Infosat, the network is scheduled to be available in the U.S. beginning in 1983. We view this as a further endorsement by Tandem of its commitment to computer networking. It further serves to position Tandem in the fast growing communication services arena, which, as we have discussed, is currently an area of major focus.

Tandem's partner in Infosat, American Satellite Company, was established in 1972 and is jointly owned by Fairchild Industries and Continental Telecom Inc.* Currently ASC offers communications services using its 20% ownership of the Western Union Westar satellites. ASC has considerable experience in satellite communications and currently provides services over more than 100 earth stations to nearly 300 customers in the U.S.

The Infosat offering is directed toward large enterprise users who require long distance leased line service. The communications service will be marketed jointly by Tandem and American Satellite Company (ASC). New low cost earth stations to be supplied by ASC will transmit and receive data over dual 56 kilobits per second transmission paths. For long distance users, the service is expected to provide significant savings relative to conventional terrestrial links.

Tandem will provide controllers, radio frequency modems and computer/satellite communications modules. Both ASC and Tandem will be involved in equipment installation. Maintenance for the entire system including the earth stations will be provided by Tandem. Communications network management will be provided by ASC.

The field of satellite communications has received considerable attention as a promising new means of communication. To date, domestic communications satellites have concentrated primarily upon television. This has largely been dictated by the economics of the early satellite communications systems. However, broader use of this new communications medium is evolving.

* An officer of Drexel Burnham Lambert is a director of Continental Telecom Inc. Drexel Burnham Lambert Incorporated from time to time provides investment banking and other services to Continental Telephone.

A major factor in the push toward new uses of satellite communications is the availability of low cost earth stations. These new facilities allow consideration of data communications by satellite direct to the user's location. This is in contrast to the large high cost earth stations employed in the original satellite systems.

The significance of these developments to Tandem, in our view, lies in the company's position in the Infosat joint venture at the ground floor of ASC's expanded undertaking. Tandem will provide the data processing side of the system. This new role, we believe, provides an opportunity for participation in a new business area with reasonably contained risks. It promises a broader scope for Tandem's business while ASC assumes the major investment in the satellite facilities.

MARKETING

The rapid growth of transaction processing applications has occurred principally in user areas concerned with management or financial aspects of the business enterprise. The greatest demand for fault-tolerant systems has resulted as users automate these critical functions. Responding to this opportunity, Tandem's marketing focus, as we have noted, has been toward large enterprise users and business and commercial applications. The company has not pursued small business users or the engineering/scientific marketplace.

In the six years since shipment of the first NonStop system, Tandem has installed 3,400 processors with 540 customers worldwide. As stated earlier, Tandem's business is concentrated among the largest enterprises in the Fortune 500 class. Early Tandem installations with these users generally pioneered new data processing approaches. This occurred as part of the overall trend toward wider use of on-line systems in place of previous batch or manual methods. Following the success of these first installations, Tandem is now benefiting from high rates of repeat business as these early installations are expanded. Currently, over half of the new processors are shipped to existing customers. This high penetration rate enables the company to sustain high sales productivity, a vital factor in today's data processing marketplace.

Following customary patterns in the minicomputer industry, Tandem markets systems directly to end users as well as through third party systems integrators. Third party firms perform an important role providing specific industry knowledge and application programming capability. Tandem's systems have been well received by leading integrators such as MCAUTO and C3. At present, about 30% of Tandem's business is handled through third parties.

Tandem has actively expanded its end user marketing efforts both in the U.S. and overseas. The company is highly marketing oriented with about 60% of its 3,300 employees in marketing, service or support functions. The company recently announced the opening of its 78th sales and service office. Tandem operates 12 foreign subsidiaries. The increasing commitment to foreign markets has resulted in a growing share of the business outside the U.S., reaching 31% in fiscal 1981. Table 5 shows the growth of international business relative to the U.S. We expect revenue outside the U.S. to be an increasingly important factor in Tandem's business. The established data processing companies typically derive half of their revenues outside the U.S. Tandem's marketing effort is greatly facilitated by the excellent reputation and outstanding user satisfaction and customer loyalty, discussed previously. The company's products consistently rate at the highest level of user surveys.

TABLE 5

TANDEM COMPUTERS
REVENUE GROWTH 1977 THROUGH 1981
(\$ Millions)

	United States		International		World-Wide	
	Revenue	% Increase	Revenue	% Increase	Revenue	% Increase
1977	\$ 5.9	--	\$ 1.8	--	\$ 7.7	--
1978	16.8	185%	7.5	317%	24.3	216%
1979	41.3	146	14.7	96	56.0	131
1980	78.8	91	30.2	105	109.0	95
1981	144.4	83	64.0	112	208.4	91

NOTE: Fiscal year ends September.

COMPETITION

Tandem has established a unique competitive situation by emphasizing fault-tolerant systems. The NonStop concept originated with Tandem and has been the key factor in differentiating the company's products. No other computer company, in our opinion, places the same emphasis on reliability, system availability and recovery from failure. The concentration on transaction processing requirements and fault-tolerance has established a strong niche in the marketplace.

The strong demand and dramatic business growth experienced by Tandem has not gone unnoticed by competitors, however. The past year has seen the entry of several new start-up companies with similar business objectives and indications of interest by established firms.

The initial start-up challenger, and the most visible, is Stratus Computers of Natick, Massachusetts, a privately financed corporation. This new contender has indicated that it will target the same transaction processing marketplace with similar fault-tolerant characteristics. Initial efforts will focus on business and commercial applications and will use independent systems houses for marketing. The first products were shipped in early 1982. Stratus has taken a different hardware direction, making extensive use of currently available microprocessors and 32-bit architecture. The new company indicates that it has found a hardware-only solution to fault-tolerance, avoiding a major software development effort. Significant price/performance advantages are claimed relative to Tandem. These claims are being disputed by Tandem in a lawsuit charging false representations of Tandem's products in ads run by Stratus.

Other less visible privately financed start-ups also targeting the Tandem marketplace include: Sequoia Systems, also of Natick, Massachusetts; Synapse Computer Corporation of Milpitas, California and Continuous Computer Corporation of Fort Lauderdale, Florida. An additional company offering fault-tolerant capabilities is August Systems Incorporated of Portland, Oregon. However, August is reported to be focusing on plant floor and process control applications and thus not competing with Tandem.

All of the large, well established competitors are currently marketing systems for transaction processing environments. In general, competitors such as IBM or Digital Equipment have made different architectural, hardware and software design trade-offs aimed primarily at low-cost single processor requirements. However, in recent months, both IBM and DEC have indicated the intent to participate in the fault-tolerant marketplace. Although neither company has yet announced a specific product, some indications have been given of the likely direction they will pursue. We consider it unlikely that these competitors would make a major commitment to an entirely new system to match Tandem's fault-tolerant characteristics. It seems more probable that the emphasis of these competitors will continue to be on improved software supporting dualized systems derived from conventional hardware. We expect a networking solution to provide alternate back-up processors in case of failure. Both IBM and DEC feature alternate pathing in their latest networking software. We believe this approach can ultimately provide greatly improved overall reliability and system availability.

On balance, we believe the demand for highly reliable transaction processing systems is massive and capable of supporting many suppliers. In our view, Tandem's lead in software development gives it a substantial advantage relative to the new contenders. The small start-up companies not only must catch up with Tandem's lead in products, but starting from a zero base, must also become established with users. In building a 540 user customer base, Tandem has created an important position for future growth with many major corporations. In some respects, these customer commitments can preempt the entry of new suppliers. The customer's investment in application software and growing familiarity with Tandem's concepts tend to confine a new entrant to completely new situations. We do not expect these new competitors to threaten Tandem's continued strong business growth.

In the computer networking arena, Tandem is a relative newcomer. Fault-tolerant characteristics, relative ease of installation and an open ended design that facilitates network expansion are big plus factors, in our opinion. The Tandem networking solution is particularly attractive for new applications that have not previously been on-line.

Tandem offers several compatibility features that enable NonStop systems to coexist with IBM mainframes. A Tandem network can function as a subsystem within an IBM SNA hierarchical network. A customer's commitment to IBM in large mainframe systems does not preclude the use of a Tandem network to perform a specialized function.

An added competitive plus for Tandem is the Infosat satellite communications services, discussed previously. We consider the ability to offer a comprehensive network including both data processing and communications links a unique competitive offering.

MANAGEMENT

Tandem's unique characteristics extend to its management style. From its inception in 1974, the company has concentrated upon establishing a solid base for future growth. The aim is to build an organization capable of guiding Tandem into the billion dollar revenue class. The organization and management team are upgraded and expanded well in advance of on-going business needs. Long range planning receives considerable attention as the company strives to anticipate the changing requirements of rapid growth. The concentration on planning extends to new employees who are made thoroughly aware of Tandem's objectives and the individual's role in their accomplishment.

The company's founding management, including the President, James G. Treybig and his three cofounders, received their basic grounding at Hewlett-Packard. They brought with them a philosophy based upon "people-oriented" management. The company is committed to a wide variety of advanced and unorthodox management and personnel practices. The Tandem style emphasizes informality, open communication and respect for the individual employee and his role in the company. This freedom is balanced by increased responsibility for working level employees and a voice in the planning and decision making process.

The Tandem philosophy is based upon the belief that the individual's effort is key to good products and a successful business. Self management and peer pressure are emphasized. Responsibility and decision making are pushed down to the working level. These enlightened policies have yielded excellent employee job satisfaction and have enabled the company to attract and retain top quality employees. Turnover is extremely low, averaging only 6.7% in 1981. This is in sharp contrast to many neighboring Silicon Valley firms with turnover in the 30% range.

Tandem's informality is balanced by well defined standards and business objectives. As the company grows, formalization of procedures and organization must necessarily increase as well. The aim, however, is to maintain the benefits of individual initiative with a growing organization. We believe Tandem has built a strong base to support its objective of continued outstanding business growth.

PRODUCT DEVELOPMENT AND MANUFACTURING

Product development and principal manufacturing operations are carried on at Tandem's headquarters location in Cupertino, California. This main location has been expanded considerably as the company has grown. A fourth headquarters building is being added at Cupertino in 1982. Some supporting subassembly and printed circuit board operations are carried on in Watsonville, California. In addition, the company has established a development and manufacturing facility in Austin, Texas with the primary mission of producing the new 6530 terminal family that we have discussed. Supplementing these production locations, Tandem maintains systems integration and test facilities in Neufahrn, West Germany; Santa Clara, California and Reston, Virginia. The company has followed a policy of leasing all facilities.

Tandem operates largely as a systems integrator, performing the functions of product design, some limited subassembly manufacturing and final assembly and test. Extensive use is made of outside sources for components and subassemblies. Approximately 40% of subassembly production is carried on in Tandem facilities with the remainder sourced from subcontractors. System peripherals, including disk drives, tape drives and some terminals, are obtained on an OEM basis from independent suppliers. This approach is designed to enable the company to concentrate its efforts on critical product areas. The principal example of this focus on key products is the 6530 terminal family.

Emphasis on research and product development has been a key factor in establishing Tandem's unique position of leadership in the marketplace. The company has consistently committed to high levels of research and development spending which averaged 8.6% of revenues in fiscal 1981 and has risen to 9.0% in the first half of fiscal 1982. Product development efforts are balanced between hardware and software activities. From the company's founding, Tandem's management has worked to create an environment that would attract and retain exceptional research and development talent.

We believe the commitment to quality development work is amply evidenced in the company's products and in high levels of user satisfaction. We expect these factors and the strong budget commitment to ensure continuation of Tandem's strong position in the marketplace.

TABLE 6

RESEARCH AND DEVELOPMENT EXPENDITURES 1977 TO 1981
(\$ Thousands)

	<u>Revenue</u>	<u>Research and Development Expend.</u>	<u>Percent of Revenue</u>
1977	\$ 7,692	\$ 1,094	14.2%
1978	24,305	2,169	8.9
1979	55,974	4,654	8.3
1980	108,989	8,786	8.1
1981	208,397	17,833	8.6
1982 (Est.)	372,300	33,000	8.9

NOTE: Fiscal year ends September.

FINANCIAL

The six years following shipment of the first NonStop system in May 1976 have seen dramatic business growth for Tandem. Over this period, the company has shipped 3,400 processors and has pushed its revenue level to a current annual rate in excess of \$300 million. During fiscal 1981, revenue increased 91%. This dramatic growth has required a steady build-up of resources. Employment has grown to 3,300 and total assets less cash and cash investments reached \$254 million at the end of March 1982.

Looking to the future, Tandem is planning revenue levels in excess of \$1 billion in 1985, as previously noted. The company's aim is to expand the business at the highest rates consistent with maintaining high operating margins and a high rate of return on assets. The operating margin of 19.4% in fiscal 1981 is at the high end of the company's 16% to 20% target range. Pretax return on average assets of 29.1% is comparable to the best in the industry. We reiterate our belief that the company's excellent products and strong position in the marketplace make the growth targets achievable. The company's ability to hire and train qualified new employees without sacrificing product quality and standards is the principal constraint on growth.

Tandem's rapid growth has required frequent infusions of new capital. The company has pursued a conservative approach to financing, relying entirely upon additions to equity. Tandem has avoided the use of debt to finance growth. Prior to the initial public stock offering in December 1977, financing had been obtained privately. From this initial offering to date, the company has had three additional major stock offerings. A further source of additional funds is employee stock purchases. These include both stock option plans and an employee stock purchase plan. In addition to being a source of funding, the company believes employee participation in ownership of the company provides important incentives and builds employee loyalty.

The following table outlines Tandem's stock sales since the initial public offering:

TABLE 7

	COMMON STOCK SALES (\$ Thousands)				6 Mo.
	1978	1979	1980	1981	1982
Sale Prior To Public Offering*	1,000	---	---	---	---
PUBLIC OFFERINGS					
Date	(12-77)	(12-78)	(11-79)	(11-80)	
Net Proceeds	7,888	10,075	24,279	96,033	---
EMPLOYEE SALES					
Options	---	354	2,042	7,396	---
Purchase Plan	---	408	950	2,273	---
Total Employee Sales	310	762	2,992	9,633	8,830
TOTAL STOCK SALES	8,198	10,837	27,271	105,702	8,830

* Sold as preferred stock subsequently converted to common stock at initial public offering. Equity sales prior to fiscal year 1978 totalled \$5,225,260.

Note: Fiscal Year Ends September 30.

Public stock offerings have provided ample funds to meet needs for expanding working capital and continued strong capital spending. The last stock issue, in December 1980, provided \$96 million from the sale of 4.5 million shares. The company was able to double total assets for a 15% addition to shares outstanding. The subsequent investment of the proceeds of the stock sale has provided significant interest income benefiting results in fiscal 1981 and 1982.

A factor of growing importance in financing growth, as indicated earlier, is the role of employee stock options and the stock purchase plan. During fiscal 1982, these plans are expected to provide \$15 million of new capital. In the future as employment increases, these sources are expected to provide an increasing share of new capital requirements. We expect operations in fiscal 1983 and beyond to be essentially self financing due to the contribution of these employee sources. In our opinion, Tandem's ability to grow is not likely to be constrained by the ability to obtain additional financing.

We expect the company to make an additional stock offering within the current year. Tandem has tended to seek additional financing in advance of actual requirements. Our analysis assumes a \$100 million equity offering in late 1982. Beyond this, earnings growth and the increasing proceeds from employee stock purchases appear adequate to meet financing needs through the mid-1980s.

TABLE 8

CAPITAL EXPENDITURES 1977 TO 1982P
(\$ millions)

	<u>Property, Plant & Equipment At Cost At End of Previous Year</u>	<u>Additions to Property, Plant & Equipment</u>	<u>Increase (Percent)</u>
1977	NA	\$ 534	---
1978	\$ 936	2,387	255%
1979	3,168	5,433	172
1980	8,519	9,966	117
1981	18,365	25,974	141
1982 (Planned)	44,339	40,000	90

NOTE: Fiscal year ends September.

TABLE 9

SUMMARY STATISTICS

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
Earnings per Share (\$)	0.02	0.16	0.20	0.35	0.72
Price Range (\$)	2-2	6-2	7-3	25-6	35-20
P/E Ratio Range	NA	39-14	30-18	53-18	48-28
Pretax Margin	4.3%	18.5%	18.1%	19.3%	24.5%
Asset Turnover	NA	1.77	1.65	1.54	1.19
Pretax Return on Assets	NA	32.7%	29.7%	29.8%	29.1%
Tax Rate	52.0%	52.0%	51.3%	49.3%	48.0%
Equity Leverage*	NA	1.50	1.44	1.39	1.28
Net Return on Equity	NA	23.6%	20.9%	21.0%	19.3%

NOTE: Fiscal Year Ends September.

*Equity Leverage: Average assets ÷ Average equity.

TABLE 10

TANDEM COMPUTERS
SOURCES AND APPLICATIONS OF FUNDS 1980 - 1984

<u>Sources of Funds</u>	<u>1980A</u>	<u>1981A</u>	<u>1982E</u>	<u>1983E</u>
Net Income	10.7	26.5	41.2	65.0
Depreciation	2.5	4.1	8.0	15.0
Other	<u>2.3</u>	<u>4.8</u>	<u>8.5</u>	<u>15.0</u>
Total From Operations	15.5	35.5	57.7	95.0
<u>Applications of Funds</u>				
Accounts Receivable	22.7	28.1	77.0	85.0
Inventory	9.6	33.6	43.0	55.0
Prepaid Expenses	0.6	3.1	8.0	10.0
Other Current Liabilities	<u>(8.2)</u>	<u>(20.5)</u>	<u>(20.0)</u>	<u>(30.0)</u>
Total Used	24.7	44.3	108.0	120.0
Sources minus Applications	(9.2)	(8.8)	(50.3)	(25.0)
Additions to Property, Plant and Equipment	10.0	26.0	40.0	75.0
<u>Net Funds Used</u>	19.2	34.8	90.3	100.0
<u>Funds Provided</u>				
<u>By Financing Sources</u>				
Misc. Debt	0.4	0.5	4.0	1.0
New Financing	<u>28.1</u>	<u>108.0</u>	<u>115.0</u>	<u>25.0</u>
Total From Financing Sources	28.5	108.5	119.0	26.0
Total Funds Used	(9.3)	(73.7)	(28.7)	74.0
Cash - Beginning of Year	6.8	16.2	89.8	118.5
Cash - End of Year	16.2	89.8	118.5	44.5

NOTE: Fiscal Year Ends September.

TABLE 11

TANDEM COMPUTERS
CONSOLIDATED BALANCE SHEETS
(\$ millions)

	June 30 1980	June 30 1981	March 31 1982
<u>Assets</u>			
Current Assets			
Cash and Investments	\$16.2	\$ 89.8	\$ 39.7
Accounts Receivable (Net)	42.6	70.7	107.3
Inventories	20.9	54.5	78.1
Other	2.0	5.0	10.3
Total Current Assets	\$81.7	\$220.1	\$235.4
Property Plant and Equipment (At Cost)	18.4	44.3	70.9
Less Depreciation	(4.3)	(8.4)	(12.3)
Net	\$14.0	\$ 35.9	\$ 58.5
Total Assets	\$95.7	\$256.0	\$294.0
<u>Liabilities and Net Worth</u>			
Current Liabilities			
Capitalized Lease Obligations	\$20.4	\$ 41.0	\$ 42.9
Long Term Debt	1.7	2.1	4.0
Deferred Income Taxes	---	---	3.7
	3.3	8.1	11.0
Total Liabilities	\$25.4	\$ 51.2	\$ 61.6
Net Worth	\$70.3	\$204.8	\$232.4
Total Liabilities and Net Worth	\$95.7	\$256.0	\$294.0

INSTITUTIONAL RESEARCH

**MONTGOMERY
SECURITIES**

MEMBER, NEW YORK STOCK EXCHANGE, INC.

600 Montgomery Street
San Francisco, CA 94111
(415) 627-2000

TECHNOLOGY RESEARCH NOTES

Tandem Business
Information Center December 12, 1984

CORPORATE
INFORMATION CENTER

TABLE OF CONTENTS

<u>Report Title</u>	<u>Author</u>	<u>Page</u>
Current Emphasis List		i
LOCAL AREA NETWORKS The Need for Commitment in the Development of Standards and Marketing is Evident	John C. Dean	1
* APPLIED MATERIALS, INC. Imminent New Products and Lowest Relative Valuation Make Stock Our Favorite	Paul A. Rickert	12
CULLINET SOFTWARE, INC. Company's Information Database Will Be the Industry's Most Important Software Product in 1985	William H. Shattuck	18
RECOGNITION EQUIPMENT, INC. On Track in 1984; Big Order Possibilities in the Second Half of 1985	Jon D. Gruber Jay W. Killea	25
SEMICONDUCTOR INDUSTRY OVERVIEW No Growth in U.S. Market Next Year Means Down Earnings for Most Companies	Daniel L. Klesken, Ph.D.	34
IBM LARGE COMPUTER MARKET CONFERENCE REVIEW An Industry Forum Presented by the Gartner Group, Inc.	David Wu, CFA	46
Montgomery Securities Research Reports Published in the Last 30 Days		53

- * Company in which Montgomery Securities currently maintains a market.
[1] Montgomery Securities was a co-manager of a public offering for Recognition
Equipment, Inc. in November 1984.

Additional Information Available Upon Request

© copyright 1984 Montgomery Securities

The study on this page and any following pages is not a complete analysis of every material fact respecting any company, industry or security. The opinions here expressed reflect the judgment of the author at this date and are subject to change. Facts have been obtained from sources considered reliable, but are not guaranteed. Montgomery Securities, its partners, and/or employees may have an interest in the securities of the issues described herein and may make purchases or sales while this report is in circulation.

REVISED EARNINGS ESTIMATES
Technology Stocks

	<u>Price</u>	<u>FY Ends</u>	<u>1983</u>	<u>Former FY 1984 Estimate</u>	<u>Current FY 1984 Estimate</u>	<u>Former FY 1985 Estimate</u>	<u>Current FY 1985 Estimate</u>
Increase							
Amdahl Corp.	\$12	12/31	\$0.96	\$0.70	\$0.70	\$0.85	\$1.00
Decrease							
Advanced Micro Devices [1]	\$27	3/31	\$1.23	\$2.55	\$2.40	\$2.15	\$2.00
Alpha Industries [1]	\$10	3/31	\$0.79	\$0.72	\$0.59	\$1.15	\$1.05
Analog Devices	\$22	10/31	\$0.73	--	\$1.38A	\$1.62	\$1.21
* Avantek	\$18	12/31	\$0.63	\$0.90	\$0.88	\$1.20	\$1.12
Computervision	\$35	12/31	\$1.24	\$1.65	\$1.65	\$2.50	\$2.40
Computer Consoles	\$9	12/31	\$0.87	\$0.60	\$0.60	\$1.20	\$1.10
Gould, Inc.	\$20	12/31	\$1.75	\$1.95	\$1.90	\$2.05	\$1.95
* Integrated Device Tech. [1,2]	\$10	3/31	(\$0.07)	\$0.32	\$0.28	\$0.80	\$0.75
* Intel Corp.	\$27	12/31	\$1.05	\$1.72	\$1.53	\$1.40	\$1.10
* LSI Logic Corp.	\$11	12/31	\$0.55	\$0.62	\$0.60	\$0.76	\$0.70
* Micron Technology [3]	\$28	8/31	(\$0.05)	--	\$0.76A	\$1.65	\$1.60
* Monolithic Memories	\$14	9/30	\$0.60	--	\$1.30A	\$1.45	\$1.00
Motorola	\$33	12/31	\$2.09	\$2.85	\$2.80	\$2.55	\$2.45
National Semiconductor [1]	\$12	5/31	\$0.75	\$1.05	\$1.00	\$0.95	\$0.90
Sanders Associates [1]	\$38	7/31	\$2.55A	\$3.05	\$2.95	\$3.75	\$3.60
* Standard Microsystems [1]	\$18	2/28	\$0.74	\$1.35	\$1.25	\$1.50	\$1.30
Texas Instruments	\$114	12/31	(\$6.09)	\$12.60	\$12.40	\$10.50	\$9.75
* VLSI Technology	\$9	12/31	(\$0.47)	\$0.38	\$0.36	\$0.57	\$0.46
Western Digital	\$7	6/30	\$0.15	--	\$0.39A	\$0.98	\$0.90
* Xicor, Inc.	\$9	12/31	(\$0.85)	\$0.26	\$0.21	\$0.50	\$0.40

* Company in which Montgomery Securities currently maintains a market.

[1] Fiscal year ends year following column heading.

[2] Montgomery Securities was co-manager of a public offering for Integrated Device Technology in February 1984.

[3] Montgomery Securities was co-manager of public offerings for Micron Technology in June 1984 and November 1984.

Date Priced: December 10, 1984

SPAL: \$ 162.83

INDU: 1172.25

EMPHASIS LIST: 35 Stocks Recommended for Best Relative Performance Over the Next Six Months

Symbol	Fiscal Year	12 Month Price Range	Added to List	Recent Price	-----Earnings Per Share-----				--P/E Ratio--		Yield	Return On Avg. Equity	Trading Volume (00's)[3]	---Millions---		
					1982	1983	1984E	1985E	1984E	1985E				Av. Sh.	Market Cap.	
S&P 500 Composite	SPAL	12/31	\$169-148		\$163	\$12.64	\$14.03	\$18.61	N/A	8.8x	N/A	4.3%	N/M			
AEROSPACE/DEFENSE																
Boeing Co.	BA	12/31	\$ 59- 36	\$ 37	\$ 53	\$ 3.02	\$ 3.67	\$ 3.95	\$ 6.25	13.4x	8.5x	2.6%	12%	3512	96.5	\$ 5,115
Lockheed Corp.	LK	12/31	\$ 49- 30	\$ 36	\$ 41	\$ 3.59	\$ 4.14	\$ 5.23	\$ 6.25	7.8x	6.6x	1.1%	42%	2297	65.0	\$ 2,665
Watkins-Johnson	WJ	12/31	\$ 30- 18	\$ 23	\$ 21	\$ 1.08	\$ 1.50	\$ 1.72	\$ 2.25	12.2x	9.3x	1.5%	20%	388	9.6	\$ 202
CONSUMER																
Anheuser-Busch, Inc.	BUD	12/31	\$ 74- 54	\$ 68	\$ 72	\$ 5.60	\$ 6.50	\$ 7.45	\$ 8.45	9.7x	8.5x	2.8%	18%	1551	53.5	\$ 3,852
Circuit City Stores[1]	CC	2/28	\$ 29- 17	\$ 25	\$ 23	\$ 0.62	\$ 1.23	\$ 2.05	\$ 2.45	11.2x	9.4x	0.3%	N/M	627	10.1	\$ 232
Holiday Inns, Inc.	HIA	12/31	\$ 52- 35	\$ 39	\$ 40	\$ 2.50	\$ 3.28	\$ 3.43	\$ 4.00	11.7x	10.0x	2.3%	N/M	1893	35.8	\$ 1,432
Home Depot[1]	HD	1/31	\$ 28- 12	\$ 15	\$ 16	\$ 0.24	\$ 0.41	\$ 0.58	\$ 1.05	27.6x	15.2x	---	25%	1154	27.8	\$ 445
PepsiCo, Inc.	PEP	12/31	\$ 46- 34	\$ 42	\$ 41	\$ 3.23	\$ 3.01	\$ 3.63	\$ 4.25	11.3x	9.6x	4.1%	17%	1866	95.4	\$ 3,911
#Pic 'N' Save Corp.	PICN	12/31	\$ 24- 14	\$ 22	\$ 18	\$ 0.87	\$ 1.17	\$ 1.30	\$ 1.75	13.8x	10.3x	---	N/M	1789	26.1	\$ 470
R. J. Reynolds Industries	RJR	12/31	\$ 72- 53	\$ 66	\$ 68	\$ 6.96	\$ 6.84	\$ 7.42	\$ 8.60	9.2x	7.9x	5.0%	16%	3390	113.4	\$ 7,711
Saga Corporation[2]	SGA	6/30	\$ 35- 25	\$ 25	\$ 31	\$ 1.55	\$ 1.93	\$ 2.40A	\$ 2.73	12.9x	11.4x	1.4%	23%	330	12.2	\$ 378
Transworld Corp.	TW	12/31	\$ 32- 24	\$ 30	\$ 30	\$ 1.03	\$ 1.30	\$ 3.07	\$ 3.50	9.8x	8.6x	1.3%	13%	1979	28.2	\$ 846
FINANCIAL																
Home Federal of S.D. MCorp[4]	HFD	12/31	\$ 20- 12	\$ 17	\$ 19	N/A	\$ 1.67	\$ 3.00	\$ 3.75	6.3x	5.1x	---	11%	871	20.5	\$ 390
#U.S. Bancorp.	MBK	12/31	\$ 29- 17	\$ 20	\$ 20	\$ 4.11	\$ 3.96	\$ 3.85	\$ 4.50	5.2x	4.4x	7.0%	N/A	N/M	41.0	\$ 820
#Washington Federal S&L	USBC	12/31	\$ 25- 15	\$ 22	\$ 23	\$ 2.65	\$ 2.60	\$ 3.10	\$ 3.55	7.4x	6.5x	4.3%	11%	283	19.7	\$ 453
	WFSL	9/30	\$ 28- 14	\$ 22	\$ 27	N/A	\$ 4.08	\$ 4.97A	\$ 5.15	5.4x	5.2x	2.6%	21%	409	4.3	\$ 116
HEALTH																
Bausch & Lomb	BOL	12/31	\$ 28- 17	\$ 20	\$ 25	\$ 1.21	\$ 1.72	\$ 1.97	\$ 2.38	12.7x	10.5x	3.1%	16%	1147	29.7	\$ 743
Becton, Dickinson[5,6]	BDX	9/30	\$ 41- 31	\$ 38	\$ 39	\$ 3.63	\$ 2.39	\$ 2.96A	\$ 4.00	13.2x	9.8x	3.1%	8%	280	20.8	\$ 811
Hospital Corp. of America	HCA	12/31	\$ 49- 35	\$ 44	\$ 39	\$ 2.25	\$ 2.80	\$ 3.35	\$ 4.05	11.6x	9.6x	1.3%	17%	2540	88.7	\$ 3,459
Novo Industri A/S	NVO	12/31	\$ 63- 21	\$ 24	\$ 25	\$ 2.51	\$ 3.14	\$ 2.75	\$ 2.90	9.1x	8.6x	1.4%	23%	2154	25.6	\$ 640
#Optical Radiation Corp.	ORCO	7/31	\$ 39- 22	\$ 26	\$ 27	\$ 0.21	\$ 0.47	\$ 1.05A	\$ 1.70	25.7x	15.9x	---	14%	698	8.2	\$ 221
Squibb Corp.[5]	SQB	12/31	\$ 53- 37	\$ 46	\$ 51	\$ 3.01	\$ 3.31	\$ 3.70	\$ 4.25	13.8x	12.0x	3.1%	14%	1088	53.1	\$ 2,708
INDUSTRIAL																
Air Products & Chem. Measurex Corp.[2]	APD	9/30	\$ 48- 36	\$ 46	\$ 46	\$ 4.06	\$ 3.47	\$ 4.55A	\$ 5.65	10.1x	8.1x	2.2%	13%	841	31.1	\$ 1,431
Morton Thiokol, Inc.[7]	MTI	6/30	\$ 22- 13	\$ 15	\$ 16	\$(0.05)	\$ 0.65	\$ 1.43	\$ 1.80	11.2x	8.9x	1.3%	13%	292	9.0	\$ 144
	MTI	6/30	\$ 31- 20	\$ 26	\$ 26	\$ 1.36	\$ 1.72	\$ 2.17A	\$ 2.50	12.0x	10.4x	2.5%	20%	763	50.4	\$ 1,310
TECHNOLOGY																
Applied Data Research	ADR	12/31	\$ 33- 18	\$ 27	\$ 26	\$ 1.35	\$ 1.35	\$ 1.70	\$ 2.20	15.3x	11.8x	---	19%	88	5.4	\$ 140
#Applied Materials, Inc.	AMAT	10/31	\$ 40- 21	\$ 27	\$ 24	\$(1.90)	\$ 0.50	\$ 2.00	\$ 2.60	12.0x	9.2x	---	6%	518	6.5	\$ 156
Digital Equipment	DEC	6/30	\$108- 68	\$ 99	\$103	\$ 7.53	\$ 5.00	\$ 5.73A	\$10.30	18.0x	10.0x	0.6%	14%	4916	59.2	\$ 6,098
Gerber Scientific[1,2]	GRB	4/30	\$ 21- 12	\$ 15	\$ 14	\$ 0.31	\$ 0.93	\$ 1.50	\$ 1.80	9.3x	7.8x	0.9%	21%	352	17.3	\$ 242
#Tandem Computers, Inc.	TNDM	9/30	\$ 40- 13	\$ 18	\$ 18	\$ 0.76	\$ 0.76	\$ 0.81A	\$ 1.25	22.2x	14.4x	---	13%	2176	41.8	\$ 752
#Telecredit, Inc.[1]	TCRD	4/30	\$ 25- 16	\$ 23	\$ 17	\$ 0.91	\$ 1.00	\$ 1.12	\$ 1.65	15.2x	10.3x	1.6%	15%	186	5.1	\$ 87
#Valid Logic Systems	VLID	12/31	\$ 18- 10	\$ 13	\$ 12	\$(0.89)	\$ 0.08	\$ 0.45	\$ 0.85	26.7x	14.1x	---	N/M	947	13.6	\$ 163
TELECOMMUNICATIONS																
#Communications Ind.[2]	COMM	12/25	\$ 28- 18	\$ 20	\$ 20	\$ 1.05	\$ 1.13	\$ 1.30	\$ 1.65	15.4x	12.1x	1.8%	18%	310	11.0	\$ 220
Northern Telecom Ltd.[8]	NT	12/31	\$ 44- 30	\$ 37	\$ 34	\$ 1.02	\$ 1.64	\$ 2.05	\$ 2.65	16.6x	12.8x	1.2%	21%	1309	115.6	\$ 3,930
Timeplex Inc.[2]	TIX	6/30	\$ 22- 12	\$ 18	\$ 18	\$ 0.29	\$ 0.46	\$ 0.67A	\$ 1.05	26.9x	17.1x	---	11%	131	8.5	\$ 153

12/12/84

-1-

Date Priced: December 10, 1984

SPAL: \$ 162.83

INDU: 1172.25

EMPHASIS LIST: 35 Stocks Recommended for Best Relative Performance Over the Next Six Months

Footnotes pertaining to prior page:

- # Montgomery Securities currently maintains a market in these securities.
- [1] Fiscal year ends year following column heading.
- [2] Montgomery Securities was manager or co-manager of a recent public offering.
- [3] Average daily trading volume based upon total October 1984 shares traded.
- [4] MCorp is a merger of Mercantile Texas Corp. and Southwest Bancshares, Inc. effective October 10, 1984. The 12-month price range and added price are those of Mercantile Texas Corp.
- [5] Earnings per share are from continuing operations.
- [6] 1983 and 1984 earnings exclude special items.
- [7] Figures are adjusted for 3:1 stock split effective November 19, 1984.
- [8] Earnings per share figures are in U.S. dollars.

A complete list of stocks appearing on our Emphasis List and performance data on those stocks while they were on our Emphasis List, is available upon request.

LOCAL AREA NETWORKS

The Need for Commitment in the Development of Standards and Marketing is Evident

Recently (November 12, 1984) we published a report entitled LANs and the Intra-Office Telecommunications Challenge, An Industry Forum Presented by the Gartner Group, Inc. This report covered LAN topics on Technology, Standards, Factory Automation, Growth as an Independent LAN Vendor, the Integrated Office and the Voice/Data PBX. Reprinted here are the General Conclusions, our Computer Vendor's LAN/PBX Environment chart and write ups on companies we cover. Stock prices have been changed to reflect current prices.

General Conclusions

The conference reaffirmed our belief that the Local Area Network marketplace has dramatic growth potential and that end users have real need and pent-up demand.

However, after listening to individual vendors of both LANs and PBXs and the many discussions of standards, feel the industry as a whole is struggling in terms of its commitment to developing and establishing standards. The independent LAN vendors (as opposed to PBX, mainframe, and minicomputer vendors) belong to a very large population (200) and appear to be focused on hardware solutions. Throughout the conference, panel speakers appealed to the audience to help establish standards. The most disturbing statement on standards revolved around the categorization of how standards are made or established and the fact that the independent LAN vendors do not seem to view themselves as creators/influencers. These categories are as follows:

- Committee(s) Standards
- De facto (via vendors) Standards
- User(s) Standards

Committees and Users speak for themselves. In the de facto area, IBM was mentioned most often, while Digital Equipment seemed to be second followed by Data General, Hewlett-Packard and Wang. None of the independent vendors seem to be in the running.

As mentioned above most discussions seemed to revolve around hardware and interfaces. During one of the discussions a representative from Datapoint--which as a company probably has the longest history in LANs--stated that LANs were 95% software and 5% hardware. This statement tends to cool one's enthusiasm for both independent LAN vendors and PBX vendors, since their focus has been in the wrong area and since Datapoint has been struggling in the marketplace with a very good but proprietary LAN.

Another feeling that permeated the panel discussions was that most of the LAN/PBX representatives came from strong technical backgrounds with many of the supplied biographical sketches confirming a technical background even though the titles indicated sales/marketing. The concept here is that an application/solutions marketplace is being developed by technicians, and the marketplace is not truly being addressed by strong marketing programs.

The overall feeling at the conference was one of pessimism. This is not a reflection on the Gartner Group or the individual panelists; this conference was almost the Who's Who of the emerging LAN vendors plus many of the most established vendors. However, the feeling we got was a fear of the future, a "wait and see", and a "fate is our destiny" attitude. This feeling was supported in a recent article in Computer Systems News (October 22, 1984) entitled LocalNet '84 Show: An Uncharacteristic Low-Key Atmosphere :

"Despite several product introductions and technical sessions, the most striking element of the recent LocalNet '84 show here was the low-key, almost tomblike air of the three-day event--particularly remarkable in the face of predicted dramatic growth for the local-area-network industry over the next few years."

Although at this point in the evolution of the LAN and LAN/PBX marketplace it is very difficult to pick the winners and losers, we are looking for the following to point towards success:

- Strong participation in the standards setting.
- Emergence of de facto standards (IBM SNA and PC Network have strong positions; Ethernet has some momentum).
- Participation in user standards development (GM MAP best example).
- Present commitment to LAN development/IBM SNA co-existence.
- Working relationships with PBX vendor(s) for LAN companies and vice-a-versa.
- Good application development capability.
- Strong end-user marketing (or knowledge).

Computer Vendors
LAN/PBX Environment

	AT&T	DGN	DPT	DEC	HWP	IBM	PRM	WANG
Standards Setting (NBS Demo)	IEEE	N.K.	N.K.	IEEE X	IEEE X	ECMA, IEEE, ISO	ECMA	CCITT, IEEE, etc.
Defacto Standards Ethernet	- Twisted Pair X	X	No	X	X	- Twisted Pair - SNA	S.O.D. ²	
User Standards (GM MAP)	N.K.	N.K.	N.K.	X	X	X		
LAN Product(s)	• ISN • 3B NET	XODIAC	ARCNET	• DECNet • SYTEK (Joint Mktg)	• LAN 9000 • SRM • Etherlink/150	PC NET	RING-NET	• WANG-NET • PC LIO
SNA Co-existence - Physical	Protocol Converters	DG/SNA	SDLC 2780/3780	DECNet Gateway	SNA NRJE	SNA = IBM	SNA S.O.D. ³	3270 SNA
Application	Program to Program? ¹			DISOSS	DCA/DIA S.O.D.			• IDS/DISSOSS • IDS/PROFS
Relationships PBX (LAN) Vendors	DMI ⁴	CPI ⁵ DMI	N.K.	CPI	CPI DMI DSN/PBX	ROLM	CPI	Intecom CPI DMI
Application Development	Not Known	Yes	Yes	Yes	Yes	Yes-Strong	Yes	Yes
Personal Computer	Yes	Yes-2	High Price/Yes-3 Function		Yes-3	Yes-4	No	Yes-2
Computer Phone	No	No	No	No	Yes-S.B.L.	ROLM	No	Yes-Prototype

1 Expected announcement of Sys. Strategies, Inc. and Communications Solutions Inc. SNA code for program to program communication.
 2 Ethernet Intent Announcement May, 1984.
 3 SNA Planning Document Intent March, 1983.
 4 DMI (Digital Multiplexer Interface) HWP/AT&T Proposal.
 5 CPI (Computer to PBX Interface) DEC/NTI Proposal.
 N.K. = Not Known
 X = Participation

12/12/84
-3-

American Telephone & Telegraph Company

Recent Price	12 Mo. Range	FY Ending	Div./Yield	E.P.S.			P/E Ratio		
				1983	1984E	1985E	1983	1984E	1985E
\$18	\$20-15	12/31	\$1.20/6.7%	N/A	\$1.46	\$2.18	N/A	12.3x	8.3x

As the local area network (LAN) market and industry structure evolve it is clear that AT&T will be one of the many participants. Not only does the company have the critical mass, research and development facilities, and financial resources to participate in this market, but it also has a significant presence in the workplace by virtue of its large installed PBX base. Currently, the company offers two LANs: Information Systems Network (ISN) and 3BNet. Introduced earlier this year, ISN is a general purpose LAN based upon proprietary technology developed by AT&T, while 3BNet, which is designed specifically to link the company's family of 3B computers, is based upon Xerox's Ethernet LAN.

To date, one major aspect of this market has been its highly fragmented nature with very little standardization. Recent developments might suggest a move towards "de facto" industry standardization in certain areas. These developments relate to the type of cable, or transport system, AT&T and IBM have settled upon in the development of their LAN strategy. When IBM announced its cabling system earlier this year, it indicated that the system would be based upon shielded twisted wire pairs. Similarly, when AT&T announced the ISN, it indicated that the system would be based upon unshielded twisted wire pairs. Not only do these announcements suggest a convergence upon an industry standard, but they also indicate AT&T's recognition of IBM's dominant market position: AT&T announced the ISN after IBM announced its cabling system and offered protocol converters for IBM's SNA to allow communications with a host computer.

At least three challenges exist for AT&T in the development of its LAN strategy. First, given the company's large installed base of leased PBXs, it must attempt to design a product that will not further antique the already out-of-date installed base. For example, if it designs a system that provides similar functions at a lower price it will accelerate the conversion of the leased base. Alternatively, if AT&T introduces functions that the installed base cannot take advantage of it alienates those customers, which could result in a very cautious response to any new product offerings because of concern for the longevity and support of new products. Second, because the ISN is based upon proprietary technology it is not a standard approach. Instead it appears to be aimed at the technology embodied in the new wave of AT&T PBXs; the System 75. It will be a challenge for AT&T to sell this new approach. Aside from the purely technical differences of the ISN, there may be a place in the market for AT&T because the company's participation is seen as a way to prevent IBM from establishing industry standards. At the same time, there is a concern that AT&T will attempt to establish itself as the "de facto" creator of industry standards. AT&T's third challenge then will be to overcome that concern.

In the area of product performance and consumer expectation, to date AT&T appears to be behind the rest of the industry. Although AT&T product announcements and marketing literature suggest that communications with the host node of the ISN are at speeds of 8.64 Mbps, it appears that currently the actual speed is a much slower 19.6 Kbps. If a customer purchases the ISN anticipating 8.64 Mbps and finds out at the time of installation that the actual speed is 19.6 Kbps, AT&T will have major problems with customer satisfaction. In contrast, IBM's PC Network can communicate at 2 Mbps and Ethernet can communicate at 10 Mbps.

Given these issues, we believe that, while this is an attractive long-term market for AT&T, in the near term the company faces a number of challenges. At present we view the company as a weak HOLD.

Robert B. Morris III, CFA

Data General Corporation

Recent Price	12 Mo. Range	FY Ending	Div./Yield	E.P.S.			P/E Ratio		
				1983	1984	1985E	1983	1984	1985E
\$53	\$59-31	9/30	None	\$0.96	\$2.60	\$4.25	5.5x	20.4x	12.5x

Of the computer manufacturers discussed in this report, Data General fits in the middle in regard to LAN/PBX involvement.

DGN has a proprietary product (XODIAC) based on Ethernet, does embrace SNA, has covered the bases with both CPI and DMI interface projects to PBXs, has dropped the personal computer entry price significantly by announcing DG ONE, and has some application development capability.

On the other hand, Data General has not been as visible in the standards process or demonstrations as many of the other vendors. Additionally DGN relationships with PBX vendors appear to be normal joint agreements as opposed to the closer working relationships of IBM/ROLM, WANG/INTECOM, DEC/NTI (CPI) and HWP/AT&T (DMI). Data General has been a major supplier to ROLM and has had good working relationships; future relationships remain in question.

Data General has developed their reputation more on hardware than software. The "half and double" philosophy of half the price for same capability or double the capability for the same price every two years is a hardware statement and has served DGN well. However, the LAN business is a software business. The Comprehensive Electronic Office (CEO) software product appears to be doing well as it appears to be a quality product. Data General needs to keep this software focus in LANs and other business opportunities.

From an investment standpoint we view the stock as a HOLD. The announcement cycle of some of DGN's main competitors (DEC, PRM) should put some emotional pressure on the stock, but we do not view the earnings to be under pressure. Their continued focus on the office puts them directly in competition with WANB, DEC, HWP, CPT, NBI and IBM, which individually and collectively provide formidable competition.

John C. Dean

Datapoint Corporation

Recent Price	12 Mo. Range	FY Ending	Div./Yield	E.P.S.			P/E Ratio		
				1983	1984	1985E	1983	1984	1985E
\$18	\$30-13	7/31	None	\$0.40	\$1.37	\$1.35	45.0x	13.1x	13.3x

Datapoint was the first company to implement a LAN with their ARCNET product. They are essentially in the second generation of ARCNET products. Company sources reference over 6,000 networks installed with over 15,000 systems in the networks.

One of the unfortunate decisions by DPT was their proprietary network approach. When they started it was necessary; there were no standards. Over time it was used as a marketing exclusive. In the last couple of years, however, open systems and standards have been the hue and cry. Datapoint did not respond.

Finally at the announcement of their VISTA PC and VISTA-82, VISTA-84 products in June of this year, Datapoint announced their intention to open the network. In September of this year the IBM PC was added to the ARCNET. It has been and is our belief that this was too little too late. Because ARCNET works over coaxial cable the company says that it will be easy to adapt to the IBM PC Net.

The computer phone market does not look like an opportunity for DPT. We know of no working relationship with a major PBX vendor; Datapoint had been in this business a few years ago but abandoned their effort.

They must very soon show support of the industry trends (Ethernet, IBM PC Network, IEEE 802.3, etc.), display a real interest in connecting to IBM SNA, and bring out better price/performance products that work in the ARCNET. The latest Convergent Technologies slippage announcement probably hurts DPT as the VISTA-PC and follow on PC products come from Convergent.

John C. Dean
David Wu, CFA

Digital Equipment Corporation

Recent Price	12 Mo. Range	FY Ending	Div./Yield	E.P.S.			P/E Ratio		
				1984	1985E	1986E	1984	1985E	1986E
\$103	\$108-68	6/30	None	\$5.73	\$9.90	\$11.50	18.0x	10.4x	9.0x

Digital has been aggressively pursuing the LAN business. They with Intel and Xerox brought out the original Ethernet specifications. The DEC products utilize LANs with DECNet and even the VAX cluster product can be considered in this area. The standards effort and the two major demonstrations (NBS and GM) at the last NCC in July have been well supported by DEC. DECNet has been considered by many to be one of the most complete Ethernet implementations with total software support through all seven layers of the ISO/OSI model.

Two recent announcements by DEC again support this aggressive communications posture. At the Autofact 6 show in Anaheim on October 1st, an integrated manufacturing product named BASEWAY was introduced. This software product has three components: a shop floor gateway, the BASEWAY application bus software using DECNet, and a programmable device support package. This software gives the user end-to-end applications support built around the LAN. The second announcement is an IBM/DISOSS (Distributed Office Support System) product for VAX systems. DISOSS is the strategic product for IBM in the office which uses SNA. DEC can now communicate to the host at a document level. This is a significant announcement and positions DEC very well for competing for office systems business.

Trade press articles indicate that DEC will be announcing a Broadband LAN capability that is a joint effort by DEC and Sytek. Sytek has strong IBM contacts with the IBM PC Network based on Sytek technology and IBM has invested \$6 million in Sytek. Working relationships with Sytek could help in an IBM coexistence strategy.

 NOTE: In the last week of November DEC announced an Ethernet-compatible transceiver for broad band installations and entered into a cooperative marketing venture with Sytek. The product is aimed at the factory and university environments; the marketing agreement states that both companies will sell Sytek products (Sytek will not sell DEC computers).

DEC has been active in the PBX area with a joint project with Northern Telecom for a Computer-to-PBX Interface (CPI); DEC is shipping the CPI product now. Also DEC has been active in voice technology with DECTalk (converts computer output to voice), which provides an additional technological base for LAN/PBX requirements.

At this point DEC is perhaps the best positioned company in the industry in LANs. Additionally they have been bringing out important software (BASEWAY, DEC/DISSO) and have been positioning themselves well in the computer integrated manufacturing area. The recent VAX 8600 (VENUS) announcement helps them at the high end of the product line and the anticipated announcement of MicroVAX II in calendar first quarter 1985 will also help a great deal. We like the stock and it remains on our emphasis list.

John C. Dean

Hewlett-Packard Company

Recent Price	12 Mo. Range	FY Ending	Div./Yield	E.P.S.			P/E Ratio		
				1983	1984E	1985E	1983	1984E	1985E
\$34	\$45-31	10/31	\$0.22/0.6%	\$1.69	\$2.12	\$2.65	21.2x	16.0x	12.8x

For years Hewlett-Packard has had the reputation as a solid communications computer vendor. Their strength has been communications among HP processors with the ability to pass data to IBM hosts. Hewlett-Packard sells the AdvanceNet, which is their overall computer networking strategy: integrated information management networks for manufacturing, engineering, commercial, and office environments.

The standards setting area has been a focal point for Hewlett-Packard. HP personnel chair and sit as members on international committees now developing industry standards. HP was only one of two computer companies (DEC the other) that participated in both Las Vegas NCC demonstrations. The General Motors demonstration was based on the IEEE 802.4 recommended standard, and the NBS office demonstration was based on the IEEE 802.3 recommended standard.

Also as part of the overall philosophy of AdvanceNet, HP is conducting a certification program with PBX vendors for CPU to PBX communication. Hewlett-Packard has been a backer of the AT&T proposed standard Digital Multiplexer Interface (DMI) and has involvement with the CPI (Computer to PBX Interface) as an alternate standard. They have been working with most of the major PBX vendors.

In the realm of IBM communication, the HP Systems Network Architecture Network Remote Job Entry (HP SNA NRJE) and HP SNA Link products allow the HP 3000 to emulate an IBM 8100 DPPX/RJE workstation, to function as a distributed processing node in an IBM SNA network and to act as a gateway between HP distributed systems and IBM SNA networks.

All of the above is viewed as excellent direction setting and a good start on product delivery. However, HP has a long way to go to deliver the necessary products to make the strategy a reality. Today the major HP products (150, 250, 1000, 3000, and 9000) cannot even communicate among themselves over a LAN network. We expect announcements but the products are missing.

We also expect announcements of products supporting IBM's DCA/DIA, which is becoming a de facto standard. DEC appears to be ahead of HP in this area, AT&T appears to be readying an announcement and Wang has a statement of direction for DCA/DIA. Hewlett-Packard should not delay.

Our overall feeling is that HP is in the process of developing many products in this area as well as others, but the stock appears to reflect this idle period. We are not interested in buying the stock at this time.

John C. Dean

Prime Computer, Inc.

Recent Price	12 Mo. Range	FY Ending	Div./Yield	E.P.S.			P/E Ratio		
				1983	1984E	1985E	1983	1984E	1985E
\$16	\$21-12	12/31	None	\$0.68	\$1.25	\$1.35	23.5x	12.8x	11.8x

Prime has a very good proprietary LAN product in the RingNet part of PrimeNet. PrimeNet appears to be very strong in the Wide Area Network area. Neither of these products has an open architecture.

Prime is focusing on an overall communications strategy that calls for compatibility, connectability, and coexistence. To support this strategy two statements of direction have been issued; these are as follows:

SNA Planning Document	March 1983
Ethernet	May 1984

The company has no comments on features, functions, dates, etc., on the above products. The lack of SNA is a major deterrent to the IBM coexistence philosophy, as today Prime communicates with IBM via Bisynch, which is not strategic.

Also of interest is the fact that Prime does not have a Personal Computer or a stand-alone CAD/CAM workstation to sell. The market for both of these products is beginning to demand LAN capability. Prime has three challenges here.

At this time we are NEUTRAL on the stock. The company has a fine management team, a good strategy, plans to upgrade field sales, etc., but is missing several key products for its chosen marketplaces.

John C. Dean

Wang Laboratories, Inc./Intecom, Inc.

	Recent 12 Mo.		FY	Div./Yield	E.P.S.			P/E Ratio		
	Price	Range	Ending		1983	1984	1985E	1983	1984	1985E
WANB	\$27	\$38-23	6/30	\$0.16/0.6%	\$1.16	\$1.52A	\$2.00	23.3x	17.8x	13.5x
INCM	\$8	\$20-7	12/31	None	\$0.33	\$0.39E	\$0.67	24.2x	20.5x	11.9x

Wang has been involved with LANs for some time, but has not been very visible in the standards setting or demonstration areas, although they do have some involvement. Wang can tie all products together via WANGNET (a 12 Mbps broadband local area bus network) or PC products via the Local Interconnect Option (a token passing bus at speeds of 2.5 Mbps). These are proprietary products that do not seem to conform to any standards.

Wang also has an active working relationship with Intecom. Recently they showed a prototype computer phone that should be a marketable product mid-1985. In addition to the Intecom relationship, Wang has supported both CPI and DMI approaches to PBX information exchange.

Recently Wang has developed the interface capability for the IBM PC in the PC Network. Indications have been that Wang will open up the network to other PCs. Openness in the WANGNET is shown by what is called the Interconnect Band on WANGNET, which enables any RS-232 or RS-449 compatible terminals or systems to communicate with both Wang and non-Wang systems by using standard data communications protocols. Application software must be a user responsibility.

In general Wang is a very experienced LAN company. Their form of openness may not be acceptable to the marketplace and is therefore a risk. Plans to embrace other de facto standards are not known. Wang, however, is working a delicate balance between being an industry leader and coexistence with IBM.

The communications strategy with IBM is clever and has an element of risk also. Wang's approach is that "we too are a major player in the office and communications." They state that more documents are in Wang format than IBM and that they have more shared WP systems than IBM. However, they do recognize that for most large accounts, IBM owns the mainframe and the network. In recognition of the above, Wang utilizes the IBM network and mainframe with two products:

IDS (Information Distribution System) Level I:

VS systems communicate with each other through the IBM network and mainframe.

IDS (Information Distribution System) Level II:

VS systems place documents in the IBM mainframe data base for access by non-VS systems.

A second major product is WITA (Wang Information Transfer Architecture), which allows other vendors to utilize the Wang document architecture. This is a challenge to the IBM efforts at making DCA/DIA the de facto standard; Wang plans on the industry having two de facto standards. Also to cover all the bases, Wang has made a statement of direction that they will support DCA/DIA.

Wang has built a strong office automation base, is gaining back its reputation as a minicomputer vendor, and has good networking. At this time, however, we view the stock as a **HOLD**--due to near-term earnings estimates.

John C. Dean
Jon D. Gruber
David Wu, CFA

APPLIED MATERIALS, INC. (AMAT)

Imminent New Products and Lowest Relative Valuation Make Stock Our Favorite

Recent Price	12 Mo. Range	FY Ending	Div./Yield	E.P.S.			P/E Ratio		
				1983	1984E	1985E	1983	1984E	1985E
\$24	\$40-21	10/31	None	\$0.50	\$2.07	\$2.60	N/M	11.5x	9.1x

Fourth Quarter and Fiscal Year Results

Applied Materials reported fourth quarter E.P.S. of \$0.62 versus \$0.18 on revenues of \$50.4 million versus \$31.9 million, substantially better than our estimate of \$0.56 on \$46 million. Orders were also better than expected at \$52.9 million versus \$35.3 million.

(FY Ends 10/31) (\$ Thousands)	FY 1983				FY 1984				M.S. Estimate			
	4th Qtr.		Year		4th Qtr.		Year		4th Qtr.		Year	
Total Sales	\$ 31,934	100.0%	\$ 105,527	100.0%	\$ 50,359	100.0%	\$ 168,400	100.0%	\$ 46,000	100.0%	\$ 164,041	100.0%
Cost of Goods Sold	\$ 18,496	58.0%	\$ 64,083	60.7%	\$ 25,376	50.4%	\$ 85,207	50.6%	\$ 22,724	48.4%	\$ 82,555	50.3%
Selling, General & Admin.	5,488	17.2%	18,373	17.4%	7,489	14.9%	27,736	16.5%	7,700	16.7%	27,947	17.0%
Research & Development	5,353	16.8%	16,436	15.6%	9,828	19.5%	31,219	18.5%	9,000	19.6%	30,391	18.5%
Operating Income	\$ 2,597	8.1%	\$ 6,635	6.3%	\$ 7,666	15.2%	\$ 24,238	14.4%	\$ 6,576	14.3%	\$ 23,148	14.1%
Interest (expense)	\$ (700)	-2.2%	\$ (1,537)	-1.5%	\$ (250)	-0.5%	\$ 320	0.2%	\$ 125	0.3%	\$ 695	0.4%
Pretax Income	\$ 1,897	5.9%	\$ 5,098	4.8%	\$ 7,416	14.7%	\$ 24,558	14.6%	\$ 6,701	14.6%	\$ 23,843	14.5%
Taxes	728	38.4%	2,000	39.2%	3,340	45.0%	11,054	45.0%	3,015	45.0%	10,729	45.0%
Net Income	\$ 1,169	3.7%	\$ 3,098	2.9%	\$ 4,076	8.1%	\$ 13,504	8.0%	\$ 3,686	8.0%	\$ 13,114	8.0%
E.P.S.	\$0.18		\$0.50		\$0.62		\$2.07		\$0.56		\$2.01	
Average Shares O/S	6,628		6,164		6,597		6,538		6,525		6,521	
Orders	\$35,300		\$115,288		\$52,900	+50%	\$210,600	+83%	\$51,500	+46%		
Backlog	\$38,254		\$38,254		\$80,500	+111%	\$80,500	+111%	\$83,500	+118%		

Although Applied's revenues were more than \$4 million higher than we had anticipated, gross margins of 49.6% were below our expectations due to an accounting change for the treatment of warranty and installation revenues which added \$1.6 million to sales with only a 12.5% pretax margin. Without this accounting change Applied's gross margins would have been on track with our estimate of 50.6%.

Selling, general and administrative expense was less than we had expected as Applied slowed its headcount increases and reduced other overhead in preparation for a more difficult 1985 environment. In addition, the company saw greater bookings from Japan where its salesforce is on straight salary, which resulted in lower commission expense. During 1985 we would expect SG&A to return to a more normal level of 16-15% as reflected in our estimates.

R&D expense continues to be quite high and came in at 19.5% of sales as we had expected. In absolute dollars however, R&D was \$800,000 higher than our estimate and increased to \$9.8 million from \$8.2 million in the previous quarter. To a large extent, Applied's abnormally high R&D spending is due to the company's policy of completely expensing all of its prototype development costs including hardware rather than treating

the prototype as inventory. This conservative policy would have permitted Applied to discontinue development on its new plasma etcher, epitaxial reactor, and ion implant products at any time without incurring a writeoff. We expect R&D in the first quarter to stay at fourth quarter levels before declining in absolute dollars for the remainder of the year as prototype development is completed and Applied's new products are introduced. Total R&D spending in 1985 should be \$33-35 million or roughly 17.3% of sales which will permit Applied to expand its pretax margins even in the difficult environment we anticipate next year.

Applied's higher-than-expected operating margins were due to the lower SG&A, which was offset by a net interest expense of \$250,000 versus net interest income of \$243,000 in the third quarter. This unexpected interest expense item was due to increases in inventories and accounts receivables. Applied has built its cash levels since the end of the fiscal year and we expect total interest expense for 1985 to be only \$500,000.

Orders

Applied's fourth quarter orders of \$52.9 million were slightly better than expected and the company continues to have a book-to-bill ratio greater than 1.0. Despite some softening in the U.S. merchant market, which represents less than 30% of the company's sales, the company's other markets remain good. Japan is an especially strong region followed by Europe with extensive ordering from Siemens, Phillips, and SGS. Applied's 8100 series of etchers is the main source of order strength with the demand for epitaxial silicon reactors leveling off.

We expect that Applied's first quarter orders will be similar to the fourth quarter and demand has stayed strong to date. In our opinion Applied's order outlook is considerably better than some other equipment companies we follow due to Applied's geographic customer diversification and rich new product calendar. We expect U.S. merchant capital spending to fall off sharply in the first half of calendar 1985. U.S. captives, Japanese and European spending should continue to increase modestly next year.

New Product Outlook

During 1985 we expect Applied Material's to formally introduce three major new products including the new 8300 series of Reactive Ion Etchers, a high output epitaxial silicon reactor, and an Ion Implantation System. These new products will stimulate order growth during 1985 and are key factors in our aggressive buy recommendation on the stock. Although Applied Materials is quite reticent about its product introductions we believe the following points accurately highlight Applied's new product plans.

- **New 8300 Reactive Ion Etcher**

- Applied's new 8300 Etcher will be similar to the old 8100 in that it is based on the same Hex Etch technology which is positive as it yields superior etch results.
 - Unlike the 8100 the system will be fully automated with cassette-to-cassette handling. The 8300 will not incorporate an Intelledex robot which is extremely positive as it suggests a more integrated and elegant solution.
 - 8300 will be bulkhead mounted which is a positive as it addresses floor space concerns. Most other etchers are not bulkhead mounted.
 - Throughput on the 8300 will be better than the 8100 and better than most competing single wafer etchers due to reduced overhead time and a larger chamber size. This is important as it means the system will be less sensitive to increasing wafer sizes.
 - Processes developed on the 8100 will be upward compatible with the 8300 which is important given the investment in process by the semiconductor manufacturers and Applied Materials.
 - One reason for Applied's very high R&D spending is that the company has expensed every aspect of the 8300's development. Applied could have stopped the project at any time and incurred no write-offs. Normally a company would choose to include its parts and prototypes as inventory.
 - We anticipate introduction of the 8300 in early 1985 and believe the unit could be extremely successful as it addresses the two main concerns regarding Applied's batch approach i.e., throughput of six-inch wafers and automation. In our opinion the quality of etch on Applied's 8100 already exceeds other etch vendors and will only improve on the 8300.
- We have now confirmed that Applied Materials is showing a high output epitaxial reactor to selected customers for delivery within 12 months. We expect this to be a large market due to the burgeoning requirements for epitaxial wafers for CMOS manufacturing.
 - Applied's Ion Implant development project is proceeding on track and has met all of its milestones on or ahead of schedule. Although we view Applied's entry into the ion implant market with some trepidation, we are pleased with the product's timely development. We look for introduction in late 1985 or early 1986.

Customer Diversity

We view Applied Material's extremely diverse customer base as a positive given our expectation that U.S. Merchant capital spending will decline in 1985 by 5-10% while U.S. Captive, Japanese and European spending will increase 15-20%. Applied's customer mix is outlined below.

U.S. Customers	
Top 10 Merchants	10-15%
Smaller Merchants	10-15%
Captives	20-25%
Wafer Mfg's	5%
Total U.S. Customers	<u>50-55%</u>
Japanese	32-33%
Europe	11-12%
Rest of World	3%

Valuation

The following chart summarizes the current valuations of the five equipment companies in our Equipment Index and should make clear why we believe Applied Materials represents the premier stock in the group. The potential valuations we expect are indicative of those reached in the 1980-1982 cycle with some adjustment upward for Teradyne and downward for Materials Research to reflect their changed fundamentals.

Semiconductor Capital Equipment
Relative Valuation Model

Company	Current Price	E.P.S. T 4Q	P/E Ratio T 4Q	Mkt. Cap. to Sales T 4Q	Trailing 12 mo. Relative Valuation		Potential Mkt. Cap/Sales		Possible Price		Percentage Change	
					P/E	Mkt. Cap.	Low	High	Low	High	Low	High
Applied Materials	\$23.75	\$2.20	10.8x	0.87x	-9.0%	-19.7%	0.75x	2.00x	\$20.37	\$54.33	-14.2%	128.8%
Teradyne	\$23.13	\$1.79	12.9x	1.37x	8.9%	26.2%	0.82x	2.10x	\$13.80	\$35.33	-40.3%	52.8%
GCA Corp.	\$21.38	\$1.72	12.4x	1.00x	4.3%	-7.8%	0.60x	2.00x	\$12.77	\$42.56	-40.3%	99.1%
Kulicke & Soffa*	\$21.63	\$2.34	9.3x	1.17x	-22.1%	7.2%	0.85x	2.30x	\$15.74	\$42.60	-27.2%	97.0%
Materials Res.	\$13.50	\$1.13	12.0x	0.53x	0.6%	-51.6%	0.40x	1.50x	\$10.25	\$38.45	-24.0%	184.8%
Equipment Index	\$1,565	\$131.66	11.9x	1.09x			0.75x	2.00x	\$1,078	\$2,874	-31.1%	83.7%

* Note that Kulicke & Soffa's market capitalization is based on its primary shares outstanding and consequently understates its true valuation by roughly 20%.

Our relative valuation work indicates that Applied Materials' stock has a potential downside risk of only 14% while its potential upside return based on its current fundamentals would be 129%. For a more detailed discussion of the methodology of our equipment index please see our Semiconductor Capital Equipment Outlook report dated July 23, 1984.

Conclusion

Applied Materials' fourth quarter and fiscal year-end results were better than our expectations. We continue to recommend aggressive purchase of the stock for the following reasons:

1. Our valuation work indicates the stock has limited downside risk of 14% with a current upside of 129%.
2. A strong new product cycle with the new 8300 etcher, a high output epitaxial reactor and the new ion implantation system are all expected next year.
3. Margins should increase next year due to lower R&D spending.
4. Less than 30% of sales come from the U.S. merchants--the only segment of the market where we expect spending to decline.

Paul A. Rickert

APPLIED MATERIALS
Annual Earnings Model
(\$ thousands)

(FY Ends 10/31)	<u>1980</u>		<u>1981</u>		<u>1982</u>		<u>1983</u>		<u>1984</u>		<u>1985E</u>	
Total Sales	\$ 69,278	100.0%	\$ 77,490	100.0%	\$ 88,269	100.0%	\$ 105,527	100.0%	\$ 168,400	100.0%	\$ 195,000	100.0%
Cost of Goods Sold	\$ 37,128	53.6%	\$ 45,529	58.8%	\$ 64,341	72.9%	\$ 64,083	60.7%	\$ 85,207	50.6%	\$ 97,305	49.9%
Selling, General & Admin.	12,553	18.1%	16,342	21.1%	19,599	22.2%	18,373	17.4%	27,736	16.5%	32,250	16.5%
Research & Development	8,090	11.7%	11,181	14.4%	14,689	16.6%	16,436	15.6%	31,219	18.5%	33,750	17.3%
Operating Income	\$ <u>11,507</u>	16.6%	\$ <u>4,438</u>	5.7%	\$ (10,360)	-11.7%	\$ <u>6,635</u>	6.3%	\$ <u>24,238</u>	14.4%	\$ <u>31,695</u>	16.3%
Interest (expense)	\$ (429)	-0.6%	\$ (1,560)	-2.0%	\$ (3,663)	-4.1%	\$ (1,537)	-1.5%	\$ 320	0.2%	\$ (500)	-0.3%
Pretax Income	\$ 11,078	16.0%	\$ 2,878	3.7%	\$ (14,023)	-15.9%	\$ 5,098	4.8%	\$ 24,558	14.6%	\$ 31,195	16.0%
Taxes	4,896	44.2%	963	33.5%	(4,581)	32.7%	2,000	39.2%	11,054	45.0%	14,038	45.0%
Net Income	\$ 6,182	8.9%	\$ 1,915	2.5%	\$ (9,442)	-10.7%	\$ 3,098	2.9%	\$ 13,504	8.0%	\$ 17,157	8.8%
E.P.S.	<u>\$1.37</u>		<u>\$0.40</u>		<u>(\$1.90)</u>		<u>\$0.50</u>		<u>\$2.07</u>		<u>\$2.60</u>	
Average Shares O/S	4,498		4,744		4,972		6,164		6,538		6,600	

-17-
12/12/84

CULLINET SOFTWARE (CUL)

Company's Information Database Will Be the Industry's Most Important Software Product in 1985

Recent Price	12 Mo. Range	FY Ending	Div./Yield	E.P.S.			P/E Ratio		
				1984	1985E	1986E	1984	1985E	1986E
\$40	\$47-24	4/30	None	\$1.09	\$1.65	\$2.30	36.7x	24.2x	17.4x

Summary and Investment Conclusion

On December 3, 1984, Wang Laboratories announced an agreement with Cullinet to support communication between Wang's VS office automation system and Cullinet's Information Database. This agreement follows other recent and similar agreements with Data General and Digital Equipment.

These agreements are not isolated or unrelated developments. Rather, they are a cohesive pattern of events which have emanated from one of the most important trends currently shaping the computer industry, i.e. the refocusing of the market away from standalone personal computers toward office automation systems which are functionally compatible with IBM mainframes and personal computers.

Through its Information Database (IDB), associated GOLDENGATE software, and overall information architecture, Cullinet is positioned to be a very significant beneficiary of this market refocusing.

The investment story of Cullinet Software has grown far more complex during the past two years, as the company has evolved from a narrowly-focused database management software company to a broadbased supplier of integrated database, applications and decision support products. Despite the premium valuation relative to its historical industry group, we recommend purchase of the stock on the basis of extremely compelling fundamentals. We believe the company can sustain financial growth near the 50% level over the next three years, despite its large revenue base and the slower 25-35% growth of the market and its competition. In particular, our purchase recommendation is based on the belief that the strategic and financial importance of the Information Database is not fully realized and discounted in the stock.

Industry Environment

For the past three years, since the IBM Personal Computer first appeared in the marketplace, the computer and office automation industry has been fixated on the standalone personal computer. As a result, the effort to develop integrated office systems, to rapidly and efficiently move and process information in the office environment, was largely stalled.

However, the focus of the market is rapidly shifting back from standalone PCs to integrated office systems for several reasons:

- Competing vendors have been categorically unsuccessful in competing against the IBM PC to gain a share of the personal computer market, and are searching for other ways to defend and build their market position.
- With its dominance in the PC market firmly established, IBM is devoting more effort to adjacent market opportunities. In fact, it is using the PC itself as a strategic corporate product and a cornerstone of its emerging strategy to dominate the office automation market.
- Personal computer users are becoming increasingly sophisticated, and are anxious to automate more of their work. Most of all, PC users within corporate environments, which now number approximately two million users, are anxious to tie their computers into corporate data processing and local area networks.

As the industry has begun to shift its focus back toward office automation requirements, it has been forced to recognize a new competitive reality, i.e. that IBM now dominates not only the corporate mainframe world, but also the newly re-positioned PC/workstation world. Before IBM achieved dominance with its PC, these competitors had hoped to build a protected base at the ground level, i.e. the end user, and meet IBM near the top of the information processing pyramid. Instead, they must now wedge their way in between the IBM PC and the IBM mainframe, and coexist with both.

We believe this shifting focus from standalone personal computers to comprehensive office information systems will be the dominant force in the commercial computer industry during 1985. Furthermore, the recognized need to directly and closely coexist with IBM, rather than offer complete and relatively independent systems, is now the essential issue in the dynamics of the office automation market.

Cullinet's Market Position

During the past two years, Cullinet has solidified the strongest position of any independent company within the IBM mainframe-compatible software market. This position is built around its product offerings, technical expertise and large customer base in database management system (DBMS) software. Its IDMS product, coupled with the relational database capability of its IDMS/R extension, provides the foundation for Cullinet's entire product line, and the means by which all products are integrated into a common family. Cullinet is the leading independent supplier of IBM-compatible DBMS software, with an estimated 40% share of the independent market (excluding IBM), and a 20% share of the total market including IBM.

Since fiscal 1982, Cullinet has substantially broadened and leveraged its DBMS strength by developing and marketing three separate families of application software products: financial accounting, manufacturing and human resources. Thus, customers who use a full complement of Cullinet application software as a consequence use Cullinet's DBMS system to store most of a company's vital information, providing the company with both significant technical and business leverage. All of this information is

organized in a highly controlled and highly centralized fashion through Cullinet's master information directory ("data dictionary"), which is the key mechanism for integrating all of its products.

The Information Database (IDB)

The IDB is a software product that resides in an IBM mainframe computer and works in conjunction with Cullinet's Data Dictionary to provide external access into centralized databases. The basic functions of the IDB are:

- to handle communication with external devices such as personal computers, minicomputers or word processing equipment;
- to manage and control the security of external access to mainframe data, at various levels of communication;
- to locate and extract desired pieces of information from large, complex and highly structured databases, and pass this information to authorized external devices.

The IDB was released to customers during the second quarter of fiscal 1985, and generated approximately \$2.6 million of revenue during the first six weeks of shipments, representing 6% of second quarter revenues. The product is priced at \$75,000 for existing DBMS customers, and \$125,000 for other customers.

GOLDENGATE

Cullinet has also developed its own microcomputer productivity software for the IBM PC, which has been named GOLDENGATE. The primary functions of this product are:

- to communicate with the Information Database, thus allowing the personal computer user to directly and easily extract data from IBM mainframe databases and move it down to an IBM PC; and
- to provide all of the popular microcomputer software tools for manipulating information, including spreadsheets, graphics, word processing and database management.

The design of GOLDENGATE represents an attractive balance between functional modularity (the orientation of IBM's Personal Decision Series) and tight functional integration (the orientation of Lotus' Symphony). As such, it should receive solid market acceptance as a standalone micro software product. However, the unique appeal of GOLDENGATE is its elegant interaction with the IDB, which makes mainframe data access extremely easy (in fact, almost invisible) for the personal computer user. GOLDENGATE is priced at \$795 per copy, plus \$295 for the IDB communications module with volume discounts of up to 50%.

Cullinet's Micro-Mainframe Integration Strategy

Based on the IDB and GOLDENGATE, Cullinet has devised a strategy that will insure the company a unique and important role in the office automation market. Moreover, because of the new requirement to coexist with IBM, the company will be a major beneficiary of the efforts of non-IBM hardware vendors to gain a share of that market. Thus, Cullinet's strategy is divided into two parts:

The first objective is to meet the growing needs of personal computer users to directly access information stored on IBM mainframes. For these customers, typically found in an all-IBM environment, Cullinet offers both the IDB and GOLDENGATE.

The second objective is to provide minicomputer and office automation hardware vendors the ability to have their equipment access IBM mainframe data, and thus more effectively coexist with IBM. The company has found these vendors very responsive and during the past six months has reached cooperative agreements with three of the most important vendors in the market: Data General (June 1984), Digital Equipment (October 1984) and Wang Laboratories (November 1984). Under these agreements, Cullinet will work with these vendors to develop the software that will operate on their own equipment and communicate with the IDB. In most cases, these products will be available during the first half of 1985.

Thus, in a very short period of time, before Cullinet's competition has been able to respond, the company's IDB has become the early favorite as an industry standard in this new software product category. During 1985, we anticipate that every significant vendor in the minicomputer and office automation market will need to offer a method for accessing IBM mainframe data. Clearly, Cullinet is well positioned to work with these other vendors as well.

Apple Computer is a particularly interesting example. Based on its Macintosh computer, its local area network scheduled for introduction in early 1985, and the Lotus Development "Jazz" software (available March 1985), Apple will launch its high-risk assault into the corporate office market during 1985. To achieve a meaningful level of success we believe that Apple must also coexist with IBM, and offer functional integration with both the IBM PC and IBM mainframes. Will Apple look to Cullinet for its integration with IBM mainframes? This would make eminently good sense, but we also point out that:

- a joint software development agreement between the two companies was terminated in 1983, because of changing corporate priorities; and
- one logical place to offer communication with Cullinet's IDB would be through Lotus' Jazz software. Would Lotus and Cullinet cooperate here, given that GOLDENGATE will compete with Symphony in the IBM PC market? (We think the answer is yes.)

Unlocking the IBM Mainframe — A Major New Software Market

The rapidly-shifting market focus toward functionally integrated office systems will lead to the creation of a major new software market for products that provide this functional integration with IBM systems. One of the most important segments of this market will be products that unlock and distribute data from centralized IBM mainframe databases to a wide variety of office automation equipment.

This will be an explosive new market for the following reasons:

- There are currently an estimated two million personal computers in use within large corporate or government organizations using IBM mainframes. Many of these users are anxious and waiting for systems to gain access to centralized databases. Within five years, there will be an estimated ten million users.
- There are currently an estimated 42,000 IBM mainframe computers (4300 series and above) installed worldwide. At present, almost none of these have software products designed to extract and distribute data to personal computers and other office automation equipment. In other words, the installed base of hardware is enormous but the software market is new and completely untapped.

How big will this market be? Over the next five years the installed base of IBM mainframes should grow to over 60,000. By this time we conservatively estimate that at least half of these, or 30,000 machines, will have software installed for data extraction and distribution. Assuming that installed products sell for an average of \$40,000 (based on the typical premium that Cullinet charges relative to its competition), this translates into an estimated \$1.2 billion of software sales over a five year period.

Cullinet's competition in this new emerging market will come primarily from its competitors in the IBM mainframe database market (primarily IBM, Applied Data Research, and Software AG) and potentially from competitors in the applications software market (e.g., Management Science, McCormack and Dodge). Although some of these companies do have micro-mainframe communication products on the market, we believe the IDB is currently the most flexible, comprehensive and complete product available. Furthermore, we believe the company can remain a product leader because:

- The Information Database is a natural piece of Cullinet's overall information architecture, rather than an isolated or narrowly focused individual product.
- Cullinet's information architecture is based on a broad family of packaged applications products, all of which are integrated into a single database foundation. All information is centrally organized through a comprehensive and continuously updated ("active") data dictionary. Because of this architecture, the IDB provides easy access to a broader range of data than can be provided by most other competitors.

- The company is sensitive to, and has already directly addressed, the issue of data security, which will be a critical consideration for companies buying the product.
- IBM, potentially Cullinet's biggest competitor, will not provide methods for its hardware competitors (e.g. DEC, Data General and Wang) to easily access mainframe data. Therefore, customers with a mixture of IBM and other vendors' hardware will not find IBM's software products as useful.

Therefore, Cullinet is not only an early leader in this market, but should remain a product leader in the future. As a result, we believe that the company should get a greater share of this new software market than its current 20% share of the database market. Using only a 25% share, we believe that the Information Database has the potential to generate in the range of \$300 million of revenues over a five year period. Although this is a surprisingly large figure, we believe it is realistic, acknowledging the confluence of several, very powerful market forces and Cullinet's unique position to address the resulting market needs.

Conclusion

The investment story of Cullinet Software has taken on several new dimensions during the past two years, including:

- The company's expansion beyond database management into packaged applications, which began in 1982, gained momentum in 1983, and is making a significant competitive impact in 1984. Based on market acceptance, Cullinet has demonstrated the benefits of application software which is constructed with tight integration upon a single database foundation.
- The decision to move beyond more generic applications into a highly specialized vertical market (commercial banking), through the acquisition of a small banking application software company in June 1984. This has further changed the investor's perception of Cullinet, and raised the possibility of entering other highly specialized markets in the future.
- The company's close relationship with EDS and, via the acquisition of EDS by General Motors, with GM itself. This acquisition represents a huge potential windfall for Cullinet, given the enormity of GM's data processing operations, EDS's expressed preference for Cullinet's software, the charter granted EDS to upgrade GM's conventional D.P. operations, and GM's industry-leading interest in highly-automated manufacturing.
- The company's early lead in the emerging market to unlock the IBM mainframe, as discussed in this report.

Because of the large (e.g., 60%) P/E premium awarded the company's stock, relative to its traditional industry grouping, we believe that many of Cullinet's new dimensions have already been discounted in the stock. However, we do not believe that the market potential and strategic significance of the Information Database is fully recognized or incorporated in the stock. We recommend purchase and accumulation of Cullinet both as a core holding in the software industry and for participation in the current market refocusing on office automation systems and the need for coexistence with IBM in this environment.

William H. Shattuck

CULLINET SOFTWARE, INC.
Financial Results and Model
(\$000)

FY 4/30	Sales	Oper. Expense (\$)	Oper. Margin (\$)	Other Income (\$)	Pretax Income	Pretax Margin (\$)	Tax Rate (\$)	Net Income	E.P.S.	Shares O/S(000)
1982-YR	\$49,269	78.0%	22.0%	6.8%	\$14,183	28.8%	46.4%	\$7,601	\$0.56	13,663
1983-1Q	\$16,137	78.3%	21.7%	5.8%	\$4,436	27.5%	46.5%	\$2,373	\$0.17	13,686
2Q	\$18,040	78.4%	21.6%	5.0%	\$4,800	26.6%	45.6%	\$2,618	\$0.19	13,780
3Q	\$20,905	79.4%	20.6%	5.3%	\$5,409	25.9%	44.1%	\$3,025	\$0.21	14,583
4Q	\$23,471	79.0%	21.0%	5.2%	\$6,146	26.2%	42.4%	\$3,536	\$0.24	15,050
YEAR	\$78,553	78.8%	21.2%	5.3%	\$20,796	26.5%	44.4%	\$11,552	\$0.81	14,332
% ch.	59.4%				46.6%			52.0%	44.6%	4.9%
1984-1Q	\$25,798	78.9%	21.1%	4.6%	\$6,620	25.7%	45.0%	\$3,641	\$0.24	15,194
2Q	\$27,703	79.4%	20.6%	4.4%	\$6,930	25.0%	45.0%	\$3,811	\$0.25	15,187
3Q	\$31,386	79.4%	20.6%	3.9%	\$7,691	24.5%	45.0%	\$4,230	\$0.28	15,186
4Q	\$35,149	79.5%	20.5%	3.6%	\$8,486	24.1%	43.3%	\$4,812	\$0.32	15,161
YEAR	\$120,036	79.3%	20.7%	4.1%	\$29,727	24.8%	44.5%	\$16,494	\$1.09	15,182
% ch.	52.8%				42.9%			42.8%	34.6%	5.9%
1985-1Q	\$40,265	79.9%	20.1%	4.7%	\$10,002	24.8%	45.0%	\$5,501	\$0.36	15,177
2Q	\$43,684	79.9%	20.1%	4.8%	\$10,868	24.9%	45.0%	\$5,977	\$0.39	15,218
3QE	\$48,000	79.9%	20.1%	4.2%	\$11,664	24.3%	45.0%	\$6,415	\$0.42	15,200
4QE	\$54,000	80.0%	20.0%	4.0%	\$12,960	24.0%	45.0%	\$7,128	\$0.47	15,200
YEARE	\$185,949	79.9%	20.1%	4.4%	\$45,478	24.5%	45.0%	\$25,021	\$1.65	15,199
% ch.	54.9%				53.0%			51.7%	51.0%	0.1%
1986-YRE	\$275,000	79.9%	20.1%	3.0%	\$63,525	23.1%	45.0%	\$34,939	\$2.30	15,200
% ch.	47.9%				39.7%			39.6%	39.6%	.0%

***** Revenue Breakdown *****

	Total Sales	---Database---		---Applications---		---Doc.Support---	
		\$	%	\$	%	\$	%
1982	\$49,200	\$49,200	100.0%	\$0	0.0%	\$0	0.0%
1983	\$78,500	\$74,000	94.3%	\$3,000	3.8%	\$1,500	1.9%
1984	\$120,000	100,000	83.3%	\$17,000	14.2%	\$3,000	2.5%
1985E	\$186,000	133,000	71.5%	\$33,000	17.7%	\$20,000	10.8%
1986E	\$275,000	180,000	65.5%	\$55,000	20.0%	\$40,000	14.5%

RECOGNITION EQUIPMENT, INC. (REC)

On Track in 1984; Big Order Possibilities in the Second Half of 1985

Recent Price	12 Mo. Range	FY Ending	Div./Yield	E.P.S.			P/E Ratio		
				1984	1985E	1986E	1984	1985E	1986E
\$12	\$17-9	10/31	None	\$0.80	\$1.02	\$1.30	15.0x	11.8x	9.2x

Summary and Investment Conclusion

Recognition Equipment, Incorporated (REC) is growing under the guidance of sales-oriented management. Business continues to be strong in the large systems, like TRACE and Input 80, while the marketing thrust is shifting toward the smaller, distributed-processing, TARTAN data entry terminal. The LIFT image processor tests and acceptances are proceeding well, with 3-4 of these systems to be accepted in this first fiscal quarter.

Revenues and earnings look good for the near term. Orders, although slow in the first quarter of 1985 should be above projection in the second half if a few of numerous, sizeable orders materialize. Award dates for certain large orders are drawing nearer and REC's established position with some of these customers bodes well for the company. At 11.5x 1985 calendar earnings of \$1.00-1.05, the stock is fairly valued in this market. We would continue to buy the stock although the big appreciation in REC stock should occur in the second quarter when orders pick up.

Products

REC designs, manufactures and services a large variety of information processing systems that increase the efficiency and lower the cost of handling large volumes of paper documents. These systems employ optical and magnetic ink character recognition, image capture, high-speed paper handling, ink-jet printing and local area terminal networking technologies. In the words of chief executive officer William Moore, REC is in the business of building machines that can read what humans read. REC is the largest company in the field of optical character recognition (OCR) and scanning.

REC's document transport products include the TRACE I and TRACE II check capture and sorting systems. These transports read the magnetic ink characters on bank checks and sort the checks at speeds up to 2,400 per minute. The Keyscan transport system is capable of handling a wide variety of paper document sizes and is used for a variety of applications including the processing of remittance documents and credit card drafts at speeds up to 900 documents per minute.

REC's other large systems are the Currency Verification Counting and Sorting (CVCS) System and the Input 80 page reader. Over 130 CVCS systems have been sold to the U.S. Federal Reserve and to the central banks of five other countries. The Input 80 page reader is a general purpose, large-scale page reading system being used by the U.S. and state governments to process millions of quarterly wage reports and 1099's yearly,

and by health insurance companies to process medical forms. The Input 80 represents the epitome of REC's optical character recognition products, with its ability to read characters in multiple fonts and even characters printed on mutilated documents.

The LIFT image processing system employs technology that represents a major advance beyond the OCR technology that has been the basis of many REC systems. LIFT is a document processing system that stores digitized images rather than pieces of paper. Once the document's image is captured, no further handling of paper is necessary.

REC dominates the world market for hand-held point-of-sale character and bar code readers. The OCR WAND ensures accurate and secure inventory information by allowing retail clerks to record the necessary data with a simple pass of the WAND over the price tag of an item being sold. Over 300 retailers worldwide have installed WAND readers giving REC about 80% of the worldwide market.

TARTAN is a local area terminal network whose primary focus is data entry, including source data capture, document and transaction processing, and error correction.

Markets—Overview

The sheer volume of paper forms used today and the advent of the personal computer have created a glut of information requiring rapid input to data processing systems. This is the generic problem REC aims to solve. On top of this trend, competitive pressures from deregulation of the banking, airline and telecommunications industries have created massive capital spending for products like RECs. The company is well positioned to gain from this spending; there are at most a half dozen companies in the image business that know how to attack the marketplace at the front end which is image capture, calibration, compression and the like.

The Image Processing Market

Image processing is a broad field that may be thought of as a combination of three technologies:

- A. Image capture, whereby a device converts any image to an electronic representation (usually a digital signal).
- B. Data compression and processing: compression reduces the number of bits required to accurately record an image and processing involves any further computer operations on the reduced data.
- C. Data storage provides the ability to hold the image data and refer to it when needed. Computers may access the stored data in its digital form and humans may view it as an image on a video terminal or as a paper printout.

Electrical representations of images may be moved, stored, edited and duplicated much faster and at a much lower cost than actual pieces of paper. As a result of these efficiencies, image processing has tremendous market potential. Only recently, however, have all three of the above technologies advanced to a point suitable for the large data requirements of image processing. The real growth of this market is just beginning: the worldwide image processing market stands at \$49 million in 1984 and is expected to reach \$1.4 billion by 1990.

Given the broadness of this market, REC's position in it may be better understood by comparing its approach with that of another firm attacking a different market segment.

Imaging Products: Recognition Equipment versus Wang

REC and WANG both have products geared for image processing. The REC system is the LIFT™ image processor while the WANG product is called PIC, for "Professional Image Center". Both systems capture images of printed documents and have the ability to display them on a cathode ray tube (CRT). Computers can then process the digitized images in various ways. The most important differences between these companies' products lie in the applications to which they are tailored rather than in specific technologies.

Imaging Products: Applications

The WANG PIC is essentially an electronic cut-and-paste device that can communicate with mainframes and WANG computers. To store an image, one places a document under a TV camera-like electronic scanner. Seconds after the operator presses a button, the document image appears on the CRT screen. The operator can then manipulate this image by entering commands from a keyboard connected to the monitor. The user can isolate portions of the image, enlarge it, reduce it and add text to it. Images may be stored in a database for later retrieval.

The PIC is an office automation product that allows one to manipulate images much as word processors manipulate text. It is best suited for report writing and similar batch jobs. The REC image systems on the other hand are intended for applications involving a steady and voluminous document flow that necessitates real-time checking and updating of the document images.

The LIFT system by REC is designed to interface with the company's remittance and check processing systems. By mid-calendar 1985, REC image systems will also interface with the Input 80 page reader and the TARTAN terminal system. Unlike the WANG PIC which requires slow, manual placement of documents to be imaged, the LIFT system is fed automatically and can capture images of hundreds of documents per minute. LIFT must operate at these speeds in order to operate in conjunction with REC's document transport systems. The LIFT system can also process the image so that only important document features are recorded, such as numbers and signatures, rather than

extraneous smudges and imperfections. The WANG system has no such processing capability. LIFT currently can not perform cut-and-paste operations on its images, but by mid-1985 the system will be able to rotate images and zoom in on selected image sections.

The degree to which a user can physically alter an image on these two systems is closely related to their differing applications. PIC customers will use that system to write reports and create information. To do so, they must be able to create and edit document images. LIFT customers, by contrast, are financial institutions who need to refer to document images without altering them. The ability to easily and anonymously alter the image of a check or credit card receipt would be of questionable legality at best.

LIFT users need to record not only the document image but also the information contained in the document. To a computer, the stored image is a random jumble of light and dark areas recorded by equally random sequences of bits. REC's optical character recognition (OCR) capability allows the central processor to "understand" and process the numerical information contained in a document. With OCR, every LIFT-created image is accompanied by a series of bits that tells the central processor what the document actually says. The WANG PIC has no OCR features.

By mid-1985 REC's Input 80 page reader will have image capability in addition to its current OCR capability. Systems consisting of TARTAN terminals together with Input 80 units having image capability will in some ways resemble WANG PIC systems. Both will have image, editing and networking features to differing degrees. What can and cannot be done with the images in each case has been described. TARTAN users can alter the OCR information that accompanies images but not the images themselves. Both systems may be composed of numerous terminals networked together and drawing from a central database of images and other information.

Despite their similarities, these two products are aimed at different markets. REC is selling its TARTAN systems to data entry departments that process the information on large volumes of documents. WANG, on the other hand, has targeted the office automation market that spends a substantial amount of time creating and altering relatively few documents.

Imaging Products: Technology

REC's image technology involves electronically sensing the light from an illuminated object with a device much like a television camera. In this respect, what REC does is quite similar to other image processing systems. **The company is unique in using proprietary algorithms to preprocess the analog image before it becomes digitized.** This preprocessing accurately filters the analog image so that the system only digitizes the most useful, salient image features.

In California, a great number of personal checks have panoramic scenes printed on them as background. REC's preprocessing filters out these scenes so that only the

important information on the check is recorded in the digitized image. When playing back an image on the REC system, an operator will see only the numbers and writing on the draft with no background scenes or other useless information. This results in a great savings of bits necessary to store images.

REC calls its preprocessing algorithm "amplitude correlation". While standard filtering algorithms do exist, REC's proprietary version is best for the company's particular applications and achieves greater bit savings than the standard algorithms. Quantifying this advantage is difficult as it depends on the image being filtered. If a document has a great deal of extraneous image noise, like panoramic scenes or smudge spots, the advantage of a REC filtering algorithm is greater than if the document is clean with a white background and needing little or no image filtering.

REC believes that the advantages of its image systems derive from far more than their image capture wizardry. The company makes the point that its goal is to sell systems that are both powerful and user friendly. The customer's opportunity to upgrade a system without reconfiguring an entire lockbox or remittance processing operation is at least as important in selling REC image systems as is their technological sophistication.

Equipment Features

	<u>Imaging Ability</u>	<u>OCR Ability</u>	<u>Ability to Alter Image</u>	<u>Networking Offered</u>	<u>Capture Images at REC Document Transport Speeds</u>
LIFT alone	Yes	No	No	No	Yes
LIFT on a REC Document Transport	Yes	Yes	No	No	Yes
LIFT and Input 80 Interfacing with TARTAN Data Entry Terminals	Yes	Yes	No	Yes	Yes
WANG PIC	Yes	No	Yes	Yes	No

Strategy

To improve margins and inventory turnover, and to increase the smoothness of its revenue stream, REC is deemphasizing its large, custom-oriented products TRACE I, II, KeyScan and CVCS. These systems typically take two years to sell, 18 months to build and are highly customized. Nevertheless, the company is competing for a Federal Reserve contract to build an advanced CVCS machine. REC has received a \$3 million award to develop the machine and the ultimate production contract could be worth \$35 million. The production contract will be announced within the next 18 months. The present machine sells for \$500,000.

Going forward, REC will concentrate on its image storage and data entry devices. These products carry 62% to 68% gross margins versus gross margins as low as 30% on the large machines being deemphasized. Inexpensive and abundant digital memory capacity in the 1980s has made image storage a reality. REC has been developing an optical disk interface but sees 12 months passing before any of its products are shipped with optical disk storage capability. Optical disks, with their very high storage capacities, are especially well suited to storing the large amounts of data produced when digitizing images. The company has determined that the optimal storage capacity of such a disk for a REC system would be 1-4 gigabytes (one to four billion bytes).

REC is striving for proprietary positions, especially in the image marketplace. These would allow REC to not only avoid the big players but also to sell to them. REC recently cross-licensed all of its patents with all those of IBM, giving the company access to IBM's entire patent portfolio, except for certain IBM patents that are unrelated to REC's products. IBM paid \$2 million for REC's 38 patents.

The government should eventually be REC's biggest customer. Within the past six months, REC booked a \$14 million contract from the IRS for its Input 80 page reader. Most of the revenues from this contract will come in by mid-calendar 1985.

Financial

For the first time ever, REC has sales people running it. The company is growing and had record revenues in the fourth quarter of fiscal 1984, ended October 31. Fourth quarter and fiscal year 1984 results were:

RECOGNITION EQUIPMENT, INC.
1984 Fourth Quarter and Fiscal Year Results
(\$ millions)

(FY Ends 10/31)	4Q/1984	%	4Q/1983	%	% Chg.	FY 1984	%	FY 1983	%	% Chg.
Total Revenue	\$ 41.0		\$ 31.4		+31%	\$ 140.1		\$ 117.0		+20%
Gross Profit	15.9	38.7%	11.5	36.7%	+38%	55.6	39.7%	45.1	38.5%	+23%
R&D	\$ 1.8	4.5%	\$ 1.7	5.3%	+6%	\$ 6.4	4.6%	\$ 6.4	5.5%	0%
Marketing	6.5	15.9%	5.6	17.8%	+16%	22.7	16.2%	17.0	14.5%	+34%
General & Admin.	2.8	6.9%	2.1	6.5%	+33%	10.3	7.3%	8.0	6.9%	+29%
Other Operating Exp.	1.6	4.0%	1.2	4.0%	+33%	5.3	3.8%	4.9	4.2%	+8%
Operating Income	\$ 3.0	7.4%	\$ 1.0	3.1%	+200%	\$ 10.9	7.8%	\$ 8.6	7.4%	
Other Income Expense	(0.6)	1.4%	1.6	5.0%		\$ (1.1)	0.8%	\$ (1.8)	1.5%	-39%
Pretax Income	2.3	6.0%	2.3	8.1%	0%	9.8	7.0%	6.8	5.9%	+44%
Taxes	0.4	16.1%	0.9	35.4%		3.6	37.0%	3.6	52.7%	0%
Net Income	\$ 2.1	5.0%	\$ 1.6	5.2%	+31%	\$ 6.2	4.4%	\$ 3.2	2.8%	+94%
E.P.S.	\$0.27		\$0.21		+29%	\$0.80		\$0.48		+67%
Shares	7,785		7,761		0%	7,742		6,725		+15%
Backlog - Equip.	\$46.7		\$35.6		+31%	\$46.7		\$35.6		+31%
- Develop.	1.4		4.8		-71%	1.4		4.8		-71%
Orders	21.6		26.8		-19%	81.3		60.3		+35%
Shipments	23.6		20.8		+14%	69.2		64.5		+7%

REC earned \$0.27 in the fourth quarter of fiscal 1984 on revenues of \$41.0 million, versus \$0.21 on revenues of \$31.4 million in the 1983 fourth quarter. While some of the earnings performance in the 1984 fourth quarter was due to a low tax rate of 16.1% in that period, the pretax earnings of \$2.5 million agreed with expectations. The overall gross margin was 38.7% in the quarter and has been falling since its 40.7% level in the first quarter. That first quarter, however, was helped by a lease conversion with a high gross margin. Otherwise, the lower margin TRACE I systems have been selling better than expected, so TARTAN, with a high margin, has not been able to make up for the drag on the gross margin.

LIFT image processing system beta tests proceeded well in the fourth quarter. Texas Commerce Bank accepted a LIFT system in that quarter and may well accept a second in the first quarter of 1985. Mercantile Bank should also accept one machine in the first quarter and Trust Company of Georgia could accept two of the systems.

Our expectations for the first quarter of 1985 include the following:

	-----1st Quarter-----	
	<u>1985</u>	<u>1984</u>
Revenues	\$38-40 million	\$29.8 million
E.P.S.	\$0.19-0.20/share	\$0.15/share
Orders	\$16-19 million	\$15.6 million
Shipments	\$20-22 million	\$10.2 million

The 1.9 million share offering in November 1984 may cause some earnings per share dilution in fiscal 1985. We are adjusting our earnings estimate to \$1.00-1.05 to reflect this dilution and the likelihood of lower interest rates in 1985.

Order Outlook

Given its backlog of \$46.7 million on October 31, 1984 (versus \$35.6 million the year before) REC will be able to ship as much as \$22 million in the 1985 first quarter if it so decides. Orders in the quarter will be less impressive, falling in the \$16-19 million range, but REC has a base order goal of \$100 million in 1985. Last year's order goal was \$78 million and the company achieved \$81.3 million in orders. The following factors provide the potential for REC to exceed its base order goal for 1985:

- An IRS order, probably awarded in the 1985 third quarter, for a new level of automation. This order has an \$8-12 million potential. REC won a \$14 million IRS order for Input 80 page readers in 1984.

- The IRS will award a large contract to a team of companies involving system development in 1985 with production over several years. The total contract value could be as high as \$300 million with a \$100-150 million potential for REC.
- The Federal Reserve will award a contract in fiscal 1985 for a new generation of currency counting and sorting systems. Two competitors will be selected, from a field of four, to produce the machines under this \$40 million contract.
- American Express may place an order for remittance processors in 1985 which would amount to \$5-15 million for REC.
- REC is one of two companies that have completed a pilot project in competition to replace data entry equipment for EDS. The contract will last 12-24 months and has a \$6.5 million potential for REC. In all, REC has six major programs with EDS which it hopes will result in substantial OEM business.
- The Social Security Administration may award a \$30 million contract in 1985 to upgrade its data entry and capture equipment. REC is the incumbent Social Security vendor for this type of equipment.

Jon D. Gruber
Jay W. Killea

RECOGNITION EQUIPMENT, INC.
Sales and Earnings Model
(\$ millions)

(FY Ends 10/31)	<u>1984A</u>		<u>1985E</u>		<u>1986E</u>	
Product Sales	\$ 77.2	55.1%	\$ 96.0	58.2%	\$ 118.0	60.5%
Lease & Maintenance	59.4	42.4	66.0	40.0	74.0	37.9
Other Revenues	3.6	2.5	3.0	1.8	3.0	1.5
Total Revenues	<u>\$ 140.1</u>		<u>\$ 165.0</u>		<u>\$ 195.0</u>	
Gross Profit						
From Sales	\$ 37.5	48.5%	\$ 47.0	49.0%	\$ 59.0	50.0%
From Lease & Maintenance	15.8	26.6	18.0	27.3	20.4	27.6
From Other Revenues	2.3	64.4	2.0	66.7	2.3	76.7
Total Gross Profit	<u>\$ 55.6</u>	39.7%	<u>\$ 67.0</u>	40.6%	<u>\$ 81.7</u>	41.9%
Research & Development	\$ 6.4	4.6%	\$ 8.7	5.3%	\$ 10.9	5.6%
Marketing	22.7	16.2	26.4	16.0	30.8	15.8
General & Administrative	10.3	7.3	11.4	6.9	12.9	6.6
Other Operating Expense	5.3	3.8	5.5	3.3	6.4	3.3
Operating Income (Loss)	<u>\$ 10.9</u>	7.8%	<u>\$ 15.0</u>	9.1%	<u>\$ 20.7</u>	10.6%
Net Interest Income (Expense)	\$ 0.5	0.3%	\$ 1.4	0.8	\$ 0.8	0.4%
Other Credits (Expense)	(1.6)	1.1	--		--	
Pretax Income	<u>\$ 9.8</u>	7.0%	<u>\$ 16.4</u>	10.1%	<u>\$ 21.5</u>	11.0
Taxes	3.6	37.0	6.4	39.0	8.4	39.0
Net Income	<u>\$ 6.2</u>	4.4%	<u>\$ 10.0</u>	6.1%	<u>\$ 13.1</u>	6.7%
E.P.S.	\$0.80		\$1.02		\$1.30	
E.P.S. Range			\$1.00-1.05		\$1.25-1.35	
Average Shares O/S (mil.)	7,742		9,800		10,100	

SEMICONDUCTOR INDUSTRY OVERVIEW**No Growth in U.S. Market Next Year Means Down Earnings for Most Companies****Current Market Outlook**

The outlook for the U.S. semiconductor market over the next seven months is dismal. The inventory correction, which began somewhat half heartedly in May-June 1984, is finally underway in earnest. Actually inventories grew in the third quarter as industry shipments were up about 7% sequentially versus second quarter shipments. Only now are shipments beginning to decline reflecting a work down of inventories. As a result of the delayed turn down of inventories this inventory correction is turning out to be much more widespread and deeper than anyone had expected.

The simple fact of it is that everyone at the OEM and distributor level ordered too many semiconductor chips and thus built an inventory of chips back in the boom times of late 1983 and early 1984. Most OEMs built in-house chip inventories of 3-6 months. There are more than a few companies that built up a one year inventory of chips. When chips were hard to get and users were paying up to 10 times list price to buy hard-to-find chips it made sense to carry several months of inventory as insurance.

Now that lead times have contracted to under 12 weeks for most product lines, many buyers are working off excess inventories and reverting to shorter ordering cycles. In some cases they have stopped ordering completely since they have several months of chip inventory to work down. Whereas most OEMs were buying on 12 month contracts with firm releases one year ago, they are now typically ordering only three or six months in advance. Even the very largest OEMs have shortened their procurement cycles in the expectation that semiconductor pricing will only improve from their point of view as lead times head toward zero.

As a result of these collapsing order patterns semiconductor shipments in the U.S. market are beginning to decline. After shipments of \$975 million, \$1,045 million, and \$1,169 million in July, August and September, respectively, October and November shipments have declined to \$910 million and \$885 million, respectively. We estimate December shipments at about \$930 million. Therefore, we estimate that the dollar value of semiconductor shipments in the U.S. market will be down about 15% sequentially in the fourth quarter. We forecast a 5% sequential revenue decline in the first quarter followed by no growth in the second quarter of 1985.

By the third quarter of 1985 we expect that inventories will have been worked down to minimum levels and shipments should to begin to grow again. We forecast sequential shipments to grow about 7% in the third quarter and 17% in the fourth quarter. The net effect of three sequential down quarters followed by a recovery in the second half of 1985 is a 1.5% decline in revenues in the U.S. semiconductor market next year. Table 1 presents historical data plus our estimates of U.S. semiconductor shipments on a quarterly basis.

Table 1

Quarterly Shipments in the U.S. Market

	1982	1983	1984	1985
Q1	\$ 1,482	\$ 1,567	\$ 2,556	\$ 2,600
Q2	1,631	1,830	2,974	2,550
Q3	1,583	2,046	3,188	2,795
Q4	1,563	2,320	2,725	3,275
Total	\$ 6,259	\$ 7,763	\$ 11,443	\$ 11,270
	1982 % Chg. vs. Pr. Qtr.	1983 % Chg. vs. Pr. Qtr.	1984 % Chg. vs. Pr. Qtr.	1985 % Chg. vs. Pr. Qtr.
Q1	N/A	0.3%	10.2%	-4.6%
Q2	10.1%	16.8%	16.3%	0.0%
Q3	-2.9%	11.8%	7.2%	7.5%
Q4	-1.3%	13.4%	-14.5%	17.2%
		1982-83 % Chg. vs. Yr. Ago	1983-84 % Chg. vs. Yr. Ago	1984-85 % Chg. vs. Yr. Ago
Q1		5.7%	63.1%	1.7%
Q2		12.2%	62.5%	-12.6%
Q3		29.2%	55.8%	-12.3%
Q4		48.4%	17.5%	20.2%
Year		24.0%	47.4%	-1.5%

Source: SIA and Montgomery Securities estimate.

This semiconductor market softening is occurring in the midst of moderate economic growth in 1985. We are assuming a 2.5-3% GNP growth in 1985 followed by 2-3% growth in 1986. Assuming that the U.S. economy continues to grow at these modest levels over the next two years we believe that 1986 could be a very strong year with the U.S. semiconductor market up by 25-30%. However, there is still much uncertainty about the 1986 economic scenario since it is still difficult to get a consensus about the economy in 1985.

Table 2 presents our estimates of the worldwide semiconductor market. The worldwide market grew about 39% in 1984 from \$18.3 to \$25.4 billion. We estimate only 6% growth in 1985 to \$26.9 billion. We estimate growth in the U.S. market at (-1%) with 7% growth in the European market. The higher growth in the European market is due mainly to a later slowing in the growth there. Japan and the rest of the world are still estimated to grow about 17% and 15%, respectively, in 1985.

Table 2

Worldwide Semiconductor Markets

	---Billions of dollars---		
	<u>1983</u>	<u>1984E</u>	<u>1985E</u>
U.S.	\$7.8	\$11.4	\$11.3
Europe	3.4	4.2	4.5
Japan	5.6	7.5	8.8
ROW	1.5	2.0	2.3
World	<u>\$18.3</u>	<u>\$25.4</u>	<u>\$26.9</u>

	---Percent Change---		
	<u>1983</u>	<u>1984E</u>	<u>1985E</u>
U.S.	20%	47%	-1%
Europe	6%	24%	7%
Japan	37%	34%	17%
ROW	50%	33%	15%
World	23%	39%	6%

Source: Montgomery Securities estimates.

While the outlook for semiconductor consumption in 1985 is dismal, most of the end users segments are still expecting moderate to good growth in 1985 although somewhat slower growth than in 1984. Table 3 presents our estimates of growth rates of the various end user segments. We expect to see strong growth in the telecommunications, computer, office automation and PC market segments in 1985. Computers and telecommunications should grow about 30% in 1985 followed about 25% growth in the office automation and PC sectors. We expect instrumentation and automotive to grow about 20% and the government/military sector about 23%.

Table 3

Slowing Growth Rates of End User Segments

	<u>1984</u>	<u>1985</u>
PC	50%	25%
Office Automation	45%	25%
Telecommunications	40%	30%
Computers	35%	30%
Instrumentation	25%	20%
Automotive	25%	20%
Government	20%	23%

In speaking to the semiconductor companies about their end user markets we find considerable uncertainty and caution about their end markets because their customers are quite nervous about the strength of the end demand for their products. Uncertainty about the tax bill, interest rates and the federal deficit are also worrying businessmen. Nevertheless, the Montgomery analysts who follow these various end user segments remain optimistic about 1985.

While these end user segments should experience good growth in 1985 their actual consumption of semiconductors will be greatly distorted by the large inventories with which they are entering the year. When the inventory liquidation ends sometime in the second quarter, the revenue growth will start off from a much lower base thereby yielding a slight decline in year to year revenues.

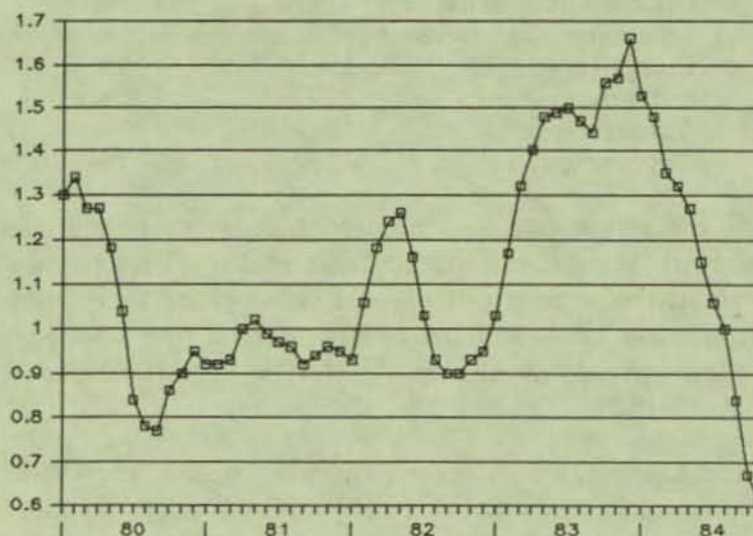
Book-to-Bill Ratio

The book-to-bill ratio for U.S. semiconductor market is shown in Figure 1. The figure shows that the three month rolling average book-to-bill ratio has declined dramatically in the last three months. Whereas it was 1.00 in August, it has reached 0.61 in November, which is an all time record low since the SIA has been keeping industry statistics. The one month book-to-bill ratio, which is not reported by the SIA but is estimated from their data, was 0.46 in October and increased to 0.64 in November.

Unfortunately too much of Wall Street's attention is focused on the book-to-bill ratio every month. It is only a single number and is a flash estimate much like the flash estimate of the Gross National Product. There are many other important indicators such as capacity, pricing and inventory levels. However, these important variables are not easily quantified or directly available to the investing public. Therefore this one number which is available on a monthly basis from the Semiconductor Industry Association commands an inordinate amount of attention, by analysts and portfolio managers.

We expect that the book-to-bill ratio is near its trough in this November-December time frame. However, we forecast that the book-to-bill ratio will remain below 1.0 in the first quarter of 1985 and will not exceed 1.0 until mid to late second quarter 1985. The book-to-bill ratio is difficult to predict since it is a ratio of two separate numbers. As bookings decline billings should also decline to reflect the lower orders thereby driving the book-to-bill ratio toward 1.0 even though bookings and billings are both deteriorating. This phenomenon has begun to occur since we have experienced sequentially lower billings in October and November. One could argue that the book-to-bill ratio should go to zero for several months while the inventory liquidation is occurring. In fact it has not gone to zero and probably will not go much lower in December because of the declining bookings. We are looking for a three month book-to-bill ratio of about 0.61 in December.

Book-To-Bill Ratio



Source: SIA.

Capacity Outlook

There is no doubt that capacity additions are coming onstream faster than demand especially in dynamic RAMs (DRAMs), static RAMs (SRAMs), EPROMs, standard logic, linear and microcontrollers. Supply will exceed demand in most all of these product areas in 1985. However, we do expect to see mix problems continuing into 1985. For example, there will be an excess of 64K DRAMs but there will not be enough 256K DRAMs. In particular the U.S. manufacturers will have a real mix problem as they are trying to ramp up the 256K DRAM. Although the Japanese suppliers have already ramped up their production of the 256K, we expect that there will also be shortages of that product from U.S. suppliers. We forecast that the price crossover point for the 256K will come in mid-1985 thereby accelerating demand in the second half of 1985.

We also expect that there will be shortages and mix problems for some of the advanced microprocessor products such as the 80286, the new advanced low power Schottky logic products and some of the 32-bit microprocessors and peripheral products.

New capacity is coming on stream at an astoundingly fast rate as manufacturers are well into the transition from 4-inch to 5- and 6-inch wafers. This important technical advance enables companies to produce 2.25 times the square inches of silicon that were formerly produced on 4-inch wafers with the same number of wafer starts.

Capacity is best measured as the product of wafers out per year times dollar revenues per wafer. Dollar revenues per wafer is the number of good die per wafer times the average selling price (ASP) of those chips. This equation is expressed below.

$$\begin{aligned} \text{Annual Capacity (Dollars)} &= \text{Wafers Out Per Year} \times \text{Good Die per Wafer} \times \text{ASP} \\ &= \text{Wafers Out Per Year} \times \text{Revenue per Wafer} \end{aligned}$$

From this equation one notes that capacity depends on three key variables that can have a wide range. The wafers out per year are equal to the wafer starts times the line yield to give the number of good wafers that reach the end of the line. Semiconductor companies work diligently to start more wafers and to improve the line yield. It is possible to significantly increase wafer output from a given factory by increasing the length of the work week from two to three shifts or from five work days to seven. These changes can be implemented without increasing the capital investment. They only require a change in the labor force. It is possible to increase wafers out by 50-88% by changing the factory utilization from 80 hours to 120 or 150 hours per week.

The yield or good die per wafer is the most widely varying factor in the capacity equation. Yield can vary by 5 or 10 to 1 and sometimes even as much as 20 or 50 to 1. For example in the early days of the 64K DRAM the good die per wafer was as low as 10 or 20 die per wafer. However, as yields have increased it is possible to have over 200 good die per wafer. Hence, this part of the capacity equation offers the most leverage. As yield improves it can easily increase the capacity by a factor of several times.

The average selling price of the chip is the final important variable. Although the ASP generally declines over time the revenue per wafer can increase if the yield increases faster than the ASP decline. This is very often the case in the early part of the product life cycle. For more mature products yield increases are more moderate while price declines continue thereby resulting in steady or declining revenues per wafer.

Micron Technology presents one good example of increasing revenue per wafer while prices are falling. About two years ago Micron was yielding less than 100 good die per wafer at a market price of about \$3.50. Thus, they were achieving a revenue per wafer of less than \$350. Now they are yielding over 400 good die per wafer at \$1.90 each. Hence the revenue per wafer has more than doubled to over \$800 while the ASP has declined by half. In the case of Micron Technology the wafers out per month have also increased dramatically--partially a result of additional equipment but also as a result of better plant utilization.

Pricing Trends

Whereas pricing was quite favorable for the semiconductor manufacturers in 1983 and 1984 we expect that it will be quite favorable to their chip customers in 1985. We estimate that the average selling price of a specific function such as a logic gate or a bit of memory fell by about 8% in 1983 followed by an estimated 12% decline in 1984. These same functions are expected to fall by about 30% in 1985 as more capacity comes onstream and competition picks up. In the case of DRAMs the average price per bit declined about 12% in 1983 and 20% in 1984. We estimate that the average price decline of DRAMs will be about 40% per bit in 1985.

We estimate that the industry-wide ASP of all products produced by the semiconductor industry will fall by some 2-3% in 1985. This industry-wide ASP includes the increasing richness of mix as a result of the increasing number of bits and gates per chip.

Table 4 presents our estimates of the price declines on specific functions and DRAM bits. Table 5 presents data on the average selling prices in the U.S. market for seven IC categories. These ASPs were calculated from SIA data by dividing total dollars by total units in each category. As seen in Table 5 prices have generally increased in 1983 and 1984 with MOS memory having the largest price increase--nearly a 24% increase in 1984. The price increase however, is due to two factors. One is the favorable environment for the semiconductor manufacturers in 1983 and 1984. The other factor is the increasing richness of the mix in each of the categories as memory circuits have gone from 64K to 256K DRAMs and from 64K to 512K EPROMs. This increasing richness of the mix has helped to increase the overall ASP of the product line. Note that for total integrated circuits the average selling price of \$1.02 in 1982 declined slightly to \$1.01 in 1983, and then increased back up to \$1.02 in 1984. Pricing pressure will probably reduce it to \$1.00 or \$0.99 in 1985, but we expect the decline to be no more than 2-3%.

Table 4
Estimated Price Decline in U.S. Market

	---Price Decline---		
	<u>1983</u>	<u>1984</u>	<u>1985</u>
ASP on Specific Functions	-8%	-12%	-30%
DRAM Price per bit	-12%	-20%	-40%
Industrywide ASP (20,000 Products)	-1%	+1%	-3%

Source: Montgomery Securities estimates

Table 5
ASPs in U.S. Market

	<u>1982</u>	<u>% Chg.</u>	<u>1983</u>	<u>% Chg.</u>	<u>1984</u>
Total IC	\$1.024	-1.1%	\$1.013	1.2%	\$1.025
MOS Memory	\$2.59	6.2%	\$2.75	23.6%	\$3.40
MOS MPU	3.27	2.8%	3.36	8.3%	3.64
MOS Logic	0.79	-2.5%	0.77	2.6%	0.79
Bipolar Memory	4.11	-15.3%	3.48	6.3%	3.70
Bipolar Logic	0.51	7.8%	0.55	3.6%	0.57
Linear	0.666	-6.8%	0.621	-0.8%	0.616

Source: SIA.

Growth Markets in 1985

Despite the poor outlook for the semiconductor market in 1985 we believe that there will be several product areas that will still experience moderate to good growth. These include high density MOS memories such as the 256K DRAM, the 64K SRAM, the 512K EPROM, and the 64KE² PROM. We also forecast good growth for ASIC (Application Specific Integrated Circuits) products, high-end microprocessors and peripherals, and advanced low power Schottky logic products.

The DRAM market should grow an estimated 25% in 1985 as measured in dollars. However all of the revenue growth will come from the 256K DRAM market, which should expand from about \$0.9 billion to about \$2.6 billion in 1985, while the 64K DRAM market declines about 22% from \$2.8 to 2.1 billion. Table 6 presents our estimates of the worldwide DRAM market together with the breakout of the 16K, 64K, 256K, 1M, and 4M DRAM markets. Price elasticity continues to drive the DRAM market as the price per bit declines by approximately 25% per year on the long-term average.

Table 6

Estimated Worldwide Dynamic RAM Market
(\$ millions)

	1980	1981	1982	1983	1984	1985	1986	1987	1988
<u>Market Value (\$ Mil.)</u>									
16K	\$ 903	\$ 374	\$ 270	\$ 269	\$ 160	\$ 47	\$ 18	\$ 4	\$ 0
64K	18	144	546	1,594	2,763	2,145	2,210	1,425	1,138
256K	0	0	0	75	924	2,613	4,200	5,950	5,500
1M	0	0	0	0	0	15	68	264	2,200
4M	0	0	0	0	0	0	0	0	75
Total	\$ 920	\$ 518	\$ 816	\$ 1,938	\$ 3,841	\$ 4,819	\$ 6,496	\$ 7,643	\$ 8,913
% Chg. vs. Prior Year		(43.7%)	57.5%	137.4%	98.5%	25.3%	34.8%	17.7%	16.6%
<u>64K DRAM Market</u>									
Units (mil.)	0.5	12.0	105.0	375.0	850.0	1,100	1,300	950	650
ASP	\$35.00	\$12.00	\$5.20	\$4.25	\$3.25	\$1.95	\$1.70	\$1.50	\$1.75
Value (\$ mil.)	\$ 18	\$ 144	\$ 546	\$ 1,594	\$ 2,763	\$ 2,145	\$ 2,210	\$ 1,425	\$ 1,138
% Chg. vs. Prior Year		722.9%	279.2%	191.9%	73.3%	-22.4%	3.0%	-35.5%	-20.2%
<u>256K DRAM Market</u>									
Units (mil.)				1.5	42.0	275.0	700.0	1,400.0	2,200.0
ASP				\$50.00	\$22.00	\$9.50	\$6.00	\$4.25	\$2.50
Value (\$ mil.)				\$ 75	\$ 924	\$ 2,613	\$ 4,200	\$ 5,950	\$ 5,500
% Chg. vs. Prior Year					1,132.0%	182.7%	60.8%	41.7%	-7.6%
<u>1M DRAM Market</u>									
Units (mil.)						0.1	1.5	12.0	200.0
ASP						\$150.00	\$45.00	\$22.00	\$11.00
Value (\$ mil.)						\$ 15	\$ 68	\$ 264	\$ 2,200
% Chg. vs. Prior Year							350.0%	291.1%	733.3%

This market, however will be very competitive in 1985 as an increasing number of suppliers, including a number of new Korean entrants, come into the market. We expect pricing pressures to increase in both the 64K and 256K DRAM markets as supply catches up and exceeds demand in the first half of 1985. We expect 64K pricing to reach the \$2.00 level in the first quarter of 1985—a full nine months ahead of the forecast made just five months ago. Fortunately, manufacturing yields continue to improve thus enabling the efficient producers to continue to make reasonable margins on DRAMs. Therefore, we expect the leading edge producers in the U.S. and Japan to continue to make money on 64K DRAMs and to become profitable on the 256K DRAM unless pricing falls by more than 60% per bit next year.

The high-end microprocessor markets should continue to grow in 1985. The heavy usage of microprocessors by the office automation, telecommunications, computer and peripheral sectors continues to exert strong demand on the high end of the 16-bit and the new 32-bit microprocessors. There is currently a pause in the demand for the 8086 and 8088 microprocessors because of the recent transition to 186 and 286-based systems. Furthermore the IBM announcement of its AT computer has caused all of the IBM clones to go back to the drawing boards and reevaluate their own product plans. Therefore while the demand from IBM remains strong, the new demand from the IBM clones has not really materialized. The clones are still modifying their product development strategies in response to the IBM-AT PC.

Demand for 32-bit microprocessors continues and should expand in 1985 as new design-in activity is centered around these more powerful chips. The CAD/CAM sector is a particularly heavy user of the new 32-bit processors. The number crunching and graphics requirements of CAD/CAM are driving designers of this equipment to use the new 32-bit microprocessors. Other graphics-intensive applications will also be heavy users of the new 32-bit MPUs. Therefore we expect the design activity to be heavy in 1985 although shipping levels will still be modest.

An important factor to realize in the 32-bit microprocessor market is the coming of the Japanese suppliers. Already NEC and Hitachi have announced their own 32-bit microprocessors. We understand that Fujitsu and Toshiba are also working on their own proprietary 32-bit microprocessors. Unlike memory, which has a four year cycle before the next product generation replaces it, microprocessors have much longer lifecycles. The 8-bit microprocessors are now about 10 years old and will probably have a 15-20 year lifecycle. We expect the 32-bit products, which are just now in their infancy, to have a 20-30 year lifecycle and that they will probably never be totally replaced because users will continue to need a hierarchy of number crunching capability.

The MOS microprocessor market, which is currently about \$2.5 billion is expected to grow to over \$10 billion by the early 1990s and be several tens of billions of dollars in size by the year 2000. Although it is only one third the size of total MOS memory market it certainly is important in terms of its sheer size and the ability to provide suppliers with drag business--not only in peripherals, but also in memory, logic, and linear.

Application Specific Integrated Circuits (ASICs), which include gate arrays, standard cells, and full custom circuits, are expected to have double digit growth next year in the face of an overall poor market. Since these circuits offer the user substantial cost savings in terms of reduced chip counts and reduced board counts, OEMs are still anxious to incorporate ASICs into their designs. This can mean savings of hundreds or even thousands of dollars. Therefore suppliers are better able to price their products on value rather than on cost. Nevertheless, one should expect increased competition in this area which is served by a large number of sizeable companies as well as many intermediate to smaller sized companies.

The Impact of Japan

The Japanese semiconductor companies continue to gain market share in the worldwide semiconductor market. In the last four years their market share has grown from approximately 25% to 35% of the worldwide semiconductor market. Their market share in the U.S. is now about 15%, up from 8% just a few years ago. By contrast the U.S. market share in Japan has been about 9% for the last 15 years. They continue to make excellent market share strides in all product categories and their strategy is to continue this expansion. The Japanese suppliers dominate the MOS memory markets today. We estimate that their market share of MOS memory is now over 50% with their share in dynamic RAMs above 70% and their share in static RAMs over 50%. Their overall market share in microprocessors is closer to one-third but is increasing steadily and now with the advent of their new 32-bit microprocessors we expect their microprocessor market share to grow.

The Japanese companies continue to spend heavily for capital expansion. They are adding massive amounts of new 6-inch capacity for MOS memory and microprocessors. They are also adding capacity for gate arrays and logic. This new incremental capacity will be employed to help the Japanese companies continue to gain market share in all product areas.

We believe that the Japanese will be price followers in 1985 rather than price leaders despite their huge capacity investments. There are several reasons for this. First, they have large market shares in memory and microprocessors which are highly profitable areas for them. We believe that they will not leave large profits on the table while trying to be price leaders. Second, the market leader generally has no need to be a price leader. Third, we believe they are politically savvy companies and will not be anxious to make any moves that might result in dumping charges. Nevertheless, the Japanese are and will continue to be aggressive competitors.

The Coming of the Koreans

Not only will there be strong competitive pressure from Japan in 1985, there will also be new competition coming from Korea. In the last two years the Korean government, together with Daewoo, Goldstar, Hyundai and Samsung have put together a major strategic plan for entry into MOS memory. These four companies, with the help of the Korean government, have invested approximately \$2 billion into new plants and equipment for a major push on dynamic RAMs. Their plan is to start with the 64K DRAM and then to move immediately to the 256K DRAM. The Koreans already produce about \$400 million worth of semiconductors which are primarily linear and TTL circuits for televisions and other consumer products. In 1985 they could produce some 30-50 million 64K DRAMs, which would represent about 3-5% of the marketplace. The real questions are "Can they sell all they make and at what price will they offer them?" We expect that the Koreans will be among the most aggressive price leaders in DRAMs in 1985.

The Koreans have some major capacity expansions underway to produce these new 64K and 256K DRAMs. We expect, however, that these major capacity expansions will just add to the worldwide glut of capacity coming onstream and put further pressure on pricing and margins. These Korean companies are significant and should not be taken lightly. Goldstar and Samsung together represent 10% of the Korean GNP. We expect that they will be long-term competitors in this marketplace. Although they are perhaps 9-10 years behind the Japanese suppliers in terms of market presence, we expect that they will be as competitive as the Japanese and a force to be reckoned with.

Impact on Margins and Earnings

The projected slow growth of the U.S. semiconductor market in 1985 will lead to pricing and margin pressure for every semiconductor company. We have therefore lowered our revenue and earnings estimates for the five major semiconductor companies for a second time. About six weeks ago we were looking for earnings of the big five to be up some 5-15%, but then we lowered them so that 1985 earnings were off by 5-15%. We are lowering those numbers again. We have also reduced our earnings estimates for the smaller capitalization companies as well.

Some of the smaller capitalization companies such as Integrated Device Technology, LSI Logic, Micron Technology, VLSI Technology, Standard Microsystems, Western Digital and Xicor have niche product lines or strategies that will enable them to

still have modest to good revenue growth and up earnings in 1985. Table 7 shows our old and new E.P.S. estimates for the semiconductor companies we follow.

Table 7

New Earnings Estimates for Semiconductor Companies

	FY	FY 1984 Estimate		FY 1985 Estimate	
		Old	New	Old	New
Advanced Micro Devices(1)	3/31	\$2.55	\$2.40	\$2.15	\$2.00
Analog Devices	10/31	\$1.38A	\$1.38A	\$1.62	\$1.21
Gould	12/31	\$1.95	\$1.90	\$2.05	\$1.95
Integrated Device Technology(1)	3/31	\$0.32	\$0.28	\$0.80	\$0.75
Intel	12/31	\$1.72	\$1.53	\$1.40	\$1.10
LSI Logic	12/31	\$0.62	\$0.60	\$0.76	\$0.70
Micron Technology	8/31	\$0.76A	\$0.76A	\$1.65	\$1.60
Monolithic Memories	9/30	\$1.30A	\$1.30A	\$1.45	\$1.00
Motorola	12/31	\$2.85	\$2.80	\$2.55	\$2.45
National Semiconductor(1)	5/31	\$1.05	\$1.00	\$0.95	\$0.90
Standard Microsystems(1)	2/28	\$1.35	\$1.25	\$1.50	\$1.30
Texas Instruments	12/31	\$12.60	\$12.40	\$10.50	\$9.75
VLSI Technology	12/31	\$0.38	\$0.36	\$0.57	\$0.46
Western Digital	6/30	\$0.39A	\$0.39A	\$0.98	\$0.90
Xicor	12/31	\$0.26	\$0.21	\$0.50	\$0.40

(1) Fiscal year ends year following column heading.

Conclusion and Investment Recommendation

If we were forced to make a single investment decision today whether or not to own the semiconductor stocks for the next two years, we would prefer to own the stocks. However, our recommendation is still to avoid making any major commitments to the semiconductor stocks until the first half of 1985. We believe there is still 10-20% downside risk in many of the semiconductor stocks and therefore would avoid taking full positions. The risk is that the stock prices do not fully reflect the poor earnings expected in the next few quarters. There is also the risk that we will have a recession in 1986 leading to two down years of earnings. Although we do not support this down scenario for 1986, we do note it as a potential risk.

Some time in the first half of 1985 we believe there will be some very attractive opportunities to buy these stocks. At that time our favorites would be AMD and Intel among the major cap stocks and Western Digital and Monolithic Memories among the smaller cap stocks.

The reason for our AMD and Intel picks is their continued high percentage of proprietary products, which will help to keep price declines more moderate. We continue

to like Western Digital because of its strong market share position in the file management data communications business. We also like Monolithic Memories because of its continued leading edge in programmable array logic together with its new CMOS technology.

Currently we are very cautious on the semiconductor group. One might ask, "What could go wrong and make us even more negative?" The answer is twofold. First, a poor economy in 1985 (less than 2% growth) combined with a recession in 1986 could mean two down years for semiconductor earnings and stock. Secondly, severe pricing pressure in 1985 could mean even lower earnings than we are assuming and could take the stock down further.

On the other hand one could ask, "What would turn us positive on the semiconductor stocks?" Inventories and pricing are the two key issues here. If we can truly see that inventories are being adequately corrected and that pricing is not going too low (more than a 30% decline), we would turn more positive.

Daniel L. Klesken, Ph.D.

IBM LARGE COMPUTER MARKET CONFERENCE REVIEW

An Industry Forum Presented by the Gartner Group, Inc.

	Recent	12 Mo.	FY	Div./Yield	E.P.S.			P/E Ratio		
	Price	Range	Ending		1983	1984E	1985E	1983	1984E	1985E
AMH	\$12	\$20-9	12/31	\$0.20/1.7%	\$0.96	\$0.70	\$1.00	12.5x	17.1x	14.1x
*APCI	\$19	\$29-16	12/31	None	\$0.37	\$0.75	\$1.40	N/M	25.3x	13.6x
CYR	\$47	\$59-38	12/31	None	\$1.77	\$2.85	\$3.10	26.5x	16.5x	15.2x
*TNDM	\$18	\$40-13	12/31	None	\$0.76	\$0.81A	\$1.25	23.7x	22.2x	14.4x

* Company in which Montgomery Securities currently maintains a market.

The following comments have been excerpted from an upcoming report on the the IBM Large Computer Market Conference sponsored by the Gartner Group and held in Tampa, Florida on December 3-5. This excerpt summarizes the salient points made at the seminar. Not all of the following points can be attributed to the Gartner Group since there were vendor representatives and users involved as well.

Our write-ups are structured as follows:

- A list of presenters/panelists followed by discussion topics.
- Salient points made at each session.
- Analyst's comments where appropriate.
- Implications for those companies followed by Montgomery Securities.

IBM's Large Systems Directions

Dan Culhane, Manager of Large Systems, National Accounts Division, spoke on the direction of IBM's large systems, addressing the following issues:

- What evidence is there that historic growth rates will continue or accelerate during the next 5-10 years?
- What new applications will fuel this growth?
- What is the role of the PC and work group computers in this growth?

Presentation Conclusions

Since 1979, when IBM first began to survey its customers about projected MIPS growth, it has found actual MIPS growth to be greater than such surveys would have predicted. In 1984 MIPS growth will be 45-47%. Although surveys currently suggest a 35% increase in 1985, IBM believes that a 40% growth rate is more realistic given the

recent experience. IBM views the need to have host software and support stabilized to support the distributed environment as a key to high MIPS growth. IBM also needs to achieve compatibility across its various office automation systems.

The biggest growth areas today are the graphics, image processing and scientific/engineering markets.

IBM views the role of PCs and workgroup computers such as its System 36 (its choice for the departmental computer supporting office automation), as existing in a framework of cooperative processing with its mainframes.

Reflecting its aim to gain market share in commercial and engineering workstations, IBM will first use state-of-the-art logic described as 10,000 bipolar circuits per chip in workstations during 1985. This will result in workstations as high as 2.5 MIPS in performance.

It is openly hinted that in 1985 Sierra will be introduced with approximately double the performance of the 3081D. IBM maintains that the Sierra will be easy for users of the 308X family to upgrade and that it will be software compatible. This family of processors will be using the same TCM packaging technology as the 308X line, requiring no major retooling by IBM. Mr. Culhane further hinted that because the X models of the 308X family has only been out for a short time, it is likely that Sierra will be announced later rather than earlier.

In terms of operating systems, IBM views both the MVS/XA and VM/SP-HP0 as separate and strategic products. It sees no convergence of these two operating systems because they will be serving quite different market segments. Another operating system rising in importance is its TPF-2 for high volume on-line transaction processing.

To enhance the productivity of salesmen, who have to handle the total product line, IBM is pricing its processor hardware aggressively on a price per MIP basis. Software will increase in importance and will approach a third of IBM's revenue by 1987, replacing the lease base as its stabilizing factor in terms of revenue mix.

With the increasing use of diagnostics and the high reliability of hardware, the importance of field engineering will diminish.

IBM, under John Opel, is much more interested in the scientific/engineering marketplace. Not only is it improving the scientific performance of its computers but it is also reinstating the 40% education discount for universities so that new college graduates will be trained on IBM equipment as well as DEC's VAX.

Microcode is of strategic importance to IBM since it allows better hardware/software integration, acts as a software assist, improves integrity, and allows for easy design and engineering changes to processor architecture in order to implement enhancements and emulations.

Analyst Comment

IBM's intention to implement its most advanced logic designs in workstations first reflects its desire to become the leading factor in the engineering workstation market. Price incentives and the use of leading edge technology can be expected to be used in IBM's assault on this market. IBM's aim would be to replace the current leader--Apollo Computer--as well as block, as best it can, the entrance of DEC (with its Micro VAX II-based workstation) and other minicomputer companies. We expect IBM to announce its entry in 1985 with volume shipments to begin in 1986.

IBM's newly found interest in the scientific/engineering market is perhaps best explained by a recent press conference fielded by Charles L. Bruce, Director of Engineering/Scientific Marketing at IBM's National Accounts Division. Engineers and scientists account for 15-20% of total computing today. The workstation segment of the market is estimated to be \$3 billion. Intermediate systems also account for about \$3 billion and the market for large systems is again \$3 billion. To date, IBM has made an uneven effort in the high-end segment but now wants to participate in all segments.

In the high-end segment, we expect IBM to introduce a supercomputer at least comparable to the performance of Cray I class computers by 1986/1987. In the intermediate segment IBM has already upgraded the scientific performance of the 4361 and 4381. In the low-end segment we expect it to introduce a UNIX-based 32-bit microprocessor engineering workstation that will have 2.5 MIPS in performance.

We anticipate that Sierra will be announced late in the first quarter or more likely the second quarter of 1985. It should be a dual processor with performance in the 25-30 MIPS range, a little more than double that of the 3081D.

The continuous move from batch to on-line applications, as well as the need for mainframe MIPS to support PCs, should continue to fuel the high growth rate. The emerging importance of TPF-2 underscores the growth of the high-end on-line transaction processing market (where 1,000 transactions per second are the norm). This is a targeted market for Tandem Computer's TXP processors.

Investment Implications

Amdahl Corporation

It is increasingly difficult, if not impossible, for a totally U.S.-based program-compatible manufacturer to compete with IBM, as detailed in a later section entitled PCMs in Perspective. The product cycle has been shortened from 48 months to 36 months and currently IBM is extremely aggressive in its marketing practices, unlike its predictable behavior a decade ago. Yet this company has a strategic relationship with Fujitsu--one of the world's leading technology companies and one of a handful of IBM's most feared competitors. Not only will this relationship allow Amdahl to compete with IBM on the basis of superior technology, having consistently maintained a 50% uniprocessor performance edge over IBM during the past decade, but it will also allow

Amdahl to share more of the R&D burden thus allowing it to be more profitable. Indeed, according to the Gartner Group, the Japanese will be ahead of IBM in mainframe technology by the late 1980s, giving the advantage to the PCMs. After releasing its own "Apache" processor in 1986, which runs at 20MIPs, it will jointly develop a successor processor with Fujitsu designed to compete with IBM's "Summit." This association will also allow Amdahl to more easily pursue a diversification strategy by giving it the opportunity to select synergistic products from Fujitsu's broad product line to market outside of Japan. The successful 4705 front-end communication processor, 6280 and 6380 PCM disk drives, and the S/370 compatible super computers are examples of the benefits that can be derived from the Fujitsu relationship.

We believe Amdahl's poor financial performance over the past few years, with the notable exception of 1983, was due to: (1) delays and initial reliability problems with its 580 family; (2) the adverse marketing impact of IBM's MVS-XA as well as the cost of providing that compatibility (which it has only over the past three months been able to convince prospective customers); and (3) the very strong U.S. dollar during that time frame, which hurt margins on close to 40% of Amdahl's revenue, which is foreign (in fact if the U.S. dollar held constant at the 1980 level, the company's E.P.S. in the third quarter of 1984 would be \$1.00 higher).

Given Amdahl's current order momentum and the fact that it is now beginning to ship its multi-processors, plus the likely delay of IBM's Sierra announcement until the second quarter of 1985, financial results over the next two quarters should be strong, as the company is postured to take the offensive from a marketing standpoint (which was not true through the first nine months of 1984). We are now projecting E.P.S. of \$1.00 in 1985 within a range of \$0.80-1.20. Financial performance should improve materially over the next three years, reaching pretax margin of 10-15% in the 1986/1987 time frame. The stock is rated a buy on weakness until the official Sierra announcement, at which time we anticipate upgrading it to a strong buy.

Apollo Computer

We continue to expect another great year for Apollo in 1985 with a doubling of revenues and earnings. The biggest cloud hanging over this pioneer of distributed computing in scientific/engineering environments, is the rising specter of product competition from the two largest computer companies--IBM and DEC--in 1986. To date, it has enjoyed a sellers' market with limited competition from Sun Micro, Masscomp and a few start-up companies. Hewlett-Packard has been a surprisingly weak competitor because of various software problems it has suffered with its HP 9000. The situation will begin to change in 1985 when at least one of its top three OEMs (which together account for 50% of revenue) will chose an additional workstation vendor. DEC will likely be offering its graphics engineering workstation based on the low-cost 2 chip version of the Micro VAX II, bringing the inherent marketing power of the incumbent leader in scientific/engineering with its vast installed base of VAX processors to the marketplace. IBM is expected to introduce a not so elegantly designed 2.5 MIPs UNIX-based engineering workstation and will aim for volume production by early 1986. Despite

its lack of elegance, we expect that the product will sell well because of its aggressive pricing and the IBM name (while not as important in this market niche as it is in commercial data processing, it is still considered a major asset). The fear is that the computer giants will turn this market segment into a PC situation creating profit pressure for every vendor. Hence, the uncertain outlook for Apollo in 1986.

There are however, important differences between the PC and the engineering workstation markets that should mitigate against excessive gross margin pressure. First and foremost, the engineering/scientific market is a professional market while the PC is much more of a consumer market. Hence, performance issues rank in importance with price and prospective buyers are more likely to buy on the basis of technical innovation and take a chance on smaller vendors. Apollo has always been aggressive in pushing technology--doubling in performance and halving price every 18-24 months. Its R&D efforts are currently organized to focus on all of its three technologies: computing, networking and graphics. From all the intelligence we have gathered so far, we do not expect IBM to capture the technology lead from Apollo. Secondly, IBM did not have to contend with existing product overlap when it moved into the PC business and therefore is free to make aggressive moves without the worry of self-impact. Its entry into engineering workstation market is certainly constrained by the presence of the 4361 which is priced at \$150,000 per MIP. A price on a 2.5 MIP UNIX engineering workstation that is too aggressive (such as less than \$20,000 per MIP) will have severe self-impact. IBM, in our opinion, will be careful to position its line of engineering workstations between the PC-AT and the 4300 series.

Since 1986 will be a transition year for Apollo it is difficult to forecast with a high degree of confidence. It will certainly be a more challenging environment and the 1986/1987 period may well turn into a shake-out period in the engineering workstation market. Apollo, as the current leader, and blessed by what we consider as the most seasoned management team of any start-up company in the computer industry for over a decade, is positioned to be no worse than in the number three spot after IBM and DEC, with a reasonable chance to be number two after IBM. Management is aware of the challenge and will be ready to react to the competitive forces.

Our 1986 preliminary estimate encompasses a wide range of possibilities and represents an attempt to give a first order of approximation. On a worst-case basis, assuming no growth in orders from its top three OEMs and 50% growth from the rest of its customer base, total revenue should be up 25%. Gross margin may not decline too much because of the increase in the mix of the higher margin end user sales. To be conservative we allow for a 3.5% drop in pretax margin and arrive at \$1.40 per share in earnings which will be flat with 1985. A best-case scenario will have business from its top three OEMs growing 25-30% and the rest of its customers growing 70%, resulting in an overall revenue growth of 50%. Assuming a moderate pretax margin decline of 1.7%, E.P.S. should come in at \$1.90, a 35% increase from 1985. At this point in time we would use a single point earnings estimate of \$1.55 per share.

We expect the stock to suffer P/E erosion during 1985 as investors focus increasingly on the evolving competitive environment. Our best estimate for the stock is a \$15-25 trading range.

Cray Research

Much like Apollo's situation, Cray's outlook in 1985 is very strong. This pioneer in supercomputers has dominated its market niche and faced limited competition from Control Data. While it is much more difficult to enter this niche than the engineering workstation segment, it is now facing the challenge from three Japanese vendors for the first time, two of which offer a S/370 compatible approach. Since some 40% of all Fortran programs are run on IBM mainframes, a S/370 compatible approach is a logical one because it will be able to share existing mainframe peripherals and will automatically vectorize existing Fortran programs without conversion. In part to protect its customer base and keep up technologically with the Japanese vendors, which it sees as its principal competitors, IBM is making a major effort in this area. A Cray I class machine should be forthcoming in the 1986/1987 time frame. The implications are that the low and medium ends of the supercomputing market will be quite competitive involving industrial customers and universities.

Cray is likely to migrate its products upward and concentrate on the high end in order to maintain its current high margins. It is not clear to us how fast this segment will grow and hence, our best estimate for Cray's growth rate past 1985 is 20%. Longer term, the growing Japanese leadership in high-performance VLSI circuits threatens all U.S. computer vendors of high-end equipment according to the Gartner Group and is of course, of particular concern to U.S. supercomputer companies such as Cray. This Japanese effort is particularly evident in their emphasis in gallium arsenide, which is expected to be the future high-speed logic and memory technology.

Again we believe the stock's P/E will decline in 1985 to allow for slower future growth of around 20% versus the approximately 30% experienced during the past few years. We would sell the stock on strength.

Tandem Computers

IBM is Tandem's most frequently encountered competitor, involved in approximately 90% of the bids. As Tandem increases the performance range of its processors, it is positioning itself as the new distributed mainframe company and as an alternative to IBM in core data processing applications among the largest industrial corporations and financial institutions in the world. What it lacks in customer relations and depth of support relative to IBM, it makes up for by the inherent superiority of its system architecture, which was originally designed for the on-line transaction environment. Speculation about an IBM response has centered around its development of a fault tolerant architecture based on its System 38 and the possibility that such a system will be introduced around 1987. In view of IBM's emphasis on TPF-2 as its strategic product for on-line transaction processing, and its current five incompatible families of intermediate processors, it is unlikely that IBM will introduce such a revolutionary multiprocessor architecture anytime soon. According to the Gartner Group, IBM's System 370 architecture is likely to evolve to become more like its System 38. It will probably require 10 years to migrate to machine-independent SNA/LAN architecture and truly relational data base management. Hence, for the foreseeable

future Tandem will be able to continue to enjoy system architectural superiority with its multi-processor approach.

The reason behind IBM's emphasis on the TPF-2 as a strategic product, which is difficult to install and support, is because of increasing competitive pressure from Tandem. Current large IBM users find that DB2 (IBM's new relational data base system) tops out at 25-30 transactions per second, and its IMS system (which is not relational) tops out at 125 transactions per second. Since Tandem can offer a throughput of 50-100 transactions per second with a large TXP processor configuration and can also offer relational data base and superior peer-to-peer networking capability, IBM is forced to emphasize the high throughput of its TPF-2 system, an adaptation of the ACP system used for airline reservations, which is difficult to use. As technology advances, we believe Tandem should be able to maintain its technological edge over IBM for at least the rest of this decade.

We are recommending the stock for purchase at current prices because of: (1) the profit margin recovery we envision for the company over the next two years; (2) the imminent series of new product introductions; and (3) the likelihood of limited direct system competition from the major computer firms over the next five years.

David Wu, CFA

**MONTGOMERY SECURITIES RESEARCH REPORTS
PUBLISHED IN THE LAST 30 DAYS**

<u>ANALYST</u>	<u>COMPANY</u>	<u>TYPE</u>	<u>DATE</u>
Cheadle	October 1984 Sales Trends in the Bldg. Materials Retailing Sector	Industry Overview	11/19
Cheadle	November 1984 Sales Trends in the Bldg. Materials Retailing Sector	Industry Overview	12/13
Cheadle	Circle K Corp.	Research Notes	11/21
Cheadle	Home Depot	Company Report	11/19
Cheadle	Standard Brands Paint	Research Notes	12/05
Cheadle	Thousand Trails, Inc.	Research Notes	11/21
Dean	LANs & The Intra-Office Telecommunications Challenge	Industry Overview	11/12
Dean	Prime Computers, Inc.	Technology Notes	11/14
Fredericks	Morgan, J. P.	Company Report	11/19
Fredericks	Quarterly Bank Monitor	Industry Overview	11/13
Fredericks	Quarterly Bank Monitor Excerpt	Research Notes	11/21
Goldman	Beverage and Tobacco Highlights	Industry Overview	11/29
Goldman	The Coca-Cola Co.	Company Report	12/07
Goldman	PepsiCo, Inc.	Company Report	11/16
Gruber/Killea	Atlantic Research	Technology Notes	11/14
Huyser/Yost	Hospital Corp. of America	Research Notes	12/05
Huyser/Yost	Hospital Market Forecast	Industry Overview	11/12
Huyser	National Medical Enterprises	Research Notes	11/21
Jolson	Managing Risk: Attracting Long-Term Investors	Industry Overview	11/12
Jolson	Savings & Loan Industry Note	Industry Note	12/05
King	G.D. Searle & Co.	Research Notes	12/05
King	Pharmacia AB	Company Report	11/14
King	Pharmacia AB	Research Notes	11/21
Klesken	Micron Technology	Technology Notes	11/14
Klesken	Micron Technology	Company Report	11/15
Klesken	October Book-to-Bill Ratio	Technology Notes	11/14
Matthies/Mueller	Flakey Jake's	Research Notes	12/05
Matthies/Mueller	Sea Galley Stores	Research Notes	12/05
Matthies/Mueller	Saga Corp.	Company Report	12/11
Morris	Pacific Telesis Group	Technology Notes	11/28
Morris	Telephone Serv. Co. Monthly Rev.	Industry Overview	11/27
Mueller	Prime Motor Inns, Inc.	Research Notes	11/21

MONTGOMERY SECURITIES RESEARCH REPORTS
PUBLISHED IN THE LAST 30 DAYS

<u>ANALYST</u>	<u>COMPANY</u>	<u>TYPE</u>	<u>DATE</u>
Rickert	Hewlett-Packard	Technology Notes	11/27
Ross	The Gap Stores	Research Notes	11/21
Ross	Levi Strauss & Co.	Research Notes	11/21
Shattuck	Applied Data Research	Technology Notes	11/14
Wu	Dataproducts Corp.	Technology Notes	11/28
Wu	Digital Equipment	Technology Notes	11/14
Yost	Becton Dickinson & Co.	Research Notes	11/21
Yost/Huyser	Hospital Market Forecast	Industry Overview	11/12
Yost	Squibb Corp.	Company Report	11/28

Drexel Burnham Lambert
INCORPORATED

*not complete
covers competition*

**Tandem Business
Information Center**

Tandem Computers[★]

(TNDM-OTC)

Gordon Casey

Improving Earnings Outlook

March 14, 1983

Price	52-Week Range	Earnings Per Share			P/E Ratio			Return on Ave. Equity	Dividend	Yield	Shares Outstanding
		1982A	1983E	1984E	1982A	1983E	1984E				
\$26	\$33-14	\$0.76	\$0.93	\$1.40	34.2	26.0	18.6	19.3%	—	—	38,018,000

Fiscal year ends September.
* Drexel Burnham Lambert Inc. makes a market in this security.

POINT OF VIEW

- Tandem holds a strong position in the computer marketplace as the leading supplier of fault-tolerant systems. High demand for Tandem's NonStop systems has built an excellent user base in major corporations. Adding to the company's position in data processing is growing strength in computer networking.
- We expect improving economic conditions to benefit Tandem with increased order rates. Accelerating revenue growth is expected to bring production levels in line with manufacturing capacity thus improving margins in fiscal 1983. We estimate earnings of \$0.93 per share in fiscal 1983, a gain of 22% over a restated \$0.76 last year. We expect a further strong gain to the range of \$1.30 to \$1.50 per share in fiscal 1984.
- The recently reported results for the first quarter of fiscal 1983 remove much of the uncertainty which previously clouded the company's outlook.
- We believe Tandem has an excellent potential for long-term growth. The company's leading position in fault-tolerant systems and growing strength in computer networking position Tandem to be a key player in the rapidly converging data processing and communications marketplace. We project earnings growth in the 1982 to 1987 period averaging approximately 35% annually.
- Tandem is currently in a period of transition and reassessment within the financial community. This positions the stock at a level which we believe is particularly attractive. We expect the stock to make strong gains in the further recovery of the market.

Research

TABLE OF CONTENTS

	<u>PAGES</u>
OUTLOOK.....	1
BACKGROUND.....	4
STRATEGIC DIRECTION.....	5
PRODUCTS.....	7
SOFTWARE.....	8
FUTURE PRODUCT DIRECTIONS.....	9
COMPETITION.....	10
FISCAL 1982 RESULTS.....	12
EARNINGS RESTATEMENT, 1982.....	13
RECENT RESULTS.....	14
MANAGEMENT.....	16
FINANCIAL.....	17

This report was prepared from data believed reliable but not guaranteed by us, without further verification or investigation and does not purport to be complete. It is not to be considered as an offer to sell or a solicitation of an offer to buy the securities of the companies covered by this report. Opinions expressed are subject to change without notice. Drexel Burnham Lambert Incorporated, or one or more of its officers, may have a position in the securities discussed herein and Drexel Burnham Lambert Incorporated will be pleased to furnish specific information in this regard at any time upon request. Drexel Burnham Lambert Incorporated may act as a principal for its own account or as agent for another person, in connection with the sale or purchase of any security which is subject of this report.

© 1983 Drexel Burnham Lambert Incorporated

BACKGROUND

The Tandem story begins with the company's pioneering work in fault tolerant systems. An outstanding record of business growth has been achieved by targeting a key need of data processing, high reliability. The company has outstanding products which in many respects are unique. High levels of system availability are achieved with multiple processor based systems. Operating system software has been designed to perform a wide range of system monitoring and management functions and to automatically perform corrective actions in the event of a system failure. The result is a set of products that continue to function effectively in the event of failure without loss or alteration of data.

Tandem has established an outstanding record of user satisfaction. Surveys consistently rate Tandem at the highest levels of product satisfaction and user loyalty. A key factor in these exceptional ratings is excellent software. The company's research and product development program includes a major commitment to software. The result has been a family of products which have significant advantages in initial installation and ease of expansion as well as high reliability.

Tandem has concentrated upon the requirements for transaction processing systems in a variety of business oriented environments. Systems are in use in a wide range of critical applications. The introduction of the computer to key business functions generally requires major changes in working procedures and the tasks that employees perform. The system becomes an integral part of the business function. Typical examples of transaction processing systems are airline reservations, on-line banking and credit authorization. In these situations, continuous system availability is critical. The organization cannot function without access to the system.

In Tandem's short seven year history, the company has installed systems in over 600 customer enterprises. In general, these installations represent the customer's first steps in automating vital business functions with on-line systems. Tandem's fault-tolerant NonStop systems were chosen to provide improved reliability and availability. In many instances, these early installations were essentially experimental. The key point, in our view, is that these initial systems have been successful and customers are now committed to Tandem as they enter a phase of widespread implementation. Rates of repeat business are climbing and we expect this factor to contribute strongly to future business growth.

Tandem's expertise in addressing the requirement for fault-tolerant systems has also yielded a strong competitive position in computer networking. The company's emphasis on communications has intensified over the past two years with a series of important hardware and software announcements. Tandem's focus is increasingly oriented toward meeting the needs of large enterprise users with massive networks employing thousands of terminals and hundreds of communications lines.

We expect Tandem to continue its progress in computer networking leading to an expanded role in this field in the mid-1980s. We view the Infosat joint announcement with the American Satellite Corporation as an important step in this direction. The Infosat move positions Tandem in the network services arena, currently an area of major focus. The fast growing area of communications and computer networking may prove to be Tandem's most important competitive battleground. Today's massive demand for data processing solutions centers upon the critical need for connecting the many dispersed locations of large enterprises. The company is building a strong base for continued leadership in this important business area. We expect Tandem to be a key participant in the rapid convergence of data processing and communications in the mid-1980s.

Tandem is currently enunciating its role in the marketplace as a key supplier of large scale integrated information systems. Tandem provides a backbone network and on-line transaction processing facilities to meet the needs of large corporate customers. This concept goes well beyond basic hardware to include the company's increasing depth of software and extensive field support services. Viewed in this light, Tandem is positioned as a major vendor with a role similar to that of the large mainframe companies.

STRATEGIC DIRECTION

Tandem's primary focus has been on transaction processing systems in the large enterprise marketplace. This continues to be an area of strong demand as major corporations seek productivity improvement by the automation of vital information processing functions. Tandem's concentration on fault-tolerant systems has provided an important competitive edge relative to conventional data processing solutions. As a result, Tandem is positioned at the leading edge of customers' efforts to automate key functions.

Tandem's customers are typically major corporations with considerable data processing experience. Tandem has compiled an excellent record in satisfying customers' needs. As noted previously, user surveys consistently rate Tandem systems at the highest levels. The company's success in automating vital business functions has gained Tandem an important foothold in over 600 major corporations worldwide.

Tandem's strategy is to extend the initial customer foothold by broadening the available array of products and services. Communications and computer networking are being emphasized. Although Tandem's original orientation and basic concept is on fault-tolerant systems, this approach also yields significant advantages in computer networking. In many respects, the basic Tandem system functions as a computer network. The operating system performs the critical role of controlling messages passing between the individual processors. Applying the same concepts to geographically dispersed systems has produced an excellent computer networking product.

The recent joint announcement with a leading satellite company extends Tandem's commitment to the area of communications. Tandem will participate in a joint venture in a new satellite communications network. Initial services are planned to begin in 1983. Tandem's partner in Infosat, American Satellite Company, (ASC), was established in 1972 and is jointly owned by Fairchild Industries and Continental Telecom Inc.* The Infosat offering is directed toward large enterprise users who require long distance leased line service. The communications service will be marketed jointly by Tandem and ASC. New low cost earth stations to be supplied by ASC will transmit and receive data over dual 56 kilobits per second transmission paths. For long distance users, the service is expected to provide significant savings relative to conventional terrestrial links.

The significance of these developments to Tandem, in our view, lies in the company's position in the Infosat joint venture at the ground floor of ASC's expanded undertaking. Tandem will provide the data processing side of the system. This new role, we believe, provides an opportunity for participation in a new business area with reasonably contained risks. It promises a broader scope for Tandem's business while ASC assumes the major investment in the satellite facilities.

* An officer of Drexel Burnham Lambert is a director of Continental Telecom Inc. Drexel Burnham Lambert Incorporated from time to time provides investment banking and other services to Continental Telecom.

Tandem's current strategic direction accords equal emphasis to networking and the depth of available software as it does to fault tolerance. The focus is on broad corporate issues and Tandem's ability to provide integrated information systems. Tandem's aim is to ultimately become the customer's principal supplier. In this context, we expect the emphasis to continue to shift toward communications and networking. The satellite communications services are a further extension of Tandem's range of offerings. In our opinion, the company is well positioned to become a major contender in the convergence of data processing and communications in the mid-1980s.

PRODUCTS

Tandem's NonStop system architecture has been designed to provide continuous system availability. It is intended for on-line transaction processing applications. High availability is ensured by hardware redundancy and software which provides the ability to automatically reconfigure the system in the event of component failure. In addition, the NonStop design includes features to guard against loss or alteration of data.

The Tandem system is a multiprocessor design which can accommodate any combination of two to 16 individual processors. A modular approach is used which provides a wide range of processing power and allows incremental growth as the user's needs increase. Modular upgrades can be made in the field without the need for a disruptive conversion.

The heart of the Tandem system, the NonStop processor, includes two microcoded processing units, one for central processing and bus control and a second for input/output control. This separation of function frees the central processor of the burden of heavy input/output activity characteristics of transaction processing applications. In its present NonStop II form, a 32-bit data access architecture is used providing ample capacity to support the needs of the largest users. A dual bus structure is used for interprocessor connection. Throughout the system, multiple components and multiple data paths are provided. This includes multiple power supplies, input/output ports and controllers for peripherals.

An operations and service processor (OSP) is used with each main processor. The OSP monitors the system providing system status and diagnostic functions, as well as facilities for unattended remote operation of the system. These functions are vital in the operation of large computer networks which frequently have unattended equipment in remote sites.

SOFTWARE

Tandem's fundamental business orientation toward transaction processing applications places great emphasis on software. Tandem offers a wide range of software products to support basic operation of systems, to facilitate application development and to support advanced data base management and communications needs. We believe Tandem's strengths in software are becoming a key differentiating factor in the marketplace. User surveys consistently give Tandem high marks for quality of software and general ease of use. We expect this to become an important strength as Tandem builds toward its objective of meeting all of an organization's information management needs.

Tandem's strength in software is exemplified by the key products which are an important factor in maintaining the company's competitive edge. Tandem's relational data base product, ENCOMPASS, performs a key role in enabling users to rapidly define and implement new applications. A key factor in this process is data base structure and ease of access to key data elements. This process is difficult enough in a stand-alone system, but becomes particularly complex when data elements reside in different distributed systems. Conventional data base management systems are inadequate in this environment, in our opinion. Tandem has addressed these requirements with ENCOMPASS, an advanced data base management system. ENCOMPASS incorporates advanced relational data base features and a query/report writer. These capabilities provide an important assist to application development and greatly facilitate program changes and system expansion.

Tandem's basic computer networking product, EXPAND, offers key advantages in reliability of network nodes and in management of communications lines. Network nodes have multiple processor Tandem systems which ensure continuous availability of nodes. In the event of a line outage, the network has the ability to retransmit over an alternate path. A further safeguard is provided by continuous monitoring of message traffic to guard against loss or alteration of data. These features ensure high availability and integrity of the network. Basic

networking capabilities are further advanced by Transfer which provides comprehensive information management facilities. Transfer is a message storage and delivery system which provides electronic mail capabilities including not only text but facsimile communication.

FUTURE PRODUCT DIRECTIONS

We expect Tandem to continue the basic strategic aim of becoming a key supplier of large scale integrated information systems. Emphasis is expected to be on enhancement of existing hardware and software with key product additions which support the basic strategic direction. As mentioned previously, Tandem has made substantial headway in initial system installations in over 600 major corporations. We expect the business to be characterized by further penetration of these enterprises, building upon the established base. The key words will be compatibility and enrichment of Tandem's offerings.

Emphasis on research and product development has been a key factor in establishing Tandem's unique position of leadership in the marketplace. From its founding, the company has committed to high levels of research and development spending which have consistently exceeded 8% of revenue. Currently, R&D is targeted at 9% to 10% of revenue and is balanced between hardware and software activities. Tandem's management has consistently worked to create an environment that would attract and retain exceptional research and development talent.

Tandem's system design has sought to avoid imposing arbitrary hardware dependent constraints on users. User programming and application development have been supported only in higher level languages. The company has not supported an assembler language. This approach gives Tandem considerable flexibility. Architectural or hardware changes can be made with minimal conversion problems for users. In this way, Tandem can utilize improved hardware technologies and price/performance advances as they become available. We expect future hardware changes to be introduced in a nondisruptive fashion without the need for users to make difficult conversions.

Tandem has indicated that several new processors are under development. The company has discussed development work aimed at applying gate array semiconductor technology to a new series of processors. This will provide the next price/performance step to maintain Tandem's competitiveness. We expect the announcement of a new series of processors based upon this work later in 1983. Longer-term, we expect Tandem to introduce further hardware changes as new technologies be-

come available. However, our basic view is that Tandem will adhere to a policy of upward compatibility and will avoid changes that might complicate user conversions.

COMPETITION

Tandem has established a unique competitive situation by emphasizing fault-tolerant systems. The NonStop concept originated with Tandem and has been the key factor in differentiating the company's products. The concentration on transaction processing requirements and fault-tolerance has established a strong niche in the marketplace. User attitudes appear to favor fault-tolerant systems in an ever wider range of applications. In our opinion, fault-tolerance will ultimately be expected in any advanced on-line application.

The strong demand for Tandem's systems and the growing user acceptance of fault-tolerant concepts has not gone unnoticed by competitors. A widening array of computer suppliers have announced fault-tolerant systems or have indicated the intent to soon make announcements. The past two years have seen the entry of several new start-up companies with similar business objectives and indications of interest by established firms.

The competitive response to Tandem has evolved along two basic paths. New start-up companies are proposing new architectural approaches to fault-tolerance. In contrast to this, existing companies are typically advocating a computer networking, or software based approach which maintains compatibility with existing hardware. However, in every instance, the competitive approaches are significantly different from Tandem's products. In the field of fault-tolerant systems, the customer is facing a steadily growing array of alternatives. The following paragraphs outline the three fault-tolerant competitors which, in our opinion, are the most significant. Stratus Computers is the leading competitor among an array of new companies and IBM and DEC need no introduction.

The new start-up companies have several advantages. They are not constrained by an existing product line or customer support requirements. They are free to choose a unique systems architecture. In addition, they benefit from the availability of a growing array of standardized low cost microprocessors. In the current environment, product development times are significantly shorter. In turn, however, the start-up company's advantages are offset by the need to catch up in software development and in building a user base.

Tandem's initial start-up challenger, and the most visible new company, is Stratus Computers of Natick, Massachusetts, a privately financed corporation. This new contender has indicated that it will target the same transaction processing marketplace with similar fault-tolerant characteristics. Initial efforts will focus on business and commercial applications and will use independent systems houses for marketing. The first shipments were made in early 1982 and by year end approximately 35 systems had been shipped. Stratus has taken a significantly different architectural approach. Extensive use has been made of currently available microprocessors emphasizing a high degree of redundancy. The low hardware cost of these new products has allowed Stratus to emphasize a hardware solution to fault-tolerance.

An October, 1982 introduction by IBM provides new capabilities for the Series 1 minicomputer. New operating software is available which will allow up to 16 Series 1 processors to operate in parallel with the appearance to the operator of a single system. This provides several advantages in non-disruptive system growth, improved reliability and redundancy in case of failure of an individual processor. However, in our opinion, the choice of the Series 1 raises questions regarding ease of installation of this new offering. The Series 1 has been marketed by IBM as a conventional minicomputer and does not have the broad array of software and installation aids which are available for other IBM products. Series 1 installations typically require significant customer effort or the services of a third party system integrator. Eventual success of this new IBM offering, in our view, will be dependent upon the level of commitment the company is willing to make in marketing emphasis and installation aids.

IBM has chosen the software approach to improved reliability. The company is marketing several systems in the small and intermediate systems marketplace. In contrast to Tandem, these processors were designed to minimize the cost of single processor installations. We believe IBM would be reluctant to introduce a completely new series of processors without first rationalizing the conflicts and overlaps between existing products. However, longer term, we expect the concept of fault-tolerance to become a key consideration in systems design. By the mid-1980's we expect IBM and other established companies to offer new hardware incorporating these considerations.

Digital Equipment is also expected to shortly announce a networking software solution based upon existing hardware. The company recognizes the opportunity for fault-tolerant systems. DEC is committed to broader participation in the business oriented systems marketplace. Originally identified as the redundant VAX, the concept has been described as a network of small VAX 32 bit processors. This approach offers the advantages of load sharing, backup in case of failure and modular growth without requiring completely new hardware.

On balance, we believe the demand for highly reliable transaction processing systems is massive and capable of supporting many suppliers. In our view, Tandem's lead in software development provides a substantial advantage relative to the new contenders. The small start-up companies not only must catch up with Tandem's lead in products, but starting from a zero base, must also become established with users. In building a 600+ user customer base, Tandem has created an important position for future growth with many major corporations. In some respects, these customer commitments can preempt the entry of new suppliers. The customer's investment in application software and growing familiarity with Tandem's concepts tend to confine a new entrant to completely new situations. We do not expect these new competitors to threaten Tandem's continued strong business growth.

Tandem's competitive posture relative to the established companies focuses more directly on communications and computer networking. In our opinion, fault-tolerant characteristics, relative ease of installation and an open ended design that facilitates network expansion are plus factors for Tandem. The Tandem networking solution is particularly attractive for new applications that have not previously been on-line.

Tandem is making a major commitment to providing compatibility features that will enable NonStop systems to coexist with IBM mainframes. A Tandem network can function as a subsystem within an IBM SNA hierarchical network. A customer's commitment to IBM in large mainframe systems does not preclude the use of a Tandem network to perform a specialized function.

An added competitive plus for Tandem is the Infosat satellite communications services, discussed previously. We consider the ability to offer a comprehensive network including both data processing and communications links a unique competitive offering.

FISCAL 1982 RESULTS

Fiscal 1982 was a pivotal year for Tandem. The company closed out fiscal 1981 with revenue growth almost double that of the previous year. Results in early fiscal 1982, as originally reported, indicated a continued strong rate of revenue growth exceeding 80% in the first half. Expectations for fiscal 1982 indicated a year of exceptional growth constrained only by Tandem's ability to add resources and supply products.

MARTIN**SIMPSON**

& Company, Inc.
115 Broadway, New York, N. Y. 10006

**Tandem Business
Information Center**

Tel: (212) 349-7450
Telex 66544

Tandem Computers End-User Survey

After several years of explosive growth, Tandem, the leading independent vendor of fault-tolerant systems for the on-line transactions processing market, experienced a major setback nearly one year ago as order rates fell and revenues and earnings were restated downward to reflect over-aggressive booking policies. Accounting practices have now been tightened and recent orders have shown some modest improvement, leading to our expectation that 1984 will be an excellent year for the company.

We recently conducted a survey of 200 Tandem users (30% of its customer base). Overall, the results were quite positive, although several problem areas were identified. Of the greatest significance, fully 97% of those polled had either definite or probable plans to expand their Tandem installations during the coming year. These users expected to add nearly 900 CPU's, which represents more than two quarter's of Tandem shipments. On the negative side, 22% of the users were unsure whether they would choose Tandem if the decision were made again. The reasons were basically twofold: high cost and support. Tandem's price/performance has deteriorated as the operating system has expanded and as competitive system prices have come down. Software support was felt to be an area in need of improvement. A new 16-bit system should be introduced in the fall and should answer some of the overhead/performance problems.

On the 32-bit issue (and Tandem's lack thereof), 62% felt that such a system was either very important (21%) or somewhat important (41%). Tandem's entry into this market is not likely until 1984. While current customers were willing to wait, prospective ones may not.

While we have some concerns regarding the current quarter now that the trade-in program has ended and the new products have not yet been introduced, we expect a very strong revenue and earnings rebound next year aided by a buoyant economic environment and favorable product cycle. We recommend purchase of the stock for substantial potential capital appreciation.

TECHNOLOGY STOCK SERVICE

Update #2
July 25, 1983

Tandem Computers, Inc.
(OTC - TNDM)

Recent Price: \$29
1982-1983 Price Range: \$14-34
1985 Price Objective: \$60
Annual Compound Appreciation: 44%
Estimated 12 Month Downside Risk: 25%

Year (9/30)	Per Share	Price/ Earnings
1980	\$0.35	82.9x
1981	\$0.72	40.3x
1982	\$0.76	38.2x
1983E	\$0.80	36.2x
1984E	\$1.40	20.7x
1985E	\$1.90	15.3x

Dividend: None Yield: Nil

Capitalization (\$000's)

Long-term Debt and Leases	\$ 21,102	8%
Common Equity	250,988	92
Total	\$272,090	100%

The company has 41 million shares outstanding. Tandem's equity at the current market price is valued at approximately \$1.19 billion.

(E) Estimates of Martin Simpson & Co., Inc.

This report is for the exclusive use of our clients. The information has been compiled from sources we believe to be reliable but we do not guarantee its accuracy or completeness. This is not a solicitation of any order to buy or sell. Members of the firm may have a position in and may from time to time purchase or sell any of the securities mentioned.

Survey Methodology And Sample Size

We recently completed a major survey of Tandem users. Nearly 200 users were contacted, representing approximately 30% of Tandem's user base, a very significant sample size. 170 responses were received by mail through questionnaires sent out by the International Tandem Users Group (**See Appendix**) while the remainder were surveyed in phone interviews conducted by Martin Simpson & Company, Inc. The survey was conducted in the April - June 1983 timeframe.

The 193 users surveyed had 1,454 Tandem CPU's installed. The sample included both NonStop I and NonStop II models, with an edge to the latter as can be seen in Table 1.

TABLE 1

Number of Tandem CPU's Surveyed By Model

NonStop I	552	38%
NonStop II	<u>902</u>	<u>62</u>
	1,454	100%

Source: Martin Simpson & Company, Inc.

The average installation size was 7.5 processors per user. The typical NonStop II installation was more than one-third larger than the average NonStop I installation.

TABLE 2

Average Size of Installation By Model

	<u>No. of Processors</u>
NonStop I	5.3
NonStop II	7.2
Total	7.5

Source: Martin Simpson & Company, Inc.

Tandem User Profile

The typical Tandem user had been a customer of the company for approximately 3 years. The distribution, as set forth in Table 3, is heavily weighted towards users with 2-3

years of experience with the company. New customers represented a small percentage of the total. This may possibly be explained by two factors (1) newer users may be less likely to be members of the International Tandem User's Group and thus were excluded from the population (2) shipments to new customers as a percentage of total placements have been declining for the company as a whole.

TABLE 3

Tandem: Average Years Of Usage

<u>No. Of Years As A Tandem Customer</u>	<u>% Of Users</u>
1	16%
2-3	47
4-5	32
6-7	5
	<u>100%</u>

Average of All Users: 3.0 Years

Source: Martin Simpson & Company, Inc.

Geographically, the U.S. represented a disproportionately large percentage, 85%, of the sample. U.S. users were fairly evenly split between the eastern and western regions. Europe accounted for only 5% of the sample, yet comprises 25% of Tandem's customer base. Participation from Canadian, Asian and Middle Eastern users was also underrepresented. This is attributable to two factors (1) no telephone interviews were conducted outside the U.S. (2) foreign users were under significantly more time pressure to return the questionnaires.

Table 4

Geographic Distribution of Tandem Users

Eastern U.S.	44%
Western U.S.	41
Canada	4
Europe	5
Asia, Middle East	6
	<u>100%</u>

Source: Martin Simpson & Company, Inc.

Distribution of the users by industry was highly correlated with the breakdown for the company as a whole, as can be seen in Tables 5 and 6.

TABLE 5

Breakdown By Industry of Tandem Users Surveyed

Banking	19%
Insurance	2
Other Financial	6
Services	17
Manufacturing	14
Government	10
Medical	7
Software House/OEM	5
Education	4
Communications	4
Retail	3
Utilities	3
Transportation	1
Distribution	1
Entertainment	1
Computer Programming	1
Agriculture	1
Religion	.5
No Response	.5
Scientific	0
	<u>100%</u>

Source: Martin Simpson & Company, Inc.

TABLE 6

Breakdown By Industry Of Tandem Users Corporate

Banking	19%
Other Financial	10
Manufacturing	11
Communications	10
Government	9
Medical	7
Distribution	3
Transportation	3
Other	28
	<u>100%</u>

Source: Martin Simpson & Company, Inc.

Banking, along with other financial sectors such as insurance and brokerage firms, is Tandem's most important industry group, accounting for nearly 30% of sales. This has risen several percentage points over the past two years reflecting both increased penetration in this marketplace as well as a recession-related decline in the manufacturing sector. Tandem has systems installed at 70% of the 25 largest banks in the U.S., and has captured many leading U.K. banks as well. The trend towards the widespread acceptance of automated teller machines as well as the possible emergence of home banking, presents an enormous marketing opportunity for Tandem. These types of real-time, transaction processing applications demand the fault-tolerance and data integrity that Tandem systems provide.

Manufacturing usage of Tandem systems as a percentage of the total has declined due to the recent recession. Certain geographical areas, such as Germany, Canada, and the Midwest U.S., were particularly hard hit. As the economy recovers, we would expect a resurgence in this sector.

Service industries (consulting, legal, etc.) have grown in importance to Tandem as has the communications industry. While users in the communications field were underrepresented in our survey, we expect dramatic growth in this area for Tandem, particularly as such services as Telex grow in importance.

The government and medical markets are both quite significant to the company, accounting for about 16% of the total. Software houses and original equipment manufacturers (OEMs) comprise a fairly small sector, while the scientific market is of virtually no importance to the company.

In terms of system acquisition, the overwhelming majority had purchased their machines (78%). Of those who had leased, many were among Tandem's newer customers. The third category comprises those organizations who use Tandem systems but do not own or lease them.

TABLE 7

Tandem Computers: System Acquisition Method

Own	79%
Lease	14
Use, but does not own or lease	<u>7</u>
	100%

Source: Martin Simpson & Company, Inc.

System Selection

As would be expected, Tandem's fail-safe capability was the primary factor users cited in the selection process. Nearly 50% of those surveyed mentioned redundancy as the key reason for installing Tandem. Ease of system expansion (particularly the fact that no reprogramming is necessary) was cited as the most important factor in the system selection by 24% of the users. Networking and database management software were cited by 12% and 11% of those surveyed, respectively. Price/performance was mentioned by a mere 1%, which correlates with the general feeling expressed throughout the survey that Tandem's systems were too expensive.

TABLE 8

Primary Reason Given For Selecting Tandem

Fail-Safe Capability	48%
Expandability	24
Networking Software	12
Data Base Management Software	11
Tandem's Reputation	1
Price/Performance	1
Other (1)	3
	<u>100%</u>

(1) Software, IBM Communications, support, ease of developing new applications.

Source: Martin Simpson & Company, Inc.

Other factors which users mentioned as key reasons in the selection process were (single responses):

1. Software
2. IBM Communications
3. Support
4. Ease of Developing New Applications
5. Desired Software Packages Ran on Tandem
6. Block Structured Language
7. Easy Operating System Maintenance

Users were asked to rate the features listed in Table 9 in order of their importance in the selection process. The higher the number, the more important the feature. While this shows the same data as in Table 8, its presentation in Table 9 shows a tighter range in the value placed on the various

criteria. Again, redundancy and expandability ranked highest, while data base management software, networking software, price/performance and the company's reputation were all rated in the same general range.

TABLE 9

Reasons For Selecting Tandem

Fail-Safe Capability	5.5
Expandability	5.3
Data Base Management Software	3.7
Networking Software	3.6
Price/Performance	3.5
Tandem's Reputation	3.3

Scale 1 = Not Important
7 = Very Important

Source: Martin Simpson & Company, Inc.

In terms of seriously evaluating competitive systems at the time the decision to install Tandem was made, Digital Equipment was most often mentioned (by 52% of those polled) followed closely by IBM (49%). The other leading minicomputer vendors, Hewlett-Packard, Data General and Prime, were mentioned nearly one-third of the time each. The BUNCH companies (Burroughs, Univac, NCR, Control Data, and Honeywell) were evaluated much less frequently, while foreign vendors were rarely looked at. At the time that most customers made their equipment evaluations, the new fail-safe start-up companies either were not in existence or did not represent a viable alternative. While 3% of those surveyed had seriously considered Stratus (and rejected it because of the company's lack of experience and/or less powerful product), less than 1% had looked at Synapse and no one had evaluated Computer Consoles, Parallel Computing, August Computers or Sequoia. Fully 15% of the users had not evaluated any competitive equipment, stating that Tandem offered the only hardware/software solution that fit their needs.

TABLE 10

% Of Tandem Users Evaluating Competitive Equipment

None	15%
Digital Equipment	52
IBM	49
Hewlett-Packard	31
Data General	27
Prime	19
Burroughs	14
Honeywell	10
Sperry Univac	5
NCR	5
Perkin-Elmer	5
Wang	3
Stratus	3
Datapoint	2
General Automation	1
Control Data	1
Modcomp	1
ICL	1
GEAC	1
Siemens	.5
Fujitsu	.5
Gould SEL	.5
Qantel	.5
MAI - Basic Four	.5
Synapse	.5
Harris	.5
Texas Instruments	.5

Source: Martin Simpson & Company, Inc.

Table 11 sets forth the ratings results on thirteen characteristics of Tandem, ranked on a scale of 1 (poor) to 5 (excellent). No category was ranked lower than 2.56 (fair-good) and the majority faired in the good - very good category. Again, as would be expected, CPU reliability ranked best at 4.33, while peripheral reliability was more than a full point lower. Disk drive and printer failures were commonly mentioned as problems. While service and support of hardware ranked high, software support was given a low rating (this issue will be discussed later) as was applications software (customers wanted to see more from Tandem.) Service responsiveness recieved the lowest overall ranking, with users commenting that while major problems were quickly corrected, minor, but troublesome issues, took Tandem a long time to resolve. Systems software products were all highly regarded, with rankings from 3.0 to 3.95. Overall satisfaction with Tandem was quite high, averaging 3.9.

TABLE 11

Tandem: System Ratings

		<u>% Of Users Responding</u>
CPU Reliability	4.33	100%
Peripheral Reliability	3.23	95
Service Quality	3.61	100
Service Responsiveness	2.56	100
Hardware Support	3.61	100
Software Support	2.88	100
Applications Software	2.70	78
Operating Systems Software	3.65	100
Data Base Management Software	3.70	87
Networking Software	3.95	47
Applications Languages	3.50	93
Program Development Tools	3.00	87
Overall Satisfaction with Tandem	3.90	100

Scale: 1 = Poor
 2 = Fair
 3 = Good
 4 = Very Good
 5 = Excellent

Source: Martin Simpson & Company, Inc.

Users were asked what they liked most about Tandem, the results of which are presented in Table 12. Once again, reliability was far and away the most highly praised feature. Users often commented that Tandem's claim to be truly fault-tolerant was correct. Few customers mentioned any downtime problems other than system crashes which occurred when Tandem maintenance personnel were working on the system (See Table 13). Other complaints were (1) there is no redundancy capability in line controllers (2) Tandem's NonStop philosophy can lead to a false sense of security if back-up functions are lost without being brought to one's attention and thus certain failures need to be highlighted or require operator acknowledgment and (3) NonStop is difficult to implement in Fortran and TAL.

Many users complimented Tandem's treatment of its customers, with the most frequent comment being a "feeling that the company wanted the user to be successful." Following on the same theme, its overall customer support was also well-regarded.

The system's performance and design (both hardware and software) were frequently cited as Tandem's greatest strengths, as was its ease of expansion. Most competitive vendors require users who need more computer power to upgrade to a higher-level

model, which is not only expensive and disruptive, but which often requires some degree of reprogramming or software modification. With a Tandem system, new CPU's can be added as desired without interrupting system performance. This has been an enormous strength for Tandem and one which several of the newer computer vendors (eg Convergent Technologies) have also adopted.

Several users praised the excellent quality of Tandem's management and staff, with many stating that the level of professionalism exhibited was unsurpassed in the industry. Tandem's ease of use and hardware service were also considered to be strong points.

Additional positive features mentioned infrequently and thus not listed in Table 12 included: data integrity, ability to recover from system failures, education centers, and NonStop I/NonStop II compatibility.

TABLE 12

Tandem Features Liked Best

	<u>No. Of Times Mentioned</u>
Reliability	65
Tandem Attitude/Support	27
System Architecture/Performance/Quality	26
Expandability	20
Quality of Employees	18
Ease of Use	15
Hardware Service	14
System Software	9
Data Base Management System	8
Software Development Tools	6
Fast Response To Major Problems	4
Networking Software	4
Enscribe Software	3

Source: Martin Simpson & Company, Inc.

There were many more separate categories given in response to what users liked least about Tandem. Leading the list was cost. Many users felt that Tandem systems were significantly overpriced. While Tandem has, from the start, commanded a premium for its fail-safe capability, this premium has increased over time due to several factors: (1) competitive systems (not necessarily fault tolerant) have undergone dramatic downward price adjustments while Tandem's prices have stayed about the same, thus widening the price gap (2) new releases of the operating system require increased overhead to maintain, thus raising system cost. Many customers were sensitive to this issue, complaining that they were forced to maintain an increasingly costly operating system which has grown to support

additional software products which these users did not require. Several users commented that it now took four processors to run the Cobol Compiler, where previously it required two, making it not only larger, but slower as well. Clearly, the issue of growing operating system overhead, which has a direct bearing on price/performance, will have to be addressed in new products from Tandem. Other cost issues related to maintenance, memory and peripherals, all of which were felt to be priced out of line with Tandem's competitors.

A major source of contention with Tandem was the issue of software support/quality control. Many users felt that software support was badly in need of attention. Customers were concerned that it took too long to get responses to questions from the company, in some cases, months. Software documentation, in particular, was felt to be poor. Quality control has deteriorated, according to some users, resulting in software with so many bugs it could not run. Specific issues raised with respect to software support and software products were:

1. Poor language support
2. Inadequate development tools - need more than an editor and TAL compiler
3. Lack of interactive query language
4. Poor user orientation ("it's better on a P.C.")
5. Would like to see a manufacturing control package and job accounting package for batch programs
6. Unavailability of applications software
7. Complex structure of TAL: need language between TAL and Fortran/Cobol
8. Software is untested
9. NonStop software is cumbersome
10. Difficulty in predicting system utilization of an application.

Problems with peripherals related to several factors, besides cost: (1) difficulty in interfacing non-Tandem terminals (2) poor sequential I/O performance and lack of tape-handling procedures (3) 600 l.p.m. printer failures (4) lack of disk compression utility (5) difficulty in diagnosing sporadic disk errors (6) lack of a one command utility to remove disk fragmentation and (7) lack of word processing support on the 6530 terminal.

As with most end-user surveys there is a certain degree of inconsistency. For instance, while staff quality was mentioned as a strength in Table 12, it was also felt to be a weakness. Regional differences can best explain this, as most of the complaints concerning employees were related to field service offices in particular locations. In terms of Tandem's management, five customers expressed concern about its unorthodox style which made it harder to sell the company to the user's top

management. A few users also felt that customers were getting involved, against their wishes, in internal company politics.

Other areas of concern were service, performance (largely related to the operating system problems discussed earlier) and documentation. Several users were upset about parts replacement (reluctance on the part of Tandem to replace, rather than fix, an obviously defective part) and its microcode policy (requiring it when not needed) which was felt to be a "marketing ploy".

A number of customers felt that while Tandem was great for interactive tasks, its ability to handle batch processing applications was weak and in need of greater support. Additionally, a few users expressed concern that Tandem's pace of new product development, both hardware and software, was too slow.

Other drawbacks that were singled out included: (1) sloppy hardware upgrades (missing parts) (2) pressure to buy before discount period runs out and (3) lack of leasing provisions.

TABLE 13

Tandem Features Liked Least

	<u>No. Of Times Mentioned</u>
High Cost	26
Software Support	25
Software Quality Control	20
Operating System Overhead	16
Staff Quality	14
Peripherals	14
System Performance	12
Field Service	11
After - Sales Support	9
Maintenance Downtime	7
Software Development Tools	7
Documentation	6
Batch Processing Capability	6
Tandem Management Philosophy	5
Microcode Policy	4
Parts Replacement	4
Not Enough New Products	4

Source: Martin Simpson & Company, Inc.

Users were then asked whether they would still choose Tandem if the decision were being made today. 78% answered "yes", without reservation. The central theme appeared to be

that Tandem still had the best hardware/software solution for their needs, despite some very real problem areas. 7% were unsure, stating that the competitive environment had changed sufficiently since the original decision was made, presenting other alternatives which would have to be evaluated. Fully 15% stated that they would not choose Tandem again, with the most common reason being its high cost. Other reasons were (1) would prefer IBM (2) would prefer Stratus (3) poor high-speed communications support and (4) disappointment with Tandem's system performance and support. It should be noted that the majority of the 15% responding "no", were planning to add to their Tandem installations within the coming year, underscoring the importance of an installed base.

TABLE 14

% Of Users Who Would Select Tandem If Decision Were Made Today

Yes	78%
Maybe	7
No	<u>15</u>
	100%

Source: Martin Simpson & Company, Inc.

32-bit systems have rapidly become the standard architecture in the minicomputer industry. These systems provide four principal advantages over 16-bit minicomputers. First, 32-bit word length allows more direct memory addressing capability, permitting direct access of up to 4 billion words or 16 billion bytes versus 64,000 words or 128,000 bytes for 16-bit processors. As a result, 32-bit systems have higher throughput and are therefore more productive. Third, computations are more precise as more significant digits can be carried through calculations. Finally, program development is made easier by the longer word length.

Tandem's product line is still 16-bit. Customers were asked how they felt about a Tandem 32-bit processor. 62% felt it was either somewhat (41%) or very (21%) important, while 35% considered the issue irrelevant. 32-bit systems are generally most appropriate in scientific applications, particularly those with heavy number crunching tasks. As can be seen in Table 5, none of the Tandem users surveyed fell into this group. While many users felt that the type of processor was not important as long as the system did the job, some felt that it would improve system throughput. Others felt that since the industry was adopting 32-bit architecture, Tandem should too. A 32-bit Tandem system is not likely to be introduced before 1984 and will probably not be fully compatible with Tandem's current 16-bit

systems. While most users can wait until next year (though perhaps not new customers), the compatibility issue will prove to be a thornier issue, in our opinion.

TABLE 15

Importance Of Tandem 32-Bit Processor

Very Important	21%
Somewhat Important	41
Not Important	35
Undecided	$\frac{3}{100\%}$

Source: Martin Simpson & Company, Inc.

"ENCOMPASS", Tandem's relational data base management system, has achieved excellent acceptance. As can be seen in Table 16, 56% have installed or plan to install the product.

TABLE 16

Tandem: ENCOMPASS Usage Plans

Have Installed or Plan to Install	56%
Do Not Plan to Install	40
Undecided	$\frac{4}{100\%}$

Source: Martin Simpson & Company, Inc.

Far fewer users, 18%, were planning to add "Transfer." This is a new software product, which based on the "Expand" network, will integrate electronic mail, facsimile and communications. It will tie together all types of equipment, regardless of the location or application.

TABLE 17

Tandem: TRANSFER Usage Plans

Have Installed or Plan to Install	18%
Do Not Plan to Install	70
Undecided	<u>12</u>
	100%

Source: Martin Simpson & Company, Inc.

Table 18 sets forth the breakdown of installations polled by model. NonStop II's have a decided edge over NonStop I's, while 18% of the users had configurations consisting of both models.

Table 18

Breakdown of Tandem Installations By Model

NonStop I	36%
NonStop II	46
Both Models	<u>18</u>
	100%

Source: Martin Simpson & Company, Inc.

Tandem introduced the NonStop II in 1981. A trade-in policy was instituted whereby customers received larger and larger credits for the NonStop I the longer they waited to upgrade. This was done in to provide an orderly transition to the new product line. At the final stages of the trade-in program, 100% credit was given for NonStop I CPU's traded in for a NonStop II. (CPU's account for approximately 50% of total system value). The trade-in program ended on June 30, 1983. As can be seen in Table 19, 38% of those polled had already upgraded while an additional 15% planned to do so (and we assume they already have since the poll was taken before the program ended). 13% had decided not to upgrade. Reasons given included (1) not enough additional power to justify the additional cost (2) paying for what you don't need (3) too costly, even with the trade-in credit and (4) would prefer to front-end the system with microcomputers and (5) are waiting for the NonStop III. Only 8% had started out with NonStop II's, reflecting the diminishing contribution from new customers, versus old.

TABLE 19

NonStop II Expansion Plans

Already Upgraded to NonStop II	38%
Plan to Upgrade to NonStop II	15
Started With NonStop II	8
Have Decided Not to Upgrade	13
Haven't Made a Decision Yet	18
No Response	<u>8</u> 100%

Source: Martin Simpson & Company, Inc.

Table 20 sheds some light on the pricing issue at Tandem. Average revenues per CPU have nearly doubled in six years, despite declining prices for the industry as a whole. Tandem has effectively maintained its prices, but is now running into customer resistance. It should be noted, of course, that newer CPU's are also much more powerful.

TABLE 20

Tandem Revenue Per CPU

	<u>CPU's</u>	<u>Revenue Per CPU (1)</u> (\$000)
1977	69	\$111.6
1978	176	138.1
1979	389	144.0
1980	653	166.9
1981	1,210	172.2
1982 (2)	1,542	202.4
1983E (2)	1,950	220.0

(1) Includes Service

(2) Increase in Revenues Per CPU are somewhat distorted on the high side as shipments represent net numbers and do not take into account returned NonStop I's.

(E) Estimate

Source: Martin Simpson & Company, Inc.

Perhaps the most impressive part of this survey is the fact that 97% will either definitely (58%) or probably (39%) expand their installations during the next twelve months, while only 3% will not. Not only does this demonstrate the value of an installed base and how difficult it is to convert software to another vendor, but also underscores customer loyalty to Tandem. Many of the users who complained the loudest about certain issues were the ones who were expanding their installations the most! However, combined with the results shown in Table 14 where 22% would possibly not choose Tandem again, it highlights the fact that while existing customers may be loyal, new customers may be hard to get unless some of the price/performance and support issues are resolved.

TABLE 21

User Expansion Plans Within Next Twelve Months

Will Definitely Expand	58%
May Expand	39
Will Not Expand	<u>3</u>
	100%

Source: Martin Simpson & Company, Inc.

Table 22 sets forth the percentage of users planning to expand within the eight categories listed. 69% of those polled were planning to add more Tandem processors. (This does not include NonStop II upgrades.) A total of 860 CPU's are expected to be added over the next twelve months, averaging 4.46 per user. Most were adding one or two CPU's while one customer planned to add 30 processors. The 860 CPU's represent more than two quarters' worth of Tandem shipments, indicating that if customers follow through with their plans, 1984 should be a very strong shipment year for the company.

TABLE 22

Tandem Expansion Plans By Product Category:
CPU's, Memory, Disk Drives, Terminals and Printers

	<u>% Of Users Expanding</u>
CPU'S	69%
Tandem Memory	61
Non - Tandem Memory	5
Tandem Disk Drives	76
Tandem Terminals	37
Non - Tandem Terminals	49
Tandem Printers	21
Non - Tandem Printers	52

Source: Martin Simpson & Company, Inc.

TABLE 23

Tandem CPU Expansion Plans Within Next Twelve Months

<u>No. Of CPU's Planned (1)</u>	<u>% Of Users</u>
1	37%
2	34
3-10	22
11-20	5
21+	<u>2</u>
	100%

Total CPU's Planned: 860

Average Planned CPU's User: 4.46

(1) Does not include upgrades of NonStop I's to NonStop II's

Source: Martin Simpson & Company, Inc.

61% of those polled planned to add Tandem memory. The average addition was 6.8 megabytes per user and a total of 1,320 Mb. Only 5% were planning to buy foreign memory (a total of only 34 Mb). However, several users felt that non-Tandem memory would become more prevalent unless Tandem lowered its memory prices. To date, this has certainly not been the case.

TABLE 24

Tandem Memory Expansion Plans Within Next Twelve Months

<u>Amount of Memory Planned</u>	<u>% Of Users</u>
Less than 1 Mb	26%
1.5 - 4 Mb	46
5 - 10 Mb	13
Greater than 10 Mb	<u>15</u>
	100%

Total Tandem Memory Planned: 1.32 Gb

Average Tandem Memory Planned Per User: 6.84 Mb

Source: Martin Simpson & Company, Inc.

TABLE 25

Non-Tandem Memory Expansion Plans
Within Next Twelve Months

<u>Amount Of Non-Tandem Memory Planned</u>	<u>% Of Users</u>
Less Than 1 Mb	11%
1.5 - 4 Mb	33
5 - 10 Mb	22
Greater Than 10 Mb	0
Undecided	34
	<u>100%</u>

Total Amount of Non-Tandem Memory Planned: 34 Mb
 Average Planned Amount of Non-Tandem Memory
 Per User: 180K

Source: Martin Simpson & Company, Inc.

76% of the users (more than any other category) planned to buy more disk drives, for a total of 1,525 units, or an average of nearly 8 drives per user. The most popular sizes were 128 Mb and 240 Mb capacities.

TABLE 26

Tandem Disk Drive Expansion Plans Within Next Twelve Months

<u>No. Of Tandem Disk Drives Planned</u>	<u>% Of Users</u>
1-2	59%
3-6	28
7-100	10
101+	3
	<u>100%</u>

Total Disk Drives Planned: 1,526
 Average Disk Drives Planned Per User: 7.91

Source: Martin Simpson & Company, Inc.

While 37% of those surveyed intended to purchase Tandem terminals, not too far below the 49% planning to add third-party terminals, the difference is enormous in terms of the absolute number of units to be added. Approximately 1,300 Tandem Model 6530 terminals will be bought, averaging 6.8 per user, with the majority purchasing very small quantities. However, these same users plan to buy nearly 17,000 non-Tandem terminals, for an average per user of 86 units. As would be expected, cost is the

major factor and several customers complained that Tandem priced its own terminals at approximately three times the third-party competition.

TABLE 27

Tandem Terminals Expansion Plans

<u>No. Of Tandem Terminals Planned</u>	<u>% Of Users</u>
1-2	19%
3-5	25
6-10	17
11-40	29
41-60	4
61-100	2
101+	4
	<u>100%</u>

Total Number of Tandem Terminals Planned: 1,311
 Average Number of Tandem Terminals Planned Per User:
 6.8 Units

Source: Martin Simpson & Company, Inc.

TABLE 28

Non-Tandem Terminals Expansion Plans

<u>No. Of Non-Tandem Terminals Planned</u>	<u>% Of Users</u>
1-2	10%
3-5	15
6-10	22
11-40	24
41-60	13
61-100	5
101-500	5
500-1000	4
1000+	2
	<u>100%</u>

Total Number of Non-Tandem Terminals Planned: 16,676
 Average Number of Non-Tandem Terminals Planned Per
 User: 86 Units

Source: Martin Simpson & Company, Inc.

The same situation prevailed for printers. More than half of the users polled planned to add third-party printers, for a total of 1,053 units, or an average of 5.5 units per customer. Only 21% expected to buy Tandem printers, for a total of 153 units.

TABLE 29

Non-Tandem Printer Expansion Plans

<u>No. Of Non-Tandem Printers Planned</u>	<u>% Of Users</u>
1	21%
2-5	27
6-50	44
51+	8
	<u>100%</u>

Total Number of Non-Tandem Printers Planned: 1,053
 Average Number of Non-Tandem Printers Planned Per User: 5.5 Units

Source: Martin Simpson & Company, Inc.

TABLE 30

Tandem Printer Expansion Plans

<u>No. Of Tandem Printers Planned</u>	<u>% Of Users</u>
1	53%
2-5	33
6+	14
	<u>100%</u>

Total Number of Tandem Printers Planned: 153
 Average Number of Tandem Printers Planned Per User: .8 Units.

Source: Martin Simpson & Company, Inc.

Conclusion

The survey results were generally quite positive but did identify some major problems that Tandem must cope with. Overall, most users felt that Tandem still offered the best total solution for their needs. Redundancy and easy expandability were the most important reasons in the selection process, followed by software, particularly data base management systems and networking. While competition in the fault-tolerant marketplace has intensified, Tandem still has a very significant lead, in our analysis. The newer entries (Stratus, Synapse, August, Parallel, No Halt) are largely still untested, often lack software, and most are less powerful than Tandem. Several of the leading computer vendors (Digital Equipment, IBM, and Hewlett-Packard) have introduced systems with some degree of redundancy but none offer truly fault-tolerant systems. Designing a fail-safe system which is compatible with existing software is an enormous engineering challenge.

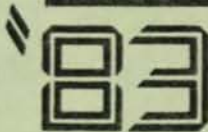
Clearly, the survey results indicate a high degree of customer loyalty as evidenced by the 97% who will either definitely or probably expand their installations in the coming year. However, the price/performance question is a thorny issue, particularly in terms of operating system overhead. The new products, due out later this year, should address this problem. Until these products are announced, it may prove difficult to add significant numbers of new customers.

The on-line transaction processing market is one of the fastest growing segments of the computer industry. Tandem has an excellent foothold in this market, particularly the banking segment which is growing at roughly twice the rate as the industry as a whole. The company's potential continues to be enormous and \$1 billion in revenues by 1986 appears to be a very attainable goal.

Le-ellen Spelman

Additional Information Available on Request

APPENDIX



ITUG CONFIDENTIAL TANDEM SURVEY

Dear Tandem User,

This brief questionnaire has been designed to provide the ITUG Board of Directors and the survey sponsor, Martin Simpson & Co., with objective, impartial, and unbiased information about Tandem users. Please fill this out immediately and return it in the attached envelope. The envelope has been pre-addressed for your convenience. The postage has been prepaid for all respondents returning the questionnaire from a U.S. location. International postal regulations prohibit us from prepaying mail sent from outside the U.S., so please attach whatever postage is necessary to return this.

All of your answers will be kept STRICTLY CONFIDENTIAL. No individual respondents will be identified. By guaranteeing you complete confidentiality, we hope you will respond freely and accurately.

Thank you very much for your understanding and consideration. Please mail this on or before May 20, 1983 so that your opinion is counted. We need to hear from you and appreciate your cooperation.

INSTRUCTIONS: Please circle or mark the response(s) which are most appropriate. If you would like to make additional comments or explain any of your answers further, please use Page 2 (the back) of this sheet. Thanks!

A. Do you or your organization own, lease, or use a Tandem system? Please circle the answer which best describes whether or not you are an official Tandem customer. Please circle only one answer. <4>

The Tandem computer system used by me and/or my organization ...

- [1] ... is owned by me or my organization.
- [2] ... is leased by me or my organization.
- [3] ... is used, but not owned or leased, by me or my organization.

B. How many years have you been a Tandem customer or a Tandem user? (If you have been a customer or user for less than 1.5 years, please put down "1" year.) <5>

- (a) I have been a Tandem customer for _____ year(s).
- (b) I have been a Tandem user for _____ year(s).

C. What is your principal application on or use of your Tandem? <6-7>

D. Which single category below best describes your organization? (Please circle only one answer. Thank you.) <8-9>

- [1] Banking
- [2] Finance, excluding banking or insurance
- [3] Insurance
- [4] Education and/or academic
- [5] Medical
- [6] Manufacturing
- [7] Government
- [8] Transportation
- [9] Services
- [10] Scientific
- [11] Other (please specify) _____

E. What is the geographic location of your primary Tandem system? (Please circle only one answer. Thank you.) <10>

- [1] Eastern U.S. (East of the Mississippi)
- [2] Western U.S. (West of the Mississippi)
- [3] Europe (including U.K. and Scandinavia)
- [4] Canada
- [5] Other (please specify the country) _____

Please rank your reasons for selecting Tandem. Use a scale of 1 thru 7, where "1" = the least important reason and "7" = the most important reason for selecting Tandem. Thank you.

- [] F. NonStop capability <11>
- [] G. Tandem's reputation <12>
- [] H. Expandability <13>
- [] I. Data Base management software <14>
- [] J. Price/Performance <15>
- [] K. Networking capability <16>
- [] L. Other (please specify) _____ <17>

M. What other vendors were seriously evaluated before you chose Tandem? (Please circle as many as apply. Thank you.) <18-35>

- [01] NCR
- [02] Prime
- [03] Data General
- [04] Hewlett-Packard
- [05] Synapse
- [06] August Computers
- [07] Burroughs
- [08] Honeywell
- [09] Stratus
- [10] Paragon Systems
- [11] IBM
- [12] Parallel Computing
- [13] DEC
- [14] Sequoia
- [15] Prime
- [16] Computer Consoles
- [17] Other (please list) _____

N. If the decision were being made today, would you still select Tandem? <36>

- [1] Yes
- [2] No

O. Please briefly explain your answer to the previous question. Thank you. <37-38>

Please rate Tandem on each of the items, below, using the following scale:

1 = Poor, 2 = Fair, 3 = Good, 4 = Very Good, 5 = Excellent, 6 = Don't Know/Not Applicable

- P. [] CPU reliability <39>
- Q. [] Peripheral reliability <40>
- R. [] Service quality <41>
- S. [] Service responsiveness <42>
- T. [] Hardware support <43>
- U. [] Software support <44>
- V. [] Applications software <45>
- W. [] Operating Systems software <46>
- X. [] DBMS software <47>
- Y. [] Networking software <48>
- Z. [] Applications languages <49>
- AA. [] Program development tools <50>
- BB. [] Overall satisfaction with Tandem <51>

Do you use or plan to use the following Tandem products?

- CC TRANSFER [1] Yes [2] No <52>
DD ENCOMPASS [1] Yes [2] No <53>
- EE How important is a 32 bit Tandem processor to you? (Please circle one answer.)
[1] Very important [2] Somewhat important [3] Not important
How many Tandem system CPU's do you have or use?
FF NonStop I CPU's: _____ <55-56> GG NonStop II CPU's: _____ <57-58>
- HH Is your system or the one you use composed of TNS I's or TNS II's? The system I use consists of _____ <59>
[1] only NonStop I's [2] only NonStop II's [3] both NonStop I's and NonStop II's
- II If you have or had NonStop I's, did you or do you plan to upgrade to NonStop II's?
[1] Already upgraded to NS II [2] Plan to upgrade to NS II
[3] Started with NS II—never had NonStop [4] Have decided not to upgrade [5] Haven't made a decision yet
If: If you answered "4" or "5" in the last question, please briefly explain why you are not or may not upgrade. Thank you. <61-62>

KK Will you be expanding your Tandem system in the next 12 months?
[1] Yes, definitely [2] Maybe [3] No, definitely not <63>

LL If you answered, "Yes" or "Maybe", ("1" or "2" in the preceding question), please describe how you plan to expand your system or installation(s) and give the approximate number of additional pieces of equipment, as listed below, which you plan to acquire (remember, your organization's name is not identified with this response so all information will be kept strictly confidential). "Our general plans are to _____ <64-65>

- MM Number of additional CPU's to be acquired: _____ <66-67>
NN Amount of additional Tandem memory: _____ <68-69>
OO Amount of additional non-Tandem memory: _____ <70-71>
PP Number of additional Tandem disk drives: _____ <71-73>
QQ Number of additional Tandem terminals: _____ <74-75>
RR Number of additional non-Tandem terminals: _____ <76-77>
SS Number of additional Tandem printers: _____ <78-79>
TT Number of additional non-Tandem printers: _____ <80-81>

(In the event you do not have a specific number, please give your best estimate for the preceding questions. Thank you.)

1 _____

2 _____

VV What is your *single* biggest compliment, if any, that you have for or about your Tandem or about Tandem Computers Incorporated? (That is, what do you like most?) _____ <86-87>

WW What is your *single* biggest complaint, if any, that you have about your Tandem or about Tandem Computers Incorporated? (That is, what bothers you the most?) _____ <88-89>

XX Name the *single* most important suggestion you can make to improve the International Tandem User's Group: _____ <90-91>

***** If you have additional comments, suggestions, or would like to explain an answer in detail, please use the following space. Please feel free to call Aaron Harber at (303) 443-2620 for clarification of any question.

Please return this questionnaire (no later than May 20, 1983) to:

ITUG CONFIDENTIAL TANDEM SURVEY
P. O. Box 2184
Boulder, CO 80306
U.S.A.

Thank you very much for your cooperation. The results will be published for everyone in the ITUG NEWSLETTER. Again, return this questionnaire on or before May 20th. Thanks!