Cypress Semiconductor Corporation

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Date Founded: 1982

CORPORATE STRATEGIC DIRECTION

Cypress Semiconductor Corporation was founded in 1982 and became publicly owned in May 1986. The company designs, develops, manufactures, and markets a broad line of high-performance digital integrated circuits that are fabricated using proprietary 0.8- and 1.2-micron complementary metal-oxide-silicon (CMOS) and bipolar complementary metal-oxide-silicon (BiCMOS) technologies.

According to Dataquest estimates, Cypress Semiconductor ranked 35th in the worldwide semiconductor market in 1990, based on estimated factory revenue of $223 million.* This represents the seventh consecutive year that Cypress has increased its market share ranking. The company's continual growth is fueled by the steady addition of new, high-performance products, 39 of which were introduced during fiscal year 1990. By the end of 1990, Cypress Semiconductor was shipping 198 products in seven distinct product areas: static random-access memories (SRAMs); programmable read-only memories (PROMs); programmable logic devices (PLDs); logic devices; reduced-instruction-set computing (RISC) microprocessors and peripherals; emitter-coupled logic (ECL) and transistor-transistor logic (TTL) BiCMOS devices; and memory modules. Cypress Semiconductor performs fabrication, assembly, and testing for over 95 percent of its products at its San Jose, California, and Round Rock, Texas, manufacturing facilities. In late 1990, the company concluded a major acquisition by purchasing Control Data Corporation's 170,000 square-foot wafer fabrication facility. This new fab facility, located in Bloomington, Minnesota, will be known as Cypress Semiconductor (Minnesota) Inc. and will give Cypress Semiconductor significant additional manufacturing capacity. Through this continued emphasis on U.S. manufacturing, the company claims it achieves very short cycle times, enabling it to be more flexible in responding to changing market conditions.

Total revenue increased 13.0 percent to $225.2 million in fiscal 1990, up from $199.3 million in 1989. A significant portion of Cypress Semiconductor's revenue growth was attributed to its subsidiaries, which accounted for 15.7 percent of total revenue in 1990 compared with 6.7 percent in 1989. Net income totaled $33.2 million for fiscal 1990, an increase of 8.2 percent over fiscal 1989. At the end of fiscal 1990, Cypress employed 1,595 people worldwide.

Cypress Semiconductor uses four methods to sell its products: direct OEM sales by the company's sales force, direct OEM sales by manufacturing representative firms, sales through domestic distributors, and sales through foreign trading companies and representative firms. The company currently has 20 sales offices in the United States, supplemented by strong ties to 6 North American distributors. Cypress Semiconductor also has 8 sales offices in Europe, an office in Japan, and a network of 32 international sales representative firms. In 1990, export sales contributed 22 percent of the company's total sales, consistent with export sales revenue totals for the previous two years.

In fiscal years 1990, 1989, and 1988, R&D expenditure totaled $55.6 million, $47.6 million, and $33.7 million, respectively. These figures total 24.7 percent, 23.9 percent, and 24.2 percent, respectively, of total revenue. R&D activities are currently focused on expanding the number of products offered and enhancing the performance of existing products. Cypress Semiconductor greatly utilizes its subsidiaries in performing such activities.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region. Tables 3 through 5 at the end of this backgrounder present comprehensive financial information.

*All dollar amounts are in U.S. dollars.

BUSINESS SEGMENT STRATEGIC DIRECTION

Cypress Semiconductor currently manufactures products in seven product areas: SRAMs, PROMs, PLDs, logic devices, RISC microprocessors and peripherals, ECL and TTL BiCMOS devices, and memory modules. These product areas are described in detail below.

SRAM

According to Dataquest, Cypress Semiconductor captured 7.9 percent of the fast SRAM worldwide market as measured in billions of bits during 1990. This figure ranked Cypress Semiconductor fourth in that market, trailing only Fujitsu Limited, Hitachi Ltd., and Sony Corporation. High-speed SRAMs are utilized for storage and retrieval of data in computers and other electronic systems. Fast SRAMs are used for functions such as cache memory to store the data being processed by the computer's central processing unit. The company's SRAM product line is broad and well diversified, featuring a 44-product portfolio with densities from 64 bits to 256Kb. During fiscal 1990, Cypress Semiconductor's SRAM product line accounted for 38 percent of the company's total revenue. Cypress Semiconductor's latest family of SRAMs, at the 1Mb density level, began shipping in volume in 1991. The company plans on utilizing its new Minnesota wafer fab plant to assist in the manufacture of SRAM products, which the company hopes will increase future profits in this competitive product area.

PROM

PROMs, which accounted for 17 percent of the company's total revenue during both 1990 and 1989, are used in computers and telecommunications systems to store fixed data that are not altered during machine operation. PROMs are generally used in systems such as minicomputers and workstations, where speed requirements justify premium PROM prices. In 1990, Cypress Semiconductor introduced eight new products to increase its total product portfolio to 37. Among these products was the company's 64K CMOS PROM family, which includes five devices featuring access times down to 20 nanoseconds. According to the company, this represents a 43 percent performance advantage over the fastest competitive devices currently on the market. With densities ranging from 4Kb to 512Kb, Cypress Semiconductor claims it provides the broadest line of high-performance CMOS PROMs in the industry and commands a 50 percent market share. The slower yet less expensive CMOS product that the company manufactures with a PROM-equivalent function is an erasable PROM (EPROM). Cypress Semiconductor introduced its first high-speed CMOS EPROMs in September 1984, becoming one of the first companies to combine the fast operating speeds of PROMs with the low power consumption of the CMOS technology.

PLD

The "logic" in an electrical system performs the nonmemory functions, such as the organization and routing of signals throughout a computer, which constitute a significant portion of the circuitry in most systems. Cypress Semiconductor manufactures several of these logic circuits, which can be programmed by the user. The company's PLD Product Group grew faster than the company in 1990 and now represents 20 percent of total revenue, with the strongest growth occurring in its MAX EPLD family, which has products with densities up to 5,000 gates. In addition, the PLD product portfolio increased by almost 50 percent to 22 products. Among the new products recently introduced by Cypress Semiconductor are a group of fast address decoder PLDs that are designed to handle the high execution speed of new RISC computer and top-end complex-instruction-set computing (CISC) microprocessors.

Logic (Fixed, Standard Product Logic Functions)

The company's logic family consists of four different categories of nonprogrammable, high-speed, standard logic products. They include bit-slice microprocessor components used in high-performance computers and controllers; digital signal processing (DSP) components such as multipliers and multiplier-accumulators, which are used in imaging, pattern recognition, graphics and radar applications; and first-in/first-out (FIFOs) and dual-port RAMs, which are used in computers and communications equipment. Cypress Semiconductor's microprocessor family includes several high-speed 16-bit microprogrammable microprocessors developed for use in peripheral controller applications such as disk controllers, graphics controllers, and modems. With two new product introductions in 1990, the Logic Product Group, which represented 9 percent of the company's total revenue, now has a product portfolio of 35 products.

RISC Microprocessor

In 1988, Ross Technology Inc. was founded to spearhead Cypress Semiconductor's scalable processor architecture (SPARC) RISC microprocessor program. Since its founding, Ross has become a subsidiary of Cypress Semiconductor and has accepted responsibility for the enhancement and marketing of the company's 32-bit, 29-mips RISC microprocessor, the CY7C601. Ross has also been chartered to design, manufacture, and market an entire family of SPARC RISC microprocessor-related peripheral devices, including cache memory management units and cache RAM devices, all of which will perform at speeds of up to 40 MHz. RISC architecture computers are a recent development in computer design and use a smaller instruction set, which is limited to instructions that are determined to be used most often by the computer. As a result, RISC computers typically execute each instruction approximately four times more efficiently than a CISC machine. During 1990, Ross introduced three significant SPARC microprocessor products to provide a complete five-chip SPARC computer solution. The Ross chip set replaces over 20 chips, allowing designers to complete system designs in significantly shorter times. The three products consist of a 40-MHz 7C604 SPARC cache controller and memory management unit; a 256Kb cache RAM (7C157) with an access time of 20 nanoseconds; and the 7C611, an embedded control version of the SPARC integer unit optimized for cost-effective controller applications.

ECL and TTL BiCMOS Devices

Cypress Semiconductor's second subsidiary, Aspen Semiconductor Corporation, founded in 1987, produces BiCMOS ultrahigh-speed ECL and TTL memory and programmable logic products. During 1990, Aspen introduced four new products, for a total portfolio of 20 products. More recently, Aspen began volume production shipments of the 9-nanosecond 64K TTL Static RAM devices. Key applications for these devices have been in 40 MHz or greater RISC-based caches in workstations. In early 1991, Aspen also introduced the industry's fastest 22V10 PLD. At 7.5 nanoseconds, this product moves midsize PLDs into the performance range of the smaller, less-easy-to-use 20-pin PLDs for the first time. The company also expects to introduce an ECL 64K SRAM performing at 7 nanoseconds during 1991.

Memory Modules

During 1990, Cypress Semiconductor's subsidiary, Multichip Technology Incorporated, introduced 13 new standard modular products, bringing its total to 35. Multichip, which was incorporated in 1988, has been chartered to design and develop high-density memory and logic modules. These modules are assembled from high-performance devices in a single surface-mount package in order to create such custom or standard enhanced single-circuit equivalents as multimegabit SRAMs and complete cache memories. These modules can provide the solution to many of the advanced circuit "building blocks" required by modern systems designers. Among Multichip's new products are its high-speed 4Mb SRAMs and its first RAM FIFO modules, which take special advantage of relatively low-cost SRAMs to produce high-density FIFOs.

Further Information

For more information on Cypress Semiconductor's business segment, please contact Dataquest's Semiconductors *Worldwide* service.

Table 1
Five-Year Corporate Highlights (Thousands of U.S. Dollars)

	1986	1987	1988	1989	1990
Five-Year Revenue	50,878.0	77,251.0	139,388.0	199,339.0	225,232.0
Percent Change	-	51.84	80.44	43.01	12.99
Capital Expenditure	14,268.0	20,073.0	39,755.0	37,794.0	43,388.0
Percent of Revenue	28.04	25.98	28.52	18.96	19.26
R&D Expenditure	10,436.0	18,883.0	33,667.0	47,604.0	55,553.0
Percent of Revenue	20.51	24.44	24.15	23.88	24.66
Number of Employees	505	770	1,157	1,388	1,595
Revenue ($K)/Employee	100.8	100.3	120.5	143.6	141.2
Net Income	13,399.0	13,407.0	20,829.0	30,714.0	33,230.0
Percent Change	-	0.06	55.36	47.46	8.19

1990 Fiscal Year	Q1	Q2	Q3	Q4
Quarterly Revenue	52,831.0	53,839.0	55,558.0	63,004.0
Quarterly Profit	8,299.0	8,505.0	8,272.0	8,154.0

Source: Cypress Semiconductor Corporation Annual Reports and Forms 10-K
Dataquest (October 1991)

Table 2
Revenue by Geographic Region (Percent)

Region	1986	1987	1988	1989	1990
North America	82.00	81.00	77.00	77.00	78.00
All Others	18.00	19.00	23.00	23.00	22.00

Source: Cypress Semiconductor Corporation Annual Reports and Forms 10-K
Dataquest (October 1991)

1990 SALES OFFICE LOCATIONS

North America—19
Europe—8
Japan—1

MANUFACTURING LOCATIONS

North America

Bloomington, Minnesota
Wafer fabrication facility
Round Rock, Texas
Wafer fabrication facility
San Jose, California
Wafer fabrication, assembly, and testing facility

SUBSIDIARIES

North America

Aspen Semiconductor Corporation (United States)
Cypress Export Inc. (United States)
Cypress Semiconductor International Inc. (United States)
Cypress Semiconductor (Minnesota) Inc. (United States)
Cypress Semiconductor (Texas) Inc. (United States)
Multichip Technology Incorporated (United States)
Ross Technology Inc. (United States)

Europe

Cypress Semiconducteurs SARL (France)
Cypress Semiconductor GmbH (Germany)
Cypress Semiconductor Italia S.R.L. (Italy)
Cypress Semiconductor AB (Scandinavia)
Cypress Semiconductor Limited (United Kingdom)

Japan

Cypress Semiconductor K.K.

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1991

National Semiconductor

Cypress Semiconductor announced an agreement with National Semiconductor to transfer a 2K x 9 high-speed ECL BiCMOS SRAM to Cypress' current ECL SRAM product line. In addition to the 2K x 9 device, Cypress also acquired rights to National's 8K x 9 ECL SRAM, plus rights to certain patents and patent applications related to the design of these SRAMs.

1990

Altera Corporation

Cypress Semiconductor reached an agreement with Altera Corporation in which Altera acquired a 9 percent interest in Cypress Semiconductor (Texas) Inc. (CTI), Cypress' first wafer fabrication subsidiary, for $7.4 million. In addition, Altera received an option to purchase up to 20 percent of the shares of CTI. In return for this investment, Altera receives wafer fab capacity in increments based on its investment, access to CTI's 0.8-micron CMOS fabrication capacity, and access to Cypress' 0.65-micron PROM technology when it becomes available. As part of the agreement, Cypress Semiconductor will also receive rights to flagship products from Altera's MAX EPLD family of high-performance, high-density programmable integrated circuits.

Econotech

Cypress Semiconductor was granted the right of first refusal on any new chip designs created by the Soviet Union's International Center for Informatics and Electronics, a coalition of some 40 Soviet scientific organizations. Cypress has done so by becoming a charter member of Econotech, a newly formed joint venture composed of representatives of the Ministries and Enterprise Groups of the Soviet Union and members of U.S. corporations. Cypress agreed to put up $100,000 for the venture, from which the Soviets can withdraw royalties. For its part, the Soviets will get access to Cypress Semiconductor's chipmaking technology.

Logic Automation Incorporated
An agreement whereby Logic Automation will develop SmartModels simulation models for Ross Technology SPARC chips. The Ross SPARC chip sets to be supported include the CY7C601 integer unit microprocessor, the CY7C604 cache controller and memory management unit for single-processor applications, and the CY7C605 cache controller and memory management unit for multiprocessor applications. SmartModels are behavioral simulation models used for board- and system-level simulation.

1988

Texas Instruments
Cypress announced a second-source cross-licensing agreement with Texas Instruments for the manufacture of SPARC RISC microprocessor components. Under terms of the agreement, both companies will manufacture complete SPARC chip sets.

MERGERS AND ACQUISITIONS

1990

Control Data Corporation (CDC)
Cypress Semiconductor purchased CDC's CMOS wafer fab facility for an aggregate $14.7 million. The facility will become a subsidiary of Cypress and be known as Cypress Semiconductor (Minnesota) Inc.

1988

Ross Technology
Cypress Semiconductor acquired 70 percent of Ross Technology, a designer and marketer of high-power computer chips.

KEY OFFICERS

T. J. Rodgers
President and chief executive officer

Tom North
President, Aspen Semiconductor Corporation

Lothar Maier
President, Cypress Semiconductor (Minnesota) Inc.

Don J. Stoops
President, Cypress Semiconductor (Texas) Inc.

Andrew J. Paul
President, Multichip Technology Incorporated

Roger D. Ross
President, Ross Technology, Inc.

Mark K. Allen
Vice president, Manufacturing Operations

Antonio R. Alvarez
Vice president, Research and Development

Thomas A. Freeze
Vice president, Programmable Logic Devices

Jeffrey K. Kaszubinski
Vice president, Programmable Read Only Memory Group

Paul D. Keswick
Vice president, Logic Products Group

Steven H. Kaplan
Vice president, Quality and Reliability Assurance

Manuel H. Mere
Vice president, Manufacturing, San Jose

Michael Powell
Vice president, SRAM Product Group

R. Michael Starnes
Vice president, Process Technology

Lowell Turriff
Vice president, Marketing and Sales

PRINCIPAL INVESTORS

Jennison Associates Capital Corporation—10.88 percent
J. P. Morgan and Co. Incorporated—8.55 percent
Merrill Lynch Asset Management—6.90 percent

FOUNDERS

Fritz Beyerlein
Fred Jenne
Steven H. Kaplan
T. J. Rodgers
R. Michael Starnes
Lowell Turriff

Table 3
Balance Sheet
Fiscal Year Ending in January
(Thousands of U.S. Dollars)

Balance Sheet	1986	1987	1988	1989	1990
Cash	76,436.0	108,301.0	53,103.0	36,386.0	26,371.0
Receivables	15,630.0	19,801.0	32,841.0	47,271.0	57,304.0
Marketable Securities	NA	NA	36,349.0	60,255.0	65,279.0
Inventory	4,383.0	10,648.0	19,226.0	23,728.0	30,047.0
Other Current Assets	1,167.0	5,573.0	8,142.0	11,133.0	13,017.0
Total Current Assets	97,616.0	144,323.0	149,661.0	178,773.0	192,018.0
Net Property, Plants	51,275.0	65,641.0	89,358.0	97,620.0	103,356.0
Other Assets	1,962.0	5,892.0	5,592.0	9,365.0	14,021.0
Total Assets	150,853.0	215,856.0	244,611.0	285,758.0	309,395.0
Total Current Liabilities	21,504.0	31,244.0	39,418.0	50,307.0	52,826.0
Other Liabilities	19,804.0	21,347.0	19,721.0	16,029.0	12,857.0
Total Liabilities	41,308.0	52,591.0	59,139.0	66,336.0	65,683.0
Converted Preferred Stock	0	0	0	0	0
Common Stock	327.0	363.0	364.0	369.0	358.0
Other Equity	113,323.0	153,600.0	154,977.0	158,208.0	153,541
Retained Earnings	(4,105.0)	9,302.0	30,131.0	60,845.0	88,309.0
Total Shareholders' Equity	109,545.0	163,265.0	185,472.0	219,422.0	242,208.0
Minority Interest	0	0	0	0	1,504.0
Total Liabilities and Shareholders' Equity	150,853.0	215,856.0	244,611.0	285,758.0	309,395.0

NA = Not available

Source: Cypress Semiconductor Corporation
Annual Reports and Forms 10-K
Dataquest (October 1991)

Table 4
Consolidated Income Statement
Fiscal Year Ending in January
(Thousands of U.S. Dollars, except Per Share Data)

Consolidated Income Statement	1986	1987	1988	1989	1990
Revenue	50,878.0	77,251.0	139,388.0	199,339.0	225,232.0
U.S. Revenue	41,720.0	62,573.0	107,329.0	153,491.0	175,681.0
Non-U.S. Revenue	9,158.0	14,678.0	32,059.0	45,848.0	49,551.0
Cost of Sales	17,047.0	30,558.0	56,291.0	81,963.0	93,947.0
R&D Expense	10,436.0	18,883.0	33,667.0	47,604.0	55,553.0
SG&A Expense	10,249.0	14,664.0	22,353.0	29,261.0	33,437.0
Capital Expense	14,268.0	20,073	39,755	37,794.0	43,388.0
Pretax Income	14,733.0	17,442.0	32,031.0	46,625.0	50,349.0
Pretax Margin (%)	28.96	22.58	22.98	23.39	22.35
Effective Tax Rate (%)	50.70	33.90	35.00	34.10	34.00
Net Income	13,399.0	13,407.0	20,829.0	30,714.0	33,230
Shares Outstanding, Thousands	29,626	36,508	37,471	38,262	38,251
Per Share Data					
Earnings	0.45	0.37	0.56	0.80	0.87
Dividend	0	0	0	0	0
Book Value	3.70	4.47	4.95	5.73	6.33

Source: Cypress Semiconductor Corporation Annual Reports and Forms 10-K
Dataquest (October 1991)

Table 5
Key Financial Ratios
Fiscal Year Ending in January

Key Financial Ratios	1986	1987	1988	1989	1990
Liquidity					
Current (Times)	4.54	4.62	3.80	3.55	3.63
Total Assets/Equity (%)	137.71	132.21	131.89	130.23	127.74
Current Liabilities/Equity (%)	19.63	19.14	21.25	22.93	21.81
Total Liabilities/Equity (%)	37.71	32.21	31.89	30.23	27.12
Profitability (%)					
Return on Assets	8.88	6.21	8.52	10.75	10.74
Return on Equity	12.23	8.21	11.23	14.00	13.72
Profit Margin	26.34	17.36	14.94	15.41	14.75
Other Key Ratios					
R&D Spending % of Revenue	20.51	24.44	24.15	23.88	24.66
Capital Spending % of Revenue	28.04	25.98	28.52	18.96	19.26
Employees	505	770	1,157	1,388	1,595
Revenue ($K)/Employee	100.8	100.3	120.5	143.6	141.2
Capital Spending % of Assets	9.46	9.30	16.25	13.23	14.02

Source: Cypress Semiconductor Corporation Annual Reports and Forms 10-K
Dataquest (October 1991)

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CORPORATE STRATEGIC DIRECTION

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Total revenue increased 43.0 percent to $199.3 million* in fiscal year 1989, up from $139.4 million in fiscal year 1988. Net income totaled $30.7 million for fiscal year 1989, an increase of 47.5 percent over fiscal year 1988. Cypress Semiconductor employed 1,388 people during 1989.

Cypress Semiconductor utilizes both direct and indirect sales channels, with 19 sales offices located in the United States, 6 located in Europe, and 1 in Japan. Cypress Semiconductor makes frequent use of distributors and original equipment manufacturers (OEMs). Cypress Semiconductor has slowly been penetrating the international market. Over the past five years, international sales have increased from representing 12 percent of total revenue in fiscal year 1985 to 23 percent in fiscal year 1989. Cypress Semiconductor sees future growth in Europe, Asia, and Japan. In addition to its sales office in Japan, Cypress has sales representatives in Hong Kong, South Korea, Singapore, and Taiwan.

In fiscal years 1989, 1988, and 1987, R&D expenditure equaled $47.6 million, $33.7 million, and $18.9 million, respectively. These figures total 23.9 percent, 24.2 percent, and 24.4 percent, respectively, of total revenue. R&D activities are currently focused on expanding the number of products offered and enhancing the performance of existing products. Cypress Semiconductor greatly utilizes its subsidiaries in performing such activities.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region. Information on revenue by distribution channel is not available. Table 3, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

SRAM

Dataquest estimates that Cypress Semiconductor captured 7.0 percent of the fast SRAM worldwide market as measured in billions of bits during 1989; therefore, Cypress Semiconductor ranked fourth, trailing behind Fujitsu, Hitachi, and Integrated Device Technology. During fiscal year 1989, Cypress Semiconductor's SRAM product line accounted for 51 percent of total

*All dollar amounts are in US dollars.

revenue. High-speed SRAMs are utilized for storage and retrieval of data in computers and other electronic systems. Fast SRAMs are used for functions such as "cache memory" to store the data being processed by the computer's central processing unit. With the introduction of 13 new SRAM products in 1989, Cypress Semiconductor increased its SRAM product portfolio to 88 products, including modules. These new products included the final five of Cypress Semiconductor's seven-member 256-Kbit SRAM family, and a high-speed 128-Kbit cache RAM designed to be used with the Intel 80386 microprocessor. In fourth quarter 1990, the SRAM group will ship Cypress Semiconductor's new 0.65-micron CMOS technology in its 1-Mbit SRAM. Products from its Aspen and Multichip subsidiaries broaden Cypress' SRAM product line. For example, Aspen's TTL BiCMOS 64K CY7C160 family offers 12-nanosecond access times, 30 percent faster than its fastest CMOS 64K; Multichip's CYM1464 module is a 45-nanosecond 4-Mbit SRAM configured as a standard 32-pin DIP. SRAMs and logic high-speed BiCMOS ECL products are also designed through the Aspen subsidiary.

CMOS PROM

CMOS PROMs, which represented 17 percent of total revenue during fiscal year 1989, are used in computers and telecommunications systems to store fixed data that are not altered during machine operation. PROMs are used principally in systems such as minicomputers, where speed requirements justify premium PROM prices. In 1989, Cypress Semiconductor unveiled four new CMOS PROM products, increasing its PROM portfolio to 29 standard parts that possess memory sizes from 4 to 256 Kbits and access times ranging from 15 to 45 nanoseconds. These new products included two 20-nanosecond 16-Kbit PROMs and a 35-nanosecond 256-Kbit PROM. The CMOS product that Cypress Semiconductor manufactures with a PROM-equivalent function is an erasable PROM (EPROM). Cypress Semiconductor introduced its first high-speed CMOS PROMs in September 1984, becoming one of the first companies to combine the fast operating speeds of PROMs with the low power consumption of the CMOS technology.

PLD

User-programmable PLDs consolidate the functions of multiple logic devices in single chips. Several of these logic circuits can be programmed by the user. Cypress Semiconductor manufactures 15 different PLD products, which represented 18 percent of total revenue in fiscal year 1989. Although the fastest bipolar PLD is faster than the fastest Cypress Semiconductor CMOS PLD, its CMOS PLD has a power reduction of approximately 50 percent over its bipolar counterparts for the same function at the equivalent speed. Cypress' Aspen subsidiary's contributions to the Cypress product line enhance the depth of the line. Aspen's pure-ECL 3-nanosecond versions of industry-standard 16P4 and 16P8 PLDs are available. Cypress is preparing to introduce sub-10-nanosecond 22C10s in the near future.

Logic (Fixed, Standard Product Logic Functions)

Accounting for 8 percent of total revenue in fiscal year 1989, the logic product group's revenue grew 44 percent in fiscal year 1989 over 1988. With six new product introductions in 1989, the logic product portfolio totals 33 products. The logic product line consists of three different categories of fixed-function (nonprogrammable), high-speed, standard logic products. They include bit-slice microprocessor components used in high-performance computers and controllers; digital signal processing (DSP) components such as multipliers and multiplier-accumulators, which are used in imaging, pattern recognition, graphics, and radar applications; and FIFOs that are used in computers and communications equipment.

RISC Microprocessor

In 1988, Cypress Semiconductor released a very high-performance, 33-MHz, 32-bit RISC microprocessor that is manufactured using Cypress Semiconductor's proprietary dual-layer metal 0.8-micron CMOS fabrication process. The RISC microprocessor was developed using the SPARC architecture licensed from Sun Microsystems, Inc. Cypress Semiconductor's microprocessor family also consists of several high-speed 16-bit microprogrammable microprocessors developed for use in peripheral controller applications such as disk controllers, graphics controllers, and modems. Cypress' RISC products are designed by its Ross Technology subsidiary.

Modules

During fiscal year 1989, Cypress Semiconductor's subsidiaries represented 6 percent of total revenue. One of those subsidiaries, Multichip Technology, designs and develops high-density memory and logic modules assembled from high-performance devices. These modules are either custom models or standard

enhanced single-circuit equivalents such as multimegabit SRAMs and complete cache memory subsystems. Hence, modules can provide the solution to many of the advanced circuit "building blocks" required by modern systems designers.

Further Information

For more information on Cypress Semiconductor's business segment, please contact Dataquest's North American Semiconductor Market.

Table 1
Five-Year Corporate Highlights (Thousands of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$17,374.0	$50,878.0	$77,251.0	$139,388.0	$199,339.0
Percent Change	-	192.84	51.84	80.44	43.01
Capital Expenditure	NA	NA	NA	NA	$32,900.0
Percent of Revenue	NA	0	0	0	16.50
R&D Expenditure	$5,191.0	$10,436.0	$18,883.0	$33,667.0	$47,604.0
Percent of Revenue	29.88	20.51	24.44	24.15	23.88
Number of Employees	300	505	770	1,157	1,388
Revenue ($K)/Employee	$57.91	$100.75	$100.33	$120.47	$143.62
Net Income	($5,307.0)	$13,399.0	$13,407.0	$20,829.0	$30,714.0
Percent Change	-	352.48	0.06	55.36	47.46

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$46.18	$50.59	$51.80	$50.76
Quarterly Profit	$7.13	$7.60	$7.90	$8.05

NA = Not available

Source: Cypress Semiconductor Corporation Annual Reports and Forms 10-K Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	88.00	82.00	81.00	77.00	77.00
International	12.00	18.00	19.00	23.00	23.00

Source: Cypress Semiconductor Corporation Annual Reports and Forms 10-K Dataquest (1990)

1990 SALES OFFICE LOCATIONS

North America—19
Europe—6
Asia/Pacific—1
  Japan—1

MANUFACTURING LOCATIONS

North America

Round Rock, Texas
  Wafer fabrication facility
San Jose, California
  Wafer fabrication and assembly and testing facility

SUBSIDIARIES

North America

Aspen Semiconductor Corporation (United States)
Cypress Export, Inc. (United States)
Cypress Semiconductor International, Inc. (United States)
Cypress Semiconductor (Texas) Inc. (United States)
Multichip Technology Incorporated (United States)
Ross Technology, Inc. (United States)

Europe

Cypress Semiconducteurs SARL (France)
Cypress Semiconductor AB (Scandinavia)
Cypress Semiconductor GmbH (Germany)
Cypress Semiconductor Limited (United Kingdom)

Asia/Pacific

Cypress Semiconductor K.K. (Japan)

ROW

Cypress Export (Barbados)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

Altera Corporation

Altera Corporation will invest $7.4 million in Cypress' Round Rock, Texas, fabrication facility and will become a minority owner of the fab with an option to acquire up to, but no more than, 20 percent of the shares of the Cypress subsidiary. In exchange, Altera is guaranteed a portion of the fab's capacity on its current 0.8-micron CMOS process and the right to excess capacity on Cypress' next-generation process technology when it is introduced. Cypress gets access to the next generation of Altera's MAX EPLD family of high-performance, high-density programmable integrated circuits.

Logic Automation Incorporated

An agreement calls for Logic Automation Incorporated to develop SmartModels simulation models for Ross Technology/Cypress Semiconductor SPARC chips. The Ross/Cypress SPARC chip sets to be supported include the CY7C601 integer unit microprocessor, the CY7C604 cache controller and memory management unit for single-processor applications, and the CY7C605 cache controller and memory management unit for multiprocessor applications. SmartModels are behavioral simulation models used for board- and system-level simulation.

1988

Texas Instruments

Cypress Semiconductor will jointly develop RISC chips with Texas Instruments.

1987

Sun Microsystems

Cypress Semiconductor will market commercial versions of Sun Microsystems' scalable processor architecture 32-bit RISC microprocessors used in the Sun-4 workstation.

Altera Corporation

Under a five-year technology exchange agreement focused on the development of new, high-performance, high-density, user-configurable logic

products, Cypress will contribute its strengths in high-speed CMOS process and EPROM device development, backed by volume manufacturing capacity from its six-inch wafer fabrication facility in Austin, Texas. Altera will provide architecture, circuit design, and software support for the new family of products.

MERGERS AND ACQUISITIONS

1989

Ross Technology
Cypress Semiconductor acquired 70 percent of Ross Technology, a designer and marketer of high-power computer chips.

KEY OFFICERS

T. J. Rodgers
President and chief executive officer

Clive E. Barton
President, Cypress Semiconductor (Texas) Inc.

Tom North
President, Aspen Semiconductor Corporation

Andrew J. Paul
President, Multichip Technology Incorporated

Roger Ross
President, Ross Technology, Inc.

Mark K. Allen
Vice president, San Jose Manufacturing Operations and Static Random Access Memory Group

Antonio Alvarez
Vice president, Research and Development

Thomas A. Freeze
Vice president, Programmable Logic Device Group

Mike Powell
Vice president, Programmable Read Only Memory Group

Richard N. Gossen
Vice president, Logic Product Group

Steven H. Kaplan
Vice president, Quality and Reliability Assurance

R. Michael Starnes
Vice president, Process Technology

Lowell Turriff
Vice president, Marketing and Sales

PRINCIPAL INVESTORS

J. P. Morgan and Co. Incorporated—8.25 percent

FOUNDERS

Information is not available.

Table 3
Comprehensive Financial Statement
Fiscal Year Ending January
(Thousands of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$17,605.0	$97,616.0	$144,323.0	$149,661.0	$178,773.0
Cash	7,604.0	76,436.0	108,301.0	53,103.0	57,025.0
Receivables	6,241.0	15,630.0	19,801.0	32,841.0	47,271.0
Marketable Securities	NA	NA	NA	36,349.0	39,616.0
Inventory	3,058.0	4,383.0	10,648.0	19,226.0	23,728.0
Other Current Assets	702.0	1,167.0	5,573.0	8,142.0	11,133.0
Net Property, Plants	$24,181.0	$51,275.0	$65,641.0	$89,358.0	$97,620.0
Other Assets	NA	$1,962.0	$5,892.0	$5,592.0	$9,365.0
Total Assets	$41,786.0	$150,853.0	$215,856.0	$244,611.0	$285,758.0
Total Current Liabilities	$9,870.0	$21,504.0	$31,244.0	$39,418.0	$50,307.0
Long-Term Debt	$8,301.0	NA	NA	NA	NA
Other Liabilities	$6,018.0	$19,804.0	$21,347.0	$19,721.0	$16,029.0
Total Liabilities	$24,189.0	$41,308.0	$52,591.0	$59,139.0	$66,336.0
Total Shareholders' Equity	$17,597.0	$109,545.0	$163,265.0	$185,472.0	$219,422.0
Converted Preferred Stock	34,576.0	NA	NA	NA	NA
Common Stock	628.0	327.0	363.0	364.0	369.0
Other Equity	(17,607.0)	113,323.0	153,600.0	154,977.0	158,208.0
Retained Earnings	NA	(4,105.0)	9,302.0	30,131.0	60,845.0
Total Liabilities and Shareholders' Equity	$41,786.0	$150,853.0	$215,856.0	$244,611.0	$285,758.0
Income Statement	**1985**	**1986**	**1987**	**1988**	**1989**
Revenue	$17,374.0	$50,878.0	$77,251.0	$139,388.0	$199,339.0
US Revenue	15,289.1	41,720.0	62,573.3	107,328.8	153,491.0
Non-US Revenue	2,084.9	9,158.0	14,677.7	32,059.2	45,848.0
Cost of Sales	$9,996.0	$17,047.0	$30,558.0	$56,291.0	$81,963.0
R&D Expense	$5,191.0	$10,436.0	$18,883.0	$33,667.0	$47,604.0
SG&A Expense	$6,315.0	$10,249.0	$14,664.0	$22,353.0	$29,261.0
Capital Expense	NA	NA	NA	NA	$32,900.0
Pretax Income	($5,307.0)	$14,733.0	$17,442.0	$32,031.0	$46,625.0
Pretax Margin (%)	(30.55)	28.96	22.58	22.98	23.39
Effective Tax Rate (%)	NA	46.00	40.00	34.00	34.00
Net Income	($5,307.0)	$13,399.0	$13,407.0	$20,829.0	$30,714.0
Shares Outstanding, Thousands	23,065.0	29,626.0	36,508.0	37,471.0	38,262.0
Per Share Data					
Earnings	($0.23)	$0.45	$0.37	$0.56	$0.80
Dividend	NA	NA	NA	NA	NA
Book Value	$0.76	$3.70	$4.47	$4.95	$5.73

Table 3 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending January
(Thousands of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	1.78	4.54	4.62	3.80	3.55
Quick (Times)	1.47	4.34	4.28	3.31	3.08
Fixed Assets/Equity (%)	137.42	46.81	40.21	48.18	44.49
Current Liabilities/Equity (%)	56.09	19.63	19.14	21.25	22.93
Total Liabilities/Equity (%)	137.46	37.71	32.21	31.89	30.23
Profitability (%)					
Return on Assets	-	13.91	7.31	9.05	11.58
Return on Equity	-	21.08	9.83	11.95	15.17
Profit Margin	(30.55)	26.34	17.36	14.94	15.41
Other Key Ratios					
R&D Spending % of Revenue	29.88	20.51	24.44	24.15	23.88
Capital Spending % of Revenue	NA	0	0	0	16.50
Employees	300	505	770	1,157	1,388
Revenue ($K)/Employee	$57.91	$100.75	$100.33	$120.47	$143.62
Capital Spending % of Assets	NA	0	0	0	11.51

NA = Not available

Source: Cypress Semiconductor Corporation Annual Reports and Forms 10-K
Dataquest (1990)

Cypress Semiconductor Corporation

Table 1

Estimated Worldwide Semiconductor Revenue by Calendar Year (Millions of Dollars)

	1984	1985	1986	1987	1988
Total Semiconductor	4	18	50	76	135
Total Integrated Circuit	4	18	50	76	135
Bipolar Digital (Function)					
Bipolar Digital Memory					
Bipolar Digital Logic					
MOS (Function)	4	18	50	76	135
MOS Memory	4	18	42	57	94
MOS Microdevices					7
MOS Logic			8	19	34
Analog					
Total Discrete					
Total Optoelectronic					

Table 2

Cypress Semiconductor Corporation 1988 Worldwide Ranking by Semiconductor Markets (Revenue in Millions of Dollars)

	1988 Rank	1987 Rank	1988 Revenue	Sales % Change 1987-1988	Industry % Change 1987-1988
Total Semiconductor	46	60	$135	77.6%	33.0%
Total Integrated Circuit	41	50	$135	77.6%	37.4%
MOS (Function)	31	39	$135	77.6%	54.5%
MOS Memory	23	22	94	64.9%	93.1%
MOS Microdevices	42	50	7		39.9%
MOS Logic	39	46	34	78.9%	29.2%

Source: Dataquest
December 1989

Cypress Semiconductor Corporation

Table 3

Cypress Semiconductor Corporation
Estimated 1988 Semiconductor Revenue by Geographic Region
(Millions of Dollars)

	U.S.	Japan	Europe	ROW
Total Semiconductor	$109	$4	$21	$1
Total Integrated Circuit	$109	$4	$21	$1
Bipolar Digital (Function)				
Bipolar Digital Memory				
Bipolar Digital Logic				
MOS (Function)	$109	$4	$21	$1
MOS Memory	75	2	16	1
MOS Microdevices	6		1	
MOS Logic	28	2	4	
Analog				
Total Discrete				
Total Optoelectronic				

Source: Dataquest
December 1989

Cypress Semiconductor Corporation

Cypress Semiconductor Corporation
3901 North First Street
San Jose, California 95134-1599
Telephone: (408) 943-2600
(Millions of Dollars)

Balance Sheet (December 29)

	1985	1986
Total Current Assets	$17.61	$ 97.62
Cash	$ 7.60	$ 76.44
Receivables	$ 6.24	$ 15.63
Inventory	$ 3.06	$ 4.38
Net Property, Plant, and Equipment		
Depreciation	$24.18	$ 51.28
Total Assets	$41.79	$150.85
Current Liabilities	$ 9.87	$ 21.50
Long-Term Debt	$ 8.30	$ 0.04
Total Liabilities	$24.19	$ 41.31
Total Shareholders' Equity	$17.60	$109.55
Conv. Preferred Stock	$34.58	0
Common Stock	$ 0.63	$113.90
Retained Earnings	0	0

Income Statement (December 29)

	1985	1986
Revenue	$17.37	$ 50.88
Cost of Sales	$10.00	$ 17.05
Gross Margin (%)	42.43	66.49
R&D Expense	$ 5.19	$ 10.44
SG&A Expense	$ 6.32	$ 10.25
Other Expense	0	0
Operating Income (Loss)	($ 4.13)	$ 13.15
Interest, Net	($ 1.18)	$ 1.59
Pretax Income	($ 5.31)	$ 14.73
Provision for Taxes	0	$ 7.47
Effective Tax Rate (%)	N/A	50.7
Net Extraordinary Items	($ 5.31)	$ 13.40
Average Shares Outstanding (Millions)	23.07	29.63
Capital Expenditures	$ 7.91	$ 32.31
Employees	N/A	505

N/A = Not Available

Source: Cypress Semiconductor Corp. Annual Report

Cypress Semiconductor Corporation

THE COMPANY

Overview

Cypress Semiconductor Corporation designs, manufactures, and markets high-performance, high-speed ICs using CMOS process technology. The Company was incorporated in California in December 1982 as INTJR, Inc. In March 1983, the Company adopted its present name; in February 1987, it was reincorporated in Delaware.

Cypress was founded by T.J. Rodgers, Fritz Beyerlein, Fred Jenne, Steve Kaplan, Michael Starnes, and Lowell Turriff. Dr. Rodgers, president and chief executive officer, managed the SRAM development team at Advanced Micro Devices (AMD) before forming Cypress. Most of the other key executives worked with Dr. Rodgers at AMD or at American Microsystems.

Cypress uses 1.2-micron or smaller CMOS technology to produce a broad line of standard products for numerous performance-driven niche markets. The Company focuses on products with minimal Japanese competition and differentiates its products with better speed, power, and value-added features.

Cypress offers fast static random access memories (SRAMs); erasable programmable read-only memories (EPROMs); and first-in, first-out (FIFO) memories; programmable logic devices (PLDs); a bit-slice family; and digital signal processing (DSP) devices.

In December 1986, Cypress formed a wholly owned subsidiary, Cypress Semiconductor Texas Inc. (CSTI) in Round Rock, Texas. (Cypress owns 100 percent of the outstanding CSTI common and preferred shares.)

Highlights

- December 1982—Incorporated as INTJR, Inc.
- March 1983—Renamed Cypress Semiconductor Corporation
- April 1983—Raised $19.8 million in first-round and lease financing
- July 1983—Set up a technology/product agreement with Monolithic Memories, Inc. (MMI)
- April 1984—Raised $11.7 million in second-round financing
- December 1984—Achieved sales of $3.2 million
- March 1985—Raised $10.5 million in third-round financing
- August 1985—Raised $10.5 million in fourth-round financing

Cypress Semiconductor Corporation

- September 1985—Achieved profitability
- October 1985—Set up a license agreement with Matra-Harris
- December 1985—Achieved sales of $17.4 million
- June 1986—Raised $72.8 million in an initial public offering
- December 1986—Achieved sales of $50.9 million, a 193 percent growth rate
- December 1986—Formed a subsidiary in Texas
- February 1987—Reincorporated in Delaware
- March 1987—Raised $39.8 million through the sale of 3.5 million shares of common stock

Management and Employees

Board of Directors. Cypress' board of directors comprises prominent members of the venture capital community who have substantial experience in the semiconductor industry. Chairman L.J. Sevin was formerly founder and president of Mostek; Pierre Lamond was a founder of National Semiconductor Corporation and served as a vice president; and L. John Doerr was formerly a sales manager at Intel. Table 1 lists Cypress board members and their affiliation.

Table 1

Cypress Semiconductor Corporation
Board of Directors

Name	Position	Affiliation
L.J. Sevin	Chairman	Sevin Rosen Management Company
Pierre R. Lamond	Director	Sequoia Partners
L. John Doerr	Director	Kleiner, Perkins, Caufield & Byers
T.J. Rodgers	Director	Cypress Semiconductor Corporation

Source: Cypress Semiconductor Corp.

Cypress employed 505 people as of December 1986; 22 in administration, 45 in engineering and quality assurance, 145 in manufacturing, 53 in R&D, 186 in assembly and test, and 54 in marketing and sales. In 1987, Cypress added about 50 people to staff its Round Rock facility. Table 2 lists the officers of the Company.

Table 2

Cypress Semiconductor Corporation
Officers of the Company

Name	Position
T.J. Rodgers	President, chief executive officer, director
Clive E. Barton	President, Cypress Semiconductor Texas Inc.
Stanley J. Meresman	Vice president, finance and administration, chief financial officer, assistant secretary
Fritz Beyerlein	Vice president, manufacturing, assembly and test
Richard Gossen	Vice president, product development
Fred Jenne	Vice president, research and development
Steve Kaplan	Vice president, engineering
Mark Allen	Vice president, wafer fabrication
R. Michael Starnes	Vice president, process development
Lowell Turriff	Vice president, marketing and sales

Source: Cypress Semiconductor Corp.

Financial Information

Between 1983 and 1985, Cypress completed four rounds of venture capital and lease financing for a total of about $52.0 million. In June 1986, Cypress raised $72.8 million through an initial public offering and a follow–on offering of common stock.

In March 1987, Cypress offered 3.5 million shares of common stock, raising $39.8 million. The Company plans to use about $30.0 million during 1987 for capital expenditures. Of this amount, approximately $26.0 million will be used for wafer manufacturing and test and assembly equipment to expand production capacity at Cypress' San Jose and Texas facilities. Approximately $4.0 million will be used for R&D equipment and general administration at the Company's facilities in San Jose.

Cypress generated its first revenue in 1984 and has been profitable each quarter since the third quarter of 1985. The Company reported revenue of $17.37 million and a net loss of $5.31 million in 1985 and revenue of $50.88 million and a net income of $13.40 million in fiscal 1986.

Shareholders. As of December 28, 1986, there were 32.7 million outstanding shares of common stock held by approximately 1,000 shareholders. Table 3 lists Cypress' principal shareholders and the percentage of shares they hold after the offering in February 1987.

Table 3

Cypress Semiconductor Corporation
Principal Shareholders

Shareholders	Percentage of Shares
Kleiner, Perkins, Caufield & Byers	7.9%
Sevin Rosen Management Company	6.9%
T.J. Rodgers	1.9%
Monolithic Memories, Inc.	0.6%
Matra-Harris Semiconducteurs	0.2%
Prudential Venture Partners	0.2%
Thermco Systems, Inc.	0.2%
Eaton Corporation	*
KLA Instruments Corporation	*
All Officers and Directors as a Group	21.0%

*Less than 0.1%

Source: Cypress Semiconductor Corporation Prospectus

Facilities

Cypress fabricates 5-inch wafers in a subclass-10, 15,000-square-foot clean room at its San Jose, California, plant (Fab I). Almost all of the Company's products are assembled in a second clean room at its San Jose plant. A test area is organized as part of the assembly facility. In January 1987, Cypress occupied a 60,000-square-foot facility adjacent to its existing facility in San Jose.

During the second quarter of 1986, the Company leased a 65,000-square-foot wafer fabrication plant in Round Rock, Texas. This facility houses Fab II, which produces six-inch wafers in a class-1 clean room and is expected to reach its maximum capacity of 3,000 wafers a week before mid-1988.

PRODUCTS AND MARKETS

Semiconductor Product Markets

CMOS memory sales accounted for all of Cypress' 1984 and 1985 revenue, as shown in Table 4. In 1986, CMOS memory accounted for 90 percent of revenue, with CMOS logic making up the remainder.

Cypress Semiconductor Corporation

Sales in the United States accounted for 88 percent of 1986 revenue, with the remainder attributed to European sales, as shown in Table 5.

Table 4

Cypress Semiconductor Corporation
Estimated Worldwide Semiconductor Revenue
(Millions of Dollars)

	1984	1985	1986
Total Semiconductor	$4	$18	$50
Total Integrated Circuit	$4	$18	$50
CMOS Total	$4	$18	$50
CMOS Memory	4	18	45
CMOS Logic	-	-	5

Source: Dataquest
November 1987

Table 5

Cypress Semiconductor Corporation
Estimated 1986 Worldwide Semiconductor Revenue by Region
(Millions of Dollars)

	United States	Europe	World
Total Semiconductor	$44	$6	$50
Total Integrated Circuit	$44	$6	$50
CMOS Total	$44	$6	$50
CMOS Memory	40	5	45
CMOS Logic	4	1	5

Source: Dataquest
November 1987

Cypress Semiconductor Corporation

Marketing Strategy

Cypress is executing the following strategy:

- To offer high-performance products that command premium prices
- To utilize advanced technology (1.5-micron CMOS or smaller) as a technology barrier
- To target niche markets small enough to be unattractive to large companies (Most of the markets in which Cypress competes have a TAM of less than $40 million.)
- To proliferate multiple product lines
- To differentiate within product markets by using special packaging, access to military markets, and advanced designs for proprietary features

Major Competitors

The firm with the most comparable capability is Integrated Device Technology (IDT), which generated revenue of $77.8 million in its fiscal year ending March 29, 1987. However, IDT competes directly with Cypress only in high-density SRAMs, and in particular, those sold to military subcontractors.

Channels of Distribution

The Company uses four channels to sell its products: direct OEM sales through Cypress' sales force and manufacturing representatives firms, sales through distributors, and sales to Japan through the Tomen Electronics Corporation, a Japanese trading company.

Semiconductor Products and Technologies

Technology

The Company has been shipping products fabricated using 1.2-micron CMOS RAM technology since March 1984 and has made limited revenue shipments of an SRAM based on 0.8-micron CMOS RAM technology since April 1986. In addition, Cypress has shipped products using a 0.9-micron CMOS EPROM technology since November 1984.

Product Lines

SRAMs. Fast SRAMs constitute the largest single product line, accounting for an estimated 50 percent of current revenue. Cypress has limited its participation to access times of 55ns or less and initially focused on lower density components, an area where there is less competition. Cypress has earned a reputation as a good, reliable supplier of

fast SRAMs in the lower-density levels (i.e., from 1K to 16K). The Company has been quite successful in "pushing" technology in order to lower the access times of lower-density SRAMs to the 15ns to 20ns range.

In 1986, Cypress ranked ninth among suppliers of fast 16K SRAMs. New SRAM products include a 25ns 64K SRAM introduced in the first quarter of 1987. The Company plans for even faster speeds in low-density devices and also for a more gradual move to the high densities (e.g., fast 256K SRAMs).

EPROMs. Cypress' EPROMs are replacement devices for bipolar PROMS. Cypress devices differ from their bipolar counterparts in that the data can be erased. The PROM market is highly fragmented, as different organizations, speeds, and circuit features are available at each density level. Cypress has focused on the highest-performance segment of the market and has incorporated many features, including registers and self-diagnostics, on the chip to differentiate its products further.

Cypress gained attention in 1985 with the introduction of high-speed CMOS EPROMs that offer access times of 55ns and below.

FIFO. FIFO memories are principally used in communications-buffering applications in which speed is generally a critical factor. Cypress has used its advanced CMOS process to attack the military and bit-slice architecture FIFO niche markets. Cypress' strength is in providing a full product line for the implementation of bit-slice systems.

PLDs. PLDs constitute Cypress' third major product family (an estimated 10 percent of revenue in 1986). The Company has been granted royalty-free rights to the patents on certain Monolithic Memories, Inc., programmable array logic (PAL) devices under an agreement reached in July 1983. (PAL is a registered trademark of Monolithic Memories, Inc.) In return, Cypress gave MMI a royalty-free license to use its 1.2-micron CMOS process technology.

Two companies that offer CMOS PLDs are Altera and Lattice Semiconductor. Altera manufactures its erasable programmable logic device (EPLD), using CMOS EPROM technology, but these devices are not directly compatible with PALs. Lattice Semiconductor also uses a CMOS EPROM technology to produce a generic logic array (GAL) family similar to Advanced Micro Devices' 22V10 logic circuits.

Bit-Slice Family. Cypress' bit-slice family contains CMOS versions of AMD's bipolar 2901 series, principally the 4-bit MPU, sequencer, and controller.

Digital Signal Processing. DSP products consist of 16x16 multipliers and multiplier-accumulators used as building blocks for applications such as imaging, pattern recognition, graphics, and radar.

Table 6 lists Cypress' products.

Cypress Semiconductor Corporation

Table 6

Cypress Semiconductor Corporation
Products

Products	Speed	Introduced
SRAMs		
1K SRAM	15ns	First quarter 1984
64–Bit SRAM	15ns	Fourth quarter 1984
16K SRAM	35ns	Fourth quarter 1984
4K SRAM	25ns	Fourth quarter 1984
16K SRAM	25ns	First Quarter 1985
64–Bit SRAM	35ns	Fourth quarter 1985
4K SRAM	15ns	Second quarter 1986
64K SRAM	25ns	First quarter 1987
EPROMs		
16K Registered EPROM	35ns	Third Quarter 1984
4K EPROM	25ns	Second quarter 1985
8K EPROM	30ns	Second quarter 1985
16K EPROM	25ns	Third quarter 1985
64K Registered EPROM	40ns	Second Quarter 1986
64K EPROM	40ns	Fourth quarter 1986
128K EPROM	45ns	Second quarter 1986
FIFOs		
64x4/x5 FIFO	15 MHz	Fourth quarter 1984
64x4 FIFO	2 MHz	Fourth quarter 1984
64x4/x5 FIFO	25 MHz	Fourth quarter 1985
64x8/x9 FIFO	35 MHz	Second quarter 1987
PLDs		
PAL 16L8/R6/R4	25ns	Second quarter 1985
PAL 22V10	25ns	First quarter 1986
PAL 20G10	25ns	Second quarter 1986
DSP		
16x16 Multiplier	38ns	First quarter 1986
16x16 Multiplier–Accumulator	45ns	Second quarter 1986
16x16 Multiplier	45ns	Third quarter 1986
Microcomponents		
4–Bit–Slice MPU	23ns	First quarter 1985
4–Bit Sequencer	30ns	Fourth quarter 1985
16–Bit–Slice MPU	24ns	Second quarter 1986
12–Bit Controller	50ns	Third quarter 1986

Source: Cypress Semiconductor Corp.

Cypress Semiconductor Corporation

Semiconductor Agreements

- Monolithic Memories, Inc. (MMI)—In July 1983, Cypress obtained a patent and royalty-free trademark license to use, manufacture, and sell certain PAL products developed by MMI. In exchange, MMI received a royalty-free license to use Cypress' 1.2-micron CMOS process. MMI provided fabrication facilities, equipment, and equipment-financing guarantees of up to $5 million. MMI purchased 375,000 shares of Cypress Series-A preferred stock for $250,000 and was granted a warrant to purchase up to 750,000 shares of Cypress' common stock for $1.33 per share (valued at $0.10 per share). MMI exercised this option in 1986.

- Matra-Harris Semiconducteurs (MHS)—In October 1985, Cypress granted MHS a $1 million license for manufacturing certain products in Europe, using Cypress' 1.2-micron CMOS RAM and 0.9-micron CMOS EPROM technologies. In addition, this license gives MHS worldwide marketing rights on the products that it designs. In 1986, MHS exercised an option to license the 0.8-micron CMOS technology for $3.0 million. MHS also became a preferred shareholder through the purchase of 333,000 shares of Cypress' Series-D stock for $2.5 million. In a second agreement, MHS licensed Cypress' dual-level metal technology for $500,000.

- Weitek Corporation—In October 1985, Cypress licensed its SRAM register file technology and a portion of its logic technology to Weitek in exchange for a patent license covering some of Weitek's logic products. No royalty or fees were incurred by either party.

- Sun Microsystems—In July 1987, Cypress and Sun agreed to jointly develop a reduced instruction set computer (RISC) MPU product line, based on the Sun scalable processor architecture (SPARC). This second-generation SPARC MPU chip will include an integer processor, a floating-point processor, a memory management unit (MMU), and cache memory.

Data General Corporation

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Westboro, Massachusetts 01580
Telephone: (508) 366-8911
Fax: (508) 366-1272
Dun's Number: 04-590-3218

Date Founded: April 15, 1968

CORPORATE STRATEGIC DIRECTION

Data General Corporation (DG) designs, manufactures, and markets general-purpose computer and communications systems, peripheral equipment, software, and related products and services, including maintenance and training.

Data General manufactures computer products for commercial applications, industrial automation, and other applications. Commercial applications include integrated information processing, distributed data processing, office automation, database management, transaction processing, communications, and decision support. Industrial automation applications include CAD, CAM, CAE, manufacturing planning and control, testing, process control, and environmental surveillance. Other applications include scientific and laboratory research, medical instrumentation and imaging, signal analysis, data acquisition, education, instrumentation, and monitoring and control.

The Company reported revenue of $1.4 billion* for fiscal 1988, an increase of 7 percent over 1987; however, it posted a net loss for the third year in a row, losing approximately $16 million in fiscal 1988. Equipment sales accounted for 67 percent of total sales; services accounted for 33 percent.

Data General's strategy for the 1990s includes three main points: retaining the advantages of the Company's proprietary systems while providing connectivity with other vendors' systems, distributing applications on networks consisting of products based on industry-standard microprocessors and operating systems, and integrating computing and telecommunications.

Data General has recognized the growing importance of the UNIX industry-standard operating system and its impact in the domain of commercial applications. The Company has responded to the availability of high-quality reduced-instruction-set computing (RISC) microprocessors and the increasing number of applications developed for UNIX-based systems by developing its Motorola 88000-based AViiON industry-standard product line, which began shipping 1989. The AViiON product line supports DG/UX, an advanced implementation of the UNIX operating system, providing symmetric multiprocessor support, a robust commercial-grade file system, and a unique scheduler for improved throughput under heavy load. Data General further emphasizes its commitment to industry standards with an extensive set of standard communications protocols supporting the MV and AViiON product lines.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Computer Systems

In the business computer market, Dataquest estimates that Data General held the number 12 market share position in 1988.

Data General's proprietary systems are grouped into the following product families: 32-bit systems in the ECLIPSE MV/Family; 16-bit ECLIPSE systems; DESKTOP GENERATION systems; DATA GENERAL/One laptop computer systems and DASHER family intelligent workstations; the DS/7500 Series of technical workstations; NOVA systems; and microNOVA microproducts.

*All dollar amounts are in U.S. dollars.

ECLIPSE computers are 32- or 16-bit computers using medium, large, and very large-scale integration (VLSI). They are capable of using substantially all of the Company's peripheral equipment, they use a more powerful instruction set than the NOVA family, and they are capable of executing most programs that operate on the NOVA family. ECLIPSE 32-bit computers are available in the MV/Family of scientific and commercial configurations.

ECLIPSE MV/Family systems are the backbone of Data General. Data General has introduced new products to the MV/Family such as the MV/40000 series and the low-end MV/1000 DC systems. The newest addition to the MV/Family is the MV/18000 Series, introduced in October 1989. ECLIPSE MV/Family systems offer better price/performance than systems from IBM and Digital. The MV/18000 Series offers total compatibility with the MV/Family.

Data General introduced new models of the midrange line of MV/Family systems in May 1989. The ECLIPSE MV/15000S Series, made up of three models with different memory and storage configurations, provides the same flexibility and single board upgradeability as the MV/15000 Series. Additionally, the MV/15000S Series includes an integrated floating-point unit, providing a higher level of performance for technical, scientific, and commercial applications, and achieves a new price/performance level for midrange systems. The MV/15000 Series will continue to be offered for customers who require a la carte configurations and pricing.

The DS/7500 Series of workstations—primarily used in engineering, scientific, and technical applications—consists of 32-bit standalone and distributed workstations, which are based on the ECLIPSE MV/Family architecture and use color or monochrome applications. The DS/7500 Series supports the AOS/VS or DG/UX operating systems.

Data General's industry-standard product line, introduced in February 1989, consists of the AViiON family of UNIX workstations, servers, and multiuser systems based on the Motorola 88000 RISC microprocessor. The AViiON family establishes industry-leading price/performance standards for RISC-based systems. These systems span a broad range of performance, from 17-mips workstations to symmetric multiprocessing systems with high-end performance of 40 mips.

Data General introduced a PC workstation family in August 1989, compatible with the IBM PC AT that runs MS-DOS and offers users a wide selection in performance, configurability, and footprint to meet a variety of distributed computing requirements. The three systems—the compact DASHER/286-12c, the midrange DASHER/386sx, and the high-powered, 25-MHz DASHER/386-25—support Data General's DG/PC*I personal computer networking software, CEO office automation software, and other components of the Company's distributed computing strategy.

Additionally, Data General offers a 16-MHz DASHER/386 and a 25-MHz DASHER/386-25 UNIX system. Both support the industry-standard 386/ix UNIX operating system, which features easy portability to and from Data General's DG/UX UNIX operating system.

Software

Data General offers operating systems in the proprietary market with such products as the AOS/VS and AOS/VS II multiprogramming systems and AOS/RT32, a real-time subset of AOS/VS. Data General also offers industry-standard operating systems including MS-DOS and DG/UX, an industry-standard UNIX implementation compatible with both AT&T System V Release 3 and BSD 4.3.

During 1989, DG also announced DG/UX Revision 4.1, the first UNIX operating system capable of running on a full family of RISC machines from single-user workstations to multiprocessor-based systems. As mentioned previously, it supports fully symmetric multiprocessing and offers a commercial-grade file system, a multilevel scheduler, and a basis for high-availability, fault-tolerant systems.

Display Terminals

Data General ranked ninth in the 1988 overall display terminal market. The Company competes in Segment 1 of the display terminal market, holding the number sixth market share position.

Further Information

For further information about the Company's business segments, please contact the appropriate industry service.

TABLE 1

Five-Year Corporate Highlights (Millions of U.S. Dollars)

	1984	1985	1986	1987	1988
Five-Year Revenue	$1,161	$1,239	$1,268	$1,274	$1,365
Percent Change	6.72	2.34	0.47	7.14	
Capital Expenditure	$130	$167	$130	$143	$97
Percent of Revenue	11.20	13.48	10.25	11.22	7.11
R&D Expenditure	$102	$128	$143	$159	$165
Percent of Revenue	8.79	10.33	11.28	12.48	12.09
Number of Employees	17,695	16,535	15,565	15,685	15,420
Revenue ($K)/Employee	$65.60	$74.93	$81.46	$81.24	$88.50
Net Income	$83	$24	($29)	($124)	($16)
Percent Change		(71.08)	(220.83)	327.59	(87.10)

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	342.7	306.08	357.1	N/A
Quarterly Profit	7.00	(23.12)	(84.10)	N/A

N/A = Not Available

Source: Data General Corp. Annual Reports
Dataquest
January 1990

TABLE 2

Revenue by Geographic Region (Percent)

Region	1984	1985	1986	1987	1988
North America	71.00	68.00	64.00	58.00	54.00
International	29.00	32.00	36.00	42.00	46.00
Europe	18.00	18.00	22.00	27.00	29.00
All Others	11.00	14.00	14.00	15.00	17.00

Source: Data General Corp. Annual Reports

TABLE 3

Revenue by Distribution Channel (Percent)

Channel	1988
Direct Sales	50.00
Indirect Sales	50.00

Source: Data General Corp.

1988 SALES OFFICE LOCATIONS

North America—92
Europe—50
All Others—21

MANUFACTURING LOCATIONS

Location/Function

North America

Apex, North Carolina
Systems integration, central processor assembly and test, printed circuit board assembly and test
Clayton, North Carolina
Printed circuit board fabrication, assembly, and test
Portsmouth, New Hampshire
Printed circuit board assembly and test, central processor assembly and test, IC preconditioning and test, systems integration and test
Westbrook, Maine
Peripheral manufacturing, metal fabrication

Japan

Gyoda
Printed circuit board assembly and test, mass storage manufacturing, systems integration

Asia/Pacific

Bangkok, Thailand
Cable and harness manufacturing, peripheral assembly and test, PC assembly and test
Manila, Philippines
Printed circuit board assembly and test, power supply manufacturing, PC assembly and test

ROW

Chihuahua, Mexico
Systems integration, central processor assembly and test, cable and harness manufacturing, field engineering product repair

During 1988, Data General's manufacturing facilities total approximately 1.9 million square feet, of which 44,000 square feet are leased in Chihuahua, Mexico.

SUBSIDIARIES

North America

China Data General Corporation (Delaware, United States)
DG Foreign Sales Corp., Inc. (Virgin Islands)
Dama Technologies Corp. (Delaware, United States)
Data General Canada Inc. (Canada)
Data General Commercial Systems, Inc. (Delaware, United States)
Data General Development Corp. (Massachusetts, United States)
Data General International Sales Corporation (Delaware, United States)
Data General Investment Corporation (Delaware, United States)
Data General Latin America, Inc. (Delaware, United States)
Data General Puerto Rico, Inc. (Delaware, United States)
Data General Subsidiary, Inc. (Delaware, United States)
Datagen, Inc. (Delaware, United States)
Design Data, Inc. (Massachusetts, United States)
Digicom, Inc. (Delaware, United States)
Digital Computer Controls, Inc. (Delaware, United States)
Long Island Communications Corp. (Delaware, United States)
WSA Systems and Services, Inc. (California, United States)

Japan

Nippon Data General Corporation (Japan)

Europe

Data General AB (Sweden)
Data General A.G. (Switzerland)
Data General A/S (Norway)
Data General ApS (Denmark)
Data General Europe, Inc. (France)
Data General France SARL (France, state of jurisdiction Delaware)
Data General GmbH (West Germany)
Data General Holland BV (Netherlands)
Data General Ireland, Ltd. (Ireland)
Data General Limited (United Kingdom)
Data General OY (Finland)
Data General (Portugal) Sociedade de Computadores Lda (Portugal)
Data General S.A. (Belgium)

Data General S.A. (Spain)
Data General S.p.A. (Italy)

Asia/Pacific

Asia Data General Corporation (Korea, state of jurisdiction Delaware)
Data General Australia Pty., Ltd. (Australia)
Data General Gesellschaft mbH (Australia)
Data General Hong Kong, Ltd. (Hong Kong)
Data General Hong Kong Sales & Service, Ltd. (Hong Kong)
Data General Importing, Ltd. (New Zealand)
Data General International Manufacturing Pte, Ltd. (Singapore)
Data General New Zealand Limited (New Zealand)
Data General Philippines, Inc. (Philippines)
Data General Singapore Pte., Ltd. (Singapore)
Data General Thailand (Thailand)

ROW

Data General Chile S.A. (Chile)
Data General Costa Rica, S.A. (Costa Rica)
Data General de Mexico, S.A. de C.V. (Mexico)
Data General del Peru, S.A. (Peru)
Data General Israel, Ltd. (Israel)
Data General Ltda (Brazil)
Data General Venezuela C.A. (Venezuela)
General Risk Insurance Company Ltd. (Bermuda)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

October 1989

Trinity Computing Systems
DG announced that Trinity will offer three health care software solutions on DG's systems under a new independent software vendor (ISV) agreement.

Telesoft Inc. and Software Systems Design
DG announced ISV agreements with Telesoft and Software Systems Design for the development of Ada software products for DG's new AViiON family.

September 1989

Medical Data Processing Inc. (MDP)
MDP will offer MDpl Medical Practice Software on DG equipment under a new value-added reseller (VAR) agreement.

August 1989

Legal Data Systems (LDS)
DG and LDS have signed an ISV agreement to provide the first legal solutions running on the new DG AViiON systems.

Hewlett-Packard (HP)
DG signed an agreement to license the HP NewWave software environment from HP.

July 1989

SARTOX Data Systems
SARTOX will offer SunPac automated student and financial accounting solutions on DG systems.

Cybertek, Informix, Oracle, Progress, and Relational Technology Informix
DG announced agreements with at least 15 leading software developers to port their products to the AViiON Family. The packages represent a broad range of development, utility, and business applications software giving AViiON users access to thousands of different applications.

June 1989

Phoenix Technologies Ltd.
Phoenix Technologies signed a licensing agreement with DG to develop a customized version of its OpenPC software for the UNIX-based AViiON family.

OASYS Inc.
DG and OASYS announced the OASYS Cross Development Software Tool Kit for the DG AViiON and DASHER/386 product families.

May 1989

Green Hills
Under an agreement, Green Hills' compilers will be offered on all of DG's UNIX-based, industry-standard systems.

Zetaco Inc.
Zetaco signed a $5 million, three-year VAR agreement for the new 88000-based AViiON systems. Additionally, Zetaco will license the DG/UX operating system.

February 1989

Novell
DG will port Novell's new Open NetWare LAN services to the Data General ECLIPSE MV/ Family of computers and to the Company's new AViiON family of Motorola 88,000 based systems.

January 1989

Infostat, Inc.
The two companies announced an ISV agreement where Infostat will provide its Hospital Information and Control System software, running on DG ECLIPSE MV/Family systems, to hospitals with 75 to 250 beds.

TLD Systems Ltd.
Under an ISV agreement, TLD will supply the Ada/1750A Compiler System, which enables users of DG ECLIPSE MV/Family computers to develop and test Ada programs targeted for U.S. MIL-STD-1750A based-systems.

May 1988

International Treasury Systems and Fame Software Corp
Under ISV agreement, the companies arranged to sell applications in the financial industries.

April 1988

Motorola
The two companies announced an agreement to develop an ultra-high speed version of the Motorola 88,000 RISC microprocessor family using ECL semiconductor technology.

O.D. Systems
DG announced a joint marketing agreement for O.D. Systems' manufacturing and distribution software.

December 1988

Pacer Software
In an ISV agreement, the companies announced that Pacer would supply PacerLink terminal emulation and desktop connectivity software that integrates Apple Macintosh PCs with ECLIPSE MV/Family systems.

1988

Broadway & Seymour and Diversified Computer Products
These companies agreed to work to provide bank branch automation solutions by integrating Data General's CEO software with platform and teller functions so the user has access to a full range of information from a single workstation.

Singapore Telecom
The two companies agreed to jointly develop an intelligent information network. Singapore Telecom markets the new system, Public Office Automation System (POAS), to approximately 180,000 corporations in Singapore.

M.I.T. Lausanne
Under an ISV agreement, M.I.T. Lausanne was to provide its CREDOC Letter of Credit System for the European banking market.

Standard & Poors Trading (S&P)
Under an ISV agreement, S&P was to provide S&P Stockmate software, a market quotation and information system for retail investment brokers.

October 1987

Nippon Telegraph & Telephone
The companies agreed to develop a new generation of high-speed digital integrated communication systems.

KEY OFFICERS

Edson D. de Castro
President and chief executive officer

Ronald L. Skates
Executive vice president and chief operating officer

Herbert Richman
Executive vice president and director

Michael Schneider
Vice president, Customer Services

Michael B. Evans
Vice president and chief financial officer

Bill Cunningham
Vice president, Worldwide Manufacturing Operations

Stephen P. Baxter
Vice president, Corporate Marketing

PRINCIPAL INVESTORS

Capital Group, Inc.—7.9 percent
Bernstein, Sanford C. & Co.—7.2 percent
State of Wisconsin Investment Board—5.0 percent

FOUNDERS

Edson D. de Castro
Henry Burkhardt, III
Herbert J. Richman
Frederick R. Adler
Richard Sogge

Table 4

Comprehensive Financial Statement
Fiscal Year Ending September
(Millions of U.S. Dollars, except Per Share Data)

Balance Sheet	1984	1985	1986	1987*	1988*
Total Current Assets	$788	$900	$823	$642	$669
Cash	199	298	272	137	141
Receivables	249	250	260	275	289
Marketable Securities	5	29	30	0	0
Inventory	324	306	238	190	185
Other Current Assets	11	17	23	40	54
Net Property, Plants	$262	$331	$367	$399	$373
Other Assets	$10	$13	$51	$14	$20
Notes Receivable	$9	$18	$16	$13	$15
Total Assets	$1,069	$1,262	$1,257	$1,068	$1,077
Total Current Liabilities	$329	$296	$320	$383	$390
Long-Term Debt	$135	$299	$241	$80	$66
Other Liabilities	$11	$9	$14	$13	$9
Total Liabilities	$475	$604	$575	$476	$465
Total Shareholders' Equity	$594	$658	$682	$592	$612
Converted Preferred Stock	0	0	0	0	0
Common Stock	0.25	230	268	303	333
Other Equity	183	(7)	7	6	12
Retained Earnings	411	435	407	283	267
Total Liabilities and Shareholders' Equity	$1,069	$1,262	$1,257	$1,068	$1,077
Income Statement	**1984**	**1985**	**1986**	**1987***	**1988***
Revenue	$1,161	$1,239	$1,268	$1,274	$1,365
U.S. Revenue	821	847	806	734	737
Non-U.S. Revenue	340	392	462	540	628
Cost of Sales	$659	$727	$702	$684	$686
R&D Expense	$102	$128	$143	$159	$165
SG&A Expense	$298	$341	$391	$438	$471
Capital Expense	$130	$167	$130	$143	$97
Pretax Income	$110	$35	$14	($70)	($7)
Pretax Margin (%)	9.47	2.82	1.10	(5.49)	(0.51)
Effective Tax Rate (%)	38.70	31.00	35.00	(14.90)	130.60
Net Income	$83	$24	($29)	($124)	($16)
Shares Outstanding, Millions	25,939	26,432	27,057	26,964	28,015
Per Share Data					
Earnings	$3.21	$0.92	($1.07)	($4.59)	($55.00)
Dividends	0	0	0	0	0
Book Value	$0.02	$0.02	$0.03	$0.02	$0.02

*1987 and 1988 have been restated to adopt the Statement of Financial Accounting Standard No. 96.

Continued on Next Page

Table 4 *(Continued)*

Comprehensive Financial Statement
Fiscal Year Ending September
(Millions of U.S. Dollars, except Per Share Data)

Key Financial Ratios	1984	1985	1986	1987	1988
Liquidity					
Current (Times)	2.40	3.04	2.57	1.68	1.72
Quick (Times)	1.41	2.01	1.83	1.18	1.24
Fixed Assets/Equity %	44.09	50.30	53.81	67.40	60.95
Current Liabilities/Equity (%)	55.36	44.98	46.92	64.70	63.73
Total Liabilities/Equity (%)	79.93	91.79	84.31	80.41	75.98
Profitability (%)					
Return on Assets	-	2.06	(2.30)	(10.67)	(1.49)
Return on Equity	-	3.83	(4.33)	(19.47)	(2.66)
Profit Margin	7.15	1.94	(2.29)	(9.73)	(1.17)
Other Key Ratios					
R&D Spending % of Revenue	8.79	10.33	11.28	12.48	12.09
Capital Spending % of Revenue	11.20	13.48	10.25	11.22	7.11
Employees	17,695	16,535	15,565	15,685	15,420
Revenues ($K)/Employee	$65.60	$74.93	$81.46	$81.24	$88.50
Capital Spending % of Assets	12.16	13.23	10.34	13.39	9.01

Source: Data General Corp. Annual Reports January 1990

Dataproducts Corporation

6200 Canoga Avenue
Woodland Hills, California 91365-0746
Telephone: (818) 887-8000
Fax: (818) 887-4789
Dun's Number: 00-116-2320

Date Founded: 1962

CORPORATE STRATEGIC DIRECTION

Dataproducts Corporation's strategic plan is to establish itself as the leading hard-copy output source for the information systems industry. It manufactures a broad range of band, dot matrix, laser, solid ink, and thermal printers, and a wide range of printer supplies. The Company also sells line and serial matrix printers produced by other manufacturers. Digital communications systems, airborne sensors and controllers, and TEMPEST printers designed and manufactured by Dataproducts are sold primarily to the U.S. government.

Since December 1988, DPC Acquisition Partners of New York City has been making acquisition overtures and has threatened to initiate a tender offer for the entire Company. To block this unfriendly takeover, Dataproducts put itself up for sale in February 1989 by authorizing Goldman, Sachs & Co. to seek a possible buyer for the Company. Two conditional proposals to acquire the whole company were received, but neither contained firm financing commitments or assurances that satisfied the board that adequate financing could be secured.

Dataproducts and Goldman, Sachs & Co. also discussed a leveraged recapitalization of Dataproducts with 10 major banks, none of which was interested in financing such a transaction.

The board therefore elected to move forward with a restructuring plan as the best strategy for maximizing shareholder value. It came up with five major actions to be implemented during the restructuring.

The first step will be to reduce costs and expenses in order to improve the Company's current and future profitability. Actions toward this end will include dividing the Company into three standalone operations: printer equipment, printer supplies, and solid ink printers. Also, most domestic manufacturing operations will be phased out and relocated to manufacturing plants in Hong Kong and Ireland, eliminating approximately 400 jobs. Moreover, the Company will move its focus from black-and-white solid ink printers to developing a color solid ink printer, discontinue its automatic ticketing and boarding pass printers, and revise its executive compensation plans.

The second major action will be to sell Dataproducts New England, a subsidiary that provides government and military customers with data communications equipment, airborne equipment, and computer printers. The proposed sale of this subsidiary is in keeping with the board's decision to refocus the Company's operations primarily on the computer printer equipment, solid ink, and printer supplies businesses.

Third, Trizec Properties has agreed to buy the Woodland Hills real estate for $63 million*in cash. The sale is subject to three conditions: a review of title, inspection of the property and improvements, and geologic and toxic testing. Dataproducts will lease back the Woodland Hills facilities for two years while relocating the remaining organizations to a nearby site. Additional properties in Milford, New Hampshire, and Austin, Texas, also are being offered for sale.

The fourth and fifth elements concern the monetary effects of the first three. Fourth is the distribution of a special cash dividend to shareholders, assuming that the Company is able to complete the proposed Dataproducts New England and Woodland Hills sales. Fifth is a one-time charge to the Company of

*All dollar amounts are in U.S. dollars.

approximately $45 million to cover relocation, severance compensation, write-offs of discontinued product lines, taxes on previously undistributed foreign earnings, and legal and investment banking costs. Gains from the sales of Woodland Hills and Dataproducts New England are expected to offset this charge.

Dataproducts' total revenue increased 2 percent to $353 million in fiscal 1989 from $345 million in fiscal 1988. Net income increased 119 percent to $3.8 million in fiscal 1989 from 1988's $20.2 million loss. Dataproducts employs approximately 3,500 people worldwide.

The U.S. sales contribution to the Company's total revenue grew to $257 million in 1989. U.S. sales accounted for 73 percent of total sales, up from 71 percent in fiscal 1988. Although 72 percent of its sales offices are in the United States, most of its manufacturing plants are in non-U.S. locations.

Research and development expenditures totaled $26.1 million in fiscal 1989, representing 7 percent of revenue. Capital expenditures totaled $11.7 million, or 3 percent of revenue.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Peripherals

During the last three years, Dataproducts' laser product revenue has risen to 25 percent of its printer sales revenue. The maturing impact printer segment slowed in 1989 but still represents a majority of Dataproducts' business. These facts provide evidence that Dataproducts is moving from being an impact printer vendor to a broader output-imaging vendor, with a balance of nonimpact and impact products. Dataquest estimates that Dataproducts' serial printer models ranked in the lower twentieth percentile and its page printer models in the lower twenty-fifth percentile in 1988. The top five manufacturers in the page printer market made up 74 percent of the 1988 market, according to Dataquest estimates. However, the strength of Dataproducts' printers was in the line printer products. In 1988, per Dataquest's estimate, Dataproducts ranked as one of the top five line printer companies, which made up 73 percent of this market.

Dataproducts is counting on solid ink jet printers to play a significant role in the printer industry. It is investing heavily to finance the strategically important technology so as to be a leader in this product market segment. In fact, Dataproducts' 1988 acquisition of Imaging Solutions, Inc., gave the Company 100 percent ownership of this new technology. It has already introduced a monochrome solid ink printer and now is concentrating its resources and efforts toward developing a color solid ink printer.

Further Information

For further information pertaining to the Company's business segment, please contact the appropriate industry service.

Table 1
Five-Year Corporate Highlights (Millions of U.S. Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$471,828	$353,837	$338,758	$345,248	$353,364
Percent Change	-	(25.01)	(4.26)	1.92	2.35
Capital Expenditure	$21,704	$8,846	$10,840	$7,250	$11,661
Percent of Revenue	4.60	2.50	3.20	2.10	3.30
R&D Expenditure	$30,803	$30,997	$22,352	$26,656	$26,086
Percent of Revenue	6.53	8.76	6.60	7.72	7.38
Number of Employees	5,700	4,200	N/A	N/A	3,500
Revenue ($K)/Employee	$82.78	$84.25	-	-	$100.96
Net Income	$27,693	($26,767)	$8,965	($20,203)	$3,782
Percent Change	-	(196.66)	133.49	(325.35)	118.72

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$85.46	$83.33	$79.96	N/A
Quarterly Profit	$0.81	$0.02	($7.68)	N/A

N/A = Not Available

Source: Dataproducts Corporation Annual Reports and Forms 10-K
Dataquest
January 1990

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	81.29	76.70	73.23	70.62	72.77
International	18.71	23.30	26.77	29.38	27.23
Europe	14.05	17.48	19.83	20.89	20.98
Asia/Pacific	4.66	5.82	6.94	8.49	6.25

Source: Dataproducts Corporation Annual Reports and Forms 10-K
Dataquest
January 1990

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	0	0
Indirect Sales	100.00	100.00
Distributor	60.00	60.00
OEM	40.00	40.00

Source: Dataquest
January 1990

1989 SALES OFFICE LOCATIONS

North America—18
Europe—5
Asia/Pacific—2

MANUFACTURING LOCATIONS

North America

Milford, New Hampshire
Manufacturing plant up for sale
Norcross, Georgia
Manufactures printer supplies
Woodland Hills, California
Manufactures serial printers

Europe

Dublin, Ireland
Manufactures line and matrix printers and printer supplies

Asia/Pacific

Hong Kong
Manufactures components for line and serial printers

ROW

Porto, Portugal
Manufactures printer supplies

SUBSIDIARIES

North America

Dataproducts New England, Inc. (United States)
Dataproducts (Santa Clara), Inc. (United States)
Echodata Corporation (United States)
Imaging Solutions, Inc. (United States)

Europe

Dataproducts (Dublin) (Ireland)

Asia/Pacific

Dataproducts Components Limited (Hong Kong)
Dataproducts (Hong Kong) Limited (Hong Kong)
Dataproducts Trading Limited (Hong Kong)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1988

GoldStar Telecommunications Co. Ltd.
Manufacturing rights for band printers

Videoton Trading Co.
Line printer license

1987

Hewlett-Packard (HP)
Marketing HP's family of line matrix printers

Howtek, Inc.
Ink jet patents

Wenger Printers AG
Coordinating resources in product design, R&D, and product customization

MERGERS AND ACQUISITIONS

1989

Echodata Corporation
Acquired this printer supplies manufacturer and distributor

1988

Imaging Solutions, Inc.
Acquired solid ink jet printer technology

KEY OFFICERS

Jack C. Davis
Chairman of the board, president and chief executive officer

Robert L. Doretti
Executive vice president, Sales and Marketing

Robert W. Kilcullen
Executive vice president, Printer Business

Charles A. Junkune
Senior vice president, Finance, and chief financial officer

John W. Leggat, III
Senior vice president, Solid Ink Programs

Irvin W. Maloney
Senior vice president, Supplies Business Group

Frank J. McQuaid
Senior vice president, Corporate Development

W. Allen Surber
Senior vice president, Research and Engineering

PRINCIPAL INVESTORS

Equitable Life Assurance Society of the U.S.—21.4 percent

Table 4
Comprehensive Financial Statement
Fiscal Year Ending March 31
(Millions of U.S. Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$294,714	$267,788	$261,476	$237,954	$177,350
Cash	121,471	126,648	114,787	101,892	36,830
Receivables	84,780	72,259	66,761	72,586	69,067
Marketable Securities	0	0	0	0	0
Inventory	85,110	64,841	74,470	59,304	68,831
Other Current Assets	3,353	4,040	5,458	4,172	2,622
Net Property, Plants	$60,404	$52,818	$50,826	$40,220	$43,962
Other Assets	$15,165	$13,499	$13,538	$31,394	$35,799
Total Assets	$370,283	$334,105	$325,840	$309,568	$257,111
Total Current Liabilities	$108,911	$91,663	$85,440	$112,558	$60,434
Long-Term Debt	$12,575	$25,462	$16,263	$2,993	$3,202
Other Liabilities	$5,868	$3,000	$3,438	$7,590	$6,148
Total Liabilities	$127,354	$120,125	$105,141	$123,141	$69,784
Total Shareholders' Equity	$242,929	$213,980	$220,699	$186,427	$187,327
Converted Preferred Stock	0	0	0	0	0
Common Stock	2,076	2,088	2,100	1,968	1,971
Other Equity	97,302	98,446	99,550	93,312	93,577
Retained Earnings	143,551	113,446	119,049	91,147	91,779
Total Liabilities and Shareholders' Equity	$370,283	$334,105	$325,840	$309,568	$257,111

Income Statement	1985	1986	1987	1988	1989
Revenue	$471,828	$353,837	$338,758	$345,248	$353,364
U.S. Revenue	383,561	271,409	248,085	243,824	257,156
Non-U.S. Revenue	88,267	82,428	90,673	101,424	96,208
Cost of Sales	$324,792	$260,112	$231,066	$253,624	$256,916
R&D Expense	$30,803	$30,997	$22,352	$26,656	$26,086
SG&A Expense	$83,877	$83,948	$69,490	$78,306	$67,822
Capital Expense	$21,704	$8,846	$10,840	$7,250	$11,661
Pretax Income	$28,848	($24,262)	$11,070	($11,643)	$5,799
Pretax Margin (%)	6.11	(6.86)	3.27	(3.37)	1.64
Effective Tax Rate (%)	11.50	4.00	19.00	37.00	34.00
Net Income	$27,693	($26,767)	$8,965	($20,203)	$3,782
Shares Outstanding, Millions	20.88	21	19.68	19.7	19.8
Per Share Data					
Earnings	$1.32	($1.29)	$0.43	($0.98)	$0.19
Dividends	$0.16	$0.16	$0.16	$0.16	$0.16
Book Value	$10.25	$10.51	$9.47	$9.55	$10.00

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending March 31
(Millions of U.S. Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	2.71	2.92	3.06	2.11	2.93
Quick (Times)	1.92	2.21	2.19	1.59	1.80
Fixed Assets/Equity (%)	24.86	24.68	23.03	21.57	23.47
Current Liabilities/Equity (%)	44.83	42.84	38.71	60.38	32.26
Total Liabilities/Equity (%)	52.42	56.14	47.64	66.05	37.25
Profitability (%)					
Return on Assets	-	(7.60)	2.72	(6.36)	1.33
Return on Equity	-	(11.72)	4.12	(9.92)	2.02
Profit Margin	(5.67)	(7.56)	2.65	(5.85)	1.07
Other Key Ratios					
R&D Spending % of Revenue	6.53	8.76	6.60	7.72	7.38
Capital Spending % of Revenue	4.60	2.50	3.20	2.10	3.30
Employees	5,700	4,200	N/A	N/A	3,500
Revenue ($K)/Employee	$82.78	$84.25	N/A	N/A	$100.96
Capital Spending % of Assets	5.86	2.65	3.33	2.34	4.54

N/A = Not Available

Source: Dataproducts Corporation Annual Reports and Forms 10-K
Dataquest
January 1990

Daewoo Telecom Ltd.

Daewoo Telecom Ltd.
Daewoo Center,
541 Namdaemoonno 5ga, Chung-gu,
Seoul, South Korea
Telephone: 82-2-726-2114
Fax: 82-2-756-1225
Dun's Number: Not Available

Date Founded: 1983

CORPORATE STRATEGIC DIRECTION

Daewoo Telecom Ltd. is the telecommunications arm of the Daewoo Group, one of the largest business conglomerates in Korea. It was founded in 1983 when Daewoo took over Taihan Telecommunications Co. Ltd. and merged it with Kwangjin Electronics Co. Ltd. Since then, it has grown into one of Korea's top telecommunications companies with total sales of $301 million* in 1990.

Daewoo Telecom specializes in the development and manufacture of high-tech computers in the communications field. The company is divided into five major divisions: Computers and Peripherals, Switching Systems, Transmission Systems, Telecommunication Systems, and Semiconductors. Its major products include a nationwide computer network, public switching systems, fiber optics, PCs, and semiconductors. With three subsidiaries and five production plants, Daewoo employs approximately 3,200 people worldwide.

Daewoo's strategy is to become a technological leader in the computer and communications industries by balancing its overseas and domestic activities. In 1990, its domestic sales totaled $203 million, while its overseas sales totaled only $98 million. According to its five-year plan, Daewoo expects both its domestic and overseas sales to grow to $672 million, totaling $1,344 million in 1994.

As part of its strategy to concentrate on its overseas activities, Daewoo Telecom took over Leading Edge Products in November 1989. A revamped distribution strategy and new products have helped Leading Edge turn around from the dire financial straits it had experienced before the takeover. Its new products include 80286-, 80386-, and 80486-based desktop systems, 80386-based laptops, notebook PCs, and several monitors. The company seems to have found its niche in the PC marketplace by selling solid products in the middle range. With the help of the company's new sales strategy of using only authorized national and local distributors, Leading Edge Products expects sales to total $100 million in 1991.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlight and revenue by region. Information on revenue by distribution channel is not available. Tables 3 through 5 at the end of this backgrounder present comprehensive financial information.

BUSINESS SEGMENT STRATEGIC DIRECTION

Computers and Peripherals

In 1990, computer sales totaled $125 million, constituting about 73 percent of Daewoo Telecom's total number of exports and 41 percent of its total sales. The computers are sold under its own brand name in Asia and Europe and by Leading Edge Products Inc. under the brand name Model-D in the United States and Canada.

Daewoo manufactures the 80386-based 33-MHz PC and notebook PCs, including the 286-16MHz and 386SX-based 20MHz. Five different versions of Model-D are available in the United States.

*All dollar amounts are in U.S. dollars.

Telecommunications Terminals

Daewoo Telecom is also one of the largest manufacturers of telecommunications terminals such as telephones and facsimile machines. It beat out all of its competitors in the sales of telephones in 1990, commanding 25 percent of Korean market share. The company ranks third in the sales of fax machines with a 22 percent market share. Daewoo started to export fax machines in July 1989. It sold only 5,000 units in 1990, but sales are expected to grow to 48,000 units in 1991.

Daewoo also has been developing and manufacturing a variety of fully digitalized equipment for the following systems:

- Public switching
- Private branch switching
- Optical transmission
- Radio communications
- Broadcasting
- Operation/control
  - TLMOS
  - SLMOS
  - BLMOS
  - CATMS
  - DTMS

With total sales of $110 million and a 24 percent market share, switching and transmission systems constitute the second-largest source of revenue for Daewoo Telecom.

In news media development, Daewoo Telecom's work scope includes cellular phone systems, videotex, teletex, electronic mail systems, and CATV. The company has also developed new telecommunications systems such as TDX-ISDN and TDX Voice Mail System.

Semiconductors

In 1990, Daewoo's semiconductor revenue grew by 10 percent from $10 million in 1989 to $11 million in 1990. Daewoo's strategy in the semiconductor market emphasizes small-volume, high-margin products in the short term. Its top priority is to concentrate on the design and production of more efficient CMOS and bipolar semiconductors. The company will continue to look for large-scale investment opportunities in 1991 to expand its facilities.

Further Information

For further information on the company's business segments, please contact the appropriate Dataquest industry services.

Table 1
Corporate Highlights (Thousands of U.S. Dollars)

	1989	1990
Revenue	310,221.3	295,110.6
Percent Change	-	(4.87)
Capital Expenditure	NA	NA
Percent of Revenue	11.51	13.28
R&D Expenditure	NA	NA
Percent of Revenue	11.65	11.67
Number of Employees	2,900	2,900
Revenue ($K)/Employee	106.97	101.76
Net Income	9,736.9	4,749.5
Percent Change	-	(51.22)

1990 Fiscal Year	Q1	Q2	Q3	Q4
Quarterly Revenue	-	-	-	-
Quarterly Profit	-	-	-	-

NA = Not available

Source: Daewoo Telecom Ltd.
Dataquest (October 1991)

Table 2
Revenue by Geographic Region
(Percent)

Region	1989	1990
Domestic (Korean)	79.70	67.47
International	20.30	32.53

Source: Daewoo Telecom Ltd.
Dataquest (October 1991)

1990 SALES OFFICE LOCATIONS

North America—13
Europe—13
Japan—2
ROW—38

MANUFACTURING LOCATIONS

Asia/Pacific

Seoul, South Korea
Semiconductors

SUBSIDIARIES

North America

Leading Edge Products Inc., Boston, Massachusetts

ROW

Daewoo Appian Technology, Seoul, Korea
Daewoo Information Systems Co., Seoul, Korea

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

Image Computing Systems
Daewoo Telecom and the Image Computing Systems Laboratory jointly developed a color display system for the NeXT computer. In exchange for development funding, Daewoo has received worldwide sales rights and access to the technology. Leading Edge Products has been scheduled to distribute the processing systems beginning in early 1992.

Micronics Computers Inc.
Daewoo Telecom has signed an OEM agreement with Micronics to use its newly developed system boards in its high-end personal computers, servers, and workstations. The system boards are designed with Micronics's new Gemini ASIC system two-chip set.

MIPS Computer Systems Inc.
Daewoo Telecom Ltd. and MIPS Computer Systems Inc. have signed a broad liscensing agreement including OEM, assembly license, and technology transfer of MIPS systems technology. Daewoo will resell MIPS' workstation and server product line in Korea under its brand name. Under the agreement, Daewoo will also assemble selected MIPS workstations and servers in Korea and port its existing software solutions for the automotive, industrial, military, and telecommunications markets onto the MIPS platform.

MERGERS AND ACQUISITIONS

1989

Leading Edge Products Inc.
Daewoo acquired Leading Edge Products for direct distribution access and sales in the United States.

KEY OFFICERS

Sung-Kyou Park
President and CEO

Jin-Chan Kim
Executive Director

Woong-Hyun You

Woo-Gee Kim
Managing Directors

Hyun-Joong

Kang Sang-Chul

Park Chun-Myung Kim
Directors

PRINCIPAL INVESTORS

Daewoo Heavy Industries
Daewoo Corporation

FOUNDERS

The Daewoo Group

Table 3
Balance Sheet
Fiscal Year Ending in December
(Thousands of U.S. Dollars)

Balance Sheet	1989	1990
Cash	7,028.9	6,869.7
Receivables	120,528.8	101,434.4
Marketable Securities	131.4	NA
Inventory	100,035.6	162,874.3
Other Current Assets	3,831.0	2,407.0
Total Current Assets	231,555.7	273,585.5
Net Property, Plants	78,490.2	88,968.6
Other Assets	109,046.8	118,375.4
Total Assets	419,092.8	480,929.5
Total Current Liabilities	114,966.5	152,145.3
Long-Term Debt	39,552.5	37,593.5
Other Liabilities	49,100.0	75,071.4
Total Liabilities	203,619.0	264,810.2
Common Stock	99,626.0	100,492.7
Other Equity	95,911.8	95,807.2
Retained Earnings	19,936.0	19,819.4
Total Shareholders' Equity	215,473.8	216,119.3
Total Liabilities and Shareholders' Equity	419,092.8	480,929.5

NA = Not available

Source: Daewoo Telecom Ltd.
Dataquest (October 1991)

Table 4
Consolidated Income Statement
Fiscal Year Ending in December
(Thousands of U.S. Dollars, except Per Share Data)

Consolidated Income Statement	1989	1990
Revenue	310,221.3	295,110.6
Domestic Revenue	247,240.5	199,120.6
International Revenue	62,980.8	95,990.6
Cost of Sales	227,756.6	204,737.1
R&D Expense	NA	NA
SG&A Expense	41,103.7	46,805.0
Capital Expense	NA	NA
Pretax Income	12,399.7	6,223.7
Pretax Margin (%)	4.00	2.11
Effective Tax Rate (%)	NA	NA
Net Income	9,736.9	4,749.5
Shares Outstanding, Millions	13,509	14,370
Per Share Data		
Earnings	NA	NA
Dividend	NA	NA
Book Value	15.95	15.04
Exchange Rate (US$1=W)	678	715

NA = Not available

Source: Daewoo Telecom Ltd.
Dataquest (October 1991)

Table 5
Key Financial Ratios
Fiscal Year Ending December

Key Financial Ratios	1989	1990
Liquidity		
Current (Times)	2.01	1.80
Total Assets/Equity (%)	36.43	41.17
Current Liabilities/Equity (%)	53.36	70.40
Total Liabilities/Equity (%)	94.50	122.53
Profitability (%)		
Return on Assets	2.32	0.99
Return on Equity	4.52	2.20
Profit Margin	3.14	1.61
Other Key Ratios		
R&D Spending % of Revenue	11.65	11.67
Capital Spending % of Revenue	11.51	13.28
Employees	2,900	2,900
Revenue ($K)/Employee	106.97	101.76
Capital Spending % of Assets	8.52	8.15

Source: Daewoo Telecom Ltd.
Dataquest (October 1991)

Daewoo Telecom Co., Ltd.

541 Namdaemoon-ro 5-ga Chung-gu, Seoul
100-095, South Korea
Telephone: (02) 771-35
Fax: (02) 756-1225
Dun's Number: Not Available

Date Founded: 1983

CORPORATE STRATEGIC DIRECTION

Daewoo Telecom Co., Ltd., is one of 26 member companies in the Daewoo Group, not including a number of affiliated companies and international subsidiaries. Total revenue for Daewoo Group totaled W 741.7 billion (US$1.1 billion) in fiscal 1989. Daewoo Shipbuilding and Heavy Machinery, Ltd., and Daewoo Motor Co., Ltd., represented 89 percent of the Daewoo Group's revenue. Daewoo Telecom contributed approximately 2.7 percent of its revenue, or W 10.2 trillion (US$15.2 million). This report focuses on Daewoo Telecom's activities.

Daewoo Telecom is one of South Korea's leading telecommunications companies. The Company was established in 1983 when the Daewoo Group acquired the telecommunications business of Daihan Electric Wire Co. The Company has four major divisions: computers and peripherals, communications equipment and optical cables, electronic switching systems, and other including semiconductors, which account for a 47, 12, 36, and 2 percent share of revenue, respectively. Daewoo Telecom employs 2,800 people worldwide, 400 of whom work in its semiconductor division.

Recently, Daewoo Telecom established a 50-50 joint venture with ZyMOS Corporation in California for semiconductor production, which added a MOS 4-inch line to its already established capacity of 9,000 wafer starts per month.

Daewoo Telecom financial information was not available for inclusion into this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

Semiconductors

The semiconductor division represents only 2 percent of Daewoo Telecom's business activity; however, revenue increased to an estimated W 13.5 billion (US$20 million) in 1989 from W 5.1 billion (US$7 million) in 1988. The major products are MOS Memory devices and linear devices. Each product category represented 50 percent of the semiconductor revenue during 1989.

Computers and Peripherals

The computers and peripherals division made up an estimated 47 percent of Daewoo Telecom's 1989 business activity. The Company exported over 600,000 personal computers to the US market, and Daewoo Telecom took over Leading Edge Products, Inc. (a US company), for direct distribution access and sales during 1989.

Communications Equipment and Optical Cables and Electronic Switching Systems

Communications equipment and optical cables and electronic switching systems made up an estimated 48 percent of Daewoo Telecom's 1989 business activity. Currently, the digital TDX-1B switching system is under development, and development of the high-capacity TDX-10 model is nearing completion.

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest industry service.

1989 SALES OFFICE LOCATIONS

North America—12
Europe—18
Asia/Pacific—20
ROW—7

MANUFACTURING LOCATIONS

Asia/Pacific

Seoul, South Korea
Semiconductors

SUBSIDIARIES

North America

ZyMOS Corporation, Sunnyvale, California (United States)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

Information is not available.

MERGERS AND ACQUISITIONS

1989

Leading Edge Products, Inc.
Daewoo took over this company for direct distribution access and sales in the United States.

KEY OFFICERS

Sung Kyu Park
President

Y. B. Kim
Executive vice president

W. H. Yoo
Managing director, Curo Plants

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Information is not available.

DataEase International, Inc.

Seven Cambridge Drive
Trumbull, Connecticut 06611
Phone: (203) 374-8000
Fax: (203) 374-3374
Dun's Number: 07-521-8867

Date Founded: April 1982

CORPORATE STRATEGIC DIRECTION

DataEase International, Inc., was originally founded as Software Solutions, Inc., in 1982 by software engineers Arun Gupta and Joseph Busch. The Company changed its name in March 1987 to DataEase International, Inc., to reflect the recognition its flagship product had received. DataEase International is a privately held company that develops PC database, graphics, and connectivity software.

The Company's main product, the DataEase relational database system, was introduced in 1983. The original DataEase product was created to fill the need for an easy-to-use relational database with support for applications development. The Company continues to develop products that enable a broad spectrum of users to develop applications and improve productivity.

DataEase International has approximately 100 employees nationwide. DataEase products are distributed by resellers in more than 37 countries worldwide. In the United States, DataEase products are distributed exclusively by Softsel Computer Products. Dataquest estimates DataEase software sales at over $25 million and ranks DataEase as one of the top five worldwide vendors of PC-based database management systems for 1989.

No financial statements are included because DataEase International is a privately held company.

BUSINESS SEGMENT STRATEGIC DIRECTION

DataEase International currently markets a line of software products under the categories of applications development and connectivity tools. The Company's PC-based products offer applications capabilities that include standalone and networked database management, micro-to-host link, business graphics, image database management, data analysis, and tools for applications development.

In 1988 the Company announced DataEase 4.0, which provides enhanced features to the Company's object-oriented relational database management system (RDBMS). Features of the 4.0 version include MultiForms, which enables users to combine information from up to 30 forms; support for Lotus/Intel/Microsoft (LIM) Expanded Memory Specifications (EMS), which gives the DataEase product search capabilities through an unlimited number of records; a menu of program options; and a quick report function that lets users select a standard data format for simultaneous integration of data from two or more databases.

DataEase announced version 4.2 of its database product in October 1989. The 4.2 version uses Rational System's DOS extender technology, enabling users to address up to 16MB of memory for larger applications. In conjunction with the 4.2 announcement, the Company introduced DataEase XDOS for UNIX.

Software products offered in conjunction with the DataEase RDBMS are: DataEase Connect, which provides connectivity to mainframe systems; DataEase SQL, which enables use of structured query language in programming applications; DataEase Developer, an application development and documentation tool; and DataEase Crossview, a data analysis tool for use with large database files.

Other DataEase products that can be used independently of the database system are GrafTalk and Imag-In. GrafTalk is a business graphics product that combines spreadsheet, graphics, and text editing functions. Imag-In is an imaging database program that allows users to file and retrieve scanned data (images or text) and incorporate scanned information with relational database files.

Further Information

For further information about DataEase International's business segments, please contact the appropriate Dataquest industry service group.

1990 SALES OFFICE LOCATIONS

North America—8
Europe—11
Asia/Pacific—3
ROW—2

MANUFACTURING LOCATIONS

North America

Trumbull, CT
PC-based software products

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1989

Sybase, Inc.
Joint marketing and development for SQL applications

Hunter Systems Software Inc.
Joint marketing of XDOS, UNIX version of DataEase

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Arun K. Gupta
Chairman, chief executive officer

Guy Scalzi
President, chief operating officer

Joseph Busch
Vice president, Development

Matthew Suffoletto
Vice president, Sales and Marketing

Helen Charov
Vice president, International Sales and Marketing

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Arun Grupta
Joseph Busch

Data General Corporation

4400 Computer Drive
Westboro, Massachusetts 01580
Telephone: (508) 366-8911
Fax: (508) 366-1272
Dun's Number: 04-590-3218

Date Founded: April 15, 1968

CORPORATE STRATEGIC DIRECTION

Data General Corporation (DG) designs, manufactures, and markets general-purpose computer and communications systems, peripheral equipment, software, and related products and services, including maintenance and training.

Data General manufactures computer products for commercial applications, industrial automation, and other applications. Commercial applications include integrated information processing, distributed data processing, office automation, database management, transaction processing, communications, and decision support. Industrial automation applications include CAD, CAM, CAE, manufacturing planning and control, testing, process control, and environmental surveillance. Other applications include scientific and laboratory research, medical instrumentation and imaging, signal analysis, data acquisition, education, instrumentation, and monitoring and control.

The Company reported revenue of $1.3 billion* for fiscal 1989, a decrease of 3.7 percent over 1988. Data General posted a net loss for the fourth year in a row, losing approximately $120 million in fiscal 1989. Equipment sales accounted for 67 percent of total sales; services accounted for 33 percent. During fiscal 1989, 1988, and 1987, international revenue accounted for 49, 46, and 42 percent, respectively, of total revenue. Approximately 30 percent of international revenue was obtained from the European market.

Data General's strategy for the 1990s includes three main points: retaining the advantages of the Company's proprietary computing systems while providing connectivity with other vendors' systems, distributing applications on networks consisting of products based on industry-standard microprocessors and operating systems, and integrating computing and telecommunications technology.

Data General has recognized the growing importance of the UNIX industry-standard operating system and its impact in the domain of commercial applications. The Company has responded to the availability of high-quality reduced-instruction-set computing (RISC) microprocessors and the increasing number of applications developed for UNIX-based systems by developing its Motorola 88000-based AViiON industry-standard product line, which began shipping 1989. The AViiON product line supports DG/UX, an advanced implementation of the UNIX operating system, providing symmetric multiprocessor support, a commercial-grade file system, and a scheduler for improved throughput under heavy load. Data General further emphasizes its commitment to industry standards with an extensive set of standard communications protocols supporting the MV and AViiON product lines.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Computer Systems

Data General's current systems are grouped into the following product families: 32-bit ECLIPSE MV/ Family; 32-bit AiiON systems and workstations; and DASHER family personal workstations.

*All dollar amounts are in US dollars.

ECLIPSE MV/Family systems are the backbone of Data General. Data General's MV/Family includes a family of high-end ECLIPSE MV/40000 and ECLIPSE MV/40000 HA (high availability) systems, the mid-range ECLIPSE MV/18000 system, and the low-end MV/1000 DC and MV/2500 DC systems. The newest addition to the MV/Family is the MV/18000 Series, introduced in October 1989. The MV/18000 Series offers total compatibility with the MV/Family.

In April 1990, Data General introduced two new products to the MV/Family: the low-end ECLIPSE MV/5500 DC and the midrange ECLIPSE MV/9500. These two products represent a new, fifth generation of MV/Family systems, which demonstrates Data General's continuing commitment to its MV/Family. The MV/5500 DC and MV/9500 are the first in the ECLIPSE MV/Family CPU architecture to be implemented on a single integrated circuit, allowing for reduced chip count and more space on the system board for memory. The ECLIPSE MV/5500 DC can deliver 5 mips of MV/Family processing power and features from 16 to 32MB of main memory, which is expandable in 8MB increments. The ECLIPSE MV/9500 possesses up to 128MB of main memory, expandable in 8MB or 32MB increments, and provides up to 76.8GB of mass storage. AOS/VS, AOS/VS II, and DG/RDOS are all supported by the ECLIPSE MV/5500 DC and MV/9500, providing a choice of operating systems that allow complete compatibility with the entire ECLIPSE MV/Family. In addition, the ECLIPSE MV/9500 supports AOS/RT32.

Data General's industry-standard product line, introduced in February 1989, consists of the AViiON family of UNIX workstations, servers, and multiuser systems based on the Motorola 88000 RISC microprocessor and the VME I/O bus. These systems span a broad range of performance, from 17-mips workstations to symmetric multiprocessing systems with high-end performance of 50 mips. Available in single-processor and dual-processor versions, the AV/5000 and AV/6000 series systems are made to function as servers or as multiuser systems for a variety of applications. The AV/300 workstations are compact, high-performance desktop systems. AViiON systems use the UNIX operating system, including DG/UX (Data General's implementation of the UNIX operating system), that is designed with features to support commercial and technical applications.

During May 1990, Data General unveiled four new members to its AViiON family: the AV 200 workstation, the AV 3200 entry-level server, and the AV 4100 and AV 4120 midrange server systems. The AV 3200 and AV 200 are based on the 16-MHz Motorola 88100 CPU. They are available with up to 16MB of memory and supports industry-standard SCSI devices. The AV 4100 and 4120 base systems include 8MB of memory, a 332MB disk, a 150MB tape drive, a two-slot industry-standard VEM chassis, and an integrated Ethernet controller for low-cost LAN connection. The AV 4100 utilizes the 20-MHz Motorola 88100 chip performing at 20 Dhrystone mips while the AV 4120 uses two 20-MHz 88100 chips performing at 40 Dhrystone mips.

The Data General DASHER PC family currently consists of eight members that span a range of price and performance capabilities. Through the use of various communications products offered by Data General, these systems can be connected to the 32-bit ECLIPSE MV/Family systems, as well as to other computers. During the first half of 1990, Data General announced three new products to its DASHER line: the DASHER/286-12j, the DASHER/386-25k and the WALKABOUT/SX. The DASHER/286-12j is a compact, IBM AT-compatible system that utilizes the Intel 80286 12.5 MHz processor and runs the MS-DOS operating system. It includes 1MB of main memory, two diskette drives, and a 40MB hard drive. The DASHER/386-25k uses the Intel 80386 25-MHz processor, supports both the MS-DOS and UNIX operating system, and includes 4MB of memory and a 100MB hard disk. The WALKABOUT/SX is a battery-powered 386SX laptop based on the high-performance, 16-MHz Intel 80386SX microprocessor. It features 5 built-in ports, provides 1 to 8MB of main memory, which is expandable in 1 or 2MB increments, and has a 40MB hard disk drive.

Local Area Networking

In February 1990, Data General announced DAA OPEN LAN in support of its Distributed Applications Architecture (DAA). DAA focuses on three main components: common user environment, distributed applications, and transparent networks. DAA OPEN LAN is a common PC LAN architecture, which supports Novell and LAN Manager networks. The DAA OPEN LAN product set consists of Netware for AViiON, Netware for ECLIPSE MV/Family systems, Advanced NetWare v.215 for DASHER/386 workstations, and a Software Developers' Kit (SDK) for AViiON PC LANs, which includes the Netwise RPC TOOL. Data General has also announced its intention to support OS/2 LAN Manager and LAN Manager/X later this year.

Peripherals

Data General manufactures and markets a range of peripheral equipment, including video display terminals, graphics workstations, magnetic disc memories, magnetic tape equipment, printers, communication controllers and multiplexors, and analog-to-digital converters. Peripheral equipment obtained from other manufacturers for use with Data General's computer systems includes magnetic disc memories, magnetic tape equipment, printers, plotters, communications boards, and digital-to-analog converters. Data General also makes peripheral controller subassemblies and related electronic equipment for connecting its computers to standard data communication equipment and computer systems manufactured by others and markets personal computers and related peripherals manufactured by other companies.

Software

Data General offers operating systems in the proprietary market with such products as the advanced operating system/virtual storage (AOS/VS), AOS/VS II multiprogramming systems, AOS/RT32 real-time subset of AOS/VS, and D6/RDOS for 32-bit systems. Data General also offers industry-standard operating systems including its UNIX-based DG/UX and MV/UX products. Programming languages available with Data General's systems include BASIC, business BASIC, COBOL 74, ICOBOL, Fortran IV, Fortran 77, Alog, DG/L, PL/1, APL, Pascal, "C," and Common Lisp. Data General's Ada compiler and Ada development environment software lets customers program in Ada, a standard programming language used in military applications. DG/DBUS software enables end-user application programs written in Datapoint Corporation's DATABUS language to run on the Data General ECLIPSE MV/ Family of systems.

During 1989, DG announced DG/UX Revision 4.1, the first UNIX operating system capable of running on a full family of RISC machines from single-user workstations to multiprocessor-based systems. It supports fully symmetric multiprocessing and offers a commercial-grade file system, a multilevel scheduler, and a basis for high-availability, fault-tolerant systems.

On January 23, 1990, Data General introduced DG/UN 4.2 featuring support for OSF/Motif, DG/AVlib—a graphics library for AViiON systems—and new SNA software packages to enhance connectivity with IBM systems.

Data General also supplies a variety of application software solutions. "Horizontal" solutions consist of CEO integrated office automation software that lets users perform routine office tasks such as electronic mail, word processing, and filing and maintaining electronic calendars while also having access to spreadsheets, graphics, a centralized database, or specialized "vertical" applications. The specialized applications may be developed by customers or purchased from Data General or third parties. Applications can be designed to operate independently or with CEO. Data General sells CEOwrite word processing software and CEO Connection communications software that allows CEO system functions to be used in products that use the MS-DOS operating system. During 1989, Data General unveiled CEO Object Office, which puts CEO office automation software into an icon-style graphics interface on a personal computer.

Further Information

For further information about the Data General's business segments, please contact Dataquest's appropriate industry service.

Table 1
Five-Year Corporate Highlights (Millions of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$1,239	$1,268	$1,274	$1,365	$1,314
Percent Change	-	2.34	0.47	7.14	(3.74)
Capital Expenditure	$167	$130	$143	$97	$92
Percent of Revenue	13.48	10.25	11.22	7.11	6.96
R&D Expenditure	$128	$143	$159	$165	$171
Percent of Revenue	10.33	11.28	12.48	12.09	13.01
Number of Employees	16,535	15,565	15,685	15,420	13,740
Revenue ($K)/Employee	$74.93	$81.46	$81.24	$88.50	$95.63
Net Income	$24	($29)	($124)	($16)	($120)
Percent Change	-	(220.83)	(327.59)	87.10	(650.00)

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$308.6	$342.7	$306.1	$357.0
Quarterly Profit	($19.5)	$7.0	($23.1)	($84.1)

Source: Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	68.00	64.00	58.00	54.00	51.00
International	32.00	36.00	42.00	46.00	49.00
Europe	18.00	22.00	27.00	29.00	30.00
All Others	14.00	14.00	15.00	17.00	19.00

Source: Annual Reports and Forms 10-K
Dataquest (1990)

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	50	50
Indirect Sales	50	50

Source: Dataquest (1990)

1990 SALES OFFICE LOCATIONS

North America—92
Europe—50
All Others—21

MANUFACTURING LOCATIONS

North America

Apex, North Carolina
Systems integration, central processor assembly and test, printed circuit board assembly and test
Clayton, North Carolina
Printed circuit board fabrication, assembly, and test
Portsmouth, New Hampshire
Printed circuit board assembly and test, central processor assembly and test, IC preconditioning and test, systems integration and test
Westbrook, Maine
Peripheral manufacturing, metal fabrication

Japan

Gyoda
Printed circuit board assembly and test, mass storage manufacturing, systems integration

Asia/Pacific

Bangkok, Thailand
Cable and harness manufacturing, peripherals assembly and test, PC assembly and test
Manila, Philippines
Printed circuit board assembly and test, power supply manufacturing, PC assembly and test

ROW

Chihuahua, Mexico
Systems integration, central processor assembly and test, cable and harness manufacturing, field engineering product repair

SUBSIDIARIES

North America

Asia Data General Corporation (Delaware, United States)
China Data General Corporation (Delaware, United States)
DG Foreign Sales Corp., Inc. (Virgin Islands)
Dama Technologies Corp. (Delaware, United States)
Data General Canada Inc. (Canada)
Data General Commercial Systems, Inc. (Delaware, United States)
Data General Europe, Inc. (Delaware, United States)
Data General International Sales Corporation (Delaware, United States)
Data General Investment Corporation (Delaware, United States)
Data General Latin America, Inc. (Delaware, United States)
Data General Puerto Rico, Inc. (Delaware, United States)
Data General Subsidiary, Inc. (Delaware, United States)
Datagen, Inc. (Delaware, United States)
Design Data, Inc. (Massachusetts, United States)
Digicom, Inc. (Delaware, United States)
Digital Computer Controls, Inc. (Delaware, United States)
Genioss, Inc. (Delaware, United States)
Long Island Communications Corp. (Delaware, United States)
WSA Systems and Services, Inc. (California, United States)

Japan

Nippon Data General Corporation (Japan)

Europe

Data General AB (Sweden)
Data General A.G. (Switzerland)
Data General ApS (Denmark)
Data General A/S (Norway)
Data General France SARL (France)
Data General Gesellschaft mbH (Austria)
Data General GmbH (West Germany)
Data General Holland BV (Netherlands)
Data General Ireland, Ltd. (Ireland)
Data General Limited (United Kingdom)
Data General OY (Finland)
Data General (Portugal) Sociedade de Computadores Lda (Portugal)
Data General S.A. (Belgium)
Data General S.A. (Spain)
Data General S.p.A. (Italy)

Asia/Pacific

Data General Australia Pty., Ltd. (Australia)
Data General Hong Kong, Ltd. (Hong Kong)
Data General Hong Kong Sales & Service, Ltd. (Hong Kong)

Data General Importing, Ltd. (New Zealand)
Data General International Manufacturing Pte., Ltd. (Singapore)
Data General Israel, Ltd. (Israel)
Data General New Zealand Limited (New Zealand)
Data General Philippines, Inc. (Philippines)
Data General Singapore Pte., Ltd. (Singapore)
Data General Thailand (Thailand)

ROW

Data General Argentina, S.A. (Argentina)
Data General Chile S.A. (Chile)
Data General Costa Rica, S.A. (Costa Rica)
Data General de Mexico, S.A. de C.V. (Mexico)
Data General del Peru, S.A. (Peru)
Data General Ltda (Brazil)
Data General Venezuela C.A. (Venezuela)
General Risk Insurance Company Ltd. (Bermuda)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

Information Presentation Technologies, Inc.
Data General and Information Presentation Technologies, Inc. (IPI), entered a marketing agreement in which IPI will make available software that integrates Apple Macintosh and personal computers using the MS-DOS operating system with Data General's UNIX-based AViiON systems.

Fourth Shift Corporation
Data General signed an agreement to have Fourth Shift Corporation port its Fourth Shift Manufacturing Software Series to Data General's AViiON product line. The agreement incorporates cooperative marketing and sale of the software on AViiON workstations, servers, and multiuser systems.

Brock Control Systems, Inc.
Data General signed an Independent Software Vendor (ISV) agreement with Brock Control Systems, Inc. Under the terms of the agreement, Brock will offer its sales automation software on Data General's AViiON family.

Adagen Ada
Data General and Adagen Ada formed an ISV agreement stating that Adagen Ada design software will be available on Data General's AViiON family of UNIX workstations and servers.

Vykor Technology
An agreement was entered into for the Vykor Image-X file server to be available to Data General's AViiON users.

1989

Cincinnati Bell Information Systems
Data General announced an agreement with Cincinnati Bell Information Systems (CBIS) to market computer systems for Computer-aided Acquisition and Logistic Support (CALS). Under the terms of the agreement, CBIS will integrate its software, Data General AViiON systems, and other third-party software products into a CALS turkey information solution.

Trinity Computing Systems
DG announced that Trinity will offer three health care software solutions on DG's systems under a new independent software vendor (ISV) agreement.

Telesoft Inc., Software Systems Design
DG announced ISV agreements with Telesoft and Software Systems Design for the development of Ada software products for DG's new AViiON family.

Medical Data Processing Inc. (MDP)
MDP will offer MDpl Medical Practice Software on DG equipment under a new value-added reseller (VAR) agreement.

Legal Data Systems (LDS)
DG and LDS have signed an ISV agreement to provide the first legal solutions running on the new DG AViiON systems.

Hewlett-Packard (HP)
DG signed an agreement to license the HP NewWave software environment from HP.

SARTOX Data Systems
SARTOX will offer SunPac automated student and financial accounting solutions on DG systems.

Cybertek, Informix, Oracle, Progress, and Relational Technology
DG announced agreements with at least 15 leading software developers to port their products to the AViiON Family. The packages represent a broad range of development, utility, and business applications software, giving AViiON users access to thousands of different applications.

Phoenix Technologies Ltd.
Phoenix Technologies signed a licensing agreement with DG to develop a customized version of its OpenPC software for the UNIX-based AViiON family.

OASYS Inc.
DG and OASYS announced the OASYS Cross Development Software Tool Kit for the DG AViiON and DASHER/386 product families.

Green Hills
Under an agreement, Green Hills' compilers will be offered on all of DG's UNIX-based, industry-standard systems.

Zetaco Inc.
Zetaco signed a $5 million, three-year VAR agreement for the new 88000-based AViiON systems. Additionally, Zetaco will license the DG/UX operating system.

Novell
DG will port Novell's new Open NetWare LAN services to the Data General ECLIPSE MV/Family of computers and to the Company's new AViiON family of Motorola 88000-based systems.

Infostat, Inc.
The two companies announced an ISV agreement where Infostat will provide its Hospital Information and Control System software, running on DG ECLIPSE MV/Family systems, to hospitals with 75 to 250 beds.

TLD Systems Ltd.
Under an ISV agreement, TLD will supply the Ada/1750A Compiler System, which enables users of DG ECLIPSE MV/Family computers to develop and test Ada programs targeted for US MIL-STD-1750A based-systems.

1988

International Treasury Systems, FAME Software Corp.
Under ISV agreement, the companies arranged to sell applications in the financial industries.

Motorola
The two companies announced an agreement to develop an ultrahigh speed version of the Motorola 88000 RISC microprocessor family, using ECL semiconductor technology.

O.D. Systems
DG announced a joint marketing agreement for O.D. Systems' manufacturing and distribution software.

Pacer Software
In an ISV agreement, the companies announced that Pacer would supply PacerLink terminal emulation and desktop connectivity software that integrates Apple Macintosh PCs with ECLIPSE MV/Family systems.

Broadway & Seymour, Diversified Computer Products
These companies agreed to work to provide bank branch automation solutions by integrating Data General's CEO software with platform and teller functions so the user has access to a full range of information from a single workstation.

Singapore Telecom
The two companies agreed to jointly develop an intelligent information network. Singapore Telecom markets the new system, Public Office Automation System (POAS), to approximately 180,000 corporations in Singapore.

M.I.T. Lausanne
Under an ISV agreement, M.I.T. Lausanne was to provide its CREDOC Letter of Credit System for the European banking market.

Standard & Poor's Trading (S&P)
Under an ISV agreement, S&P was to provide S&P Stockmate software, a market quotation and information system for retail investment brokers.

1987

Nippon Telegraph & Telephone
The companies agreed to develop a new generation of high-speed digital integrated communication systems.

KEY OFFICERS

Ronald L. Skates
President, chief executive officer, director

Herbert J. Richman
Executive vice president, International Sales and Service

Stephen P. Baxter
Vice president, Corporate Marketing

Primus Berger
Vice president, European Operations

Lindsay Yelland
Vice president, Asia/Pacific Sales and Service

Angelo Guadagno
Vice president, American Sales and Service

William Cunningham
Vice president, Manufacturing

Joel Schwartz
Vice president, Software Business Unit

J. Thomas West
Senior vice president, Systems Development

PRINCIPAL INVESTORS

Capital Group, Inc.—7.9 percent
Bernstein, Sanford C. & Co.—7.2 percent
State of Wisconsin Investment Board—5.0 percent

FOUNDERS

Edson D. de Castro
Henry Burkhardt, III
Herbert J. Richman
Frederick R. Adler
Richard Sogge

Table 4
Comprehensive Financial Statement
Fiscal Year Ending September
(Millions of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$900	$823	$642	$669	$710
Cash	298	272	137	141	129
Receivables	250	260	275	289	317
Marketable Securities	29	30	0	0	0
Inventory	306	238	190	185	209
Other Current Assets	17	23	40	54	55
Net Property, Plants	$331	$367	$399	$373	$292
Other Assets	$13	$51	$14	$20	$25
Notes Receivables	$18	$16	$13	$15	$14
Total Assets	$1,262	$1,257	$1,068	$1,077	$1,041
Total Current Liabilities	$296	$320	$383	$390	$442
Long-Term Debt	$299	$241	$80	$66	$71
Other Liabilities	$9	$14	$13	$9	$5
Total Liabilities	$604	$575	$476	$465	$518
Total Shareholders' Equity	$658	$682	$592	$612	$523
Converted Preferred Stock	0	0	0	0	0
Common Stock	230	268	303	333	361
Other Equity	(7)	7	6	12	14
Retained Earnings	435	407	283	267	148
Total Liabilities and Shareholders' Equity	$1,262	$1,257	$1,068	$1,077	$1,041

Income Statement	1985	1986	1987	1988	1989
Revenue	$1,239	$1,268	$1,274	$1,365	$1,314
US Revenue	847	806	734	737	676
Non-US Revenue	392	462	540	628	638
Cost of Sales	$727	$702	$684	$686	$700
R&D Expense	$128	$143	$159	$165	$171
SG&A Expense	$341	$391	$438	$471	$491
Capital Expense	$167	$130	$143	$97	$92
Pretax Income	$35	$14	($70)	($7)	($114)
Pretax Margin (%)	2.82	1.10	(5.49)	(0.51)	(8.68)
Effective Tax Rate (%)	31.00	35.00	(14.90)	130.60	5.10
Net Income	$24	($29)	($124)	($16)	($120)
Shares Outstanding, Millions	26	27	27	28	29
Per Share Data					
Earnings	$0.92	($1.07)	($4.59)	($0.55)	($4.10)
Dividend	0	0	0	0	0
Book Value	$25.31	$25.26	$21.93	$21.86	18.03

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending September
(Millions of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	3.04	2.57	1.68	1.72	1.61
Quick (Times)	2.01	1.83	1.18	1.24	1.13
Fixed Assets/Equity (%)	50.30	53.81	67.40	60.95	55.83
Current Liabilities/Equity (%)	44.98	46.92	64.70	63.73	84.51
Total Liabilities/Equity (%)	91.79	84.31	80.41	75.98	99.04
Profitability (%)					
Return on Assets	-	(2.30)	(10.67)	(1.49)	(11.33)
Return on Equity	-	(4.33)	(19.47)	(2.66)	(21.15)
Profit Margin	1.94	(2.29)	(9.73)	(1.17)	(9.13)
Other Key Ratios					
R&D Spending % of Revenue	10.33	11.28	12.48	12.09	13.01
Capital Spending % of Revenue	13.48	10.25	11.22	7.11	6.96
Employees	16,535	15,565	15,685	15,420	13,740
Revenue ($K)/Employee	$74.93	$81.46	$81.24	$88.50	$95.63
Capital Spending % of Assets	13.23	10.34	13.39	9.01	8.79

Source: Annual Reports and Forms 10-K
Dataquest (1990)

Datapoint Corporation

9725 Datapoint Drive
San Antonio, Texas 78229-8500
Telephone: (512) 699-7000
Fax: (512) 699-7472
Dun's Number: 04-701-3966

Date Founded: 1968

CORPORATE STRATEGIC DIRECTION

In 1968, Computer Terminal Corporation, a video display terminal manufacturer, was founded in San Antonio, Texas. To more closely identify itself with its developing and expanding product lines, Computer Terminal changed its name to Datapoint Corporation in December 1972. Datapoint Corporation develops, manufactures, and markets hardware and software computer and communications products for integrated network systems throughout the world. During fiscal year 1989, Datapoint focused on four key industry segments: financial services, government, distribution, and manufacturing. To achieve a better focus on key market segments, Datapoint created four strategic business units: major end-user accounts, value-added resellers, the public sector, and video teleconferencing.

For fiscal year 1989, total revenue decreased 5.5 percent to $312.5 million,* down from $330.8 million in fiscal 1988. Datapoint attributes a significant portion of this loss to the restructuring and redirecting of its business, along with the unfavorable impact of a stronger U.S. dollar. Datapoint employs 2,451 people worldwide.

Datapoint's research and development is oriented toward the development of new hardware and software products, as well as the improvement and expansion of its existing products and services. Datapoint maintains R&D facilities in San Antonio, Texas; Toronto, Canada; and Brussels, Belgium. For fiscal years 1988 and 1989, R&D expenditures totaled $11.6 million and $11.2 million, respectively, representing approximately 3.5 percent of yearly revenue each year.

*All dollar amounts are in U.S. dollars.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Integrated Office Systems

In 1979, Datapoint introduced its first integrated electronic office systems, called Vista-Office Systems. Through Vista, Datapoint allows its users to integrate a wide range of office activities through multiple products such as Vista-Guide, Vista-Word, Vista-Mail, and Vista-Agenda. The system enables a wealth of applications, such as data communications, financial accounting programs, mailing lists, word processing, electronic mail, and program development. Dataquest estimates that, during 1989, Datapoint held less than a 1 percent share of the integrated office systems software market in both the worldwide and U.S. markets.

LANs

In 1977, Datapoint introduced Attached Resource Computer Network (ARCNET), a multiuser computer system that was not based on a mainframe. This was its first local area network.

Computers

In 1989, Datapoint's worldwide computer systems product mix changed significantly. Revenue greatly

increased with Datapoint's shipments of 80386-based processors: the 7950, the 7800, and the 7700. Shipments of Datapoint's revenue from its proprietary processors, the 8600 and the 8850, which are based on older technology, declined significantly.

Further Information

For more information about the Company's business segments, please contact the appropriate industry service.

Table 1
Five-Year Corporate Highlights (Thousands of U.S. Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$520,168.0	$325,227.0	$312,090.0	$330,827.0	$312,549.0
Percent Change	-	(37.48)	(4.04)	6.00	(5.52)
Capital Expenditure	N/A	N/A	N/A	N/A	N/A
Percent of Revenue	0	0	0	0	0
R&D Expenditure	$44,741.0	$22,633.0	$19,369.0	$11,633.0	$11,205.0
Percent of Revenue	8.60	6.96	6.21	3.52	3.59
Number of Employees	5,993	3,621	2,749	2,693	2,451
Revenue ($K)/Employee	$86.80	$89.82	$113.53	$122.85	$127.52
Net Income	($48,264.0)	($8,558.0)	($57,770.0)	($7,997.0)	($29,236.0)
Percent Change	-	82.27	(575.04)	86.16	(265.59)

1989 Calendar Year (US$M)	Q1	Q2	Q3	Q4
Quarterly Revenue	$75.52	$80.96	$78.96	N/A
Quarterly Profit	($19.57)	($8.89)	($29.58)	N/A

N/A = Not Available

Source: Datapoint Corporation
Annual Reports and Forms 10-K
Dataquest
1990

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	60.51	30.44	20.79	15.51	14.25
International	39.49	69.56	79.21	84.49	85.75

Source: Datapoint Corporation
Annual Reports and Forms 10-K
Dataquest
1990

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	10.00	10.00
Indirect Sales	90.00	90.00

Source: Datapoint Corporation
Annual Reports and Forms 10-K
Dataquest
1990

1989 SALES OFFICE LOCATIONS

North America—7
Japan—1
Europe—17
Asia/Pacific—8
ROW—15

MANUFACTURING LOCATIONS

Most of Datapoint's products are purchased from third parties that manufacture the products to Datapoint's specifications. Later, the products are resold under Datapoint's name. The remaining products are manufactured within Datapoint by assembling various purchased components into subassemblies, then into finished products. Much of this manufacturing occurs at Datapoint's facilities in San Antonio, Texas.

SUBSIDIARIES

North America

Datapoint Canada, Inc. (Canada)
Datapoint Development Center, Inc. (United States)
Datapoint Disc, Inc. (United States)
Datapoint International, Inc. (United States)
Datapoint International Exports, Inc. (United States)
Datapoint International Investments, Inc. (United States)
Datapoint International Services, Inc. (United States)
Inforex International, Inc. (United States)

Europe

Datapoint Beheer, B.V.
Datapoint Belgium S.A. (Belgium)
Datapoint Deutschland G.m.b.H. (West Germany)
Datapoint Holdings Ltd.
Datapoint Iberica S.A.
Datapoint Italia S.p.A. (Italy)
Datapoint Netherlands B.V. (Netherlands)
Datapoint S.A.
Datapoint Switzerland Ltd. (Switzerland)
Datapoint Vastgoed, B.V.
Inforex Ltd.

Asia/Pacific

Datapoint Corp. (New Zealand)

ROW

Datapoint Corp. Pty. Ltd. (South Africa)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1989

Standard Microsystems (SMC) and NCR Microelectronic Products Division (NCR)
The companies formed an alliance to bring Datapoint's 20-Mbps ARCNETplus network technology to the workstation, personal computer, and LAN server marketplace.

Intersystems Corporation
Datapoint made a distribution agreement with Federal Integrated Systems Corporation (FISC), which is jointly owned by Datapoint and Electronic Data Systems. The agreement states that FISC will market InterSystems' relational database management system and application generator, M/SQL, to government and commercial end users in health care markets and via value-added resellers.

Micro Focus, Inc.
The companies made an agreement to license Micro Focus' COBOL/2 products across Datapoint's 286 and 386 network computers.

1988

TeleVideo Systems, Inc.
Under an agreement, TeleVideo is to provide Datapoint with up to 10,000 top-of-the-line TelOAS III microcomputers.

Texcom Management Services, Inc.
The companies made an agreement in which all new domestic leases of Datapoint's product line, at Datapoint's option, may be sold to Texcom.

1987

Communications Solutions Inc. (CSI) and TITN, Inc.
These companies joined forces with Datapoint to produce a communications gateway for Datapoint's ARC LAN, based upon Datapoint's new network communications server, Vista-Gate.

Network General Corporation
The companies made a joint development and OEM licensing agreement to develop an ARC version of the Network General Sniffer Protocol Analyzer, which will later be licensed to Datapoint for use and resale as a network analysis and diagnostic tool.

KEY OFFICERS

Asher B. Edelman
Chairman of the board

Michael M. Michigami
President and chief executive officer

James R. Barnes
Vice president, Technical Operations, and acting vice president, Product Development

Donald P. Bynum
Vice president, Worldwide Marketing

Raymond R. Dittrich
Vice president, U.S. Sales

Brian M. Gifford
Vice president, Northern Europe

Yvon Y. Le Roux
Vice president, Southern Europe

Table 4
Comprehensive Financial Statement
Fiscal Year Ending July
(Thousands of U.S. Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$265,956.0	$223,091.0	$217,728.0	$197,445.0	$163,486.0
Cash	12,813.0	17,813.0	14,583.0	39,237.0	22,166.0
Receivables	116,801.0	84,894.0	81,430.0	80,452.0	67,765.0
Marketable Securities	N/A	21,495.0	70,864.0	26,771.0	40,318.0
Inventory	82,875.0	63,664.0	45,648.0	45,623.0	28,987.0
Other Current Assets	53,467.0	35,225.0	5,203.0	5,362.0	4,250.0
Net Property, Plants	$70,909.0	$60,863.0	$45,307.0	$57,620.0	$47,819.0
Other Assets	$165,587.0	$135,267.0	$141,600.0	$132,352.0	$118,698.0
Total Assets	$502,452.0	$419,221.0	$404,635.0	$387,417.0	$330,003.0
Total Current Liabilities	$117,070.0	$86,305.0	$121,489.0	$119,915.0	$106,316.0
Long-Term Debt	$105,174.0	$98,186.0	$100,107.0	$81,765.0	$81,213.0
Other Liabilities	$3,983.0	$1,465.0	$1,145.0	$3,553.0	$7,395.0
Total Liabilities	$226,227.0	$185,956.0	$222,741.0	$205,233.0	$194,924.0
Total Shareholders' Equity	$276,225.0	$233,265.0	$181,894.0	$182,184.0	$135,079.0
Converted Preferred Stock	N/A	N/A	2,000.00	2,000.00	2,000.00
Common Stock	5,104.0	5,184.0	5,234.0	5,263.0	5,275.0
Other Equity	141,952.0	151,519.0	161,714.0	163,778.0	155,481.0
Retained Earnings	129,169.0	76,562.0	12,946.0	11,143.0	(27,677.0)
Total Liabilities and Shareholders' Equity	$502,452.0	$419,221.0	$404,635.0	$387,417.0	$330,003.0

Income Statement	1985	1986	1987	1988	1989
Revenue	$520,168.0	$325,227.0	$312,090.0	$330,827.0	$312,549.0
U.S. Revenue	314,767.0	99,004.0	64,880.0	51,324.0	44,540.0
Non-U.S. Revenue	205,401.0	226,223.0	247,210.0	279,503.0	268,009.0
Cost of Sales	$240,607.0	$175,573.0	$210,249.0	$184,936.0	$196,550.0
R&D Expense	$44,741.0	$22,633.0	$19,369.0	$11,633.0	$11,205.0
SG&A Expense	$193,397.0	$128,897.0	$142,391.0	$119,263.0	$124,803.0
Capital Expense	N/A	N/A	N/A	N/A	N/A
Pretax Income	($71,878.0)	($7,401.0)	($54,283.0)	$12,650.0	($28,626.0)
Pretax Margin (%)	(13.82)	(2.28)	(17.39)	3.82	(9.16)
Effective Tax Rate (%)	N/A	N/A	N/A	N/A	N/A
Net Income	($48,264.0)	($8,558.0)	($57,770.0)	($7,997.0)	($29,236.0)
Shares Outstanding, Millions	19,582.8	17,977.6	12,863.5	10,048.5	10,080.6
Per Share Data					
Earnings	($2.46)	($0.48)	($4.98)	($0.18)	($3.85)
Dividends	N/A	N/A	N/A	N/A	N/A
Book Value	$14.11	$12.98	$14.14	$18.13	$13.40

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending July
(Thousands of U.S. Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	2.27	2.58	1.79	1.65	1.54
Quick (Times)	1.56	1.85	1.42	1.27	1.27
Fixed Assets/Equity (%)	25.67	26.09	24.91	31.63	35.40
Current Liabilities/Equity (%)	42.38	37.00	66.79	65.82	78.71
Total Liabilities/Equity (%)	81.90	79.72	122.46	112.65	144.30
Profitability (%)					
Return on Assets	-	(1.86)	(14.02)	(2.02)	(8.15)
Return on Equity	-	(3.36)	(27.83)	(4.39)	(18.43)
Profit Margin	(9.28)	(2.63)	(18.51)	(2.42)	(9.35)
Other Key Ratios					
R&D Spending % of Revenue	8.60	6.96	6.21	3.52	3.59
Capital Spending % of Revenue	0	0	0	0	0
Employees	5,993	3,621	2,749	2,693	2,451
Revenue ($K)/Employee	$86.80	$89.82	$113.53	$122.85	$127.52
Capital Spending % of Assets	0	0	0	0	0

N/A = Not Available

Source: Datapoint Corporation
Annual Reports and Forms 10-K
Dataquest
1990

Data Translation, Inc.

100 Locke Drive
Marlboro, Massachusetts 01752-1192
Telephone: (508) 481-3700
Fax: (508) 481-8620
Dun's Number: 06-933-7202

Date Founded: 1973

CORPORATE STRATEGIC DIRECTION

Data Translation, Inc., concentrates on the design, manufacture, and marketing of high-performance image processing, data acquisition, and array processing computer boards and software. These and related products are for use with microcomputers (including personal computers) in industrial, laboratory, medical, scientific, and other environments. The Company's principal products are analog input/output (I/O) boards, which record analog signals and convert them to and from digital form for digital signal processing (DSP) and image processing applications on microcomputers. Data Translation manufactures over 600 products that are sold in over 40 countries.

Data Translation implemented a cost containment program in 1989 aimed at holding operating expenses flat and reducing manufacturing costs. This led to a 10 percent reduction in employment in the third quarter of 1989. Also, the Company was restructured around four separate business units: Data Acquisition, Image Processing, Desktop Video, and Local Area Networks. Data Translation's reorganization was intended to more directly address the variety of markets that it serves and to become more responsive to its customers' needs.

Data Translation sells to both end users and resellers. Resellers include original equipment manufacturers (OEMs), systems integrators, and value-added resellers (VARs) that integrate the Company's products into specialized microcomputer systems. Data Translation relies on comprehensive catalogs and a highly automated inside sales group that allows the Company to sell its products efficiently and without the need for a direct sales staff. Products are sold worldwide (principally in Western Europe and the Far East) through subsidiaries in the United Kingdom and Germany, and by more than 30 foreign distributors.

Data Translation experienced an 8.5 percent increase in sales in 1989, after eight years with an average sales growth rate of almost 30 percent. Revenue increased to $42.0 million,* up from $38.7 million in 1988. Earnings decreased 8.5 percent, from $2.7 million in 1988 to $2.4 million in fiscal 1989. Data Translation attributes these results to increased competition in its niche markets.

The level of R&D expenditure was relatively flat in 1989 because of the effort to reduce operating expenses. R&D totaled $3.6 million in 1989, or 9.0 percent of revenue. Capital expenditure also was maintained at approximately the same level as in 1988, totaling $2.8 million in 1989, or 6.7 percent of revenue. Because the restructuring has been completed and Data Translation believes that substantial opportunities exist in its traditional markets, R&D and capital expenditure is expected to increase significantly in 1990.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by geographic region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Data Acquisition

The Data Acquisition unit manufactures data acquisition products such as modules, I/O boards, supporting software, and accessories for use in scientific and industrial applications. Its principal products are analog I/O boards that receive analog signals that may

*All dollar amounts are in US dollars.

represent temperature, pressure, and flow, and then convert them into digital language. These products are used in a wide range of professional fields including seismology and earthquake prediction, automobile crash testing, engine testing, and checking raw materials such as cotton for fineness of fiber and tensile strength.

In 1989, Data Translation perceived a trend in this market toward personal computers rather than toward larger Digital Equipment Corporation (DEC) and Multibus multiuser systems. The availability of new low-cost, 32-bit, high-performance microcomputers such as Apple's Macintosh II and most of IBM's PS/2 series computers provides significant impetus to the development of this and other new markets.

Data Translation's new data acquisition offerings in 1989 ranged from very high-speed, niche-market products on the PC and PC AT to lower-cost, single-function PS/2 boards. Data Translation introduced families of I/O boards shortly after the emergence of significant computer buses such as Apple's Macintosh II NuBus; DEC's Q-bus and UNIBUS; IBM's PC XT, AT, and PS/2 Micro Channel Architecture (MCA) buses; Intel's BITBUS; Motorola's VMEbus; and the STD BUS.

A new product introduced in 1990 called Global Lab provides a software package for data acquisition boards. It is the first menu-driven software that enables users to perform data gathering and storage to disk at 250 KHz. Global Lab supports up to 20 Mbytes of expanded memory and 15 Mbytes of extended memory. The program works with DT2801, DT2821, DT2831, and DT2901 series boards for the IBM PC AT, XT, and PS/2 computers. The Company also has introduced the 2831 series of "Hands Off" data acquisition boards that totally eliminate the need for potentiometers.

Image Processing

Data Translation has produced image processing products since 1984. These products include monochrome and color frame grabber boards, frame processor boards, and software. The boards are designed to receive images into a computer, where they can be analyzed, modified, and stored. Data Translation targets scientific, medical, and industrial users for these products. In 1989, sales of image processing related products accounted for 21 percent of Data Translation's total sales.

In 1989, Data Translation emphasized image processing products for IBM PC and PC AT clones and expanded the sales for PS/2 and Macintosh II machines. New product introductions included new frame grabber hardware and software for users of Sun workstations.

Data Translation also announced QuickCapture for IBM PC AT compatibles. The new product is a real-time frame grabber product that is fully software-compatible with its PS/2 predecessor. Both models capture images electronically from video cameras or VCRs, and are targeted at scientific image processing and desktop publishing markets.

Desktop Video

Desktop video is a relatively new market featuring products that permit video images to be created, edited, or merged with documents using desktop publishing, graphics, and animation computer software. In 1989, the Company's desktop video product line expanded to include products for use on the IBM PS/2 and the Macintosh II.

Data Translation's ColorCapture boards enable animators and desktop publishers to integrate and automate functions that formerly required dedicated equipment. ColorCapture enables users to input color video from a camera or a recorder to the computer, where it can be edited, placed in a desktop publishing document, or manipulated by a computer animation routine.

Local Area Networks (LANs)

Data Translation's UK subsidiary, Data Translation Ltd., has been a distributor of externally sourced LAN products in the United Kingdom since 1982. Data Translation Ltd. provides maintenance support programs, customer training, and consulting services to assist its customers and VARs. In 1989, sales by this division accounted for 24 percent of the Company's total sales.

The LAN division provides three types of networking products: local area networking, wide area networking, and network management. The first of these offers hardware and software products that link computers, terminals, and printers within a single building. Corporations, universities, and research organizations are large users of Data Translation's LAN products. Wide area networks provide communication between computers in different buildings,

cities, or even countries. Wide area networks can provide links between local area networks. Finally, network management offers products that manage and control these networks.

Color Desktop Publishing

In 1988, Data Translation created the Overlain Development Group in Cambridge, Massachusetts. The new business unit was designed to create a Macintosh-compatible software package that would enable desktop publishers to edit color photographs electronically as easily as they manipulate text. PhotoMac 1.0 was the result of this new development project. It was enhanced in 1989 with PhotoMac 1.1 and again in 1990 with PhotoMac 1.5.

PhotoMac is used in a variety of fields including newspaper publishing, photo retouching and illustration, advertising agencies, and graphic designers.

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest industry service.

Table 1
Five-Year Corporate Highlights (Thousands of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$16,849	$23,069	$30,858	$38,680	$41,984
Percent Change	-	36.92	33.76	25.35	8.54
Capital Expenditure	$1,949	$1,752	$2,870	$2,843	$2,821
Percent of Revenue	11.57	7.59	9.30	7.35	6.72
R&D Expenditure	$1,832	$2,096	$2,819	$3,659	$3,647
Percent of Revenue	10.87	9.09	9.14	9.46	8.69
Number of Employees	163	183	233	268	240
Revenue ($K)/Employee	$103.37	$126.06	$132.44	$144.33	$174.93
Net Income	$1,639	$2,125	$2,904	$2,662	$2,435
Percent Change	-	29.65	36.66	(8.33)	(8.53)

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$11,193	$11,428	$9,409	$9,954
Quarterly Profit	$924	$888	$146	$477

Source: Data Translation, Inc.
Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	81.29	76.70	73.23	70.62	72.77
International	18.71	23.30	26.77	29.38	27.23
Europe	14.05	17.48	19.83	20.89	20.98
Asia/Pacific	4.66	5.82	6.94	8.49	6.25

Source: Data Translation, Inc.
Annual Reports and Forms 10-K
Dataquest (1990)

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	0	0
Indirect Sales	100.00	100.00
Distributors*	60.00	60.00
OEMs*	40.00	40.00

*Dataquest Estimate

Source: Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—1
Europe—2

MANUFACTURING LOCATIONS

North America

Marlboro, Massachusetts
Full range of Data Translation's 600 products

SUBSIDIARIES

North America

Data Translation International, Inc. (United States)
Data Translation Investments, Inc. (United States)

Europe

Data Translation GmbH (Germany)
Data Translation Ltd. (United Kingdom)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

Digital Equipment Corporation (DEC)
Data Translation was the first data acquisition and image processing board vendor to receive advance specifications for DEC's new TURBO channel-based desktop workstation, the DECstation 5000 Model 200. Data Translation's I/O boards will allow the new RISC/UNIX-based DECstation to be used as an engineering, scientific, or image processing workstation or remote host.

1989

Laboratory Technologies
Data Translation and Laboratory Technologies have jointly developed an easy-to-use, menu-driven software package that will be shipped free of charge with the DT2914 analog input board. The software package is called ACQUIRE.

1988

Silicon Beach Software
Data Translation and Silicon Beach Software announced a codevelopment and comarketing agreement to promote Digital Darkroom photo retouching software and the QuickCapture frame grabber board in Mac II desktop publishing applications. Such applications include graphic arts, page layout, and photo design.

Letraset
Letraset's Graphic Design Software Division and Data Translation formed a joint marketing agreement to promote Letraset's Imagestudio software and Data Translation's QuickCapture frame grabber board in desktop publishing and graphic design.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Alfred A. Molinari, Jr.
President

Robert P. Cirrone
Chief financial officer and vice president, Finance

John Molinari
Vice president, Marketing and Sales

Kevin F. Rozak
Vice president, Strategic Planning

John R. Turner
Vice president, Engineering

Ellen Wirka
Vice president, Manufacturing

PRINCIPAL INVESTORS

Alfred A. Molinari, Jr.—22.4 percent
Wellington Management Company—10.0 percent
First Chicago Corporation—6.3 percent
Brinson Partners—5.0 percent

FOUNDERS

Information is not available.

Table 4
Comprehensive Financial Statement
Fiscal Year Ending March 31
(Thousands of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$11,494	$14,684	$17,252	$20,644	$21,351
Cash	2,135	2,054	2,372	1,634	6,271
Receivables	2,798	4,687	4,863	7,301	6,867
Marketable Securities	3,004	4,345	5,540	3,176	2,913
Inventory	3,294	3,236	3,975	7,780	4,266
Other Current Assets	263	362	502	753	1,034
Net Property, Plants	$3,087	$3,700	$5,052	$5,871	$6,173
Other Assets	$46	$50	$764	$907	$805
Total Assets	$14,627	$18,434	$23,068	$27,422	$28,329
Total Current Liabilities	$3,041	$4,349	$5,516	$6,713	$5,474
Long-Term Debt	0	0	0	0	0
Other Liabilities	$476	$471	$605	$699	$592
Total Liabilities	$3,517	$4,820	$6,121	$7,412	$6,066
Total Shareholders' Equity	$11,110	$13,614	$16,947	$20,010	$22,263
Common Stock	22	30	30	30	31
Other Equity	6,385	6,778	7,030	7,341	7,643
Retained Earnings	4,709	6,834	9,738	12,400	14,835
Total Liabilities and Shareholders' Equity	$14,627	$18,434	$23,068	$27,422	$28,329
Income Statement	**1985**	**1986**	**1987**	**1988**	**1989**
Revenue	$16,849	$23,069	$30,858	$38,680	$41,984
US Revenue	14,463	17,783	23,598	26,910	27,423
Non-US Revenue	2,386	5,286	7,260	11,770	14,561
Cost of Sales	$7,438	$10,842	$13,462	$18,578	$20,913
R&D Expense	$1,832	$2,096	$2,819	$3,659	$3,647
SG&A Expense	$5,170	$6,553	$9,655	$12,414	$14,192
Capital Expense	$1,949	$1,752	$2,870	$2,843	$2,821
Pretax Income	$2,710	$3,862	$5,125	$4,397	$3,711
Pretax Margin (%)	16.08	16.74	16.61	11.37	8.84
Effective Tax Rate (%)	39.50	45.00	43.30	39.50	34.40
Net Income	$1,639	$2,125	$2,904	$2,662	$2,435
Shares Outstanding, Millions	2.7	3.1	3.2	3.0	3.1
Per Share Data					
Earnings	$0.60	$0.70	$0.91	$0.78	$0.88
Dividend	0	0	0	0	0
Book Value	$4.11	$4.39	$5.30	$6.67	$7.18

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending March 31
(Thousands of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	3.78	3.38	3.13	3.08	3.90
Quick (Times)	2.70	2.63	2.41	1.92	3.12
Fixed Assets/Equity (%)	27.79	27.18	29.81	29.34	27.73
Current Liabilities/Equity (%)	27.37	31.95	32.55	33.55	24.59
Total Liabilities/Equity (%)	31.66	35.40	36.12	37.04	27.25
Profitability (%)					
Return on Assets	-	12.86	13.99	10.54	8.74
Return on Equity	-	17.19	19.00	14.41	11.52
Profit Margin	12.61	9.21	9.41	6.88	5.80
Other Key Ratios					
R&D Spending % of Revenue	10.87	9.09	9.14	9.46	8.69
Capital Spending % of Revenue	11.57	7.59	9.30	7.35	6.72
Employees	163	183	233	268	240
Revenue ($K)/Employee	$103.37	$126.06	$132.44	$144.33	$174.93
Capital Spending % of Assets	13.32	9.50	12.44	10.37	9.96

Source: Data Translation, Inc.
Annual Reports and Forms 10-K
Dataquest (1990)

Decision Data Inc.

410 Horsham Road
Horsham, Pennsylvania 19044
Telephone: (215) 956-5728
Fax: (215) 675-1931
Dun's Number: 05-142-1857

Date Founded: 1969

CORPORATE STRATEGIC DIRECTION

Decision Data Inc., through its two operating subsidiaries, Decision Data Computer Corporation (DDCC) and Decision Data Service, Inc., is a worldwide independent supplier of IBM System/3X- and AS/400-compatible products and services. DDCC markets a broad line of products including IBM System 3X and AS/400 systems, personal computers, workstations, terminals, printers, and computer supplies. DDCC controls domestic operations and includes Decision Data Computer International (DDCI), Decision Data Canada Inc., Decision Data Direct, and Decision Business Solutions Corporation (DBSC).

Decision Data Service, Inc., services more than 1,000 models of computer equipment, including IBM, Texas Instruments, Wang, and DDCC peripherals.

DDCC markets IBM System/3X and AS/400 peripherals. DDCC's strategy is to establish strategic alliances with original equipment manufacturers (OEMs). DDCI sells localized System/3X and AS/400 peripheral products through 18 distributors that conduct operations in 22 countries. Olivetti Corporation will distribute Decision Data workstations and terminals, communications controllers, add-in memory, and a full line of printers for IBM midrange computer systems in Europe under a recently signed agreement. Decision Data Direct provides accessories and supplies for midrange and personal computers through catalog orders. Decision Data Canada provides sales, service, and support for DDCC products throughout Canada. DBSC trades, leases, sells, and upgrades DDCC peripherals and IBM midrange computers.

Since Decision Data Inc. is a privately held company, no financial information is included in this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

According to Dataquest estimates, Decision Data ranked second behind IBM in 1989 in terminal shipments by minicomputer vendors and manufacturers of IBM 5250-compatible terminals with 13.8 percent market share. Dataquest estimates that Decision Data ranked fifth in 1989 total North American display terminal shipments with 5.1 percent market share.

In early 1990, DDCC introduced a personal workstation based on the Intel 80286 microprocessor. The new DDCC 5054-01 is designed to connect to an IBM midrange computer system or to operate as a standalone personal computer. The DDCC 5054-01 comes standard with 640KB of RAM on the system board and a maximum capacity of 2MB of RAM on the main processor board. The Company also introduced the DDCC 5074-01 personal workstation. The 5074 can be connected to a System 3X or AS/400 host as a terminal or a PC running under IBM PC support. The 5074 features an 80386 SX 32-bit microprocessor.

Further Information

For further information about Decision Data Inc., please contact the appropriate Dataquest industry service.

1989 SALES OFFICE LOCATIONS

North America—75

MANUFACTURING LOCATIONS

Information is not available.

SUBSIDIARIES

North America

Decision Business Solutions Corporation (United States)
Decision Data Canada Inc. (Canada)
Decision Data Computer International (United States)
Decision Data Direct (United States)
Decision Data Service, Inc. (United States)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

Olivetti Corporation
Olivetti will distribute midrange computer products supplied by DDCC in Europe.

MERGERS AND ACQUISITIONS

The Company has not participated in any mergers or acquisitions.

KEY OFFICERS

Joseph Kroger
President and chief executive officer

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Information is not available.

Dell Computer Corporation

9505 Arboretum Boulevard
Austin, Texas 78759
Telephone: (512) 338-4400
Fax: (512) 338-8700
Dun's Number: Not Available

Date Founded: 1984

CORPORATE STRATEGIC DIRECTION

Dell Computer Corporation designs, manufactures, sells, services, and supports high-performance personal computers compatible with industry standards. Dell completed its initial public offering in June 1988.

Dell Computer has grown rapidly through a direct-to-the-user marketing, support, and custom-manufacturing strategy. This strategy enables users to purchase systems configured to their requirements directly from Dell Computer. A customer's relationship with Dell Computer is usually established over the telephone, complemented, for some large accounts, with sales visits to Dell. The Company maintains the relationship through its program of after-sale support. Dell Computer targets individuals, small and medium-size businesses, major corporations, government agencies, academic institutions, and value-added resellers (VARs).

In 1989, Dell Computer changed its organizational structure by turning its subsidiaries in the United Kingdom, Canada, and Germany into independent business units. The new units are fully responsible for profit and losses, and will act autonomously. Direct sales will still remain the primary channel for the international operations, but other channels will be considered. On-site manufacturing will continue to grow at the European units. In early 1990, two new European subsidiaries were established in France and Sweden.

Total revenue increased by 51 percent to $388.6 million* in fiscal 1990 from $257.8 million in fiscal 1989. Net income decreased 65 percent to $5.1 million in fiscal 1990 from $14.4 million in fiscal 1989. Dell Computer employs 1,508 people worldwide.

*All dollar amounts are in US dollars.

R&D expenditure totaled $16.9 million in fiscal 1989, representing 4.3 percent of total revenue. Dell has de-emphasized its development efforts in reduced-instruction-set computing (RISC) and multiprocessing technology.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Dell has developed a series of high-performance personal computers based on Intel 80486, 80386, 80386SX, and 80286 microprocessors. These Dell systems are compatible with the IBM PC AT industry standard. All of Dell's products run Microsoft Corporation's MS-DOS and MS-OS/2 operating systems, as well as versions of AT&T's UNIX operating system.

80486-Based System

In March 1990, Dell announced the Dell System 425E, its first computer based on the high-powered Intel 80486 microprocessor and the high-performance 32-bit Extended Industry Standard Architecture (EISA). The Dell 425E runs at 25 MHz and is designed for applications that demand very high computation powers and high-speed, large-capacity storage. These applications include multiuser processing under UNIX, use as a network server, and computer-aided design and engineering.

80386-Based Systems

The Dell Systems 325 and 310 are high-performance systems that use Intel's 80386 microprocessor, running at 25 MHz and 20 MHz, respectively. They support a variety of single-user, multiuser, and network applications. These systems offer 32KB of high-speed static cache memory and page-mode interleaved architecture to enhance memory throughput.

80386SX-Based Systems

In March 1990, Dell announced the Dell System 320LX, an 80386SX-based system running at 20 MHz. The Dell 320LX provides 25 percent higher performance than typical 16-MHz 386SX systems. The Dell 320LX features extensive expansion options that offer flexibility in system configuration. Initial shipments of the Dell 320LX were made in the first quarter of fiscal 1991.

The Dell Systems 316 and 316SX are based on Intel's 80386SX microprocessor running at 16 MHz, offering 32-bit functionality of the 80386 processor at lower prices. The Dell 316 is a large chassis machine, offering extensive expandability. The Dell 316SX provides equivalent performance in a more compact design.

The Dell 316LT offers performance advantages of the 80386SX 16-MHz microprocessor in a portable, battery-powered laptop system. The Dell 316LT includes a hard disk drive, 1 megabyte of random access memory (RAM), and a monochrome video graphics array (VGA) liquid crystal display.

80286-Based System

The Dell System 210, based on Intel's 80286 microprocessor, offers 12.5-MHz performance in a compact design. The Dell 210 is offered as an affordable personal computer suitable for home and office use.

UNIX Operating System Products

In March 1990, Dell announced the DELL Stations 425E and 325 multiuser workstations. The DELL Stations incorporate Dell UNIX System V, Uniplex office automation software, and a graphic user interface (GUI) that permits users to avoid having to learn the complex UNIX command syntax. The DELL Station 425E is based on the Dell System 425E; the DELL Station 325 is based on the Dell System 325. The DELL Stations are scheduled for shipment in the second quarter of fiscal 1991.

Along with the DELL Stations, Dell announced the DELL Station Partner software kit. The DELL Station Partner kit is software that permits a personal computer running the standard MS-DOS operating system to emulate a color X terminal, which is a UNIX terminal that uses a graphics interface to support multitasking.

Other

In addition to its systems offerings, Dell sells and supports a complete line of software, peripherals, and accessories. Dell markets versions of MS-DOS, MS-OS/2, and UNIX operating systems that are enhanced by Dell. The enhancements enable these operating systems to increase their performance when running on Dell products and include programs that provide additional functions and features. The Company also offers a variety of widely used application software packages from major software publishers. In addition, Dell offers laser and Epson dot-matrix printers. Other peripheral products offered include high-resolution graphics adapters and monitors, modems, and network adapters. These peripheral products are manufactured by third parties; some of them are marketed under the Dell name.

Further Information

For more information about the Company's business segments, please contact the appropriate Dataquest industry service.

Table 1
Corporate Highlights (Thousands of US Dollars)

	1987	1988	1989	1990
Four-Year Revenue	$69,450.0	$159,037.0	$257,810.0	$388,558.0
Percent Change	-	128.99	62.11	50.71
Capital Expenditure	NA	NA	NA	NA
Percent of Revenue	-	-	-	-
R&D Expenditure	$1,583.0	$5,502.0	$7,097.0	$16,877.0
Percent of Revenue	2.28	3.46	2.75	4.34
Number of Employees	NA	NA	NA	1,508
Revenue ($K)/Employee	-	-	-	$257.66
Net Income	$2,161.0	$9,370.0	$14,428.0	$5,114.0
Percent Change	-	333.60	53.98	(64.56)

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$87,485.00	$95,694.00	$95,549.00	$109,830.00
Quarterly Profit	$2,051.00	$1,866.00	$104.00	$1,093.00

NA=Not available

Source: Dell Computer Corporation
Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1987	1988	1989	1990
North America	-	-	85.43	81.70
International	-	-	14.57	18.30
Europe	-	-	14.57	18.30

Source: Dell Computer Corporation
Annual Reports and Forms 10-K
Dataquest (1990)

Table 3
Revenue by Distribution Channel (Percent)

Channel	1989	1990
Direct Sales	100.00	100.00
Indirect Sales	0	0

Source: Dell Computer Corporation
Annual Reports and Forms 10-K
Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—8
Europe—4

MANUFACTURING LOCATIONS

North America

Austin, Texas
Canada

Europe

United Kingdom
West Germany

Manufacturing activities include final assembly, functional testing, and quality control of the Company's products and the components, parts, and subassemblies incorporated in them. Dell's flexible manufacturing process allows it to custom-configure its products to customer specifications.

SUBSIDIARIES

North America

Dell Computer Corp. (Canada)
Dell Computer Services Corp. (United States)
Dell Direct Sales Corp. (United States)
Dell Field Sales Corp. (United States)
Dell International Inc. (United States)
Dell Products Corp. (United States)
Dell USA Corp. (United States)

Europe

Dell Computer AB (Sweden)
Dell Computer Corp. (United Kingdom)
Dell Computer GmbH (Germany)
Dell Computer S.A. (France)

Asia/Pacific

Dell Computer Corp. Far East (Japan)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

SourceMate Information Systems
Dell Computer and SourceMate Information Systems, the publisher and developer of AccountMate modifiable business software, entered a comarketing and cross-channel agreement. This agreement enables SourceMate resellers to qualify for discounts on Dell Computer products provided they meet Dell value-added reseller (VAR) qualifications. Dell VARs will be offered demo programs and in-house copies of SourceMate products at substantial discounts.

Dell Computer and Locus Computing Corp.
Dell Computer and Locus Computing signed a two-year OEM agreement, providing Locus's DOS/UNIX connectivity software and X Window functionality to Dell's personal computers.

IXI Ltd.
Dell Computer and IXI entered into a licensing agreement under which IXI will provide its X.desktop 2.0 UNIX graphical interface to Dell. The Open Software Foundation (OSF)/Motif-compliant desktop manager will be bundled with Dell's new 80386 and 80486 systems.

Renaissance GRX Inc.
Dell Computer and Renaissance GRX entered an agreement where Renaissance will supply Dell with its GPX 1024/16 and PPX 1024/256 intelligent graphics controllers.

1988

IBM
Dell Computer and IBM entered into a licensing agreement under which IBM will receive royalties from Dell on past, current, and future sales of systems incorporating patented IBM know-how, including PC XT- and AT-compatible and future PS/2-compatible.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Michael S. Dell
Chairman and chief executive officer

Andrew R. Harris
Senior vice president, Marketing and International

G. Glenn Henry
Senior vice president, Product Group

Joel J. Kocher
Senior vice president, US Sales and Operations

Donald D. Collis
Vice president of Finance and chief financial officer

Rick Germani
Vice president of Procurement

James R. Hindmarch
Vice president of Manufacturing

David S. Register
Vice president of Product Development

B. Kent Roberts
Vice president of Plans and Controls

PRINCIPAL INVESTORS

Michael S. Dell—57.4 percent

FOUNDERS

Information is not available.

Table 4
Comprehensive Financial Statement
Fiscal Year Ending February/January
(Thousands of US Dollars, except Per Share Data)

Balance Sheet	1987	(Jan.)1988	(Jan.)1989	(Feb.)1990
Total Current Assets	NA	$51,813.0	$149,429.0	$142,516.0
Cash	NA	7,457.0	2,631.0	-
Receivables	NA	17,057.0	36,360.0	60,042.0
Marketable Securities	NA	-	-	-
Inventory	NA	24,062.0	103,999.0	68,246.0
Other Current Assets	NA	3,237.0	6,439.0	14,228.0
Net Property, Plants	NA	$4,016.0	$14,854.0	$26,170.0
Other Assets	NA	$403.0	$2,749.0	$3,088.0
Total Assets	NA	$56,232.0	$167,032.0	$171,774.0
Total Current Liabilities	NA	$25,080.0	$86,303.0	$84,546.0
Long-Term Debt	NA	$1,020.0	$5,472.0	$6,041.0
Other Liabilities	NA	$447.0	-	$1,426.0
Total Liabilities	NA	$26,547.0	$91,775.0	$92,013.0
Total Shareholders' Equity	NA	$29,685.0	$75,257.0	$79,761.0
Converted Preferred Stock	NA	20,228.0	NA	NA
Common Stock	NA	110.0	186.0	188.0
Other Equity	NA	130.0	51,426.0	50,814.0
Retained Earnings	NA	9,217.0	23,645.0	28,759.0
Total Liabilities and Shareholders' Equity	NA	$56,232.0	$167,032.0	$171,774.0

Income Statement	1987	(Jan.)1988	(Jan.)1989	(Feb.)1990
Revenue	$69,450.0	$159,037.0	$257,810.0	$388,558.0
US Revenue	NA	NA	220,239.0	317,447.0
Non-US Revenue	NA	NA	37,571.0	71,111.0
Cost of Sales	$53,420.0	$109,012.0	$176,693.0	$277,826.0
R&D Expense	$1,583.0	$5,502.0	$7,097.0	$16,877.0
SG&A Expense	$10,304.0	$27,289.0	$51,198.0	$80,929.0
Capital Expense	-	-	-	-
Pretax Income	$3,866.0	$8,270.0	$21,163.0	$15,123.0
Pretax Margin (%)	5.57	5.20	8.21	3.89
Effective Tax Rate (%)	44.10	38.00	31.80	38.20
Net Income	$2,161.0	$9,370.0	$14,428.0	$5,114.0
Shares Outstanding, Thousands	11,468.0	13,070.0	18,012.0	19,229.0
Per Share Data				
Earnings	$0.19	$0.72	$0.80	$0.27
Dividend	NA	NA	NA	NA
Book Value	NA	$2.27	$4.18	$4.15

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending February/January
(Thousands of US Dollars, except Per Share Data)

Key Financial Ratios	1987	(Jan.)1988	(Jan.)1989	(Feb.)1990
Liquidity				
Current (Times)	-	2.07	1.73	1.69
Quick (Times)	-	1.11	0.53	0.88
Fixed Assets/Equity (%)	-	13.53	19.74	32.81
Current Liabilities/Equity (%)	-	84.49	114.68	106.00
Total Liabilities/Equity (%)	-	89.43	121.95	115.36
Profitability (%)				
Return on Assets	-	33.33	12.92	3.02
Return on Equity	-	63.13	27.50	6.60
Profit Margin	3.11	5.89	5.60	1.32
Other Key Ratios				
R&D Spending % of Revenue	2.28	3.46	2.75	4.34
Capital Spending % of Revenue	-	-	-	-
Employees	-	-	-	1,508
Revenue ($K)/Employee	-	-	-	$257.66
Capital Spending % of Assets	-	-	-	-

NA = Not available

Source: Dell Computer Corporation Annual Reports and Forms 10-K
Dataquest (1990)

Delphax Systems

35 Pacella Park Drive
Randolph, Massachusetts 02368
Telephone: (617) 961-2312
Fax: (617) 963-7206
Dun's Number: Not Available

Founded: 1980

CORPORATE STRATEGIC DIRECTION

Delphax is the original developer and a leading manufacturer of high-speed ion deposition page printers, print engines, components, and supplies. Its products are designed for medium- and high-volume data processing applications and are marketed worldwide through value-added resellers (VARs), original equipment manufacturers (OEMs), and contract licensing partnerships.

Delphax was formed in 1980 as a joint venture between Dennison Manufacturing Company and Canada Development Corporation (CDC). CDC's share in the Company was purchased by Xerox Corporation in 1984. In spring 1990, Olympus Optical Company (Tokyo) purchased an equal share in the venture through its American subsidiary, Olympus Corporation. As a result of the $15 million* purchase, the three companies each now hold 33 percent shares in the company. Olympus plans to start marketing Delphax's ion deposition printers under the Olympus brand name in the United States and Japan.

Delphax believes that its ion deposition page printing systems are ideally suited to mid- to high-volume printing applications with fast turnaround requirements. Key applications include financial/accounting reports, data processing output, and internal management reports. These systems are also being used increasingly for corporate publishing, technical documentation, and optical character recognition (OCR) encoding in retail and financial service industries.

Delphax's R&D efforts are being devoted to investigating shades of color, duplex printing at a variety of speeds, high-quality fonts, and improved raster image processing (RIP) functionality through additional interfaces and emulations.

*All dollar amounts are in US dollars.

Delphax Systems is a $47 million company. Delphax owns all patents for ion deposition printing technology, one of the four technology pillars of the $6.3 billion nonimpact printer market. The others are laser electrophotography, magnetography, and LED array. In 1989, Delphax employed approximately 440 people, a 16 percent reduction from 1988 employment figures. Delphax currently has more than 20 OEM customers. Over 10,000 Delphax-manufactured printers and engines are now in use worldwide.

As mentioned previously, Delphax is owned by Dennison Manufacturing Company, Olympus Corporation, and the Xerox Corporation. Because it is not an independent company, comprehensive financial information is not available.

BUSINESS SEGMENT STRATEGIC DIRECTION

Page Printer Systems

The S6000-2 ion deposition printer produces up to 75 single-sided images per minute (75-ppm simplex), with a duty cycle of up to 1 million pages per month. The S9000-2C printer combines ion deposition technology with a pair of high-speed print engines that allow it to produce up to 180 double-sided images per minute (90-ppm duplex), with a duty cycle of up to 1.5 million pages per month. Both printers have a resolution of 240 x 240 dots per inch (dpi).

Both of these models are designed to work in conjunction with FormMaker II, a software package that allows the user to develop custom forms and to redesign old forms. FormMaker II runs on any standard IBM PC or compatible and includes a host of menu-driven utilities. Both printers are available with

an optional multiforms buffer capable of storing several forms at once for quicker job throughput.

Engines

The 2460 Image Output Module (IOM) is a 60-pages-per-minute (ppm) ion deposition print engine; the 2490 IOM is a 90-ppm ion deposition print engine. These engines are sold to OEM customers such as Bull Printing Systems, C. Itoh, Northern Telecom, Unisys, and Xerox.

Fonts

Delphax licensed Intellifont, a type design software system from Agfa Compugraphic, to edit the Delphax fonts. Intellifont provides access to an industry-standard library of 1,700 fonts. Delphax now offers 240 x 240 dpi resolution, along with its selection of nearly 300 type fonts, each supporting domestic and international character sets. The fonts are available in text and display sizes, from 4 to 36 points. Also, Delphax has a variety of non-Latin fonts and two original typefaces, Boston Gothic and Nile.

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest industry service.

1989 SALES OFFICE LOCATIONS

North America—4
Europe—1

MANUFACTURING LOCATIONS

North America

Mississauga, Ontario, Canada
Ion deposition printers, engines, and components

SUBSIDIARIES

Europe

Delphax GmbH (Germany)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

C. Itoh and Olympus Corporation
The 3030 (30-ppm) and 4530 (45-ppm) printers are marketed through a joint licensing arrangement with C. Itoh and Olympus.

Derex, Inc.
Derex released a 90-ppm ion deposition printer subsystem for minicomputer and mainframe users. The engines for the printers are manufactured by Delphax.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Alex Cimochowski
President and chief executive officer

Jake Arnold
Director, Human Resources

Tom Beale
Vice president, Manufacturing

John H. Buchanan
Vice president, Finance and Administration

Debbie Depp
Vice president, Marketing

Michael Dillon
Vice president, Sales

Patrick Dolan
Vice president, Business Development

Robert Rushby
Vice president, Engineering

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Information is not available.

Digital Equipment Corporation

146 Main Street
Maynard, Massachusetts 01754
Telephone: (617) 897-5111
Fax: (508) 493-8780
Dun's Number: 00-103-8066

Date Founded: August 23, 1957

CORPORATE STRATEGIC DIRECTION

Digital Equipment Corporation was founded by Kenneth Olsen, Stanley Olsen, and Harland Anderson, three former employees of MIT's Lincoln Laboratory. Digital has grown from its origin as a manufacturer of computer logic modules into the second largest computer manufacturer in the United States. Digital is a leading supplier of networked computer systems, minicomputer systems, software, and services, including systems integration.

Digital operates in the United States and 82 other countries around the world, manufacturing, selling, and servicing computers, peripheral equipment, software, and supplies. Digital's product portfolio includes desktop, time sharing, transaction processing, and scientific systems that address a broad range of information processing needs. The Company's corporate mission is to provide solutions that help organizations become more productive and more competitive.

In his president's letter at the beginning of the report to stockholders of September 1, 1989, Kenneth Olsen states: "Digital is committed to integrating existing desktop computer systems into corporate networks while increasing our share of the terminal, personal computer, and workstation market; developing distributed transaction processing systems and applications; becoming a leader in integrating the products of different manufacturers by building a network of alliances with software developers, other manufacturers, and with systems integrators."

Digital's total revenue increased 11.0 percent to $12.7 billion* for the fiscal year ended July 1, 1989, up from $11.4 billion in fiscal 1988. Net income decreased by 17.8 percent to $1.1 billion in fiscal 1989, down from $1.3 billion in fiscal 1988. Flat year-to-year sales in the United States and a higher level of operating expenses led to the decline. The Company's profit margin also decreased to 8.4 percent in fiscal 1989, down from 11.4 percent in fiscal 1988. This figure is representative of the industry as a whole, which is suffering from decreasing profit margins due to pricing competition and higher operating expenses.

North America was Digital's largest single market, representing 46.0 percent of total revenue, and Europe accounts for 40.3 percent of total revenue. Digital has maintained constant growth in sales and income growth rate in markets outside the United States. In 1989, 54.0 percent of Digital's revenue came from foreign markets, up nearly 5.0 percent from the 1988 figure of 49.4 percent. Digital has approximately 500 worldwide sales offices; 53.0 percent are located in the United States.

In fiscal 1989, $4.5 billion or 35.7 percent of revenue came from service and other revenue, which include maintenance, software support, consulting services, customer training, and the sale of replacement parts. This sector of Digital's revenue has been increasing steadily for the last 10 years at a slightly faster pace than product sales. Digital attributes this increase to high levels of customer satisfaction and a comprehensive portfolio of customer services.

Research and development (R&D) increased 16.7 percent to $1.5 billion in fiscal 1989 compared with $1.3 billion in fiscal 1988. Much of this increase was spent on software support. Digital recognizes that it must excel in software support to satisfy its existing clients' needs and lure future clients. Digital will be announcing major programs within fiscal 1990 for end-user software support. The Company also entered

*All dollar amounts are in US dollars.

into a comprehensive technology exchange agreement with MIPS Computer for current and future RISC technology and designs. With the addition of ULTRIX/OSF systems using RISC technology, the Company is able to offer customers more versatility in matching technology to application demands. These two developments partially accounted for R&D reaching 12.0 percent of revenue.

Capital expenditures decreased from $1.5 billion in 1988 to $1.2 billion in 1989, which represented 9.6 percent of revenue. The Company has discontinued leases and canceled plans for a $100 million technical center in Britain as part of its strategy to reduce capital spending levels. Nevertheless, the Company added approximately 3.8 million square feet of building space in 1989, bringing the total amount of space to 42.3 million square feet. However, nearly two-thirds of this expenditure was for the purchase of machinery and equipment to be used to support continued advances in technology. Digital employed approximately 125,800 people worldwide in 1989.

Digital's Customer Services Organization is the primary provider of service, support, and education to the Company's customer base. This operation has traditionally focused on delivering a variety of total service solutions in a way that is often rendered transparent to the user and constitutes a key element in Digital's overall business strategy. Digital employs approximately 35,000 service professionals in support organizations that span 450 locations in 64 countries. During 1989, Digital reassigned several thousand employees from its manufacturing operations to be trained and appointed to service and sales duties. This move supports the new strategy, which relies heavily on sales and support.

Digital ranks first in integrated office systems (IOS), with an estimated 55.2 percent market share based on the number of users worldwide. Digital ranks second, with 21.5 percent of IOS licenses sold worldwide, behind IBM's 32.0 percent in 1989. However, Digital ranks first in US shipments of integrated office systems with 42.3 percent of 1989 market share. ALL-IN-1 office system sales increased 30.6 percent in Europe and maintain a 15.7 percent share of the market behind IBM and Nixdorf.

Digital emphasized its commitment to UNIX in 1989 by introducing its RISC/ULTRIX product offerings. Dataquest estimates that Digital ranks third in technical workstation markets with sales of $960 million, and fifth in the UNIX operating systems market with $672 million in sales of ULTRIX and UNIX products.

In the United States, Digital has been operating for some time as nine regional sales organizations supported by matrixed industry and channel marketing groups. However, 1989 saw a restructuring of US sales and marketing into teams focused on vertical industries and specific major accounts within each industry. This is the reaction to sluggish demand in the US market and increasingly effective competition from IBM and others with more finely tuned sales and support staffs.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Technical Computers

For the year ended December 31, 1989, Dataquest estimated Digital's worldwide revenue market share to be 18.9 percent for the total technical computer market. This market share places Digital less than 1.0 percent behind IBM in the total technical computing market. In the technical superminicomputer segment Dataquest ranks Digital in first place with a 50.4 percent revenue market share. In the technical workstation market, Digital earned a revenue market share of 15.6 percent, ranking third behind Sun and HP/Apollo.

In January 1989, Digital introduced the DECstation 3100, a RISC-based UNIX workstation, that is source-code compatible with Digital's ULTRIX. Developed at Digital's Palo Alto, California, facility, the 3100 has expanded to include a family of DECstation products based on the MIPS Computer Systems R2000 and R3000 microprocessors. Digital currently offers a full range of RISC products with performance ratings from 10 to 36 mips. Using the

ability to absorb lower margins on workstations because of its larger VAX business and an aggressive pricing strategy, Digital's future in the workstation market is limited only by the current lack of DECstation application software.

In September 1989, Digital announced a new multichip packaging technology. It uses wafer-scale technology to replace the printed circuit board (PCB), which minimizes the interboard connections and distance between chips. By minimizing the distance between chips, performance can be doubled, according to the Company. In addition, this new packaging technology can accommodate in one 5-inch package the quantity of logic that is on four VAX 8800 PCBs.

In November 1989, Digital introduced the much-anticipated VAX 9000 using the new multichip product. The VAX 9000 offers a peak floating-point speed of 500 mflops and transfer rates of up to 320MB per second with up to 220GB of storage capacity. Dataquest believes that this technology may provide Digital with the price/performance leverage that is required for high-end VAX VMS systems to succeed.

Business Computers

The introduction of DECtp in 1989 strengthened Digital's product offerings for transaction-processing applications, one of the fastest-growing segments of the minicomputer market. Major components of the DECtp system package are a new transaction monitor, a relational database monitor, a storage array, large disk systems, and special installation services. In February 1990, Digital introduced the VAXft fault-tolerant system, along with DECtpa, further enhancing its product offerings for fault-tolerant and transaction-processing use.

Digital also introduced several new products, expanding its superminicomputer market for business applications. In January 1989, Digital announced the VAX 6300 Systems, a series of expandable multiprocessor systems that can support up to 600 users for office applications. In July 1989, Digital introduced the VAX 6000 model 400 systems along with changes in the 200 and 300 models, further extending the range of the VAX family in both the high and low ends of the market.

Digital's VAX and MicroVAX systems are designed to integrate the complete customer environment, from large distributed clusters to individual desktops. Application areas include scientific research, computation, communications, education, data analysis, industrial control, time sharing, commercial data processing, graphic arts, word processing, office automation, health care, instrumentation, engineering, and simulation.

Microcomputer Systems

In a radical departure from its previous practice, Digital announced OEM agreements in October 1988 with Tandy and Ing. C. Olivetti to resell their PCs with the Digital label in North America and Europe, respectively. Digital's goal with the PC product line is to generate sales opportunities for Digital minicomputers, workstations, and local area networks (LANs) in the form of complete solutions packages. In addition, Digital hopes to increase its level of service sales in general by servicing Digital and other brands of PCs.

In January 1989, Digital introduced the DECstation 210, 316, and 320 personal computers. Based on Intel's 80286 and 80386 microprocessors, the systems are IBM-compatible and supported on Digital's PCLANserver 2000 and by VAX/VMS Services for MS-DOS configured VAX systems. Sales of the new PCs were slow for 1989. Dataquest believes that this sluggishness was due primarily to the lack of software ported to DECwindows, Digital's graphical user interface for desktop-to-mainframe operating environments.

Software

Digital provides several operating system environments including MS-DOS, UNIX, and VMS. In July 1989, Digital introduced VMS version 5.2 with enhancements to its VAXcluster software, security, and systems management features. Digital incorporated UNIX into its technical computer products in 1983 and currently offers users of both business and technical systems choices between VMS and ULTRIX (Digital's version of the UNIX operating system).

Digital has worked closely with other hardware and software vendors to develop guidelines for an open systems environment, and the ULTRIX software is compliant with open systems standards developed by OSF. ULTRIX also is an integral part of Network

Application Support (NAS), Digital's plan for application integration in a distributed, multivendor environment.

In 1990, Digital is continuing expansion of its independent software vendor (ISV) program. Under the NAS program, Digital has over 500 software vendors developing approximately 700 applications. The mission statement of the Digital Independent Software Vendor group is to provide a broad-based portfolio of applications for Digital's desktop VMS and ULTRIX environments to customers worldwide.

Telecommunications

Digital remains the number-one vendor of LAN systems based on an estimated $900 million in sales of LAN products in 1989. Digital supplies a full range of networking products, from host computers, network interface units, gateways, wide area networks (WANs), and local Ethernet networks, to terminals and workstations. Highlights of the year included the introduction of the File/Server 3100 models for network systems environments and Digital's announcement of DECnet support for OS/2.

Display Terminals

In 1989, Digital maintained its position among the top five display terminal vendors worldwide. Dataquest estimates that Digital ranks fourth worldwide based on unit shipments of 484,100 and third in North America with an 8.9 percent unit market share. Currently, Digital derives approximately 47.0 percent of its display terminal product revenue from international markets, with strong sales of the VT320, which sold approximately 230,000 units in 1989.

In May 1990, Digital introduced the VT420 Text Video Terminal for use in office applications such as word processing, on-line transaction processing, and data management. Dataquest believes that if Digital can link its display terminal hardware strategy with its applications software strategy, the VT420 will be a useful tool for presentation management. In conjunction with the VT420 announcement, the VT330+ and VT340+ text and graphics terminals also were introduced, providing improved performance over the earlier VT330/340 models.

Graphics

Digital's goal is to expand its range of desktop display offerings. It sees X Window displays as part of a diverse group of products that will compete for desktop space. In March 1990, Digital formally entered the X Window terminal market with the announcement of its VT1000. Using a ROM-based X server, the VT1000 is designed to access terminal, DECwindows, and X Window applications on VMS, ULTRIX, and UNIX systems.

Printers

Digital's worldwide printer strategy is to provide a comprehensive range of user solutions regardless of user applications or operating systems. It is following through on this strategy by buying print engines from other vendors and then enhancing or adding value to the product. The Company adds value by providing user transparency through DECPrint, paper handling, and user-service ability.

In the first half of 1989, Digital added ULTRIX/UNIX support to its PrintServer 40, upgraded its ScriptPrinter with new V.2 software, reduced line printer pricing, added quantity discounts, and introduced tiered pricing through its distribution channels to increase shipments of printer products. In November, Digital introduced the LA324 Multiprinter, a 300-cps, 24-wire, color optional printer.

In May 1990, Digital added DECprint utility for PostScript to Sixel printing in a VMS environment. At the same time it also introduced a new SIDM printer model, the LA70, an entry-level, 9-wire, 200-cps, narrow-carriage printer.

CAD/CAM/CAE

Dataquest estimates that in 1989 Digital's worldwide market share of the CAD/CAM/CAE market was 7.0 percent based on end-user revenue (OEM revenue excluded). In March 1989, in response to end-user demands for smaller, workstation-based systems, Digital extended its CAD/CAM product offerings with the introduction of the DECsystem 3100. The 3100 models represent a change for Digital from large, VMS-based systems to the UNIX-based workstation format.

Digital's strategy in the CAD/CAM/CAE market is to develop strategic relationships with key vendors of software applications and create pull-through demand for the Digital hardware platform. Digital continues to build these relationships and has developed the System Cooperative Marketing Program and the Cooperative Marketing Program to focus on applications development.

According to Dataquest estimates, Digital ranks second in the worldwide computer integrated manufacturing (CIM) market with an 8.0 percent revenue market share. This number represents a 14.9 percent growth over 1988 levels. One of the highlights in 1989 was Digital's announcement of support for Manufacturing Automation Protocol (MAP) 3.0 guidelines.

CSIS

In 1989, Digital maintained its first place ranking in the 1/2-inch tape-drive market with an estimated 14 percent revenue market share. Although the overall 12-inch tape-drive market experienced a decline, Digital had strong sales of its 1/2-inch cartridge products as users switched from reel-to-reel to cartridge tape drives.

In September 1989, Digital announced a removable disk drive product, the RF30 and RF71 removable storage element (RSEs). The RSE is based on Digital's DSSI architecture which encloses the disk drive and controller in a single 5.25-inch package called an integrated storage element. Storage capacity ranges from 150MB up to 400MB in the RF71 RSE.

In October 1989, Digital also announced expanded storage capacity for the MicroVAX 3300, 3400, and 3800 systems. Mass storage capacity was tripled to 7.2GB for the MicroVAX 3800. Mass storage for the MicroVAX 3400 and 3300 was expanded to 7.2GB and 6.3GB, respectively. In March 1990, Digital announced that it will be incorporating 4mm digital audio tape (DAT) storage into its product line later this year.

Further Information

For further information about the Company's business segments, please contact the Client Inquiry Center or appropriate industry service.

Table 1
Five-Year Corporate Highlights (Millions of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$6,686	$7,590	$9,389	$11,475	$12,742
Percent Change	-	13.52	23.70	22.22	11.04
Capital Expenditures	$572	$564	$748	$1,518	$1,223
Percent of Revenue	8.56	7.43	7.97	13.23	9.60
R&D Expenditures	$717	$814	$1,010	$1,307	$1,525
Percent of Revenue	10.72	10.72	10.76	11.39	11.97
Number of Employees	89,000	94,700	110,500	121,500	125,800
Revenue ($K)/Employee	$75.10	$80.10	$85.00	$89.10	$102.00
Net Income	$447	$617	$1,147	$1,306	$1,073
Percent Change	35.86	38.03	84.27	14.86	(17.84)

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$2,941.8	$3,179.5	$3,125.8	$3,494.9
Quarterly Profit	$223.4	$279.6	$256.4	$313.2

Source: Digital Equipment Corp.
Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	61.00	58.90	53.40	50.60	45.91
International	39.00	41.10	46.60	49.40	54.11
Japan	NA	NA	NA	NA	NA
Europe	29.10	29.8	34.60	36.80	40.26
Asia/Pacific	NA	NA	NA	NA	NA
ROW	NA	NA	NA	NA	NA

NA = Not available

Source: Digital Equipment Corp.
Annual Reports and Forms 10-K
Dataquest (1990)

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988*	1989*
Direct Sales	50.00	50.00
Indirect Sales	50.00	50.00
Distributors	3.00	3.00
Dealers	1.00	1.00
OEMs	46.00	46.00

*Computer systems only

Source: Digital Equipment Corp.
Annual Reports and Forms 10-K
Dataquest (1990)

1989 SALES AND SERVICE OFFICE LOCATIONS

North America—263
Japan—29
Europe—117
Asia/Pacific—31
ROW—54

MANUFACTURING LOCATIONS

North America

Albuquerque, New Mexico
  Video displays
Augusta, Maine
  CPU expansion cabinets
Boston, Massachusetts
  Keyboards
Burlington, Vermont
  Computers
Colorado Springs, Colorado
  Disk drives
Greenville, South Carolina
  Printed wiring boards
Hudson, Massachusetts
  Custom ICs, network interface boards
Kanata, Q.A., Canada
  Computers, backplanes, subassemblies
Marlboro, Massachusetts
  VAX systems
Maynard, Massachusetts
  Module production
Merrimack, New Hampshire
  Software development, special systems
Nashua, New Hampshire
  Software development, special systems
Phoenix, Arizona
  Video displays, character printers
Salem, New Hampshire
  Special systems
Shrewsbury, Massachusetts
  Thin film heads, disk and tape drives
Springfield, Massachusetts
  Disk drives
Westfield, Massachusetts
  Computers
Westminster, Massachusetts
  Software

Europe

Annecy, France
  Field service, special computer systems
Ayr, Scotland
  Components, subassemblies
Conmel, Ireland
  Power supplies, communications products
Dublin, Ireland
  Computers, power supplies
Galway, Ireland
  VAX systems and supplies
Kaufbeuren, West Germany
  Storage arrays
South Queensferry, Scotland
  Custom ICs
Valbonne, France
  Terminals

Asia/Pacific

Hong Kong
  Terminals
Singapore
  Disk drives, heads
Tachi, Taiwan
  Terminals

ROW

Aguadilla, Puerto Rico
  CPU manufacturing, printed wiring boards
Chihuahua, Mexico
  Power supplies
San German, Puerto Rico
  Electronic cards

SUBSIDIARIES

North America

Computer Insurance Company Limited
Digital Equipment Caribbean, Inc. (United States)
Digital Equipment Co. Limited (United States)
Digital Equipment Corporation International (United States)
Digital Equipment (DEC) Limited (United States)
Digital Equipment Filipinas Inc. (United States)
Digital Equipment Finance Corporation (United States)
Digital Equipment International Limited (United States)

Digital Equipment of Canada Limited/Digital Equipment Du Canada Limite (Canada)
Digital Equipment Services, Inc. (United States)
Digital Growth, Inc. (United States)
Digital Incorporated (United States)
Digital International Sales Corporation (United States)
Old Colony Insurance Ltd. (United States)

Japan

Nihon Digital Equipment Corporation KK

Europe

Digital Equipment Aktiebolag (Sweden)
Digital Equipment B.V. (Netherlands)
Digital Equipment Betriebliche Altersversorgungsgesellschaft mbH (West Germany)
Digital Equipment Centre Technique (Europe) SARL
Digital Equipment Corporation A/S (Denmark)
Digital Equipment Corporation A/S (Norway)
Digital Equipment Corporation Espana, S.A. (Spain)
Digital Equipment Corporation Finance B.V. (Netherlands)
Digital Equipment Corporation Gesellschaft mbH (West Germany)
Digital Equipment Corporation International (Europe)
Digital Equipment Corporation Ireland Limited (Ireland)
Digital Equipment Corporation Oy (Finland)
Digital Equipment Corporation S.A./A/G (West Germany)
Digital Equipment Corporation Services (Europe)
Digital Equipment Foreign Sales Corporation B.V. (Netherlands)
Digital Equipment France (France)
Digital Equipment GmbH (West Germany)
Digital Equipment Hellas Ltd. (Greece)
Digital Equipment (Holdings) B.V. (Netherlands)
Digital Equipment International B.V. (Netherlands)
Digital Equipment Int. Betriebliche Altersversorgungsgesellschaft mbH (West Germany)
Digital Equipment International GmbH (West Germany)
Digital Equipment N.V./S.A. (Belgium)
Digital Equipment Overseas Finance N.V. (Netherlands)
Digital Equipment Parts Center B.V. (Netherlands)
Digital Equipment PLC Limited (United Kingdom)
Digital Equipment Portugal, Limitada (Portugal)
Digital Equipment Scotland Limited (Scotland)
Digital Equipment S.p.A. (Italy)

Asia/Pacific

Digital Computer Taiwan Limited (Taiwan)
Digital Equipment China, Inc. (China)
Digital Equipment Corporation Limited (New Zealand)
Digital Equipment Corporation Pty. Ltd. (Australia)
Digital Equipment Hong Kong Limited (China)
Digital Equipment Inc. (Korea)
Digital Equipment Sdn. Bhd. (Malaysia)
Digital Equipment Singapore (Pte) Limited (Singapore)
Digital Equipment Ltd. (Thailand)
Digital Equipment Taiwan Limited (Taiwan)

ROW

Digital Equipment de Brazil Ltda. (Brazil)
Digital Equipment Corporation de Puerto Rico (Puerto Rico)
Digital Equipment (DEC) Technical Center Limited (Israel)
Digital Equipment de Mexico, S.A. De C.V. (Mexico)
Digital Equipment Panama, Inc. (Panama)
Kam Hon Development Company, Limited

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

Joint Marketing Alliances

Automated Systems Inc.
Digital to supply workstations, networks; ASI to supply Prance GT software in a cooperative marketing program

Combustion Engineering
Plant systems joint marketing

Cullinet
Voice-processing products; VAX/IBM communications

Calma
MicroVAX II-based mechanical CAD systems

Cincinnati Bell
Billing management systems for cellular nets

Daisy Systems
MicroVAX II-based workstations for CAE

Datap
Marketing of real-time data management systems

Eastman Kodak Co.
Market the fastest PostScript networked printer

Ericsson Systems
Integration and marketing of banking systems

Prime Computer
VAX-based MEDUSA CAD/CAM systems

Tektronix
MicroVAX II-based CAD/CAE systems

Technology Licensing Agreements

Elebra Computadores
License to manufacture VAX 11/750s in Brazil

Planar Systems
OEM agreement to resell EL flat-panel displays

Relational Technologies
Bundling Ingres RDBMS with ULTRIX licenses

RSA Data Security
License for RSA data encryption and security software

Tandy Corporation
OEM agreement to resell Tandy PCs

Product Development Agreements

Alberta Telecom
Joint development of optic research projects

Allen-Bradley
Industrial control and management systems

Alcatel
Display terminals development

Apollo Computer
Joint development, licensing of NCS software

Apple Computer
DECnet-Appletalk communications interfaces

Ashton-Tate
Multiuser database product development

CAI
Utility software development

Codex
Development of DEC EMA access modules

Cray Research
VAX/CRAY high-performance interface

Digital Comm Assoc.
Development of DEC EMA access modules

DSC Communications
Development of network service control systems

EDA Systems
Design management software

Evans & Sutherland
Development of workstation products

Insignia
VAXpc, PC emulation software running under VMS

Locus Computing
Connectivity software development

Lotus Development
VAX application software development

MIPS
OEM agreement to buy/manufacture MIPS RISC chip set

Motorola
Jointly design a fiber distributed data interface (FDDI) chip set

Northern Telecom
Development of integrated voice/data products

Olivetti
PC-DECnet interface technology exchange

Open Software Found.
UNIX development standards group

Phoenix Technology
BIOS port to MicroVAX

Schlumberger
Develop Bravo3 CAD/CAM software under VMS

Scientific Calc.
Digital minority interest in CAD software company

Siemens AG
Development of DEC EMA access modules

Siemens AG
Development of gateways for packetswitching

SPEC
Standards group for workstations and minis

StrataCom Inc.
Development of DEC EMA access modules

3Com
OS/2 and DOS connectivity to VAX/VMS

Timeplex Inc.
Development of DEC EMA access modules

TSB International
Development of DEC EMA access modules

Valid Logic
CAD/CAE system software

Vitalink Comm
Remote LAN bridges; develop EMA access modules

X/Open
Software standards consortium

KEY OFFICERS

Kenneth H. Olsen
President

Winston R. Hindle, Jr.
Senior vice president, Corporate Operations

John J. Shields
Senior vice president, Sales and Service, Marketing and International

John F. Smith
Senior vice president, Engineering, Manufacturing, Product Marketing

George A. Chamberlain III
Vice president, Manufacturing, Engineering, and Marketing Finance

Pier Carlo Falotti
Vice president, president, and CEO, Europe

FOUNDERS

Kenneth H. Olsen (MIT)
Stanley C. Olsen (MIT)
Harland Anderson (MIT)

Table 4
Comprehensive Financial Statement
Fiscal Year Ending June
(Millions of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$4,638	$5,306	$6,201	$6,930	$6,894
Cash	1,080	1,911	2,118	2,164	1,665
Receivables	1,539	1,903	2,312	2,592	2,965
Marketable Securities	0	0	0	0	0
Inventory	1,756	1,200	1,453	1,575	1,638
Other Current Assets	263	292	318	599	636
Net Property, Plants	$1,731	$1,867	$2,127	$3,095	$3,646
Other Assets	0	0	$79	$87	127
Total Assets	$6,369	$7,173	$8,407	$10,112	$10,667
Total Current Liabilities	$943	$1,083	$1,825	$2,414	$2,394
Long-Term Debt	$837	$333	$269	$124	$136
Other Liabilities	$34	$29	$20	$63	$102
Total Liabilities	$1,814	$1,445	$2,114	$2,601	$2,632
Total Shareholders' Equity	$4,555	$5,728	$6,293	$7,511	$8,036
Converted Preferred Stock	0	0	0	0	0
Common Stock	59	129	130	130	130
Other Equity	1,738	2,224	1,753	1,917	1,540
Retained Earnings	2,758	3,375	4,410	5,464	6,366
Total Liabilities and Shareholders' Equity	$6,369	$7,173	$8,407	$10,112	$10,668

Income Statement	1985	1986	1987	1988	1989
Revenue	$6,686	$7,590	$9,389	$11,475	$12,742
US Revenue	4,078	4,411	4,976	5,746	5,849
Non-US Revenue	2,642	3,179	4,413	5,730	6,893
Cost of Sales	$4,088	$4,282	$4,514	$5,468	$6,242
R&D Expense	$717	$814	$1,010	$1,307	$1,525
SG&A Expense	$1,432	$1,665	$2,253	$3,066	$3,639
Capital Expense	$572	$564	$748	$1,518	$1,223
Pretax Income	$431	$858	$1,689	$1,740	$1,421
Pretax Margin (%)	6.45	11.30	17.99	15.16	11.15
Effective Tax Rate (%)	NA	28.00	32.70	25.00	24.50
Net Income	$447	$617	$1,137	$1,306	$1,073
Shares Outstanding, Millions	124.1	130.8	133.3	131.9	122.0
Per Share Data					
Earnings	$3.71	$4.81	$8.53	$9.90	$8.45
Dividend	0	0	0	0	0
Book Value	$76.87	$44.50	$47.21	$56.94	$56.94

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending June
(Millions of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	4.92	4.90	3.40	2.87	2.88
Quick (Times)	3.06	3.79	2.60	2.22	2.20
Fixed Assets/Equity (%)	38.00	32.59	33.80	41.21	45.37
Current Liabilities/Equity (%)	20.70	18.91	29.00	32.14	29.79
Total Liabilities/Equity (%)	39.82	25.23	33.59	34.63	32.75
Profitability (%)					
Return on Assets	-	9.11	14.60	14.10	10.33
Return on Equity	-	12.00	18.92	18.92	13.80
Profit Margin	6.69	8.13	12.11	11.38	8.42
Other Key Ratios					
R&D Spending % of Revenue	10.72	10.72	10.76	11.39	11.97
Capital Spending % of Revenue	8.56	7.43	7.97	13.23	9.60
Employees	89,000	94,700	110,500	121,500	125,800
Revenue ($K)/Employee	$75.10	$80.10	$85.00	$89.10	$102.00
Capital Spending % of Assets	8.98	7.86	8.90	15.01	11.47

NA = Not available

Source: Digital Equipment Corp. Annual Reports
Dataquest (1990)

Digital Microwave Corporation

170 Rose Orchard Way
San Jose, California 95134
Telephone: (408) 943-0777
Fax: (408) 432-8001
Dun's Number: 11-329-9986

Date Founded: 1984

CORPORATE STRATEGIC DIRECTION

Digital Microwave Corporation (DMC) designs, manufactures, and supplies advanced, high-performance digital microwave radio and fiber-optic communications products and systems for sale in the United States and selected international markets. The Company's products have the capacity to transmit and receive multiple T1, T2, and single T3 digital lines and Conference Europeene des Postes et Telecommunications (CEPT) hierarchy digital lines carrying voice, data, and video signals over distances of up to 45 miles.

In fiscal 1990, revenue increased 68 percent to $111.0 million* from $66.0 million in 1989. Net income was $13.2 million, compared with the previous year's net income of $11.6 million. The Company spent $9.5 million, or 8.6 percent of sales, on R&D in fiscal 1990 compared with $5.7 million, or 8.6 percent of sales, in 1989. DMC employs approximately 500 people.

The Company expanded its operations in North America in 1990 with the creation of a new division, DMC Digital Video. The new division focuses on the design and marketing of broadcast-quality digital video products for the broadcast and teleconferencing markets.

DMC offers its products and services principally through its own sales and service organization. To sell and support its products, DMC has seven regional sales offices and service centers in North America and two in the United Kingdom. The Company also markets its products through multiple channels consisting of systems integrators, resellers, value-added sales representatives, international dealer networks, and direct product licensing through technology transfer and OEM arrangements.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights by revenue and by region. A breakdown of revenue by distribution channel is not available. Table 3, a comprehensive financial statement, is at the end of this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

DMC manufactures digital microwave products that operate within the 2-, 8-, 10-, 13-, 15-, 18-, and 23-GHz frequency bands. These radios are used in short-haul point-to-point applications by cellular phone companies, telephone operating companies, Fortune 1000 companies, utilities, and government and military agencies. The Company's digital microwave radios consist of three basic components: a digital modem for interfacing with digital terminal equipment, a radio frequency (RF) unit for converting a low-frequency carrier signal from the modem to a high-frequency microwave signal, and an antenna to radiate transmitting signals and capture receiving signals.

The Company has developed and currently is marketing several radio product families. The LC Series consists of the DMC 23LC and DMC 18LC radios, which contain circuitry allowing the digital interface to be configured for North American or CEPT signals enabling the system to accommodate from 24 to 120 voice-grade channels. The W Series, digital microwave radios designed for use in the 8-, 13-, 15-, 18-, and 23-GHz frequency bands, is capable of

*All dollar amounts are in US dollars.

transmitting voice, data, video, and facsimile signals. The DMC M Series is a low- to medium-capacity digital microwave radio series that operates in the 2-, 8-, 10-, 13-, 15-, 18-, and 23-GHz frequency bands and can accommodate either up to 16 T1 or 2-Mbps CEPT lines. The DMC DV Series radio combines a high-speed digital coder/decoder and a radio in the 18- and 23-GHz bands into an integrated system to provide point-to-point video and program audio transmission.

A basic terminal consists of a digital encoder/modulator unit and RF unit, while a basic receive terminal consists of a digital decoder/demodulator unit and RF unit. The Company also produces and markets a number of active and passive repeaters designed for operation in the 13-, 18-, and 23-GHz frequency bands. Active repeaters are most frequently used to extend the path length beyond normal operating distances. The DMC Net is a network monitoring and control system designed to provide network control from anywhere in the microwave network or from a remote location.

The Company's current fiber-optic product line consists of the DMC OTS and fiber-optic versions of the M Series radio modems. These products enable users to establish communications links over distances of up to 20 miles. The Optical Transmission System is optimized for fiber-optic transmission and eliminates the additional circuitry used for microwave transmission that is not required by a fiber-optic system. The M Series modems may be equipped with optical interfaces providing fiber products with extensive features and flexibility.

DMC markets its products across most sectors of the telecommunications industry. The principal market segments are cellular telephone companies, telephone companies and common carriers, private networks, and government customers.

Further Information

For further information on DMC's business segments, please contact the appropriate Dataquest industry service.

Table 1
Corporate Highlights (Thousands of US Dollars)

	1988	1989	1990
Three-Year Revenue	$39,310.0	$65,976.0	$110,976.0
Percent Change	-	67.84	68.21
Capital Expenditure	$2,619.0	$6,083.0	$8,083.0
Percent of Revenue	6.66	9.22	7.28
R&D Expenditure	$2,885.0	$5,682.0	$9,494.0
Percent of Revenue	7.34	8.61	8.56
Number of Employees	154	323	515
Revenue ($K)/Employee	$255,260	$204,260	$215,487
Net Income	$7,114.0	$11,576.0	$13,232.0
Percent Change	-	62.72	14.31

1990 Fiscal Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$22,049.00	$25,364.00	$28,766.00	$34,797.00
Quarterly Profit	$3,200.00	$3,938.00	$4,449.00	$1,645.00

Source: Digital Microwave Corporation Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1988	1989	1990
North America	NA	29.00	26.00
International	NA	71.00	74.00
Europe	NA	71.00	74.00

NA = Not available

Source: Digital Microwave Corporation Annual Reports and Forms 10-K
Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—7
Europe—2

MANUFACTURING LOCATIONS

North America

San Jose, California
Microwave and fiber-optic systems

Europe

East Kilbride, Scotland
Microwave and fiber-optic systems

SUBSIDIARIES

Europe

DMC Telecom U.K. Ltd. (United Kingdom)
Digital Microwave International Inc. (United Kingdom)
Digital Microwave Investment Holding Co. (United Kingdom)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

AT&T
DMC and AT&T network systems signed a three-year supply-and-distribution agreement for an expanded line of DMC's microwave radio and fiber-optic transmission equipment. AT&T will distribute the equipment, on a private-label basis, separately or as part of systems it sells to telephone companies and business and government customers both domestically and internationally.

1989

Microelectronics Technology Inc. (MTI)
DMC and MTI formed a joint venture, Optical Microwave Networks Inc. (OMNI), to engineer and manufacture certain microwave subassemblies currently supplied by MTI. OMNI is owned 80 percent by MTI and an affiliated entity and 20 percent by DMC.

Andrew Yule Company of India
Digital Microwave signed a technology transfer and manufacturing licensing agreement for 18- and 23-GHz digital radios with the Andrew Yule Company.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

William E. Gibson
President and chief executive officer

P. Michael Friedenbach
Chairman of the board

Dr. Douglas H. Morais
Senior vice president

Robert K. Dahl
Executive vice president and chief financial officer

Robert E. Friess
Executive vice president and chief technical officer

George P. Roberts
Executive vice president and chief operating officer

Charles C. Pai
Vice president, Finance

Edward J. Stocker, O.B.E.
Managing director and chief executive officer, DMC Telecom Europe

James B. Murray
Vice president and general manager, DMC Digital Video

PRINCIPAL INVESTORS

BEA Associates
William E. Gibson

FOUNDERS

P. Michael Friedenbach
Robert E. Friess
William E. Gibson

Table 3
Comprehensive Financial Statement*
Fiscal Year Ending March
(Thousands of US Dollars, except Per Share Data)

Balance Sheet	1988	1989	1990
Total Current Assets	$41,772.0	$61,891.0	$81,781.0
Cash	743.0	2,753.0	109.0
Receivables	10,690.0	29,395.0	43,162.0
Marketable Securities	20,414.0	8,600.0	0
Inventory	8,047.0	16,598.0	32,701.0
Other Current Assets	1,878.0	4,545.0	5,809.0
Net Property, Plants	$3,721.0	$7,599.0	$12,421.0
Other Assets	0	0	0
Total Assets	$45,493.0	$69,490.0	$94,202.0
Total Current Liabilities	$5,623.0	$17,291.0	$26,465.0
Long-Term Debt	$973.0	$331.0	$67.0
Other Liabilities	0	0	0
Total Liabilities	$6,596.0	$17,622.0	$26,532.0
Total Shareholders' Equity	$38,897.0	$51,868.0	$67,670.0
Converted Preferred Stock	0	0	0
Common Stock	113.0	116.0	118.0
Other Equity	30,303.0	31,695.0	34,263.0
Retained Earnings	8,481.0	20,057.0	33,289.0
Total Liabilities and Shareholders' Equity	$45,493.0	$69,490.0	$94,202.0

Income Statement	1988	1989	1990
Revenue	$39,310.0	$65,976.0	$110,976.0
North America	NA	18,955.0	29,296.0
International	NA	47,021.0	81,680.0
Cost of Sales	$18,018.0	$31,633.0	$62,198.0
R&D Expense	$2,885.0	$5,682.0	$9,494.0
SG&A Expense	$7,906.0	$11,776.0	$18,819.0
Capital Expense	$2,619.0	$6,083.0	$8,083.0
Pretax Income	$11,115.0	$17,674.0	$20,049.0
Pretax Margin (%)	28.28	26.79	18.07
Effective Tax Rate (%)	36.00	34.50	34.00
Net Income	$7,114.0	$11,576.0	$13,232.0
Shares Outstanding, Thousands	11,921.0	12,232.0	12,405.0
Per Share Data			
Earnings	$0.60	$0.95	$1.07
Dividend	0	0	0
Book Value	$3.26	$4.24	$5.46

Table 3 (Continued)
Comprehensive Financial Statement*
Fiscal Year Ending March
(Thousands of US Dollars, except Per Share Data)

Key Financial Ratios	1988	1989	1990
Liquidity			
Current (Times)	7.43	3.58	3.09
Quick (Times)	6.00	2.62	1.85
Fixed Assets/Equity (%)	9.57	14.65	18.36
Current Liabilities/Equity (%)	14.46	33.34	39.11
Total Liabilities/Equity (%)	16.96	33.97	39.21
Profitability (%)			
Return on Assets	-	20.14	16.17
Return on Equity	-	25.51	22.14
Profit Margin	18.10	17.55	11.92
Other Key Ratios			
R&D Spending % of Revenue	7.34	8.61	8.56
Capital Spending % of Revenue	6.66	9.22	7.28
Employees	154	323	515
Revenue ($K)/Employee	$255,260	$204,260	$215,487
Capital Spending % of Assets	5.76	8.75	8.58

*The Company completed its initial public offering in May, 1987. Therefore, selected financial information prior to fiscal 1988 is not available.
NA = Not available

Source: Digital Microwave Corporation Annual Reports and Forms 10-K Dataquest (1990)

Digital Research Incorporated

70 Garden Court
Monterey, California 93942
Telephone: (408) 649-3896
Fax: (408) 646-6248
Dun's Number: 08-530-0218

Date Founded: 1976

CORPORATE STRATEGIC DIRECTION

Digital Research Incorporated is a multinational, privately owned software company that develops and markets operating systems software, development tools, and graphics applications for a variety of platforms.

Digital Research began as a developer of operating systems for personal computers. It has since repositioned itself as more of a niche-oriented company, targeting those markets that its larger competitors do not reach. For example, it offers an operating system for supermarket check-out scanners that IBM has adopted for its scanner system used by Safeway Stores.

Net sales increased 13 percent to $36 million* in fiscal 1989 from $32 million in fiscal 1988. International sales increased 23 percent to $13 million in fiscal 1989 from $11 million in fiscal 1988. Net income in fiscal 1989 was approximately $1 million, marking the first time in eight years that the Company has recorded a profit.

Research and development expenditure increased 33 percent to $8 million in fiscal 1989 from $6 million in fiscal 1988. The Company has been spending approximately 20 percent of total revenue on R&D for the past four years. Digital Research currently employs 282 people.

No financial statements are included because Digital Research Incorporated is a privately held company.

*All dollars amounts are in US dollars.

BUSINESS SEGMENT STRATEGIC DIRECTION

Operating Systems Software

Operating systems software accounted for approximately one-half of Digital Research's total revenue. The Company offers three lines of operating systems software: DR DOS, FlexOS, and Concurrent DOS.

DR DOS is a single-user, single-tasking DOS 3.x-compatible operating system for use on computers utilizing the full family of Intel microprocessors. The product is used as a low-cost, DOS-compatible operating system designed for OEMs who want to provide systems software that runs PC-DOS/MS-DOS applications together on their Intel-based systems. DR DOS is being used in the PC-compatible market, which includes desktops, portables, laptops, and hand-held computers.

In 1989, the Company introduced a new version of DR DOS, release 5.0, which offers many new user benefits including advanced memory management and full file-transfer facilities. DR DOS 5.0 will be marketed to original equipment manufacturers (OEMs).

The Company has licensed more than 3.5 million copies of DR DOS to over 100 OEMs and VARs worldwide.

FlexOS is a family of real-time, multitasking operating systems that provide a 32-bit, protected-mode platform for integrated solutions. FlexOS is targeted toward real-time vertical markets such as industrial automation, process control, transaction processing, and electronic point-of-sale (POS). The main products in the FlexOS family include the following:

- FlexOS 186 is a real-time, ROMable executive for embedded applications using the Intel 80186, NEC V20, or NEC V25 microprocessor. FlexOS 186 is designed for control applications that require multitasking, real-time response and reprogramming flexibility.
- FlexOS 286 is a real-time, protected-mode operating system for computers based on the Intel 80286 or 80386 microprocessor. The FlexOS 286 is designed for industrial applications such as data acquisition and motion control, and transaction processing such as retail and financial uses. The FlexOS 286 development environment is an IBM PC AT.
- FlexOS 386 is a real-time, protected-mode operating system with broad functionality for computers based on the Intel 80386 microprocessor. FlexOS 386 complements the application program interface (API) that it shares with FlexOS 286 and FlexOS 186 by adding a flat-space, 32-bit memory addressing and a fully DOS 3.3-compatible application environment.

The FlexOS product line also includes FlexView, a source-level system and application debugger for FlexOS; FlexNET, which allows transparent connectivity between FlexOS-based systems and other general-purpose systems such as DOS, OS/2, and UNIX; and X/GEM, an extended version of the Company's graphics environment technology, which was added to the FlexOS line in 1989.

The FlexOS family of products are sold to OEMs, systems integrators, value-added resellers (VARs), and independent software vendors (ISVs).

Digital Research's more advanced operating system, Concurrent DOS 386, is a multitasking, multiuser operating system compatible with DOS 3.3. Concurrent DOS 386 is specifically designed to take advantage of the Intel 80386, 80386SX, and 80486 microprocessors and can be used in place of standard DOS on a microcomputer. The system is configured to allow up to ten multitasking users to share hardware such as hard disks and printers. It supports popular DOS LAN applications, providing a built-in LAN capability on a single 386.

In 1989, the Company introduced its newest version of Concurrent DOS 386, release 3.0. Release 3.0 offers improved performance, provides applications with more memory in which to execute, and includes new utilities that enhance the product's connectivity.

Concurrent DOS 386 is marketed through value-added distributors, retail dealers, and VARs.

Graphics Application Software

Graphics application software products accounted for approximately one-half of Digital Research's total revenue. The Company's line of graphics applications is focused on providing business users with sophisticated productivity tools. These products include Artline, Draw Plus, and Presentation Team, as follows:

- Artline is an illustration application for business and graphics professionals for use on the personal computer. The newest release, version 2.0, offers a unique interactive autotracing feature that requires minimal reediting; toolboxes that can be customized to combine multistep tasks; PANTONE colors; and Extended Memory Support. Digital Research has an upgrade policy whereby customers who purchased version 1.0 on or after December 13, 1989, will receive an upgrade to version 2.0 free of charge.
- Draw Plus, a drawing package for the personal computer, is a drawing solution for producing a wide range of diagrams, charts, and forms, from simple schematics to complex architectural drawings.
- Presentation Team is a comprehensive presentation graphics program. It has been designed to help users to create, manage, and produce effective presentation visuals and handouts. The newest version of the product, version 2.0, emphasizes presentation management, on-line help, network support, and full integration of text, charts, graphs, and drawings.

The graphics application products are directly available to customers through resellers, VARs, and OEMs.

Further Information

For more information on Digital Research's business segments, please contact the appropriate Dataquest industry service.

1989 SALES OFFICE LOCATIONS

North America—2

MANUFACTURING LOCATIONS

North America

Salinas, California
Operating systems and application software

Europe

Hungerford, Berkshire, United Kingdom
Operating systems software

SUBSIDIARIES

North America

Digital Foreign Sales Corp. (United States)
Digital Research California Inc. (United States)
Digital Research Distribution Inc. (United States)
Digital Research Manufacturing Inc. (United States)
Digital Research Microwave Inc. (United States)
Digital Research Operations Inc. (United States)
Owlcat International Corp. (United States)

Europe

Digital Research (Europe) Manufacturing Ltd. (United Kingdom)
Digital Research, GmbH (Germany)
Digital Research, S.A. (France)
Digital Research, U.K. Ltd. (United Kingdom)

Asia/Pacific

Digital Research Japan (Japan)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

Information is not available.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Gary A. Kildall
Chairman

Dick Williams
President and chief executive officer

Dieter Giesbrecht
Senior vice president, European Operations

Masahiro Morimoto
Vice president, Japanese Operations

Peter DiCorti
Vice president and chief financial officer

Dana Hooper
Vice president and general manager, Graphics Business Unit

Joe Taglia
Vice president and general manager, Integrated Systems Business Unit

Steve Tucker
Vice president and general manager, General Purpose Operating Systems

Frank Bailinson
Vice president, Corporate Marketing and Strategy

Dave Van Daele
Vice president, Distribution, Sales, and Customer Service

PRINCIPAL INVESTORS

Information is not available

FOUNDERS

Gary A. Kildall

DSC Communications Corporation

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Plano, Texas 75075
Telephone: (214) 519-3000
Fax: (214) 519-2322
Dun's Number: 08-365-4947

Date Founded: 1976

CORPORATE STRATEGIC DIRECTION

DSC Communications Corporation (DSC) designs, manufactures, markets, and services telecommunications systems and products for domestic and international long distance carriers, local exchange carriers, and private network customers. The Company's principal products are large, complex electronic systems that incorporate sophisticated hardware and software technology. DSC develops both hardware and software to meet US and international standards, and the specific requirements of the regional holding companies (RHCs), independent telephone companies, long distance carriers, private networks, and companies operating public and private communications networks in other countries.

During 1989, revenue grew 27 percent to $429.7 million* from $339.7 million in 1988. Net income for 1989 was $33.3 million, versus $12.6 million in 1988. Net income for 1988 included losses and estimated costs associated with the discontinuance of the North American Standard transmultiplexer business amounting to $8.3 million.

In July 1990, DSC acquired Optilink Corporation for approximately $54 million in cash. Optilink markets to the digital loop carrier marketplace and has developed a third-generation, fiber-optic, Synchronous Optical Network (SONET)-based intelligent access product.

The Company sells products and services to both the public and private network markets through various sales and distribution channels. DSC's internal sales group is a direct sales force, divided into both switching and transmission products. The Company also sells through third-party distributors, original equipment manufacturers (OEMs), and sales representatives.

*All dollar amounts are in US dollars.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region. Information on revenue by distribution channel is not available. Table 3, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Switching and Intelligent Network Products

The Company's switching and intelligent network products include the MegaHub product line, the DSC DEX 200, DSC DEX 400, and DSC DEX 600 family of digital tandem switches, and the DSC DEX 600C cellular switching platform.

DSC's initial application of the MegaHub technology was the MegaHub Signal Transfer Point (MegaHub STP). The MegaHub STP is a high-capacity packet-switching system used to route or switch signaling messages through the Common Channel Signaling System No. 7 (CCS7) network. The CCS7 network is a separate packet-switched signaling network that interfaces with the carrier network to provide access to transaction-based services, call routing information, and network management test and maintenance capabilities. DSC is the primary provider of signal transfer points to the alternative long distance marketplace. Additionally, the Company is now delivering the MegaHub STP to the majority of major local telephone companies in the United States, including the Bell Operating Companies (BOCs) and DDI Corporation of Japan.

DSC announced the availability of the MegaHub Service Control Point (MegaHub SCP) in mid-1989, following the Company's agreement with Digital

Equipment Corporation (DEC) to jointly develop the MegaHub SCP. The MegaHub SCP combines the CCS7 functionalities of the Company's MegaHub STP and the advanced computing capabilities of DEC's VAX computer systems.

The Company is a leading vendor of tandem switches to MCI Communications Corporation and one of the leaders in domestic tandem switching system sales to US companies that compete with AT&T as alternate long distance carriers. Tandem switches generally are used to route calls over long distance networks.

As an extension of its tandem switching business, the Company has developed a cellular telephone switch, the DSC DEX 600C. The DSC DEX 600C connects cellular callers to each other within a cellular system and to the public carrier network. DSC has supplied the DSC DEX 600C cellular switch under an exclusive agreement with Motorola. The DSC DEX 600C switch is marketed by Motorola as the EMX 2500 cellular switch.

Digital Cross-Connect Products

DSC's digital cross-connect systems provide switching, multiplexing, and termination of digital transmission services. The Company's cross-connect products include the DSC DEXCS, the DSC DEX ECS1, and the DSC DEX ECS3. DSC's various digital cross-connect products are distinguished from one another principally by the capacity that each system handles.

Other Products

DSC develops, manufactures, and markets transmission products and products for wide area networks and local area networks. The transmission products include radio systems, network test and management systems, transmultiplexers, echo cancelers, transcoders, and a full line of multiplexers. The Company also provides a family of high-performance, fault-tolerant file servers and network operating systems that support industry-standard interfaces.

Further Information

For more information about DSC's business segments, please contact the appropriate Dataquest industry service.

Table 1
Five-Year Corporate Highlights (Thousands of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$174,718.0	$195,031.0	$266,332.0	$339,671.0	$429,730.0
Percent Change	-	11.63	36.56	27.54	26.51
Capital Expenditure	NA*	$18,397.0	$23,002.0	$45,851.0	$50,498.0
Percent of Revenue	NA*	9.43	8.64	13.50	11.75
R&D Expenditure	$54,493.0	$44,096.0	$40,137.0	$44,990.0	$43,944.0
Percent of Revenue	31.19	22.61	15.07	13.25	10.23
Number of Employees	2,450	2,365	2,543	2,766	3,317
Revenue ($K)/Employee	$71,313	$82,466	$104,731	$122,802	$129,554
Net Income	($58,535.0)	$16,951.0	$18,368.0	$12,568.0	$33,324.0
Percent Change	-	(128.96)	8.36	(31.58)	165.15

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$90,089.00	$104,002.00	$106,316.00	$129,323.00
Quarterly Profit	$5,230.00	$8,116.00	$8,414.00	$11,564.00

*Not available due to restatement

Source: DSC Communications Corporation Annual Reports and Forms 10-K Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	NA	NA	91.52	83.51	87.91
International	NA	NA	8.48	16.49	12.09

NA = Not available

Source: DSC Communications Corporation Annual Reports and Forms 10-K Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—16
Europe—1
Asia/Pacific—2
  Japan—1
ROW—0

MANUFACTURING LOCATIONS

North America

Aguada, Puerto Rico
Carlsbad, California
Plano, Texas
San Jose, California

Europe

Weybridge, England

SUBSIDIARIES

North America

DSC Communications Canada
DSC Communications Limited
DSC Communications Pty. Ltd.
DSC Corporate Services Inc.
DSC Finance Corp.
DSC International Corp.
DSC Marketing Services Inc.
DSC of Puerto Rico Inc.
DSC Technologies Corp.
Dynamic Telecommunication Systems Inc.
Granger Associates Inc.

Asia/Pacific

DSC Japan Inc.

ROW

DSC of Virgin Islands Inc.

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

General Electric Company (GE)
DSC signed an agreement with GE that formalized the continuing purchase of DSC's Digital Network Access System and related services by GE components, subsidiaries, and affiliates.

Metromedia/ITT Long Distance
DSC signed an agreement with Metromedia/ITT that determined the terms and conditions under which Metromedia/ITT can purchase DSC tandem and Signaling System No. 7 (SS7) switching equipment.

Contel Corporation
DSC entered into an agreement with Contel for the supply of DSC MegaHub STPs and DSC/DEC jointly developed MegaHub SCPs.

1989

Motorola
DSC signed an expanded ten-year agreement with the Cellular Infrastructure Division of Motorola. The agreement provides that DSC will be the sole external cellular switch platform vendor to Motorola for all turnkey cellular switch applications where Motorola is the complete systems integrator.

DDI Corporation of Japan
DSC signed a supply agreement for digital switching equipment for use in the Japanese public network.

Digital Equipment Corporation (DEC)
DSC and DEC formed a joint agreement for the development for the MegaHub SCP. This platform supports intelligent information-oriented database services to be sold to local and long distance telephone carriers.

MERGERS AND ACQUISITIONS

1990

Optilink Corporation
DSC acquired Optilink, which markets to the digital loop carrier marketplace and has developed a third-generation, fiber-optic, Synchronous Optical Network (SONET)-based intelligent access product.

KEY OFFICERS

James L. Donald
Chairman of the board, president, and chief executive officer

Gerald F. Montry
Senior vice president, chief financial officer, and director

David M. Holland
Senior vice president, North American Sales and Service

Gunnar J. Korpinen
Senior vice president and director

J. Douglas Bailey
Vice president, International

PRINCIPAL INVESTORS

Ardsley Partners—5.71 percent
The Putnam Companies Inc.—5.35 percent

FOUNDERS

Information is not available.

Table 3
Comprehensive Financial Statement[1]
Fiscal Year Ending December
(Thousands of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	NA[2]	$261,860.0	$192,148.0	$235,110.0	$363,519.0
Cash	NA[2]	79,884.0	26,274.0	7,211.0	68,272.0
Receivables	NA[2]	83,550.0	86,203.0	100,044.0	120,587.0
Marketable Securities	NA[2]	0	0	0	0
Inventory	NA[2]	87,578.0	72,132.0	113,705.0	153,842.0
Other Current Assets	NA[2]	10,848.0	7,539.0	14,150.0	20,818.0
Net Property, Plants	NA[2]	$116,796.0	$104,046.0	$124,668.0	$146,510.0
Other Assets	NA[2]	$27,682.0	$72,155.0	$69,472.0	$59,966.0
Total Assets	$395,990.0	$406,338.0	$368,349.0	$429,250.0	$569,995.0
Total Current Liabilities	NA[2]	$69,658.0	$94,272.0	$123,821.0	$129,915.0
Long-Term Debt	NA[2]	$133,706.0	$59,828.0	$82,754.0	$178,952.0
Other Liabilities	NA[2]	$1,635.0	$3,409.0	$6,761.0	$7,212.0
Total Liabilities	$219,957.0	$204,999.0	$157,509.0	$213,336.0	$316,079.0
Total Shareholders' Equity	$176,033.0	$201,339.0	$210,840.0	$215,914.0	$253,916.0
Converted Preferred Stock	NA[2]	0	0	0	0
Common Stock	NA[2]	410.0	419.0	427.0	443.0
Other Equity	NA[2]	167,802.0	158,926.0	151,424.0	156,086.0
Retained Earnings	NA[2]	33,127.0	51,495.0	64,063.0	97,387.0
Total Liabilities and Shareholders' Equity	$395,990.0	$406,338.0	$368,349.0	$429,250.0	$569,995.0
Income Statement	**1985**	**1986**	**1987**	**1988**	**1989**
Revenue	$174,718.0	$195,031.0	$266,332.0	$339,671.0	$429,730.0
US Revenue	NA[2]	NA[2]	243,736.0	283,645.0	377,787.0
Non-US Revenue	NA[2]	NA[2]	22,596.0	56,026.0	51,943.0
Cost of Sales	NA[2]	NA[2]	$158,517.0	$194,369.0	$254,370.0
R&D Expense	$54,493.0	$44,096.0	$40,137.0	$44,990.0	$43,944.0
SG&A Expense	$44,586.0	$43,080.0	$58,185.0	$69,026.0	$77,892.0
Capital Expense	NA[2]	$18,397.0	$23,002.0	$45,851.0	$50,498.0
Pretax Income	NA	($20,431.0)	$2,141.0	$24,365.0	$44,368.0
Pretax Margin (%)	0	(10.48)	0.80	7.17	10.32
Effective Tax Rate (%)	NA	NA	70.40	17.90	23.00
Net Income	($58,535.0)	$16,951.0	$18,368.0	$12,568.0	$33,324.0
Shares Outstanding, Thousands	39,774.0	40,966.0	39,901.0	39,027.0	40,169.0
Per Share Data					
Earnings	($1.48)	$0.41	$0.44	$0.30	$0.79
Dividend	0	0	0	0	0
Book Value	$4.43	$4.91	$5.28	$5.53	$6.32

Table 3 (Continued)
Comprehensive Financial Statement[1]
Fiscal Year Ending December
(Thousands of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	NA[2]	3.76	2.04	1.90	2.80
Quick (Times)	NA[2]	2.50	1.27	0.98	1.61
Fixed Assets/Equity (%)	NA[2]	58.01	49.35	57.74	57.70
Current Liabilities/Equity (%)	NA[2]	34.60	44.71	57.35	51.16
Total Liabilities/Equity (%)	NA[2]	101.82	74.71	98.81	124.48
Profitability (%)					
Return on Assets	-	4.23	4.74	3.15	6.67
Return on Equity	-	8.98	8.91	5.89	14.19
Profit Margin	(33.50)	8.69	6.90	3.70	7.75
Other Key Ratios					
R&D Spending % of Revenue	31.19	22.61	15.07	13.25	10.23
Capital Spending % of Revenue	NA[2]	9.43	8.64	13.50	11.75
Employees	2,450	2,365	2,543	2,766	3,317
Revenue ($K)/Employee	$71,313	$82,466	$104,731	$122,802	$129,554
Capital Spending % of Assets	NA[2]	4.53	6.24	10.68	8.86

[1]Certain prior years' financial information has been reclassified to conform with the current presentation.
[2]Certain figures for 1986 and 1985 are not available due to restatement.
NA = Not available

Source: DSC Communications Corporation Annual Reports and Forms 10-K
Dataquest (1990)

Dowty Group Plc

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Gloucestershire GL51 OTP, England
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Fax: (0242) 521054
Dun's Number: 21-717-1156

Founded: 1931

CORPORATE STRATEGIC DIRECTION

Dowty Group Plc is an international group of engineering companies creating systems and products using the latest electronic, hydromechanical, and polymer technologies. Its customers are mainly in the aerospace, maritime, professional electronics, information technology, and automotive industries. Dowty comprises 50 operating units structured in 4 divisions and based in 16 countries around the world.

In 1989, Dowty disposed of businesses that it considered to be in declining sectors and now seeks to replace them with businesses with higher growth potential. The Company's mining equipment and industrial hydraulics businesses, which formerly represented 20 percent of turnover, were sold in 1989. The divestitures demonstrate Dowty's desire to become a more high-technology-based company. Dowty is now organized into four divisions: Aerospace, Electronic Systems, Information Technology, and Polymer Engineering.

Dowty has appealed to the British government to address two key issues that the Company believes may have an adverse effect both on Dowty and British industry in general. Dowty has experienced an increase in the effective tax rate from 28 percent in 1984 to 37 percent in 1990. The Company believes that these taxes will restrict the amount of capital that Dowty and other companies will be able to invest, making it more difficult for them to compete internationally. Secondly, Dowty has consistently called on the British government to take steps to create "level playing fields" by addressing unfair trade practices by other nations.

In 1990, Dowty's revenue increased 7 percent to £731 million (US$1.12 billion), up from £599.3 million (US$982.5 million) in 1989. (Percentage changes refer only to £ amounts; US$ percentage changes will differ because of fluctuations in Dataquest exchange rates.) Profits before taxes increased 8 percent to £85.4 (US$140.1 million). Dowty believes that these figures might have been higher had it not been for a material strike internally and others in two of the Group's largest customers (Airbus and Boeing). Each of the Company's divisions experienced increases in revenue, and all except the Electronic Systems Division experienced increases in profit. Dowty cites stagnation of the property market and restructuring costs as reasons for the profit increase not being greater.

International business accounts for 58 percent of the Dowty Group's total revenue. North and South America generate the most with £193.7 million (US$317.0 million) in 1990. Also, the Company relies on its civil-based business for 67 percent of revenue. Dowty has sought to reduce its reliance on defense-related business because it expects international defense spending to continue to decline due to the recent political and social changes in Eastern Europe. In 1990, 33 percent of sales were defense-related, versus 38 percent in 1989.

R&D expenditure totaled £73.7 million (US$120.9 million) in 1990, representing 10.1 percent of total revenue. This is an increase of 13.5 percent over the previous year's figure of £64.9 million (US$106.4 million). Capital expenditure for 1990 was £39.1 million (US$64.0 million), representing 5.3 percent of total revenue. This is a 15 percent increase over the 1989 figure of £33.8 million (US$55.4 million).

Due to differences in US and British accounting policies and procedures, a financial analysis is not available.

BUSINESS SEGMENT STRATEGIC DIRECTION

Aerospace Division

The Aerospace Division is one of the world's leading manufacturers of aircraft landing gear, flight control actuation systems, and propellers. It supplies most major aircraft manufacturers, including Airbus Industrie, Boeing, British Aerospace, McDonnell Douglas, and others. Civil projects, a growing portion of this unit's business, represent 65 percent of divisional sales, military programs account for 32 percent, and the remaining 3 percent is generated by other business. In 1990, the £289 million (US$474 million) in revenue for this unit represented an 11 percent increase over the previous year's figure of £259 million (US$424.6 million) and accounted for 39 percent of Dowty's total revenue.

In addition to manufacturing new equipment, the division provides customer support service. The repair business is growing rapidly and accounts for 17 percent of total aerospace revenue. Also, a new space project operation designs and manufactures propellant tanks and control valves for spacecraft propulsion systems. The division's products are also prominent in the maritime market, especially its winching systems, cable handling equipment, and submarine hydraulic systems. Dowty supports 30 air forces and 300 civilian operators in 90 countries.

Electronic Systems Division

The Electronic Systems Division focuses its electronic and hydromechanical resources on aircraft and engine control, underwater and surface ship antisubmarine warfare (ASW), and missile systems markets. The division is a major supplier of command systems to the British Royal Navy. Other products include full-authority digital engine controls, landing gear computers for the Airbus, a series of magnetic ranges, and a comprehensive range of sonobuoys.

This division showed a 17 percent increase in revenue in 1990, posting sales of £165 million (US$270.6 million). Electronic Systems Division sales accounted for 22 percent of Dowty's total revenue while contributing £11 million (US$18.0 million), accounting for 12 percent of total net income.

Information Technology Division

The Information Technology Division, created in 1987 from existing Dowty businesses, designs and manufactures advanced network systems, modems, multiplexers, video display unit (VDU) terminals, computer graphics instrumentation and industrial systems, customized design, and assemblies and power supplies for the information technology (IT) markets. The IT divisions include nine operating companies with offices in Europe, the United States, and the Far East.

Sales by the Information Technology Division increased 48 percent in 1990, totaling £196 million (US$321.4 million) and representing 27 percent of Dowty's total revenue. Associated net income rose 26 percent, totaling £21.7 million (US$35.6 million). These increases were largely due to the fact that 1990 was CASE/Datatel's first full year of operation in the Dowty Group. Dowty believes that one of its advantages over many of its competitors is the fact that Dowty owns the core technologies in the majority of its products.

The division will continue to look at strategic alliances to secure technology, improve its position in North America, and secure distribution arrangements in Europe. Commitment to international standards such as OSI remains a key priority for the division's data communications activities.

The CASE Group of Companies

The CASE Group of companies was acquired in Dowty's fiscal year 1989. Dowty believes that the addition of CASE will be beneficial to the Company because of CASE's sales and service coverage and complementary product range.

CASE/Datatel, a designer and manufacturer of a complete line of voice and data communications equipment, and is based in Cherry Hill, New Jersey. Its communications products include T-1 and E-1 nodal processors and multiplexers, fractional T-1's, X.25 packet switches and packet assemblers/disassemblers (PADs), network management systems, modems, and channel service unit/data service unit (CSU/DSU) products.

CASE Communications is headquartered in Watford, United Kingdom, and specializes in the design,

manufacture, and support of total networking solutions, including X.25 products, local area networks/wide area networks (LANs/WANs), and voice and data integration. Customers include commercial organizations, health authorities, and government and emergency services, worldwide. CASE Communications has subsidiaries in France, Australia, New Zealand, Japan, Hong Kong, Singapore, and Sweden.

CASE Cabling was formed in early 1990 to market and install structured wiring systems over which both voice and data can be delivered flexibly and cost-effectively. The Company views these systems as an extension of CASE's LAN/WAN technology and business.

Dataquest estimates that CASE captured 1.8 percent of the US modem market in 1989, based on revenue of £32.8 million (US$20 million). Significant contracts for CASE in 1989 included the supply of 6,500 modems to Sprint International's private networks division in the United States and the sale of text-handling computer and ancillary equipment to the Soviet Union.

Dowty Information Systems

Dowty Information Systems manufactures modems, multiplexers, VDUs, and graphics systems. This unit is one of the leading suppliers of low-speed, dial-up modems and digital multiplexers in Europe. Products are sold to major computer and telecommunications original equipment manufacturers (OEMs), distributors, and value-added resellers (VARs). Significant events for this unit in 1990 include having sold the 100,000th Quattro modem (a V22bis modem) and having won a key contract for a terminals and communications network linking all the mainland UK job centers. New technology for the year included a half-card internal modem, designed for PS/2 microcomputers using surface-mount techniques to occupy only half the normal board area, and a PC-based network management system capable of controlling all of Dowty's new modems from one central site.

Other Information Technology Division Units

The Information Technology division also includes Dowty Power Conversion, Dowty RFL Industries, Dowty Electronics, and the Dowty Advanced Development Centre.

Polymer Engineering Division

The Polymer Engineering Division provides polymer technology products and services to a wide range of industries throughout the world. The companies in this division design and manufacture high-integrity seals for major automotive companies, military and civil aerospace customers, and the fluid power industries. Its particular strengths are in safety-critical applications in fuel control, braking and climate control systems, and in high-performance hydraulic actuators and potable water systems. Specialist materials and services are provided for aircraft, maritime, and territorial equipment for signature management, ballistics protection and noise, vibration and temperature control, and personal security products including body armor and smoke-protection devices.

Revenue for this division increased 20 percent to £91.2 million (US$149.6 million) in 1990 and represented 12 percent of the Company's total.

Further Information

For more information about the Company's business segments, please contact the appropriate Dataquest industry service.

SALES OFFICE LOCATIONS

Information is not available.

MANUFACTURING LOCATIONS

Information is not available.

SUBSIDIARIES

North America

CASE/Datatel Inc. (United States)
Dowty Aerospace Aviation Services (United States)
Dowty Aerospace Los Angeles (United States)

Dowty Aerospace Peterborough (Canada)
Dowty Aerospace Toronto (Canada)
Dowty Aerospace Yakima (United States)
Dowty & Smiths Industries Controls Inc. (United States)
Dowty Avionics (United States)
Dowty Control Technologies (United States)
Dowty Custom Electronics Inc. (United States)
Dowty Palmer-Chenard Inc. (United States)
Dowty Polymers Inc. (United States)
Dowty (USA) Holdings Inc. (United States)

Europe

CASE Communications Ltd. (United Kingdom)
Dowty Aerospace Isle of Man (United Kingdom)
Dowty Aerospace Gloucester Ltd. (United Kingdom)
Dowty Aerospace Wolverhampton (United Kingdom)
Dowty & Smiths Industries Controls Ltd. (United Kingdom)
Dowty Armourshield Ltd. (United Kingdom)
Dowty Defense and Air Systems Ltd. (United Kingdom)
Dowty Electronic Components Ltd. (United Kingdom)
Dowty Information Systems Ltd. (United Kingdom)
Dowty International Holdings Ltd. (United Kingdom)
Dowty Group Services Ltd. (United Kingdom)
Dowty Maritime Ltd. (United Kingdom)
Dowty O Rings International (Malta)
Dowty Polyspace S.p.A. (Italy)
Dowty Power Electronics GmbH (Germany)
Dowty Power Electronics Ltd. (United Kingdom)
Dowty SA (France)
Dowty Seals Ltd. (United Kingdom)
Dowty Systems Integration Ltd. (United Kingdom)
Dowty Woodville Polymer Ltd. (United Kingdom)

Asia/Pacific

CASE Communications Systems Ltd. (Australia and New Zealand)
Dowty Aerospace Aviation Services (Singapore)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1989

Matrix Datacom

Dowty Information Systems chose Matrix Datacom as a VAR for its Syncro and Mayze ranges of dial-up and leased-line modems, plus the KMX 8000 and Arrow 80 multiplexers.

MERGERS AND ACQUISITIONS

1990

Dataco

Dowty acquired Dataco (Denmark), a LAN company, for an initial sum of £22.7 million (US$37.2 million). As much as £13.6 million (US$22.3 million) could be paid, depending on Dataco's profits over the next three years. Dataco will be integrated into the Dowty Information Technology Division. Dataco supplies the ScaNet networking system, which it claims is compatible with 85 percent of all data processing equipment.

1989

Palmer Chenard Industries

Dowty acquired Palmer Chenard Industries, a specialist in the use of high-performance polymers, for £7.5 million (US$12.3 million). Palmer employs 280 people, and will be incorporated into Dowty's Polymer Engineering Division.

Armourshield

Armourshield, an armored systems concern, is now 60 percent owned by Dowty Group. The balance will be acquired in five years at a cost linked to the firm's profit performance.

Resdel Engineering

Resdel Engineering has been purchased by Dowty Group. The purchase increases Dowty's ASW capabilities. Resdel is developing sonobuoy receivers for Boeing's P-3C Orion Update IV project.

Mayze Systems

Dowty acquired the remaining 30 percent stake in Mayze Systems to augment the 70 percent stake it had acquired through the purchase of the CASE Group. Dowty intends to use the company as a central marketing and development concern for its Information Technology Division.

1988

CASE/Datatel

CASE/Datatel was formed by Dowty Group through the merger of CASE Communications

with Datatel, both Dowty units. Dowty acquired Datatel in October 1987, and acquired CASE Communications in September 1988. The combined firm is based in Cherry Hill, New Jersey, and in Columbia, Maryland.

KEY OFFICERS

Lord Harrowby
Chairman

Tony Thatcher
Chief executive

Bruce Ralph
Deputy chief executive

Reg Moore
Financial director

Mike Spence
Director, Strategic Development

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Information is not available.

Dainippon Screen Manufacturing Co., Ltd.

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Teranouchi-argaru 4-chome
Horikawa-dori, Kamikyo-ku
Kyoto 602, Japan
Telephone: 075-414-7111
Fax: 075-451-9603
Telex: 5422-679 SCREEN J
Dun's Number: Not Available

Date Founded: 1943

CORPORATE STRATEGIC DIRECTION

Dainippon Screen Manufacturing Co., Ltd., supplies an extensive range of systems and equipment to the graphic arts, electronics, and other industries, including the printing and print screen industries. Akira Ishida, the Company's president, has undertaken an assessment of the Company's organizational structure. He has announced a corporate restructuring project that calls for the formation of an Information and Graphic Devices Division. This division's primary purpose is to develop applications in new markets, extending beyond producing high-precision image input and output systems and equipment.

The Company's philosophy consists of three basic tenets: development of high-quality products by encouraging R&D, effective diversification into new market sectors, and cultivation of a talented staff, which is its highest priority. Dainippon Screen consists of four divisions: Graphics Arts, Components and Electronics, Office Automation, and the recently formed Information and Graphic Devices.

Late in 1988, the Company purchased a majority interest in Island Graphics Corporation of San Rafael, California. Island Graphics is a leading developer of custom computer graphics software for a number of original equipment manufacturers (OEMs). Dainippon Screen has commissioned Island Graphics to develop a series of software for future workstation-based color electronic prepress systems.

Consolidated revenue totaled ¥122 billion (US$951.6 million) for year ended March 1989. This is an increase of 21.6 percent over the previous year's revenue of ¥100.4 billion (US$727.1 million). (Percentage changes refer only to ¥ amounts; US$ percentage changes will differ because of fluctuations in Dataquest exchange rates.) The increase was spurred by the shortage of 1Mb DRAMs during 1989, while production equipment used in manufacturing semiconductors enjoyed a growth period. Production equipment for electronics industries other than semiconductors also showed strong growth. As a result, sales for the Components and Electronics Division increased 48.9 percent over the previous fiscal year's sales and represented 34.5 percent, or ¥42 billion (US$327.5 million), of total revenue for year ended March 1989.

Sales from the Graphic Arts Division rose 15.1 percent over the previous year's total and represented 50.1 percent of the total revenue generated for fiscal 1989. Sales of the SG-608 color scanner alone increased 70.0 percent over fiscal 1988.

Revenue generated by the Office Automation Division remained stable at ¥8:5 billion (US$66.1 million). Industrial copiers performed well in the Japanese market, whereas overseas sales stayed at the same levels as in the preceding term, failing to compensate for the downward trend in the market.

Net income increased 364.3 percent during fiscal 1989 to ¥2.8 billion (US$21.5 million) from ¥594.0 million (US$4.3 million) for the previous year. A decrease in general expenses and an increase in the gross profit margin helped increase net income for the year ended March 1989.

Capital expenditure totaled ¥4.6 billion (US$36.0 million), representing 3.8 percent of total revenue for the year ended March 1989. This was a 64.5 percent increase over the previous year's figure of ¥2.8 billion (US$20.3 million), which represented 2.8 percent of revenue. Dainippon Screen employed 2,435 people during fiscal 1989.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region. Information on revenue by distribution channel is not available. Tables 3 and 4, comprehensive financial statements, are at the end of this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

In 1988, Dainippon Screen announced the OMEGA Network concept. This concept seeks to integrate all reproduction tasks into a single, freely configurable system that allows full compatibility among all makes of equipment.

Graphic Arts

In April 1990, Dainippon Screen introduced integrated text and image processing equipment at the Drupa Conference held in Dusseldorf, Germany. Included in the introductions was the HF-60 Mechanical Reader, a high-resolution monochromatic flat-bed scanner designed to scan and read mechanical layout, logos, and illustrations.

The text and line art processing station, the TX-570, receives digitized mechanical input through the HF-60 or typesetter input through a raster image-processor manufactured by Tegra Inc. The TX-570 organizes the page with tints and a special text format, then sends the data to a Sigmagraph page makeup system for direct output.

The PS-1/Omega RIP is a PC-based raster image processor that works with PostScript page files. The PS-1 splits the data into image files and text/line art files, which are then raster image-processed and transferred to the Sigmagraph system or TX-670.

Components and Electronics

Dainippon Screen manufactures and markets semiconductor equipment on a worldwide basis. Increased demand in fiscal 1989, primarily for 1Mb chips, spurred Japanese semiconductor manufacturers to invest heavily in production facilities. The Company responded by offering the in-line spinner D-SPIN 629 wafer-surface processer and is close to introducing a successor to the D-SPIN to be used in the manufacturing of 4 and 16Mb chips. The Company also started sales of the Spin Processor SPW-812A.

The Company also showed a strong performance in thin-film production equipment. Development in this area is being pursued in three areas: large-size black-and-white LCDs, multicolor LCDs, and full-color image-quality LCDs comparable to conventional color TV screens.

Dainippon Screen is also active in large-size shadow masking and printed circuit board production and inspection equipment.

Office Automation

Dainippon Screen offers large-format color copy systems as well as computerized image processing equipment. The Company specializes in systems for transforming images and color to data that can be handled by computers and then used for output. One such system is the Large Format Copy System CCS-12001, which reads fine differences in color and density in designs, maps, computer graphic images, and color photos, and reproduces them in large-size color copies. Another is the ISM-900 Largesize Drawing Input Scanner, a flatbed scanner for digitizing industrial drawings and tables.

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest service.

Table 1
Five-Year Corporate Highlights (Millions of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$392.9	$463.2	$579.2	$727.1	$951.6
Percent Change	-	17.88	25.05	25.53	30.88
Capital Expenditure	$39.2	$64.7	$41.6	$20.3	$36.0
Percent of Revenue	9.98	13.97	7.19	2.79	3.78
R&D Expenditure	NA	NA	NA	NA	NA
Percent of Revenue	NA	NA	NA	NA	NA
Number of Employees	2,043	2,277	2,364	2,357	2,435
Revenue ($K)/Employee	$192	$203	$245	$308	$391
Net Income	$18.0	$8.4	$7.5	$4.3	$21.5
Percent Change	-	(53.29)	(10.90)	(42.64)	399.72
Exchange Rate (US$1=¥)	¥243.5	¥221.3	¥159.6	¥138.0	¥128.3

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	NA	NA	NA	NA
Quarterly Profit	NA	NA	NA	NA

NA = Not available

Source: Dainippon Screen Manufacturing Co., Ltd. Annual Reports and Forms 10-K Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
Asia/Pacific	69.90	64.78	NA	NA	72.57
Japan	69.90	164.78	NA	NA	72.57
International	30.09	35.22	NA	NA	27.43

NA = Not available

Source: Dainippon Screen Manufacturing Co., Ltd. Annual Reports and Forms 10-K Dataquest (1990)

1990 SALES OFFICE LOCATIONS

North America—5
Europe—10
Asia/Pacific—26
  Japan—19

MANUFACTURING LOCATIONS

Asia/Pacific

Hikone, Japan
Kumiyama, Japan
Kuze, Japan
Kyoto, Japan
Rakusai, Japan

SUBSIDIARIES

North America

Dainippon Screen Engineering of America Incorporated (three offices in California) (United States)
DS America Incorporated (offices in Illinois, California, New Jersey, and Georgia) (United States)

Europe

Dainippon Screen (Benelux) BV (Netherlands)
Dainippon Screen (Deutschland) GmbH (Germany)
Dainippon Screen Engineering of Europe Co., Ltd. (United Kingdom)
Dainippon Screen (France) S.A. (France)
Dainippon Screen (U.K.) Ltd. (United Kingdom)

Asia/Pacific

Dainippon Screen (Australia) Pty. Ltd. (Australia)
Dainippon Screen (Hong Kong) Ltd. (Hong Kong)
Dainippon Screen Singapore Pte. Ltd. (Singapore)
Great Ocean Industry Co., Ltd. (Taiwan)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

Information is not available.

MERGERS AND ACQUISITIONS

1988

Island Graphics Corporation
Dainippon Screen acquired Island Graphics, which publishes image editing and page composition software.

KEY OFFICERS

Tokujiro Ishida
Chairman of the board

Akira Ishida
President

Takashi Oji
Executive vice president

Keizo Taketani
Senior managing director

Satoshi Kumon
Senior managing director

PRINCIPAL INVESTORS

Nippon Life Insurance Co.—7.93 percent
The Daiwa Bank Limited—4.97 percent
The Bank of Kyoto, Ltd.—3.57 percent
The Sumitomo Trust &Banking Co., Ltd.—2.62 percent

FOUNDERS

Information is not available.

Table 3
Comprehensive Financial Statement
Fiscal Year Ending March
(Millions of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$363.0	$405.1	$577.9	$701.2	$848.7
Cash	34.0	45.3	57.9	62.5	25.9
Receivables	140.4	166.0	243.5	328.6	422.6
Marketable Securities	61.0	33.8	60.1	60.1	71.1
Inventory	125.2	147.4	200.9	231.2	303.4
Other Current Assets	2.3	12.7	15.5	18.8	25.7
Net Property, Plants	$104.7	$166.1	$240.0	$255.8	$264.4
Other Assets	$1.3	$42.1	$53.7	$76.3	$115.4
Total Assets	$469.0	$613.3	$871.6	$1,033.2	$1,228.6
Total Current Liabilities	$193.2	$171.8	$262.4	$335.3	$477.9
Long-Term Debt	$37.1	$163.6	$225.5	$249.8	$215.5
Other Liabilities	$0.3	$1.7	$0.8	$1.0	$1.6
Total Liabilities	$230.7	$337.1	$488.8	$586.0	$694.9
Total Shareholders' Equity	$238.2	$276.2	$382.8	$447.2	$533.6
Common Stock	49.9	57.8	80.8	96.8	123.9
Other Equity	130.7	148.5	210.0	247.0	285.5
Retained Earnings	57.6	69.8	92.1	103.4	124.3
Total Liabilities and Shareholders' Equity	$469.0	$613.3	$871.6	$1,033.2	$1,228.6
Income Statement	**1985**	**1986**	**1987**	**1988**	**1989**
Revenue	$392.9	$463.2	$579.2	$727.1	$951.6
Japanese Revenue	274.7	300.0	NA	NA	690.5
Non-Japanese Revenue	118.2	163.1	NA	NA	261.1
Cost of Sales	$256.6	$316.4	$410.2	$509.8	$642.9
R&D Expense	NA	NA	NA	NA	NA
SG&A Expense	$87.4	$111.8	$166.0	$196.1	$236.8
Capital Expense	$39.2	$64.7	$41.6	$20.3	$36.0
Pretax Income	$44.5	$21.1	($2.7)	$10.9	$51.2
Pretax Margin (%)	11.32	4.56	(0.47)	1.50	5.38
Effective Tax Rate (%)	NA	55.50	58.70	64.90	60.00
Net Income	$18.0	$8.4	$7.5	$4.3	$21.5
Shares Outstanding, Millions	104.7	116.8	135.2	136.3	141.6
Per Share Data					
Earnings	$0.17	$0.07	$0.06	$0.03	$0.15
Dividend	$0.05	$0.06	$0.04	$0.05	$0.08
Book Value	$2.28	$2.36	$2.83	$3.28	$3.77
Exchange Rate (US$1=¥)	¥243.5	¥221.3	¥159.6	¥138.0	¥128.3

NA = Not Available

Source: Dainippon Screen Manufacturing Co., Ltd. Annual Reports and Forms 10-K
Dataquest (1990)

Table 4
Comprehensive Financial Statement
Fiscal Year Ending March
(Millions of Yen, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	¥88,390.0	¥89,625.0	¥92,208.0	¥96,785.0	¥108,851.0
Cash	8,278.0	10,016.0	9,240.0	8,629.0	3,328.0
Receivables	34,194.0	36,722.0	38,854.0	45,361.0	54,199.0
Marketable Securities	14,858.0	7,478.0	9,583.0	8,289.0	9,117.0
Inventory	30,492.0	32,603.0	32,058.0	31,910.0	38,906.0
Other Current Assets	568.0	2,806.0	2,473.0	2,596.0	3,301.0
Net Property, Plants	¥25,494.0	¥36,745.0	¥38,302.0	¥35,304.0	¥33,910.0
Other Assets	¥311.0	¥9,320.0	¥8,561.0	¥10,528.0	¥14,806.0
Total Assets	¥114,195.0	¥135,690.0	¥139,071.0	¥142,617.0	¥157,567.0
Total Current Liabilities	¥47,054.0	¥38,013.0	¥41,870.0	¥46,283.0	¥61,292.0
Long-Term Debt	¥9,046.0	¥36,202.0	¥35,984.0	¥34,475.0	¥27,633.0
Other Liabilities	¥83.0	¥374.0	¥132.0	¥134.0	¥202.0
Total Liabilities	¥56,183.0	¥74,589.0	¥77,986.0	¥80,892.0	¥89,127.0
Total Shareholders' Equity	¥58,012.0	¥61,101.0	¥61,085.0	¥61,725.0	¥68,440.0
Common Stock	12,161.0	12,798.0	12,891.0	13,366.0	15,887.0
Other Equity	31,827.0	32,848.0	33,504.0	34,089.0	36,617.0
Retained Earnings	14,024.0	15,455.0	14,690.0	14,270.0	15,936.0
Total Liabilities and Shareholders' Equity	¥114,195.0	¥135,690.0	¥139,071.0	¥142,617.0	¥157,567.0
Income Statement	**1985**	**1986**	**1987**	**1988**	**1989**
Revenue	¥95,669.0	¥102,478.0	¥92,417.0	¥100,358.0	¥122,044.0
Japanese Revenue	66,879.0	66,387.0	NA	NA	88,562.0
Non-Japanese Revenue	28,790.0	36,091.0	NA	NA	33,482.0
Cost of Sales	¥62,484.0	¥70,010.0	¥65,444.0	¥70,373.0	¥82,448.0
R&D Expense	NA	NA	NA	NA	NA
SG&A Expense	¥21,281.0	¥24,736.0	¥26,487.0	¥27,063.0	¥30,374.0
Capital Expense	¥9,552.0	¥14,317.0	¥6,641.0	¥2,805.0	¥4,615.0
Pretax Income	¥10,825.0	¥4,671.0	(¥430.0)	¥1,506.0	¥6,572.0
Pretax Margin (%)	11.32	4.56	(0.47)	1.50	5.38
Effective Tax Rate (%)	NA	55.50	58.70	64.90	60.00
Net Income	¥4,389.0	¥1,863.0	¥1,197.0	¥594.0	¥2,758.0
Shares Outstanding, Millions	104.7	116.8	135.2	136.3	141.6
Per Share Data					
Earnings	¥41.90	¥15.96	¥8.99	¥4.38	¥19.63
Dividend	¥11.50	¥13.50	¥7.00	¥7.00	¥10.00
Book Value	¥554.08	¥523.13	¥451.81	¥452.86	¥483.33

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending March
(Millions of Yen, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	1.88	2.36	2.20	2.09	1.78
Quick (Times)	1.23	1.50	1.44	1.40	1.14
Fixed Assets/Equity (%)	43.95	60.14	62.70	57.20	49.55
Current Liabilities/Equity (%)	81.11	62.21	68.54	74.98	89.56
Total Liabilities/Equity (%)	96.85	122.07	127.67	131.05	130.23
Profitability (%)					
Return on Assets	-	1.49	0.87	0.42	1.84
Return on Equity	-	3.13	1.96	0.97	4.24
Profit Margin	4.59	1.82	1.30	0.59	2.26
Other Key Ratios					
R&D Spending % of Revenue	0	0	0	0	0
Capital Spending % of Revenue	9.98	13.97	7.19	2.79	3.78
Employees	2,043	2,277	2,364	2,357	2,435
Revenue (¥K)/Employee	¥46,828	¥45,006	¥39,093	¥42,579	¥50,121
Capital Spending % of Assets	8.36	10.55	4.78	1.97	2.93
Exchange Rate (US$1=¥)	¥243.5	¥221.3	¥159.6	¥138.0	¥128.3

NA = Not available

Source: Dainippon Screen Manufacturing Co., Ltd. Annual Reports and Forms 10-K
Dataquest (1990)

E. I. du Pont de Nemours and Company

1007 Market Street
Wilmington, Delaware 19898
Telephone: (302) 774-1000
Fax: (302) 724-9560
Dun's Number: 00-1131-5704

Date Founded: 1802

CORPORATE STRATEGIC DIRECTION

E. I. du Pont de Nemours and Company was founded in 1802 and incorporated in Delaware in 1915. The Company consists of six primary business segments: industrial products; fibers; polymers; petroleum; coal; and diversified businesses consisting of electronics, imaging systems, agricultural products, and medical products.

Du Pont has approximately 85 major businesses selling a wide array of products to many different markets that include energy, transportation, textile, construction, electronics, health care, packaging, and agriculture. Business operations of Du Pont and its subsidiaries exist in approximately 60 countries.

Total revenue increased by 10 percent to $36 billion* in fiscal 1989 from $33 billion in fiscal 1988. Net income increased 13 percent to $2.5 billion in fiscal 1989 from $2.2 billion in fiscal 1988. Du Pont employs 145,787 people worldwide.

R&D expenditure totaled $1.4 billion in fiscal 1989, representing 4 percent of revenue. Most R&D is performed internally, although some research is accomplished within joint ventures for a few embryonic businesses. R&D focus at present is being placed on health sciences, agricultural products, electronics, new imaging systems, and advanced materials.

Du Pont maintains two large research centers near Wilmington, Delaware: The Experimental Station engages in research of a fundamental, exploratory, and applied nature; the Chestnut Run Laboratories are concerned principally with technical activities related to the end-use performance and requirements of Company products. Du Pont conducts research at facilities in Ponaca City, Oklahoma, for new products and new petroleum business technology, and in Library, Pennsylvania, for coal businesses. Internationally, major research facilities are located in Canada, Belgium, Germany, Switzerland, and Japan.

Capital spending totaled $5 billion in fiscal 1989, representing 14 percent of revenue.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Industrial Products

In fiscal 1989, the industrial products business segment had sales of $3.7 billion. Industrial products comprise a wide range of commodity and specialty products that include white pigments, organic chemicals, polymer intermediates, fluorochemicals, petroleum additives, and mineral acids. These products are used in the construction, transportation, petroleum, agricultural, coatings, paper, cleaning agents, and textile industries.

Fibers

Du Pont produces the most extensive family of man-made fibers in the world. In fiscal 1989, the fibers business segment had sales of $6 billion. Developed through material and processing expertise, new fiber systems are being used wherever high performance is

*All dollars amounts are in US dollars.

required—from advanced composites to protective apparel, active sportswear, and floor coverings.

Polymer Products

Du Pont's polymer products are used by a wide array of industries that include transportation, packaging chemical processing, construction, electrical/electronics, paper, adhesives, and textiles. Product lines include engineering polymers, ethylene polymers, elastomers, fluoropolymers, films, acrylics, membranes, and fabricated parts. In fiscal 1989, the polymer products business segment had sales of $5.6 billion.

Petroleum Exploration and Production

In fiscal 1989, the petroleum exploration and production business segment group had sales of $12.3 billion. Du Pont's petroleum operations are conducted through its Conoco subsidiary. Exploration activities are conducted worldwide, with crude oil produced in the United States, Canada, the United Kingdom, Norway, the Netherlands, Egypt, Dubai, and Indonesia. Natural gas is sold in the United States, Canada, the United Kingdom, and Norway.

Coal

In fiscal 1989, the coal business segment's sales were $1.8 billion. Du Pont's coal operations are conducted through Consolidated Coal Company (Consol), a subsidiary. Operations consist primarily of mining stream and metallurgical coal that is sold mainly to electric utilities and steel producers in the United States.

Diversified Businesses

The diversified businesses segment consists of electronics, imaging systems, agricultural products, and medical products. In fiscal 1989, the diversified businesses segment had revenue of $6.2 billion.

Electronics

Du Pont's electronics businesses seek to become a premier supplier of materials and components to the worldwide data processing, telecommunications, and information storage industries. This segment includes materials for electronic circuits; electronic components that include connectors and microelectric packages; information storage media for the audio, video, and data markets; photographic systems and products for printing and a broad array of industrial applications; finishes for the automotive, chemical, and petroleum industries; and analytical instruments for research and monitoring industrial processes. Du Pont at present ranks among the leaders of the world's broad-based material and components suppliers.

Acquisitions during 1989 concentrated on achieving a leadership position in a relatively new business—photomasks used in producing integrated circuits. New alliances were forged with National Semiconductor, SGS-Thompson, and N.V. Philips to supply them with photomasks. New plants were opened in Europe and North America.

Imaging Systems

In 1989, the imaging systems business used strategic acquisitions to improve its position as one of the top four suppliers to the world's printing industry. Howson-Algraphy, manufacturer of offset plates based in the United Kingdom, was acquired in 1989. Also, this segment expanded with the acquisitions of Imagitex and Camex. These companies provide Du Pont a strong position in the black-and-white prepress markets.

Agricultural Products

Du Pont's agricultural products include fungicides, herbicides, and insecticides.

Medical Products

The medical products segment includes a broad line of medical X-ray products; diagnostic kits, instruments, reagents, and imaging agents; prescription pharmaceuticals; and a wide range of radiolabled chemicals, biological materials, and instruments used in biomedical research.

Further Information

For more information about the Company's business segments, please contact Dataquest's Semiconductor Equipment and Materials Service.

Table 1
Five-Year Corporate Highlights (Millions of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$29,865.0	$27,421.0	$30,344.0	$32,771.0	$35,991.0
Percent Change	-	(8.18)	10.66	8.00	9.83
Capital Expenditure	$3,095.0	$2,939.0	$3,212.0	$4,207.0	$5,092.0
Percent of Revenue	10.36	10.72	10.59	12.84	14.15
R&D Expenditure	$1,144.0	$1,156.0	$1,223.0	$1,319.0	$1,387.0
Percent of Revenue	3.83	4.22	4.03	4.02	3.85
Number of Employees	146,017	141,268	140,145	140,949	145,787
Revenue ($K)/Employee	$204.53	$194.11	$216.52	$232.50	$246.87
Net Income	$1,118.0	$1,538.0	$1,786.0	$2,190.0	$2,480.0
Percent Change	-	37.57	16.12	22.62	13.24

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$8,674.00	$9,278.00	$8,589.00	$8,993.00
Quarterly Profit	$736.00	$714.00	$547.00	$483.00

Source: E. I. du Pont de Nemours and Company
Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	67.98	68.41	67.09	66.63	66.31
International	32.02	31.59	32.91	33.37	33.69

Source: E. I. du Pont de Nemours and Company
Annual Reports and Forms 10-K
Dataquest (1990)

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	100.00	100.00
Indirect Sales	0	0

Source: Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—80
Europe—15
Asia/Pacific—15
ROW—15

MANUFACTURING LOCATIONS

North America—35; Europe—1; Asia/Pacific—3; ROW—5

Industrial products production activities include Ti-Pure titanium dioxide, Freon fluorocarbons, sodium cyanide, hydrogen peroxide, Adi-Pure adipic acid and other polymer intermediates, sulfuric acid, formaldehyde, methanol, aniline, Tetrathane products, and fuel additives.

North America—5; Europe—2; Asia/Pacific—4; ROW—4

Electronics production activities include connectors and packaging, Riston photoresists, Kapton polyimide film, thick film and semiconductor materials and photomasks, Mylar polyester film, chromium dioxide particles, and optical disks.

North America—8; Europe—3

Imaging systems production activities include Cromalin proofing systems; Howson offset and Cyrel printing plates, chemicals and equipment; Bright Light and other silver-sensitized films and papers; a full line of color electronic systems; and color and black-and-white text systems for news, classified, and display ads for newspapers.

SUBSIDIARIES

North America

Conoco Inc.(United States)
Conoco International (United States)
Conoco Pipeline Company (United States)
Conoco Shale Company (United States)
Consolidated Coal Company (United States)
Continental Overseas Oil Company (United States)
Douglas Oil Company (United States)
Du Pont Canada Ltd. (Canada)
Du Pont Electronic Materials Inc. (Puerto Rico)
Du Pont Pharmaceutical Caribe Inc. (Puerto Rico)
Fairmont Supply Company (United States)
Kayo Oil Company (United States)
Louisiana Gas System Inc. (United States)
Remington Arms Company Inc. (United States)

Europe

Conoco Ireland Ltd. (Ireland)
Conoco Norway Inc. (Norway)
Du Pont de Nemours (Belgium)
Du Pont de Nemours B.V. (Netherlands)
Du Pont de Nemours GmbH (Germany)
Du Pont de Nemours Italiana S.p.A. (Italy)
Du Pont de Nemours International S.A. (Switzerland)
Du Pont de Nemours S.A. (France)
Du Pont de Nemours S.A. (Luxembourg)
Du Pont Iberia S.A. (Spain)
Du Pont Ltd. (United Kingdom)
Du Pont Scandinavia AB (Sweden)

Asia/Pacific

Conoco Irian Jaya Co. (Indonesia)
Du Pont China Ltd. (China)
Du Pont Company Ltd. (Thailand)
Du Pont Electronics Private Ltd. (Singapore)
Du Pont Japan Ltd. (Japan)
Du Pont Ltd. (Australia)
Du Pont Ltd. (New Zealand)
Du Pont Philippines (Philippines)
Du Pont Taiwan Ltd. (Taiwan)

ROW

Du Pont S.A. de C.V. (Mexico)
Du Pont de Brasil S.A. (Brazil)
Du Pont de Colombia S.A. (Colombia)
Du Pont de Venezuela C.A. (Venezuela)
Duclio S.A. (Argentina)
World Wide Transport Inc. (Liberia)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

Hewlett-Packard and Los Alamos National Laboratory

Du Pont, Hewlett-Packard, and the Los Alamos National Laboratory have agreed to an $11 million

cooperative superconductivity R&D project. The deal, one of the biggest such pacts between industry and a government research facility, covers a three-year period and initially will be for manufacturing thin-film, high-temperature superconductors for electronics components.

Hanyang Chemical
Du Pont and Hanyang Chemical have received government approval to build a joint-venture titanium dioxide plant in South Korea that will produce 65,000 metric tons per year. Planned start-up is expected in late 1993.

Freshworld and Sunkist Growers
Freshworld, a joint venture of Du Pont and DNA Plant Technology, signed a five-year agreement with Sunkist Growers to distribute produce. Patented packaging and processing techniques developed by the joint venture produce ready-to-eat celery and carrots with a shelf life of 30 days.

Waste Management of North America
Du Pont and Waste Management of North America entered into a joint venture to build a plastics recycling plant in southwest Chicago.

Chemical Exchange Industries
Du Pont acquired worldwide marketing rights for hexamethyleneimine (HMI) from Chemical Exchange Industries.

Merck and Co., Inc.
Du Pont and Merck entered into an agreement calling for Du Pont to receive exclusive marketing rights to Sinemet, a major Parkinson's disease therapy.

Waste Management, Inc.
Du Pont and Waste Management plan joint development of a $5 million, 100,000-square-foot plastics recycling facility in the Harrowgate section of Philadelphia, Pennsylvania.

1989

Soviet Union
A discussed joint venture would have Du Pont produce and sell chemicals in the Soviet Union and be paid back in crude oil.

Biolistics
Du Pont and Biolistics entered into a licensing agreement that would have Biolistics license its biolistic gene gun technology to Du Pont.

C&C Industries
Du Pont and C&C Industries signed a marine fabrics technical and marketing pact relating to the use of woven Kevlar, along with glass fabrics, in sailboats made by C&C.

MERGERS AND ACQUISITIONS

1990

Seicor
Du Pont acquired Seicor's electronic and optoelectronic LAN component business, which produces connection devices that hook up personal computers to local area networks.

National Semiconductor
Du Pont acquired National Semiconductor's photomask operation.

1989

Howson-Algraphy
Du Pont acquired Howson-Algraphy, a leading printing plate manufacturer in the United Kingdom.

KEY OFFICERS

Edgar S. Woolard, Jr.
Chairman of the board, chief executive officer

Constantine S. Nicandros
Executive vice president

Charles L. Henry
Group vice president, Electronics

Mark A. Suwyn
Group vice president, Imaging Systems

J. Edward Newall
Group vice president, International

Alexander MacLachlan
Senior vice president, Technology

PRINCIPAL INVESTORS

Charles R. Bronfman—22.9 percent
Edgar M. Bronfman—22.9 percent

FOUNDERS

Information is not available.

Table 4
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$8,876.0	$8,960.0	$9,953.0	$10,238.0	$11,344.0
Cash	583.0	584.0	756.0	603.0	692.0
Receivables	4,044.0	3,771.0	4,376.0	4,815.0	5,298.0
Inventory	3,873.0	4,253.0	4,342.0	4,467.0	4,910.0
Other Current Assets	376.0	352.0	479.0	353.0	444.0
Net Property, Plants	$15,195.0	$15,697.0	$15,854.0	$17,221.0	$18,876.0
Other Assets	$1,069.0	$2,076.0	$2,402.0	$3,260.0	$4,495.0
Total Assets	$25,140.0	$26,733.0	$28,209.0	$30,719.0	$34,715.0
Total Current Liabilities	$5,311.0	$5,636.0	$6,140.0	$6,696.0	$9,348.0
Long-Term Debt	$3,191.0	$3,227.0	$3,018.0	$3,158.0	$4,080.0
Other Liabilities	$3,979.0	$4,496.0	$4,807.0	$5,285.0	$5,489.0
Total Liabilities	$12,481.0	$13,359.0	$13,965.0	$15,139.0	$18,917.0
Total Shareholders' Equity	$12,659.0	$13,374.0	$14,244.0	$15,580.0	$15,798.0
Converted Preferred Stock	237.0	237.0	237.0	237.0	237.0
Common Stock	401.0	400.0	398.0	399.0	411.0
Other Equity	3,761.0	3,670.0	3,621.0	4,595.0	4,399.0
Retained Earnings	8,260.0	9,067.0	9,988.0	10,349.0	10,751.0
Total Liabilities and Shareholders' Equity	$25,140.0	$26,733.0	$28,209.0	$30,719.0	$34,715.0
Income Statement	**1985**	**1986**	**1987**	**1988**	**1989**
Revenue	$29,865.0	$27,421.0	$30,344.0	$32,771.0	$35,991.0
US Revenue	20,301.0	18,758.0	20,358.0	21,834.0	23,865.0
Non-US Revenue	9,564.0	8,663.0	9,986.0	10,937.0	12,126.0
Cost of Sales	$17,898.0	$15,129.0	$16,613.0	$17,900.0	$19,604.0
R&D Expense	$1,144.0	$1,156.0	$1,223.0	$1,319.0	$1,387.0
SG&A Expense	$2,077.0	$2,350.0	$2,716.0	$3,065.0	$3,377.0
Capital Expense	$3,095.0	$2,939.0	$3,212.0	$4,207.0	$5,092.0
Pretax Income	$3,195.0	$2,985.0	$3,588.0	$3,797.0	$4,324.0
Pretax Margin (%)	10.70	10.89	11.82	11.59	12.01
Effective Tax Rate (%)	65.00	48.50	50.20	42.30	42.60
Net Income	$1,118.0	$1,538.0	$1,786.0	$2,190.0	$2,480.0
Shares Outstanding, Millions	240.6	240.0	238.8	718.3	685.3
Per Share Data					
Earnings	$4.61	$6.35	$2.46	$3.04	$3.53
Dividend	$3.00	$3.05	$3.30	$1.23	$1.45
Book Value	$52.61	$55.73	$59.65	$21.69	$23.05

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	1.67	1.59	1.62	1.53	1.21
Quick (Times)	0.94	0.84	0.91	0.86	0.69
Fixed Assets/Equity (%)	120.03	117.37	111.30	110.53	119.48
Current Liabilities/ Equity (%)	41.95	42.14	43.11	42.98	59.17
Total Liabilities/ Equity (%)	98.59	99.89	98.04	97.17	119.74
Profitability (%)					
Return on Assets	-	5.93	6.50	7.43	7.58
Return on Equity	-	11.82	12.93	14.69	15.81
Profit Margin	3.74	5.61	5.89	6.68	6.89
Other Key Ratios					
R&D Spending % of Revenue	3.83	4.22	4.03	4.02	3.85
Capital Spending % of Revenue	10.36	10.72	10.59	12.84	14.15
Employees	146,017	141,268	140,145	140,949	145,787
Revenue ($K)/Employee	$204.53	$194.11	$216.52	$232.50	$246.87
Capital Spending % of Assets	12.31	10.99	11.39	13.70	14.67

Source: E. I. du Pont de Nemours and Company Annual Reports and Forms 10-K
Dataquest (1990)

12.15 Ducommun, Inc. (Kierulff Electronics)

Ducommun, Incorporated
612 South Flower Street
Los Angeles, California 90017
(213)589-6541

(Millions of Dollars Except per Share Data)

Balance Sheet (December 31)

	1978	1979	Percent Change 1978-1979
Working Capital	$ 48.1	$ 67.5	40.4%
Long-Term Debt	$ 21.1	$ 39.2	85.6%
Shareholders' Equity	$ 34.3	$ 37.4	9.0%
Equity as a Percent of Assets	38.0%	30.6%	
After-Tax Return on Average Equity	11.0%	15.6%	

Operating Performance (Fiscal Year Ending December 31)

	1978	1979	Percent Change 1978-1979
Revenue	$245.4	$325.2	32.5%
Cost of Goods	$182.4	$241.1	32.1%
Marketing, SG&A Expense	$ 50.1	$ 64.0	27.7%
Pretax Income	$ 6.5	$ 10.5	62.4%
Pretax Margin (%)	2.6%	3.2%	
Net Income	$ 3.6	$ 5.6	54.1%
Per Share Data*			
Earnings**	$ 2.45	$ 3.86	57.6%
Dividends	$ 0.40	$ 0.50	25.0%
Book Value	$ 24.44	$ 26.55	8.6%
Average Shares Outstanding (Millions)	1.40	1.41	0.4%
Capital Expenditures	$ 1.3	3.3	156.3%
Sales/Average Assets	2.80	3.10	9.2%
Sales/Average Inventory	5.54	5.90	6.6%
Total Employees	1,702	1,833	7.7%

*Includes redeemable preferred stock
**Fully diluted

Source: Ducommun, Inc. Annual Report
DATAQUEST, Inc.

12.15 Ducommun, Inc. (Kierulff Electronics)

Table 12.15-1

Ducommun, Inc.
REVENUES BY LINE OF BUSINESS
(Millions of Dollars)

	1976	1977	1978	1979
Metals Distribution	$109.1	$129.9	$152.8	$185.3
Electronics Distribution (Kierulff)	53.4	62.7	87.4	135.8
Other	6.6	4.7	5.2	4.2
Total	$169.1	$197.3	$245.4	$325.2

Source: Ducommun, Inc. Annual Reports
DATAQUEST, Inc.

12.15 Ducommun, Inc. (Kierulff Electronics)

Table 12.15-2

Ducommun, Inc.
FINANCIAL STATEMENT HISTORY 1972-79
(Millions of Dollars)

		Fiscal Year Ending December 31									
		1972	1973	1974	1975	1976	1977	1978	1979	TREND	CMPD GR
BALANCE SHEET											
1	*CASH & LIQUID SECURITIES*	1.84	3.22	3.43	2.27	3.82	2.57	1.37	1.47	(0.15)	(7.13)
3	*RECEIVABLES*	23.37	27.64	29.22	20.63	23.14	27.95	35.08	44.65	2.20	7.03
4	*INVENTORY*	38.36	39.66	43.28	36.07	31.84	43.66	44.95	65.22	2.52	5.18
5	*OTHER CURRENT ASSETS*	1.22	1.37	1.76	1.25	1.50	1.58	1.52	1.85	0.06	3.97
7	*EXCESS FUNDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	*TOTAL CURRENT ASSETS*	64.80	71.88	77.69	60.21	60.29	75.76	82.92	113.19	4.62	5.56
9	*GROSS P P E*	18.09	19.63	20.74	21.64	22.60	23.26	19.93	23.96	0.61	2.93
10	*ACCUMULATED DEPRECIATION*	11.16	12.01	12.21	13.11	14.15	14.45	12.86	15.09	0.47	3.68
11	*NET P P E*	6.94	7.62	8.54	8.53	8.45	8.82	7.07	8.87	0.14	1.73
12	*MISC ASSETS*	0.34	0.30	0.76	0.48	0.34	0.34	0.33	0.27	(0.02)	(4.56)
15	**TOTAL ASSETS**	72.08	79.80	86.98	69.21	69.08	84.91	90.33	122.33	4.74	5.19
16	*NOTES PAYABLE*	4.75	5.75	12.75	1.75	0.00	4.50	0.00	2.50	(0.85)	(81.39)
17	*ACCTS PYBLE & ACCRUED LIA*	18.72	24.26	24.18	13.72	14.01	23.47	29.38	38.45	1.93	7.31
18	*ACCRUED TAXES*	0.90	2.66	1.22	0.88	1.81	0.65	3.31	2.94	0.20	10.24
19	*ACCRUED LIABILITIES*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	*CURR MAT LONG TERM DEBT*	0.40	0.40	0.41	0.41	0.46	1.23	2.01	1.58	0.22	28.59
21	*DIVIDNDS PAYBLE*	0.00	0.00	0.00	0.00	0.14	0.14	0.14	0.21	0.03	3586.58
22	*TOTAL CURR LIABILITIES*	24.78	33.07	38.55	16.75	16.42	29.98	34.85	45.68	1.54	4.59
23	*LONG TERM DEBT*	16.00	16.00	16.12	21.11	21.11	23.15	21.14	39.23	2.49	10.99
24	*DEFERRED TAXES*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	*MISC LIABILITIES*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	*DEFICIT FUNDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	*TOTAL LIABILITIES*	40.78	49.07	54.67	37.86	37.52	53.14	55.99	84.90	4.03	7.02
29	*PREFERRED STOCK*	6.37	4.38	4.06	3.75	3.44	3.13	2.81	1.06	(0.57)	(16.97)
30	*COMMON STOCK*	3.01	3.01	3.01	3.01	3.01	3.04	3.04	3.05	0.01	0.20
31	*CAPITAL SURPLUS*	2.20	2.20	2.20	2.20	2.20	2.29	2.29	2.36	0.02	1.03
32	*RETAINED EARNINGS*	19.73	21.14	23.05	22.39	22.91	23.35	26.22	30.95	1.25	5.24
33	*TREASURY STOCK*	0.00	0.00	0.00	0.00	0.00	(0.03)	(0.03)	0.00	0.00	*********
34	*TOTAL EQUITY*	31.30	30.73	32.32	31.35	31.56	31.78	34.34	37.43	0.71	2.12
35	**TOTAL LIAB & EQUITY**	72.08	79.80	86.98	69.21	69.08	84.91	90.33	122.33	4.74	5.19
36	*NET WORKING CAPITAL*	40.02	38.81	39.14	43.46	43.88	45.78	48.07	67.51	3.08	6.40
INCOME & EXPENSE											
38	*SALES*	153.59	186.86	216.38	157.29	169.11	197.25	245.44	325.20	17.24	7.93
40	*COST OF GOODS*	114.26	137.31	162.28	115.44	123.88	146.22	182.45	241.06	12.78	7.92
41	*GROSS PROFIT*	39.33	49.56	54.10	41.86	45.22	51.04	62.99	84.14	4.46	7.95
42	*S G & A EXPENSE*	31.06	36.79	39.59	33.45	35.57	42.03	50.07	64.02	3.65	8.49
43	*MISC OPERATING EXPENSE*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45	*OPERATING PROFIT*	8.28	12.77	14.51	8.41	9.65	9.01	12.92	20.12	0.81	6.11
46	*DEPRECIATION*	1.12	1.03	1.17	1.43	1.32	1.36	1.31	1.39	0.04	3.76
47	*LEASE PAYMENTS*	1.90	3.42	3.79	3.66	3.97	4.90	5.26	5.74	0.47	13.65
48	*INTEREST EXPENSE*	1.23	1.71	2.33	2.10	1.68	1.91	2.17	2.78	0.14	7.46
49	*MISC EXPENSE*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51	*MISC INCOME*	0.00	0.00	0.00	0.00	0.00	0.76	2.30	0.30	0.19	3710.28
53	*PRETAX PROFIT*	4.02	6.62	7.22	1.22	2.69	1.60	6.48	10.52	0.35	3.52
54	*INCOME TAXES*	2.01	3.47	3.45	0.44	1.24	0.40	2.86	4.94	0.11	(0.12)
55	*EXTRAORDINARY ITEM*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
56	*NET PROFIT*	2.01	3.15	3.77	0.77	1.45	1.20	3.63	5.59	0.24	6.19
57	*EPS AFTER PFD DIVIDENDS*	1.15	2.02	2.52	0.38	0.88	0.71	2.45	3.86	0.19	7.99
58	*COMMON DIV PER SHARE*	1.00	1.00	1.15	0.85	0.40	0.40	0.40	0.50	(0.11)	(14.70)

Source: Ducommun, Inc. Annual Reports
DATAQUEST, Inc.

12.15 Ducommun, Inc. (Kierulff Electronics)

Table 12.15-3

Ducommun, Inc.
FINANCIAL STATEMENT HISTORY 1972-79
(Percent)

		Fiscal Year Ending December 31									
		1972	1973	1974	1975	1976	1977	1978	1979	TREND	CMPD GR
	BALANCE SHEET										
1	*CASH & LIQUID SECURITIES*	2.56	4.03	3.94	3.27	5.52	3.03	1.52	1.20	(0.27)	(11.71)
3	*RECEIVABLES*	32.42	34.63	33.59	29.80	33.49	32.92	38.84	36.50	0.61	1.75
4	*INVENTORY*	53.22	49.70	49.76	52.11	46.08	51.41	49.77	53.31	0.00	(0.01)
5	*OTHER CURRENT ASSETS*	1.70	1.72	2.02	1.81	2.18	1.86	1.68	1.51	(0.02)	(1.16)
7	*EXCESS FUNDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	*TOTAL CURRENT ASSETS*	89.90	90.07	89.32	86.99	87.28	89.22	91.80	92.52	0.32	0.35
9	*GROSS P P E*	25.10	24.60	23.85	31.26	32.71	27.40	22.07	19.58	(0.47)	(2.14)
10	*ACCUMULATED DEPRECIATION*	15.48	15.05	14.03	18.94	20.48	17.01	14.24	12.33	(0.19)	(1.43)
11	*NET P P E*	9.63	9.54	9.82	12.32	12.23	10.38	7.83	7.25	(0.28)	(3.29)
12	*MISC ASSETS*	0.48	0.38	0.87	0.69	0.49	0.40	0.37	0.22	(0.04)	(9.26)
15	**TOTAL ASSETS**	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
16	*NOTES PAYABLE*	6.59	7.21	14.66	2.53	0.00	5.30	0.00	2.04	(1.17)	(82.50)
17	*ACCTS PYBLE & ACCRUED LIA*	25.98	30.40	27.79	19.82	20.28	27.64	32.53	31.43	0.58	2.02
18	*ACCRUED TAXES*	1.25	3.34	1.40	1.27	2.62	0.76	3.67	2.41	0.11	4.80
19	*ACCRUED LIABILITIES*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	*CURR MAT LONG TERM DEBT*	0.55	0.50	0.47	0.59	0.66	1.45	2.23	1.29	0.20	22.25
21	*DIVIDNDS PAYBLE*	0.00	0.00	0.00	0.00	0.20	0.16	0.15	0.17	0.03	3584.74
22	*TOTAL CURR LIABILITIES*	34.37	41.45	44.32	24.20	23.76	35.31	38.58	37.34	(0.25)	(0.57)
23	*LONG TERM DEBT*	22.20	20.05	18.53	30.50	30.55	27.27	23.40	32.06	1.33	5.51
24	*DEFERRED TAXES*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	*MISC LIABILITIES*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	*DEFICIT FUNDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	*TOTAL LIABILITIES*	56.57	61.50	62.85	54.71	54.31	62.58	61.98	69.40	1.08	1.74
29	*PREFERRED STOCK*	0.83	5.48	4.67	5.42	4.98	3.68	3.11	0.87	(0.85)	(21.06)
30	*COMMON STOCK*	4.18	3.78	3.47	4.36	4.36	3.59	3.37	2.50	(0.16)	(4.74)
31	*CAPITAL SURPLUS*	3.05	2.75	2.52	3.17	3.18	2.70	2.54	1.93	(0.10)	(3.96)
32	*RETAINED EARNINGS*	27.37	26.49	26.49	32.35	33.17	27.49	29.03	25.30	0.02	0.05
33	*TREASURY STOCK*	0.00	0.00	0.00	0.00	0.00	(0.04)	(0.03)	0.00	0.00	********
34	*TOTAL EQUITY*	43.43	38.50	37.15	45.29	45.69	37.42	38.02	30.60	(1.08)	(2.92)
35	**TOTAL LIAB & EQUITY**	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
36	*NET WORKING CAPITAL*	55.52	48.63	45.00	62.79	63.51	53.91	53.22	55.18	0.57	1.15
	INCOME & EXPENSE										
38	*SALES*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
40	*COST OF GOODS*	74.39	73.48	75.00	73.39	73.26	74.13	74.34	74.13	0.00	0.00
41	*GROSS PROFIT*	25.61	26.52	25.00	26.61	26.74	25.87	25.66	25.87	0.00	0.02
42	*S G & A EXPENSE*	20.22	19.69	18.30	21.27	21.03	21.31	20.40	19.69	0.10	0.52
43	*MISC OPERATING EXPENSE*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45	*OPERATING PROFIT*	5.39	6.83	6.71	5.34	5.71	4.57	5.26	6.19	(0.10)	(1.68)
46	*DEPRECIATION*	0.73	0.55	0.54	0.91	0.78	0.69	0.53	0.43	(0.02)	(3.86)
47	*LEASE PAYMENTS*	1.24	1.83	1.75	2.32	2.35	2.48	2.14	1.76	0.09	5.30
48	*INTEREST EXPENSE*	0.80	0.91	1.08	1.34	0.99	0.97	0.88	0.85	(0.01)	(0.44)
49	*MISC EXPENSE*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51	*MISC INCOME*	0.00	0.00	0.00	0.00	0.00	0.39	0.94	0.09	0.08	3095.44
53	*PRETAX PROFIT*	2.62	3.54	3.34	0.77	1.59	0.81	2.64	3.24	(0.08)	(4.08)
54	*INCOME TAXES*	1.31	1.86	1.59	0.28	0.73	0.20	1.16	1.52	(0.07)	(7.46)
55	*EXTRAORDINARY ITEM*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
56	*NET PROFIT*	1.31	1.69	1.74	0.49	0.86	0.61	1.48	1.72	(0.01)	(1.61)
57	*EPS AFTER PFD DIVIDENDS*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
58	*COMMON DIV PER SHARE*	86.77	49.47	45.67	225.16	45.53	56.34	16.35	12.96	(9.88)	(21.01)

Source: Ducommun, Inc. Annual Reports
DATAQUEST, Inc.

12.15 Ducommun, Inc. (Kierulff Electronics)

Table 12.15-4

Ducommun, Inc.
FUNDS FLOW HISTORY 1973-79
(Millions of Dollars)

		Fiscal Year Ending December 31								
		1973	1974	1975	1976	1977	1978	1979	TREND	CMPD GR
SOURCES										
56	*NET PROFIT*	3.15	3.77	0.77	1.45	1.20	3.63	5.59	0.27	7.70
46	*DEPRECIATION*	1.03	1.17	1.43	1.32	1.36	1.31	1.39	0.05	3.98
61	*NEW LONG TERM DEBT*	0.40	0.53	5.40	0.45	3.28	0.00	19.66	1.95	(64.47)
62	*NEW EQUITY*	(2.00)	(0.31)	(0.31)	(0.45)	(0.19)	(0.31)	(1.58)	0.04	(3.69)
63	*INCR OTHER LIABILITIES*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
66	*TOTAL SOURCES*	2.58	5.15	7.29	2.77	5.66	4.62	24.97	2.30	25.38
USES										
67	*P P E EXPENDITURES*	1.70	2.09	1.42	1.25	1.73	(0.43)	3.19	(0.01)	*********
68	*REPAYMENT LONG TERM DEBT*	0.40	0.40	0.41	0.41	0.46	1.23	2.01	0.23	29.38
69	*PREFERRED DIVIDENDS*	0.34	0.27	0.25	0.23	0.21	0.19	0.15	(0.03)	(11.33)
70	*COMMON DIVIDENDS*	1.39	1.60	1.18	0.56	0.56	0.56	0.70	(0.17)	(16.00)
72	*INCR WORKING CAPITAL*	(1.21)	0.34	4.31	0.47	2.67	3.08	19.00	2.30	*********
71	*INCR OTHER ASSETS*	(0.04)	0.45	(0.28)	(0.14)	0.00	(0.01)	(0.06)	(0.02)	*********
74	*TOTAL USES*	2.58	5.15	7.29	2.77	5.63	4.62	25.00	2.30	25.38
75	*EXCESS/DEFICIT*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
76	*CUMULATIVE SUR/DEF*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Ducommun, Inc. Annual Reports
DATAQUEST, Inc.

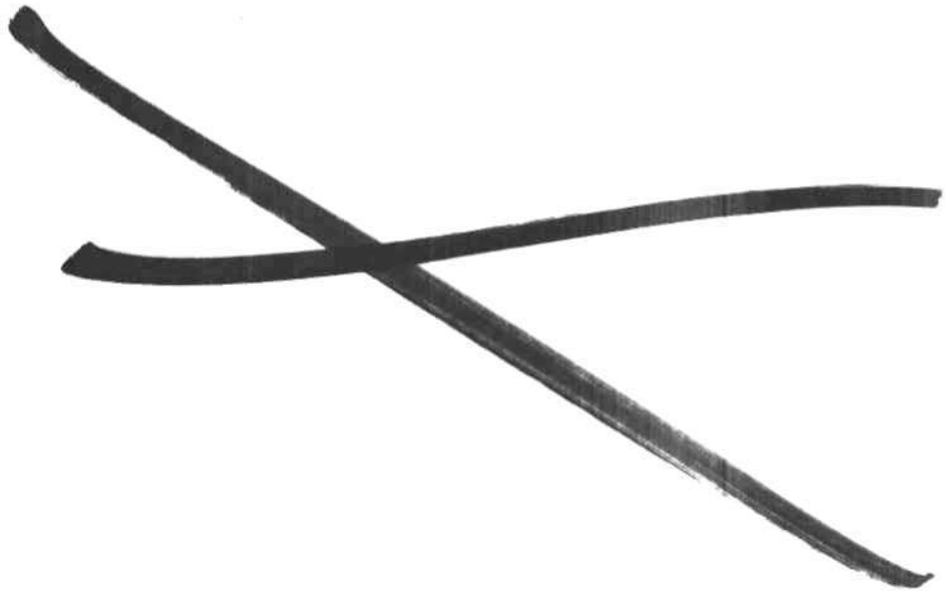
12.15 Ducommun, Inc. (Kierulff Electronics)

Table 12.15-5

Ducommun, Inc.
FINANCIAL RATIO HISTORY 1972-79

		Fiscal Year Ending December 31									
		1972	1973	1974	1975	1976	1977	1978	1979	ST AV	WTD AVG
LIQUIDITY											
1	*CURRENT RATIO*	2.615	2.173	2.015	3.594	3.672	2.527	2.380	2.478	2.682	2.705
2	*QUICK RATIO*	1.017	0.933	0.847	1.367	1.642	1.018	1.046	1.010	1.110	1.128
3	*CASH RATIO*	0.074	0.097	0.089	0.135	0.232	0.086	0.039	0.032	0.098	0.091
4	*WORKING CAPITAL/SALES*	0.261	0.208	0.181	0.276	0.259	0.232	0.196	0.208	0.228	0.223
6	*DAYS RECEIVABLES*	55.530	53.981	49.289	47.860	49.944	51.727	52.168	50.118	51.327	50.805
7	*DAYS INVENTORY*	122.553	105.425	97.353	114.037	93.796	108.983	89.931	98.746	103.853	100.666
LEVERAGE											
8	*LONG TERM DEBT/CAPITALIZ*	0.338	0.342	0.333	0.402	0.401	0.422	0.381	0.512	0.391	0.415
11	*LONG TERM DEBT/EQUITY*	0.511	0.521	0.499	0.673	0.669	0.729	0.616	1.048	0.658	0.726
12	*TOTAL DEBT/EQUITY*	0.676	0.721	0.906	0.742	0.683	0.909	0.674	1.157	0.808	0.851
COVERAGE											
13	*EBIT/INTEREST*	4.267	4.882	4.099	1.578	2.603	1.840	3.988	4.807	3.508	3.418
14	*FIXED CHARGE COVERAGE*	1.811	2.011	2.011	1.134	1.373	1.187	1.790	2.167	1.686	1.674
16	*REPAY LTD+FIX CHARGE COV*	*********	1.882	1.897	1.064	1.287	1.115	1.545	1.763	1.507	1.471
OPER PERFORMANCE											
17	*GROSS PROFIT/SALES*	0.256	0.265	0.250	0.266	0.267	0.259	0.257	0.259	0.260	0.260
18	*OPER PROFIT/SALES*	0.054	0.066	0.067	0.053	0.057	0.046	0.053	0.062	0.058	0.056
21	*PRETAX PROFIT/SALES*	0.026	0.035	0.033	0.008	0.016	0.008	0.026	0.032	0.023	0.022
22	*NET PROFIT/SALES*	0.013	0.017	0.017	0.005	0.009	0.006	0.015	0.017	0.012	0.012
23	*NET PROFIT/AVG EQUITY*	*********	0.102	0.120	0.024	0.046	0.038	0.110	0.156	0.085	0.091
24	*NET PROFIT/AVG CAPITALIZ*	*********	0.067	0.079	0.015	0.028	0.022	0.066	0.085	0.052	0.053
26	*NET PROFIT/AVG TOT ASSETS*	*********	0.042	0.045	0.010	0.021	0.016	0.041	0.053	0.032	0.034
27	*E P S GROWTH RATE*	*********	0.754	0.245	(0.850)	1.327	(0.192)	2.446	0.577	0.615	0.777
28	*SALES GROWTH RATE*	*********	0.217	0.158	(0.273)	0.075	0.166	0.244	0.325	0.130	0.164
TURNOVER											
31	*SALES/AVG EQUITY*	*********	6.025	6.864	4.941	5.376	6.228	7.424	9.062	6.560	6.972
32	*SALES/AVG CAPITALIZ*	*********	3.975	4.547	3.118	3.217	3.666	4.446	4.922	3.985	4.098
33	*SALES/AVG TOT DEBT + EQTY*	*********	3.548	3.780	2.707	3.139	3.467	4.154	4.705	3.643	3.821
34	*SALES/AVG TOTAL ASSETS*	*********	2.461	2.595	2.014	2.446	2.562	2.801	3.058	2.562	2.661
35	*SALES/AVG OPER ASSETS*	*********	2.471	2.611	2.030	2.460	2.573	2.812	3.067	2.575	2.673
36	*SALES/AVG GROSS P P E*	*********	9.907	10.719	7.423	7.645	8.602	11.364	14.818	10.068	10.683
BALANCE SHEET											
37	*CASH/SALES*	0.012	0.017	0.016	0.014	0.023	0.013	0.006	0.005	0.013	0.012
38	*RECEIVABLES/SALES*	0.152	0.148	0.135	0.131	0.137	0.142	0.143	0.137	0.141	0.139
41	*INVENTORY/SALES*	0.250	0.212	0.200	0.229	0.188	0.221	0.183	0.201	0.211	0.204
42	*OTH CURR ASSETS/SALES*	0.008	0.007	0.008	0.006	0.009	0.008	0.006	0.006	0.008	0.007
44	*GROSS P P E/SALES*	0.118	0.105	0.096	0.136	0.134	0.118	0.081	0.074	0.108	0.103
46	*MISC ASSETS/SALES*	0.002	0.002	0.003	0.003	0.002	0.002	0.001	0.001	0.002	0.002
47	*ACCOUNTS PAYABLE/SALES*	0.122	0.130	0.112	0.087	0.083	0.119	0.120	0.118	0.111	0.110
48	*ACCRUED TAXES/SALES*	0.006	0.014	0.006	0.006	0.011	0.003	0.013	0.009	0.008	0.009
51	*ACCRUED LIABILITY/SALES*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
52	*LINE 21/SALES*	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.000	0.000
53	*DEFERRED TAXES/SALES*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
54	*MISC LIABILITIES/SALES*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MISCELLANEOUS											
57	*EQUITY PER COMMON SHARE*	17.940	18.959	20.315	19.846	20.237	20.506	22.465	25.804	20.759	21.780
58	*RETIRE/PREV GROSS P P E*	*********	(0.009)	(0.050)	(0.025)	(0.013)	(0.047)	(0.124)	0.042	(0.033)	(0.033)
61	*DEPREC/PREV GROSS P P E*	*********	0.057	0.060	0.069	0.061	0.060	0.056	0.070	0.062	0.063
62	*COM DIVS/EXM-PFD DIVS*	0.868	0.495	0.457	2.252	0.455	0.563	0.163	0.130	0.673	0.558
63	*TAX RATE*	0.500	0.524	0.478	0.363	0.461	0.251	0.441	0.469	0.436	0.419
64	*COST OF GOODS/SALES*	0.744	0.735	0.750	0.734	0.733	0.741	0.743	0.741	0.740	0.740
65	*S G & A/SALES*	0.202	0.197	0.183	0.213	0.210	0.213	0.204	0.197	0.202	0.204

Source: Ducommun, Inc. Annual Reports
DATAQUEST, Inc.



Eastman Kodak Company

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Dun's Number: 00-220-6183

Date Founded: 1880

CORPORATE STRATEGIC DIRECTION

Eastman Kodak Company was founded by George Eastman in 1880. Since its development of the first snapshot camera in 1888, Kodak has branched out into numerous new frontiers. Today, Kodak develops, manufactures, and markets imaging, information systems, chemicals, and health products. Kodak reorganized its overall Company operations into four area segments. They are as follows: the Information Systems segment, the Imaging segment, the Chemicals segment, and the Health segment. Kodak has a cluster of divisional units for each segment, and each is responsible for its product, research, manufacturing, and marketing worldwide.

Total revenue increased 8 percent to $18.4 billion* in fiscal 1989 from $17.0 billion in fiscal 1988. Sales for the year grew at a steady rate in virtually every one of Kodak's business segments. Net income was down 62 percent to $529.0 million for fiscal 1989 from $1.4 billion in fiscal 1988. Kodak attributed the decrease to the significant expenses related to its restructuring efforts and the impact of general inflation on operating costs, higher interest expense, and exchange-rate fluctuations. Kodak employs 137,750 people throughout the world.

Kodak spent $1.3 billion, $1.1 billion, and $992.0 million in research and development (R&D) during fiscal 1989, 1988, and 1987, respectively. These figures accounted for 6.8, 6.7, and 7.5 percent of total revenue for the respective years. R&D groups are located primarily in Rochester, New York; Kingsport, Tennessee; Longview, Texas; Rensselaer, New York; and Malvern, Pennsylvania. These groups' strategy is to closely cooperate with manufacturing units and marketing organizations in order to develop new products and applications to serve existing and new markets. Kodak protects its investment in R&D and its freedom to use its inventions by obtaining patents wherever feasible.

In fiscal year 1989, Kodak's revenue was generated mostly through the US market; however, over the past five years, domestic sales have slowly decreased while international sales have slowly increased. Domestic sales have fallen from representing 78.0 percent of total revenue in fiscal year 1985 to 69.5 percent of total revenue in fiscal year 1989. Europe has been the biggest contributor to international sales, totaling 22.6 percent in fiscal year 1989. The financial section provides a breakdown of revenue by geographic region for the past five years.

Kodak uses many different types of channels to distribute its products. Imaging products and services, which account for the greatest amount of sales, are distributed primarily through dealers; however, Kodak also uses independent retail outlets and independent national distributors. Information Systems segment products are sold and leased directly to users as well as marketed overseas through independent national distributors. Chemical products are marketed by the direct sales force and manufacturing distributors. Health care products have the greatest number of sales channels including dealers, independent distributors, wholesalers, jobbers, hospitals, retail drugstores, variety outlets, department stores, and food stores.

In 1976, a lawsuit was filed by Polaroid Corporation against Eastman Kodak Company. It resulted in a decision from the US District Court in Boston on October 11, 1985, holding that Kodak's PR-10 instant film and EK4 and EK6 instant cameras infringed upon seven Polaroid patents. An injunction, effective January 9, 1986, restricted further manufacturing or sale of such products in the United States. The US Court of Appeals for the Federal Circuit maintained the decision on April 25, 1986, and the United States

*All dollar amounts are in US dollars.

Supreme Court denied Kodak's petition for certiorari on October 6, 1986.

The case was returned to the US District Court in Boston for trial on issues such as if Kodak's infringement of any of the patents was willful and deliberate, whether damages were adequate to compensate Polaroid for Kodak's infringement, the prejudgment interest on this amount and if the damage award should be tripled, whether costs should be taxed against either party, and whether Polaroid is entitled to its reasonable attorney fees. Trial of these issues ended on November 20, 1989, at which time Polaroid stated claims for damage of $3.9 billion in lost profits, $2.2 billion in prejudgment interest, and increased damages of $7.8 billion. In addition, Polaroid requested reimbursement for attorney fees, costs, and postjudgment interest. Kodak has contested the amount of damage declared by Polaroid and has asserted that Polaroid's damages should be based on a reasonable royalty. It has denied that Polaroid is entitled to increased damages and attorney fees. Kodak plans to charge the amount of the judgment against its future earnings.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region. Information on revenue by distribution channel is not available. Table 3, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Information Systems Segment

The Information Systems segment comprises businesses that serve the imaging and information needs of business, industry, and government. Kodak manufactures and markets a wide range of components of information systems products and offers service agreements to support these products. Its product line consists of graphic arts film, microfilm products, magnetic media, applications software, copiers, printers, and other business equipment. These products are targeted toward the commercial printing and publishing, office automation, and government markets.

The Information Systems segment is divided into two groups: Commercial Systems and Imaging Information Systems. The Commercial Systems Group links two of Kodak's largest customer bases in Copy Products and Graphics Imaging Systems Divisions with equipment manufacturing and customer service. Copy Products markets products such as the Kodak ColorEdge full-color copier, a line of high-end plain paper copiers, and the Kodak Ektaprint 1392. Graphics Imaging Systems markets products such as the Kodak Signature color-proofing system, the Designmaster electronic stripping station, and Kodak Aqua-Image products. The Imaging Information Systems Group is made up of two business units, the Business Imaging Systems Division and the Federal Systems Division. These business units serve markets having customers that are usually the earliest users of advanced electronic imaging and information systems technologies.

According to Dataquest, Kodak captured 11.7 percent of the low-volume and 4.5 percent of the midvolume document image management systems worldwide market share during 1989. In 1985, Kodak came out with its first electronic image management system, the Kodak Image Management System (KIMS). KIMS is a series of distributed, multiuser configurations based on DEC's MicroVAX servers and workstations. Other components of KIMS include optical disk drives and jukeboxes, scanners, and laser printers connected to a local area network (LAN). Storage can be done on Kodak's microfilm library unit, an optical disk jukebox, or standalone optical disk drives depending on the system. KIMS multifunctional workstations consist of a 19-inch display, a mouse, either a word processing or nonword processing keyboard, and a digital controller; a customer may choose the VAXstation 3100 as the workstation choice. Kodak provides two levels of KIMS: the KIMS 3000 series for department-level imaging and the KIMS 5000 series for enterprise-wide imaging. KIMS image management offers the following software packages: Desktop software, Work-In-Process software, and Image Server software. The KIMS 4500 enables the use of microfilm as an archival medium. It is a computer-assisted microfilm retrieval system using Kodak's automated microfilm library. In replacement of its PC Image Handler system, Kodak introduced the KIMS 4000 in October 1988. The KIMS 4000 is not compatible with the rest of the KIMS line and is targeted toward low-volume application users.

Revenue from the Information Systems segment represented 22.8, 23.1, and 26.3 percent of total revenue during 1989, 1988, and 1987, respectively. Sales reached $4.2 billion in fiscal year 1989, up 7.0 percent from fiscal year 1988. Within the

United States, sales increased 5.0 percent over fiscal year 1988 to $2.7 billion in fiscal year 1989. International sales totaled $1.6 billion for fiscal year 1989, a 9.0 percent increase over fiscal year 1988. However, the Information Systems segment showed a loss of $360.0 million for fiscal year 1989 compared with operating earnings of $311.0 million in fiscal year 1988. The loss occurred because of restructuring costs. Without that expenditure, earnings from operations would have totaled $57.0 million.

Imaging Segment

The products of the Imaging segment are used for capturing, recording, or displaying an image. Kodak manufactures and markets a variety of imaging system components. For amateur photography, Kodak manufactures and markets cameras, projectors, films, processing services, photographic papers, batteries, and chemicals. Kodak products for nonamateur photography include films, photographic papers, photographic plates, chemicals, processing equipment, and audiovisual equipment. For these products, Kodak targets professional photofinishers and photographers, as well as customers in the motion picture, television, audiovisual, industrial, financial, commercial, and government markets.

The Imaging segment products are Kodak's greatest revenue generator. During 1989, 1988, and 1987, the imaging segment accounted for 38, 39, and 47 percent, respectively, of total revenue. Sales for the Imaging segment increased 5 percent to $7.0 billion in fiscal year 1989, up from $6.6 billion in fiscal year 1988. Within the United States, domestic sales rose 7 percent to $3.1 billion for fiscal year 1989 from $2.9 billion for fiscal year 1988. International sales totaled $3.9 billion for fiscal year 1989, representing an increase of 4 percent over fiscal year's 1988 figure of $3.7 billion. Net income fell 36 percent in fiscal year 1989 to $821.0 million. Thirty percent of this decrease was due to restructuring costs and unfavorable exchange rates.

In 1989, The Walt Disney Company signed a 15-year, multimillion dollar contract with Kodak. Kodak will be the official supplier of film, batteries, camera, and other allied photographic products for Disney. The agreement also makes Kodak the exclusive photographic consultant to all Disney theme parks in the United States and to the new Euro Disneyland scheduled to open near Paris, France, in 1992. Kodak possesses a similar agreement with theme parks run by Universal Studios. Kodak will also be an official sponsor of the 1992 Summer Olympic Games in Barcelona, Spain, and of the 1992 Winter Olympic Games in Albertville, France, as well as a sponsor of the 1992 US Olympic Team.

Chemical Segment

The Chemical segment divides its segment into four groups: olefin, acetyl, polyester, and specialty chemical products. Olefin refers to ethylene and propylene. Ethylene and propylene are used as intermediates in manufacturing processes leading to a variety of products: alcohols, solvents, and plasticizes sold to paint, chemical, and plastics manufacturers; and polyethylene and polypropylene plastics used in applications such as plastic film and automative parts. Ethylene oxide is converted into ethylene glycol, a necessary material for polyester products.

Acetyl products are derived from acetaldehyde, itself derived from ethylene, and from synthesis gas derived from coal. A succession of conversion steps produces acetic acid and acetic anhydride. These chemicals are reacted with purchased wood pulp and cotton linters to produce cellulose esters. Cellulose esters are used to make acetate yarn, photographic film base, TENITE cellulosic plastics, and filter tow for use in filter cigarettes. Cellulose esters are also sold to the trade for a variety of applications.

Polyester products use, as a starting material, purchased paraxylene, which is a purified material derived from petroleum. Paraxylene is used to make terephthalic acid that is either converted to dimethyl terephthalate (DMT) or purified terephthalate acid (PTA). The DMT and PTA is reacted with ethylene glycol to produce polyester polymer. These polyester polymers are marketed for a variety of plastic uses, including bottles for beverages. Kodel polyester fibers are used in textile yarn for knitting, sewing thread, fiberfill, nonwovens, and industrial end-use applications. Other Kodak units use this polymer in their polyester film base.

Specialty and fine chemical products include photographic chemicals sold to the Kodak Imaging segment, health and nutrition products, and high-technology organic chemicals including complex intermediates sold to pharmaceutical companies for further conversion to prescription drugs.

Sales for the Chemicals segment for fiscal year 1989 increased 13 percent to $3.5 billion from $3.1 billion for fiscal year 1988. Net income for the year was $643.0 million, accounting for a 2 percent increase over fiscal year 1988.

Health Segment

The Health segment manufactures and sells pharmaceutical products including medicines prescribed by physicians or made specifically for use in hospitals. These products also consist of bulk pharmaceuticals, intermediates, and other life-science chemicals sold principally to other manufacturers. Consumer health products include over-the-counter medicines. Kodak provides X-ray film, screens, cassettes, processors, and chemicals for radiography markets and also offers blood analysis equipment and consumables. The Health segment also markets household, do-it-yourself, and personal care products such as disinfectants, all-purpose cleaners, floor-care products, rodenticides, septicides, wood stains, concrete and wood protectors, deodorants, and hair-care products.

In fiscal year 1989, sales for the Health segment grew 11 percent to $4.0 billion from $3.6 billion in fiscal year 1988. Net income was $487 million in fiscal year 1989 in comparison with $591 million in fiscal year 1988.

Further Information

For more information on Kodak's business segments, please contact Dataquest's Copying and Duplicating Industry Service and/or Document Imaging Management System.

Table 1
Five-Year Corporate Highlights (Millions of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$10,631.0	$11,550.0	$13,305.0	$17,034.0	$18,398.0
Percent Change	-	8.64	15.19	28.03	8.01
Capital Expenditure	NA	NA	NA	NA	NA
Percent of Revenue	NA	NA	NA	NA	NA
R&D Expenditure	$838.0	$1,059.0	$992.0	$1,147.0	$1,253.0
Percent of Revenue	7.88	9.17	7.46	6.73	6.81
Number of Employees	128,950	121,450	124,400	145,300	137,750
Revenue ($K)/Employee	$82.44	$95.10	$106.95	$117.23	$133.56
Net Income	$332.0	$374.0	$1,178.0	$1,397.0	$529.0
Percent Change	-	12.65	214.97	18.59	(62.13)

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$3,900.00	$4,500.00	$5,112.00	$4,890.00
Quarterly Profit	$200.00	$60.00	$329.00	($60.00)

NA = Not available

Source: Eastman Kodak Company Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America*	77.99	73.23	70.02	68.86	69.52
International	22.01	26.77	29.98	31.14	30.48
Europe	17.74	20.87	22.32	21.73	22.55
Other	4.27	5.90	7.66	9.41	7.93

*North America consists of sales from the US, Canada, and Latin America.

Source: Eastman Kodak Company Annual Reports and Forms 10-K
Dataquest (1990)

1990 SALES OFFICE LOCATIONS

Information is not available.

MANUFACTURING LOCATIONS

North America

Batesville, Arkansas
Chemical manufacturing
Belle Mead, New Jersey
Health product manufacturing
Canada
Imaging and health product manufacturing
Columbia, South Carolina
Chemical manufacturing
Kingsport, Tennessee
Chemical manufacturing
Lincoln, Illinois
Health product manufacturing
Longview, Texas
Chemical manufacturing
Myerstown, Pennsylvania
Health product manufacturing
Rochester, New York
Copiers, photographic goods, chemical and health product manufacturing
Windsor, Colorado
Photographic goods and health product manufacturing

Europe

England
Imaging and chemical manufacturing
France
Imaging and health product manufacturing
Germany
Imaging manufacturing
Ireland
Imaging manufacturing
United Kingdom
Health product manufacturing

Asia/Pacific

Australia
Imaging manufacturing

ROW

Brazil
Imaging manufacturing
Mexico
Imaging manufacturing
Puerto Rico
Health product manufacturing

SUBSIDIARIES

North America

Cook-Waite Laboratories, Inc. (United States)
Cyclotomics, Inc. (United States)
Datatape Incorporated (United States)
Dorothy Gray, Ltd. (United States)
Eastman Canada, Inc. (Canada)
Eastman Chemical International Ltd. (United States)
Eastman Chemical Products, Inc. (United States)
Eastman Gelatine Corporation (United States)
Eastman Kodak Credit Corporation (United States)
Eastman Kodak International Capital Company, Inc. (United States)
Eastman Kodak International Sales Corporation (United States)
Eastman Technology, Inc. (United States)
Electronic Pre-Press Systems, Inc. (United States)
Holston Defense Corporation (United States)
Interactive Systems Corporation (United States)
International Biotechnologies, Inc. (Canada)
Kodak Canada, Inc. (Canada)
Minwax Company, Inc. (United States)
Mustang Pipeline Company (United States)
Northfield Pharmaceuticals Limited (United States)
Ogilvie Products, Inc. (United States)
Pinto Pipeline Company of Texas (United States)
R. D. Acquisition Corp. (United States)
Sterling Drug, Inc. (United States)
Sterling Drug Limited (Canada) Eastmanchem, Inc. (Canada)
Sterling Pharmaceuticals, Inc. (United States)
Sterling Products International, Inc. (United States)
The SDI Divestiture Corp. (United States)
The Sydney Ross Company (United States)
The d-Con Company, Inc. (United States)
Thompson & Formby, Inc. (United States)
Torrey Pines Realty Company, Inc. (United States)
Tussy Cosmetics, Inc. (United States)
Ultra Technologies, Inc. (United States)
Winthrop Products, Inc. (United States)

Europe

Eastman Kodak International Finance B.V. (Netherlands)
Ecotona Fibres Ltd. (England)
Hinds GmbH (Germany)
Kodak A.G. (Germany)
Kodak AB (Sweden)
Kodak Ireland Limited (Ireland)
Kodak Limited (England)
Kodak Nederland B.V. (The Netherlands)
Kodak Norge A/S (Norway)
Kodak Oy (Finland)
Kodak Portuguesa Limited (Portugal)
Kodak S.A. (Spain)
Kodak S.p.A. (Italy)
Kodak S.A. (Switzerland)
Kodak A.S. (Denmark)
Kodak-Pathe (France)
Maggioni-Winthrop S.p.A. (Italy)
N.V. Kodak S.A. (Belgium)
Pharma-Investi S.A. (Spain)
Saxet (UK) Ltd. (United Kingdom)
Schulke & Mayr GmbH (Germany)
Sterling Drug (Ireland) Ltd. (Ireland)
Sterling Pharmaceutica Portuguesa Lda (Portugal)
Sterling-Winthrop S.A. (Spain)
Sterling-Winthrop Group Ltd. (England)
Sterling-Winthrop, S.A. (France)
Sterwin A.G. (Switzerland)
Valda S.A. (France)
Veraline S.A. (France)

Asia/Pacific

Eastman Kodak (Japan) Ltd. (Japan)
K.K. Kodak Information Systems (Japan)
Kodak (Australasia) Proprietary Limited (Australia)
Kodak (Export Sales) Ltd. (Hong Kong)
Kodak (Far East) Purchasing, Inc.
Kodak Imagica K.K. (Japan)
Kodak Japan Ltd. (Japan)
Kodak Korea Ltd. (South Korea)
Kodak New Zealand Limited (New Zealand)
Kodak Philippines, Ltd. (Philippines)
Kodak (Singapore) Pte. Limited (Singapore)
Kodak Taiwan Limited (Taiwan)
Komal S.B. (Malaysia)
Sterling Products Pty. Limited (Australia)
Sterling-Winthrop K.K. (Japan)

ROW

Farmaceutica Argentina S.A. (Argentina)
Foto Interamericana de Peru, Ltd. (Peru)
Industria Fotografica Interamericana, S.A. de C.V. (Mexico)
Industria Mexicana de Foto Copiadoras, S.A. de C.V. (Mexico)
Kodak Brasileira C.I.L. (Brazil)
Kodak Caribbean, Limited
Kodak Chilena S.A.F. (Chile)
Kodak (Egypt), S.A. (Egypt)
Kodak Export Limited
Kodak (Kenya) Limited (Kenya)
Kodak Mexicana, Ltd. (Mexico)
Kodak Panama, Ltd.
Kodak Uruguaya, Ltd.
Kodak Venezuela, S.A. (Venezuela)
Laboratorios Kodak Limitada
Productos Sterling de Mexico, S.A. de C.V. (Mexico)
Sterling Products (Nigeria), Ltd. (Nigeria)
Sterling-Winthrop Products, Inc. (Panama)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS*

1990

Matsushita Electric Corporation of America

Kodak and Matsushita Electric have a joint-venture manufacturing facility, the Matsushita-Ultra Tech Battery Corporation, within the Corporate Ridge Industrial Park in Columbus, Georgia. The facility is a 160,000-square-foot plant that manufactures alkaline batteries for Kodak and Panasonic.

1989

The Walt Disney Company

Kodak and The Walt Disney Company signed a 15-year, multimillion-dollar contract, making Kodak the official supplier of film, batteries, cameras, and other allied photographic products for Disney.

Unisys Corporation

An original-equipment manufacturer (OEM) agreement was signed for Kodak to design and manufacture high-speed, cut-sheet, electrophotographic printer engines for Unisys Corporation.

*Alliances, joint ventures, licensing agreements, mergers, and acquisitions are traced back only to 1987.

Digital Equipment Corporation
An agreement was signed for Kodak to sell its image management system through DEC. The agreement includes DEC selling Kodak products as part of its computer networks. In addition, DEC will sell Kodak's Imagelink scanners, optical disk systems and libraries, and Ektaprint 1392 printers.

Cultor
Kodak and Cultor formed a 50/50 joint-venture company to produce and market biotechnology chemicals and industrial enzymes.

MEDSTAT Systems
Kodak and MEDSTAT have a service agreement to use MEDSTAT databases and analytical computing services to control the rising cost of Kodak's group health insurance.

Rhone-Poulenc Animal Nutrition
Rhone-Poulenc has acquired an exclusive worldwide license for Kodak's coatings technology and know-how to include protecting the active elements in the stomach of ruminants with polymers or other material.

Rank Cintel
Kodak and Rank Cintel are jointly developing a high-definition telecine, used to transfer film images to video.

Oldelift
Kodak will begin marketing Oldelift's enhanced X-ray imaging systems in the United States along with Philips Medical Systems of North America.

BP Chemicals International
BP Chemicals' gas phase technology will be used by Kodak for its PE plant being built in Longview, Texas.

Archer-Daniels-Midland Co.
An agreement was signed to commercialize Kodak's amino-acid technology for use in animal feed. Under the agreement, ADM has exclusive worldwide marketing and manufacturing rights.

Digital Equipment Corporation
Kodak and DEC entered a marketing agreement in which both companies will work together to market a PostScript networked printer. The two companies will offer DEC customers the expanded option of high-volume, high-quality networked printing with Kodak's Ektaprint 1392 printer, model 24.

Olivetti
Kodak and Olivetti will jointly develop, manufacture, and market 5.25-inch and 3.5-inch optical disk drives for PCs.

Iomega Corporation
Iomega signed an OEM agreement with Kodak whereby Iomega will supply its Bernoulli 5.25-inch 20-megabyte removable mass-storage drives for use in the Kodak Ektaprint Input Processor (KIP).

1988

PMP Distribution, Inc.
An agreement was signed in which PMP will handle US sales and distribution of the Kodak Displaymaker videographics system and related accessories.

1987

Cygnet Systems
A multimillion dollar original-equipment manufacturer agreement gives Kodak limited rights to manufacture Cygnet's Series 1800 Expandable Jukebox. Kodak will incorporate the Series 1800 Expandable Jukebox into its integrated office system, called the Kodak KIMS system.

MERGERS AND ACQUISITIONS

1988

Sterling Drug, Inc.
Kodak acquired Sterling Drug, which enabled Kodak to add new products, markets, and abilities to its growing Eastman Pharmaceuticals organization.

KEY OFFICERS

Kay R. Whitmore
Chairman, chief executive officer, and president

Robert L. Long
Senior vice president, Corporate Planning

Edwin P. Przybylowics
Senior vice president, Research

Richard T. Bourns
Senior vice president, Manufacturing and Distribution

Frank P. Strong, Jr.
Group vice president, Commercial Systems Group

Earnest W. Deavenport
Group vice president, Eastman Chemical Company

Leo J. Thomas
Group vice president, Health Group

Lawrence J. Matteson
Group vice president, Imaging Information Systems Group

Wilbur J. Prezzano
Group vice president, International Group

William E. Fowble
Group vice president, Photographic Products Group

PRINCIPAL INVESTORS

Information is not available.

FOUNDER

George Eastman

Table 3
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$5,677.0	$5,811.0	$6,791.0	$8,684.0	$8,591.0
Cash	161.0	145.0	702.0	848.0	1,095.0
Receivables	2,346.0	2,563.0	3,144.0	4,071.0	4,245.0
Marketable Securities	652.0	468.0	290.0	227.0	184.0
Inventory	1,940.0	2,072.0	2,178.0	3,025.0	2,507.0
Other Current Assets	578.0	563.0	477.0	513.0	560.0
Net Property, Plants	$5,977.0	$6,276.0	$6,663.0	$8,013.0	$8,628.0
Other Assets	$488.0	$815.0	$1,244.0	$6,267.0	$6,433.0
Total Assets	$12,142.0	$12,902.0	$14,698.0	$22,964.0	$23,652.0
Total Current Liabilities	$3,325.0	$3,791.0	$4,140.0	$5,850.0	$6,573.0
Long-Term Debt	$988.0	$911.0	$2,382.0	$7,779.0	$7,376.0
Other Liabilities	$1,267.0	$1,812.0	$2,163.0	$2,555.0	$3,061.0
Total Liabilities	$5,580.0	$6,514.0	$8,685.0	$16,184.0	$17,010.0
Total Shareholders' Equity	$6,562.0	$6,388.0	$6,013.0	$6,780.0	$6,642.0
Converted Preferred Stock	NA	NA	NA	NA	NA
Common Stock	621.0	622.0	933.0	934.0	934.0
Other Equity	(769.0)	(767.0)	(2,059.0)	(2,076.0)	(2,094.0)
Retained Earnings	6,710.0	6,533.0	7,139.0	7,922.0	7,802.0
Total Liabilities and Shareholders' Equity	$12,142.0	$12,902.0	$14,698.0	$22,964.0	$23,652.0
Income Statement	**1985**	**1986**	**1987**	**1988**	**1989**
Revenue	$10,631.0	$11,550.0	$13,305.0	$17,034.0	$18,398.0
US Revenue*	8,291.0	8,457.6	9,315.9	11,729.0	12,790.0
Non-US Revenue	2,340.0	3,092.4	3,989.1	5,305.0	5,608.0
Cost of Sales	$7,129.0	$7,613.0	$8,004.0	$9,727.0	$11,075.0
R&D Expense	$838.0	$1,059.0	$992.0	$1,147.0	$1,253.0
SG&A Expense	$2,378.0	$2,693.0	$3,190.0	$4,495.0	$4,857.0
Capital Expense	NA	NA	NA	NA	NA
Pretax Income	$530.0	$598.0	$1,984.0	$2,263.0	$925.0
Pretax Margin (%)	4.99	5.18	14.91	13.29	5.03
Effective Tax Rate (%)	NA	NA	NA	NA	NA
Net Income	$332.0	$374.0	$1,178.0	$1,397.0	$529.0
Shares Outstanding, Millions	227.3	338.6	334.7	324.2	324.3
Per Share Data					
Earnings	$1.46	$1.10	$3.52	$4.31	$1.63
Dividend	NA	NA	NA	NA	NA
Book Value	$28.87	$18.87	$17.97	$20.91	$20.48

Table 3 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	1.71	1.53	1.64	1.48	1.31
Quick (Times)	1.12	0.99	1.11	0.97	0.93
Fixed Assets/Equity (%)	91.09	98.25	110.81	118.19	129.90
Current Liabilities/Equity (%)	50.67	59.35	68.85	86.28	98.96
Total Liabilities/Equity (%)	85.04	101.97	1,444.44	238.70	256.10
Profitability (%)					
Return on Assets	-	2.99	8.54	7.42	2.27
Return on Equity	-	5.78	19.00	21.84	7.88
Profit Margin	3.12	3.24	8.85	8.20	2.88
Other Key Ratios					
R&D Spending % of Revenue	7.88	9.17	7.46	6.73	6.81
Capital Spending % of Revenue	NA	NA	NA	NA	NA
Employees	128,950	121,450	124,400	145,300	137,750
Revenue ($K)/Employee	$82.44	$95.10	$106.95	$117.23	$133.56
Capital Spending % of Assets	NA	NA	NA	NA	NA

*US revenue includes sales from Canada.
NA = Not available

Source: Eastman Kodak Company
Annual Reports and Forms 10-K
Dataquest (1990)

Electronics Research and Service Organization (ERSO)

Electronics Research and Service Organization
195-4-S40, SEC. 4, Chung Hsing Road, Chu Tung, Hsin Chu
Telephone: 035-966100, Fax: 035-957826
(Millions of Dollars)

Balance Sheet (Combined with ITRI)

	1981	1982	1983	1984	1985	1986	1987
Revenue*	$ 7.7	$ 8.8	$11.8	$16.7	$17.2	$26.4	$28.4
Cost of Revenue	$ 5.2	$ 6.2	$ 8.8	$10.9	$12.7	$18.6	$20.0
R&D Expense	$ 0.4	$ 0.5	$ 0.8	$ 1.2	$ 1.3	$ 1.5	$ 1.6
SG&A Expense	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pretax Income	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Employees (excluding G/A)	340	400	450	480	530	530	430
Exchange Rate (NT$/US$)	37.8	39.9	40.3	39.5	39.9	37.8	31.9

N/A = Not Available
*Revenue of IC sales to the merchant market only

Source: Electronics Research and Service Organization Annual Reports

Electronics Research and Service Organization (ERSO)

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Electronics Research and Service Organization (ERSO)

BACKGROUND

The Electronics Research and Service Organization (ERSO) is the Electronics Division of Industrial Technology Research Institute (ITRI). Founded in 1974, ERSO promotes electronic technology in Taiwan. ERSO implements this mission in two ways: (1) develops advanced generic technologies and transfers them to industry; (2) provides needed technical services for the industry. ERSO concentrates its technology on semiconductors, computer/communication, industrial automation, reliability, and thin film devices, and has made significant achievements in these fields. In its first 10 years, ERSO developed ICs, computers, microwave tubes, precision parts, and quality assurance procedures. ERSO's IC demonstration plant has been both a research lab for technology development and a testing ground for manufacturing technology in Taiwan. As a result, ERSO, although an R&D organization, is also selling ICs to the merchant market. The success of ERSO's IC operation spurred creation of United Microelectronics Corporation (UMC), which received ERSO's technology. Because of ERSO's diverse activities, a financial report specifically addressed to merchant market IC sales has not been easy. The following report reflects the best estimates of ERSO's resources allocated to the merchant market IC sales and the income from it.

Capital spending (excluding VLSI lab) (Millions of U.S. Dollars):

	1983	1984	1985	1986	1987
Plant & Equipment	0.7	5.1	2.1	3.5	3.4
R&D	0.8	1.2	1.3	1.5	1.6

MAIN PRODUCTS AND TECHNOLOGIES

ERSO's main products are peripheral chips; microcontrollers; telecom, telephone, melody, audio, and television ICs; memories; A/D and D/A converters; gate arrays; standard cells; and full custom designs.

Its main technologies are:

- CMOS 1.5-micron, 2-micron, 3-micron, and 5-micron, Al-gate and Si-gate
- NMOS 3-micron, Si-gate
- Bipolar standard linear

Electronics Research and Service Organization (ERSO)

SALES (INCLUDING SALES TO GOVERNMENT) (Millions of U.S. Dollars)

	1981	1982	1983	1984	1985	1986	1987
Total Semiconductor	$9.0	$12.0	$25.0	$32.0	$26.0	$26.4	$28.4
Bipolar (linear)	0.2	0.2	0.5	2.0	2.1	3.4	3.7
MOS	8.8	11.8	24.5	30.0	23.9	23.0	24.7
CMOS	8.8	11.8	19.5	25.5	21.9	--	--
NMOS	--	--	5.0	5.0	2.0	--	--

Source: Dataquest
November 1988

FACILITIES

Facility Name	Clean Room Square Footage and Class
Pilot Plant	20,400 Square Feet, Class 100

INTERNATIONAL OPERATIONS

ITRI
2950 Scott Boulevard
Santa Clara, CA 95054-3312

Telephone: (408) 727-1280/81
Fax: (408) 727-1338

Electronics Research and Service Organization (ERSO)

Electronics Research and Service Organization
195-4-S40, SEC. 4, Chung Hsing Road, Chu Tung, Hsin Chu
Telephone: 036-966100, Fax: 036-957826
(Millions of Dollars)

Balance Sheet (Combined with ITRI)

	1981	1982	1983	1984	1985
Revenue*	$ 7.7	$ 8.8	$11.8	$16.7	$17.2
Cost of Revenue	$ 5.2	$ 6.2	$ 8.8	$10.9	$12.7
R&D Expense	$ 0.4	$ 0.5	$ 0.8	$ 1.2	$ 1.3
SG&A Expense	N/A	N/A	N/A	N/A	N/A
Pretax Income	N/A	N/A	N/A	N/A	N/A
Total Employees (excluding G/A)	340	400	450	480	530
Exchange Rate (NT$/US$)	37.8	39.9	40.3	39.5	39.9

N/A = Not Available
*Revenue of IC sales to the merchant market only

Source: Electronics Research and Service Organization Annual Reports

Electronics Research and Service Organization (ERSO)

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Electronics Research and Service Organization (ERSO)

BACKGROUND

The Electronics Research and Service Organization (ERSO) is the Electronics Division of Industrial Technology Research Institute (ITRI). Founded in 1974, ERSO promotes electronic technology in Taiwan. In its first 10 years, ERSO developed ICs, computers, microwave tubes, precision parts, and quality assurance procedures. ERSO's IC demonstration plant has been both a research lab for technology development and a testing ground for manufacturing technology in Taiwan. As a result, ERSO, although an R&D organization, is also selling ICs to the merchant market. The success of ERSO's IC operation spurred creation of United Microelectronics Corporation (UMC), which received ERSO's technology. Because of ERSO's diverse activities, a financial report specifically addressed to merchant market IC sales has not been easy. The following report reflects the best estimates of ERSO's resources allocated to the merchant market IC sales and the income from it.

Capital spending (excluding VLSI lab):

1981	1982	1983	1984	1985
US$1.1M	US$3.6M	US$0.7M	US$5.1M	US$2.1M

MAIN PRODUCTS AND TECHNOLOGIES

ERSO's main products are peripheral chips; microcontrollers; telecom, telephone, melody, audio, and television ICs; memories; A/D and D/A converters; gate arrays; standard cells; and full custom designs.

Its main technologies are:

- CMOS 1.5-micron, 2-micron, 3-micron, and 5-micron, Al-gate and Si-gate
- NMOS 3-micron, Si-gate
- Bipolar standard linear

PRODUCTION

- 200,000 4-inch wafers per year

Electronics Research and Service Organization (ERSO)

SALES TO MERCHANT MARKET (Millions of U.S. Dollars)

	1981	1982	1983	1984	1985
Total	$7.3	$8.8	$11.9	$16.5	$17.2
Bipolar (linear)	0.2	0.2	0.4	1.9	2.1
MOS	7.1	8.6	11.5	14.6	15.1
CMOS	7.1	8.6	11.5	14.4	13.6
NMOS	-	-	-	0.2	1.5

SALES (INCLUDING SALES TO GOVERNMENT) (Millions of U.S. Dollars)

	1981	1982	1983	1984	1985	1986
Total Semiconductor	$9.0	$12.0	$25.0	$32.0	$26.0	$20.0
Bipolar (linear)	0.2	0.2	0.5	2.0	2.1	1.0
MOS	8.8	11.8	24.5	30.0	23.9	19.0
CMOS	8.8	11.8	19.5	25.5	21.9	18.0
NMOS	-	-	5.0	5.0	2.0	1.0

Source: Dataquest
March 1987

MATERIALS SUPPLY

Wafers: Monsanto, Wacker

Chemicals: J.T. Baker

Resist: Hunt

Special gas: Matheson

Electronics Research and Service Organization (ERSO)

FACILITIES SUPPLY

Aligner: Ultratech, Perkin-Elmer, Canon

Metal deposition: Varian, Airco-Temescal

Plasma Etcher: Tegal, Applied Material, Drytek, IPC

Ion Implanter: Eaton, Varian

Tester: Fairchild, Teradyne, Xincom, Megatest

Electronics Research and Service Organization (ERSO)

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Electronics Research and Service Organization (ERSO)

Electronics Research and Service Organization
195-4-S40, SEC. 4, Chung Hsing Road, Chu Tung, Hsin Chu
Telephone: 036-966100, Fax: 036-957826
(Millions of Dollars)

Balance Sheet (Combined with ITRI)

	1981	1982	1983	1984	1985
Revenue*	$ 7.7	$ 8.8	$11.8	$16.7	$17.2
Cost of Revenue	$ 5.2	$ 6.2	$ 8.8	$10.9	$12.7
R&D Expense	$ 0.4	$ 0.5	$ 0.8	$ 1.2	$ 1.3
SG&A Expense	N/A	N/A	N/A	N/A	N/A
Pretax Income	N/A	N/A	N/A	N/A	N/A
Total Employees (excluding G/A)	340	400	450	480	530
Exchange Rate (NT$/US$)	37.8	39.9	40.3	39.5	39.9

N/A = Not Available
*Revenue of IC sales to the merchant market only

Source: Electronics Research and Service Organization Annual Reports

Electronics Research and Service Organization (ERSO)

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Electronics Research and Service Organization (ERSO)

THE COMPANY

Overview

The Electronics Research and Service Organization (ERSO) is the Electronics Division of Industrial Technology Research Institute (ITRI). Founded in 1974, ERSO promotes electronic technology in Taiwan. In its first 10 years, ERSO developed ICs, computers, microwave tubes, precision parts, and quality assurance procedures. ERSO's IC demonstration plant has been both a research lab for technology development and a testing ground for manufacturing technology in Taiwan. As a result, ERSO, although an R&D organization, is also selling ICs to the merchant market. The success of ERSO's IC operation spurred creation of United Microelectronics Corporation (UMC), which received ERSO's technology. Because of ERSO's diverse activities, a financial report specifically addressed to merchant market IC sales has not been easy. The following report reflects the best estimates of ERSO's resources allocated to the merchant market IC sales and the income from it.

Capital Spending (Excluding VLSI Lab)

1981	1982	1983	1984	1985
US$1.1M	US$3.6M	US$0.7M	US$5.1M	US$2.1M

MAIN PRODUCTS AND TECHNOLOGIES

ERSO's main products are peripheral chips; microcontrollers; telecom, telephone, melody, audio, and television ICs; memories; A/D and D/A converters; gate arrays; standard cells; and full custom designs.

SALES TO MERCHANT MARKET
(Millions of U.S. Dollars)

	1981	1982	1983	1984	1985
Total	$7.3	$8.8	$11.9	$16.5	$17.2
Bipolar (linear)	0.2	0.2	0.4	1.9	2.1
MOS	7.1	8.6	11.5	14.6	15.1
CMOS	7.1	8.6	11.5	14.4	13.6
NMOS	-	-	-	0.2	1.5

Electronics Research and Service Organization (ERSO)

SALES (INCLUDING SALES TO GOVERNMENT)
(Millions of U.S. Dollars)

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CMOS	8.8	11.8	19.5	25.5	21.9	18.0
NMOS	-	-	5.0	5.0	2.0	1.0

Source: Dataquest
September 1987

Environmental Systems Research Institute Inc. (ESRI)

380 New York Street
Redlands, California 92373
Telephone: (714) 793-2853
Fax: (714) 793-5953
Dun's Number: 06-313-4175

Date Founded: 1969

CORPORATE STRATEGIC DIRECTION

Environmental Systems Research Institute Inc. (ESRI) is the world's leading supplier of geographic information systems (GIS) software. Dataquest ranks ESRI as one of the leading vendors of mapping industry software, with an estimated $40.2 million* in factory revenue for 1989. Founded by Jack Dangermond in 1969 as a research group devoted to improving methods for handling geographic data, ESRI was a pioneer in the development and application of software products and services for use in geographic analysis and mapping.

ESRI developed the first database-oriented GIS product, ARC/INFO, combining cartographic capabilities of traditional mapping systems, with an analysis system built around a relational data base management system (RDBMS). ARC/INFO is the most mature GIS software system on the market and is available on the widest array of hardware platforms in the CAD/CAM industry.

The Company markets its products to government agencies, municipal and state governments, and forestry, petroleum, and utility industries for mapping purposes. ESRI products are also used in environmental monitoring, natural resource management, transportation and site planning, and by commercial retail companies. In 1989, ESRI was awarded a $5.6 million contract from the US Environmental Protection Agency, and a $10 million contract for software and services from the Defense Mapping Agency.

ESRI is a privately held company employing approximately 400 people in its eight regional offices in the United States and foreign offices in Australia, Canada, France, Italy, and Germany. In addition, ESRI has 30 distributors worldwide and over 50 distributors in the United States.

*All dollar amounts are in US dollars.

In-depth financial information for ESRI is not publicly available at this time; therefore, financial tables are not included in this report.

BUSINESS SEGMENT STRATEGIC DIRECTION

ESRI develops, distributes, and supports a set of automated geographic information systems software for storing, managing, analyzing, and displaying spatially oriented geographical data. The ARC/INFO system, a vector-based GIS, provides full data entry, management, analysis, and display capabilities.

The ARC/INFO system is made up of two "subsystems." The ARC system, developed by ESRI, is used for storing cartographic data, and INFO, an RDBMS, is used for storing attribute data. This system can also be interfaced with other Stet databases through a generic RDBMS "handshake" permitting the integration of ARC/INFO software with other commercially available RDBMS products.

ESRI sells ARC/INFO as a standalone package and as part of a turnkey system (including hardware). ARC/INFO software will run on mainframe, minicomputer, workstation, and PC platforms made by Data General, Digital Equipment Corporation (DEC), HP/Apollo, IBM, Intergraph, Olivetti, Prime, Sun Microsystems, and Tektronix. ARC/INFO software is designed not only to run on various platforms, but also to maintain consistency across those platforms for data transfer.

During 1989, ESRI introduced version 5.0 of ARC/INFO. This release included expanded macro language capabilities, improved graphic user interface, and new data conversion programs, in addition to other enhanced features. In 1990, ESRI introduced

the 3.4D version of ARC/INFO, which allows PC ARC/INFO to be used with Ashton-Tate's dBASE database management system.

Further Information

For further information about the Company's business segments, please contact Dataquest's CAD/CAM Industry Service.

1989 SALES OFFICE LOCATIONS

Information is not available.

MANUFACTURING LOCATIONS

North America

Redlands, California
Development and production of software packages

SUBSIDIARIES

The Company has no subsidiaries.

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

Oracle Corporation
Oracle Corporation and ESRI renewed and expanded their value-added relicenser agreement. Under the agreement, ESRI will continue to resell ORACLE RDBMS, support services, and training with its ARC/INFO product. The agreement also covers licenses for Oracle's SQL suite of software products.

1989

Ingres (Relational Technology, Inc.)
Ingres (Relational Technology, Inc.) and ESRI announced an agreement to provide interfacing of INGRES (RDBI-I) to ARC/INFO GIS software.

Digital Equipment Corporation (DEC)
DEC and ESRI signed a Cooperative Marketing Program agreement under which the two companies will work together to market ESRI's ARC/INFO software on DEC's computers and workstations. ESRI has licensed to DEC the use of ARC/INFO for demonstrations, marketing, and sales promotions. In return, DEC provides ESRI with technical information on DEC platforms for ESRI's use in developing ARC/INFO solutions on DEC computers.

Hewlett-Packard (HP)
HP and ESRI announced that ESRI will market ARC/INFO for the full line of HP 9000 UNIX system workstations through HP's Software Supplier Program. ESRI will sell complete hardware and software GIS packages using HP workstations and ARC/INFO.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Jack Dangermond
President

Laura Dangermond
Vice president and secretary

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Jack Dangermond

EPITAXX, Inc.

EPITAXX Inc.
3490 U.S. Route 1
Princeton, NJ 08540
(609)452-1188

Established 1984
No. of Employees: Approximately 50

BACKGROUND

EPITAXX Inc. was founded in 1984 to develop, produce, and market optoelectronic devices for the fiber-optic communications, infrared sensing, and instrumentation markets. The Company's focus is on long-wavelength InGaAsP components for commercial and military markets. Its customers include NASA, NBS, NSF, and the U.S. Army and Air Force. EPITAXX was the first company to measure and report a predicted lifetime of more than 10 billion hours for its high-speed photodetector products. The Company is supporting compliance testing to Bellcore specifications.

COMPANY EXECUTIVES

- President—Dr. Gregory Olsen
- V.P. Marketing and Sales—Dr. Yves Dziawolski
- V.P. Operations—Vladimere Ban
- V.P. Finance—James Coleman

FINANCIAL BACKING

- Major investors are Warburg, Pincus (New York, New York) and DSV Partners (Princeton, New Jersey)

SERVICES

- MIL STD 883C processing, custom device development, and production

PROCESS TECHNOLOGY

- VPE processing of various III-V compound materials, including InGaAsP

EPITAXX, Inc.

PRODUCTS

- 1300 and 1550nm ELEDs
- 60 and 75um high-speed photodiodes on ceramic submounts
- 75 and 100um detectors in various packages
- 300, 500, 1000, 2000, and 3000um large area devices
- Custom optoelectronic devices

FACILITIES

The Princeton facilities include 22,000 square feet of space, of which 5,000 square feet are Class 100 or better clean rooms; the clean rooms will be expanded to approximately 15,000 square feet by mid-1990.

Ericsson Group

Ericsson Group
Telefonplan
Midsommarkransen
126 25 Stockholm
Sweden
Tel: 46 8 719 00 00

THE COMPANY

Background

The Ericsson Group is a subsidiary of LM Ericsson Telephone Company, a Swedish company formed in 1876. The Ericsson Group designs, manufactures, and markets telecommunications and information-handling systems and equipment used in more than 100 countries. It is one of the few organizations able to deliver a complete telecommunications package—switching and transmission systems, cable, instruments, and peripheral equipment—for public, private, and military networks virtually anywhere in the world. The Group also specializes in advanced business communications and information-processing systems. The Group's products are manufactured in more than 20 countries.

The Ericsson Group and its licensees captured more than 15 percent of the world market for telephone exchange equipment by the close of the 1970s. This was an increase from 10 percent of the market held by the Group in the early 1970s. This growth is primarily due to Ericsson's AXE Switching System, which is based on a modular design that places each major function, hardware or software, in a self-contained unit. The AXE System was introduced commercially in 1977, and is marketed to large public networks. It offers relatively easy installation, facilitates corrections and repairs, and provides flexibility for modernization.

Early in 1981, the Ericsson Group acquired 90.5 percent of Datasaab AB, a Swedish manufacturer of computers and terminals. By January 1982, the merger of Datasaab AB and the Ericsson Group's divisions for subscriber equipment (PBXs, PAXs, and telephone instruments) and information systems (private data networks, data transmission, and office automation) had resulted in a new organization known as the Ericsson Information System (EIS). Its operations are directed toward integrated systems for office communication and office automation.

In order to improve its position in the U.S. market for automated office systems, in 1980 the Ericsson Group combined its U.S. operations with the wire and cable division of Atlantic Richfield Company, forming a joint venture company, Anaconda-Ericsson. In 1981, Anaconda-Ericsson acquired 100 percent of the shares of Axxa Corporation, a manufacturer of computerized office communications equipment. During 1983, Anaconda-Ericsson changed its name; it is now known as Ericsson Inc.

Ericsson Group

The Ericsson Group also owns controlling interests in SRA Communications, a manufacturer of mobile telephone systems and equipment for tactical communication, and in Autotank AB, a Swedish company that develops, manufactures, and sells computerized cash terminals for gasoline stations.

Operations

The Ericsson Group's operations are now organized into eight major business areas. The objective of the new structure, which became effective January 1, 1984, is to improve Ericsson's ability to adapt smoothly to changed market requirements and to create a more flexible operations structure. The eight business areas and their products are:

- Public telecommunications—Telephone, data, and telex exchanges; transmission equipment
- Information systems—Systems and products for office automation and telecommunications in business and industry; alarm and monitoring systems
- Cables—Power and telecommunications cable; optical fiber cable
- Defense systems—Defense electronics, military telecommunications for strategic and tactical networks
- Radio communication—Microwave systems, mobile radio, mobile (cellular) telephony, personal paging systems
- Network engineering and construction—Network material; signaling systems for railways, streets, and highways; network planning and construction for public and industrial telecommunications
- Components—Electronic and power equipment
- Other operations

The Public Telecommunications business area, which less than 10 years ago accounted for more than 50 percent of the Group's sales, today represents less than 33 percent of the Company's operations. The Information Systems business area has grown from a 15 percent share to approximately 29 percent of the total, almost equaling the Public Telecommunications area. Table 1 shows the Group's sales by business segment.

In May 1983, the Group issued 4 million new shares in the U.S. capital market, thereby increasing its share capital by nearly $228 million. The proceeds will be used primarily to finance the Group's expansion. The share issue should also be regarded as an important element toward establishing Ericsson's presence in the U.S. market.

Ericsson Group

Table 1

Ericsson Group
Sales by Business Segment
(Billions of Swedish Kroner)

Segment	1983	1984	1985*	1986*
Public Telecommunications	SKr 8.491	SKr 9.718	SKr 10.561	SKr 10.316
Information Systems	7.457	9.295	9.986	9.187
Cables	3.645	4.022	4.225	3.618
Defense Systems	1.603	1.831	2.143	2.795
Radio Communication	1.592	1.991	2.480	2.688
Network Engineering and Construction	2.239	1.970	2.013	2.201
Components	0.933	1.225	0.852	0.788
Other Operations	0.348	0.528	0.236	0.051
Less: Intersegment Sales	(1.064)	(1.203)	-	-
	SKr 25.244	SKr 29.378	SKr 32.496	SKr 31.644

*The figures for 1985 and 1986 show sales to external customers only.

Source: Ericsson Group
Annual Report

International Operations

Ericsson's sales in its major markets showed varying rates of growth. Table 2 shows Ericsson sales by geographic area. The greatest growth was seen in Europe where sales increased 10.7 percent during 1986. Sales in Sweden were higher due primarily to increased orders for office automation equipment. Although Latin America traditionally has been an important market for Ericsson, the percentage of sales there has decreased since 1985.

Ericsson Group

Table 2

Ericsson Group
Sales by Geographic Area
(Billions of Swedish Kroner)

Area	1983	1984	1985	1986
Sweden	SKr 4.939	SKr 6.161	SKr 6.515	SKr 6.993
Europe (Excluding Sweden)	8.658	10.186	12.179	13.480
North America (United States and Canada)	2.675	3.630	3.214	3.133
Latin America	2.995	3.501	4.251	3.291
Africa	1.028	0.897	0.687	0.601
The Middle East	2.704	2.016	1.384	1.013
Asia (Excluding the Middle East)	0.932	1.824	2.588	1.645
Australia (Australia, New Zealand, and Oceania)	1.313	1.163	1.678	1.488
	SKr 25.244	SKr 29.378	SKr 32.496	SKr 31.644

Source: Ericsson Group
Annual Report

Asia had been increasing in importance for Ericsson, following intensive cultivation of the markets for public networks, primarily for mobile telephony and the fully digital version of AXE, but sales fell there during 1986.

The North American market accounted for a large part of the volume growth in the entire area of communication, and Ericsson is continuing to allocate substantial resources to adapting its AXE systems and MD 110 subscriber exchange to North American standards. The AXE is already in place in several U.S. long distance networks and in mobile telephony networks. Ericsson will continue to make large investments in the American market in the 1986/1987 time frame.

Ericsson Group

Marketing

Most of the Group's products are marketed directly to users by Ericsson's worldwide marketing force or directly through Ericsson's subsidiaries throughout the world. Certain products and product lines from various business sectors are also sold through distributors and dealers on a worldwide basis.

Research and Development

Although system and product development programs dominate the Group's technical activities, resources are also being focused on basic technology. The largest development programs are in the areas of digital telephone exchanges, semiconductor technology (design methods and processes), mobile telephony, and information systems.

Research and development expenditures have increased in parallel with sales during the past 10 years and amounted to SKr 3.117 billion in 1986, against SKr 2.798 billion in 1985. Ericsson's 1986 R&D costs were equal to 9.9 percent of its sales.

Employees

The Group employed a total of 72,575 people at the end of 1986, a decrease of 7 percent over fiscal 1985. Of this decrease, two-thirds of the employees were in operations divested during the year. Table 3 shows the distribution of Ericsson employees by region. More than 53 percent of the employees are employed in Sweden, 21 percent of whom work directly for the parent company. Of the Group's total employees, 27 percent are employed in other European countries, 4 percent are employed in North America, 12 percent are employed in Latin America, and the balance is located in the Rest of World region.

Ericsson Group

Table 3

Ericsson Group
Employees by Geographic Area

Area	1984	1985	1986
Sweden			
Parent Company	16,882	16,876	15,310
Other	20,576	23,296	23,249
Subtotal	37,458	40,172	38,559
Europe (Excluding Sweden)	20,310	20,423	19,633
North America (United States and Canada)	3,750	2,894	2,690
Latin America	10,605	11,386	8,702
Other Countries	2,993	3,284	2,991
Total	75,116	78,159	72,575

Source: Ericsson Group Annual Report

BUSINESS SEGMENTS

Public Telecommunications

The principal operations of this business area comprise the development, production, and installation of telecommunications equipment for the following telecom administrations:

- Telephone exchanges—Accounting for 71 percent of sales
- Transmission equipment—Accounting for 14 percent of sales
- Telex and data processing equipment—Accounting for 4 percent of sales

Ericsson Group

Income from telephone operations and other activities accounted for 5.0 percent and 6.0 percent, respectively. This business segment accounted for 32.6 percent of the Company's total sales in 1986. The largest market was Western Europe, which accounted for approximately 35.0 percent of total sales in 1986, compared with 37.0 percent in 1985.

During 1986, a local exchange using the AXE system to be delivered to British Telecom was installed in Sevenoaks, Kent. By the year-end, British Telecom had placed orders for 790,000 lines with Ericsson.

Information Systems

The information systems business area consists of three main divisions:

- Communications systems
  - Large MD 110 subscriber exchanges
  - Enpax data networks
  - Modems
  - Intercom systems
  - Telephone instruments
- Data systems
  - Data terminals
  - Personal computers
  - Small business systems/minicomputers
  - Bank terminal systems
- Office equipment
  - Printers
  - Typewriters
  - Calculators
  - Office furniture

Ericsson Group

The Data Systems division is the largest in this business area, accounting for 42 percent of sales. This was followed by the Communications Systems division and the Office Equipment division, with 35 percent and 21 percent of sales, respectively.

In 1985, sales in the information systems business area amounted to SKr 9.571 billion. The biggest market was in Europe, excluding Sweden, accounting for 60 percent of total sales.

A decision to reorganize this business area's future production resources was made during 1986. Production of data processing systems will be concentrated in the plants in Blekinge. The data products manufacturing operation in Barkarby is being relocated and operations in Linkoping are being transferred to Ericsson Radio Systems.

Cables

Ericsson manufactures and markets power cable used in the distribution of electric power, telecommunications cable used for the transmission of communications signals, and speciality cables, including those used in the data processing industry. This business segment accounts for 11.4 percent of total sales, which in 1986 totaled SKr 3.618 billion, a decrease 14.4 percent since 1985.

Defense Systems

The defense systems business area operates through four product areas:

- Avionics and missile electronics (33 percent of sales)
- Defense communication (13 percent of sales)
- Local mobile defense systems (26 percent of sales)
- Control and computer systems (14 percent of sales)
- Microwave communication, including radio links and satellite operations (14 percent of sales)

Sales in this business area totaled SKr 2.795 billion in 1986, an increase of 20 percent over 1985. Continued growth is expected in the world market, notably in the field of advanced systems with high contents of electronic components. The products are often large, complicated systems that take a long time to negotiate and involve long contract periods. Due to the high demands imposed on their reliability, precision, and long life, price is not the most important factor.

Ericsson Group

Radio Communications

Radio communication comprises the following product areas:

- Mobile telephony, including base stations and terminals
- Mobile radio, including systems with stationary and mobile units for closed networks
- Personal paging systems for local networks
- Radio transmission, including radio-link systems and space projects

Sales in this area amounted to SKr 2.688 billion in 1986, 1.2 percent higher than in 1985, accounting for 8.5 percent of total sales. Ericsson continued solid profitability in mobile telephony. Deliveries of base stations in the Nordic market increased 50 percent.

Network Engineering and Construction

This business segment comprises local networks for telecommunications authorities; complex telecommunications systems for other customers; network operation and maintenance; and railway, street, and highway signaling systems. Complete turnkey systems are delivered and accordingly have specialized project management, planning, and construction work. Material and equipment can also be supplied exclusive of installation.

Components

The components business area develops, manufactures, and markets components and power equipment for the electronics industry operations, conducted mainly within Rifa AB. It comprises three product areas:

- Microcircuits (integrated and hybrid circuits)
- Power systems
- Capacitors and standard components

The components business area's largest customer is the Ericsson Group, which buys more than 40 percent of the products.

Esprit Systems, Inc.

2115 Ringwood Avenue
San Jose, California 95131
Telephone: (408) 954-9900
Fax: (408) 954-9800
Dun's Number: 07-626-3557

Date Founded: 1983

CORPORATE STRATEGIC DIRECTION

Esprit Systems, Inc., was founded in 1983 through the acquisition of the assets of Hazeltine Corporation's Computer Terminal Division. In 1984, Esprit entered the microcomputer business when it acquired DBS International; however, Esprit refocused its direction back on the display terminal market in 1986 and embarked into the local area network (LAN) processing terminal market in 1988. According to Dataquest, Esprit Systems held 1.6 percent share of the US display terminal market and 1.4 percent of the worldwide display terminal market for 1988. In the middle of 1989, Esprit relocated its headquarters from Melville, New York, to San Jose, California. Through this move, Esprit hopes to utilize the technology available in the Silicon Valley and to build new strategic business relationships. Esprit currently employs 53 employees at its new location; a staff of 14 sales and service employees remains at the Melville location.

Total revenue decreased 14.1 percent to $19.8 million* in fiscal year 1989, down from $23.1 million in fiscal 1988. Net loss reached $4.3 million in fiscal 1989 as compared with $1.6 million in fiscal 1988. Esprit employed 77 people during fiscal year 1989.

Esprit products are sold in two industry segments: the multiuser computer systems market and the LAN market. Esprit focuses on three main areas: the large computer mainframe compatibility market, the ASCII/ANSI compatibility market, and the PC-compatible terminal and peripheral market. Esprit utilizes a network of over 85 authorized independent distributors located in 30 countries. Esprit also sells its products to original equipment manufacturers (OEMs) and large end users, and, to a lesser extent, through commissioned representatives. In fiscal years 1989, 1988, and 1987, Esprit's international sales respectively accounted for 25.4, 26.7, and 25.8 percent of total revenue. Esprit primarily targets the European and Australian markets.

In March 1990, Esprit received an offer from an investment group that wants to buy 100 percent of its equity and take the Company private. The investment group is led by ADI Corporation of Taiwan, already a controlling shareholder and the sole supplier of Esprit's products.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region. Information on revenue by distribution channel is not available. Table 3, a comprehensive financial statement, is at the end of this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

Display Terminals

ESP 6316

The ESP 6316 provides full-featured emulation of ADDS Regent 25/Viewpoint, Lear Siegler ADM3A, TeleVideo 950/925/910 Plus, and Esprit II/Hazeltine 1500. The ESP 6316 is characterized by its ergonomic styling, high-resolution 14-inch dark glass nonglare screen, menu-selectable setup mode, line drawing graphics, and smooth scroll.

*All dollar amounts are in US dollars.

ESP 6110+

The ESP 6110+ is compatible with products from ADDS, Hazeltine, Lear Siegler, and TeleVideo. The ESP 6110+ can be utilized to run general-purpose inquiry response system applications, batch entry and data retrieval systems, interactive communications systems, order entry systems, and inventory control applications.

Opus 2

The Opus 2 consists of a 14-inch high-contrast flat screen, a sculptured keyboard, function key flipstrips, a pop-up calculator, and a host of productivity tools. It models Esprit's 6110+ terminal and is compatible with products by ADDS, Hazeltine, Lear Siegler, TeleVideo, and Wyse.

OPUS 220

The OPUS 220 emulates the DEC VT 220 terminal and is fully compatible with all DEC VT 220, VT 100, and VT 52 application software. It offers PC-like windowing through Express Windows, sculptured keyboard function key flipstrips, one-touch tilt, and a lazy Susan swivel mechanism.

OPUS 3n1+

The OPUS 3n1+ is an ASCII/ANSI/PC terminal. The OPUS 3n1+ possesses Express Windows, dual ports, and an All-in-One keyboard. It enables simultaneous access to applications on two hosts supporting the same or dissimilar protocols. The All-in-One keyboard combines the appropriate keytop legends to accurately support VT 220, ASCII, and enhanced IBM AT layouts simultaneously at a single station. A hot key allows users to toggle between concurrent sessions. The OPUS 3n1+ gives MS-DOS, UNIX, XENIX, PICK, VMS, Ultrix, MultiLink Advanced, and PC-MOS/386 users the ability to use Express Windows to overlay important messages, help screens, and menus on live applications.

Color Terminals

Esprit III Color

The Esprit III Color terminal consists of a 13-inch high-contrast 16-color display, flexible line-drawing capabilities, an optional 4-page display memory, and programmable remote commands and function keys on a detached keyboard.

PICTerm CBG

The PICTerm CBG is characterized by a PC-like color display consisting of windows, a 64-color palette, and high-quality business graphics in a terminal that can access powerful minicomputer applications. The PICTerm CBG limits the need for software developers to write window management code and reduces host processing burdens by including imbedded graphics primitives and window management facilities resident in the terminal firmware.

Diskless Netstations

LANTerm

The LANTerm provides a NEC V40 (8086-compatible) CPU with a built-in ARCnet or Ethernet local area network, 768KB RAM, serial and parallel ports, a compact footprint, and the OPUS enclosure design. The LANTerm's user-friendliness and plug-and-play characteristics are enhanced through an integrated menu-driven setup and self-diagnostics. The LANTerm includes a diskless boot to Novell NetWare with a user-adaptable boot to Netbios networks.

LANTerm 2

The LANTerm 2 is based on a 12.5-MHz 80286 CPU with 1MB of RAM, an 80287 coprocessor socket, two serial ports and one parallel port, a built-in ARCnet or Ethernet local area network interface, a color or monochrome VGA display, and a compact footprint. The LANTerm 2 possesses the same user-friendliness and plug-and-play features as the 8086-compatible LANTerm. A diskless boot to Novell NetWare is included with a user-adaptable boot to Netbios networks.

LANTerm 3

The LANTerm 3 runs on a 32-bit 16-MHz 80386SX processor and supports a 16-MHz 80387 coprocessor, two serial ports and one parallel port, and an integrated VGA video controller. The LANTerm 3 operates with zero-wait states using an interleaved memory scheme and comes with 1MB of DRAM, which can be expanded up to 8MB on the main board using single in-line memory modules (SIMMs). It has a built-in ROM for booting to Novell NetWare and includes a ROM cartridge feature for easy installation of boot ROMS to take advantage of Netbios, TCP/IP,

and other industry-standard networks. The LANTerm 3 is available in four models: the Model CE (Color VGA display and Ethernet interface), the Model CA (Color VGA display and ARCnet interface), the Model ME (Monochrome VGA display and Ethernet interface), and the Model MA (Monochrome VGA display and ARCnet interface). The LANTerm 3 Ethernet models achieve high network throughput by using shared-memory interfacing for multipacket buffering.

Further Information

For more information on Esprit Systems' business segments, please contact Dataquest's Display Terminals Industry Service.

Table 1
Five-Year Corporate Highlights (Thousands of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$26,504.0	$23,222.0	$18,246.0	$23,068.0	$19,811.0
Percent Change	-	(12.38)	(21.43)	26.43	(14.12)
Capital Expenditure	$604.0	$117.0	$388.0	($523.0)	($229.0)
Percent of Revenue	2.28	0.50	2.13	(2.27)	(1.16)
R&D Expenditure	$1,783.0	$693.0	$951.0	$890.0	$718.0
Percent of Revenue	6.73	2.98	5.21	3.86	3.62
Number of Employees	82	75	72	64	77
Revenue ($K)/Employee	$323.22	$309.63	$253.42	$360.44	$257.29
Net Income	($2,453.0)	$169.0	($2,107.0)	($1,610.0)	($4,250.0)
Percent Change	-	106.89	(1,346.75)	23.59	(163.98)

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$4,484.00	$5,567.00	$3,606.00	$6,154.00
Quarterly Profit	($687.00)	($866.00)	($962.00)	($1,735.00)

Source: Esprit Systems, Inc.
Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	NA	NA	74.24	73.32	74.65
International*	NA	NA	25.76	26.68	25.35

*Includes sales to Canada
NA = Not available

Source: Esprit Systems, Inc.
Annual Reports and Forms 10-K
Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—2
Europe—1

MANUFACTURING LOCATIONS

Asia/Pacific

Taichung, Taiwan
All Esprit's products are produced under contract by ADI, in accordance with Esprit's specifications.

SUBSIDIARIES

Information is not available.

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

Information is not available.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Michael K. C. Tsai
President and chief executive officer

Chun H. Pan
Vice president, Operations, and secretary

William S. Kwong
Vice president, general manager, Networking Products Division

PRINCIPAL INVESTORS

Tsai Chiu Hsin—11.29 percent

FOUNDERS

Information is not available.

Table 3
Comprehensive Financial Statement
Fiscal Year Ending June
(Thousands of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$15,108.0	$11,030.0	$9,098.0	$10,864.0	$10,612.0
Cash	277.0	139.0	53.0	600.0	165.0
Receivables	6,197.0	5,099.0	3,653.0	6,332.0	6,068.0
Marketable Securities	NA	NA	NA	NA	NA
Inventory	6,612.0	2,474.0	4,486.0	3,649.0	4,309.0
Other Current Assets	2,022.0	3,318.0	906.0	283.0	70.0
Net Property, Plants	$1,431.0	$968.0	$1,049.0	$1,217.0	$1,148.0
Other Assets	$50.0	$50.0	$88.0	$51.0	$66.0
Total Assets	$16,589.0	$12,048.0	$10,235.0	$12,132.0	$11,826.0
Total Current Liabilities	$13,031.0	$6,839.0	$7,743.0	$11,650.0	$15,594.0
Long-Term Debt	$500.0	$1,000.0	$400.0	NA	NA
Other Liabilities	$20.0	0	0	NA	NA
Total Liabilities	$13,551.0	$7,839.0	$8,143.0	$11,650.0	$15,594.0
Total Shareholders' Equity	$7,492.0	$9,840.0	$9,830.0	$482.0	($3,768.0)
Common Stock	39.0	76.0	76.0	76.0	76.0
Other Equity	7,453.0	9,764.0	9,754.0	406.0	(3,844.0)
Retained Earnings	NA	NA	NA	NA	NA
Deficit	(4,454.00)	(5,631.00)	(7,738.0)	-	-
Total Liabilities and Shareholders' Equity	$16,589.0	$12,048.0	$10,235.0	$12,132.0	$11,826.0
Income Statement	**1985**	**1986**	**1987**	**1988**	**1989**
Revenue	$26,504.0	$23,222.0	$18,246.0	$23,068.0	$19,811.0
US Revenue	NA	NA	13,545.0	16,913.0	14,788.0
Non-US Revenue*	NA	NA	4,701.0	6,155.0	5,023.0
Cost of Sales	$19,604.0	$16,049.0	$12,110.0	$15,956.0	$14,347.0
R&D Expense	$1,783.0	$693.0	$951.0	$890.0	$718.0
SG&A Expense	$5,960.0	$5,503.0	$6,242.0	$6,907.0	$7,533.0
Capital Expense	$604.0	$117.0	$388.0	($523.0)	($229.0)
Pretax Income	($2,883.0)	$293.0	($1,617.0)	($685.0)	($2,787.0)
Pretax Margin (%)	(10.88)	1.26	(8.86)	(2.97)	(14.07)
Effective Tax Rate (%)	(13.60)	15.70	NA	NA	NA
Net Income	($2,453.0)	$169.0	($2,107.0)	($1,610.0)	($4,250.0)
Shares Outstanding, Thousands	3,934.3	4,901.2	7,628.8	7,629.3	7,629.3
Per Share Data					
Earnings	($1.51)	($0.24)	($0.28)	($0.21)	($0.53)
Dividend	0	0	0	0	0
Book Value	$1.90	$2.01	$1.29	$0.06	($0.49)

Table 3 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending June
(Thousands of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	1.16	1.61	1.17	0.93	0.68
Quick (Times)	0.65	1.25	0.60	0.62	0.40
Fixed Assets/Equity (%)	19.10	9.84	10.67	252.49	(30.47)
Current Liabilities/Equity (%)	173.93	69.50	78.77	2,417.01	(413.85)
Total Liabilities/Equity (%)	180.87	79.66	82.84	2,417.01	(413.85)
Profitability (%)					
Return on Assets	-	1.18	(18.91)	(14.40)	(35.48)
Return on Equity	-	1.95	(21.42)	(31.23)	258.67
Profit Margin	(9.26)	0.73	(11.55)	(6.98)	(21.45)
Other Key Ratios					
R&D Spending % of Revenue	6.73	2.98	5.21	3.86	3.62
Capital Spending % of Revenue	2.28	0.50	2.13	(2.27)	(1.16)
Employees	82	75	72	64	77
Revenue ($K)/Employee	$323.22	$309.63	$253.42	$360.44	$257.29
Capital Spending % of Assets	3.64	0.97	3.79	(4.31)	(1.94)

*Includes sales to Canada
NA = Not available

Source: Esprit Systems, Inc.
Annual Reports and Forms 10-K
Dataquest (1990)

E-Systems, Inc.

6250 LBJ Freeway
P.O. Box 660248
Dallas, Texas 75266-0248
Telephone: (214) 661-1000
Fax: (214) 661-8508
Dun's Number: 04-559-1104

Date Founded: 1964

CORPORATE STRATEGIC DIRECTION

E-Systems, Inc., designs, develops, and produces advanced electronic systems and products, principally for sale in defense-related markets. E-Systems groups its products into four business segments: electronic warfare systems; command, control, and communications systems; guidance, controls, and navigation systems; and aircraft maintenance, modification, and other services. E-Systems' electronic warfare systems and command, control, and communications systems together accounted for 84 percent of the Company's total revenue for fiscal year 1989.

Total revenue increased 13.2 percent to $1.6 billion* in fiscal year 1989, up from $1.4 billion in fiscal 1988. Net income totaled $83.0 million for fiscal year 1989, an 11.3 percent increase over fiscal 1988. E-Systems employed 17,920 people during fiscal 1989.

During 1989, the US government and prime contractors with the US government accounted for 88 percent of E-Systems' total sales. Several of the contracts awarded to E-Systems are as follows: a $4.7 million US Navy contract to develop a naval data distribution system terminal; an $8.9 million US Air Force contract for 10 survivable communications units; an $8.9 million air force contract for the Survivable Communications Integration System (SCIS); a $4.6 million contract to upgrade military teleprinters for the navy; a $150 to $200 million contract for flight control equipment from Boeing Commercial; a $64.6 million air force contract for communications equipment; and a $64.6 million contract for an air force/army tactical communications system.

*All dollar amounts are in US dollars.

International sales accounted for 10 percent of total revenue during fiscal 1989, with Europe contributing 6.6 percent, Asia/Pacific 0.3 percent, and the Rest of World 3.1 percent. Electronic warfare systems, high-altitude aircraft platforms, and ground-based transportable aircraft navigation systems were the main contributors to E-Systems' international sales revenue.

E-Systems respectively allocated $34.9 million, $35.7 million, and $33.7 million to its R&D activities for fiscal years 1989, 1988, and 1987. These expenditures represent 2.1, 2.5, and 2.8 percent, respectively, of total revenue. E-Systems believes that R&D activities have been important factors in its growth in that a significant portion of E-Systems' revenue is generated through R&D-oriented projects conducted under cost-reimbursable contracts that often result in the production of prototype hardware and systems.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region. Information on revenue by distribution channel is not available. Table 3, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Electronic Warfare Systems

E-Systems' electronic warfare system segment respectively accounted for 63.4, 65.0, and 60.9 percent of net sales during fiscal years 1989, 1988, and 1987. E-Systems' electronic warfare focus is on systems for intelligence, reconnaissance, and

surveillance applications. These systems include signal intelligence systems (i.e., communications and electronic intelligence systems), intrusion detection systems, electronic support measures, and automated, remotely controlled reconnaissance systems. E-Systems manufactures strategic electronic warfare systems that use technically advanced sensors, receivers, electro-optical devices, processing equipment, computers, and display and communications devices that detect, locate, and analyze hostile electromagnetic signals and other data. The systems supply information on the location and sources of such signals and the functions, operating characteristics, and intentions of such sources. The systems can be adapted to meeting various needs such as arms-control verification, drug interdiction, and improved submarine detection. E-Systems markets four primary types of electronic warfare systems: remotely controlled collection systems, airborne collection systems, land- and sea-based collection systems, and image processing systems.

Command, Control, and Communications Systems

E-Systems markets a wide range of systems and products for instantaneous communication via line-of-sight, satellites, or integrated networks. These systems receive information that is gathered by advanced electronic means and conventional measures such as radar, photoreconnaissance, and radio. The information is then transferred to data processing systems and is displayed in a command center in a form that can be readily used to command and control forces and to monitor rapidly changing strategic and tactical events. These systems include large-scale data processing, software, data link terminals, analog and digital communication, and antenna and display equipment.

Beginning in 1981, E-Systems has participated in air traffic control automation through the development and production of the Flight Service Automation System for the Federal Aviation Administration. The system is an extensive nationwide network of 400 computers and 3,000 display terminals ranging over 18,000 airports. It supplies general aviation pilots with weather briefings, navigation advisories, and assistance in filing flight plans. E-Systems also manufactures mobile command and control facilities that can be airlifted anywhere in worldwide command mission areas. These facilities are self-contained command centers for the control of airlift operations from tactical airfields that have no other communications facilities in place. They provide secure line-of-sight or satellite data and voice communication. During fiscal years 1989, 1988, and 1987, the command, control, and communications system segment represented 20.0, 19.7, and 21.0 percent, respectively, of net sales.

Guidance, Controls, and Navigation Systems

E-Systems' guidance, controls, and navigation systems segment produced the smallest amount of sales, representing respectively 6.1, 5.5, and 5.0 percent of net sales during fiscal years 1989, 1988, and 1987. E-Systems develops and produces automatic control products for aircraft, missile steering and tracking systems, and aircraft navigation aids. E-Systems manufactures most of the flight controls for all Boeing commercial jet aircraft. These flight control systems supply pilots with computer-measured responses to stress on aircraft control surfaces and perform other precision control functions. The systems are also sold to manufacturers as original equipment and to airlines as replacements.

Aircraft Maintenance, Modification, and Other Services

During fiscal years 1989, 1988, and 1987, E-Systems' aircraft maintenance, modification, and other services accounted for 10.4, 9.8, and 13.0 percent, respectively, of net sales. E-Systems provides maintenance, repair, and modification services for commercial, executive, and military aircraft of all types and is the prime contractor of the US Special Air Mission fleet maintenance program. E-Systems also manufactures computer-based training and simulation systems.

Further Information

For more information on E-Systems' business segments, please contact Dataquest's MilAero Technology Service.

Table 1
Five-Year Corporate Highlights (Thousands of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$931,431.0	$1,145,483.0	$1,224,540.0	$1,443,135.0	$1,632,949.0
Percent Change	-	22.98	6.90	17.85	13.15
Capital Expenditure	$56,067.0	$47,763.0	$56,178.0	$54,695.0	$67,060.0
Percent of Revenue	6.02	4.17	4.59	3.79	4.11
R&D Expenditure	$32,300.0	$32,700.0	$33,700.0	$35,700.0	$34,900.0
Percent of Revenue	3.47	2.85	2.75	2.47	2.14
Number of Employees	13,405	14,932	15,506	16,717	17,920
Revenue ($K)/Employee	$69	$77	$79	$86	$91
Net Income	$44,982.0	$61,553.0	$60,400.0	$74,570.0	$82,984.0
Percent Change	-	36.84	(1.87)	23.46	11.28

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$395.36	$396.50	$402.38	$438.71
Quarterly Profit	$19.07	$19.43	$21.30	$23.19

Source: E-Systems, Inc.
Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	92.29	93.14	93.43	89.61	90.00
International	7.71	6.86	6.57	10.39	10.00
Europe	1.85	1.94	2.39	6.21	6.57
Asia/Pacific	1.29	1.20	0.48	0.26	0.33
ROW	4.57	3.72	3.70	3.92	3.10

Source: E-Systems, Inc.
Annual Reports and Forms 10-K
Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—10
Europe—1
ROW—1

MANUFACTURING LOCATIONS

North America

St. Petersburg, Florida
The Communications Manufacturing Division manufactures communications security devices for the Department of Defense (DOD), advanced airborne radios for navy aircraft, standard UHF shipboard radios for the navy, ARC-182 standard airborne radios, WSC-3(V) LOS communications sets, and WSC-3(V) Have Quick modification kits.

St. Petersburg, Florida
The ECI Division manufactures communications systems for the air force's SCIS, UHF communications equipment for NATO, systems engineering support for the SYR-1 communications tracking sets for the navy, and UGC-136 teleprinters. It also upgrades Time Division Multiple Access (TDMA) satellite communications systems.

Dallas, Texas
The Garland Division manufactures CV-3333/U Digital Speech Processors, Joint Service Imagery Processing Systems (JSIPS), TSC-114S military airlift reaction communications systems, and radio sets for TRC-181 systems.

Greenville, Texas
The Greenville Division specializes in airborne systems installation and integration. It designs and installs highly complex airborne reconnaissance, surveillance, and C3 systems.

Falls Church, Virginia
The Melpar Division engages in field support of specialization electronic warfare systems. It also manufactures remotely controlled airborne electronic warfare systems, microminiature airborne electronic warfare systems, Battle Group Passive Horizon Extension System-Surface Terminals for the navy (SLQ-50), and APR-39(V) radar warning systems.

Salt Lake City, Utah
The Montek Division manufactures precision distance measuring equipment, flight controls, DME, TACAN, and VORTAC.

Greenville, Texas
Serv-Air, Inc., engages in operation and maintenance support services for the army and NASA, operation of the government-owned electronics maintenance facility at the Lexington Blue Grass Army Depot, aircraft maintenance and logistics services for the navy and the air force, and customer service.

SUBSIDIARIES

North America

Center for Advanced Planning and Analysis (United States)
Engineering Research Associates, Inc. (United States)
E-Systems Export Co., Inc. (United States)
Serv-Air, Inc. (United States)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1989

Elekluft, Grob Luft and Raumfahrt, Hughes Aircraft, Messerschmitt-Boelkow Blohm (MBB), and Telefunken Systemtechnik
E-Systems formed a marketing venture with Elekluft, Grob Luft and Raumfahrt, Hughes Aircraft, Messerschmitt-Boelkow Blohm, and Telefunken Systemtechnik for the Egrett-1 environmental and disarmament verification reconnaissance sailplane. E-Systems will serve as systems integrator and Hughes will provide airborne radar.

1987

Vitesse Semiconductor
An agreement allowing E-Systems to use Vitesse Semiconductor's GaAs semiconductor technology will give E-Systems the option to purchase proprietary design, packaging, and test technology from Vitesse, as well as give Vitesse the chance to participate in E-Systems' advanced electronic warfare program.

Italiana Telecom
The companies have a marketing agreement calling for Italiana Telecom to sell E-Systems' integrated secure voice terminal (ISVT).

MERGERS AND ACQUISITIONS

1989

Engineering Research Associates, Inc. (ERA)
E-Systems acquired Engineering Research Associates, which produces high-frequency surveillance systems and specializes in automated training systems and related computer systems.

KEY OFFICERS

E. Gene Keiffer
Chairman of the board and chief executive officer

A. Lowell Lawson
President and chief operating officer

Dr. Terry W. Heil
Senior vice president

Eaton Adams, Jr.
Vice president, Strategic Planning and Development

Robert C. Kroeger
Vice president, Quality and Manufacturing

Harry L. Thurmon
Vice president, New Business Development

PRINCIPAL INVESTORS

E-Systems, Inc., Employee Stock Ownership Trust—17.3 percent

FOUNDERS

Information is not available.

Table 3
Comprehensive Financial Statement
Fiscal Year Ending December
(Thousands of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$327,606.0	$441,331.0	$432,249.0	$497,312.0	$532,548.0
Cash	10,029.0	5,842.0	10,911.0	27,290.0	13,052.0
Receivables	108,187.0	163,284.0	208,915.0	251,493.0	296,086.0
Marketable Securities	39,707.0	77,273.0	570.0	NA	NA
Inventory	10,895.0	9,848.0	9,135.0	9,425.0	8,062.0
Other Current Assets	158,788.0	185,084.0	202,718.0	209,104.0	215,348.0
Net Property, Plants	$149,625.0	$170,382.0	$195,525.0	$212,578.0	$234,745.0
Other Assets	$1,571.0	$16,088.0	$37,850.0	$48,352.0	$84,852.0
Total Assets	$478,802.0	$627,801.0	$665,624.0	$758,242.0	$852,145.0
Total Current Liabilities	$105,414.0	$131,586.0	$150,414.0	$140,308.0	$162,622.0
Long-Term Debt	$19,316.0	$68,494.0	$49,832.0	$86,201.0	$91,133.0
Other Liabilities	$33,083.0	$50,750.0	$35,867.0	$40,785.0	$37,264.0
Total Liabilities	$157,813.0	$250,830.0	$236,113.0	$267,294.0	$291,019.0
Total Shareholders' Equity	$320,989.0	$376,971.0	$429,511.0	$490,948.0	$561,126.0
Common Stock	30,036.0	30,420.0	30,823.0	30,898.0	31,043.0
Other Equity	61,732.0	70,918.0	77,990.0	80,213.0	83,812.0
Retained Earnings	229,221.0	275,633.0	320,698.0	379,837.0	446,271.0
Total Liabilities and Shareholders' Equity	$478,802.0	$627,801.0	$665,624.0	$758,242.0	$852,145.0

Income Statement	1985	1986	1987	1988	1989
Revenue	$931,431.0	$1,145,483.0	$1,224,540.0	$1,443,135.0	$1,632,949.0
US Revenue	859,628.0	1,066,919.0	1,144,095.0	1,293,257.0	1,469,602.0
Non-US Revenue	71,803.0	78,564.0	80,445.0	149,878.0	163,347.0
Cost of Sales	$759,330.0	$946,633.0	$1,029,293.0	$1,218,120.0	$1,390,533.0
R&D Expense	$32,300.0	$32,700.0	$33,700.0	$35,700.0	$34,900.0
SG&A Expense	$75,716.0	$84,771.0	$91,755.0	$106,295.0	$113,641.0
Capital Expense	$56,067.0	$47,763.0	$56,178.0	$54,695.0	$67,060.0
Pretax Income	$95,162.0	$109,330.0	$96,178.0	$109,662.0	$118,549.0
Pretax Margin (%)	10.22	9.54	7.85	7.60	7.26
Effective Tax Rate (%)	45.00	46.00	40.00	34.00	34.00
Net Income	$44,982.0	$61,553.0	$60,400.0	$74,570.0	$82,984.0
Shares Outstanding, Thousands	30,555.0	30,802.0	31,016.0	31,066.0	31,270.0
Per Share Data					
Earnings	$1.47	$2.00	$1.95	$2.40	$2.65
Dividend	$0.50	$0.50	$0.50	$0.50	$0.50
Book Value	$10.51	$12.24	$13.85	$15.80	$17.94

Table 3 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending December
(Thousands of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	3.11	3.35	2.87	3.54	3.27
Quick (Times)	3.00	3.28	2.81	3.48	3.23
Fixed Assets/Equity (%)	46.61	45.20	45.52	43.30	41.83
Current Liabilities/Equity (%)	32.84	34.91	35.02	28.58	28.98
Total Liabilities/Equity (%)	49.16	66.54	54.97	54.44	51.86
Profitability (%)					
Return on Assets	-	11.12	9.34	10.47	10.31
Return on Equity	-	17.64	14.98	16.20	15.78
Profit Margin	4.83	5.37	4.93	5.17	5.08
Other Key Ratios					
R&D Spending % of Revenue	3.47	2.85	2.75	2.47	2.14
Capital Spending % of Revenue	6.02	4.17	4.59	3.79	4.11
Employees	13,405	14,932	15,506	16,717	17,920
Revenue ($K)/Employee	$69	$77	$79	$86	$91
Capital Spending % of Assets	11.71	7.61	8.44	7.21	7.87

NA = Not available

Source: E-Systems, Inc.
Annual Reports and Forms 10-K
Dataquest (1990)

European Silicon Structures

BACKGROUND AND OVERVIEW

European Silicon Structures (ES2), the brainchild of Jean Luc Grand-Clement, was formally announced in September 1985. Initial funding of $65 million was sought from institutional and industrial investors for the new all-European microchip company. The money is coming from all corners of the continent--Great Britain, West Germany, France, the Netherlands, Belgium, and Sweden. The first investment of about $5 million came from a group of venture capital companies led by Advent in London and Techno Venture Management in Munich, which is backed by firms such as Siemens AG and Daimler-Benz AG. ES2 has turned down offers from U.S. investors because it wants to maintain a European identity.

ES2 is one of the first semiconductor start-up companies in Europe since 1978, previous ones being Inmos, Matra-Harris, Integrated Power, and Mietec. Two new ASIC start-ups have since joined the ranks: Qudos and Advanced Silicon Corporation.

The new venture is chaired by Robert Heikes, a former corporate vice president and managing director of National Semiconductor Corporation in Europe and Latin America, and Robb Wilmot, chairman of STC International Computers and a board member of STC plc. Mr. Wilmot's initial involvement in the project was in a private capacity with no involvement from International Computers Ltd. (ICL). Robb Wilmot resigned as chairman of STC in December 1985 and also gave up his position as nonexecutive chairman of ICL. Jean Luc Grand-Clement, the company's chief executive and managing director, is a former vice president and deputy general manager at Motorola Semiconductor's European headquarters and more recently the head of Eurotechnique, the joint venture that was taken over by Thomson in 1983. Pierre Lesieur, formerly a director of finance at Motorola in Europe, will be vice president for finance and administration. In addition, the group has attracted executives from National Semiconductor, Lattice Logic, Thomson Eurotechnique, and Sierra Semiconductors.

ES2 will be incorporated in Luxembourg and headquartered in West Germany. Its initial plans are to develop its design automation technology in Britain, where it has already created a link with Lattice Logic, a small Edinburgh-based company specializing in microchip design techniques. A production plant is planned to be built near Aix-en-Provence in southern France in late 1986. ES2 plans to open microchip design centers throughout Europe in Paris, Munich, Milan, Stockholm, and Edinburgh; its Bracknell-based design center in London was officially opened on April 15, 1986. A second production plant, to be based in either Great Britain or West Germany, will be considered in a few years. ES2 expects to employ around 300 people by the end of 1986 and roughly 1,000 people by 1990.

European Silicon Structures

In December 1985, it was announced that six leading European high-technology companies were to take a 39 percent stake, worth $25 million, in ES2; the backers were to include Philips (the Netherlands), Olivetti (Italy), Saab-Scania (Sweden), Brown Boveri (Switzerland), and CIE (Switzerland). In January 1986, British Aerospace took a $5 million stake in ES2. Telefonica (Spain) and Bull (France) conclude the present list of participants. Along with these new investors, the financial institutions and industrial companies will hold approximately 23 percent of the Company.

Approximately 13 percent of the Company is owned by six venture capital firms led by Techno Venture Management of Munich and Advent Capital Ltd. of London. The remaining 25 percent will be owned by the founders and employees of European Silicon Structures.

In January 1986, ES2 signed a key marketing agreement with Solomon Design Associates (SDA) systems. Under this agreement, ES2 will market SDA design systems throughout Europe and will also use them in a number of planned design centers. SDA's Designer Edge series of EDA systems will be installed in all ES2 design center locations.

PRODUCTS AND MARKETS SERVED

ES2 has targeted the markets for custom-designed chips--small-volume, low-profit areas that are of no interest to the big volume commodity chip producers. ES2 will be able to provide a fast customized service using two techniques. First, it will use silicon compilers, computer software systems that cut design times dramatically. Second, it will use direct-write electron beam lithography, which permits chips to be produced by direct writing, thus eliminating the costly and time-consuming process of producing a mask for etching the silicon.

OUTLOOK

In April 1986, ES2 announced its first contract--a $60,000 deal with a Belgian design center to supply two solo electronic CAE systems based on the Whitechapel workstation and the Lattice Logic compilation software tools.

In May 1986, ES2 announced four new appointments as directors of its Board: Viscount Etienne Dauignon, director of the Societe Generale de Belgique; Dr. Albert Kloezen, managing director of Euroventure,

Benelux; Elserino Piol, executive vice president in charge of strategy and development for the Olivetti group (Italy); and Klaus Volkholz, director of corporate planning and strategy of Philips International BV (the Netherlands).

In May 1986, initial discussions took place between ES2, Philips, and Texas Instruments regarding the possibilities of joining forces in a standard cell cooperation. ES2 would provide a small quantity resource for production. No firm agreement has been made to date.

Two unique services offered by ES2's Bracknell design center were announced in June 1986. These are the ability to design circuits at transistor level using SDA software tools, and a standard cell optimized array service that can take a customer all the way through the design process, including route and place, to software simulation for £2,000.

In the first quarter of 1986, ES2 announced that it had received its first orders and made its first shipments, with the shipments coming from the sale of software and design services. The Company plans, by the second half of 1987, to have an ES2 proprietary software product--the first step toward the "behavioral computer." A complete behavioral computer will be introduced one year later. Expected worldwide turnover for the company is $5 million in the first 12 months of operation.

European Silicon Structures

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Evans & Sutherland Computer Corporation

600 Komas Drive
P.O. Box 8700
Salt Lake City, Utah 84108
Telephone: (801) 582-5847
Fax: (801) 582-9701
Dun's Number: 04-526-3035

Date Founded: 1968

CORPORATE STRATEGIC DIRECTION

Evans & Sutherland Computer Corporation was founded in 1968 by David C. Evans and Ivan E. Sutherland with the goal of creating usable, interactive computer graphics systems. At the time, the Company concentrated on two specific areas: graphics displays used for flight simulation and interactive 3-D graphics terminals used for applications such as comuputer-aided engineering (CAE). Today, Evans & Sutherland designs, manufactures, markets, and services interactive computing systems and software for such systems. Its products are labeled as four basic types: visual systems, interactive graphics display systems, industrial design systems, and software systems.

In 1986, Evans & Sutherland reorganized the Company into three independent divisions: the Interactive Systems Division, the Simulation Division, and the Design System Division. The Interactive Systems Division produces three-dimensional graphics hardware for a variety of applications and specialized software for mechanical engineering and molecular modeling. The Simulation Division produces visual image systems used in vehicle training simulators and in whole vehicle simulation. The Design System Division develops and markets engineering workstations and industrial design products.

Total revenue increased 6.9 percent to $138.6 million* in fiscal year 1989 from $129.6 million in fiscal year 1988. Net income was $1.0 million for fiscal year 1989, a 46.8 percent decrease from fiscal year 1988. Evans & Sutherland employed 1,418 people during fiscal year 1989.

Evans & Sutherland's R&D spending reached $23.4 million, $27.1 million, and $30.6 million for fiscal years 1989, 1988, and 1987, respectively. These figures respectively accounted for 16.9, 20.9, and 22.8 percent of total revenue. R&D activities were focused on the enhancement of existing products and the development of new products, as well as on a supercomputer project that has now been discontinued. Evans & Sutherland believes that the elimination of the supercomputer project will offset increases in R&D expenditure during 1990.

Evans & Sutherland's visual systems are directly marketed to end users, subcontractors, and prime contractors on a worldwide basis, excluding Japan. A sales agent, Rikei, sells Evans & Sutherland's products within Japan. Evans & Sutherland's graphics, software systems, and new products are sold through specific salespeople who are product specialists. The majority of sales are domestic; the US government respectively accounted for 30.0 and 22.0 percent of total revenue during fiscal years 1989 and 1988. International sales respectively represented 11.8, 12.6, and 22.9 percent of total revenue during fiscal years 1989, 1988, and 1987. Throughout the past five years, the European market has been the primary source of international revenue for Evans & Sutherland.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region. Information on revenue by distribution channel is not available. Table 3, a comprehensive financial statement, is at the end of this profile.

*All dollar amounts are in US dollars.

BUSINESS SEGMENT STRATEGIC DIRECTION

Visual Systems

Visual systems, also referred to as computer image generator (CIG) systems, are used as components in training and engineering simulators. Evans & Sutherland offers the following five systems: ESIG-100, ESIG-200, ESIG-500, ESIG-600, and ESIG-1000.

The ESIG-100 is a low-cost day/dusk/night system for applications in which frame-rate image update is acceptable. It displays 500 textured polygons and 1,000 light points.

The ESIG-200 is a dusk/night system that meets all of the requirements for FAA Phase II training. It displays 225 textured polygons and 4,800 full-color calligraphic light points.

The ESIG-500 is a day/dusk/night system that meets all of the new requirements for FAA Phase III training. It is used for civil aviation training as well as military tactical and operational flight training. It displays 500 textured polygons and 5,000 calligraphic light points.

The ESIG-600 is a day/dusk/night system that includes all of the basic performance factors of the ESIG-500 as well as significant enhancements. It displays 1,000 textured polygons and 5,000 calligraphic light points. Contour texture and photographic texture capability are available, along with an increased number and size of texture maps. Nonlinear image mapping is also available for compatibility with a large range of dome displays.

The ESIG-1000 is a day/dusk/night system that includes the capability of Evans & Sutherland's previous CT6 expanded to take advantage of the latest technological improvements. It provides additional texture map capability with dynamic texture paging, area-of-interest database management, higher scene feature density provided through on-line memory expansion, higher channel capacity, improved maintenance capability, and additional dynamic moving objects with new special effects.

Graphics Display Systems

Evans & Sutherland designs and manufactures the PS 300 family of interactive computer graphics systems. PS 300 family products are very high-performance, 3-D interactive graphics terminals. In 1986, Evans & Sutherland introduced the PS 390, the newest family member. Dataquest estimates that Evans & Sutherland held less than 1 percent market share of the graphics terminal worldwide market in 1988. Evans & Sutherland recently announced the ESV series of RISC/UNIX-based 20-mips workstations. The workstations will bring new levels of graphics performance to the workstation market on a completely standards-based platform. The ESV workstation requires no reduction of graphics speed or image quality for standards compliance. It has a wide range of graphics performance and expandability, with programmable hardware that enables customization of the system to meet specific customer design and engineering requirements.

Industrial Design Products

In 1989, Evans & Sutherland introduced the first shipments of its industrial design product, the Conceptual Design and Rendering System (CDRS). It is an integrated product with both general and special-purpose hardware and application software designed to allow stylists to use familiar techniques to build mathematical models of aesthetic shapes. It allows photorealistic images to be created in seconds.

Software Systems

In June 1987, Evans & Sutherland acquired Tripos Associates, Inc., a supplier of software that helps pharmaceutical chemists understand the shape of molecules. During 1989, Tripos introduced several new software products and gained a 60 percent increase in revenue for the year.

Further Information

For more information on Evans & Sutherland's business segments, please contact the appropiate Dataquest industry service.

Table 1
Five-Year Corporate Highlights
(Thousands of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$79,588.3	$109,264.1	$134,415.0	$129,625.0	$138,564.0
Percent Change	-	37.29	23.02	(3.56)	6.90
Capital Expenditure	NA	NA	NA	NA	NA
Percent of Revenue	NA	NA	NA	NA	NA
R&D Expenditure	$17,480.6	$20,264.8	$30,639.1	$27,070.0	$23,376.0
Percent of Revenue	21.96	18.55	22.79	20.88	16.87
Number of Employees	1,000	1,170	1,350	1,205	1,418
Revenue ($K)/Employee	$79.59	$93.39	$99.57	$107.57	$97.72
Net Income	$6,190.6	$10,877.3	$14,744.5	$1,887.0	$1,004.0
Percent Change	-	75.71	35.55	(87.20)	(46.79)

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$25.17	$34.44	$37.00	$41.95
Quarterly Profit	$1.33	$1.80	$2.52	($4.65)

NA = Not available

Source: Evans & Sutherland Computer Corporation Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region
(Percent)

Region	1985	1986	1987	1988	1989
North America	79.45	82.27	71.84	87.39	88.16
International	20.55	17.73	28.16	12.61	11.84
Europe	15.16	12.55	22.91	12.61	11.84
Others	5.39	5.18	5.25	0	0

Source: Evans & Sutherland Computer Corporation Annual Reports and Forms 10-K
Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—5
Europe—3

MANUFACTURING LOCATIONS

St. Louis, Missouri
Software development
Salt Lake City, Utah
Hardware development

SUBSIDIARIES

Information is not available.

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1988

StereoGraphics Corporation
An agreement calls for StereoGraphics to supply Evans & Sutherland with its time-multiplexed, liquid crystal-based stereo 3-D computer graphics systems.

MERGERS AND ACQUISITIONS

1987

Tripos Associates
Evans & Sutherland acquired Tripos Associates, a producer of graphic representations for molecular modeling.

KEY OFFICERS

David C. Evans
Chairman of the board

Rodney S. Rougelot
President and chief executive officer

J. Robert Driggs
Vice president and chief financial officer

Richard F. Leahy
Vice president, secretary and treasurer

Gary E. Meredith
Vice president

Susan K. Mickelsen
Vice president

C. Grant Schultz
Controller

PRINCIPAL INVESTORS

Harris Associates L.P.—11.8 percent
Spear Benzak Salomon & Farrell Inc.—8.1 percent

FOUNDERS

David C. Evans
Ivan E. Sutherland

Table 3
Comprehensive Financial Statement
Fiscal Year Ending December
(Thousands of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$71,172.4	$81,337.2	$144,472.5	$122,179.0	$136,188.0
Cash	17,805.8	26,080.1	69,188.9	47,590.0	52,823.0
Receivables	27,719.7	24,260.2	36,049.2	45,489.0	42,145.0
Marketable Securities	NA	NA	NA	NA	NA
Inventory	17,296.5	17,214.8	21,164.0	16,010.0	15,677.0
Other Current Assets	8,350.4	13,782.1	18,070.4	13,090.0	25,543.0
Net Property, Plants	$32,948.5	$37,617.0	$48,908.4	$57,912.0	$57,802.0
Other Assets	$5,211.3	$5,959.8	$6,763.1	$6,921.0	$6,622.0
Total Assets	$109,332.2	$124,914.0	$200,144.0	$187,012.0	$200,612.0
Total Current Liabilities	$35,768.5	$39,723.5	$38,142.7	$27,436.0	$45,102.0
Long-Term Debt	$5,036.7	$5,054.1	$62,600.6	$57,029.0	$51,745.0
Other Liabilities	$3,288.7	$3,472.1	$4,780.2	$4,753.0	$2,745.0
Total Liabilities	$44,093.9	$48,249.7	$105,523.5	$89,218.0	$99,592.0
Total Shareholders' Equity	$65,238.3	$76,664.3	$94,620.5	$97,794.0	$101,020.0
Converted Preferred Stock	NA	NA	NA	NA	NA
Common Stock	1,615.3	1,620.9	1,675.8	1,686.0	1,712.0
Other Equity	8,912.9	9,456.0	11,821.4	13,098.0	15,294.0
Retained Earnings	54,710.1	65,587.4	81,123.3	83,010.0	84,014.0
Total Liabilities and Shareholders' Equity	$109,332.2	$124,914.0	$200,144.0	$187,012.0	$200,612.0

Income Statement	1985	1986	1987	1988	1989
Revenue	$79,588.3	$109,264.1	$134,415.0	$129,625.0	$138,564.0
US Revenue	63,236.3	89,892.2	96,560.1	113,285.0	122,161.0
Non-US Revenue	16,352.0	19,371.9	37.854.9	16,340.0	16,403.0
Cost of Sales	$39,904.6	$51,409.7	$59,729.9	$64,918.0	$64,958.0
R&D Expense	$17,480.6	$20,264.8	$30,639.1	$27,070.0	$23,376.0
SG&A Expense	$14,883.4	$19,389.1	$27,503.5	$25,302.0	$24,244.0
Capital Expense	NA	NA	NA	NA	NA
Pretax Income	$10,028.4	$19,785.9	$23,894.9	$404.0	($1,267.0)
Pretax Margin (%)	12.60	18.11	17.78	0.31	(0.91)
Effective Tax Rate (%)	NA	NA	NA	NA	NA
Net Income	$6,190.6	$10,877.3	$14,744.5	$1,887.0	$1,004.0
Shares Outstanding, Thousands	8,076.7	8,104.7	8,378.8	8,487.0	8,684.0
Per Share Data					
Earnings	$0.72	$1.33	$1.72	$0.22	$0.12
Dividend	NA	NA	NA	NA	NA
Book Value	$8.08	$9.46	$11.29	$11.52	$11.63

Table 3 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending December
(Thousands of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	1.99	2.05	3.79	4.45	3.02
Quick (Times)	1.51	1.61	3.23	3.87	2.67
Fixed Assets/Equity (%)	50.50	49.07	51.69	59.22	57.22
Current Liabilities/Equity (%)	54.83	51.81	40.31	28.05	44.65
Total Liabilities/Equity (%)	67.59	62.94	111.52	91.23	98.59
Profitability (%)					
Return on Assets	-	9.29	9.07	0.97	0.52
Return on Equity	-	15.33	17.22	1.96	1.01
Profit Margin	7.78	9.96	10.97	1.46	0.72
Other Key Ratios					
R&D Spending % of Revenue	21.96	18.55	22.79	20.88	16.87
Capital Spending % of Revenue	NA	NA	NA	NA	NA
Employees	1,000	1,170	1,350	1,205	1,418
Revenue ($K)/Employee	$79.59	$93.39	$99.57	$107.57	$97.72
Capital Spending % of Assets	NA	NA	NA	NA	NA

NA = Not available

Source: Evans & Sutherland Computer Corporation Annual Reports and Forms 10-K
Dataquest (1990)

EXECUTONE Information Systems Inc.

6 Thorndal Circle
Darien, Connecticut 06820
Telephone: (203) 655-6500
Fax: (602) 948-5470
Dun's Number: Not Available

Date Founded: 1988

CORPORATE STRATEGIC DIRECTION

EXECUTONE Information Systems Inc. designs, manufactures, sells, installs, and services voice and data communications equipment for business locations with less than 300 stations and is a supplier of specialized hospital communications equipment. Products are sold primarily under the EXECUTONE, ISOETEC, and INFOSTAR brand names through a nationwide network of Company-owned direct sales and service offices and independent distributors. As of December 31, 1989, EXECUTONE had an installed product base of more than 1 million stations.

EXECUTONE Information Systems was formed on July 8, 1988, through the merger of ISOETEC Communications Inc. and Vodavi Technology Corporation. Early in 1988, Vodavi and ISOETEC jointly acquired Executone Inc. from Contel Corporation. The new EXECUTONE is a pooling of the strengths of its predecessors in the areas of design, engineering, manufacturing, distribution, customer service, financial resources, and management. The old Executone possessed an extensive and mature distribution channel along with a large installed customer base. ISOETEC had a smaller distribution channel and customer base, but had direct access to low-cost manufacturing, proprietary products with a focus on application-specific software, and a business strategy centered on the customer base and vertical integration. Vodavi had a developed distribution channel for OEM products and also access to low-cost manufacturing.

Total revenue was $287 million* in fiscal 1989. The Company had a net loss of $4 million. EXECUTONE employs approximately 2,400 people worldwide.

*All dollar amounts are in US dollars.

R&D expenditure totaled $6.7 million in fiscal 1989, representing 2.4 percent of revenue. During 1990, EXECUTONE's engineering efforts are being focused on applications-oriented software products for its voice and data communications systems and enhancements to its line of specialized health care communications equipment.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

EXECUTONE's product lines range from sophisticated single-line telephones to fully featured telephone systems. These products are offered in three major categories: voice/data telecommunications systems, key systems, and internal communications systems. EXECUTONE's communications and voice processing products are positioned with a strong focus on software applications that increase office productivity and reduce expenses.

Voice/Data Telecommunications Systems

EXECUTONE markets the ISOETEC Digital System, various ISOETEC analog telephone systems, and the ECX family of telephone systems, along with various peripheral products. The Company's largest system and most sophisticated product is the ISOETEC Digital System, which can be expanded to 864 nonblocking ports, 432 for voice and 432 for data. EXECUTONE's telecommunications systems are characterized by flexible software and a hardware

design that makes them readily adaptable to evolving technology and customer requirements. The software in each system also provides such features as automatic dialing, add-on conferencing, call forwarding, last number redialing, message waiting, paging capability, call accounting, internal diagnostic routines, and other commonly used communications features.

Some of the more advanced features and applications software of EXECUTONE's products are automatic call distribution (ACD), voice messaging, automated attendant, enhanced call processing, network designer, least-cost routing (LCR), data switch, and Centrex capability and applications.

EXECUTONE offers ACD in five levels of sophistication. Basic ACD provides the capability to distribute or route incoming calls to available agents based upon management's specifications. Dynamic ACD allows the supervisor of the call processing group to monitor call traffic on-line through a computer terminal. Advanced ACD, in addition to features of Basic and Dynamic ACD, provides the capability to store and retrieve call data for a limited period and print out standard call traffic reports. Custom ACD provides the same features as Dynamic ACD, except that the reports can be customized to the needs of a specific application. Custom Plus ACD provides color screens and graphics to monitor traffic and greatly enhances the ability to store and retrieve call data.

EXECUTONE's telephone systems are integrated with voice mail systems, which are either provided by the Company or by an outside vendor. The voice message or voice mail systems receive, record, store, distribute, transfer, and replay messages from both external and internal callers.

The automated attendant feature answers and transfers calls without operator intervention, and is an integrated feature of EXECUTONE's voice mail system. The enhanced call processing feature provides the attendant with video display terminals and management reports, permitting the monitoring of calls.

The network designer feature is a computer-generated study of a customer's calling patterns in order to recommend the optimum configuration of its network. Recommendations might include which long distance carriers to use and the number of lines a customer might need.

EXECUTONE's LCR feature stores current tariff tables for the long distance carriers employed by the customer and automatically selects the least expensive carrier for each specific call at the moment the call is placed.

The Company's data switching feature provides the capability to switch data between mainframes, minicomputers, personal computers, terminals, and peripherals through the telephone systems.

In addition, EXECUTONE's telephone systems can be programmed to function in conjunction with and enhance the features of Centrex services offered by local telephone companies.

EXECUTONE develops its own application-specific software options. Its software includes remote capabilities built into certain systems that enable the Company to customize and update selected features continuously. Certain EXECUTONE systems are capable of having service diagnostics, updates, and modifications performed on a remote basis.

Key Systems

Through its Vodavi Communications Systems Division (VCS), EXECUTONE designs, manufactures, sells, and supports several private-label families of key telephone systems, the StarPlus line of key telephone systems, industry-standard commercial single-line telephones, and a line of private label single-line telephones. The private-label telephone systems are proprietary products sold under long-term contracts. The StarPlus key telephone system is a family of four systems that can accommodate up to 24 lines and 48 stations. The commercial single-line telephones consist of industry-standard model 2500 and 2554 phones, as well as enhanced models that include features such as tap, message wait, speakerphones, and multiline phones. These telephones are produced in traditional telephone styles, as well as in new enhanced styles proprietary to VCS referred to as the 2600 series. Additionally, VCS produces a proprietary line of private-label telephones for GTE Communication Systems Corporation.

Internal Communications Systems

EXECUTONE develops and markets a line of specialized internal communications systems used primarily in the health care industry and correctional facilities. These internal communications systems are

microcomputer-controlled intercom and patient-to-nurse communications systems and paging and sound equipment. Additionally, the Company is developing new products for these markets, including "locater systems" and products that can be integrated with EXECUTONE's voice and data communications systems.

Customer Support

EXECUTONE operates a National Service and Support Center. This center can diagnose system problems for many end-user customers of its direct sales and service offices by coordinating field service personnel and programming certain corrections remotely from a centralized location at its headquarters in Darien, Connecticut. All service calls are controlled from initial diagnosis to ultimate disposition through an internally developed and maintained proprietary software package. The center maintains detailed customer records and is used to market and monitor certain products and services such as maintenance contracts. Additionally, the center provides EXECUTONE with statistical data and reports regarding a product's performance. The Company anticipates that by the end of 1990, the majority of end-user customers will be serviced by the National Service and Support Center.

Further Information

For more information about the Company's business segments, please contact the appropriate Dataquest industry service.

Table 1
Corporate Highlights (Thousands of US Dollars)

	1988*	1989
Two-Year Revenue	$150,129.0	$287,474.0
Percent Change	-	-
Capital Expenditure	-	-
Percent of Revenue	-	-
R&D Expenditure	$4,106.0	$6,758.0
Percent of Revenue	2.73	2.35
Number of Employees	2,400	2,400
Revenue ($K)/Employee	$62.55	$119.78
Net Income	($1,101.0)	($4,217.0)
Percent Change	-	-

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$74,784.00	$74,519.00	$70,040.00	$68,131.00
Quarterly Profit	$180.00	$758.00	$175.00	($5,330.00)

*Six months ended December 31, 1988

Source: EXECUTONE Information Systems Inc. Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1988	1989
North America	91.00	91.00
International	9.00	9.00

Source: EXECUTONE Information Systems Inc. Annual Reports and Forms 10-K
Dataquest (1990)

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	70.00	70.00
Indirect Sales	30.00	30.00

Source: Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—69

MANUFACTURING LOCATIONS

North America

Norwalk, Connecticut, and Long Island City, New York
EXECUTONE assembles and tests certain new products during the early phases of their development at its production facility in Norwalk. Currently, most of EXECUTONE's specialized health care and internal communications systems are produced at its production facility in Long Island City. This facility was closed June 30, 1990. The manufacturing functions were consolidated and integrated with EXECUTONE's Norwalk assembly and production facility.

Asia/Pacific

South Korea
Most of EXECUTONE's telephone products are assembled or manufactured in South Korea by Goldstar Telecommunication Co. Ltd. and Oriental Precision Company. The Company is in the process of establishing an additional supply source in Hong Kong. Certain of EXECUTONE's key telephone systems are manufactured by Goldstar pursuant to a long-term manufacturing agreement.

ROW

Dominican Republic
Certain components of EXECUTONE's digital telecommunications are manufactured by Quality Telecommunications Products in the Dominican Republic.

SUBSIDIARIES

North America

ISOETEC Communications Inc. (United States)
Vodavi Technology Corporation (United States)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

MCI Communications Corp.
EXECUTONE and MCI Communications signed a three-year agreement in which EXECUTONE will operate as a sales agent for MCI long distance services. Under terms of the agreement, EXECUTONE will market MCI's Commercial Dial-1 Card, Prism Plus, and 800 Common Business Services to its existing customer base and to new customers.

1988

Octel
EXECUTONE and Octel signed an OEM agreement under which EXECUTONE will market Octel's VPC 100 voice processing system under a private label.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Alan Kessman
President and chief executive officer

Stanley M. Blau
Vice chairman

Michael W. Yacenda
Executive vice president and chief operating officer

Kent R. Burgess
Vice president, Production

Glenn R. Fitchet
Vice president and general manager, VCS Division

Andrew Kontomerkos
Vice president, Hardware Engineering

Shlomo Shur
Vice president, Software Engineering

James H. Stirling
Vice president, Marketing

H. Nicholas Visser
Vice president, Direct Sales

Frank J. Rotatori
Vice president, Direct Sales

Robert Hopwood
Vice president, Customer Support

PRINCIPAL INVESTORS

William R. Hambrecht—10.8 percent
Entities associated with Hambrecht & Quist Group—9.8 percent
Goldstar Telecommunication Co. Ltd.—7.6 percent
Steven Sherman—5.9 percent

FOUNDERS

Information is not available.

Table 4
Comprehensive Financial Statement
Fiscal Year Ending December
(Thousands of US Dollars, except Per Share Data)

Balance Sheet	1988*	1989
Total Current Assets	$112,510.0	$92,107.0
Cash	7,096.0	7,967.0
Receivables	42,834.0	39,528.0
Marketable Securities	-	-
Inventory	58,107.0	40,624.0
Other Current Assets	4,473.0	3,988.0
Net Property, Plants	$18,012.0	$21,144.0
Other Assets	$89,289.0	$101,400.0
Total Assets	$219,811.0	$214,651.0
Total Current Liabilities	$85,049.0	$80,753.0
Long-Term Debt	$84,170.0	$83,656.0
Other Liabilities	-	-
Total Liabilities	$169,219.0	$164,409.0
Total Shareholders' Equity	$50,592.0	$50,242.0
Common Stock	279.0	287.0
Other Equity	50,313.0	49,955.0
Retained Earnings	-	-
Total Liabilities and Shareholders' Equity	$219,811.0	$214,651.0

Income Statement	1988*	1989
Revenue	$150,129.0	$287,474.0
US Revenue	-	-
Non-US Revenue	-	-
Cost of Sales	$93,854.0	$179,174.0
R&D Expense	$4,106.0	$6,758.0
SG&A Expense	$47,575.0	$87,714.0
Capital Expense	-	-
Pretax Income	($1,119.0)	$1,050.0
Pretax Margin (%)	(0.75)	0.37
Effective Tax Rate (%)	-	-
Net Income	($1,101.0)	($4,217.0)
Shares Outstanding, Thousands	27,900	28,300
Per Share Data		
Earnings	($0.04)	($0.15)
Dividend	-	-
Book Value	$1.81	$1.78

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending December
(Thousands of US Dollars, except Per Share Data)

Key Financial Ratios	1988*	1989
Liquidity		
Current (Times)	1.32	1.14
Quick (Times)	0.64	0.64
Fixed Assets/Equity (%)	35.60	42.08
Current Liabilities/Equity (%)	168.11	160.73
Total Liabilities/Equity (%)	334.48	327.23
Profitability (%)		
Return on Assets	(0.50)	(1.94)
Return on Equity	(2.18)	(8.36)
Profit Margin	(0.73)	(1.47)
Other Key Ratios		
R&D Spending % of Revenue	2.73	2.35
Capital Spending % of Revenue	-	-
Employees	2,400	2,400
Revenue ($K)/Employee	$62.55	$119.78
Capital Spending % of Assets	0	0

*Six months ended December 31, 1988

Source: EXECUTONE Information Systems Inc. Annual Reports and Forms 10-K
Dataquest (1990)

Facit AB

S-172 91 Sundbyberg
Sweden
Telephone: 46-8-7643000
Fax: 46-8-982329
Dun's Number: Not Available

Date Founded: 1413

CORPORATE STRATEGIC DIRECTION

Facit Inc. is a wholly owned subsidiary of Facit AB of Stockholm, Sweden, a manufacturer of computer peripherals, terminals, word processing equipment, calculators, numerical control products, and office furnishings. Facit AB employs over 2,500 people, with sales and service in over 90 countries. Worldwide sales for Facit AB during fiscal 1989 were approximately US$350 million. In 1988, Facit AB, formerly part of Ericsson, was purchased by the Norwegian group Entranor.

The Facit Inc. subsidiary was founded in 1938 to introduce its line of adding machines and typewriters in the United States. In 1982, Facit Inc. relocated from Greenwich, Connecticut, to Nashua, New Hampshire, and merged with Dataroyal Inc., an Electrolux subsidiary. Facit moved its corporate headquarters to Merrimack, New Hampshire, in 1984 and later to an expanded facility in Manchester, New Hampshire.

Facit Inc. is a manufacturer and distributor of computer printers for original equipment manufacturers (OEMs), systems integrators, and resellers. Facit differentiates itself by having the ability to match its products with particular applications and work loads. Facit also matches a printer to a particular requirement by adding custom features and functionality. While its competitors address the high-volume printer market, Facit focuses on addressing specific printing problems. Key applications include word and data processing, electronic publishing, multipart forms and reports generation, industrial printing, bar coding, and financial and database uses.

Facit AB also manufactures and markets personal computers throughout Europe, using its subsidiary Facit Ltd. in the United Kingdom.

Because Facit AB is a wholly owned subsidiary of Entranor, no financial analysis is included.

BUSINESS SEGMENT STRATEGIC DIRECTION

Printers

Facit AB's printer products are manufactured in the United States, Sweden, and the Far East, and are distributed in the United States through OEMs, systems integrators, and resellers. Facit products are serviced in the United States by Facit-owned service depots or through Intelogic Trace. Bull HK handles third-party service in Canada.

Facit Inc. sells a full line of printers, including laser, dot matrix, color, and thermal technologies. The Facit B-line is the Company's most popular dot matrix printer family. Its models include 9-, 18-, and 24-pin printers in either 80- or 136-column versions that print in black only or in full color. Products in this category include the B3550, designed for multiuser computer systems and providing continuous high print speeds for volume printouts; and the B2000 Series, which are 9- and 24-pin printers designed for a variety of office workstation applications, including word and data processing, invoices, labels, multipart forms, and graphics. The B1000 Series are low-end 9- and 24-pin printers that can accommodate various paper widths and print up to 80 columns at 10 characters per inch (cpi). These low-end and midrange printers have an estimated work load of 100 pages per day.

The Facit Documate 3000 is designed for efficient handling of forms, labels, and other media. It features

true demand document capability and a flat platen that readily accepts up to six-part forms and a variety of label materials. Eleven different bar code configurations are built into the Documate's software, providing internal bar code configurations independent of the host computer.

The Facit T-line is a thermal printer family with print speeds of up to 4 inches per second and a 4-inch image area. The T9500 is designed for wide thermal bar code printing at high speeds.

The Facit P6060 is a Hewlett-Packard (HP) Laserjet Series II-compatible laser printer. It uses standard HP-compatible font cartridges and soft fonts.

Although Facit Inc.'s current line of printers is capable of handling most applications, the Company offers the ability to add custom features and functionality to match the special application needs of its customers. Through its Custom Center in Manchester, Facit Inc. modifies such features as firmware, interfaces, drivers, hardware, and aesthetics to match printers to unique applications.

Personal Computers

Facit AB is concentrating its PC marketing activities in five countries: Sweden, Norway, France, the United Kingdom, and Spain. Its models include the S110 (an 8086-based, 10-MHz PC), S210 (a 286-based, 10-MHz PC), S212 (a 286-based, 12-MHz PC), S316SX (a 386-based, 16-MHz PC), S320 (a 386-based, 20-MHz PC), and S325T (a 386-based, 25-MHz PC). Sales in this division are driven by the 286 models, with nearly 66 percent of divisional sales coming from these machines.

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest industry service.

1989 SALES OFFICE LOCATIONS

North America—8
Europe—Not available
Asia/Pacific—Not available
ROW—Not available

MANUFACTURING LOCATIONS

North America

Manchester, New Hampshire
  Printers Europe

Europe

England
  PCs
Sweden
  Printers

SUBSIDIARIES

North America

Facit Inc. (United States)

Europe

Facit Ltd. (United Kingdom)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

Information is not available.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

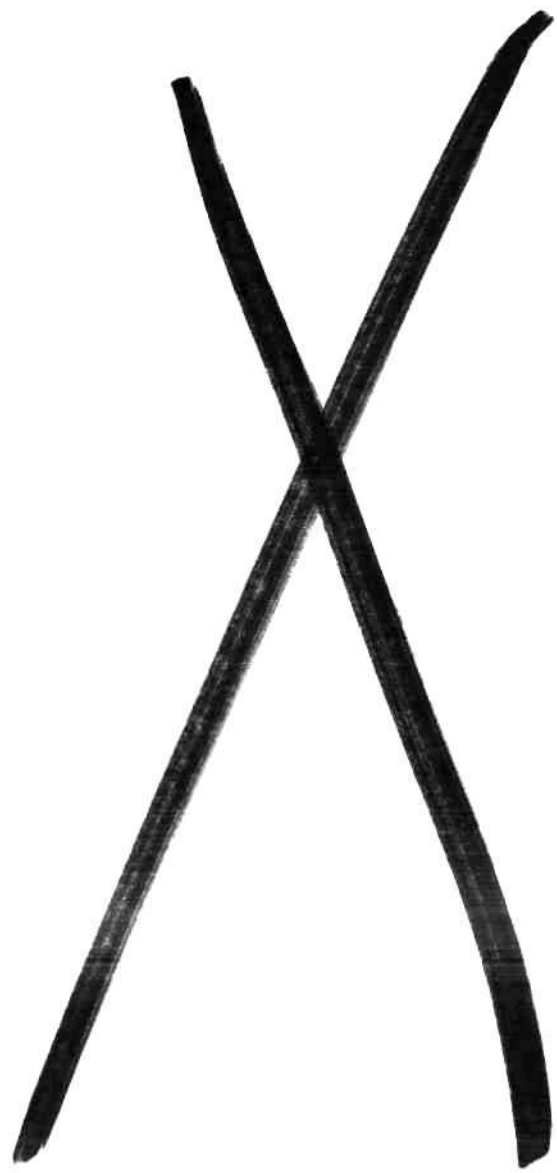
Information is not available.

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Information is not available.



DATAQUEST INCORPORATED
A Subsidiary of A.C. Nielsen Co.
RESEARCH NEWSLETTER

SIS Code: 8.02 Fairchild Camera & Instrument

February 20, 1979

UPDATE ON FAIRCHILD

Summary

Fairchild has reported total 1978 sales of $534 million plus royalties and other income of $16 million for total revenues of $550 million. This is an increase of 17 percent over 1977's $470 million. Net income in 1978 was $24.8 million ($4.48 per share) up sharply from $11.2 million ($2.06 per share) in 1977. This increase comes despite continued difficulties in consumer electronics. Fairchild faces intense competition, especially in semiconductors, but has benefited from a strong market. The following major factors shape the Company's current outlook:

- Inadequate capacity expansion in 1977 caused Fairchild's 1978 semiconductor growth to lag the semiconductor industry, resulting in a loss of market share. This loss was exacerbated by product positioning problems in some of the Company's key product lines.

- Fairchild's major LSI strength—bipolar memories—continues to expand with extremely strong market demand, but faces increased competition from other companies.

- DATAQUEST expects that Fairchild will make MOS a major corporate priority in 1979.

- Fairchild has had successful market entry with its new high-speed Schottky circuits, but market size and acceptance remain in doubt.

- Fairchild is expected to become an important second source of 6800 microprocessors to General Motors, and is also expected to participate in other significant automotive opportunities.

- Fairchild's Government and Industrial Products Group is profitable and should grow about 17 percent this year, while its Test Systems Group is quite profitable and should grow about 56 percent in 1979.

- DATAQUEST expects that Fairchild may withdraw totally from the consumer electronics business in 1979 as this group had losses and write-offs estimated at $18 million in 1978.

- Capital expenditures for 1979 are expected to increase to more than $80 million, up more than 150 percent from $32 million in 1978.

- Part ownership of Magnuson (35 percent) and a joint venture with GEC in England appear to be progressing satisfactorily.

Estimated Revenues

DATAQUEST's revenue estimates for 1976 through 1979 for each of Fairchild's operating groups are presented in Table 1. Total revenues in 1978 were $550 million, up 17 percent from $470 million in 1977. We expect Fairchild's 1979 revenues to grow about 12 percent to $615 million. This growth is reasonable in view of declining revenues from its consumer operations. Estimated consumer revenues were $59 million in 1977, $36 million in 1978, and are expected to be about $5 million in 1979. Fairchild's growth in 1979 should come from systems, which is expected to grow about 56 percent to $125 million, and semiconductors, which is expected to grow about 14 percent to $434 million.

DATAQUEST expects Fairchild's first quarter 1979 revenues to decline about $15 million from the fourth quarter of 1978 because of lower consumer product revenues and fewer shipments of test systems. The latter group experienced a shipping bulge in the fourth quarter and is now adding three new systems service centers. Fairchild is allocating some of its first quarter test system production for the equipping of these service centers. This will result in higher manufacturing costs with no commensurate increase in first quarter shipments and revenues.

Royalties and other income provided Fairchild revenue of about $16 million in 1978. We believe that about $6 million came from interest income, sale of Cray Research stock, and special one-time technology licensing. About $10 million, therefore, represents a recurring but decreasing base of patent royalty income.

Semiconductors are the largest product group in Fairchild. DATAQUEST estimates of Fairchild's revenues from semiconductors are shown in Table 2. Fairchild divides its Semiconductor Group into two areas, components and LSI (large scale integration). Generally, small chips are included in the Components Group and larger chips in the LSI Group. Because of changes in reporting from year to year, comparisons for these groups over time are hazardous. During 1978, some product groups were moved from LSI to Components. Thus, year-to-year growth in the digital IC area is not as high as the numbers imply and the LSI numbers do not reflect all growth in the bipolar memory area as some of the products are in the Components Group.

Table 1

Fairchild Camera and Instrument Corporation

ESTIMATED REVENUES 1976-1979

(Dollars in Millions)

	1976	1977	1978	1979
Semiconductor	$307	$323	$380	$434
Government and Industrial	42	49	57	67
Government	-	-	36	43
Industrial	-	-	21	24
Test Systems	23	43	80	125
Consumer	104	59	36	5
Games	10	29	18	-
Watches	69	30	18	-
Components[1]	25	-	-	-
Intracompany	(33)	(14)	(19)	(25)
Royalties & Licensing[2]	7	10	16	9
Total Revenues	$450	$470	$550	$615
Net Profit After Tax (Percent)	2.77%	2.37%	4.50%	5.00%
Net Income	$12.46	$11.16	$24.76	$30.75
Earnings Per Share (In Dollars)	$ 2.41	$ 2.06	$ 4.48	$ 5.55

[1]This figure, primarily Optoelectronics, is included in Semiconductor after 1976.

[2]In 1978, approximately $10 million of the total was royalty income.

Source: DATAQUEST, Inc.
February 1979

Table 2

Fairchild Camera and Instrument Corporation

ESTIMATED SEMICONDUCTOR REVENUES 1976-1979[1]

(Dollars in Millions)

	1976	1977	1978	1979
Components				
Digital ICs	$ 70	$ 78	$ 92	$102
Linear	63	52	61	68
Discrete	78	79	87	95
Hybrids	-	-	20	25
Optoelectronics	25	16	18	20
Total Components	$236	$225	$278	$310
LSI				
Bipolar	$ 36	$ 40	$ 51	$ 63
MOS	35	58	51	61
Total LSI	$ 71	$ 98	$102	$124
Total Semiconductor	$307	$323	$380	$434

[1]During 1978, some product groups were moved from LSI to Components. Thus, year-to-year numbers are not comparable.

Source: DATAQUEST, Inc.
February 1979

Margin Analysis

In 1978, Fairchild earned $24.8 million after taxes ($4.48 per share) for an after-tax margin of 4.5 percent. Its pretax earnings were $40.6 million, which includes an estimated $18 million of operating losses and write-offs in its consumer operations. Partially offsetting the consumer losses were some one-time income items from the sale of Cray Research stock, patent settlements with Thompson CSF, and possibly other items. Discounting the heavy losses in consumer operations, Fairchild's operating margins for the other operations are estimated by DATAQUEST to be: Semiconductors about 8 percent, Government about 10 percent, Industrial Products about 15 percent, and Test Systems about 20 percent.

On a normalized basis, excluding nonrecurring items such as losses from consumer operations, the sale of Cray Research stock, and individual patent settlements, DATAQUEST estimates that Fairchild could have earned about $52 million net profit before taxes in 1978, or $31.2 million net profit after taxes ($5.65 per share). True earnings computations are never as simplistic as the above, but the analysis indicates Fairchild's ability to be reasonably profitable in its basic businesses of semiconductors, systems, government, and industrial. We believe that these basic and continuing operations earned about $1.40 per share in the fourth quarter of 1978, after excluding year-end adjustments as discussed above, versus the $1.09 per share reported.

Realizing that in 1979 Fairchild must invest substantially in its basic semiconductor business, and assuming a 13 percent growth in U.S semiconductor consumption, DATAQUEST estimates that Fairchild can earn at least 5 percent net profit after taxes on revenues of about $615 million for a net after-tax profit of at least $30.75 million ($5.55 per share). We believe the above numbers can be achieved, despite a substantial investment in MOS and Test Systems in 1979.

Semiconductor Groups

In 1978, the Semiconductor Groups at Fairchild grew by about $57 million or 17.6 percent. This performance is somewhat less than U.S. semiconductor consumption, which grew about 20 percent; therefore, the Company lost market share in 1978. In integrated circuits (ICs), it slipped from third to fifth in dollar volume among U.S. suppliers, taking a place behind Texas Instruments, Motorola, National, and Intel.

Fairchild's growth in 1978 was limited by a lack of wafer fabrication capacity at the start of the year. This problem has been remedied by new capacity coming on stream, and 1979 revenue growth for the Semiconductor Groups is expected to be about $54 million or 14.2 percent, which is slightly above the expected growth in U.S. semiconductor consumption of 13.1 percent. Achieving this growth is closely related to Fairchild's ability to improve its position in MOS.

Both Fairchild's competitive position in semiconductors and its long-term growth are constrained by its current product mix. This product positioning problem can be expected to remain for some time. Although over two-thirds of the semiconductor revenues are ICs, a number of major revenue segments are in product areas that are currently experiencing slow growth, or are expected to slow in the near future. Specifically, these include small signal transistors and diodes, digital bipolar integrated circuits (SSI - small scale integration), some linear circuits, and some MOS products. The Company's position in MOS (eleventh among U.S. producers) was a weakness in 1978 and is the major corporate challenge in 1979.

To support both future growth and profits, Fairchild needs to find growth areas in which it can gain a significant market share and then use these growth areas to strengthen its competitive position. Because of its general weakness in MOS, it must invest heavily in this area and find those market niches where it can excel. Fairchild does have several areas of promise, including bipolar memory, CCD devices, low-power Schottky, CMOS, ECL, hybrids, and others.

Digital ICs

The digital bipolar market grew rapidly in 1978, but it is expected to have much slower growth rates in the future as its markets are eroded by incursions from MOS LSI. Thus, we believe Fairchild's position in TTL SSI has only a limited future. However, Fairchild is well positioned within that segment to take advantage of the growing low-power Schottky TTL market. While this market is still dominated by Texas Instruments, Fairchild has a significant market share.

Recently, Fairchild introduced a new line of fast Schottky TTL devices. These devices, with the acronym FAST (Fairchild Advanced Schottky TTL), are designed to compete in the market niche between TTL and very fast ECL devices. They have improved performance over the older Schottky TTL. Because of Fairchild's product announcements, a similar line due to be introduced by Texas Instruments was delayed. These circuits were designed at Fairchild's facility in England, with initial production at its facility in Portland, Maine.

Initial market acceptance has been enthusiastic, but Fairchild will have to fill out the line with a full range of products. It is still too early to estimate total market size and acceptance. However, the movement of minicomputer manufacturers to faster logic may open some large potential markets.

Fairchild has become increasingly competitive in ECL (see DATAQUEST's newsletter dated August 3, 1978, "The Domestic ECL Market"). Overall in ECL, Fairchild is second in production only to Motorola. There are no other major merchant competitors at this time, although ECL is produced by Signetics and will probably be introduced in 1979 by National Semiconductor. Fairchild has the

largest market share of ECL memory. Its 100K series devices, with subnanosecond gate delays, is providing competition to Motorola. Fairchild's ECL gate array, being the only one currently in production, is proving popular with computer manufacturers. Although other companies have more complex devices in the process of being designed, the availability of the Fairchild part has given it a significant market advantage.

Linear and Discrete

Fairchild's linear product line suffers from a number of older products. As a result, the Company has been losing market share in this product area for the past several years.

Fairchild suffers in the discrete semiconductor market from a lack of strong product focus and the generally slow (or negative) market growth for small signal devices. By generally holding margins in discrete, Fairchild can use it as a "cash cow" to finance investment in newer high-growth areas. As a result of this strategy, the Company has been gradually losing market share in discretes.

Hybrids

The Automotive/Hybrid Division makes devices for the automotive, consumer, industrial, and telecommunications industries. The majority of its production is automotive ignition systems; Fairchild recently shipped its ten millionth ignition module to General Motors. Because of the increase in automotive electronics and the general growth of hybrid devices in other areas, this division is expected to grow rapidly. The introduction of solid state engine control systems in automobiles in 1980 should allow rapid expansion. Sales in 1978 were about $20 million for this division and are expected to exceed $25 million in 1979.

DATAQUEST believes Fairchild has been selected by General Motors to second source the 6800 type microprocessor for GM's engine control system. Other substantial automotive revenues could result for 8K PROMs, as automobile manufacturers are planning to use PROMs in odometers and engine control systems. In the odometer application, a PROM fuse could be blown every 10 miles, thereby yielding a tamperproof odometer.

Fairchild has licensed Bosch in West Germany and Femsa in Spain to produce hybrids for automobiles. The Company gets royalties as well as device sales, and in this way has penetrated Ford Europe, Opel, and Volkswagen.

Optoelectronics

Fairchild's Optoelectronic Division is prospering despite the loss of significant captive business as its consumer operations decline. The Company has become a major producer of liquid crystal displays (LCDs), especially for the large digits used in industrial displays. LCD revenues were about $5 million in 1978 and are expected to double in 1979.

Bipolar

Fairchild is the leading producer of bipolar RAMs and has dominated this market for several years, but it now has competition from Signetics and Motorola. In addition, National Semiconductor is believed to be poised to enter the market in 1979, and MOS fast static RAMs available from Intel affect the market for bipolar RAMs. In 1978, Motorola and Signetics provided price competition in the bipolar RAM market in their bids to increase market share. Prices for 1K RAMs fell to about $3.00, resulting in decreased margins for Fairchild in this area. However, we note recent activity by Signetics appears to emphasize bipolar PROMs over bipolar RAMs.

Demand for bipolar RAMs has exceeded available supply, a condition that should last through part of 1979. We perceive that Fairchild has a cost advantage in bipolar RAMs and that competitive pressures have eased in recent months. Fairchild's 4K bipolar RAMs should be available in production volumes in 1979.

In bipolar PROMs, Fairchild shipped an estimated $15 million in 1978. This is an area where Signetics has a clear market advantage by virtue of being the only company shipping 16K bipolar PROMs—an advantage that it has used as a lever to increase its penetration in bipolar memory. Fairchild must meet this competition in 1979 to maintain its market leadership.

Fairchild is still the only major producer of devices with isoplanar technology—a technology that enables it to design extremely small die sizes. We understand that its 1K bipolar RAM is 6,000 square mils, the smallest on the market. As the market moves to 4K and 16K bipolar RAMs, this ability should be of increasing importance to Fairchild. We estimate that this process will account for 50 percent of its bipolar digital revenues by 1980.

The 9440 16-bit I^3L microprocessor has been sampled to more than 100 accounts. While this microprocessor may miss the mainstream 16-bit market, it should nonetheless provide good business for Fairchild. The microprocessor can compete effectively at the board or system level in specific applications and should prove popular with the military market. Fairchild's board and system products incorporating the 9440 are referred to as its Microflame products.

MOS

In MOS, Fairchild suffers from a lack of scale and a limited investment in design personnel. The inability to become a major MOS producer has been a significant problem with the Company for several years. However, rapid market growth in 1979 and industry undercapacity for MOS could provide the Company with time to improve its product and market position and attain improved economies of scale. We believe the Company will make a significant effort with substantial investment in MOS in 1979.

Fairchild and TI are the only major producers of charge coupled devices (CCDs). While market acceptance of this technology has been

slower than previously anticipated, it is accelerating; the use of these devices for digital and optical applications can provide good future growth. Storage Technology and Memorex, among others, have designed CCDs into new memory systems that buffer large amounts of data between disc memory and main memory. The Company's 64K CCD has a $15 million backlog and production is capacity limited. Fairchild must get its CCD production down the learning curve quickly or some of the CCD opportunities will switch to alternate technologies. We believe that Fairchild is developing a large CCD memory system for a mainframe computer manufacturer.

Fairchild has a good market position in digital CMOS and trails only Motorola and RCA in this market. It is estimated that the Company shipped $12 million of CMOS in 1978.

Test Systems Group

The Test Systems Group was the fastest growing area in Fairchild in 1978 and is estimated by DATAQUEST to be the most profitable. Table 3 presents DATAQUEST's estimates of Test Systems Group revenues by major product line. Estimated revenues in 1978 were about $80 million and pretax profits are estimated to be in excess of $16 million. The group is expected to show substantial growth in 1979, with estimated revenues of about $125 million.

Fairchild is setting up service centers for its test systems, with six centers in the United States and three international centers in Munich, Hong Kong, and Singapore. While equipping these service centers will have a negative short-term effect, it will help place the Company in a good long-range position as less knowledgeable users begin to acquire test equipment.

The Test Systems Group is currently the largest manufacturer of semiconductor test equipment. Its Sentry testers have been extremely popular, with 1978 sales of about $55 million. The Sentry was designed several years ago and will be at an increasing competitive disadvantage as time progresses. However, the only major competitor that is positioned to take advantage of this is Tektronix. Fairchild must redesign its testers and revamp its product line in 1979 and 1980 to maintain its market share. This may have some impact on group profits.

The Company has recently introduced the Sentinel test system. This is a high-speed, high-throughput, low-priced LSI tester. The Sentinel system is aimed at Fairchild's current Sentry customers. We believe that this system represents a stopgap attempt by Fairchild to protect its customer base against smaller, lower-cost systems—a strategy that appears successful. We also believe that the Company already has a $10 million order backlog for the Sentinel at an average selling price of $150,000 per unit.

Table 3

Fairchild Camera and Instrument Corporation

ESTIMATED TEST SYSTEMS GROUP REVENUES 1976-1979

(Dollars in Millions)

Product Lines	1976	1977	1978	1979
Sentry	$20	$36	$55	$ 70
Sentinel	0	0	0	15
Xincom	1	5	10	15
Faultfinders and Testline[1]	0	0	14	25
Other Instruments[2]	2	2	1	0
Total Group Revenues	$23	$43	$80	$125

[1]Faultfinders and Testline were purchased in 1978. Estimated revenues for the full year are $19 million.

[2]Includes instruments such as digital panel meters and other bench-top testers. The last of these product lines was sold in 1978.

Source: DATAQUEST, Inc.
February 1979

Xincom had estimated revenues of more than $10 million in 1978, and its memory testers continue to be popular. In 1979, it is expected to introduce a high speed (25 mHz) memory tester to meet the rapidly growing market for fast MOS memories. In addition, Xincom is expected to introduce a tester for magnetic bubble memories. Fairchild is also expected to introduce a linear tester and an ECL tester in 1979 in a move to broaden and expand the Company's market position.

In 1978, the Company acquired two small test equipment manufacturers—Faultfinders in Latham, New York, and Testline in Titusville, Florida. Both of these groups make testers for in-circuit printed circuit board testers. These companies are expected to provide combined revenues of about $25 million in 1979.

Fairchild's commitment to this business is indicated by its capacity plans for 1979. Faultfinders will add 150,000 square feet, Testline will add 60,000 square feet, and Systems will add 60,000 square feet to support the Sentry product line.

Government and Industrial Products Group

The Government and Industrial Products Group has been consistently profitable for Fairchild for the last several years. The Government operation makes aerial reconnaissance cameras and electronic countermeasures equipment. A cockpit video camera for the

military has generated considerable interest. The system uses Fairchild's 400-mil-square CCD die. Sales in 1978 are estimated at $35 million with 10 percent operating profit margin.

The Industrial Products Division makes rear-screen slide projectors, crash recorders, and cockpit voice recorders. A new weight and balance system for aircraft cargo loading is proving popular. DATAQUEST estimates that the Industrial Products Division had sales in 1978 of about $21 million, with an operating profit margin in the 15 percent range.

Consumer Products Group

The Consumer Products Group revenues declined in 1978 to an estimated $36 million from an estimated $59 million in 1977 and $79 million in 1976. At the end of 1978, Fairchild decided to withdraw from the digital watch business, and 1978 results include the write-offs associated with withdrawal. DATAQUEST believes that in 1978 the Consumer Products Group had an operating loss of $12 million plus an additional $6 million write-off for the Watch Division.

It is estimated that 1978 watch sales were about $18 million and that game sales were about $18 million. The Company has been hampered by a lack of new products, and its costs and prices are not competitive with other products on the market. Short term, we believe the games business will continue at a minimum level, with no new game consoles but continued sales of cartridges for an inventory workdown. At the appropriate time, we expect Fairchild to withdraw from the game business. The consumer business should not have a significant effect on Fairchild henceforth.

Capacity Expansion

Fairchild made moves to significantly expand its semiconductor capacity in 1978. Total capital expenditures for 1978 are estimated at $32 million and are believed to be budgeted at about $80 million for 1979. Semiconductor expansion in 1978 included a new 4-inch NMOS fabrication module in South San Jose, California, a 4-inch bipolar fabrication module for its FAST product family in Portland, Maine, and an update of its facility in Wappingers Falls, New York.

Joint Venture

In 1978, Fairchild concluded a joint venture agreement with the General Electric Company in England (no connection with General Electric in the United States) to establish a semiconductor production facility in the United Kingdom. The British Government will supply half the initial funding of $38 million. This venture will provide Fairchild with production facilities and market access in Europe as well as capital funds, as the British Government is providing Fairchild with funds for some of the Company's future capacity expansion. This deal is not dissimilar in that respect to arrangements made by Motorola and National Semiconductor in France.

Magnuson Industries

Fairchild now owns about 35 percent of Magnuson. Its initial investment was $4.5 million, part of which was convertible bonds. Magnuson is currently shipping computers and rapidly building production. However, the recent introduction by IBM of Models 4331 and 4341 may put some price pressure on plug-compatible manufacturers like Magnuson, but it is too early to determine the extent of this pressure.

James F. Riley
Frederick L. Zieber
Daniel L. Klesken

DATAQUEST INCORPORATED RESEARCH NEWSLETTER

SIS Code: 8.02 Fairchild Camera and Instrument March 20, 1978

UPDATE ON FAIRCHILD

Summary

Fairchild reported total revenues of $470 million in 1977, up from $450 million in 1976. Net income in 1977 was approximately $11.2 million, down slightly from $12.5 million the previous year. This income was maintained despite serious difficulties in consumer electronics. Although those problems are past, the Company still faces intense competition, especially in semiconductors. The following major considerations will shape Fairchild's future:

- Fairchild lost market share in semiconductors in 1977 due to end-market loss in calculator and watch components and to product positioning problems in some of its key product lines. We expect these factors will maintain Fairchild's growth in 1978 at a slower rate than prior to 1977.

- Fairchild's major LSI strength, bipolar memories, faces intense new competition from other companies as well as from MOS products.

- DATAQUEST perceives that the MOS LSI Group, unprofitable in 1977, needs growth and profitability if Fairchild is to continue to be a strong supplier in the future. Startup costs in San Jose for 16K RAMs, and 64K CCDs contributed to MOS LSI losses in 1977.

- DATAQUEST perceives that Fairchild has limited the size and impact of its consumer electronics operations thereby freeing management to focus its attention on its basic component business.

- The Watch Division has overcome the tremendous losses of 1977 and is currently profitable, with excellent growth expected in 1978.

- The Instrumentation and Systems Group continues to have rapid growth and excellent profits. DATAQUEST estimates 1978 revenues at approximately $70 million.

- The growth and performance of the Federal Systems Group and Industrial Products Division remain steady, if not spectacular. Increased collection efforts on royalties and technical licensing may increase revenues this year. New products will have to replace profit losses from declining royalty incomes as they are phased out after 1979.

- Fairchild's capital expenditures were about $25 million in 1977. We believe the Company will duplicate this amount in 1978, but with the major difference that none of these expenditures will go toward new buildings.

- Fairchild has actively considered takeovers, especially in the area of minicomputers or related EDP systems. As this newsletter goes to press we understand that Fairchild is negotiating for a 30 percent interest at $4 million of Magnuson Industries in Santa Clara, California. Magnuson is a new company that manufactures plug-to-plug compatible with the IBM 138 and 148.

- We believe management is not favorably inclined to encourage merger action. Nevertheless, it is DATAQUEST's understanding that Fairchild had tentative discussions on joint operations with a major international corporation which did not progress further.

- For 1978, DATAQUEST expects Fairchild revenues will grow about 16 percent to about $545 million. Because profit margins have been slim, the Company has a potential to rapidly increase profits if business remains good.

Estimated Revenues

Estimated revenues by division for Fairchild Camera and Instrument Corporation are shown in Table 1. DATAQUEST estimates that Fairchild's total revenues will be about $545 million in 1978 with growth expected in all major groups. In 1977, major growth areas were in the Systems Group and in the Federal Systems Group and Industrial Products Division. Slower growth was experienced in semiconductors, and consumer electronic products experienced a major decline in watch sales that was instrumental in limiting corporate growth. In 1978, DATAQUEST expects excellent revenue growth from the Systems Group, with other revenue segments expected to show more moderate growth.

The largest product group in Fairchild is semiconductors. Estimated revenues for the Components and Large Scale Integration Groups are shown in Table 2. Because of changes in bases, year-to-year comparisons for this breakdown are hazardous. In particular, Linear Products in 1976 included substantial hybrid components from the Automotive Products Division. Revenues in the optoelectronics area have declined in 1977 due partly to problems in the Watch Products Division, which has seen a shift to LCD displays from LED displays.

Margin Analysis

Fairchild's 1977 pretax profits of $18.3 million were heavily impacted by losses from the Consumer Products Group. DATAQUEST esti-

Table 1

Fairchild Camera and Instrument Corporation

ESTIMATED REVENUES
(Dollars in Millions)

	1976	1977	1978
Semiconductor	$307	$325	$360
Government & Industrial	42	48	60
Systems	23	43	70
Consumer	104	-	-
Games	10	30	30
Watches	69	30	30
Components[1]	25	-	-
Intracompany	(33)	(16)	(15)
Royalties & Licensing	7	10	10
Total Corporation	$450	$470	$545

[1]This figure representing primarily optoelectronics is included in the semiconductor number for 1977.

Source: DATAQUEST, Inc.
March 1978

Table 2

Fairchild Camera and Instrument Corporation

ESTIMATED SEMICONDUCTOR REVENUES 1976-78
(Dollars in Millions)

Components	1976	1977	1978
Digital ICs	$ 70	$ 78	$ 85
Linear	63	52	61
Discrete	78	82	82
Optoelectronics	25	16	16
Total Components	$236	$228	$246
LSI			
Bipolar	$ 36	$ 42	$ 51
MOS	35	55	65
Total LSI	$ 71	$ 97	$116
Total Semiconductor	$307	$325	$360

Source: DATAQUEST, Inc.
March 1978

mates that last year Fairchild lost approximately $25 million on electronic watches. This may have been ameliorated somewhat by profits from the sales of video games and by reserves taken prior to last year.

DATAQUEST estimates that year-end pretax margins in games were running about 8 percent; thus, estimated profits for this division are about $2.5 million. The Government and Industiral Product Groups had estimated margins of about 12 percent (10 percent for Government Products), for estimated revenues of $5.2 million. We feel the Systems Group had the highest margin in the Company, ranging between 20 and 25 percent, or approximately $9 million. Corporate items affecting pretax profits include intracompany profits of about $1 million and interest of about $7.2 million.

This analysis indicates that profits in the semiconductor area are approximately $34.4 million, or somewhat above 10 percent.

Due to the wide possible flucuations, it is difficult to estimate profits for 1978. This is further confused by changes in the corporate structure during 1977. However, several points can be made:

- Profits in the semiconductor group are better than generally realized, indicating a healthy business outlook for 1978. However, it must be remembered that semiconductor profits include approximately $10.3 million from royalties and licensing. Nevertheless, these margins indicate that this area has the operating margins to support investments in new product areas that will have potential long run benefits.

- If major problems do not recur in any group or division, reasonable profit margins for 1978 could show significant upward leverage in total corporate profits. Fairchild has the potential to increase profits rapidly and show a tremendous increase in earnings per share.

- Despite the elimination of heavy losses in the Watch Division by the end of 1977, total corporate margins did not improve commensurately as the year progressed. Indeed, some of the increase in margins in the fourth quarter may be attributed to Consumer Products. In short, overall corporate margins were still low at year end 1977 despite a breakeven in the Watch Division.

Profits for Fairchild could benefit from an increased drive by the Company to increase royalty and licensing revenues in 1978. We believe that Fairchild will actively pursue collection on its patents and will also actively pursue technical exchanges and licensing in 1978. For example, Fairchild has recently closed an agreement with Tungsram in Hungary to provide them with T^2L assembly technology.

Fairchild is making a major effort on previous nonroyalty-paying semiconductor companies, including foreign corporations, especially in Japan.

Semiconductor Groups

In 1978, the Semiconductor Groups in Fairchild should not be hampered by the very heavy losses in consumer electronics. DATAQUEST believes Fairchild will be much more aggressive in the semiconductor market this year than it has been in the recent past, and this may catch some competitors unaware.

Fairchild's semiconductor revenues are approximately one-third discrete devices and two-thirds integrated circuits. Despite the preponderance of integrated circuits in its revenues, the Company currently has some product positioning problems in semiconductors. A number of major revenue segments are in product areas currently experiencing slow growth. These include small signal transistors and diodes, digital bipolar integrated circuits, some linear circuits, and some MOS products. The discrete devices are primarily small signal transistors and diodes that make up the majority of the discrete devices. This market segment has been experiencing small growth for several years due to market incursion by ICs, and limited growth is expected in the future.

The Digital IC Group consists primarily of small scale integration (SSI) TTL integrated circuits, as well as some ECL parts. The SSI TTL market is being replaced by bipolar and MOS large scale integration (LSI) devices, which are more economical, thereby giving this market segment slower growth. The Company does, however, have a good market position—second to Texas Instruments—in Schottky TTL.

The overall linear market has been experiencing rapid growth. Fairchild is well positioned here, with the exception of some older operational amplifiers currently being phased out in many designs. The extent of these products makes rapid growth in this market segment difficult for the Company.

Fairchild's strongest product segment is in bipolar memory where it has dominated the bipolar RAM market for several years. Fairchild's bipolar memory shipments, about $39 million, account for nearly all bipolar LSI revenues. In 1977, this market saw intense competition from Motorola, Signetics, and Texas Instruments. It is expected that National Semiconductor will also enter this market more competitively in 1978. We believe these companies have been gaining market share with competitive pricing. Although Fairchild is still the dominant supplier of bipolar memory, the renewed competitive pressure from other companies has hurt both growth and profits. Additionally, the bipolar memory market has been impacted by the advent of fast MOS memories, particularly the 2147 fast 4K static RAM and the 2115 fast 1K static RAM manufactured by Intel Corporation. These MOS devices are usurping the market segment for slower devices. However, the bipolar memory area and other associated bipolar LSI parts remain as the most promising areas in the Semiconductor Group.

Fairchild lost some of its momentum last year in bipolar memory due to processing and yield problems. However, we feel the Company recovered most of this momentum in the last half of 1977, particularly in 1K static RAMs. The Company has also made a heavily concentrated effort to introduce the 4K static bipolar RAM, and we believe this part is proving popular with many users. Additionally, the Company made a major effort to penetrate the PROM market.

Fairchild has been quietly updating its wafer fabrication modules and, at this time, all of its bipolar memory is fabricated using projection alignment masking. For the entire Company, about one-third of production currently uses projection alignment.

A new product area for Fairchild is its 16-bit bipolar microprocessor, the 9440, which will be marketed both as a component and as a board product. The Company currently is committing considerable investment to the development of peripheral products, software, and other development in marketing aids. The 9440 microprocessor is fabricated using I^2L technology. Currently, a fabrication area in Mountain View, California, has been converted to I^2L to support this product. These products will be marketed under the trade name µflame. They will face stiff competition from other 16-bit devices and systems by General Instrument, Intel, NEC, Texas Instruments, and Zilog, currently on the marketplace or being introduced. One competitive advantage, however, is the ability of the Fairchild device to utilize existing software.

Fairchild still has a limited product line in MOS devices with a definite lack of breadth and depth. Out of an estimated $55 million in MOS shipments in 1977, about $22 million are believed to be in MOS memory and about about $21 million in CMOS logic. In the latter market, Fairchild is third in the market behind Motorola and RCA. Fairchild is a major manufacturer of 1K static MOS RAMs, but these products will soon be replaced by newer 4K static MOS RAMs. The MOS segment underscores the need for the Company to have a number of product introductions in major new product areas where it can gain significant market share. We understand the Company currently is sampling 16K dynamic RAMs, 4K static RAMs, and the 6800 microprocessor.

We believe Fairchild is de-emphasizing production of 4K dynamic RAMs in favor of more profitable business for the 2102 1K static RAM. In that market of about 2.3 million units per month, Fairchild has a significant market share.

Fairchild currently has a lead position in the development and production of charge-coupled devices (CCDs). If this market develops, it will give the Company a badly needed leadership in a growth area. However, significant growth is not expected until 1979 for this market.

The Imaging Systems Department of the Government Products Division utilizes CCD devices for its aerial cameras. This group had

sales last year of between $4 million and $5 million. These CCD devices for optical uses are quite large. We are aware of one chip measuring approximately 166,000 square mils. In this market, Fairchild has a definite technical lead.

The Company plans to use its South San Jose, California, facility as the fabrication module to spearhead its penetration into state-of-the-art technology MOS products. Initially, this includes 16K dynamic RAMs, with later production of 64K CCD memories, 64K dynamic RAMs, and 256K CCD memory devices as time progresses.

These product positions underscore the fact that Fairchild lost market share in semiconductors in 1977; this problem may not be rectified in 1978. Nevertheless, a healthy semiconductor market (as forecast by DATAQUEST) indicates that this group should have moderate growth. This beneficial market growth should buy the Company time to bring solutions to its problem.

Instrumentation and Systems Group

The Instrumentation and Systems Group continues to show excellent growth. DATAQUEST estimates that 1977 revenues were approximately $43 million. Sentry Testers accounted for about $35 million and XINCOM Testers had estimated revenues of about $5 million. All other areas had total revenues of about $2 million. About 30 percent of group revenues were to overseas customers, roughly split between Japan and the rest of the world.

The Microsystems Division has been folded back into the LSI Division of the Components Group at a write-off cost of about $1 million. The Group has also abandoned its digital appliance control business, with Amana and others, at a cost of about $1 million.

The Systems Group is extremely profitable. We believe that pretax profits across the Division have been about 25 percent including write-offs. Because the Division has excellent market share, with near dominance of Sentry Testers (for general purpose LSI devices), we believe margins will continue in 1978.

DATAQUEST expects the Division to experience substantial revenue increases in 1978 over 1977. The Division has already booked a large number of Sentry VII and Sentry VIII Testers for shipment to Japan and we understand that IBM has placed a major order exceeding $8 million for Sentry VIIIs. With this impetus, it is expected that the Division will have revenues of about $70 million in 1978 of which $60 million will be Sentry type machines.

The Systems Division is expected to introduce a linear testing machine in 1978 and perhaps also a machine to test printed circuit boards. We believe the initial product will be an adaptation of the Sentry Testers. It is our understanding the Fairchild is working closely with Intel to develop testing capability for telecommunications and other linear products.

The introduction of memory board products and systems is not expected to occur at least until the Company has production volumes of 16K dynamic MOS RAMs.

Federal Systems Group and Industrial Products Division

These two groups have been consistently profitable for Fairchild over the last several years. The Industrial Products Division makes rear screen slide projectors, crash recorders, cockpit voice recorders, and weight and balance systems for aircraft. DATAQUEST estimates that the Industrial Products Division has a pretax profit in the 13-15 percent range.

The Federal Systems Group makes aerial reconnaissance cameras and electronic counter measure equipment. Much of the work is classified. Additionally, the group manufactures special analog-to-digital equipment priced in the $10,000-$15,000 range. Because the revenues are from the Government, the group is technically limited to 10 percent net profit before taxes.

Consumer Products Group

The Consumer Products Group has been divided into two divisions—watches and games. We understand that by management edict, total consumer product revenues will likely be aimed at approaching a level of 10 percent of total Company levels or less. However, this may not be possible until 1979.

Watch Division

In 1977, Fairchild lost a substantial amount of money from its electronic watch business, an estimated $25 million. Its watch problems have resulted from a number of causes, particularly a precipitous price decrease initiated by Texas Instruments, substantial inventory problems after Christmas 1976, and changes in consumer attitude from LED watches to LCD watches. The inventory problems resulted both from too much segmentation of its product mix and a mismatch with consumer demand.

We believe that these problems are behind Fairchild at this time, and that the Company currently holds a reasonable market position in the jewelry departments of mass merchandisers. It is believed that the watch business is currently profitable, but the operations should be observed very closely for problems of inventory control and write-offs.

Games Division

In 1977, Fairchild's revenues from games were approximately $30 million. In 1978 the Company has the potential to raise games revenues substantially, but DATAQUEST believes that to limit risks, revenues will be held to $30 million or less. It is our estimate that the Games Division had a profit before taxes in the 7 to 9 percent range.

There are currently 13 cartridges available for the Channel F video game, with seven more due in 1978. We understand further that there will be two new products this year in the games area. One of these will include a shift for the game program from the current cartridge to a device that resembles an IC being inserted in its carrier. This should have a substantial effect upon costs. Secondly, a lower-cost control module is expected to be introduced. It is our understanding that Fairchild is currently buying 4K RAMs for its Games Division from other vendors. In 1978, we estimate that Fairchild should ship about four cartridges for every game. Fairchild currently has marketing arrangements with eight firms in Europe, which purchase unassembled kits, assemble the components into finished games, and market them. Substantial revenue increases could probably be generated if Fairchild takes that added value in-house.

Fairchild is being extremely cautious with its investments in this area after its problems in watches last year. The withholding of needed advertising and product development dollars may have an adverse long term effect. These considerations, plus the volatility in inventory and consumer preference, make consumer electronics a sensitive area for the Company.

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DATAQUEST INCORPORATED RESEARCH NEWSLETTER

SIS Code: 8.02 Fairchild

June 24, 1977

UPDATE ON FAIRCHILD

Summary

Fairchild's semiconductor shipments are forecast by DATAQUEST to be up about 19 percent in 1977. For the entire company, three out of four division are expected to report good increases in both sales and profits. These gains are offset by decreased sales and operating losses (estimated at $7 to $8 million in the first quarter) by the Time Products Division of the Consumer Products Group. Fluctuations in Fairchild's profits in the past as well as in the future continue to be determined by the fortunes of the Consumer Products Group. Fairchild can achieve better than last year's earnings if its profit improvement programs in the Consumer Products Group are successful. However, DATAQUEST anticipates that corporate second quarter 1977 profits will be down from the first quarter 1977 on slightly increased revenues.

DATAQUEST's major conclusions on Fairchild are:

- The Consumer Products Group is estimated to have lost money at the rate of about $2.5 million a month in the first quarter. Losses were reduced somewhat in the second quarter. Management plans are for Consumer Products to be profitable in the fourth quarter.

- The remainder of the corporation is believed to have improved its profit margins in 1977. In the first quarter of 1977, DATAQUEST estimates that Fairchild (excluding the Consumer Products Group) shipped $103 million with a pretax profit of $12 million; this is a substantial improvement over 1976.

- All of the semiconductor groups are profitable.

- Fairchild has achieved an impressive market position in LSI testing, including both random access memories (RAMs) and microprocessors.

- The Instrumentation and Systems Group is expected to double its revenues in 1977 to $50 million from revenues of $23 million in 1976. DATAQUEST estimates net profits before taxes (NPBT) for this group of about 20 percent.

Corporate Analysis

DATAQUEST estimates of revenues by each of Fairchild's major business segments are presented in Table 1.

Table 1

Fairchild Camera and Instrument
ESTIMATED REVENUES
(Dollars in Millions)

Division	1975	Percent Change 1975-1976	1976	Percent Change 1976-1977	1977
Semiconductor	$236	30.1%	$307	18.9%	$365
Government and Industrial	35	20.0%	42	19.0%	50
Systems	21	9.5%	23	117.4%	50
Consumer	9	1,055.6%	104 (1)	-42.3%	60 (1)
Intracompany	(10)	230.0%	(33)	-39.4%	(20)
Net Sales	$291	52.2%	$443	14.0%	$505
Royalties	8	-12.5%	7	-14.3%	6
Total Revenues	$299	50.5%	$450	13.6%	$511

(1) 1976 Revenues for the Consumer Products Group include about $25 million in components, including optoelectronics, watch modules and chips. In 1977, these revenues are included in the Semiconductor Groups due to organizational changes at Fairchild. 1977 revenues for the Consumer Group include only time products and video games.

Source: DATAQUEST, Inc.
June 1977

Semiconductor Groups

Revenues for the Semiconductor Groups are expected to increase about 19 percent in 1977 over revenues of 1976. All five semiconductor divisions—Digital Integrated Circuits, Linear Integrated Circuits, Discrete Devices, MOS/CCD Products, and Bipolar Memory Products—are believed to be profitable. This is a considerable improvement from 1975 and 1976.

DATAQUEST estimates for 1977 sales of the Semiconductor Groups are shown in Table 2.

Table 2

Fairchild Camera and Instrument
ESTIMATED 1977 REVENUES—SEMICONDUCTOR GROUPS
(Dollars in Millions)

Components	
Digital IC	$ 90
Linear	75
Discrete	85
Optoelectronics	15
Total Components	$265
LSI	
Bipolar	$ 55
MOS	45
Total LSI	$100
Total Semiconductor	$365

Source: DATAQUEST, Inc.
June 1977

Fairchild's strategy is to separate the semiconductor business into two areas: components, the mature part of the business or "Yesterday's Winners," to generate cash; and LSI or "Tomorrow's Business," whose charter is to generate market share.

The Bipolar Division is expected to grow 50 percent in 1977 to $55 million. This division includes bipolar RAMs, PROMs, MACROLOGIC, ECL (approximately $10 million estimated in 1977), and I^2L (low shipments currently). Fairchild dominates the bipolar RAM market, with more than 50 percent of the market. However, N-channel speed enhancement is a threat to this business.

Concerning the recent lawsuit brought by Data General on the 9440, Fairchild's position is that the software used has been assembled from Nova users and is not proprietary to Data General.

Fairchild is currently involved in the discussions with Mostek regarding a cross-licensing agreement on the 3870 microprocessor. The company is shipping limited quantities of its own version of this device.

The MOS facility at Wappingers Falls is manufacturing at full capacity. MOS manufacturing is currently moving into Fairchild's South San Jose facility. The F8 continues to receive good market acceptance. DATAQUEST estimates that Fairchild shipped 90,000 to 100,000 F8 chip sets during the first quarter of 1977; about 30 to 40 percent of those were used internally. The F8 is doing well in Europe and has been designed into Blaupunkt and Grundig equipment among others. Fairchild's 4K RAM shipments in the first quarter of 1977 were approximately 400,000 units. Shipments are believed to be flat in the second quarter. A faster 4K RAM as well as a second source to the 4027 are being qualified somewhat slower than anticipated. DATAQUEST expects Fairchild to sample 16K RAMs in the third quarter of this year. We understand that the company has prototype devices operating at this time.

DATAQUEST estimates that Fairchild is shipping 400,000 to 500,000 2102s per month at an ASP of $1.00. We understand that Fairchild is currently shipping a few thousand 2708 8K EPROM devices per month. The LSI Division is expected to grow from $60 million to $100 million—a growth of 60 percent.

In the Components Group, Fairchild is experiencing good acceptance of its low power Schottky TTL, with estimated revenues of about $10 million in 1977. These parts (and Motorola's) are faster than Texas Instrument's units and are being chosen for many equipment designs, which is forcing TI to redesign its products. The digital IC group has received a four-year contract to assemble SLT modules for IBM in its Portland plant. Currently, 50 people are receiving training at IBM's facility in Burlington.

In manufacturing, Fairchild has made a commitment to projection alignment with about 12 to 15 units currently installed, and at least that many additional units are on order. The company is directing its E-Beam development toward making masks for VLSI CCD and I^2L circuits. DATAQUEST understands that with E-Beam, substantial progress in yields has been achieved on prototype 64K CCD devices. This should put Fairchild into a very competitive position with this unit.

Intrumentation and Systems Group

This group is one of the least known but most profitable of Fairchild. DATAQUEST estimates of the revenue breakdown for the major segments of this group for 1976 and 1977 are shown in Table 3.

Table 3

Fairchild Camera and Instrument
ESTIMATED REVENUES—INSTRUMENTATION
AND SYSTEMS GROUP
(Dollars in Millions)

	1976	1977
Sentry Testers	$18	$34
XINCOM Testers	3	6
Digital Panel Meters	1	4
Microsystems Division	0.5	4
Memory Systems	0.5	2
Total	$23	$50

Source: DATAQUEST, Inc.
June 1977

DATAQUEST estimates that this group operates at a pretax profit margin of about 20 percent. The strategy of the Instrumentation and Systems Group is to develop leadership in four areas: memory and microprocessor testers where it is well established, and linear IC and printed circuit board testers where it is not established. DATAQUEST perceives that the Instrumentation and Systems Group will achieve linear and printed circuit board testing capability by acquisition. Other tester products such as commodity digital devices, discrete devices, and functional testers (such as watch module testers) are not expected to be pursued by the company. This group has achieved a satisfactory market position in memory testing by the acquisition of XINCOM. In microprocessor and LSI testing (the Fairchild Sentry VI, VII, and VIII), Fairchild has exceeded its expectations and is currently production limited; this should continue into the near future. The MITI VLSI program has ordered 12 Sentry VIII testers with a probable unit price of about $1 million. DATAQUEST estimates that this division had 10 percent of corporate sales for the first quarter of 1977 and about 50 percent of corporate pretax profits.

Consumer Products Group

In 1976 watches and clocks accounted for over an estimated 70 percent of this group's revenues. This year, home video games are expected to account for over half of the group revenues. DATAQUEST perceives that the strategy of Consumer Products Group is to market

well-styled watches at prices close to, but not at, the bottom price point. In games, the perceived strategy is the further development of a line of programmable games.

At the June Consumer Electronics Show in Chicago, both Atari and Bally introduced programmable video games with prices equal to or higher than Fairchild. Demand is believed to be sufficient to keep prices for the programmable games firm for 1977. All of these companies should sell this year's production. DATAQUEST estimates that Fairchild will ship 60,000 video games in each of the third and fourth quarters. Fairchild has seven cassettes approved, and four more approvals are expected before the Christmas selling season. DATAQUEST estimates cassette sales at 800,000 to 1,000,000 units at an ASP of $12.00. DATAQUEST game shipment estimates do not include kit sales to several European firms which are marketing the games in Europe. The ROMs for the games are manufactured by the Exetron Division. DATAQUEST estimates that by next Spring, Fairchild will have placed 200,000 units of its video games.

Fairchild's immediate problem with games is not orders, but costs. The console sells OEM for $110, which we believe is currently only marginally profitable. In the third quarter this year, Fairchild is introducing an LSI chip which will replace 35 TTL interface devices as part of its efforts to become more cost competitive.

In watches, Fairchild has been adversely affected by the precipitous price decline to $10 retail for low end LED watches. This was instituted by Texas Instruments and has hurt all watch manufacturers in the industry, including Texas Instruments. DATAQUEST believes that the retail buyers have slowed orders substantially. Fairchild has elected to set its lowest priced watches at $19.95 except for promotion of discontinued units. We believe Fairchild's current production rates are below 50,000 units per month—all with LCD displays. It is DATAQUEST's perception from the Consumer Electronics Show that watch orders will pick up. Fairchild should also benefit from Intel's de-emphasis (wind down) of Microma. In watches, like in video games, Fairchild must substantially reduce costs to make this group profitable again.

DATAQUEST perceives that the following actions by Fairchild will help its Time Products Division profitability:

- A new 100,000 square foot factory is being opened in Hong Kong to fabricate LCD displays (at a savings of 66 percent) and assemble watch cases and watches.

- Fairchild had to use an inventory of cases and crystals during the first and second quarters at costs which were double current market costs.

- Emphasis is on manufacturing and marketing LCD watches, which have higher price points.

- The returns problem (approximately 100,000 units) has been worked through the system.

- Inventories of LED watches have been reduced substantially to an estimated 300,000 to 400,000 equivalent units.

DATAQUEST estimates that the Consumer Products Group (including Optoelectronics) shipped about $13 to $14 million in the first quarter of 1977. We estimate the second quarter revenues will be somewhat below that figure. DATAQUEST believes the Group lost $7 to $8 million in the first quarter, somewhat less in the second quarter of this year, and that losses will continue, although at a reduced level, in the third quarter of this year.

Government and Industrial Groups

These Groups produce products such as imaging systems, gun cameras, electronic counter measure equipment, rear screen projectors, and other related equipment. They are believed to be solidly profitable and have a positive cash flow. We anticipate a reasonable increase in both revenues and profits for both division of this group.

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Fairchild Semiconductor Corporation

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This information is based on data available prior to the acquisition of Fairchild Semiconductor Corporation by National Semiconductor Corporation. This transaction was completed in October 1987. The following company profile, therefore, treats Fairchild as it operated before the acquisition.

Fairchild Semiconductor Corporation is a privately held company; therefore, balance sheet and income statement data are unavailable.

Fairchild Semiconductor Corporation

Fairchild Semiconductor Corporation
10400 Ridgeview Court
Cupertino, California 95014
(408) 864-6250

Established: 1957

Employees: 12,000

Primary Semiconductor Products: Fairchild's greatest proportion of revenue is in bipolar logic and linear integrated circuits. Its semiconductor products cover many areas, including application-specific integrated circuits (ASICs), memories, microprocessors, and discrete components.

1986 Semiconductor Revenue: $495 million

1986 U.S. Market Share Ranking: 6th

1986 Worldwide Market Share Ranking: 14th

EXECUTIVE SUMMARY

Background

Fairchild Semiconductor Corporation, founded by eight prominent engineers who left Shockley Semiconductor in 1957, is a pioneering semiconductor manufacturer in Silicon Valley. Many of the leading companies in the semiconductor industry today--most notably Advanced Micro Devices, Intel, Motorola, National Semiconductor, and Signetics--owe their inceptions to former Fairchild personnel. Fairchild has an established reputation as a high-performance, high-reliability supplier of semiconductors. It is a key supplier to the U.S. military market, conducting business with all of the major U.S. defense contractors. In addition, Fairchild's line of high-performance logic products has given it a niche in the high end of the computer market.

While the world has turned increasingly to CMOS technology solutions, Fairchild chose years ago to concentrate its efforts in the bipolar area, and has only recently placed greater emphasis in its CMOS technology. Fairchild has not, however, remained technologically moribund. Research and development efforts are under way to address the digital signal processing market and to develop high-performance, bipolar VLSI technologies and mixed-process technologies. (See the "Technology Trends/Emerging Areas" section of this profile.)

Fairchild Semiconductor Corporation

Fairchild's strengths remain in the standard logic product area and in bipolar technologies, including emitter-coupled logic (ECL). Fairchild is now applying its expertise in bipolar logic to the design of ASIC products, particularly bipolar gate arrays. The Company is also moving into the 32-bit microprocessor arena with a sub-2-micron CMOS process technology. Additionally, Fairchild does nearly $200 million of business in established "bread and butter" markets such as discrete diodes and transistors, as well as linear devices such as amplifiers, voltage regulators, and interface products.

Company Milestones

The following is a list of key events in the history of Fairchild Semiconductor Corporation, listed in chronological order:

- 1920--Sherman Fairchild invents and begins manufacturing aerial cameras in New York, New York.
- 1927--Fairchild Aerial Camera Corporation is incorporated in Delaware.
- 1944--Fairchild Aerial Camera Corporation becomes Fairchild Camera and Instrument Corporation.
- 1957--Fairchild Semiconductor Corporation is founded in Palo Alto, California, under sponsorship of Fairchild Camera and Instrument Corporation. Its charter is to manufacture silicon diffused transistors and other semiconductor devices.
- 1959--The Planar diffusion process is developed using silicon dioxide masking techniques for semiconductor products; transistors are marketed.
- 1961--Fairchild Semiconductor Corporation becomes the Semiconductor Division of Fairchild Camera and Instrument Corporation.
- 1961--Fairchild introduces the world's first monolithic integrated circuit.
- 1968--Fairchild corporate headquarters moves to Mountain View, California, from Syosset, New York.
- 1971--The isoplanar process is developed for bipolar high-density memory production.
- 1975--The Consumer Products Group is formed to produce and market video games and digital watches and clocks.

Fairchild Semiconductor Corporation

- 1978--The FAST (Fairchild Advanced Schottky TTL-compatible) family of logic devices is introduced.
- 1978--I^3L (Isoplanar Integrated Injection Logic) technology is developed for use in advanced microprocessors.
- 1979--Schlumberger Ltd. acquires Fairchild at a cost of approximately $400 million.
- 1985--Donald Brooks, former Texas Instruments executive, is appointed president after two years as vice president of North American semiconductor operations.
- 1985--Fairchild Camera and Instrument Corporation becomes Fairchild Semiconductor Corporation.
- 1985--The FACT (Fairchild Advanced CMOS Technology) family of digital logic is introduced.
- 1985--The Clipper 32-bit microprocessor is introduced.
- 1986--Schlumberger enters into an agreement with Fujitsu, Ltd., of Japan to sell 80 percent of Fairchild.
- 1987--Schlumberger and Fujitsu terminate their agreement because of rising political controversy over national security issues and trade friction between the United States and Japan.
- 1987--The ASPECT (Advanced Single Polysilicon Emitter-Coupled Technology) process technology is employed in producing logic products.

Corporate Management

Fairchild Semiconductor Corporation's corporate management is as follows:

- Donald Brooks--President and Chief Executive Officer
- Nelson Stone--Vice President, General Counsel, Secretary
- Alex Woo--Treasurer
- Stavros Prodromou--Executive Vice President, Custom and Microprocessor Unit
- Kirk Pond--Executive Vice President, Logic Unit
- Ron Norris--Executive Vice President, Memory and Asia Unit

Fairchild Semiconductor Corporation

- Tony Ley--Vice President, Research and Development
- Howard Sachs--Vice President, General Manager, Advanced Processor Division

OPERATIONS

Fairchild Semiconductor Corporation is organized by product area and operational function, as shown in Figure 1.

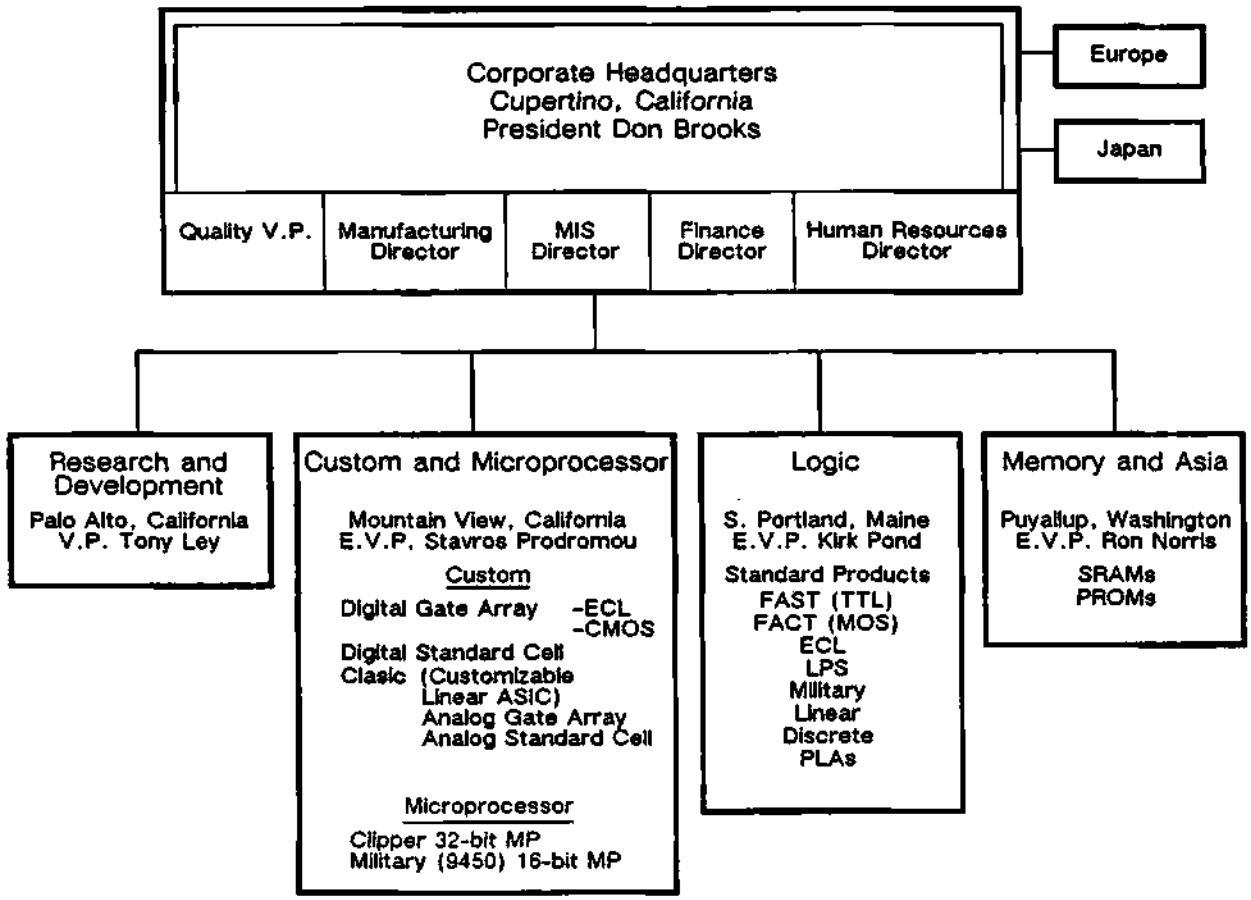
Fairchild's semiconductor products fall into a number of broad product areas. These categories, as defined and tracked by Dataquest, are as follows:

- Logic--Includes standard logic devices and application-specific integrated circuits (ASICs). ASICs include custom products, cell-based integrated circuits (CBICs), gate arrays, and programmable logic devices (PLDs). ASICs substitute for a conglomeration of standard logic ICs to meet user-defined specifications.
- Memory--Includes dynamic random-access memories (DRAMs), static random-access memories (SRAMs), read-only memories (ROMs), programmable read-only memories (PROMs), erasable programmable read-only memories (EPROMs), and electrically erasable programmable read-only memories (EEPROMs).
- Linear--Includes devices manipulating analog data, such as signal conditioners (e.g., amplifiers, interface devices) and data converters (analog-to-digital, digital-to-analog, resolver-to-digital).
- Discretes--Includes products such as transistors (small signal and power), diodes (small signal, power, and zener) and thyristors.
- Microdevices--Includes microcontrollers, microprocessors, and peripherals that support these components.

Fairchild Semiconductor Corporation

Figure 1

Fairchild Semiconductor Corporation
ORGANIZATION CHART



Source: Fairchild Semiconductor Corporation

Fairchild Semiconductor Corporation

Manufacturing Facilities

Table 1 describes Fairchild's manufacturing facilities according to the classification scheme followed by Dataquest's Semiconductor Equipment and Materials Service (SEMS).

Table 1

Fairchild Semiconductor Corporation
SEMICONDUCTOR MANUFACTURING FACILITIES

Factory	Type	Floor Space (Sq. Ft.)	Products	Technology
Milpitas, CA	F	14,000	MEM, MPU Logic Gate Array	CMOS
Mt. View, CA	F	75,000	Peripheral	Linear
Mt. View, CA	F	30,000	Linear	Linear
Palo Alto, CA	R	40,000		Bipolar
Puyallup, WA	F	20,000	Memory, High-Speed Logic	Bipolar
So. Portland, ME	F	15,000	Logic PLAs	Bipolar
So. Portland, ME	F	5,000	Logic 32-Bit Clipper	Bipolar
So. Portland, ME	F	3,600	Standard Logic	CMOS
Wasserburg, W. Ger.	F,A,T	N/A	Bipolar TTL	Bipolar, CMOS
Nagasaki, Japan	F	N/A	256K SRAM	Bipolar, CMOS

F = Front-End Processing Fab
R = Semiconductor Research Facility
A = Assembly
T = Test
N/A = Not Available

Source: Dataquest
November 1987

Capital Expenditures

Capital spending by the Company has been kept at a constant level over the past two years, although expenditures as a percentage of semiconductor revenue have declined slightly. Recent capital spending has been for upgrading and refurbishing existing fabs and for building new fabs in Nagasaki, Japan, and Wasserburg, West Germany. Fairchild's capital spending history is listed in Table 2.

Table 2

Fairchild Semiconductor Corporation
SEMICONDUCTOR CAPITAL SPENDING BY CALENDAR YEAR
1982-1986
(Millions of Dollars)

	1982	1983	1984	1985	1986
Semiconductor Revenue	$410	$455	$665	$492	$495
Semiconductor Capital Spending	$156	$125	$195	$135	$135
Percent of Semiconductor Revenue	38.0%	27.5%	29.3%	27.4%	27.3%
Percent Increase in Capital Spending	11.4%	(19.9%)	56.0%	(30.8%)	0

Source: Dataquest
November 1987

MARKET ANALYSIS

1986 Summary

As it was for many semiconductor manufacturers, 1986 was a difficult year for Fairchild. Although financial information about Fairchild is not generally disclosed, a loss of $363 million was reported by Schlumberger in its 1986 Annual Report. This loss on estimated revenue of $495 million for 1986 was slightly more than for the previous year.

During 1986, Fairchild was put up for sale by its parent of seven years, the French corporation Schlumberger, Ltd. Fujitsu Ltd. of Japan appeared as the most willing suitor, offering an estimated $250 million to acquire 80 percent of Fairchild, with Schlumberger retaining a 20 percent share of the company. Through the acquisition, Fujitsu stood to bolster its solid ECL business and gain access to American markets, particularly for ASICs. Fairchild would certainly have benefited from Fujitsu's financial resources, as well as from Fujitsu's manufacturing skill and considerable presence in the bipolar logic market. Fujitsu's CMOS manufacturing expertise may also have been attractive to Fairchild's infant 32-bit microprocessor business.

Fairchild Semiconductor Corporation

Combined, Fujitsu and Fairchild would have accounted for 15 percent of the worldwide bipolar logic market, based on 1986 revenue. In the area of ECL bipolar technology, the impact of the Fairchild-Fujitsu merger would have been even more pronounced, representing a combined market share of 37 percent.

Under mounting political pressure caused by national security concerns, U.S.-Japan trade friction, and U.S. competitors' fears of a revitalized Fairchild, Fujitsu and Schlumberger backed away from the acquisition. A structure of key alliances is being worked out, however. As of this writing, management buyout (MBO) plans have followed the failed Fairchild-Fujitsu marriage. Possible contributors to the cash requirements of the MBO include Intergraph Corp., a maker of high-performance workstations and the primary customer for Fairchild's 32-bit Clipper microprocessor. Schlumberger and Fujitsu may each retain some equity in Fairchild.

Although listed as a discontinued operation on Schlumberger's books, Fairchild continued to trim back its business and consolidate its operations during 1986. Following withdrawal from the optoelectronics market in 1983, Fairchild announced discontinuation of hybrid chip production in March 1986. A test and assembly facility in Indonesia was closed, as well as fabs in Wappington Falls, New York, and Mountain View and San Rafael, California. New fabs in Nagasaki, Japan, and Wasserburg, West Germany, are currently up for sale, possibly in order to reduce the net worth of the Company and thereby lower the price of the buyout.

During 1986, Fairchild increased its presence in the CMOS market as part of a strategy to assert itself as a technology leader. New devices were added to Fairchild's FACT line of CMOS standard logic products, bringing the total number of FACT product types to 53. A total of 31 of these product types have been qualified for the most stringent military standards. Second-sourcing agreements were made with Motorola and Hitachi, signaling a major victory in promoting the FACT line as an industry standard.

Table 3 shows a history of Fairchild's semiconductor revenue by major product area, while Table 4 looks at Fairchild's 1986 semiconductor revenue by geographic region. Table 5 shows Fairchild's change in revenue between 1985 and 1986.

Fairchild Semiconductor Corporation

Table 3

Fairchild Semiconductor Corporation
ESTIMATED WORLDWIDE SEMICONDUCTOR REVENUE
1979-1986
(Millions of Dollars)

	1979	1980	1981	1982	1983	1984	1985	1986
Total Semiconductor	$469	$566	$462	$410	$455	$665	$492	$495
Total Integrated Circuit	353	461	370	333	384	595	451	452
Bipolar Digital (Technology)	198	273	226	206	246	410	329	329
TTL	156	228	186	162	184	315	256	252
ECL	30	32	31	34	54	90	69	73
Other Bipolar Digital	12	13	9	10	8	5	4	4
Bipolar Digital (Function)	198	273	226	206	246	410	329	329
Bipolar Digital Memory	62	73	64	50	45	45	36	32
Bipolar Digital Logic	136	200	262	156	201	365	293	297
MOS (Technology)	77	105	65	50	48	45	22	26
NMOS	45	55	35	32	30	26	8	3
PMOS	15	18	10	5	4	5	3	3
CMOS	17	32	20	13	14	14	11	20
MOS (Function)	77	105	65	50	48	45	22	26
MOS Memory	29	41	16	7	5	4	4	5
MOS Microdevices	20	28	24	23	24	17	10	4
MOS Logic	28	36	25	20	19	24	8	17
Linear	78	83	79	77	90	140	100	97
Total Discrete	90	81	76	62	64	66	39	42
Transistor	55	37	35	28	24	22	12	14
Small Signal Transistor	40	36	35	28	24	22	12	12
Power Transistor	15	1						2
Diode	35	44	41	34	40	43	27	28
Small Signal Diode	29	32	30	25	40	38	22	23
Power Diode	5	7	4	3		3	3	3
Zener Diode	1	5	7	6		2	2	2

(Continued)

Table 3 (Continued)

Fairchild Semiconductor Corporation
ESTIMATED WORLDWIDE SEMICONDUCTOR REVENUE
(Millions of Dollars)

	1979	1980	1981	1982	1983	1984	1985	1986
Total Discrete (Continued)								
Thyristor								
Other Discrete						1		
Total Optoelectronic	26	24	16	15	7	4	2	1
LED Lamps	7	6	4	4	1			
LED Displays	15	14	9	8	4			
Optical Couplers	3	3	2	2	1	1		
Other Optoelectronics	1	1	1	1	1	3	2	1
Exchange Rate (Yen/US$)	219	227	221	248	235	237	238	167

Source: Dataquest
November 1987

Table 4

Fairchild Semiconductor Corporation
ESTIMATED SEMICONDUCTOR REVENUE BY GEOGRAPHIC REGION--1986
(Millions of Dollars)

	United States	Japan	Europe	Rest of World	Total
Total Semiconductor	$321	$41	$85	$48	$495
Integrated Circuit	301	41	80	30	452
Bipolar Digital	226	28	53	22	329
MOS	10	6	10	0	26
Linear	65	7	17	8	97
Discrete	19	0	5	18	42
Optoelectronic	1	0	0	0	1

Source: Dataquest
November 1987

Fairchild Semiconductor Corporation

Table 5

Fairchild Semiconductor Corporation
WORLDWIDE RANKING--SEMICONDUCTOR MARKETS
(Millions of Dollars)

	1986 Rank	1985 Rank	1986 Revenue	1985 Revenue
Total Semiconductor	14	13	$495	$492
Integrated Circuits	13	13	452	451
Bipolar Digital	5	4	329	329
MOS Digital	49	47	26	22
Linear	16	12	97	100
Discrete	30	28	42	39

Source: Dataquest
November 1987

Market Strategy

Fairchild's marketing strategy targets high-performance market niches in its solid customer base of avionics/military, data processing, and telecommunications applications. The current Fairchild corporate theme is "taking the high ground"--in other words, producing the highest-quality, highest-performance products in Fairchild's chosen markets.

Through vertical marketing, Fairchild hopes to leverage its broad product line by convincing customers that all of their semiconductor needs can be met by Fairchild. This objective will be accomplished by a marketing organization that understands the customer's design and marketing objectives. For example, Fairchild is directing a great deal of marketing effort at the desktop computer/workstation market and is striving in many market areas to design devices that are ideal for high-performance workstation implementation. The following paragraphs describe Fairchild's positioning in its most important product areas. Included are graphs that indicate Fairchild's standing among its competitors.

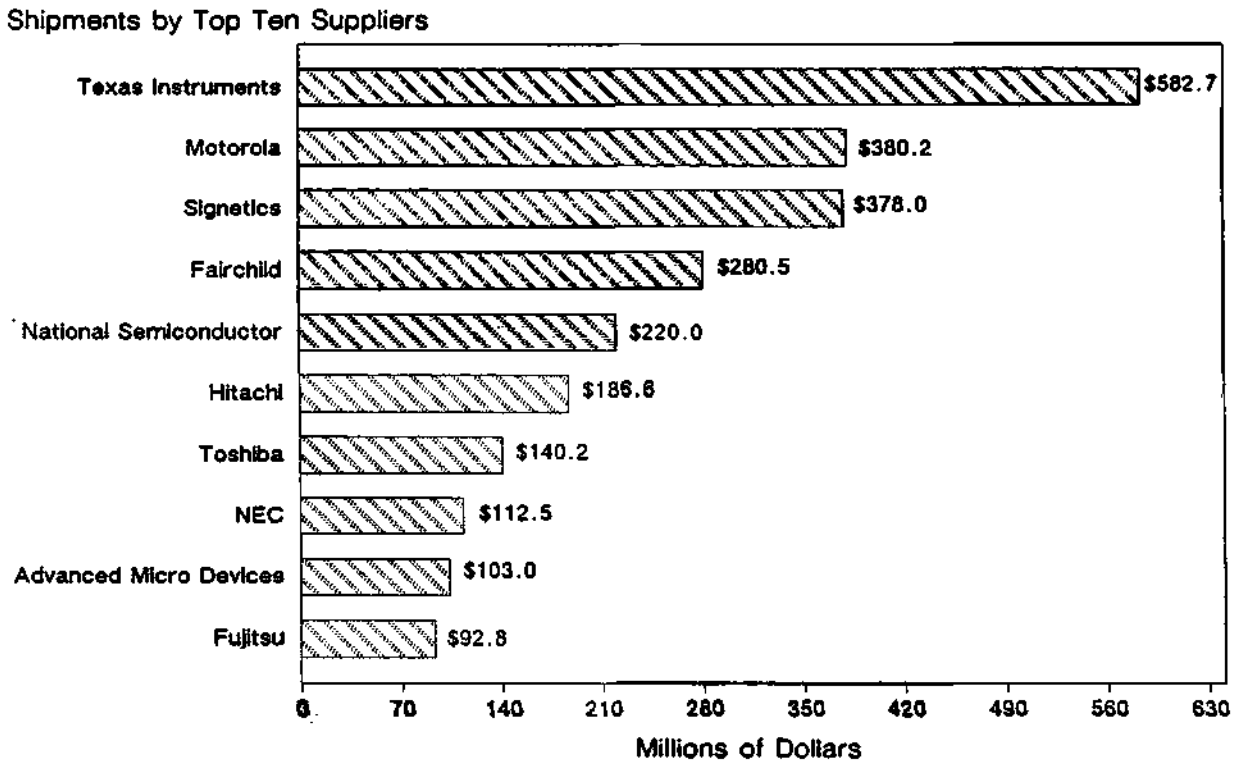
Fairchild Semiconductor Corporation

Standard Logic

Fairchild has been a strong force in the standard logic market, manufacturing a variety of products in both bipolar and CMOS technologies. With $281 million in standard logic sales out of a total market of $2.8 billion in 1986, Fairchild was the fourth largest standard logic producer in the world. Figure 2 shows the leading competitors in the standard logic market.

Figure 2

Fairchild Semiconductor Corporation
1986 STANDARD LOGIC SHIPMENTS--Total
TOP TEN COMPANIES



Source: Dataquest
November 1987

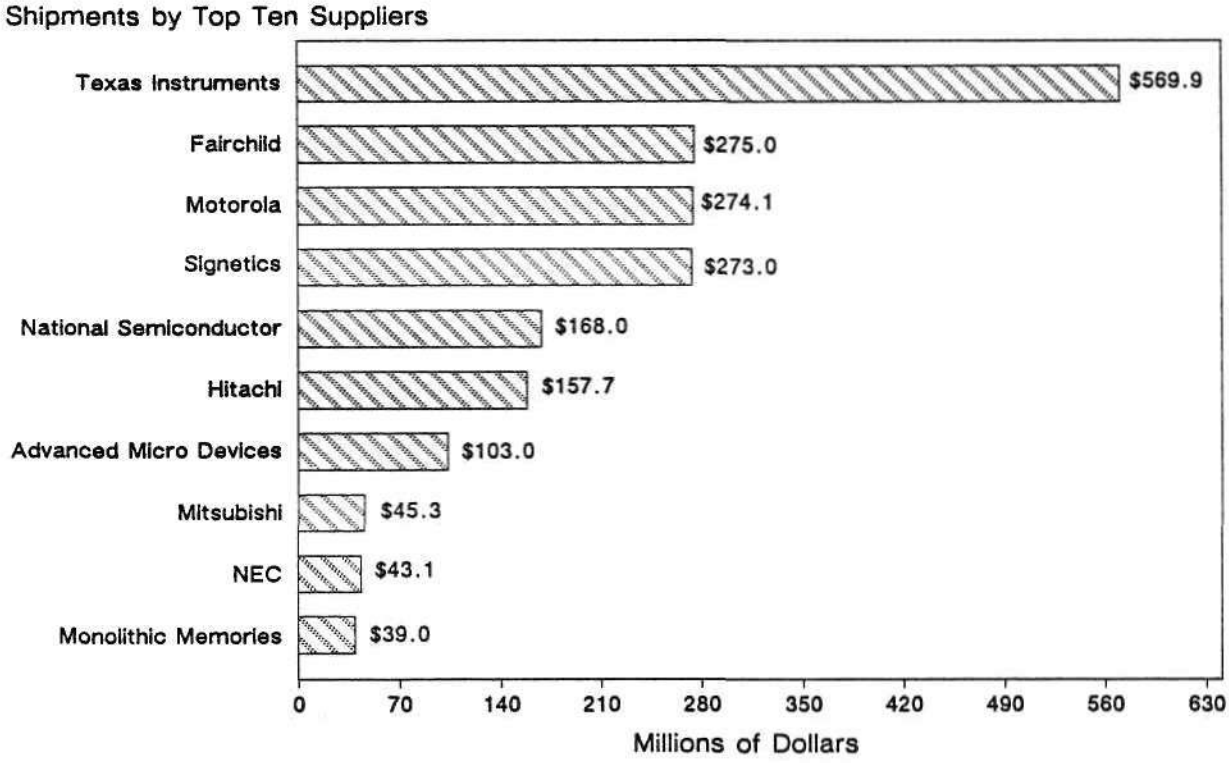
Fairchild Semiconductor Corporation

Fairchild's FAST (Fairchild Advanced Schottky TTL) bipolar logic family has been a mainstay product of the Company, establishing itself as an industry standard. Fairchild not only supports the FAST TTL logic family, but also makes products utilizing STD-TTL, S-TTL, and LS-TTL. At the high end of the performance spectrum, standard logic applications generally use ECL (emitter-coupled logic) bipolar logic components. Fairchild is a market leader in ECL technology, supporting ECL-10K, ECL-100K, and DTL (diode-to-transistor logic). Fairchild's ASPECT technology allows the densest ECL gates ever, with speeds twice those of previous technologies at half the power dissipation--overcoming a historic problem with ECL. ASPECT is clearly aimed at the continued satisfaction of Fairchild's military and high-end computer clientele, where speed and energy economy are of highest priority.

Bipolar logic sales for the top 10 worldwide suppliers, including both ECL and TTL families, are shown in Figure 3.

Figure 3

Fairchild Semiconductor Corporation
1986 STANDARD LOGIC SHIPMENTS--BIPOLAR
TOP TEN SUPPLIERS



Source: Dataquest
November 1987

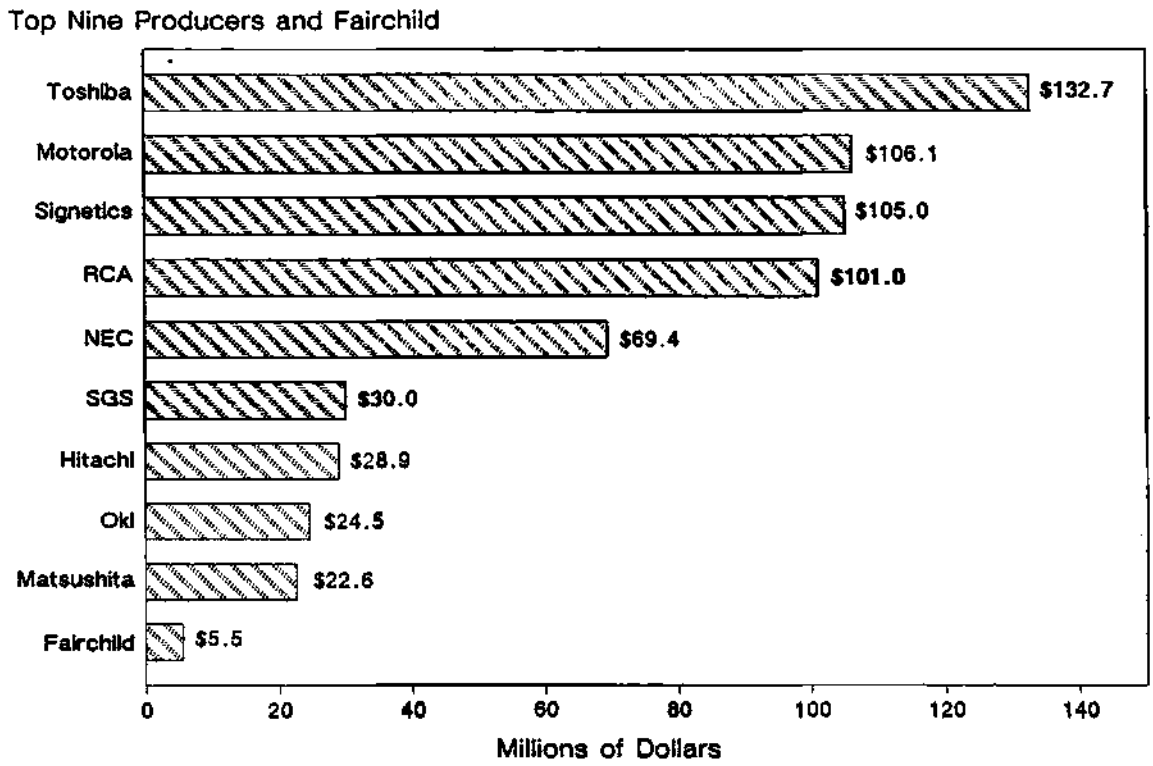
Fairchild Semiconductor Corporation

As higher-performance CMOS logic products evolve, their lower power dissipation makes them attractive substitutes for low-end bipolar logic devices. To face this competitive challenge, Fairchild's newer FACT line of CMOS standard logic products joins its earlier 4000/74C and 74HC CMOS logic families. Introduced in October 1985, FACT is quickly becoming the preferred industry standard. Although sales of CMOS logic were a small portion of Fairchild's 1986 logic revenue, they are expected to grow as a percentage of sales in coming years. Figure 4 illustrates Fairchild's relative sales in MOS logic compared to the nine largest MOS logic producers.

Fairchild fully intends to maintain its strong market position in standard logic. While FAST TTL markets continue to grow, the FACT line is expected to increase in importance with increasing low-power applications, for which CMOS is a natural choice. ASPECT will put Fairchild on the ECL cutting edge in performance, making ECL products strong in Fairchild's traditional high-performance base.

Figure 4

Fairchild Semiconductor Corporation
1986 STANDARD LOGIC SHIPMENTS--MOS
TOP NINE SUPPLIERS AND FAIRCHILD



Source: Dataquest
November 1987

Fairchild Semiconductor Corporation

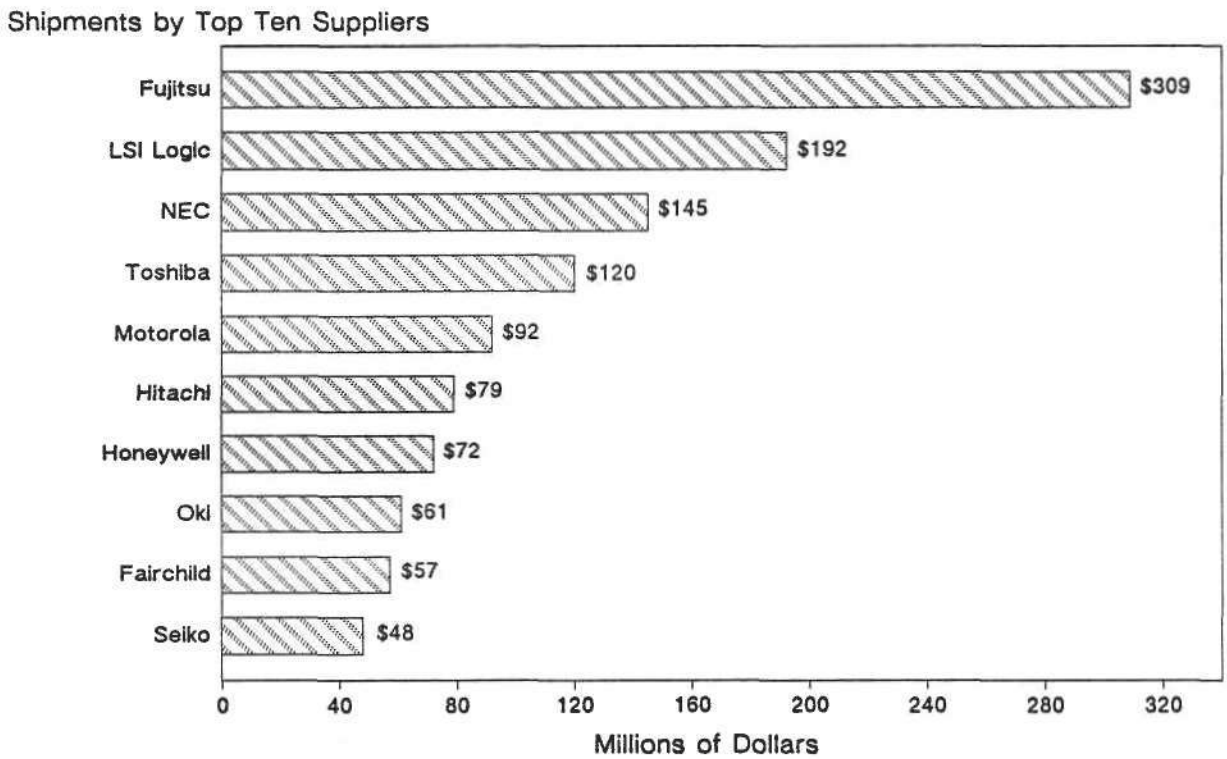
Fairchild's bipolar standard logic components compete head-on with the industry standard AS-TTL and ALS-TTL bipolar components from Texas Instruments (TI). Fairchild was second only to TI in bipolar standard logic sales in 1986, with $275.0 million versus TI's $569.9 million. In the area of CMOS standard logic, Fairchild's FACT line represents an alternative pin design to TI's AC/ACT logic offering.

Application-Specific Integrated Circuits

Fairchild offers both ECL and CMOS gate arrays served by design centers scattered across the United States and at two locations abroad. The Company's 1986 gate array sales of $57 million placed it ninth in a $1.8 billion worldwide gate array market, trailing U.S. firms LSI Logic, Motorola, and Honeywell. Gate array market share is illustrated in Figure 5, which shows the top 10 suppliers worldwide.

Figure 5

Fairchild Semiconductor Corporation
1986 GATE ARRAY SHIPMENTS--TOTAL
TOP TEN SUPPLIERS



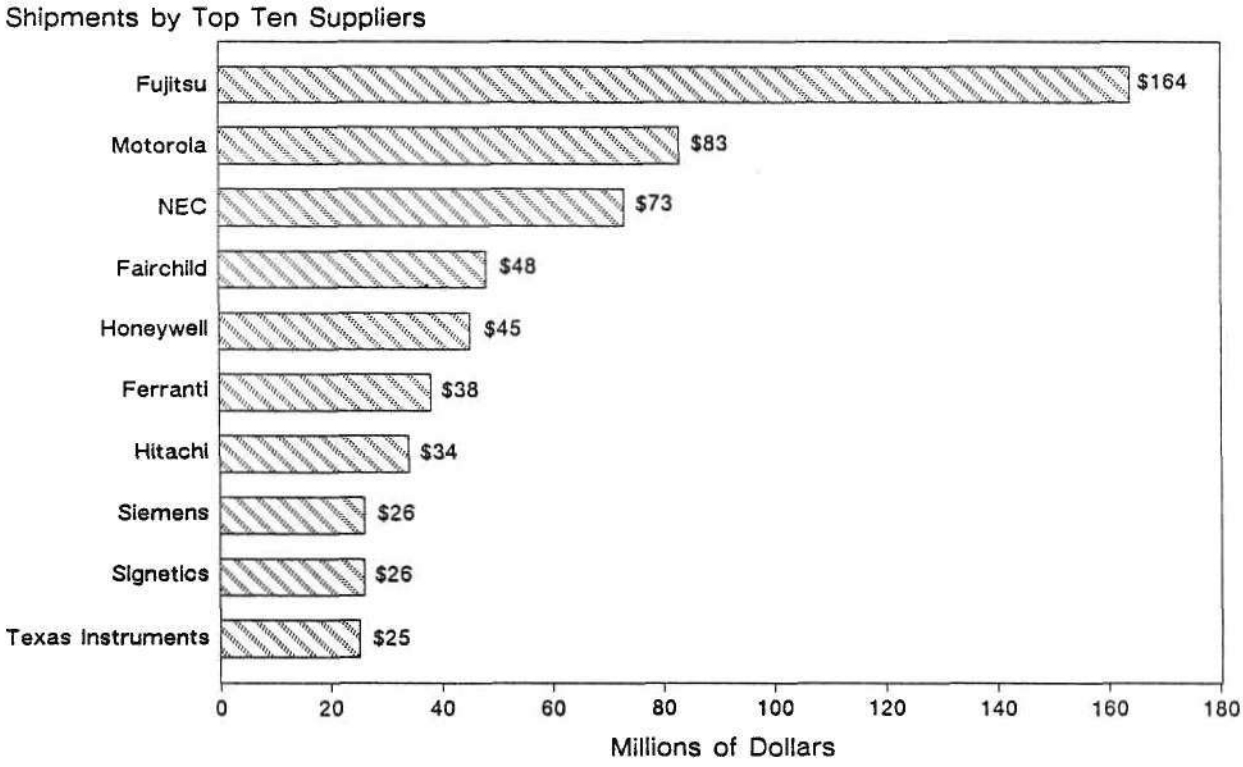
Source: Dataquest
November 1987

Fairchild Semiconductor Corporation

In bipolar gate arrays, Fairchild employs high-performance ECL, used primarily in military applications. Here Fairchild is a market leader, ranking fourth in the world, with $48 million of the $720 million market. Fairchild is currently utilizing its powerful ASPECT technology to offer customers an attractive combination of gate density and highest speed, with reasonable power requirements. Figure 6 demonstrates Fairchild's strength among competitors in the bipolar gate array market. By contrast, Fairchild accounted for only $9 million of the estimated $1.1 billion 1986 MOS gate array business.

Figure 6

Fairchild Semiconductor Corporation
1986 BIPOLAR GATE ARRAY SHIPMENTS--BIPOLAR
TOP TEN SUPPLIERS



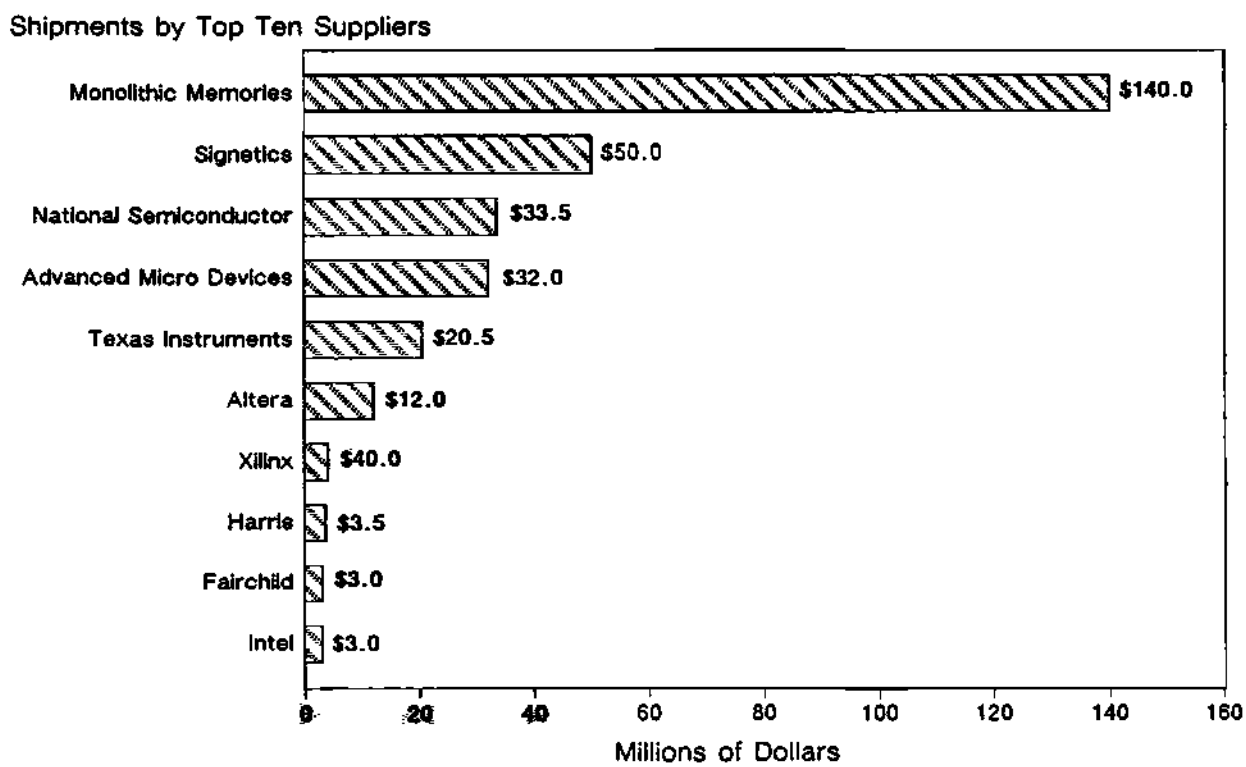
Source: Dataquest
November 1987

Fairchild Semiconductor Corporation

Fairchild also participates in the smaller but fast-growing programmable logic device (PLD) market, capturing $3 million of the estimated $308 million 1986 market. This places Fairchild in a tenth-place tie with Intel (see Figure 7). PLDs are integrated circuits containing a structured, partially interconnected set of logic gates that can be fuse programmed for customization by the end user. The largest markets for PLDs are electronic data processing, industrial applications, communications, and the military. To manufacture their FASTPLA line of programmable logic, Fairchild uses a proprietary Isoplanar-Z bipolar process that employs high-accuracy vertical fuses and high-density circuits. (Isoplanar-Z is a registered trademark of Fairchild Semiconductor Corporation.)

Figure 7

Fairchild Semiconductor Corporation
1986 PROGRAMMABLE LOGIC DEVICE SHIPMENTS
TOP TEN SUPPLIERS



Source: Dataquest
November 1987

Fairchild Semiconductor Corporation

Memory Devices

Fairchild offers memory devices in ECL, TTL, and CMOS technologies. The Company sold approximately $37 million worth of memory products in 1986--$32 million of which were in combined ECL and TTL bipolar technology. Fairchild has been a minor player in the memory market in the past five years, quitting the DRAM market, as did many American semiconductor producers, when the Japanese entered. Fairchild's ECL PROMs boast the lowest power requirements in the industry and have found application in control, mapping, and code controlling in high-performance systems.

Fairchild's goal in the memories business is to increase its share of the market in high-performance, static random-access memory (SRAM) devices. For example, Fairchild plans to bring out a BICMOS, sub-1-micron architecture, with 256K SRAM 200-picosecond access speed in the first quarter of 1988. This type of device is designed for speed-critical buffer memories and cache memories in military or supercomputer applications. Other recent product offerings are intended to assert Fairchild's presence in this market.

Microprocessors

Since 1985, Fairchild has supported the 9450 line of 16-bit microprocessors, which is fully qualified to meet military standard 1750. Fairchild has now made a bold entrance into the high-performance microprocessor (MPU) market, with a 32-bit MPU called the Clipper.

At present, some half dozen original equipment manufacturers (OEMs), have designed the Clipper into their products. While the capabilities of the Clipper provide users with mainframe power on a desktop, the applications for using this kind of power are still relegated to a market in between the data processing orientation of the typical PC user and the high-end engineering workstation realm of companies such as Sun Microsystems and Apollo Computer.

Linear, Discrete, and Special-Function Devices

Fairchild accounted for $97.0 million of the $6.2 billion market for linear devices in 1986. Fairchild's line of linear products, including amplifiers, line drivers, and data converters have recently received greater attention. Fairchild's new LFAST technology is intended to revitalize its bipolar linear product line. In the CMOS area, high-performance CMOS digital-to-analog converters (DACs) are being produced under a joint venture with start-up company, Brooktree, Inc.

Along with high-performance DACs, another linear growth area is the modem market. Fairchild's uA212AT modem chip, compatible with the industry standard Hayes version, has performed well in tests against competing chips and has garnered high market share and many design wins due to its accuracy as a transmitter and receiver of data.

Fairchild Semiconductor Corporation

In discrete products, Fairchild has a strong relationship with military OEMs. Fairchild's $42.0 million discrete sales in 1987 ranked it number 30 among worldwide semiconductor producers. The recent introduction of the COOLFETs line of MOSFETs has supported Fairchild's discrete product line with a low-power breakthrough that is aimed at capturing further market share in the discrete area. (COOLFETs is a registered trademark of Fairchild Semiconductor Corporation.)

Distribution Channels

Fairchild has many sales offices in different regions of the world, as listed in Table 6.

Table 6

Fairchild Semiconductor Corporation
WORLDWIDE SALES OFFICES

Region	Number of Sales Offices
United States	37 in 25 states
Europe	12 in 8 countries
ROW	11
Japan	2

Source: Dataquest
November 1987

Fairchild utilizes 11 distributors throughout the United States. In addition, Fairchild has 45 different distributors in 11 European countries, 5 distributors in Japan, and 13 distributors throughout Canada. Among Fairchild's U.S. distributors are the following:

- Hamilton/Avnet Electronics
- Schweber Electronics
- Wyle Laboratories
- Arrow Electronics
- Zeus Components

Fairchild Semiconductor Corporation

Fairchild's design centers for advanced customer support and gate array design are located in the following cities:

- Cupertino, California
- Costa Mesa, California
- Dallas, Texas
- Orlando, Florida
- Minneapolis, Minnesota
- Boston, Massachusetts
- Reading, England
- Tokyo, Japan
- Wasserburg, West Germany

To further support customer design needs, Fairchild employs field product specialists (FPSs) and field service engineers (FSEs), all of whom are assisted by more than 100 field application engineers (FAEs). FAIRCAD computer-aided design stations are available for customer use, providing interactive design debugging with fault-checking and calculations performed on Cray supercomputers.

Application Markets

Fairchild's high-performance products are targeted toward applications in military, high-speed computing, and telecommunications end markets. One of the most important target markets for Fairchild is the high-performance, single-user enhanced computer market. This market includes desktop workstations and board products that are added to microcomputer systems.

PRODUCTS AND TECHNOLOGY

The trade-offs between bipolar and CMOS technologies--the high speed and precision of bipolar versus the low power dissipation and greater densities of CMOS--have dictated that both technologies be employed in meeting end-user needs in the high-performance computer and military markets targeted by Fairchild. As previously noted, Fairchild has been a market leader in

Fairchild Semiconductor Corporation

developing bipolar technologies. In past years, growing CMOS markets were to some extent neglected by Fairchild. Today, however, Fairchild supports both CMOS and highly advanced bipolar processes. The following processes define the state of the art of Fairchild semiconductor production:

- ASPECT (Advance Single Polysilicon Emitter-Coupled Technology)--A self-aligned, fine-line, contactless poly-emitter bipolar transistor structure and process offering high speed, high density, and lower power requirements that rival CMOS. (This process uses sub-2-micron design rules and delivers ECL gate sizes of 3 mil^2, minimum transistor sizes of 36 $micron^2$, delays of 120 picoseconds, impedance of 200uA, and total power dissipation of 1mW. ASPECT is employed in Fairchild's high-speed ECL gate arrays and standard logic products.)

- FAST Z (Fairchild Advanced Schottky TTL)-- An advanced TTL process used in bipolar gate arrays and standard logic devices

- L FAST--A linear version of FAST technology used in analog products such as line drivers, amplifiers, and converters

- FACT (Fairchild Advanced CMOS Technology)--A 2-micron CMOS technology applied to Fairchild's memory, microprocessors, and FACT line of standard logic products, as well as in gate arrays and standard cell products (FACT is targeted for low-power applications such as portable computers.)

- Isoplanar-Z--A special vertical fuse technology that improves the reliability and accuracy of programmable logic devices (PLDs) and programmable read-only memories (PROMS) produced in TTL bipolar technology and in fast SRAMs produced in CMOS (Isoplanar-Z is a registered trademark of Fairchild Semiconductor Corporation.)

Recent Product Introductions

Fairchild Semiconductor Corporation's recent semiconductor product introductions include the following, listed in reverse chronological order:

- Standard Logic

  - March 1987--JAN Class S reliability certification was achieved for the FAST family of standard logic devices, stepping up performance from the long-held Class B level.

- March 1987--Ten FACT family members qualified for military standard 883C, bringing the number of FACT devices meeting MIL-STD 883C to 31.

  . Performance increased using a 1.3-micron process; for example, the 54AC540 octal buffer/line driver operates with tPLH equal to 7.0ns when operated at V_{CC} equal to 4.5 to 5.5 volts and tPHL equal to 6.5ns maximum at 4.5 to 5.5 volts over the full military temperature range.

  . These products are available in CDIP, flatpac, and LCC packaging.

- July 1986--Two first-in, first-out buffer memory circuits were added to the FAST digital logic family.

  . The 74F403 (16 words by 4 bits) and the 74F413 (64 words by 4 bits) employ a proprietary isoplanar process that exceeds the switching speed and output drive capability of Schottky TTL circuits, while providing superior noise margins and one-fourth the power consumption.

- March 1986--Seven FACT devices joined the nine originally released in October of 1985.

  . They include Hex Inverters, Hex Schmidt Trigger Inverters, Octal Buffers/Line Drivers, Octal D Latches, and Octal D Flip-Flops with power consumption levels as low as 0.1mW per gate at 1-MHz clock frequency, internal gate delays of 1.0ns, and worst-case propagation delays of 5.0ns. Source or sink 24mA.

  . They employ the 1.2-micron silicon gate CMOS process also used to manufacture CMOS gate arrays.

• ASICs

- May 1987--Fairchild introduced the FGE6320R ECL gate array with 3500 equivalent gates and 2304 bits of embedded RAM.

  . This product offers propagation delays of 250ps and an access time of 4ns for the RAM cells.

  . It consumes 30 percent less power per gate than the previous FGE Series and is designed for system applications requiring both logic and memory, such as high-speed computers, color graphics, and instrumentation.

Fairchild Semiconductor Corporation

- April 1987--The Company introduced the FGX12000 ECL gate array with 12,000 gates and maximum power dissipation of 18W.
  - At 120ps, it pulls a switching current of 300uA, thus making the speed-power product two to three times better than industry standard arrays.
  - It Employs a three-layer metal process.
- June 1986--The FGE6300 ECL gate array was introduced with propagation delay of 225ps and power consumption per gate 30 percent below previous FGE Series ECL gate arrays.
  - It has 560 internal cells and allows 220 I/O signals.
  - It is manufactured in 1.5-micron FAST-Z fine-line bipolar process.
- April 1986--FASTPLA programmable logic devices made their debut.
  - They offered vertical fuse architecture with propagation delay times as fast as 15ns and 50-MHz maximum clock frequency.
  - They were intended to upgrade existing designs at low cost.

• Memory

- April 1987--The F1620 64K x 4-bit SRAM was introduced employing advanced isoplanar oxide-isolation CMOS process in sub-2-micron geometries.
  - It is available in 25ns, 35ns, and 45ns read and write access time versions.
  - It has interface capability with FAST or FACT families of logic and with ECL with a translator.
- August 1986--The 93Z667 bipolar TTL 64K programmable read-only memory (PROM) was released.
  - It is organized in 8,192 words by 8 bits with access times of 40ns to 45ns and military qualified in 300-mil dual-in-line package (DIP).
  - It is aimed at applications such as military systems, telecommunications systems with advanced packet-switching data rates, artificial intelligence applications, and voice processing.

- July 1986--Speed-enhanced versions of the F100422 and F10422 256 x 4 ECL SRAMs were released.
  - They feature 7ns maximum address access times and 5ns bit-select access times.
  - These are upgrades of two prior SRAMs based on F100K and F10K logic families.

- Microprocessors
  - October 1986--The first F9450 shipments were made.
    - The F9450 is a high-performance 16-bit microprocessor meeting military temperature specifications and having a 15-MHz clock speed.
    - It performs 32- and 48-bit floating-point operations without a coprocessor.
  - December 1985--The Clipper 32-bit microprocessor was released.
    - It has a 33-MHz clock cycle with RISC (reduced-instruction-set computer) architecture and an average performance of 5 mips with peak performance of 33 mips.
    - It includes a floating-point CPU and two units for cache-memory management on a 3.0- x 4.5-inch PCC (printed circuit card).

Technology Trends/Emerging Areas

As has already been alluded to in the "Market Analysis" section of this profile, Fairchild's strategy is to further consolidate its position as a leading supplier to the military and high-end data processing markets. Successful execution of this strategy depends heavily on two key elements:

- The ability to push forward the performance limits of bipolar logic technology--Fairchild's area of historic strength
- The ability to broaden end-user solutions to include mixed processes (BICMOS), CMOS technology, functionality (high-speed memories to complement microprocessor and logic products), and design customization

Fairchild Semiconductor Corporation

Meeting these requirements has created the following imperatives to emerge as major Fairchild technology trends:

- Decreasing device geometries in CMOS technology, leading to density advantages
- Increasing CMOS production as a proportion of output in logic products through growing FACT product line revenue
- Increasing performance achievements in fine-line CMOS used in static RAMs and other memory products
- Increasing integration of functions--packing more in each chip
- Increasing substitution of ASICs for standard products
- Increasing productivity in TTL products, such as the FAST line, to maintain and increase market share in such applications as midsize computers
- Developing BICMOS, a high-density process combining ASPECT-based bipolar technology with CMOS to be employed in upcoming SRAM products

In 1986, Fairchild began shipments of the Clipper, its first 32-bit microprocessor (MPU). The Clipper marks a distinct departure from today's popular 32-bit MPU architectures. To begin with, the Clipper is a chip set on a small board, rather then a single piece of packaged silicon. The board is composed of three chips, one of which combines the CPU with a floating-point unit (FPU), while the other two handle cache memory for both instructions and data. These two cache chips each have their own memory management unit (MMU). This architecture, combined with the RISC-like approach, results in a device with very high performance.

Whereas Motorola's 68020 and Intel's 80386 are both single-chip, general-application microprocessors, the Clipper is based on mainframe central processing unit (CPU) architecture. Fairchild reasoned that since 32-bit MPUs make mainframe computer applications possible on desktop machines, the microprocessor engines that run them should logically be based on mainframe designs.

ALLIANCES

Table 7 presents a summary of agreements that Fairchild has entered into with other semiconductor vendors. In this table, Company A has licensed Company B for the type of activity and products listed.

Fairchild Semiconductor Corporation

Synopses of the listed alliances between Fairchild and other semiconductor manufacturers or between Fairchild and customers are discussed in the following paragraphs.

Table 7

Fairchild Semiconductor Corporation
SUMMARY OF ALLIANCES

	Company A	Company B	Type	Products	Date
1.	Fairchild	Triad	JV	64K SRAMs	1985
2.	Fairchild	TRW	MA	Mil dice	12/86
3.	Fairchild	Motorola	SS	8-Bit MPUs	10/86
4.	XTAR	Fairchild	SS	Graphics MPUs	09/86
5.	Fairchild	Hitachi	SS	Logic products	07/86
6.	VLSI	Fairchild	JV	Gate arrays	06/86
7.	Fairchild	Brooktree	FA, JV	Converters	04/86
8.	Fujitsu	Fairchild	FA	Clipper, ASICs	1987

SS = Second Source
FA = Foundry Agreement
JV = Joint Venture
MA = Marketing Agreement

Source: Dataquest
November 1987

Fairchild Semiconductor Corporation

Fairchild and Triad

Triad Semiconductor Corporation and Fairchild have signed a joint-venture agreement under which Fairchild supplies a 64K SRAM manufactured using a 1.5-micron process. Triad will design products using Fairchild's technology, and both companies will act as alternate sources for the products.

Fairchild and TRW

On December 23, 1986, Fairchild and TRW Corporation (TRWCI) announced that they had entered into a three-year multimillion dollar agreement with an automatic one-year renewal. Fairchild will supply military-qualified S-level integrated-circuit dice to TRWCI for subsequent assembly, test, qualification, and sale by TRWCI to the space industry. Also, Fairchild will sell TRWCI wafers and dice for certain semiconductor products including linear, memory, and high-speed logic, microcontroller, power, discrete, and FACT.

Fairchild and Motorola

Motorola is serving as a second source for Fairchild's low-power Schottky TTL and 65,000 charge-coupled memory.

XTAR and Fairchild

Fairchild has become the first alternate-source supplier of a graphics microprocessor chip set developed by XTAR Electronics. Under this agreement, XTAR is to provide Fairchild with design information on its X1001/X1002 graphics microprocessor chip set, which Fairchild will redesign for manufacture using the FACT fabrication process. Both chip sets will be available from both companies.

Fairchild and Hitachi

On July 7, 1986, Fairchild and Hitachi Semiconductor signed an alternate-source agreement making Hitachi the first alternate-source supplier of Fairchild's FACT family of advanced CMOS digital logic circuits. Under the terms of the agreement, Hitachi will manufacture FACT devices using a CMOS fabrication process compatible with the Fairchild 1.2-micron silicon-gate process. Both companies will participate in future design and definition of FACT products.

Fairchild Semiconductor Corporation

VLSI and Fairchild

VLSI Technology is adding a high-end member to its gate array family with an 8,000-gate CMOS device developed under a joint-design pact with Fairchild. Later in the year, Fairchild will offer the device as an alternate source.

Fairchild and Brooktree

Fairchild and Brooktree have begun a broad-ranging partnership coupling Brooktree's unique digital-to-analog conversion technology with Fairchild's manufacturing capabilities. The strategic alliance lets Fairchild tap a new area of high-performance products, effectively adding to its design capability and systems expertise. Brooktree gains foundry privileges in Fairchild fabs to produce the new products. After Brooktree has marketed a new product for six months, Fairchild will have the right to market Brooktree designs under its own label.

Fujitsu and Fairchild

Fairchild has a foundry agreement with Fujitsu that was put into place at the beginning of 1987. The agreement includes Fairchild's 32-bit Clipper microprocessor and certain ASIC products. Although Fujitsu has the capability to build Clipper modules, it is currently manufacturing dice but not packaging them. While industry observers believe that a significant alliance structure is being put in place with Fujitsu, disclosure has been limited.

DATAQUEST SUMMARY

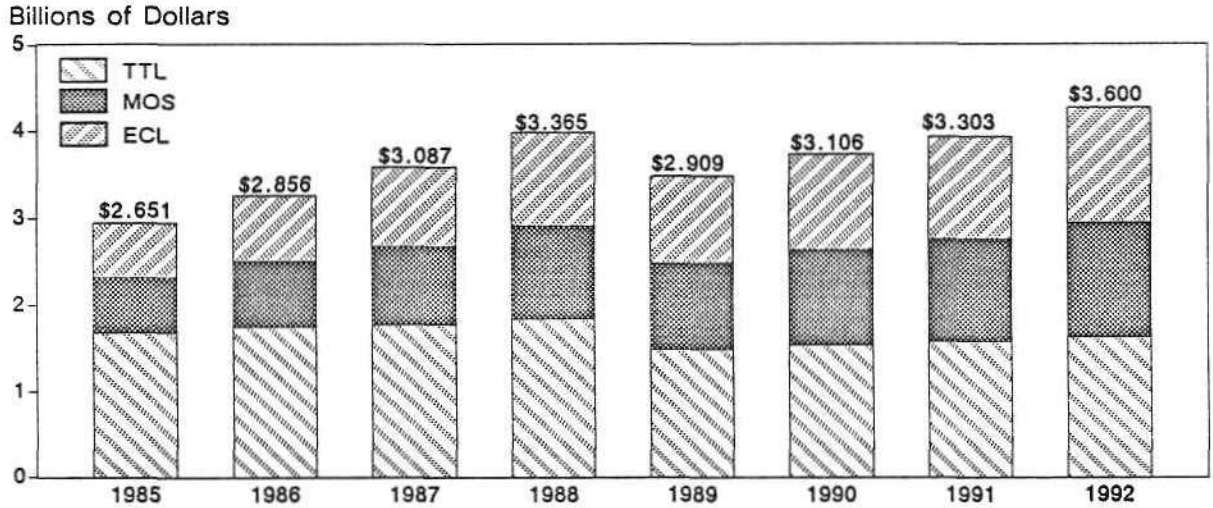
When we examine Fairchild Semiconductor Corporation, a picture emerges of a company that is both investing in the areas of its historic strength and addressing those technologies that could, if neglected, erode its market niches. Under the management team put together by Donald Brooks, Fairchild is consolidating the markets in which it wishes to participate and, at the same time, broadening its products and services to maintain the reputation it currently enjoys in those markets.

In the market for standard logic products, TTL and ECL processes currently maintain speed advantages over CMOS, with CMOS maintaining architectural flexibility and density advantages. CMOS capabilities of 15 to 35ns will soon approach current characteristic speeds of 5ns to 10ns for TTL, with ECL maintaining the ultimate speed advantage of 2ns performance. Dataquest expects the ECL bipolar logic family in which Fairchild is a market leader to grow from $294.0 million in 1986 to $648.6 million in 1991.

While LS-TTL is currently in most widespread use of TTL logic, use of Texas Instruments' AS-TTL and use of Fairchild's FAST logic product families are expected to grow as a proportion of standard logic sales, replacing the older LS-TTL applications. In fact, we expect the FAST family to grow faster than AS-TTL because of performance advantages. Fairchild's logic products offer a higher speed of 3ns per gate and power dissipation levels of just 4mW per gate. We believe that total consumption of FAST standard logic (including equivalent products from other suppliers) will grow from $218.0 million in 1986 to $400.0 million in 1991. We expect FACT and AC/ACT combined logic consumption to grow from $6.2 million in 1986 to $220.0 million in 1992. Figure 8 shows forecast growth in the standard logic market by technology. Total growth is expected to be steady at a compound annual growth rate (CAGR) of 6 percent until 1989, when an industry downturn is expected. We expect growth to continue at 5 percent CAGR until 1992.

Figure 8

Fairchild Semiconductor Corporation
ESTIMATED STANDARD LOGIC MARKET GROWTH
BY TECHNOLOGY



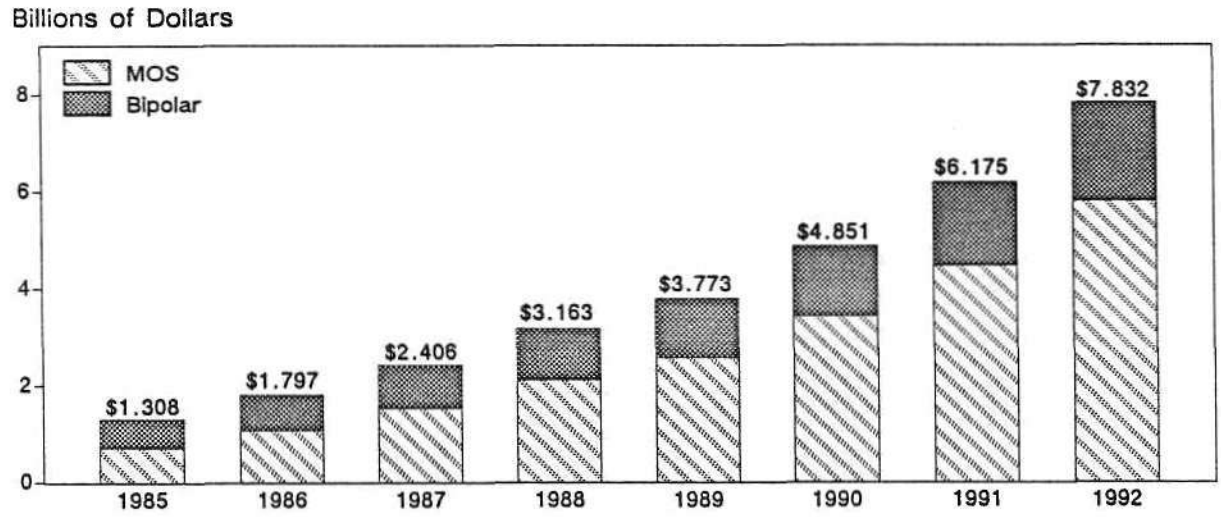
Source: Dataquest
November 1987

Although ASICs were introduced as long ago as the mid-1960s, recent development in CAD and CAE have allowed the ASIC market to grow rapidly in recent years. We believe that as it becomes less costly to combine gate arrays for more efficient replacement of standard logic chips, ASIC production will increase. Consequently, ASIC producers have proliferated in the past few years. We believe the bipolar gate array market share to grow to approximately $2.0 billion of the approximately $8.0 billion gate array market in 1992. We believe that, despite the increased downward pressure on price caused by the large number of competitors, the MOS gate array market will grow from its estimated $1.1 billion 1986 level to $5.8 billion by 1992. Figure 9 illustrates the forecast growth in the gate array market by technology.

By 1992, we expect the PLD market to grow to $1.1 billion dollars, with bipolar products composing $500.0 million of this total. Within the bipolar segment, ECL devices will account for $32.0 million. Figure 10 shows the PLD market by technology.

Figure 9

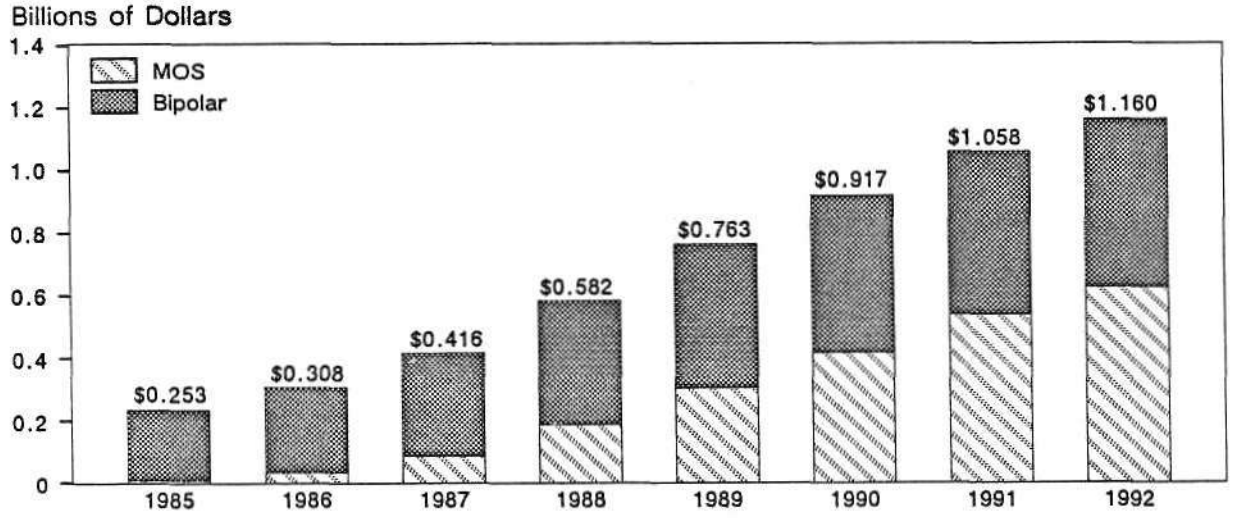
ESTIMATED GATE ARRAY MARKET GROWTH BY TECHNOLOGY



Source: Dataquest
November 1987

Figure 10

Fairchild Semiconductor Corporation
ESTIMATED PROGRAMMABLE LOGIC DEVICE GROWTH
BY TECHNOLOGY



Source: Dataquest
November 1987

The static RAM market that Fairchild has targeted is critical to high-speed computing, as cache memory must keep up with increasing processing speeds. As high-speed computer, graphics systems, and advanced military systems applications increase, we expect the SRAM market to grow from $350 million in 1986 to $750 million in 1991. Figure 11 illustrates this growth.

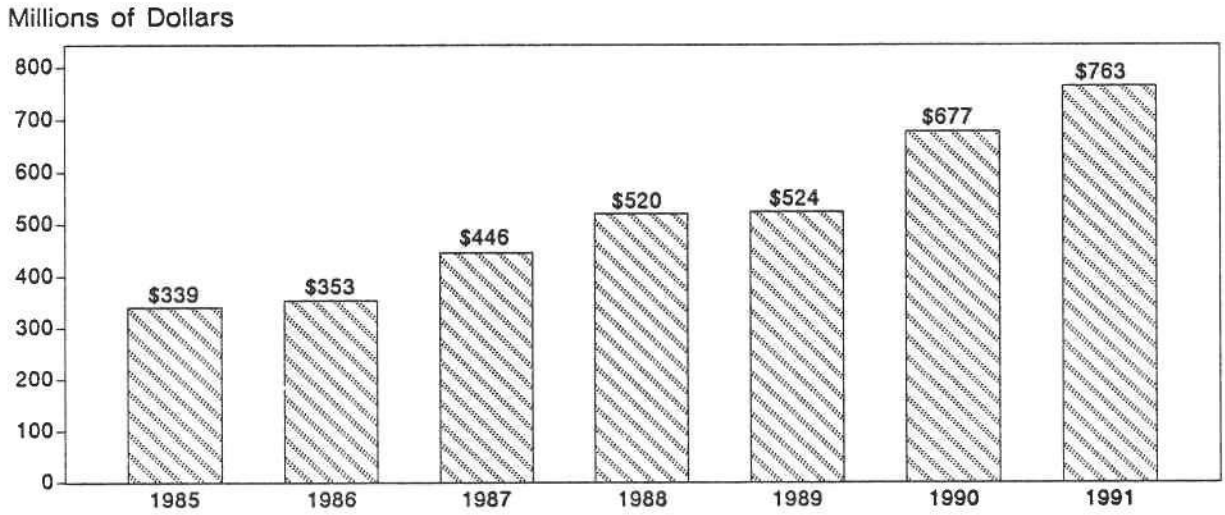
Although the Clipper microprocessor is clearly not a competitive threat to Intel and Motorola at this time, Fairchild's 32-bit MPU is targeted at a very attractive high-performance workstation market. It is here that Fairchild hopes to win designs away from today's major players. The Clipper, executing 5 mips (millions of instructions per second), outperforms other 32-bit MPUs on the market, operating at a 33-MHz clock rate at a time when newer versions of Intel's and Motorola's 32-bit MPUs are targeted at 20 to 25 MHz. The end user pays for this performance, however, with a premium that puts the Clipper at three to four times the average selling price of its competitors.

Driven by growth in applications such as technical workstations, the microprocessor market is expected to grow at a CAGR of 23 percent from 1987 to 1992 and at a 15 percent CAGR from 1992 to 1997. The outlook for the microprocessor market is depicted in Figure 12.

Fairchild Semiconductor Corporation

Figure 11

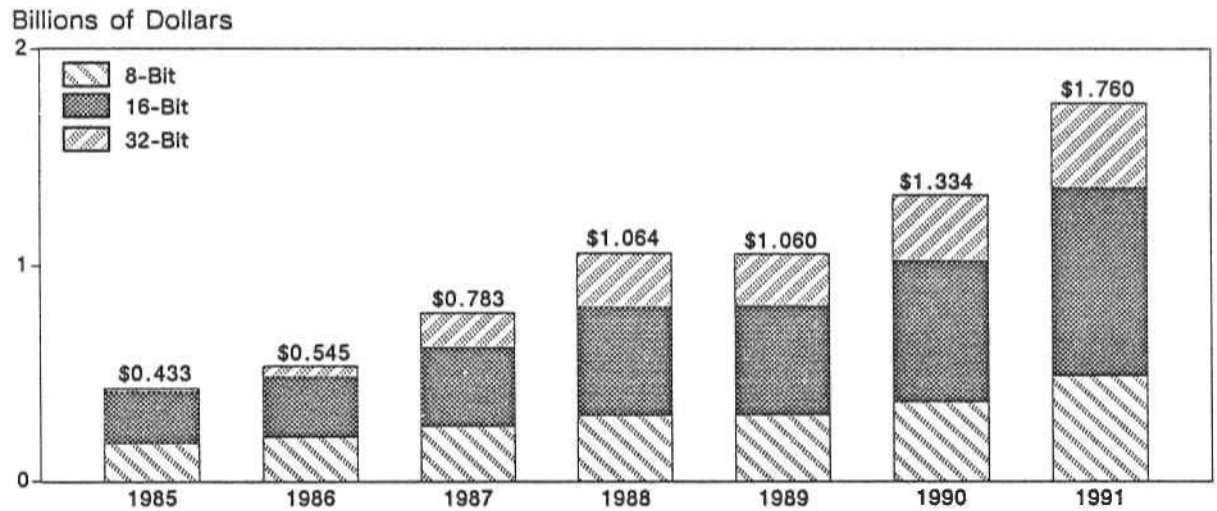
Fairchild Semiconductor Corporation
ESTIMATED FAST STATIC RAM MARKET GROWTH



Source: Dataquest
November 1987

Figure 12

Fairchild Semiconductor Corporation
FORECAST MICROPROCESSOR MARKET GROWTH



Source: Dataquest
November 1987

Fairchild Semiconductor Corporation

Fairchild is a veteran company of Silicon Valley. It has gone through many structural changes in its 60 years as a corporation and 30 years as a semiconductor producer. Whether Fairchild's strategy of "taking the high ground" and its current focus on specific product areas will restore the company to its former glory or not, there is little doubt that the company's recent direction under president Donald Brooks has been very positive.

Fairchild Camera & Instrument

Fairchild Camera & Instrument
WORLDWIDE SEMICONDUCTOR REVENUE
(Millions of Dollars)

	1978	1979	1980	1981	1982	1983	1984	1985
Total Semiconductor	358	469	566	462	410	455	665	492
Total Integrated Circuit	253	353	461	370	333	384	595	451
Bipolar Digital (Technology)	141	198	273	226	206	246	410	329
TTL	105	156	228	186	162	184	315	256
ECL	23	30	32	31	34	54	90	69
Other Bipolar Digital	13	12	13	9	10	8	5	4
Bipolar Digital (Function)	141	198	273	226	206	246	410	329
Bipolar Digital Memory	45	62	73	64	50	45	45	36
Bipolar Digital Logic	96	136	200	162	156	201	365	293
MOS (Technology)	52	77	105	65	50	48	45	22
NMOS		45	55	35	32	30	26	8
PMOS		15	18	10	5	4	5	3
CMOS		17	32	20	13	14	14	11
MOS (Function)	52	77	105	65	50	48	45	22
MOS Memory		29	41	16	7	5	4	4
MOS Micro Devices		20	28	24	23	24	17	10
MOS Logic		28	36	25	20	19	24	8
Linear	60	78	83	79	77	90	140	100
Total Discrete	87	90	81	76	62	64	66	39
Transistor	54	55	37	35	28	24	22	12
Small Signal Transistor	37	40	36	35	28	24	22	12
Power Transistor	17	15	1					
Diode	33	35	44	41	34	40	43	27
Small Signal Diode	25	29	32	30	25	40	38	22
Power Diode	7	5	7	4	3		3	3
Zener Diode	1	1	5	7	6		2	2
Thyristor								
Other Discrete							1	
Total Optoelectronic	18	26	24	16	15	7	4	2
LED Lamps	5	7	6	4	4	1		
LED Displays	10	15	14	9	8	4		
Optical Couplers	2	3	3	2	2	1	1	
Other Optoelectronics	1	1	1	1	1	1	3	2

Source: DATAQUEST
November 1986

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Fairchild Semiconductor Corporation

BACKGROUND AND OVERVIEW

Fairchild Semiconductor Corporation was formed in 1957 by a breakaway team from the Shockley Semiconductor Corporation with financial backing from Fairchild Camera and Instrument Corporation. Notable among the founders were Gordon E. Moore and Robert N. Noyce, who were later to breakaway a second time to found Intel Corporation.

Fairchild invented the planar transistor and pioneered planar technology--the mainstay of all current semiconductor technology. As an early innovator of integrated circuits, Fairchild developed the industry-standard 930 series diode transistor logic (DTL) family, in the mid-sixties. Texas Instruments later surpassed the DTL family with the ubiquitous 74 series transistor transistor logic (TTL) families.

By 1977, Fairchild was benefiting from a strong market demand for its major LSI strength, bipolar memories, but was subsequently faced by increasing competition, particularly from Japanese companies. Fairchild's inability to become a major MOS producer has been a continuing problem for the Company.

In late 1979, Fairchild was acquired by Schlumberger, the French oil services giant. Since then Fairchild has been through radical management and structural changes. Schlumberger's strategy has been to decentralize the Company, slash its worldwide employee headcount, and invest heavily in R&D and capital projects.

Large-scale readjustments of facilities and operations have taken place within the Company, including the closing of the MOS operations in San Jose, California and the Optoelectronics Division in Santa Clara, California.

Fairchild now employs approximately 18,000 people worldwide (including about 4,000 in Silicon Valley), compared with 26,000 worldwide at the end of 1978.

As shown in Table 1, DATAQUEST estimates that Fairchild's European revenues in 1982 were $111 million, a decrease of approximately 1 percent from 1981.

Fairchild Semiconductor Corporation

Table 1

Fairchild Semiconductor Corporation
ESTIMATED EUROPEAN SEMICONDUCTOR REVENUES BY PRODUCT LINE
(Millions of U.S. Dollars)

	1977	1978	1979	1980	1981	1982
Total Semiconductor	$ 72	$ 88	$ 99	$135	$112	$111
Total Integrated Circuit	$ 50	$ 63	$ 73	108	$ 86	$ 86
Bipolar Digital	30	36	40	56	49	49
MOS	5	10	13	18	11	9
Linear	15	17	20	34	26	28
Total Discrete	$ 18	$ 21	$ 21	$ 20	$ 20	$ 20
Transistor	10	12	11	8	10	11
Diode	8	9	10	12	10	9
Thyristor	0	0	0	0	0	0
Other	0	0	0	0	0	0
Total Optoelectronic	$ 4	$ 4	$ 5	$ 7	$ 6	$ 5

Source: DATAQUEST
October 1983

PRODUCTS AND MARKETS SERVED

Fairchild's product range covers most of the semiconductor product categories, with particular strength in bipolar digital integrated circuits and linear integrated circuits. In 1982, discrete semiconductors accounted for approximately 18 percent of Fairchild's European revenues. These discretes were primarily small-signal devices. Fairchild also supplied optoelectronic devices but withdrew from this market segment during 1983.

Fairchild Semiconductor Corporation

Fairchild is a leading supplier of bipolar LSI and VLSI products. The Company is pursuing the latest generation of advanced bipolar logic families with its FAST product line (Fairchild Advanced Schottky TTL), in direct competition with Texas Instrument's Advanced Schottky TTL families (AS and ALS).

In MOS, Fairchild is a major supplier of CMOS logic and has a limited presence in memory and microprocessor products. The Company is a second source for the Mostek 3870 8-bit microcomputer and the Motorola 6800 8-bit microprocessor.

OUTLOOK

Fairchild is still undergoing management changes and restructuring of its business activities. Alongside the plant closures are new investments. In January 1983, Fairchild installed $2 million worth of equipment at its Reading design center in the United Kingdom. This equipment will enable three simultaneous customer design teams to handle all stages of the semicustom design process up to the generation of mask data.

Fairchild may reestablish a wafer fabrication facility in Europe at its Wasserburg West German assembly and test plant. A plan to build a wafer fabrication facility in Japan, recently mothballed, may also be revived in line with the current improved worldwide semiconductor demand.

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Fairchild Camera & Instrument

Fairchild Camera & Instrument
ESTIMATED SEMICONDUCTOR REVENUES
(Millions of Dollars)

	1974	1975	1976	1977	1978	1979	1980	1981	1982
Total Semiconductor	323	234	307	325	358	469	566	462	410
Total Integrated Circuit	212	144	204	226	253	353	461	370	333
Bipolar Digital (Technology)	139	74	106	116	141	198	273	226	206
TTL	105	53	80	83	105	156	228	186	162
DTL	27	14	15	12	10	8	9	5	5
ECL	3	3	8	18	23	30	32	31	34
Other Bipolar Digital	4	4	3	3	3	4	4	4	5
Bipolar Digital (Function)	139	74	106	116	141	198	273	226	206
Bipolar Digital Memory	-	-	-	-	45	62	73	64	50
Bipolar Digital Logic	-	-	-	-	96	136	200	162	156
MOS (Technology)	20	22	35	58	52	77	105	65	50
NMOS	-	-	-	-	-	45	55	35	32
PMOS	-	-	-	-	-	15	18	10	5
CMOS	-	-	-	-	-	17	32	20	13
MOS (Function)	20	22	35	58	52	77	105	65	50
MOS Memory	-	-	-	-	-	29	41	16	7
MOS Microprocessor	-	-	-	-	-	20	28	24	23
MOS Logic	-	-	-	-	-	28	34	25	20
Linear	53	48	63	52	60	78	83	79	77
Total Discrete	98	72	78	83	87	90	81	76	62
Transistor	68	46	51	51	54	55	37	35	28
Small Signal Transistor	52	33	33	32	37	40	36	35	28
Power Transistor	16	13	18	19	17	15	1	-	-
Diode	28	24	25	30	33	35	44	41	34
Small Signal Diode	24	21	21	23	25	29	32	30	25
Power Diode	3	2	3	5	7	5	7	4	3
Zener Diode	1	1	1	2	1	1	5	7	6
Thyristor	-	-	-	-	-	-	-	-	-
Other Discrete	2	2	2	2	-	-	-	-	-
Total Optoelectronic	13	20	25	16	18	26	24	16	15
LED Lamps	2	3	4	4	5	7	6	4	4
LED Displays	7	13	16	9	10	15	14	9	8
Optical Couplers	2	2	3	2	2	3	3	2	2
Other Total Optoelectronics	2	2	2	1	1	1	1	1	1

Source: DATAQUEST

Fairchild Camera & Instrument

Fairchild
ESTIMATED SEMICONDUCTOR REVENUES
(Millions of Dollars)

	1974	1975	1976	1977	1978	1979	1980	1981
TOTAL SEMICONDUCTOR	323	236	307	325	358	469	566	464
Total Integrated Circuit	212	144	204	226	253	353	461	370
Bipolar Digital	139	74	106	116	141	198	273	226
TTL	105	53	80	83	105	156	228	186
DTL	27	14	15	12	10	8	9	5
ECL	3	3	8	18	23	30	32	31
Other	4	4	3	3	3	4	4	4
Bipolar Digital (Recap)					141	198	273	226
Memory					45	62	73	64
Logic					96	136	200	162
MOS	20	22	35	58	52	77	105	65
NMOS						45	55	35
PMOS						15	18	10
CMOS						17	32	20
MOS (Recap)						77	105	65
Memory						29	41	16
Microprocessor						20	28	24
Logic						28	36	25
Linear	53	48	63	52	60	78	83	79
Total Discrete	98	72	78	83	87	90	81	78
Transistor	68	46	51	51	54	55	37	35
Small Signal	52	33	33	32	37	40	36	35
Power Transistor	16	13	18	19	17	15	1	0
Diode	28	24	25	30	33	35	44	43
Small Signal	24	21	21	23	25	29	32	30
Power	3	2	3	5	7	5	7	6
Zener	1	1	1	2	1	1	5	7
Thyristor	0	0	0	0	0	0	0	0
Other	2	2	2	2	0	0	0	0
Total Optoelectronic	13	20	25	16	18	26	24	16
LED Lamps	2	3	4	4	5	7	6	4
LED Displays	7	13	16	9	10	15	14	9
Optical Couplers	2	2	3	2	2	3	3	2
Other	2	2	2	1	1	1	1	1

Source: DATAQUEST, Inc.

Fairchild Camera & Instrument

Fairchild Camera & Instrument
ESTIMATED SEMICONDUCTOR REVENUES
(Millions of Dollars)

	1974	1975	1976	1977	1978	1979	1980	1981	1982
Total Semiconductor	323	236	307	325	358	469	566	462	410
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TTL	105	53	80	83	105	156	228	186	162
DTL	27	14	15	12	10	8	9	5	5
ECL	3	3	8	18	23	30	32	31	34
Other Bipolar Digital	4	4	3	3	3	4	4	4	5
Bipolar Digital (Function)	139	74	106	116	141	198	273	226	206
Bipolar Digital Memory	-	-	-	-	45	62	73	64	50
Bipolar Digital Logic	-	-	-	-	96	136	200	162	156
MOS (Technology)	20	22	35	58	52	77	105	65	50
NMOS	-	-	-	-	-	45	55	35	32
PMOS	-	-	-	-	-	15	18	10	5
CMOS	-	-	-	-	-	17	32	20	13
MOS (Function)	20	22	35	58	52	77	105	65	50
MOS Memory	-	-	-	-	-	29	41	16	7
MOS Microprocessor	-	-	-	-	-	20	28	24	23
MOS Logic	-	-	-	-	-	28	36	25	20
Linear	53	48	63	52	60	78	83	79	77
Total Discrete	98	72	78	83	87	90	81	76	62
Transistor	68	46	51	51	54	55	37	35	28
Small Signal Transistor	52	33	33	32	37	40	36	35	28
Power Transistor	16	13	18	19	17	15	1	-	-
Diode	28	24	25	30	33	35	44	41	34
Small Signal Diode	24	21	21	23	25	29	32	30	25
Power Diode	3	2	3	5	7	5	7	4	3
Zener Diode	1	1	1	2	1	1	5	7	6
Thyristor	-	-	-	-	-	-	-	-	-
Other Discrete	2	2	2	2	-	-	-	-	-
Total Optoelectronic	13	20	25	16	18	26	24	16	15
LED Lamps	2	3	4	4	5	7	6	4	4
LED Displays	7	13	16	9	10	15	14	9	8
Optical Couplers	2	2	3	2	2	3	3	2	2
Other Total Optoelectronics	2	2	2	1	1	1	1	1	1

Source: DATAQUEST

Fairchild Camera & Instrument

Fairchild
ESTIMATED SEMICONDUCTOR REVENUES
(Millions of Dollars)

	1974	1975	1976	1977	1978	1979	1980	1981
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TTL	105	53	80	83	105	156	228	186
DTL	27	14	15	12	10	8	9	5
ECL	3	3	8	18	23	30	32	31
Other	4	4	3	3	3	4	4	4
Bipolar Digital (Recap)					141	198	273	226
Memory					45	62	73	64
Logic					96	136	200	162
MOS	20	22	35	58	52	77	105	65
NMOS						45	55	35
PMOS						15	18	10
CMOS						17	32	20
MOS (Recap)						77	105	65
Memory						29	41	16
Microprocessor						20	28	24
Logic						28	36	25
Linear	53	48	63	52	60	78	83	79
Total Discrete	98	72	78	83	87	90	81	78
Transistor	68	46	51	51	54	55	37	35
Small Signal	52	33	33	32	37	40	36	35
Power Transistor	16	13	18	19	17	15	1	0
Diode	28	24	25	30	33	35	44	43
Small Signal	24	21	21	23	25	29	32	30
Power	3	2	3	5	7	5	7	6
Zener	1	1	1	2	1	1	5	7
Thyristor	0	0	0	0	0	0	0	0
Other	2	2	2	2	0	0	0	0
Total Optoelectronic	13	20	25	16	18	26	24	16
LED Lamps	2	3	4	4	5	7	6	4
LED Displays	7	13	16	9	10	15	14	9
Optical Couplers	2	2	3	2	2	3	3	2
Other	2	2	2	1	1	1	1	1

Source: DATAQUEST, Inc.

8.02 Fairchild Camera & Instrument

Fairchild Camera & Instrument Corp.
464 Ellis Street
Mountain View, California 94042
(415) 962-5011

Balance Sheet (Fiscal Year Ending December 31)

	1977	1978	Percent Change 1977-1978
Working Capital ($ Millions)	$121.2	$123.1	1.6%
Long-Term Debt ($ Millions)	$ 69.5	$ 69.2	(0.4%)
Shareholders' Equity ($ Millions)	$184.9	$205.9	11.4%
After-Tax Return on Average Equity (%)	6.0%	12.0%	

Operating Performance (Fiscal Year Ending December 31)

	1977	1978	Percent Change 1977-1978
Revenue ($ Millions)	$470.4	$550.4	17.0%
Cost of Goods ($ Millions)	$263.7	$283.9	7.7%
R&D Expenditures ($ Millions)	$ 49.7	$ 56.2	13.1%
Marketing, SG&A Expense ($ Millions)	$102.4	$123.5	20.6%
Pretax Income ($ Millions)	$ 18.3	$ 40.6	121.9%
Pretax Margin (%)	3.9%	7.5%	
Net Income ($ Millions)	$ 11.2	$ 24.8	121.9%
Per Share Data[1]			
Earnings ($)	$ 2.01	$ 4.12	105.0%
Dividends ($)	$ .80	$ .80	0.0%
Book Value ($)	$ 34.42	$ 38.19	11.0%
Average Shares Outstanding (Millions)	5.56	6.01	
Capital Expenditures ($ Millions)	$ 22.0	$ 32.0	45.1%
Total Employees	19,893	25,939	30.4%

[1] Fully diluted

Source: Fairchild Annual Reports
DATAQUEST, Inc.

8.02 Fairchild Camera & Instrument

Table 8.02-1
Fairchild Camera & Instrument
ESTIMATED REVENUES BY GROUP
(Dollars in Millions)

	1971	1972	1973	1974	1975	1976	1977	1978
Semiconductors	$125.0	$163.0	$283.0	$324.0	$236.0	$307.0	$323.2	$378.6
Government & Other	57.9	45.0	50.1	40.1	35.2	42.5		
Systems	11.4	17.2	19.7	23.3	21.4	23.0		
Commercial & Industrial Equipment[1]							92.4	154.5
Consumer Products					9.0	100.7	59.1	17.0
Intracompany Sales	(0.8)	(1.3)	(1.6)	(2.5)	(10.0)	(30.0)	(14.6)	(16.3)
Net Sales	$193.1	$223.9	$351.2	$384.9	$291.5	$443.2	$460.1	$533.8
Royalties and Other	7.6	6.3	10.4	10.6	8.2	7.2	10.3	16.6
Total Revenues	$200.7	$230.2	$361.6	$395.5	$299.7	$450.4	$470.4	$550.4

[1]The 1977 reorganization formed Commercial & Industrial Equipment from "Government & Other." Twenty percent of Systems business went into Consumer Products group. The remaining 80 percent was reclassified with the Semiconductor Group.

Source: Fairchild Annual Reports
DATAQUEST, Inc.

8.02 Fairchild Camera & Instrument

Table 8.02-2

Fairchild Camera & Instrument
ESTIMATED SEMICONDUCTOR REVENUES
(Dollars in Millions)

	1970	1971	1972	1973	1974	1975	1976	1977	1978
TOTAL SEMICONDUCTOR	152	124	163	283	323	236	307	325	380
TOTAL I C	84	73	97	186	212	144	204	226	255
BIPOLAR DIGITAL	54	47	66	134	139	74	106	116	143
TTL	23	25	41	98	105	53	80	83	105
DTL	26	18	21	31	27	14	15	12	12
ECL	0	0	0	1	3	3	8	18	23
OTHER	5	4	4	4	4	4	3	3	3
MOS	3	4	5	12	20	22	35	58	51
PMOS									
NMOS									
CMOS									
LINEAR	27	22	26	40	53	48	63	52	61
INTERFACE									
CONTROL									
ENTERTAINMENT									
OTHER									
HYBRID									
TOTAL DISCRETE	67	48	61	87	98	72	78	83	107
TRANSISTOR				60	68	46	51	51	64
SMALL SIGNAL				51	52	33	33	31	45
POWER				9	16	13	18	19	19
DIODE				26	28	24	25	30	43
SMALL SIGNAL				24	24	21	21	23	35
POWER				2	3	2	3	5	7
ZENER				0	1	1	1	2	1
THYRISTOR				0	0	0	0	0	0
OTHER	67	48	61	1	2	2	2	2	0
OPTOELECTRONIC	1	3	5	10	13	20	25	16	18
LED LAMPS	0	0	1	2	2	3	4	4	5
LED DISPLAYS	1	2	3	6	7	13	16	9	10
COUPLERS	0	0	0	1	2	2	3	2	2
OTHER	0	1	1	1	2	2	2	1	1

Source: DATAQUEST, Inc.

8.02 Fairchild Camera & Instrument

Table 8.02-3

Fairchild Camera & Instrument
FINANCIAL STATEMENT HISTORY 1971-78
(Dollars in Millions)

		Fiscal Year Ending December 31									
		1971	1972	1973	1974	1975	1976	1977	1978	TREND	CMPD GR
BALANCE SHEET											
1	*CASH & LIQUID. SECURITIES*	11.67	25.54	34.27	33.39	25.19	26.90	43.04	59.25	4.65	16.71
3	*RECEIVABLES*	30.70	48.61	65.61	68.96	56.64	82.23	72.67	95.52	7.28	13.23
4	*INVENTORY*	37.31	47.87	62.34	73.38	93.03	96.53	78.00	90.48	7.68	12.90
5	*OTHER CURRENT ASSETS*	1.80	0.95	1.26	1.87	1.81	3.67	5.88	4.46	0.60	24.87
6	*PREPAID INCOME TAX*	0.00	0.84	7.13	7.66	10.89	6.91	8.10	9.17	1.23	676.28
7	*EXCESS FUNDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	*TOTAL CURRENT ASSETS*	81.48	123.80	170.61	185.26	187.56	216.23	207.69	258.88	21.43	14.54
9	*GROSS P P E*	110.88	106.84	135.46	158.45	165.30	187.79	199.43	214.30	16.08	10.99
10	*ACCUMULATED DEPRECIATION*	41.38	40.80	47.42	49.61	53.05	57.38	67.18	76.45	4.89	9.25
11	*NET P P E*	69.49	66.04	88.04	108.85	112.26	130.40	132.25	137.85	11.19	11.94
12	*MISC ASSETS*	0.85	0.85	1.19	0.95	1.37	2.57	8.22	22.44	2.29	55.14
13	*INVEST JOINT VENTURES*	0.00	1.23	1.49	1.89	2.53	2.88	3.47	4.51	0.57	596.78
15	**TOTAL ASSETS**	151.83	191.93	261.32	296.95	303.72	352.09	351.63	423.67	35.48	14.16
16	*NOTES PAYABLE*	4.28	9.52	7.26	6.82	9.46	13.62	8.81	19.50	1.48	15.96
17	*ACCOUNTS PAYABLE*	13.60	16.00	22.45	16.66	18.74	23.91	22.02	30.39	1.83	9.38
18	*ACCRUED TAXES*	2.22	2.33	10.07	23.11	18.80	21.04	12.74	25.04	2.86	38.66
19	*ACCRUED LIABILITIES*	6.38	10.15	18.63	22.16	26.72	27.21	26.13	32.98	3.53	23.24
20	*CURR MAT LONG TERM DEBT*	1.82	2.40	2.48	2.53	2.32	3.03	2.90	4.52	0.27	9.75
21	*ACCRUED COMPENSATION*	6.59	7.57	11.43	12.62	11.02	13.56	13.91	23.34	1.83	15.73
22	*TOTAL CURR LIABILITIES*	34.90	47.97	72.32	83.89	87.06	102.37	86.50	135.78	11.81	17.49
23	*LONG TERM DEBT*	57.38	54.80	49.20	47.06	44.51	65.06	69.46	69.18	2.39	3.88
24	*DEFERRED TAXES*	0.00	0.00	2.65	2.97	3.22	4.14	6.25	7.47	1.05	2489.18
25	*MISC LIABILITIES*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	*EMPL. BENEFIT RESERVES*	1.76	2.47	2.95	3.64	2.61	2.91	4.56	5.33	0.41	13.28
27	*DEFICIT FUNDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	*TOTAL LIABILITIES*	94.03	105.24	127.12	137.56	137.39	174.48	166.77	217.76	15.66	11.48
29	*PREFERRED STOCK*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	*COMMON STOCK*	4.39	4.98	5.11	5.16	5.28	5.36	5.37	5.39	0.12	2.40
31	*CAPITAL SURPLUS*	47.89	65.16	72.91	74.87	78.31	81.32	81.69	82.26	4.19	6.50
32	*RETAINED EARNINGS*	5.52	16.55	56.19	79.36	82.74	90.93	97.80	118.26	15.51	46.05
34	*TOTAL EQUITY*	57.80	86.69	134.21	159.39	166.33	177.61	184.86	205.92	19.82	17.52
35	**TOTAL LIAB & EQUITY**	151.83	191.93	261.32	296.95	303.72	352.09	351.63	423.67	35.48	14.16
36	*NET WORKING CAPITAL*	46.58	75.83	98.29	101.37	100.51	113.86	121.19	123.10	9.62	12.08
INCOME & EXPENSE											
38	*SALES*	193.09	223.90	351.17	384.93	291.54	443.22	460.11	533.83	44.63	14.18
40	*COST OF GOODS*	117.18	121.04	187.76	202.10	146.88	254.20	263.67	283.92	24.10	13.55
41	*GROSS PROFIT*	75.91	102.85	163.41	182.83	144.66	189.02	196.44	249.91	20.53	15.05
42	*S G & A EXPENSE*	44.51	47.89	61.98	75.88	69.73	94.43	102.39	123.48	10.91	15.52
43	*R & D EXPENSE*	28.14	29.29	38.25	40.29	38.00	47.00	49.70	56.21	3.84	10.05
44	*DISCONT. PRODUCT LINE*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.93	0.49	552.28
45	*OPERATING PROFIT*	3.25	25.68	63.19	66.66	36.93	47.60	44.35	64.28	5.29	30.23
46	*DEPRECIATION*	11.35	10.37	12.04	14.09	15.89	16.66	18.31	22.71	1.61	11.03
47	*LEASE PAYMENTS*	2.26	5.10	7.40	7.72	7.94	9.52	10.90	10.30	1.09	19.84
48	*INTEREST EXPENSE*	3.95	4.25	4.18	3.87	4.15	5.50	7.18	7.28	0.50	9.73
49	*MISC EXPENSE*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51	*ROYALTY & OTHER INCOME*	7.63	6.33	10.40	10.62	8.19	7.16	10.34	16.61	0.84	8.07
53	*PRETAX PROFIT*	(6.69)	12.29	49.97	51.61	17.13	23.07	18.30	40.60	2.93	*********
54	*INCOME TAXES*	1.15	4.96	23.65	24.58	6.71	10.61	7.14	15.83	0.67	21.65
55	*EXTRAORD. ITEM*	0.00	(3.18)	(14.51)	0.00	(2.65)	0.00	0.00	0.00	0.68	*********
56	*NET PROFIT*	(7.84)	10.51	40.82	27.03	13.07	12.46	11.16	24.76	1.58	*********
57	*EPS AFTER PFD DIVIDENDS*	(1.79)	2.16	7.45	5.00	2.41	2.27	2.01	4.12	0.27	*********
58	*COMMON DIV PER SHARE*	0.00	0.00	0.30	0.75	0.80	0.80	0.80	0.80	0.13	1838.28

Source: Fairchild Annual Reports
DATAQUEST, Inc.

8.02 Fairchild Camera & Instrument

Table 8.02-4

Fairchild Camera & Instrument
FINANCIAL STATEMENT HISTORY 1971-78
(Percent)

		Fiscal Year Ending December 31									
		1971	1972	1973	1974	1975	1976	1977	1978	TREND	CMPD GR
	BALANCE SHEET										
1	*CASH & LIQUID SECURITIES*	7.68	13.30	13.11	11.24	8.30	7.64	12.24	13.98	0.23	2.23
3	*RECEIVABLES*	20.22	25.33	25.11	23.22	18.65	23.36	20.67	22.54	(0.20)	(0.82)
4	*INVENTORY*	24.57	24.94	23.85	24.71	30.63	27.42	22.18	21.36	(0.23)	(1.11)
5	*OTHER CURRENT ASSETS*	1.18	0.49	0.48	0.63	0.59	1.04	1.67	1.05	0.08	9.38
6	*PREPAID INCOME TAX*	0.00	0.44	2.73	2.58	3.59	1.96	2.30	2.16	0.28	556.71
7	*EXCESS FUNDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	*TOTAL CURRENT ASSETS*	53.67	64.50	65.29	62.39	61.76	61.42	59.07	61.10	0.15	0.33
9	*GROSS P P E*	73.03	55.67	51.84	53.36	54.43	53.34	56.71	50.58	(1.74)	(2.78)
10	*ACCUMULATED DEPRECIATION*	27.26	21.26	18.15	16.71	17.47	16.30	19.10	18.04	(0.95)	(4.31)
11	*NET P P E*	45.77	34.41	33.69	36.65	36.96	37.04	37.61	32.54	(0.79)	(1.95)
12	*MISC ASSETS*	0.56	0.44	0.45	0.92	0.45	0.73	2.34	5.30	0.52	35.89
13	*INVEST JOINT VENTURES*	0.00	0.64	0.57	0.64	0.83	0.82	0.99	1.07	0.12	489.46
15	**TOTAL ASSETS**	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
16	*NOTES PAYABLE*	2.82	4.96	2.78	2.30	3.11	3.87	2.51	4.60	0.05	1.58
17	*ACCOUNTS PAYABLE*	8.96	8.33	8.59	5.61	6.17	6.79	6.26	7.17	(0.33)	(4.19)
18	*ACCRUED TAXES*	1.46	1.21	3.85	7.78	6.19	5.98	3.62	5.91	0.57	21.45
19	*ACCRUED LIABILITIES*	4.20	5.29	7.13	7.46	8.80	7.73	7.43	7.79	0.46	7.95
20	*CURR MAT LONG TERM DEBT*	1.20	1.25	0.95	0.85	0.76	0.86	0.83	1.07	(0.04)	(3.86)
21	*ACCRUED COMPENSATION*	4.34	3.94	4.37	4.25	3.63	3.85	3.96	5.51	0.07	1.37
22	*TOTAL CURR LIABILITIES*	22.98	24.99	27.68	28.25	28.66	29.07	24.60	32.05	0.79	2.91
23	*LONG TERM DEBT*	37.79	28.55	18.83	15.85	14.65	18.48	19.75	16.33	(2.34)	(8.92)
24	*DEFERRED TAXES*	0.00	0.00	1.01	1.00	1.06	1.17	1.78	1.76	0.26	2007.00
25	*MISC LIABILITIES*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	*EMPL. BENEFIT RESERVES*	1.16	1.29	1.13	1.23	0.86	0.83	1.30	1.26	(0.01)	(0.78)
27	*DEFICIT FUNDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	*TOTAL LIABILITIES*	61.93	54.83	48.64	46.33	45.24	49.56	47.43	51.40	(1.30)	(2.35)
29	*PREFERRED STOCK*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	*COMMON STOCK*	2.89	2.59	1.95	1.74	1.74	1.52	1.53	1.27	(0.21)	(10.31)
31	*CAPITAL SURPLUS*	31.54	33.95	27.90	25.21	25.78	23.10	23.23	19.42	(1.81)	(6.71)
32	*RETAINED EARNINGS*	3.64	8.62	21.50	26.72	27.24	25.83	27.81	27.91	3.33	27.93
34	*TOTAL EQUITY*	38.07	45.17	51.36	53.67	54.76	50.44	52.57	48.60	1.30	2.94
35	**TOTAL LIAB & EQUITY**	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
36	*NET WORKING CAPITAL*	30.68	39.51	37.61	34.14	33.09	32.34	34.46	29.06	(0.64)	(1.83)
	INCOME & EXPENSE										
38	*SALES*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
40	*COST OF GOODS*	60.69	54.06	53.47	52.50	50.38	57.35	57.31	53.19	(0.32)	(0.55)
41	*GROSS PROFIT*	39.31	45.94	46.53	47.50	49.62	42.65	42.69	46.81	0.32	0.76
42	*S G & A EXPENSE*	23.05	21.39	17.65	19.71	23.92	21.30	22.25	23.13	0.24	1.17
43	*R & D EXPENSE*	14.58	13.08	10.89	10.47	13.03	10.60	10.80	10.53	(0.45)	(3.62)
44	*DISCONT. PRODUCT LINE*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.11	0.09	467.30
45	*OPERATING PROFIT*	1.68	11.47	17.99	17.32	12.67	10.74	9.64	12.04	0.44	14.06
46	*DEPRECIATION*	5.68	4.63	3.43	3.66	5.45	3.76	3.98	4.25	(0.14)	(2.76)
47	*LEASE PAYMENTS*	1.17	2.28	2.11	2.00	2.72	2.15	2.37	1.93	0.08	4.95
48	*INTEREST EXPENSE*	2.05	1.90	1.19	1.00	1.42	1.24	1.56	1.36	(0.07)	(3.90)
49	*MISC EXPENSE*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51	*ROYALTY & OTHER INCOME*	3.95	2.83	2.96	2.76	2.81	1.61	2.25	3.11	(0.15)	(5.35)
53	*PRETAX PROFIT*	(3.46)	5.49	14.23	13.41	5.88	5.20	3.98	7.60	0.42	*********
54	*INCOME TAXES*	0.60	2.21	6.73	6.38	2.30	2.39	1.55	2.97	(0.05)	6.54
55	*EXTRAORD. ITEM*	0.00	(1.42)	(4.13)	0.00	(0.91)	0.00	0.00	0.00	0.22	*********
56	*NET PROFIT*	(4.06)	4.69	11.63	7.02	4.48	2.81	2.43	4.64	0.24	*********
57	*EPS AFTER PFD DIVIDENDS*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
58	*COMMON DIV PER SHARE*	0.00	0.00	4.03	15.00	33.20	35.18	39.81	19.42	5.32	3257.56

Source: Fairchild Annual Reports
DATAQUEST, Inc.

8.02 Fairchild Camera & Instrument

Table 8.02-5

Fairchild Camera & Instrument
FUNDS FLOW HISTORY 1972-78
(Dollars in Millions)

		Fiscal Year Ending December 31								
		1972	1973	1974	1975	1976	1977	1978	TREND	CMPD GR
SOURCES										
56	*NET PROFIT*	10.51	40.82	27.03	13.07	12.46	11.16	24.76	(1.11)	(2.81)
46	*DEPRECIATION*	10.37	12.04	14.09	15.89	16.66	18.31	22.71	1.86	12.74
61	*NEW LONG TERM DEBT*	0.00	0.00	0.40	0.00	23.58	7.30	4.25	1.80	6202.19
62	*NEW EQUITY*	18.38	8.34	2.21	(1.79)	3.21	0.54	1.09	(2.37)	*********
63	*INCR OTHER LIABILITIES*	0.71	3.13	1.01	(0.78)	1.22	3.76	1.99	0.19	*********
66	*TOTAL SOURCES*	39.97	64.33	44.74	26.38	57.13	41.06	54.81	0.37	1.05
USES										
67	*P P E EXPENDITURES*	6.92	34.04	34.90	19.30	34.81	20.16	28.30	1.30	12.01
68	*REPAYMENT LONG TERM DEBT*	2.00	5.52	2.48	2.77	2.32	3.03	2.90	(0.09)	(0.56)
69	*PREFERRED DIVIDENDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70	*COMMON DIVIDENDS*	0.00	1.64	4.05	4.34	4.38	4.44	4.81	0.73	1073.29
72	*INCR WORKING CAPITAL*	29.83	22.53	3.14	(1.08)	14.07	7.19	3.53	(3.52)	*********
71	*INCR OTHER ASSETS*	1.23	0.59	0.17	1.06	1.55	6.24	15.26	1.96	67.71
74	*TOTAL USES*	39.97	64.33	44.74	26.38	57.13	41.07	54.81	0.37	1.05
75	*EXCESS/DEFICIT*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
76	*CUMULATIVE SUR/DEF*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Fairchild Annual Reports
DATAQUEST, Inc.

8.02 Fairchild Camera & Instrument

Table 8.02-6

Fairchild Camera & Instrument
FINANCIAL RATIO HISTORY 1971-78

		Fiscal Year Ending December 31									
		1971	1972	1973	1974	1975	1976	1977	1978	ST AV	WTD AVG
LIQUIDITY											
1	*CURRENT RATIO*	2.335	2.581	2.359	2.208	2.154	2.112	2.401	1.907	2.257	2.192
2	*QUICK RATIO*	1.214	1.546	1.381	1.220	0.940	1.066	1.338	1.140	1.231	1.192
3	*CASH RATIO*	0.334	0.532	0.474	0.398	0.289	0.263	0.498	0.436	0.403	0.400
4	*WORKING CAPITAL/SALES*	0.241	0.339	0.280	0.263	0.345	0.257	0.263	0.231	0.277	0.271
6	*DAYS RECEIVABLES*	58.041	79.239	68.192	65.386	70.917	67.718	57.649	65.308	66.556	65.821
7	*DAYS INVENTORY*	116.218	144.351	121.180	132.536	231.165	138.608	107.981	116.320	138.545	138.125
LEVERAGE											
8	*LONG TERM DEBT/CAPITALIZ*	0.498	0.387	0.268	0.228	0.211	0.268	0.273	0.251	0.298	0.266
11	*LONG TERM DEBT/EQUITY*	0.993	0.632	0.367	0.295	0.268	0.366	0.376	0.336	0.454	0.372
12	*TOTAL DEBT/EQUITY*	1.098	0.770	0.439	0.354	0.338	0.460	0.439	0.453	0.544	0.459
COVERAGE											
13	*EBIT/INTEREST*	(0.693)	3.891	12.965	14.342	5.124	5.191	3.548	6.573	6.368	6.598
14	*FIXED CHARGE COVERAGE*	(0.077)	2.315	5.315	5.455	2.417	2.535	2.012	3.309	2.910	3.060
16	*REPAY LTD+FIX CHARGE COV*	*********	1.937	4.403	4.494	1.998	2.196	1.723	2.840	2.799	2.622
OPER PERFORMANCE											
17	*GROSS PROFIT/SALES*	0.393	0.459	0.465	0.475	0.496	0.426	0.427	0.468	0.451	0.455
18	*OPER PROFIT/SALES*	0.017	0.115	0.180	0.173	0.127	0.107	0.096	0.120	0.117	0.122
21	*PRETAX PROFIT/SALES*	(0.035)	0.055	0.142	0.134	0.059	0.052	0.040	0.076	0.065	0.070
22	*NET PROFIT/SALES*	(0.041)	0.047	0.116	0.070	0.045	0.028	0.024	0.046	0.042	0.045
23	*NET PROFIT/AVG EQUITY*	*********	0.145	0.370	0.184	0.080	0.072	0.062	0.127	0.149	0.121
24	*NET PROFIT/AVG CAPITALIZ*	*********	0.082	0.251	0.139	0.063	0.055	0.045	0.094	0.104	0.088
26	*NET PROFIT/AVG TOT ASSETS*	*********	0.061	0.180	0.097	0.044	0.038	0.032	0.064	0.074	0.061
27	*E P S GROWTH RATE*	**********		2.457	(0.329)	(0.518)	(0.056)	(0.116)	1.051	**********	
28	*SALES GROWTH RATE*	*********	0.160	0.568	0.096	(0.243)	0.520	0.038	0.160	0.186	0.163
TURNOVER											
31	*SALES/AVG EQUITY*	*********	3.099	3.179	2.622	1.790	2.577	2.539	2.732	2.648	2.562
32	*SALES/AVG CAPITALIZ*	*********	1.745	2.162	1.975	1.397	1.955	1.852	2.017	1.872	1.878
33	*SALES/AVG TOT DEBT + EQTY*	*********	1.630	2.027	1.883	1.330	1.839	1.752	1.889	1.764	1.771
34	*SALES/AVG TOTAL ASSETS*	*********	1.303	1.550	1.379	0.971	1.352	1.308	1.377	1.320	1.309
35	*SALES/AVG OPER ASSETS*	*********	1.314	1.566	1.393	0.982	1.371	1.340	1.449	1.345	1.343
36	*SALES/AVG GROSS P P E*	*********	2.057	2.899	2.619	1.801	2.511	2.377	2.581	2.406	2.421
BALANCE SHEET											
37	*CASH/SALES*	0.060	0.114	0.098	0.087	0.086	0.061	0.094	0.111	0.089	0.091
38	*RECEIVABLES/SALES*	0.159	0.217	0.187	0.179	0.194	0.186	0.158	0.179	0.182	0.180
41	*INVENTORY/SALES*	0.193	0.214	0.178	0.191	0.319	0.218	0.170	0.169	0.206	0.204
42	*OTH CURR ASSETS/SALES*	0.009	0.004	0.004	0.005	0.006	0.008	0.013	0.008	0.007	0.008
43	*LINE 6/SALES*	0.000	0.004	0.020	0.020	0.037	0.016	0.018	0.017	0.016	0.019
44	*GROSS P P E/SALES*	0.574	0.477	0.386	0.412	0.567	0.424	0.433	0.401	0.459	0.443
45	*LINE 13/SALES*	0.000	0.006	0.004	0.005	0.009	0.007	0.008	0.008	0.006	0.007
46	*MISC ASSETS/SALES*	0.004	0.004	0.003	0.002	0.005	0.006	0.018	0.042	0.011	0.015
47	*ACCOUNTS PAYABLE/SALES*	0.070	0.071	0.064	0.043	0.064	0.054	0.048	0.057	0.059	0.056
48	*ACCRUED TAXES/SALES*	0.012	0.010	0.029	0.060	0.065	0.047	0.028	0.047	0.037	0.043
51	*ACCRUED LIABILITY/SALES*	0.033	0.045	0.053	0.058	0.092	0.061	0.057	0.062	0.058	0.062
52	*LINE 21/SALES*	0.034	0.034	0.033	0.033	0.038	0.031	0.030	0.044	0.034	0.035
53	*DEFERRED TAXES/SALES*	0.000	0.000	0.008	0.008	0.011	0.009	0.014	0.014	0.008	0.010
54	*MISC LIABILITIES/SALES*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
56	*LINE 26/SALES*	0.009	0.011	0.008	0.009	0.009	0.007	0.010	0.010	0.009	0.009
MISCELLANEOUS											
57	*EQUITY PER COMMON SHARE*	13.180	17.775	24.492	29.482	30.663	32.429	33.279	34.262	26.945	30.419
58	*RETIRE/PREV GROSS P P E*	*********	(0.099)	(0.051)	(0.088)	(0.079)	(0.075)	(0.045)	(0.067)	(0.072)	(0.068)
61	*DEPREC/PREV GROSS P P E*	*********	0.094	0.113	0.104	0.100	0.101	0.097	0.114	0.103	0.104
62	*COM DIVS/ERN-PFD DIVS*	0.000	0.000	0.040	0.150	0.332	0.352	0.398	0.194	0.183	0.245
63	*TAX RATE*	(0.172)	0.403	0.473	0.476	0.392	0.460	0.390	0.390	0.352	0.404
64	*COST OF GOODS/SALES*	0.607	0.541	0.535	0.525	0.504	0.574	0.573	0.532	0.549	0.545
65	*S G & A/SALES*	0.231	0.214	0.176	0.197	0.239	0.213	0.223	0.231	0.216	0.218

Source: Fairchild Annual Reports
DATAQUEST, Inc.

Falco Data Products, Inc.

440 Potrero Avenue
Sunnyvale, California 94086
Telephone: (408) 745-7123
Fax: (408) 745-7860
Dun's Number: Not Available

Date Founded: 1979

CORPORATE STRATEGIC DIRECTION

Falco Data Products, Inc., was founded in 1979 as a video display terminal manufacturer. Falco delivered its first terminal, the TS line, in 1980 and began volume shipments in early 1981. The debut and rise of the FAME terminal line occurred in 1984 and 1985, and with it a greater emphasis on distribution of the FAME II and III. Original equipment manufacturer (OEM) sales continued to be strong due to the modular design of FAME housing, logic cards, and keyboards. The FAME series of terminals was discontinued in 1986 after the Company's third generation of terminals, the Falco 500 series, was introduced. Three terminals in this series were introduced: the 500, the 5220, and the 5500. All three terminals offered multihost windowing, multiple emulations, and higher display resolution in a redesigned enclosure.

In 1987, Falco introduced the 500e, 5220e, and 5500e, which are enhanced versions of the 500, 5220, and 5500, and two completely new terminals, the 5000 and 5600. In 1988, Falco introduced several new products: the 5600s, 5220s, 580, 5330, and 5088. Falco also expanded into the minicomputer market. In 1987, Falco introduced the System 5000 Series, Intel 80386-based minicomputers, to the European market. The Company formally announced the products in the domestic market in late 1988.

Currently, the Company designs, manufactures, and markets a full spectrum of video display terminals and systems products including desktop computers, monitors, LAN workstations and multiuser systems. Falco competes in two video display terminal segments: the American Standard Code for Information Interchange (ASCII) market and the American National Standard Institute (ANSI) market. The privately held Company has become one of the largest independent suppliers of ANSI/ASCII graphics terminals in the United States. For the year ended December 31, 1989, Dataquest ranks Falco as the number seven supplier of multipurpose ASCII/ANSI terminals (Segment 4) in North America, with 3.8 percent market share.

Falco's success in the terminal market lies in producing products with a high degree of compatibility with computer systems of various sizes and configurations. This has provided the Company with experience in computer operating systems, CPUs, communications, and networking. Based on expertise in these areas of technology, Falco expanded into the computer market with a line of multiuser systems introduced in 1989 and, in 1990, entered the personal computer arena.

Falco's sales channels include OEMs, distributors, and value-added resellers (VARs) in the US and international markets. In the domestic marketplace, the Company sells 80 percent of its products through the distributor/VAR channels, 15 percent through direct sales to corporate end users, and the remaining 5 percent to OEM customers. The Company sells exclusively through distributors in the international market. Falco's corporate and manufacturing facilities are based in Sunnyvale, California, where the Company has nearly 100 employees.

Since Falco is a privately owned company, financial information is unavailable and no financial tables are included in this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

Display Terminals

The Infinity Series of high-resolution, borderless display terminals includes five ANSI/ASCII and

graphics terminals that feature a 70Hz refresh rate, full 400-line borderless display, and function key-selectable setup menus. The Infinity G Series includes Infinity ANSI/ASCII, with or without graphics, and the Infinity Multi-Personality terminals, all with the Infinity Interface. The Infinity Series comprises the Infinity G and Infinity S product lines.

The eight-member 5000 Series provides models suited for either single or multihost installations with multioperating systems. The 5000 Series offers Digital Equipment Corporation (DEC) SSU support on all ANSI models and is also available in ANSI/ASCII/PC or ASCII/PC models.

Lan Workstations

The Falco 5088 LAN Workstation is an intelligent diskless workstation combining PC functionality in a small terminal package.

Multiuser Systems

The highly configurable System 5000 Series was designed to provide resellers with the opportunity to add value to their customer base. When combined with Falco's own terminals, the unique Multi-Channel Port of this system makes it possible for a user to run up to six UNIX and DOS applications simultaneously on a single line. The multiple windowing and operating systems capabilities make the System 5000 suited for industries where ready access to more than one database of applications is necessary.

The System 4000 Series, comprising the models 4025 (25 MHz), 4020 (20 MHz), and 4016 (16 MHz), is 80386-based and is designed to run UNIX, XENIX, and/or DOS applications concurrently on multiwindowing screens. The design allows the System 4000 Series to be configured with Falco terminals to efficiently support from 4 to 16 users running multiple applications.

The 4000X is a dedicated X Window version of the Falco 4000 Series, also designed around the 80386. It has the Falco FX/386 UNIX V3.2 operating system installed and is shipped with X Window and TCP/IP Ethernet software to provide natural links to standard networks. With the addition of a color graphics card, the System 4000X may be configured for simultaneous use as a color X Window server and as an X Window client for multiple terminal workstations.

Personal Computers

The Infinity Desktop is an 80386SX-based unit. The 16-MHz Infinity Desktop comes standard with 1MB of RAM, expandable to 2, 4, or 8MB. A 1.44MB 3.5-inch floppy drive is included along with an integral/floppy/IDE controller and two three-quarter-length 16-bit expansion slots. Through low-power components and a convection cooling design, the Infinity Desktop requires no internal fan for cooling. It is available in four configurations: diskless, floppy disk, floppy disk with 40MB hard disk, and floppy disk with 100MB hard disk. The unit is compatible with DOS 4.01 and Windows 3.0 and supports all OS/2 software.

Further Information

For further information about Falco's business segments, please contact the appropriate Dataquest industry service.

1989 SALES OFFICE LOCATIONS

North America—2

MANUFACTURING LOCATIONS

North America

Sunnyvale, California

SUBSIDIARIES

Falco has no subsidiaries.

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

Information is not available.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Joseph D'Alessandro
President and chief executive officer

Kachun Lee
Vice president, Engineering

Andre Yurkovic
Vice president, Sales and Marketing

William Bynarowicz
Vice president, Finance/Administration, and chief financial officer

Cindy Kimball
Director of Operations

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Information is not available.

Ferranti International plc

Bridge House, Park Road
Gatley, Cheadle, Cheshire
United Kingdom SK8 4HZ
Telephone: (061) 428-3644
Fax: (061) 428-7233
Dun's Number: 21-278-1348

Date Founded: 1882

CORPORATE STRATEGIC DIRECTION

Ferranti International plc had its origins in the business formed by Sebastian Ziani de Ferranti in 1882 to manufacture an alternator he invented with Sir William Thomson. The business was incorporated as Ferranti plc in 1905. In September 1987, Ferranti plc and International Signal and Control (ISC) announced their merger, which led to the current company, Ferranti International plc. Today the Company is an international technology systems contractor to defense, space, and civil markets, with manufacturing subsidiaries in the United Kingdom, Europe, and the United States.

In September 1989, Ferranti International plc discovered a major fraud within a subsidiary of ISC, which resulted in a subsequent loss of £215 million (US$352 million) in fiscal 1989. In addition to legal proceedings to obtain redress for losses caused by the fraud, the Company has increased its debt, sold several subsidiaries, and consolidated its business lines. Ferranti's new strategy is to concentrate its resources into three divisions: Aerospace Systems, Strategic Management Systems, and Commercial and Industrial Systems.

For the fiscal year ended March 31, 1990, total revenue was £794.9 million (US$1.3 billion). The Company incurred an operating loss for the year of £112 million (US$183.6 million) after exceptional write-offs of £122.3 million (US$200 million). Net income for the year was £43.2 million (US$69.7 million).

In order to reduce its debt, Ferranti sold its defense systems group to General Electric Company plc (GEC) and its Italian subsidiaries to Finmeccanica SpA. The Company also sold its civil computer maintenance, components, and laser subsidiaries during the past year. In February 1990, Ferranti entered into a joint agreement with Thomson-CSF for its sonar business. Under the agreement, Thomson purchased a 50 percent stake in Ferranti's Sonar Systems Division. In July 1990, Ferranti announced that it intends to sell its majority stake in the Zonephone cordless phone network.

The Company funded £16 million (US$26 million) in R&D during the fiscal year ended March 31. Although the Company is committed to further development, expenditure is being reassessed to determine appropriate levels needed for continuing businesses. As part of the Company's cost reduction and reorganization plans, it announced plans to reduce its work force by 20 percent, or approximately 1,600 workers worldwide, over the next two years. As of March 31, 1990, Ferranti employed approximately 21,300 worldwide.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region. Information on revenue by distribution channel is not available. Tables 3 and 4, comprehensive financial statements, are at the end of this backgrounder. Due to differences between US and British accounting practices, a financial ratio analysis is not available.

BUSINESS SEGMENT STRATEGIC DIRECTION

Ferranti International has reorganized its business segments, consolidating its six operating units into

three new divisions: Aerospace Systems, Strategic Management Systems, and Commercial and Industrial Systems.

Commercial and Industrial Systems

The Commercial and Industrial Systems Division manages a broad range of business activities, from large-scale systems, to monitor and control nuclear power stations, transport systems, and satellite and microwave digital communications networks, to advanced industrial, health care, and telecommunications systems. Ferranti has facilities established in the United States, England, Germany, France, Belgium, Italy, and Australia.

The division covers three major market segments. The first unit is process control and manufacturing systems, which produces automatic computer control systems sold mainly to utility companies. These systems provide database management and network modeling software in conjunction with real-time process control and safety management systems. The newest development in this area is the Ranger system being developed by Ferranti International Controls Corporation in Houston, Texas.

The second market segment the division covers is transport management systems. Ferranti provides integrated real-time information systems used by airports and airline industries. These systems include broadband cable communications networks in addition to computer hardware and software. Most recently, Ferranti has developed systems used for urban traffic control.

The division's third market segment is community and communications systems. Systems for the community include civil command and control systems used by police, fire, and ambulance services. Ferranti also sells computer systems used in the health care industries. Communications systems include a wide range of systems from microwave-based digital networks to multisite business telephone systems and personal portable telephones. Ferranti provides satellite systems, broadband radar and remote systems, and microwave digital communications services. The Company also distributes GTE and Siemens PABX telephone systems to large and medium-size businesses. Under the brand name Rhapsody, the Company also supplies digital key telephone systems for Oki and fax machines.

Strategic Management Systems

The Strategic Management Systems Division designs and integrates large-scale systems for use within civil and defense industries. Ferranti provides systems integration for defense command and control centers, sonar, navigation, and radar. In addition, the division provides training and simulation services. Strategic Management Systems sells its products in Europe, the United States, the United Kingdom, and in developing countries worldwide.

Aerospace Systems

The Aerospace Systems Division consolidates all of Ferranti International's resources and capabilities in aerospace and ordnance businesses. These business activities include the development and manufacturing of missile systems, rocket and propulsion technology, weapon control and guidance systems, aircraft instruments, airborne secondary power systems, high-technology mines, electronic fuses, and electronic components.

Further Information

For further information regarding the Company's business segments, please contact the appropriate Dataquest industry service.

Table 1
Five-Year Corporate Highlights (Millions of US Dollars)

	1986	1987	1988	1989	1990
Five-Year Revenue	$876.2	$1,030.7	$1,326.1	$1,520.5	$1,282.1
Percent Change	-	17.63	28.66	14.66	(15.68)
Capital Expenditure	$21.8	$18.2	$26.3	NA	NA
Percent of Revenue	2.5	1.8	2.0	0	0
Number of Employees	21,791	21,683	24,818	25,549	21,299
Revenue ($K)/Employee	$40.21	$47.53	$53.43	$59.51	$60.20
Net Income	$41.2	$51.6	$27.2	($1.3)	$69.7
Percent Change	-	25.41	(47.34)	(104.82)	(5,412.90)
Exchange Rate (US$1=£)	£0.68	£0.61	£0.57	£0.61	£0.62

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	NA	NA	NA	NA
Quarterly Profit	NA	NA	NA	NA

NA = Not available

Source: Ferranti International plc Annual Reports
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1986	1987	1988	1989	1990
Europe	81.00	82.00	86.00	NA	NA
Non-Europe	19.00	18.00	14.00	NA	NA
North America	10.00	10.00	13.00	NA	NA
ROW	9.00	8.00	1.00	NA	NA

NA = Not available

Source: Ferranti International plc Annual Reports

1989 SALES OFFICE LOCATIONS

North America—8
Europe—10
Asia/Pacific—2
ROW—1

MANUFACTURING LOCATIONS

Europe

Cheadle Heath, England
Computer systems
Cwmbran, Wales
Computer products
Edinburgh, Scotland
Electronic systems, electro optics, navigation systems, aircraft displays, video recording and mission planning systems
Manchester, England
Electronics, aircraft instrumentation, energy management systems, telecom systems
Oldham, England
Aerospace and defense systems
Poynton, England
Microwave generators and systems, satellite communications terminals
Wythenshawe, England
Civil systems

North America

Chatsworth, California
Microwave components, antennas, tracking systems
Farmingdale, New York
Custom-designed military power supply systems
Lancaster, Pennsylvania
Electronic systems, communication and security systems
Sunnyvale, California
RF modems and RF data link communications products
Van Nuys, California
Propulsion technology and ordnance products
Westlake, California
Tactical guided missiles, weapon control systems and support equipment
Woodbury, New York
Radar, display and communications equipment

Asia/Pacific

Sydney, Australia
Military and civil computer-based systems

SUBSIDIARIES

Europe

Ferranti Business Communications Ltd. (England)
Ferranti Computer Systems Ltd. (England)
Ferranti Industrial Electronics Ltd. (Scotland)
Ferranti Infographics Ltd. (Scotland)
Ferranti Instrumentation Ltd. (England)
Ferranti International Dynamics Ltd. (England)
Ferranti International Holdings Ltd. (England)
Ferranti International Investments BV (Netherlands)
ISC Technologies Ltd. (England)

North America

Cardion Electronics (United States)
Electro-Magnetic Processes Inc. (United States)
Ferranti Aerospace Inc. (United States)
Ferranti Defense & Space Inc. (United States)
Ferranti International Controls Corp. (United States)
Ferranti International Inc. (United States)
Ferranti Scialy, Inc. (United States)
The Marquardt Company (United States)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

Thomson-CSF
Ferranti signed a joint venture agreement with Thomson-CSF for development of sonar systems. The joint company, Ferranti-Thomson Sonar Systems U.K. Ltd., is owned 50 percent by Thomson-CSF and 50 percent by Ferranti.

MERGERS AND ACQUISITIONS

Information is not available.

PRINCIPAL INVESTORS

Information is not available.

KEY OFFICERS

Eugene Anderson
Chairman and chief executive officer

Philip Atterton
Chairman, Ferranti Industrial Electronics Ltd.

Ian Ball
Managing director, Aerospace Systems

Nathan Blackwell
Executive director, International Marketing

Bill Broekhuizen, MBE
Managing director, Commercial and Industrial Systems

Albert Dodd
Managing director, Strategic Management Systems

FOUNDERS

Sebastian Ziani de Ferranti

Table 3
Comprehensive Financial Statement
Fiscal Year Ending March 31
(Millions of US Dollars, except Per Share Data)

Balance Sheet	1986	1987	1988	1989	1990
Fixed Assets	$183.7	$214.6	$451.2	$467.0	$300.3
Tangible Assets	164.9	194.8	437.0	410.6	274.9
Investments	18.8	19.8	14.2	56.4	25.4
Current Assets	$481.6	$563.1	$1,327.0	$993.1	$993.5
Stocks	256.6	313.8	786.7	294.8	154.4
Debtors	172.6	220.3	461.6	588.5	457.7
Investments	0	0	0	0	113.7
Cash	52.4	29.0	78.8	109.8	267.7
Current Liabilities	($359.0)	($405.9)	($1,014.9)	($849.00)	($798.10)
Provision for Liabilities and Charges	($30.6)	($28.2)	($155.2)	($292.50)	($120.20)
Net Current Assets	$122.6	$157.2	$312.1	$144.1	$195.4
Net Assets	$275.7	$343.6	$608.1	$318.6	$375.5
Capital and Reserves	$272.9	$341.1	$364.2	$316.1	$371.9
Share Capital	67.1	75.2	135.3	126.7	126.0
Share Premium Account	3.1	4.8	6.7	7.9	7.9
Profit and Loss	202.6	261.0	154.0	118.4	203.1
Other Reserves	0.1	0.2	68.2	63.1	35.0
Minority Interest	$2.8	$2.5	$1.6	$2.6	$3.2
Shareholders' Equity	$275.7	$343.6	$365.8	$318.7	$375.2

Income Statement	1986	1987	1988	1989	1990
Revenue	$876.2	$1,030.7	$1,326.1	$1,520.5	$1,282.1
Cost of Sales	$287.2	$311.0	$534.2	$1,447.9	$1,462.9
SG&A Expense	$365.7	$442.3	$564.6	NA	NA
Capital Expense	$21.8	$18.2	$26.3	NA	NA
Operating Profit	$70.0	$90.8	$138.4	$72.6	($180.8)
Pretax Income	$60.4	$82.3	$95.6	$21.5	($260.8)
Pretax Margin (%)	6.90	7.98	7.21	1.41	(20.34)
Effective Tax Rate (%)	40.00	35.00	35.00	NA	NA
Net Income	$41.2	$51.6	$27.2	($1.3)	$69.7
Shares Outstanding, Millions	NA	432.0	551.0	NA	NA
Per Share Data					
Earnings	$9.62	$12.30	$11.68	$1.44	($33.87)
Dividend	$2.50	$3.18	$4.08	$1.25	0
Book Value	NA	$0.79	$0.66	NA	NA
Exchange Rate (US$1=£)	£0.68	£0.61	£0.57	£0.61	£0.62

NA = Not available

Source: Ferranti International plc Annual Reports
Dataquest (1990)

Table 4
Comprehensive Financial Statement
Fiscal Year Ending March 31
(Millions of Pounds, except Per Share Data)

Balance Sheet	1986	1987	1988	1989	1990
Fixed Assets	£124.9	£130.9	£257.2	£467.0	£300.3
Tangible Assets	112.1	118.8	249.1	410.6	274.9
Investments	12.8	12.1	8.1	56.4	25.4
Current Assets	£444.5	£343.5	£756.4	£605.8	£616.0
Stocks	174.5	191.4	448.4	179.8	95.7
Debtors	117.0	134.4	263.1	359.0	283.8
Investments	117.4	0	0	0	70.5
Cash	35.6	17.7	44.9	67.0	166.0
Current Liabilities	(£244.1)	(£247.6)	(£578.5)	(£517.89)	(£494.82)
Provision for Liabilities and Charges	(£30.6)	(£17.2)	(£88.5)	(£178.43)	(£74.52)
Net Current Assets	£200.4	£95.9	£177.9	£87.9	£121.1
Net Assets	£294.7	£209.6	£346.6	£376.5	£346.9
Capital and Reserves	£185.6	£208.1	£207.6	£192.8	£230.6
Share Capital	45.6	45.9	77.1	77.3	78.1
Share Premium Account	2.1	2.9	3.8	4.8	4.9
Profit and Loss	137.8	159.2	87.8	72.2	125.9
Other Reserves	0.1	0.1	38.9	38.5	21.7
Minority Interest	£1.9	£1.5	£0.9	£1.6	£2.0
Shareholders' Equity	£187.5	£209.6	£208.5	£194.4	£232.6
Income Statement	**1986**	**1987**	**1988**	**1989**	**1990**
Revenue	£595.8	£1,030.7	£755.9	£927.5	£794.9
Cost of Sales	£195.3	£189.7	£304.5	£883.2	£907.0
SG&A Expense	£248.7	£269.8	£321.8	NA	NA
Capital Expense	£14.8	£11.1	£15.0	NA	NA
Operating Profit	£47.6	£55.4	£78.9	£44.3	(£112.1)
Pretax Income	£41.1	£50.2	£54.5	£13.1	(£161.7)
Pretax Margin (%)	6.90	4.87	7.21	1.41	(20.34)
Effective Tax Rate (%)	40.00	35.00	35.00	NA	NA
Net Income	£28.0	£31.5	£15.5	(£0.8)	£43.2
Shares Outstanding, Millions	NA	432.0	551.0	NA	NA
Per Share Data					
Earnings	£6.54	£7.50	£6.66	£0.88	(£21.00)
Dividend	£1.70	£1.94	£2.33	£0.76	£0
Book Value	NA	£0.48	£0.38	NA	NA
Exchange Rate US$1=£	£0.68	£0.61	£0.57	£0.61	£0.62

NA = Not Available

Source: Ferranti International plc Annual Reports
Dataquest (1990)

Ferranti International Signal plc

Bridge House, Park Road
Gatley, Cheadle, Cheshire, England SK8 4HZ
Telephone: (061) 428-3644
Fax: (061) 428-7233
Dun's Number: 21-278-1348

Date Founded: 1882

CORPORATE STRATEGIC DIRECTION

Ferranti International Signal plc, which was incorporated in 1905, has its origins in the business formed by Sebastian Ziani de Ferranti in 1882 to manufacture the alternator that he had invented with Sir William Thomson. Mr. de Ferranti's interest in the electrical field led to subsequent inventions and the expansion of his business to include the manufacture of alternators, meters, transformers, fuzes, and switching gear.

In September 1987, Ferranti plc and International Signal and Control (ISC) announced their merger, hence Ferranti International Signal plc. Today the Company is an international technology systems contractor to the world defense, space, and civil markets.

In November 1987, Ferranti sold its semiconductor division to Plessey for $49 million* to further strengthen its position in the defense-related business. Additionally, Ferranti discontinued other businesses serving the offshore oil industry.

Ferranti International operates under six operating units, each responsible for the design, development, marketing, and manufacture of its own line of products. These units are avionics, communications, industrial, naval, space, and weapons.

In fiscal 1988, Ferranti International reported consolidated revenue of $1.4 billion, a 40 percent increase over fiscal 1987. Net income decreased from $51.6 million in 1987 to $42.6 million in 1988 as a result of discontinuing businesses.

*All dollar amounts are in U.S. dollars.

Ferranti International's capital expenditures totaled $26.3 million in fiscal 1988 compared with $18.2 million in 1987.

Eighty-six percent of Ferranti International's business is conducted in Europe, 13 percent in North America, and 1 percent in ROW. Ferranti International employs more than 24,000 people worldwide.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile. Due to differences between U.S. and European accounting practices, a financial ratio analysis is not available.

BUSINESS SEGMENT STRATEGIC DIRECTION

Avionics

Ferranti International's involvement in aircraft-related activities encompasses a broad spectrum of systems and components, including power-generation and conversion equipment. Ferranti Defense Systems, the operating unit in avionics, produces inertial navigation systems, displays, radars, and electro-optical systems for the armed services.

Dataquest estimates Ferranti's mil/aero electronic revenue to be $1.4 billion in 1988, up from $983.0 million in 1987.

Computers

Ferranti Computer Systems is one of the largest system houses in Europe and provides a line of real-time, on-line computer, and information technology systems. The sector comprises three operating divisions. Each concentrates on particular market sections in which it can assume total responsibility for the specification, design, manufacture, programming, implementation, and field support of complete systems.

Defense

The Bracknell Divison's prime activity is defense work for the U.K. armed services and for countries overseas. The division specializes in action information and weapon control systems for all classes of ships, from aircraft carriers to fast patrol boats and submarines.

Navy

Ferranti International is a major provider of command and control systems and sonar to the surface and submarine fleets of navies throughout the world.

Space

Ferranti International provides space platforms, propulsion and navigation systems, and production equipment to various space programs.

Weapons

Ferranti International is a major supplier of weapon systems including missiles, clustered munitions, fuzes, and targeting equipment.

The Cheadle Heath Division has both civilian and defense interests that include the supply of advanced sonar systems to the Royal Navy and hazard-monitoring systems for oil rigs and industrial plants.

Industrial

Ferranti Industrial Electronics offers a wide range of products including communications and control equipment, quality-control machines, and electronic components.

Communications

Ferranti International produces a variety of communications equipment, from secure military radios through microwave links and PABXs, to cellular radios and the new portable cordless Zonephone, as well as data communications.

The Company acquired the minority shareholding in Ferranti GTE and renamed it Ferranti Business Communications. This new company distributes and installs PABX and keyswitch systems in the United Kingdom.

The Wythenshawe Division supplies automated process control and management systems to the steel, petrochemical, automotive, transportation, and printing industries. These systems also are used in the production and distribution of electricity, oil, and gas.

Further Information

For further information about the Company's business segments, please contact the appropriate industry service.

Table 1
Five-Year Corporate Highlights (Millions of U.S. Dollars)

	1984	1985	1986	1987	1988
Five-Year Revenue	$602.3	$737.5	$876.2	$1,030.7	$1,442.3
Percent Change	-	22.46	18.80	17.63	39.94
Capital Expense	$13.7	$19.9	$21.8	$18.2	$26.3
Percent of Revenue	2.3	2.7	2.5	1.8	1.8
Number of Employees	19,085	20,454	21,791	21,683	24,818
Revenue ($K)/Employee	$31.56	$36.06	$40.21	$47.53	$58.11
Net Income	$29.7	$39.1	$41.2	$51.6	$42.6
Percent Change	-	31.47	5.34	25.41	(17.44)

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	N/A	N/A	N/A	N/A
Quarterly Profit	N/A	N/A	N/A	N/A

N/A = Not Available

Source: Ferranti Annual Reports
Dataquest January 1990

Table 2
Revenue by Geographic Region (Percent)

Region	1984	1985	1986	1987	1988
Europe	84.00	81.00	81.00	82.00	86.00
International	16.00	19.00	19.00	18.00	14.00
North America	9.00	12.00	10.00	10.00	13.00
ROW	7.00	7.00	9.00	8.00	1.00

Source: Ferranti Annual Reports

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988
Direct Sales	N/A
Indirect Sales	N/A

N/A = Not Available

Source: Ferranti Annual Reports

1988 SALES OFFICE LOCATIONS

North America—Not available
Japan—Not available
Europe—Not available
Asia/Pacific—Not available
ROW—Not available

MANUFACTURING LOCATIONS

Europe

Bellshill, Scotland
Automatic test equipment
Cheadle Heath, England
Computer-based systems
Cwmbran, Wales
Computer products
Dundee, Scotland
Microwave components and subsystems, power tubes, wound magnetic components and power supplies, connectors and connection systems, CO2 lasers
Edinburgh, Scotland (4)
Electronic systems, electro-optics, navigation systems, aircraft displays, video recording and mission planning systems
Ellon, Scotland
Subsea wellhead control systems, underwater electric couplers
Firenze, Italy
Communications systems
Hounslow, Scotland
Instruments and systems
Livingston, Scotland
CAD/CAM systems
Moston, England
Electronics, aircraft instrumentation, energy management systems, telecommunications
Newport Pagnell, England
Naval systems
Oldham, England
Defense systems
Peterlee, England
GRP products
Pomezia, Italy
Equipment and systems for military applications
Poynton, England
Parametric amplifiers, microwave generators and systems, satellite communications terminals
Vimodrone, Italy
On-board data handling systems, attitude and orbit control instrumentation, on-board payloads, electrical ground support equipment, electronics
Wythenshawe, England
Civil systems

North America

Chatsworth, California
Antennas, tracking systems, microwave components, and threat emitters
Farmingdale, New York
Custom-designed military power supply systems
Lancaster, Pennsylvania
Equipment and components for the U.S. market
Long Island, New York
Custom-designed military power supply systems
Sunnyvale, California
RF modems and RF data link communications products
Van Nuys, California
Propulsion technology and ordnance products
Westlake, California
Tactical guided missiles, weapon control systems, and support equipment
Woodbury, New York
Radar, navaids, display, and communications equipment for civil and military customers

Asia/Pacific

Sydney, Australia
Military and civil computer-based systems

SUBSIDIARIES

Europe

Ferranti Business Communications Ltd. (England)
Ferranti Computer Systems Ltd. (England)
Ferranti Defense Systems Ltd. (Scotland)
Ferranti Industrial Electronics Ltd. (Scotland)
Ferranti Infographics Ltd. (Scotland)
Ferranti Instrumentation Ltd. (England)
Ferranti International Dynamics Ltd. (England)
Ferranti Offshore Systems Ltd. (Scotland)

Ferranti Subsea Systems Ltd. (Scotland)
International Signal & Control Group PLC (England)
ISC Elmer SpA (Italy)
ISC Investments BV (Netherlands)
ISC Laben SpA (Italy)
ISC Ote SpA (Italy)
ISC Proel Tecnologie SpA (Italy)
ISC Technologies Ltd. (England)

North America

Ferranti International Controls Corp. (United States)
Ferranti International Signal, Inc. (United States)
Ferranti Sciaky, Inc. (United States)
ISC Aerospace, Inc. (United States)
ISC Cardion Electronics, Inc. (United States)
ISC Defense & Space Group, Inc. (United States)
ISC Defense Systems, Inc. (United States)
ISC Electro-magnetic Processes, Inc. (United States)
ISC Technologies, Inc. (United States)
The Marquardt Company (United States)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1988

Bendix
A joint venture was formed for Bendix to manufacture variable-speed, constant-frequency generators.

Oki of Japan
Ferranti Business Communications and Oki entered a marketing agreement for Ferranti to distribute a digital, multiple-facility key system.

MERGERS AND ACQUISITIONS

1988

Universal Sonar and DBE Technology
Ferranti International acquired both firms to strengthen its sonar capability.

Sciaky Brothers of Chicago
Ferranti Industrial Electronics acquired this company for its industrial division.

KEY OFFICERS

Sir Derek Alun-Jones
Chairman and managing director

J.H. Guerin
Deputy chairman

A.A. Shepherd
Deputy managing director, Ferranti Operations

C.R. Scott
Deputy managing director, Finance and Administration

FOUNDERS

Sebastian Ziani de Ferranti FRS (Ferranti plc)
James H. Guerin (ISC)

Table 4
Comprehensive Financial Statement
Fiscal Year Ending March 31
(Millions of U.S. Dollars, except Per Share Data)

Balance Sheet	1984	1985	1986	1987	1988
Fixed Assets	$117.2	$144.5	$183.7	$214.6	$451.2
Tangible Assets	111.1	137.4	164.9	194.8	437.0
Investments	6.1	7.1	18.8	19.8	14.2
Current Assets	$316.3	$418.4	$481.6	$563.1	$1,327.0
Stocks	146.3	208.8	256.6	313.8	786.7
Debtors	117.1	148.1	172.6	220.3	461.6
Investments	1.5	0.6	0	0	0
Cash	51.5	60.9	52.4	29.0	78.8
Current Liabilities	($212.0)	($311.4)	($359.0)	($405.9)	($1,014.9)
Long-Term Debt	($2.0)	($2.2)	($2.4)	($1.5)	($27.5)
Other Liabilities	($23.3)	($29.0)	($28.2)	($26.7)	($127.7)
Net Current Assets	$104.3	$107.0	$122.6	$157.2	$312.1
Net Assets	$196.1	$220.4	$275.7	$343.6	$608.1
Capital and Reserves	$194.5	$213.8	$272.9	$341.1	$606.5
Share Capital	60.3	59.1	67.1	75.2	135.3
Share Premium Account	0.3	1.8	3.1	4.8	6.7
Profit and Loss	133.9	152.7	202.6	261.0	267.4
Other Reserves	0.1	0.1	0.1	0.2	197.2
Minority Interest	$1.6	$6.6	$2.8	$2.5	$1.6
Shareholders' Equity	$196.1	$220.4	$275.7	$343.6	$608.1
Income Statement	**1984**	**1985**	**1986**	**1987**	**1988**
Revenue	$602.3	$737.5	$876.2	$1,030.7	$1,442.3
European	507.5	601.6	712.2	845.7	1,233.7
International	94.8	136.0	164.0	184.9	208.6
Cost of Sales	$198.3	$247.7	$287.2	$311.0	$534.2
SG&A Expense	$248.4	$293.2	$365.7	$442.3	$564.6
Capital Expense	$13.7	$19.9	$21.8	$18.2	$26.3
Operating Profit	$53.3	$65.2	$70.0	$90.8	$138.4
Pretax Income	$51.7	$59.7	$60.4	$82.3	$119.3
Pretax Margin (%)	8.59	8.10	6.90	7.98	8.27
Effective Tax Rate (%)	50.00	45.00	40.00	35.00	35.00
Net Income	$29.7	$39.1	$41.2	$51.6	$42.6
Shares Outstanding, Millions	85.4	428.0	N/A	432.0	551.0
Per Share Data					
Earnings	$45.75	$9.31	$9.62	$12.30	$14.49
Dividends	$8.80	$2.03	$2.50	$3.18	$4.08
Book Value	$2.28	$0.50	N/A	$0.79	$1.10
Exchange Rate: US$1=£	£0.75	£0.77	£0.68	£0.61	£0.57

N/A = Not Available

Source: Ferranti Annual Reports
Dataquest
January 1990

Ferranti plc

BACKGROUND AND OVERVIEW

Ferranti plc, which was incorporated in 1905, has its origins in the business formed by Sebastian Ziani de Ferranti in 1882 to manufacture the alternator invented independently by himself and Sir William Thomson. Mr. de Ferranti's interest in the electrical field led to subsequent inventions and the expansion of his business to include the manufacture of alternators, meters, transformers, fuses, and switch gear.

The Company ran into financial difficulties in 1974 but was rescued by the U.K. government through the National Enterprise Board (NEB) with a £15 million investment. This investment gave the NEB 62.5 percent of the Company's equity. The NEB holding was subsequently reduced to 50 percent in 1978 and was reduced again in July 1980 when the majority of the NEB's holdings were placed with various financial institutions in London and in Scotland. It was a condition of this placement that the shares would not be traded for two years. The equity is widely held by financial institutions and the public, with Ferranti family interests retaining a minority holding.

In 1977, Ferranti acquired Interdesign Inc., a Sunnyvale, California, company founded in 1970 to provide application-specific integrated circuits (ASICs). This complemented the ASIC gate array--uncommitted logic array (ULA)--activity already firmly established by Ferranti in the United Kingdom since the 1970s. Interdesign is now one of the leading U.S. manufacturers of integrated circuits.

In 1982, Ferranti joined forces with the Wheelock Marden Group of Hong Kong to form a new company for the design and manufacture of ASICs for the Far East electronics industry. The new company is called Ferranti Wheelock Microelectronics Limited and is the first company in Hong Kong to offer such design and manufacturing facilities.

In January 1984, as a result of its continuing success in ASICs, Ferranti completed and opened a new wafer fabrication and assembly facility for integrated circuits in Oldham, Manchester, the United Kingdom. This facility consists of 85,000 square feet of production area and is capable of producing 7,000 4-inch wafers per week in the class 10 clean room area. Also in early 1984, Ferranti bought TRW Control Corp. of Texas, to broaden its market base in the United States.

Ferranti plc

In 1985, Ferranti Electronics was given the Queen's Award for Export and Technology, for the export success of its ULA products.

In 1985, the U.K. Ministry of Defense awarded a $27.5 million contract to Plessey Marine, Ferranti, and GEC Sonics for an integrated sonar system for the Royal Navy. Plessey Marine was to act as prime contractor, with the other companies as subcontractors. Ferranti was also awarded a contract worth more than $9 million to supply action information organization and fire control computer systems for update of Oberon class submarines.

Ferranti plc is currently divided into six main business areas:

- Ferranti Defense Systems
- Ferranti Industrial Electronics
- Ferranti Computer Systems
- Ferranti Electronics
- Ferranti Instrumentation
- Ferranti Other Activities
  - Ferranti GTE
  - Ferranti Engineering
  - Ferranti Venus Scientific

As shown in Table 1, Dataquest estimates that Ferranti's European semiconductor revenue in 1986 was $66 million; worldwide revenue was an estimated $95 million, as shown in Table 2.

Ferranti plc

Table 1

Ferranti plc
ESTIMATED EUROPEAN SEMICONDUCTOR REVENUE BY PRODUCT LINE
(Millions of U.S. Dollars)

	1982	1983	1984	1985	1986
Total Semiconductor	$45	$54	$67	$65	$66
Total Integrated Circuit	$35	$42	$52	$50	$53
Bipolar Digital	14	22	26	28	28
MOS	7	8	8	4	5
Linear	14	12	18	18	20
Total Discrete	$10	$12	$15	$15	$13
Transistor	5	6	8	8	6
Diode	5	6	7	7	7
Thyristor	0	0	0	0	0
Other	0	0	0	0	0
Total Optoelectronic	$ 0	$ 0	$ 0	$ 0	$ 0

Source: Dataquest
February 1987
Ref. 0187-06P

Ferranti plc

Table 2

Ferranti plc
ESTIMATED WORLDWIDE SEMICONDUCTOR REVENUE BY PRODUCT LINE
(Millions of U.S. Dollars)

	1982	1983	1984	1985	1986
Total Semiconductor	$82	$85	$105	$98	$95
Total Integrated Circuit	$68	$68	$ 85	$78	$78
Bipolar Digital	32	36	46	49	43
MOS	13	11	12	6	11
Linear	23	21	27	23	24
Total Discrete	$14	$17	$20	$20	$17
Transistor	7	9	11	11	8
Diode	7	8	9	9	9
Thyristor	0	0	0	0	0
Other	0	0	0	0	0
Total Optoelectronic	$ 0	$ 0	$ 0	$ 0	$ 0

Source: Dataquest
February 1987
Ref. 0187-06P

Ferranti plc

PRODUCTS AND MARKETS SERVED

Ferranti Electronics' main sphere of business is electronic components--integrated circuits and discrete devices. The Company also manufactures microwave components and systems (parametric amplifiers, field-effect transistor amplifiers, and microwave frequency generators) through its microwave division, as well as ceramic seals through its ceramic seals division.

Discrete products are manufactured in Oldham, the United Kingdom. They include a wide range of small-signal plastic and metal can transistors, radio frequency transistors, VMOS power transistors, general-purpose diodes, zener diodes, Schottky diodes, and tuner diodes.

Integrated circuit products are developed and manufactured in the United Kingdom and North America. They include standard logic families, linear circuits, analog-to-digital converters, and semicustom (ULA) and custom circuits, using advanced bipolar LSI technology.

All products are marketed worldwide directly by Ferranti Electronics and through Ferranti GmbH in West Germany, Ferranti Electric and Ferranti Interdesign in the United States, and Ferranti Wheelock Microelectronics in Hong Kong.

The following are some highlights of the Company's semiconductor activities in 1985 and 1986:

- Additional semiconductor facilities in Oldham, the United Kingdom, were brought fully on stream during the year.
- The Microelectronics Center at Hollinwood, the United Kindgom, was extended, with a new wafer processing development area provided.
- At Ferranti Interdesign, a new U.S. marketing structure for semicustom circuits was implemented, increasing marketing staff and facilities and improving design capability.
- In July 1985, Ferranti and Array Logic signed an agreement through which Array Logic obtained the right to design and prototype the Ferranti R series ULAs and G series Digilin ULAs.

Ferranti plc

In early 1986, Ferranti unveiled its DS series, reinforcing its position as the leading world source of semicustom silicon.

- Ferranti believes that the DS series implements a bipolar process that betters CMOS in every aspect.
- Ferranti claims the DS series improves the processing speed of the chip's circuits from two to four times and reduces power consumption.

OUTLOOK

Ferranti's success can be attributed to its ASIC activities, particularly its ULA devices. The Company is a world leader in bipolar large-scale integrated circuit technology using its proprietary Collector Diffused Isolation (CDI) process. The CDI process offers high yields, large-chip-size capability, and low manufacturing cost. It also allows for mixed digital and linear functions to be readily fabricated on the same monolithic silicon chip.

To date, the Company's strategy has been to identify and develop specialist market niches, rather than to compete directly with the major U.S. and Japanese semiconductor manufacturers.

FileNet Corporation

3565 Harbor Boulevard
Costa Mesa, California 92626
Telephone: (714) 966-3400
Fax: (714) 966-3440
Dun's Number: 07-495-8679

Date Founded: 1982

CORPORATE STRATEGIC DIRECTION

FileNet Corporation was incorporated in California in July 1982 and became public and reincorporated in Delaware in June 1987. FileNet develops, manufactures, markets, and services document image processing computer systems made to improve the productivity and customer service capabilities of organizations that process, file, and retrieve substantial volumes of paper documents. The systems are based upon a distributed architecture of four functional subsystems: a document entry station, an image management system, integrated workstations, and a document printing station. These subsystems are connected by a local area network (LAN) and contain one or more computing devices called servers that share a common hardware design based on the Motorola 6800 microprocessor series and run their own copies of the FileNet operating system software, built on UNIX. Dataquest estimates that FileNet held 25.8 percent market share of the high-end and 4.7 percent market share of the midrange worldwide document imaging systems market during 1989. Dataquest estimates that the FileNet installed base totals 309. FileNet also manufactures and markets image application software.

Total revenue increased 31.4 percent to $83.1 million* in fiscal year 1989 from $63.2 million in fiscal year 1988. FileNet attributed the growth to an increase in domestic sales of about 29 percent. Net income increased to $3.0 million in fiscal 1989, representing a 118.5 percent growth over fiscal 1988. FileNet employs 711 people.

Within the United States, FileNet uses its direct sales force and alternative sales channels to market its systems to end users. Domestic sales accounted for 71.6 percent of FileNet's total revenue for fiscal 1988. FileNet also utilizes its wholly owned subsidiaries in Canada, France, and Germany, as well as distributors and OEMs in other international and certain vertical markets. FileNet systems are sold internationally by distributors in 35 countries throughout Europe, the Pacific Rim, and the Middle East. International sales respectively accounted for 29.8 and 28.4 percent of total revenue for fiscal years 1989 and 1988. Dataquest estimates that an even split existed in revenue earned by FileNet's direct sales force and its indirect sales force during fiscal year 1988. The majority of international revenue was attributed to sales made by FileNet's marketing partner, Ing. C. Olivetti, S.p.A., during fiscal years 1989 and 1988.

For fiscal years 1989, 1988, and 1987, respective R&D expenditure was $9.7 million, $7.9 million, and $7.0 million. These figures respectively represented 11.7, 12.5, and 13.4 percent of total revenue. FileNet is firmly dedicated to enhancing its existing products and developing new products that satisfactorily meet market needs. FileNet intends to continue to make substantial investments in product development activities because it believes that its future success greatly depends upon it.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Document Entry Station

The Document Entry Station consists of a server configured with an OEM-sourced document scanner

*All dollar amounts are in US dollars.

and an image display terminal. A customer can pick from a wide range of document scanners, depending on the size of the documents, the quality of the paper being scanned, and requirements for entry speed. An image display terminal allows an operator to view the document images to assure that proper page sequence and display quality have been maintained.

For the onetime conversion of large document files or continuous high-volume scanning applications, users can scan off-line with a Standalone Entry System. This system allows scanning and indexing without interfering with other document processing operations through storing scanned document images and index data on an optical disk cartridge that can later be added to the optical storage and retrieval (OSAR) library of an on-line system.

Image Management System

The electronic images of documents that have been scanned and indexed are organized and stored on optical disks in the Image Management System (IMS). The FileNet family of image systems comprises the 1100 System, the 1500 System, the 3100 System, and the 3500 System. The IMS has one or more OSAR libraries and associated Image Management Servers. FileNet designs and manufactures an OSAR library that contains an electromechanical robotic system that transports individual optical disk cartridges between their storage slots and the OSAR library's optical disk drives. OSAR libraries are available in 64-, 90-, 111-, 204-, and 288-disk models, with storage capacities of about 3 million and 10 million 8.5 x 11-inch pages. A FileNet system may include up to eight OSAR libraries, with an aggregate capacity of over 80 million pages. FileNet permits access of the IMS from PC ATs, PS/2s, compatibles, Sun SunSPARCs, and DEC VAXstations.

During 1989, FileNet introduced the Series 1000, an entry-level system for work groups, departments, divisions, or entire organizations. Its complete compatibility with all FileNet products enables the user to expand the system as application volumes and workstation requirements increase. The Series 1000 comprises two full-function systems: the System 1100 (S/1100) and the System 1500 (S/1500). Both feature 5.25-inch optical disk technology and peripheral devices. The S/1100 is a single-image, management server-based system that supports scanning, printing, image display, and image management services. All of these peripherals are directly attached to the single server. The S/1100 supports up to four standalone 5.25-inch optical drives, one to eight 5.25-inch OSAR Libraries (OSAR-48), and 16 users. The S/1500 also is based on a single-image management server but supports an increase in scanning and printing volumes by providing dedicated servers for peripherals. The S/1500 optionally supports upgrades to multiple image management servers (Roots, Index, OSAR, and WorkFlo Queue servers). The system supports one to eight OSAR-48 Libraries and 32 users.

The Series 1000 uses two different types of optical drives: the standalone optical drive and the OSAR library optical drive. The main difference between them is the load life or number of insertions. The loader mechanism in the OSAR library optical drive can achieve a load life of 200,000 insertions. The standalone optical drive load life is approximately 50,000 insertions.

The Series 1000 supports the Business Forms Scanner and the Imaging II Printer as standard peripherals. It supports multiple Document Entry and Printing Stations. The Mixed Document Scanner, the Universal III Scanner, and the High Capacity Printer can be configured optionally on the S/1100 as the second scanning or printing station, or on the S/1500 as either the first or second scanning or printing station. Image workstations, cluster workstations, and PCs will be supported as user workstations on the Series 1000. Image Access Facility software is required to support PCs on the Series 1000.

The Series 1000 uses 5.25-inch magnetic disk technology. The minimum magnetic disk requirement is one 340MB drive, but the unit can support a maximum of four 340MB drives per image management server. It uses a disk and tape controller. The controller is called the small computer system interface (SCSI). Each SCSI controller can have either one or two SCSI ports that can operate simultaneously.

Integrated Workstations

FileNet designs and manufactures its own Integrated Workstations to provide users with the processing power and display functionality required to access, view, and manipulate document images, data, and text. Its windowing software enables users to view two 8.5 x 11-inch document images simultaneously, to create multiple windows for specific processing application requirements, to enlarge by a factor of two or four all or part of an image, to scan multiple documents in an electronic file folder, and to communicate with a mainframe through DEC VT100 and IBM 3270 terminal emulation.

Document Printing Station

The Document Printing Station consists of a server and an OEM-sourced laser printer. The printer server controls the operation of the printer, queues and prioritizes printing jobs, and enables multiple users to share printing facilities.

On-line Optical Character Reader (OCR) System

The On-line Optical Character Reader System is an on-line optical character recognition capability to aid in automating image indexing.

Imaging II Printer and Print Server

The Imaging II Printer and Print Server is a high-quality, low-volume laser printer and print server that produces 400-dots-per-inch output.

OSAR-48

The OSAR-48 is an optical storage and retrieval library based on 5.25-inch optical technology. The library is capable of storing up to 48 optical cartridges on-line, and from 1 to 4 optical drivers. Each 5.25-inch optical cartridge has a capacity of 600MB that translates into approximately 12,000 50KB images. An OSAR-48 with 48 full optical cartridges is capable of storing more than 500,000 50KB images.

OSAR-90

The OSAR-90 is an optical storage and retrieval library that holds up to 90 12-inch optical disk cartridges and 2, 3, or 4 optical disk drives. It can store the equivalent of approximately 4.5 million 8.5 x 11-inch pages.

OSAR-111

The OSAR-111 is an optical storage and retrieval library that holds up to 111 optical disk cartridges and 2 optical disk drives, for an approximate storage capacity of 5.5 million 8.5 x 11-inch pages.

OSAR-288

The OSAR-288 is a high-end optical disk library unit that can store up to 115 million images on-line when fully configured with eight attached libraries.

OSAR-64GT

The OSAR-64GT is an optical storage and retrieval library that holds up to 64 12-inch optical disk cartridges and up to 4 LMSI LD1250 optical disk drives.

OSAR-79GT

The OSAR-79GT is an optical storage and retrieval library that holds up to 79 12-inch optical disk cartridges and up to 2 optical disk drives. Both the OSAR-64GT and OSAR-79GT use servomotor technology, which provides improved robotic arm speeds.

OSAR-90GT

The OSAR-90GT can house up to 90 optical disk cartridges and 2, 3, or 4 disk drives, providing on-line access to 234 gigabytes of data (roughly the equivalent of 4.5 million 8.5 x 11-inch pages).

OSAR-111GT

The OSAR-111GT holds up to 111 optical disk cartridges and 2 optical disk drives. This library provides on-line access to 288 gigabytes of data (approximately 5.5 million 8.5 x 11-inch pages).

Duplex Document Scanner

The Duplex Document Scanner is a document scanner that scans up to 30 two-sided, business-size document pages per minute.

Universal II Scanner

The Universal II Scanner is a low-volume, flatbed, desktop scanner designed for scanning text, line art, and photographs measuring up to 11 x 17 inches.

Software

FileNet Distributed Operating System (FDOS) Software

The FileNet Distributed Operating System is based on the UNIX operating system, runs on all Image Management Servers, and is also loaded into memory in FileNet's diskless stations. Included in FDOS are Administrative Services-Security, Clearinghouse Services, System Administration Software, and Diagnostic and Recovery Software.

Administrative Services-Security possesses the following features: operator "username" and "password" link to the security profile; program execution privileges that are checked against the operator profile; document read/write privileges that are checked against the operator profile; workstation access that is checked against the operator profile; repeated failed logon attempts will automatically disable the workstation; five user types that automatically designate what range of functions and menu items can be performed; programs that are not accessible to a user do not appear as menu selection items; security access is checked for all functions, documents, and files; 16 security-level codes can be specified for each document, document annotation, file folder, menu, menu item, WorkFlo program, and any other function; and a start-up procedure that can automatically log a user directly into a WorkFlo program. Clearinghouse Services are used to determine the actual network addresses, type of services, and properties of named IMS services when requested by a client.

Clearinghouse Services supports the distribution network of cooperative processors by directing all service requests to the correct server. System Administration Software allows a series of system support functions including dial-up system support from the FileNet corporate support group; automatic system error logging; magnetic tape backup and recovery of magnetic disk databases; disaster recovery of the optical disk transaction cartridge; database transaction logging; system console to control system; separate control over OSAR and optical disk-related functions; and reconfiguration tools to enable stations on other systems on the network.

FileNet systems were designed to be supported by nontechnical staff. As a result, the end-user tools and recovery steps include a range of options that can be performed by nontechnical users. Modems are provided with all systems to allow remote technical support from FileNet corporate headquarters when necessary. Backup of information is supported at two levels: image data can be written to both a journal optical disk and to a primary optical disk cartridge and the databases that support the Image Management System can be backed up to magnetic tape.

Index Services Software

The index database is a functionally rich database management system for managing document classes, folders of all data types, retention schedules, database backup, access security, optical disk clustering and disk family associations, and for providing complete transaction integrity.

Document Services Software

Document Services provide for committal and deletion of documents, migration of documents to and from the optical disk, import of optical disks/documents from other systems, disk consolidation and recovery, document copy, optical disk volume management, prefetching documents, allocating image and document IDs, and a number of query functions on the document locator database. The document locator database, or Multi-Keyed File (MKF) system, is designed for rapid determination of the location of an object. The MKF database is capable of handling tens of millions of image objects with fast response time and with extensive roll-back and roll-forward journaling capability for backup and recovery. MKF contains software redundancy checking to maximize system availability and data integrity.

Batch Entry Services Software

Batch Entry Services supports high-volume, batch-oriented document scanning. Batch Entry Services is designed to support the many varied phases of document entry. It can execute on the same IMS server (processor) as other services or execute on dedicated Batch Entry Stations concurrently with its own copy of an uncommitted page cache for high-volume operations.

OSAR Services Software

OSAR Services supports from one to eight OSAR libraries on a single OSAR server. Multiple OSAR servers may be attached to a single system. OSAR Services provides library management including optical disk loading, swap optimization, location of most convenient surface to service reads, OSAR jam recovery, and slot management. The software supports the complete family of OSAR libraries offered by FileNet, including both 12-inch and 5.25-inch form factors.

Root and Region Services Software

Root Services software provides booting, program loading, swap space (virtual memory), error logging, network time synchronization services, and time reference for the entire system. A number of the Root server software functions can be off-loaded to other servers. The diskless workstation booting function may be off-loaded to multiple Region servers. The Region Services software and hardware would hence be required to support large populations of diskless peripherals (e.g., workstations, printers, and document entry stations).

Document Entry Services Software

The following phases are included in the Standard Document Entry software: document entry session definition, document scanning, image verification (if desired), document indexing or OCR, index verification (if desired), entry correction, batch totals (if desired), and document committal.

Print Services Software

Print Services is a print spooler program, managing all requests for printing of documents and text streams. It manages all printer attributes, printer status, and spooler request status. It handles all Document and Cache Services requests automatically after print or facsimile jobs have been requested.

WorkFlo Application Software

WorkFlo is a high-level programming language that offers a facility to automate repetitive steps. WorkFlo can arrange the electronic desktop with the folders, documents, and data required to perform a specific task and provide customized menus and prompts to bring images and data to the operator's attention in a simple, timely manner. Through using WorkFlo software in conjunction with Mainframe Terminal Emulation software, a FileNet system can pass data to and receive data from a foreign computer. Statistics about WorkFlo-processed information can be accumulated to provide management reports.

WorkFlo CDE Software

WorkFlo is a compound document editor (CDE). Under WorkFlo, control documents can be automatically created. Text, data, and image information can be incorporated into a single document and then transferred to optical disk for permanent storage.

WorkFlo Spelling Checker Software

The WorkFlo Spelling Checker allows the automatic spelling verification of textual information within a WorkFlo-generated document. Its dictionary contains over 87,000 words; user-defined words can be added.

Electronic Forms Package Software

The Electronic Forms Package enables custom forms to be produced on the FileNet system. The forms can be automatically printed on the laser printer and automatically filed on optical disk.

Computer Output to Laser Disk (COLD) Software

COLD software allows computer-generated reports to be stored permanently on the FileNet system's optical disks for fast retrieval and multiuser processing. COLD replaces Computer Output to Microfilm (COM) systems.

Image Access Facility (IAF) Software

The FileNet IAF is a collection of open, standard interfaces between the FileNet system and other computers. This open system architecture allows a variety of computer systems and workstations (called "client platforms") access to the FileNet system. IAF consists of two software products: Image Access Services and Client Libraries.

Image Access Services Software

Image Access Services resides on a server in a FileNet Image Management system. It performs system functions such as document retrieval, caching, indexing, and printing for client programs.

IAF Client Libraries Software

IAF Client Libraries resides in the computer or workstation being interfaced to the FileNet system. Its function is to act as an interpreter that translates requests from programs on the client platform into commands that allow transparent access to the FileNet system. FileNet currently offers Client Libraries for DEC VAX/VMS, SunOS, and MS-DOS. They are offered as part of a Developer's Tool Kit. The following six Client Libraries exist for the SunOS and VMS operating systems: Session Management Library, Cache Services Library, Document Services Library, Index Services Library, Print Services Library, and Batch Services Library. For the MS-DOS operating system, the Client Libraries are: Cache Manager Library, Date/Time Library, Error Message Library, Floating Point Library, Help Message Library, Retrieval Data Dictionary Library, and IAF Library.

Document Display Services Software

Document Display Services is a software package provided for the FileNet system that enables the users to manage the workstation display without having to treat various types of information differently (e.g.,

image, text, and data). The following features are provided: storage and retrieval of images, text, and data of all types; simultaneous viewing of up to eight partial documents on the screen at one time for rapid browsing; scroll, pan, and zoom images, forms, word processing documents, COLD documents, and other types of data; browsing from one document, or page of a document, to the next, emulating how someone manually leafs through pages of a file folder; and annotation of documents by electronically paper-clipping comments to existing documents filed on the FileNet system. WorkFlo can be used in conjunction with the Document Display package to simplify searching and retrieving of information for use in routine "paper" processing applications.

Mainframe Terminal Emulation Software

Mainframe Terminal Emulation software allows the FileNet workstation to emulate a DEC VT100 or IBM 3278 terminal, hence eliminating the requirement for a separate data processing terminal on a user's desk. Additional WorkFlo scripts can be written to interface with the terminal emulation window to programmatically transfer data between the FileNet system and the mainframe.

PC Imaging Software (PCIS)

The FileNet PCIS provides FileNet image workstation capabilities for IBM personal computers and compatibles. PCIS allows users to add FileNet imaging capabilities to make their PCs more productive. It operates under Microsoft Windows so it fits easily into the current PC environment to operate concurrently with or move easily between imaging and other application programs. In addition to FileNet system security, PCIS provides the following image workstation capabilities: query the FileNet document index database; retrieve the index database information in Query Match Report form; retrieve and display FileNet document images, COLD, and forms documents; pan, scroll, zoom, and scale the document images when displayed; browse through and between multipaged documents; create, display, modify, and delete FileNet document annotations; save FileNet documents as MS-DOS files; convert FileNet documents for use with other Microsoft Windows application programs; user FileNet Print services and Facsimile services; and archive and restore MS-DOS files to optical disk with FileNet image management capabilities. FileNet document annotation capabilities are available in PCIS. All of the standard FileNet system Print and Facsimile Services utility programs are available with PCIS. The Ethernet communications software used by PCIS is Novell NetWare. This enables PCs to access Novell NetWare server applications software as well as FileNet imaging capabilities. Support of Novell NetWare is part of FileNet's overall strategy of providing software for industry-standard workstations in addition to the production imaging IWS and CWS. Image processing has some unique requirements that may require off-the-shelf enhancements for existing PCs. Additional memory and an image-capable monitor and mouse that are Microsoft Windows/286-compatible are required.

Multiple Network Segments (MNS) Software

Multiple Network Segments software allows workstations, printers, and document entry stations in remote locations to access the FileNet Image Management System over 56-Kbps or T1 communications lines.

Intersystem Communications Software

Intersystem Communications software allows the sharing of resources among multiple networked FileNet systems. Images and database information on one system can be accessed by users and WorkFlo scripts on other systems, eliminating the need for duplicate image libraries and databases on each system.

Further Information

For more information about FileNet's business segments, please contact Dataquest's Document Image Management Systems service.

Table 1
Five-Year Corporate Highlights (Thousands of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$10,828.0	$29,164.0	$52,130.0	$63,202.0	$83,051.0
Percent Change	-	169.34	78.75	21.24	31.41
Capital Expenditure	NA	NA	$4,725.0	$5,701.0	$7,492.0
Percent of Revenue	NA	NA	NA	20.66	31.42
R&D Expenditure	$4,589.0	$5,617.0	$6,966.0	$7,872.0	$9,724.0
Percent of Revenue	42.38	19.26	13.36	12.46	11.71
Number of Employees	NA	NA	294	533	711
Revenue ($K)/Employee	NA	NA	$177.31	$118.58	$116.81
Net Income	($4,857.0)	$1,359.0	$6,862.0	$1,370.0	$2,993.00
Percent Change	-	127.98	404.93	(80.03)	118.47

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$17,547.00	$20,382.00	$18,602.00	$26,520.00
Quarterly Profit	$443.00	$1,570.00	($1,808.00)	$2,788.00

NA = Not available

Source: FileNet Corporation
Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	NA	69.46	76.29	71.61	70.19
International	NA	30.54	23.71	28.39	29.81
Europe	NA	27.62	18.65	24.40	23.00
Others	NA	2.92	5.06	3.99	6.81

NA = Not available

Source: FileNet Corporation
Annual Reports and Forms 10-K
Dataquest (1990)

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	50.00	73.00
Indirect Sales	50.00	27.00
VARs	1.00	1.00
Distributors	45.00	15.00
OEMs	3.00	7.00
Joint Marketing	1.00	4.00

Source: FileNet Corporation
Annual Reports and Forms 10-K
Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—25
Europe—2

MANUFACTURING LOCATIONS

North America

Costa Mesa, California
All products that FileNet directly manufactures

SUBSIDIARIES

North America

FileNet International Corporation (United States)
FileNet Canada, Inc. (Canada)

Europe

FileNet France S.A. (France)
FileNet GmbH (Germany)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

ACCESS Corporation
FileNet and ACCESS Corporation announced an agreement in which ACCESS will provide FileNet customers with ACCESS' Engineering Document Image Control System as well as Electronic Change Control software.

Appalachian Computer Services (ACS)
FileNet signed ACS as a joint marketing associate and conversion services associate. Under the agreement, ACS will offer FileNet users a full range of system design, installation, and support services, including document conversion services.

Gandalf Data
In this joint marketing agreement, Gandalf will expand the capabilities of its Starmaster network processor to include document imaging and to provide MS-DOS application processing to users of FileNet's image processing systems.

1989

West Coast Information Systems
FileNet signed West Coast Information Systems on as a systems integrator and a conversion services associate.

Arthur D. Little, Inc.
Arthur D. Little will act as a consultant to FileNet by assisting FileNet in the sales and installation of systems.

SBI
SBI became a joint marketing associate of FileNet. SBI provides WorkFlo programming and/or system training to end users as an adjunct to FileNet's Systems Consultant staff.

Advanced Datasystems Ltd. (ADS)
FileNet made ADS a value-added reseller. ADS provides computerized information systems and related services to health care organizations.

The Information Consulting Group
FileNet signed The Information Consulting Group as a joint marketing associate and a systems integrator. The Information Consulting Group provides information systems consulting, technology integration, customizing system/application design, project management, programming, and life cycle support.

DMR Group Inc.
DMR Group became a systems integrator for FileNet.

Gannon Technology Inc.
FileNet made Gannon Technology a systems integrator. Gannon specializes in the conversion of archive and reference library documents from paper to electronic images and computer-readable code.

West Coast Information Systems
FileNet signed West Coast Information Systems on as a systems integrator and a conversion services associate.

Data Dimensions Corporation
Data Dimensions Corporation became a conversion services associate. FileNet customers utilizing Data Dimensions' image conversion service will receive faster system utilization and internal cost savings.

Delphi Communications Inc.
FileNet signed a joint marketing agreement with Delphi Communications, a supplier of electronic filing and search systems.

Arthur Andersen Consulting
In this systems integrator agreement between FileNet and Arthur Andersen Consulting, Arthur Andersen will offer the full line of FileNet document image processing hardware and software to its client base.

Unisys Corporation
This agreement calls for FileNet to provide Unisys with Image Access Facility software to operate on Unisys hardware.

Information Dimensions, Inc. (IDI)
This joint marketing agreement calls for FileNet and IDI to work together to market image processing solutions incorporating powerful text searching and retrieval capabilities.

Datalogics Incorporated
FileNet signed a joint marketing agreement with Datalogics, a supplier of large-scale reference data publishing systems.

CES/BancTec Incorporated
FileNet signed a joint marketing agreement with CES/BancTec, a leader in document processing equipment for the banking industry.

System-Pro
This marketing agreement calls for System-Pro to market FileNet's computer systems in Hong Kong.

First International Computers
This marketing agreement calls for First International Computers to market FileNet's computer systems in Taiwan.

Terminal Data Corporation
In this multiyear OEM purchase agreement with Terminal Data Corporation, FileNet will purchase the DocuScan DS-2400 and DS-2600 digital image paper scanners.

1988

Operations Management Group, Inc.
Operations Management Group will act as a consultant for FileNet.

HealthPlex, Inc.
FileNet made HealthPlex a value-added reseller.

Jorm Microlab, Inc.
Jorm Microlab, Inc., became a joint marketing associate of FileNet. Jorm Microlab is a specialist in document management systems.

International Datacasting
A joint marketing agreement with International Datacasting calls for high-speed satellite transmission of FileNet optical disk systems.

Lomas Information Systems, Inc.
A joint marketing agreement calls for Lomas Information Systems to help build FileNet's strength in the financial services industry. Lomas is one of the largest mortgage loan servicing firms in the United States.

CES/BancTec
A joint marketing effort combines FileNet's system and CES/BancTec's image capture capabilities.

TRW
TRW was signed as a conversion service associate under FileNet's ValueNet program.

International

FileNet has 45 international alliances unavailable for listing.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Theodore J. Smith
President, chief executive officer and chairman of the board

Edward A. Miller
Vice president, Engineering, and secretary

Mark S. St. Clare
Vice president, Finance, chief financial officer and assistant secretary

Lawrence S. Jordan
Vice president, Sales

Robert C. Reece
Vice president, Manufacturing

David C. Seigle
Vice president, International

Robert L. Castle
Vice president, Marketing

Denny Mack
Vice president, Customer Support

PRINCIPAL INVESTORS

Cede & Company—37.9 percent
Weiss, Peck & Greer—17.7 percent
Matrix Partners, L.P.—8.2 percent
John Hancock Venture Capital—6.4 percent
Olivetti Holding N.V.—6.0 percent

FOUNDERS

Information is not available.

Table 4
Comprehensive Financial Statement
Fiscal Year Ending December
(Thousands of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$14,008.0	$24,722.0	$59,086.0	$56,507.0	$62,473.0
Cash	926.0	10,885.0	4,613.0	4,550.0	6,140.0
Receivables	3,232.0	9,653.0	19,042.0	19,194.0	29,271.0
Marketable Securities	6,448.0	NA	26,224.0	20,031.0	13,568.0
Inventory	3,129.0	3,990.0	8,853.0	11,191.0	12,895.0
Other Current Assets	273.0	194.0	354.0	1,541.0	599.0
Net Property, Plants	$4,317.0	$5,445.0	$9,431.0	$12,307.0	$15,471.0
Other Assets	$1,129.0	$1,999.0	$1,639.0	$2,550.0	$4,417.0
Total Assets	$19,454.0	$32,166.0	$70,156.0	$71,364.0	$82,361.0
Total Current Liabilities	$2,084.0	$4,139.0	$10,069.0	$10,193.0	$18,627.0
Long-Term Debt	$937.0	$1,063.0	$1,388.0	$980.0	$598.0
Other Liabilities	NA	$167.0	$381.0	$396.0	0
Total Liabilities	$3,021.0	$5,369.0	$11,838.0	$11,569.0	$19,225.0
Total Shareholders' Equity	$16,433.0	$26,797.0	$58,318.0	$59,795.0	$63,136.0
Converted Preferred Stock	595.0	675.0	NA	NA	NA
Common Stock	10.0	11.0	96.0	97.0	98.0
Other Equity	15,828.0	26,111.0	58,222.0	59,698.0	63,038.0
Retained Earnings	NA	NA	NA	NA	NA
Total Liabilities and Shareholders' Equity	$19,454.0	$32,166.0	$70,156.0	$71,364.0	$82,361.0
Income Statement	**1985**	**1986**	**1987**	**1988**	**1989**
Revenue	$10,828.0	$29,164.0	$52,130.0	$63,202.0	$83,051.0
US Revenue	NA	20,257.0	39,770.0	45,259.0	58,290.0
Non-US Revenue	NA	8,907.0	12,360.0	17,943.0	24,761.0
Cost of Sales	$6,628.0	$12,453.0	$19,139.0	$22,701.0	$29,741.0
R&D Expense	$4,589.0	$5,617.0	$6,966.0	$7,872.0	$9,724.0
SG&A Expense	$4,884.0	$8,540.0	$14,850.0	$24,631.0	$28,567.0
Capital Expense	NA	$1,664.0	$4,725.0	$5,701.0	$7,492.0
Pretax Income	($4,857.0)	$1,516.0	$7,895.0	$1,509.0	$3,874.0
Pretax Margin (%)	(44.86)	5.20	15.14	2.39	4.66
Effective Tax Rate (%)	NA	10.00	13.00	9.00	23.0
Net Income	($4,857.0)	$1,359.0	$6,862.0	$1,370.0	$2,993.0
Shares Outstanding, Thousands	6,976.3	7,794.0	9,193.0	10,120.0	10,258.0
Per Share Data					
Earnings	($0.70)	$0.17	$0.75	$0.14	$0.29
Dividend	NA	NA	NA	NA	NA
Book Value	$2.36	$3.44	$6.34	$5.91	$6.15

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending December
(Thousands of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	6.72	5.97	5.87	5.54	3.35
Quick (Times)	5.22	5.01	4.99	4.45	2.66
Fixed Assets/Equity (%)	26.27	20.32	16.17	20.58	24.50
Current Liabilities/Equity (%)	12.68	15.45	17.27	17.05	29.50
Total Liabilities/Equity (%)	18.38	20.04	20.30	19.35	30.45
Profitability (%)					
Return on Assets	-	5.27	13.41	1.94	3.89
Return on Equity	-	6.29	16.12	2.32	4.87
Profit Margin	(44.86)	4.66	13.16	2.17	3.60
Other Key Ratios					
R&D Spending % of Revenue	42.38	19.26	13.36	12.46	11.71
Capital Spending % of Revenue	0	5.71	9.06	9.02	9.02
Employees	NA	NA	294	533	711
Revenue ($K)/Employee	NA	NA	$177.31	$118.58	$116.81
Capital Spending % of Assets	NA	5.17	6.73	7.99	9.10

NA = Not available

Source: FileNet Corporation
Annual Reports and Forms 10-K
Dataquest (1990)

Ford Microelectronics

Ford Microelectronics, Inc.
10340 State Highway 83 North
Colorado Springs, CO, 80908-3698
(303) 528-7700

Established 1982
No. of Employees: N/A

BACKGROUND

Ford Microelectronics was established to advance the use of IC technologies in aerospace and automotive applications. Ford has invested approximately $33 million in GaAs plant and facilities intended to supply the GaAs merchant market (95 percent of planned shipments), as well as Ford Aerospace needs. The facility was recently expanded to include the design and manufacture of GaAs ICs for both internal applications and commercial markets; its first products were available in early 1986.

COMPANY EXECUTIVES

- President—John R. Wallace
- Executive Vice President—Dr. He Bong Kim
- Director of Marketing—Michael F. Doyle
- Worldwide Sales Manager—Harry A. Nystrom
- GaAs Marketing Manager—Charlotte S. Diener

STRATEGIC ALLIANCES

Ford is teamed with COMSAT, IBM, Pacific Monolithics, Singer and TriQuint to enable widespread insertion of application-specific MMIC (ASMMIC) technology into systems. Ford and Vitesse have an E/D GaAs IC alternate source agreement.

SERVICES

The Company provides full foundry services including design kit, engineering consultation, SPICE-based simulation, prototype runs of 10 devices, hermetic packaging, burn-in, environmental screening, and production of five-wafer minimum lots.

Ford Microelectronics

PROCESS TECHNOLOGY

- E/D self-aligned gate MESFET featuring 150 ps logic gates with speed-power product of approximately 100fJ (loaded, fanout = 3)
- Si CMOS

PRODUCTS

- Standard digICs including 3ns dual-port SRAM
- Gate arrays to 1,000 gates
- MSI/LSI density ASICs and semicustom GaAs digICs
- Multipliers
- MMICs including 600-MHz op amp

Applications

- Military/aerospace
- Automotive
- Radar
- Communications

FACILITIES

The Colorado Springs fabrication plant, dedicated on March 15, 1985, is one of the largest facilities of its type at 100,000 square feet. The facility includes a 12,000-square-foot class 10 foundry with capacity exceeding 500 wafers per week.

Four-Phase Systems, Inc.

THE COMPANY

Background

Four-Phase Systems, Inc., was acquired by Motorola, Inc., in early 1982. The Company's primary product is small office computers, but it also has a semiconductor facility that operates as a merchant wafer foundry.

Four-Phase's Semiconductor Operation was originally established in 1974 as a fully captive facility serving the Company's total MOS integrated circuit needs. As the Company turned toward purchasing commodity parts on the merchant market, a substantial proportion of the fabrication capability became available. Four-Phase began offering wafer foundry services in 1979 and currently supplies approximately 90 percent of its production to outside users.

Operations

Four-Phase Systems, Inc., Semiconductor Operations offers MOS wafer fabrication services from its customers' own masks. The Company can supply tested or untested wafers, dice or packaged devices. Four-Phase has in-house capability for ceramic packaging and will subcontract plastic packaging upon request. The majority of the packaged production is in 28-, 40-, and 64-pin DIP. The Company uses a negative resist process with four to five micron geometries on 3-inch wafers. Four-Phase is currently offering PMOS metal gate, CMOS metal gate, and NMOS silicon gate. CMOS silicon gate processing will be available by mid-1983. The Company currently sees most demand in the CMOS metal gate area but is expecting strong growth in the CMOS silicon gate market.

Marketing

Four-Phase markets its services through the Company sales headquarters and through field representatives. Sales headquarters for Four-Phase's Semiconductor Operations are:

Four-Phase Systems, Inc.
Semiconductor Operations, MS-21-184
10700 North De Anza Boulevard
Cupertino, CA 95014

Telephone: (408) 255-0900

The Company sells its products to gate array companies as well as to end users.

Four-Phase Systems, Inc.

Semiconductor Products

Four-Phase can produce full custom, standard cell, and gate array MOS devices from customer's own masks. The majority of its sales are untested wafers. The Company enjoys a reputation for high-yielding wafers and attributes this in part to an exceptionally stable work force as well as to a strong emphasis on quality in all aspects of production.

Financial Information

Four-Phase's wafer foundry sales are growing rapidly. Revenues were $850,000 in 1981, growing to $1.5 million in 1982. For 1983, the Company is estimating revenues of approximately $3 million.

Ford Microelectronics

Ford Microelectronics, Inc.
10340 State Highway 83 North
Colorado Springs, CO, 80908-3698
(719) 528-7600

Established 1982
No. of Employees: N/A

BACKGROUND

Ford Microelectronics was established to advance the use of IC technologies in aerospace and automotive applications. Ford has invested approximately $33 million in GaAs plant and facilities intended to supply the GaAs merchant market (95 percent of planned shipments), as well as Ford Aerospace needs. The facility was recently expanded to include the design and manufacture of GaAs ICs for both internal applications and commercial markets; its first products were available in early 1986. In May, 1988, Ford announced successful demonstration of LSI digital circuits and HgCdTe photovoltaic detectors on GaAs-on-Si substrates at wafer yields above 10 percent.

COMPANY EXECUTIVES

- President—Mark Barron
- Director of GaAs Operations—Ted Davenport
- Director of Advanced Development—Dr. Chris Ito
- Vice President of Marketing—Doug Finch
- GaAs Marketing Manager—Charlotte S. Diener

STRATEGIC ALLIANCES

Ford is teamed with COMSAT, IBM, Pacific Monolithics, Singer, and TriQuint to enable widespread insertion of application-specific MMIC (ASMMIC) technology into systems. Ford and Vitesse have an E/D GaAs ASIC alternate source agreement (at the design rule level).

SERVICES

The Company provides full foundry services including design kit, engineering consultation, SPICE-based simulation, prototype runs of 10 devices, hermetic packaging, burn-in, environmental screening, and production of five-wafer minimum lots.

Ford Microelectronics

PROCESS TECHNOLOGY

- E/D self-aligned gate MESFET featuring 150ps logic gates with speed-power product of approximately 100fJ (loaded, fanout = 3)
- GaAs-on-Silicon wafers

PRODUCTS

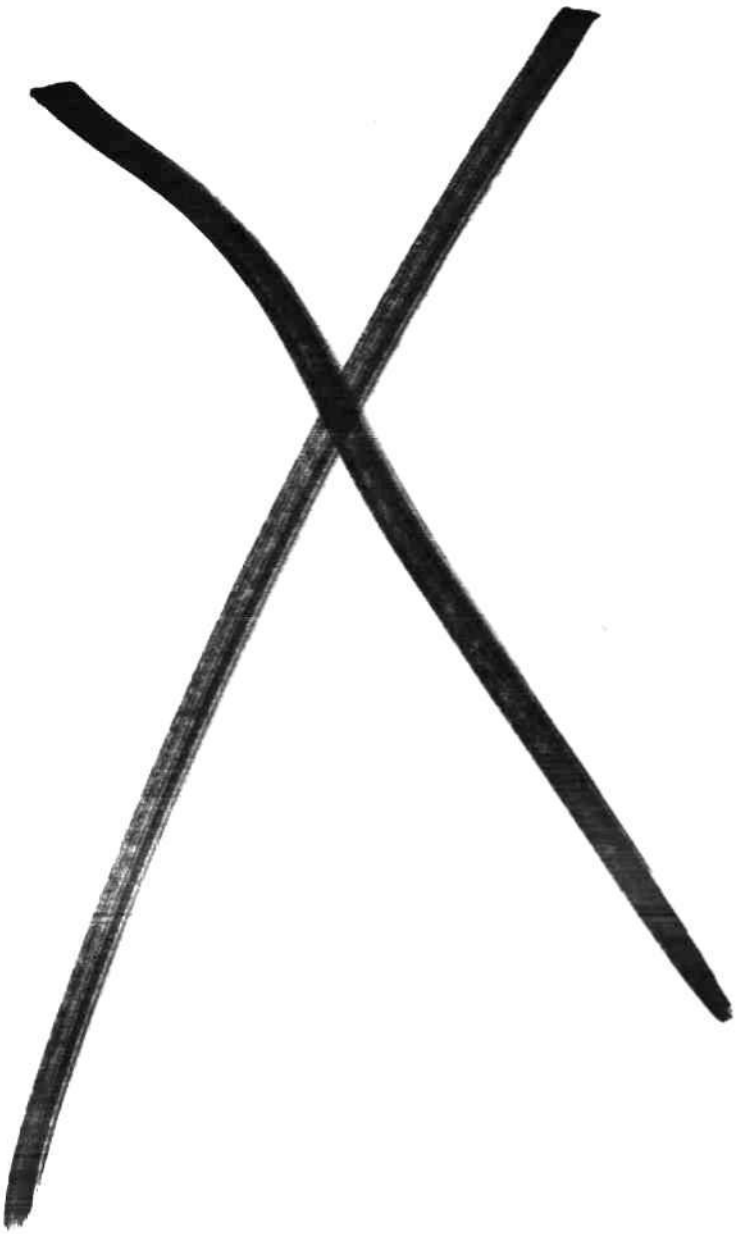
- Gate arrays to 3,000 gates
- ASICs and standard cell products to 3,000 gates density
- MSI/LSI density ASICs and semicustom GaAs digICs
- ASIC MMICs

Applications

- Military/aerospace
- Automotive
- Radar
- Communications

FACILITIES

The Colorado Springs fabrication plant, dedicated on March 15, 1985, is one of the largest facilities of its type at 100,000 square feet. The facility includes a 12,000-square-foot class 10 foundry with capacity exceeding 300 wafers per week.



Hitachi, Ltd.

6, Kanda-Surugadai
4-chome, Chiyuoda-ku
Tokyo 101, Japan
Telephone: (03) 258-1111
Fax: (03) 253-2186
Dun's Number: 69-054-1503

Date Founded: 1910

CORPORATE STRATEGIC DIRECTION

Hitachi, Ltd., was founded to develop indigenous Japanese electrical power equipment manufacturing technology. Initially, the Company emphasized the development of heavy electrical equipment and industrial machinery. After World War II, Hitachi expanded into the consumer product area and in the 1950s entered the electronics field, producing computers, semiconductors, and other electronic devices.

Over the years, Hitachi continued to expand and diversify the scope of its business activities, which led to the development of the Hitachi Group. The Hitachi Group is made up of Hitachi, Ltd., domestic and overseas, and its subsidiaries and affiliates, including the three major subsidiaries, Hitachi Chemical, Hitachi Metals, and Hitachi Cable. The Hitachi Group companies conduct business in electrical and electronic equipment, metals, metallic products, machinery, chemicals, trading, and transportation.

Hitachi's consolidated revenue of ¥7,077.8 billion (US$49.7 billion) in the period ending March 31, 1990, increased 10.5 percent from ¥6,401.4 billion (US$49.9 billion) in 1989. (Percentage changes refer only to ¥ amounts; US$ percentage changes will differ because of fluctuations in Dataquest exchange rates.) Information, Communication Systems, and Electronic Devices were the largest contributors, responsible for 33 percent of revenue with ¥2,318 billion ($16.3 billion). Overseas computer sales had substantial increases, primarily for large general-purpose machines.

The Japanese domestic sales contribution to Hitachi's total revenue increased to ¥5,420.1 billion (US$38.0 billion) for the period ending March 31, 1990, up from ¥4,932.3 billion (US$38.5 billion) in fiscal 1988. In fiscal 1989, domestic sales accounted for about 77 percent of total revenue.

Net income increased by 13.69 percent to ¥211.0 billion (US$1.5 billion) for the period ending March 31, 1990, compared with ¥185.6 billion (US$1.4 billion) in fiscal 1988. The improved results were attributed to the Company's steady expansion on a worldwide scale. Hitachi employs more than 290,000 people worldwide.

Research and development expenditure increased to ¥429.4 billion (US$3.0 billion) and represented 6.0 percent of total revenue for the period. This figure is an increase of 15 percent over the 1988 figure of ¥373.5 billion (US$2.9 billion). Areas of focus were the development of technologies that will enable Hitachi to respond to future increased processing power, the development of higher speed and packing density technologies for semiconductors, and development of nonsilicon devices.

Capital expenditure for the year ending March 31, 1990, were not available.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Tables 4 and 5, comprehensive financial statements, are at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Semiconductors

Hitachi is the third largest worldwide semiconductor manufacturer with ¥5.09 trillion (US$3.974 billion, Dataquest exchange rate) in if-sold revenue for calendar 1989, representing a 6.9 percent market share.

Dataquest estimates the Company's single largest market to be Japan, which generates approximately ¥3.48 trillion (US$2.7 billion), representing 11.8 percent of the market. Dataquest ranks Hitachi third in this market. Hitachi's next largest market is in North America, where Hitachi earned ¥752 billion (US$587 million) in calendar 1989, ranking eighth and posting a 28 percent increase in revenue generated. Dataquest estimates that Hitachi ranks tenth in Europe with 3 percent of the market and fourth in Rest of World with a 5.8 percent market share in calendar 1989.

Dataquest estimates that the highest growth rate experienced by Hitachi in semiconductors was in BiCMOS semiconductors, which grew by 2,086 percent worldwide. Hitachi's best-selling semiconductor was the MOS memory chip, which accounted for approximately ¥1.96 trillion (US$13.75 billion) worldwide in calendar 1989. Hitachi's CMOS semiconductors accounted for ¥1.86 trillion (US$13.05 billion) worldwide in calendar 1989.

Dataquest estimates that the Company ranked second in the Japanese bipolar digital market with a 19.7 percent share. This ranking is based on ¥4.4 billion (US$345 million) in revenue for calendar 1989. The revenue figures were down 7 percent when compared with the 1988 figures of ¥4.73 billion (US$369 million), while the total market experienced an 8 percent decrease in sales.

Hitachi has focused on high-value-added products such as 1MB, 4MB, and 16MB DRAMs. However, future revenue may be gained by the Company's increasing efforts on 32-bit MPUs and ASICs. These efforts are part of a corporate goal to expand the Company's product mix and reduce dependence on any one product line.

Hitachi generates significant revenue from its bipolar (ECL) products. In calendar 1989, Hitachi earned ¥1.56 billion (US$122 million) in revenue from the ECL products.

Computers

In 1989, Hitachi and General Motors Electronic Data Systems bought National Advanced Systems, the mainframe arm of National Semiconductor. The two companies have changed the name of the company to Hitachi Data Systems (HDS).

In 1989, Hitachi had less than 1 percent of the worldwide market share in the personal, business, and technical computer industry segments. Dataquest estimates that Hitachi had 4.9 percent of the worldwide mainframe market while Hitachi Data Systems controlled 1.8 percent of the market. HDS's Andromeda system, which competes directly with IBM in the United States and elsewhere, is pushing the eventual release of IBM's Summit system.

HDS announced in 1989 extensions to its family of 370 plug-compatible machines (PCMs). The three new machines—the EX 85, EX 310, and EX 420—are upgrades of the existing EX Series. A fourth model was announced in Japan, the M880/220. The announcement precedes the release of HDS's new mainframe, "ZEUS," expected out in 1990.

Other Hitachi computers include the B16 LX XX, the B32 Series, the HL 500 Series, the PROSET 30, the PWS 2020, and the PWS 2050.

Computer Storage

Hitachi is active in two computer storage markets. Dataquest estimates that Hitachi ranks second in the 12-inch WORM optical disk drive market, with a 28 percent share based on 3,400 units shipped. Hitachi is the leader in the CD-ROM optical disk drive market. Hitachi captured 26 percent of this market in 1989 by selling 40,000 units, which generated $11.8 million in if-sold revenue. Hitachi sold CD-ROMs under its own brand name, as well as through Amdek and Denon via its subsidiary Nippon Columbia.

Printers

Dataquest estimates that in the printer peripheral market, Hitachi is in the lower 25 percent of both line printer and page printer companies. Hitachi had less than 1 percent in these markets in 1989.

Telecommunications

Hitachi is not a very significant competitor in the PBX business communications market. Dataquest estimates that Hitachi ranked tenth in the US PBX market, with a 2.3 percent market share. Hitachi is not considered a major player in the European PBX market.

CAD/CAM

Hitachi holds a 1.4 percent market share by revenue, on a worldwide basis, of the CAD/CAM market. Hitachi has concentrated on the Asian market, which

is responsible for all of its market-generated revenue in 1989. The revenue generated was in turnkey systems and services.

Other Products

Hitachi's Power and Equipment Division witnessed a 10 percent increase in calendar 1989 sales because of expanded sales of thermal plants to power companies. Sales in Hitachi's Consumer Product Division, on the other hand, grew only slightly as a result of a mature VCR market, reduced export levels, and increasing competition. Revenue in the Industrial Machinery and Plants Division increased 16 percent, primarily because of expanded activities in the construction equipment field. The Wire and Cable, Metals, Chemicals, and Other Products Division witnessed a 10 percent growth in sales over the preceding year.

Further Information

For further information pertaining to the Company's business segments, please contact the appropriate industry service.

Table 1
Five-Year Corporate Highlights (Billions of US Dollars)

	1986	1987	1988	1989	1990
Five-Year Revenue	$22.6	$30.4	$36.0	$49.9	$49.7
Percent Change	-	34.19	18.61	38.48	(0.47)
Capital Expenditure	$2.0	$4.1	$2.3	$4.2	NA
Percent of Revenue	8.92	13.56	6.44	8.32	0
R&D Expenditure	$1.3	$1.9	$2.3	$2.9	$3.0
Percent of Revenue	5.90	6.34	6.51	5.83	6.07
Number of Employees	164,117	161,325	159,910	274,508	290,000
Revenue ($K)/Employee	$0.14	$0.19	$0.23	$0.18	$0.17
Net Income	$0.4	$0.6	$1.0	$1.4	$1.5
Percent Change	-	38.67	60.22	46.02	2.34
Exchange Rate (US$1=¥)	¥221.26	¥159.56	¥138.03	¥128.25	¥142.47

NA = Not available

Source: Hitachi, Ltd.
Annual Reports and Forms 20-F
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1986	1987	1988	1989	1990
Japan	99.86	99.84	76.00	77.05	76.58
International	30.16	26.18	24.00	22.95	23.42

Source: Hitachi, Ltd.
Annual Reports
Dataquest (1990)

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989	1990
Direct Sales	30	30	30
Indirect Sales	70	70	70
Distributor	70	70	70

Source: Hitachi, Ltd.
Annual Reports
Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—2
Europe—2
Asia/Pacific—11
Japan—50
ROW—9

MANUFACTURING LOCATIONS

North America

High Voltage Breakers, Norcross, Georgia
SF6 gas breakers
Hitachi Automotive Products, Farminghills, Michigan
Electronic auto parts
Hitachi Cable Manchester, Inc., Manchester, New Hampshire
Cables
Hitachi Cable Manchester, Inc., New Albany, Indiana
Automobile brake hose
Hitachi (Canadian), Ltd., Calgary, Alta.
Turbine generator and heavy industrial equipment
Hitachi Computer Products (America), Norman, Oklahoma
Computer products (magnetic disk devices, magnetic tape cartridges)
Hitachi Construction Machinery Corp., Brampton, Ontario
Excavators, cranes, tunnel shield machines
Hitachi Consumer Products of America, Anaheim, California
Color TVs, VCRs
Hitachi Denshi (Canada), Ltd., Scarborough, Ontario
Broadcast and professional video, CCTV equipment, test and instrumentation
Hitachi (HSC) Canada, Inc., Pointe Claire, Quebec
TVs, VCRs, and household electric appliances
Hitachi Semiconductor (America), Irving, Texas
Semiconductors
Hitachi Telecom, Norcross, Georgia
Digital PBXs

Europe

Hitachi Consumer Products (Europe), Germany
VCRs
Hitachi Consumer Products (U.K.), United Kingdom
Color TVs
Hitachi Semiconductor Europe, Germany
Semiconductors

Asia/Pacific

Akita Electronic Co., Akita, Japan
MOS, bipolar IC
Hanshi Electric, Japan
Ignition coils for automobiles
Haramachi Semiconductor Ltd., Ibaraga, Japan
Diodes, thyristors
Hitachi Computer Engineering, Japan
Development of automatic designing systems
Hitachi Consumer Products, Malaysia
TV parts
Hitachi Consumer Products, Singapore
Color TVs, audio equipment, vacuum cleaners
Hitachi Consumer Products, Thailand
Electric fans, refrigerators, TVs, motors, air-conditioners, electric rice cookers
Hitachi Cubu Electric, Japan
Switchboards
Hitachi Denshi, Japan
Communications equipment, measuring instruments, information equipment
Hitachi Electronic Devices, Singapore
Color CRTs
Hitachi Electronics Engineering, Japan
Information equipment, semiconductor devices, energy-saving equipment
Hitachi Elevator Engineering, Singapore
Elevators, escalators
Hitachi Engineering, Japan
Electric/electronic equipment, plant engineering
Hitachi Haramachi Semiconductor, Japan
Semiconductor parts
Hitachi Kiden Kogyo, Japan
Cranes, water treatment equipment, FA-related equipment
Hitachi Kyowa Kogyo, Japan
Electric equipment
Hitachi Maxell, Japan
Dry batteries, magnetic tapes, electronic devices
Hitachi Medical, Japan
Medical equipment
Hitachi Microcomputer Engineering, Tokyo, Japan
MPUs, ASICs
Hitachi Mizusawa, Japan
Transformers for TVs
Hitachi Naka Seiki, Japan
Chromatographic equipment, scientific instruments
Hitachi Nissin Electronics, Japan
Electronic parts
Hitachi Ohira Industrial, Japan
Parts for refrigerators, air conditioners
Hitachi Process Computer Engineering, Japan
Process computers
Hitachi Semiconductor, Malaysia
Semiconductors

Hitachi Setsubi Engineering, Japan
FA equipment
Hitachi Techno Engineering, Japan
Electronic part manufacturing equipment
Hitachi Telecom Technologies, Japan
Switching systems
Hitachi Television, Taiwan
Color TVs, audio equipment, displays
Hitachi Video Engineering, Japan
Development of video equipment
Hitachi Works, Ibaraga, Japan
Discrete devices
Hitachi Yomezawa Electronic, Japan
Semiconductor elements
Hokkai Semiconductor, Hokkaido, Japan
SRAMs
Horiba Ltd., Japan
Electric measuring instruments
Japan Servo, Japan
Precision motors
Jidosha Denki Kogyo, Japan
Electrical auto parts
Kaohsiung Hitachi Electronics, Taiwan
Electronic parts, transistors, LCDs
Kokusai Electric, Japan
Electric communications equipment
Kokusan Denki, Japan
Electrical auto parts, generators, motors
Komoro Works, Nagano, Japan
Photo devices, hybrid ICs
Mobara Works, Chiba, Japan
DRAMs, CMOS logic, LCDs
Musashi Works, Tokyo, Japan
MPUs, diodes, DRAMs, SRAMs
Naka Works, Ibaraga, Japan
Semiconductor sensors, DRAMs, SRAMs
Nakayo Telecommunications, Japan
Telephone and switching systems
Nigata Works, Nigata, Japan
Linear, bipolar digital ICs
Nippon Columbia, Japan
Records, stereos, and other audio equipment
Nissin Electronics Ltd., Ibaraga, Japan
MOS
Taga Sangyo, Japan
Electric equipment
Taiwan Hitachi, Taiwan
Room air-conditioners
Takasaki Works, Gunma, Japan
Bipolar and MOS ICs, EPROMs, CMOS logic
Tobu Semiconductor Ltd., Aomari, Japan
Bipolar ICs
Tobu Semiconductor Ltd., Saitama, Japan
Transistor, hybrid ICs
Tokico Ltd., Japan
Electrical auto parts and equipment
Tokyo Electronics Co., Yamanashi, Japan
Diodes, bipolar ICs
Yagi Antenna, Japan
Antennas
Yomezawa Electronic Co., Yamagata, Japan
MOS

ROW

Industrias Hitachi, Brazil
Distribution equipment, air-conditioners, electronic parts, transformers, switches

SUBSIDIARIES

North America

Hitachi America, Ltd. (United States)
Hitachi Automotive Products (USA), Inc. (United States)
Hitachi Computer Products (America), Inc. (United States)
Hitachi Consumer Products of America Inc. (United States)
Hitachi Semiconductor (America) Inc. (United States)
Hitachi Telecom (USA), Inc. (United States)

Europe

Hitachi Consumer Products Europe Ltd. (United Kingdom)
Hitachi Semiconductor Europe (Germany)
Hitachi Consumer Products (Europe) (Germany)

Asia/Pacific

Asahi Kogyo Co., Ltd. (Japan)
Babcock-Hitachi K.K. (Japan)
Chuo Shoji, Ltd. (Japan)
Hitachi Air Conditioning & Refrigeration Co., Ltd. (Japan)
Hitachi Australia Ltd. (Australia)
Hitachi Automobile Appliances Sales Co., Ltd. (Japan)
Hitachi Cable Ltd. (Japan)
Hitachi Chemical Co., Ltd. (Japan)
Hitachi Construction Machinery Co., Ltd. (Japan)
Hitachi Consumer Products (Malaysia) Sdn. Bhd. (Malaysia)
Hitachi Consumer Products Pte. Ltd.
Hitachi Credit Corporation (Japan)

Hitachi Electronic Components (Asia) Ltd. (Hong Kong)
Hitachi Electronic Devices (Singapore) Pte. Ltd. (Singapore)
Hitachi Denshi, Ltd. (Japan)
Hitachi Electronics Engineering Co., Ltd. (Japan)
Hitachi Electronics Service Co., Ltd. (Japan)
Hitachi Elevator Engineering and Service Co., Ltd. (Japan)
Hitachi Engineering Co., Ltd. (Japan)
Hitachi Heating Appliances Co., Ltd. (Japan)
Hitachi Higashi Shohin Engineering, Ltd. (Japan)
Hitachi Hokkai Semiconductor, Ltd. (Japan)
Hitachi Kiden Kogyo, Ltd. (Japan)
Hitachi Lighting, Ltd. (Japan)
Hitachi Machinery and Engineering, Ltd. (Japan)
Hitachi Maxell, Ltd. (Japan)
Hitachi Medical Corporation (Japan)
Hitachi Metals, Ltd. (Japan)
Hitachi Mokuzai Jisho, Ltd. (Japan)
Hitachi Nishi Shohin Engineering, Ltd. (Japan)
Hitachi Plant Engineering & Construction Co., Ltd. (Japan)
Hitachi Power Engineering Co., Ltd. (Japan)
Hitachi Printing Co., Ltd. (Japan)
Hitachi Sales Corporation (Japan)
Hitachi Seiko, Ltd. (Japan)
Hitachi Semiconductor (Malaysia) Sdn. Bhd. (Malaysia)
Hitachi Service Engineering Co., Ltd. (Japan)
Hitachi Software Engineering Co., Ltd. (Japan)
Hitachi Techno Engineering Co., Ltd. (Japan)
Hitachi Telecom Technologies, Ltd. (Japan)
Hitachi Television, Ltd. (Taiwan)
Hitachi Tochigi Electronics, Co., Ltd. (Japan)
Hitachi Tohbu Semiconductor, Ltd. (Japan)
Hitachi Tokyo Electronics Co., Ltd. (Japan)
Hitachi Transport System, Ltd. (Japan)
Hitachi Welfare Service, Ltd. (Japan)
Japan Servo Co., Ltd. (Japan)
Nippon Business Consultant Co., Ltd. (Japan)
Nissei Sangyo Co., Ltd. (Japan)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

Comparex Information Systems GmbH
Comparex Information Systems GmbH will ship Hitachi's new Integrated Vector Feature for its 8/9X series of processors.

VLSI Technology Inc.
Hitachi plans to supply SRAMs to VLSI Technology Inc. on an OEM basis. The SRAMs have been jointly developed by the two companies.

Kansai Electric Power Co., Matsushita Electric Industrial Co., Toshiba Corp., Mitsubishi Electric Corp., Sumitomo Electric Industries, Ltd., Kawasaki Heavy Industries, Ltd., and Kobe Steel, Ltd.
Hitachi has agreed to set up a new company by year end, which will perform research and development for free electron lasers with the preceding companies.

Sears and Roebuck
Hitachi agreed to let Sears and Roebuck market its VY15A video printer.

1989

Sun Microsystems
Hitachi will license Sun's Open Network Computing/Network File System technology for implementation on Hitachi's mainframe computers.

Zuken Inc.
Hitachi agreed to allow Zuken to develop CAD/CAM/CAE software packages for the 2050G Series of engineering workstations made by Hitachi.

Adaptive Information Systems (AIS)
AIS has been formed by Hitachi to market document image processing systems using optical storage technology.

Hewlett-Packard
Hewlett-Packard is licensing its proprietary Precision Architecture to Hitachi.

Texas Instruments
Texas Instruments will supply SRAMs to Hitachi on an OEM basis.

GoldStar
Hitachi signed a major pact with South Korea's GoldStar Company covering 1Mb DRAMs, for which Hitachi will provide technical consultations and manufacturing technology. Hitachi will get royalty payments from GoldStar and eventually will buy chips to sell under its own label.

Cray
This agreement gives each company the right to make use of the other's patents in designing computer hardware.

Hewlett-Packard
The two companies will jointly develop a new set of chips using HP's proprietary Precision Architecture RISC MPU technology.

National Semiconductor
Under this production agreement for FACT logic devices, both companies can mutually produce independently defined and independently developed new functions.

MERGERS AND ACQUISITIONS

1990

Dataproducts Corporation
Two Hitachi affiliates, Hitachi Koki and Nissei Sangyo, acquired Dataproducts Corporation for approximately $160 million. Dataproducts manufactures a broad range of band, dot matrix, laser, solid ink, and thermal printers, and a wide range of printer supplies. Dataproducts is counting on solid ink jet printers to play a significant role in the printer industry and is investing heavily to finance this strategically important technology. The 1988 acquisition of Imaging Solutions, Inc., gave Dataproducts 100 percent ownership of this new technology. Dataproducts had sales of $353 million in fiscal 1989, an increase of 2 percent over 1988.

1989

National Advanced Systems
Mainframe computers and peripheral subsystems

KEY OFFICERS

Katsushige Mita
President and representative director

Masataka Nishi
Executive vice president and representative director

Shiro Kawada
Executive vice president and director

Yutaka Sonoyama
Executive vice president and director

Sutezo Hata
Executive vice president and director

Takeo Miura
Executive vice president and director

Tsutomu Kanai
Executive vice president and director

Table 4
Comprehensive Financial Statement
Fiscal Year Ending March
(Billions of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$14.8	$21.6	$27.2	$38.0	$37.8
Cash	3.0	5.6	8.0	12.8	12.0
Receivables	4.4	6.3	7.8	10.7	11.2
Marketable Securities	2.2	2.9	3.0	3.0	3.3
Inventory	4.4	5.6	7.0	9.7	9.5
Other Current Assets	0.8	1.1	1.4	1.7	1.8
Net Property, Plants	$5.4	$7.4	$8.2	$11.5	$12.0
Other Assets	$3.1	$4.4	$5.3	$4.6	$5.0
Total Assets	$23.3	$33.4	$40.7	$54.1	$54.8
Total Current Liabilities	$10.8	$14.3	$17.4	$24.8	$23.3
Long-Term Debt	$1.7	$3.1	$3.1	$4.1	$9.7
Other Liabilities	$1.4	$2.2	$2.8	$3.8	NA
Total Liabilities	$13.9	$19.6	$23.3	$32.6	$33.0
Minority Interests	$1.5	$2.3	$2.8	$3.7	$3.9
Total Shareholders' Equity	$7.9	$11.4	$14.6	$17.8	$18.0
Common Stock	0.6	0.9	1.3	1.7	1.7
Other Equity	0.8	1.3	1.8	2.5	2.5
Retained Earnings	6.4	9.3	11.5	13.6	13.7
Total Liabilities and Shareholders' Equity	$23.3	$33.4	$40.7	$54.1	$54.8

Income Statement	1986	1987	1988	1989	1990
Revenue	$22.6	$30.4	$36.0	$49.9	$49.7
Japanese Revenue	22.6	30.3	27.4	38.5	38.0
Non-Japanese Revenue	6.8	8.0	8.7	11.5	11.6
Cost of Sales	$16.9	$23.0	$28.7	$35.5	$35.3
R&D Expense	$1.3	$1.9	$2.3	$2.9	$3.0
SG&A Expense	$4.4	$6.0	$7.5	$11.0	$10.8
Capital Expense	$2.0	$4.1	$2.3	$4.2	N/A
Pretax Income	$1.7	$1.6	$2.4	$3.8	$3.7
Pretax Margin (%)	7.41	5.33	6.66	7.67	7.49
Effective Tax Rate (%)	57.50	57.50	56.10	56.10	56.10
Net Income	$0.4	$0.6	$1.0	$1.4	$1.5
Shares Outstanding, Millions	2,803.4	2,816.3	2,921.7	3,017.7	3,418.6
Per Share Data					
Earnings	$0.23	$0.21	$0.32	$0.46	$0.43
Dividend	$0.04	$0.06	$0.07	$0.07	$0.06
Book Value	0	0	$0.01	$0.01	$0.01
Exchange Rate (US$1=¥)	¥221.26	¥159.56	¥138.03	¥128.25	¥142.47

Source: Hitachi Ltd.
Annual Reports
Dataquest (1990)

Table 5
Comprehensive Financial Statement
Fiscal Year Ending March
(Billions of Yen, except Per Share Data)

Balance Sheet	1986	1987	1988	1989	1990
Total Current Assets	¥3,276.2	¥3,444.8	¥3,757.4	¥4,870.0	¥5,390.9
Cash	661.7	892.9	1,103.9	1,638.3	1,705.5
Receivables	971.0	1,010.6	1,080.7	1,372.2	1,594.3
Marketable Securities	492.4	470.6	412.3	385.1	473.0
Inventory	980.0	898.5	960.6	1,250.0	1,355.0
Other Current Assets	171.1	172.2	199.9	224.4	263.1
Net Property, Plants	¥1,200.0	¥1,179.1	¥1,133.0	¥1,473.1	¥1,708.9
Other Assets	¥688.0	¥704.1	¥730.7	¥594.4	¥705.3
Total Assets	¥5,164.2	¥5,328.0	¥5,621.1	¥6,937.5	¥7,805.1
Total Current Liabilities	¥2,393.3	¥2,288.5	¥2,399.0	¥3,183.5	¥3,314.9
Long-Term Debt	¥369.7	¥488.9	¥432.8	¥520.9	¥1,380.8
Other Liabilities	¥319.6	¥352.3	¥381.9	¥481.0	NA
Total Liabilities	¥3,082.6	¥3,129.7	¥3,213.7	¥4,185.4	¥4,695.7
Minority Interests	¥338.9	¥372.4	¥388.8	¥470.4	¥548.7
Total Shareholders' Equity	¥1,742.7	¥1,825.8	¥2,018.6	¥2,281.7	¥2,560.7
Common Stock	140.3	141.2	180.3	219.4	246.8
Other Equity	186.5	199.6	244.4	322.0	357.8
Retained Earnings	1,415.9	1,485.0	1,593.9	1,740.3	1,956.1
Total Liabilities and Shareholders' Equity	¥5,164.2	¥5,327.9	¥5,621.1	¥6,937.5	¥7,805.1
Income Statement	**1986**	**1987**	**1988**	**1989**	**1990**
Revenue	¥5,010.5	¥4,848.7	¥4,975.0	¥6,401.4	¥7,077.8
Japanese Revenue	3,499.5	3,579.3	3,781.0	4,932.3	5,420.1
Non-Japanese Revenue	1,511.0	1,269.4	1,194.0	1,469.1	1,657.7
Cost of Sales	¥3,741.2	¥3,675.0	¥3,961.9	¥4,552.1	¥5,023.5
R&D Expense	¥295.7	¥307.6	¥324.0	¥373.5	¥429.4
SG&A Expense	¥962.7	¥958.8	¥1,032.4	¥1,416.1	¥1,533.2
Capital Expense	¥447.0	¥657.4	¥320.4	¥532.4	NA
Pretax Income	¥371.1	¥258.3	¥331.1	¥491.1	¥530.0
Pretax Margin (%)	7.41	5.33	6.66	7.67	7.49
Effective Tax Rate (%)	57.50	57.50	56.10	56.10	56.10
Net Income	¥98.7	¥98.7	¥136.8	¥185.6	¥211.0
Shares Outstanding, Millions	2,803.4	2,816.3	2,921.7	3,017.7	3,418.6
Per Share Data					
Earnings	¥50.65	¥33.45	¥44.14	¥58.94	¥61.71
Dividend	¥9.00	¥9.00	¥9.00	¥9.00	¥9.00
Book Value	¥0.62	¥0.65	¥0.69	¥0.76	¥0.75

Table 5 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending March
(Billions of Yen, except Per Share Data)

Key Financial Ratios	1986	1987	1988	1989	1990
Liquidity					
Current (Times)	1.37	1.51	1.57	1.53	1.63
Quick (Times)	0.96	1.11	1.17	1.14	1.22
Fixed Assets/Equity (%)	68.86	64.58	56.13	64.56	66.74
Current Liabilities/Equity (%)	137.33	125.34	118.84	139.52	129.45
Total Liabilities/Equity (%)	176.89	171.42	159.20	183.43	183.37
Profitability (%)					
Return on Assets	-	1.88	2.50	2.96	2.86
Return on Equity	-	5.53	7.12	8.63	8.71
Profit Margin	1.97	2.04	2.75	2.90	2.98
Other Key Ratios					
R&D Spending % of Revenue	5.90	6.34	6.51	5.83	6.07
Capital Spending % of Revenue	8.92	13.56	6.44	8.32	0
Employees	164,117	161,325	159,910	274,508	290,000
Revenue (¥K)/Employee	¥30.53	¥30.06	¥31.11	¥23.32	¥24.41
Capital Spending % of Assets	8.66	12.34	5.70	7.67	0
Exchange Rate (US$1=¥)	¥221.26	¥159.56	¥138.03	¥128.25	¥142.47

NA = Not available

Source: Hitachi, Ltd.
Annual Reports
Dataquest (1990)

Hitachi, Ltd.

6, Kanda-Surugadai
4-chome, Chiyuoda-ku
Tokyo 101, Japan
Telephone: (03) 258-1111
Fax: (03) 253-2186
Dun's Number: 69-054-1503

Date Founded: 1910

CORPORATE STRATEGIC DIRECTION

Hitachi, Ltd., was founded to develop indigenous Japanese electrical power equipment manufacturing technology. Initially, the Company emphasized the development of heavy electrical equipment and industrial machinery. After World War II, Hitachi expanded into the consumer product area and, in the 1950s, entered the electronics field, producing computers, semiconductors, and other electronic devices.

Over the years, Hitachi continued to expand and diversify the scope of its business activities, which led to the development of the Hitachi Group. The Hitachi Group is made up of Hitachi, Ltd., domestic and overseas, and its subsidiaries and affiliates, including the three major subsidiaries—Hitachi Chemical, Hitachi Metals, and Hitachi Cable. The Group companies conduct business in electrical and electronic equipment, metals, metallic products, machinery, chemicals, trading, and transportation.

Hitachi's consolidated revenue of $48.5 billion* in the period ending March 31, 1989, increased 22 percent from the previous year's sales of $39.8 billion. Net income was $1.4 billion, an increase of 28.5 percent from $1.1 billion in fiscal 1988. The improved results were attributed to the Company's steady expansion on a worldwide scale. Hitachi employs more than 274,500 people worldwide.

The Japanese domestic sales contribution to Hitachi's total revenue grew to $37.4 billion in 1989. Japanese domestic sales accounted for 77 percent of the total, up from 76 percent in fiscal 1988. Sixty-seven percent of the company's 74 sales offices are in Japan. Hitachi has manufacturing locations worldwide with a concentration in Japan.

Research and development expenditures totaled $2.8 billion in fiscal 1989, representing 6 percent of Hitachi's revenue. Capital expenditures totaled $3.9 billion in fiscal 1989, representing 8 percent of the Company's revenue.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Semiconductors

Hitachi is the third largest worldwide semiconductor manufacturer with $3.5 billion in revenue and 6.9 percent of the market share in 1988. The Company's semiconductor products span the entire range, including bipolar digital memory and logic, MOS memory, microdevices, and logic, linear ICs, and all types of discrete and optoelectronic devices.

In 1988, Hitachi was the world's third largest MOS memory supplier with revenue of $1.1 billion and worldwide market share of 9.6 percent. Hitachi was also the world's fourth largest MOS microdevice supplier in 1988 with revenue of $525 million and 7.4 percent of the market. MOS memory increased 93.4 percent over 1987 revenue of $576 million, which exceeded the Company's announced goal of

*All dollar amounts are in U.S. dollars.

increasing memory production to 30 percent of total semiconductor production. The efforts focused on high-value-added products such as 1Mb, 4Mb, and 16Mb DRAMs. However, future MOS memory revenue may be affected by the Company's increasing efforts on 32-bit MPUs, the TRON project, and ASICs. These efforts are part of a corporate goal to expand its product mix and reduce dependence on any one product line.

Hitachi's next thrust is in the ASIC area with a concentration on gate arrays and PLDs. Currently, Hitachi has a family of low-count gate arrays and, according to Dataquest ASIC analysts, generates significant revenue from its bipolar (ECL) products. In 1988, Hitachi ranked number two in bipolar digital memory products with 17.8 percent of the worldwide market share, which is about half that of the number one ranked company. Hitachi ranked fifth in the bipolar digital logic segment, with 8.4 percent of the worldwide market share in 1988.

Computers

In 1988, in the personal, business, and technical computer industry segments, Hitachi had less than 1 percent of the worldwide market share. In Japan, Hitachi offers the M68X and M66X lines of almost-compatible IBM machines and leads IBM in market share. In the United States, under the National Advanced Systems Corporation logo, it captured a 4.5 percent share of units and a 4.2 percent share of revenue of all 370-style high-end processor systems. Although attention has been focused on the mainframe business, the 3380 disk market has been where Hitachi's market share has grown a very profitable 7 percent.

In 1989, Hitachi and General Motors Electronic Data Systems (EDS) bought National Advanced Systems, the mainframe arm of National Semiconductor. Hitachi and EDS bring enormous resources to a company that was previously under the wings of an ailing parent. The two companies have changed the name of the company to Hitachi Data Systems. National Advanced Systems was a distributor of Hitachi systems, but without the middleman, Hitachi can sell its big computers and storage peripherals for less. Hitachi Data Systems is expected to do very well. In fact, the first month after the acquisition, sales doubled and were better than all but one month in National Advanced Systems' history. Hitachi is looking toward a long-term investment in Hitachi Data Systems.

Computer Storage

Hitachi is one of the leading optical drive suppliers. Dataquest estimates that, in 1988, Hitachi captured 28 percent of the market share and was gaining momentum on the number one ranked company. Hitachi appears to have an edge in CD-ROM shipments; it sells under its own brand name plus Amdek and Denon via its subsidiary Nippon Columbia. Among the suppliers of write once, read many (WORM) drives, Hitachi is also one of the leaders in the larger 12-inch disk format.

Printers

Dataquest estimates that, in the printer peripheral market, Hitachi ranks in the lower 25 percent of both line printer and page printer companies. In both of these market segments, the top five vendors captured almost 75 percent of the market share.

Telecommunications

Hitachi also is not a very large competitor in the PBX business communications market worldwide. According to Dataquest's estimate, Hitachi ranked ninth in 1988, capturing only 2.4 percent of the market share.

CAD/CAM

Hitachi is present in the CAD/CAM market with 1.5 percent of the market share, but it is not considered a major player in the industry.

Other Products

Hitachi's Power and Equipment division witnessed a 10 percent increase in fiscal 1989 sales due to expanded sales of thermal plants to power companies. Sales in Hitachi's Consumer Product division, on the other hand, grew only slightly as a result of a mature VCR market, reduced export levels, and increasing competition. The Industrial Machinery and Plants division accomplished a 16 percent boost in revenue, owing primarily to expanded activities in the construction equipment field. Finally, the Wire and Cable, Metals, Chemicals, and Other Products division witnessed a buoyant 10 percent growth in sales over the preceding year.

Further Information

For further information pertaining to the Company's business segments, please contact the appropriate industry service.

Table 1
Five-Year Corporate Highlights (Millions of U.S. Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$20,053.2	$29,473.3	$34,633.2	$39,800.8	$48,495.6
Percent Change	-	46.98	17.51	14.92	21.85
Capital Expenditure	$1,820.5	$2,632.0	$2,552.8	$2,333.0	$3,901.0
Percent of Revenue	9.08	8.93	7.37	5.86	8.04
R&D Expenditure	$1,071.7	$1,739.5	$2,197.1	$2,591.2	$2,829.6
Percent of Revenue	5.34	5.90	6.34	6.51	5.83
Number of Employees	164,951	164,117	161,325	159,910	274,508
Revenue ($K)/Employee	$121.57	$179.59	$214.68	$248.90	$176.66
Net Income	$840.6	$883.6	$704.8	$1,094.4	$1,406.0
Percent Change	-	5.12	(20.24)	55.28	28.47

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	N/A	N/A	N/A	N/A
Quarterly Profit	N/A	N/A	N/A	N/A

N/A = Not Available

Source: Hitachi, Ltd. Annual Reports
Dataquest
January 1990

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
Japan	67.38	69.84	73.82	76.07	77.05
Overseas	32.62	30.16	26.18	23.93	22.95

Source: Hitachi, Ltd. Annual Reports

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988*	1989*
Direct Sales	30.00	30.00
Indirect Sales	70.00	70.00
Distributors	70.00	70.00

*For Japanese semiconductor parts

Source: Dataquest
January 1990

1989 SALES OFFICE LOCATIONS

North America—2
Japan—50
Europe—2
Asia/Pacific—11
ROW—9

MANUFACTURING LOCATIONS

North America

High Voltage Breakers, Norcross, Georgia
SF6 gas breakers
Hitachi Automotive Products, Farminghills, Michigan
Electronic auto parts
Hitachi Cable Manchester, Inc., Manchester, New Hampshire
Cables
Hitachi Cable Manchester, Inc., New Albany, Indiana
Automobile brake hoses
Hitachi (Canadian), Ltd., Calgary, Alberta
Turbine generator and heavy industrial equipment
Hitachi Computer Products (America), Norman, Oklahoma
Computer products (magnetic disk devices, magnetic tape cartridges)
Hitachi Construction Machinery Corp., Brampton, Ontario
Excavators, cranes, tunnel shield machines
Hitachi Consumer Products of America, Anaheim, California
Color TVs, VCRs
Hitachi Denshi (Canada), Ltd., Scarborough, Ontario
Broadcast and professional video, CCTV equipment, test and instrumentation
Hitachi (HSC) Canada, Inc., Pointe Claire, Quebec
TVs, VCRs, and household electric appliances
Hitachi Semiconductor (America), Irving, Texas
Semiconductors
Hitachi Telecom, Norcross, Georgia
Digital PBXs

Japan

Akita Electronic Co., Akita
MOS, bipolar IC
Hanshi Electric
Ignition coils for automobiles
Haramachi Semiconductor Ltd., Ibaraga
Diodes, thyristors
Hitachi Computer Engineering
Development of automatic designing systems
Hitachi Cubu Electric
Switchboards
Hitachi Denshi
Communications equipment, measuring instruments, information equipment
Hitachi Electronics Engineering
Information equipment, semiconductor devices, energy-saving equipment
Hitachi Engineering
Electric/electronic equipment, plant engineering
Hitachi Haramachi Semiconductor
Semiconductor parts
Hitachi Kiden Kogyo
Cranes, water treatment equipment, FA-related equipment
Hitachi Kyowa Kogyo
Electric equipment
Hitachi Maxell
Dry batteries, magnetic tapes, electronic devices
Hitachi Medical
Medical equipment
Hitachi Microcomputer Engineering, Tokyo
MPUs, ASICs
Hitachi Mizusawa
Transformers for TVs
Hitachi Naka Seiki
Chromatographic equipment, scientific instruments
Hitachi Nissin Electronics
Electronic parts
Hitachi Ohira Industrial
Parts for refrigerators, air conditioners
Hitachi Process Computer Engineering
Process computers
Hitachi Setsubi Engineering
FA equipment
Hitachi Techno Engineering
Electronic part manufacturing equipment
Hitachi Telecom Technologies
Switching systems
Hitachi Video Engineering
Development of video equipment
Hitachi Works, Ibaraga
Discrete devices
Hitachi Yomezawa Electronic
Semiconductor elements
Hokkai Semiconductor, Hokkaido
SRAMs
Horiba Ltd.
Electric measuring instruments
Japan Servo
Precision motors

Jidosha Denki Kogyo
Electrical auto parts
Kokusai Electric
Electric communication equipment
Kokusan Denki
Electrical auto parts, generators, motors
Komoro Works, Nagano
Photo devices, hybrid ICs
Mobara Works, Chiba
DRAMs, CMOS logic, LCDs
Musashi Works, Tokyo
MPUs, diodes, DRAMs, SRAMs
Naka Works, Ibaraga
Semiconductor sensors, DRAMs, SRAMs
Nakayo Telecommunications
Telephone and switching systems
Nigata Works, Nigata
Linear, bipolar digital ICs
Nippon Columbia
Records, stereos, and other audio equipment
Nissin Electronics Ltd., Ibaraga
MOS
Taga Sangyo
Electric equipment
Takasaki Works, Gunma
Bipolar and MOS ICs, EPROMs, CMOS logic
Tobu Semiconductor Ltd., Aomari
Bipolar ICs
Tobu Semiconductor Ltd., Saitama
Transistor, hybrid ICs
Tokico Ltd.
Electrical auto parts and equipment
Tokyo Electronics Co., Yamanashi
Diodes, bipolar ICs
Yagi Antenna
Antennas
Yomezawa Electronic Co., Yamagata
MOS

Europe

Hitachi Consumer Products (Europe), West Germany
VCRs
Hitachi Consumer Products (U.K.), United Kingdom
Color TVs
Hitachi Semiconductor Europe, West Germany
Semiconductors

Asia/Pacific

Hitachi Consumer Products, Malaysia
TV parts
Hitachi Consumer Products, Singapore
Color TVs, audio equipment, vacuum cleaners
Hitachi Consumer Products, Thailand
Electric fans, refrigerators, TVs, motors, air conditioners, electric rice cookers
Hitachi Electronic Devices, Singapore
Color CRTs
Hitachi Elevator Engineering, Singapore
Elevators, escalators
Hitachi Semiconductor, Malaysia
Semiconductors
Hitachi Television, Taiwan
Color TVs, audio equipment, displays
Kaohsiung Hitachi Electronics, Taiwan
Electronic parts, transistors, LCDs
Taiwan Hitachi, Taiwan
Room air conditioners

ROW

Industrias Hitachi, Brazil
Distribution equipment, air conditioners, electronic parts, transformers, switches

SUBSIDIARIES

North America

Hitachi America, Ltd. (United States)
Hitachi Automotive Products (USA), Inc. (United States)
Hitachi Computer Products (America), Inc. (United States)
Hitachi Consumer Products of America Inc. (United States)
Hitachi Semiconductor (America) Inc. (United States)
Hitachi Telecom (USA), Inc. (United States)

Japan

Asahi Kogyo Co.,Ltd.
Babcock-Hitachi K.K.
Chuo Shoji, Ltd.
Hitachi Air Conditioning & Refrigeration Co., Ltd.
Hitachi Automobile Appliances Sales Co., Ltd.
Hitachi Cable, Ltd.
Hitachi Chemical Co., Ltd.
Hitachi Construction Machinery Co., Ltd
Hitachi Credit Corporation
Hitachi Denshi, Ltd.
Hitachi Electronics Engineering Co., Ltd.

Hitachi Electronics Service Co., Ltd.
Hitachi Elevator Engineering and Service Co., Ltd.
Hitachi Engineering Co., Ltd.
Hitachi Heating Appliances Co., Ltd.
Hitachi Higashi Shohin Engineering, Ltd.
Hitachi Hokkai Semiconductor, Ltd.
Hitachi Kiden Kogyo, Ltd.
Hitachi Lighting, Ltd.
Hitachi Machinery and Engineering, Ltd.
Hitachi Maxell, Ltd.
Hitachi Medical Corporation
Hitachi Metals, Ltd.
Hitachi Mokuzai Jisho, Ltd.
Hitachi Nishi Shohin Engineering, Ltd.
Hitachi Plant Engineering & Construction Co., Ltd.
Hitachi Power Engineering Co., Ltd.
Hitachi Printing Co., Ltd.
Hitachi Sales Corporation
Hitachi Seiko, Ltd.
Hitachi Service Engineering Co., Ltd.
Hitachi Software Engineering Co., Ltd.
Hitachi Techno Engineering Co., Ltd.
Hitachi Telecom Technologies, Ltd.
Hitachi Tochigi Electronics, Co., Ltd.
Hitachi Tohbu Semiconductor, Ltd.
Hitachi Tokyo Electronics Co., Ltd.
Hitachi Transport System, Ltd.
Hitachi Welfare Service, Ltd.
Japan Servo Co., Ltd.
Nippon Business Consultant Co., Ltd.
Nissei Sangyo Co., Ltd.

Europe

Hitachi Consumer Products Europe, Ltd. (United Kingdom)
Hitachi Semiconductor Europe (West Germany)
Hitachi Consumer Products (Europe) (West Germany)

Asia/Pacific

Hitachi Australia, Ltd. (Australia)
Hitachi Consumer Products (Malaysia) Sdn. Bhd. (Malaysia)
Hitachi Consumer Products Pte., Ltd.
Hitachi Electronic Components (Asia), Ltd. (Hong Kong)
Hitachi Electronic Devices (Singapore) Pte., Ltd. (Singapore)
Hitachi Semiconductor (Malaysia) Sdn. Bhd. (Malaysia)
Hitachi Television, Ltd. (Taiwan)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1989

Texas Instruments
Texas Instruments will supply SRAMs to Hitachi on an OEM basis.

GoldStar
Hitachi signed a major pact with South Korea's GoldStar Company covering 1Mb DRAMs, for which Hitachi will provide technical consultations and manufacturing technology. Hitachi will get royalty payments from GoldStar and eventually will buy chips to sell under its own label.

Cray
This agreement gives each company the right to make use of the other's patents in designing computer hardware.

Hewlett-Packard
The two companies will jointly develop a new set of chips using HP's proprietary Precision Architecture RISC MPU technology.

National Semiconductor
Under this production agreement for FACT logic devices, both companies can mutually produce independently defined and independently developed new functions.

1988

Texas Instruments
Texas Instruments and Hitachi agreed to codevelop a common technology for building 16Mb DRAMs over the next three years.

Mitsubishi
The two companies developed LSI chip sets for use in extended-definition TV using common specifications.

VLSI Technology
This wide-ranging agreement covered cross-licensing, technology exchanges, and joint product development.

Kodak
Hitachi is to purchase Kodak thermal media products to sell with Hitachi-manufactured consumer video printers.

1987

International Rectifier
This company agreed to license its power MOSFET patents to Hitachi.

MERGERS AND ACQUISITIONS

1989

National Advanced Systems
Mainframe computers and peripheral subsystems

KEY OFFICERS

Katsushige Mita
President and representative director

Masataka Nishi
Executive vice president and representative director

Shiro Kawada
Executive vice president and director

Yutaka Sonoyama
Executive vice president and director

Sutezo Hata
Executive vice president and director

Takeo Miura
Executive vice president and director

Tsutomu Kanai
Executive vice president and director

Table 4
Comprehensive Financial Statement
Fiscal Year Ending March 31
(Millions of U.S. Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$13,274.0	$19,271.4	$24,605.5	$30,058.7	$36,892.0
Cash	3,327.5	3,892.2	6,378.1	8,831.1	12,411.6
Receivables	3,881.7	5,711.6	7,218.6	8,645.6	10,394.8
Marketable Securities	1,400.0	2,896.5	3,361.3	3,298.1	2,917.3
Inventory	3,950.8	5,764.4	6,417.6	7,684.8	9,468.2
Other Current Assets	714.0	1,006.7	1,229.9	1,599.1	1,700.1
Net Property, Plants	$4,379.1	$7,059.1	$8,422.0	$9,064.4	$11,163.3
Other Assets	$2,642.4	$4,047.1	$5,029.9	$5,846.2	$4,502.7
Total Assets	$20,295.5	$30,377.6	$38,057.4	$44,969.3	$52,558.0
Total Current Liabilities	$10,018.3	$14,078.6	$16,346.4	$19,192.6	$24,117.4
Long-Term Debt	$1,291.7	$2,175.0	$3,492.2	$3,462.2	$3,946.1
Other Liabilities	$1,143.0	$1,879.9	$2,516.1	$3,055.5	$3,646.5
Total Liabilities	$12,453.0	$18,133.5	$22,354.7	$25,710.3	$31,710.0
Minority Interests	$1,293.3	$1,993.2	$2,660.1	$3,110.6	$3,563.5
Total Shareholders' Equity	$6,549.2	$10,250.9	$13,042.6	$16,148.4	$17,284.5
Converted Preferred Stock	0	0	0	0	0
Common Stock	561.2	825.4	1,008.7	1,442.4	1,661.7
Other Equity	827.1	1,226.8	1,643.7	2,261.5	2,718.5
Retained Earnings	5,160.9	8,198.7	10,390.2	12,444.5	12,904.3
Total Liabilities and Shareholders' Equity	$20,295.5	$30,377.6	$38,057.4	$44,969.3	$52,558.0

Income Statement	1985	1986	1987	1988	1989
Revenue	$20,053.2	$29,473.3	$34,633.2	$39,800.8	$48,495.6
Japanese Revenue	13,512.2	20,585.3	25,567.2	30,277.8	37,367.6
Non-Japanese Revenue	6,541.0	8,888.0	9,066.0	9,523.0	11,128.0
Cost of Sales	$14,592.3	$22,007.3	$26,250.9	$29,535.0	$34,485.5
R&D Expense	$1,071.7	$1,739.5	$2,197.1	$2,591.2	$2,829.6
SG&A Expense	$3,672.6	$5,663.1	$6,848.3	$8,259.3	$10,728.3
Capital Expense	$1,820.5	$2,632.0	$2,552.8	$2,333.0	$3,901.0
Pretax Income	$2,034.8	$2,182.8	$1,845.0	$2,649.1	$3,720.5
Pretax Margin (%)	10.15	7.41	5.33	6.66	7.67
Effective Tax Rate (%)	53.10	57.50	57.50	56.10	56.10
Net Income	$840.6	$883.6	$704.8	$1,094.4	$1,406.0
Shares Outstanding, Millions	2,803.2	2,803.4	2,816.3	2,921.7	3,017.7
Per Share Data					
Earnings	$0.29	$0.30	$0.24	$0.35	$0.45
Dividends	$0.03	$0.05	$0.06	$0.06	$0.06
Book Value	$2.34	$3.66	$4.63	$5.53	$5.73

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending March 31
(Millions of U.S. Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	1.32	1.37	1.51	1.57	1.53
Quick (Times)	0.93	0.96	1.11	1.17	1.14
Fixed Assets/Equity (%)	152.97	137.34	125.33	118.85	139.53
Current Liabilities/Equity (%)	152.97	137.34	125.33	118.85	139.53
Total Liabilities/ Equity (%)	190.15	176.90	171.40	159.21	183.46
Profitability (%)					
Return on Assets	-	3.49	2.06	2.64	2.88
Return on Equity	-	10.52	6.05	7.50	8.41
Profit Margin	4.19	3.00	2.04	2.75	2.90
Other Key Ratios					
R&D Spending % of Revenue	5.34	5.90	6.34	6.51	5.83
Capital Spending % of Revenue	9.08	8.93	7.37	5.86	8.04
Employees	164,951	164,117	161,325	159,910	274,508
Revenue ($K)/Employee	$121.57	$179.59	$214.68	$248.90	$176.66
Capital Spending % of Assets	8.97	8.66	6.71	5.19	7.42

Source: Hitachi, Ltd.
Annual Reports
Dataquest
January 1990

Hitachi, Ltd.

Hitachi, Ltd.
6, Kanda-Surugadai
4-chome, Chiyoda-ku
Tokyo 101-10, Japan
(03) 258-1111

Established 1910
No. of Employees: 274,508

BACKGROUND

Hitachi, Ltd., was founded in 1910 by Namihei Odaira, an engineer, to develop domestic manufacturing technology for electric power equipment. After World War II, the Company entered consumer electronics, and in 1950 it entered the field of electronics. Hitachi views electronics and the development of alternative energy sources as its two areas of strategic growth in this decade. Hitachi was the third largest worldwide semiconductor producer in 1988, with total semiconductor sales of $3.51 billion, an increase of 34.1 percent over 1987.

Hitachi's compound semiconductor R&D effort has included development of InGaAsP lasers in the visible spectrum (specifically, 752nm to 756nm). Hitachi also has developed a buried-layer GaAs FET with threshold voltage deviations of only 5 percent.

COMPANY EXECUTIVES (GaAs Activities)

- President--Katsushige Mita
- Head of Marketing--Shuzo Hata
- Group Executive, Electronic Devices--Kazuo Kimbara

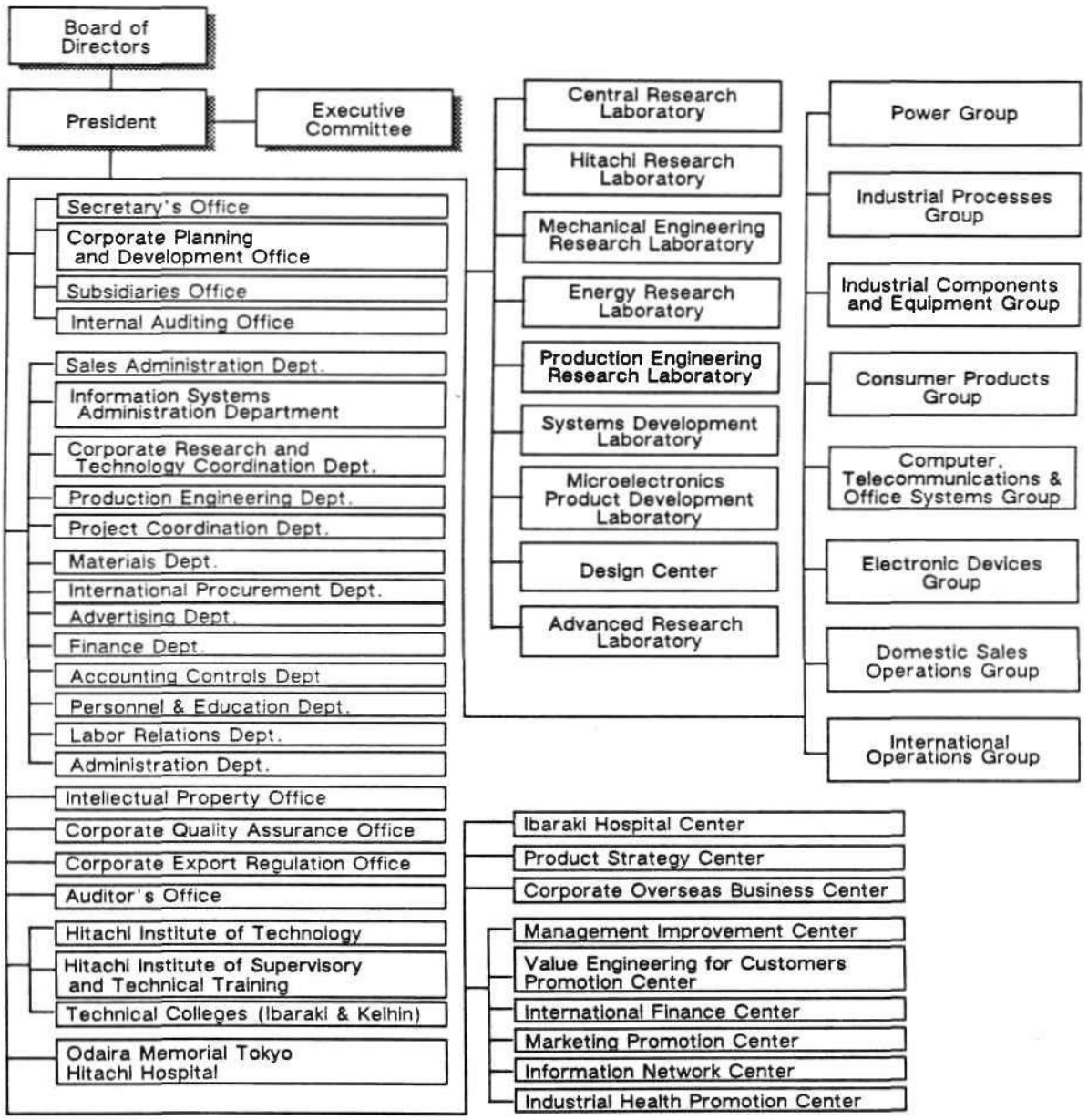
COMPANY ORGANIZATION

Figure 1 shows Hitachi's company organization.

Hitachi, Ltd.

Figure 1

Hitachi, Ltd.
Company Organization



0005360-1

Source: Hitachi, Ltd.

Hitachi, Ltd.

FINANCIAL BACKING AND STRATEGIC ALLIANCES

Hitachi originated from the pre-World War II Nissan Konzern. The Hitachi Group, formed under Hitachi Ltd., is not one of the six major Japanese industrial groups. The group companies have relations with former Nissan Kozern companies, including Nissan Chemical Industries, through cross-shareholdings and common directors; they also participate in deliberation councils with the DBK, Fuyo, and Sanwa Groups. Figure 2 is a diagram of the Hitachi Group.

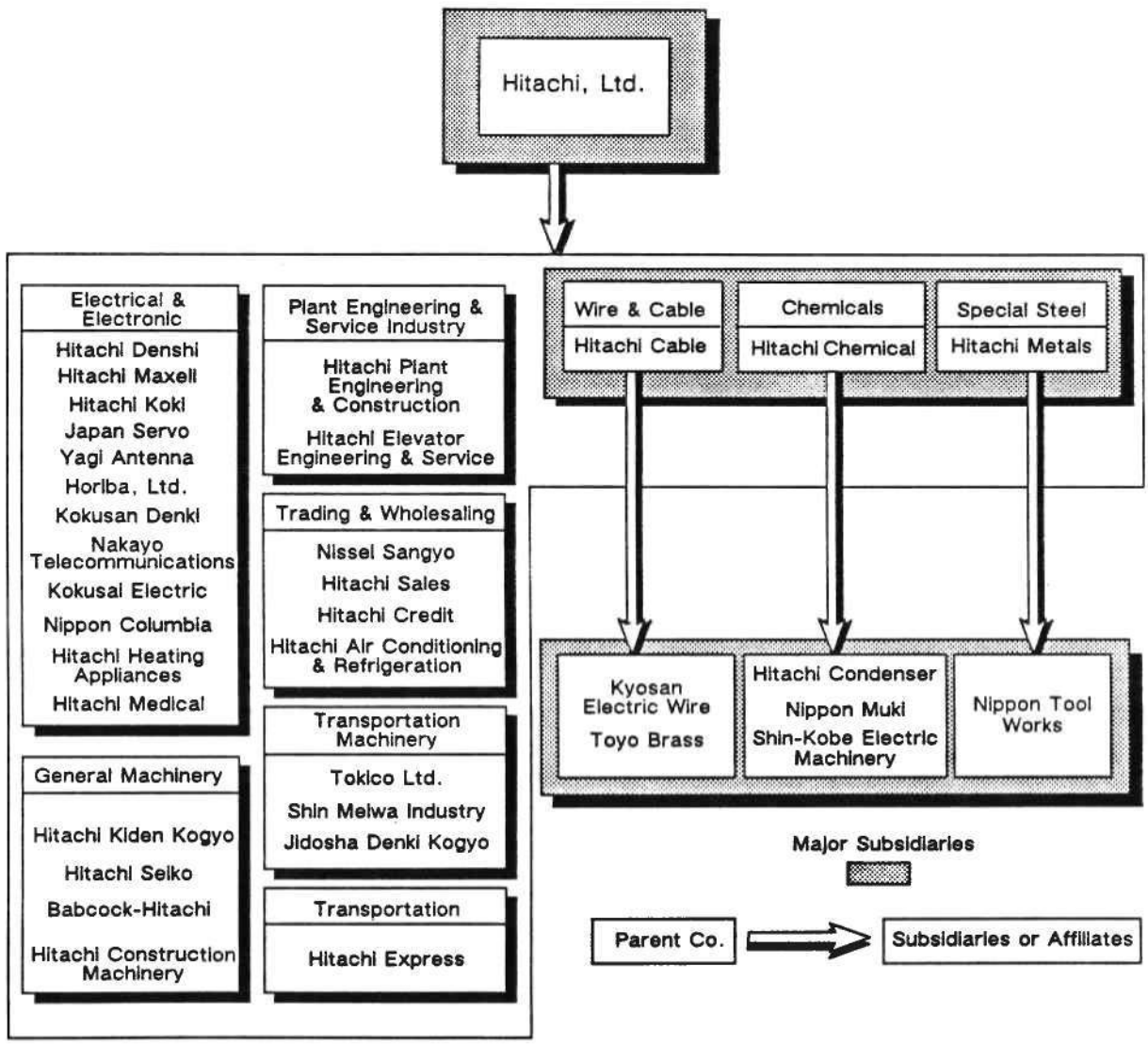
The top shareholders of Hitachi include Mitsubishi Trust (4.1 percent), Nippon Life Insurance (4.0 percent), Mitsui Trust (3.1 percent), Toya Trust (2.8 percent), Yasuda Trust (2.8 percent), Dai-Ichi Mutual Life Insurance (2.7 percent), Sanwa Bank (2.3 percent), and Meiji Mutual Life Insurance (2.2 percent). Approximately 14 percent of Hitachi's stock is foreign-owned; the ceiling for foreign ownership is set at 30 percent.

Hitachi has technology-sharing and/or licensing agreements with Asahi Chemical, Fairchild (bought by National Semiconductor), Fujitsu, General Motors (owner of Hughes Aircraft), Hewlett-Packard, Monsanto, Motorola, NTT, Signetics (a subsidiary of Philips), Sperry (now part of Unisys), Thomson-CSF, and others.

Hitachi, Ltd.

Figure 2

Hitachi Group



0005360-2

Source: Industrial Groupings in Japan 1986/1987
Dodwell, Tokyo

Hitachi, Ltd.

PROCESS TECHNOLOGY

Hitachi produces for internal use and for the merchant market, e-beam masking, wafer inspection, and test equipment for production processes requiring submicron resolution and 0.1-micron accuracy. This equipment is used in its GaAs and other compound semiconductor processes.

PRODUCTS

- LEDs
- Lasers
- Detectors
- Small-signal transistors

Applications

- Fiber-optic communications
- High-speed instrumentation
- Military/aerospace
- UHF and microwave communications

FACILITIES

- Takasaki plant
- Komoro factory—fab, assembly, and test of opto devices and hybrids

Hitachi, Ltd.

Hitachi, Ltd.
6, Kanda-Surugadai
4-chome, Chiyoda-ku
Tokyo 101, Japan
(Millions of Dollars except Per Share Data)

Balance Sheet (March 31)

	1982	1983	1984	1985	1986
Working Capital	$ 2,730	$ 2,521	$ 3,117	$ 3,318	$ 3,998
Long-Term Debt	$ 1,133	$ 1,049	$ 1,379	$ 1,316	$ 1,674
Shareholders' Equity	$ 5,063	$ 5,205	$ 6,118	$ 6,675	$ 7,893
After-Tax Return on Average Equity (%)	12.8	12.3	12.2	12.8	8.6

Operating Performance (Fiscal Year Ending March 31)

	1982	1983	1984	1985	1986
Revenue	$16,110	$15,832	$18,528	$20,437	$22,692
Japanese Revenue	$11,651	$11,495	$13,306	$13,771	$15,851
Non-Japanese Revenue	$ 4,459	$ 4,337	$ 5,222	$ 6,666	$ 6,843
Cost of Revenue	$11,743	$11,563	$13,632	$14,872	$16,944
R&D Expense	$ 699	$ 757	$ 898	$ 1,092	$ 1,339
SG&A Expense	$ 2,963	$ 2,901	$ 3,367	$ 3,743	$ 4,360
Pretax Income	$ 1,496	$ 1,515	$ 1,728	$ 2,074	$ 1,681
Pretax Margin (%)	9.3	9.6	9.3	10.1	7.4
Effective Tax Rate (%)	52.3	52.7	52.3	53.1	53.3
Net Income	$ 599	$ 604	$ 709	$ 857	$ 680
Average Shares Outstanding (Millions)	2,763	2,832	2,802	2,803	2,803
Per Share					
Earnings	$ 0.22	$ 0.21	$ 0.25	$ 0.31	$ 0.24
Dividends	$ 0.03	$ 0.03	$ 0.03	$ 0.03	$ 0.04
Book Value	$ 1.83	$ 1.84	$ 2.18	$ 2.38	$ 2.81
Price Range*	$ 1.84-4.02	$ 2.21-3.41	$ 3.22-4.12	$ 3.02-4.08	$ 2.82-3.84
Total Employees	154,525	155,582	161,533	164,951	164,117
Capital Expenditures	$ 1,077	$ 1,336	$ 1,619	$ 1,855	$ 2,026
Exchange Rate (Yen per US$)	228.7	249.1	235.7	245.3	220.8

*The stock prices are estimated from a bar graph in the Hitachi Annual Report.

Source: Hitachi, Ltd.,
Annual Reports
Dataquest
June 1987

Hitachi, Ltd.

Hitachi, Ltd.
6, Kanda-Surugadai
4-chome, Chiyoda-ku
Tokyo 101, Japan
(Billions of Yen except Per Share Data)

Balance Sheet (March 31)

	1982	1983	1984	1985	1986
Working Capital	¥ 624.4	¥ 627.9	¥ 734.7	¥ 813.9	¥ 882.7
Long-Term Debt	¥ 259.1	¥ 261.4	¥ 325.1	¥ 322.9	¥ 369.7
Shareholders' Equity	¥1,157.9	¥1,296.5	¥1,442.1	¥1,637.3	¥1,742.7
After-Tax Return on Average Equity (%)	12.8	12.3	12.2	12.8	8.6

Operating Performance (Fiscal Year Ending March 31)

	1982	1983	1984	1985	1986
Revenue	¥3,684.4	¥3,943.7	¥4,367.1	¥5,013.3	¥5,010.5
Japanese Revenue	¥2,664.5	¥2,863.4	¥3,136.2	¥3,378.0	¥3,500.0
Non-Japanese Revenue	¥1,019.9	¥1,080.3	¥1,230.9	¥1,635.3	¥1,511.0
Cost of Revenue	¥2,685.6	¥2,880.4	¥3,213.0	¥3,648.1	¥3,741.2
R&D Expense	¥ 159.8	¥ 188.6	¥ 211.7	¥ 267.9	¥ 295.7
SG&A Expense	¥ 677.6	¥ 722.7	¥ 793.5	¥ 918.1	¥ 962.7
Pretax Income	¥ 342.2	¥ 377.5	¥ 407.2	¥ 508.7	¥ 371.1
Pretax Margin (%)	9.3	9.6	9.3	10.1	7.4
Effective Tax Rate (%)	52.3	52.7	52.3	53.1	53.3
Net Income	¥ 137.1	¥ 150.5	¥ 167.1	¥ 210.2	¥ 150.2
Average Shares Outstanding (Millions)	2,763	2,832	2,802	2,803	2,803
Per Share					
Earnings	¥ 49.62	¥ 53.14	¥ 59.6	¥ 75.0	¥ 53.6
Dividends	¥ 5.83	¥ 7.33	¥ 7.00	¥ 8.00	¥ 9.50
Book Value	¥ 419.6	¥ 457.8	¥ 514.7	¥ 584.1	¥ 621.7
Price Range*	¥ 420-920	¥ 550-850	¥ 760-970	¥ 740-1,000	¥ 627-847
Total Employees	154,525	155,582	161,533	164,951	164,117
Capital Expenditures	¥ 246.2	¥ 332.7	¥ 381.6	¥ 455.1	¥ 447.4
Exchange Rate (Yen per US$)	228.7	249.1	235.7	245.3	220.8

*The stock prices are estimated from a bar graph in the Hitachi Annual Report.

Source: Hitachi, Ltd.,
Annual Reports
Dataquest
June 1987

Hitachi, Ltd.

THE COMPANY

Overview

Hitachi, Ltd., was established in 1910 to develop indigenous Japanese electrical power equipment manufacturing technology. The Company initially emphasized the development of heavy electrical equipment and industrial machinery. After World War II, Hitachi expanded into the consumer product area and in the 1950s entered the electronics field, producing computers, semiconductors, and other electronic devices.

Over the years, Hitachi continued to expand and diversify the scope of its business activities, which led to the development of the Hitachi Group. The Hitachi Group is made up of Hitachi, Ltd., and its subsidiaries and affiliates, domestic and overseas--including the three major subsidiaries, Hitachi Chemical, Hitachi Metals, and Hitachi Cable. The group companies conduct business in the fields of electrical and electronic equipment, metals, metallic products, machinery, chemicals, trading, and transportation.

New technologies and products developed by Hitachi are the driving force behind its progress. The Company has consistently maintained a high level of research and development (R&D) expenditure and places special emphasis on areas with high growth potential. Hitachi views electronics and the development of alternative energy sources as its two areas of strategic growth during the 1980s.

Hitachi is also intensifying its international activities to increase its presence as an international corporation.

Highlights

The following paragraphs summarize significant information about Hitachi.

- Hitachi reported fiscal 1986 consolidated revenue of ¥5,010.5 billion, down slightly from the previous year.
- Hitachi is the second largest electronics manufacturer in Japan under the leadership of its chairman, Hirokichi Yoshiyama, and its president, Katsushige Mita.

Hitachi, Ltd.

- Hitachi is the second largest supplier of semiconductors in the world with sales of $2,305 million.

- Hitachi retains its lead as the world's leading supplier of MOS memory products, with 1986 sales of $814 million, an increase of 23 percent from 1985.

The major shareholders of Hitachi are:

Shareholders	Percent of Shares
Nippon Life Insurance	3.9%
Dai-Ichi Mutual Life Insurance	2.8%
Industrial Bank of Japan	2.6%
Sanwa Bank	2.4%
Nats Cumco	2.3%
Meiji Mutual Life Insurance	2.3%

Of Hitachi's outstanding stock, 23.2 percent is foreign owned. Hitachi is listed on the Amsterdam, Frankfurt, Hong Kong, Luxembourg, New York, and Paris stock exchanges, as well as on the eight domestic markets.

Major short- and long-term Hitachi borrowings are from Dai-Ichi Kangyo Bank, Fuji Bank, Industrial Bank of Japan, and Sanwa Bank.

OPERATIONS

Consolidated revenue of ¥5,010.5 billion in the period ending March 31, 1986, was down slightly from the previous year's sales of ¥5,013 billion. Net earnings were ¥150.2 billion, a decrease of 29 percent from ¥210.2 billion, and earnings per share decreased to ¥53.6 from ¥75.0.

The lower results were attributed to a sluggish performance by the electronics and consumer products sectors, particularly in semiconductor and VTR sales. Another factor affecting Hitachi's results was the rapid appreciation of the yen against foreign currencies in the latter half of 1985, which had an impact on overseas sales.

Hitachi's main lines of business are:

- Consumer Products

- Industrial Machinery and Plants

- Information and Communications Systems and Electronic Devices

Hitachi, Ltd.

- Power Systems and Equipment
- Wire and Cable, Metals, Chemicals, and Other Products

Revenue for each category is shown in Table 1.

Table 1

Hitachi, Ltd.
REVENUE BY PRODUCT CATEGORY
(Billions of Yen)

	Fiscal Year Ending March 31				
	1982	1983	1984	1985	1986
Consumer Products	¥ 832	¥ 834	¥ 930	¥1,104	¥1,081
Industrial Machinery & Plants	672	755	730	786	835
Information & Communications Systems/Electronic Devices	796	910	1,174	1,507	1,452
Power Systems & Equipment	626	703	727	720	761
Wire & Cable, Metals, Chemicals, & Other	758	742	806	896	881
Total	¥3,684	¥3,944	¥4,367	¥5,013	¥5,010
Exchange Rate (Yen per US$)	¥228.7	¥249.1	¥235.7	¥245.3	¥220.8

Source: Hitachi, Ltd., Annual Reports
Dataquest
June 1987

The Consumer Products Division and the Information and Communications Systems and Electronic Devices Division, both major contributors to sales in the past, showed a decrease in sales for fiscal 1986. The sales for Consumer Products were ¥1,081 billion, 2 percent less than 1985, and the sales for Information and Communications Systems and Electronic Devices were ¥1,452 billion, 4 percent less than 1985. The Wire and Cable, Metals, Chemicals, and Other Products Division sales were ¥881 billion, also down from the previous year by 2 percent.

The Industrial Machinery and Plants division and the Power Systems and Equipment Division both reported sales increases of 6 percent in fiscal 1986, with sales of ¥835 billion and ¥761 billion, respectively.

International Activities

In 1986, Hitachi reported a decrease in overseas revenue, which, at ¥1,511 billion, was 8 percent below the 1985 level. The proportion of total revenue accounted for by overseas revenue decreased by 3 percentage points, to 30 percent.

Hitachi stated the following factors as causes for the decrease in its overseas revenue:

- The increase in the value of the yen
- The slump in semiconductors and VTRs
- The restriction of imports into China

Hitachi is taking the following steps to improve its position as an international corporation:

- Continuing to dedicate an increasing amount of funds to R&D
- Improving production technology and reducing costs
- Increasing its overseas production bases
- Increasing overseas materials procurement
- Promoting cultural and technology exchanges--Hitachi set up The Hitachi Foundation to further U.S.-Japanese exchanges
- Boosting the efficiency of fund use

Table 2 shows Hitachi's estimated 1986 semiconductor revenue by geographic region. Dataquest estimates that approximately 35 percent of Hitachi's semiconductor sales were overseas, with about 17 percent, or $394 million, in the United States; 10 percent in Europe; 8 percent in Rest of World (ROW); and the remaining 65 percent in Japan.

Hitachi, Ltd.

Table 2

Hitachi, Ltd.
ESTIMATED SEMICONDUCTOR REVENUE BY GEOGRAPHIC REGION--1986
(Millions of Dollars)

	United States	Japan	Europe	Rest of World	Total
Total Semiconductor	$394	$1,508	$221	$182	$2,305
Integrated Circuit	$356	$1,086	$214	$114	$1,771
Bipolar Digital	47	230	14	48	339
MOS	292	620	195	59	1,167
Linear	17	236	5	7	265
Discrete	$ 19	$ 399	$ 5	$ 61	$ 484
Optoelectronic	$ 19	$ 23	$ 2	$ 7	$ 50

Source: Hitachi, Ltd.,
Annual Reports
Dataquest
June 1987

Facilities

Hitachi operates 18 Japanese semiconductor manufacturing facilities, which are listed in Table 3.

Hitachi also has a plant in Irving, Texas, that assembles MOS memory products for sale in the United States. Hitachi assembles MOS memory products for sale in Europe in Landshut, West Germany. An integrated production line is planned for the United States. Hitachi's overseas facilities are listed in Table 4.

Hitachi, Ltd.

Table 3

Hitachi, Ltd.
JAPANESE SEMICONDUCTOR MANUFACTURING PLANTS

Factory	Floor Space (m^2)	Products/Function
Akita Denshi	N/A	Assembly--Linear, Discrete
Akita Denshi Yuwa Factory	N/A	Assembly--Linear, Discrete
Hitachi Chitose Factory	2,790	Assembly--MOS Memory
Hitachi Device Development Center	N/A	Fab, Test--Bipolar Digital, MOS
Hitachi Factory	N/A	Rectifiers, TTL
Hitachi Hokkai Semiconductor	N/A	Assembly, Test--MOS Memory
Hitachi Iruma Denshi	N/A	Assembly--MOS Logic
Hitachi Iruma Goshogawara Factory	6,000	Assembly--Discrete
Hitachi Oume Denshi	N/A	Assembly, Test--MOS Logic
Hitachi Oume Yanai Factory	N/A	Assembly--Diodes
Hitachi Yonezawa Denshi	N/A	Assembly--Linear, Discrete
Kofu Branch Factory	13,500	Fab, Assembly, Test--MOS Memory, MPU, Logic, 256K DRAM
Mobara Factory	205,000	Fab, Assembly, Test--MOS Memory
Musashi Factory	N/A	Fab, Assembly, Test--ICs, Discrete, Opto
Naka Factory	N/A	Fab--MOS Memory
Nissin Kogyo Tsuchiura Factory	N/A	Assembly
Takasaki Factory	N/A	Fab, Assembly, Test--Bipolar Digital, Transistors
Takasaki Komoro Branch Factory	N/A	Assembly Test--ICs, Discrete, Laser Diodes

N/A = Not Available

Source: Dataquest
June 1987

Hitachi, Ltd.

Table 4

Hitachi, Ltd.
OVERSEAS FACILITIES

Hitachi Electronic Devices (Singapore) Pte., Ltd.

Hitachi Consumer Products (Singapore) Pte., Ltd.

Hitachi Television (Taiwan) Ltd.

Hitachi Consumer Products of America, Inc.

Hitachi America, Ltd.

Hitachi Semiconductor (Europe) GmbH

Hitachi Semiconductor (Malaysia) Sdn. Bhd.

Hitachi Semiconductor (America) Inc.

Source: Hitachi, Ltd.,
Annual Reports

MARKETING AND SALES

In 1986, Hitachi became the second largest worldwide semiconductor manufacturer in dollars, rising from the fourth largest in 1985. Hitachi's growth has been significantly higher than the industry average, except in MOS microdevices. Of particular note is MOS memory, where Hitachi is the world leader by a large margin. Total semiconductor revenue in 1986 was $2,305 million compared with $1,671 in 1985, an increase of 37.9 percent.

Table 5 shows Hitachi's estimated semiconductor revenue for 1982 through 1986.

Hitachi, Ltd.

Table 5

Hitachi, Ltd.
ESTIMATED SEMICONDUCTOR REVENUE
(Millions of Dollars)

	1982	1983	1984	1985	1986
Total Semiconductor	$879	$1,277	$2,051	$1,671	$2,305
Total Integrated Circuit	$609	$ 912	$1,569	$1,236	$1,771
Bipolar Digital (Technology)	$111	$ 144	$ 223	$ 195	$ 339
TTL	-	-	170	143	243
ECL	-	-	36	36	83
Other Bipolar Digital	-	-	17	15	14
Bipolar Digital (Function)	$111	$ 144	$ 223	$ 195	$ 339
Bipolar Digital Memory	40	52	59	55	80
Bipolar Digital Logic	71	92	164	140	259
MOS (Technology)	$392	$ 638	$1,167	$ 852	$1,167
NMOS	241	383	708	493	668
PMOS	9	4	8	3	3
CMOS	142	251	451	356	496
MOS (Function)	$392	$ 638	$1,167	$ 853	$1,167
MOS Memory	291	500	971	662	814
MOS Micro Devices	66	85	120	110	240
MOS Logic	35	53	76	81	113
Linear	$106	$ 130	$ 179	$ 189	$ 265
Total Discrete	$240	$ 331	$ 430	$ 393	$ 484
Transistor	$ 90	$ 123	$ 155	$ 137	$ 177
Small Signal Transistor	-	-	81	70	95
Power Transistor	-	-	74	67	83
Diode	$120	$ 164	$ 213	$ 194	$ 239
Small Signal Diode	-	-	104	91	104
Power Diode	-	-	83	80	102
Zener Diode	-	-	26	23	33

(Continued)

Table 5 (Continued)

Hitachi, Ltd.
ESTIMATED SEMICONDUCTOR REVENUE
(Millions of Dollars)

	1982	1983	1984	1985	1986
Total Discrete (Continued)					
Thyristor	$11	$17	$22	$22	$25
Other Discrete	$19	$27	$40	$39	$43
Total Optoelectronic	$30	$34	$52	$42	$50
LED Lamps	-	-	$15	$13	$15
LED Displays	-	-	-	-	-
Optical Couplers	-	-	$15	$13	$15
Other Optoelectronics	-	-	$22	$17	$20
Exchange Rate (Yen/US$)	¥248	¥235	¥237	¥238	¥167

Source: Dataquest
June 1987

Hitachi, Ltd.

Hitachi's 1986 preliminary worldwide semiconductor market share rankings are shown in Table 6.

Table 6

Hitachi, Ltd.
WORLDWIDE RANKING BY SEMICONDUCTOR MARKETS
(Millions of Dollars)

	1986 Rank	1985 Rank	1986 Revenue	Revenue % Change 1985-1986	Industry % Change 1985-1986
Total Semiconductor	2	4	$2,305	37.9%	25%
Integrated Circuits	2	4	$1,771	43.3%	24%
Bipolar Digital	6	7	339	73.8%	14%
MOS Digital	2	3	1,167	37.0%	25%
Linear	9	10	265	40.2%	30%
Discrete	3	2	$ 484	23.2%	25%
Opto	11	9	$ 50	19.0%	36%

Source: Dataquest
June 1987

Hitachi is one of the top four suppliers of communications equipment to Nippon Telegraph and Telegraph (NTT), along with Fujitsu Limited, NEC Corporation, and Oki Electric Industry Company Limited.

Channels of Distribution

In Japan, almost 70 percent of Hitachi's semiconductor products are marketed through distributors, and 30 percent are marketed by the Company's sales force:

- Hitachi distributes consumer products through Hitachi Sales Corporation, a 66 percent-owned consolidated subsidiary with sales offices throughout Japan, which in turn distributes the products through wholesalers to retail outlets.

- Computer equipment may be purchased or rented directly from the Company. Some Hitachi computers are rented through Japan Electronic Computer Co., Ltd., a rental company owned by the major Japanese computer manufacturers--Fujitsu, Mitsubishi, and NEC.

- Hitachi has three major Japanese distributors: Nissei Denshi Co., Ltd.; Nissei Sangyo; and Easton Electronics.

Hitachi has a worldwide sales organization, with offices throughout North, Central, and South America; Western Europe; and Asia and Oceania.

In 1981, Hitachi's nondomestic revenue was only 24 percent of its total revenue. Because of its economic need to be a large exporter of manufactured goods, the Company publicly stated in 1980 that it planned to have exports at 30 percent of total revenue in the near future, a figure it surpassed in 1985.

To accomplish this growth, Hitachi has developed a global network of production, exports, material and funds procurement, and sales, which includes eight overseas consolidated subsidiaries and liaison, sales, and service offices in most major countries of the world.

- Overseas, semiconductor products are marketed by Hitachi's own sales force and are also sold through distributors. Some of Hitachi's major U.S. distributors are Cetec, Diplomat, Marshall, and Milgray. In Europe, Hitachi's distributors include Anzac and Dialogue (United Kingdom), and Astronic, TeleRadio, and Müller (West Germany), among others.

CAPITAL SPENDING AND R&D SPENDING

Due to adverse market conditions, Hitachi curtailed investments in plants and equipment related to expanding production in the semiconductor sector. Hitachi's capital expenditures in 1986 were ¥544 billion, a decrease of 2 percent, compared with ¥447 billion in 1985.

However, Hitachi is implementing a policy that emphasizes automation of production processes and development of new products and technologies in growth areas. During fiscal 1986, the Company spent ¥296 billion on R&D, an increase of 10 percent, from 1985. Hitachi's R&D has been increasing steadily; in fiscal 1981, R&D expenditures were only 3.7 percent of revenue. Over the past several years, about half of R&D has been directed into the electronics sector.

Table 7 shows the shift of investment from capital expenditures to R&D. Combined capital spending and R&D spending continued to rise. In 1986, total capital expenditures and R&D expenditures increased only slightly.

Hitachi, Ltd.

Table 7

Hitachi, Ltd.
CAPITAL SPENDING AND R&D SPENDING AS A PERCENT OF REVENUE
(Billions of Yen)

	1982	1983	1984	1985	1986
Revenue	¥3,684.4	¥3,943.7	¥4,367.1	¥5,013.3	¥5,010.5
Capital Spending	246.2	332.7	381.6	455.1	447.4
% of Revenue	6.68%	8.44%	8.74%	9.08%	8.92%
R&D Spending	159.8	188.6	211.7	267.9	295.7
% of Revenue	4.34%	4.78%	4.85%	5.34%	5.90%
Combined Capital and R&D Spending	406.0	521.3	593.3	723.0	743.1
% of Revenue	11.02%	13.22%	13.59%	14.42%	14.82%
% Increase	18.0%	28.4%	13.8%	21.7%	2.8%
Exchange Rate (Yen per US$)	¥288.7	¥249.1	¥235.7	¥ 245.7	¥220.8

Source: Hitachi, Ltd., Annual Reports
Dataquest
June 1987

Hitachi, Ltd.

Table 8 shows Hitachi's capital spending and R&D spending in dollars.

Table 8

Hitachi, Ltd.
CAPITAL SPENDING AND R&D SPENDING IN DOLLARS
(Millions of Dollars)

	1982	1983	1984	1985	1986
Revenue	$16,110	$15,832	$18,528	$20,437	$22,692
Capital Expenditures	$ 1,077	$ 1,336	$ 1,619	$ 1,855	$ 2,026
R&D Expenditures	$ 699	$ 757	$ 898	$ 1,092	$ 1,339

Source: Hitachi, Ltd.,
Annual Reports
Dataquest
June 1987

Table 9 shows Hitachi's semiconductor capital spending by calendar year.

Table 9

Hitachi, Ltd.
SEMICONDUCTOR CAPITAL SPENDING BY CALENDAR YEAR
(Millions of Dollars)

	1982	1983	1984	1985	1986
Semiconductor Revenue	$879	$1,277	$2,051	$1,671	$2,305
Semiconductor Capital Spending	$145	$ 264	$ 506	$ 387	$ 318
% of Semiconductor Revenue	16%	21%	25%	23%	14%

Source: Dataquest
June 1987

Hitachi, Ltd.

Hitachi's stated attitude toward R&D is reflected in the following objectives:

- Strong focus on the development of cutting-edge technology
- Development of original technology (i.e., not reliance on imported technology)
- Concentration on basic research as well as on applied technology (In 1985 Hitachi set up the Advanced Research Laboratory to develop technologies for its long-term growth.)

Hitachi operates 11 R&D centers:

- Central Research Laboratory (Kokubunji City)
- Hitachi Research Laboratory (Hitachi City)
- Mechanical Engineering Research Laboratory (Tsuchiura City)
- Energy Research Laboratory (Hitachi City)
- Production Engineering Research Laboratory (Yokohama Works)
- System Development Laboratory (Kawasaki City)
- Design Center (Kodaira City)
- Consumer Products Research Center (Yokohama City)
- Device Development Center (Kodaira City)
- Microelectronics Products Development Laboratory (Yokohama City)
- Advanced Research Laboratory

There are also independent research groups in each factory.

Hitachi also conducts R&D in cooperation with other Japanese companies:

- Hitachi and NTT will conduct research in the area of small-ring synchotron orbital radiation (SOR) equipment. A project that will begin in the fall of 1987 is one involving 64Mb plus a DRAM ring.

- In 1986, Hitachi joined seven other Japanese companies (Fujitsu, Matsushita, Mitsubishi, NEC, NTT, Oki Electric, and Toshiba) to form the TRON (The Real-time Operating Nucleus) Council to accelerate the development of proprietary 32-bit MPU technology and operating systems for next-generation microcomputers. Headed by Hitachi's Kazuo Kanahara, the project will develop three operating systems capable of handling Japanese and other foreign languages: B-TRON for office automation equipment, I-TRON for real-time industrial systems, and M-TRON for networking with distributed processors.

  Hitachi, NEC, and others have already developed several I-TRON operating systems for 16-bit MPUs and are focusing on 32-bit versions. The TRON project has a goal of developing 32-bit MPUs by 1987.

  In March 1986, Hitachi announced TRON-based operating systems to be used with foreign MPUs in industrial applications. Hitachi has developed a system for Motorola's 68000.

- In February 1986, Hitachi and General Motors agreed to an extensive tie-up to pursue joint R&D and production projects in five high technology areas: automotive parts, semiconductors and other electronics, computers, optical fibers, magnetic materials and other new materials, and factory automation.

In addition, Hitachi participates in the following government-sponsored programs:

- The VLSI Research Association, a four-year program begun in 1976 and 50 percent subsidized by the Japanese government

- The Fifth Generation Computer project, a joint venture by eight companies to develop a 900,000-word electronic dictionary for fifth generation computers

SEMICONDUCTOR PRODUCTS AND TECHNOLOGIES

Hitachi's semiconductor products span the entire range, including bipolar linear digital memory and logic; MOS memory, microdevices and logic; linear ICs; and all types of discrete and optoelectronic devices.

To reinforce its semiconductor business, Hitachi continued to push ahead with a vigorous program of R&D to develop advanced products and also to diversify its product line. In fiscal 1986, the Company focused on expanding its range of microprocessors, gate arrays, and other logic devices, while moving to bring its 1.3-micron process on-line.

The following are some of Hitachi's accomplishments:

- Hitachi retains its lead as the world's leading supplier of MOS memory products, with 1986 sales of $814 million, an increase of 23 percent from 1985.
- Hitachi ranked second in 1986 unit shipments of 256K DRAMs, shipping 123 million units. Hitachi also ranked second in 1Mb DRAMs, shipping 780,000 units.
- Hitachi also showed an increase of 118 percent in MOS microdevices and an increase of 40 percent in MOS logic.

Major Developments by Product Area

The following sections list Hitachi's major developments in 1986 and 1987 by product area.

Memory

Hitachi has developed and marketed three series of 64K ECL RAMS by adapting HI-BICMOS technology. The models are the HM100490-15 ECL 100K-compatible version with a 15ns access time, the HM10490-12 ECL 10K-compatible version with 12ns access time, and the HM10490-15 ECL 10K-compatible version with 15ns access time.

The Company has manufactured 1Mb, 2Mb, and 4Mb mask ROMs. All models are manufactured by employing CMOS fine-process technology with a minimum of 1.3-micron linewidth, using the vertical ROM method. Maximum access time for the 1Mb model is 150ns and, for the 2Mb and 4Mb, 200ns.

The Company increased its 1Mb DRAM production from 300,000 units a month to one million units a month in the summer of 1987. It had initially planned to increase production in the autumn, but moved it up due to rapidly growing demand.

Hitachi plans to increase its 256K DRAM production threefold to one million units per month in 1987. Its 256K SRAM integrates about 1.6 million elements on a chip by use of 1.3-micron process technology.

The Company developed a new 256K DRAM using 2-micron CMOS process technology. The new device, named HM51256L (256Kx1), adds a standby mode to the substrate bias generation circuit, lowering power consumption to 100uA. Refresh time is 256 cycles/32ms, eight times longer than conventional models. Access time is 10ns.

Hitachi, Ltd.

The Company has developed a 25ns 16K static RAM, the HM6268P, using 1.3-micron CMOS processing technology.

Hitachi has developed two models of 1Mb SRAM modules (128Kx8) and began sampling in February 1987. The models are HM66203 series with decoder (outside) and HM66204 series with built-in decoder.

The Company developed a 1Mb pseudo static RAM, the HM65128/LP. The new device of 128Kx8 structure features 1.3-micron CMOS process technology, 120ns maximum access time, and very low power consumption (85mA in operation).

Microprocessors/Microcontrollers

Hitachi developed a single-chip microcontroller, the HD401304, which has a built-in EEPROM and image display function. The device features an 8-bit MPU, image display function, a 256-byte EEPROM, a 3.5-Kbyte ROM, and an 80-byte RAM.

The Company began sampling the HD63265, a CMOS floppy disk controller, and HD68562, a dual universal serial communication controller, in the second half of 1986. The HD63265 contains a VFO circuit and a write precompensation circuit. The HD68562 is a second-source product of Signetics Corporation.

Hitachi developed two models of interface ICs for small-size hard disk drives and two models of motor drive ICs.

Digital Signal Processing

In the third quarter 1986, Hitachi introduced the HD61811, a floating-point DSP chip with instruction ROM changed into RAM.

Hitachi offered two graphics signal processors--the HD63085Y, capable of shrinking data by 1/10 to 1/30 according to CCIT facsimile standards, and the HD63084, capable of converting signals from facsimile CCD line sensors into digital form.

Application Specific Integrated Circuits

Hitachi introduced the HG28 Series, a HI-BICMOS gate array series with 630/864/1008/1326/1800/2550 gates.

The Company has developed a series of CMOS gate arrays with built-in diagnostic functions. The two models are the HG62B Series, with 4,032 gates, and HG62B71, with 7,136 gates.

Application Specific Memory

Hitachi Maxell introduced an ML series memory IC card--8K/16K/32K memory types with CMOS SRAMs.

Hitachi, Ltd.

Gallium Arsenide

Hitachi has developed two models of gallium arsenide (GaAs) field-effect transistors (FETs), the 2SK779 and the 2KS780. In the 2SK779, ultralow noise of 1.3dB has been realized, while the 2SK780 features low noise of 1.6dB.

In the third quarter 1986, Hitachi introduced 1.3-micron and 1.55-micron InGaAs photodiodes--100-micron and 300-micron devices for monitoring laser diode output.

Hitachi and the Opto Electronics Joint Research Laboratory have jointly developed a high-speed FET using lanthanum hexafluoride (LaF_6). The technological breakthrough is a major step toward the development of GaAs VLSIs. The company plans to manufacture a 256K SRAM equivalent to silicon VLSI.

The Company has achieved over 30-GHz resonance frequency with a MQW (multi-quantum-well) type semiconductor laser. It features an undoped GaAs well layer and a doped GaAlAs barrier layer. The technological breakthrough will pave the way to large capacity optical transmission systems over 10 Gbps.

Discretes

Hitachi has announced that it has produced two models of distributed feedback (DBF) laser diodes, the HL1341A (1.3-micron zone) and the HL1541A (1.55-micron zone) and will begin volume production for the first time in Japan. The new devices have three to six times longer distance than conventional semiconductor lasers.

The Company announced an ion beam MOSFET featuring an arsenide-doped layer impregnated with boron ions between the source and drain; it is faster than conventional EMOS transistors.

Optoelectronics

Hitachi plans to commercialize charge-coupled devices (CCDs) this year. In 1986, Hitachi developed the HE98241, a MOS image sensor that has higher resolution than CCDs, and included it in the Company's video camera.

The Company has manufactured a MOS-type, programmable logic array (PLA) method, transversal signal line (TSL) solid state image pickup device that has about 350,000 units of picture elements.

The Company introduced a distributed feedback laser diode (sixth generation laser) capable of transmitting data three to six times farther than conventional diodes.

Hitachi, Ltd.

Hitachi introduced optoelectronic IC (OEIC) incorporating laser diodes, light wave paths, and an optical switch.

Hitachi Cable, Ltd., developed a high-power linear LED array (LLA) that features three to four times higher glow power.

Josephson Junctions

Hitachi has experimentally developed a 4 x 4 multiplier circuit based on a niobium Josephson junction device. The part has attained a speed of 210 picoseconds. In test manufacturing, ultrahigh speed operation up to 11.9 GHz has been confirmed.

New Semiconductor Functions

Hitachi and the Institute of Physical and Chemical Research introduced a new superconductive device--the quantum magnetic flux parametron.

New Processes

In the third quarter 1986, Hitachi and the Toyohashi University of Technology claimed the world's first hybrid beam source capable of emitting either electrons or ions for future 64Mb DRAMs and three-dimensional ICs.

Packaging

In the second quarter 1986, Hitachi announced a super high density printed circuit board for megabit DRAMs featuring 50 layers of interconnect wiring in a 4mm-wide area. It is capable of accommodating up to 16Mb DRAMs.

Manufacturing Equipment

Hitachi has developed a direct-write electron beam machine that is capable of writing 0.1-micron circuit patterns on a wafer in one hour per wafer. The new equipment, named EB-F, will accelerate the development of next generation LSIs and ultrahigh speed ICs by the use of gallium arsenide.

The Company has developed and offered for sale the PD1000, a mask inspection machine. It can check even a 1-micron particle on masks and reticles, and so is suitable for VLSIs such as 1Mb DRAMs.

The Company has commercialized a high-speed electron beam tester and started taking orders. Testing time is 10 to 20 times faster than the probe and 35 times faster than the conventional EB tester.

Hitachi Electronics Engineering Co., Ltd., has developed the LS-5000, a wafer surface testing machine. The new device is adaptable to 4Mb memories and is capable of inspecting various defects, including haze and slipline, at 0.16-micron accuracy.

Hitachi, Ltd.

Hitachi Electronics Engineering Co., Ltd., has developed and marketed a test system for custom ICs. The new system, named HITES-3150, is adaptable to large capacity EPROM/EEPROMs up to 4Mb and is capable of implementing 100 writing function tests at the same time. Test speed is 10 MHz.

Semiconductor Agreements

1985 Agreements

Motorola	Both firms announced 2-micron HCMOS versions of the 6800; Motorola was granted a license to second source Hitachi's HD6310V and HD6303R 8-bit microcontrollers.
Thomson-CSF	Hitachi licensed its 6300 series (CMOS 8-bit MCUs) to Thomson in exchange for Thomson's telecommunication ICs.
Signetics	Hitachi licensed its 63484 CRT controller to Signetics in exchange for Signetics' 68562 data exchange IC.
Microtec	Microtec agreed to develop a microassembler, utilities, and Pascal and C compilers to run on Hitachi's first standalone in-circuit emulator for the HD64180 8-bit CMOS MPU (compatible with the Z80 and 8080 families).
Sophia Systems	Hitachi and Sophia Systems agreed to jointly manufacture a development support system for Hitachi's proprietary MPUS, to joint commercialization of software development tools and a program development emulator in late 1985.
Unisys	Unisys and Hitachi agreed to a technology exchange and joint development effort to study the feasibility of using Hitachi's high-speed ICs in Sperry's 1100 system architecture; Hitachi already manufactures Sperry's personal computer.
Hewlett-Packard	HP is allowed to manufacture 64K DRAMs using Hitachi's photomasks and 3-micron rule NMOS process. HP does not sell these devices on the open market.

1986 Agreements

Asahi Chemical	Asahi Chemical will market Hitachi's 64K and 256K SRAMs, mask ROMs, and CMOS gate arrays on an OEM basis for two years; the two companies are developing high-speed SRAMs with 25ns access times.

Hitachi, Ltd.

General Motors	Hitachi and General Motors agreed to an extensive tie-up to pursue joint R&D and production projects in five high technology areas: automotive parts, semiconductors and other electronics, computers, optical fibers, magnetic materials and other new materials, and factory automation.
Zilog	Zilog is licensed to second source Hitachi's 8-bit CMOS MPU (HD64180). Zilog will market the Z80-compatible device under the Z64180 label.
Fujitsu	Fujitsu and Hitachi will cooperate in developing a 32-bit MPU and peripheral LSI family based on the TRON architecture. The TRON chip will be 1.0- to 1.3-micron CMOS and will integrate 700,000 transistors.
Riken	Hitachi and Riken will jointly develop the Quantum Flux Parametron, an ultrahigh-speed switching element with a 50-picosecond switching speed and 1.8-GHz clock frequency. The new device can operate without electrical voltage and has a power dissipation one-thousandth of that of a Josephson junction.
Fairchild	Hitachi signed a five-year agreement to become the first alternate source for Fairchild's Fairchild Advanced CMOS Technology (FACT) logic. Fairchild gave Hitachi its design data base for 20 devices.
Signetics	Hitachi acquired manufacturing and sales licenses from Signetics for two telecommunications LSI models (HD68562 and HD64941) for transferring data between terminals and mainframe computers. Hitachi aims to strengthen peripheral LSIs for its 16-bit MPUs.
Toyohashi University	Hitachi Works and Toyohashi Technology and Science University announced a hybrid electron/ion beam manufacturing equipment prototype jointly developed since 1983 under the auspices of the Ministry of Education's R&D program.
NTT	Hitachi announced a direct-write electron beam machine capable of writing 0.1-micron circuit patterns on a wafer at a rate of one hour per wafer. The machine was jointly developed with NTT's Atsugi Laboratory. Hitachi plans to market the machine in the second half on 1987.
Monsanto	Hitachi agreed to share its silicon wafer manufacturing technology with Monsanto. Monsanto will send wafer engineers to Hitachi to acquire the technology necessary to manufacture products to meet Hitachi's standards.

NONSEMICONDUCTOR PRODUCTS SUMMARY

Consumer Products

Sales of consumer products for fiscal 1986 were ¥1,081 billion, 2 percent less than 1985. This division accounted for 22 percent of total sales, and it is the Company's second largest product division. Included in this division are television sets, radios, tape recorders, video tape recorders, video cameras, air conditioners, washing machines, refrigerators, microwave ovens, vacuum cleaners, space heaters, kitchen appliances, lighting fixtures, dry batteries, and audio and video tapes.

Fiscal 1986 highlights of the Consumer Products Division include:

- A surge in the sales of a number of new generation consumer electronics products such as video camera/recorder units (camcorders), compact disk players, and laser system video disk players
- Emphasis on consolidating its international sales setup

Industrial Machinery and Plants

Net sales in the Industrial Machinery and Plants Division were ¥835 billion, an increase of 6 percent from fiscal 1985. This accounted for 16 percent of total sales. Products of this division include rolling mill equipment, chemical plants, construction machinery, elevators, industrial robots, and refrigeration and air-conditioning equipment.

Fiscal 1986 highlights of the Industrial Machinery and Plants Division include:

- Introduction of a compact microorganism cultivator designed specifically for research laboratory applications
- Development of a new type of automatic train controller (ATC) that will be used in the Sendai municipal subway

Information and Communication Systems and Electronic Devices

Fiscal 1986 sales of information and communication systems and electronic devices, Hitachi's largest segment, were ¥1,452 billion, a 4 percent decrease from fiscal 1985. Sales of this division accounted for 28 percent of total sales. This division's products include computers, office automation (OA) equipment, semiconductors, other electronic devices, communications equipment, measuring equipment, and medical equipment. Dataquest believes that this division has become the most important of all Hitachi's divisions.

Major fiscal 1986 events in the Information and Communication Systems and Electronic Devices Division include:

- Beginning of shipments on the high-end M-680 processor and 5-gigabyte disk storage systems in the third quarter
- Beginning of marketing of Product Lineup for Advanced Network (PLANET) information network system

Power Systems and Equipment

Net fiscal 1986 sales of power systems and equipment were ¥761 billion, an increase of 6 percent from fiscal 1985, which accounted for 15 percent of total sales. Products included in this division are nuclear, hydroelectric, and thermal power plants; water, steam, and gas turbines; generators; boilers; transformers; circuit breakers; motors; control equipment; switchboards; and automobile parts and accessories.

Major fiscal 1986 events in the Power Systems and Equipment Division include:

- Research in advanced boiling water reactors, fast breeder reactors, and advanced thermal converter reactors
- Establishment of a new company to develop and produce centrifugal separators in a joint venture with Toshiba Corporation and Mitsubishi Heavy Industries
- Completion of an automotive components plant in Kentucky, which has begun production

Wire and Cable, Metals, Chemicals, and Other Products

Net fiscal 1986 sales of wire and cable, metals, chemicals, and other products were ¥881 billion, a decrease of 2 percent from fiscal 1985, representing 18 percent of total sales. The products of this division include electric wire and cable, optical fiber cable, steel, cast-iron products, synthetic resin materials and products, carbon and graphite products, printed circuit boards, and ceramic materials.

Hitachi, Ltd.

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(Billions of Yen except Per Share Data)

Balance Sheet (March 31)

	1982	1983	1984	1985	1986
Working Capital	¥ 624.4	¥ 627.9	¥ 734.7	¥ 813.9	¥ 882.7
Long-Term Debt	¥ 259.1	¥ 261.4	¥ 325.1	¥ 322.9	¥ 369.7
Shareholders' Equity	¥1,157.9	¥1,296.5	¥1,442.1	¥1,637.3	¥1,742.7
After-Tax Return on Average Equity (%)	12.8	12.3	12.2	12.8	8.6

Operating Performance (Fiscal Year Ending March 31)

	1982	1983	1984	1985	1986
Revenue	¥3,684.4	¥3,943.7	¥4,367.1	¥5,013.3	¥5,010.5
Japanese Revenue	¥2,664.5	¥2,863.4	¥3,136.2	¥3,378.0	¥3,500.0
Non-Japanese Revenue	¥1,019.9	¥1,080.3	¥1,230.9	¥1,635.3	¥1,511.0
Cost of Revenue	¥2,685.6	¥2,880.4	¥3,213.0	¥3,648.1	¥3,741.2
R&D Expense	¥ 159.8	¥ 188.6	¥ 211.7	¥ 267.9	¥ 295.7
SG&A Expense	¥ 677.6	¥ 722.7	¥ 793.5	¥ 918.1	¥ 962.7
Pretax Income	¥ 342.2	¥ 377.5	¥ 407.2	¥ 508.7	¥ 371.1
Pretax Margin (%)	9.3	9.6	9.3	10.1	7.4
Effective Tax Rate (%)	52.3	52.7	52.3	53.1	53.3
Net Income	¥ 137.1	¥ 150.5	¥ 167.1	¥ 210.2	¥ 150.2
Average Shares Outstanding (Millions)	2,763	2,832	2,802	2,803	2,803
Per Share					
Earnings	¥ 49.62	¥ 53.14	¥ 59.6	¥ 75.0	¥ 53.6
Dividends	¥ 5.83	¥ 7.33	¥ 7.00	¥ 8.00	¥ 9.50
Book Value	¥ 419.6	¥ 457.8	¥ 514.7	¥ 584.1	¥ 621.7
Price Range*	¥ 420-920	¥ 550-850	¥ 760-970	¥ 740-1,000	¥ 627-847
Total Employees	154,525	155,582	161,533	164,951	164,117
Capital Expenditures	¥ 246.2	¥ 332.7	¥ 381.6	¥ 455.1	¥ 447.4
Exchange Rate (Yen per US$)	228.7	249.1	235.7	245.3	220.8

*The stock prices are estimated from a bar graph in the Hitachi Annual Report.

Source: Hitachi, Ltd.,
Annual Reports
Dataquest
March 1988

Hitachi, Ltd.

Hitachi, Ltd.
6, Kanda-Surugadai
4-chome, Chiyoda-ku
Tokyo 101, Japan
(Millions of Dollars except Per Share Data)

Balance Sheet (March 31)

	1982	1983	1984	1985	1986
Working Capital	$ 2,730	$ 2,521	$ 3,117	$ 3,318	$ 3,998
Long-Term Debt	$ 1,133	$ 1,049	$ 1,379	$ 1,316	$ 1,674
Shareholders' Equity	$ 5,063	$ 5,205	$ 6,118	$ 6,675	$ 7,893
After-Tax Return on Average Equity (%)	12.8	12.3	12.2	12.8	8.6

Operating Performance (Fiscal Year Ending March 31)

	1982	1983	1984	1985	1986
Revenue	$16,110	$15,832	$18,528	$20,437	$22,692
Japanese Revenue	$11,651	$11,495	$13,306	$13,771	$15,851
Non-Japanese Revenue	$ 4,459	$ 4,337	$ 5,222	$ 6,666	$ 6,843
Cost of Revenue	$11,743	$11,563	$13,632	$14,872	$16,944
R&D Expense	$ 699	$ 757	$ 898	$ 1,092	$ 1,339
SG&A Expense	$ 2,963	$ 2,901	$ 3,367	$ 3,743	$ 4,360
Pretax Income	$ 1,496	$ 1,515	$ 1,728	$ 2,074	$ 1,681
Pretax Margin (%)	9.3	9.6	9.3	10.1	7.4
Effective Tax Rate (%)	52.3	52.7	52.3	53.1	53.3
Net Income	$ 599	$ 604	$ 709	$ 857	$ 680
Average Shares Outstanding (Millions)	2,763	2,832	2,802	2,803	2,803
Per Share					
Earnings	$ 0.22	$ 0.21	$ 0.25	$ 0.31	$ 0.24
Dividends	$ 0.03	$ 0.03	$ 0.03	$ 0.03	$ 0.04
Book Value	$ 1.83	$ 1.84	$ 2.18	$ 2.38	$ 2.81
Price Range*	$ 1.84-4.02	$ 2.21-3.41	$ 3.22-4.12	$ 3.02-4.08	$ 2.82-3.84
Total Employees	154,525	155,582	161,533	164,951	164,117
Capital Expenditures	$ 1,077	$ 1,336	$ 1,619	$ 1,855	$ 2,026
Exchange Rate (Yen per US$)	228.7	249.1	235.7	245.3	220.8

*The stock prices are estimated from a bar graph in the Hitachi Annual Report.

Source: Hitachi, Ltd., Annual Reports
Dataquest
March 1988

Hitachi, Ltd.

Table 1

Hitachi, Ltd.
Revenue by Product Category
(Billions of Yen)

	Fiscal Year Ending March 31				
	1982	1983	1984	1985	1986
Consumer Products	¥ 832	¥ 834	¥ 930	¥1,104	¥1,081
Industrial Machinery & Plants	672	755	730	786	835
Information & Communications Systems/Electronic Devices	796	910	1,174	1,507	1,452
Power Systems & Equipment	626	703	727	720	761
Wire & Cable, Metals, Chemicals, & Other	758	742	806	896	881
Total	¥3,684	¥3,944	¥4,367	¥5,013	¥5,010
Exchange Rate (Yen per US$)	¥228.7	¥249.1	¥235.7	¥245.3	¥220.8

Source: Hitachi, Ltd., Annual Reports
Dataquest
March 1988

Hitachi, Ltd.

Table 2

Hitachi, Ltd.
Estimated Semiconductor Revenue
(Millions of Dollars)

	1982	1983	1984	1985	1986
Total Semiconductor	$879	$1,277	$2,051	$1,671	$2,305
Total Integrated Circuit	$609	$ 912	$1,569	$1,236	$1,771
Bipolar Digital (Technology)	$111	$ 144	$ 223	$ 195	$ 339
TTL	-	-	170	143	243
ECL	-	-	36	36	83
Other Bipolar Digital	-	-	17	15	14
Bipolar Digital (Function)	$111	$ 144	$ 223	$ 195	$ 339
Bipolar Digital Memory	40	52	59	55	80
Bipolar Digital Logic	71	92	164	140	259
MOS (Technology)	$392	$ 638	$1,167	$ 852	$1,167
NMOS	241	383	708	493	668
PMOS	9	4	8	3	3
CMOS	142	251	451	356	496
MOS (Function)	$392	$ 638	$1,167	$ 853	$1,167
MOS Memory	291	500	971	662	814
MOS Micro Devices	66	85	120	110	240
MOS Logic	35	53	76	81	113
Linear	$106	$ 130	$ 179	$ 189	$ 265
Total Discrete	$240	$ 331	$ 430	$ 393	$ 484
Transistor	$ 90	$ 123	$ 155	$ 137	$ 177
Small Signal Transistor	-	-	81	70	95
Power Transistor	-	-	74	67	83
Diode	$120	$ 164	$ 213	$ 194	$ 239
Small Signal Diode	-	-	104	91	104
Power Diode	-	-	83	80	102
Zener Diode	-	-	26	23	33

(Continued)

Table 2 (Continued)

Hitachi, Ltd.
Estimated Semiconductor Revenue
(Millions of Dollars)

	1982	1983	1984	1985	1986
Total Discrete (Continued)					
Thyristor	$11	$17	$22	$22	$25
Other Discrete	$19	$27	$40	$39	$43
Total Optoelectronic	$30	$34	$52	$42	$50
LED Lamps	-	-	$15	$13	$15
LED Displays	-	-	-	-	-
Optical Couplers	-	-	$15	$13	$15
Other Optoelectronics	-	-	$22	$17	$20
Exchange Rate (Yen/US$)	¥248	¥235	¥237	¥238	¥167

Source: Dataquest
March 1988

Hitachi, Ltd.

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(Millions of Dollars Except Per Share Data)

Balance Sheet (March 31)

	1981	1982	1983	1984	1985
Working Capital	$ 2,262	$ 2,730	$ 2,521	$ 3,117	$ 3,318
Long-Term Debt	$ 1,093	$ 1,133	$ 1,049	$ 1,379	$ 1,316
Shareholders' Equity	$ 4,573	$ 5,063	$ 5,205	$ 6,118	$ 6,675
After-Tax Return on Average Equity (%)	14.0	12.8	12.3	12.2	12.8

Operating Performance (Fiscal Year Ending March 31)

	1981	1982	1983	1984	1985
Revenue	$ 15,531	$ 16,110	$ 15,832	$ 18,528	$ 20,437
Japanese Revenue	$ 11,782	$ 11,651	$ 11,495	$ 13,306	$ 13,771
Non-Japanese Revenue	$ 3,749	$ 4,459	$ 4,337	$ 5,222	$ 6,666
Cost of Revenue	$ 11,454	$ 11,743	$ 11,563	$ 13,632	$ 14,872
R&D Expense	$ 594	$ 699	$ 757	$ 898	$ 1,092
SG&A Expense	$ 2,820	$ 2,963	$ 2,901	$ 3,367	$ 3,743
Pretax Income	$ 1,411	$ 1,496	$ 1,515	$ 1,728	$ 2,074
Pretax Margin (%)	9.1	9.3	9.6	9.3	10.1
Effective Tax Rate (%)	49.7	52.3	52.7	52.3	53.1
Net Income	$ 590	$ 599	$ 604	$ 709	$ 857
Average Shares Outstanding (Millions)	2,725	2,763	2,832	2,802	2,803
Per Share					
Earnings	$ 0.22	$ 0.22	$ 0.21	$ 0.25	$ 0.31
Dividend	$ 0.03	$ 0.03	$ 0.03	$ 0.03	$ 0.03
Book Value	$ 1.71	$ 1.83	$ 1.84	$ 2.18	$ 2.38
Price Range*	$ 1.16-1.86	$ 1.84-4.02	$ 2.21-3.41	$ 3.22-4.12	$ 3.02-4.08
Total Employees	151,295	154,525	155,582	161,533	164,951
Capital Expenditures	$ 996	$ 1,077	$ 1,336	$ 1,619	$ 1,855
Exchange Rate (Yen per US$)	216	229	249	236	245

*The stock prices are estimated from a bar graph in the Hitachi Annual Report.

Source: Hitachi, Ltd., Annual Reports
DATAQUEST
May 1986

Hitachi, Ltd.

Table 1

Hitachi, Ltd.
NET SALES BY PRODUCT CATEGORY
(Billions of Yen)

	Fiscal Year Ending March 31				
	1981	1982	1983	1984	1985
Consumer Products	¥ 692	¥ 832	¥ 834	¥ 930	¥1,104
Industrial Machinery & Plants	627	672	755	730	786
Information & Communications Systems/Electronic Devices	666	796	910	1,174	1,507
Power Systems & Equipment	593	626	703	727	720
Wire & Cable, Metals, Chemicals, & Other	769	758	742	806	896
Total	¥3,347	¥3,684	¥3,944	¥4,367	¥5,013
Exchange Rate (Yen per US$)	¥215.5	¥228.7	¥249.1	¥235.7	¥245.3

Source: Hitachi, Ltd., Annual Reports
DATAQUEST
May 1986

Hitachi, Ltd.

Table 2

Hitachi, Ltd.
ESTIMATED SEMICONDUCTOR REVENUE
(Millions of Dollars)

	1978	1979	1980	1981	1982	1983	1984	1985
Total Semiconductor	453	453	622	807	879	1,277	2,051	1,671
Total Integrated Circuit	247	269	374	502	609	912	1,569	1,236
Bipolar Digital (Technology)	38	45	73	95	111	144	223	194
TTL	0	0	0	0	0	0	170	143
ECL	0	0	0	0	0	0	36	36
Other Bipolar Digital	0	0	0	0	0	0	17	15
Bipolar Digital (Function)	38	45	73	95	111	144	223	194
Bipolar Digital Memory	0	11	16	25	40	52	59	54
Bipolar Digital Logic	0	34	57	70	71	92	164	140
MOS (Technology)	139	147	213	288	392	638	1,167	853
NMOS	0	94	126	158	241	383	708	493
PMOS	0	8	12	14	9	4	8	3
CMOS	0	45	75	116	142	251	451	357
MOS (Function)	139	147	213	288	392	638	1,167	853
MOS Memory	0	117	149	200	291	500	971	662
MOS Micro Devices	0	15	39	50	66	85	120	110
MOS Logic	0	15	25	38	35	53	76	81
Linear	70	77	88	119	106	130	179	189
Total Discrete	196	173	228	275	240	331	430	392
Transistor	78	76	87	108	90	123	155	137
Small Signal Transistor	0	0	0	0	0	0	81	70
Power Transistor	0	0	0	0	0	0	74	67
Diode	88	87	113	135	120	164	213	194
Small Signal Diode	0	0	0	0	0	0	104	91
Power Diode	0	0	0	0	0	0	83	80
Zener Diode	0	0	0	0	0	0	26	23
Thyristor	10	10	14	16	11	17	22	22
Other Discrete	20	0	14	16	19	27	40	39
Total Optoelectronic	10	11	20	30	30	34	52	43
LED Lamps	0	0	0	0	0	0	15	13
LED Displays	0	0	0	0	0	0	0	0
Optical Couplers	0	0	0	0	0	0	15	13
Other Optoelectronics	0	0	0	0	0	0	22	17

Source: Dataquest
August 1986

Hitachi Ltd.

BACKGROUND AND OVERVIEW

Hitachi Ltd., was established in 1910 by Namihei Odaira. The Company's initial goal was to develop Japan's electrical power equipment manufacturing technology. At that time, Japan was heavily reliant on European and American electrical power equipment in its struggle toward modernization. This led to Hitachi's perseverance to become self-reliant in its research and development activities. Hitachi's operations are now dispersed over a much wider field of applications, ranging from industrial machinery to household electrical appliances and electronic products. DATAQUEST estimates that more than 10 percent of Hitachi's 154,000 employees are currently involved in the development of technology.

Hitachi entered the semiconductor industry in 1957, producing transistors for consumer products. By 1982 Hitachi was the second largest Japanese semiconductor manufacturer and the fourth largest in the world. Hitachi is also now well established as the leading manufacturer of 64K dynamic RAMs (DRAMs).

In 1981, Hitachi made a concerted effort to internationalize its operations, not only to promote exports but also to increase overseas production. In 1981, Hitachi increased its European revenues by 44 percent over 1980. The year 1982 saw a further increase of 15 percent in Hitachi's European revenues, up to $75 million. DATAQUEST's estimates for Hitachi's European semiconductor revenues are shown in Table 1. Contributing to these figures were gains made by Hitachi Electronic Components Europe GmbH, based in West Germany, and Hitachi Electronic Components (U.K.) Ltd.

DATAQUEST estimates that in 1982, approximately 46 percent of Hitachi's worldwide semiconductor revenues were from sales outside of Japan, with approximately 11 percent resulting from sales in Europe.

Hitachi Ltd.

Table 1

Hitachi, Ltd.
ESTIMATED EUROPEAN SEMICONDUCTOR REVENUES BY PRODUCT LINE
(Millions of U.S. Dollars)

	1977	1978	1979	1980	1981	1982
Total Semiconductor	$ 7	$ 13	$ 22	$ 45	$ 65	$ 75
Total Integrated Circuit	$ 7	$ 12	$ 19	$ 41	$ 60	$ 70
Bipolar Digital	0	1	2	6	8	8
MOS	7	11	16	34	50	59
Linear	0	0	1	1	2	3
Total Discrete	0	$ 1	$ 2	$ 3	$ 4	$ 4
Transistor	0	0	1	2	2	2
Diode	0	0	0	0	0	0
Thyristor	0	1	1	1	1	1
Other	0	0	0	0	1	1
Total Optoelectronic	0	0	$ 1	$ 1	$ 1	$ 1

Source: DATAQUEST
October 1983

PRODUCTS AND MARKETS SERVED

Hitachi is best known in Europe for its memory products such as 64K dynamic RAMs. The company's total product range consists of a broad spectrum of semiconductor products, from small-signal discrete devices to advanced memories and microprocessors.

Hitachi also makes 8-bit and 16-bit single-chip microcomputers; the 16-bit version is being developed through an agreement with Digital Research Corporation of the United States as part of a joint development of a standard CP/M operating system.

Hitachi Ltd.

Hitachi is also a second source of the Motorola 6800 8-bit and 68000 16-bit family of microprocessors. The two companies have agreed to the joint development of 68000-compatible 16-bit peripheral devices.

Hitachi is now producing limited quantities of a 256K dynamic RAM, and DATAQUEST believes that a 1-megabit device is in development.

Hitachi's newly developed U-groove isolation technology will be used for its 16K-bit bipolar RAMs and 64K-bit PROMs. This new process results in higher speed and a large increase in circuit density, both crucial factors for the development of LSI products.

Hitachi has also developed a wide range of NMOS and CMOS static RAMs (SRAMs).

OUTLOOK

During 1983, DATAQUEST believes Hitachi intends to concentrate on the following applications:

- Production of CMOS versions of its microprocessors
- Volume production of its 64K CMOS SRAM
- Introduction of the following:
  - CMOS 64K EPROM
  - 64K EEPROM
  - 256K DRAM

In October 1983, Hitachi launched in the United Kingdom a satellite design link with its Japanese facilities to serve the emerging European market for application-specific integrated circuits (ASICs).

The largest European application areas for Hitachi's components are computer, telecommunications, and automotive end-user market segments.

Hitachi, Ltd.

Hitachi Ltd.
New Marunouchi Bldg., 5-1 Marunouchi
1-chome, Chioyda-ku
Tokyo 100, Japan
(Billions of Yen Except Per Share Data)

Balance Sheet (March 31)

	1978	1979	1980	1981	1982
Working Capital	¥ 324.8	¥ 372.9	¥ 436.9	¥ 487.5	¥ 624.4
Long-Term Debt	¥ 311.5	¥ 280.9	¥ 252.9	¥ 235.5	¥ 259.1
Shareholders' Equity	¥ 669.7	¥ 757.4	¥ 860.6	¥ 985.4	¥1,157.9
After-Tax Return on Average Equity (%)	12.3	13.6	14.2	14.0	12.8

Operating Performance (Fiscal Year Ending March 31)

	1978	1979	1980	1981	1982
Revenue	¥2,377.0	¥2,574.5	¥2,945.4	¥3,359.2	¥3,698.7
Japanese Revenue	¥1,905.0	¥2,076.5	¥2,345.4	¥2,551.2	¥2,678.8
Non-Japanese Revenue	¥ 472.0	¥ 498.0	¥ 600.0	¥ 808.0	¥1,019.9
Cost of Revenue	¥1,746.3	¥1,853.5	¥2,130.6	¥2,468.4	¥2,685.6
R&D Expense	¥ 80.0	¥ 92.1	¥ 108.8	¥ 128.0	¥ 159.8
SG&A Expense	¥ 447.1	¥ 490.4	¥ 547.8	¥ 608.4	¥ 678.4
Pretax Income	¥ 177.2	¥ 229.0	¥ 272.1	¥ 304.1	¥ 342.2
Pretax Margin (%)	7.5	8.9	9.2	9.1	9.3
Effective Tax Rate (%)	51.1	48.9	49.1	49.7	52.3
Net Income	¥ 77.8	¥ 97.0	¥ 115.2	¥ 129.1	¥ 137.1
Average Shares Outstanding (Millions)	2,727	2,732	2,742	2,725	2,763
Per Share					
Earnings	¥ 28.55	¥ 35.50	¥ 42.02	¥ 47.37	¥ 49.62
Dividends	¥ 5.68	¥ 5.70	¥ 5.73	¥ 6.77	¥ 5.83
Book Value	¥ 258.3	¥ 289.8	¥ 327.0	¥ 369.5	¥ 419.6
Price Range	N/A	N/A	N/A	N/A	N/A
Total Employees	138,690	141,132	143,270	151,295	154,525
Capital Expenditures	¥ 106.1	¥ 120.9	¥ 147.0	¥ 214.6	¥ 246.2
Exchange Rate (US$ per ¥)	0.00395	0.00500	0.00431	0.00464	0.00438

N/A = Not Available

Source: Hitachi Ltd.
Annual Reports
DATAQUEST

Hitachi, Ltd.

Table 1

Hitachi Ltd.
NET SALES BY PRODUCT CATEGORY
(Billions of Yen)

	Fiscal Years Ending March 31				
	1978	1979	1980	1981	1982
Power Systems & Equipment	¥ 494	¥ 472	¥ 518	¥ 595	¥ 626
Consumer Products	521	557	628	694	834
Information & Communication Systems/Electron Devices	403	479	558	668	800
Industrial Machinery & Plants	413	486	560	629	676
Wire & Cable, Metals, Chemicals, & Other	546	581	681	773	763
	¥2,377	¥2,575	¥2,945	¥3,359	¥3,699

Source: Hitachi Ltd. Annual Reports
DATAQUEST

Hitachi, Ltd.

Table 2

Hitachi Ltd.
ESTIMATED SEMICONDUCTOR REVENUES
(Millions of Dollars)

	1974	1975	1976	1977	1978	1979	1980	1981	1982
TOTAL SEMICONDUCTOR	178	198	267	279	465	468	658	824	850
Total Integrated Circuit	74	83	120	127	259	284	410	519	580
Bipolar Digital	19	18	18	21	38	45	73	95	111
TTL									
DTL									
ECL									
Other									
Bipolar Digital (Recap)						45	73	95	111
Memory						11	16	25	40
Logic						34	57	70	71
MOS	38	43	63	62	139	147	213	238	320
NMOS						94	126	134	190
PMOS						8	12	14	5
CMOS						45	75	90	125
MOS (Recap)						147	213	238	320
Memory						117	149	150	220
Microprocessor						15	39	61	75
Logic						15	25	27	25
Linear	17	22	39	44	82	92	124	186	149
Total Discrete	103	114	145	144	196	173	228	275	240
Transistor				58	78	76	87	108	90
Small Signal									
Power									
Diode				66	88	87	113	135	120
Small Signal									
Power									
Zener									
Thyristor				6	10	10	14	16	11
Other				14	20	0	14	16	19
Total Optoelectronic	1	1	2	8	10	11	20	30	30
LED Lamps									
LED Displays									
Optical Couplers									
Other									

Source: DATAQUEST
March 1983

Hitachi, Ltd.

Hitachi Ltd.
6, Kanda-Surugadai
4-chome, Chiyoda-ku
Tokyo 101, Japan
(Billions of Yen Except Per Share Data)

Balance Sheet (March 31)

	1979	1980	1981	1982	1983
Working Capital	¥ 372.9	¥ 436.9	¥ 487.5	¥ 624.4	¥ 627.9
Long-Term Debt	¥ 280.9	¥ 252.9	¥ 235.5	¥ 259.1	¥ 261.4
Shareholders' Equity	¥ 757.4	¥ 860.6	¥ 985.4	¥1,157.9	¥1,296.5
After-Tax Return on Average Equity (%)	13.6	14.2	14.0	12.8	12.3

Operating Performance (Fiscal Year Ending March 31)

	1979	1980	1981	1982	1983
Revenue	¥2,565.0	¥2,937.0	¥3,347.0	¥3,684.4	¥3,943.7
Japanese Revenue	¥2,067.0	¥2,337.0	¥2,539.0	¥2,664.5	¥2,863.4
Non-Japanese Revenue	¥ 498.0	¥ 600.0	¥ 808.0	¥1,019.9	¥1,080.3
Cost of Revenue	¥1,853.5	¥2,130.6	¥2,468.4	¥2,685.6	¥2,880.4
R&D Expense	¥ 92.1	¥ 108.8	¥ 128.0	¥ 159.8	¥ 188.6
SG&A Expense	¥ 490.4	¥ 547.8	¥ 607.8	¥ 677.6	¥ 722.7
Pretax Income	¥ 229.0	¥ 272.1	¥ 304.1	¥ 342.2	¥ 377.5
Pretax Margin (%)	8.9	9.2	9.1	9.3	9.6
Effective Tax Rate (%)	48.9	49.1	49.7	52.3	52.7
Net Income	¥ 97.0	¥ 115.2	¥ 127.1	¥ 137.1	¥ 150.5
Average Shares Outstanding (Millions)	2,732	2,742	2,725	2,763	2,832
Per Share					
Earnings	¥ 35.50	¥ 42.02	¥ 47.37	¥ 49.62	¥ 53.14
Dividends	¥ 5.70	¥ 5.73	¥ 6.77	¥ 5.83	¥ 7.33
Book Value	¥ 289.8	¥ 327.0	¥ 369.5	¥ 419.6	¥ 457.8
Price Range	N/A	N/A	N/A	N/A	N/A
Total Employees	141,132	143,270	151,295	154,525	155,582
Capital Expenditures	¥ 120.9	¥ 147.0	¥ 214.6	¥ 246.2	¥ 332.7
Exchange Rate (Yen per US$)	¥ 200.0	¥ 232.0	¥ 215.5	¥ 228.7	¥ 249.1

N/A = Not Available

Source: Hitachi Ltd.
Annual Reports
DATAQUEST

Hitachi, Ltd.

Table 1

Hitachi Ltd.
NET SALES BY PRODUCT CATEGORY
(Billions of Yen)

	Fiscal Year Ending March 31				
	1979	1980	1981	1982	1983
Power Systems & Equipment	¥ 470	¥ 517	¥ 593	¥ 626	¥ 703
Consumer Products	555	626	692	832	834
Information & Communications Systems/Electron Devices	477	556	666	796	910
Industrial Machinery & Plants	484	558	627	672	755
Wire & Cable, Metals, Chemicals, & Other	579	680	769	758	742
	¥2,565	¥2,937	¥3,347	¥3,684	¥3,944
Exchange Rate (Yen per US$)	¥200.0	¥232.0	¥215.5	¥228.7	¥249.1

Source: Hitachi Ltd.
Annual Reports
DATAQUEST

Hitachi, Ltd.

Table 2

Hitachi Ltd.
ESTIMATED SEMICONDUCTOR REVENUES
(Millions of Dollars)

	1976	1977	1978	1979	1980	1981	1982
Total Semiconductor	267	280	453	453	622	807	877
Total Integrated Circuit	120	128	247	269	374	502	607
Bipolar Digital (Technology)	18	21	38	45	73	95	111
TTL							
DTL							
ECL							
Other Bipolar Digital							
Bipolar Digital (Function)	18	21	38	45	73	95	111
Bipolar Digital Memory				11	16	25	40
Bipolar Digital Logic				34	57	70	71
MOS (Technology)	63	62	139	147	213	288	390
NMOS				94	126	158	240
PMOS				8	12	14	9
CMOS				45	75	116	141
MOS (Function)	63	62	139	147	213	288	390
MOS Memory				117	149	200	290
MOS Microprocessor				15	39	61	75
MOS Logic				15	25	27	25
Linear	39	45	70	77	88	119	106
Total Discrete	145	144	196	173	228	275	240
Transistor		58	78	76	87	108	90
Small Signal Transistor							
Power Transistor							
Diode		66	88	87	113	135	120
Small Signal Diode							
Power Diode							
Zener Diode							
Thyristor		6	10	10	14	16	11
Other Discrete		14	20	0	14	16	19
Total Optoelectronic	2	8	10	11	20	30	30
LED Lamps							
LED Displays							
Optical Couplers							
Other Optoelectronics							

Source: DATAQUEST

10.02 Hitachi

Table 10.02.2-1
Hitachi
ESTIMATED SEMICONDUCTOR REVENUES
(Dollars in Millions)

	1972	1973	1974	1975	1976	1977
TOTAL SEMICONDUCTOR	121	172	173	149	260	246
TOTAL I C	40	62	72	66	127	114
BIPOLAR DIGITAL	14	13	18	16	19	19
TTL						
DTL						
ECL						
OTHER						
MOS	16	33	37	34	67	55
PMOS						
NMOS						
CMOS						
LINEAR	10	16	17	16	41	40
INTERFACE						
CONTROL						
ENTERTAINMENT						
OTHER						
HYBRID						
TOTAL DISCRETE	81	109	101	82	132	125
TRANSISTOR						49
SMALL SIGNAL						
POWER						
DIODE						56
SMALL SIGNAL						
POWER						
ZENER						
THYRISTOR						6
OTHER						14
OPTOELECTRONIC	0	1	0	1	1	7
LED LAMPS						
LED DISPLAYS						
COUPLERS						
OTHER						

Source: DATAQUEST, Inc.

10.02 Hitachi

Table 10.02-1

Hitachi

ESTIMATED SEMICONDUCTOR REVENUES

(Dollars in Millions)

	1971	1972	1973	1974	1975	1976	1977	1978
TOTAL SEMICONDUCTOR		121	195	178	198	267	279	465
TOTAL I C	26	40	68	74	83	120	127	259
BIPOLAR DIGITAL	12	14	15	19	18	18	21	38
TTL								
DTL								
ECL								
OTHER								
MOS	9	16	35	38	43	63	62	139
PMOS								
NMOS								
CMOS								
LINEAR	5	10	18	17	22	39	44	82
INTERFACE								
CONTROL								
ENTERTAINMENT								
OTHER								
HYBRID								
TOTAL DISCRETE		81	126	103	114	145	144	196
TRANSISTOR							58	78
SMALL SIGNAL								
POWER								
DIODE							66	88
SMALL SIGNAL								
POWER								
ZENER								
THYRISTOR							6	10
OTHER							14	20
OPTOELECTRONIC			1	1	1	2	8	10
LED LAMPS			0	0	0	0	0	0
LED DISPLAYS			0	0	0	0	0	0
COUPLERS			0	0	0	0	0	0
OTHER			1	1	1	2	8	10

Note: The following exchange rates were used to convert yen to dollars:
1971: 343 yen = $1.00; 1972: 302 yen = $1.00; 1973: 269 yen = $1.00;
1974: 292 yen = $1.00; 1975: 297 yen = $1.00; 1976: 296 yen = $1.00;
1977: 266 yen = $1.00; 1978: 207 yen = $1.00

Source: DATAQUEST, Inc.

10.02 Hitachi

Table 10.02.2-1

Hitachi
ESTIMATED SEMICONDUCTOR REVENUES
(Dollars in Millions)

	1971	1972	1973	1974
TOTAL SEMICONDUCTOR		219	271	271
TOTAL I C	31	67	86	92
BIPOLAR DIGITAL	15	17	23	25
TTL				
DTL				
ECL				
OTHER				
MOS	11	33	43	50
PMOS				
NMOS				
CMOS				
LINEAR	4	14	17	14
INTERFACE	0	0	0	0
CONTROL	0	0	0	0
ENTERTAINMENT	0	0	0	0
OTHER	0	0	0	0
HYBRID	1	3	3	3
TOTAL DISCRETE		152	184	179
TRANSISTOR				
SMALL SIGNAL				
POWER				
DIODE				
SMALL SIGNAL				
POWER				
ZENER				
THYRISTOR				
OTHER				
OPTOELECTRONIC	0	0	1	0

Source: DATAQUEST, Inc.

10.02 Hitachi

Table 10.02.2-1

Hitachi
ESTIMATED SEMICONDUCTOR REVENUES
(Dollars in Millions)

	1971	1972	1973	1974	1975	1976
TOTAL SEMICONDUCTOR		219	271	271	169	247
TOTAL I C	31	67	86	92	81	114
BIPOLAR DIGITAL	15	17	23	25	16	19
TTL						
DTL						
ECL						
OTHER						
MOS	11	33	43	50	49	67
PMOS						
NMOS						
CMOS						
LINEAR	5	17	20	17	16	28
INTERFACE						
CONTROL						
ENTERTAINMENT						
OTHER						
TOTAL DISCRETE		152	184	179	87	132
TRANSISTOR						
SMALL SIGNAL						
POWER						
DIODE						
SMALL SIGNAL						
POWER						
ZENER						
THYRISTOR						
OTHER						
OPTOELECTRONIC	0	0	1	0	1	1
LED LAMPS						
LED DISPLAYS						
COUPLERS						
OTHER						

Source: DATAQUEST, Inc.

Hitachi, Ltd.

Hitachi, Ltd.
6, Kanda-Surugadai
4-chome, Chiyoda-ku
Tokyo, 101, Japan
(Billions of Yen)

Balance Sheet (March 31)	1984	1985	1986	1987*	1988*	1989*
Total Current Assets	¥3,029	¥3,319	¥3,276	¥3,445	¥4,303	¥4,870
Cash	¥1,015	¥1,182	¥1,154	¥1,364	¥1,405	¥1,638
Receivables	¥ 945	¥ 971	¥ 971	¥1,011	¥1,220	¥1,372
Inventory	¥ 914	¥ 988	¥ 980	¥ 898	¥1,135	¥1,250
Other Current Assets	¥ 155	¥ 178	¥ 171	¥ 172	¥ 543	¥ 610
Net Property, Plant, and Equipment	¥ 944	¥1,095	¥1,200	¥1,179	¥1,354	¥1,474
Depreciation	¥1,102	¥1,294	¥1,490	¥1,680	¥2,071	¥2,250
Other Assets	¥ 638	¥ 660	¥ 688	¥ 704	¥ 531	¥ 594
Total Assets	¥4,611	¥5,074	¥5,164	¥5,842	¥6,188	¥6,938
Total Current Liabilities	¥2,294	¥2,505	¥2,393	¥2,288	¥2,851	¥3,184
Long-Term Debt	¥ 325	¥ 323	¥ 370	¥ 489	¥ 468	¥ 521
Other Liabilities	¥ 258	¥ 285	¥ 320	¥ 353	¥ 850	¥ 951
Total Liabilities	¥2,877	¥3,113	¥3,083	¥3,130	¥4,169	¥4,656
Total Shareholders & Equity	¥1,734	¥1,961	¥2,081	¥2,198	¥2,019	¥2,282
Common Stock	¥ 140	¥ 140	¥ 140	¥ 141	¥ 180	¥ 219
Other Equity	¥ 485	¥ 527	¥ 525	¥ 572	¥ 248	¥ 322
Retained Earnings	¥1,109	¥1,294	¥1,416	¥1,485	¥1,591	¥1,740
Total Liability and Total Equity	¥4,611	¥5,074	¥5,164	¥5,328	¥6,188	¥6,938
Revenue	¥4,367	¥5,013	¥5,010	¥5,543	¥5,717	¥6,401
Domestic Sales	¥3,136	¥3,378	¥3,499	¥4,068	¥4,286	¥4,932
Overseas Sales	¥1,231	¥1,635	¥1,511	¥1,475	¥1,431	¥1,469
Cost of Sales	¥3,213	¥3,648	¥3,741	¥4,089	¥4,123	¥4,552
Gross Margin (%)	¥ 26	¥ 27	¥ 25	¥ 26	¥ 28	¥ 29
R&D Expense	¥ 212	¥ 268	¥ 296	¥ 314	¥ 332	¥ 374
SG&A Expense	¥ 581	¥ 650	¥ 667	¥ 869	¥ 943	¥1,042
Other Operating Expenses	0	0	0	0	0	0
Total Operating Expenses	¥4,006	¥4,566	¥4,704	¥5,272	¥5,398	¥5,968
Operating Income (Loss)	¥ 361	¥ 447	¥ 306	¥ 271	¥ 319	¥ 433
Interest, Net	¥ 46	¥ 62	¥ 65	¥ 24	¥ 61	¥ 58
Pretax Income	¥ 407	¥ 509	¥ 371	¥ 295	¥ 380	¥ 491
Provision for Taxes (Credit)	¥ 213	¥ 270	¥ 198	¥ 175	¥ 218	¥ 272
Effective Tax Rate	¥ 52	¥ 53	¥ 53	¥ 59	¥ 57	¥ 55
Extraordinary Items,	(¥ 27)	(¥ 29)	(¥ 23)	(¥ 21)	(¥ 25)	(¥ 33)
Net Income	¥ 167	¥ 210	¥ 150	¥ 99	¥ 137	¥ 186
Avg. Shares Outstanding (Millions)	2,802	2,803	2,803	2,810	2,869	2,970
Employees	161,533	164,951	164,117	161,325	263,996	274,508
Capital Expenditures (Millions)	¥ 382	¥ 455	¥ 447	¥ 421	¥ 373	¥ 515
Exchange Rate (Yen per US$1)	236	245	221	160	138	128

*In 1989, Hitachi restated its 1987 and 1988 balance statements. The Company has included previously unconsolidated subsidiaries. In 1987, the value for total assets was restated, but the detail was not provided. In the balance sheets, the details were not changed, but the restated total asset number has been added. Therefore, the columns will not add correctly.

Source: Hitachi, Ltd. Annual Reports
Dataquest
November 1989

Hitachi, Ltd.

Hitachi, Ltd.
6, Kanda-Surugadai
4-chome, Chiyoda-ku
Tokyo, 101, Japan
(Millions of Dollars)

Balance Sheet (March 31)	1984	1985	1986	1987*	1988*	1989*
Total Current Assets	$12,835	$13,547	$14,824	$21,531	$31,101	$38,047
Cash	$ 4,301	$ 4,824	$ 5,222	$ 8,525	$10,181	$12,797
Receivables	$ 4,004	$ 3,963	$ 4,394	$ 6,319	$ 8,841	$10,719
Inventory	$ 3,873	$ 4,033	$ 4,434	$ 5,613	$ 8,225	$ 9,766
Other Current Assets	$ 657	$ 727	$ 774	$ 1,075	$ 3,935	$ 4,766
Net Property, Plant, and Equipment	$ 4,000	$ 4,469	$ 5,430	$ 7,369	$ 9,812	$11,516
Depreciation	$ 4,669	$ 5,282	$ 6,742	$10,500	$15,007	$17,578
Other Assets	$ 2,703	$ 2,694	$ 3,113	$ 4,400	$ 3,848	$ 4,641
Total Assets	$19,538	$20,710	$23,367	$33,300	$44,841	$54,203
Total Current Liabilities	$ 9,720	$10,224	$10,828	$14,300	$20,659	$24,875
Long-Term Debt	$ 1,377	$ 1,318	$ 1,674	$ 3,056	$3,391	$ 4,070
Other Liabilities	$ 1,093	$ 1,163	$ 1,448	$ 2,206	$6,159	$ 7,430
Total Liabilities	$12,191	$12,706	$13,950	$19,563	$30,210	$36,375
Total Shareholders & Equity	$ 7,347	$ 8,004	$ 9,416	$13,738	$14,630	$17,825
Common Stock	$ 593	$ 571	$ 633	$ 881	$1,304	$ 1,714
Other Equity	$ 2,055	$ 2,151	$ 2,376	$ 3,575	$1,797	$ 2,515
Retained Earnings	$ 4,699	$ 5,282	$ 6,407	$ 9,281	$11,529	$13,596
Total Liability and Total Equity	$19,538	$20,710	$23,367	$33,300	$44,840	$54,200
Revenue	$18,504	$20,461	$22,670	$34,644	$41,428	$50,008
Domestic Sales	$13,288	$13,788	$15,833	$25,425	$31,058	$38,531
Overseas Sales	$ 5,216	$ 6,673	$ 6,837	$ 9,219	$10,370	$11,477
Cost of Sales	$13,614	$14,890	$16,928	$25,556	$29,877	$35,563
Gross Margin (%)	$ 26	$ 27	$ 25	$ 26	$ 28	$ 29
R&D Expense	$ 898	$ 1,094	$ 1,339	$ 1,963	$ 2,406	$ 2,922
SG&A Expense	$ 2,462	$ 2,653	$ 3,018	$ 5,431	$ 6,833	$ 8,141
Other Operating Expenses	0	0	0	0	0	0
Total Operating Expenses	$16,975	$18,637	$21,285	$32,950	$39,116	$46,625
Operating Income (Loss)	$ 1,530	$ 1,824	$ 1,385	$ 1,694	$ 2,312	$ 3,383
Interest, Net	$ 195	$ 253	$ 294	$ 150	$ 442	$ 453
Pretax Income	$ 1,725	$ 2,078	$ 1,679	$ 1,844	$ 2,754	$ 3,836
Provision for Taxes (Credit)	$ 903	$ 1,102	$ 896	$ 1,094	$ 1,580	$ 2,125
Effective Tax Rate	$ 52	$ 53	$ 53	$ 59	$ 57	$ 55
Extraordinary Items	($ 114)	($ 118)	($ 104)	($ 131)	($ 181)	($ 258)
Net Income	$ 708	$ 857	$ 679	$ 619	$ 993	$ 1,453
Avg. Shares Outstanding (Millions)	2,802	2,803	2,803	2,810	2,869	2,970
Employees	161,533	164,951	164,117	161,325	263,996	274,508
Capital Expenditures (Millions)	$ 1,619	$ 1,857	$ 2,023	$ 2,631	$ 2,703	$ 4,023
Exchange Rate (Yen per US$1)	236	245	221	160	138	128

*In 1989, Hitachi restated its 1987 and 1988 balance statements. The Company has included previously unconsolidated subsidiaries. In 1987, the value for total assets was restated, but the detail was not provided. In the balance sheets, the details were not changed, but the restated total asset number has been added. Therefore, the columns will not add correctly.

Source: Hitachi, Ltd. Annual Reports
Dataquest
November 1989

Hitachi, Ltd.

The following tables are included in this section:

Table 1—Sales by Product Segment (Billions of Yen)

Table 2—Estimated Worldwide Semiconductor Revenue by Calendar Year (Billions of Yen)

Table 3—Estimated Worldwide Semiconductor Revenue by Calendar Year (Millions of Dollars)

Table 4—1988 Percent Change in Worldwide Semiconductor Revenue (Millions of Dollars)

Table 5—1988 Estimated Semiconductor Revenue Percent by Region (Billions of Yen)

Table 1

Sales by Product Segment
(Billions of Yen)

	1984	1985	1986	1987*	1988*	1989
Power Systems and Equipment	727	720	761	858	804	881
Consumer Products	930	1,104	1,081	1,065	1,018	1,033
Information/Communication Systems/Electronic Devices	1,174	1,507	1,452	1,568	1,729	2,051
Industrial Machinery/Plants	730	786	835	874	903	1,046
Wire/Cable/Metals/ Chemicals/Others	806	896	881	1,178	1,263	1,390
Total	4,367	5,013	5,010	5,543	5,717	6,401
Exchange Rate (Yen per US$1)	236	245	221	160	138	128

*These years have been restated by the Company.

Source: Hitachi, Ltd.
Annual Reports
Dataquest
November 1989

Hitachi, Ltd.

Table 2

Estimated Worldwide Semiconductor Revenue by Calendar Year (Billions of Yen)

	1981	1982	1983	1984	1985	1986	1987	1988
Total Semiconductor	178.3	217.9	300.0	485.8	397.8	360.4	376.7	456.2
Total IC	111.0	151.0	214.3	371.6	294.2	273.9	280.2	355.0
Bipolar Digital (Technology)	21.0	27.5	33.8	52.7	46.3	53.7	66.6	65.1
MOS (Technology)	63.7	97.2	149.9	276.5	202.8	175.9	168.9	245.1
NMOS	34.9	59.8	90.0	167.8	117.3	76.3	67.6	90.9
PMOS	3.2	2.2	0.9	1.8	0.7	0.5	0.3	0.1
CMOS	25.6	35.2	59.0	106.9	84.8	99.1	100.6	153.2
BiCMOS	0	0	0	0	0	0	0.4	0.9
MOS (Function)	63.7	97.2	149.9	276.5	202.8	175.9	168.9	245.6
MOS Memory	44.2	72.2	117.5	230.1	157.5	120.1	82.9	144.9
MOS Microdevices	11.1	16.3	19.9	28.4	26.1	38.1	57.9	68.5
MOS Logic	8.4	8.7	12.5	18.0	19.2	17.7	28.1	32.2
Analog	26.3	26.3	30.6	42.4	45.1	44.3	44.7	44.8
Total Discrete	60.7	59.5	77.7	102.0	93.5	79.5	89.8	92.1
Transistor	23.9	22.3	28.9	36.7	32.7	28.9	33.4	35.3
Diode	29.8	29.8	38.5	50.4	46.2	39.3	45.3	44.6
Thyristor	3.5	2.7	4.0	5.3	5.3	4.1	4.1	4.7
Other Discrete	3.5	4.7	6.3	9.6	9.3	7.2	7.0	7.5
Total Optoelectronic	6.6	7.4	8.0	12.2	10.1	7.0	6.7	9.1
Exchange Rate (Yen per US$1)	221	249	237	237	238	168	144	130

Source: Dataquest
November 1989

Hitachi, Ltd.

Table 3

Estimated Worldwide Semiconductor Revenue by Calendar Year (Millions of Dollars)

	1981	1982	1983	1984	1985	1986	1987	1988
Total Semiconductor	807	875	1,266	2,050	1,671	2,157	2,618	3,506
Total IC	502	606	904	1,568	1,236	1,639	1,946	2,729
Bipolar Digital (Technology)	95	110	143	222	195	321	463	501
MOS (Technology)	288	390	632	1,167	852	1,053	1,173	1,885
NMOS	158	240	380	708	493	457	469	678
PMOS	14	9	4	8	3	3	5	43
CMOS	116	141	249	451	356	593	699	1,157
BiCMOS	0	0	0	0	0	0	3	7
MOS (Function)	288	390	632	1,167	852	1,053	1,173	1,885
MOS Memory	200	290	496	971	662	719	576	1,114
MOS Microdevices	50	65	84	120	110	228	402	525
MOS Logic	38	35	53	76	81	106	195	246
Analog	119	106	129	179	189	265	310	343
Total Discrete	275	239	328	430	393	476	625	707
Transistor	108	90	122	155	137	173	232	271
Diode	135	120	162	213	194	235	315	343
Thyristor	16	11	17	22	22	25	29	36
Other Discrete	16	19	27	41	39	43	49	57
Total Optoelectronic	30	30	34	51	42	42	47	70
Exchange Rate (Yen per US$1)	221	249	237	237	238	168	144	130

Source: Dataquest
November 1989

Hitachi, Ltd.

Table 4

1988 Percent Change in Worldwide Semiconductor Revenue
(Millions of Dollars)

	1987	1988	% Change	World Market % Change
Semiconductor	$2,618	$3,506	33.9%	33.0%
IC	1,946	$2,729	40.2%	37.4%
Bipolar Digital	463	501	8.2%	9.2%
MOS (Technology)	1,173	1,885	60.7%	54.5%
MOS Memory	576	1,114	93.4%	91.3%
MOS Micro	402	525	30.6%	39.9%
MOS Logic	195	246	26.2%	29.2%
Analog	310	343	10.6%	16.0%
Discrete	$ 625	$ 707	13.1%	14.4%
Optoelectronics	$ 47	$ 70	48.9%	27.5%
Exchange Rate (Yen per US$1)	144	130		

Source: Dataquest
November 1989

Table 5

1988 Estimated Semiconductor Revenue Percent by Region
(Billions of Yen)

Product	United States	Japan	Europe	ROW
Semiconductor	13%	70%	7%	10%
IC	16%	67%	9%	8%
Bipolar Digital	7%	74%	1%	19%
MOS (Technology)	20%	62%	12%	6%
MOS Memory	27%	56%	12%	5%
MOS Micro	13%	67%	13%	7%
MOS Logic	5%	82%	5%	8%
Analog	6%	88%	2%	5%
Discrete	3%	82%	1%	14%
Optoelectronics	7%	69%	6%	18%
Exchange rate (Yen per US$1)				130

Note: Rows may not equal 100% because of rounding.

Source: Dataquest
November 1989

Hitachi, Ltd.

Hitachi, Ltd.
6, Kanda-Surugadai
4-chome, Chiyoda-ku
Tokyo, 101, Japan
(Billions of Yen)

Balance Sheet (March 31)

	1984	1985	1986	1987	1988
Total Current Assets	¥ 3,029	¥ 3,319	¥ 3,276	¥ 3,445	¥ 3,757
Cash	¥ 1,015	¥ 1,182	¥ 1,154	¥ 1,364	¥ 1,516
Receivables	¥ 945	¥ 971	¥ 971	¥ 1,011	¥ 1,081
Inventory	¥ 914	¥ 988	¥ 980	¥ 898	¥ 961
Net Property, Plant, & Eqp.	¥ 944	¥ 1,095	¥ 1,200	¥ 1,179	¥ 1,133
Depreciation	¥ 1,102	¥ 1,294	¥ 1,490	¥ 1,680	¥ 1,819
Total Assets	¥ 4,611	¥ 5,074	¥ 5,164	¥ 5,328	¥ 5,621
Total Current Liabilities	¥ 2,294	¥ 2,505	¥ 2,393	¥ 2,288	¥ 2,399
Long-Term Debt	¥ 325	¥ 323	¥ 370	¥ 489	¥ 433
Total Liabilities	¥ 2,877	¥ 3,113	¥ 3,083	¥ 3,130	¥ 3,214
Total Shareholders' Equity	¥ 1,734	¥ 1,961	¥ 2,081	¥ 2,198	¥ 2,407
Common Stock	¥ 140	¥ 140	¥ 140	¥ 141	¥ 180
Retained Earnings	¥ 1,109	¥ 1,294	¥ 1,416	¥ 1,485	¥ 1,594

Income Statement (March 31)	1984	1985	1986	1987	1988
Revenue	¥ 4,367	¥ 5,013	¥ 5,010	¥ 4,849	¥ 4,975
Domestic Sales	¥ 3,136	¥ 3,378	¥ 3,499	¥ 3,580	¥ 3,785
Overseas Sales	¥ 1,231	¥ 1,635	¥ 1,511	¥ 1,269	¥ 1,190
Cost of Sales	¥ 3,213	¥ 3,648	¥ 3,741	¥ 3,675	¥ 3,692
Gross Margin (%)	26	27	25	24	26
R&D Expense	¥ 212	¥ 268	¥ 296	¥ 308	¥ 324
SG&A Expense	¥ 581	¥ 650	¥ 667	¥ 651	¥ 708
Operating Income (Loss)	¥ 361	¥ 447	¥ 306	¥ 215	¥ 251
Interest, Net	46	62	65	43	80
Pretax Income	407	509	371	258	331
Effective Tax Rate (%)	52	53	53	54	52
Extraordinary Items, Net	(27)	(29)	(23)	(19)	(22)
Net Income	¥ 167	¥ 210	¥ 150	¥ 99	¥ 137
Avg. Shares Outstanding (M)	2,802	2,803	2,803	2,810	2,869
Employees	161,533	164,951	164,117	161,325	159,910
Capital Expenditure (¥M)	¥ 382	¥ 455	¥ 447	¥ 357	¥ 320
Exchange Rate (Yen per US$)	236	245	221	160	139

Source: Hitachi, Ltd.
Annual Reports

Hitachi, Ltd.

Hitachi, Ltd.
6, Kanda-Surugadai
4-chome, Chiyoda-ku
Tokyo, 101, Japan
(Millions of Dollars)

Balance Sheet (March 31)	1984	1985	1986	1987	1988
Total Current Assets	$12,835	$13,547	$14,824	$21,531	$27,029
Cash	$ 4,301	$ 4,824	$ 5,222	$ 8,525	$10,906
Receivables	$ 4,004	$ 3,963	$ 4,394	$ 6,319	$ 7,777
Inventory	$ 3,873	$ 4,033	$ 4,434	$ 5,613	$ 6,914
Net Property, Plant, & Eqp.	$ 4,000	$ 4,469	$ 5,430	$ 7,369	$ 8,151
Depreciation	$ 4,669	$ 5,282	$ 6,742	$10,500	$13,086
Total Assets	$19,538	$20,710	$23,367	$33,300	$40,439
Total Current Liabilities	$ 9,720	$10,224	$10,828	$14,300	$17,259
Long-Term Debt	$ 1,377	$ 1,318	$ 1,674	$ 3,056	$ 3,115
Total Liabilities	$12,191	$12,706	$13,950	$19,563	$23,122
Total Shareholders' Equity	$ 7,347	$ 8,004	$ 9,416	$13,738	$17,317
Common Stock	$ 593	$ 571	$ 633	$ 881	$ 1,295
Retained Earnings	$ 4,699	$ 5,282	$ 6,407	$ 9,281	$11,468

Income Statement (March 31)	1984	1985	1986	1987	1988
Revenue	$18,504	$20,461	$22,670	$30,306	$35,791
Domestic Sales	$13,288	$13,788	$15,833	$22,375	$27,230
Overseas Sales	$ 5,216	$ 6,673	$ 6,837	$ 7,931	$ 8,561
Cost of Sales	$13,614	$14,890	$16,928	$22,969	$26,561
Gross Margin (%)	26	27	25	24	26
R&D Expense	$ 898	$ 1,094	$ 1,339	$ 1,925	$ 2,331
SG&A Expense	$ 2,462	$ 2,653	$ 3,018	$ 4,069	$ 5,094
Operating Income (Loss)	$ 1,530	$ 1,824	$ 1,385	$ 1,344	$ 1,806
Interest, Net	$ 195	$ 253	$ 294	$ 269	$ 576
Pretax Income	$ 1,725	$ 2,078	$ 1,679	$ 1,613	$ 2,381
Effective Tax Rate (%)	52	53	53	54	52
Extraordinary Items, Net	$ (114)	$ (118)	$ (104)	$ (119)	$ (158)
Net Income	$ 708	$ 857	$ 679	$ 619	$ 986
Avg. Shares Outstanding (M)	$ 2,802	$ 2,803	$ 2,803	$ 2,810	$ 2,869
Total Employees	161,533	164,951	164,117	161,325	159,910
Capital Expenditures (M)	$ 1,619	$ 1,857	$ 2,023	$ 2,231	$ 2,302
Exchange Rate (Yen per US$)	236	245	221	160	139

Source: Hitachi, Ltd.
Annual Reports

Hitachi, Ltd.

Table 1

Hitachi, Ltd.
Revenue by Lines of Business
(Billions of Yen)

	Fiscal Year Ending March 31				
	1984	1985	1986	1987	1988
Consumer Products	¥ 930	¥1,104	¥1,081	¥ 870	¥ 821
Industrial Machinery & Plants	730	786	835	809	829
Information & Communications Systems/Electronic Devices	1,174	1,507	1,452	1,491	1,659
Power Systems & Equipment	727	720	761	827	766
Wire & Cable, Metals, Chemicals, & Other	806	896	881	852	900
Total	¥4,367	¥5,013	¥5,010	¥4,849	¥4,975
Exchange Rate (Yen per US$)	¥ 236	¥ 245	¥ 221	¥ 160	¥ 139

Source: Hitachi, Ltd.
Annual Reports
Dataquest
October 1988

Hitachi, Ltd.

Table 2

Hitachi, Ltd.
Estimated Semiconductor Revenue
(Millions of Dollars)

	1983	1984	1985	1986	1987
Total Semiconductor	$1,277	$2,051	$1,671	$2,307	$2,781
Total Integrated Circuit	$ 912	$1,569	$1,236	$1,771	$2,169
Bipolar Digital (Technology)	144	223	195	339	410
TTL	-	170	143	243	302
ECL	-	36	36	82	94
Other Bipolar Digital		17	15	14	14
Bipolar Digital (Function)	144	223	195	339	410
Bipolar Digital Memory	52	59	55	80	93
Bipolar Digital Logic	92	164	140	259	317
MOS (Technology)	638	1,167	852	1,167	1,461
NMOS	383	708	493	668	788
PMOS	4	8	3	3	2
CMOS	251	451	356	496	671
MOS (Function)	638	1,167	853	1,167	1,461
MOS Memory	500	971	662	814	764
MOS Micro Devices	85	120	110	240	429
MOS Logic	53	76	81	113	268
Linear	130	179	189	265	298
Total Discrete	$ 331	$ 430	$ 393	$ 476	$ 544
Transistor	123	155	137	174	198
Diode	164	213	194	235	268
Thyristor	17	22	22	25	29
Other Discrete	27	40	39	42	49
Total Optoelectronic	$ 34	$ 52	$ 42	$ 60	$ 68
Exchange Rate (Yen/US$)	235	237	238	167	144

Source: Dataquest
October 1988

Hitachi, Ltd.

Table 3

Hitachi, Ltd.
Estimated Semiconductor Revenue by Geographic Region—1987
(Millions of Dollars)

	United States	Japan	Europe	Rest of World	Total
Total Semiconductor	$365	$1,929	$180	$307	$2,781
Integrated Circuit	320	1,474	169	206	2,169
Bipolar Digital	47	261	11	91	410
MOS	256	950	152	103	1,461
Linear	17	263	6	12	298
Discrete	20	427	7	90	544
Optoelectronic	25	28	4	11	68

Source: Dataquest
October 1988

Hitachi, Ltd.

Hitachi, Ltd.
6, Kanda-Surugadai
4-chome, Chiyoda-ku
Tokyo, 101, Japan
(Billions of Yen)

Balance Sheet (March 31)

	1984	1985	1986	1987	1988
Total Current Assets	¥ 3,029	¥ 3,319	¥ 3,276	¥ 3,445	¥ 3,757
Cash	¥ 1,015	¥ 1,182	¥ 1,154	¥ 1,364	¥ 1,516
Receivables	¥ 945	¥ 971	¥ 971	¥ 1,011	¥ 1,081
Inventory	¥ 914	¥ 988	¥ 980	¥ 898	¥ 961
Net Property, Plant, & Eqp.	¥ 944	¥ 1,095	¥ 1,200	¥ 1,179	¥ 1,133
Depreciation	¥ 1,102	¥ 1,294	¥ 1,490	¥ 1,680	¥ 1,819
Total Assets	¥ 4,611	¥ 5,074	¥ 5,164	¥ 5,328	¥ 5,621
Total Current Liabilities	¥ 2,294	¥ 2,505	¥ 2,393	¥ 2,288	¥ 2,399
Long-Term Debt	¥ 325	¥ 323	¥ 370	¥ 489	¥ 433
Total Liabilities	¥ 2,877	¥ 3,113	¥ 3,083	¥ 3,130	¥ 3,214
Total Shareholders' Equity	¥ 1,734	¥ 1,961	¥ 2,081	¥ 2,198	¥ 2,407
Common Stock	¥ 140	¥ 140	¥ 140	¥ 141	¥ 180
Retained Earnings	¥ 1,109	¥ 1,294	¥ 1,416	¥ 1,485	¥ 1,594

Income Statement (March 31)	1984	1985	1986	1987	1988
Revenue	¥ 4,367	¥ 5,013	¥ 5,010	¥ 4,849	¥ 4,975
Domestic Sales	¥ 3,136	¥ 3,378	¥ 3,499	¥ 3,580	¥ 3,785
Overseas Sales	¥ 1,231	¥ 1,635	¥ 1,511	¥ 1,269	¥ 1,190
Cost of Sales	¥ 3,213	¥ 3,648	¥ 3,741	¥ 3,675	¥ 3,692
Gross Margin (%)	26	27	25	24	26
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Pretax Income	407	509	371	258	331
Effective Tax Rate (%)	52	53	53	54	52
Extraordinary Items, Net	(27)	(29)	(23)	(19)	(22)
Net Income	¥ 167	¥ 210	¥ 150	¥ 99	¥ 137
Avg. Shares Outstanding (M)	2,802	2,803	2,803	2,810	2,869
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Capital Expenditure (¥M)	¥ 382	¥ 455	¥ 447	¥ 357	¥ 320
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Annual Reports

Hitachi, Ltd.

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(Millions of Dollars)

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Receivables	$ 4,004	$ 3,963	$ 4,394	$ 6,319	$ 7,777
Inventory	$ 3,873	$ 4,033	$ 4,434	$ 5,613	$ 6,914
Net Property, Plant, & Eqp.	$ 4,000	$ 4,469	$ 5,430	$ 7,369	$ 8,151
Depreciation	$ 4,669	$ 5,282	$ 6,742	$10,500	$13,086
Total Assets	$19,538	$20,710	$23,367	$33,300	$40,439
Total Current Liabilities	$ 9,720	$10,224	$10,828	$14,300	$17,259
Long-Term Debt	$ 1,377	$ 1,318	$ 1,674	$ 3,056	$ 3,115
Total Liabilities	$12,191	$12,706	$13,950	$19,563	$23,122
Total Shareholders' Equity	$ 7,347	$ 8,004	$ 9,416	$13,738	$17,317
Common Stock	$ 593	$ 571	$ 633	$ 881	$ 1,295
Retained Earnings	$ 4,699	$ 5,282	$ 6,407	$ 9,281	$11,468

Income Statement (March 31)	1984	1985	1986	1987	1988
Revenue	$18,504	$20,461	$22,670	$30,306	$35,791
Domestic Sales	$13,288	$13,788	$15,833	$22,375	$27,230
Overseas Sales	$ 5,216	$ 6,673	$ 6,837	$ 7,931	$ 8,561
Cost of Sales	$13,614	$14,890	$16,928	$22,969	$26,561
Gross Margin (%)	26	27	25	24	26
R&D Expense	$ 898	$ 1,094	$ 1,339	$ 1,925	$ 2,331
SG&A Expense	$ 2,462	$ 2,653	$ 3,018	$ 4,069	$ 5,094
Operating Income (Loss)	$ 1,530	$ 1,824	$ 1,385	$ 1,344	$ 1,806
Interest, Net	$ 195	$ 253	$ 294	$ 269	$ 576
Pretax Income	$ 1,725	$ 2,078	$ 1,679	$ 1,613	$ 2,381
Effective Tax Rate (%)	52	53	53	54	52
Extraordinary Items, Net	$ (114)	$ (118)	$ (104)	$ (119)	$ (158)
Net Income	$ 708	$ 857	$ 679	$ 619	$ 986
Avg. Shares Outstanding (M)	$ 2,802	$ 2,803	$ 2,803	$ 2,810	$ 2,869
Total Employees	161,533	164,951	164,117	161,325	159,910
Capital Expenditures (M)	$ 1,619	$ 1,857	$ 2,023	$ 2,231	$ 2,302
Exchange Rate (Yen per US$)	236	245	221	160	139

Source: Hitachi, Ltd.
Annual Reports

Hitachi, Ltd.

THE COMPANY

Executive Summary

The following paragraphs summarize significant information about Hitachi:

- Hitachi reported fiscal 1988 consolidated revenue of ¥4,975 billion, a 3 percent increase from fiscal 1987.
- Hitachi, Ltd., is the largest electronics manufacturer in Japan under the leadership of chairman, Hirokichi Yoshiyama, and president, Katsushige Mita.
- Hitachi, Ltd., is the third-largest worldwide supplier of semiconductors, with annual sales in calendar 1987 of $2,532 million.

The major shareholders of Hitachi are shown in Table 1.

Table 1

Hitachi, Ltd.
Major Shareholders

Shareholder	Percent Shares
Mitsubishi Trust	4.5%
Nippon Life Insurance	4.0%
Toyo Trust	2.9%
Mitsui Trust	2.9%
Dai-Ichi Mutual Life Insurance	2.7%
Industrial Bank of Japan	2.5%
Sanwa Bank	2.4%
Group Companies' Stockholders	2.3%
Yasuda Trust	2.2%

Source: Japan Company Handbook

Hitachi, Ltd.

OVERVIEW

Hitachi, Ltd., was founded to develop indigenous Japanese electrical power equipment manufacturing technology. The Company initially emphasized the development of heavy electrical equipment and industrial machinery. After World War II, Hitachi expanded into the consumer product area, and in the 1950s, entered the electronics field, producing computers, semiconductors, and other electronic devices.

Over the years, Hitachi continued to expand and diversify the scope of its business activities, which led to the development of the Hitachi Group. The Hitachi Group is made up of Hitachi, Ltd., domestic and overseas and its subsidiaries and affiliates, including the three major subsidiaries—Hitachi Chemical, Hitachi Metals, and Hitachi Cable. The group companies conduct business in the fields of electrical and electronic equipment, metals, metallic products, machinery, chemicals, trading, and transportation. Figure 1 is a diagram of the Hitachi Group of companies. Figure 2 is an organization chart of Hitachi, Ltd.

New technologies and products developed by Hitachi are the driving force behind its progress. The Company has consistently maintained a high level of research and development (R&D) expenditure and places special emphasis on areas with high-growth potential. Hitachi views electronics and the development of alternative energy sources as its two areas of strategic growth during the 1980s.

Hitachi is also intensifying its international activities to increase its presence as an international corporation.

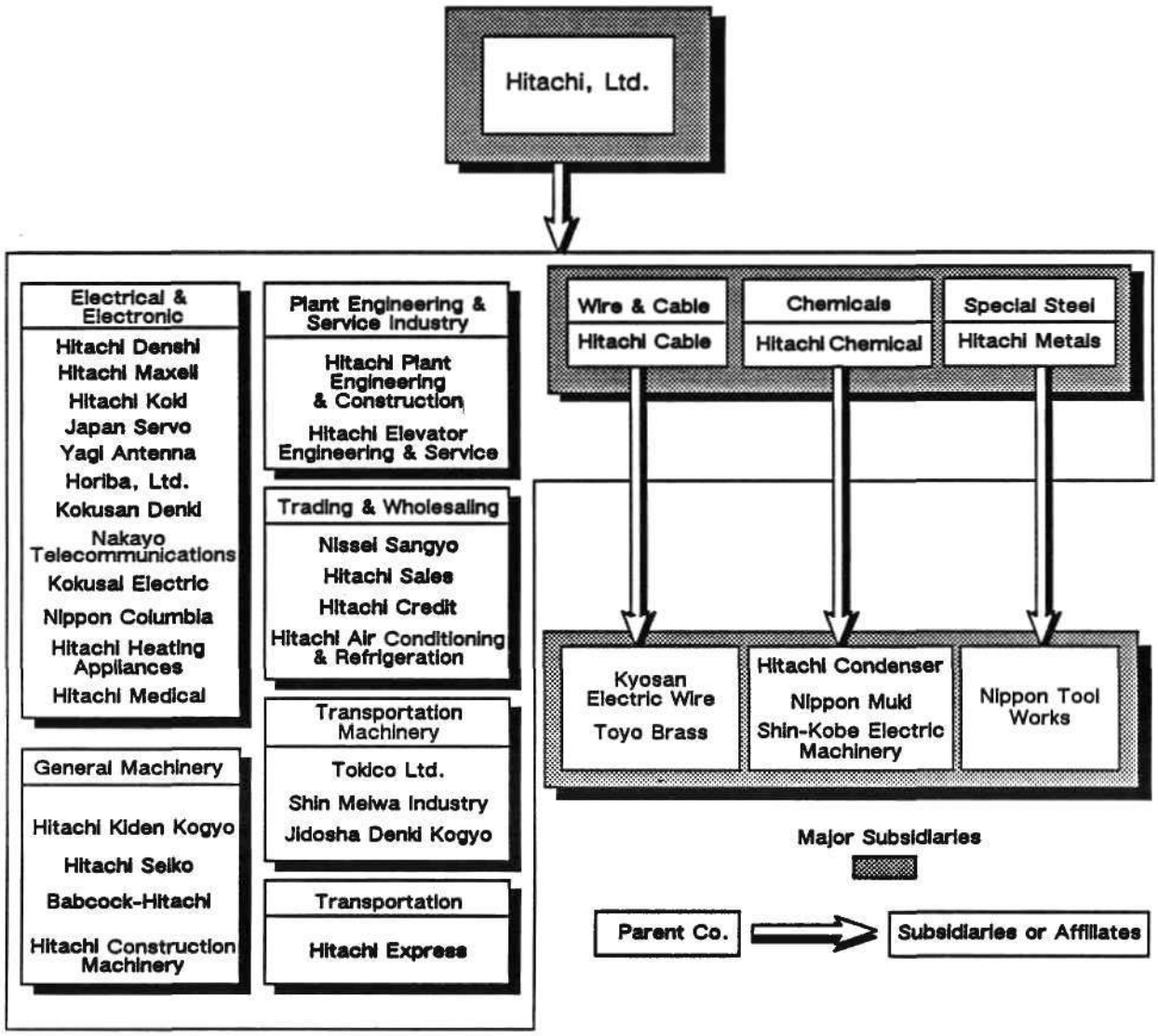
Of Hitachi's outstanding stock, 13.3 percent is owned by non-Japanese parties. Hitachi is listed on the Amsterdam, Frankfurt, Hong Kong, Luxembourg, Paris, and New York stock exchanges, as well as on the eight domestic markets.

Major short- and long-term Hitachi borrowings are from Dai-Ichi Kangyo Bank, Fuji Bank, Industrial Bank of Japan, and Sanwa Bank.

Hitachi, Ltd.

Figure 1

Hitachi Group

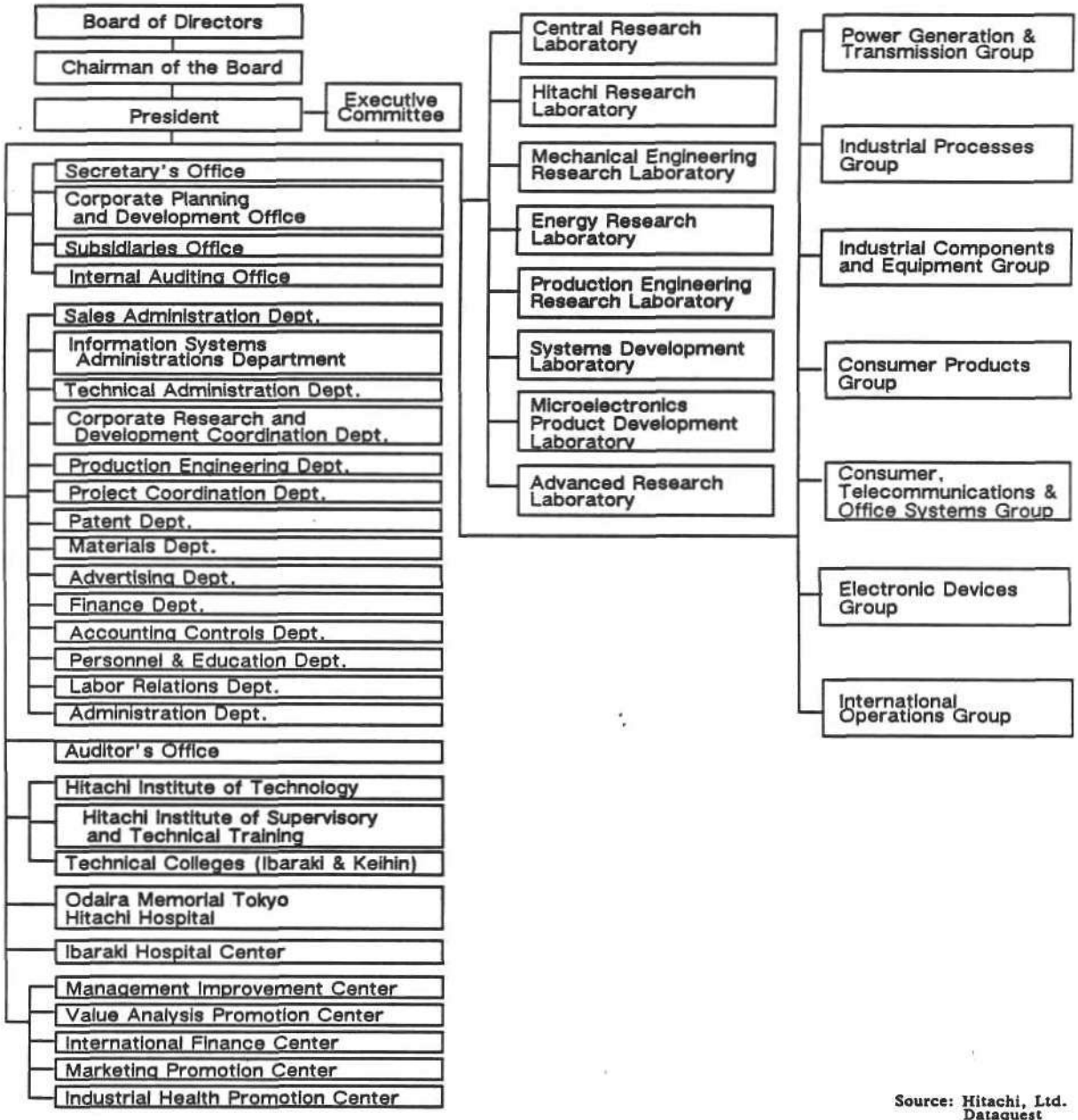


Source: Industrial Groupings in Japan 1986/87
Dodwell, Tokyo

Hitachi, Ltd.

Figure 2

Hitachi, Ltd.
Organization Chart



Source: Hitachi, Ltd.
Dataquest
October 1988

Hitachi, Ltd.

OPERATIONS

Consolidated revenue of ¥4,975 billion in the period ending March 31, 1988, increased slightly from the previous year's sales of ¥4,849 billion. Net income was ¥137 billion, an increase of 38 percent from ¥99 billion in 1987.

The improved results were attributed mainly to advances in the computer segment, a recovery in the semiconductor segment, and an upswing in domestic demand. These positive factors offset declines in the Company's Power Systems and Equipment and Consumer Products sectors. Hitachi's revenue by line of business is shown in Table 2 and in Figure 3.

Table 2

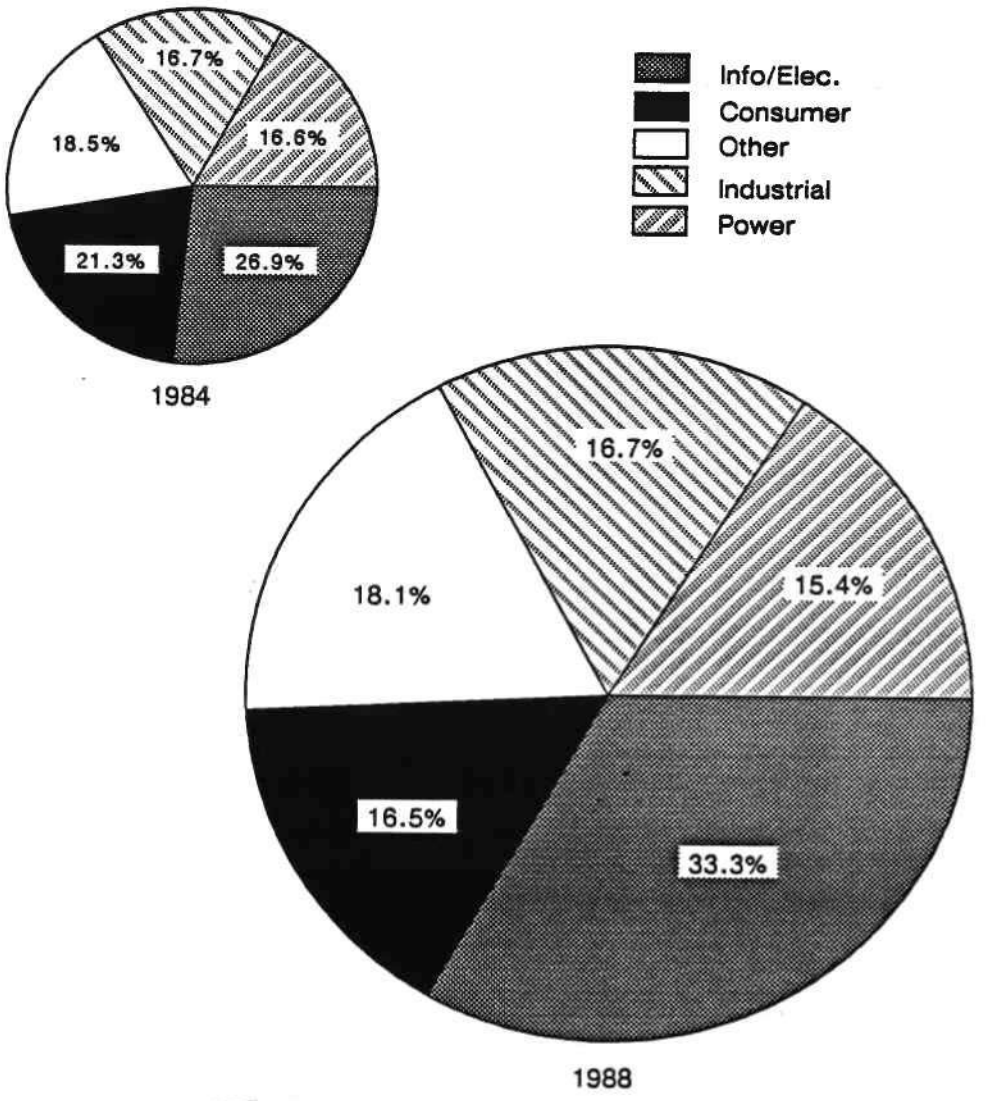
Hitachi, Ltd.
Revenue by Lines of Business
(Billions of Yen)

	Fiscal Year Ending March 31				
	1984	1985	1986	1987	1988
Consumer Products	¥ 930	¥1,104	¥1,081	¥ 870	¥ 821
Industrial Machinery & Plants	730	786	835	809	829
Information & Communications Systems/Electronic Devices	1,174	1,507	1,452	1,491	1,659
Power Systems & Equipment	727	720	761	827	766
Wire & Cable, Metals, Chemicals, & Other	806	896	881	852	900
Total	¥4,367	¥5,013	¥5,010	¥4,849	¥4,975
Exchange Rate (Yen per US$)	¥ 236	¥ 245	¥ 221	¥ 160	¥ 139

Source: Hitachi, Ltd. Annual Reports
Dataquest October 1988

Figure 3

Hitachi, Ltd.
Net Sales by Product Category
(Percent of Yen)



Source: Dataquest
October 1988

The electronics sector posted an 11 percent gain partly due to a demand for large computer systems from the financial and service sectors. The Company's semiconductor operations also contributed to the gain as a result of the shipment of 1Mb DRAMs and other memory devices. Hitachi is one of the top four suppliers of communication equipment to Nippon Telegraph and Telephone (NTT), along with Fujitsu Limited, NEC Corporation, and Oki Electric Industry Company Limited.

The Company's Industrial Machinery and Plants division and Other Products Division both reported sales increases in 1988. The increases were attributed to building construction growth and the public works-related sectors, two areas that benefited from the rise in domestic demand.

The Consumer Products Division showed a sales decrease in 1988 despite brisk domestic sales of audio/video equipment and related products. The decrease was due to declining prices, intense competition, and the depressing effect of the yen on exports.

International Activities

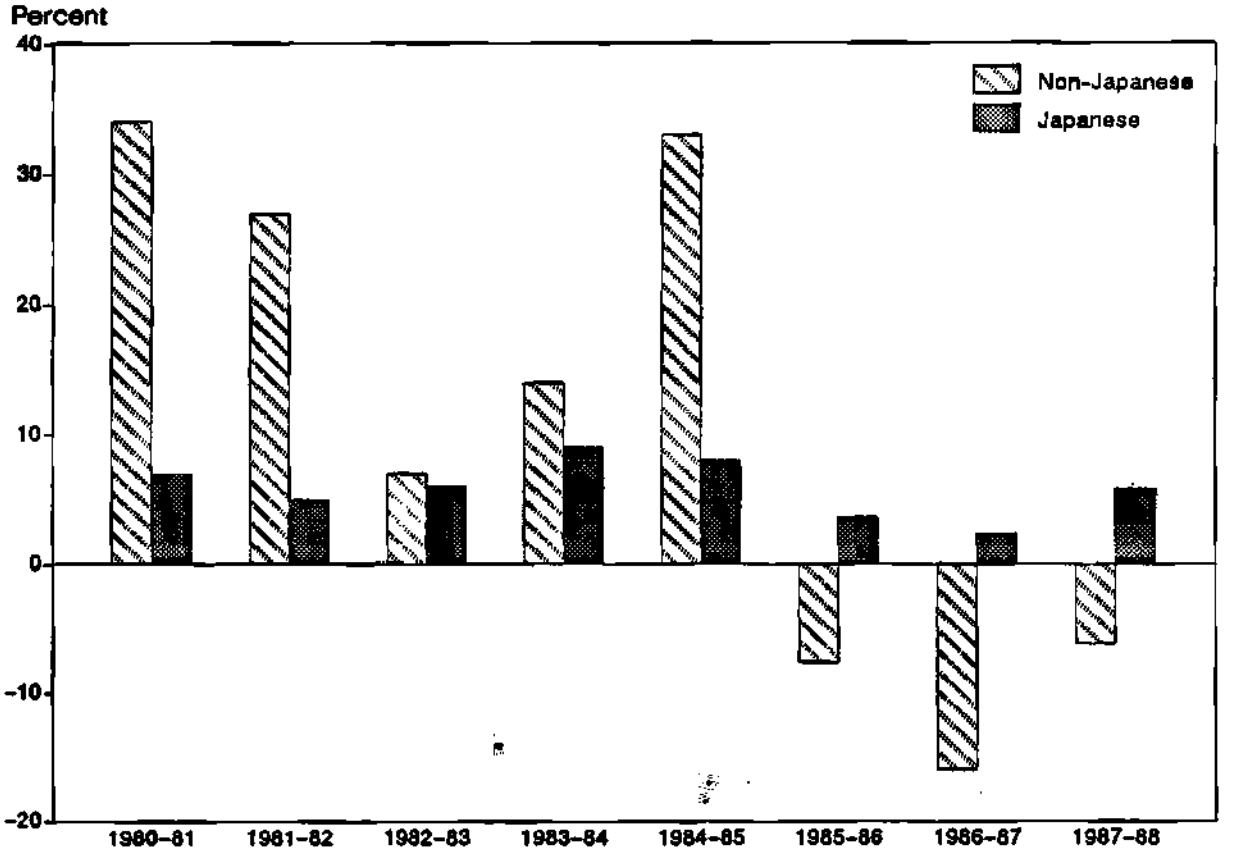
Hitachi reported a decrease in overseas revenue for the third year in a row. Overseas revenue for 1988 was ¥1,190 billion compared with ¥1,269 billion in 1987 and ¥1,511 billion in 1986. In 1980, Hitachi stated that it planned to increase exports to 30 percent of total revenue, a figure it surpassed in 1985. Since then, overseas revenue was 30 percent of total revenue in 1986, 26 percent in 1987, and 24 percent in 1988. Total revenue has increased from ¥2,937 billion in 1980 to ¥4,975 in 1988. Figure 4 shows the changes in domestic and overseas revenue from 1980 through 1988.

Hitachi is taking the following steps to improve its position as an international corporation:

- Continuing to increase R&D investment
- Improving production technology and reducing costs
- Increasing its overseas production bases
- Increasing overseas materials procurement
- Promoting cultural and technology exchanges—Hitachi set up The Hitachi Foundation to further U.S.-Japanese exchanges
- Boosting the efficiency of fund utilization

Figure 4

Hitachi, Ltd.
Growth of Nondomestic Revenue vs. Domestic Revenue
(Percent of Yen)



Source: Dataquest
October 1988

Channels of Distribution

Hitachi has developed a global network of production, exports, material and funds procurement, and a sales operation that includes eight overseas consolidated subsidiaries and liaison, sales, and service offices in most major countries of the world. The Company's worldwide sales organization consists of offices throughout North, Central, and South America; Western Europe; and Asia and Oceania. The Company's semiconductor products are marketed overseas through distributors and by Hitachi's own sales force.

Hitachi, Ltd.

In Japan, almost 70 percent of Hitachi's semiconductor products are marketed through distributors, and 30 percent are marketed by the Company's sales force, as follows:

- Hitachi distributes consumer products through Hitachi Sales Corporation, a 66-percent-owned consolidated subsidiary with sales offices throughout Japan, which in turn distributes the products through wholesalers to retail outlets.
- Computer equipment may be purchased or rented directly from the Company. Some Hitachi computers are rented through Japan Electronic Computer Co., Ltd., a rental company owned by the major Japanese computer manufacturers—Fujitsu, Mitsubishi, and NEC.
- Hitachi has three major Japanese distributors: Nissei Denshi Co., Ltd., Nissei Sangyo, and Easton Electronics.

Facilities

Hitachi's 18 Japanese semiconductor manufacturing facilities are listed in Table 3 and shown on the map in Figure 5. Hitachi also has a plant in Irving, Texas, that assembles MOS memory products for sale in the United States. In February 1988, Hitachi announced that it was expanding the Texas plant into a full-scale production unit. The plant will perform wafer fabrication and test in addition to assembly. The Company expects the installation of clean rooms to be completed by December 1988 and wafer fabrication to begin by May 1989. Initially, the facility will produce 1.3-micron MOS memories, with MCUs and ASICs to be added at a later date. Hitachi assembles MOS memory products for sale in Europe in Landshut, West Germany.

Hitachi, Ltd.

Table 3

Hitachi, Ltd.
Japanese Semiconductor Manufacturing Plants

Map Code	Plant Name	Year Established	Employees	Floor Space (M^2)	Function/Products
A	Akita Electronics Co., Main Plant	1969	250	13,000	Assy, Inspection--MOS IC, Bipolar IC
B	Akita Electronics Co., Yuwa Plant	1972	200	8,000	Assy, Inspection--MOS IC, Bipolar IC
C	Hitachi, Ltd. Hitachi Works	1983	200	2,000	Front end--Bipolar Digital
D	Hitachi, Ltd. Kofu Works	1969	1,400	43,435	Full process of Diode, Front end of MOS
E	Hitachi, Ltd. Komoro Works	1969	750	N/A	Full process--Photo device, hybrid IC
F	Hitachi, Ltd. Mobara Works	1943	9,068	10,000	Full process--MOS Memory, CMOS Logic, Linear
G	Hitachi, Ltd. Musashi Works	1958	2,682	83,200	Full process--R&D
H	Hitachi, Ltd. Naka Works	1985	1,828	15,000	Full process--MOS Memory, s/c sensor
I	Hitachi, Ltd. Takasaki Works	1970	1,947	93,000	Full process--Bipolar, MOS EPROM, CMOS Logic
J	Hitachi Haramachi Semiconductor, Ltd., Haramachi Plant	N/A	680	N/A	Full process--Diode, Thyristor
K	Hitachi Hokkai Semiconductor Co. Chitose Works	1983	360	20,000	Assy, Inspection--MOS Memory

(Continued)

Table 3 (Continued)

Hitachi, Ltd.
Japanese Semiconductor Manufacturing Plants

Map Code	Plant Name	Year Established	Employees	Floor Space (M^2)	Function/Products
L	Hitachi Hokkai Semiconductor Co. HQ	1974	1,800	N/A	Assy--MOS IC
M	Hitachi Microcomputer Engineering, Ltd.	1980	1,600	8,000	Full process--R&D, Trial Production of MPU, ASICs
N	Hitachi Nissin Elec., Ltd., Tsuchiura Plant	1985	150	2,400	Assy, Inspection--MOS LSI
O	Hitachi Tobu Semiconductor, Ltd., Main Plant	1965	1,400	2,363	Assy--Transistor, Hybrid IC
P	Hitachi Tobu Semiconductor, Ltd., Tsugaru Works	1974	500	22,000	Assy, Inspection--Bipolar IC
Q	Hitachi Tokyo Elec. Co., Yamanashi Works	1963	1,900	5,000	Assy, Inspection--Diode, Bipolar IC
R	Hitachi Tokyo Elec. Co., Yanai Works	1983	350	6,500	Assy--Bipolar, Diode
S	Hitachi Yomezawa Elec. Co.	1969	600	16,000	Assy, Inspection--MOS LSI
T	Toyo Electronics, Ltd., Niigata Works	N/A	220	2,400	Assy--Linear, Bipolar Digital
U	Toyo Electronics, Ltd., Kofu Works	1982	150	1,000	Assy--Diode, MOS Memory

N/A = Not Available

Source: Dataquest
October 1988

Hitachi, Ltd.

Figure 5

Hitachi, Ltd.
Japanese Semiconductor Manufacturing Facilities

Source: Dataquest
October 1988

Hitachi, Ltd.

Capital Spending and Research and Development Spending

Hitachi invested ¥405 billion in fiscal 1988 in plant and equipment, a 12 percent increase compared with ¥357 billion invested in fiscal 1987.

Hitachi continues to increase investment in R&D, which reflects the corporate philosophy that the development of leading-edge technology is essential to the Company's long-term growth. During fiscal 1988, the Company spent ¥324 billion on R&D, an increase of 5 percent from fiscal 1987. In fiscal 1981, R&D spending was only 3.7 percent of revenue; in fiscal 1988, R&D spending was 7 percent of revenue. Over the past several years, about half of R&D has been directed into the electronics sector.

Table 4 shows the continued commitment by Hitachi to both R&D and capital investments.

Table 4

Hitachi, Ltd.
Capital Spending and R&D Spending as a Percent of Revenue
(Billions of Yen)

	1984	1985	1986	1987	1988
Revenue	¥4,367	¥5,013	¥5,010	¥4,849	¥4,975
Capital Expenditures	¥ 382	¥ 455	¥ 447	¥ 357	¥ 320
Percent of Revenue	9	9	9	7	6
R&D Expense	¥ 212	¥ 268	¥ 296	¥ 308	¥ 324
Percent of Revenue	5	5	6	6	7
Combined Capital and R&D Spending	¥ 594	¥ 723	¥ 743	¥ 665	¥ 644
Percent of Revenue	14	14	15	13	13
Exchange Rate (Yen per US$)	236	245	221	160	139

Source: Hitachi, Ltd.
Annual Reports

Hitachi, Ltd.

Table 5 shows Hitachi's capital spending and R&D spending in dollars.

Table 6 shows Hitachi's semiconductor capital spending as a percent of the Company's semiconductor revenue by calendar year. Dataquest believes that Hitachi's semiconductor capital investment will be $385 million in calendar year 1988, an increase of 85 percent from the $208 million invested in 1987.

Table 5

Hitachi, Ltd.
Capital Spending and R&D Spending
(Millions of Dollars)

	1984	1985	1986	1987	1988
Revenue	$18,504	$20,461	$22,670	$30,306	$35,791
Capital Expenditures	$ 1,619	$ 1,857	$ 2,023	$ 2,231	$ 2,302
Percent of Revenue	9%	9%	9%	7%	8%
R&D Expense	$ 898	$ 1,094	$ 1,339	$ 1,925	$ 2,331
Percent of Revenue	5%	5%	6%	6%	7%
Combined Capital and	$ 2,517	$ 2,951	$ 3,362	$ 4,156	$ 4,633
Percent of Revenue	14%	14%	15%	13%	13%
Exchange Rate (Yen per US$)	236	245	221	160	139

Source: Hitachi, Ltd.
Annual Reports

Hitachi, Ltd.

Table 6

Hitachi, Ltd.
Semiconductor Capital Spending by Calendar Year
(Millions of Dollars)

	1983	1984	1985	1986	1987
Semiconductor Revenue	$1,277	$2,051	$1,671	$2,157	$2,532
Semiconductor Capital Spending	$ 264	$ 506	$ 387	$ 318	$ 208
Percent of Semiconductor Revenue	21%	25%	23%	15%	8%

Source: Dataquest
October 1988

In the first quarter of 1988, Hitachi announced that it intended to resume semiconductor production in the United States. The Company had stopped investing in the United States after it completed a factory building in Irving, Texas, in early 1987. Since semiconductor demand has been steadily recovering since the latter half of 1987, Hitachi has decided to resume its investment in the factory. It plans to begin fully integrated production of SRAMs, mainly 256K models, in the spring of 1989. Hitachi will be the first Japanese semiconductor maker to start fully integrated production of SRAMs in a foreign country.

Hitachi's stated attitude toward research and development is reflected in the following objectives:

- Focus strongly on the development of cutting-edge technology
- Develop original technology (i.e., not to rely on imported technology)
- Concentrate on basic research as well as on applied technology (Advanced Research Laboratory established in 1985 to develop technologies for Hitachi's long-term growth)

Hitachi operates 11 R&D centers as listed below:

- Central Research Laboratory (Kokubunji City)
- Hitachi Research Laboratory (Hitachi City)
- Mechanical Engineering Research Laboratory (Tsuchiura City)

Hitachi, Ltd.

- Energy Research Laboratory (Hitachi City)
- Production Engineering Research Laboratory (Yokohama Works)
- System Development Laboratory (Kawasaki City)
- Design Center (Kodaira City)
- Consumer Products Research Center (Yokohama City)
- Device Development Center (Kodaira City)
- Microelectronics Products Development Laboratory (Yokohama City)
- Advanced Research Laboratory

There are also independent research groups in each factory.

Hitachi also conducts research and development in cooperation with other Japanese companies:

- Hitachi and NTT will conduct research in the area of small-ring SOR (synchrotron orbital radiation) equipment. A project involving a 64Mb DRAM ring began in the fall of 1987.
- In 1986, Hitachi joined seven other Japanese companies (Fujitsu, Matsushita, Mitsubishi, NEC, NTT, Oki Electric, and Toshiba) to form the TRON Council (The Real-Time Operating Nucleus) to accelerate the development of proprietary 32-bit MPU technology and operating systems for next-generation microcomputers.
  - Headed by Hitachi's Kazuo Kanahara, the project is developing three operating systems capable of handling Japanese and other foreign languages.
  - These systems are B-TRON for office automation equipment, I-TRON for real-time industrial systems, and M-TRON for networking with distributed processors.
  - Hitachi, NEC, and others have already developed several I-TRON operating systems for 16-bit and 32-bit MPUs.
  - In March 1986, Hitachi announced TRON-based operating systems to be used with foreign MPUs in industrial applications. Hitachi has developed a system for Motorola's 68000.

Hitachi, Ltd.

- In February 1986, Hitachi and General Motors agreed to an extensive tie-up to pursue joint R&D and production projects in six high-technology areas: automotive parts, semiconductors and other electronics, computers, optical fibers, magnetic and other new materials, and factory automation.

- Hitachi, Toshiba Corporation, and General Electric Company are working jointly in the area of energy management.

In addition, Hitachi participates in the following government sponsored programs:

- The VLSI Research Association—a four-year program begun in 1976 and 50 percent subsidized by the Japanese government

- The Fifth Generation Computer project—eight companies that formed a joint venture to develop a 900,000-word electronic dictionary for fifth-generation computers

PRODUCTS AND MARKETS

Semiconductor Product Markets

Hitachi is the third largest worldwide semiconductor manufacturer, with $2,532 million in 1987 revenue, of which 49 percent is MOS digital (see Table 7). The Company made extraordinary gains in MOS logic. MOS logic revenue grew 60 percent from $106 million in 1986 to $170 million in 1987.

Table 7

Hitachi, Ltd.
Estimated Semiconductor Revenue
(Millions of Dollars)

	1983	1984	1985	1986	1987
Total Semiconductor	$1,277	$2,051	$1,671	$2,157	$2,532
Total Integrated Circuit	$ 912	$1,569	$1,236	$1,639	$1,941
Bipolar Digital (Technology)	144	223	195	321	395
TTL	-	170	143	234	299
ECL	-	36	36	76	88
Other Bipolar Digital		17	15	11	8

(Continued)

Hitachi, Ltd.

Table 7 (Continued)

Hitachi, Ltd.
Estimated Semiconductor Revenue
(Millions of Dollars)

	1983	1984	1985	1986	1987
Total Semiconductor (Continued)					
Total Integrated Circuit (Continued)					
Bipolar Digital (Function)	144	223	195	321	395
Bipolar Digital Memory	52	59	55	81	95
Bipolar Digital Logic	92	164	140	240	300
MOS (Technology)	638	1,167	852	1,053	1,236
NMOS	383	708	493	457	460
PMOS	4	8	3	3	2
CMOS	251	451	356	593	774
MOS (Function)	638	1,167	853	1,053	1,236
MOS Memory	500	971	662	719	769
MOS Micro Devices	85	120	110	228	297
MOS Logic	53	76	81	106	170
Linear	130	179	189	265	310
Total Discrete	$ 331	$ 430	$ 393	$ 476	$ 544
Transistor	123	155	137	173	198
Diode	164	213	194	235	268
Thyristor	17	22	22	25	29
Other Discrete	27	40	39	43	49
Total Optoelectronic	$ 34	$ 52	$ 42	$ 42	$ 47
Exchange Rate (Yen/US$)	235	237	238	167	144

Source: Dataquest
October 1988

Hitachi ceded its position as the largest MOS memory supplier to NEC in 1987, with sales of $769 million. This amount is a 7 percent increase from the $719 million reported in 1986. NEC, formerly the second largest MOS memory supplier, had 1986 MOS memory revenue of $586 million and 1987 MOS memory revenue of $838 million.

Hitachi, Ltd.

Overall, Hitachi did not grow as fast as the industry as a whole. See Table 8 for Hitachi's worldwide ranking and the Company's 1986–1987 growth rate compared with the industry growth rate.

Table 8

Hitachi, Ltd.
Worldwide Ranking by Semiconductor Markets
(Millions of Dollars)

	1986 Rank	1987 Rank	1987 Revenue	Revenue % Change 1986–1987	Industry % Change 1986–1987
Total Semiconductor	3	3	$2,532	17.4%	23.0%
Integrated Circuits	3	4	1,941	18.4%	25.9%
Bipolar Digital	7	7	395	23.1%	8.3%
MOS Digital	3	4	1,236	17.4%	35.3%
Linear	11	9	310	17.0%	19.1%
Discrete	3	3	544	14.3%	13.2%
Opto	13	13	47	11.9%	16.3%

Source: Dataquest
October 1988

Dataquest estimates that approximately 69 percent, or $1,929 million, of Hitachi's semiconductor sales were to Japan. Approximately 13 percent were to the United States, 7 percent to Europe, and the remaining 11 percent to the ROW countries. Table 9 shows Hitachi's semiconductor revenue by geographic region.

Table 9

Hitachi, Ltd.
Estimated Semiconductor Revenue by Geographic Region—1987
(Millions of Dollars)

	United States	Japan	Europe	Rest of World	Total
Total Semiconductor	$335	$1,751	$156	$290	$2,532
Integrated Circuit	311	1,296	145	189	1,941
Bipolar Digital	35	264	5	91	395
MOS	256	759	135	86	1,236
Linear	20	273	5	12	310
Discrete	19	427	8	90	544
Optoelectronic	5	28	3	11	47

Source: Dataquest
October 1988

Product Portfolio Analysis

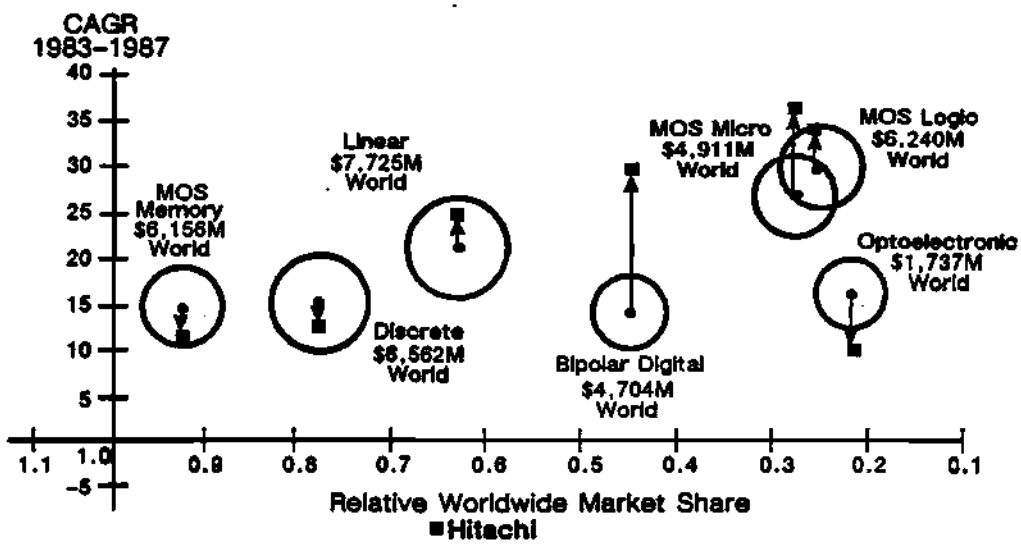
Figure 6 shows Hitachi's 1987 product portfolio analysis compared with worldwide competition. This figure is designed to show which product areas the Company has chosen to focus on. Figure 7 is a similar analysis of Hitachi's performance vis-a-vis its Japanese competitors.

The x axis is Hitachi's market share relative to the leading manufacturer in each product area. If Hitachi is the leader in a product area, the market share shown is relative to the Company's next competitor.

The y axis is the historical product CAGR from 1983 to 1987. Hitachi's CAGR for each product is marked by a small square. In Figure 6, the worldwide product CAGR is marked by a dot within a circle that represents total world market for the product. In Figure 7, the total Japanese company CAGR for each product is marked by a dot within a circle that represents total Japanese company sales for the product.

Figure 6

Hitachi, Ltd.
Product Portfolio
Compared to Worldwide Competition

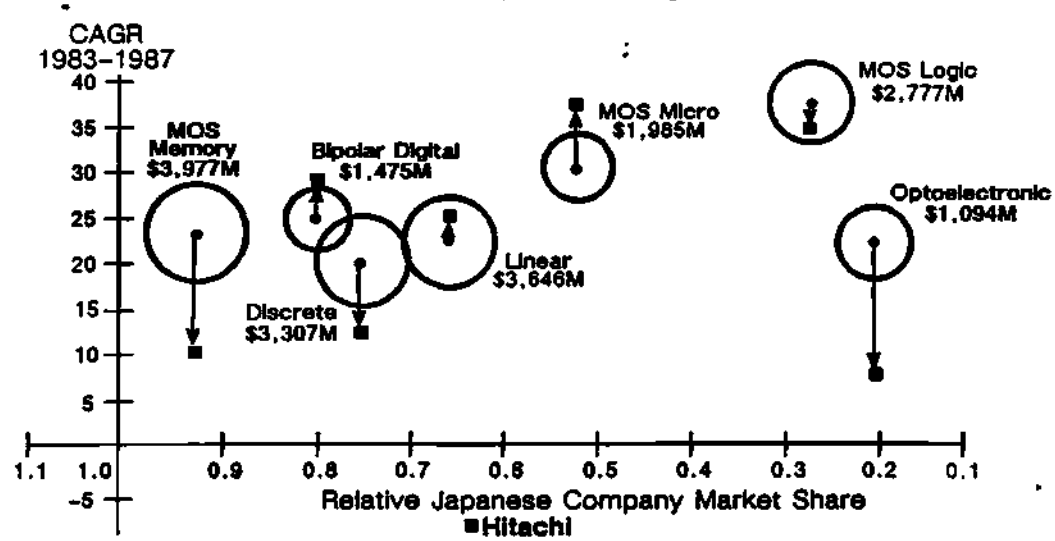


Note: Up arrow indicates growth higher than worldwide industry average; down arrow indicates the opposite.

Source: Dataquest October 1988

Figure 7

Hitachi, Ltd.
Product Portfolio
Compared to Japanese Competition



Note: Up arrow indicates growth higher than Japanese companies' average; down arrow indicates the opposite.

Source: Dataquest October 1988

Hitachi, Ltd.

The meanings of the graph point locations are as follows:

- Upper Right Quadrant—These are the "developing products." The Company is not currently a leading supplier in these products, but the products exhibit positive growth.

- Upper Left Quadrant—These are the "stars." The Company is the leading supplier in these products, and the products exhibit positive growth.

- Lower Left Quadrant—These are the "cash cows." The Company is the leading supplier in a declining product segment, but there is generally a high profit margin on these products.

- Lower Right Quadrant—These are the "dogs." The TAM for this product area is decreasing, and the Company is not the leading supplier.

A worldwide competitive analysis shows that Hitachi's growth has been significantly higher than the industry average in linear, bipolar digital, MOS microdevices, and MOS logic. Of particular note is MOS memory, where Hitachi is the second largest supplier. Hitachi's growth in MOS memory, as well as in discrete and optoelectronic, has been lower than the industry average.

Against its Japanese competitors, Hitachi's growth rates were higher than average in only two product categories: bipolar digital and MOS microdevices. Its growth was equal to the Japanese company average in linear and below the average in MOS memory, discrete, MOS logic, and optoelectronic.

Semiconductor Products and Technologies

Hitachi's semiconductor products span the entire range, including bipolar digital memory and logic, MOS memory, microdevices and logic, linear ICs, and all types of discrete and optoelectronic devices.

To reinforce its semiconductor business, Hitachi continued to push ahead with a vigorous program of research and development related to advanced products and also to diversify its product line. In fiscal 1988, the Company focused on expanding its range of microprocessors, gate arrays, and other logic devices while moving to bring its 1.3-micron process on-line.

The following are some of Hitachi's 1987 and 1988 product announcements:

Analog

- Hitachi developed a coder-decoder IC and a phase-locked loop (PLL) IC for coded mark inversion (CMI) communication using a 2-micron rule HIBICMOS process. The HD153201 and HD152202 function in high-speed data transmission and also feature high-speed response and low power consumption.

Hitachi, Ltd.

Application-Specific Integrated Circuits

- Hitachi's HG62E Series of CMOS gate arrays incorporate an automatic diagnostic function consisting of functions for automatic test circuit creation and test pattern generation. The series is fabricated using 1.0-micron CMOS process technology, offers a typical gate delay of 0.7ns, and is available with up to 24,000 gates.

- Hitachi made plans to enter the next-generation gate array market by commercializing a sea-of-gates technology. Several models with 20,000 to 50,000 gates were planned for sale in the spring of 1988.

Gallium Arsenide

- Under the MITI Scientific Computing Systems Program, Hitachi's Central Research Lab in Kokubunji, Tokyo, has fabricated and tested ECL-compatible 1K and 4K GaAs enhancement/depletion (E/D) mode, direct-coupled FET logic (DCFL) SRAMs. The chips have an access-time spread of less than 1ns and use conventional Schottky-coupled FET logic (SCFL) interface circuit structures for improved noise margin.

Memory

- Hitachi began 1Mb DRAM assembly at Hitachi Semiconductor, Malaysia.

- Hitachi planned to increase memory production between October 1987 and March 1988 to 30 percent of the Company's total semiconductor production. The increase will be focused on high value-added products such as 1Mb DRAMs.

- Hitachi announced plans to begin 4Mb DRAM production in 1988. The 4Mb DRAM employs a 0.8-micron CMOS process technology and offers an 80ns access time. The device has three column access functions: high-speed page mode, nibble mode, and static column mode. Bit organization is selectable from both the x1 and x4 versions. For high-density board design, the chip can be housed in a small outline J-bend package or in a zig-zag in-line package.

- Hitachi announced that it has developed a 16Mb DRAM with an access time of 60ns. The DRAM is fabricated using 0.6-micron CMOS technology and is organized 16Mbx1.

- Hitachi introduced the HD63487 Memory Interface and Video Attribute Controller (MIVAC), a single-chip graphics support device. When used with Hitachi's existing advanced CRT controller chip and Hitachi's 1Mb DRAM, the device can be used to build a low-cost graphics system in the space of a business card. Such a system can draw images into its memory at 2 million pixels per second and then transfer those images to a CRT at 33 million pixels per second.

Hitachi, Ltd.

- Hitachi is producing 64K SRAMs with an access time of 15ns. Bit configuration is available in either x1 or x4.

- Hitachi is offering the HM100500–15, a 256K SRAM with an access time of 15ns. The device is fabricated using a 1.0–micron HIBICMOS technology.

- Hitachi has developed the HM628128, a 1Mb CMOS SRAM organized 128Kx8. The device employs a 0.8–micron HICMOS process.

- Hitachi announced plans to boost production of 1Mb pseudo SRAMs as a result of increased demand from OA equipment makers. SRAMs will be increased to 100,000 units per month from the current 50,000 units at the Naka Plant in Ibaraki prefecture. The Company also announced plans to sample 4Mb pseudo SRAMs.

- Hitachi stopped production of 64K DRAMs and 64K and 128K EPROMs and increased production of 512K and 1Mb EPROMs and MCUs.

Microprocessors/Microcontrollers

- Hitachi is offering the HD64180Z, an 8–bit MPU that operates at 8 MHz. The device contains MMU, direct memory access controller, a memory refresh unit, two serial communication interfaces, two 16–bit timers, and an interrupt controller. The device is in production now.

- The G Micro Group, which consists of Fujitsu Ltd., Hitachi, and Mitsubishi Electric Corporation, developed a 32–bit MPU and three models of peripheral LSIs based on the TRON operating system. The GMICRO200, an MPU developed by Hitachi, integrates about 73,000 transistors on one chip. Hitachi plans to begin volume production in the autumn of 1988. The three peripheral LSIs, including a direct memory access controller, were developed by Fujitsu. Fujitsu and Mitsubishi also plan to begin volume production of the 32–bit MPU by licensing the Hitachi technology.

- Hitachi sampled the HD6840F controller that converts RGB video signals to LCD drive signals.

- Hitachi reported that it will discontinue production of six models of CMOS 8–bit microcontrollers that use Motorola architecture. The Company negotiated with Motorola to continue production, but did not reach an agreement. The HD63705V, HD63705Z, and HD6305Z will be discontinued as of March 31, 1990. The HD63701V, HD63701X, and HP63701Y will be discontinued as of March 21, 1991.

Hitachi, Ltd.

Optoelectronics

- Hitachi's Central Research Lab fabricated a family of three optoelectronic ICs (OEICs). The circuits include a 4–GHz laser driver, a 2.4–GHz preamp, and a 2.4–GHz gain–controlled amplifier implemented with 0.7–micron gate GaAs SAG MESFET processing. Hitachi plans to refine GaAs ICs to achieve at least 10–GHz optical transmit/receive rates.

- Hitachi developed a new plastic optical fiber capable of withstanding temperatures as high as 170 degrees centigrade. The new fiber is suitable for installation in car engine chambers or near heating equipment in buildings.

Superconductivity

- Hitachi's Central Research Laboratories created a prototype superconducting quantum interference device (SQUID) using thin–film processing and lithographic techniques similar to those used in semiconductor device production.

Manufacturing Equipment

- Hitachi developed a new technology for low–temperature dry etching, which is capable of realizing 0.3–micron circuit width. Hitachi has manufactured a low–temperature microwave plasma etching machine on an experimental basis. The Company believes that this technological breakthrough will be a major step forward toward the development of next–generation LSIs, including 64Mb DRAMs.

Semiconductor Agreements

The following is a list of Hitachi's 1987 and 1988 semiconductor agreements:

Fujitsu. Fujitsu and Hitachi have connected their respective digital private branch exchange (PBX) machines with NTT's large ISDN switches, the model D707, for use in telephone offices.

IR. International Rectifier agreed to license its power MOSFET patents to Hitachi. Hitachi may use and sell devices incorporating any of IR's power MOSFET products worldwide. Hitachi will pay undisclosed royalties as well as other payments.

VLSI. VLSI Technology and Hitachi signed a long–term technology alliance under which VLSI Technology will provide its ASIC design technology for use in Hitachi Semiconductor and Integrated Circuits Divisions. Hitachi will provide advanced CMOS process technology and manufacturing expertise. The technology will begin at the 1.0–micron level and continue at submicron levels. Included in the agreement are cell libraries and foundry support.

Hitachi, Ltd.

The following is a list of Hitachi's 1986 semiconductor agreements:

Fairchild. Hitachi signed a five-year agreement to become the first alternate source for Fairchild's FACT (Fairchild Advanced CMOS Technology) logic. Fairchild gave Hitachi its design data base for 20 devices.

Fujitsu. Fujitsu and Hitachi will cooperate in developing a 32-bit MPU and peripheral LSI family based on the TRON architecture. The TRON chip will be 1.0- to 1.3-micron CMOS and will integrate 700,000 transistors.

General Motors. Hitachi and General Motors agreed to an extensive tie-up to pursue joint R&D and production projects in six high-technology areas: automotive parts, semiconductors and other electronics, computers, optical fibers, magnetic and other new materials, and factory automation.

Monsanto. Hitachi agreed to share its silicon wafer manufacturing technology with Monsanto. Monsanto will send wafer engineers to Hitachi to acquire the technology necessary to manufacture products to meet Hitachi's standards.

NTT. Hitachi announced a direct-write electron beam machine capable of writing 0.1-micron circuit patterns on a wafer at a rate of one hour per wafer. The machine was jointly developed with NTT's Atsugi Laboratory, with plans for Hitachi to market the machine in the second half of 1987.

Riken. Hitachi and Riken will jointly develop the Quantum Flux Parametron, an ultrahigh-speed switching element with a 50-picosecond switching speed and 1.8-GHz clock frequency. The new device can operate without electrical voltage and has a power dissipation of one-thousandths that of a Josephson junction.

Signetics. Hitachi acquired manufacturing and sales licenses from Signetics for two telecommunication LSI models (HD68562 and HD64941) for transferring data between terminals and mainframe computers.

Toyohashi University. Hitachi Works and Toyohashi Technology and Science University announced a hybrid electron/ion beam manufacturing machine prototype jointly developed since 1983 under the auspices of the Ministry of Education's R&D program.

Zilog. Zilog is licensed to second source Hitachi's 8-bit CMOS MPU (HD64180). Zilog will market the Z80-compatible device under the Z64180 label.

The following is a list of Hitachi's 1985 semiconductor agreements:

Hewlett-Packard. HP is allowed to manufacture 64K DRAMs using Hitachi's photomasks and 3-micron rule NMOS process. HP does not sell these devices on the open market.

Microtec. Microtec agreed to develop a microassembler, utilities, and Pascal and C compilers to run on Hitachi's first standalone in-circuit emulator for the HD64180 8-bit CMOS MPU, which is compatible with the Z80 and 8080 families.

Motorola. Motorola and Hitachi announced 2-micron HCMOS versions of the 6800; Motorola was granted a license to second source Hitachi's HD6310V and HD6303R 8-bit microcontrollers.

Signetics. Hitachi licensed its 63484 CRT controller to Signetics in exchange for Signetics' 68562 data exchange IC.

Sophia. Hitachi and Sophia Systems jointly agreed to manufacture a Systems development support system for Hitachi's original microprocessors.

SGS-Thomson. Hitachi licensed its 6300 series (CMOS 8-bit MCUs) to Thomson in return for Thomson's telecommunication ICs.

Unisys. Unisys and Hitachi agreed to a technology exchange and joint development effort to study the feasibility of using Hitachi's high-speed ICs in Sperry's 1100 system architecture; Hitachi already manufactures Sperry's personal computer.

Nonsemiconductor Products Summary

Consumer Products

Products in this division are television sets, radios, tape recorders, video tape recorders, video cameras, air conditioners, washing machines, refrigerators, microwave ovens, vacuum cleaners, space heaters, kitchen appliances, lighting fixtures, dry batteries, and audio and video tapes.

Recent highlights of this division include the following:

- Hitachi introduced the VM-C30A camcorder capable of creating a high-resolution image of 350 lines with the use of an MOS image sensor. The sensor contains 300,000 pixels and can capture colors, light, and shadow to a precise degree.
- Hitachi developed the Compatible Player VIP-35C that can be used with compact disks, laser disks, and the newly developed CD video.
- Hitachi reinforced its line of air conditioners that feature both cooling and heating functions with a new series of products that employ inverter control to maintain an environment for optimum efficiency.

Hitachi, Ltd.

Industrial Machinery and Plants

Products in the Industrial Machinery and Plants Division include rolling mill equipment, chemical plants, construction machinery, elevators, industrial robots, and refrigeration and air conditioning equipment.

In the development of new sectors, the Company is concentrating mainly on biotechnology equipment and semiconductor production equipment. Recently, Hitachi marketed a microinjector system that uses a laser beam to implant genes into cells, and a microwave plasma etch system capable of producing pattern lines as fine as 0.8- to 0.5-micron.

As part of the Company's effort to enhance its mature products, Hitachi is adding value through the incorporation of microprocessors and inverters. For example, in the construction equipment sector, Hitachi marketed a new hydraulic excavator that uses microprocessor control for optimization of engine speed and hydraulic fluid flow. The result is improved efficiency and quieter operation.

The following are a few of this division's recent highlights:

- Hitachi developed a centrifugal-type air-to-water heat pump that covers up to 3,516 kW (1,000 RT) in cooling mode and 2,791 kW (2.4 Gcal/h) in heating mode.

- Hitachi developed a hot-wire air-flow sensor for use in automobile engines. The sensor is designed to measure the air-flow mass to the engine intake manifold without compensating for air density, which can change in accordance with surrounding temperature.

- Hitachi has produced the model M5030 welding robot that emphasizes the Company's "Superior Functions, Simple Operation" philosophy. The M5030 incorporates a menu-guidance system enabling simple instruction of the robot regarding operational steps and conditions.

Information and Communication Systems and Electronic Devices

This division's products include computers, office automation (OA) equipment, semiconductors, other electronic devices, communications equipment, measuring equipment, and medical equipment. This is by far Hitachi's largest division.

- Hitachi introduced the 5.25-inch DK514-38 hard disk drive for small-scale mainframes, superminicomputers, and minicomputers. The drive features a compact size, 382-Mbyte storage capacity, and 1.8-Mbyte data transfer rate.

- Hitachi introduced the H-6916 semiconductor memory storage subsystem that replaces conventional magnetic disk drives with 1Mbit DRAMs. The unit is suited as a filing system for frequently accessed information because it handles relatively small amounts of information at high speed.

- Hitachi developed the multifunction, expandable filing system series named HITFILE650. The system uses optical disks to store information and uses either 5.25-inch disks for small capacity or 12-inch disks for larger storage needs.

- Hitachi designed the B16LX laptop personal computer that features a built-in Japanese 140,000-word ROM dictionary and a sequential kana to kanji ideograph conversion function. The B16LX comes in models with a built-in 20-Mbyte hard disk drive or with a built-in asynchronous modem (300/1,200bps) and autodialing software.

- Hitachi developed a switching module to work with NTT's ISDN network. The module can transmit two full-duplex 64 Kbps channel simultaneously and connect a maximum of eight terminals, including digital telephones, facsimile machines, and other office automation subscribers.

Power Systems and Equipment

Hitachi is a major supplier of 1,100 MW-Class boiling water reactors. In addition to BWRs, this division produces nuclear, hydroelectric, and thermal power plants; water, steam, and gas turbines; generators; transformers; circuit breakers; motors; control equipment; switchboards; and automobile parts and accessories.

The following are a few of this division's highlights:

- Hitachi, in conjunction with Toshiba Corporation and General Electric Company, successfully developed a 1,350 MW-Class advanced boiling water reactor (ABWR). The ABWR features an improved turbine apparatus that provides economical power generation while simultaneously assuring a high level of operating safety.

- The Chubu Electric Power Co., Ltd., and Hitachi developed a 40-inch long blade for application in the last stage of a steam turbine. The blade is said to be the longest in the world for use in a 3,600-rpm turbine.

- In 1987, Hitachi delivered a 100 kW photovoltaic power generation system to the Kyushu Electric Power Co., Inc. The system is designed for use in combination with a diesel power generator and was specially developed for use in remote islands.

Hitachi, Ltd.

Wire and Cable, Metals, Chemicals, and Other Products

The products of this division include electric wire and cable, optical fiber cable, steel, cast iron products, synthetic resin materials and products, carbon and graphite products, printed circuit boards, and ceramic materials.

In October 1987, research commenced at Hitachi Chemical's Tsukuba Research Laboratory. The laboratory will conduct both research and production of prototypes in connection with optoelectronic materials, thin-film products, and other such developments for future products. Over the long term, the laboratory is expected to play an important role in Hitachi Chemical's effort to strengthen its competitiveness.

Hitachi Ltd.

BACKGROUND AND OVERVIEW

Hitachi Ltd. was established in 1910 by Namihei Odaira. The Company's initial goal was to develop Japan's electrical power equipment manufacturing technology. At that time, Japan was heavily reliant on European and American electrical power equipment in its struggle toward modernization. This led to Hitachi's perseverance to become self-reliant in its research and development activities. Hitachi's operations are now dispersed over a wide field of applications, ranging from industrial machinery to household electrical appliances and electronic products.

Hitachi entered the semiconductor industry in 1957, producing transistors for consumer products. In 1986, Hitachi was one of the largest Japanese semiconductor manufacturers and among the leaders worldwide. Hitachi is now well established as a supplier of many electronic products—MOS memories, bubble memories, microprocessors, gate arrays, optoelectronic devices, liquid crystal displays, and modules.

In 1981, Hitachi made a concerted effort to internationalize its operations, not only to promote exports but also to increase its overseas production. Dataquest's estimates for Hitachi's European semiconductor revenue are shown in Table 1. Hitachi Electronic Components Europe GmbH, based in Landshut (assembly and test), and Munich, West Germany, and Hitachi Electronic Components (U.K.) Ltd. are the two main Hitachi divisions in Europe.

Table 1

Hitachi Ltd.
Estimated European Semiconductor Revenue by Product Line
(Millions of U.S. Dollars)

	1982	1983	1984	1985	1986	1987
Total Semiconductor	$71	$110	$201	$169	$177	$157
Total Integrated Circuit	$66	$104	$193	$161	$168	$146
Bipolar Digital	8	11	10	10	11	5
MOS	55	90	179	147	137	136
Linear	3	3	4	4	4	5
Total Discrete	$ 4	$ 4	$ 6	$ 6	$ 6	$ 8
Transistor	2	2	2	2	1	1
Diode	0	0	0	0	0	0
Thyristor	1	1	2	2	2	3
Other	1	1	2	2	3	4
Total Optoelectronic	$ 1	$ 2	$ 2	$ 2	$ 3	$ 3

Source: Dataquest
May 1988

Hitachi Ltd.

PRODUCTS AND MARKETS SERVED

Hitachi is a leading supplier in Europe for both MOS and bubble memory products. The Company's total product range consists of a broad spectrum of semiconductor products, from small-signal discrete devices, through logic devices such as gate arrays, and on to advanced memories and microprocessors.

In 1986, the Company developed international operations to alleviate trade tensions and overcome problems relating to the sharp appreciation of the yen. Hitachi established Hitachi Computer Products (America) in Oklahoma for the manufacture of computer disk drives, while VCR production was started at Hitachi Consumer Products (Europe) in West Germany.

In semiconductors, Hitachi continued a vigorous program of research and development. The Company also focused on expanding its range of microprocessors, gate arrays, and other logic devices, as well as bringing on-line its 1.3-micrometer fine circuit pattern process technology for the manufacture of 256K SRAMs and 1-Mbit DRAMs.

In microprocessors, a new series called ZTAT (Zero Turnaround Time) was marketed for use in limited production-run products or products in the early stages of high-volume production. A CMOS version of the 16-bit 68000 microprocessor was also developed jointly with Motorola.

In high-speed CMOS gate arrays, eight new products were marketed—from 440- to 7,136-gate versions.

OUTLOOK

Hitachi is working toward consolidating its position as an international corporation with a strong presence throughout the world—in production, material procurements, and technology exchanges.

Hittite Microwave Corporation

Hittite Microwave Corporation
21 Cabot Road
Woburn, MA 01801
(617) 933-7267

Established 1985
No. of Employees: N/A

BACKGROUND

Hittite Microwave Corporation was formed to design and supply custom and proprietary GaAs MMICs for military and commercial applications. The Company has had several government contracts for microwave IC design and development. Initially, Hittite is providing in-house design, layout, verification, and test capabilities. It is using outside foundries for wafer fabrication. Hittite was a prime contractor in Phase O of the MIMIC program and is a member of the TRW team involved in Phase I of MIMIC.

COMPANY EXECUTIVES

- President—Dr. Francis Paik
- Vice President R&D—Yalcin Ayasli (formerly R&D manager, Raytheon Research)
- CFO—Ronald Kaplan (formerly controller, Wang)

FINANCIAL BACKING

Funding sources include U.S. government contract funding and private sources.

ALLIANCES

Hittite is part of the TRW team associated with the DOD MIMIC program, which also includes General Dynamics, Honeywell Kodak Corporation.

SERVICES

- Design, including custom design of MMIC
- Assembly
- Test

Hittite Microwave Corporation

PROCESS TECHNOLOGY

The Company uses 0.5u and 1.0u GaAs MESFET technology; processing is performed by outside foundries.

PRODUCTS

- Signal control components
- Microwave radar ranging systems
- Other proprietary products

FACILITIES

The Company's office, R&D, and test facilities occupy approximately 5,000 square feet in Woburn, Massachusetts.

Hittite Microwave Corporation

Hittite Microwave Corporation
21 Cabot Road
Woburn, MA 01801
(617) 933-7267

Established 1985
No. of Employees: N/A

BACKGROUND

Hittite Microwave Corporation was formed to design and develop custom and proprietary GaAs MMICs for military and commercial applications. The Company has an Air Force contract for circuit design and development. Initially, Hittite is providing in-house design, layout, verification and test capabilities. It is using outside foundries for wafer fabrication.

COMPANY EXECUTIVES

- President—Yalcin Ayasli (formerly R&D manager, Raytheon)
- CFO—Ronald Kaplan (formerly controller, Wang)

FINANCIAL BACKING

Funding sources include U.S. government contract funding and others.

SERVICES

The Company's services include design and test.

PROCESS TECHNOLOGY

The Company uses 0.5u and 1.0u GaAs MESFET technology.

PRODUCTS

Hittite Microwave's products are proprietary.

FACILITIES

The Company's office, R&D, and test facilities are in Woburn, Massachusetts.

Honeywell, Inc.

Table 1

Estimated Worldwide Semiconductor Revenue by Calendar Year (Millions of Dollars)

	1983	1984	1985	1986	1987	1988
Total Semiconductor	24	64	88	137	187	182
Total Integrated Circuit		37	57	102	147	142
Bipolar Digital (Function)		37	50	68	44	27
Bipolar Digital Memory						
Bipolar Digital Logic		37	50	68	44	27
MOS (Function)			7	34	77	88
MOS Memory				7	5	14
MOS Microdevices						
MOS Logic			7	27	72	74
Analog					26	27
Total Discrete					10	10
Total Optoelectronic	24	27	31	35	30	30

Table 2

Honeywell, Inc.
1988 Worldwide Ranking by Semiconductor Markets (Revenue in Millions of Dollars)

	1988 Rank	1987 Rank	1988 Revenue	Sales % Change 1987-1988	Industry % Change 1987-1988
Total Semiconductor	37	33	$182	(2.7%)	33.0%
Total Integrated Circuit	39	31	$142	(3.4%)	37.4%
Bipolar Digital (Function)	21	15	$ 27	(38.6%)	9.2%
Bipolar Digital Logic	21	14	27	(38.6%)	9.0%
MOS (Function)	42	38	$ 88	14.3%	54.5%
MOS Memory	40	43	14	180.0%	93.1%
MOS Logic	31	25	74	2.8%	29.2%
Analog	45	41	$ 27	3.8%	16.0%
Total Discrete	41	41	$ 10	0	14.4%
Total Optoelectronic	17	15	$ 30	0	27.5%

Source: Dataquest
December 1989

Honeywell, Inc.

Table 3

Honeywell, Inc.
Estimated 1988 Semiconductor Revenue by Geographic Region
(Millions of Dollars)

	U.S.	Japan	Europe	ROW
Total Semiconductor	$160	$7	$15	
Total Integrated Circuit	$120	$7	$15	
Bipolar Digital (Function)	22		$ 5	
Bipolar Digital Memory				
Bipolar Digital Logic	22		5	
MOS (Function)	$ 78		$10	
MOS Memory	14			
MOS Microdevices				
MOS Logic	64		10	
Analog	$ 20	$7		
Total Discrete	$ 10			
Total Optoelectronic	$ 30			

Source: Dataquest
December 1989

Hualon Microelectronics Corporation

6F, 42, Section 2
Chung Sun North Road
Taipei, Taiwan ROC
Telephone: (886) 2-5628813
Fax: (886) 2-5313241
Dun's Number: Not Available

Date Founded: 1986

CORPORATE STRATEGIC DIRECTION

Hualon Microelectronics Corporation (HMC) was founded by the Hualon Group in 1986 to manufacture integrated circuits. The Hualon Group is one of the largest conglomerates in Taiwan, with 1990 sales of NT$135 billion and more than 16,000 employees worldwide. Its businesses include: textiles, real estate, livestock, stockbrokerage, computer assembly, trade, and semiconductors. In recent years, Hualon has diversified its business into the areas of integrated circuit (IC) design, assembly, and testing and has made several advances in its semiconductor business.

HMC's main products include: 256K and 1Mb dynamic random-access memories (DRAMs), 64K and 256K static random-access memories (SRAMs), read-only memories (ROMs) up to 4Mb, voice synthesizers up to 20 seconds adaptive differential pulse code modulation, melody and sound-effect ICs, dual-tone multifrequency receivers, telephone ICs, peripherals, and mass storage controllers. All of these products are manufactured in one of Taiwan's largest and most advanced IC plants. The first phase of the HMC factory was completed in 1988 and has the capacity to produce 30,000 5-inch VLSI wafers per month. Phase II of the factory is expected to be completed by early 1992, at which time production of 6-inch VLSI wafers will be boosted to 30,000 pieces per month. HMC also plans to enter into a joint venture with the Malaysian government to build a new IC plant in Malaysia.

During 1990, HMC and SEEQ Technology Inc. made a manufacturing and technology agreement that includes giving Hualon a 10 percent stake in SEEQ for an investment of NT$137.3 million (US$5.2 million). The eight-year renewable agreement calls for HMC to provide foundry services for SEEQ in Hsinchu, Taiwan. The companies will also jointly develop and market semiconductor products, and the agreement gives SEEQ access to a new 0.8-micron facility.

HMC's comprehensive financial statements are not available for publication in this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

The company's semiconductor strategic direction is to strive constantly for high quality at lower cost. Hualon emphasizes that success lies in R&D and customer satisfaction. Its product strategy is to move into micro and memory ICs while maintaining profitability in consumer and telecom sales. (According to Dataquest estimates, Hualon ranked 28th in total integrated circuit sales and 24th in MOS digital sales in the Asia/Pacific region in 1990.)

Further Information

For further information about the company's business segments, please contact Dataquest's Semiconductors *Asia* service.

1990 SALES OFFICE LOCATIONS

North America—91
Europe—29
Japan—1
ROW—10

MANUFACTURING LOCATIONS

ROW

Hsinchu, Taiwan
CMOS process, memory devices (SRAM, DRAM, BiCMOS)

SUBSIDIARIES

Hualon Microsystems Corporation (United States)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1991

Burr-Brown Corporation/Monolith Technologies
Burr-Brown and HMC will establish a joint venture company to develop and market mixed-signal ICs for the multimedia, digital telecommunications, and consumer audio markets. The forte of this new company, called Monolith Technologies, will be its ability to produce circuits using a mix of digital and precision analog technologies.

1990

Saratoga Semiconductor Inc.
HMC purchased the former Saratoga Semiconductor's BiCMOS process technology for the manufacture of high-speed memory devices in HMC's wafer fab. Saratoga Semiconductor closed down its business in 1990.

SEEQ Technology Inc.
HMC is investing $5.22 million for a minority stake in SEEQ Technology Inc. This investment is part of a foundry agreement with SEEQ that also embraces joint development and sales. (Please see Corporate Strategic Direction for more information.)

MERGERS AND ACQUISITIONS

1991

Vitelic Corporation
Vitelic and HMC signed a letter of intent to merge the two companies in March of 1991. However, the merger has been postponed indefinitely, according to HMC.

SWEDA Group Inc.
Hualon Group acquired 100 percent of the shares of SWEDA Group Inc. of Dallas, Texas, a point-of-sale computer system and terminal supplier with subsidiaries in the United States, Canada, and Mexico. Hualon will make use of the U.S. company's marketing outlets in North America, South America, and Asia to sell Hualon Group-made electronic products and import electronic components to Taiwan for Hualon's use. The company name will be SWEDA Inc.

KEY OFFICERS

D. M. Oung
President

Chung Hsu
Vice president

PRINCIPAL INVESTORS

Hualon Textile Co. (subsidiary of the Hualon Group)

FOUNDER

D. M. Oung

Hualon Microelectronics Corporation

6F, 42, Section 2
Chung Sun North Road
Taipei, Taiwan ROC
Telephone: (886) 2-5628813
Fax: (886) 2-5313241
Dun's Number: Not Available

Date Founded: 1986

CORPORATE STRATEGIC DIRECTION

Hualon Microelectronics Corporation, better known in Taiwan as HMC, is one of the more recent IC companies to set up a fab on the island. The founder, D. M. Oung, is chairman of the Hualon Group, which originally produced textiles. Dataquest estimates HMC's 1989 revenue at NT$1.3 billion (US$50 million). HMC is the semiconductor arm of the Hualon Group, which was a NT$105.6 billion (US$4 billion) company in 1989 with 16,000 employees worldwide. In recent years, Hualon has diversified its business into the areas of IC design, assembly, and testing, and has made several advances in its semiconductor business.

During 1990, HMC and Seeq Technology Inc. forged a manufacturing and technology agreement that includes giving Hualon a 10 percent stake in Seeq for an investment of NT$137.3 million (US$5.2 million). The eight-year renewable agreement calls for HMC to provide foundry services for Seeq in Hsinchu, Taiwan. The companies will also jointly develop and market semiconductor products, and the agreement gives Seeq access to a new 0.8-micron facility.

Hualon Group also acquired 100 percent of the shares of SWEDA Group Inc. of Dallas, Texas, a point-of-sale computer system and terminal supplier with subsidaries in the United States, Canada, and Mexico. Hualon will make use of the US company's marketing outlets in North America, South America, and Asia to sell Hualon Group-made electronic products and import electronic components to Taiwan for Hualon's use.

Hualon's Line 2 is scheduled to start DRAM and SRAM production in the first quarter of 1992.

HMC's comprehensive financial statements are not available for publication in this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

The Company's semiconductor strategic direction is to strive constantly for high quality at lower cost. Hualon emphasizes that success lies in R&D and customer satisfaction. Its product strategy is to move into micro and memory ICs while maintaining profitability in consumer and telcom sales.

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest industry service.

1989 SALES OFFICE LOCATIONS

North America—91
Europe—29
Asia/Pacific—4
ROW—1

MANUFACTURING LOCATIONS

Asia/Pacific

Hsinchu, Taiwan
CMOS process, memory devices (SRAM, DRAM)

SUBSIDIARIES

Information is not available.

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

Information is not available.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Mr. D. M. Oung
President

Chung Hsu
Vice president

PRINCIPAL INVESTORS

Hualon Textile Co. (subsidiary of the Hualon Group)

FOUNDER

D. M. Oung

Hoechst AG

Postfach 80 03 20
D-6230 Frankfurt am main 80
Federal Republic of Germany
Telephone: (069) 305-0
Fax: (069) 316700
Dun's Number: 31-756-2718

Date Founded: 1863

CORPORATE STRATEGIC DIRECTION

Hoechst AG (The Hoechst Group) comprises six business areas: chemicals and color, fibers and plastic film, polymers, health, engineering and technology, and agriculture. The Company is active in the European Community (EC), North America, Latin America, Africa, and the Asia/Pacific region.

Consolidated revenue increased 12.0 percent to DM 45.9 billion (US$24.4 billion) in 1989, from DM 41.0 billion (US$23.5 billion) in 1988. Growth outside Germany proved to be greater, with sales rising 14.0 percent as opposed to sales within Germany increasing 7.0 percent. Chemical sales rose 5.0 percent during 1989 totaling DM 11.6 billion (US$6.1 billion), representing 25.3 percent of total revenue. (Percentage changes refer only to DM amounts; US$ percentage changes will differ because of fluctuations in Dataquest exchange rates.)

Revenue in the fibers and plastic film business area increased 16.0 percent and totaled DM 9.0 billion (US$4.9 billion), representing 19.6 percent of total revenue. In this business area, plastic film generated approximately DM 1.6 billion (US$851 million), whereas fibers and fiber intermediates generated DM 7.4 billion (US$3.9 billion).

Revenue from the polymers business area increased approximately 5 percent to DM 7.8 billion (US$4.1 billion), representing 17 percent of total revenue. Of this total, paints and synthetic resins generated nearly DM 3.3 billion (US$1.8 billion), and plastics and waxes and engineering plastics generated DM 3.1 (US$1.6 billion) and DM 1.4 billion (US$744 million), respectively, for fiscal 1989.

In the health business area, revenue increased 14.0 percent, totaling DM 8.3 billion (US$4.4 billion) for fiscal 1989. Almost half of the sales were in Western Europe, with 11.0 percent in North America and 14.0 percent in Japan. Sales of pharmaceuticals increased nearly DM 1 billion (US$531.9 million), reaching approximately DM 8 billion (US$4.3 billion). Sales in cosmetics remained stable, totaling approximately DM 300 million (US$159.0 million). Sales in this business area represented 18.1 percent of total revenue.

The engineering and technology business area sales grew 7.0 percent to DM 6.5 billion (US$3.5 billion), representing 14.2 percent of total revenue for fiscal 1989. The industrial gases and welding technologies total sales were approximately DM 2.0 billion (US$1.1 billion), showing an 11.0 percent increase over the previous year's total. Technical information systems sales remained stable at DM 1.3 billion (US$691.5 million), whereas the new carbon products division posted DM 1.0 billion (US$532.0 million) in sales for fiscal 1989. The plant engineering division and the engineering ceramics division generated DM 500.0 million (US$266.0 million) and DM 250.0 million (US$133.0 million) during fiscal 1989, respectively.

The agriculture business area sales increased 14 percent, totaling DM 2.7 billion (US$1.4 billion) for fiscal 1989. Nearly 93 percent of these sales occurred outside Germany.

Net income increased 5.7 percent in fiscal 1989 to DM 2.1 billion (US$1.1 billion) from DM 2.0 billion (US$1.1 billion) in fiscal 1988.

R&D for fiscal 1989 totaled DM 2.6 billion (US$1.4 billion), representing 5.7 percent of revenue. This is an increase of 8.3 percent over the previous

year's figure of DM 2.4 billion (US$1.4 billion). Research costs by business area show that the health business area received 44.0 percent of R&D expenditure. Chemicals and color received 13.0 percent, the polymers area received 12.0 percent, agriculture 10.0 percent, and fibers and plastic film 8.0 percent for fiscal 1989. Engineering and technology and central research received 7.0 and 6.0 percent, respectively.

Capital expenditure totaled DM 3.9 billion (US$2.1 billion) for fiscal 1989, representing 8.4 percent of revenue. This is an 87.3 percent increase from the previous year's figure of DM 2.1 billion (US$1.2 billion), which represented 5.0 percent of fiscal 1988 revenue.

The Hoechst Group employed 169,295 people at the close of fiscal 1989. Seventy percent of these employees worked in the EC, 15 percent in North America, 7 percent in Latin America, and the remaining 8 percent in the Asia/Pacific and the Rest of World regions.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region. Information on revenue by distribution channel is not available. Tables 3 and 4, comprehensive financial statements, are at the end of this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

Products for Component Equipment

Hoechst has 12 divisions and subsidiaries that serve all areas of microelectronics. The Technical Information Systems Division serves the semiconductor manufacturer market. Materials for photolithography such as AZ positive photoresists, protective coatings, developers and thinners for photoresists, adhesion promoters, and strippers are manufactured by this division. The division provides printed circuit board (PCB) manufacturers with materials for photoprinting and screen printing, such as negative and positive Ozatec dry film, photoresists and liquid photoresists, diazo-duplicating film and screen emulsion, screen stencil films, photosolder masks, and dry film photoresist processing equipment.

Messer Griesheim GmbH provides semiconductor manufacturers with deposition gases like silane, dichlorosilane, nitrous oxide, ammonia, tungsten hexafluoride, and oxygen; and with doping gases like arsine, phosphine, diborane, and boron trifluoride. This division provides gases used in etching, such as tetrafluoromethane, trifluoromethane, silicon tetrafluoride, sulphur hexafluoride, nitrogen trifluoride, chlorine, hydrogen chloride, and boron trichloride. It also supplies storage and transfer equipment for gases, as well as purification and supply systems, including valves, pressure regulators, manifolds, and gas cabinets.

Messer Griesheim GmbH PECO manufactures seal welding machines for metal and ceramic housings for semiconductor and hybrid manufacturers; gap welding machines for bonding for PCB manufacturers; and thin- and thick-film equipment.

Riedel-de Haen AG manufactures VLSI PURANAL, which is the brand name of a product range specially designed for the cleaning and etching processes in VLSI manufacturing. Riedel-de Haen's hydrofluoric acid production also forms the basis for a number of chemicals used in the production of PCBs.

Hoechst's Chemicals Division manufactures chemicals for the doping and production of III/V compounds, as well as inorganic and fluorocarbon gases for doping and plasma etching processes. This division also produces acids, bases, and salts for etching and stripping PCBs; Frigen 113 TR for cleaning, perfluorinated inert fluids for vaporphase soldering and components testing, and lubricants for vacuum pumps.

Ringsdorff Werke GmbH produces high-purity graphite components, such as susceptors, heating elements, heat shields for crystal growth, slicing beams, SiC-coated susceptors for epitaxy, wafer trays for plasma-etched chemical vapor deposition (PECVD), electrodes, diffusers, shields for ion implantation, soldering and glass-to-metal sealing jigs, and pyrolitic boron-nitride components.

The equipment that SIGRI GmbH produces for semiconductor manufacturers includes carbon felts, graphite felts and foils, heating elements, charge carriers, charging equipment, and superstructures for furnaces.

The Hoechst Plastics and Waxes Division manufactures a sealing agent for semiconductor manufacturers. This division also produces fluoropolymers

hostaflon as insulating and corrosion-resistant materials for PCB manufacturers. The Plastics and Waxes Division produces heat- and chemical-resistant components for wire and cable insulation, PCB housing, plugs, and insulating components.

Hoechst's Synthetic Resins Division manufactures phenolic and durophen, which are phenolic and epoxy resins. This division also produces Beckopox for laminates.

The Hoechst Films Division produces hostaphan, polyester films, trespaphan, polypropylene films for the component market, and carrier film for audio, video, and computer tapes. This division produces polyester films as base materials for flexible PCBs.

Hoechst CeramTec produces chip carrier and pin grid arrays for the semiconductor market. This division produces ceramic rods and tubes for carbon film, metal film, and wire wound resistors for all leading manufacturers of resistors in the components market.

Herberts produces solder, finishing varnishes, and casting resins for the PCB market.

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest industry service.

Table 1
Five-Year Corporate Highlights (Millions of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$14,531.3	$17,518.0	$20,531.1	$23,275.0	$24,413.8
Percent Change	-	20.55	17.20	13.36	4.89
Capital Expenditure	$804.4	$1,234.6	$1,330.0	$1,171.0	$2,057.4
Percent of Revenue	5.54	7.05	6.48	5.03	8.43
R&D Expenditure	$708.5	$985.3	$1,231.7	$1,372.7	$1,394.1
Percent of Revenue	4.88	5.62	6.00	5.90	5.71
Number of Employees	180,561	153,651	167,781	164,527	169,295
Revenue ($K)/Employee	$80	$114	$122	$141	$144
Net Income	$499.3	$644.7	$848.9	$1,144.9	$1,133.0
Percent Change	-	29.12	31.66	34.87	(1.04)
Exchange Rate (US$1=DM)	DM 2.94	DM 2.17	DM 1.80	DM 1.76	DM 1.88

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	NA	NA	NA	NA
Quarterly Profit	NA	NA	NA	NA

NA = Not available

Source: Hoechst AG
Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
German	25.28	28.49	60.19	58.73	57.73
Non-German	74.72	71.51	39.81	41.27	42.27

Source: Hoechst AG
Annual Reports and Forms 10-K
Dataquest 1990

SALES OFFICE LOCATIONS

Information is not available.

MANUFACTURING LOCATIONS

Information is not available.

SUBSIDIARIES

Information is not available.

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

Chemiefaser Guben
Hoechst and Chemiefaser Guben have signed a letter of intent to establish a joint venture in East Germany to produce polyester tire cord, with Hoechst becoming the majority owner of the joint venture.

BASF and Bayer
Hoechst, BASF, and Bayer will form Entwicklungsgesellschaft fuer die Wiederverwertung von Kunststoffen (EWK), which will be responsible for recycling plastics waste.

Deutsche Wellcome
Hoechst has received marketing rights for Zovirax, an antiviral, from Deutsche Wellcome, a subsidiary of Wellcome Foundation (United Kingdom).

Daicel Chemical Industries, Ltd.
Hoechst and Daicel plan to establish a UK joint venture for the production and marketing of acrylonitrile butadiene styrene (ABS) resin. A production plant will be built in the United Kingdom.

Lucky Goldstar
Hoechst AG and Lucky Goldstar of South Korea have established a joint venture to produce chiefly ultrahigh molecular weight high-density plasma etchant (HDPE) in South Korea. The venture calls for the construction of a plant in South Korea.

Mitsubishi Kasei
Hoechst and Mitsubishi formed a 50/50 dyestuffs joint venture.

MERGERS AND ACQUISITIONS

1990

Benckiser-Knapsack
Joh Benckiser sold its 50 percent share in its joint venture company, Benckiser-Knapsack, to partner Hoechst.

Fincisa, Fibras Sinteticos SA of Portugal
Hoechst has agreed to purchase from Imperial Chemical Industries Plc its 50 percent share in Fincisa, Fibras Sinteticos SA of Portugal. At its Portalegre site, Finicisa produces polyester fiber staple and PET polymer for bottle and packaging applications.

Union Carbide
Union Carbide will sell its primary alcohol ethoxylates business to Hoechst. Applications for primary alcohol ethoxylates include household products such as cleaners and laundry detergents.

Schwarzkopf GmbH
Hoechst has increased its holding in Schwarzkopf to 77 percent. Schwarzkopf operates in the Eastern European cosmetics market.

KEY OFFICERS

R. Sammet
Chairman of the Supervisory Board

R. Brand
Vice chairman of the Supervisory Board

G. Bradeck
Member of the Supervisory Board

E. Bouillon
Member of the Supervisory Board

W. Hilger
Chairman of the Board of Directors

G. Metz
Vice chairman of the Board of Directors

M. Fruhauf
Member of the Board of Directors

H. Gareis
Member of the Board of Directors

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Information is not available.

Table 3
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$6,005.6	$8,366.3	$8,866.1	$9,935.8	$9,899.5
Cash	356.0	1,875.6	946.1	970.5	763.3
Receivables	2,768.1	3,316.3	4,060.6	4,576.1	4,460.1
Marketable Securities	425.7	195.3	499.4	943.8	1,065.4
Inventory	2,455.8	2,979.0	3,360.0	3,445.5	3,610.6
Other Current Assets	0	0	0	0	0
Net Property, Plants	$3,090.1	$3,996.6	$7,118.3	$7,831.8	$4,411.6
Other Assets	$213.5	$310.5	$88.3	$61.9	$73.9
Total Assets	$9,309.3	$12,673.4	$16,072.8	$17,829.5	$14,385.0
Total Current Liabilities	$2,319.7	$2,767.6	$1,286.1	$1,607.4	$1,549.5
Long-Term Debt	$1,235.3	$1,393.3	$3,598.9	$3,497.7	$3,279.8
Other Liabilities	$2,433.7	$3,555.9	$1,762.2	$6,264.8	$6,206.9
Total Liabilities	$5,988.7	$7,716.9	$6,647.2	$11,369.9	$11,036.2
Total Shareholders' Equity	$3,320.6	$4,956.5	$9,425.6	$6,459.7	$6,701.6
Common Stock	876.9	1,264.5	1,553.9	1,608.5	1,534.0
Other Equity	1,508.0	1,212.4	4,593.3	4,148.3	4,468.1
Retained Earnings	935.7	2,479.7	3,278.3	702.8	699.5
Total Liabilities and Shareholders' Equity	$9,309.3	$12,673.4	$16,072.8	$17,829.5	$7,737.8
Income Statement	**1985**	**1986**	**1987**	**1988**	**1989**
Revenue	$14,531.3	$17,518.0	$20,531.1	$23,275.0	$24,413.8
German Revenue	3,672.8	4,991.7	12,358.3	13,669.9	14,094.1
Non-German Revenue	10,858.5	12,526.3	8,172.8	9,605.1	10,319.7
Cost of Sales	NA	NA	$12,881.1	$14,534.1	$15,572.3
R&D Expense	$708.5	$985.3	$1,231.7	$1,372.7	$1,394.1
SG&A Expense	NA	NA	$4,845.6	$5,303.4	$5,542.6
Capital Expense	$804.4	$1,234.6	$1,330.0	$1,171.0	$2,057.4
Pretax Income	$1,073.5	$1,479.7	$1,726.7	$2,321.6	$2,205.3
Pretax Margin (%)	7.39	8.45	8.41	9.97	9.03
Effective Tax Rate (%)	NA	NA	NA	NA	NA
Net Income	$499.3	$644.7	$848.9	$1,144.9	$1,133.0
Shares Outstanding, Millions	63.1	63.1	62.0	62.5	64.1
Per Share Data					
Earnings	$7.91	$10.21	$13.68	$18.30	$17.79
Dividend	$3.40	$4.61	$6.11	$6.82	$6.91
Book Value	$52.62	$78.55	$152.03	$103.35	$104.55
Exchange Rate (US$1=DM)	DM 2.94	DM 2.17	DM 1.8	DM1.76	DM 1.88

NA = Not available

Source: Hoechst AG
Annual Reports and Forms 10-K
Dataquest (1990)

Table 4
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of Deutsche Marks, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	DM 17,656.6	DM 18,154.9	DM 15,959.0	DM 17,487.0	DM 18,611.0
Cash	1,046.5	4,070.1	1,703.0	1,708.0	1,435.0
Receivables	8,138.3	7,196.4	7,309.0	8,054.0	8,385.0
Marketable Securities	1,251.7	423.9	899.0	1,661.0	2,003.0
Inventory	7,220.1	6,464.5	6,048.0	6,064.0	6,788.0
Other Current Assets	0	0	0	0	0
Net Property, Plants	DM 9,084.9	DM 8,672.7	DM 12,813.0	DM 13,784.0	DM 14,597.0
Other Assets	DM 627.8	DM 673.7	DM 159.0	DM 109.0	DM 139.0
Total Assets	DM 27,369.3	DM 27,501.3	DM 28,931.0	DM 31,380.0	DM 33,347.0
Total Current Liabilities	DM 6,820.0	DM 6,005.8	DM 2,315.0	DM 2,829.0	DM 2,913.0
Long-Term Debt	DM 3,631.8	DM 3,023.5	DM 6,478.0	DM 6,156.0	DM 6,166.0
Other Liabilities	DM 7,155.0	DM 7,716.3	DM 3,172.0	DM 11,026.0	DM 11,669.0
Total Liabilities	DM 17,606.8	DM 16,745.6	DM 11,965.0	DM 20,011.0	DM 20,748.0
Total Shareholders' Equity	DM 9,762.5	DM 10,755.7	DM 16,966.0	DM 11,369.0	DM 12,599.0
Common Stock	2,578.2	2,743.9	2,797.0	2,831.0	2,884.0
Other Equity	4,433.4	2,630.9	8,268.0	7,301.0	8,400.0
Retained Earnings	2,750.9	5,380.9	5,901.0	1,237.0	1,315.0
Total Liabilities and Shareholders' Equity	DM 27,369.3	DM 27,501.3	DM 28,931.0	DM 31,380.0	DM 33,347.0

Income Statement	1985	1986	1987	1988	1989
Revenue	DM 42,722.0	DM 38,014.0	DM 36,956.0	DM 40,964.0	DM 45,898.0
German Revenue	10,798.0	10,832.0	22,245.0	24,059.0	26,497.0
Non-German Revenue	31,924.0	27,182.0	14,711.0	16,905.0	19,401.0
Cost of Sales	NA	NA	DM 23,186.0	DM 25,580.0	DM 29,276.0
R&D Expense	DM 2,083.0	DM 2,138.0	DM 2,217.0	DM 2,416.0	DM 2,621.0
SG&A Expense	NA	NA	DM 8,722.0	DM 9,334.0	DM 10,420.0
Capital Expense	DM 2,365.0	DM 2,679.0	DM 2,394.0	DM 2,061.0	DM 3,868.0
Pretax Income	DM 3,156.0	DM 3,211.0	DM 3,108.0	DM 4,086.0	DM 4,146.0
Pretax Margin (%)	7.39	8.45	8.41	9.97	9.03
Effective Tax Rate (%)	NA	NA	NA	NA	NA
Net Income	DM 1,468.0	DM 1,399.1	DM 1,528.0	DM 2,015.0	DM 2,130.0
Shares Outstanding, Millions	63.1	63.1	62.0	62.5	64.1
Per Share Data					
Earnings	DM 23.27	DM 22.16	DM 24.63	DM 32.21	DM 33.44
Dividend	DM 10.00	DM 10.00	DM 11.00	DM 12.00	DM 13.00
Book Value	DM 154.71	DM 170.45	DM 273.65	DM 181.90	DM 196.55

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of Deutsche Marks, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	2.59	3.02	6.89	6.18	6.39
Quick (Times)	1.53	1.95	4.28	4.04	4.06
Fixed Assets/Equity (%)	93.06	80.63	75.52	121.24	115.86
Current Liabilities/Equity (%)	69.86	55.84	13.64	24.88	23.12
Total Liabilities/Equity (%)	180.35	155.69	70.52	176.01	164.68
Profitability (%)					
Return on Assets	-	5.10	5.42	6.68	6.58
Return on Equity	-	13.64	11.02	14.22	17.77
Profit Margin	3.44	3.68	4.13	4.92	4.64
Other Key Ratios					
R&D Spending % of Revenue	4.88	5.62	6.00	5.90	5.71
Capital Spending % of Revenue	5.54	7.05	6.48	5.03	8.43
Employees	180,561	153,651	167,781	164,527	169,295
Revenue (DM K)/Employee	DM 237	DM 247	DM 220	DM 249	DM 271
Capital Spending % of Assets	8.64	9.74	8.27	6.57	11.60
Exchange Rate (US$1=DM)	DM 2.94	DM 2.17	DM 1.8	DM 1.76	DM 1.88

NA = Not available

Source: Hoechst AG
Annual Reports and Forms 10-K
Dataquest (1990)

Hughes Microwave Products Division

Hughes Microwave Products Division
P.O. Box 2940
Torrance, CA 90509-2940
(213) 517-6400

Established 1977
No. of Employees: N/A

BACKGROUND

Hughes Aircraft Company, now owned by General Motors, began GaAs R&D in the late 1960s. The Microwave Products Division (MPD) in Torrance started operations in 1977. From 1977 to the early 1980s, the division invested about $1 million per year in capital equipment. In 1982, the prototype lab was completed. Another $10 million was invested in the pilot fab line constructed in 1985. As of mid-1985 Hughes was investing $40 million in GaAs ICs; $20 million had been invested prior to that time. In 1987, Hughes MPD tripled its GaAs clean rooms to a total of 44,300 square feet, permitting high-volume production in a facility separate from the prototype fab and diode fab areas.

COMPANY EXECUTIVES

- Division Manager—Dr. N. Bruce Kramer
- Assistant Division Manager and Facilities Manager—K.P. Grabowski
- Assistant Division Manager and GaAs Operations Manager—H.J. Kuno
- Marketing Manager—Richard A. Johnson
- Controller—E.V. Ryan
- Quality Assurance Manager—P.J. Nobile

STRATEGIC ALLIANCES

MPD is a division of Hughes Aircraft, which is owned by General Motors. Hughes Aircraft is developing electronics for future automotive applications including collision avoidance and communications systems.

Hughes and McDonnell Douglas are teamed with AT&T Bell Laboratories on a DARPA program to develop SDHT (HEMT) SRAMs and logic circuits.

The Hughes MIMIC (DOD initiative) team includes AT&T, GE, Harris Microwave Semiconductor, and M/A-COM.

Hughes Microwave Products Division

SERVICES

The Company provides circuit design, CAD support, wafer fab, and chip test and evaluation for internal and selected external use.

PROCESS TECHNOLOGY

- GaAs MESFET to 0.25u gates; SDHT (HEMT)
- Ion implantation, direct-write e-beam, and second-generation MBE equipment (Hughes patented the ion-implanted channel FET.)

PRODUCTS

- LNAs
- Power FETs
- Matched drivers
- MMICs

Applications

Its products are used by the military/aerospace market, including radar, electronic warfare and communications instrumentation and commercial electronics.

FACILITIES

MPD's facilities are located in Torrance, California. They include 44,300 square feet of clean rooms with 8,000 square feet for diode fabrication, 6,400 square feet for materials and prototype fabrication, and 29,900 square feet for GaAs production areas.

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Torrance, CA 90509-2940
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In 1988, Hughes received a Phase I MIMIC award. Phase I is expected to be completed by mid-1991. Hughes is teamed with AT&T, GE, HMS, and M/A-COM on this DARPA-sponsored program. This team is developing a total of 16 chip types for military radar, communications, and smart weapons applications.

COMPANY EXECUTIVES

- Division Manager—Dr. N. Bruce Kramer
- Assistant Division Manager and Facilities Manager—Kenneth P. Grabowski
- Assistant Division Manager and GaAs Operations Manager—H. J. Kuno
- Division Sales Manager—Richard A. Johnson
- Business Development Manager—Richard Larson
- Controller—E. V. Ryan
- Quality Assurance Manager—P. J. Nobile

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Hughes Microwave Products Division

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- GaAs MESFET to 0.25u gates; SDHT (HEMT)
- Ion implantation, direct-write e-beam, and second-generation MBE equipment (Hughes patented the ion-implanted channel FET.)

PRODUCTS

- LNAs
- Power FETs including 1-Watt, 15-GHz devices
- Matched drivers
- MMICs

APPLICATIONS

Hughes' GaAs products are used by military/aerospace market segments such as radar, electronic warfare and communications, instrumentation, and commercial electronics including automotive.

FACILITIES

MPD's facilities are located in Torrance, California. They include 44,300 square feet of clean rooms with 8,000 square feet for diode fabrication, 6,400 square feet for materials and prototype fabrication, and 29,900 square feet for GaAs production areas.

Hyundai Electronics Industries

San 136-1, Ami-ri, Bubal-myun
Ichon-kun, Kyoungki-do
Korea 467-860
Telephone: (02) 741-0661/4
Telex: k23955/7 HDETN
Fax: (02) 741-0737
Dun's Number: 13-193-6494

Date Founded: 1983

CORPORATE STRATEGIC DIRECTION

Hyundai Electronics Industries (HEI) is a member of the Hyundai Group, which was founded in 1945 by Chung Ju Yung. The Hyundai Group's major business areas are construction and engineering, shipbuilding, heavy industry, automobiles, electronics, housing development, petrochemicals, securities and insurance trading, iron/steel/aluminum, and shipping.

HEI was incorporated in 1983 as a business unit of the Hyundai Group in response to the growing market for electronics and high-technology products and services. The major businesses for HEI include semiconductor manufacturing and assembly, advanced information systems, computer systems, peripheral devices, telecommunications products, and industrial electronics. According to HEI, annual sales for 1990 totaled $1.2 billion.*

The corporate strategy is to position the company as a long-term player in the high-tech marketplace. This strategy includes the scheduling and design of new products, the implementation of operations programs and support for dealers, and careful expansion of the dealer channel. The distribution channel is of extreme importance to HEI, which adheres to a philosophy of partnership with its dealers. The company's PC products are now sold to end users solely through dealers and VARs.

Currently, HEI has two subsidiaries: Hyundai Electronics America (HEA) and Hyundai Electronics Europe (HEE). Each company oversees sales and marketing in its respective region. HEI also has branch offices in Canada, Japan, Hong Kong, Taiwan, Singapore, the United Kingdom, and Germany, employing approximately 15,000 people worldwide.

Hyundai Electronics America, established in 1983, specializes in three major divisions: Information Systems, Semiconductor, and Assembly/Test. To strengthen the company's product development in the United States, an R&D center was established in 1990 at San Jose, California. According to HEA, the main goal of the R&D center is to advance the technology Hyundai offers in microcomputers, workstations, systems, and peripherals. The company plans to expand its full line of PC products, with the goal of becoming a single-source supplier of PC products.

Under a new regulation adopted by the Korean government in 1991, conglomerates have to nominate three core activities, which become the only businesses to have access to preferential credit terms. The Hyundai Group chose electronics, petrochemicals, and automotive as its three core activities.

No financial statements are included because Hyundai Electronics is a privately held company.

BUSINESS SEGMENT STRATEGIC DIRECTION

Semiconductors

Dataquest estimates that Hyundai ranked thirty-third in the total Asian/Pacific semiconductor market share in 1990. Hyundai holds 3.4 percent of the Asian/Pacific market for semiconductors with an estimated revenue of $57 million. Revenue in 1990 and 1989

*All dollar amounts are in U.S. dollars.

was approximately $200 million and $220 million, respectively.

Hyundai produces a full line of memory devices, including SRAMs, DRAMs, EEPROMs, ASICs, EEPLDs, and microcontrollers, based on CMOS technology. Some of Hyundai's latest developments include the 16Mb DRAM, 1Mb SRAM, and various EEPLDs. Hyundai's Semiconductor Research and Development Lab (SRDL) is currently focusing on the development of 64Mb DRAMs and 4Mb SRAMs and is expanding its development activities into the areas of microprocessors, graphic ICs, and automotive components ICs.

Hyundai is also a member of the Korean VLSI Joint Development Project organized to develop fabrication steps and critical equipment for the next generation of memory chips with the details of less than half a micron. Hyundai's participation in the VLSI Joint Development Project will enable Hyundai to develop memory chips capable of storing 16Mb, 64Mb, and more on a single chip.

SRDL is currently setting up an advanced R&D process development facility (class 1) in its Ichon complex in Korea and an overseas design center in the United States to cope with the increasing global competition in the VLSI area. The design center in the United States will be the source of information and technologies for implementing spectrum in the areas of Memories and SIC Devices.

Personal Computers

HEI has established itself as a manufacturer of a full line of personal computer products known for their high quality and competitive prices. Hyundai fills a niche in the marketplace by using existing technology to provide a high-performance, low-cost personal computer. In 1987, HEI adopted the strategy of selling its PCs under its own brand name. Hyundai was the only Korean PC manufacturer to record growth in the first half of 1990, which HEI attributes to this strategy.

Dataquest estimates that Hyundai Electronics Industries is the fifth largest personal computer vendor in Korea, with a 10.2 percent market share in 1990 (based on unit shipments). HEI's relatively low domestic rank reflects its strategy in the past years of relying on overseas markets. Dataquest estimates that over 70 percent of Hyundai's personal computer sales come from its U.S. businesses. In order to balance its overseas business, the company plans to decrease its reliance on the U.S. market to 40 percent and increase sales to the European and Asian markets to 35 percent and 25 percent, respectively.

Exports in 1991 are targeted at 306 million, representing a 37 percent increase from 1990. Dataquest estimates that Hyundai's share of the U.S. market in 1990 to remain at the 1989 level of 1.1 percent. According to Dataquest, the majority of HEI's PC market share can be attributed to the Super-LT3 product line.

Domestically, Hyundai's strategy is to provide a wide variety of personal computer hardware. HEI is trying to penetrate the market for banks and other financial institutions, government offices, and small to medium-size corporations with the development of high-level personal computers such as 486-based machines and 386SX-based notebooks.

Currently, Hyundai sells five types of 80386 systems, including a 20-MHz notebook, two types of 80286 systems in the United States, a new 80486/33 ISA PC, which was introduced in the second quarter of 1991, and a corporate series of modular computers, including an 80386/42, 80486/33, and 80486SX. The X terminals and RISC workstations will be introduced in the latter part of 1991.

Monitors

Hyundai manufactures six models of monochrome monitors: the HMM-1200A, the HMM-1201A, the HMM-1401A, the HMM-202, the HMM-413, and the 19-inch HMM-1900 and six models of VGA color monitors: the HCM-421E Super VGA, the HCM-402B VGA, the HCM-402C VGA, the HCM-402S, the HCM-402T, and the HCM-423E/B, which was introduced in the third quarter of 1991.

Telecommunications

Hyundai produces and sells cellular mobile phones, PBX machines, and television retrieve only (TVRO) systems. It is also in the process of introducing a new compact facsimile product with 20 automated functions. Hyundai sells its telecommunications products in the Asian countries only.

Further Information

For more information about the company's business segments, please contact Dataquest's Asian Semiconductor and Electronics Technology service.

1990 SALES OFFICE LOCATIONS

North America—8
Europe—2
Japan—1
ROW—4

MANUFACTURING LOCATIONS

North America

San Jose, California
Semiconductor assembly

ROW

Ichon-kun, Kyoungki-do, Korea
All HEI equipment

SUBSIDIARIES

Hyundai Electronics America (HEA) (United States)
Hyundai Electronics Europe (HEE) (Germany)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1991

LaserByte Corporation
LaserByte Corporation and HEA have agreed to jointly develop small-form-factor erasable optical disk drives for microcomputers. The optical disk drives have data storage capacity hundreds of times greater than floppy drives.

Selko Company
Selko and Hyundai agreed to establish a joint venture company in Poland to cultivate the market in Poland, Yugoslavia, the USSR, and other Eastern European nations.

Goldstar Company, Opus Systems Inc., and Tatung Co.
Goldstar Company, Tatung Co., and HEI are working together with Opus Systems Inc.'s instant Sun clone kit to make SPARC stations commodity items.

1990

ComputerLand Corporation
ComputerLand Corporation and Hyundai Electronics America signed a central purchasing agreement that adds Hyundai to ComputerLand's PC products line. ComputerLand now carries a full line of Hyundai's laptop and desktop computers.

Dowell Industrial
Dowell Industrial of Hong Kong and HEI signed a distribution agreement for a full range of Hyundai's high-quality memory devices in Hong Kong and Macau. The products covered by the agreement include SRAMs, DRAMs, EEPROMs, and EEPLDs.

Integrated Electronics Corporation
Integrated Electronics is distributing Hyundai's semiconductors in Irvine, Sacramento, and Canoga Park, California; Denver, Colorado; Hoffman Estates, Illinois; Salt Lake City, Utah; Seattle, Washington; and Beaverton, Oregon.

Intelligent Electronics (IE)
Under a central purchasing agreement between Intelligent Electronics and HEI, Intelligent Electronics will market HEI's line of personal computers. Intelligent Electronics' marketing support for the Hyundai product line will include a variety of promotional programs designed for the diversity of the IE dealers.

Korea Computer Research Association (KCRA)
Daewoo Telecommunications, Goldstar Company, Samsung Electronics, and HEI will jointly develop superminicomputers under the auspices of KCRA.

LSI Logic and Metaflow Technologies
Hyundai Electronics, LSI Logic, and Metaflow Technologies will jointly develop a new SPARC chip. All three companies expect this next generation chip, known as "Lightning," to be the highest performance CMOS processor available in the 1990s, exceeding 80 mips on most compiled programs. The Lightning chip will implement Sun Microsystems' SPARC instruction set for RISC microprocessors and will be based on a unique architecture developed by Metaflow Technologies that significantly improves efficiency and performance.

Optrex Corp.
LCD manufacturer Optrex Corp. will begin importing and marketing LCDs produced by HEI. During the next three years, Optrex plans to import 850,000 units of 52 × 22mm LCDs per month from Hyundai, which will be marketed for use in automobiles.

Pyramid Technology
Hyundai and Pyramid Technology made a technology exchange agreement calling for the cooperative assembly of the MIS (Management Information Service) superminicomputer series. Under the agreement, Pyramid will provide Hyundai with the technical knowledge to domestically produce the superminicomputers over the next years. The systems can process information at 17-200 mips, and utilize a built-in symmetric multiprocessing device.

SGS-Thomson Microelectronics Inc.
HEI settled its semiconductor dispute with SGS-Thomson Microelectronics Inc. by agreeing to conclude a 10-year cross-licensing contract. Hyundai has agreed to pay royalties to Thomson for the use of technology in its production of DRAMs and SRAMs.

Transcriptions Ltd.
Transcriptions has signed a VAR agreement with HEA to resell HEA's laptops, 80386 and 80386X machines, and IBM's XT- and AT-compatible computers, as well as monitors, modems, and printers.

Unisys Corporation
Hyundai Electronic Industries has agreed to assemble and market Unisys Corp.'s Intel iAPS-86 family U6000 Models 51, 55, and 60 UNIX boxes. HEI will market the boxes in Korea as the Hyundai Super 6000 Series as part of its strategy to capture financial, insurance, and government business.

Val Laboratory Inc.
Val Laboratory and HEI have made an agreement whereby Val Laboratory will supply HEI with its Pharaoh integrated business software package.

MERGERS AND ACQUISITIONS

Hyundai Electronics has made no mergers or acquisitions recently.

KEY OFFICERS

M.H. Chung
President and CEO

C. S. Park
Senior vice president, Corporate Planning and Sales and Marketing, Semiconductor Division

H.T. Lee
Executive vice president, Finance

Y.Y. Rha
Vice president, Semiconductor Division Operations

K.H. Oh
Vice president, R&D, Semiconductor Division

Y.H. Kim
CEO, HEA

Joseph Reid
Vice president, Sales and Marketing, Information Systems Division, HEA

Stan Katz
Vice president and general manager, Semiconductor Division, HEA

PRINCIPAL INVESTORS

The Hyundai Group

FOUNDERS

Chung Ju Yung

Hyundai Electronics Industries

San 136-1, Ami-ri, Bubal-myun
Ichon-kun, Kyoungki-do
Korea 467-860
Telephone: 33-2001
Telex: k23955/6 HDETN
Fax: 741-0737
Dun's Number: 13-193-6494

Date Founded: 1945

CORPORATE STRATEGIC DIRECTION

Hyundai Electronics Industries (HEI) is a member of the Hyundai Group, which was founded in 1945 by Cung Ju Yung. The Hyundai Group's major business areas are construction and engineering, shipbuilding, heavy industry, automobiles, electronics, housing development, petrochemicals, securities and insurance trading, iron/steel/aluminum, and shipping.

HEI was incorporated in 1983 as a business unit of the Hyundai Group. The major businesses for HEI include semiconductor manufacturing and assembly, information systems, computer systems, peripheral devices, telecommunication products, and industrial electronics. The Company has two affiliated companies, Hyundai Electronics America (HEA) and Hyundai Electronics Europe (HEE). According to HEI, annual sales for 1989 totaled $1.5 billion.* With branch offices in the United States, Japan, Hong Kong, Taipei, Singapore, the United Kingdom and Germany, HEI employs approximately 15,000 people worldwide.

The Company has established itself as a manufacturer of a full line of personal computer products known for their high quality and competitive prices. HEI fills a marketplace niche by using existing technology to provide high-performance, low-cost personal computers. The Company was an OEM supplier for other major manufacturers, but for the past two and a half years has manufactured and marketed PCs under its own name.

The corporate strategy is one of controlled growth in positioning HEI as a long-term player in the high-tech marketplace. This strategy includes the scheduling and design of new products, the implementation of operations programs and support for dealers, and careful expansion of the dealer channel. The indirect distribution channel is of extreme importance to HEI, which adheres to a philosophy of partnership with its dealers. The Company's PC products are now sold only through resellers and value-added resellers (VARs) in over 1,600 locations across the United States. Its method of distribution is similar worldwide.

No financial statements are included because Hyundai Electronics is a privately held company.

BUSINESS SEGMENT STRATEGIC DIRECTION

Semiconductors

Dataquest estimates that HEI ranks 37th with less than 1 percent market share in the worldwide semiconductor market, with sales estimated to be $210 million, or 14 percent of HEI's total revenue for 1989. This 98 percent increase in revenue over the previous year reveals the Company's strategy of focusing on semiconductor revenue generation during 1990. The Company ranks 28th in North America with less than 1 percent market share. However, North American sales represented 52 percent of the total semiconductor revenue for HEI, or $110 million for 1989. The Rest of World market represented 36.5 percent of HEI's 1989 semiconductor revenue, or $78 million. This is 189 percent growth over 1988. The Company participates in the European semiconductor market, which contributed 10 percent of HEI's 1989 semiconductor revenue, or $19 million, with

*All dollar amounts are in US dollars.

less than 1 percent market share in the European market. HEI also sell semiconductors in Japan, which represented the remaining 1.5 percent of total semiconductor revenue for 1989. Semiconductor revenue in the Japanese market was $3.0 million.

HEI manufactures MOS memory chips only, primarily using CMOS technology. The Company's memory chips include DRAMs (256K, 1Mb), SRAMs (64K, 256K), and EPROMs (64K, 256K).

Personal Computers

Dataquest estimates that in 1989, HEI shipped 136,000 personal computers worldwide, of which 115,500 were shipped in the United States. HEI had less than 1 percent share in the worldwide market and nearly 1 percent of the personal computer market. Dataquest estimates that the if-sold units of HEI personal computers generated $322 million worldwide for 1989, of which $273 million, or 85 percent, came from the United States. Personal computer sales represented 21.5 percent of HEI's total revenue. Dataquest believes that in 1990, HEI will ship 147,000 units worldwide and 124,000 units in the United States.

Dataquest believes that HEI's top models in 1989 were the Super-16TE, which shipped 29,000 units worldwide, the Super-286, which shipped 27,000 units worldwide, and the Super-286C, which shipped 21,000 units worldwide. Eighty-five percent of HEI's top models were shipped within the United States.

The Company's computer announcements in 1989 included the Super-286N and Super-16X (April), the Super-286E and Super-386C (August), and the Super-386S and Super-LT3 (October). Announcements in 1990 included the Super-386N and Super-286X (January). HEI also introduced the Super-386T in September 1990.

HEI distributes its computers through dealers in the United States and through distributors (Micro D and Parity Plus) in Canada and Europe.

Terminals

HEI manufactures two models of computer terminals: the HPT-1000 and the HTE-2420. Dataquest estimates that HEI has less than 1 percent market share in the worldwide terminal market.

Monitors

HEI participates in the monitor market, manufacturing eight models: the HCM-421, HMM-1200, HMM-1900, HMM-202, HCM-402, HMM-1203, HCM-413, and HMM-1404. Dataquest estimates that HEI has less than 1 percent share of the worldwide monitor market.

Printers

HEI produces the following dot matrix printers: the HDP-930, HDP-940, HDP-1810, and HDP-1820. It plans to introduce a 24-pin printer in fall 1990, discontinuing the HDP-1810 and the HDP-1820. Dataquest estimates that the Company has less than 1 percent market share both worldwide and in the United States.

Telecommunications

The Company produces and sells PBX machines, satellite receivers, and telephone units. It sells its telecommunication products in the Asian countries only. Facsimile machines currently are being marketed in Asian countries but will begin sales in the United States and Europe during September and October.

Further Information

For more information about the Company's business segments, please contact the appropriate Dataquest industry service.

1989 SALES OFFICE LOCATIONS

North America—6
Europe—2
Asia/Pacific—5

MANUFACTURING LOCATIONS

North America

San Jose, California
Semiconductor assembly

Asia/Pacific

Ichon-kun, Kyoungki-do, Korea
All HEI equipment

SUBSIDIARIES

Information is not available.

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

Computer Factory
HEI has a central purchasing agreement with Computer Factory for Computer Factory to join its dealership list and market Hyundai's line of personal computers.

Integrated Electronics Corporation
Integrated Electronics is distributing Hyundai's semiconductors in Irvine, Sacramento, and Canoga Park, California; Denver, Colorado; Hoffman Estates, Illinois; Salt Lake City, Utah; Seattle, Washington; and Beaverton, Oregon.

Transcriptions Ltd.
Transcriptions has signed a VAR agreement with HEA to resell HEA's laptops, 80386 and 80386X machines, and IBM's XT- and AT-compatible computers, as well as monitors, modems, and printers.

Val Laboratory Inc.
Val Laboratory and HEI have made an agreement whereby Val Laboratory will supply HEI with its Pharaoh integrated business software package.

Optrex Corporation
Optrex has signed an agreement to supply LCD technology to HEI.

Tokyo Electric Co.
HEI has branched out into the production and sales of point-of-sales (POS) systems in a 50-50 joint venture with Tokyo Electric. The venture is called Hyundai Tech-Systems.

Korea Computer Research Association (KCRA)
Daewoo Telecommunications, Goldstar Company, Samsung Electronics, and HEI will jointly develop superminicomputers under the auspices of KCRA.

Metaflow Inc.
HEI will receive technical knowledge from Metaflow, which is licensed for SPARC chip production and design. HEI will begin production of engineering workstations with the newly acquired knowledge.

1989

Connecting Point America
HEI has a central purchasing agreement with Connecting Point for Connecting Point to market HEI's line of personal computers.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

M. H. Chung
President and chief executive officer

T. H. Kim
Vice president, Sales and Marketing

Y. H. Kim
Chief executive officer, Hyundai Electronics America

K. O. Park
Vice president, Research and Development

H. T. Lee
Executive vice president

K. H. Oh
Vice president, Manufacturing

Y. Y. Rha
Vice president, Assembly and Test

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Cung Ju Yung

Hyundai

Table 1

Estimated Worldwide Semiconductor Revenue by Calendar Year (Millions of Dollars)

	1986	1987	1988
Total Semiconductor	18	30	106
Total Integrated Circuit	18	30	106
Bipolar Digital (Function)			
Bipolar Digital Memory			
Bipolar Digital Logic			
MOS (Function)	18	30	106
MOS Memory	4	30	106
MOS Microdevices			
MOS Logic	14		
Analog			
Total Discrete			
Total Optoelectronic			

Table 2

Hyundai
1988 Worldwide Ranking by Semiconductor Markets
(Revenue in Millions of Dollars)

	1988 Rank	1987 Rank	1988 Revenue	Sales % Change 1987-1988	Industry % Change 1987-1988
Total Semiconductor	56	83	$106	253.3%	33.0%
Total Integrated Circuit	47	72	$106	253.3%	37.4%
MOS (Function)	38	51	$106	253.3%	54.5%
MOS Memory	20	28	106	253.3%	93.1%

Source: Dataquest
December 1989

Hyundai

Table 3

Hyundai
Estimated 1988 Semiconductor Revenue by Geographic Region
(Millions of Dollars)

	U.S.	Japan	Europe	ROW
Total Semiconductor	$38	$1	$11	$56
Total Integrated Circuit	$38	$1	$11	$56
Bipolar Digital (Function)				
Bipolar Digital Memory				
Bipolar Digital Logic				
MOS (Function)	$38	$1	$11	$56
MOS Memory	38	1	11	56
MOS Microdevices				
MOS Logic				
Analog				
Total Discrete				
Total Optoelectronic				

Source: Dataquest
December 1989

Hyundai Electronics Industries Co., Ltd.

THE COMPANY

Overview

The Hyundai Group was founded as a construction company in 1947. The firm is now the largest business organization in South Korea. It has worldwide operations in construction, shipbuilding, steel fabrication, automobile manufacturing, and electronics. Its 32 affiliated companies, including five in the United States, employ more than 150,000 people. Hyundai's total 1985 sales were US$13 billion.

BACKGROUND

Hyundai Electronics Industries (HEI) was established in February 1983 by the Hyundai Group. A sister company, Hyundai Electronics America (HEA), formerly Modern Electrosystems, Inc., was founded about the same time, in March 1983. HEI encompasses six technical divisions: Semiconductor Manufacturing, Semiconductor R&D, Semiconductor Assembly and Test, Information Systems, Telecommunications, and Industrial Electronics. Of these, three are related to semiconductor operations, and one is a laboratory.

MAIN PRODUCTS

The Company's main products are semiconductors, computers and peripherals, mobile telephones, communication equipment, automobile electronics, industrial instrumentation, and control systems.

Its semiconductor products include:

- CMOS memory: 16K and 64K SRAM, 128K ROM, 1K EEPROM, 64K and 256K EPROM, 64K and 256K DRAM
- MPU: 8-bit, 16-bit, CMOS

Hyundai Electronics Industries Co., Ltd.

SEMICONDUCTOR DIVISIONS

Semiconductor Manufacturing Division: General Manager--Dr. D.W. Chun (senior managing director)

Semiconductor R&D Division: General Manager--Dr. K.O. Park (senior managing director)

Semiconductor Assembly and Test Division: General Manager--J.H. Lee (senior managing director)

SEMICONDUCTOR PRODUCTION

Address: 133-2 Ami-ri, Bubal-myun, Ichon-kun Kyungki-do, South Korea

Date of first production: Semiconductor Plant I--December 1984
Semiconductor Plant II--December 1985
Assembly--April 1985

Employees: 2,000

Capital Spending

CAPITAL SPENDING
(Millions of U.S. Dollars)

	1983	1984	1985	1986*
All plants	$30	$131	$129	$25
R&D	5	7	12	6
Total	$35	$138	$141	$31

*Estimated

Hyundai Electronics Industries Co., Ltd.

JOINT VENTURES/LICENSING

Partner	Country	Year	Technology
Hyundai Electronics America	United States	1983	NMOS, CMOS process
International CMOS Technology	United States	1984	EEPROM, EPROM, PEEL
Western Design Center	United States	1985	8-bit, 16-bit CMOS MPU
Vitelic	United States	1986	64K, 256K and 1M CDRAM
MOSEL	United States	1986	64K SRAM
Western Design Center	United States	1984	8-bit, 16-bit, CMOS MPU

U.S. SISTER COMPANY

Hyundai Electronics America, Inc. (HEA) is the marketing arm of HEI, Korea.

Location: 4401 Great America Parkway, 3rd Fl., Santa Clara, CA 95054, U.S.

Telephone: (408) 986-9800

Telex: 278841 HEA UR

Date established: March 1983

Chief operating officer: C.S. Park

Employees: 40 (December 1985)

In October 1985, HEA closed its product development and manufacturing activities and announced that it will concentrate on marketing activities.

Hyundai Electronics Industries Co., Ltd.

PARENT COMPANY

The Hyundai Group was founded as a construction company in 1947. The firm is now the largest business organization in South Korea. It has worldwide operations in construction, shipbuilding, steel fabrication, automobile manufacturing, and electronics. Its 32 affiliated companies, including five in the United States, employ more than 150,000 people. Hyundai's total 1985 sales were US$13 billion.

BACKGROUND

Hyundai Electronics Industries (HEI) was established in February 1983 by the Hyundai Group. A sister company, Hyundai Electronics America (HEA), formerly Modern Electrosystems, Inc., was founded about the same time, in March 1983. HEI encompasses six technical divisions: Semiconductor Manufacturing, Semiconductor R&D, Semiconductor Assembly and Test, Information Systems, Telecommunications, and Industrial Electronics. Of these, three are related to semiconductor operations, and one is a laboratory.

MAIN PRODUCTS

The Company's main products are semiconductors, computers and peripherals, mobile telephones, communication equipment, automobile electronics, industrial instrumentation, and control systems.

Its semiconductor products include:

- CMOS memory: 16K and 64K SRAM, 128K ROM, 1K EEPROM, 64K and 256K EPROM, 64K and 256K DRAM
- MPU: 8-bit, 16-bit, CMOS

SEMICONDUCTOR DIVISIONS

Semiconductor Manufacturing Division: General Manager--Dr. D.W. Chun (senior managing director)

Semiconductor R&D Division: General Manager--Dr. K.O. Park (senior managing director)

Semiconductor Assembly and Test Division: General Manager--J.H. Lee (senior managing director)

Hyundai Electronics Industries Co., Ltd.

SEMICONDUCTOR PRODUCTION

Address: 133-2 Ami-ri, Bubal-myun, Ichon-kun Kyungki-do, South Korea

Date of first production: Semiconductor Plant I--December 1984
Semiconductor Plant II--December 1985
Assembly--April 1985

Employees: 2,000

Capital spending (millions of U.S. dollars):

	1983	1984	1985	1986*
All plants	$30	$131	$129	$25
R&D	5	7	12	6
Total	$35	$138	$141	$31

*Estimated

Partial Equipment List	Number of Units
Furnaces	72
Wafer steppers	41
Projection aligners	6
Ion implanters	7
Sputtering equipment	7
Etching equipment	23
CVD systems	14

Average wafer starts (per month):

Plant	Wafer Size	Wafers
Semiconductor Plant I	5-inch	15,000
Semiconductor Plant II	6-inch	25,000

Design centers: Originally, Hyundai operated two design groups, one at Inchon, South Korea, and the other at HEA in the United States, serving in-house product development needs. In 1985, HEA announced the closing of engineering and manufacturing activities, which included the U.S. design center.

Equipment: 2 Calma GDS II with 4 workstations

Hyundai Electronics Industries Co., Ltd.

JOINT VENTURES/LICENSING

Partner	Country	Year	Technology
Hyundai Electronics America	United States	1983	NMOS, CMOS process
International CMOS Technology	United States	1984	EEPROM, EPROM, PEEL
Western Design Center	United States	1985	8-bit, 16-bit CMOS MPU
Vitelic	United States	1986	64K, 256K and 1M CDRAM
MOSEL	United States	1986	64K SRAM
Western Design Center	United States	1984	8-bit, 16-bit, CMOS MPU

CONTRACT MANUFACTURING: HISTORY AND CAPACITY

International CMOS Technology: EEPROM

Texas Instruments: 64K, 256K DRAM

Vitelic: 64K, 256K, CMOS DRAM

General Instrument: EPROMS
5,000 5-inch wafers per month
20,000 6-inch wafers per month

Hyundai Electronics Industries Co., Ltd.

U.S. SISTER COMPANY

Hyundai Electronics America, Inc. (HEA) is the marketing arm of HEI, Korea.

Location: 4401 Great America Parkway, 3rd Fl., Santa Clara, CA 95054, U.S.

Telephone: (408) 986-9800

Telex: 278841 HEA UR

Date established: March 1983

Chief operating officer: C.S. Park

Employees: 40 (December 1985)

In October 1985, HEA closed its product development and manufacturing activities and announced that it will concentrate on marketing activities.