



**MOTOROLA INC.**

Annual Report 1987



**"Motorola's  
fundamental  
objective  
is total  
customer  
satisfaction."**

Motorola, Inc. is one of the world's leading manufacturers of electronic equipment, systems and components produced for both United States and international markets. Motorola is one of the few end-equipment manufacturers that can draw on expertise in both semiconductor technology and government electronics.

**The Communications Sector** designs and manufactures two-way radios, pagers and other forms of electronic communications systems for agriculture, commercial business, construction, education, state, local and federal government and health care markets, as well as for industrial, mining, petroleum, radio common carrier, telephone, and transportation companies and utilities.



**The Semiconductor Products Sector** designs and produces a broad line of discrete semiconductors and integrated circuits, including microprocessors, microcomputers and memories, to serve the advanced systems needs of the computer, consumer, automotive, industrial, federal government/military and telecommunications markets.



**The Information Systems Group** combines



the capabilities of Codex Corp. and Universal Data Systems to provide all the elements for distributed data systems, from basic modems to integrated network management systems.

**The Government Electronics Group** specializes in research, development and production of advanced electronics systems and equipment for the U.S. Department of Defense, NASA and other government agencies, commercial users and international customers.



**The General Systems Group** designs and manufactures computer-based cellular radio-telephone systems, mobile and portable radiotelephones, microcomputer boards, and information processing and handling equipment, such as multi-user microcomputer systems.



**The Automotive and Industrial Electronics Group** serves the motor vehicle, industrial equipment



and major appliance industries through the development and production of a variety of electronic modules, components and power conversion equipment.

**The New Enterprises** organization manages Motorola's entry into completely new businesses in emerging high-growth, high-technology arenas, including semiconductor equipment, hospital clinical information systems and real-time distributed computing systems, as well as automation systems for factories, utilities and the semiconductor industry.



# Financial Highlights

(In millions of dollars, except per share data)

Motorola, Inc. and Consolidated Subsidiaries,  
Years ended December 31

	1987	1986
Net sales . . . . .	<b>\$6,707</b>	\$5,888
Earnings before income taxes . . . . .	<b>416</b>	265
% to sales . . . . .	<b>6.2%</b>	4.5%
Net earnings . . . . .	<b>308</b>	194
% to sales . . . . .	<b>4.6%</b>	3.3%
Net earnings per share . . . . .	<b>2.39</b>	1.53
Research and development expenditures . . . . .	<b>524</b>	481
Fixed asset expenditures . . . . .	<b>658</b>	567
Working capital . . . . .	<b>1,039</b>	868
Current ratio . . . . .	<b>1.62</b>	1.63
Return on average invested capital (stockholders' equity plus long- and short-term debt, net of short-term investments) . . . . .	<b>9.2%</b>	6.1%
% of total debt less short-term investments to total debt less short-term investments plus equity . . . . .	<b>14.6%</b>	15.3%
Book value per common share . . . . .	<b>23.27</b>	21.48
Yearend employment (approximate) . . . . .	<b>97,700</b>	94,400

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## Annual Meeting of Stockholders

The annual meeting will be held on May 2, 1988. A notice of the meeting, together with a form of proxy and a proxy statement, will be mailed to stockholders on or about March 18, 1988, at which time proxies will be solicited by the Board of Directors.

## Form 10-K

After the close of each fiscal year, Motorola submits a report on Form 10-K to the Securities and Exchange Commission containing certain additional information concerning its business. A copy of this report may be obtained without charge by addressing your request to the Secretary, Motorola, Inc., Corporate Offices, Motorola Center, 1303 E. Algonquin Road, Schaumburg, Ill. 60196.

## Transfer Agent and Registrar

Harris Trust and Savings Bank  
111 W. Monroe Street  
Chicago, Ill. 60603

## Auditors

Peat Marwick Main & Co.  
303 E. Wacker Drive  
Chicago, Ill. 60601

## On the Cover

A section of Motorola's PMR2000™ Personal Message Receiver is shown enlarged eight times. Alphanumeric pagers like the PMR2000 make Motorola customers more productive. "MOT" is Motorola's New York Stock Exchange symbol.



# To Our Stockholders and Other Friends

Motorola's fundamental objective is total customer satisfaction. In 1987 we made major progress toward achieving that objective.

Focusing our efforts on several key initiatives, we continued to improve quality and efficiency, we developed products and technologies that make our customers more productive, we stressed participative management, and we improved our financial performance.

Sales in 1987 rose 14% to a record \$6.71 billion from \$5.89 billion in 1986. Earnings increased to \$308 million, or \$2.39 per share, compared with \$194 million, or \$1.53 per share, in 1986.

Sales, new orders and operating profits all increased in the Communications and Semiconductor Products sectors, as well as in the Information Systems and Cellular groups. Other businesses had mixed results. Detailed information is in the following sections of this report.

## **Management Transition Plan Completed**

The final phase of the transition to the next generation of chief executive office leadership went into effect Jan. 1, 1988.

Robert W. Galvin continues as chairman of the board, the top officer in the company. William J. Weisz, formerly vice chairman of the board and chief executive officer, continues as vice chairman and was elected an officer of the board. John F. Mitchell, formerly president and chief operating officer, also was elected a vice chairman and officer of the board.

The Board of Directors expressed its enthusiastic appreciation to Bill Weisz and John Mitchell for their superb and dedicated leadership in the Chief Executive Office. We join the board in anticipating with pleasure their continuing, full-time, high-level service in their ongoing officership roles.

George Fisher, formerly senior executive vice president and deputy to the Chief Executive Office, was elected president and chief executive officer. Gary L. Tooker, formerly chief corporate staff officer, continues as senior executive vice president and was elected chief operating officer. Christopher B. Galvin, formerly corporate vice president and general manager

of the Paging Division of the Communications Sector, was elected senior vice president and chief corporate staff officer.

The first phase of the management transition plan went into effect July 1, 1986, and was described in last year's Annual Report.

Stephen L. Levy, formerly executive vice president and general manager, Japanese Operations, retired after 23 years of service with the company. He continues to serve in a consulting role as senior advisor and deputy representative for the Chief Executive Office. He was succeeded by Arnold S. Brenner, who was senior vice president and chief of Communications Sector staff operations before becoming assistant general manager of Japanese Operations earlier in 1987.

Other important executive changes are discussed later in this report. The list of elected officers on pages 30 and 31 indicates with an asterisk which of the officers advanced in rank or assumed a new position since last year's Annual Report.

## **Board of Directors Expanded**

The Board of Directors was expanded from 17 to 18 members. Donald R. Jones, executive vice president and chief financial officer, was elected a director.

## **Our Fundamental Objective:**

### **Total Customer Satisfaction**

Throughout 1987 we focused our efforts on our continuing, overriding responsibility—achieving total customer satisfaction. In doing so, we reaffirmed two key beliefs that have been part of the Motorola culture since the company began: constant respect for people, and uncompromising integrity.

We identified three key goals we must accomplish:

1. Increased Global Market Share.
2. Best in Class—in terms of people, technology, marketing, product, manufacturing and service.
3. Superior Financial Results.

To achieve these goals and provide total customer satisfaction, we are concentrating on five key operational initiatives.

#### **1. Six Sigma Quality**

Despite Motorola's leadership in quality today, we must improve it even more to remain a leader. At the beginning of 1987, we approved new, tougher goals—a tenfold improvement in quality in two years, and 100-fold in four years, on the way to achieving Six Sigma by 1992. Six sigma is a statistical term that translates into a 99.9997% perfect product or service. The CEO Quality



Left to right: John F. Mitchell, George Fisher, Robert W. Galvin, Gary L. Tooker, William J. Weisz

Award winners on page 33 demonstrate the impressive improvements we are achieving.

## 2. Total Cycle Time Reduction

Cycle time is the elapsed time from the moment a customer places an order for an existing product to the time we deliver it. In the case of a new product, it is from the time we conceive of the product to the time it ships. To reduce cycle time, we examine the total system, including design, manufacturing, marketing and administration. We have already seen some dramatic improvements, which are detailed later in this report.

## 3. Product and Manufacturing Leadership

This is closely related to the first two initiatives, and it emphasizes the need for product development and manufacturing disciplines to work together in an integrated world. The success of many of the products featured in this year's report results from "designing for manufacturability" and related programs.

## 4. Profit Improvement

This initiative is a long-term, customer-driven approach that shows us where to commit our resources today in order to give our customers what they need, thus improving long-term profits. It recognizes that superior financial results will enable us to fund our continued growth. These results are discussed in the Financial Review on pages 17 and 18.

## 5. Participative and Cooperative Management Cultures

This final initiative means working more participatively within our organization and more cooperatively across functions and across organizations. This horizontal approach is resulting in more synergy and more

efficiency. It recognizes that at Motorola, the whole is truly greater than the sum of its parts. We can draw upon our unique core competencies and technologies to provide solutions for customers that no other company can provide. We are improving our ability to build on this strength to provide total customer satisfaction.

## The Future

We remain confident about the future, both in 1988 and for the longer term. Although the fall of the stock market in October generated uncertainty about the economy, our major operations continued to perform well in the fourth quarter. We finished 1987 with sales and order rates at high levels.

Our core businesses are fundamentally sound; they can grow not only in absolute terms but in market share as well. We already have benefited throughout the world from the lower dollar. We have seen some improvement in access to markets in Japan.

Our products and services make our business and governmental customers more productive. In uncertain times, they look for cost savings, and buying from Motorola is an effective way to reduce operating costs.

We will continue to press forward with research and development, and we intend to increase our investment in capital equipment to improve quality and manufacturing efficiency.

Motorola's employees will continue to focus their efforts on our fundamental objective of total customer satisfaction. We are gratified by the success we have achieved thus far. This success creates more opportunities, and makes us even more optimistic about future growth in sales and earnings.

Robert W. Galvin  
Chairman of the Board

George Fisher  
President and Chief Executive Officer

Gary L. Tooker  
Senior Executive Vice President and  
Chief Operating Officer

# Communications Sector

The Communications Sector achieved record sales and operating profits in 1987 as worldwide demand grew for paging and advanced, more complex two-way radio systems.

Sales rose 12% to \$2.51 billion, new orders increased 18% and backlog was up 33% from the end of 1986. Operating profits were higher.

International orders rose sharply, led by Europe, Japan, Mexico and Latin America. U.S. orders were higher in government, radio common carrier, commercial and utility markets.

In December, Rhesa S. Farmer, executive vice president and general manager of the sector, retired after

more than 30 years of service. He was succeeded by Arthur P. Sundry, formerly assistant general manager. Two assistant general managers were elected as part of a new three-person Office of the General Manager. They are David K. Bartram, previously general manager of the International Group, and Morton L. Topfer, formerly general manager of Product Operations.



**The Saber™ portable two-way radio features an eight-character alphanumeric display.**

## **New Products Set a Record**

Focusing its efforts on total customer satisfaction, our Communications Sector enhanced its product and manufacturing leadership and introduced a record number of new products. They included three new mobile and four new portable two-way radio lines, new paging products and new radio data terminals. They are designed to make customers more productive.

The new Spectra™ mobile is the industry's first trunked radio to operate on the 900 MHz channels allocated at the end of 1986. It offers the latest in microchip technology and is available for conventional, trunked or dual operation systems. Trunking provides computer-aided sharing of channels by many users. We also introduced a 900 MHz repeater to provide complete

system capability. The MaxTrac™ line of compact, dash-mounted mobile radios features both conventional and trunked models. Their operating characteristics can be quickly changed or duplicated in the field.

Our new portable two-way radios also feature compact designs and are field programmable. The new microcomputer-controlled Saber™ radio combines small size with many advanced features. Passwords can be used to prevent unauthorized use, and a scan option can provide 10 independent scan lists with up to 12 channels each. It is our most flexible portable and can be equipped with encryption capabilities to operate in a Motorola secure voice communications system. The MT1000™ portable features a digital display and, with 99 channels, can be used in small to large systems. A trunked version, the MTX800™ portable, is designed for commercial market trunking systems and can operate on any Motorola Specialized Mobile Radio System (SMRS). The new HT600® radio is a 6-channel portable with greater protection from water, dust, shock and vibration than in previous models.

Our new Radius™ family of economically priced portable and mobile radios and base stations provides system flexibility with options such as telephone interconnect.

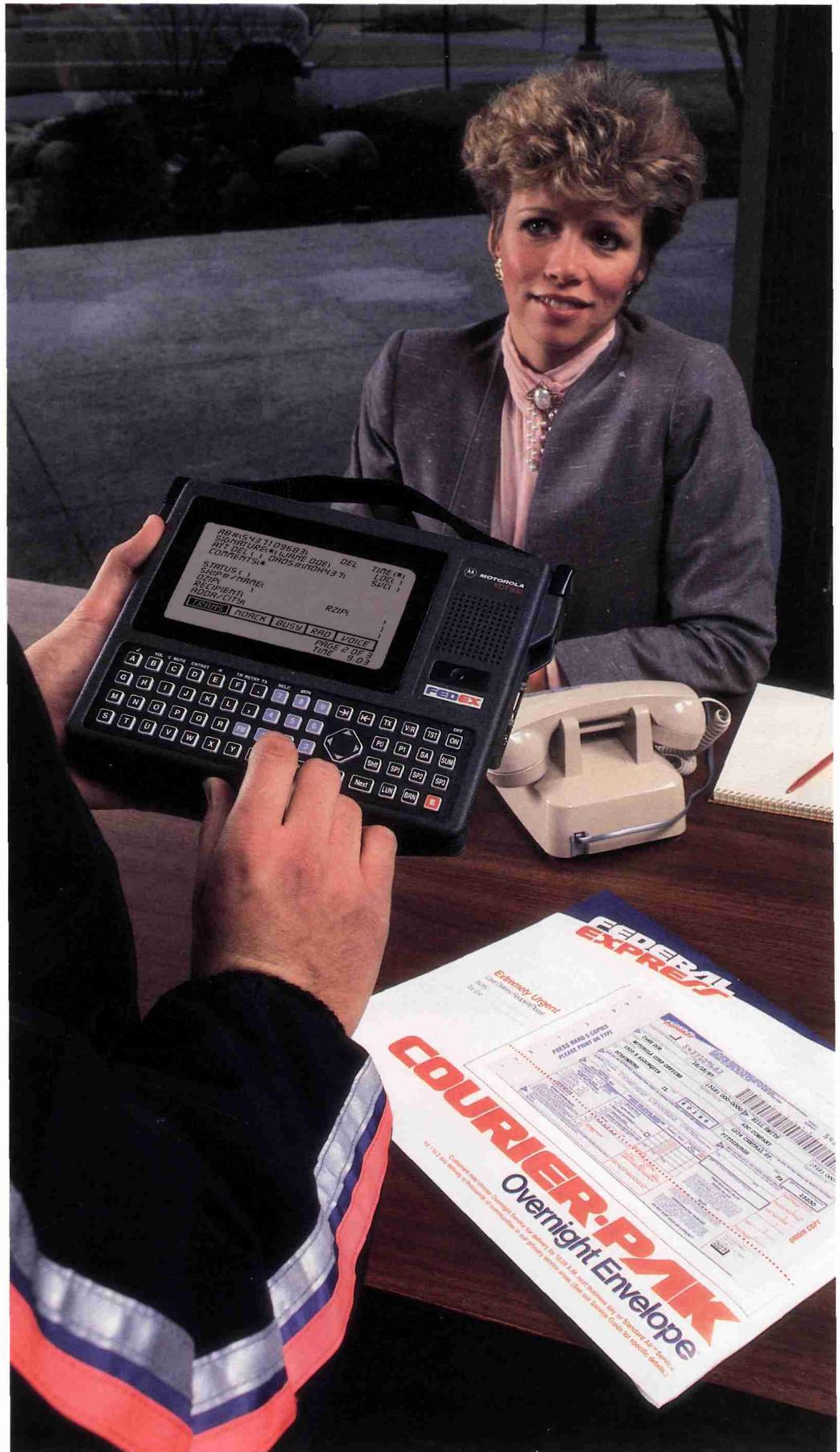
## **Improved Quality and Manufacturing Leadership**

The sector made impressive progress during 1987 in improving quality, cycle time and manufacturing capability. Four CEO Quality Awards recognized the sector's efforts in reducing defect levels and achieving zero defect performances in three U.S. manufacturing operations and one international facility.

Manufacturing thrusts include a program to work with the fewest vendors possible to assure the timely delivery of zero defect parts. The sector reduced its supplier base by more than 50% in 1987. As part of the effort to automate its factories, the sector is developing state-of-the-art, flexible computer integrated manufacturing and new training programs to enhance the skills of technical and production personnel.

The sector also began building a laboratory and staffing a new manufacturing research center at the Schaumburg, Ill., facility. The center is committed to applied research into manufacturing processes, materials, equipment and systems. Its efforts will be expanded through interactive programs with universities such as the Massachusetts Institute of Technology, Georgia Institute of Technology and the University of Illinois. The universities are planning major research programs, which Motorola is helping to establish.

Couriers from Federal Express Corp. will use Motorola KDT900™ portable radio data terminals to transmit delivery information and receive customer requests to pick up packages and documents. The terminals are part of a system designed for use by Federal Express in congested metropolitan areas. Linked to a host computer, the terminals help in tracking shipments and keeping customer information up to date. The KDT900 is the industry's first portable radio terminal that can transmit data at 19,200 bits per second.



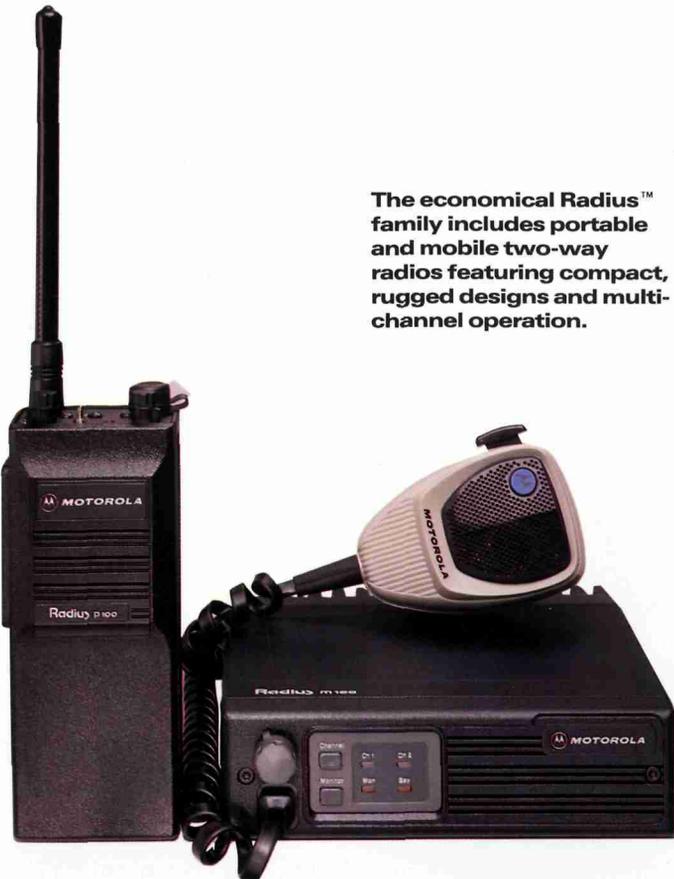
### Worldwide Growth in Communications

We received several major contracts during 1987 that extend Motorola two-way radio systems throughout the world. In the People's Republic of China, for example, we received an order for the PRC's first 800 MHz trunking system. Our Storno subsidiary received orders for 11 trunked systems from various customers in China. Other orders for Storno® trunked systems included awards from British Airways and the Royal Automobile Club in the United Kingdom.

In Japan, we received large orders for subscriber paging units from Nippon Telegraph & Telephone (NTT). We shipped our 500,000th pager to NTT during 1987, and we are currently supplying NTT with a new numeric display pager.

Along with six Japanese companies, Motorola is a joint venture partner in the Tokyo Telemesssage Paging Co., which provides a paging service in Tokyo. We supplied the system's infrastructure and a significant share of the pagers for the system, which began operation in October.

We also started, on a joint venture basis, our first shared trunked two-way radio system in Japan. Motorola systems in three different cities began operating during the fourth quarter.



**The economical Radius™ family includes portable and mobile two-way radios featuring compact, rugged designs and multi-channel operation.**

In the United States, major orders for large Smartnet™ trunking systems included awards from Baltimore County, Maryland, Georgia Power Co., the State of Rhode Island Department of Transportation and the City of St. Louis, Mo. We also received four orders from AT&T totaling \$4.5 million to upgrade its nationwide two-way radio communications system used by service technicians.



**The Spectra™ mobile radio operates on the newly allocated 900MHz frequency band.**

In paging, Metromedia Paging Services, Inc. awarded Motorola a contract to supply a variety of paging products, including numeric, alphanumeric and 900 MHz pagers. We received other large paging orders from the Radio Paging Division of Graphic Scanning Corp. for digital display pagers and from Paging Network, Inc. for base stations and controllers featuring digital diagnostics and digital remote control for use throughout the United States.

### Motorola Goes to the Olympics

Motorola Canada Ltd., as an official sponsor of the XV Olympic Winter Games Organizing Committee, was the supplier of two-way radio, paging and cellular communication products and systems for the 1988 Winter Games in Calgary.

Motorola also continues as the official communications sponsor of the U.S. Olympic team. We are supplying two-way radio and paging communication systems to the U.S. Olympic team for use in training in 1988 and at the 1988 Summer Games in Seoul, Korea.

## Semiconductor Products Sector

Higher sales and new orders throughout the world, coupled with major customer service and manufacturing improvements, helped improve the Semiconductor Products Sector's profitability in 1987.

Sales increased 21% to \$2.19 billion, new orders rose 29% and backlog was 31% higher than at the end of 1986. Operating profits were significantly higher.

Market demand remained strong and stable throughout the year. All major regions grew, led by Asia Pacific and Japan, where strong export-driven manufacturing was sustained throughout 1987. This was aided by the continuing movement of U.S. and Japanese equipment manufacturers into Hong Kong, Singapore and Taiwan.

Orders were higher in key North American markets, paced by computer and consumer segments. The industrial, communications and distribution markets also showed good growth. The automotive segment grew slightly and the federal/military segment was lower. In major product categories, microprocessors and memories were particularly strong. Average selling



**Apple Computer's Macintosh II high-end personal computer is based on the 32-bit Motorola MC68020 microprocessor.**

prices were stable to slightly lower for most products.

Despite higher demand, delivery lead times remained in the 4-to-8 week range for most product

lines. Reduced manufacturing cycle times and firm delivery commitments helped customers keep their semiconductor inventories to a minimum.

### Focus on Sector Imperatives

Sector management established five major objectives—called Sector Imperatives—to serve as the strategic framework for continuing success in the semiconductor industry. They are to achieve or enhance total customer satisfaction; manufacturing excellence; success in the Japanese marketplace; consistent, superior financial performance; and market share gains worldwide. Considerable progress was achieved during the year.

Methods of achieving total customer satisfaction included rapid order acknowledgement, on-time delivery commitments and execution, continued quality improvements and expanded data linkages with customers.

We established more partnerships with major customers seeking stable component supplies. These partnerships include extensive design resources, computerized order entry and tracking, component certification and joint product development. For example, Motorola and Delco Electronics agreed to jointly develop discrete power transistors and integrated circuits for future automotive applications. Under another key technology agreement, Motorola and Northern Telecom made substantial progress in defining a family of industry-standard components for the Integrated Services Digital Network (ISDN). We also completed joint development with IBM of a new broadband RF (radio frequency) modem for IBM's PC network.

### Product Leadership

New leadership products were introduced to make Motorola customers more competitive in their marketplaces. In microprocessors, we began shipping our second-generation 32-bit microprocessor, the MC68030. Available in speeds up to 25 MHz, the "030" provides substantially higher performance than the MC68020 and competitive products. Shipments also began for a companion device, the MC68882 second-generation floating point math coprocessor, offering two to four



**The 32-bit MC68030 microprocessor provides twice the performance of first-generation 32-bit machines and maintains 100% upward software compatibility with the entire M68000 family.**

times the performance of its predecessor.

During 1987, Motorola's MC68020 remained the world's leading 32-bit microprocessor. Key customer applications based on the "020" included Apple Computer's Macintosh II high-end personal computer and NCR Inc.'s Tower 32/800 multi-user office computer. By yearend, one million 68020-based systems had been produced by 500 customers worldwide.

We announced initial development work on an even more powerful, third-generation 32-bit machine, designated the MC68040. It will maintain full upward compatibility with other members of the 32-bit family. Also announced was a major development program for



**A Motorola application specific IC controls liquid crystal display, logic and a memory of 80,000 words in this hand-held electronic speller from Franklin Computer Corp.**

a Reduced-Instruction-Set Computer (RISC) processor. Shipments began for the DSP56001, a general purpose digital signal processor designed into several hundred applications.

To meet customer needs for greater system performance, we expanded our offerings in the application specific integrated circuit (ASIC)

market. These included a family of complementary metal oxide semiconductor (CMOS) gate arrays with densities ranging from 6,000 to more than 100,000 gates. We also introduced an ultra-high-performance 10,000-gate emitter coupled logic (ECL) array and an 8,000-gate BIMOS array. Additional functions were added to our CMOS standard cell library.

In memories, we introduced one-megabit dynamic random access memories (DRAMs). These devices initially are being manufactured using dice from Toshiba Corp. However, we plan to begin wafer fabrication of one megabit chips in the latter half of 1988. Key additions to our static RAM portfolio included 256K (kilobit), 64K and 16K devices in various speed capabilities.

In logic, we introduced a bipolar ECL family providing three times the speed of today's highest performance logic devices at the same power requirements. It was designed for next generation high-end computer, instrumentation, graphics, automated test and digital communications applications. Key additions also were made in our analog, microcontroller, development systems and discrete semiconductor product portfolios.

## **The Manufacturing Excellence Imperative**

Actions supporting the sector's manufacturing excellence imperative included reductions in cycle times, yield improvements, and major progress in implementing statistical process control across all manufacturing operations. U.S. wafer manufacturing operations were decentralized and aligned to specific product groups. Many production areas were restructured to improve product flow and overall efficiency.

New or upgraded equipment and the expanded use of automation resulted in increased product output in existing facilities. A new, automated assembly module for microprocessor products was placed into operation in Hong Kong.

### **Progress in Japan**

In support of the Japan imperative, the sector expanded its relationships with major Japanese companies. The Canon camera pictured on page 9 is one of many examples. An expanded marketing thrust increased sales, particularly in microprocessors, logic and SMARTMOS™ power transistors.

A major element of the Japan strategy, Motorola's alliance with Toshiba Corp., was completed in 1987. This comprehensive agreement includes construction of a joint venture manufacturing facility in Izumi, Japan, to produce CMOS memories and microprocessors. The facility is scheduled to begin production in mid-1988.

Additional staffing at Nippon Motorola Ltd., and an expanded training and exchange program among the sector's worldwide facilities also supported this imperative.

The fourth imperative, superior financial performance, was aided by progress on the first three sector imperatives. Employee productivity improvements and strong expense controls also contributed to the progress. The final imperative, market share gains, was influenced by improvements in customer satisfaction and manufacturing and further success in Japan, resulting in increased world market share for some microprocessor, logic and discrete product categories.

To better serve customers in Europe and Asia, the sector occupied a design and test facility in Munich, West Germany, and announced construction of a new manufacturing and design center in Hong Kong, which is scheduled to be completed by the end of 1990.

The new Canon EOS 650 auto-focus camera, shown here in a special clear plastic case, features Motorola's highest performance 8-bit microcomputer chip that is used as the central controller for the camera's auto-focus and metering systems. Motorola SMARTMOS™ and custom TMOS power devices wind the shutter spring and advance and rewind the film. Motorola designers in Japan and Phoenix, Ariz., worked closely with Canon engineers on the project. The surface-mount devices are on flexible printed circuit boards.



# Information Systems Group

The Information Systems Group enjoyed solid worldwide growth in 1987 in both the high-end network management segment of the data communications industry and in modem markets. Sales increased

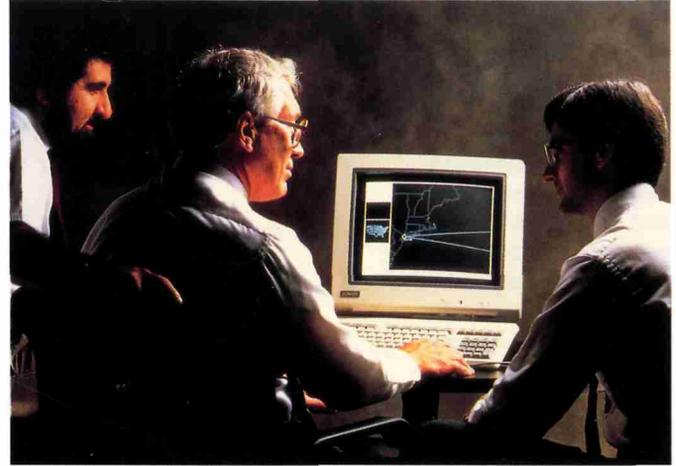


**Banking and financial services industries are key markets targeted by Codex. Modems and encryption software support automatic teller machines and other remote banking applications.**

13%, new orders rose 16% and backlog was up 7%. Operating profits were higher.

Codex, celebrating its 25th anniversary, continued its strategic transition from the traditional analog leased line and dial modems and statistical multiplexer busi-

nesses to digital products, including data voice multiplexers, network management and devices for the Integrated Services Digital Network (ISDN).



**The Codex 9800 Series Integrated Network Management System features the industry's first integrated, open architecture.**

## **Codex Expands in Network Management**

Reflecting its focus on network management and control, Codex introduced the 9300 Series of network management products designed for smaller networks. The 9300 Series simplifies network management by combining advanced technology with personal computer-based color graphics, windowing capabilities and user-customized software for management reporting. Customers are able to identify and solve problems in the system without using highly skilled technical personnel.

In September, Codex introduced its 9800 Series Integrated Network Management System. It features the industry's first integrated, open architecture, which enables users to control and manage modems and multiplexers, as well as perform management applications. The Codex 9800 Series software architecture is based on the international Open Systems Architecture Interconnection (OSI) standards, which foster creation of heterogeneous multi-vendor networks. Codex's close involvement with standards organizations will enable it to adopt industry standards as they emerge.

In the rapidly growing digital T1 multiplexer market, Codex also introduced the 6290 Integrated Digital Exchange. Using fast packet technology, the 6290 combines the benefits of packet and circuit switching for network applications.

Several products were introduced for the banking and financial services markets in 1987, including the Codex 2630 Dual Multipoint Data Modem. With the 2630, users can reduce costs by combining two inde-

pendent multipoint applications on a single line. The parallel circuits are combined by using proprietary signal processing VLSI technology and Motorola's MC68000 microprocessor.

Codex also announced the Independent Encryption Option (IEO), the first of a family of cost effective security products. It is part of the Codex 2600 Series of high-speed modems and is aimed at the financial services industry.

To enhance its reputation as the industry leader in quality, Codex continued to make customer satisfaction and quality a strategic thrust in 1987. Factory and product shipment defects were reduced significantly.

### Universal Data Systems Expands

Universal Data Systems (UDS) introduced the 9600 bit-per-second dial-up V.32 modem. Through aggressive pricing, UDS

positioned itself as a leader in this fast-growing market.

UDS continued its emphasis on developing products for international data communications markets. It received the Presidential "E" Award for Excellence in Exporting, one of only



**This new V.32 modem from Universal Data Systems operates at 9600 bits per second over private or dial-up lines.**

20 U.S. companies to earn the award in 1987.

UDS also expanded in digital products with new designs such as multi-rate digital service units (DSUs), multiplexers with built-in DSUs and products supporting many of the new carrier services. These efforts form the groundwork for ISDN activities.

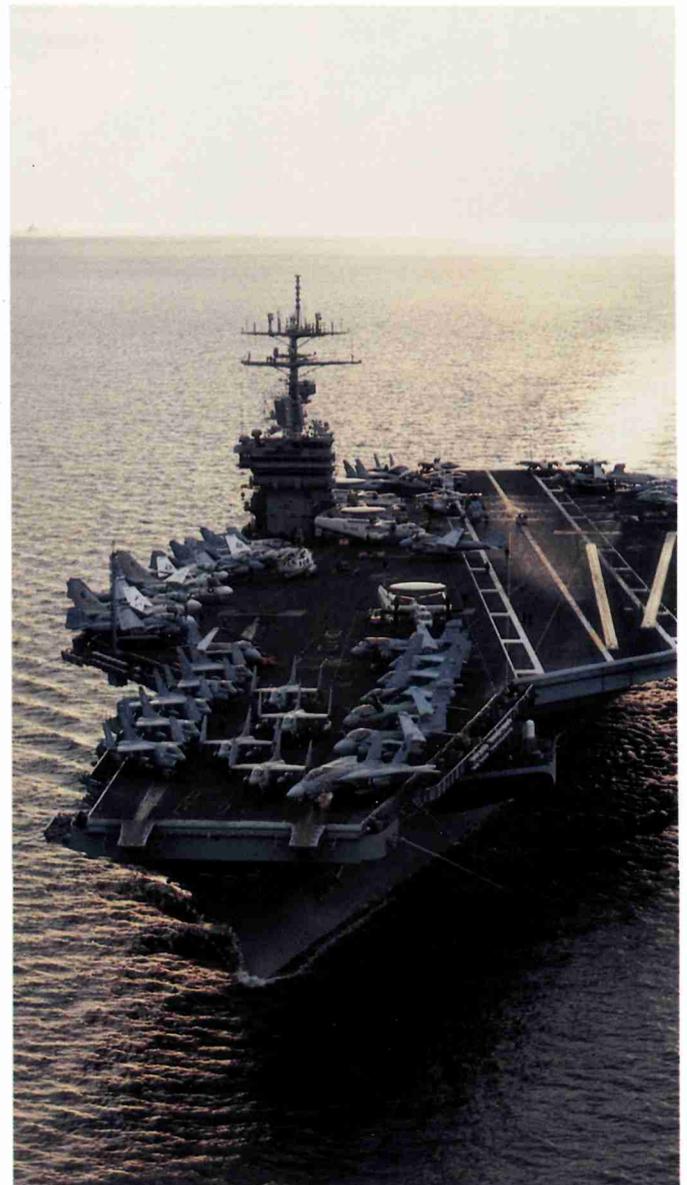
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## Government Electronics Group

The Government Electronics Group (GEG) continued to attract new business in an increasingly competitive market during 1987. Sales increased 3%, new orders were up 7% and backlog was 14% higher. Operating profits were sharply lower, as a result of contract price adjustments, costs associated with various internal and governmental reviews, and current operating performance on selected contracts.

Major contracts received during the year included:

- A \$56.6 million joint-service procurement to manufacture FMU-139 electronic ordnance devices for the U.S. Air Force and Navy.
- A \$36.6 million follow-on production award from the U.S. Navy for MK-45 target detecting devices for the Navy's Standard Missile. Since production began in 1972, more than 12,000 units have been delivered.
- A \$23.6 million contract from Aerojet Ordnance for the production of FZU-39/B proximity sensors used by the U.S. Air Force on the Combined Effects Munitions System.
- \$20.3 million in classified awards for products related to the Future Secure Voice System (FSVS).



**GEG's Automatic Carrier Landing System (ACLS) enables U.S. Navy pilots to achieve hands-off carrier landings under conditions of zero visibility. GEG successfully integrates hardware and software components into the complex environments in which military equipment and systems must operate.**

James R. Lincicome retired as executive vice president and general manager of GEG after 37 years of service with Motorola. David G. Wolfe, formerly corporate vice president and assistant general manager, was elected senior vice president and general manager of the group, and James R. Baum was promoted to corporate vice president and assistant general manager.



**This color raster scan display is part of the ground station module for Joint STARS, a joint-service radar-based surveillance system. GEG is the prime contractor for the ground station module, which is deployed with U.S. Army tactical operations centers and artillery command centers.**

### **International Operations Expand**

For several years, GEG has been redirecting its international activities toward major programs and systems. That strategy resulted in record international orders in 1987. Since a large portion of the business is in the Asia-Pacific basin, GEG will open a field office in Hong Kong in early 1988. Outside Asia, the group received contracts for transponders and enhancements of an airborne surveillance and reconnaissance radar system and ground-to-air communications system.

### **Total Customer Satisfaction**

GEG assessed customer satisfaction through individual meetings with all major customers. The group reemphasized its commitment to perfect product quality and error-free performance in all phases of the government business.

Cycle time management resulted in improved productivity and lower costs for production programs throughout GEG. By reducing cycle times, other measures of performance also have improved, such as reduced inventory levels, better on-time performance and improved project team participation.

A team from GEG and the Semiconductor Products Sector received CEO Quality Awards for outstanding quality in classified spacecraft equipment. Motorola equipment has been on virtually every classified Defense Department satellite for the last 10 years. More than 900 space secure systems have been delivered and none has experienced a failure.

GEG received a letter of recognition from NASA's Goddard Space Flight Center for contributions to the Data Link Module program, NASA's next-generation space communication and data system. GEG's primary contribution was the conceptual development of the communication equipment and implementation of the demonstration program.

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## **General Systems Group**

The Cellular and Computer businesses made significant progress in 1987 in improving customer satisfaction through quality improvements, reductions in cycle time and the introduction of new products to meet customer needs.

### **Cellular Group Expands Worldwide**

Despite intense worldwide competition, sales of the Cellular Group rose 37%, new orders increased 57% and backlog was up 98%. Operating profits were higher. During the year, the group maintained its cellular leadership and received awards to supply over 50 new systems, bringing the total to more than 170 worldwide. By yearend, more than 120 Motorola-supplied systems in 10 countries were in operation.

To continue its dramatic growth in the United Kingdom, Cellnet placed orders for Motorola's new Extended Total Access Communications System base stations. The Austrian cellular system was expanded with additional Motorola equipment and an innovative 450 MHz small-cell design.

We brought systems into service in Thailand, Amer-

**Motorola enables a worldwide base of professional and commercial users to increase productivity by providing cellular telephones of the highest quality and reliability.**



ican Samoa and China. We also received an award to supply a system for Pusan, Korea. In the U.S., we received system equipment awards for more than 50

In the United Kingdom, Cellnet, the largest contiguous operating cellular telephone system in the world, has continued its expansion using top-quality equipment and a CCITT#7 signaling system provided by Motorola.

● Coverage area



new cities and shipped equipment to expand over 50 additional systems. We installed Distributed Mobile Exchange (DMX) systems to extend the linking of cellular systems in the Northeast Corridor from Massachusetts to Maryland. A new Motorola Remote Switch Unit (RSU) allowed United Telespectrum to use existing switching control equipment in Raleigh, N.C., to provide cost-effective service to Fayetteville, N.C.



The MVME 140 multiprocessor board is the first such product to be based on Motorola's MC68030 second-generation 32-bit microprocessor.

in Arlington Heights, Ill., won three CEO Quality Awards for significant quality improvements and a better than 90% reduction in cycle time. The same processes have been implemented at the cellular operation in Stotfold, England.

We announced plans for a research and development center in Stotfold, England, and we expanded the R&D efforts of Storno to participate in development of Pan European Digital Cellular, the next-generation of cellular for Europe.

Motorola enhanced its cellular product leadership with breakthroughs in product quality and manufacturing cycle time. The Mini TAC™ cellular transceiver team

We introduced the 9500XL personal portable cellular telephone, which offers a larger alphanumeric display and a host of menu-driven features. In Europe, we expanded the Mini TAC transceiver portfolio with a new generation of 900 MHz products for Switzerland.

#### Computer Group: New Products Well Received

In the Computer Group, equipment orders increased throughout the year. New orders for equipment increased 38% and backlog was up 70%. Revenues were down 14%, and the group continued to report an operating loss.



As part of a multistate program, the Oregon State Department of Transportation awarded Motorola a contract to automate control of heavy vehicle traffic. Based on the System 8000, the monitoring system integrates the state's "weigh-in motion" scale, which can weigh a truck and measure its wheelbase as it rolls through a station at 35 mph, with the Automatic Vehicle Identification system, which electronically reports the name of the truck's owner, inspection history, current permits and tax payments. The system reduces costs and improves productivity and safety in trucking.

To achieve higher levels of product quality and customer satisfaction, the computer boards and systems manufacturing operations in Tempe, Ariz., were converted to just-in-time assembly using statistical process control. As a result, the build cycle time was reduced by 75%.

We introduced several major new products during 1987, including the MVME 135/136 boards, the first true 68020 VME microcomputer for real-time applications such as flight simulation. Major expansions to our families of supermicrocomputer systems included the VME Delta Series™ 2316 for original-equipment manufacturers and the System 8000, Model 100 for small work groups in commercial and governmental markets.

The Computer Group also announced its first prod-

ucts based on the Motorola MC68030 microprocessor. The VME Delta Series Models 3641 and 3841 are for OEM customers, while the System 8000 high tier Models 8430 and 8630 offer commercial and governmental customers higher performance and can accommodate up to 64 work group users on a single system.

The State of California selected Motorola to do the system integration for its Employment Development Department office automation system, including processing, centralized data files, mainframe access, spreadsheets, microcomputing capability and graphics. The installed system integrates several hundred workstations and printers connected to a Local Area Network, all attached to Motorola System 8000 supermicrocomputers.

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## Automotive and Industrial Electronics Group

The Automotive and Industrial Electronics Group (AIEG) changed its portfolio of businesses during 1987 to focus on high-technology electronics for automotive and industrial applications. Sales rose 4%, while new orders declined 1% and backlog was 8% lower. Operating profits improved substantially.

The group divested its computer terminals and CRT display businesses and signed an agreement to sell its alternator and electromechanical meter product lines.

### Advances in Automotive Electronics

Demand was high for passenger car electronics products as major customers outperformed the market. Customer response continued strong for our mapped ignition product; AIEG has production programs with four European vehicle manufacturers. In the United Kingdom, Austin Rover Group selected Motorola for powertrain electronics, with production scheduled to begin for the 1989 model year. We received a commitment for an Anti-lock Braking System (ABS) control module development program from a leading brake supplier.

AIEG began shipping piezoresistive transducer (PRT) sensors to a German vehicle system supplier and achieved design-in of the PRT sensor at a leading European car manufacturer. We launched production of a motor control program and we are testing mass air flow sensors on customer vehicles.



**AIEG supplies engine controls and other automotive electronics products to major vehicle manufacturers worldwide. The group has achieved Q1 Supplier status, Ford Motor Co.'s recognition for superior supplier performance.**

For the heavy vehicle market, we began producing an electronic diesel engine control and a tire inflation system control. New programs for our customers include an electronic control module for transmissions, LCD instruments for agricultural vehicles and vehicle controls for trucks.



**This mapped ignition for the European market is designed to simultaneously improve engine performance while reducing fuel consumption and emissions.**

## Customer Satisfaction and Quality

AIEG made progress in its drive to improve customer satisfaction and quality. We have achieved "Q1 Supplier" status, Ford Motor Co.'s recognition for superior supplier performance, and we have earned "ship-to-use" status at Cummins Engine Co. Our Seguin, Texas, plant received Chrysler Corp.'s Quality Excellence Award.



Mass air flow sensors, which directly measure the air mass inducted into an engine, are being field tested on customer vehicles.

The group targeted performance improvements across its operations. For example, the Angers, France, facility

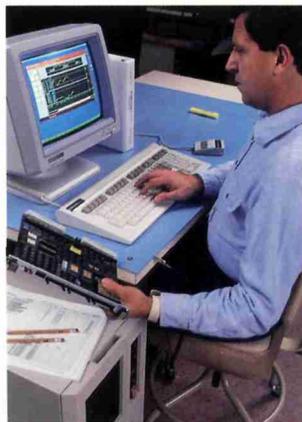
achieved a field return rate of less than two parts per million for its hermetic regulator; the Seguin facility reduced manufacturing cycle time by 80% on key products; and the Stotfold, U.K., plant met increased customer requirements with on-time delivery exceeding 99%.

AIEG continued to invest heavily in customer support capabilities. The group built a new Taiwan facility for sensor and electronic appliance control production, expanded its capacity at Angers, and completed a U.S. Application and System Engineering Center in the Detroit area. Engineering and administration in the Chicago area were consolidated at the new Northbrook, Ill., headquarters.

## New Enterprises

The New Enterprises organization is an entrepreneurial greenhouse that allows Motorola to enter completely new businesses in emerging high-growth, high-technology arenas. Start-ups, small acquisitions and spinoffs from core businesses can flourish here from the idea stage into successful businesses.

**Motorola Computer X** designs and manufactures real-time distributed computing systems that combine two operating systems—a real-time UNIX and Motorola's cX operating system—on the same processor. The technology is based on a single virtual machine/message process model, which provides modularity and inherent distribution.



A Motorola Computer X system with its sophisticated human interface used in statistical process control applications.

The cX systems can be migrated upward from one MC68010 single-board computer to multiple processors in the M68000 family without having to change the applications software. The products are targeted for computer integrated manufacturing. A number of Computer X systems have been installed in Motorola factories. Honeywell, Inc. has selected Computer X as the platform around which Honeywell is building its cell control systems, which automate factory floor operations and materials movement.

**Emtek** designs and produces a clinical information management system using bedside clinical computers and nursing productivity workstations for the hospital.

In the semiconductor equipment arena, **Tegal** has become a leader in the single wafer etching and stripping business. Tegal supplies equipment to U.S., Japanese and European semiconductor manufacturers.

**Spectrum CVD, Inc.**, designs and manufactures semiconductor thin film deposition equipment. **CTX International** is a small acquisition that was combined with another small acquisition, Phase 2 Automation, to serve factory automation in clean-room environments such as semiconductor and rigid disk factories.

**Dacscan** designs and produces Supervisory Control and Data Acquisition Systems (SCADA) for utility markets and cell controllers for factory automation. Initial cell controller systems were shipped in 1987 to a major U.S. automotive company.

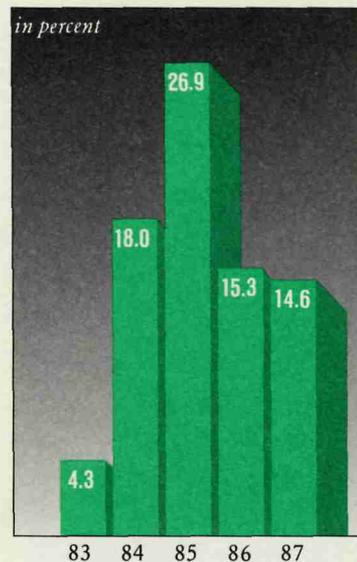
# Financial Review

## Financial Condition

Nineteen eighty-seven was not only a year of increased sales and improved earnings but also a year in which Motorola continued to strengthen its balance sheet. While total debt increased to \$724 million at year-end 1987 from \$641 million at the end of 1986, the ratio of debt, net of short-term investments, to net debt plus equity decreased to 14.6 percent from 15.3 percent at the end of 1986.

Back up credit facilities totaling \$989 million were in place at the end of 1987, an increase of \$56 million from the end of 1986. Revolving credit agreements of \$350 million were discontinued during 1987 and other credit facilities were adjusted to reduce costs and more closely reflect current and projected short-term borrowing needs.

## Net Debt to Net Debt plus Equity\* (as of year end)



\*Total Debt Less Short-Term Investments  
Total Debt Less Short-Term Investments  
plus Stockholders' Equity

## Receivables and Inventories

Average weeks of receivables in 1987 decreased to 7.3 weeks from 7.5 weeks in 1986. Year-end receivables totaled \$1.10 billion in 1987, up from \$851 million a year earlier. Approximately one-half of this increase is attributable to the increased sales level of the company with the remainder of the increase due to a higher level of weeks experienced at the end of 1987 in comparison to an unusually low level at the end of 1986. Maintaining a strong level of receivable performance will remain a challenge in light of the continuing shift of sales mix to more complex products and systems orders.

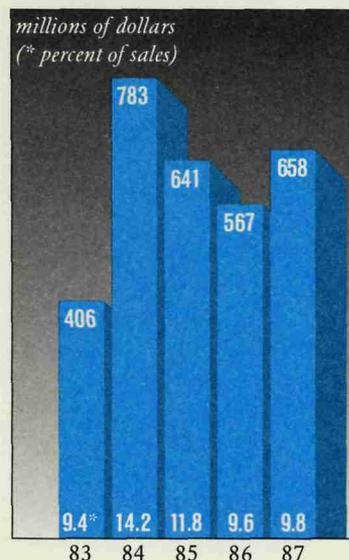
The current ratio was essentially unchanged, ending 1987 at 1.62, compared with 1.63 at the end of 1986. Working capital increased by \$171 million to \$1.04 billion principally due to an increase in accounts receivable from an unusually low level at the end of 1986.

Management believes the company continues to have sufficient capital resources to meet the needs of its businesses.

Improvement in inventory management continued for the third consecutive year. Inventory turnover, based upon a more stringent cost of goods sold definition used internally, increased to 3.2 turns from 3.0 turns in 1986. Year-end

inventory increased to \$909 million from \$819 million in 1986. The potential for further improvements in inventory utilization exists as a direct result of our initiative on total cycle time reduction.

## Fixed Asset Expenditures



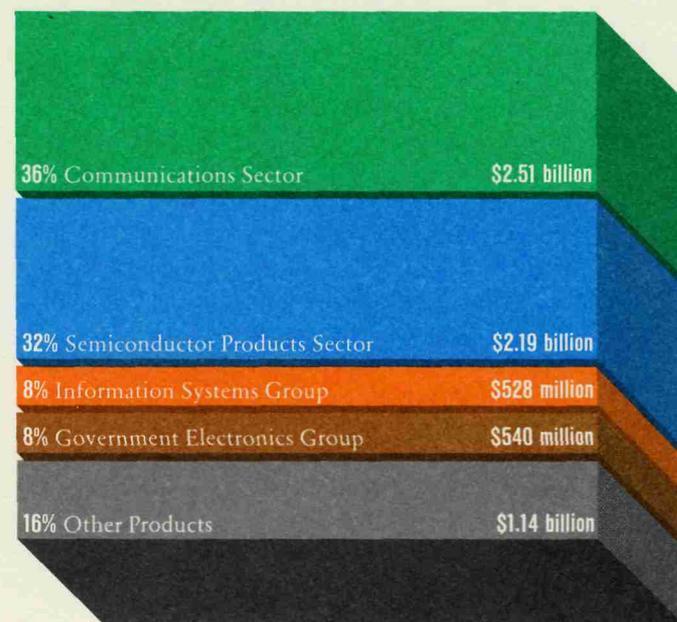
## Fixed Asset Expenditures

Investment in fixed assets increased in 1987, after two consecutive years of decline, and was consistent with historical levels as a percent of sales. Expenditures for the year were \$658 million, or 9.8 percent of sales compared with

\$567 million or 9.6 percent of sales in 1986. As shown in the segment information on page 26 of this report, the Semiconductor Products segment continues to make the highest dollar investment.

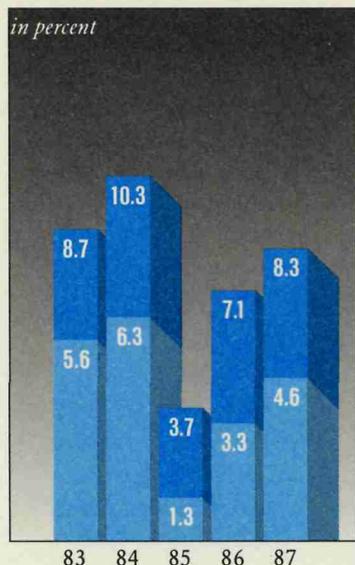
As the company continues to pursue its fundamental objective of total customer satisfaction, along with the supporting goals and initiatives detailed in the letter to stock-

## 1987 Net Sales by Business Segment



holders on pages 2 and 3, investments will be made as deemed appropriate. We are, therefore, not confined by a specific level of future investment in fixed assets as measured by a percent of future sales.

### Profit Margins



● Operating  
● Net

segment growth rate slowed and its share of total sales declined. In the Other Products segment, the Cellular Group's sales increased sharply, while Automotive and Industrial Electronics Products sales increased modestly and Computer Group Products sales declined in comparison with 1986.

Operating and net profits of the company continued to improve and are nearing the historical range, although they remain below management's long-term profitability targets. Operating profits were 8.3 percent of sales in 1987 compared with 7.1 percent in 1986, while net earnings improved to 4.6 percent of sales compared to 3.3 percent in 1986. The improved company profit margins resulted from improved margins achieved by the Semiconductor Products segment, Cellular Group and Automotive and Industrial Electronics Group. Operating profits benefited from continuing improvements in the percent to net sales of manufacturing and other costs of sales, which have been reduced by 2.1 percentage points since 1985. Continuing improvements in the ratios to sales of depreciation and interest expense have also had positive effects on profits.

As noted in the individual discussions of each of our businesses elsewhere in this report, we see favorable indications for each of our businesses that should enable them to achieve further improvements in growth and profitability in 1988. Information on the company's sales, operating profits and assets by product and market segments is shown in Note 8 on page 26 of this report.

### Operations

Sales for the company again increased to a record level, as the Semiconductor business accelerated its growth rate in the second year of its recovery from the severe industry downturn in 1985. The Communications Products segment achieved growth comparable to the company as a whole and represents 36 percent of total sales. The Information Systems Products segment also maintained its share of the company's sales while the Government Electronic Products

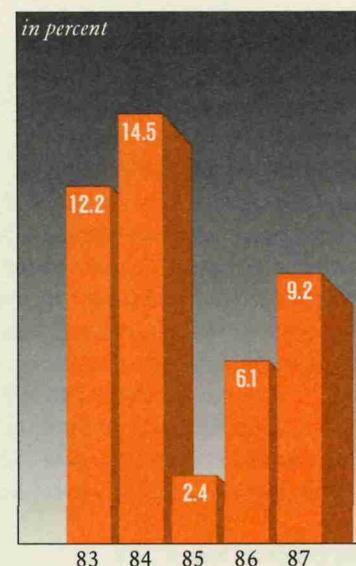
### Return on Average Invested Capital

The company's return on average invested capital improved for the second consecutive year to 9.2 percent from 6.1 percent in 1986. This moderate improvement remains short of the goals management believes the company should achieve. Increased emphasis has been focused on improving this rate of return through the company's participative management incentive program. A major element of this program is now keyed, within the company, to return on net assets (RONA), which is equivalent to return on average invested capital.

### Research and Development

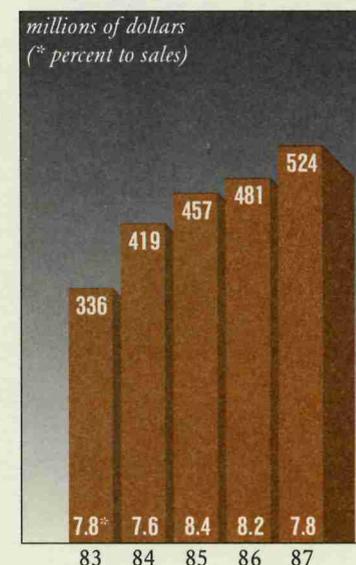
Research and development expenditures, exclusive of government funded work, increased 9 percent to \$524 million. While this represents a slight decline as a percent of sales in comparison to the prior two years, this level of expenditure is still very much within the company's historical pattern. Management continues to believe that a strong emphasis on research and development is critical to the company's long-term success.

### Return on Average Invested Capital



### Research and Development Expenditures\*\*

(Exclusive of Government Funded Work)  
\*\* As defined by SEC



# Statements of Consolidated Earnings

Motorola, Inc. and Consolidated Subsidiaries,  
Years ended December 31

(In millions of dollars, except per share data)

	1987	1986	1985
<b>Net Sales</b> .....	<b>\$6,707</b>	\$5,888	\$5,443
Manufacturing and other costs of sales .....	<b>4,059</b>	3,647	3,406
Selling, general and administrative expense .....	<b>1,659</b>	1,431	1,464
Depreciation of plant, equipment and leased equipment .....	<b>494</b>	459	441
Interest expense, net .....	<b>79</b>	86	87
Total costs and other expenses .....	<b>6,291</b>	5,623	5,398
<b>Earnings before income taxes</b> .....	<b>416</b>	265	45
Income taxes (benefit) provided on earnings .....	<b>108</b>	71	(27)
<b>Net earnings</b> .....	<b>\$ 308</b>	\$ 194	\$ 72
<b>Net earnings per share</b> .....	<b>2.39</b>	1.53	.61
Average shares outstanding (in millions) .....	<b>128.9</b>	126.5	119.0

See accompanying notes to consolidated financial statements.

# Statements of Consolidated Stockholders' Equity

Motorola, Inc. and Consolidated Subsidiaries,  
Years ended December 31

(In millions of dollars, except per share data)

	Common Stock and Additional Paid-in Capital			Retained Earnings		
	1987	1986	1985	1987	1986	1985
Balances at January 1, .....	<b>\$1,202</b>	\$ 844	\$ 834	<b>\$1,552</b>	\$1,440	\$1,444
Net earnings .....	—	—	—	<b>308</b>	194	72
Stock option plans .....	<b>28</b>	18	6	—	—	—
Stock issuance .....	—	334	—	—	—	—
Contributions to Employee Stock Ownership Plan .....	<b>1</b>	6	4	—	—	—
Dividends declared (\$.64 per share in 1987, 1986 and in 1985) .....	—	—	—	<b>(83)</b>	(82)	(76)
Balances at December 31, .....	<b>\$1,231</b>	\$1,202	\$ 844	<b>\$1,777</b>	\$1,552	\$1,440

See accompanying notes to consolidated financial statements.

# Consolidated Balance Sheets

(In millions of dollars, except per share data)

Motorola, Inc. and Consolidated Subsidiaries,  
as of December 31

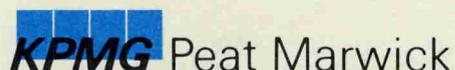
	1987	1986
<b>Assets</b>		
<b>Current assets</b>		
Cash .....	\$ 47	\$ 42
Short-term investments, at cost (approximating market) .....	211	143
Accounts receivable, less allowance for doubtful accounts (1987, \$32; 1986, \$33) .....	1,101	851
Inventories:		
Finished goods .....	237	194
Work in process and production materials .....	672	625
Future income tax benefits .....	201	206
Other current assets .....	238	178
Total current assets .....	2,707	2,239
<b>Property, plant and equipment</b>		
Land .....	88	86
Buildings .....	1,258	1,092
Machinery .....	2,694	2,471
Accumulated depreciation .....	(1,711)	(1,509)
Property, plant and equipment, net .....	2,329	2,140
Equipment leased to others, net .....	115	130
Sundry assets .....	170	173
Total assets .....	\$5,321	\$4,682
<b>Liabilities and Stockholders' Equity</b>		
<b>Current liabilities</b>		
Notes payable and current portion of long-term debt .....	\$ 380	\$ 307
Accounts payable .....	546	411
Accrued liabilities .....	662	536
Income taxes payable .....	80	117
Total current liabilities .....	1,668	1,371
Long-term debt .....	344	334
Noncurrent deferred taxes .....	137	110
Other noncurrent liabilities .....	164	113
<b>Stockholders' equity</b>		
Common stock, \$3 par value.		
Authorized shares (in millions):		
1987, 300.0; 1986, 300.0		
Outstanding shares (in millions):		
1987, 129.3; 1986, 128.2 .....	388	385
Preferred stock, \$100 par value issuable in series.		
Authorized shares (in millions): 0.5 (none issued) .....	—	—
Additional paid-in capital .....	843	817
Retained earnings .....	1,777	1,552
Total stockholders' equity .....	3,008	2,754
Total liabilities and stockholders' equity .....	\$5,321	\$4,682

See accompanying notes to consolidated financial statements.

# Statements of Consolidated Changes in Financial Position

(In millions of dollars)	Motorola, Inc. and Consolidated Subsidiaries, Years ended December 31	1987	1986	1985
<b>Operations</b>	Net earnings .....	<b>\$ 308</b>	\$ 194	\$ 72
	Add (deduct) noncash items:			
	Depreciation:			
	Fixed assets .....	<b>448</b>	406	366
	Equipment leased to others .....	<b>46</b>	53	75
	Net change in deferred taxes .....	<b>32</b>	(26)	(24)
	Funds provided by operations	<b>834</b>	627	489
	Funds provided by (used for):			
	Cash .....	<b>(5)</b>	(23)	6
	Accounts receivable, net .....	<b>(250)</b>	(38)	4
	Inventories .....	<b>(90)</b>	(18)	136
	Other current assets .....	<b>(60)</b>	(29)	(16)
	Accounts payable and accrued liabilities .....	<b>261</b>	117	(146)
	Income taxes payable .....	<b>(37)</b>	53	(51)
	Sundry assets .....	<b>3</b>	(50)	(24)
	Other noncurrent liabilities .....	<b>51</b>	17	15
	Total funds provided by (used for) .....	<b>(127)</b>	29	(76)
	Net funds provided by operations .....	<b>707</b>	656	413
<b>Investments</b>	Fixed asset expenditures .....	<b>(658)</b>	(567)	(641)
	Disposals and other changes to plant and equipment, net .....	<b>21</b>	2	36
	Increase in equipment leased to others .....	<b>(31)</b>	(26)	(82)
	Decrease (increase) in short-term investments .....	<b>(68)</b>	14	(14)
	Net funds used for investments .....	<b>(736)</b>	(577)	(701)
<b>Dividends Declared</b>		<b>(83)</b>	(82)	(76)
	Total funds required .....	<b>\$(112)</b>	\$ (3)	\$(364)
<b>Financing</b>	Increase in notes payable and current portion of long-term debt	<b>\$ 73</b>	\$ 16	\$ 180
	Increase (decrease) in long-term debt	<b>10</b>	(371)	174
	Issuance of common stock .....	<b>29</b>	358	10
	Net funds provided by financing .....	<b>\$ 112</b>	\$ 3	\$ 364

See accompanying notes to consolidated financial statements.



Certified Public Accountants

Peat Marwick Main & Co.  
303 East Wacker Drive  
Chicago, Illinois 60601  
(312) 938-1000

The Board of Directors and Stockholders  
of Motorola, Inc.:

We have examined the consolidated balance sheets of Motorola, Inc. and consolidated subsidiaries as of December 31, 1987 and 1986, and the related statements of consolidated earnings, stockholders' equity, and changes in financial position for each of the years in the three-year period ended December 31, 1987. Our examinations were made in accordance with generally accepted auditing standards and, accordingly, included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the aforementioned consolidated financial statements present fairly the financial position of Motorola, Inc. and consolidated subsidiaries at December 31, 1987 and 1986, and the results of their operations and changes in their financial position for each of the years in the three-year period ended December 31, 1987, in conformity with generally accepted accounting principles applied on a consistent basis.

*Peat Marwick Main & Co.*

January 20, 1988

# Notes to Consolidated Financial Statements

Motorola, Inc. and Consolidated Subsidiaries

## 1. Accounting Policies

The following is a summary of significant accounting policies used in the preparation of these consolidated financial statements.

**Consolidation:** The consolidated financial statements include the accounts of the Company and all majority-owned subsidiaries except for financial and insurance subsidiaries, which are not significant and are accounted for on the equity basis. All significant intercompany accounts and transactions have been eliminated in consolidation.

**Inventories:** Inventories are valued at the lower of average cost (which approximates computation on a first-in, first-out basis) or market (i.e., net realizable value or replacement cost), less progress payments on long-term contracts. Progress payments included in net inventories were \$111 million and \$75 million in 1987 and 1986, respectively.

**Investment Tax Credits:** Investment tax credits are recorded under the flow-through method.

**Property, Plant and Equipment and Equipment Leased to Others:** Property, plant and equipment is stated at cost. Equipment leased to others is stated at cost, net of accumulated depreciation. The cost of buildings, machinery and equipment is depreciated, generally by the declining-balance method, over the estimated useful lives of such assets, as follows: buildings and building equipment, 5-50 years, machinery and equipment, 2-12 years.

**Foreign Currency Translation:** The Company uses the U.S. dollar as the functional currency for financial reporting. Gains and losses from translation to U.S. dollars are included in the determination of net income in the period in which they occur.

**Reclassifications:** Certain amounts in the 1986 and 1985 financial statements have been reclassified to conform to the current year's presentation. The reclassifications are not significant.

## 2. Income Taxes

The Company provides for income taxes based on earnings reported for financial statement purposes. Income tax expense differs from income taxes currently payable because of timing differences in the recognition of certain income and expense items for tax and financial statement purposes.

The components of earnings before income taxes are as follows:

(In millions of dollars)	1987	1986	1985
U.S. and U.S. possessions .....	\$243	\$137	\$(10)
Other nations .....	173	128	55
Total .....	<u>\$416</u>	<u>\$265</u>	<u>\$ 45</u>

The components of income taxes (benefit) are as follows:

(In millions of dollars)	1987	1986	1985
Current:			
United States .....	\$ 33	\$ 52	\$(42)
Other nations .....	26	39	34
State income taxes (U.S.) .....	17	6	5
Total current .....	76	97	(3)
Deferred .....	32	(26)	(24)
Income taxes (benefit) .....	<u>\$108</u>	<u>\$ 71</u>	<u>\$(27)</u>

The Company carried back 1985 U.S. pretax operating losses to reduce taxes provided and paid in prior years. As of December 31, 1987, for federal income tax purposes, general business credit carryforwards of \$11 million are available to reduce future taxes. If not used, these credits will begin to expire in 2000. For financial reporting purposes, all of the tax credits have been utilized.

Income taxes (benefits) are different from the amounts computed by applying the U.S. statutory federal income tax rate of 40%. The differences are summarized as follows:

(In millions of dollars)	1987	1986	1985
Income tax expense at U.S. Federal Corporate rate of 40% (46% in 1986 and 1985) .....	\$167	\$122	\$ 21
Increase (decrease) in tax expense resulting from:			
Taxes on earnings in other nations and U.S. possessions .....	(48)	(37)	(10)
Investment tax credit .....	1	(9)	(36)
Research and experimentation tax credit .....	(2)	(5)	(13)
State income taxes .....	10	4	1
Foreign Sales Corporation .....	(5)	(4)	(2)
Other .....	(15)	—	12
Income taxes (benefit) .....	<u>\$108</u>	<u>\$ 71</u>	<u>\$(27)</u>

Income taxes have not been provided on the undistributed earnings of certain of the Company's foreign subsidiaries amounting to \$462 million, \$353 million and \$299 million at December 31, 1987, 1986 and 1985, respectively. It is intended that these earnings will be permanently invested in operations outside the United States. Should these earnings be distributed, foreign tax credits would reduce the additional U.S. income tax which would be payable.

At December 31, 1987, certain non-U.S. subsidiaries had loss carryforwards for financial reporting purposes of approximately \$57 million.

The Internal Revenue Service has examined the Federal income tax returns for Motorola, Inc. through 1981 and the returns have been settled through 1978. In connection with the audits for the years 1979-1981, the IRS has proposed adjustments to the Company's income for those years which would result in substantial additional tax. The Company disagrees with most of the proposed adjustments and is contesting them. In the opinion of the Company's management, the final disposition of these matters will not have a material adverse effect on the business or financial position of the Company.

An analysis of the changes in deferred taxes is as follows:

(In millions of dollars)	1987	1986	1985
General business credit carryforward ...	\$ 39	\$ (1)	\$(17)
Completed contract accounting .....	(21)	5	37
Depreciation .....	28	3	2
Earnings of foreign subsidiaries anticipated to be repatriated in the future .....	9	8	4
Income from long-term lease of equipment .....	(22)	(6)	(6)
Inventory valuations .....	5	5	(24)
Capitalization of expense items .....	(3)	(7)	(6)
Other, net .....	(3)	(33)	(14)
Net change in deferred taxes .....	<u>\$ 32</u>	<u>\$(26)</u>	<u>\$(24)</u>

### 3. Long-term Debt and Backup Credit Facilities

Long-term debt at December 31 consisted of the following:

(In millions of dollars)	1987	1986
<b>Floating Rate Debt:</b>		
Foreign notes payable (generally at prevailing local rates) due in installments to 1992 .....	\$ 13	\$ 14
<b>Fixed Rate Debt:</b>		
12¼% eurodollar notes due December 15, 1994 ..	—	2
12% eurodollar notes due December 15, 1994 ....	68	67
11½% eurodollar notes due May 9, 1997 .....	93	95
8⅝% ECU notes due July 16, 1992 .....	65	54
8% sinking fund debentures due October 1, 2007 (callable at 104.6% reducing to 100.0% of the principal amount) .....	62	62
7¾% industrial revenue bonds due January 1, 2014 .....	20	20
Capitalized lease obligations .....	34	21
Other long-term debt .....	7	9
	<u>362</u>	<u>344</u>
Less current maturities .....	(18)	(10)
Long-term debt .....	<u>\$344</u>	<u>\$334</u>

During 1987, warrants were exercised to purchase \$1 million of the 12% eurodollar bearer notes. Also during 1987, the company exercised an option and called \$2 million of the 12¼% eurodollar notes. The increase in value of the 8⅝% ECU notes is a result of a change in exchange rates.

The Company had total backup credit facilities of \$989 million at December 31, 1987. Of the available lines of backup credit facilities \$413 million remain unused at December 31, 1987. The Company pays commitment fees generally of ⅛% of unused lines of credit. Borrowings are generally at the market rate.

The aggregate maturities and sinking fund requirements for long-term debt during the next five years are as follows:

(In millions of dollars)	1988	1989	1990	1991	1992
	18	13	7	5	71

# Notes to Consolidated Financial Statements

Motorola, Inc. and Consolidated Subsidiaries

## 4. Leases

The Company owns most of its major facilities, but does lease certain office, factory and warehouse space, land, data processing and other equipment.

Rental expense was \$115 million in 1987, \$111 million in 1986, and \$104 million in 1985.

Minimum future lease revenues, as well as the Company's minimum future lease obligations, net of minimal sublease rentals, both of which were based on noncancellable leases in effect at year-end, 1987, were as follows:

(In millions of dollars)

Year ending December 31:	Future Lease Revenues	Future Lease Obligations
1988	\$88	\$76
1989	47	60
1990	20	45
1991	8	33
1992	3	20
Later	—	99

## 5. Employee Benefit and Incentive Plans

**Management Incentive:** The Company may provide up to 7% of its annual consolidated pretax earnings, as defined in the Motorola Executive Incentive Plan, for the payment of cash incentive awards to key employees. During 1987, \$14 million was provided for incentive awards, as compared to a provision of \$3 million in 1986. No provision was recorded in 1985.

**Retirement Benefits:** The Company and certain subsidiaries have profit-sharing plans, principally contributory, in which all eligible employees participate. The Company contributions to profit-sharing funds in the United States and other nations, which are generally based upon percentages of pretax earnings from those operations, as defined, were \$22 million in 1987 and \$9 million in both 1986 and 1985. The company contribution for 1987 was \$15 million for the plan covering most domestic employees. No company contribution was provided in 1986 and 1985 for the same plan.

The Company has a noncontributory pension plan covering most domestic employees after one year of service. The benefit formula is dependent upon employee earnings and years of service. The Company's policy is to fund the accrued pension cost or the amount allowable based on the full funding limitations of the Internal Revenue Service, if less.

The Company also has a noncontributory pension plan covering selected domestic employees as well as a supplemental plan for elected officers which is also noncontributory. Both of these plans are unfunded with the benefit formula driven by employee earnings and years of service.

Benefits under all plans are valued based upon the projected unit credit cost method in accordance with SFAS No. 87. The actuarial present value of the projected benefit obli-

gation was calculated using an investment return assumption of 8 percent, the rate of increase of future compensation of 5.5 percent, and a discount rate of 8.25 percent in 1987 and 1986.

Net U.S. pension expense (income) for 1987 and 1986 included these components:

(In millions of dollars)	1987		1986	
	Funded Plan	Unfunded Plans	Funded Plan	Unfunded Plans
Service cost	\$20	\$1	\$15	\$1
Interest cost on projected obligation	18	4	17	4
Actual return on plan assets	(45)	—	(67)	—
Net amortization and deferral	4	2	27	1
Net pension expense (income)	\$ (3)	\$7	\$(8)	\$6

In 1985, no pension expense was recognized on the funded plan, although the company recognized \$5 million on the unfunded plans. The aggregate cost method was utilized prior to the adoption of SFAS No. 87 in 1986.

(In millions of dollars)	1987		1986	
	Funded Plan	Unfunded Plans	Funded Plan	Unfunded Plans
Actuarial present value of benefit asset (liability):				
Vested benefit obligation	\$(167)	\$(34)	\$(149)	\$(27)
Accumulated benefit obligation	\$(184)	\$(47)	\$(169)	\$(39)
Projected benefit obligation for service rendered to date	\$(250)	\$(52)	\$(230)	\$(42)
Plan assets at fair value, primarily listed stocks, bonds and cash equivalents	446	—	411	—
Plan assets in excess (deficit) of projected benefit obligation	196	(52)	181	(42)
Unrecognized net (gain) loss from past experience different from assumptions	(59)	7	(36)	—
Unrecognized net transition (asset) liability	(125)	16	(137)	18
Pension asset (liability) recognized in statement of financial position	\$ 12	\$(29)	\$ 8	\$(24)

The Company adopted a five-year market-related asset value method of amortizing actuarial gains and losses. There was no unrecognized prior service cost. The plan assets include no Motorola stock or debt.

The funded plan's transition asset is being amortized over a period of 13 years. The unfunded plans' transition liabilities are being amortized over a period of 15 years.

Certain foreign subsidiaries have varying types of retirement plans providing benefits for substantially all of their employees. The Company has adopted SFAS No. 87 for some of its foreign subsidiaries. Other foreign plans have not adopted SFAS No. 87. Essentially all of the cost of these plans is borne by the subsidiaries. Amounts charged to earnings for the plans were \$9 million in 1987, \$7 million in 1986, and \$6 million in 1985.

In addition to providing pension benefits the Company provides certain health care benefits to its retired employees. The majority of its domestic employees may become eligible for these benefits if they reach normal retirement age while working for the Company. The cost of retiree health care benefits is recognized as expense when claims are paid and totaled \$4 million in 1987, \$4 million in 1986, and \$2 million in 1985. There are no significant post-retirement health care benefit plans in foreign countries.

**Stock Options:** Under the Company's employee share option plans, shares of common stock have been made available for grant to key employees. The exercise price of each option granted is 100% of market value on the date of the grant. Shares subject to option under these plans during 1987 and 1986 are as follows:

(In thousands of shares)	1987	1986
Options outstanding beginning of year	5,409	5,306
Additional options granted	1,177	1,055
Options exercised	(1,235)	(823)
Options terminated, cancelled or expired	(95)	(129)
Options outstanding at end of year	5,256	5,409
Shares reserved for possible future options grants	4,344	5,427
Total shares reserved	9,600	10,836
Total options exercisable	4,082	4,354

Options exercised during 1987 were at per share prices from \$11.48 to \$47.38. Options outstanding at December 31, 1987 were at per share prices from \$11.48 to \$69.94.

## 6. Other Financial Data

(In millions of dollars)	1987	1986	1985
Interest expense	\$ 96	\$105	\$111
Interest income	(15)	(15)	(19)
Interest capitalized	(2)	(4)	(5)
Net interest expense	\$ 79	\$ 86	\$ 87
Research and development expenditures	\$524	\$481	\$457
Foreign currency gains (losses)	\$ 8	\$ 4	\$(7)
Accrued liabilities:			
Taxes (other than income taxes)	\$ 81	\$ 61	\$ 65
Contribution to employees' pension and profit sharing funds	22	9	8
Accrued compensation	191	148	135
Dividends payable	21	21	19
Other	347	297	228
Total accrued liabilities	\$662	\$536	\$455

**Nonconsolidated Subsidiaries:** The following is a summary of financial information for the Company's nonconsolidated subsidiaries for years ending December 31:

(In millions of dollars)	1987	1986	1985
Total revenue	\$ 20	\$ 17	\$ 13
Net income	\$ 5	\$ 4	\$ 3
Total assets	\$228	\$201	\$128
Total liabilities	(195)	(147)	(80)
Stockholders' investment and advances	\$ 33	\$ 54	\$ 48

The finance subsidiary purchases customer obligations under long-term contracts from the Company at net carrying value. The insurance subsidiary insures the Company's excess workers' compensation and property risks.

## 7. Contingencies

The Company is a defendant in various suits and claims which arise in the normal course of business and is obligated under repurchase and other agreements principally in connection with the financing of sales.

Motorola's Government Electronics Group (GEG) was subpoenaed for records in connection with a federal criminal investigation. The investigation appeared to involve allegations of defective pricing and whether Motorola improperly charged labor expenses under certain government defense contracts.

In order to resolve the federal criminal investigation, Motorola has entered into a plea agreement pursuant to which it has agreed to plead guilty to certain charges and pay certain fines, penalties and restitution. Motorola expects the plea to be tendered in the first quarter of 1988. Under government procurement regulations, such action could result in Motorola being suspended from eligibility for awards of new government contracts for one year and could result in Motorola being debarred from eligibility for awards of new government contracts for one year or more. Motorola is negotiating with the Department of Defense to demonstrate its present responsibility and thus avoid or minimize the impact of suspension or debarment. In addition, GEG is being audited by the Department of Defense with respect to government contract pricing, cost allocation and charging matters. GEG has voluntarily made some refunds and contract adjustments.

The Company is unable to predict the outcome of the criminal investigation in that the plea agreement will be subject to Court approval, and is also unable to predict the outcome of the present responsibility review. Further, Motorola is unable to estimate the kinds or amounts of claims or other actions that could be instituted as a result of the audits.

In the opinion of management, the ultimate disposition of these matters will not have a material adverse effect on the business or financial position of the Company.

# Notes to Consolidated Financial Statements

Motorola, Inc. and Consolidated Subsidiaries

## 8. Information by Industry Segment and Geographic Region

Information about the Company's operations in different industry segments for the years ended December 31, is summarized below (in millions of dollars and percent of net sales):

	Net Sales			Operating Profit					
	1987	1986	1985	1987		1986		1985	
Communications Products	\$2,515	\$2,243	\$2,016	\$259	10.3%	\$243	10.9%	\$231	11.5%
Semiconductor Products (A)	2,193	1,807	1,667	171	7.8%	81	4.5%	(44)	(2.6)%
Information Systems Products	528	465	428	83	15.8%	75	16.2%	65	15.2%
Government Electronic Products	540	526	496	8	1.5%	33	6.3%	39	7.8%
Other Products (A)	1,141	1,029	995	40	3.5%	(10)	(1.0)%	(88)	(8.9)%
Adjustments and eliminations	(210)	(182)	(159)	(3)		(2)		(3)	
Industry totals	<u>\$6,707</u>	<u>\$5,888</u>	<u>\$5,443</u>	<u>558</u>	<u>8.3%</u>	<u>420</u>	<u>7.1%</u>	<u>200</u>	<u>3.7%</u>
General corporate expenses				(63)		(69)		(68)	
Interest expense, net				(79)		(86)		(87)	
Earnings before income taxes				<u>\$416</u>	<u>6.2%</u>	<u>\$265</u>	<u>4.5%</u>	<u>\$ 45</u>	<u>0.8%</u>

	Assets		
	1987	1986	1985
Communications Products	\$1,659	\$1,404	\$1,227
Semiconductor Products (A)	1,875	1,617	1,480
Information Systems Products	361	360	318
Government Electronic Products	371	350	311
Other Products (A)	657	628	768
Adjustments and eliminations	(44)	(40)	(33)
Industry totals	<u>4,879</u>	<u>4,319</u>	<u>4,071</u>
General corporate assets	409	308	251
Other, net	33	55	48
Consolidated totals	<u>\$5,321</u>	<u>\$4,682</u>	<u>\$4,370</u>

	Fixed Asset Expenditures			Depreciation		
	1987	1986	1985	1987	1986	1985
Communication Products	\$149	\$128	\$120	\$104	\$ 94	\$ 72
Semiconductor Products (A)	327	249	324	227	203	195
Information Systems Products	30	44	52	25	21	19
Government Electronic Products	34	46	55	27	19	15

Expenditures and depreciation for property, plant and equipment do not include amounts for equipment leased to others.

(A) Restated to reflect products transferred from semiconductor products to other products.

Information about the Company's operations in different geographic regions for the years ended December 31, is summarized below (in millions of dollars and percent of net sales):

	Net Sales			Operating Profit					
	1987	1986	1985	1987		1986		1985	
United States .....	\$ 5,849	\$ 5,258	\$ 5,040	\$369	6.3%	\$299	5.7%	\$113	2.2%
Other nations .....	2,937	2,250	1,818	209	7.1%	164	7.3%	76	4.2%
Adjustments and eliminations .....	(2,079)	(1,620)	(1,415)	(20)	—	(43)	—	11	—
Geographic totals .....	<u>\$ 6,707</u>	<u>\$ 5,888</u>	<u>\$ 5,443</u>	<u>558</u>	<u>8.3%</u>	<u>420</u>	<u>7.1%</u>	<u>200</u>	<u>3.7%</u>
General corporate expenses .....				(63)		(69)		(68)	
Interest expense, net .....				(79)		(86)		(87)	
Earnings before income taxes .....				<u>\$416</u>	<u>6.2%</u>	<u>\$265</u>	<u>4.5%</u>	<u>\$ 45</u>	<u>0.8%</u>

	Assets		
	1987	1986	1985
United States .....	\$3,322	\$3,109	\$3,084
Other nations .....	1,652	1,278	1,046
Adjustments and eliminations .....	(95)	(68)	(59)
Geographic totals .....	<u>4,879</u>	<u>4,319</u>	<u>4,071</u>
General corporate assets .....	409	308	251
Other, net .....	33	55	48
Consolidated totals .....	<u>\$5,321</u>	<u>\$4,682</u>	<u>\$4,370</u>

The Company operates predominately in one industry, electronic equipment and components. Operations involve the design, manufacture and sale of a diversified line of electronic products, which include, but are not limited to, two-way radio and communications systems; semiconductors, including integrated circuits and microprocessor units; data communication and distributive data processing equipment and systems; and electronic equipment and industrial electronic products. The Company operates manufacturing and distribution facilities outside the United States. No single country outside the United States accounts for more than 10% of consolidated net sales or total assets.

Operating profit was computed as total revenues less operating expenses which exclude general corporate expenses, net interest and income taxes. Identifiable assets are those assets of the Company that are identified to classes of similar products or operations in each geographical area, excluding

internal receivables. Corporate assets are principally cash and marketable securities and the corporate administrative headquarters. Intersegment sales, principally semiconductor components, amounted to \$156 million for 1987, \$121 million for 1986 and \$113 million for 1985. Intersegment and inter-geographic transfers are accounted for on an arm's length pricing basis and are consistent with rules and regulations of domestic and foreign taxing authorities.

Sales to the United States federal government agencies aggregated \$830 million for 1987, \$809 million for 1986 and \$780 million for 1985. No other single customer (or group of customers under common control) accounted for 10% or more of the Company's sales.

The equity in the net assets of non-U.S. subsidiaries amounted to \$951 million at December 31, 1987 and \$767 million at December 31, 1986.

#### Quarterly and Other Financial Data (Unaudited)

Motorola, Inc. and Consolidated Subsidiaries

The principal market for Motorola Common Stock is the New York Stock Exchange. The table below sets forth the high and low sales price per share for Motorola Common Stock as reported by the New York Stock Exchange and the dividends declared and paid for the periods indicated.

(In millions of dollars, except per share data)

	1987				1986			
	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
Net sales .....	\$1,547	\$1,639	\$1,672	\$1,850	\$1,339	\$1,499	\$1,431	\$1,619
Gross profit before depreciation .....	597	665	660	727	518	576	525	622
Net earnings .....	56	80	70	102	45	55	31	63
Net earnings per share .....	.44	.62	.54	.79	.37	.43	.24	.49
Dividends:								
Declared and paid .....	.16	.16	.16	.16	.16	.16	.16	.16
Stock prices:								
High .....	57.75	63.88	74.00	73.75	45.88	50.00	44.50	40.00
Low .....	35.63	51.38	51.25	35.00	35.63	37.25	33.75	33.63

The number of holders of record of Motorola Common Stock on January 30, 1988 was 13,663.

# Five Year Financial Summary

Motorola, Inc. and Consolidated Subsidiaries,  
Years ended December 31

	1987	1986	1985	1984	1983
<b>Operating Results</b> (In millions of dollars)					
Net sales	\$6,707	\$5,888	\$5,443	\$5,534	\$4,328
Manufacturing and other costs of sales	4,059	3,647	3,406	3,206	2,593
Selling, general and administrative expenses	1,659	1,431	1,464	1,472	1,110
Depreciation of plant, equipment, and leased equipment	494	459	441	353	289
Net interest expense	79	86	87	37	27
Total costs and other expenses	6,291	5,623	5,398	5,068	4,019
Earnings before income taxes	416	265	45	466	309
Income taxes (benefit) provided on earnings	108	71	(27)	117	65
Cancellation of DISC taxes	—	—	—	(38)	—
Net earnings	\$ 308	\$ 194	\$ 72	\$ 387	\$ 244
Net earnings excluding DISC tax cancellation	\$ 308	\$ 194	\$ 72	\$ 349	\$ 244
Net earnings excluding DISC tax cancellation as a percent of sales	4.6%	3.3%	1.3%	6.3%	5.6%
<b>Per Share Data<sup>2</sup></b> (In dollars)					
Net earnings	\$ 2.39	\$ 1.53	\$ .61	\$ 3.27	\$ 2.09
Net earnings excluding DISC tax cancellation	\$ 2.39	\$ 1.53	\$ .61	\$ 2.95	\$ 2.09
Dividends declared	.64	.64	.64	.61	.53
<b>Balance Sheet</b> (In millions of dollars)					
Total assets	\$5,321	\$4,682	\$4,370	\$4,194	\$3,236
Working capital	1,039	868	924	1,001	894
Long-term debt	344	334	705	531	262
Total debt	724	641	996	642	270
Stockholders' equity	\$3,008	\$2,754	\$2,284	\$2,278	\$1,948
<b>Other Data</b>					
Current ratio	1.62	1.63	1.78	1.83	2.07
Return on average invested capital	9.2%	6.1%	2.4%	14.5% <sup>1</sup>	12.2%
Return on average stockholders' equity	10.7%	7.4%	3.2%	16.4% <sup>1</sup>	13.5%
Yearend employment (approximate)	97,700	94,400	90,200	99,900	88,800
Average shares outstanding (in millions) <sup>2</sup>	128.9	126.5	119.0	118.5	117.1

NOTES

<sup>1</sup>Excludes cancellation of DISC taxes.

<sup>2</sup>Year 1983 reflects the 3-for-1 stock split in 1984.

## Management's Discussion and Analysis of Financial Condition and Results of Operations

**Operations:** The Company's principal operations are the Communications, Semiconductor, Information Systems, and Government Electronic Products segments. Note 8 to the consolidated financial statements indicates each segment's relative contribution to the Company's overall sales and operating profit for each of the past three years.

For the Company as a whole, sales increased to a new record while operating profits continued the improvement which began in 1986. Net earnings increased more than 50 percent; however, net margin on sales of 4.6 percent remained below the historical levels of the early 1980's. Return on average invested capital increased to 9.2 percent from the 6.1 percent in 1986.

The Communications Products segment sales rose 12 percent and operating profits increased slightly from the prior year. As in 1986, international orders rose sharply, led by Europe, Japan and Latin American countries. The Sector set a record for the number of new products introduced during the year.

Sales in the Semiconductor Products segment increased 21 percent and operating profits more than doubled from the prior year. Market demand remained strong and stable throughout the year. Orders rose 29 percent and backlog was up 31 percent from 1986, although delivery lead times remained in the 4 to 8 week range for most product lines.

Information Systems Products segment sales increased 13 percent and operating profits were higher. The segment had solid worldwide growth in both the high network management products and modem products for the data communication industry.

Sales in the Government Electronic Products segment were up 3 percent from 1986. Operating profits were sharply lower than a year ago as a result of contract price adjustments, costs associated with various internal and governmental reviews, and current operating performance on selected contracts.

Within the Other Products segment, sales increased 37 percent for Cellular Products, 4 percent for Automotive and Industrial Electronic Products and declined 14 percent for Computer Products. The Other Products segment had an operating profit in 1987 compared to an operating loss a year ago. Operating profits were higher for Cellular and Automotive and Industrial Electronics Products, while the Computer Products had an operating loss in both 1987 and 1986.

**Liquidity and Capital Resources:** Total debt of the Company increased from \$641 million in 1986 to \$724 million in 1987 principally to fund the normal growth of the Company. Net of short-term investments, the debt to debt plus equity ratio decreased from 15.3 percent in 1986 to 14.6 percent in 1987. Fixed asset expenditures increased to \$658 million from \$567 million in 1986. Note 3 to the consolidated

financial statements details the changes to the Company's long-term debt and Note 8 presents the majority of fixed asset expenditures by segment.

The current ratio was essentially unchanged in 1987, ending the year at 1.62 compared to 1.63 at yearend 1986. Working capital increased to \$1.04 billion in 1987 from \$868 million at yearend 1986 primarily due to increased accounts receivable at yearend.

Management believes the Company continues to have sufficient capital resources to meet the needs of its businesses.

**Effects of Inflation:** The electronic components and equipment industry (e.g., semiconductors and semiconductor-based equipment), has been able to accomplish significant productivity gains in its manufacturing processes, which have reduced the costs of products sold more than the increase in the costs of production resources due to inflation. Thereby, over time, selling prices generally decrease. Productivity gains in the Company's other businesses have reduced the effects of increased production costs, resulting in price increases over time at rates significantly less than general inflation. Management believes that the historical statements fairly represent the financial position and results of operations of the Company and have not been significantly distorted by inflation.

**Accounting Issues:** During 1987, the Financial Accounting Standards Board (FASB) issued three Statements of Financial Accounting Standards (SFAS) which the Company has elected not to adopt in 1987.

SFAS 94 will require the Company to consolidate all of its majority owned subsidiaries beginning in 1988. The consolidation of these subsidiaries will not have a material effect on the Company's operating statement. However, the balance sheet ratio of net debt to net debt plus equity will increase from 14.6 percent to 19.0 percent.

SFAS 95 requires additional disclosures and a different format for the Company's Statement of Consolidated Changes in Financial Position. The Company expects only minor changes to the current format in order to comply with the new Statement of Cash Flows.

SFAS 96 was issued in December 1987, and requires a new approach ("liability method") regarding accounting for deferred taxes. It also limits the amounts of the deferred tax assets that companies may recognize in their financial statements. However, the Statement provides that companies may adopt certain "tax-planning strategies" when calculating the amounts of deferred taxes. Due to the complexity of the final Statement and the various strategies which the Company may elect when implementing the new Statement, the Company cannot at this time predict the impact on its financial statements or operations.

## Directors of Motorola, Inc.

**Robert W. Galvin**

**George M. C. Fisher**

**Gary L. Tooker**

**William J. Weisz**

**John F. Mitchell**

**David R. Clare**

*President and Chairman of the Executive Committee, Johnson & Johnson*

**Wallace C. Doud**

*Retired; formerly Vice President, International Business Machines Corporation*

**John T. Hickey**

*Retired; formerly Executive Vice President and Chief Financial Officer, Motorola, Inc.*

**Lawrence Howe**

*Executive Director, Civic Committee of the Commercial Club of Chicago; formerly Vice Chairman, Jewel Companies, Inc.*

**Anne P. Jones**

*Partner, Sutherland, Asbill & Brennan law firm*

**Donald R. Jones**

**M. Joseph Lambert**

*Retired; formerly Senior Vice President and Chief Financial Officer, Kraft, Inc.*

**Stephen L. Levy**

*Retired; Senior Advisor and Deputy Representative for the Chief Executive Office, Motorola, Inc.*

**Walter E. Massey**

*Vice President for Research and for Argonne National Laboratory, The University of Chicago*

**Arthur C. Nielsen, Jr.**

*Chairman Emeritus, A.C. Nielsen Company*

**William G. Salatch**

*Retired; formerly President, Gillette North America, and Vice Chairman of the Board, Gillette Company*

**Gardiner L. Tucker**

*Retired; formerly Vice President for Science and Technology, International Paper Company*

**B. Kenneth West**

*Chairman of the Board and Chief Executive Officer, Harris Bankcorp, Inc.*

*Director Emeritus*

**Elmer H. Wavering**

*Formerly Vice Chairman and Chief Operating Officer, Motorola, Inc.*

## Elected Officers of Motorola, Inc.

	Age	As of 1/1/88 Years of Service		Age	Years of Service
<b>Corporate</b>			<b>Personnel</b>		
Robert W. Galvin <i>Chairman of the Board</i>	65	47	*James Donnelly <i>Executive Vice President and Motorola Director of Personnel</i>	48	18
*George M. C. Fisher <i>President and Chief Executive Officer</i>	47	11	Joseph F. Miraglia <i>Corporate Vice President and Assistant Motorola Director of Personnel</i>	51	9
*Gary L. Tooker <i>Senior Executive Vice President and Chief Operating Officer</i>	48	25	William B. Dimitro <i>Corporate Vice President and Director, Career Direction Center</i>	58	20
*William J. Weisz <i>Vice Chairman of the Board and Officer of the Board</i>	60	39	*A. William Wiggenhorn <i>Corporate Vice President and Director, Motorola Training &amp; Education Center</i>	43	7
*John F. Mitchell <i>Vice Chairman of the Board and Officer of the Board</i>	59	34	<b>Staff</b>		
Levy Katzir <i>Senior Vice President and General Manager, New Enterprises</i>	55	31	*Christopher B. Galvin <i>Senior Vice President and Chief Corporate Staff Officer</i>	37	15
<b>Finance</b>			Jack Germain <i>Senior Vice President and Motorola Director of Quality</i>	61	37
Donald R. Jones <i>Executive Vice President and Chief Financial Officer</i>	57	37	Keith J. Bane <i>Corporate Vice President and Motorola Director of Strategy</i>	48	14
David W. Hickie <i>Senior Vice President and Assistant Chief Financial Officer</i>	54	25	*William V. Braun <i>Corporate Vice President and Motorola Director of Research and Development</i>	52	29
Richard H. Weise <i>Senior Vice President, General Counsel and Secretary</i>	52	19	*Karl Burgess <i>Corporate Vice President and Director of Systems, Telecommunications and Computer Services</i>	52	8
*Kenneth J. Johnson <i>Corporate Vice President, Controller and Director of Corporate Audit</i>	52	16	Vincent J. Rauner <i>Corporate Vice President for Patents, Trademarks and Licensing</i>	60	17
H. Richard Klotz <i>Corporate Vice President and Director of Taxes</i>	61	12	<b>Communications Sector</b>		
Victor R. Kopidlansky <i>Corporate Vice President and Assistant General Counsel</i>	56	22	*Arthur P. Sundry <i>Executive Vice President and General Manager, Communications Sector</i>	59	30
*A. Peter Lawson <i>Corporate Vice President and Assistant General Counsel</i>	41	7	*David K. Bartram <i>Senior Vice President and Assistant General Manager, Communications Sector</i>	51	27
*Garth Milne <i>Corporate Vice President and Treasurer</i>	45	8	*Morton L. Topfer <i>Senior Vice President and Assistant General Manager, Communications Sector</i>	51	16
<b>International Operations</b>			Theodore Saltzberg <i>Senior Vice President and Director, Research and New Businesses</i>	60	31
Carl E. Lindholm <i>Executive Vice President, International Operations</i>	58	20	*Robert W. Bigony <i>Corporate Vice President and General Manager, Communications International Group</i>	46	21
C. Travis Marshall <i>Senior Vice President and Motorola Director of Government Relations</i>	61	17	*Wilhelm Braxmaier <i>Corporate Vice President and General Manager, Motorola-Storno Communications Group</i>	57	19
James D. Burge <i>Corporate Vice President and Director of Employment Regulatory Affairs</i>	53	29	Richard C. Buetow <i>Corporate Vice President and Director, Quality Assurance</i>	56	29
<b>Japanese Operations</b>			R. LaVance Carson <i>Corporate Vice President and General Manager, National Markets Division</i>	58	34
*Arnold S. Brenner <i>Senior Vice President and General Manager, Japanese Operations</i>	50	28	Gordon Comerford <i>Corporate Vice President and Sector Director, Business Management</i>	51	13
*Toshiaki Irie <i>Corporate Vice President and Chairman, Nippon Motorola Limited</i>	54	3			
*Richard W. Younts <i>Corporate Vice President and President, Nippon Motorola Limited</i>	48	20			

	Age	Years of Service		Age	Years of Service		Age	Years of Service
*Ronald E. Greenwell Corporate Vice President and General Manager, Domestic Distribution Group	49	25	*Gordon C. Chilton Senior Vice President and General Manager, Discrete and Special Technologies Group	48	7	<b>Information Systems Group</b> John A. Lockett Corporate Vice President, Information Systems Group, and President, Codex Corporation	45	14
*Robert L. Growney Corporate Vice President and General Manager, Radio Technologies Group	45	21	Murray A. Goldman Senior Vice President and General Manager, Microprocessor Products Group	50	18	<b>Government Electronics Group</b> *David G. Wolfe Senior Vice President and General Manager, Government Electronics Group	52	23
*Robert S. Hall Corporate Vice President and General Manager, Manufacturing Technologies Group	58	26	Gary M. Johnson Senior Vice President and General Manager, Standard Logic and Analog Integrated Circuits Group	43	20	*James R. Baum Corporate Vice President and Assistant General Manager, Government Electronics Group	57	30
Robert L. Hammer Corporate Vice President and Sector Director, Personnel	52	14	*Geno Ori Senior Vice President and Director, Customer Relations	50	25	<b>General Systems Group</b> *Edward F. Staiano Executive Vice President and General Manager, General Systems Group	51	14
Kenneth R. Hessler Corporate Vice President and General Manager, Distribution Service Group	54	30	Charles E. Thompson Senior Vice President and Sector Director of World Marketing	58	18	*Carl F. Koenemann Corporate Vice President and Director of Finance	49	17
Bradford K. Kroha Corporate Vice President and Director of Sector Sourcing	61	33	*Weldon D. Douglas Corporate Vice President and General Manager, Low-frequency Power Transistor/Thyristor & Electronic Materials Division	50	27	*Bernard R. Smedley Corporate Vice President and General Manager, Radio-Telephone Systems Group	51	11
*Francis C. LeGere Corporate Vice President and Operations Manager, Distribution Service Group	64	32	Lawrence L. Gartin Corporate Vice President and Director, Sector Finance	44	20	Lawrence R. Paggeot Corporate Vice President and General Manager, Cellular Subscriber Division	47	19
Wayne H. Leland Corporate Vice President and General Manager, U.S. Federal Government Division	44	22	*Brian O. Hilton Corporate Vice President and Marketing Director, North America	45	20	*Robert N. Weissappel Corporate Vice President and General Manager, North American Subscriber Division	43	17
Jerome C. Leonard Corporate Vice President and General Manager, Portable Products Division	50	26	Bob J. Jenkins Corporate Vice President and Director, Semiconductor Technology Management	53	23	<b>Automotive and Industrial Electronics Group</b> Gerhard Schulmeyer Senior Vice President and General Manager, Automotive and Industrial Electronics Group	49	7
*John E. Major Corporate Vice President and General Manager, Communications Systems Group	42	9	*George A. Needham Corporate Vice President and General Manager, Final Manufacturing and Equipment Engineering Group	52	26	Frederick T. Tucker Corporate Vice President and Assistant General Manager, Automotive and Industrial Electronics Group	47	22
*William J. Millon Corporate Vice President and General Manager, Commercial Market Systems Division	54	28	Michael J. Pollak Corporate Vice President and General Manager, Logic Integrated Circuits Division	42	19	Philip D. Gunderson Corporate Vice President and Business Director, Sensors and Power Controls Business	49	19
*Robert J. Mueller Corporate Vice President and General Manager, State and Local Government Markets Division	58	28	*David L. Pulatie Corporate Vice President and Sector Director of Personnel	45	22	Chi-Sun Lai Corporate Vice President and Director, Group Manufacturing Operations	51	17
*Irvin A. Neruda Corporate Vice President and Director of Finance, Communications International Group	58	37	*Hector Ruiz Corporate Vice President and Assistant General Manager, Microprocessor Products Group	42	9	*Parviz Mokhtari Corporate Vice President and General Manager, Automotive Powertrain and Chassis Electronics Division	46	21
*Donald F. Sauls Corporate Vice President and Director, Product Finance	60	32	Dedy Saban Corporate Vice President and General Manager, European Semiconductor Group	56	16			
*Robert L. Wasni Corporate Vice President and General Manager, Parts Division	55	31	Paul J. Shimp Corporate Vice President and Director, Sector Support Operations	48	23			
<b>Semiconductor Products Sector</b>			*C. D. Tam Corporate Vice President and General Manager, Asia/Pacific Semiconductor Products Division	43	19			
James A. Norling Executive Vice President and General Manager, Semiconductor Products Sector	45	22	*Barry Waite Corporate Vice President and Assistant General Manager, European Semiconductor Group	39	5			
Thomas D. George Senior Vice President and Assistant General Manager, Semiconductor Products Sector	47	8						
Andre Borrel Senior Vice President and General Manager, International Semiconductor Group	51	20						

\*Assumed new title or advanced in rank since previous annual report.

# Sectors, Groups and Divisions

## Communications Sector

### Communications Systems Group

State and Local Market Systems Division  
Commercial Market Systems Division  
Special/National Market Systems Division

### Distribution Service Group

National Service  
Parts Division

### Domestic Distribution Group

Commercial Markets Division  
National Markets Division  
State and Local Government Markets Division

### International Group

Export Sales Division

### Manufacturing Technologies Group

### Motorola-Storno Communications Group

### Radio Technologies Group

Component Products Division  
Portable Products Division

### Data Products Division

### Paging Products Division

### Radius Division

### U.S. Federal Government Division

## Semiconductor Products Sector

### Discrete and Special Technologies Group

Low-frequency Power Transistor/Thyristor and Electronic Materials Division  
RF and Optoelectronic Products Division  
Small Signal and Sensor Products Division  
Zener/Rectifier Products Division

### Final Manufacturing and

### Equipment Engineering Group

### International Semiconductor Group

Asia Pacific Semiconductor Products Division

### European Semiconductor Group

Discrete and Analog Products Division (Toulouse)

Logic, ASIC and Microsystems Products Division (Munich)

MOS Memory and Microprocessor Division (East Kilbride)

### Microprocessor Products Group

High End MPU Division  
Microcontroller Division

### Standard Logic and Analog

### Integrated Circuits Group

Bipolar Analog Integrated Circuits Division

Logic Integrated Circuits Division

MOS Digital-Analog Integrated Circuits Division

### Application Specific Integrated

### Circuits Division

### MOS Memory Products Division

## Information Systems Group

### Codex Corporation

### Universal Data Systems

### Government Electronics Group

### Communications Division

### Radar Systems Division

### Strategic Electronics Division

### Tactical Electronics Division

### General Systems Group

### Computer Group

Computer Systems Division  
Field Service Division  
International Division  
Microcomputer Division

### Radio-telephone Systems Group

Cellular Infrastructure Division

### Cellular Subscriber Division

North American Subscriber Division

### Automotive and Industrial Electronics Group

### Automotive Powertrain and

### Chassis Electronics Division

### Automotive Body and

### Appliance Electronics Business

### Sensors and Power Controls Business

Major facilities in:

### Australia

Melbourne

### Canada

Ontario

Brampton, North York

### Costa Rica

Guadalupe

### Denmark

Copenhagen

### France

Angers, Toulouse

### Hong Kong

Kowloon

### Israel

Tel Aviv

### Japan

Aizu Wakamatsu, Tokyo

### Korea

Seoul

### Malaysia

Kuala Lumpur, Penang, Seremban

### Mexico

Guadalajara, Leon, Mexico City

### Philippines

Manila

### Singapore

### Switzerland

Geneva

### Taiwan

Chung-Li

### United Kingdom

Basingstoke, Camberley, East Kilbride, Stotfold

### United States

Alabama

Huntsville

Arizona

Chandler, Mesa, Phoenix, Scottsdale,

Tempe

California

Cupertino, Petaluma

Florida

Boynton Beach, Fort Lauderdale

Illinois

Arlington Heights, Franklin Park,

Northbrook, Schaumburg

Iowa

Mount Pleasant

Massachusetts

Canton, Mansfield

New Mexico

Albuquerque

New York

Arcade

Texas

Austin, Dallas, Fort Worth, Seguin

Puerto Rico

Vega Baja

### West Germany

Flensburg, Munich, Taunusstein

# Motorola Products

## Communications Sector

Base stations  
Closed-circuit television systems  
Communications control centers  
Component products  
Digital voice-protection systems  
Electronic command and control systems  
Health care communications systems  
High-frequency single-sideband radio systems  
Information display systems  
Microwave communications systems  
Mobile and portable FM two-way radio communications systems  
Mobile/portable data communications systems  
Portable data terminals  
Radio paging systems  
Signaling and remote control systems

## Semiconductor Products Sector

Bipolar, BIMOS and CMOS Macrocell arrays, HCMOS standard cells  
Bipolar and CMOS analog ICs  
Bipolar and CMOS digital ICs  
Control circuits  
Custom and semi-custom semiconductors (ASICs)  
Data conversion circuits  
Digital signal processors  
Fiber optic active components  
Field effect transistors (FETs)  
Industrial control circuits  
Interface circuits  
Manufacturing Automation Protocol (MAP) products  
Microcomputers and peripherals  
Microprocessors and peripherals  
Microwave transistors  
MOS and bipolar memories  
Motor control circuits  
Operational amplifiers  
Optoelectronics components  
Power supply circuits  
Pressure and temperature sensors  
Rectifiers  
RF power and small signal transistors  
Telecommunications circuits  
Thyristors and triggers  
TMOS™ and bipolar power products  
Voltage regulator circuits  
Zener and other diodes

## Information Systems Group

Custom modems  
Dial modems  
Digital service/channel service units  
Distributed communications processors  
Electronic data switches  
Gateways  
Leased-line modems  
Limited distance modems  
Multiplexers: statistical, digital, T1  
Network control and management systems  
Protocol converters  
Switched network modems  
X.25 concentrators

## Government Electronics Group

Antenna and microwave systems  
Battlefield management systems (Joint STARS)  
C<sup>3</sup>I systems  
Countermeasures systems  
Drone command and control systems  
Electronic defense systems  
Electronic fuze systems  
Electronic positioning and tracking systems  
Fixed and satellite communications systems  
Intelligent display terminals and systems  
Missile and aircraft instrumentation  
Missile fuze systems  
Missile guidance systems  
Network and trunk encryption systems  
Satellite data systems  
Satellite power electronics  
Satellite survey and positioning systems  
Secure voice/data communications  
Surveillance radar systems  
Survival transceivers  
Tactical voice/data communications  
Tracking and command transponder systems

## General Systems Group

Cellular mobile and portable subscriber products  
Cellular radiotelephone systems  
Electronic Mobile Exchange (EMX) series  
HD and LD series cellular base stations  
IMTS car telephones  
IMTS radiotelephone systems  
Microcomputer board-level products  
Microcomputer systems and peripherals  
Microprocessor development system hardware and software  
Minicomputer systems and peripherals  
OEM operating systems (SYSTEM V/68,™ VERSA™ dos)  
Software for distributed data processing, work group computing and office automation

## Automotive and Industrial Electronics Group

Anti-skid braking systems  
Automotive and industrial sensors  
Calibration and development consoles  
Electronic instrumentation  
Electronic appliance controls  
Electronic engine controls (gasoline and diesel)  
Electronic motor controls  
Ignition systems  
Transmission controls  
Vehicle theft deterrent systems  
Voltage regulators

## New Enterprises

Cell controllers for factory automation  
Clinical information management systems and nursing productivity workstations for the hospital  
Real-time distributed computing systems for Computer Integrated Manufacturing (CIM)  
Single wafer etching and stripping equipment for semiconductor market  
Statistical process control, cell controllers, engineering analysis and robotic systems for wafer fabrication automation  
Supervisory control and data acquisition systems for utility markets  
Thin film deposition equipment for semiconductor market

# 1987 Dan Noble Fellows

The Dan Noble Fellow is the highest honorary award that can be made to a technologist within Motorola. It recognizes outstanding technical creativity, innovative ability and productive achievements. It is named for Dan Noble, a visionary technological pioneer, former vice chairman of Motorola and chairman of its Science Advisory Board. Only 97 Motorolans are Dan Noble Fellows. Those chosen in 1987 are:

Howard Berg, *Semiconductor Products Sector*  
John Byrns, *Corporate Research and Development*  
Lance Carson, *Government Electronics Group*  
Bob Deutsch, *Automotive and Industrial Electronics Group*  
Ken Felix, *General Systems Group*  
Tom Freeburg, *General Systems Group*  
Fred Hickernell, *Government Electronics Group*  
Kevin Kloker, *Corporate Research and Development*  
Eric Main, *Semiconductor Products Sector*  
Ira Miller, *Semiconductor Products Sector*  
Tony Van Den Heuvel, *Communications Sector*  
Roger Whatley, *Semiconductor Products Sector*

## CEO Quality Awards

Winners of Motorola's Chief Executive Office Quality Awards in 1987 were:

### Communications Sector:

- The Penang, Malaysia, facility
- The Fixed Products Hybrid Microcircuits operation
- The Printed Circuit Board Assembly operation for base stations, control centers and microwave radios
- The Microwave Equipment Manufacturing operations

### Semiconductor Products Sector:

- The East Kilbride, Scotland, CMOS Assembly/Test operations
- The Bipolar Logic team
- Jolene McAdam, Mesa, Ariz., Distribution Center

### Government Electronics Group:

- Strategic Secure Communications Office and Strategic Production Office

### General Systems Group:

- Mini TAC Cellular Development/Manufacturing operations teams
- Cellular Product Development team
- Mini TAC Cellular Development/Manufacturing operations teams and the Cellular Reliability Laboratories

### Joint Award:

- Government Electronics Group Integrated Circuit facility and Motorola Integrated Circuit Applied Research Laboratories, Semiconductor Products Sector

Winners of the Motorola Supplier Award for Excellence were Ingram Paper, Phoenix, Ariz., for non-production materials; and Airborn, Inc., Addison, Texas, for production materials. The internal supplier award was won by the Electronic Materials operations of the Discrete and Special Technologies Group, Semiconductor Products Sector.



**MOTOROLA INC.**

Corporate Offices  
Motorola Center  
1303 E. Algonquin Rd.  
Schaumburg, Ill. 60196  
Phone: (312) 397-5000

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