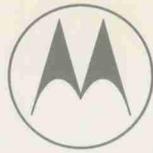


*MOTOROLA ANNUAL REPORT 1964*



## **Directors and Officers**

### **BOARD OF DIRECTORS**

ROBERT W. GALVIN  
MATTHEW J. HICKEY, JR.  
DANIEL E. NOBLE  
ARTHUR L. REESE  
WALTER B. SCOTT  
EDWARD R. TAYLOR  
EDWIN P. VANDERWICKEN  
ELMER H. WAVERING

### **OFFICERS**

ROBERT W. GALVIN  
*Chairman of the Board*

ELMER H. WAVERING  
*President*

DANIEL E. NOBLE  
*Group Executive Vice President,  
Communications, Semiconductor,  
Military Electronics, and Solid State  
Systems Divisions*

ARTHUR L. REESE  
*Executive Vice President,  
Communications and Solid State  
Systems Divisions*

WALTER B. SCOTT  
*Vice President,  
Consumer and Automotive Production*

EDWIN P. VANDERWICKEN  
*Vice President for Finance,  
Treasurer and Secretary*

FRANKLIN C. BREWSTER  
*Vice President and General Manager,  
Automotive Products Division*

ALLEN H. CENTER  
*Vice President, Public Relations*

JOSEPH A. CHAMBERS  
*Vice President and General Manager,  
Military Electronics Division*

JOHN I. DAVIS  
*Vice President,  
Consumer Products Engineering*

SYLVESTER R. HERKES  
*Vice President and General Manager,  
Consumer Products Division*

C. LESTER HOGAN  
*Vice President and General Manager,  
Semiconductor Products Division*

JOHN A. HUBENY  
*Controller*

OSCAR P. KUSISTO  
*Vice President,  
Automotive Products Division*

HOMER L. MARRS  
*Vice President, Communications Sales*

KENNETH M. PIPER  
*Vice President, Human Relations*

WILLIAM J. WEISZ  
*Vice President and  
Assistant General Manager,  
Communications Division*

## **Table of Contents**

Directors and Officers	Inside Front Cover
Highlights of 1964	2
Letter to Shareholders	2
Balance Sheet	4
Statement of Earnings	6
Ten Year Financial Summary	7
Consumer Products Division	9
Communications Division	11
Semiconductor Products Division	13
Military Electronics Division	15
Automotive Products Division	17
Solid State Systems Division	18
International Operations	19
<i>Special Report:</i>	20
Human Relations at Motorola	



## Highlights of 1964

---

SALES AT ALL-TIME HIGH OF \$419 MILLION,  
TOPPING 1963 RECORD YEAR OF \$378  
MILLION BY 11 PERCENT

---

EARNINGS AT RECORD \$5.12 PER SHARE,  
BETTERING THE \$3.21 OF 1963  
BY 60 PERCENT

---

BOARD DECLARES 50 PERCENT INCREASE  
IN QUARTERLY CASH DIVIDEND,  
PLANS A 50 PERCENT STOCK DIVIDEND

---

COLOR TV VOLUME HELPS BOOST  
CONSUMER PRODUCTS DIVISION  
TO RECORD SALES YEAR

---

INDUSTRY'S FIRST ALL-TRANSISTOR  
MOBILE TWO-WAY RADIO  
GOES TO MARKET

---

SALES AND EARNINGS OF  
SEMICONDUCTOR PRODUCTS DIVISION  
UP SUBSTANTIALLY

---

MOTOROLA FIRST TO DELIVER  
QUALIFIED EQUIPMENT FOR GEMINI  
TWO-MAN ORBITAL FLIGHT PROGRAM

---

ALTERNATOR SALES INCREASE  
WITH EXPANDED PRODUCT LINE

---

SOLID-STATE SYSTEM DEVELOPED FOR  
PETROLEUM COMPANIES TO COUNT GALLONS  
OF GASOLINE DISPENSED FROM SERVICE  
STATIONS

---

SALES OVERSEAS AT RECORD HIGH

---

## To The Shareholders

In 1964 Motorola achieved its finest record. Sales of \$419,066,694 were 11% over 1963 sales of \$377,852,809. Earnings of \$20,666,724, or \$5.12 per share, were 60% above the \$3.21 per share reported last year.

It should be noted that 18¢ of the 1964 share earnings represent an adjustment in tax reserves, provided in prior years, as a result of the change in tax laws in 1964 relating to the 7% investment credit.

As it enters a new year, the company finds itself involved in a wide array of interesting new challenges.

Emphasis is placed here on challenge for three reasons. The first is to provide shareholders an insight into the current problems of the business as well as the achievements of the past year. The second is to assure shareholders that their management is not complacent about the current results, however favorable. The third is to observe that challenges can be the forerunners to future opportunities and growth just as past challenges have been converted into 1964's results.

The principal challenge in our consumer products division is to consolidate our market position in color television. Motorola's strategy of flanking its established competition with the exclusive and early development of a 23-inch rectangular short neck color television tube, made by National Video Corporation and marketed in premium quality receivers, was a spectacular success. That strategy and product moved the company from virtually no position early in the year to a position among the top four in color television by year's end.

In 1965, a greater variety of receivers employing the Motorola tube

must be readied and introduced, with additional retailers enrolled in the marketing of them. A second source of supply for the Motorola-designed tube must be provided adjacent to our television set factory to augment the fine services of our present and continuing tube supplier. Our problems in the accomplishment of this are many but our expectations are high.

The automotive division, which has enjoyed an expansive automotive market, faces two problems of note. The Ford Motor Company is an important customer for Motorola original equipment car radios. A few years ago, Ford bought Philco Corporation and Philco is a source of supply for Ford car radios. Motorola continues, however, to serve the Ford Motor Company with a great zeal to retain an important part of that volume. It is our hope, with innovative product and superior service, that we will continue to merit a supplier relationship with this fine customer.

The second matter of note concerns the effects of an agreement concluded between the federal governments of Canada and the United States aimed at correcting Canada's balance of payments problem, specifically in the automotive markets. Because one of the objectives of this new agreement was to help the Canadians export more automotive components from Canada back to American car manufacturers, Motorola may find it necessary to establish another factory in Canada, one of whose purposes will be the manufacture of certain of our automotive products for sale to our U.S. auto customers. We intend to remain alert to these and other conditions in the interest of our important automotive division business.

The communications division again

enjoyed healthy growth in 1964. The principal products of the division are two-way portable and mobile radios. Because of superior product and systems service, Motorola has earned the majority of this market in competition with such giants as General Electric and RCA as well as other able electronics suppliers. Our biggest task in this business is to assist the Federal Communications Commission in finding a solution to the shortage of frequencies available for this radio service which is important to public health and safety as well as industrial efficiency. Together with the others in the industry, we have launched an exhaustive analysis of the frequency spectrum problem. We are working intimately with the skilled staff of the Commission in an effort to find an intelligent proposal which the Commission could endorse in order to eventually make more frequencies available for this essential communications service. In the meantime, the needs for communication grow and the market for two-way radio products and other specialty products of the division improve.

Motorola's newest business challenge is our entry into the controls industry with our solid state systems division. The many controls markets, which we feel represent a good potential, require extensive technical expenditures and complex production and marketing talents. We believe we have chosen four basic product areas which offer substantial promise and which, we are confident, will lead us to other attractive products as well. Although we cannot see a profit in this business in 1965, we believe realistically that the prospects will be rewarding in the years beyond.

Our semiconductor division operates in a fiercely competitive components market but, because of unique product and services, has enjoyed increased sales and good earnings in the transistor, diode and rectifier markets. The immediate problem requiring special attention is the mastery of the integrated circuit segment of this business. Large expenditures in the last couple of years have provided this division with an extensive fund of technical skills and products. This year and next we must learn to convert these into a profitable business. This may prove to be the most complex marketing situation the company has ever faced, but we feel that meeting that challenge will result in important rewards.

The restrictions on military spending announced by the federal government are having their impact on the nature of competition in military business. Our military electronics division is having to learn to work with a larger proportion of fixed-price contracts and to engage in increasingly sophisticated technologies. Headlined by products that will serve such well publicized projects as Mariner, Gemini and Apollo, Motorola's military/space business should increase in both volume and earnings in the year ahead.

The year 1965 should bring to the company a further gain in sales volume and earnings. It is to this objective that our management associates and fellow employees, who have achieved so well in 1964, dedicate themselves in the year ahead.



FOR THE BOARD OF DIRECTORS

*Elmer H. Hawking*  
 PRESIDENT

*Robert W. Galvin*  
 CHAIRMAN OF THE BOARD

MARCH 15, 1965

# Motorola, Inc. and Subsidiaries

as of December 31

ASSETS	1964	1963
<i>Current assets</i>		
Cash	\$ 7,922,825	\$ 7,876,905
Short-term investments, at cost	7,027,114	4,766,123
Accounts receivable		
United States government	13,528,545	12,803,501
Other	66,798,241	59,888,040
Allowance for doubtful accounts	(2,473,803)	(2,478,099)
Costs recoverable under United States government contracts, less progress billings	5,403,575	5,839,035
Inventories, at the lower of average cost or market	60,280,741	49,348,825
Other current assets	2,656,833	2,452,083
<i>Total current assets</i>	161,144,071	140,496,413
Plant and equipment—less depreciation (note 1)	67,836,835	67,283,543
Sundry assets, net	3,099,867	3,697,458
	\$232,080,773	\$211,477,414

## NOTES TO FINANCIAL STATEMENTS

1. The companies' investment in plant and equipment at December 31, 1964 and 1963 was as follows:

	1964	1963
Land—at cost	\$ 3,488,342	\$ 3,127,574
Buildings—at cost, less depreciation (1964, \$16,179,559; 1963, \$13,719,523)	39,698,127	39,950,000
Machinery and equipment—at cost, less depreciation (1964, \$22,250,963; 1963, \$18,718,554)	22,260,707	21,662,502
Dies, tools, and leasehold improvements—at cost, less amortization	2,389,659	2,543,467
	\$67,836,835	\$67,283,543

2. Long-term debt at December 31, 1964 and 1963 consisted of the following:

	1964	1963
4¾% debentures due April 1, 1986 (with annual sinking fund requirements commencing in 1967)	\$30,000,000	\$30,000,000
Notes payable:		
3¾%, due \$1,000,000 in 1965, \$1,500,000 in 1966, and \$500,000 annually thereafter to 1972	5,500,000	6,500,000
4¾%, due \$500,000 annually, 1965-1976	6,000,000	6,500,000
Real estate mortgages	1,103,150	1,175,080
	42,603,150	44,175,080
Less current maturities, included in current liabilities	1,573,931	1,570,594
Noncurrent portion of long-term debt	\$41,029,219	\$42,604,486

# Consolidated Balance Sheet

as of December 31

LIABILITIES	1964	1963
<i>Current liabilities</i>		
Current maturities of long-term debt	\$ 1,573,931	\$ 1,570,594
Accounts payable—trade	19,251,327	20,360,029
Accrued compensation	4,081,544	4,644,611
Federal income taxes, less United States Treasury obligations of \$13,191,650 in 1964 and \$9,450,950 in 1963	897,102	—
Other taxes	3,807,201	4,109,097
Contribution to employees' profit sharing fund	6,947,697	4,210,417
Product and service warranties	2,079,931	1,237,257
Other	14,879,399	12,005,556
<i>Total current liabilities</i>	<u>53,518,132</u>	<u>48,137,561</u>
Long-term debt (note 2)	<u>41,029,219</u>	<u>42,604,486</u>
<i>Shareholders' equity</i>		
Capital stock, \$3.00 par value. Authorized, 6,000,000 shares. Outstanding: 1964, 4,035,822 shares; 1963, 4,026,872 shares (net of 3,410 treasury shares) (note 3)	12,107,466	12,080,616
Additional paid-in capital (note 3)	14,486,641	13,844,820
Retained earnings (note 2)	110,939,315	94,809,931
<i>Total shareholders' equity</i>	<u>137,533,422</u>	<u>120,735,367</u>
	<u>\$232,080,773</u>	<u>\$211,477,414</u>

At December 31, 1964 approximately \$42,000,000 of retained earnings was free from dividend restrictions contained in the debenture and note agreements.

3. Under the Employee Share Option Plan adopted in 1960, options have been granted to key employees to purchase Motorola, Inc. shares at not less than 95% of market value at date of grant if granted prior to January 1, 1964 and at 100% of market if granted thereafter. The options become exercisable two years after date of grant; they expire at the end of ten years if granted prior to January 1, 1964 and five years if granted thereafter, and are contingent upon continued employment by the company or its subsidiaries.

During 1964 an option to purchase 200 shares was granted, options on 3,300 shares were terminated, and options on 8,950 shares were exercised; the excess (\$641,821) of the option price over the par value of the capital stock issued was credited to additional paid-in capital. At the year end 78,030 shares were under option, at an aggregate option price of \$5,640,900, of which 44,230 shares were currently exercisable, in the total amount of \$3,331,675; an

additional 113,000 shares were reserved for options which may be granted until May 2, 1965.

4. The Internal Revenue Act of 1964 eliminated the requirement that the cost of qualified facilities be reduced by the amount of the investment credit for purposes of computing depreciation. Therefore, the investment credit for 1964 (\$549,000) and the portion of prior years' credit which was deferred (\$723,000) have been applied as a reduction of 1964 federal income tax expense.
5. The companies are obligated under repurchase and other agreements, principally in connection with the financing of sales of products to consumers, and are defendants in suits and claims, which it is believed will have no material effect on the business of the companies.

# Statement of Consolidated Earnings and Retained Earnings

	Years ended December 31	
	1964	1963
SALES AND OTHER REVENUES	\$419,066,694	\$377,852,809
Manufacturing and other costs of sales	294,060,184	275,720,213
Selling, service, and administrative expenses	67,875,746	60,406,904
Depreciation of plant and equipment	9,235,479	8,150,707
Contribution to employees' profit sharing fund	6,947,697	4,210,417
Interest and amortization of debenture expense	2,020,864	2,238,042
<i>Total costs and other expenses</i>	<u>380,139,970</u>	<u>350,726,283</u>
Income before federal income taxes	38,926,724	27,126,526
Federal income taxes (note 4)	<u>18,260,000</u>	<u>14,200,000</u>
EARNINGS		
(per share outstanding at end of year: 1964, \$5.12; 1963, \$3.21)	20,666,724	12,926,526
Retained earnings at beginning of year	<u>94,809,931</u>	<u>85,910,277</u>
<i>Total</i>	115,476,655	98,836,803
Cash dividends declared (per share: 1964, \$1.125; 1963, \$1.00)	<u>4,537,340</u>	<u>4,026,872</u>
Retained earnings at end of year (note 2)	<u>\$110,939,315</u>	<u>\$ 94,809,931</u>

See accompanying notes to financial statements.

## ACCOUNTANTS' REPORT

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

We have examined the consolidated balance sheet of Motorola, Inc. and subsidiaries as of December 31, 1964 and the related statement of earnings and retained earnings for the year then ended. Our examination was 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. It was not practicable to confirm accounts receivable from United States government departments or agencies by communication with them but we satisfied ourselves as to such accounts by means of other auditing procedures.

In our opinion, the accompanying consolidated balance sheet and statement of consolidated earnings and retained earnings present fairly the financial position of Motorola, Inc. and subsidiaries at December 31, 1964 and the results of their operations for the year then ended, in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

PEAT, MARWICK, MITCHELL & CO.

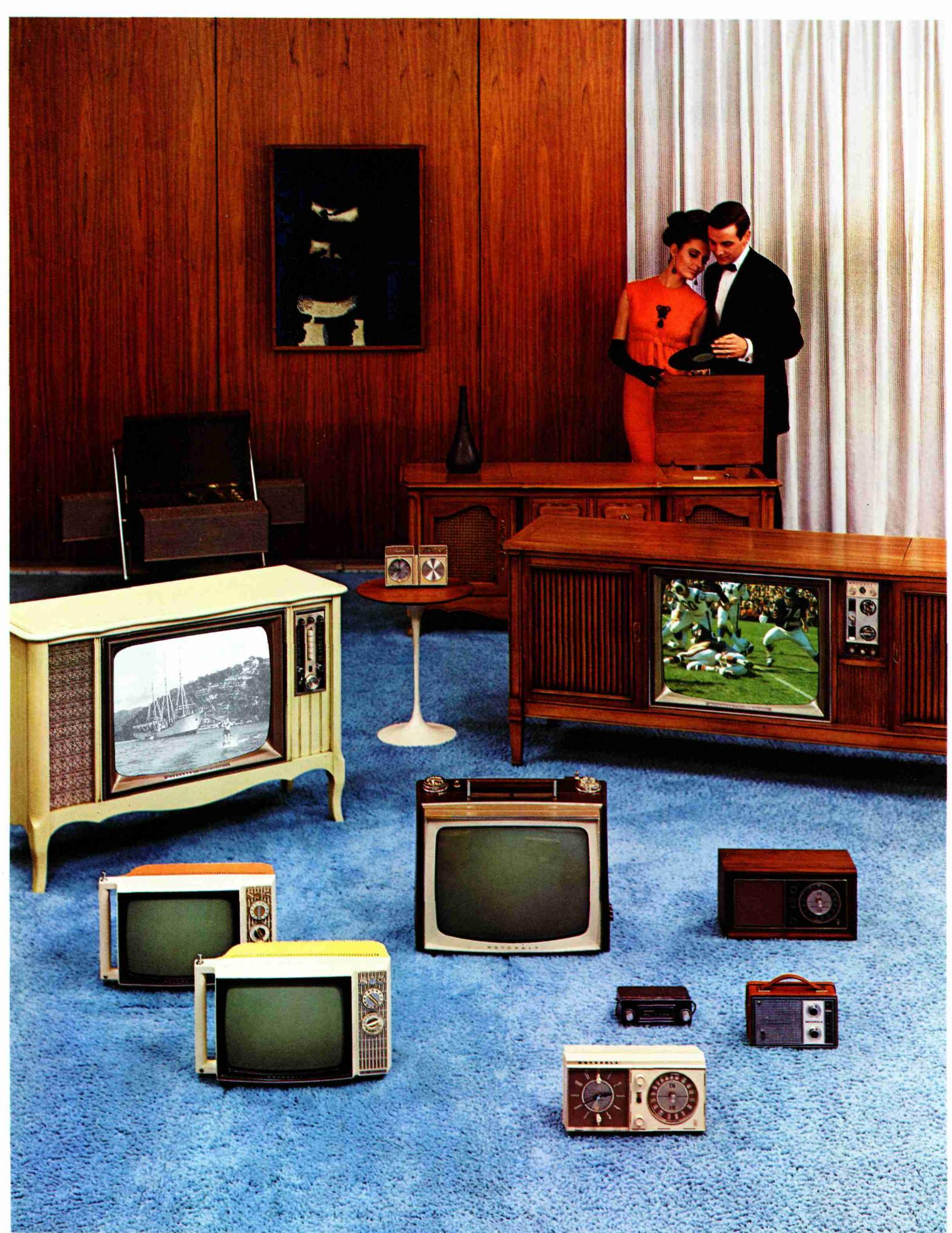
Chicago, Illinois, February 22, 1965

## Ten Year Financial Summary

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
<b>SALES AND OTHER REVENUES</b>	\$228,428,063	229,266,055	228,431,385	218,909,968	293,081,127	301,049,185	298,219,845	346,881,779	377,852,809	<b>419,066,694</b>
<b>INCOME BEFORE INCOME TAXES</b>	\$18,740,426	16,936,334	15,756,431	15,171,013	27,756,237	26,548,813	19,900,308	26,514,514	27,126,526	<b>38,926,724</b>
<b>EARNINGS</b>	\$8,490,539	7,966,817	7,824,431	7,356,213	14,171,237	12,633,813	9,517,308	13,206,514	12,926,526	<b>20,666,724</b>
<b>EARNINGS PER SHARE*</b>	\$2.19	2.06	2.02	1.90	3.59	3.14	2.36	3.03	3.21	<b>5.12</b>
<b>WORKING CAPITAL</b>	\$42,892,165	54,936,569	56,425,360	59,585,830	63,336,998	73,790,019	95,078,616	96,804,189	92,358,852	<b>107,625,939</b>
<b>NET INVESTMENT IN PLANT AND EQUIPMENT</b>	\$19,179,992	25,388,866	27,167,597	27,615,287	33,436,676	44,594,599	48,427,446	54,783,818	67,283,543	<b>67,836,835</b>
<b>SHAREHOLDERS' EQUITY</b>	\$56,186,590	61,305,080	66,172,446	71,533,020	83,338,386	97,166,850	102,655,506	111,835,713	120,735,367	<b>137,533,422</b>

\*Earnings per share are based on the number of shares outstanding at the end of the respective years, adjusted for share distributions.

Earnings per share shown above for 1962 do not include 25c of nonrecurring capital gain from sale of finance subsidiary.



Record sales were achieved by the consumer products division in 1964.

Color television sparked the sales surge. The output of rectangular color tube television sets started slowly at the beginning of the year, but by August had gained accelerating momentum. Considering the late re-entry into the color TV market, based upon a planned program of returning only with new products offering obvious consumer benefits, the division secured an impressive share of market in this product category. The 23-inch Motorola rectangular color television tube has set a new standard in the industry to which all competitors are urgently trying to adapt their programs.

The success of the persistent and painstaking rectangular color tube development program is already legendary as a technological achievement, and also as an achievement in cooperation. Motorola developed the tube and invited National Video Corporation to cooperate in its production. Bringing forth such a sophisticated and difficult product required an unusual devotion of the staffs of both companies to the cause of advancing the art of design and production of tubes.

It seems highly appropriate to salute in this report a sizeable and dedicated group of Motorola engineers who worked tirelessly, night and day, to get this effort into motion and the color tube production staff of National Video Corporation who so capably responded to the challenge.

In January of 1965, Motorola announced plans to enter the business of producing rectangular color tele-

## **Consumer Products Division**

vision tubes by 1966 as a necessary second source of supply to supplement the output of National Video Corporation and to enable National Video Corporation to meet the requirements of its other customers for this unique tube.

Black and white television continues, of course, to be a major category. The outstanding new product in 1964 was the 12-inch "Cadet" black and white portable television receiver, an instantaneous "hit" with its unusual styling, featuring the handle mounted on the side for convenient carrying. Completing the novel styling, the monopole antenna is mounted in the handle, allowing use in such places as book shelves.

New designs of home and portable radios and stereo phonographs added luster to the Motorola line of consumer products.

An interesting consumer benefit is found in the 1965 car radio line. It is Motorola's LUMALERT warning signal for the forgetful motorist who accidentally leaves headlights on, draining the battery. This transistorized tone signal sounds an alarm through the radio when the headlights are on and the ignition is turned off. The signal is silenced when the headlights are turned off or a silencer switch is turned.

S. R. Herkes was appointed general manager of the consumer products division during the past year. Preparing for the increased sales projected for the division, a reorgan-

ization was instituted in several departments. The consumer engineering department was streamlined to more clearly define responsibilities of various groups and it was strengthened at the management level.

The purchasing department was given a new structure for purposes of strengthening this important support function and the marketing department was re-grouped with particular emphasis on product planning.

Reinforcement of the division's marketing program was achieved in another direction late in the year. A National Distributor Council was organized to provide closer lines of communication and contribute toward a more efficient total marketing effort between the consumer products division and its more than 90 wholesale distributors across the nation. This liaison body consists of 10 members, each heading up a regional group. Each Motorola distributor principal is entitled to membership on one of the geographically oriented regional groups. Ideas and experiences will be passed through the regional group to the national council which will meet on regularly scheduled occasions with the top management of the division and with top executives of the corporation.

Looking ahead, a record of some 10 million television receiver sales is projected for the industry during 1965 to be sold by wholesalers, of which over two million are expected to be color sets, including additional sizes of color television tubes.

*Stereophonic High Fidelity Phonographs*

*Black and White Console Television*

*Color Television*

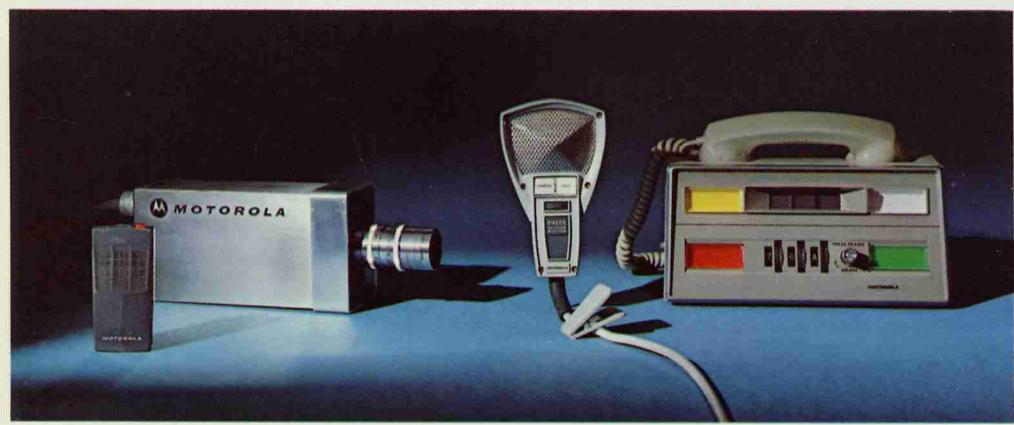
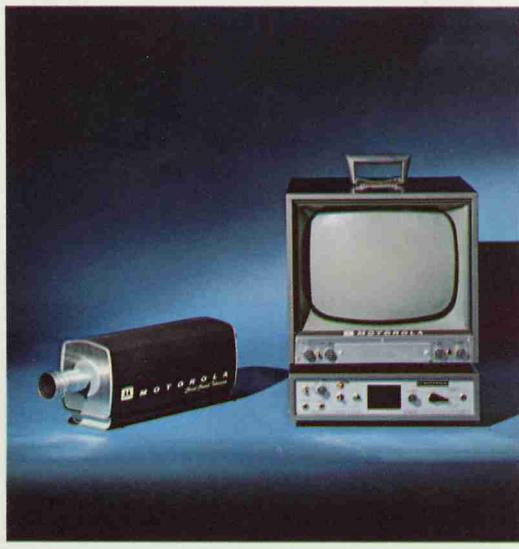
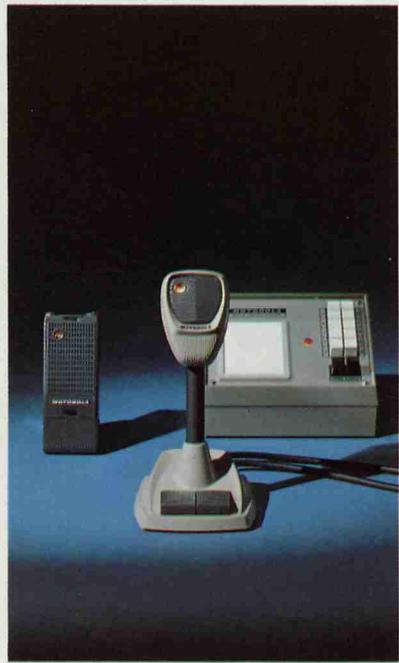
*Black and White Portable Television*

*AM and AM/FM Clock Radios*

*AM, FM and AM/FM Car Radios*

*AM and AM/FM Table Radios*

*AM and AM/FM Portable Radios*



The communications division set another new sales record in 1964.

It further improved its leading position in the two-way radio industry based upon superior engineering, quality production, low cost, and effective marketing.

The company's technical pre-eminence in the two-way radio field was again manifested by the introduction of the industry's first full-powered all-transistor mobile radiophone. The unit is called the MOTRAN series radio and is an extension of Motorola's MOTRAC radio line, the most popular mobile radio in the industry since it was introduced five years ago.

All tubes and relays in the new MOTRAN radio have been replaced by solid state components. It marks the first time that the critical transmitter portion of a mobile unit of this type has been transistorized. The radio operates on low and high band VHF frequencies and ties into existing or new two-way radio networks.

During 1964 the division took a major step in pioneering another two-way radio product with the introduction of a standard line of communications control consoles. These consoles provide fast, flexible control of two-way radio networks, ranging from relatively small systems to very elaborate, intricate networks. Primary customers were in the police, utility, municipal, forestry-conservation and highway maintenance fields.

Sales of the division's portable two-way radio line increased sharply in 1964. The equipment is finding interesting application as a valuable addition to mobile systems to contact men on foot. A policeman walking a beat or overseeing a subway station

## Communications Division

can be in immediate contact with squad cars, for example.

In another engineering achievement, the division developed the first single-piece, fully-transistorized portable two-way radio operating on Ultra High Frequencies (UHF). This radio, taken together with similar all-transistor radiophones for VHF channel operation and a second series of lightweight "Handie-Talkie" units, gives Motorola an increasingly diversified line of portable equipment to meet virtually any customer need.

Among the major contracts for two-way and portable radio networks received or completed were: an extensive system for Montgomery County, Maryland; a state-wide net for the New York Conservation Department; an order for an additional 1,000 MOTRAC radios for Commonwealth Edison Company; and a subway communications system for the New York Transit Authority. Major contracts for MOTRAC radios with the Louisville and Nashville Railroad and the New York Central Railroad headed an excellent sales year in the railroad market.

Sales of radio paging systems continued at a good level. The systems are widely used in manufacturing plants and large office buildings to immediately contact key personnel, especially in emergencies. Introduced were several accessory products, adding benefits and flexibility to the system concept.

The division's car telephone line (IMTS Radio) has grown into an important program.

Increasing market acceptance of Motorola's total communications concept led to an improvement in sales of the hospital line. Full-line systems were ordered by major hospitals throughout the country including the Greater Baltimore Medical Center; Scripps Hospital in La Jolla, California; St. Joseph's Hospital, Tampa, Florida; Southeast Community Hospital, Washington, D. C.;

and Mercy Hospital, Cedar Rapids, Iowa. The Greater Baltimore Medical Center system features a unique bedside control console which enables the patient to operate the radio and television set, contact a nurse and even adjust the draperies, reading and room lights.

Several new products were added to the comprehensive hospital communications line. One was a push-button dial intercom system for fast contact between departments within a hospital. Another was an x-ray subtraction system that serves as a diagnostic tool by providing pinpoint viewing of the desired area of the x-ray. The division also began marketing a compact, portable closed-circuit television system enabling close-up views of surgical procedures for training programs.

Increasing interest in its major markets—industry and government—keynoted the year for the closed-circuit television product line and Motorola further enhanced its image as the quality equipment manufacturer. CCTV installations in 1964 covered a broad range of uses including Atomic processes, the Lincoln Tunnel in New York and the San Francisco opera. The largest portion of sales was in the industrial field where the company is establishing itself as a leader, especially in the application of TV to security systems. Its unique gate-watch package, for example, providing both video and two-way voice communications, is serving various industries.

Several significant advances were made in the division's family of signaling products. The growing importance of the radio traffic control concept was evidenced in contracts to build systems for the city of Pittsburgh, city of Toledo, and for Orange County, California. Several existing systems were expanded.

A wholly new concept in operating overhead cranes was unveiled with the development of a portable radio remote control system that saves on manpower while providing flexibility by putting the man who controls the crane on the ground instead of in the cab.

(Pictured Left to Right by Rows)

*Mobile and Portable Two-way Radio*

*Pushbutton Car Telephone*

*Radio Paging*

*Closed Circuit Television*

*Hospital Communications*

*Portable Crane Control*

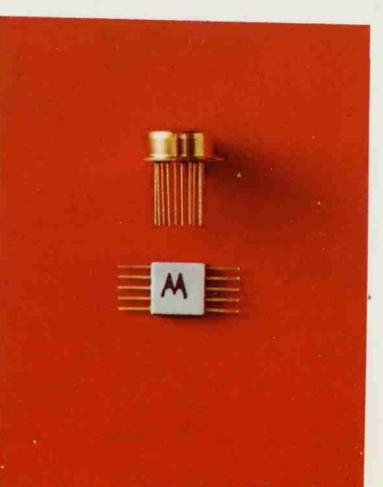
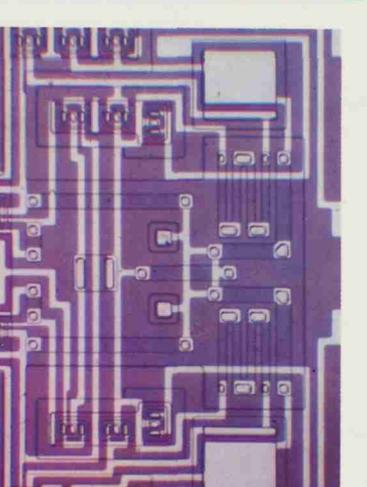
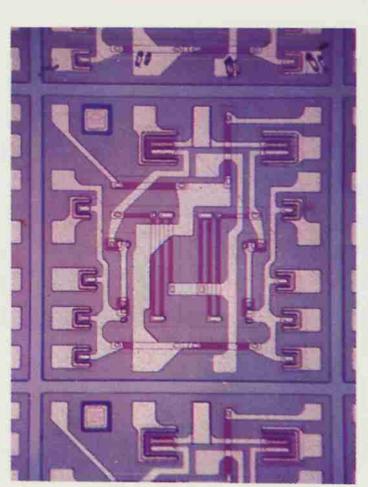
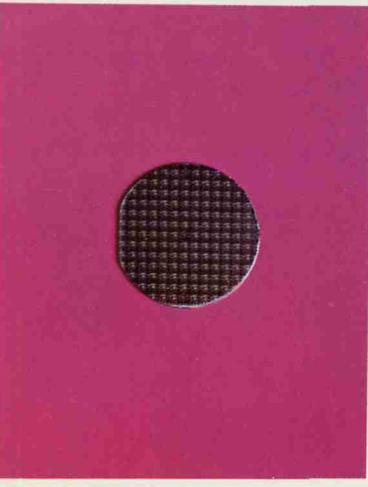
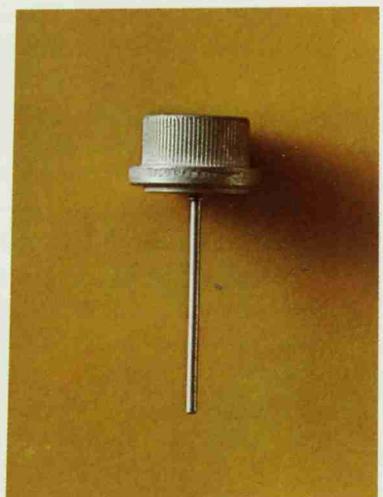
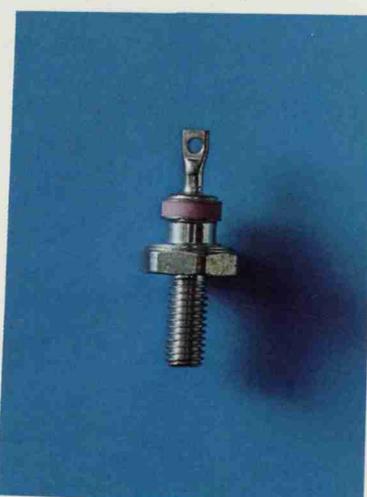
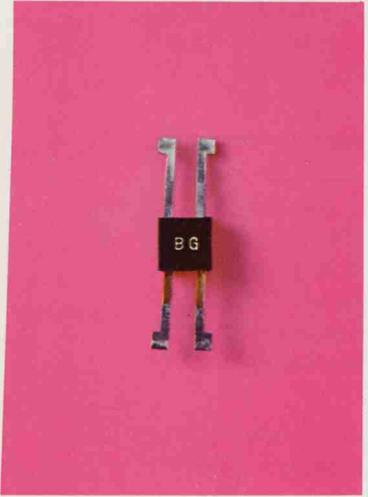
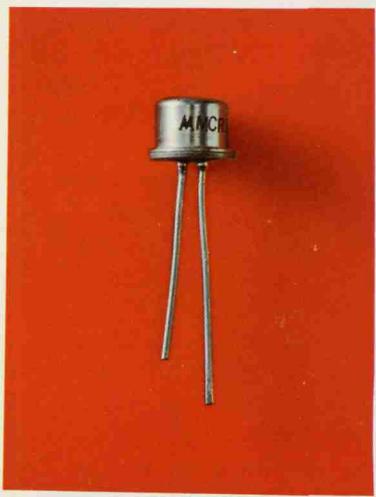
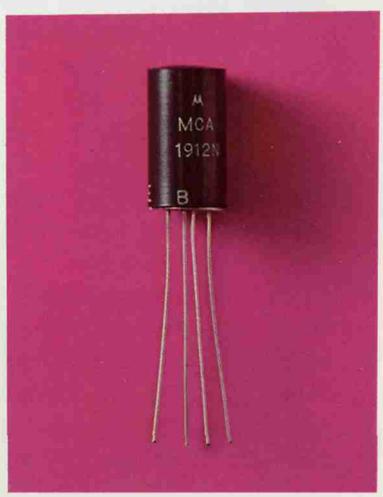
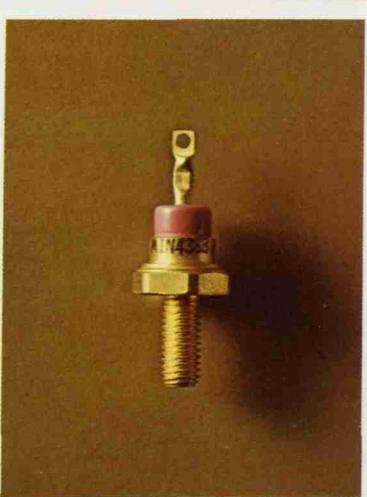
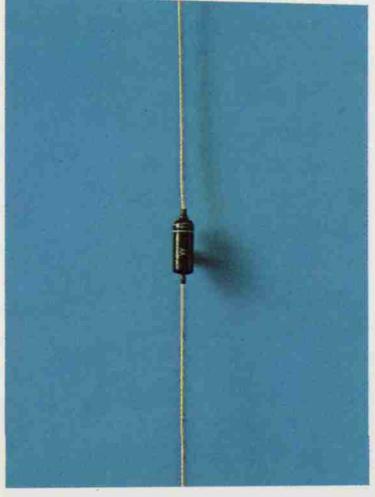
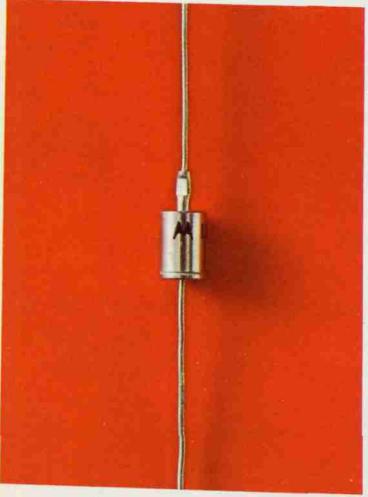
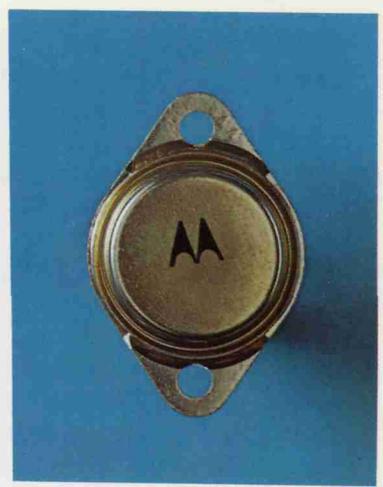
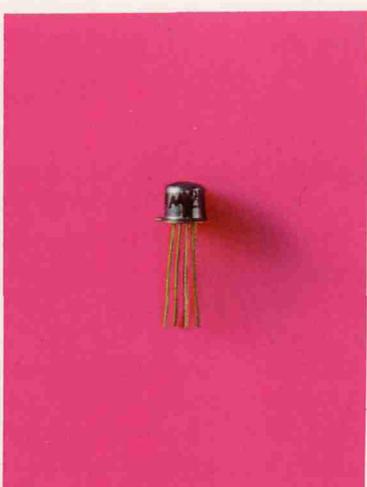
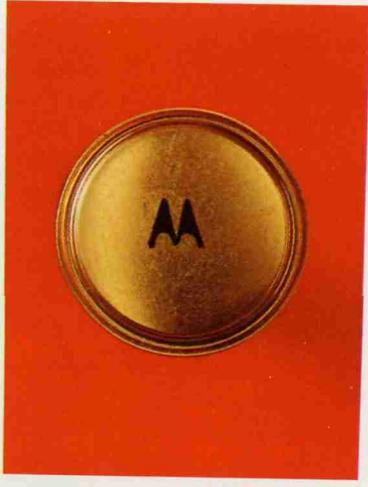
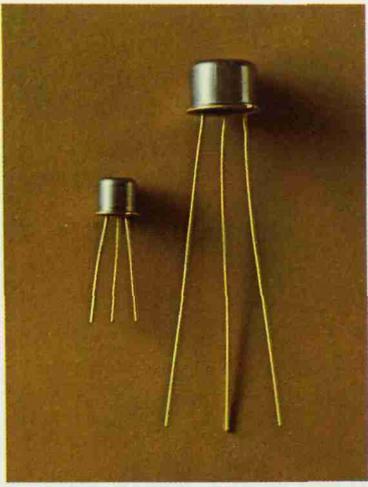
*Remote Alarm and Function Reporting*

(Other products)

*Radio Traffic Control*

*Specialized Communication Centers and Systems*

*Precision Test and Measurement Equipment*



The development and introduction of new products highlighted another rise in sales for the semiconductor products division. The dollar sales increase was more than 30 percent.

Many products representing technical breakthroughs were introduced. Success of these products, along with increased sales of established lines and improved efficiency, enabled the division to achieve substantially improved earnings.

New products are the basic nutrient for the successful semiconductor manufacturer and during 1964 the division introduced more than 100 new device types. One was a high voltage transistor which permits the design of high-speed switching and amplifying circuits at line voltages (such as the 120 volts found in the home). These new high voltage transistors were made possible by the exclusive Motorola "annular" transistor fabrication process which the division announced in 1963. This process uses special surface control techniques to provide protection against contamination. Devices capable of handling up to 300 volts, to create new applications, have been developed for introduction early in 1965.

Devices using the "annular" process helped make it possible for the company to increase its share of the silicon transistor market by some 300 percent. The principal application of these devices is in computers—both military and industrial. Thus, Motorola became a major manufacturer of silicon transistors with

## ***Semiconductor Products Division***

nearly a third of the total U. S. market. This increased share of market was gained in spite of intense competition.

Also introduced was a new, low-level silicon switching transistor, trademarked as the "O-pf" transistor, which has capacitance (electrical storage properties) so low that other circuit values become the speed limiting considerations. This new device makes it possible for low power circuits, such as those used in space satellites, to operate some 50 to 100 times faster than ever before.

A new series of low-cost silicon power transistors which offer power and frequency performance superior to those now available was developed to open a new and important segment of the semiconductor market to Motorola. These transistors are used in power supply portions of electronic equipment.

Microwave devices—such as voltage-variable capacitors and high-frequency, high-power varactor diodes—became new product lines for the division. These units complement existing amplifier transistor lines and make it possible for Motorola to market semiconductors for all stages in transmitter and receiver designs.

In the field of integrated circuits the division has put into varying stages of production families of integrated logic circuits in all major

forms of logic system design presently in use. MECL circuits, Motorola's special integrated circuit design, have been engineered into their first computer. Broad industry acceptance is expected for this logic family.

Also made available were linear (amplifier) integrated circuits. Many were the first of their type to be developed. The circuits are the result of Motorola's "compatible" process in which the successful marriage of the two major technologies of "thin-film" and "semiconductor" fabrication processes was achieved.

One of the industry trends given great attention by the division last year was the "high reliability" concept. To provide impetus toward economical standardization, the division developed the Motorola Meg-A-Life II high reliability program. This new program was carefully constructed to answer a wide variety of customer demands met in day-to-day operations. It offers a high degree of device reliability at low cost as well as much shorter delivery time.

In the past the division has concentrated its product development and marketing efforts on the more sophisticated, high value, high performance industrial/military type devices. Today consumer product applications offer a major market opportunity. An entire family of new plastic encapsulated high-performance silicon transistors has been developed for introduction in mid-1965 to serve this market.

(Pictured Left to Right by Rows)

*Silicon and Germanium Switching Transistors*  
*Power Transistors*  
*"O-pf" Silicon Switching Transistors*  
*Switching and Amplifier Power Transistors*

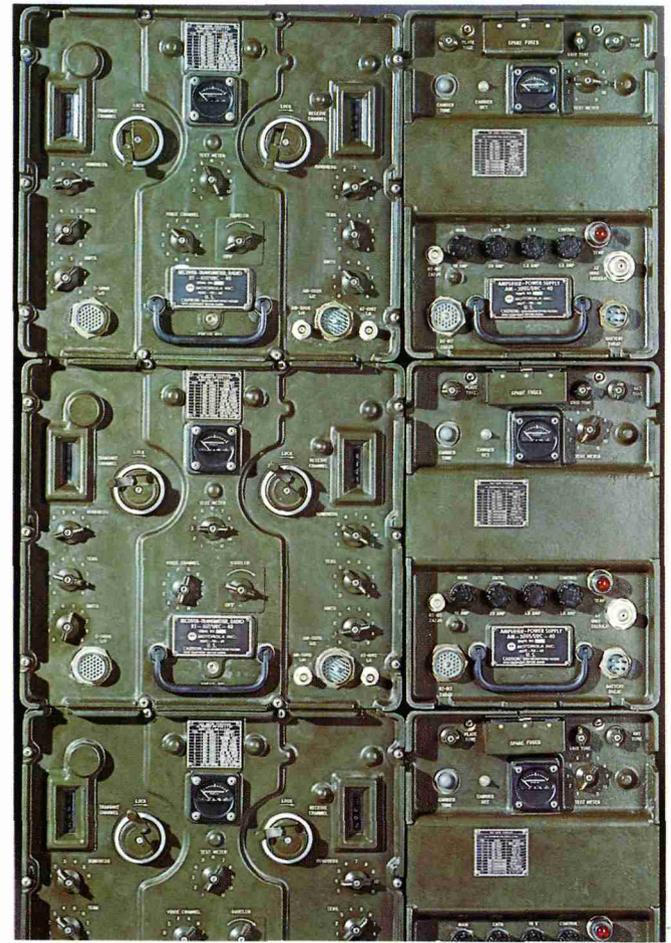
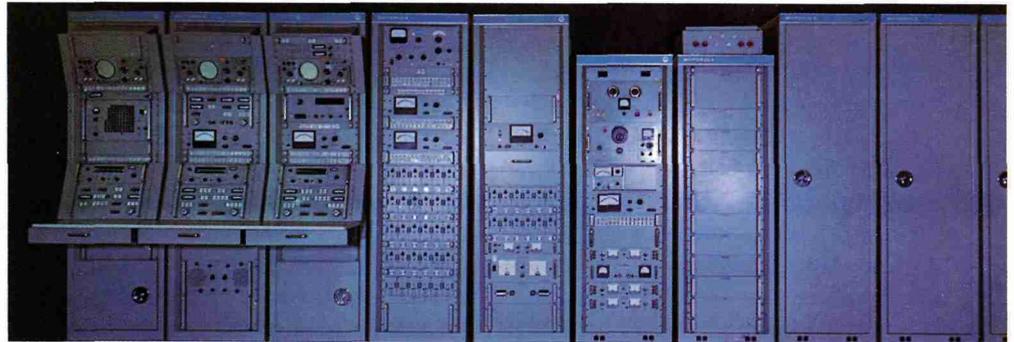
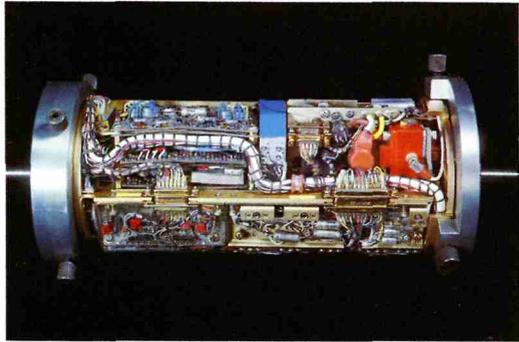
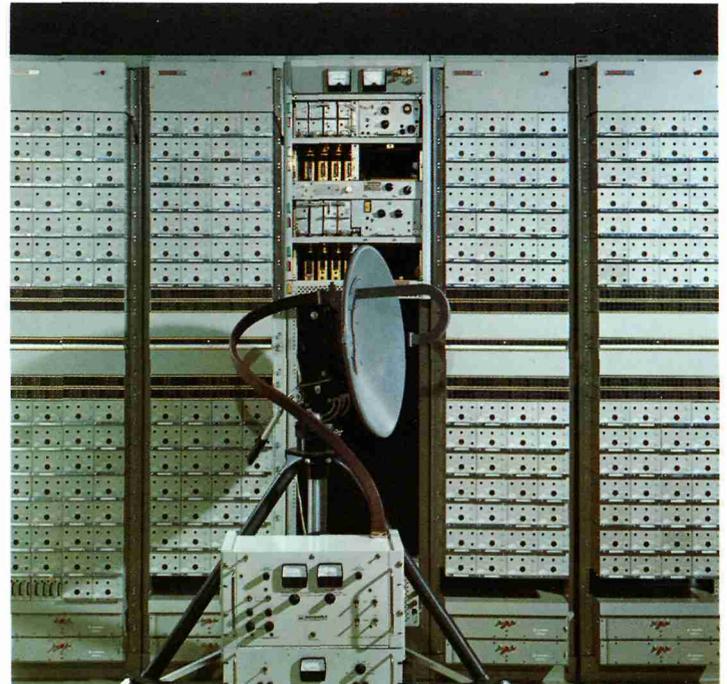
*Zener Diodes*  
*Zener Diodes*  
*Silicon Controlled Rectifiers*  
*Reference Amplifiers*

*Power Varactors*  
*Molded Diode Assemblies*  
*Fast Recovery Rectifiers*  
*Silicon Rectifiers*

*Integrated Circuits*  
*Same Integrated Circuit under microscope*  
*Integrated Circuit-microscope view*  
*Packaging techniques for Integrated Circuits*

(Other products)

*Multiple Devices*  
*Voltage Variable Capacitors*  
*Silicon and Germanium R. F. Transistors*  
*Gate Controlled Switches*  
*Milliwatt Transistors*  
*Silicon Reference Diodes*  
*Rectifier Stacks and Assemblies*



Motorola's role in protecting our nation and thrusting it forward in space exploration was enhanced during 1964 through several major contributions.

The activities of the division added up to a considerable improvement in profits, while sales dropped slightly due mainly to market changes. The announced cutbacks in defense spending are affecting the division only indirectly because they do not fall into Motorola's primary areas of interest. They have, however, increased competition from companies seriously affected who are seeking new fields.

Motorola's exceptional experience in aerospace electronics resulted in a marked business increase in this dramatic area in 1964.

One of the most exciting space programs is the Apollo manned lunar exploration. In 1964, Motorola received a number of additional contracts under this program, which is designed to land American astronauts on the moon. These included a contract to build the transceiver for the Lunar Excursion Module (LEM). During the critical moon mission, the Apollo spacecraft will carry three astronauts into a lunar orbit. Two will then transfer to the LEM, which will separate from the Apollo and descend to the moon's surface. While exploring the moon, the two space men will remain in contact with the earth through the Motorola transceiver on the LEM

## **Military Electronics Division**

and the transponder on the Apollo command module. The Motorola communications equipment also will relay to earth such astronaut biological data as pulse, heart beat and respiration, and will transmit signals back to earth that will permit recreation on earth of television pictures of the lunar mission.

Motorola equipment also is providing a key communications link between earth and space in the Gemini program, now underway, which will put two men in orbit to perform the important rendezvous and docking maneuvers, preliminary to the Apollo exploration. By delivering the digital command system early in 1964, Motorola became the first major contractor to supply qualified equipment for the two-man orbital project.

The Mariner/Mars spacecraft, launched on its historic mission late in the year, is providing space scientists and engineers with interplanetary data between earth and Mars with the aid of communications equipment built by Motorola. At year's end (midnight December 31), the Mariner spacecraft was traveling 7,491 miles per hour, 5,751,807 miles from earth, and the Motorola equipment was helping to maintain perfect communication.

The division has played a part in virtually every space program undertaken by this country. Last summer, the Ranger VII was launched on a highly successful photographic mission to the moon. A crucial midcourse maneuver, some 115,000 miles from earth, was accomplished by signals commanding the move, received by a Motorola transponder.

Motorola also is intimately involved in the all-important job of tracking spacecraft and missiles sent into space. The company was selected by the California Institute of Technology, Jet Propulsion Laboratory/NASA to supply sophisticated equipment for the Deep Space Instrumentation Facility (DSIF) which will provide the capability for a worldwide deep space tracking network.

A major contract was awarded Motorola late in the year to build a

test model for a high accuracy system based on a new concept developed by NASA's Marshall Space Flight Center for measuring position and velocity of spacecraft. The new system is known as Airborne Ranging Orbital Determination (AROD). It will employ advanced integrated circuit designs that will allow the tracking equipment to be installed on board the spacecraft instead of in large ground tracking complexes.

Motorola's extensive experience in building electronic equipment for the various space programs over the past decade has enabled the company to become the leader in supplying command receivers, decoders, transponders and other range instrumentation products for non-space applications.

The work of Motorola's military electronics division was far from confined to space efforts in 1964. Major military programs representing all branches of the armed services were also conducted.

For example, a production program was completed on the AN/APS-94 Airborne Radar System, which provides new airborne radar mapping capability.

In 1964 the Sidewinder air-to-air missile program passed Navy operational evaluation and was conditionally released to the fleet. Volume production of this equipment was in progress at year's end.

The Army put Motorola's AN/USC-3 (V) Mobile Radio Communications System through rigorous troop tests.

The Air Force Flight Test Center Data Acquisition and Transmission system moved nearer completion. This microwave system is used to obtain flight data from such advanced programs as the X-15 and B-70.

Motorola's MP-7 portable microwave package was successfully demonstrated to key military representatives in Washington, D.C. and plans are underway for a vigorous marketing effort in 1965.

During the year, Joseph C. Chambers, vice president, was named general manager of the military electronics division. Replacing Chambers as manager of the western center was J. Paul Jones. Norman L. Winter remains as manager of the division's Chicago center.

(Pictured Left to Right by Rows)

*Range Instrumentation Product Line  
Military Microwave Radio Equipment*

*Missile Guidance Systems*

*Spacecraft Tracking Systems (Deep Space  
Instrumentation Facility tracking  
equipment shown)*

*Aerospace Telecommunications (Apollo and  
Lunar Excursion Module Equipment  
shown)*

*Tactical Communications Systems  
(AN/USC-3(V) Mobile Radio  
Communications System shown)*

*Field Replaceable Spare Modules (Lower Left)*

(Representative of other products)

*Radar and Radar Data Relay Systems*

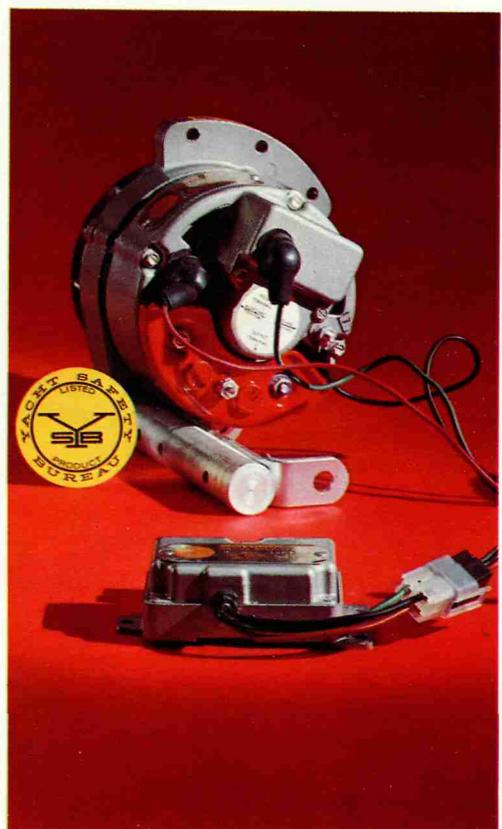
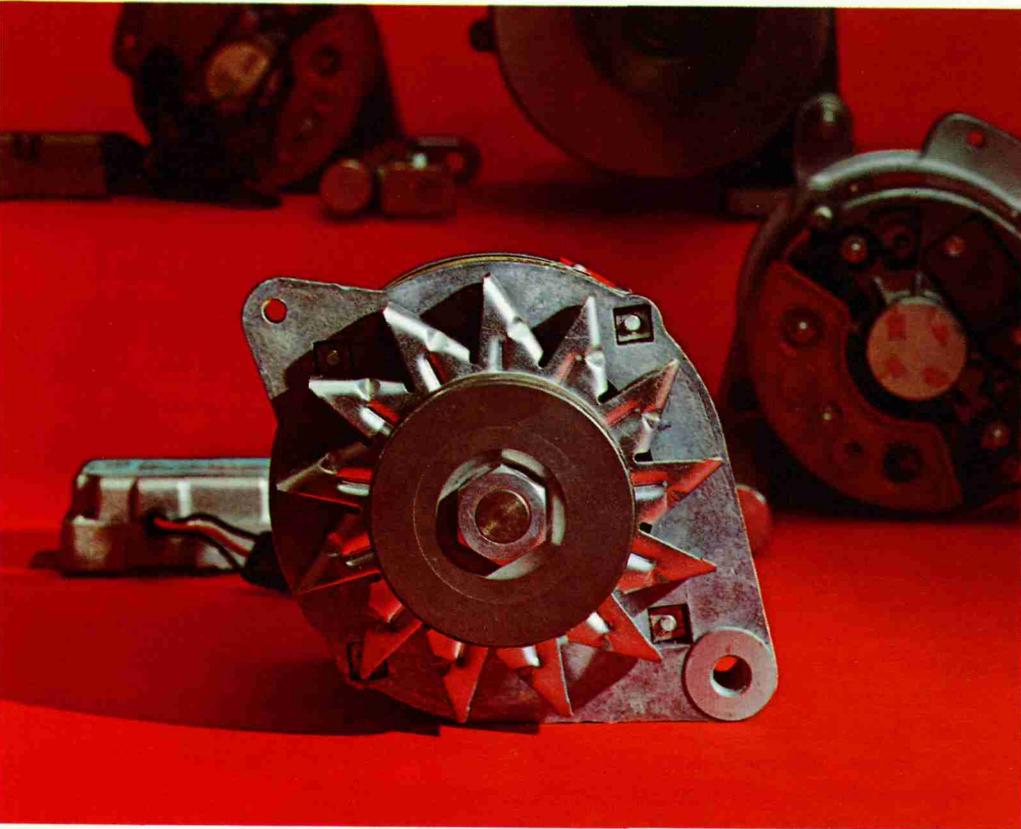
*Navigation Systems*

*Antenna Systems*

*Surveillance Systems*

*Anti-submarine Warfare Equipment*

*Digital Data Systems*



Sales of the division set a record as a result both of increased car radio and electronic alternator volume.

Radio sales reflected the record volume of eight million cars. Motorola continued to supply radios to Ford Motor Company, Chrysler Corporation, American Motors Corporation, Renault, Inc. (U.S. distribution), Checker Motors Corporation and the truck division of International Harvester Company. In addition to the regular broadcast band receivers, American Motors was also supplied combination AM/FM radios.

Motorola improved its position as a leader in designing and manufacturing radios for import cars with a number of new customers in 1964. Radios were delivered to Volkswagen, units were produced for the Austin-Healey and MG models of British Motors Corporation/Hambro, Inc., and late in the year, the division began building units for Standard Triumph Motor Company, Inc. cars sold in this country. The custom-designed radios carry the car manufacturer's name and are sold through their distributors.

The company moved forward in the truck radio field during 1964 as well. In addition to International Harvester, the division supplied units to The White Motor Company and Mack Trucks, Inc. The radios feature rugged construction to withstand truck vibration.

Significant progress was made in broadening the division's electronic alternator line and diversifying the markets for this system. The company's manufacturing facility at Arcade, New York, was fully utilized, and plans to accommodate

## ***Automotive Products Division***

further growth are being considered.

Motorola continued to supply alternator systems as original equipment to American Motors Corporation, Kaiser Jeep Corporation and Checker Motors Corporation.

Noteworthy headway was made in capturing a substantial portion of the industrial aftermarket for alternator systems, aided by several new models. These new models provided the base for several major and dozens of smaller original equipment contracts. Among the larger contracts were Deere and Company, Waukesha Motor Company, Onan—division of Studebaker Industries, Inc., Thermo-King Corporation and West Coast Machinery, Inc., for use on U.S. Post Office vehicles.

The marine alternator line was expanded to parallel the emphasis on this important market. A 70-ampere machine was added to the 35-amp unit to cover large boat applications. A new all-transistor voltage regulator permits operation at 24, 30 or 32 volts. The additions resulted in a number of marine contracts for these systems.

Motorola became the only company to build an electronic alternator system listed by the Yacht Safety Bureau, a professional marine organization that conducts extensive testing on products to insure safe and reliable operation of boating equipment. A Motorola alternator system producing 50 amperes passed the rigorous testing program and was given the Bureau label. The company later received a contract

from Chris Craft Company to supply the Bureau-listed systems.

To take advantage of the sales opportunity created by its diversified product line, the division further expanded its after-market distribution. Industrial and marine markets were emphasized. Altogether, the alternator and transistor ignition systems are being sold through approximately 5,000 outlets.

Operations abroad were stepped up during the year as well. S.E.V./Motorola S. A. in France established after-market distribution for alternator systems throughout the common market countries. It expanded the supply of alternators as original equipment to Renault of France, Volvo-Penta of Sweden, and BMW of Germany.

In May, S.E.V./Motorola S.A. began assembling diodes for use in its own alternators and selling the components to other alternator manufacturers in Europe. Alternators are now being produced in the 70,000 square foot Blois, France facility which has a capability of producing 2,000 units per day.

Corporacion Nacional Distribuidora is assembling alternator systems for the major car manufacturers of Mexico, through a licensing arrangement.

Mid-way through the year, Franklin C. Brewster was elected a vice president of the corporation and named general manager of the automotive products division, succeeding Elmer H. Wavering, upon his election as president of Motorola. Oscar P. Kusisto was elected a vice president of Motorola Inc.

### *Car Radios*

### *Electronic Alternator Systems*

### *Yacht Safety Bureau-listed Alternator Systems*

### *(Other products)*

### *Transistor Ignition Systems*

## Solid State Systems Division

The challenging job of building markets and sales for revolutionary new products, applying the art of electronics to the controls industry, moved ahead significantly.

Three major advances were made: 1) greater market penetration; 2) important product developments; and 3) an expansion of the sales and service force. They apply to all three of the division's product lines—supervisory control systems, data systems and process control systems.

The number of customers at the end of 1964 was five times greater than at the beginning of the year. A major percentage of the division's business came from the highly-integrated petroleum and gas industry which the division seeks to serve with an integrated system of controls.

Some of the customers served are American Oil Company, Cities Service Oil Company, Gulf Oil Corporation, Humble Oil and Refining Company, Mountain Fuel Supply Company, Natural Gas Pipeline Company of America, Northern Illinois Gas Company, Panhandle Eastern Pipe Line Company, Phillips

Petroleum Company, Pure Oil Company, Shell Oil Company and Sinclair Oil Corporation.

There were many other interesting applications.

IBM contracted for a process control system—the first of its type—to automatically control pressure, temperature and other functions in connection with the manufacture of its 360 computer product line.

A process control system was installed at the world's largest furfural extraction plant, in Tulsa, Oklahoma, by Sunray-DX Company.

A data system contract was received for installation at the world's largest bulk terminal, operated at Linden, New Jersey by Humble Oil. Sinclair Oil is installing a data system in the LP gas field.

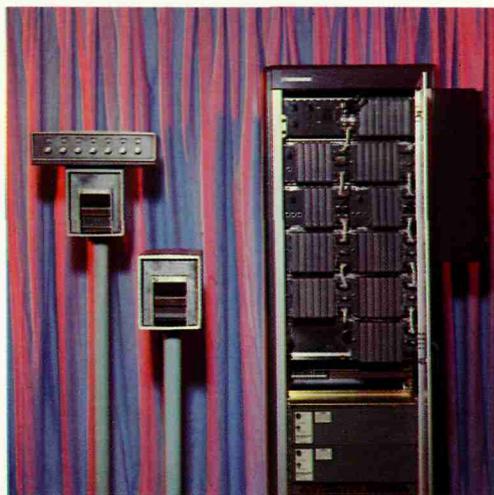
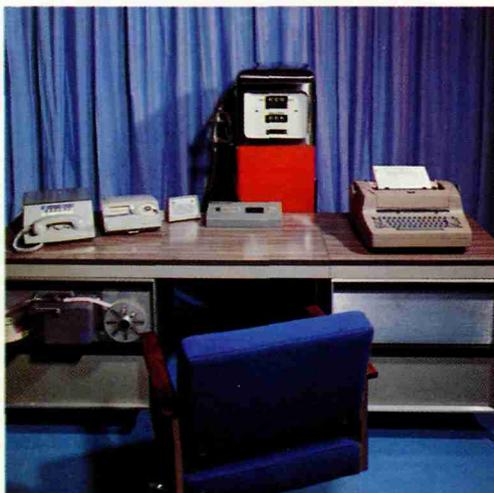
In the area of product development, the division introduced a significantly new system concept and made refinements on existing lines that provide added customer benefits.

The new system enables petroleum companies automatically and rapidly to contact service stations to determine the amount of gasoline being dispensed at each one. With this information immediately available, the oil company can plan and evaluate marketing programs; see daily and hourly results of price adjustments and changes in traffic flow; more efficiently dispatch trucks for delivery; and automate accounting procedures.

In another product development, the division introduced a new modular design approach for its supervisory control system. Each function of the system is handled by a single consolidated unit containing all circuitry required to do the job.

The division strengthened its sales and service organization by setting up offices in several more cities and by adding representatives in major cities already covered.

(Pictured Left to Right)  
*Supervisory Control Systems*  
*Service Station Data Systems*  
*Bulk Terminal Data Systems*  
*Process Control Systems*





Motorola's human relations program is based on recognition of the individual employee for his contribution to the effectiveness and efficiency of the company.

The development of his talents and abilities through company-sponsored education programs; his participation in the profits of the company; and his enjoyment of other employee benefits, are all focused on increasing his tenure and productivity.

Motorola has found profit sharing to be an important means for creating effective team effort. Its basic philosophy develops a community of interest as well as a personal interest in the success of the company in which each employee shares in a tangible and significant way.

Paul Galvin, Motorola's founder, believed in the principle that "people come first," which was the basis for establishment of the Employee Savings and Profit Sharing Plan in 1947. Today the fund totals \$79,870,719 and an employee with 17 years of service has a vested account value of \$26,470. It is estimated that by the plan's 25th anniversary in 1972, typical charter members will have account values in excess of \$50,000.

The success of the profit sharing plan has had a positive effect on other areas of employee relations. Because of the company's willingness to share with employees, the employees have further trusted management's judgment in fair wage, salary and fringe benefit administration. This relationship of trust is evidenced in the fact that Motorola is now one of the three largest companies in the country with no collective bargaining agreement.

Motorola maintains an extensive

## ***A Special Report: Human Relations At Motorola***

recruiting program in order to find the best qualified candidates for each available position. Great care is taken in the selection of engineers, scientists and future business managers from college campuses across the nation, and in the selection of the best qualified people in the skilled and hourly-pay categories.

During 1964 Motorola continued to defend its right to use race-free tests in the selection of employees. For 20 months, the Illinois Fair Employment Practices Commission retained jurisdiction of the case and in February of this year the company appealed the Commission's decision before a court of law. It is believed that at one step or another the courts will vindicate Motorola's position that employees can be selected on a merit basis without regard to race, color or religion.

A training and management development program for professional personnel is maintained with the assistance of educators from the fine colleges and universities in the Chicago and Phoenix areas. This program has aided a policy of promotion and growth from within the company.

The employee benefit program, in addition to profit sharing, includes a liberal participating insurance program of life, hospital and major medical coverage. A pension plan supplements the profit sharing plan in order to provide personnel whose participation in the profit sharing

plan is limited, with retirement income more equitably related to their working income.

Great emphasis has been placed on internal company communications, so that employees are continually aware of the progress of the company. An annual film "report" on the developments in each of the operating divisions of the company is seen by all employees. Management newsletters, bulletin boards and an unusual house publication keep employees in geographically dispersed facilities up to date on the latest company news.

More than one out of four employees has now been with Motorola for over ten years—an unusual record of job tenure, considering the rapid growth of our employee population. Employee turn-over rates in all of our facilities are below those of other employers in the same cities.

Employee-operated credit unions aid employees in purchases of consumer and capital goods according to the employees' income capacities and home ownership loans are available from the profit sharing plan.

Extensive recreation programs absorb a good part of the social life of many employees and their families.

All of the facets of the human relations program are continually reviewed to insure that they satisfy existing needs. Management personnel are reminded frequently of the precept that "people come first." As a result, Motorola is a good place to work and it is free of the frustration and conflict which is all too common in industry all over the world.

#### **ANNUAL MEETING**

The annual meeting will be held on Monday, May 3, 1965.

A notice of the meeting, together with a form of proxy and a proxy statement, will be mailed to shareholders on or about April 2, 1965, at which time proxies will be solicited by management.

#### **TRANSFER AGENTS**

Harris Trust and Savings Bank  
111 W. Monroe St., Chicago 90, Illinois

Chemical Bank New York  
Trust Company  
165 Broadway, New York 15, New York

#### **REGISTRARS**

Continental Illinois National Bank and  
Trust Company of Chicago  
231 S. La Salle St., Chicago 90, Illinois

Irving Trust Company  
1 Wall St., New York 15, New York

### ***MOTOROLA INC.***

9401 WEST GRAND AVENUE,  
FRANKLIN PARK, ILLINOIS

MAJOR FACILITIES LOCATED AT:  
Chicago, Franklin Park  
and Quincy, Illinois  
Phoenix and Scottsdale, Arizona  
Arcade, New York.

**MOTOROLA**

