

MOTOROLA ANNUAL REPORT 1962

COMMUNICATIONS PRODUCTS: TWO-WAY RADIO—MOBILE, PORTABLE, POCKET, AND BASE STATION EQUIPMENT • PUSHBUTTON MOBILE RADIOTELEPHONE • ANTENNAS • TOWERS • ACCESSORIES AND PARTS • CONTRACT MAINTENANCE AND INSTALLATION SERVICE • RAILROAD RADIO SYSTEMS • AUTOMATIC CAPACITANCE SWITCHING FOR ELECTRIC UTILITIES • REMOTE ALARM SYSTEMS • ELECTRONIC SIGNALING DEVICES • CLOSED CIRCUIT TELEVISION EQUIPMENT • MICROWAVE RELAY SYSTEMS • RADIO TRAFFIC CONTROL • RADIO PAGING SYSTEMS • HOSPITAL COMMUNICATIONS SYSTEMS • POWER MEGAPHONES • PRECISION TEST AND MEASUREMENT EQUIPMENT • SELECTIVE CALLING EQUIPMENT FOR AIRLINES • AIRCRAFT VHF NAVIGATION AND COMMUNICATIONS EQUIPMENT • AIRCRAFT AUTOMATIC DIRECTION FINDERS • AUTOMATIC FLIGHT CONTROL SYSTEMS • CONSUMER PRODUCTS: TELEVISION RECEIVERS • STEREOPHONIC HIGH FIDELITY PHONOGRAPHS AM AND AM-FM TABLE RADIOS • CLOCK AND PORTABLE RADIOS • AM AND FM CAR RADIOS • ANTENNAS ACCESSORIES AND PARTS • HEARING AIDS • SEMICONDUCTOR PRODUCTS: POWER TRANSISTORS • MESA TRANSISTORS • GENERAL PURPOSE TRANSISTORS • INDUSTRIAL AUDIO TRANSISTORS • INDUSTRIAL SWITCHING TRANSISTORS • RECTIFIERS • ZENER DIODES • INTEGRATED CIRCUITS • AUTOMOTIVE PRODUCTS: AM AND FM CAR RADIOS • PUSHBUTTON TRANSMISSION CONTROLS • ALTERNATOR SYSTEMS • TRANSISTORIZED VOLTAGE REGULATORS • TRANSISTORIZED IGNITION SYSTEMS • MILITARY ELECTRONICS PRODUCTS: RADAR SYSTEMS COMMUNICATIONS SYSTEMS • MISSILE GUIDANCE SYSTEMS AND SPACE INSTRUMENTATION • INDICATORS AND DISPLAY SYSTEMS • ANTISUBMARINE WARFARE EQUIPMENT • DATA LINK SYSTEMS • NAVIGATION SYSTEMS AND EQUIPMENT • TELEMETERING SYSTEMS • DRONE CONTROL SYSTEMS • GROUND SUPPORT, TRAINING, AND TEST EQUIPMENT • ELECTRONIC COUNTER-MEASURE SYSTEMS • FLIGHT SAFETY EQUIPMENT SOLID STATE PRODUCTS: PROCESS MEASUREMENT AND CONTROL SYSTEMS • REMOTE SUPERVISORY CONTROL SYSTEMS • ANALOG AND DIGITAL INSTRUMENTATION • INTEGRATED ELECTRONIC SUB-ASSEMBLIES

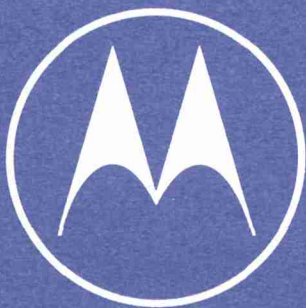
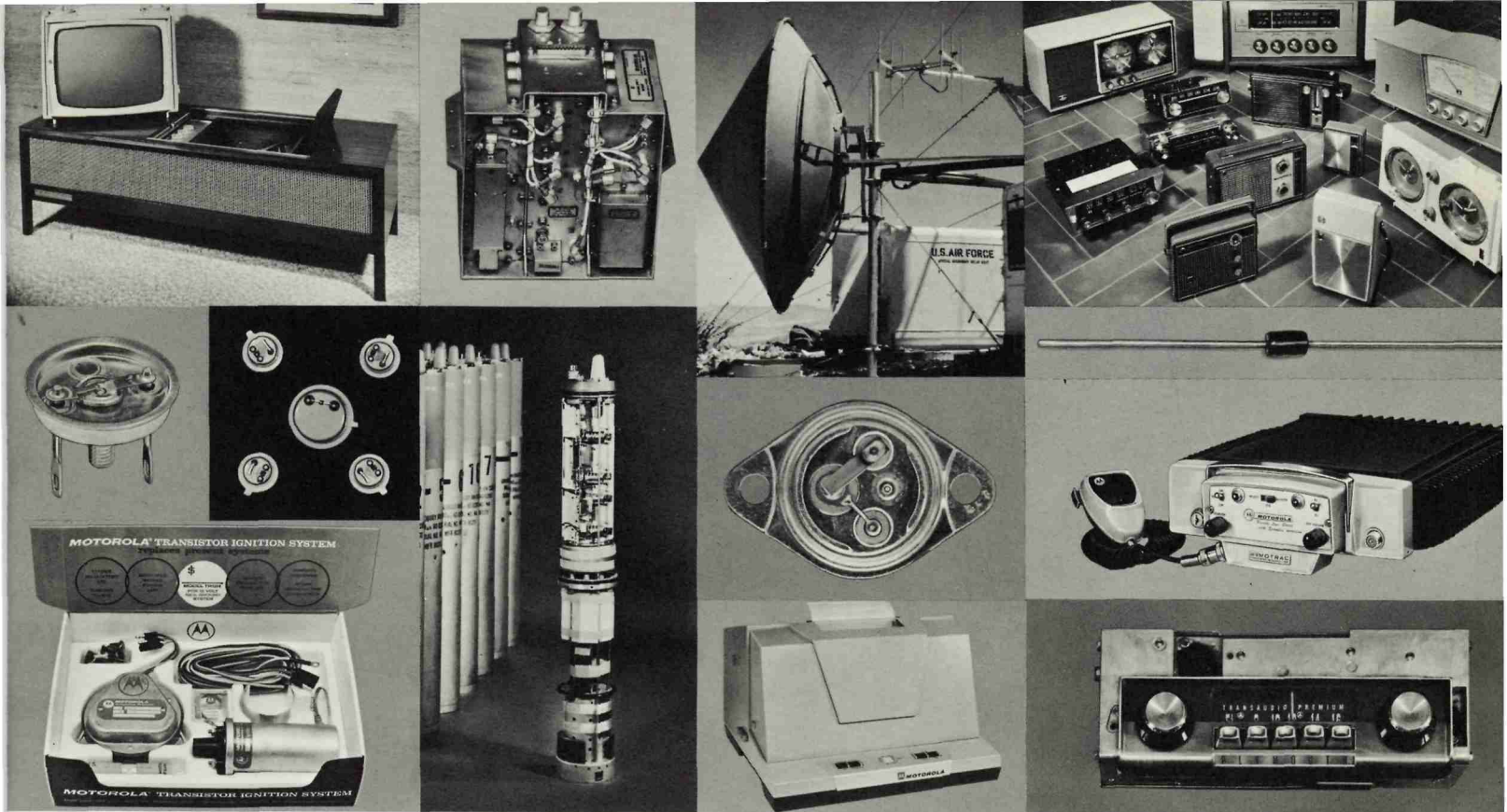


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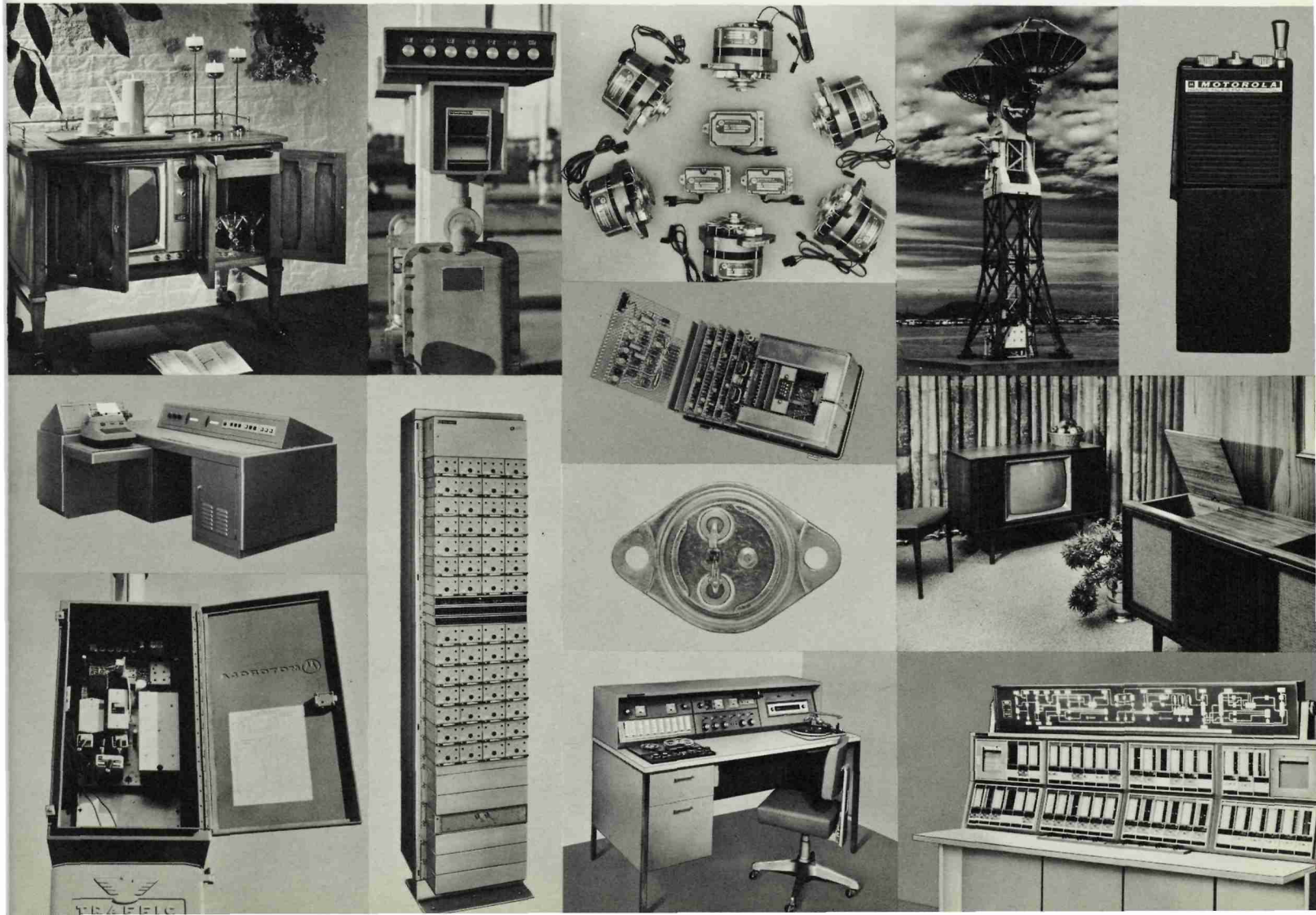
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MOTOROLA INC. / 9401 WEST GRAND AVENUE, FRANKLIN PARK, ILLINOIS

MAJOR FACILITIES LOCATED IN: ARCADE, NEW YORK • CHICAGO, FRANKLIN PARK, AND QUINCY, ILLINOIS
MINNEAPOLIS, MINNESOTA • PHOENIX AND SCOTTSDALE, ARIZONA • CULVER CITY AND RIVERSIDE, CALIFORNIA



DIVERSIFICATION IN ELECTRONICS • MOTOROLA ANNUAL REPORT 1962



HIGHLIGHTS OF 1962

Semiconductor Products Division claims No. 2 position in industry.

Largest share of television market ever attained.

Newly formed Solid State Systems Division enters electronic controls market.

Introduction of fully transistorized miniature "Handie-Talkie" radio.

Joint venture in France (S.E.V./Motorola, S.A.) begins building alternator systems for Renault.

Successful performance of spaceborne equipment in Mercury, Mariner, and Ranger flights.

Awarded contract to develop Bell Telephone mobile telephone system.

First Motorola integrated circuitry devices introduced.

Initial stereo FM radio receivers marketed.

Completed 266,500 square feet of new facilities, with 633,000 square feet in process.

President's Letter to the Shareholders

This year's report emphasizes two subjects . . . the results for 1962 and the Company's increasing and successful diversification.

THE YEAR 1962

Sales

Sales and other revenue increased 16% in 1962 over 1961 and totaled \$346,881,779. This represents a new record to which all divisions contributed by improved sales performance.

Earnings

Operating earnings after taxes of \$12,192,862, the equivalent of \$3.03 per share, increased 28% compared with \$2.36 per share earned in 1961. All but one division contributed importantly to this improvement. As we stated in quarterly reports through the year and as described in the military division section of this report, particular contract problems effectively reduced our military results to a break-even point in 1962. These problems are now largely behind us.

Finance Company

In addition to the operating earnings reported above, we realized a capital gain of 25¢ per share (approximately \$1,000,000 after taxes) resulting from the sale of our finance company to a subsidiary of Associates Investment Company. For six years Motorola Finance Company had successfully handled leases, conditional sales agreements, and secured inventory financing of Motorola products. As demands for such financing continued to increase, the supporting services had to become more extensive. Because of Associates Investment's 526 offices across the Nation, these expanded needs and services can more adequately be met, and at the same time we can conserve our resources for the expansion of our electronics businesses, where our primary skills and interests can most properly be directed.

Balance Sheet

The balance sheet is the strongest in

our history. At December 31, 1962, working capital was \$96,804,189, an increase of \$1,725,573 for the year. During 1962 the ratio of current assets to current liabilities improved from 2.6 to 3.1.

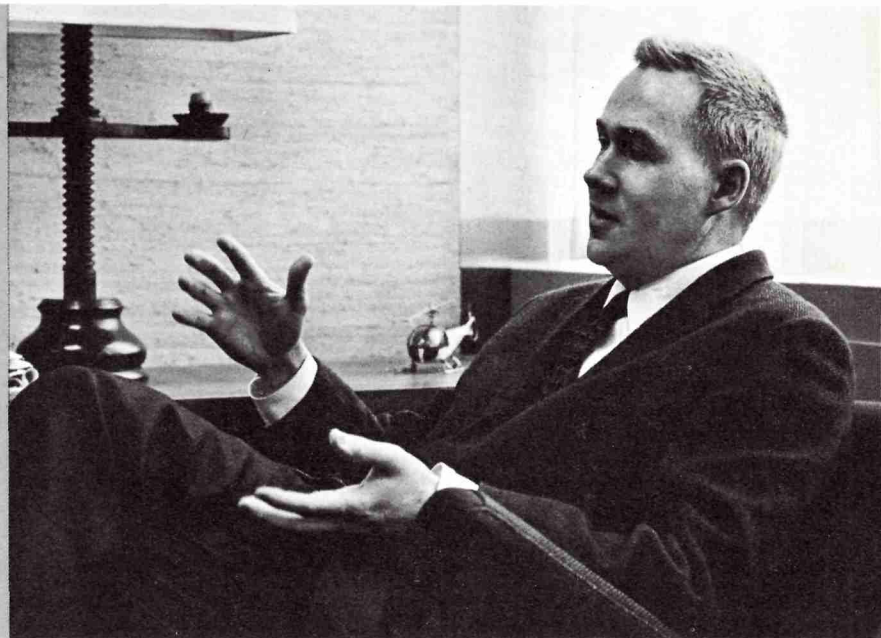
Capital Expenditures

In 1962 the Company completed 266,500 square feet of new facilities at 4 sites. We have under construction 633,000 additional square feet at 2 sites. In 1962 capital expenditures were \$13,960,395. We have budgeted a greater and record high amount for 1963. As we progress to more and more advanced electronic technologies, the requirement for highly sophisticated laboratory and production equipment causes a much more costly investment program than in the past.

Shareholders

At year end our shareholders numbered 6,921, but in fact, many more people have a stake in Motorola

(continued)



Robert W. Galvin, President

because of holdings in numerous investment funds and insurance companies. Our own profit sharing fund holds 84,170 shares, giving the great majority of our 19,000 employees an ownership interest in the Company. You will note in our forthcoming proxy statement that the directors and officers also hold a large number of shares.

International

Again in 1962 we enjoyed an increase in international sales, as well as license income, and this department operated at an attractive profit. For its many recent accomplishments in international trade, the Company was awarded the "Export E Award" by the Department of Commerce. International business represents 3% of our total sales and has attractive promise for the future. The largest of several arrangements concluded last year was the establishment of a joint venture, S.E.V./Motorola S.A. in France, to manufacture our automobile alternator. Our partner is the highly regarded French company, Societe Anonyme Pour L'Equipement Electrique des Vehicules.

Many other highlights of this eventful and rewarding year are detailed on the Highlights page and in the following sections of this report.

DIVERSIFICATION

Motorola is a diversified company in the field of electronics. The informed investor appreciates the value and strengths of purposeful diversifica-

tion. It is important in your evaluation of the Company to understand the breadth and the promise of the wide range of products which are listed on the front cover and pictured and described throughout this report. A brief description of how today's diversification came about may illustrate how tomorrow's growth is likely to unfold.

History

Motorola's first principal product was car radio. In the late 30's we began to adapt car radios for use as police radio receivers. This was the start of our now important two-way mobile communications business, in an industry which today serves widely diversified customers and which we continue to lead. Our car radio distributor organization was a natural for the distribution of home radios, which business was started in 1937 and which set the stage for our entry into television 10 years later. Part of the earnings from one business was thus invested in others, making possible our expansion into new fields. World War II diverted our skills and resources to military electronics which today represents some 15% of our total sales.

Semiconductors

Because our entry into the semiconductor business is having a profound impact on the Corporation and each of its divisions, the thinking that went into the establishment of that activity is described in somewhat

greater detail. More than 10 years ago, our principal technical managers predicted that the Company must eventually possess a semiconductor capability. The reason was that effective use of semiconductors would determine whether or not our equipments would in the future be "leader" or "follower" products.

External Sales

Having decided that we needed such a capability, we then asked, "Would requirements for semiconductors in Motorola products alone provide sufficient volume to enable a semiconductor operation to support the research and engineering and to achieve the yields and costs necessary to a viable business?" Our conclusion was that despite the large demands of our equipment divisions, this volume would not be adequate. We had to serve successfully the much greater outside market to grow big enough to survive and attain leadership in this new technology.

Components and Equipment

Then we asked, "Can we succeed as a component supplier while continuing to grow as an equipment manufacturer?" Among other factors, we had to consider that the components business was different from the equipment business and that we would sometimes find ourselves a competitor of a company while also attempting to be a supplier to it through the Semiconductor Products Division. We concluded, however,

that the component user always looks for the fresh and better solution to his problems. There were already many examples of companies engaged successfully in such a dual role and this trend in American industry seems to be growing. This determined, however, that we must have distinctive values to offer our semiconductor customers, external and internal, and that we must earn this business on merit.

We have done just this. Today over 85% of our semiconductor shipments are outside the company and we maintain complete respect for the confidential relationship that must exist with each customer. At the same time, our equipment divisions continue to get specific benefits from close technical liaison with the Semiconductor Products Division, each as a separate customer of that division.

Integrated Circuits

Success in the semiconductor business has proven our competence in the technologies of physics, chemistry, metallurgy, and advanced mathematics . . . and naturally prompted our investigations into the broad and revolutionary science of solid state physics and electronics.

Integrated circuits in various forms represent an important new product area based on these advanced scientific studies.

Control Instruments

We have already developed unique

capabilities in application of these technologies to instrumentation products. In 1962 our Solid State Systems Division announced new lines of process and supervisory control products which are illustrated elsewhere in this report. These control and measuring devices can be better designed around solid state electronic concepts than with other approaches. Our work in basic materials has enabled us to design equipment with unique and distinctive features which promises early acceptance in such markets as petroleum pipeline refinery and distribution systems, and the chemical and power utility fields.

Future Growth

Almost all of Motorola's diversification has come from internal development. It is likely that future growth will come primarily from the same source, as one new field of opportunity grows out of a previously established successful activity.

Present Products

The prospects for growth are not limited exclusively to new fields of endeavor. Each of our present businesses has attractive potential. Growth will be variously achieved by such conditions as an increase in the total demand for black and white and color television receivers; greater penetration of all the markets we serve; increasing new uses as well as replacement demand for two-way communications; an un-

ending requirement for military electronics; continually expanding demand for semiconductor devices; and untapped markets for integrated circuits and solid state equipments. We hope to apply wisely a proper portion of today's earnings and efforts to the further cultivation of these markets, as well as to new opportunities. Our dividend policy has been consistent with these objectives, and our divisional organization gives us a proper structure to effectively achieve them.

Long Range Planning

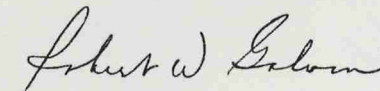
To assure active and coordinated effort to energize this growth and diversification, the Company established a formal long range planning program in 1962. We expect that this program will assist us in defining and achieving proper goals for periods five and ten years hence.

The Year 1963

For 1963 we anticipate further sales growth and a proportionately greater improvement in earnings.

My associates in the Company have again made notable individual contributions to the success and advancement of our affairs. I know that you join with me in acknowledging with appreciation the unique contribution of each of them.

For the Board of Directors



March 13, 1963

President



A point of concentration in the Communications Division laboratories these days is the advanced technical work which will result in an improved and highly transistorized mobile radio for the nationwide mobile telephone service.

Communications Division

Sales and earnings of the Communications Division reached new highs in 1962 and the Division maintained its leadership position in the two-way radio business.

Highlights of the year included the development of a fully transistorized "Handie-Talkie" FM radiophone, introduction of new hospital communications products, a series of major contracts for two-way radio networks, and establishment of a fifth sales area.

The new "Handie-Talkie" FM radiophone, designed for use in mobile two-way radio networks, provides vital communications for men away from vehicles. It further personalizes two-way radio and extends its usefulness for such customers as police and fire departments, construction companies, forestry and conservation departments as well as many other types of organizations. It is fully transistorized and weighs only 33 ounces.

Two-way radio sales in 1962 were highlighted by a series of major contracts for extensive systems. A new state-wide communications network was delivered to the Michigan Highway Department. The system incorporates 550 mobile units tied into state headquarters and 10 district of-

fices scattered throughout the state.

Major systems were also delivered to the Washington Highway Department, Indiana Highway Department, and Georgia Department of Public Safety. Large city police departments ordering equipment included Cincinnati, Washington, D.C., Minneapolis, Philadelphia, and New York. Comprehensive systems were delivered to many prominent companies in the power utilities field.

Leading the way in two-way equipment sales continues to be the Division's transistorized line—the broadly accepted MOTRAC Radio and the Business "Dispatcher" Radio. The latter is designed primarily for the general and small business market which has become an important segment.

An innovation in the mobile radio industry introduced in 1961—the Division's "Extender" noise suppression circuitry—received wide acceptance during the year. The circuitry increases radio system effectiveness by blanking out ignition noise interference.

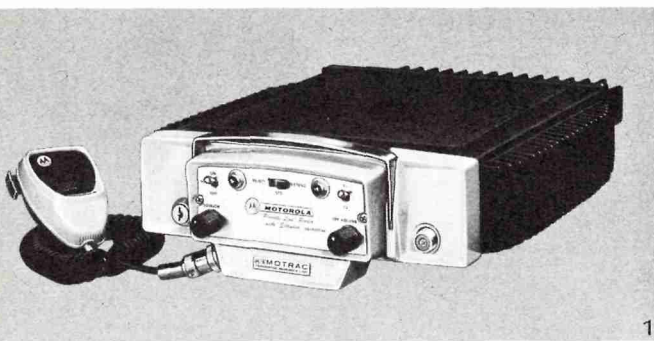
The Division's new line of transistorized closed-circuit television equipment improved its position in this potential market.

The Communications Division engineered and constructed an ad-

vanced radio traffic control network for the city of Tampa in 1962 and put into operation a system for the New Jersey Turnpike Authority that controls road signs along the 131-mile highway from central headquarters.

The Division's leadership in hospital communications systems was even more firmly established during the fourth quarter by the introduction of important new products. A comprehensive network that provides an answer to all major communications requirements of a hospital gained wide recognition. An aggressive merchandising program which included expanded sales staff and a series of nationwide symposiums was also initiated.

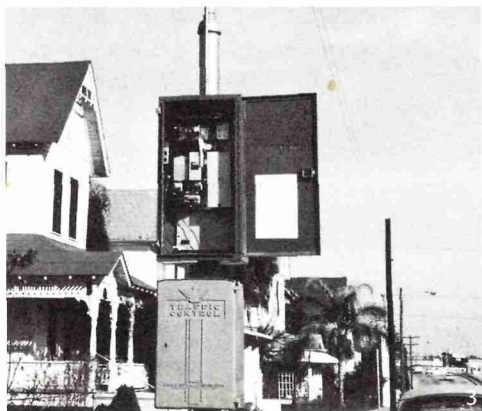
To meet the demands of the growing radio communications industry, a fifth sales area was established in 1962 by Motorola Communications and Electronics, Inc., sales subsidiary for the Division. The new area encompasses the southeastern section of the country and is headquartered in Atlanta, Georgia, where new office facilities have been constructed. Atlanta takes its place with Burlingame, California; Chicago; Dallas; and Fair Lawn, New Jersey, as headquarters for radio communications sales and service.



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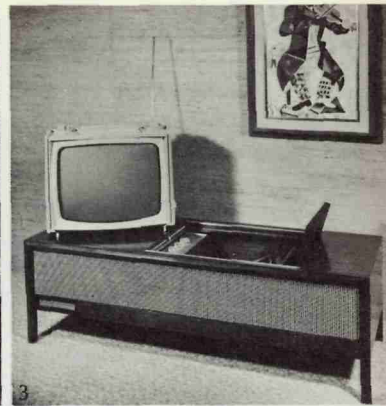
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Motorola's Communications Division designs and manufactures systems to meet the communication needs of many different types of governmental and business organizations. Among its diversified products are: 1/the transistorized MOTRAC Two-way Radio, now featuring built-in vehicle noise silencing circuitry called "Extender Operation" • 2/the new lightweight "Handie-Talkie" FM two-way radiophone • 3/radio traffic control systems to coordinate traffic flow by synchronizing intersection signals • 4/complete communications networks for hospitals, tying together various devices for nurse call, hospital staff contact, and patient radio and television entertainment. (Shown is the internal radio station WELL Console, a part of the hospital network.)

Home entertainment and car radio products in a broad range of price categories and designs are produced by the Consumer Products Division for Motorola customers throughout the world. Some examples are: 1/Drexel contemporary television and stereo hi-fi console pieces • 2/table, clock, portable, shirt-pocket-size, and car radios • 3/budget-minded portable TV and coffee table stereo hi-fi and 4/the exclusive Motorola Designer-Decorator Collection which includes a serving cart housing a TV receiver.



Consumer Products Division

The year was one of notable progress in three principal ways.

First, the Division attained the largest proportion of industry sales of black and white television receivers that it ever recorded as well as the largest percent of gain over the previous year since the early days of television manufacture.

Second, it was a year of preparation in color television. The Division carried on extensive research, development and testing activities in components, circuitry, and finished receivers, pointing toward the Company's re-entry into the color television market mid-year 1963. Motorola's color television receivers are expected to be the industry's most advanced equipment in performance, design and reliability.

Third, another significant step was taken in upgrading the consumer products customer image. An effective promotion was made in a selective market with the Designer-Decorator Collection of home entertainment equipment. This group is comprised of television receivers and stereo high fidelity instruments housed in fine furniture cabinets designed to function as furniture pieces

as well as entertainment equipment. The series includes such features as a room divider with a built-in record changer and radio, a serving cart equipped with a television set, and a hexagonal coffee table housing a stereo hi-fi phonograph and FM/AM radio combination. They were styled by Motorola's design department in conjunction with the Drexel and Heritage furniture companies.

Distributor sales of television receivers increased 35%, with gains in consoles as well as compact units. Four factors are considered responsible for the increases: one, growth in consumer acceptance of the Motorola line as a result of outstanding engineering for reliability, performance, and value; two, a consistent advertising program of unusual freshness and attention-getting interest; three, a line of merchandise in all price and style categories; and four, a stronger distributor organization with higher quality dealers.

Stereo hi-fi phonograph sales were greater than last year with the largest growth being in console equipment. Distributor sales of console sets were up 27% over the previous calendar year.

Another noteworthy product introduction in 1962 was the budget-priced SK-100 stereo hi-fi, housed in a coffee table. Sales of this model greatly exceeded original estimates and the design started a new trend in styling.

Stereo-FM radio was new to the market in 1962. Both a table model and a unit designed to be built into console hi-fi stereos were included in the line. Stereo radio should gradually increase in demand.

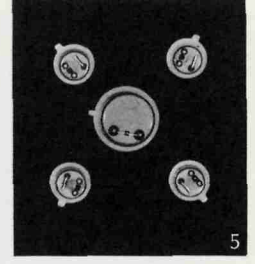
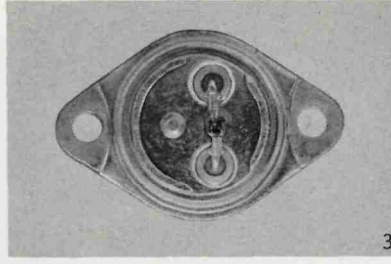
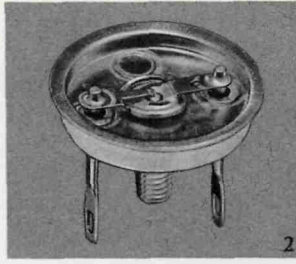
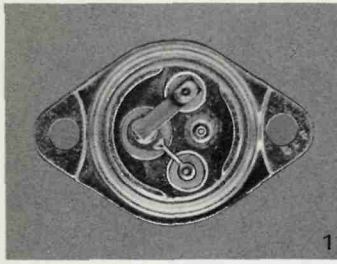
Car radio sales made through consumer product distributors showed a substantial increase over 1961. Considerable interest was shown in the FM car radio tuner introduced early in the year, necessitating an increase in original production estimates.

Home, clock, table, and portable radio volume did not meet expectation, particularly the shirt-pocket size radios which fell off sharply due to the distress market condition caused by foreign imports.

The Motorola Courtesy Salon at the Palmer House arcade on Chicago's State Street has been a successful innovation. Traffic flow through the salon is well beyond expectation.

Each model in the high fashion Designer-Decorator
Collection of television and stereo high fidelity series starts
with a Motorola furniture stylist at a drawing board trying out
concepts of future consumer preferences.





Of the many devices produced by the Semiconductor Products Division during 1962, five were of particular significance. The photographs show the actual size of the devices. 1/silicon controlled rectifier • 2/ round base power transistor • 3/silicon power transistor • 4/"Surmetic" zener diode • 5/silicon epitaxial "Star" planar transistors.

Semiconductor Products Division

During the past year Motorola's Semiconductor Products Division laid claim to leadership as the country's second largest producer of semiconductor and integrated circuit products. The Division has, in existence and under construction, what will be the second largest semiconductor research and manufacturing facility in the world. In 1962 the Division's dollar sales increased very substantially whereas industry dollar sales figures indicate only a modest growth.

Since the formation of the Division in 1955, the basic objective has been to emphasize research and development to assure a steady flow of new products designed to meet the rapidly evolving needs of customers and to take advantage of the developments in production technology. The Division's unrivalled growth in sales and earnings, in an industry which in the past two years has been beset by chaotic price-cutting, has been particularly gratifying. Inasmuch as the skills and technology of this Division will form the basis for the new developments in integrated circuitry, its fine performance has importance beyond the present.

The Division is now engaged in an \$8 million expansion program including an additional building and new types of equipment for inte-

grated circuit production in Phoenix. Upon completion, the new facilities will provide an additional 425,000 square feet of research and manufacturing area bringing the total to about one million feet.

Motorola offers a broad line of some 4,000 semiconductor devices, and over the years the Division has achieved a reputation for its emphasis on reliability. Each working week at Motorola results in a minimum of 8 million device hours logged in operating life tests of standard devices. Research to develop new products is constantly underway.

The most notable development of the year was the coming of age of integrated circuits. The Division's integrated circuitry technology is believed to be at least as advanced as any in the industry. It has evolved from the discovery phase to the practical stage.

Integrated circuits are being produced for both military and industrial applications. Work with customers has already begun in designing and producing integrated circuits on a custom-built basis.

In 1961 the Division introduced the epitaxial "Star" planar silicon transistor which has achieved such wide-spread acceptance that additional production space was required to keep pace with demand.

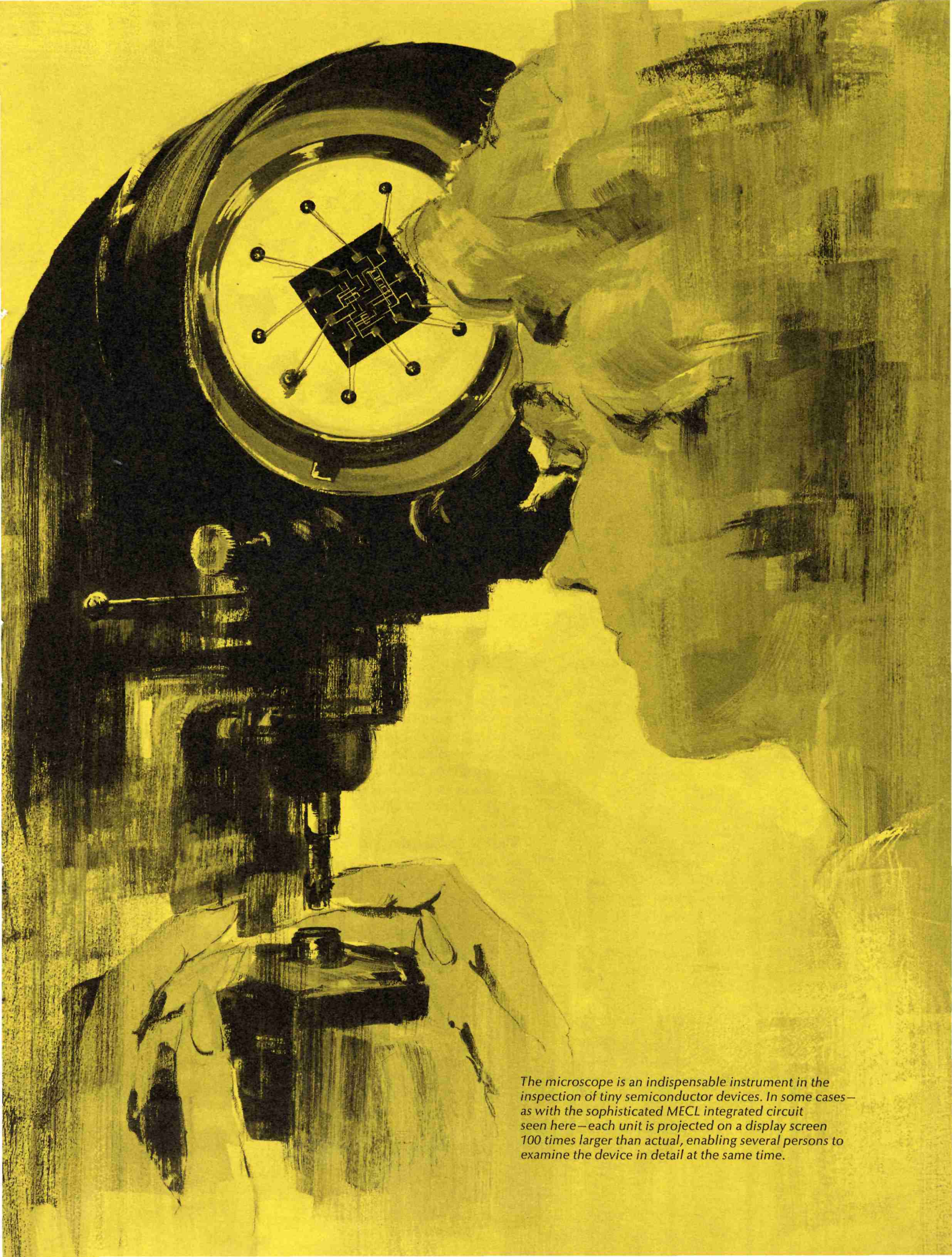
Last year, the Division entered the medium-current silicon controlled rectifier market with two new product lines in the high efficiency Motorola diamond package. In the power control field these devices have unlimited applications.

Development of a new series of power transistors with the highest available voltage ratings in germanium devices was announced by the Division. Due to their improved characteristics they can be used for numerous high-voltage applications where currently the use of much more expensive silicon transistors is required. At present, Motorola offers the most complete line of power transistors on the market.

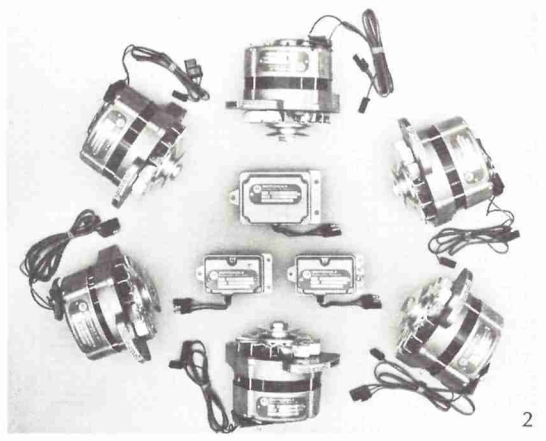
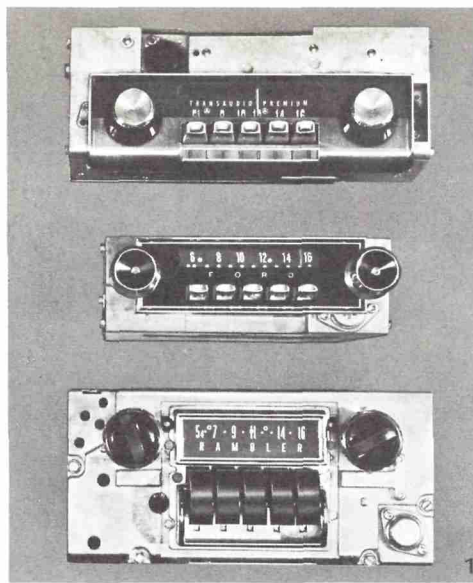
The particular epitaxial techniques developed in 1961 by Motorola scientists have, together with the epitaxial process in general, made possible a new series of silicon transistors which will open new markets for Motorola transistors.

Major efforts are being put into reducing the costs of production, packaging, and testing.

The Division has recognized the great potential of overseas sales and a special group within the Division's marketing department has been established to develop sales abroad. Field offices have been planned in Paris, Milan, Munich, and London.



The microscope is an indispensable instrument in the inspection of tiny semiconductor devices. In some cases—as with the sophisticated MECL integrated circuit seen here—each unit is projected on a display screen 100 times larger than actual, enabling several persons to examine the device in detail at the same time.



The contract car radio business of the Automotive Products Division is now supplemented by diversification into new products which are made practical by new applications of transistors. 1/All Motorola car radios now are transistorized • 2/Transistorized alternator systems are available for practically all automotive applications, the line consisting of six models of alternators and three models of regulators • 3/A transistorized ignition systems kit is being marketed for all engines having battery ignition.

Automotive Products Division

Sales volume of the Automotive Products Division increased along with the generally good acceptance by consumers of the 1963 lines of automobiles.

This Division continued to supply all-transistorized car radios to Ford, Chrysler, and American Motors. The Division supplied the total car radio requirement for Ford Motor's "Thunderbird," "Galaxie," "Comet," "Meteor," and "Continental"; Chrysler Corporation's Dodge and Plymouth cars; American Motors' "Rambler"; Renault (U.S. sold); Checker Motors; and International Harvester.

Motorola all-electronic alternator systems, which take the place of generators on automobiles, have received wide attention at the domestic marketplace. Numerous state and city police departments, as well as large commercial automotive fleets, have converted to these systems as standard equipment on their vehicles. Motorola supplies original equipment alternator systems for American Motor's "Rambler," Willy's

"Jeep," and the Checker Motor's vehicles.

Additional models of alternator systems were introduced having different voltages and capacities to broaden the total line for aftermarket fleet use. Motorola now supplies 6, 12, and 24-volt electronic alternator systems for practically all cars now in existence.

In mid-fall of the year, the Company completed a joint venture with Societe Anonyme Pour L'Equipe-ment Electrique des Vehicules, Paris, France (S.E.V.) by forming a new company, S.E.V./Motorola S.A.

Manufacture of alternator systems has already begun for the Renault automobile in the new plant of S.E.V./Motorola in Blois, France. It is anticipated that several additional automobile manufacturers in the European Common Market will begin to install Motorola alternator systems on their 1964 model cars.

At the turn of the new year, the Automotive Products Division introduced a newly developed transistor

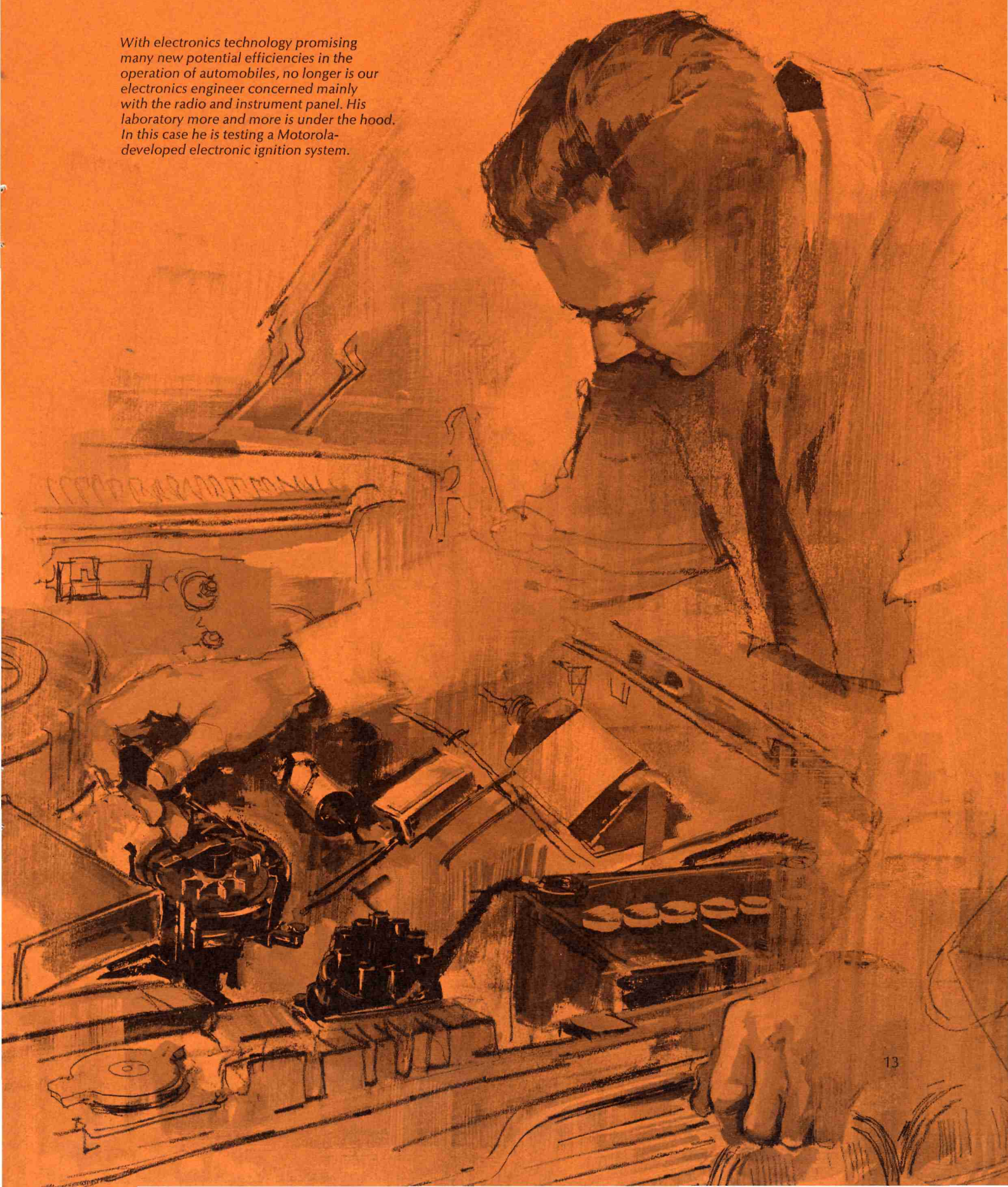
ignition system which results in breaker point life many times that of conventional systems, provides easier cold weather starting, better high speed performance, and eliminates the ignition condenser.

In order to meet the need for a system which would greatly increase the reliability and operational life over systems currently being used, a team of Motorola engineers developed an ignition system which could be easily installed in automobiles now on the road by making use of the standard distributor and its breaker points.

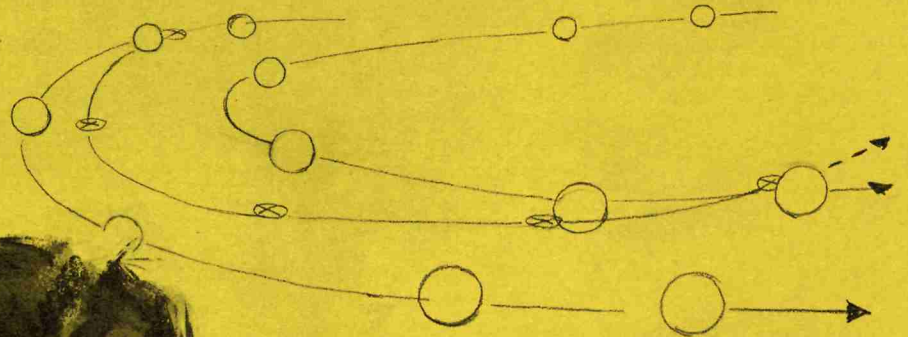
The Motorola Transistor Ignition System is designed for use on most automotive, marine, and stationary engines having battery ignition. The system greatly reduces the number of tune-ups required by conventional ignition systems.

A magnetic-type transistorized ignition system is undergoing operational tests by several car and truck manufacturers for possible original equipment use in the future.

With electronics technology promising many new potential efficiencies in the operation of automobiles, no longer is our electronics engineer concerned mainly with the radio and instrument panel. His laboratory more and more is under the hood. In this case he is testing a Motorola-developed electronic ignition system.



Mariner 2



Motorola-developed command receivers or transponders performed successfully in all the Mercury capsules, and on Mariner and Ranger flights. As a result, aerospace has become an environment in which Motorola scientists work with confidence and enthusiasm. The next order of business: contracts for spaceborne instruments in the Gemini two-man craft, and the Apollo three-man moon shot.

Military Electronics Division

For the Military Electronics Division, the year 1962 can be summarized in terms of substantial sales growth, improvement in facilities, and noteworthy program achievements. In spite of this, however, earnings were disappointing.

Sales for 1962 were one-third greater than 1961. At the close of 1962 the Division's backlog was up 50% from a year ago. Profits were down substantially in 1962 due primarily to a very heavy loss incurred on one contract which is now under control.

A primary Division objective continues to be the expansion and strengthening of its proprietary products business. In 1962 the Western Center enjoyed a good improvement in sales and profits of its proprietary command receiver and transponder products. Motorola command receivers have been used in such aerospace projects as "Saturn," "Agena," "Polaris," "Minuteman," and "Mercury." Transponder systems have been used in the "Scout," "Pershing," and "Saturn" programs. Further sales and profit increases are projected for these products in 1963.

The Chicago Center began deliveries of its proprietary "Teleprinter" in the third quarter of the year. The "Teleprinter" is a 3,000-word-per-

minute, electronic page printer system developed specifically for military data processing systems. The "Teleprinter" translates digitally-encoded messages into a print code and then prints the decoded message on paper.

Motorola has contracted to supply 500 systems for use in the Air Force command and control communications system. The equipment is also scheduled for use in NASA systems for monitoring future space shots and is being evaluated by the Navy and the Army for future applications.

The Division's largest contract award in 1962 was for the APS 94 side looking radar system. It is now operational and production quantities will be delivered to the Army starting in May. This system, which is the first airborne radar surveillance system to be standardized by the Army, provides a significant and unique new capability to the country's limited-war requirements.

"Radio Central," one of the Division's largest contracts, passed two significant milestones this past year. After extensive field testing, the Army granted design approval of the system and in the summer of the year the equipment was subjected to rigorous operational tests while being employed in the "Swift-Strike" war games. Its performance was em-

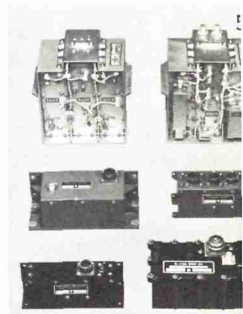
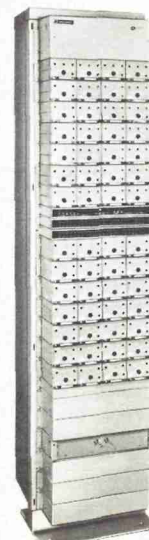
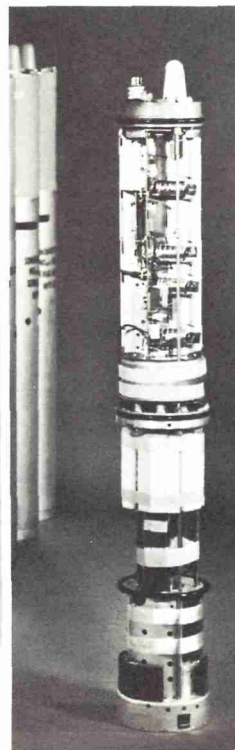
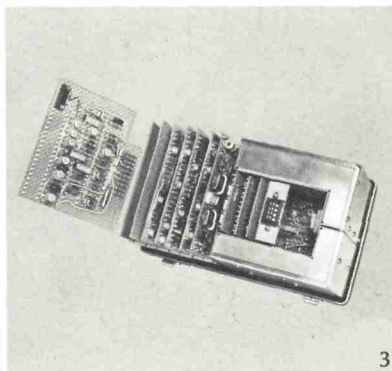
phatically satisfactory. It is believed this program will contribute significant future sales and profits.

The Division's role in NASA's Mariner program constitutes the most exciting and dramatic achievement of 1962. The deepspace transponder and the command system for the Mariner II space craft was built by the Western Center for Cal Tech's Jet Propulsion Laboratories. About the size of a small radio, the transponder was responsible for the historic 36-million mile radio transmission between earth and Mariner II as it passed near the planet Venus. The receiver portion of the system operated for all 109 days of the 180-million mile flight.

The Motorola-built transponder and command system, was used early in the Mariner flight to transmit mid-course maneuver commands. The mid-course maneuver was used to change the course of the space craft when it was more than a million miles from the earth, correcting the trajectory to permit the craft to pass within the desired range of the planet.

This unique communications equipment, consisting of 2,925 parts—or the equivalent of those contained in 10 television sets, weighed 8 pounds and required no more power to operate than is required to light four Christmas tree bulbs.

Motorola's military facilities serve the armed forces, NASA, and other government agencies, providing research, development, and production capabilities in electronic systems and equipment. Activities include aerospace, surface and sub-surface applications. 1/NASA's Goddard Range and Range Rate Tracking System to accurately track space vehicles in near-earth orbit • 2/Automatic Microwave Data Acquisition and Relay Unit to monitor high-speed flight test programs • 3/Random Access Discrete Address System for self-organizing communications • 4/Sonobuoy undersea detection equipment • 5/Proprietary products: a) electronic teleprinter • b) MC-50 multiplex system for "Rally" Air Force project • c) command receivers and transponders.



Solid State Systems Division

Following four years of research and development of solid state instrumentation and control equipment, market analysis, and organizational development, the Solid State Systems Division was formed early in 1962. It marked its first year as a division with accelerated sales activities starting early in the year; the release and excellent customer approval of several new products during the summer and fall; the successful operation of several installed control systems; and a build-up in backlog and sales during the last six months of the year.

Its three industrial product categories are: digital supervisory systems for remote monitoring and control of operations in the petroleum, gas, water, and power distribution industries; digital data acquisition systems for the monitoring of loading operations at bulk petroleum plants and terminals; and analog control instrumentation for monitoring and control in the continuous process industries such as the chemical, oil refining, petrochemical, food processing, and paper industries.

Effort is continuing on the development of other new products with emphasis on the use of integrated solid state electronics in basic instrumentation for heavy electrical and mechanical equipment. Many of the results of previous research and development efforts in semiconductor, thin film, ceramic, and glass technology are being applied in the development of new applications.

A subsidiary, Motorola Instrumentation and Control Incorporated, has been formed to market the products of the Division. Four sales regions have been established with headquarters in Fairlawn, New Jersey; Chicago; Houston; and Los Angeles. Canadian sales will be handled by Canadian Motorola Electronics, Inc. located in Toronto.

Three important developments occurred. First, the installation of "Telememory" supervisory systems in the oil, gas, power, and water distribution industries to monitor pressures, levels, flows, electrical quantities, and the status of alarm contacts, enabling an operator to remotely control as well as interrogate the status of valves, water gates, pumps, and circuit breakers.

Second, "Telememory" data acquisition systems were installed for two major oil companies to provide complete accounting for transactions at bulk loading terminals. The information provided includes identification of the driver, the carrier, the product withdrawn, and the volume; the date and time of each transaction; a daily accounting of accumulated transactions; and the incoming product and inventory balance. A Motorola-designed "card reader" permits driver operation of the system and activates the recording of the full transaction.

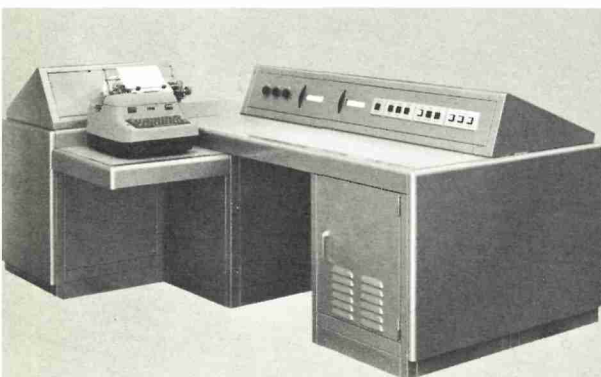
The third development was the completion of a broad and competitive line of analog process control and instrumentation equipment. The new "Veritrak" line, containing some

30 models of equipment, provides both flexibility and compatibility. The equipment is designed with features for the sensing, recording, indicating, and controlling of pressure, differential pressure, temperature, level, and flow. Its first applications will be in the continuous process industries manufacturing petroleum, chemical, petro-chemical, and similar products. The line includes a complete group of accessory amplifiers and analog computers.

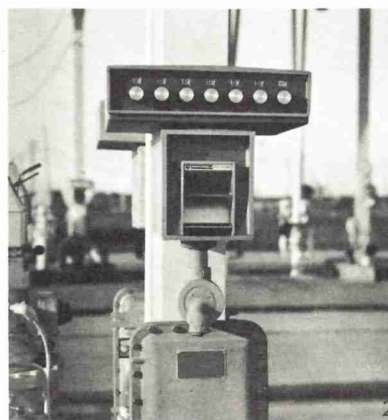
As evidence of the fine start made by these new products, the backlog of orders at the end of 1962 equaled half of the sales projected for 1963.

Research efforts in solid state technology continued during the year. Activities concerned better control over the processing of thin film, glasses, and ceramics, used in device and equipment development; the application of optical and acoustical coupling in radio frequency amplifiers constructed in the form of a completely solid block of material; miniaturization of portions of radio frequency receivers utilizing thin film electronics and tunnel diodes; application of thin film resistors and glass insulating layers to the construction of pressure sensitive elements; the movement into prototype production and the application of positive temperature coefficient thermistors to over-temperature protection of electric motors; and, the achievement of previously unobtainable power levels and switching characteristics in ferrite microwave devices.

1/TELEMEMORY solid state electronic supervisory control systems monitor and control remotely located or unattended industrial facilities • 2/Motorola-designed "card reader," part of a digital data acquisition system for automating bulk loading operations • 3/VERITRAK analog control instrumentation for monitoring and control of continuous process operations.



1



2



3

TEN YEAR FINANCIAL SUMMARY

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	
SALES AND OTHER REVENUES	\$219,089,238	206,821,801	228,428,063	229,266,055	228,431,385	218,909,968	293,081,127	301,049,185	298,219,845	346,881,779	375 350 325 300 275 250 225 200 175 150
INCOME BEFORE INCOME TAXES	\$15,512,489	16,523,889	18,740,426	16,936,334	15,756,431	15,171,013	27,756,237	26,548,813	19,900,308	26,514,514	30 28 26 24 22 20 18 16 14 12
EARNINGS	\$7,076,335	7,572,024	8,490,539	7,966,817	7,824,431	7,356,213	14,171,237	12,633,813	9,517,308	13,206,514	15 14 13 12 11 10 9 8 7 6
EARNINGS PER SHARE*	\$1.83	1.96	2.19	2.06	2.02	1.90	3.59	3.14	2.36	3.03	3.60 3.40 3.20 3.00 2.80 2.60 2.40 2.20 2.00 1.80
WORKING CAPITAL	\$38,222,001	38,308,612	42,892,165	54,936,569	56,425,360	59,585,830	63,336,998	73,790,019	95,078,616	96,804,189	100 90 80 70 60 50 40 30 20 10
NET INVESTMENT IN PLANT AND EQUIPMENT	\$14,301,004	16,579,531	19,179,992	25,388,866	27,167,597	27,615,287	33,436,676	44,594,599	48,427,446	54,783,818	55 50 45 40 35 30 25 20 15 10
SHAREHOLDERS' EQUITY	\$45,929,419	50,598,747	56,186,590	61,305,080	66,172,446	71,533,020	83,338,386	97,166,850	102,655,506	111,835,713	120 110 100 90 80 70 60 50 40 30

*Earnings per share are based on the number of shares outstanding at the end of the respective years, adjusted for subsequent share distributions. Earnings per share shown above for 1962 do not include 25¢ of nonrecurring capital gain from sale of finance subsidiary.

Motorola, Inc. and Subsidiaries

CONSOLIDATED BALANCE SHEET AS OF DECEMBER 31

ASSETS	1962	1961
<i>Current assets</i>		
Cash	\$ 6,951,241	\$ 8,794,244
Short-term investments, at cost approximating market value	11,815,863	—
Receivables		
Accounts		
United States government	10,317,838	7,773,137
Other	60,907,231	47,714,344
Notes and contracts (note 1)		
Lease and conditional sales contracts—net of unearned finance charges	—	32,725,036
Other	—	8,011,781
Allowance for doubtful accounts	(1,621,023)	(1,801,559)
Costs recoverable under United States government contracts, less progress billings	9,915,619	8,440,774
Inventories, at the lower of average cost or market	42,633,352	39,958,980
Other current assets	2,702,538	2,865,560
<i>Total current assets</i>	<u>143,622,659</u>	<u>154,482,297</u>
Plant and equipment—less depreciation (note 2)	54,783,818	48,427,446
Sundry assets, net	3,889,812	3,648,892
Patents, debenture expense, and other deferred items—less amortization	532,933	1,242,955
	<u>\$202,829,222</u>	<u>\$207,801,590</u>

NOTES TO FINANCIAL STATEMENTS

1/The notes and contracts receivable in 1961 arose from financing of sales of the companies' products and were held by Motorola Finance Corporation, a wholly-owned subsidiary which was sold during 1962. The purchaser is providing similar financing services.

2/The companies' investment in plant and equipment at December 31, 1962 and 1961 was as follows:

	1962	1961
Land—at cost	\$ 3,535,240	\$ 3,395,726
Buildings—at cost, less depreciation (1962, \$11,316,989; 1961, \$8,902,050)	31,283,655	28,569,406
Machinery and equipment—at cost, less depreciation (1962, \$15,525,093; 1961, \$12,555,411)	17,628,179	14,451,480
Dies, tools, and leasehold improvements—at cost, less amortization	2,336,744	2,010,834
Total	<u>\$54,783,818</u>	<u>\$48,427,446</u>

The companies have adopted depreciation guidelines as provided under Internal Revenue procedure, the effect of which was to increase 1962 depreciation expense by approximately \$1,050,000.

Forty-eight per cent (\$219,000) of the "investment credit" in respect of acquisition of qualified facilities, obtained under the Internal Revenue Act of 1962 as a credit against the 1962 federal income tax liability of the companies, has been applied by them as a reduction of federal income tax expense for the year; \$224,000 has been deferred to subsequent periods to offset the effect of reduced depreciation allowances arising from the total credit.

3/Long-term debt at December 31, 1962 and 1961 consisted of the following:

	1962	1961
4 ³ / ₄ % Debentures due April 1, 1986 (with annual sinking fund requirements commencing in 1967)	\$ 30,000,000	\$ 30,000,000
Notes payable		
3 ³ / ₄ % due \$1,000,000 annually to 1965, \$1,500,000 in 1966, and \$500,000 annually thereafter to 1972	7,500,000	8,500,000
4 ³ / ₈ % due \$500,000 annually 1963-1976	7,000,000	7,000,000
Real estate mortgages	1,242,463	1,306,825
	<u>45,742,463</u>	<u>46,806,825</u>
Less current maturities, included in current liabilities	1,567,424	1,064,422
Noncurrent portion of long-term debt	<u>\$ 44,175,039</u>	<u>\$ 45,742,403</u>

LIABILITIES

Current liabilities

	1962	1961
Notes payable to banks and others	\$ —	\$ 20,500,000
Current maturities of long-term debt	1,567,424	1,064,422
Accounts payable—trade	21,942,506	14,085,533
Federal income taxes, less United States Treasury obligations of \$8,282,316 in 1962	—	5,956,588
Other taxes	3,681,571	3,077,136
Contribution to employees' profit sharing fund	4,236,647	2,624,174
Product and service warranties	1,178,234	969,649
Other	14,212,088	11,126,179
<i>Total current liabilities</i>	<u>46,818,470</u>	<u>59,403,681</u>
Long-term debt (note 3)	<u>44,175,039</u>	<u>45,742,403</u>
Shareholders' equity		
Capital stock, \$3.00 par value. Authorized, 6,000,000 shares. Outstanding: 1962, 4,026,872 shares; 1961, 4,028,652 shares (net of 3,410 and 1,610 treasury shares, respectively) (note 4)	12,080,616	12,085,956
Additional paid-in capital (note 5)	13,844,820	13,838,015
Retained earnings (note 6)	<u>85,910,277</u>	<u>76,731,535</u>
<i>Total shareholders' equity</i>	<u>111,835,713</u>	<u>102,655,506</u>
	<u>\$202,829,222</u>	<u>\$207,801,590</u>

4/Under the Employee Share Option Plan adopted in 1960, options may be granted to key employees to purchase Motorola, Inc. shares at not less than 95% of market value at date of grant. The options granted may be exercised two years after the date of grant; they expire at the end of ten years and are contingent upon continued employment by the company and its subsidiaries.

At December 31, 1962 options outstanding consisted of 39,980 shares at \$73.25 per share (granted in 1960 and all currently exercisable), 6,900 shares at \$83.875 (granted in 1961) and 9,700 shares at \$78.14 (granted in 1962). During 1962 options for 20 shares were exercised (at \$73.25) and options for 3,600 shares were terminated (3,000 from 1960 grant, 400 from 1961 and 200 from 1962). An additional 143,400 shares were reserved for options which may be granted by the Board of Directors until May 2, 1965.

5/Additional paid-in capital was increased during 1962 by the excess of the option price over the par value of twenty shares of capital stock issued under the Employee Share Option Plan, \$1,405, and by the par value of 1,800 shares of the company's capital stock returned as an adjustment of shares issued in 1959 in the acquisition of the capital stock of a subsidiary, \$5,400.

6/At December 31, 1962 approximately \$24,650,000 of retained earnings was free from dividend restrictions contained in the debenture and note agreements.

7/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.

Motorola, Inc. and Subsidiaries

STATEMENT OF CONSOLIDATED EARNINGS AND RETAINED EARNINGS

YEARS ENDED DECEMBER 31	1962	1961
SALES AND OTHER REVENUES	\$346,881,779	\$298,219,845
Manufacturing and other costs of sales	250,434,021	214,871,908
Selling, service, and administrative expenses	55,788,368	52,409,790
Depreciation of plant and equipment (note 2)	7,416,150	5,276,286
Contribution to employees' profit sharing fund	4,236,647	2,624,174
Interest and amortization of debenture expense	2,492,079	3,137,379
<i>Total costs and other expenses</i>	<u>320,367,265</u>	<u>278,319,537</u>
Income before federal income taxes	26,514,514	19,900,308
Federal income taxes	<u>13,308,000</u>	<u>10,383,000</u>
EARNINGS (per share outstanding at end of year: 1962, \$3.03 plus 25¢ of nonrecurring capital gain from sale of finance subsidiary; 1961, \$2.36)	13,206,514	9,517,308
Retained earnings at beginning of year	<u>76,731,535</u>	<u>71,242,879</u>
<i>Total</i>	89,938,049	80,760,187
Cash dividends declared—\$1.00 per share	<u>4,027,772</u>	<u>4,028,652</u>
Retained earnings at end of year (note 6)	<u>\$ 85,910,277</u>	<u>\$ 76,731,535</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, 1962 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, 1962 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.

DIRECTORS AND OFFICERS

Board of Directors

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

Officers

ROBERT W. GALVIN
President

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

FRANK J. O'BRIEN
Vice President, Purchasing

ARTHUR L. REESE
Vice President and General Manager,
Communications Division

WALTER B. SCOTT
Vice President,
Consumer and Automotive Production

EDWARD R. TAYLOR
Executive Vice President,
Consumer Products Division

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

ELMER H. WAVERING
Executive Vice President,
Automotive Products Division

ALEX ARNOLD
Vice President, Contoller

ALLEN H. CENTER
Vice President, Public Relations

JOSEPH A. CHAMBERS
Vice President and Manager, Western Center,
Military Electronics Division

JOHN I. DAVIS
Vice President, Consumer Products Engineering

SYLVESTER R. HERKES
Vice President, Consumer Products Marketing

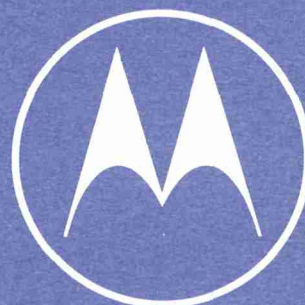
C. LESTER HOGAN
Vice President and General Manager,
Semiconductor Products Division

HOMER L. MARRS
Vice President, Communications Sales

KENNETH M. PIPER
Vice President, Human Relations

WILLIAM J. WEISZ
Vice President, Communications Products

WILLIAM S. WHEELER
Vice President and General Manager,
Military Electronics Division



The annual meeting will be held on Monday, May 6, 1963. A notice of the meeting, together with a form of proxy and a proxy statement, will be mailed to shareholders on or about April 8, 1963, 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. LaSalle St., Chicago 90, Illinois
Irving Trust Company
1 Wall St., New York 15, New York

