

MOTOROLA

annual report

1956



8

world's largest exclusive electronics manufacturer

MOTOROLA[®]

4545 AUGUSTA BOULEVARD, CHICAGO 51, ILLINOIS

TELEVISION

HOME AND
PORTABLE
RADIOS

CAR RADIOS

TWO-WAY
RADIO AND
MICROWAVE

MILITARY
ELECTRONICS

TRANSISTORS

*directors and officers
of Motorola*

transfer agents

Chemical Corn Exchange Bank
165 Broadway, New York 15, New York

Harris Trust and Savings Bank
115 West Monroe Street, Chicago 90, Illinois

registrars

Irving Trust Company
One Wall Street, New York 15, New York

**Continental Illinois National Bank
and Trust Company of Chicago**
231 South La Salle Street, Chicago 90, Illinois

*The annual meeting will be held on Monday, May 6, 1957.
A notice of the meeting, together with a form of proxy and a proxy
statement, will be mailed to shareholders on or about April 10, 1957,
at which time proxies will be solicited by the management.*



Maj. Gen. Samuel R. Brentnall
(U. S. A. F. ret.)
Vice President
Military Electronics



Joseph A. Chambers
Vice President, Western Area
Military Electronics



Matthew J. Hickey, Jr.
Director



Daniel E. Noble
Director
Executive Vice President
Industrial, Semi-Conductor
and Military Electronics
Division



John I. Davis
Vice President
Consumer Product Engineering



Frank J. O'Brien
Director
Vice President, Purchasing



Paul V. Galvin
Chairman of the Board
of Directors



Robert W. Galvin
Director
President



Edward R. Taylor
Director
Executive Vice President
Consumer Products Division



Sylvester R. Herkes
Vice President
Consumer Product Marketing



Walter B. Scott
Director
Vice President, Consumer
and Military Production



Arthur L. Reese
Vice President, Communications
and Industrial Electronics



Elmer H. Wavering
Director
Executive Vice President
Automotive Products Division



Edwin P. Vanderwicken
Director
Vice President, Finance,
and Treasurer



Charles E. Green
Secretary



Alex Arnold
Controller

10

year financial summary

YEAR	NET SALES	EARNINGS BEFORE TAXES ON INCOME	NET EARNINGS	NET EARNINGS PER SHARE ¹	WORKING CAPITAL	INVESTMENT IN PLANT AND EQUIPMENT ²	SHAREHOLDERS' EQUITY
1947	\$46,679,148	\$ 4,179,110	\$ 2,510,410	\$ 1.30	\$ 7,028,844	\$ 2,811,211	\$10,635,345
1948 ³	61,981,442	5,755,347	3,550,347	1.83	11,088,342	3,148,206	13,085,196
1949 ⁴	81,803,358	8,585,696	5,280,196	2.73	14,558,505	4,071,987	17,165,391
1950	177,104,669	27,368,061	13,130,246	6.78	20,731,871	5,794,309	26,895,638
1951	135,285,086	14,020,739	7,240,452	3.74	29,851,003	9,005,880	31,920,882
1952	168,734,653	15,576,165	7,012,700	3.62	38,007,247	11,429,532	41,755,780
1953	217,964,074	15,512,489	7,076,335	3.66	38,222,001	14,301,004	45,929,419
1954	205,226,077	16,523,889	7,572,024	3.91	38,308,612	16,579,531	50,598,747
1955	226,653,953	18,740,426	8,490,539	4.39	42,892,165	19,179,992	56,186,590
1956 ⁴	227,562,168	16,887,834	7,966,817	4.12	50,882,200	25,388,866	61,305,080

¹Earnings per share of common stock based upon the 1,935,131 shares outstanding at December 31, 1956.

²Net investment after deduction of depreciation reserves.

³Thirteen month period ended December 31, 1948.

⁴Consolidated information including financial data of wholly-owned subsidiaries in 1949 and subsequent years. In 1956 Motorola Finance Corporation, a subsidiary formed in 1956, is not included in consolidation.

to the shareholders of **MOTOROLA**

SALES and EARNINGS

Consolidated sales in 1956 set a new record of \$227,562,000 which compares with \$226,654,000 in 1955. Sales of consumer radios and phonographs, communications and industrial and military electronic products increased quite substantially. Reduced sales of the automobile industry were reflected in a smaller volume of car radio sales to the car manufacturers. While television unit sales were off somewhat, the dollar value declined more, reflecting a larger proportion of low-priced and portable sets. Sales were also affected by Motorola's withdrawal from manufacturing operations in Canada, where we converted in mid-year to a licensing arrangement with another company with respect to radio and television.

Consolidated earnings in 1956, before provision for income taxes, were \$16,887,834 compared with \$18,740,426 in 1955. After taxes, we earned \$7,966,817 or \$4.12 per share in 1956 compared with \$8,490,539 or \$4.39 per share in 1955.

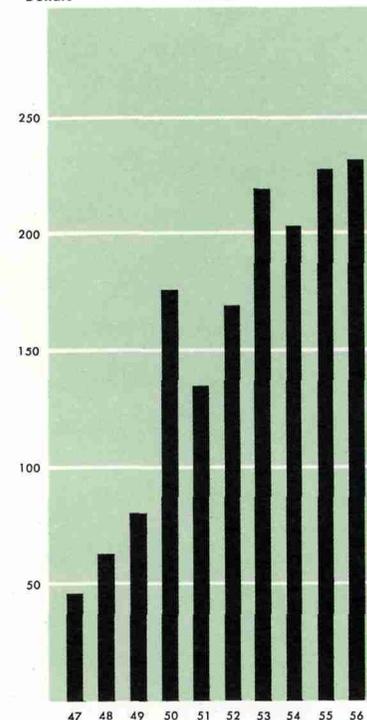
Television pricing was very competitive in 1956 and, together with the reduced volume and earnings in auto radio, is the principal reason for the decline in earnings. In the light of the problems affecting the whole television industry, we believe the year confirmed the soundness of our diversification within the electronics field.

TELEVISION

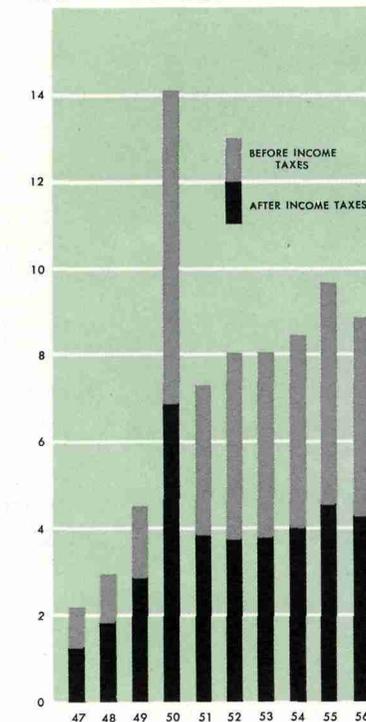
The industry produced 5% fewer television sets than in 1955. The principal problem in 1956 was low prices and margins. It was a highly competitive environment.

However, we think this is a natural consequence of the truly fabulous growth of the television industry to a major one over just a few years. In the lush, early years of such an attractive industry, too many companies decide to participate. Then, as the business settles down to a normal pace, individual companies attempt to maintain sales volume by engaging in drastic forms of competition. However, the ad-

Millions of Dollars SALES



Dollars per Share EARNINGS PER SHARE



vances in the art and technology no longer provide the opportunities for reducing costs in the same degree as in the early years. Lower prices must therefore reduce profits and this has proved too much for a number of companies to withstand and they have withdrawn from the business. The liquidation of their inventories further affects prices. The industry was in this stage in 1956.

While we don't expect a rapid recovery from this stage, it is possible that, as current excess inventories are reduced, a gradual turn for the better may occur in

1957. Of one thing we are sure—Motorola will be among the strongest survivors. We have, for example, strengthened our distributing outlets, as a result of the adjustment to fewer manufacturers, and we are improving our design and manufacturing costs.

Color television continues in its early introductory stage. At some not-too-distant point, color could finally come into its own, aided by the increasing replacement demand resulting from obsolescence of the first great wave of television sets marketed in volume beginning in 1950.

Under the circumstances, Motorola early in 1956 decided on a moderate approach

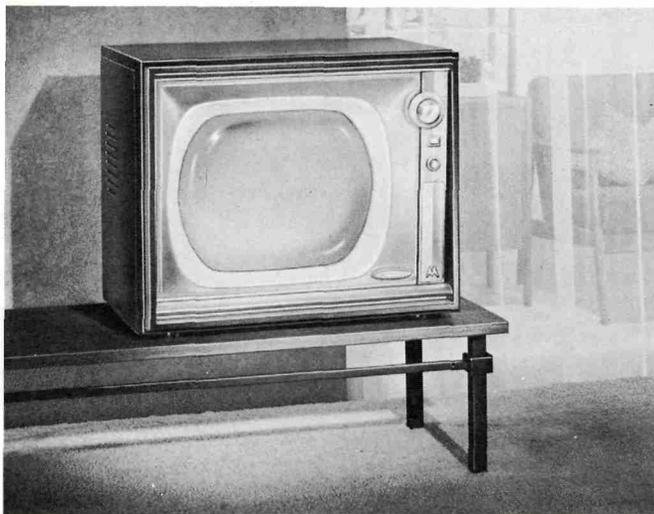
to both the low-priced portable TV market and to the marketing of color TV. We did not attempt to build color sets to meet the lowest price. We stressed superior performance—both in color and monochrome reception—and freedom from service requirements.

At the same time we continued to make important improvements in black-and-white television, particularly in the better quality brackets. An important development was Motorola's "zero-in", automatic fine tuning. Prior to this development, many sets were generally poorly tuned in for the best possible picture available from a given station signal. Zeroing-in, automatically, to the best possible use of the signal eliminates the variable human factor on which the best operation of the set depended.

The Motorola Transituner provides a wireless, remote channel control. By pressing the Transituner button, as far as 25 feet away from the set, the channels can be changed silently and quickly without the inconvenience of manually turning the dial on the set. In combination with "zero-in" tuning, the maximum in convenience and performance is thus provided.

RADIOS and PHONOGRAPHS

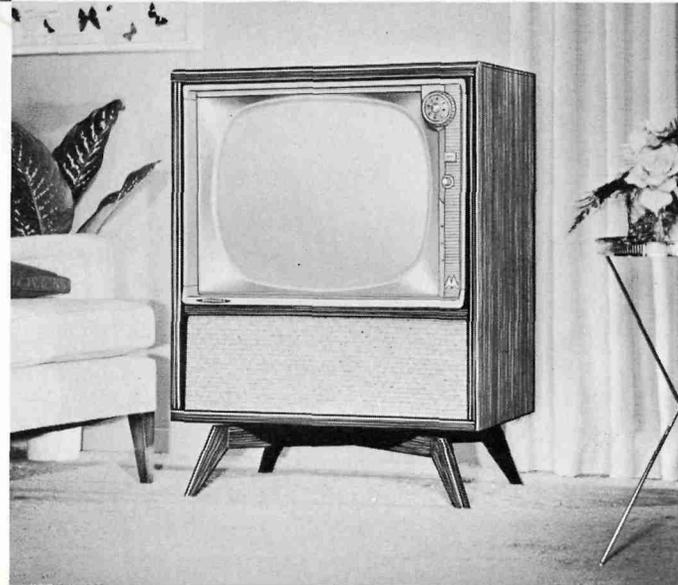
In 1956 Motorola sales of portable, table and clock radios and phonographs increased nearly 50% over the previous year which follows an increase of 55% for 1955 over 1954.



Color Television



Monochrome Television



Portable Television

These increases in the face of so-called saturation in the radio business, with some 108,000,000 radios in consumers' hands, attest to the improvements in design and performance of Motorola products as well as the fundamental value of radio in the scale of consumer wants.

Motorola was the first in the industry to use STAcir and PAKcir components. STAcir stands for stacked circuitry in which coils, condensers and resistors are combined into one component which, by means of layer upon layer of components in wafer form, makes up a unit about one inch square. Two of these units take the place of 26 individual components. PAKcir stands for packed circuitry, sometimes called rescaps, in which a number of resistors and capacitors are combined into one unit and sealed against humidity and other interferences. For example, three PAKcirs replace some 19 separate components.

These methods reduce assembly effort, save space, improve performance and increase reliability. In combination with Motorola's PLAcir, or plated circuitry, transistors and the rotating antenna on portable radios, these developments mark the latest stage in the revolution progressing in the electronics industry.

Just as important as these considerable technical advances, has been the improved styling and design of Motorola radios and phonographs.

The transistorized portable radio has an important, new appeal in its greater convenience, longer battery life and freedom from tube failures. Motorola has aggressively and successfully participated in this new field.

High-fidelity phonographs, packaged in a cabinet and giving superior performance at reasonable cost, have found increasing favor and Motorola experienced a 100% increase in volume in 1956 in these products.

AUTO RADIO

The substantial sales decline of contract car radio in 1956 was already reversed at year-end when production for new-model automobiles was under way. Production for our two largest customers, Ford and Chrysler, has been at a good rate so far this year.

The year 1955 had been an unusually good one, not only because of record automobile production but also because Motorola was called upon to produce more than its normal share of the business. The decline in 1956 sales was therefore greater than the decline in automobile production.

In mid-1956 Motorola pioneered the introduction of the transistor powered car radio to its contract customers. Its acceptance was so rapid that by the end of the year our entire contract car radio production had converted to transistor power. We produce all our power transistors ourselves and, with over one million already in use, the reliability is 99.99%.

Sales of Motorola branded car radios through our distributor and dealer outlets maintained a satisfactory level. Most models were converted to power transistors and important improvements in circuitry and performance were made.

Clock Radio

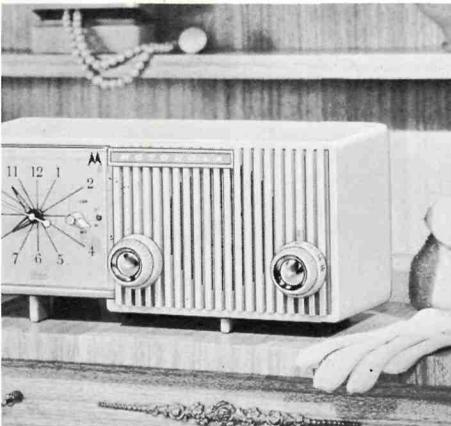


Table Radio



Portable Radio



Car Radio



COMMUNICATIONS and INDUSTRIAL ELECTRONICS

Motorola was the pioneer and continues to be the standard of the two-way radio communications industry in design, quality and value. Motorola systems have been adopted by well over half of the users of such equipment who rely on the superior field engineering and maintenance service provided by Motorola. It is no wonder, then, that the sales increase for these products in 1956 was the greatest on record.

The municipal, county and state market continues to grow for such users as the police and fire departments, forestry services and civilian defense. Substantial increased use of two-way radio is being made by trucking companies, ready-mix concrete suppliers, fuel delivery companies, public utilities, manufacturers and railroads.

The "Private-Line" radio system, introduced in 1956, met with an enthusiastic reception. You may be amused to know that one of the problems which it was intended to solve is the anticipated interference caused by the sunspot cycle which is now on the ascendancy. The State of Georgia, the City of Los Angeles and many others adopted this system in 1956 and the Associated Police Communications Officers recommended adoption of this type of product by all police agencies.

Many two-way radio installations have to overcome siren, wind, engine and plant noise. For such needs Motorola introduced a compact speaker with a built-in transistor power amplifier with ten times the previous voice power output.

Another transistorized product, the dynamic microphone with built-in pre-amplifier, has set a wholly new standard for clarity and quality of voice messages on two-way radio.

The transistorized "Handi-Talkie" radiophone was a major success in 1956. It is a higher-power, lighter-weight, transistorized unit which, for example, was adopted by the U.S. Forest Service as a standard communications device.

The pocket-sized radio pager proved a commercial success in 1956 and installations are increasing in hospitals, hotels and factories.

Four more major airlines adopted Motorola's selective signalling system and it is being specified as original equipment in new turbo-jet and jet airliners to be delivered in coming years.

Microwave systems (long distance two-way radio systems by means of relay towers) had increasing acceptance in 1956. Southern Railway Co. and the Southern Pacific Co. installed Motorola microwave systems for signalling, voice, teletypewriter and telegraph communications, replacing the familiar wire lines along the right of way. Cleveland Electric Illuminating Co. has eliminated costly high voltage circuit breakers through automatic remote reporting and control of outages by

Airborne Microwave



**Transistorized
"Power Voice" Speaker**



**Transistorized, Mobile
Dynamic Microphone**



"Private Line" Radiophone

Transistorized "Handle-Talkie" Radiophone



Guided Missile Systems



Motorola microwave. The Ohio Oil Co. and others now use Motorola microwave for telephone, teletype, remote metering, remote pump station control and remote two-way radio control—all simultaneously on the same system. The Vermont State Police and Eastern Air Lines have installed additional Motorola microwave systems to remotely control two-way radio. The Bell Telephone System substantially increased its use of Motorola message circuit microwave relay equipment in 1956, in part as result of a new and superior product, frequency-diversity microwave, which automatically selects the best of two received beams.

Motorola microwave color TV relay equipment also was in greater demand in 1956.

Just prior to the mid-air collision of two commercial air liners over the Grand Canyon, the Civil Aeronautics Administration took steps to procure from Motorola a large radar relay system. It will collect air traffic information from a radar network and present the data to various air traffic control centers. Traffic in the entire area can thus be supervised and watched. Motorola, as the only electronics manufacturer with a product specifically designed for this application, has aided in the development of an air traffic control system which will eventually cover the entire nation.

During 1956 the organization of the communications and industrial electronics division was expanded and decentralized to match the growth of its markets and to further improve its service to customers.

10" Radar Indicator



**Transistorized
"Handle-Talkie" Pocket Pager**

MILITARY ELECTRONICS

Sales of electronic equipment and laboratory services for national defense increased 22% over 1955, much of the increase occurring in research and development. Even though less profitable, the laboratory services provide an opportunity for successful bidding on production contracts growing out of laboratory development.

Additional facilities were in process of construction in Phoenix, Arizona, to supplement the existing laboratory and pilot production facilities and are now being occupied.

Considerable work was done on data link systems for automatic instructions and control of missiles and planes.

Work has continued on missile guidance and control systems, and we were working on five different missiles during the year.

Advanced radar systems and communications systems, including components of the DEW line in northern Canada, were among the many military projects in 1956. Beacons for navigation and missile systems were another important area of development and production.

TRANSISTORS

The new plant built to house the development and production of transistors in Phoenix went into operation in early 1956. By year-end it was in profitable operation

although substantial development costs to expand the kinds of transistors to be produced will continue.

Our early operations have concentrated on a power transistor, and we believe Motorola produced more of this type than the rest of the transistor industry combined. Important improvements in yield, performance and cost have been achieved.

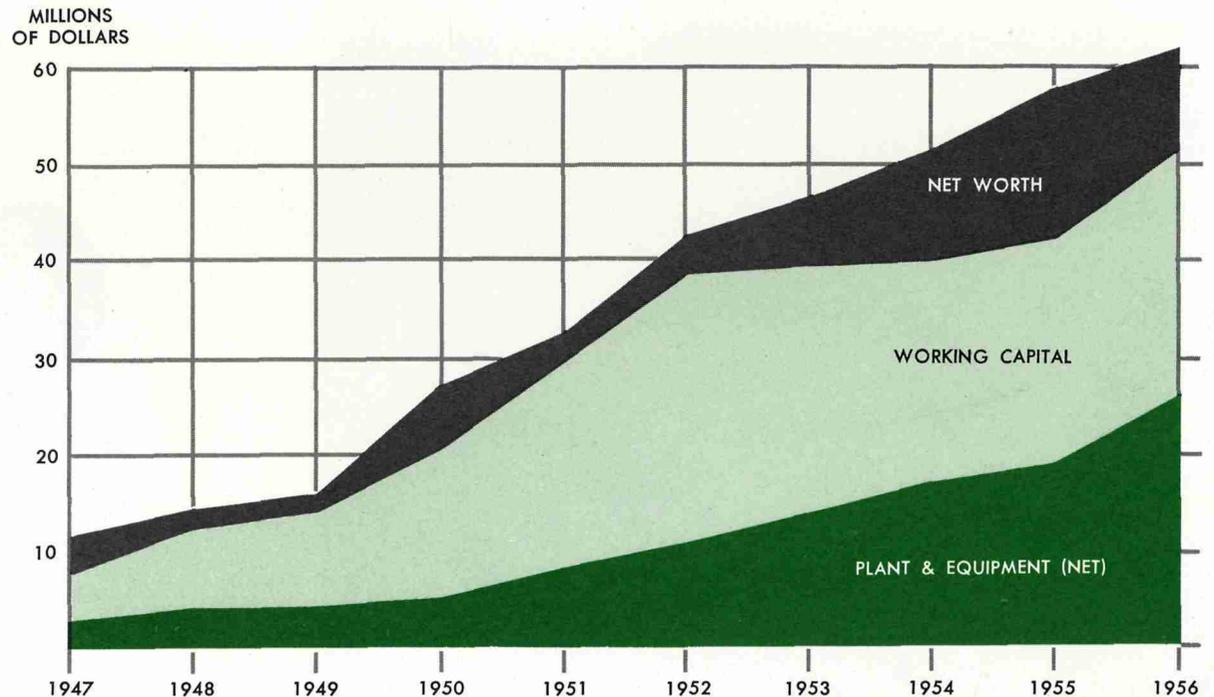
Plans are now under way to produce in volume, diffused base, radio frequency transistors and silicon power rectifiers, developed by Motorola, as well as a medium power transistor.

Motorola has begun the sale of transistors to other users.

FINANCES

During 1956 the company sold \$11,000,000 additional long term notes to Prudential Insurance Company to replenish working capital and to provide funds for increased facilities. Working capital requirements have increased with the larger mix of slow-turnover sales of military and communications equipment. With several additions in Chicago, our present major program of adding space will have been completed. Further improvements in equipment and manufacturing facilities remain to be made.

You will note an additional financial statement in the following pages. The balance sheet of Motorola Finance Corporation is displayed for the first time because this



*net worth, working capital
and investment
in plants and equipment*

wholly-owned subsidiary is not included in consolidation with the parent company. The finance company was formed in 1956 to aid in the financing of leases and conditional sales agreements covering two-way radio installations, for limited wholesale financing of consumer products and for administering certain other financing activities for the company. While it operated only part of the year, it earned a satisfactory profit.

At the 1956 year-end consolidated working capital of Motorola, Inc. was \$50,882,200, an increase of \$7,990,035 over the year, while consolidated net worth stood at \$61,305,080, an increase of \$5,118,490. Dividends totalling \$1.50 per common share were paid in 1956. A conservative dividend policy was continued in view of the company's need for capital funds.

At the close of the year there were 4,688 Motorola stockholders. Directors, officers and their relatives owned, directly or beneficially, 705,501 shares of Motorola stock.

ORGANIZATION

Late in 1956 I was elected Chairman of the Board of Directors, remaining as Chief Executive Officer. Robert W. Galvin was elected President. It is my intention to remain in fully active service but with fewer administrative duties.

The company was also divisionalized on a more formal basis and an executive vice president was elected to head each of three divisions: the industrial, semi-conductor

and military electronics division, the consumer products division, and the automotive division. This new structure is designed to provide better planning and improved control of operations and costs.

THE FUTURE

We are anticipating an increase in our annual sales volume for 1957 over 1956 as well as an increase in our earnings. It is expected that this increase will come as a result of improvement in volume in all divisions of our company.

We are opening a new plant for additional military development and production in Phoenix, which will be in partial operation by mid-year, although we do not expect to get the full benefit from a billing volume standpoint until some time in 1958.

In the research and development areas we have new products that will issue from time to time in the future. They will enhance and support the several divisions with additional volume.

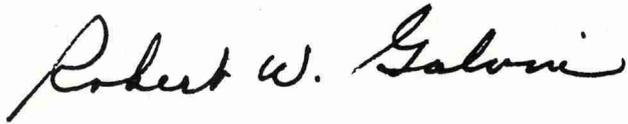
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I take this opportunity to express appreciation for the splendid cooperation and support on the part of all the Motorola employees, Motorola distributors and our suppliers in making the year 1956 a success.

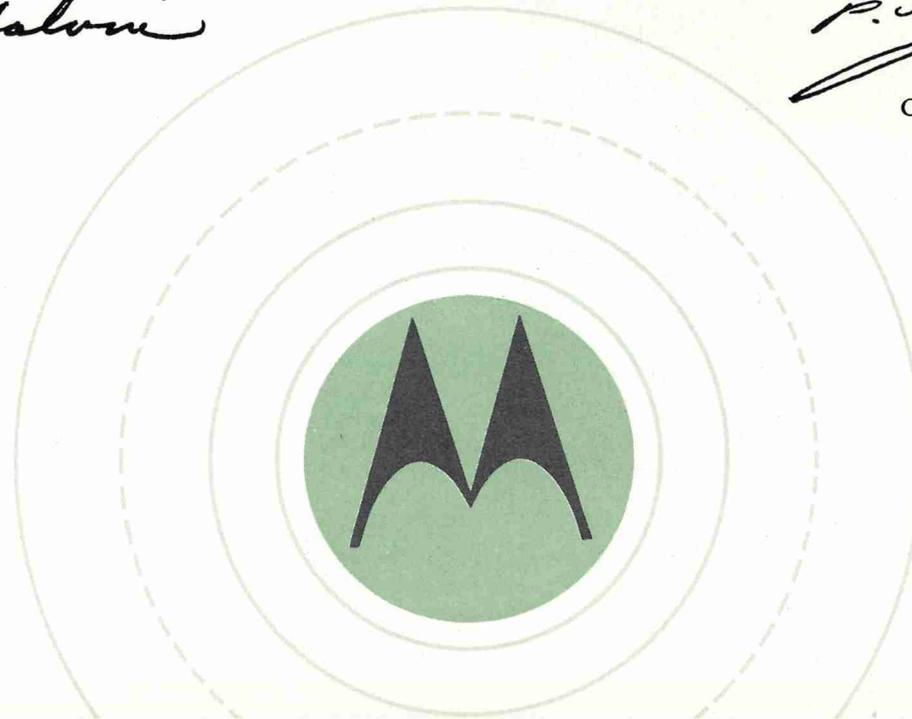
For the Board of Directors,



Chairman



President



MOTOROLA INC. AND CONSOLIDATED SUBSIDIARIES

December 31,

assets

	1956	1955
Cash.....	\$ 10,724,488	\$ 5,936,356
Accounts and notes receivable:		
United States Government.....	11,530,446	9,067,795
Other trade receivables (less reserve for bad debts— 1956, \$825,000; 1955, \$850,000).....	23,335,735	28,863,516
Other current receivables.....	1,179,240	1,195,103
Costs recoverable under United States Government contracts, less progress billings.....	13,098,183	11,378,434
Inventories—at the lower of prime cost or market.....	22,131,776	24,805,491
Prepaid expenses.....	515,517	324,295
TOTAL CURRENT ASSETS.....	\$ 82,515,385	\$ 81,570,990
Investment in Motorola Finance Corporation, subsidiary not consolidated—at cost plus undistributed earnings (see accompanying balance sheet).....	4,054,369	
Other assets.....	1,542,865	3,495,463
Plant, equipment and leasehold improvements (less reserves for depreciation—1956, \$6,783,667; 1955, \$5,197,536).....	25,388,866	19,179,992
Patents and trademarks—less amortization.....	219,663	184,773
	<u>\$113,721,148</u>	<u>\$104,431,218</u>

liabilities

Current maturities of long-term debt, and short-term borrowings of subsidiaries.....	
Accounts payable—trade.....	
Accrued taxes.....	
Reserves for product and service warranties.....	
Other current liabilities.....	
TOTAL CURRENT LIABILITIES.....	
Long-term debt, less current maturities above:	
Notes payable:	
Due November 1, 1966, 3¾%, with annual prepay- ment requirements of \$500,000.....	
Due July 1, 1972, 3¾%, with annual prepayment re- quirements of \$500,000 commencing July 1, 1958	
Due November 1, 1976, 4⅜%, with annual prepay- ment requirements of \$500,000 commencing No- vember 1, 1963.....	
Real estate mortgages of subsidiaries, principally ma- turing after 1965.....	
Total liabilities.....	
DEFERRED INCOME.....	
SHAREHOLDERS' EQUITY	
Capital stock, \$3.00 par value—authorized, 3,000,000 shares; issued and outstanding, 1,935,131 shares.....	
Capital surplus.....	
Retained earnings.....	
Undistributed earnings of Motorola Finance Corporation	
Total shareholders' equity.....	

ES, balance sheets as of December 31, 1956 and 1955

December 31,

1956

1955

notes to financial statements

\$ 505,399	\$ 992,056
9,328,831	13,992,508
9,476,859	10,616,111
1,037,638	1,312,734
<u>11,284,458</u>	<u>11,765,416</u>
\$ <u>31,633,185</u>	\$ <u>38,678,825</u>
5,000,000	5,500,000
7,500,000	3,500,000
7,000,000	
560,404	565,803
\$ <u>51,693,589</u>	\$ <u>48,244,628</u>
\$ <u>722,479</u>	
\$ 5,805,393	\$ 5,805,393
9,018,506	9,018,506
46,426,812	41,362,691
54,369	
\$ <u>61,305,080</u>	\$ <u>56,186,590</u>
<u>\$113,721,148</u>	<u>\$104,431,218</u>

A — All of the company's subsidiaries are wholly-owned, and all except Motorola Finance Corporation are included in the consolidated financial statements. The accounts of Canadian subsidiaries (in liquidation on December 31, 1956) are included in terms of United States funds, at appropriate rates of exchange; the amounts pertaining to Canadian companies are relatively inconsequential.

B — The company's business under United States Government contracts is subject to price renegotiation, in accordance with federal statute. The company's renegotiation status has been reviewed by the Government for years to and including 1953, and no refund was required. It is believed that no excessive profits were realized in subsequent years which would be required to be refunded under general price renegotiation.

C — In connection with the financing of sales and leases of products to consumers the companies are obligated under repurchase and other agreements. It is believed that these obligations will have no material effect on the business of the companies.

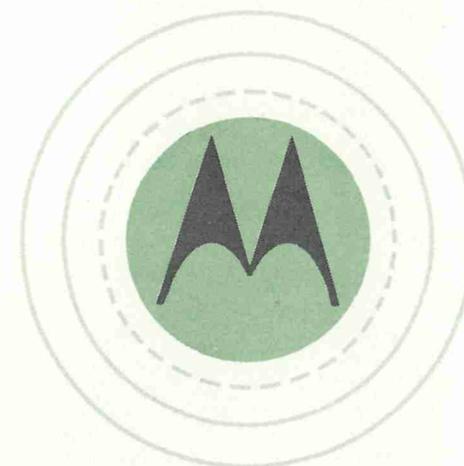
D — The Retained Earnings account at December 31, 1956 is the balance after transfer therefrom in prior years of \$2,945,385 to capital surplus and \$5,034,625 to the capital stock account, in connection with stock dividends, share distributions and increase in the par value of capital stock. Capital surplus consists of \$6,073,121 of paid-in capital and the above-mentioned transfer from the Retained Earnings account.

MOTOROLA INC. AND CONSOLIDATED SUBSIDIARIES

statement of consolidated income and retained earnings

Year Ended December 31,

	1956	1955
Sales.....	\$227,562,168	\$226,653,953
Other income.....	1,420,685	1,774,110
Total income.....	\$228,982,853	\$228,428,063
Manufacturing and other costs of sales.....	\$180,683,026	\$179,293,927
Selling, service and administrative expenses.....	23,925,552	24,133,615
Depreciation and amortization of leasehold improvements.....	2,245,173	1,840,911
Contribution to employees' profit-sharing fund.....	2,872,056	3,362,514
Interest and other expenses.....	2,369,212	1,056,670
Total costs and other expenses.....	\$212,095,019	\$209,687,637
Net income before provision for taxes on income.....	\$ 16,887,834	\$ 18,740,426
Provision for federal, state and Canadian income taxes...	8,921,017	10,249,887
Earnings..(per common share—1956, \$4.12; 1955, \$4.39)	\$ 7,966,817	\$ 8,490,539
Retained earnings, beginning of year.....	41,362,691	35,774,848
Total.....	\$ 49,329,508	\$ 44,265,387
Deduct dividends—\$1.50 per share.....	2,902,696	2,902,696
Retained earnings, end of year.....	\$ 46,426,812	\$ 41,362,691



See the accompanying notes to financial statements.

Motorola Finance Corporation

Balance Sheet as of December 31, 1956

auditors' report

BAUMANN, FINNEY & Co.

Certified Public Accountants
208 SOUTH LA SALLE STREET
CHICAGO 4, ILLINOIS

February 20, 1957

ASSETS

Cash.....	\$ 1,542,198
Receivables:	
Lease and conditional sales contracts maturing in installments generally over 3 to 5 years	\$ 9,225,362
Notes receivable, distributors, maturing in less than 1 year.....	3,186,717
Total.....	\$12,412,079
Less unearned income on lease and conditional sales contracts.....	1,656,826
Net.....	\$10,755,253
Other assets.....	\$ 94,656
	<u>\$12,392,107</u>

LIABILITIES

Notes payable, banks—short term.....	\$ 8,000,000
Accounts payable to Motorola, Inc. and consolidated subsidiaries.....	271,735
Accrued taxes.....	48,500
Other current liabilities.....	17,503
Total current liabilities.....	\$ 8,337,738

SUBORDINATED DEBT AND NET WORTH

Subordinated note payable to Motorola, Inc.—due 1959.....	\$ 2,000,000
Capital stock—\$1.00 par value; authorized and issued, 20,000 shares	20,000
Paid in surplus.....	1,980,000
Retained earnings.....	54,369
Total subordinated debt and net worth.....	\$ 4,054,369
	<u>\$12,392,107</u>

To the Board of Directors and
Stockholders of Motorola, Inc.:

We have examined the balance sheet of Motorola, Inc. and consolidated subsidiaries as of December 31, 1956 and the related statement of income 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 attempt to obtain confirmations of certain receivables from the United States Government, but we satisfied ourselves as to their substantial accuracy by means of other auditing procedures.

We made a similar examination with respect to Motorola Finance Corporation, a subsidiary not consolidated.

In our opinion, the accompanying financial statements present fairly (a) the consolidated financial condition of Motorola, Inc. and consolidated subsidiaries as of December 31, 1956 and the results of their operations for the year then ended, and (b) the financial condition of Motorola Finance Corporation as of December 31, 1956, in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Baumann, Finney & Co.

Note: All receivables of Motorola Finance Corporation are covered by the repurchase and other obligations discussed in Note "C" of Notes to Financial Statements.

In any field of human endeavor it is impossible merely to stand still. You either go forward, or you fall behind.

Today this maxim applies with compelling force in the competitive arena of electronics.

Going forward, of course, depends upon many factors. But vital to it all is the never-ending planning and refining of production facilities, not only to meet effectively the needs of today, but also to anticipate the opportunities of tomorrow.

On the following pages, you will see a pictorial cross section of some major, and some minor, efforts in Motorola's continuing program for achieving greater efficiency in plant, equipment and methods.

Company on the move:

A house has been described as a machine for living. By the same token, a factory building may be thought of as a machine for production.

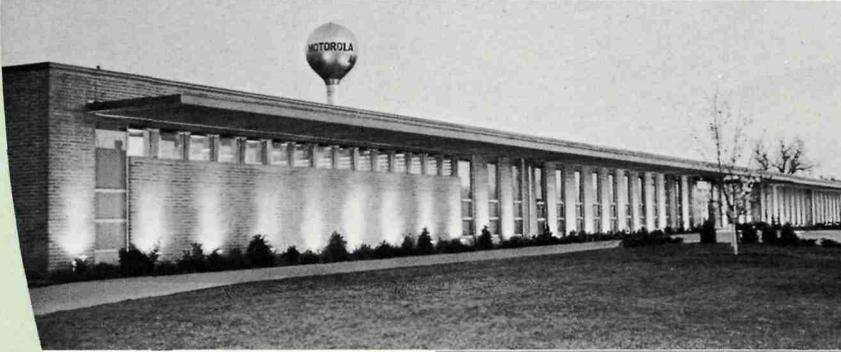
It is this concept that has guided Motorola in the design of new plants and modification of existing structures during the recent period of growth.

To achieve the degree of efficiency necessary to bring the public the best possible products at the smallest possible cost, each new facility has been *built around* the product.

Planning has incorporated advanced ideas on product flow and process mechanization, many of them original and others drawn not only from within the electronics industry, but from many other industries as well.

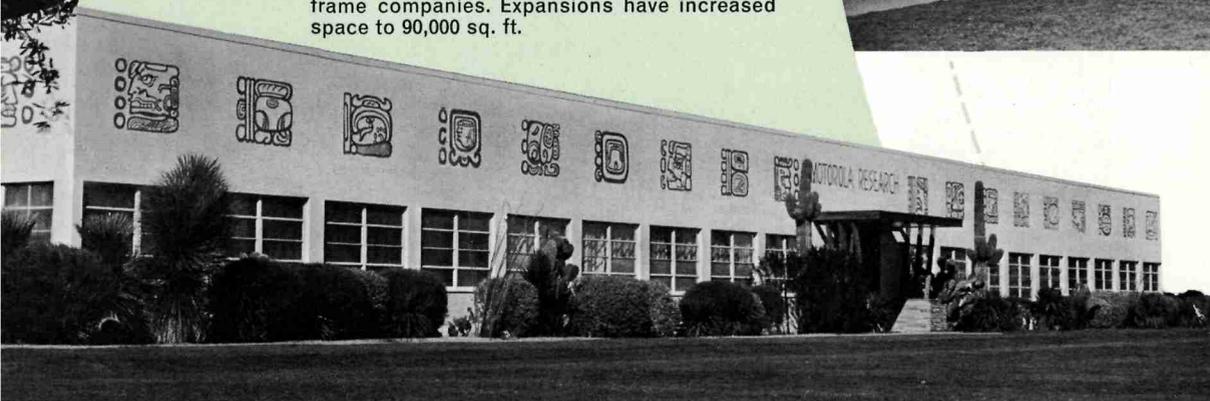
Further, each facility has been designed to permit economical expansion with minimum interruption of operations.

Provision has been made so that additional material and finished product storage area systematically becomes available with each expansion of production space. Machinery layout has been planned so that additions and modifications can be made without disrupting the smooth flow of goods.



Defense development at Phoenix. Designed specifically for research, development and pilot production of military electronic products, this modern laboratory at Phoenix, Arizona, serves the Air Force, Army, Navy, A.E.C. and major air-frame companies. Expansions have increased space to 90,000 sq. ft.

◀ **Efficiency through consolidation.** Motorola's new radio manufacturing plant at Quincy, Illinois, brings under one roof the operations formerly carried on at four separate locations. Through mechanization this 185,000 sq. ft. facility provides far greater productivity per square foot than previous buildings.



new Motorola buildings

Double output at Arcade, N.Y. To meet increased production requirements, this car radio tuner plant has been expanded 60% in the past two years. Modernization and the installation of automatic equipment have simplified materials flow, reduced costs and contributed to a twofold increase in output. Total space now is 90,000 sq. ft.



Weapon systems research center. Staffed with engineers, physicists and mathematicians, the Motorola Research Laboratory at Riverside, California, is devoted entirely to research, design and development of complex weapon systems and associated sub-systems and components. Every inch of its 23,000 sq. ft. was planned with this sole function in mind.



Milestone in assembly plants. The latest ideas in materials handling, cost saving and flexibility have been designed into Motorola's Franklin Park, Illinois, plant. Its 278,000 sq. ft. are devoted to final assembly, warehousing and shipping of television sets and phonographs. Docks can handle 22 box cars and 18 trailer trucks simultaneously.

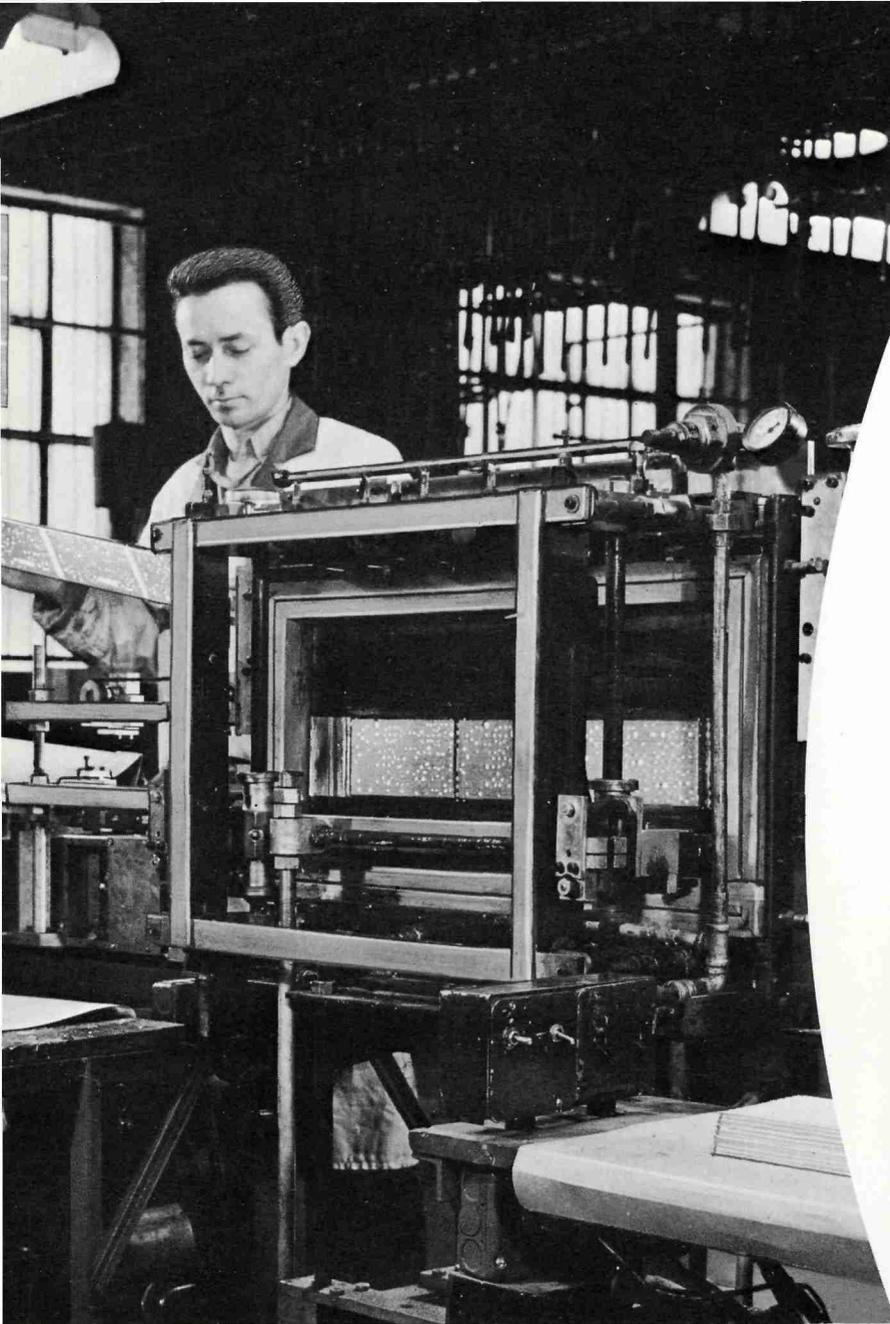


Military electronics in the Southwest. Another example of efficient specialization is this 185,000 sq. ft. plant planned for research, development and production of military electronic equipment. It is now being readied for occupancy near Phoenix, Arizona.

Transistor history in the making. A prime example of specialized design, this Motorola plant at Phoenix, Arizona, has pioneered the mass production of power and radio-frequency transistors. Among the most complete centers for semi-conductor research and manufacturing, it incorporates in its 68,000 sq. ft. numerous advanced features such as humidity control and electrostatic air filtering.



Two plants in one at Chicago. This modern structure on Cicero Avenue in Chicago is really twins. The section at left, comprising 75,000 sq. ft., is set up for economical production of microwave and power line carrier equipment. The 78,000 sq. ft. section at right is a high-speed metal fabricating plant which supplies parts for all Motorola products.



Company on the move:

If a factory building may be considered a machine for production, then the equipment in it can be called the "works" that make it go.

In its perpetual quest for more ways to reduce costs, Motorola has installed special machines and assembly lines embodying the most advanced concepts in efficiency.

Many, such as the automatic core grader, the in-line testing unit and the straight-line soldering system, were designed and built by Motorola and are unique in the industry.

Alert early to the promise of mechanization, Motorola years ago established an Advanced Mechanization Group made up of industrial engineers and draftsmen.

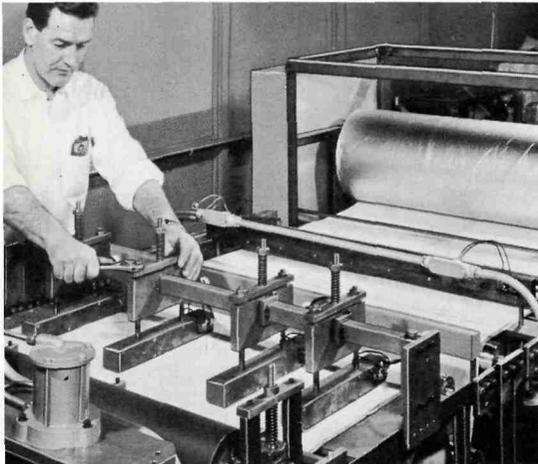
Its mission: continuing research in the application of mechanization to every phase of the Company's operations. The hundreds of projects undertaken have resulted in new efficiencies in every Motorola plant.



▲ **Printed laminates "on the double".** The remarkable machine pictured here is the only printer in existence that can print circuitry configurations on both sides of the chassis laminate simultaneously. Designed by Motorola for use in the production of its plated PLAcir chassis, it eliminates several hand operations and can turn out circuitry for as many as 4000 car radios per hour.

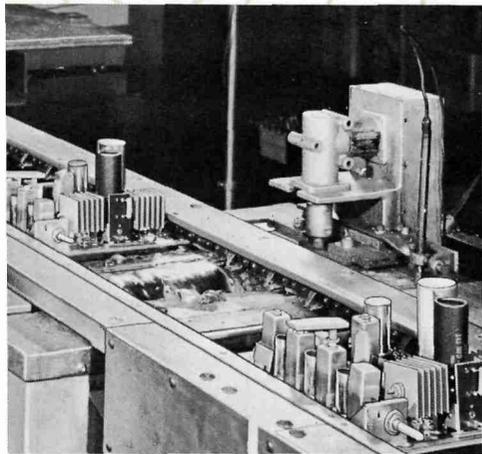
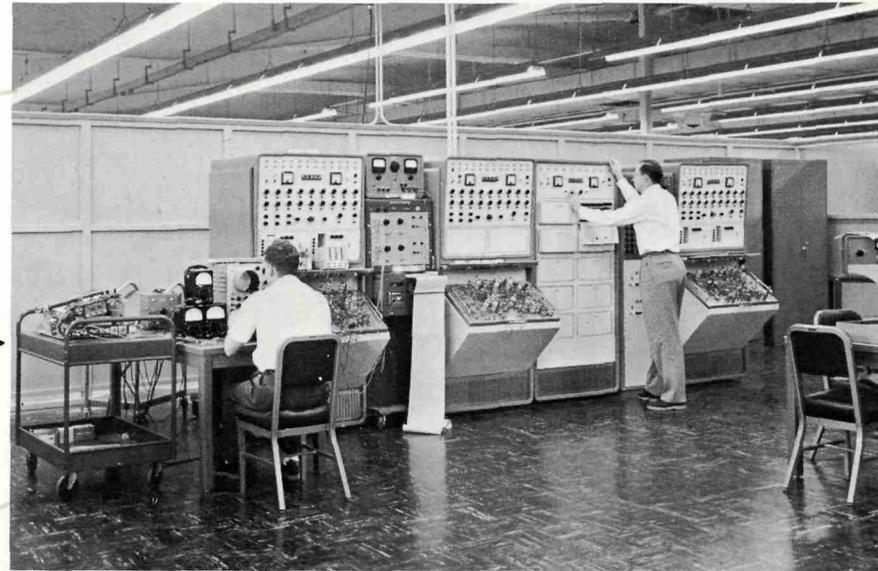
▲ **Final inspections simplified.** Through specialization of functions, this in-line testing system designed by Motorola has cut the time required to train inspectors and speeded the final testing of car radios. Since installation, the time for final inspections has been reduced by approximately one-fourth.

new Motorola equipment

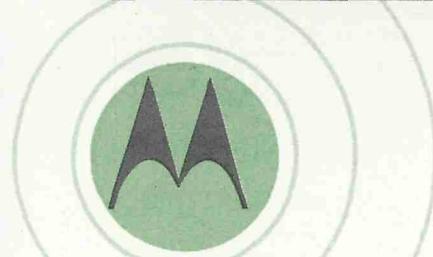
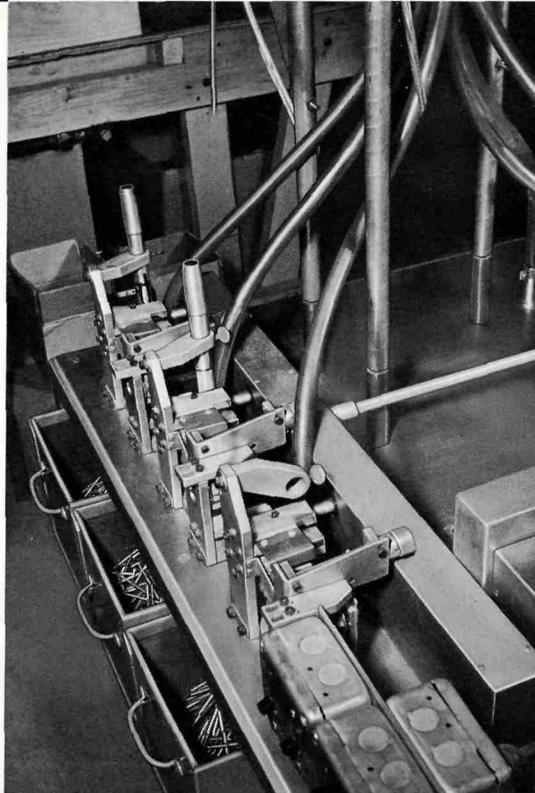


◀ **25% saving in the bag.** Moistureproof bags and barriers for military electronic equipment were once purchased from outside sources. Since they were available only in standard sizes, this created waste and storage problems. To solve them, Motorola built this automatic machine which produces bags and barriers in the sizes required. Result—costs reduced, storage space freed.

▶ **Electronic answer men.** To facilitate handling of complex design work on government contracts, Motorola has increased its analog computer facilities by 30% at Riverside, California. Now everyday "tools" at this laboratory, these intricate electronic brains are indispensable to the quick, accurate solutions of problems relating to servomechanisms, nonlinear equipment and airframe design.



▲ **Mechanized soldering.** Chassis connections were formerly soldered by hand. Here you see Motorola's exclusive straight-line soldering system that now makes this operation automatic. A conveyor line passes plated circuit panels, with chassis components in place, over a solder pot where metal is deposited only in the desired spots.



▶ **Automatic "heart insurance."** The heart of a 2-way radio is a tiny crystal so sensitive it must be installed in an oven maintained at an unvarying temperature. The thermostats that control the heat, therefore, are crucial. To guard against failures Motorola designed and built the automatic thermostat tester you see here. It eliminates human error, insures uniform quality, speeds flow of units.

◀ **Core grading goes automatic.** Only one of its kind in the industry, this automatic core grader sorts and grades the powdered iron cores used for car radio assemblies into 9 different categories of permeability. This is done with far greater speed and accuracy than is possible by other methods. Built by Motorola, it has brought improved quality and savings in time and labor.

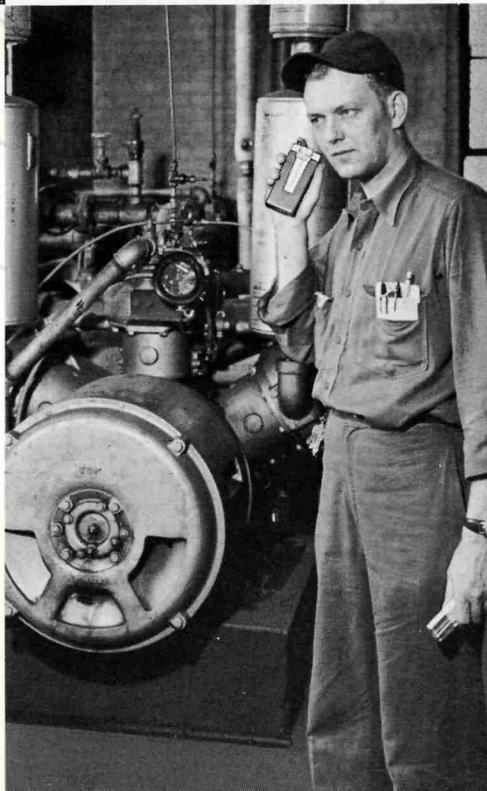


Company on the move: new Motorola



▲ **Shaking out the "bugs."** One way Motorola works to stop trouble before it starts is shown by this vibration table at the Quincy car radio plant. Units from the assembly lines are placed on this table and subjected to vibrations and stresses far more severe than any they will get in actual use. Thus potential difficulties are discovered and nipped in the bud.

▲ **Taking our own medicine.** Motorola's Handie-Talkie Pocket Radio Pager has enabled hundreds of firms to utilize maintenance personnel with greater efficiency. It does the same for us. If a machine breaks down, for example, the right maintenance people can be summoned in seconds. Production can be restored quickly. It's estimated this device has improved maintenance staff efficiency at Motorola by 25%.



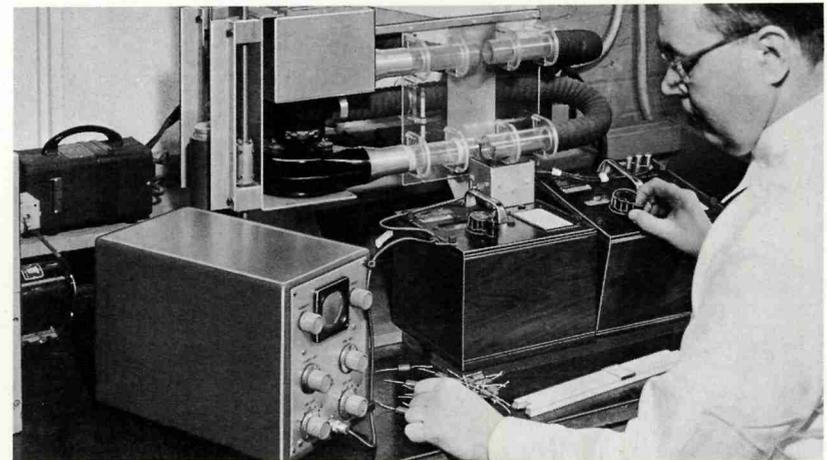
Perhaps the truest measure of any organization's capacity for progress is its willingness to seek out better ways to do that which is already being done well enough.

At Motorola no process, no procedure, no technique is considered perfect. All are subject to constant review in the light of the latest developments in the field of industrial engineering.

Motorola has long conducted a work simplification program to train personnel in modern, scientific techniques for handling all factory operations.

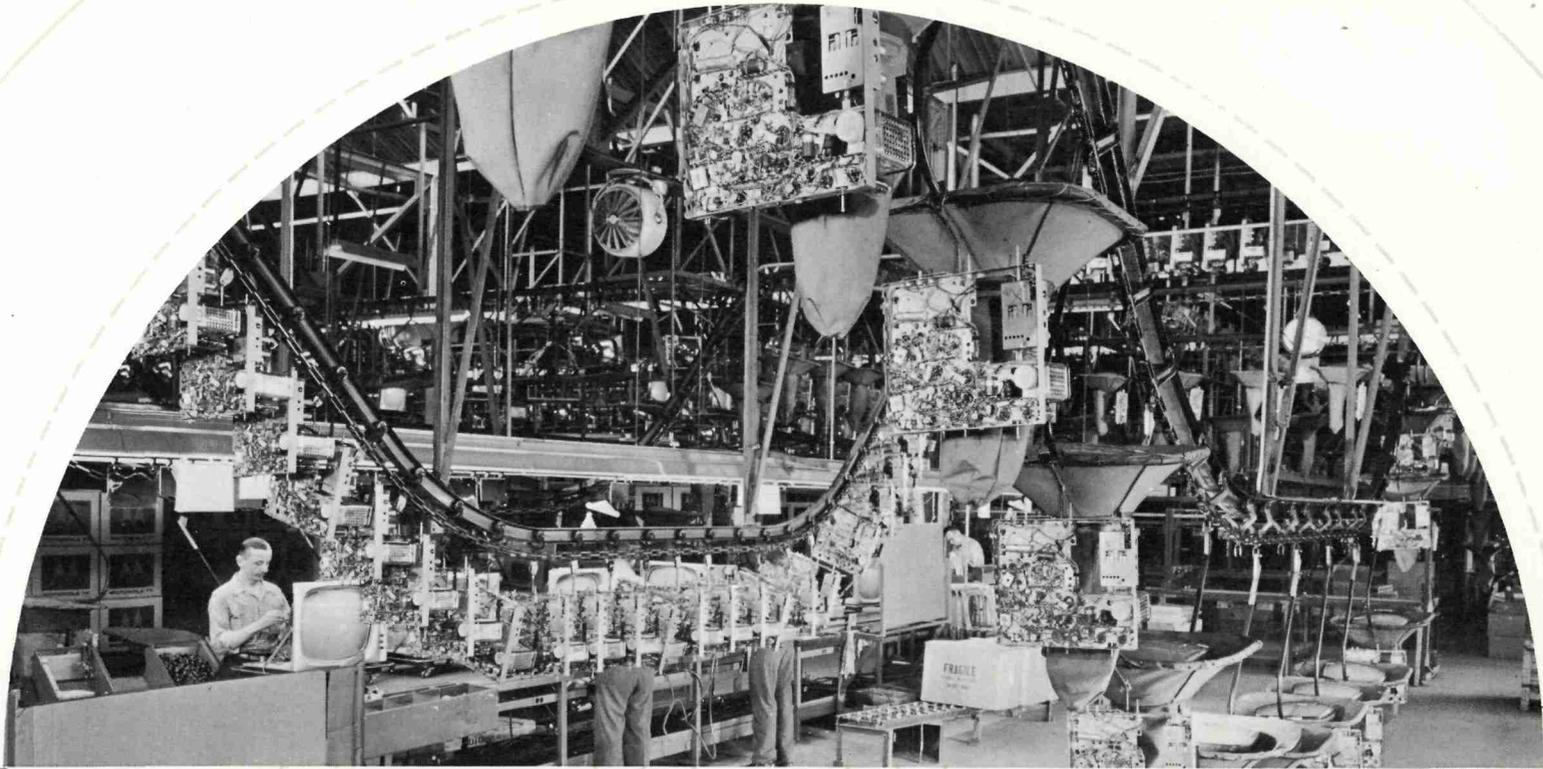
And, believing that good ideas are where you find them, its methods improvement program is designed to tap the imagination of all other employees as well as management and supervisory personnel.

Out of these programs have come ideas which have contributed importantly to cost reduction, quality control and improved productivity.



▲ **In-coming quality checks.** Every shipment of parts received by Motorola undergoes rigid inspection and testing before acceptance. In this picture, for example, capacitors are being checked with a temperature coefficient capacity tester built by Motorola. Advanced quality control methods such as this safeguard the reliability of Motorola products from start to finish.

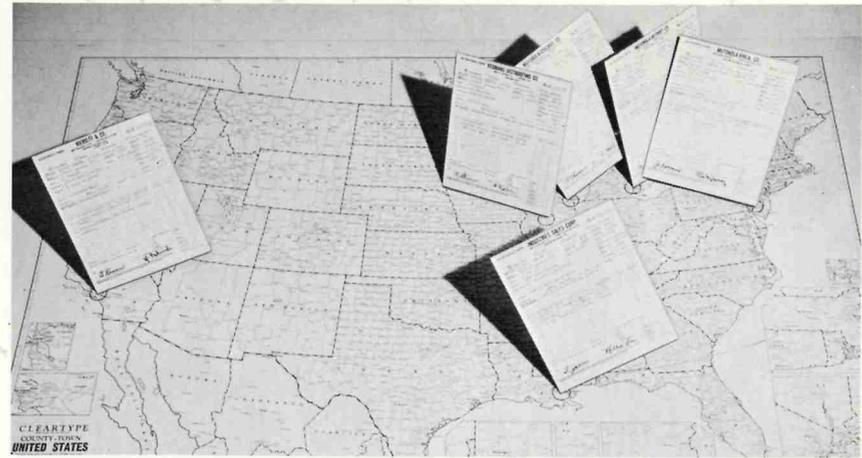
methods



▲ **2-Mile conveyor system.** A unique 2-mile long conveyor system designed by Motorola has resulted in great savings in materials handling and assembly time at the Franklin Park, Illinois, television plant. Nine different types of conveyors move picture tubes, chassis, finished units and waste with remarkable efficiency. Another benefit—space in the upper reaches of the plant, often not usable in ordinary buildings, is here fully utilized for product storage.



▲ **Transistorized sleuthing.** In-process manufacturing tests at the Phoenix, Arizona, transistor plant are made with special jigs designed and built by Motorola. Used to check the many electrical characteristics of transistors, these jigs are themselves fully transistorized.



▲ **Long-distance quality control.** A good example of how far Motorola quality control extends is the quality improvement program for distributors. Six key distributors strategically located from coast to coast submit service reports to the home office each day. Out of this continuous flow of accurate data come ideas for design improvements in all Motorola products.

Company on the move: looking forward

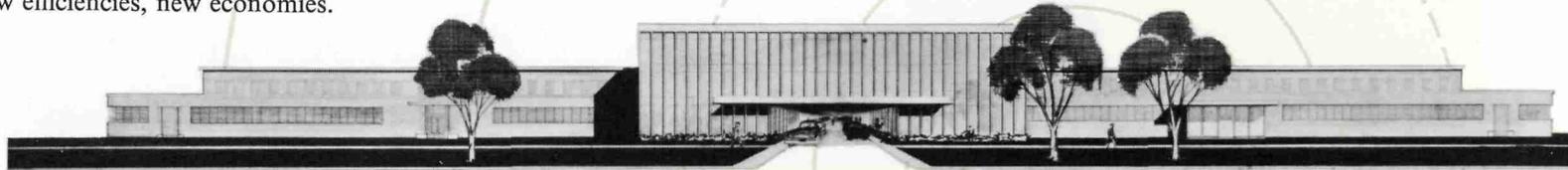
Opportunity smiles most often upon those who prepare for it.

Motorola is preparing always.

Plants and equipment have been designed for quick, economical expansion and modification to meet changing needs.

Methods studies are continually being made for cost reduction, improved product quality and greater productivity.

And plans for further integration and mechanization promise new efficiencies, new economies.



Architect's sketch of the new administration building (center) soon to be erected at Motorola's Augusta Boulevard plant in Chicago. In addition to making possible the efficient centralization of administrative functions, this annex will also free production space to meet increasing needs.



Planning is a task that never ends at Motorola. Its goal is not only to meet present operating needs more efficiently, but also to anticipate future problems so that they can be stopped before they start. Here, Vice President Walter Scott and members of the Consumer Products Manufacturing Staff check details and a scale model of a new plant to evaluate its operating efficiency before it is actually built.



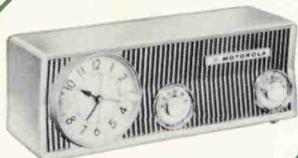
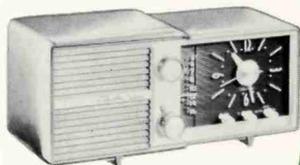
CAR RADIOS



PHONOGRAPHS



PORTABLE RADIOS



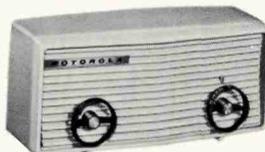
CLOCK RADIOS



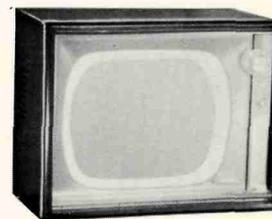
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TABLE RADIOS



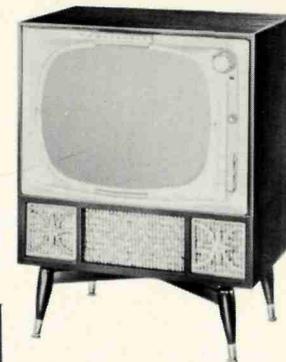
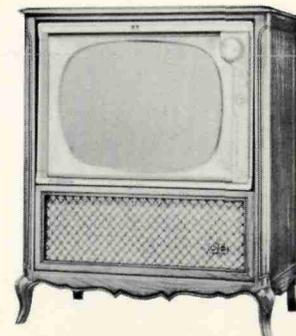
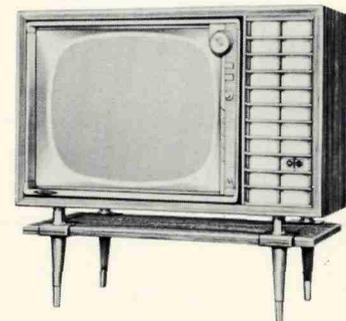
*Quality
is engineered
into every
MOTOROLA
product*



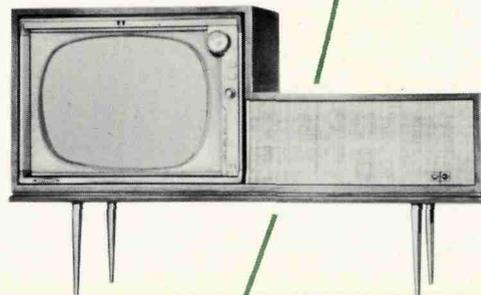
COLOR TELEVISION



PORTABLE TELEVISION



BLACK AND WHITE
TELEVISION





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28 YEARS OF LEADERSHIP IN ELECTRONICS EXCLUSIVELY