Marconi 1969

a catalogue showing
the complete range of equipment
and services available from
The Marconi Company Limited
Chelmsford, Essex, England

Member of GEC-Marconi Electronics Limited

THE QUEEN'S AWARD TO INDUSTRY
1966 1967 1968 1969

All performance details quoted in this catalogue are subject to confirmation at time of ordering

MARCONI PRODUCT RESPONSIBILITY

Marconi products and systems are marketed by 12 specialist Product Divisions, each having its own management, development and system planning organization; design offices, sales, contracts and accounts departments; and installation and after sales services. These Product Divisions are structured into 3 groups each led by a General Manager.

TELECOMMUNICATIONS DIVISIONS

ELECTRONICS DIVISIONS

COMPONENTS

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W & J Mackay & Co Limited, Chatham, Kent

INDEX AND PRODUCT GUIDE

★Equipments appearing in this catalogue for the first time

ELECTRONICS DIVISIONS' PRODUCTS

Airborne Equipment

Electro-Optical Systems

Marconi is the only electronics company in the United Kingdom to have received four Queen's Awards to Industry and is one of only four companies from the whole of British industry to achieve this distinction.

1966 — Cited for outstanding export achievement

1967 — Three citations for outstanding technological innovation

1968 — Cited for outstanding technological innovation

1969 — Cited for outstanding export achievement

COMPANY STRUCTURE

THE GENERAL ELECTRIC AND ENGLISH ELECTRIC COMPANIES LIMITED

The merger between The General Electric Company Limited and The English Electric Company Limited became effective in November 1968. The merger brought together the business of The General Electric Company (GEC), Associated Electrical Industries (AEI) and The English Electric Company to form The General Electric and English Electric Companies Limited.

The new Company constitutes one of the largest electrical combines in the Western World, employing 250,000 people and having an annual turnover in excess of £900,000,000.

The Marconi Company (and its subsidiaries) had been an English Electric subsidiary since 1948.

GEC-MARCONI ELECTRONICS LIMITED

In December 1968, GEC-Marconi Electronics Limited was formed as a Management Company, responsible for the combined capital electronics interests of both GEC and English Electric under the direction of Mr R. Telford, Managing Director of The Marconi Company Limited.

GEC-Marconi Electronics, with a turnover well in excess of £100,000,000 and employing 30,000 people, is by far Britain's largest and most comprehensive capital electronics organization.

Member companies of GEC-Marconi Electronics are:

The Marconi Company Limited
- **Marconi Instruments Limited**
- **Marconi-Elliott Microelectronics Limited**
- **Marconi Italiana SpA**
- **Marconi (South Africa) Limited**
- **Marconi (China) Limited**
- **Eddystone Radio Limited**

(For locations of The Marconi Company and its subsidiaries see pages xi and xii)

GEC-AEI (Electronics) Limited
(U.K locations: Stanmore, Portsmouth, Leicester, Watford and Coventry)

Elliott Flight Automation Limited
(U.K location: Rochester)

Elliott Automation Radar Systems Limited
(U.K locations: Borehamwood, Hillend (Scotland))

Elliott Space and Weapon Automation Limited
(U.K locations: Frimley, Borehamwood, Hillend)

E-A Space and Advanced Military Systems Limited
(U.K location: Camberley)

THE MARCONI COMPANY LIMITED

Complete system planners, designers and makers of electronic equipment for space, radio, digital and naval communication; broadcasting and television; automation; avionics; air traffic control and air defence; navigation aids. Computers, components and microelectronics.

Head Office: Marconi House, Chelmsford, Essex, England

Type of Company: Limited Liability

Date of formation: 1897

Numbers of personnel: 14,620

Engineers, Draughtsmen, Technicians:	3,850
Production:	8,290
Commercial and administrative:	2,480

Area: 2,553,000 sq ft

Research and Development	616,000sq ft
Production	1,491,000sq ft
Commercial and administrative	446,000sq ft

THE MARCONI COMPANY GREAT BRITAIN

CHELMSFORD (Essex)

Marconi House (Head Office and Main Works)
Central management
Central services
Radio Communications Division
Broadcasting Division
Mercantile Marine Division
Transmitter development laboratories
Maritime development laboratories
General manufacture
Research and development workshops

Kensal House
Computer Division
Computer development

Arbour Lane
Marconi College

Waterhouse Lane
Television development laboratories
Central Division
Sheet metal production facilities
Research and development workshops

Beehive Lane
Computer manufacture and test

Widford
Computer commissioning
Small quantity production

Crompton Works
Radar Division
Radar development laboratories
General manufacture
Research and development workshops

Westway
THE MARCONI INTERNATIONAL MARINE COMPANY LIMITED (Associated Company)

GREAT BADDOW (Essex)

Central Research Laboratories
Automation development laboratories
Research and development workshops
Computer systems commissioning
Automation Division (Marrable House)
Space Communications Division (Marrable House)
Space communications development laboratories (Marrable House Annexe)

WRITTLE (Essex)

Line Communications Division
Telecommunications development laboratories
Mechanical research laboratory
Research and development workshops

BASILDON (Essex)

Aeronautical Division
Electro-Optical Systems Division
Aeronautical development laboratories
Electro-Optical systems development laboratories
General manufacture

BILLERICAY (Essex)

Specialized Components Division
Development and production of ferrite devices

WITHAM (Essex)

MARCONI-ELLIOTT MICROELECTRONICS LIMITED (Subsidiary)

RIVENHALL (Essex)

Marconi Rivenhall Establishment
Aerial test site
Cableform and light assembly facilities

BIRMINGHAM

EDDYSTONE RADIO LIMITED (Subsidiary)
Eddystone range of telecommunications receivers

GATESHEAD (County Durham)

Marconi Gateshead Works
Production of large aerial systems and mechanical structures

GLENROTHES (Fife, Scotland)

Marconi-Elliott Microelectronics Limited

HACKBRIDGE (Surrey)

Marconi Hackbridge Works
Development and production of quartz crystals, crystal oscillators and filters

ST. ALBANS (Hertfordshire)

MARCONI INSTRUMENTS LIMITED (Subsidiary)
Telecommunications measurement equipment
Industrial electronic instruments
Medical and industrial X-ray apparatus

STEVENAGE (Hertfordshire)

Marconi Instruments Limited (Sanders Division)
Microwave components, instruments, equipment

WEMBLEY (Middlesex)

Marconi Wembley Works
General manufacture, particularly marine and telecommunications equipment

MARCONI INTERNATIONAL

The responsibility for The Marconi Company's international organization is exercised through the Marconi International Division, located at Marconi House, Chelmsford, Essex, England.

Agents

Marconi agents are established in 73 countries to provide a regional point of contact for customers.

Technical Representatives

Twenty Marconi technical representatives are situated in Europe, North and South America, Africa, Middle East, Far East and Asia, to assist customers with technical matters.

Overseas Subsidiary Companies

Marconi Italiana S.p.A
Via Ambrogio Negrone 1A, Cornigliano, Genoa 16153, Italy

Marconi (South Africa) Limited
Cor. Van Dyk and Falkirk Roads, Industrial Sites, Benoni, S. Africa

Marconi (China) Limited
Shell House, Queen's Road Central, Hong Kong

Companhia Marconi Brasileira
Caixa Postal 126-ZC 00, Rio de Janeiro, Brazil

Overseas Associated Companies

Amalgamated Wireless (Australasia) Limited
47 York Street, Sydney, N.S.W, Australia

Amalgamated Wireless (Australasia) N.Z. Limited
Commerce House, 126 Wakefield Street, Wellington C.1, New Zealand

Canadian Marconi Company
Marconi Building, 2442 Trenton Avenue, Montreal 16, Canada

English Electric-Marconi Argentina S.R.L
Casilla de Correo 4476 Buenos Aires, Argentina

Société Anonyme Internationale de Télégraphie Sans Fil
66 Chaussée de Ruisbroek, Brussels 19, Belgium

Svenska Radioaktiebolaget
Alstromergatan 14, Stockholm 12, Sweden

Norsk Marconikompani A/S
Ryensvingen 5, P.O. Box 50, Manglerud, Norway

The English Electric Corporation, Marconi Division
1 Park Avenue, New York, NY 10016, USA

Marconi Philippines Inc
Commercial Bank and Trust Company Building, Ayala Avenue, Makati, Rizal, Philippines

English Electric-Marconi de Venezuela C.A
Apartado 3946, Caracas, Venezuela

OVERSEAS REPRESENTATI
A Associated Company
a Agency Representation
S Subsidiary Compan
T Technical Representation

MARCONI RESEARCH

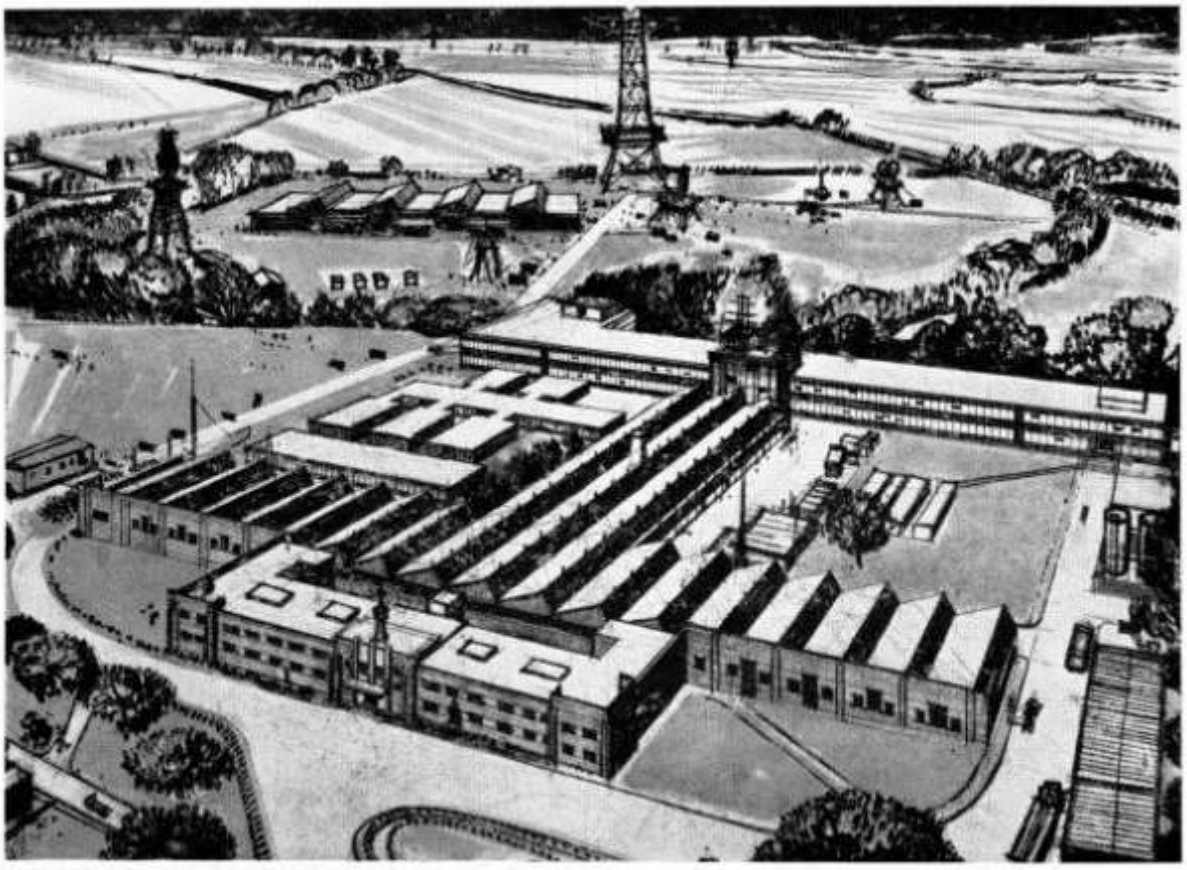
The purpose of research in an industrial organization is to provide a foundation of sound, scientific knowledge on which commercial products may be based. So far as The Marconi Company is concerned, virtually all these products come within the category of capital electronics, the technologies associated with which have a tremendous rate of advance. Marconi invests considerable sums of money in first-class research facilities and studies in order to keep ahead of current electronic technology. Indeed, its expenditure on research and development accounts for 1% of the *total* United Kingdom expenditure on research and development in *all* fields.

The Marconi Baddow Research Laboratories stand in their own 200,000 sq ft of grounds, near enough to the Product Divisions to allow for close collaboration, but far enough away to ensure that degree of detachment necessary for single-minded research.

Each of the laboratories, listed below, is characterized by expertise in certain techniques:

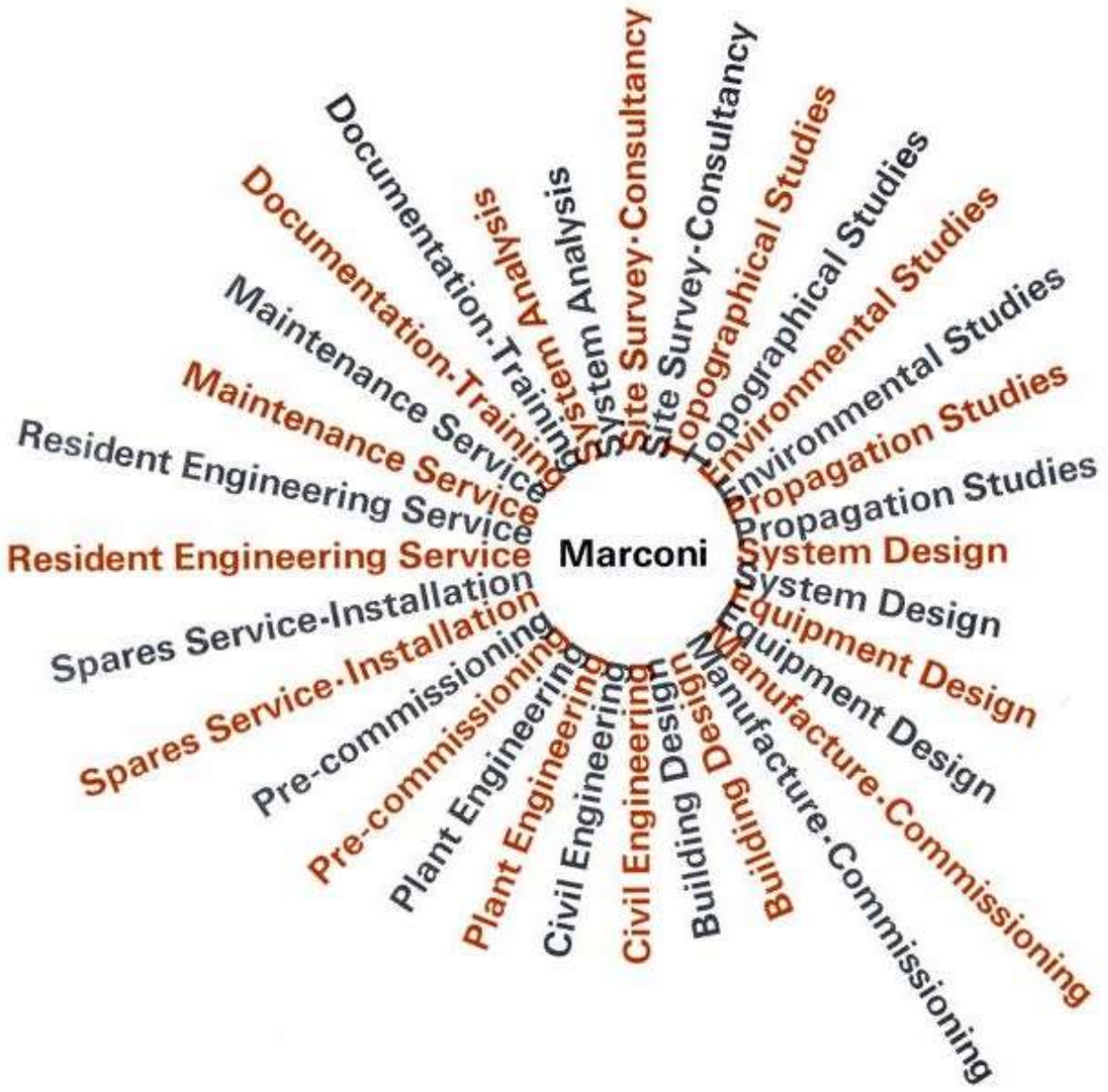
Aerials
Applied Physics
Autonomics
Communications
Magnetic Materials
Mechanical Engineering
Microcircuit Assembly Techniques
Semiconductor Physics
Special Techniques
Theoretical Sciences
Transmission Techniques

The diversity of the research effort may be gauged by the fact that it is concerned with a power range of about 10^{21} (megawatts to small fractions of a picowatt); with a frequency range of about 10^{9} (broadcast frequencies to visible light); with an operational temperature range from near absolute zero upwards; with a size range of about 10^{7} (tens of metres in the largest aerials to microns in the smaller semiconductor devices). It covers all forms of communication, all forms of radar, all sophisticated forms of data processing and computing for whatever purpose, and all disciplines which have a bearing on these processes.



MARCONI RESEARCH LABORATORIES *at Great Baddow, Essex*

MARCONI SYSTEMS CAPABILITY



In the majority of fields in which it is concerned, The Marconi Company produces the world's most comprehensive range of equipment. Whatever the range or quality, however, equipment cannot always be regarded as an end in itself. The degree of success of a large project depends upon the underlying system concept and the competence with which it is realized.

Marconi is a systems company. It has always specialized in planning, equipping and building complete systems. Everyday, Marconi system planning engineers are working on international system and consultancy contracts, analysing system purpose, carrying out topographical, radio propagation and site surveys, implementing environmental studies of geography and climate, selecting the best and most suitable equipment from whatever source, assessing local architectual standards and civil engineering capability, and integrating these factors into economic, reliable and unified systems.

Having worked out the blue-prints, The Marconi Company employs the most up-to-date techniques to ensure optimum efficency in the management of large projects. It uses PERT (programme evaluation and review technique) to control and relate the numerous activities and disciplines, and computers to process the PERT network.

Having completed and commissioned a system, The Marconi Company will operate and maintain it or will undertake to train the customer's own personnel, either locally or at Chelmsford.

MARCONI MANUFACTURE

Each of Marconi's manufacturing plants is characterized by certain specialist skills, which are supported by appropriate building design, environment and machinery and by the apposite production engineering, quality control, laboratory, inspection, testing, packing and despatch services. Thus, the workload from the various specialist Product Divisions of the Company may be placed with confidence on factories which are equipped and staffed to carry out their specific manufacturing requirements.

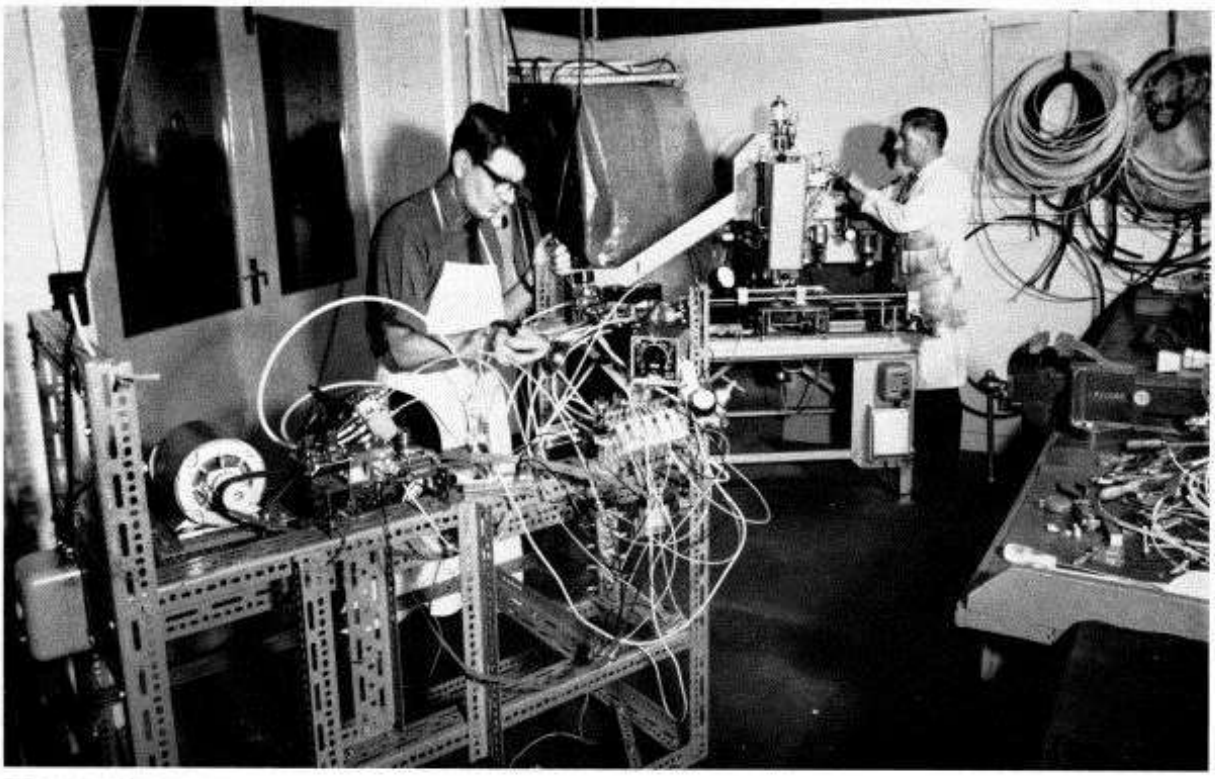
Because The Marconi Company is a manufacturer of high-speed computers and also has comprehensive autonomics research facilities, it is naturally orientated towards the most up-to-date methods of production and stores control, planning, work allocation, manufacture and testing. These methods embrace computer-assisted programme evaluation and review techniques (PERT) and critical path analysis, and the numerical and sequence control of production machinery.

The work-load on each factory is determined centrally by the manufacturing services organization, through which the Company's Product Divisions channel their production requirements. This pattern of administration has made it possible to maintain a high degree of specialization within each factory—a factor leading to economies and a close relationship between the production unit and the Product Division which it serves. It also, however, makes for maximum flexibility so that, when necessary, the Controller of Manufacturing Services, who is the central authority, can marshall all the production resources of the Company to meet the requirements of a major project. The inter-factory compatibility which is essential to the execution of such an exercise is assured by the fact that the examination and adoption of new manufacturing techniques and the procuring of up-to-date machinery are also centrally controlled.

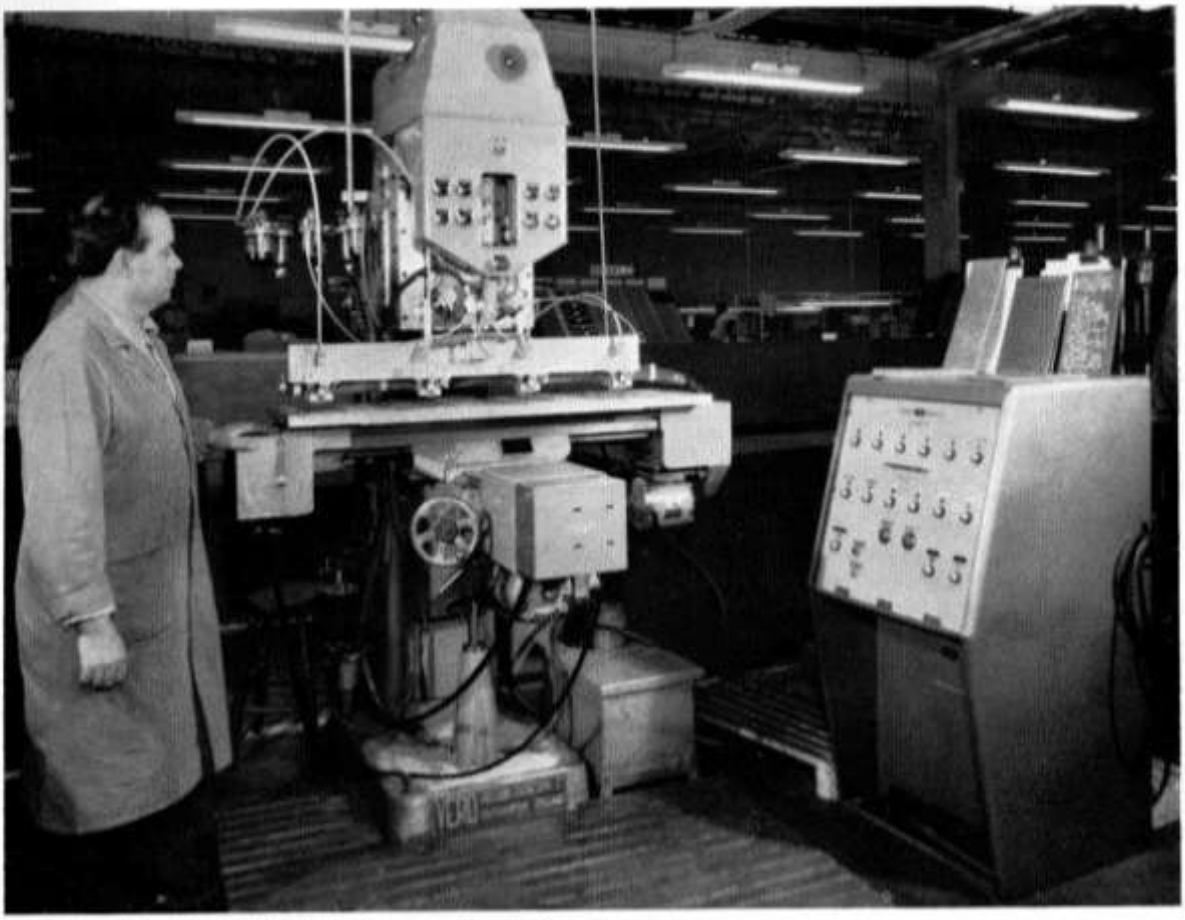
The manufacturing requirements of Marconi-Elliott Microelectronics Limited, a subsidiary of The

TAPE CONTROLLED HIGH SPEED TEST SYSTEMS *operating in an assembly area*

SEQUENCE CONTROLLED LATHES *in the Wembley Machine shops*



SPECIAL PURPOSE MACHINES. *designed by Marconi, being constructed at Chelmsford*



TAPE CONTROLLED MULTIPLE DRILL *designed and constructed by Marconi*

Marconi Company, are met in a different way from those of other Marconi Divisions. Overall control is vested in Marconi-Elliott Microelectronics which possesses its own production plants at Witham, Essex and Glenrothes, in Scotland. Together they occupy over 150,000 sq ft and the Witham establishment is the most modern clean-air microelectronics plant in Europe.

Up-to-date factory organization and production equipment are two essential features of successful manufacture. The third is high quality workmanship. To ensure that its standards are met in this respect, The Marconi Company has introduced a programme of staff training and development, and has established in each of its major factories an apprentice training scheme designed to recruit and train craftsmen and technicians. Over 1,200 employees and apprentices are currently undergoing training.

ROBOT TESTER *An operator carries out a printed board check in the Chelmsford Works*

MARCONI QUALITY CONTROL

The measures taken by The Marconi Company to control the quality of its products are among the most stringent in the world. They are based on the most advanced techniques available and are backed by the services of the Research Division, the Commodity Information and Identification Service, the Test Engineering Department and such facilities as the Metrology Room, the Materials and Process Laboratories and the Environmental Test Laboratories. The Company's Quality Control System qualifies as a British Ministry of Technology Approved Organization, an Air Registration Board Approved Organization and is also approved by the Ministry of Defence (Naval Department). It is supervised by resident representatives of the Director General of Inspection, the Naval Weapons Production Overseas (Radio) and visiting inspecting surveyors of the United Kingdom Registration Board. Close liaison is maintained with these authorities in the setting up of production facilities, in particular, clean areas and controlled environments.

Standardization

The Company's Commodity Information and Identification Service ensures that materials, components and processes used across the range of Marconi products are rationalized to the maximum extent and it specifies standards which apply to the raw materials, parts and components carried in stock at the various factories.

Design

Quality control is exercised from the design stage of an equipment, when test engineers, working closely with the development and design engineers, cover the test and measuring requirements, specifications and procedures and advise on costs and methods. Critical appraisal of the performance of new designs is carried out as part of design approval procedure and includes environmental testing to meet temperature, vibration, humidity and pressure requirements.

Production

Both mechanical inspection and electrical testing are an integral part of the production process in all its stages. Control techniques vary according to the type and complexity of the various manufacturing processes, and a Central Test Equipment Research and Engineering Unit, having studied the requirement, meets it with specifically designed equipment. The Marconi Company is a world leader in the development of automatic test equipment and procedures and many of the manufacturing processes are sub-

CLEAN AIR ASSEMBLY UNIT *One of the many clean areas which have been set up in the Marconi production complexes*

EQUIPMENT TEST *Mark VII colour television cameras in test at Chelmsford Works. Intensive tests are carried out during all design and production stages of Marconi equipments and systems*

jected to automatic tape-controlled inspection. Whatever the technique employed, it shares the common aim to provide fast, positive verification of the work in progress and the processes to drawings and specifications.

Subcontractors

A special organization exists in the Company to monitor the performance of outside suppliers of materials. Before a major order is placed, the subcontractor is visited, the adequacy of the inspection equipment and quality control arrangements is assessed and quality control data sheets are compiled, specifying the level and nature of the inspection that the subcontractors must undertake. A separate inspection and test facility in The Marconi Company ensures that each consignment received meets the specification requirement.

System Testing

Where appropriate, complete functional testing of systems is carried out to ensure that the equipment performs under operating conditions and that all aspects 'phase in' correctly.

TESTING *the components of outside suppliers is carried out in a special inspection and test facility*

MARCONI VALUE ENGINEERING

Value engineering is a discipline, the purpose of which is to reduce manufacturing costs. The successful achievement of this purpose is of significant benefit to the equipment user, for it becomes possible either to lower the price of the product or, in circumstances of rising labour and raw material costs, to maintain price levels. These ends can also be achieved of course by using conventional cost reduction methods, but the result can lead to a degradation of the product, whereas the application of value engineering principles unfailingly leads to product improvement. It is clearly in the customer's interest, therefore, to know which of these cost reduction methods a company adopts in order to achieve competitiveness in a fiercely competitive market.

The Marconi Company practises value engineering.

Since the mid-1960s it has maintained a specialist department whose sole responsibility is to introduce the V.E philosophy to the Company's engineers, to train them in its application and to help set up the conditions needed to put it into everyday practice.

Value engineering calls for a completely new attitude to design and for a sharpened analytical awareness. It demands that the engineer shall approach the design of a product with a mind free from preconceived ideas, habits and even cherished beliefs; that he shall unequivocally establish the product's function and produce a design which incorporates no mechanical feature or electronic circuit which is not absolutely germane to the fulfilment of that function. This discipline has far-reaching effects. It stimulates creative and imaginative thinking, frequently leading to the discardment of traditional, in favour of entirely new, materials, components and techniques; it results in design simplification which makes not only for production and testing economies but also for improved performance, greater reliability and ease of operation, reduced size, weight and maintenance costs and enhanced appearance.

TEAM WORK *Development, production and test engineers and estimators work together to apply the principles of value engineering to new and established equipment*

MARCONI AFTER SALES SERVICE

MARCONI CENTRAL DIVISION HEADQUARTERS, *base of the administrative offices and spares holdings. The Division's technical authors and draughtsmen are attached to each Product Division of the Company.*

The Marconi Company provides a comprehensive after sales service which is designed to meet every contingency during the long life of its equipments and systems.

The Company will contract to maintain and operate a system, alternatively it will arrange maintenance and equipment courses, locally or at Marconi College, Chelmsford, to which customers may send their own engineers. Full operating and maintenance information is given in manuals produced by the Company's Central Division, which administers one of the largest technical information groups in the electronics industry. Special-to-system, fully proven fault diagnostic aids and planned maintenance schedules can be supplied if required—a unique feature in the Company's after sales service.

Central Division administers the Company's spares service on behalf of all the Product Divisions except Aeronautical Division, for which special provision is made in order to meet the conditions imposed by the Air Registration Board.

The Marconi spares service is unequalled in its field anywhere in the world. It covers the free replacement of any part failing in the first year of equipment service otherwise than from misuse; it guarantees the availability of Marconi parts for 10 years from the date of equipment purchase—a period which in practice is often greatly exceeded; it covers the provision of non-Marconi parts—often at considerable expense to the Company. Central Division deals with demands for spares with the utmost speed and deals with emergencies under a special day-and-night, seven-day-a-week service which enables orders to be executed on average in 48 hours.

Central Division is also responsible for all repairs to customers' equipments executed on the Company's premises and for advising customers on carrying out their own maintenance. A system of exchange parts is shortly to be introduced, covering the more costly parts or those which are difficult to repair.

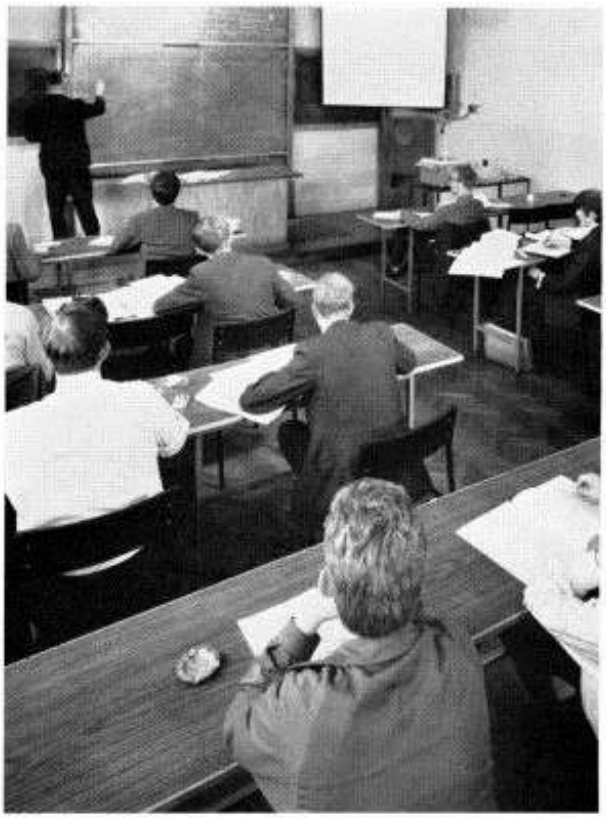
In addition to possessing a highly geared, all-embracing after sales organization, Marconi possesses an attitude towards its responsibilities which is second to none in the industry. The Company's interest and sense of involvement in the work it undertakes go far beyond contractual obligations and last for all time. Collaboration with the customer does not end with the execution of a contract and material help and advice are forthcoming whenever they are needed.

MARCONI TRAINING

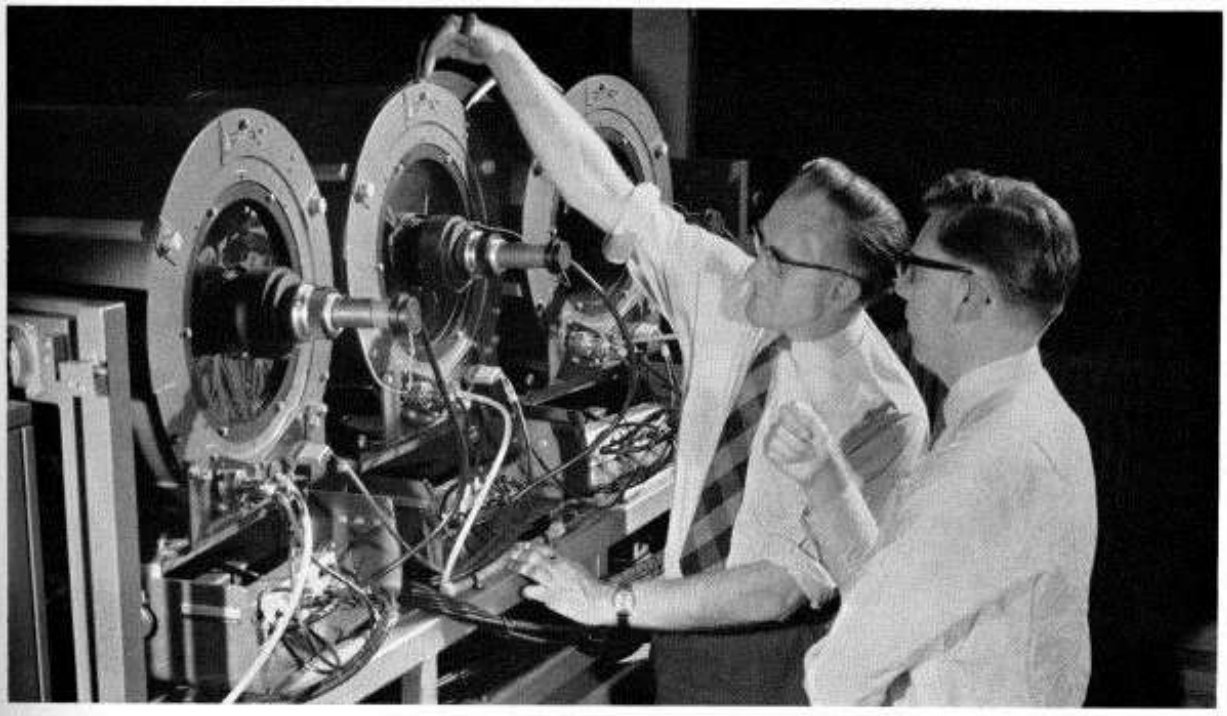
The Marconi Company will undertake the intensive training of customers' personnel at its College in Chelmsford.

Marconi College was founded in 1901 in the days when no facilities existed to instruct recruits in the science of radio. When the situation changed and radio science became an established discipline in many colleges and universities, Marconi College devoted itself to filling the gaps in man's knowledge which could never be satisfactorily dealt with elsewhere, either then or now. On the one hand it set out to teach Marconi customers' personnel new Marconi-applied techniques and the methods of setting up, operating and maintaining specific equipments and systems. On the other hand it set out to teach Marconi graduates how to apply their knowledge practically to the increasingly specialized work of the Company. These have remained the objectives to the present time and in achieving them the College has made a notable contribution to the high standards of technical and technological skill in this country and abroad. Engineers from more than fifty countries have received training during the last ten years. The College courses can be broadly classified in three groups:

Electronic Engineering Technology Group courses are designed to prepare customers' nominated engineers for senior posts in their own organization.



LECTURE ROOM *One of the fourteen lecture rooms which are allocated for the exclusive use of individual courses*



COLOUR TELEVISION PROJECTION LABORATORY *One of the thirteen fully equipped Marconi College laboratories*

MARCONI COLLEGE *Part of the College teaching complex*

Equipment Training Group courses are concerned with teaching the methods of setting up and maintaining production equipments and systems. *Systems Techniques Group* courses provide a general techniques training for members of a customer's staff who, while of good general calibre, need converting to a new technique or strengthening technically.

There are forty full-time engineer-lecturers associated with Marconi College, thirteen laboratories, all of which are fitted with up-to-date examples of production equipment, fourteen lecture rooms, a workshop, library and a residential wing.

In special circumstances, where it is not practicable for an overseas authority to send its staff to Britain, Marconi College will set up and staff a school in the country concerned. The Company will also, when required to do so, arrange for on-site equipment training to be given to customer personnel.

STUDY BEDROOMS *are provided for forty-four students*