FACTS ABOUT FAIRCHILD

FAIRCHILD CAMERA AND INSTRUMENT CORPORATION

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300 ROBBINS LANE, SYOSSET, LONG ISLAND, NEW YORK

Carl Schmidt

FAIRCHILD CAMERA AND INSTRUMENT CORPORATION

300 Robbins Lane, Syosset, Long Island, New York

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Transfer Agent
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Registrar
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Growth and Achievement . . . the story of

FAIRCHILD CAMERA AND INSTRUMENT CORPORATION

What is now Fairchild Camera and Instrument Corporation had its beginning in 1920 when Sherman M. Fairchild, Chairman of the Board, produced an aerial camera designed around his invention, an extremely fast and efficient between-the-lens shutter which made accurate aerial photography possible for the first time. This was the first in a long line of new engineering ideas, developed or sponsored by Mr. Fairchild, which have contributed to the company's steady growth.

The original aerial camera business has grown greatly since 1920. In World War II, ninety percent of all the aerial cameras used by the allied forces were of Fairchild design or manufacture. Through the years new products were fitted into Fairchild's production and engineering facilities. Many of these new products were born of necessity because it was impossible to find outside suppliers who would make them with the accuracy and performance standards that Fairchild required. At various times in its history Fairchild has designed and manufactured such widely diverse products as radio compasses, electronic gunsights, electro-mechanical components, sextants, high-fidelity professional sound recording equipment, graphic arts equipment, and a wide variety of special cameras including x-ray, ophthalmic, high-speed and motion picture.

In addition to pioneering in new products within the company, Fairchild's management has been alert to the possibilities of product expansion through the acquisition of other companies with compatible interests, the further development of which would result in strengthening the company's position and broaden its product base. Examples of this policy are the acquisition of the assets of the Teletypesetter Corporation from a subsidiary of Western Electric, the assets of Acme Telectronix Division of NEA Service, Inc., the Technical Products Division of the Waste King Corporation, the Circle Weld Company, Curtis Laboratories and the Cable Facilities of Pacific Mercury Electronics. A merger with the Allen B. Du Mont Laboratories brought many new products and capabilities to Fairchild as did the sponsorship and later acquisition of what is now the Fairchild Semiconductor Division.

Many future developments and products will come from the Corporation's current expansion in basic research. Fairchild has built and staffed modern laboratories for research into solid state photosensitive materials, photographic chemistry, semiconductor technology, and a \$2,000,000 Space Environments Laboratory – the only one of its kind. Each Division also maintains research and development sections concentrating on the particular Division's specialties.

By exercising such foresight, Fairchild Camera and Instrument Corporation has grown from the manufacture of a single product – an aerial camera – to a multi-division company with a wide variety of product lines and services for government, industry and the consumer.

SHERMAN M. FAIRCHILD, Chairman of the Board, Fairchild Camera and Instrument Corporation.

Soon after perfecting his first aerial camera in 1920, Sherman Fairchild promoted commercial aerial photographic mapping. In this 1925 picture he is shown loading a Fairchild K-3 Aerial Camera aboard a photo-plane prior to a commercial aerial photographic mission.

This Fairchild K-3 Camera was built in 1927 and was in continuous service until 1959 when it was retired to the Air Force Museum at Wright Patterson Air Force Base.

ORGANIZATION OF

FAIRCHILD CAMERA AND INSTRUMENT CORPORATION

BOARD OF DIRECTORS

Office of the President and Executive Vice President

Functionally, Fairchild Camera and Instrument Corporation operates as is indicated in the accompanying Functional Organization Chart, with the parent corporation serving as the control point from which divisional management policies stem.

Wholly owned subsidiaries, from the functional standpoint, operate in the same manner as the line divisions of the parent corporation.

This form of organization enables each operating division or subsidiary to concentrate on its own product development and research, and eliminates the conflict that exists in large centralized organizations in which many products compete for management attention and action.

At the same time, this degree of specialization permits these divisions to supply a pool of experts to back up any one division to an extent which is not possible in heterogeneous organizations.

This brochure attempts to describe only briefly the functions of the various divisions and the products and services offered by each. For further information on specific products, services or facilities you are invited to communicate directly with the pertinent division or its nearest district office listed on pages 33 to 36.

DEFENSE PRODUCTS DIVISION

SEMICONDUCTOR DIVISION

FAIRCHILD GRAPHIC EQUIPMENT

ALLEN B. DUMONT LABORATORIES DIVISIONS

FAIRCHILD CONTROLS CORPORATION

INDUSTRIAL PRODUCTS DIVISION

SPECIAL PRODUCTS DIVISION

BUSINESS MACHINES DIVISION

CABLE DIVISION

AERIAL SURVEYS DIVISION

FAIRCHILD INTERNATIONAL DIVISION

Fairchild is a pioneer in rapid film processing techniques. Model of rapid processing unit above is used for analyzing new approaches to viscous processing.

A section of the Division's Basic Research Laboratories, established in 1959. One of the best equipped laboratories of its kind, this facility has recently been expanded.

Below — Assembly section of the Du Mont Military Electronics Department, newly integrated with the Defense Products Division.

Large area displays created by Fairchild are of great stategic, planning and training importance to the armed services.

Headquarters of the **DEFENSE PRODUCTS DIVISION** is located in this modern 167,000 square foot facility at Syosset, L. I., New York.

FACTS ABOUT

THE DEFENSE PRODUCTS DIVISION

The Defense Products Division designs and produces specialized, high performance electro-optical systems and instruments for all branches of the armed forces, government agencies and major defense contractors.

An acknowledged leader in the aerial child has long been the nation's major photographic field since 1920, Fair- producer of reconnaissance and mapping equipment for the military. The Division's capabilities in the combined application of optics, electronics, mechanics, servomechanisms and computer techniques were substantially broadened in 1960 with the integration of the Du Mont Military Electronics organization. This addition has provided greatly increased competence in electronic reconnaissance and imaging systems, military television, communications, special radar and large area display systems and check-out equipment..

With the acquisition of Curtis Laboratories, Inc., in April 1961, the Division further expanded its capabilities to include the design and production of complex and highly precise optical sub-systems.

Today the Defense Products Division is an outstanding designer, developer and producer of data acquisition, processing and display systems, communication and special radar systems, electronic control systems, precision optical sub-systems, ground support equipment and ordnance products.

ENGINEERING SCOPE

The Defense Products engineering team has performed successfully on assignments ranging from feasibility studies to complete systems management programs. It has developed high acuity frame and panoramic cameras for wide angle, high resolution coverage from extreme altitudes, the first fully automatic tactical air-to-ground Photo Transmission System, and special data handling devices such as the Reassembly Viewer, Integrated Mapping System, Photographic Reproduction System, Target Map Coordinate Locator and Advanced Photogrammetric Charting System.

The Division has also developed and produced specialized programming, fuzing, safety and arming devices which are playing vital roles in a number of current missile, satellite and space programs.

Fairchild's special capabilities in the development of data handling devices is exemplified in the Integrated Mapping System illustrated below.

LINE DROP CONTOUR PLOTTER

STEREOPLOTTER

ORTHOPHOTOSCOPE

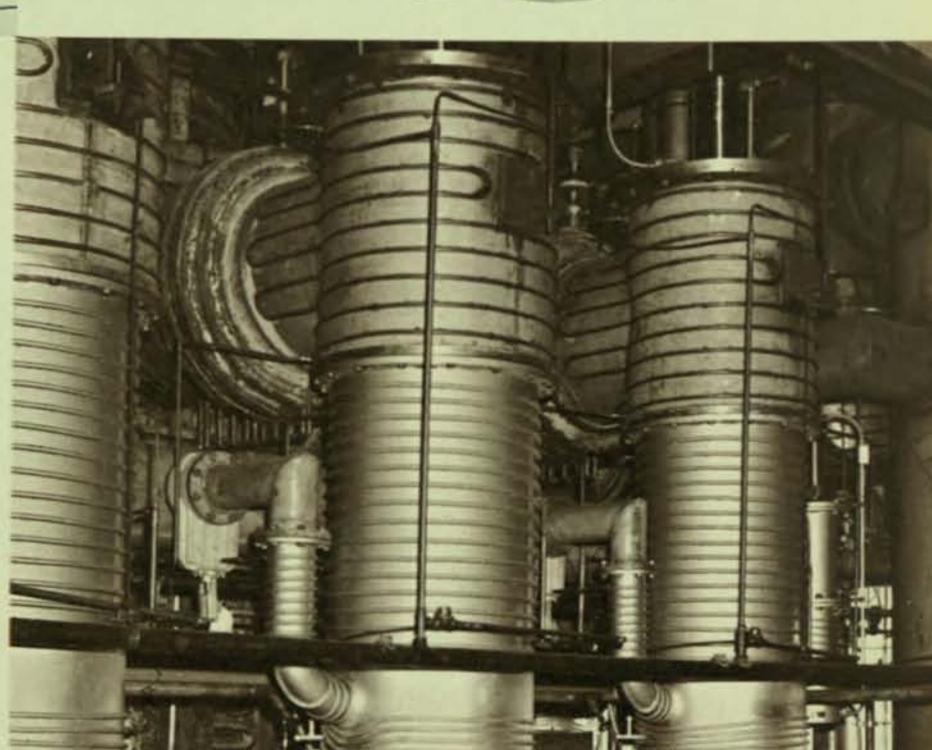
Modern data processing systems speed evaluation of engineering and research data in various departments of the Division.

Grinding and polishing operations produce optics to the most exacting requirements at the Curtis Optical Department.

Fairchild Television Missile Tracking system (left) is an an important link in our nation's defense system.

The K-47 Camera System (right) is a complete day-night, one-or-two-camera aerial photography system which provides the utmost versatility in photo reconnaissance.

The Division has developed specialized fuzing, arming and safety devices which are playing vital roles in current missile, satellite and space programs.



THE DEFENSE PRODUCTS DIVISION

Fairchild developed the first fully automatic tactical air-to-ground Photo Transmission System, the components of which are shown above.

An Advanced Studies Group is making substantial contributions in projecting the Division's technology into the aerospace environment. The Group recently completed a study for the National Aeronautics and Space Administration of the problem of accurately mapping the entire surface of the moon. Contract development work of a classified nature has also been accomplished in the satellite reconnaissance field.

The Du Mont Department's engineering team is composed of Reconnaissance, Data and Display, Test Equipment, Communications and Radar, Product Design and Advanced Development Laboratories. It is actively engaged in the development of complete sub-system and major components for real time, delayed readout or stored information systems including sensor, data link, processing, display, monitoring and control equipments. Transistorized electronic imaging systems for high resolution or minimum light requirements have been designed for integration with multi-sensor systems such as infra red, radar and photography.

RESEARCH AND DEVELOPMENT

Reflecting its determination to maintain its leadership in the photographic processing and reproduction fields, in 1959 the Division established a Basic Research laboratory and a Photographic Processing Laboratory. The success of research efforts in solid state photosensitive materials and photographic chemistry has resulted in further expansion of these facilities for conducting studies on new methods of recording images and the development of new photo-processing devices.

SPACE ENVIRONMENTS LABORATORY

A major $2 million addition to the Division's test facilities, the Space Environments Laboratory, provides a unique means of testing a variety of surveillance and charting sensors in the combined altitude, temperature and vibration conditions encountered throughout the mission profile of space vehicles. Its large size and pumping capacity permits entire systems to be evaluated at simulated altitudes up to 200 miles. A 36 inch parabolic collimator of highest optical quality can be moved on tracks to a position beneath the vacuum chamber for resolution testing of very long focal length, large relative aperture, diffraction limited optical systems.

Three of the six 32-inch high-vacuum pumps which are part of the Space Environments Laboratory, Fairchild's unique test facility for testing surveillance and charting sensors in the combined altitude, temperature and vibration conditions encountered in space vehicles.

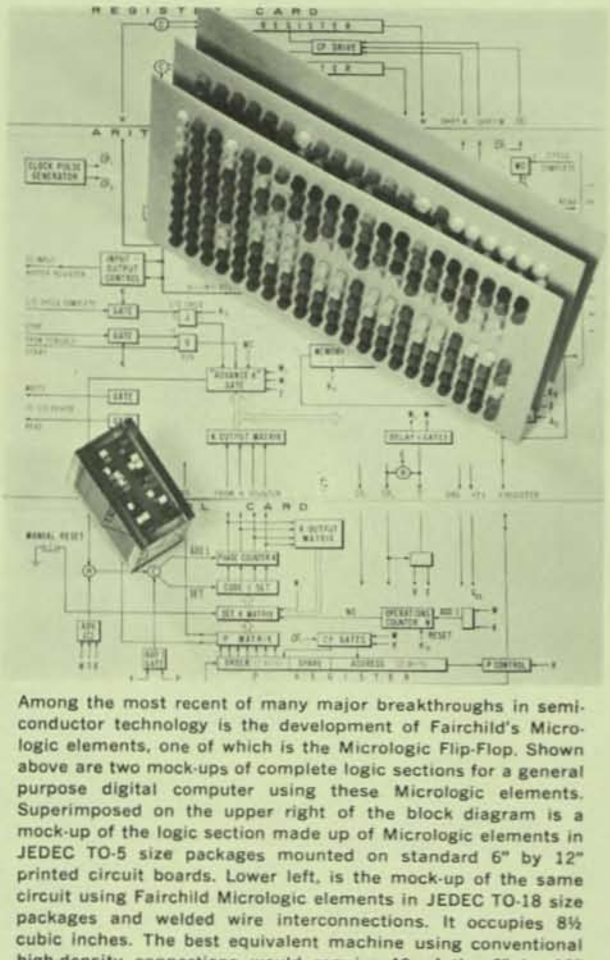
PRODUCTION

Quality control is maintained over every phase of production and all new materials, lubricants and finishes are carefully analyzed by a Metallurgical Laboratory to insure adherence to customer quality and reliability specifications.

Manufacturing facilities are equipped with modern machinery capable of producing the finest precision work to close tolerances and of meeting highest military specifications.

The Du Mont plant maintains its own environmental testing facilities and the Curtis Optical Department, as part of its equipment for production of optical systems and components to the most exact requirements, has a high vacuum coating facility and specialized collimation equipment.

The Division's rapidly growing engineering, research and production facilities encompass over 400,000 square feet of space at Syosset, Long Island, Clifton, New Jersey and Los Angeles, California. Located at Syosset are the Division's headquarters, its administrative offices, engineering, research, development, environmental test and manufacturing facilities, and the Systems Management and Engineering Department. The Du Mont Department occupies 130,000 square feet in Clifton and the Curtis Optical Department has a 20,000 square foot facility in Los Angeles.



Among the most recent of many major breakthroughs in semiconductor technology is the development of Fairchild's Micrologic elements, one of which is the Micrologic Flip-Flop. Shown above are two mock-ups of complete logic sections for a general purpose digital computer using these Micrologic elements. Superimposed on the upper right of the block diagram is a mock-up of the logic section made up of Micrologic elements in JEDEC TO-5 size packages mounted on standard 6" by 12" printed circuit boards. Lower left, is the mock-up of the same circuit using Fairchild Micrologic elements in JEDEC TO-18 size packages and welded wire interconnections. It occupies 8½ cubic inches. The best equivalent machine using conventional high-density connections would require 40 of the 6" by 12" printed circuit boards.

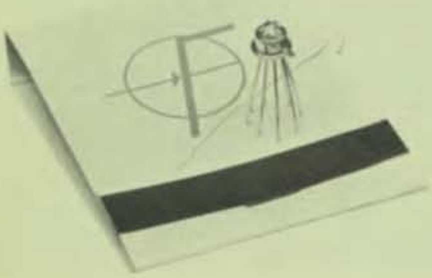
Fairchild's Micrologic flip-flop **(right)** first announced by the firm at the 1961 IRE Show in New York.

Below (right) — An inspector in the Quality Assurance Department tests diodes on the reverse current checker.

Below — Progress is being checked on the silicon ingot being grown in the crystal-growing furnace. This is the first step in the manufacture of transistors.

FACTS ABOUT F THE SEMICONDUCTOR DIVISION

Above — **SEMICONDUCTOR DIVISION** headquarters and transistor plant at Mountain View, Calif.
Left to right on opposite page are **INSTRUMENTATION DEPARTMENT,** Palo Alto; **RELIABILITY EVALUATION DIVISION** building at Mountain View; **RESEARCH AND DEVELOPMENT LABORATORY,** Palo Alto; and **DIODE PLANT** at San Rafael, Calif. The above facilities total approximately 180,000 square feet.



An electronic revolution began with the development of the transistor in 1948. Historically, Fairchild Semiconductor Division was a latecomer, founded in 1957; but within less than three years it had attained an undeniable position of leadership. Its achievement in translating the double diffusion technology to volume production of advanced silicon transistors has placed Fairchild at the top of the semiconductor industry.

The Division, from its beginning, has carried on a dynamic program of research, tool design and pilot production. The Fairchild "Mesa" transistor was the first in its class and "Mesa" became a byword in the industry. Fairchild became the "state of the art" leader in the field.

The succeeding array of new products represents continuing development leadership. The complementary PNP type silicon transistor opened entirely new areas of complementary switching and amplifying circuitry; the 2N706, a new type of 500 mc silicon logic transistor, is highly advantageous in computer applications.

The Planar process, developed exclusively by Fairchild, has been one of the firm's most important technological breakthroughs to date. Planar devices feature an integral oxide surface on the wafer; surface dependent characteristics do not deteriorate with time, leakage is extremely low and gain is usable down to very low current levels. The Planar process afforded a production and product advantage in diode manufacture and signalled the Division's entry into that market.

Another new development, the Planar Epitaxial process, makes possible the design of improved circuits with usable current gain over a broader current range than either could achieve alone.

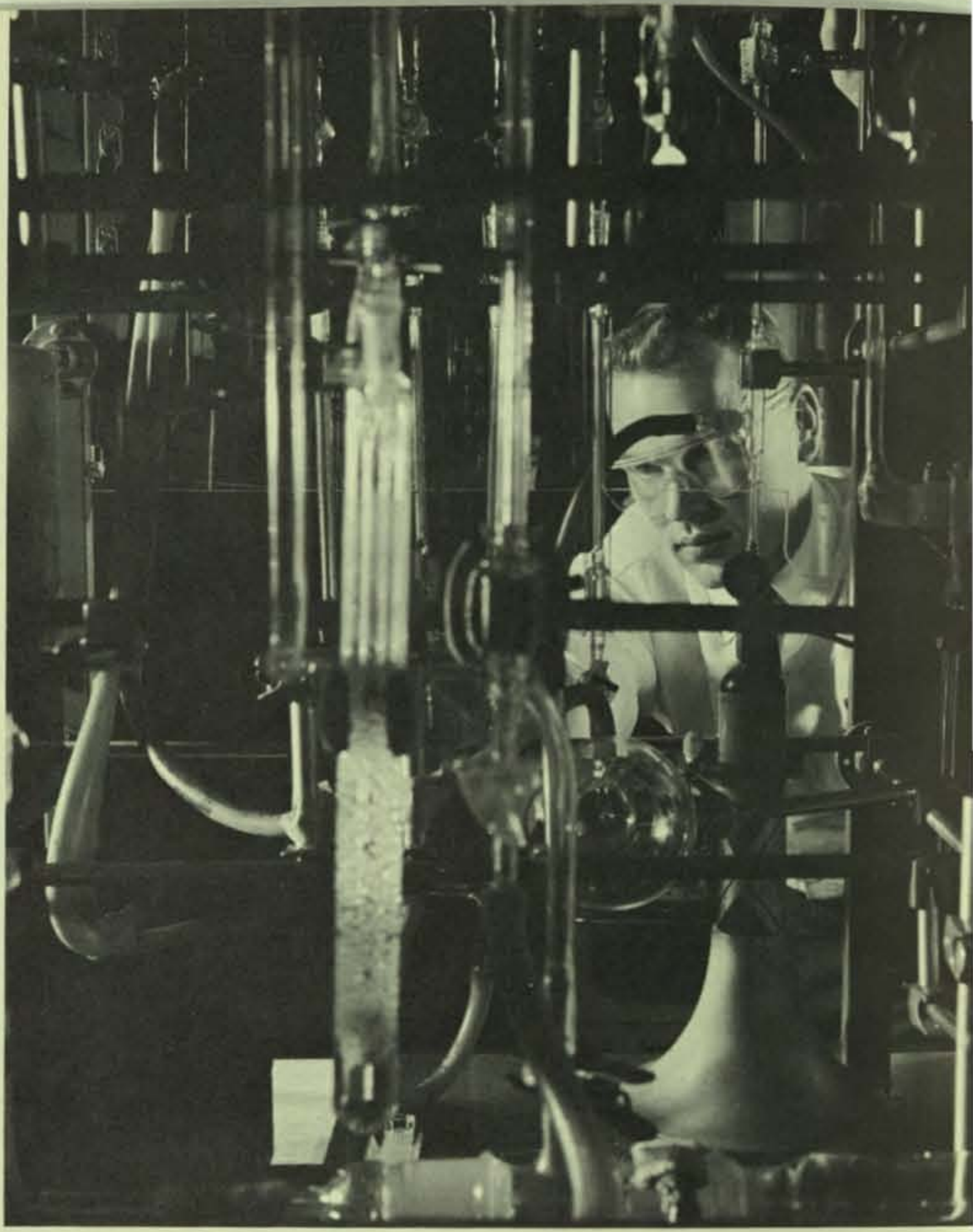
The Micrologic flip-flop is the first element of the Micrologic family of digital functional blocks produced by Fairchild. the six elements of the family are sufficient to build efficiently the complete logic section of a digital computer or control system. The Micrologic concept — diffusing a complete circuit into a silicon chip — represents another "first" for Fairchild.

The Division's Instrumentation group designed and built a number of transistor testers of both the go, no-go and absolute readout types to meet the need created by Fairchild's technology in the production of Planar devices.

A Special Products group is responsible for the production and sale of multiple assemblies of standard transistors and/or diodes packaged as a single unit and developed for particular applications.

Fairchild's Type 4 Tester, one of the transistor testers designed and produced by the firm and now being marketed on special order.

In addition to offering single types of the devices, Fajrchild offers Planar diodes packaged in pairs and quads with matched characteristics. The devices simplify component mounting



and improve circuit performance besides offering ultra-fast recovery time and high conductance.

Early in 1960, Fairchild embarked on the industry's most comprehensive evaluation program of electronic reliability. Two contracts from Autonetics, a division of North American Aviation, Inc., associate prime contractor for the MINUTEMAN ICBM program, called for reliability evaluation. The Reliability Evaluation Division was established to conceive and execute life testing of transistors under varied conditions. R. E. D., a separate group within the Semiconductor Division, is continuing an extensive program of testing for constant improvement in the performance of Fairchild devices. An unprecedented reliability level of .001% per 1,000 hours has been set as the program's goal.

New distributors are constantly being added to the nation-wide marketing network. Internationally, the acquisition of an interest in Societa General Semiconduttori SpA, (SGS) an Italian Semiconductor firm in Milan, provides for reciprocal marketing rights to the Companies' devices.

Present facilities occupy approximately 180,000 square feet in six locations. Headquarters and transistor production are in Mountain View, the Research and Development Laboratory in Palo Alto, and the Diode plant is in San Rafael, California.

Increased facilities have become necessary due to the Division's rapid growth, and construction began in April 1961 on an addition to the Mountain View plant. Construction was also scheduled in 1961 for a new Research and Development facility in Palo Alto on the Stanford University campus area. The present R & D lab will be retained for other departments of the Division.

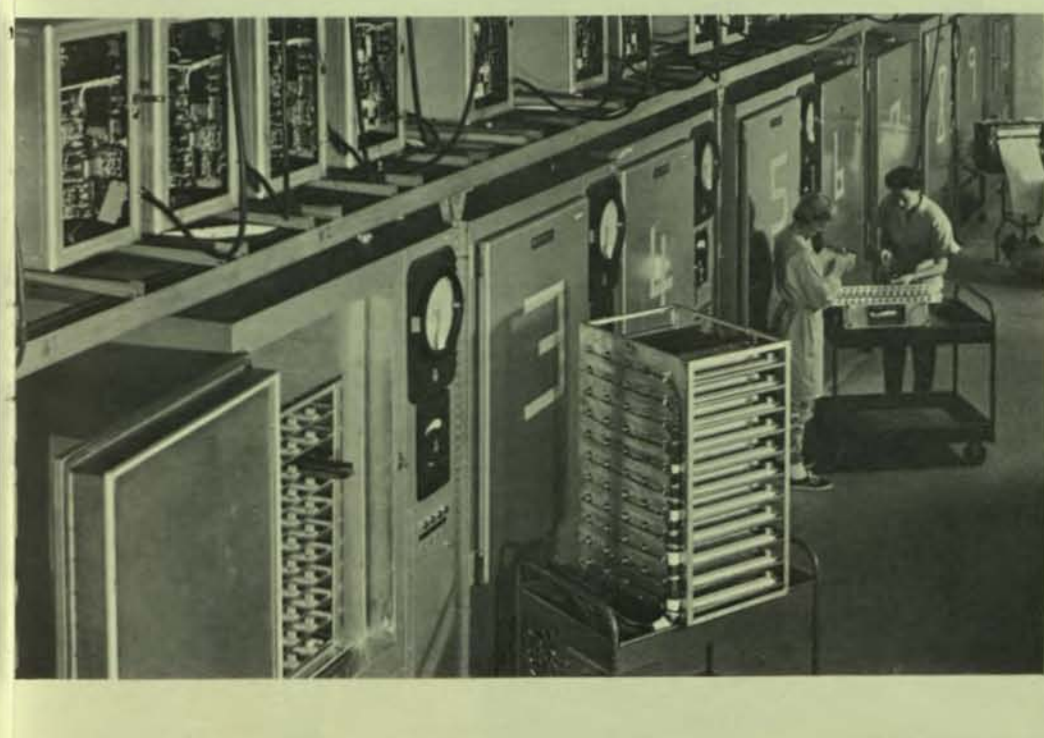
The Instrumentation group is housed near the R & D laboratory, and temporary facilities have been rented near the main transistor plant for three other departments of the company. The Reliability Evaluation Division maintains its own Mountain View site.

Present plans will bring Semiconductor facilities to 283,000 square feet, the necessary space for increased research and development as well as production expansion.

Above (left) — Engineer takes readings on the flow meter at a diffusion furnace. The meter controls the flow of gases into the furnace and the gases, by a diffusion process, tailor the semiconducting properties of silicon.

A part of the production line at the main Fairchild transistor plant in Mountain View is shown at **left below.**

Below — Some of the 28 environmental test chambers used by the Reliability Evaluation Division in life-testing transistors for a period up to 18 months.



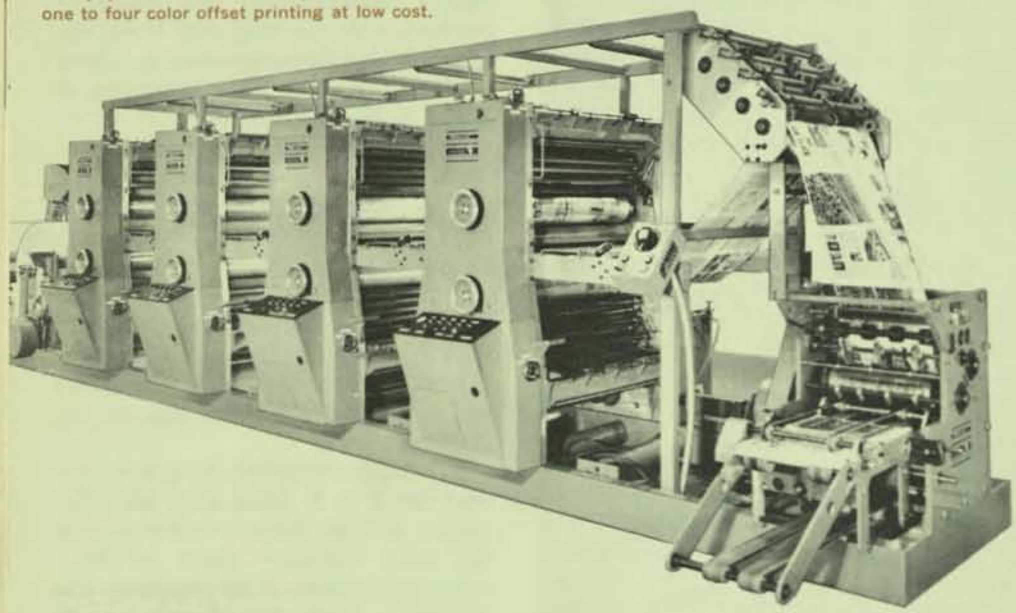
[illegible] View plant will look like when the addition is completed

Archite[illegible] Research and Development Laboratory to be built during 1961 in Palo Alto, California.

Left – SCAN-A-PLATE®, Fairchild's specialized plate-making material, is manufactured in this 9,500 square foot plant at Syosset, N. Y.

Right – ADMINISTRATIVE, SALES and **SERVICE** headquarters of the Division are located in this modern, 58,500 square foot plant at Plainview, N. Y.

The Color King Web Offset Perfecting Press offers newspapers and commercial printers high quality one to four color offset printing at low cost.



Teletypesetter equipment, which automates Linotype and Intertype linecasting machines has enjoyed world-wide acceptance. The Perforator Unit shown **above** uses a typewriter-like keyboard to punch tape from which the linecasting machine is operated automatically.

Scan-A-Color **(extreme left)** electronically produces color-corrected separations for use in letterpress, offset and gravure printing.

The Scan-A-Graver ILLUSTRATOR, one in a complete line of electronic engravers, is widely used by newspapers throughout the world.

Fairchild Graphic designed and built the first automatic exposure and wash-out equipment **(below left)** for processing DuPont "Dycril" photopolymer printing plates.

FACTS ABOUT FAIRCHILD GRAPHIC EQUIPMENT

Fairchild moved into the graphic arts field in 1948 with the introduction of the Scan-A-Graver, an electronic engraving device which produces halftone printing plates for the newspaper and printing industry.

Acceptance of this new machine was so enthusiastic that in 1955 a separate division was organized to extend and develop Fairchild's talents in the fields of optics, electronics and precision mechanics to serve more areas in the graphic arts.

Since then Scan-A-Graver and an improved enlarging and reducing version, the Scan-A-Sizer, have become the accepted and standard method of producing halftone engravings for thousands of newspapers in the U.S., and Canada and throughout the world.

PRODUCTS RESULTING FROM SCANNING TECHNIQUES

Fairchild know-how in electronic scanning techniques led to the development of Scan-A-Color, a device which provides a fast, economical means of producing color-corrected separations electronically for use in letterpress, offset and gravure.

The Division also devised an electronic printing rectifier for the Air Force. This device accepts oblique aerial photographs and reproduces a rectified vertical image therefrom.

TELETYPESETTER SYSTEMS

In 1958 the Division acquired the assets of the Teletypesetter Corporation from a subsidiary of Western Electric. Teletypesetter equipment is used to automate linecasting machines by means of perforated tape. The equipment is used by both large and small newspapers, news services and book printers, as well as publications having multi-plant operations in various parts of the country. It can also be used to automate address plate embossing machinery.

The Division has developed several Teletypesetter accessories. The Rule Dropper automatically inserts cut-off rules between classified advertising copy. The Mat Detector automatically senses failure of a matrix to drop or other malfunction of the linecasting machine — thereby saving substantial correction time. The Fairchild Allotter programs a battery of linecasting machines keeping them automatically and steadily supplied with tape.

EQUIPMENT FOR PHOTOPOLYMER PROCESS

The Division, cooperating with the engineering and research staff of DuPont, designed and built the first automatic exposure and washout equipment for processing "Dycril" photopolymer printing plates. The first equipment deliveries were made to DuPont in 1956. Since then many installations have been made for a variety of applications. Continuing cooperation with the DuPont organization insures the production of the most efficient "Dycril" processing equipment.

WEB OFFSET PERFECTING PRESS

With the acquisition in 1961 of the Technical Products Division of the Waste King Corporation, the Division undertook the marketing and servicing of the Color King Web Offset Perfecting Press. This press is designed for the small and medium size newspaper and the commercial printer. It offers all the advantages of offset printing — reduction of overhead costs, faster and better reproduction, greater flexibility in layout, easy reproduction of art and photos — plus color. It may be used as a one color press, for spot color and for two, three and four color process.

FACSIMILE EQUIPMENT

Early in 1961 Fairchild announced a new type of facsimile transmitting and receiving equipment for industrial use. Developed by the Graphic Division, Scan-A-Fax features transistorized circuitry as well as a series of operational features which provide greater transmission and recording capacity. Scan-A-Fax transmits information (written, drawn, typed, printed or photographed) by flat bed scanning, which permits transmission of almost infinite length copy. This equipment is considerably lighter, more compact and more durable than its predecessors. Scan-A-Fax is marketed by a special department of the Corporation.

The Division has its headquarters in Plainview, Long Island, New York; manufacturing facilities in Joplin, Missouri; and maintains a plant in Syosset, New York for the manufacture of Scan-A-Plate, its specialized platemaking material.

Overseas, the Division maintains a sales, service and manufacturing facility in the Netherlands and sales and service offices in Canada and in England.

The Scan-A-Fax transmitter.

The Scan-A-Fax receiver.

Newly developed, low priced, miniature closed-circuit television camera can be used for industry, business or at home. It connects by wire directly to a standard television receiver or professional video monitor.

The **DU MONT DIVISIONS** occupy buildings totalling 215,000 square feet in Clifton, New Jersey, which house management, sales, engineering, and production.

Closed-circuit television camera and high quality microscope in a single package for use in medical research laboratories, medical teaching, and biology classes.

Du Mont's Type K1202 character cathode-ray tube is utilized in the Missile Master System. This System is being installed and operated by the Armed Services for the protection of key metropolitan areas.

The Du Mont EnginScope is used as part of the final quality control checking of all vehicles made at Ford Motor Company plants.

FACTS ABOUT

ALLEN B. DUMONT LABORATORIES DIVISIONS

Top to bottom, the new Du Mont double-ended scan converter storage tube; an advanced design of an oscilloscope tube for modern instruments; and a new, lightweight, compact radar tube particularly suited for use in aircraft where weight and size are vital factors.

Production of complicated tube types requires a high degree of skilled craftsmanship in glass handling and fabrication.

The Allen B. Du Mont Laboratories became divisions of Fairchild Camera and Instrument Corporation following a merger in July, 1960.

The two Du Mont Divisions covered here are the Electronic Tube Division and the Industrial Electronics Division.

Du Mont Laboratories' history dates back to 1931 when Dr. Allen B. Du Mont produced the first commercially practical cathode-ray tube, the visual indicating device of television, radar, oscilloscopes, and other electronic equipment. Its operations today are concentrated on intensive engineering and market expansion in electronic tubes, scientific electronic instruments, two-way mobile radio, closed-circuit and industrial television systems, and automotive test equipment.

THE ELECTRONIC TUBE DIVISION

This Division makes almost 2,000 types of cathode-ray tubes. Its leading position in the field is constantly being strengthened by development in the areas of improved gain, transit time, resolution, smaller size and lower drive, heater, power, and deflection power requirements.

Cathode-ray tubes by the Du Mont Division are used in original equipment or as replacement for all major oscilloscope manufacturers. A large number of tube types are used in military and commercial ground and airborne radar. The military services of the United States are prime users of Du Mont tubes — as direct purchases and in military equipment furnished by other manufacturers.

MULTIPLIER PHOTOTUBES

The design and manufacture of multiplier phototubes is virtually an industry unto itself. These tubes convert light to an electrical signal and then multiply that signal as much as one million times.

Different tube types are made to range throughout the color spectrum — from ultra-violet to infra-red. For example, the tubes that react to infra-red light are used in the Metascope for map-reading by tactical forces in absolute darkness and they are used in the modern army "weapon-sight."

Multiplier phototubes find extensive application in nuclear research and in radiation and measuring equipment. In combination with scintillation crystals they are utilized for quantitative and qualitative analysis of radiation. They are used also in geological exploration, for petroleum and minerals and age determination of material through carbon 14 counting equipment. Du Mont multiplier phototubes are produced with diameters of from ¾" to 21".

STORAGE TUBES

This is a rapidly growing, yet relatively new, field of cathode-ray tube technology in which the Du Mont Divisions are placing special research and engineering emphasis.

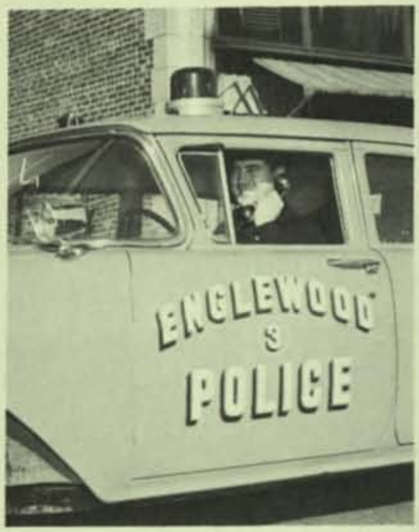
These tubes permit display retention far beyond the capabilities of ordinary phosphor persistence, have high brightness, and permit erasing all, or any portion of the display at will. Recent developments include image storatrons, scan converters, and "write-through" storage tubes. Du Mont direct-view storage tubes are used for data display in radar applications, in military reconnaissance, analog analyses, airport traffic control, and in many other fields where sharp, bright, long-lasting displays are important.

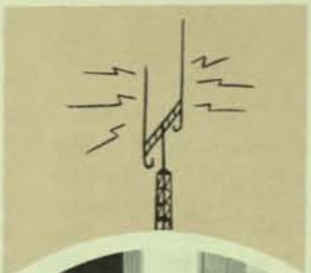
MICROWAVE TUBES

During the past three years Du Mont has developed and manufactured planar triode tubes for microwave applications. Low noise R. F. amplifier tubes and high frequency pulse tubes have also been developed.

OTHER DEVELOPMENTS

Among major tube research and development projects at the Du Mont Divisions are: fiber optics — the art of transmitting visual information through bundles of flexible hollow glass fibres, printing tubes — permitting the recording of transmitted information on sensitized paper for high quality pictures, Du Mont's two-way mobile radio communications, TRANSICOM, is saving money and time for many businesses, government agencies and municipal departments that use trucks, cars or other vehicles. Units are transistorized, small in size and low in cost.





Du Mont Cathode-Ray Tubes are used in display indicators of new meteorological radar sets now in use by the United States Weather Bureau for more accurate and immediate weather forecasting.

The Du Mont Divisions produce one of the most extensive lines of cathode ray oscilloscopes in the industry. Shown below are a group of the new type 425 Digital Read-Out Oscilloscopes undergoing final inspection. Exacting quality control procedures provide finished instruments of highest reliability.

and general improvements in uniformity of response, phosphor research, lower noise, and other refinements.

INDUSTRIAL ELECTRONICS DIVISION

This Division encompasses products in four separate fields: electronic instrumentation, 2-way mobile radio, closed-circuit television systems, and electronic automotive test equipment.

ELECTRONIC INSTRUMENTS

A full line of oscilloscopes in all frequency ranges, storage and dual-beam oscilloscopes, pulse generators, oscilloscope record-cameras, plus many specialized measuring instruments produced in the Electronic Instrument Department of the Division. Recent developments include: new plug-in units to extend the existing ultra-versatility of the Du Mont Type 425 high-frequency direct digital readout oscilloscope, an extremely high-sensitivity Type 403-B oscilloscope, a pulse generator with ranges extended over that of existing equipment, and a high-frequency oscilloscope with all of the versatile features of the 425 for those applications not requiring readout.

Specialized and standard scopes are used in large quantities in military systems such as radar monitoring systems, specialized oscilloscopes for the Federal Aviation Agency, automatic test equipment for the Minuteman missile, and for calibration of U.S. Navy test equipment.

AUTOMOTIVE TEST EQUIPMENT

Du Mont automotive type oscilloscope test equipment utilizes a Du Mont-patented "raster" presentation — a series of fact-revealing traces which permit analysis of all cylinders of an internal combustion engine simultaneously on full screen. The newest product, the Type 904 Ignitionscope, includes circuitry for supplying synchronizing power to an accessory Du Mont timing light, permitting engine analysis without the need for extra leads in under-the-hood working area. Du Mont automotive test equipment is used by service stations, garages, fleet operators, car dealers, automobile manufacturers, military bases, and in others requiring analysis of internal-combustion type engines.

TWO-WAY MOBILE RADIO

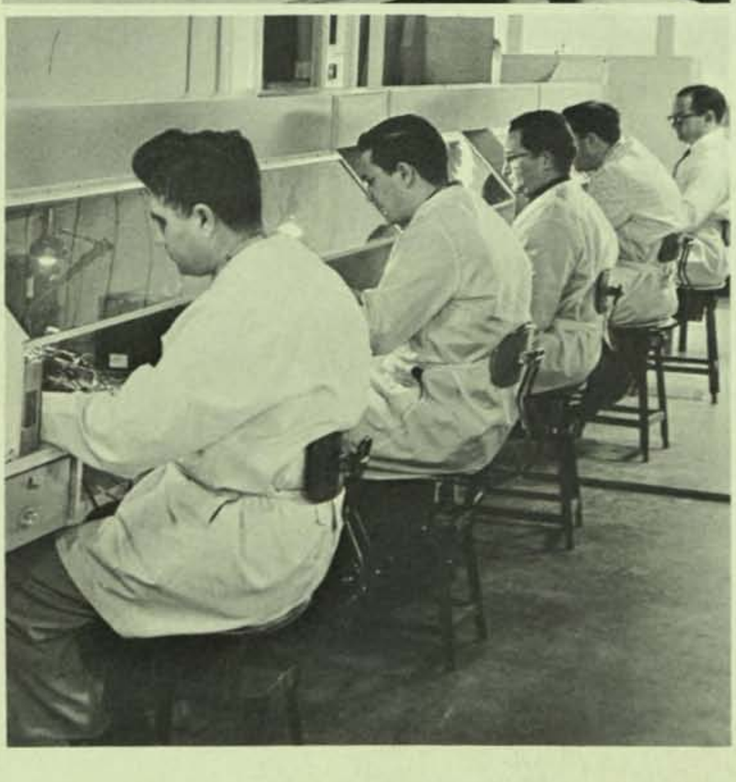
The Division produces and markets two-way radio equipments for all types of vehicle-to-vehicle and vehicle-to-base station requirements. The TRANSICOM line is a compact, economical, easily operated transmitter/receiver. This line includes models that satisfy requirements for ac or dc operation for varying distance ranges, and in different mounting arrangements. Backing the TRANSICOM is an extensive line of accessories to broaden the usefulness of two-way radio equipment. Du Mont two-way radio equipment is presently used by many of the country's largest municipalities, in fire and police departments, public utilities and in hundreds of industries requiring two-way communication with vehicles.

INDUSTRIAL TELEVISION

A complete line of cameras, monitors, control equipment, and associated accessories marketed through a network of distributor/installers from coast to coast is accounting for a steady growth in this product line. Du Mont Industrial Television installations are found in all types of public institutions, schools, utilities, business operations, railroads, banks, department stores, hospitals, industrial plants and military establishments. Recently added to the line is the Du Mont Teleye® — a compact, economical TV camera that displays a high resolution picture on either a monitor or commercial TV receiver. Du Mont also provides and merchandises a Micro Vue system which uses a TV camera and microscope in combination for large display of microscopic material.

Precision production and test equipment and a high order of manual skill are combined in the assembly of the Division's new 3S-G Pressure Transducer.

The 3S-G Solid-State Strain Gage Pressure Transducer, an advanced type of pressure transducer of unusual reliability and performance, possesses extraordinary accuracy and environmental capabilities.



Final assembly of precision components is accomplished under positive-pressure bench hoods supplying electrostatically cleaned air.

FACTS ABOUT FAIRCHILD CONTROLS CORPORATION

East Coast Headquarters of **FAIRCHILD CONTROLS CORPORATION,** occupying 43,000 square feet of air-conditioned space, houses management, marketing, engineering and production.

West Coast plant (left above) is a modern 24,000 square foot building housing marketing, engineering and production.

Fairchild, a leader in the precision potentiometer field, since 1947, has pioneered new designs and production techniques in developing a full line of precision, high-reliability sensing components for the electronics and avionics industries.

POTENTIOMETERS

Fairchild potentiometers, the outgrowth of a World War II requirement for accurate, high-performance components in an all-electrical gunfire control system, are specified where accuracy and the utmost in reliability is required. They are used in such applications as missile guidance and control systems, aircraft instruments, radar and fire control systems, and various computers. A staff of applications specialists is constantly developing special units to meet unusual or difficult requirements.

NEW SENSING DEVICES ADDED TO THE LINE

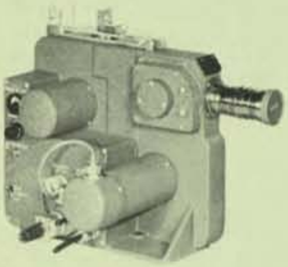
In 1956, Fairchild introduced a line of precision pressure transducers, and the next year accelerometers were added. These lines have now been expanded to include a variety of altitude and airspeed sensors as well as transducers to measure pressure from as low as 1 psi to as high as 10,000 psi.

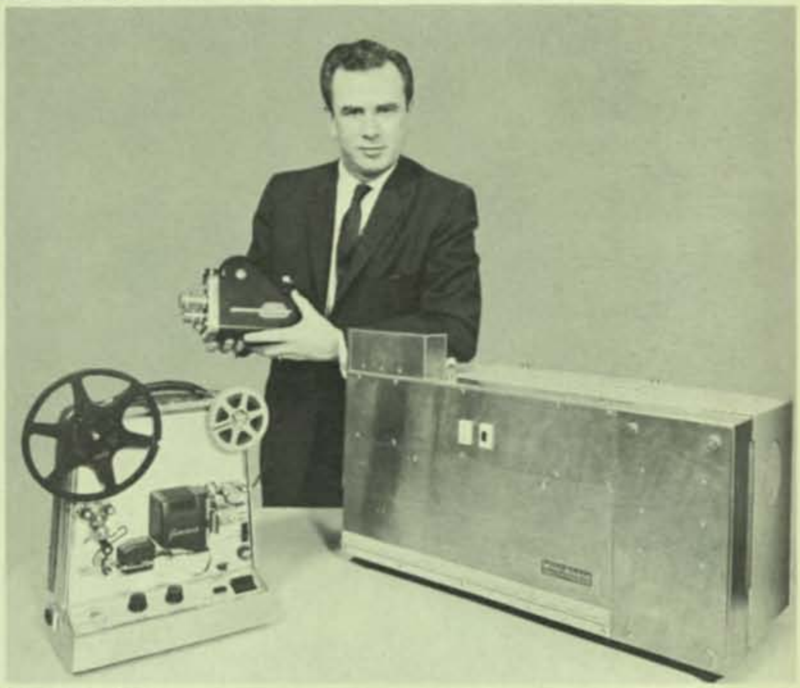
The first of a line of miniature rate gyros with tremendously increased shock resistance, the result of years of research, development and test work, was first shown in the spring of 1958. Thereafter production was begun on a miniature guidance "brain" using three of these gyros and two Fairchild accelerometers combined in the smallest package of this type yet produced.

In 1960 a new kind of pressure transducer, the 3S-G Silicon Semiconductor Strain Gage Pressure Transducer was developed by the Division in cooperation with Semiconductor Division. This is the first of a complete new line of Solid-State Strain Gage Transducers. The 3S-G pressure transducer possesses extraordinary accuracy, repeatability and environmental capabilities. It can be used with either digital or analog systems and has wide application potential.

The Division operates two plant facilities, one on the east coast and the other on the west coast. Both offer complete engineering, sales, development and production facilities. The east coast plant at Hicksville, Long Island, New York, includes three buildings, totaling 50,000 square feet. The Los Angeles plant, has 24,000 square feet of modern production space with provisions for expansion. All plants are completely air-conditioned with special provision for the removal of dust particles in all assembly areas.

Fairchild Components are assembled under carefully controlled atmospheric conditions as in this gyro assembly "clean" room.





The HS401, a lightweight, high-speed Motion Analysis Camera **(above)**, provides maximum efficiency in rapid start-stop applications. This 16mm camera permits repeated short bursts at all speeds up to 8,000 pictures per second.

The Fairchild Photographic Flight Analyzer **(left above)** records 58 abutting images of an aircraft's space trajectory.

The Fairchild Cinephonic 8 **(right above)** is the first 8mm movie camera with built-in magnetic sound recording head. Its companion sound projector-recorder offers several exclusive features.

Television stations are using the Cinephonic 8 Camera and Projector together with Fairchild's Mini-Rapid 16, a portable, automatic, rapid processor for 16mm film **(right)**. This combination enables the station to produce low budget sound news films.

Sales demonstrations, sales training, and audio-visual instruction are just a few of the uses for this new lightweight Fairchild Cinephonic 200 8mm rear-view sound projector **(below right)**.

Fairchild-Polaroid Identification cameras **(below)** are used in defense plants, government agencies, department stores and other business and industrial establishments where personnel identification photos and records are required.

Management, marketing and engineering facilities of the Division occupy this 10,000 square foot building in Yonkers, New York.

FACTS ABOUT THE INDUSTRIAL PRODUCTS DIVISION

The Industrial Products Division produces and markets a broad line of special cameras and related equipment for industrial, consumer and commercial use.

HOME SOUND MOVIE CAMERAS

In 1960 the Division introduced the world's first 8mm home movie camera with self-contained, synchronized magnetic sound – the Fairchild Cinephonic 8. A companion sound projector-recorder was also introduced. Sound film, in color or black and white, developed by Ansco, is marketed under the Fairchild label. Accessories to this line are also offered by the Division.

Cinephonic 8 equipment is being sold to the advanced amateur, business and educational markets through over 500 franchised dealers.

REAR SCREEN PROJECTORS

A line of portable 8mm sound movie projection equipment especially designed for sales demonstrations, training, and for audio-visual instruction was introduced early in 1961. The projectors are each about the size of a small portable typewriter and weigh less than fifteen pounds. Two models are being produced; one has a 200′ capacity, equal to 11 minutes showing time; the other has 400′ capacity for up to 22 minutes showing time. Each projector incorporates a continuous film magazine which does not require rethreading of the film, but replays continuously. Applications for this equipment include use in sales demonstrations, social services, in travel agencies, and in department stores.

SPECIALIZED PHOTOGRAPHIC EQUIPMENT

The Division offers a line of specialized cameras for industrial use. Among them is a group of high speed motion analysis cameras and related equipment. Used by engineers to detect malfunctions in high speed machinery, in missile testing and in similar fields, these 16mm motion picture cameras are capable of taking up to 8,000 frames per second. The Division has also developed specialized instrumentation equipment for use with the cameras, including remote control and timing devices, exposure meters and specialized motors.

Fairchild Oscilloscope cameras with Polaroid film attachments are widely used by design and test engineers in research laboratories and in all applications requiring permanent or semi-permanent records of oscilloscope traces. A Polaroid-back Identification camera used by industrial security, police agencies and all organizations needing quantity personnel records is also offered.

Marketed by the Division are several other specialized cameras: Fairchild System Siemens, a 16mm recording camera especially useful in laboratory and scientific work; Fairchild-Camerz, featuring a unique system of interchangeable film magazines and other accessories for industrial and military requirements; and the Fairchild Photographic Flight Analyzer which records on a single record, the take-off or landing space trajectory of a moving object.

The Fairchild System Siemens (top) is a versatile 16mm recording camera designed for a wide range of laboratory and scientific photo applications.

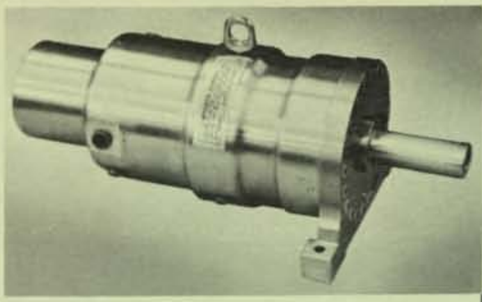
Fairchild-Camerz, another exceptionally versatile 35 to 70 mm photo-recording system, features a wide range of interchangeable magazines and accessories that can be adapted to meet virtually any photo-recording application.

FILM PROCESSING EQUIPMENT

The first of the Division's line of film processing equipment was introduced in 1957. This was the Mini-Rapid 16, a portable, automatic, rapid processor for 16mm motion picture film. It will completely process 100 feet of film, dry-to-dry and ready for viewing, in approximately 20 minutes.

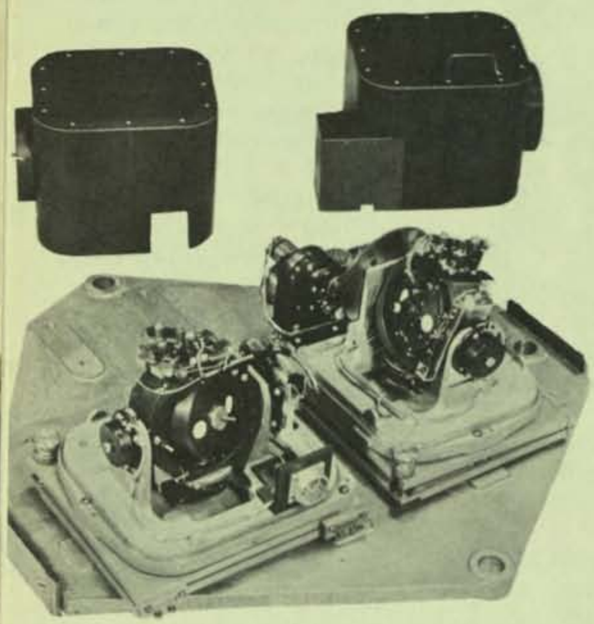
In addition to its industrial applications the device has proved popular with television stations which use it as a fast, money saving means of rushing news films onto the air waves at speeds unobtainable with other methods of processing. Television stations also find that the Mini-Rapid, with the Cinephonic 8 and Fairchild's 8mm Television Projector, affords low budget sound news film coverage as well as enabling the small station to film local commercials and special features.

The Division is headquartered at 580 Midland Avenue, Yonkers, N.Y.



ICBM Launchers depend on this Hydraulic Temperature Compensator to compensate for thermal expansion of the hydraulic oil supplied to the vertical maintenance system.

Quality Control at Special Products Division is maintained at a very high level. All critical parts, tube configurations, irregular profiles, etc. are constantly checked on a statistical quality control sampling basis.



The LEV III Gyro, described as "the workhorse of missilery" has been used in firings of the Redstone, Pershing, and Mercury Missiles as well as others.

A few of the many special configurations produced by the Circle Weld Department of the Special Products Division. These include manifold ducting, flexible sections, bent tubes, element forms, bellows, braided assemblies, metal hose, expansion joints and many others.

FACTS ABOUT THE SPECIAL PRODUCTS DIVISION

The **SPECIAL PRODUCTS DIVISION** is housed in this new 26,000 square foot building in Los Angeles, California. In addition to administrative and sales offices the building accommodates research laboratory, engineering, and manufacturing facilities.

In February, 1961, the Special Products Division was established through the acquisition of the Technical Products Division of the Waste King Corporation. This Division was enlarged in May, 1961 when Fairchild acquired the Circle Weld Company of Los Angeles and made it part of the Division.

The Special Products Division produces precision equipment for both industrial and government use. A staff of highly skilled engineering and production personnel is engaged in the design, development and manufacture of heat exchangers for liquid propellant rocket engines, flight data recorders for commercial and military aircraft, missile ground handling equipment, guidance gyros, airborne gear boxes, components of light weight metal configurations for use in aircraft, missile and rocket and engine applications.

FLIGHT DATA RECORDERS

The Division's Flight Data Recorder is a new concept in recorders, producing a permanent, virtually indestructible record of up to 30 channels of flight data by engraving on an Inconel recording medium. It is an exceptionally reliable system of small size and minimum weight that meets and exceeds both the Federal Aviation Agency's requirements and the airlines' specifications.

Fabrication of precision-formed lightweight metal products requires a high degree of manual skill. Mechanic is shown here performing extra stage spinning operation to deepen corrugations in a flexible member.

Welding segmented section of liquid oxygen fuel line used on Titan and Atlas missiles. Exacting requirements demand that welders performing such operations be U. S. Government certified.

The Fairchild Flight Data Recorder **(right)** provides commercial airlines with a continuous and virtually indestructible record of key flight information in compliance with FAA regulations.

GYROS

An innovator in the field of gyrostatics for several years, the Division's LEV III has been used in firings of Explorer I and the Redstone, Pershing and Mercury missiles. This line also includes the LUT II developed for the guidance of underwater weapons.

PRECISION COMPONENTS

ICBM launchers depend on the Division's Hydraulic Temperature Compensator to compensate for thermal expansion of the hydraulic oil supplied to the vertical maintenance system.

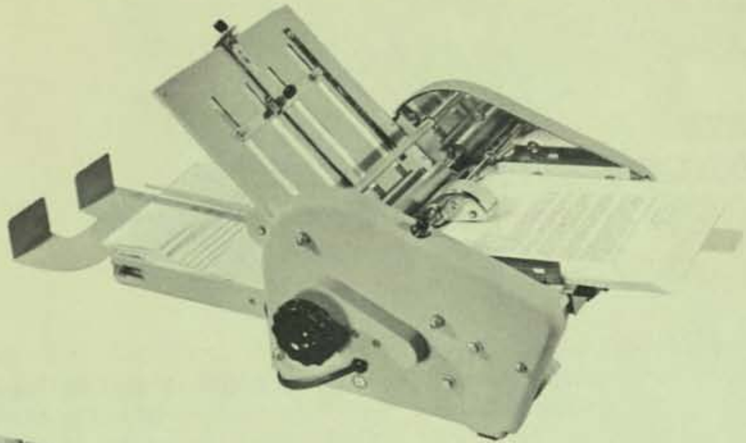
Special skills and processes developed by the Division have produced a family of light weight missile heat exchangers used to convert liquid oxygen, helium and nitrogen into gaseous form. These units are completely leak free during extreme temperature and pressure changes and provide maximum efficiency under severe vibration. With the acquisition of Circle Weld the Division now produces its own manifold ducting, flexible sections, bent tubes, element forms, transition pieces, bellows, braided assemblies, half shells, expansion joints, metal diaphragms, aneroid capsules and gimbal joints – enlarging even further its capabilities in heat transfer and allied systems.

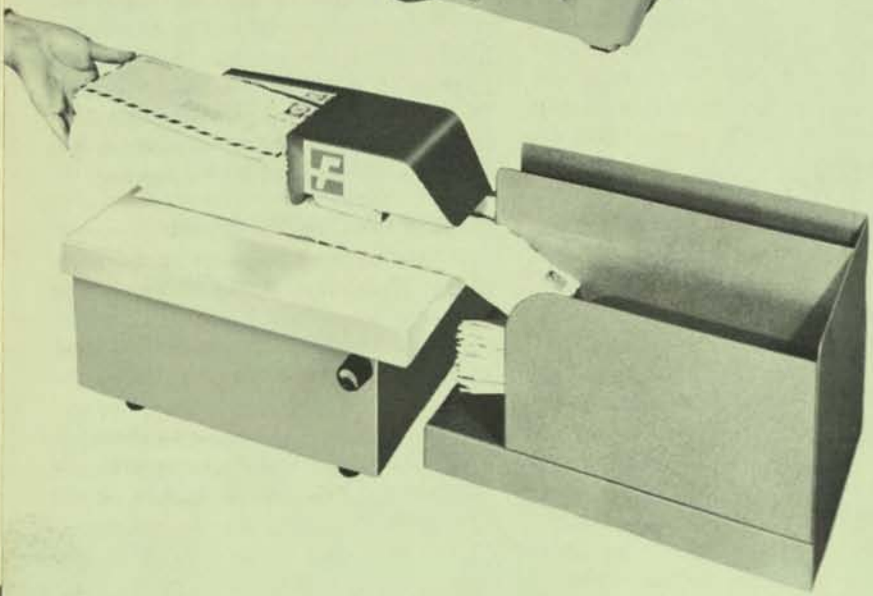
The Division also produces special gear boxes for the Fletcher air-to-air fueling system and Rotating Joint Assemblies used to transport coolants during pre-launch routine of the ICBM.

PRINTING PRESS

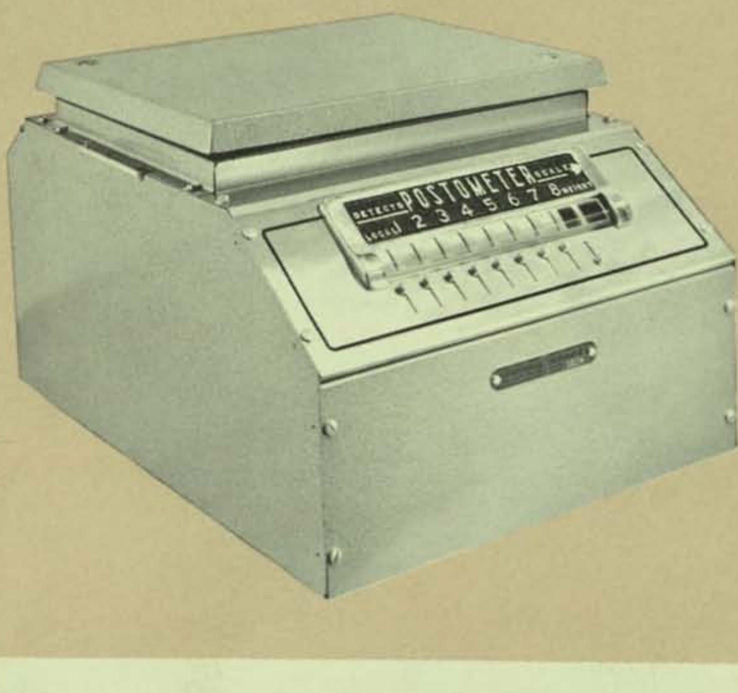
The Division manufactures the Color King Web Offset Perfecting Press which is marketed and serviced by Fairchild Graphic Equipment.

Located in Los Angeles, California, the Special Products Division occupies three buildings totaling 45,000 square feet, and maintains extensive engineering facilities, temperature controlled laboratories, model shop, fabrication machine shop, and test and assembly areas for mechanical, hydraulic, heat transfer and electronic products.





The Business Machines Division is currently marketing a variety of office and mail room equipment. At left are shown a desk type automatic folding machine and an automatic letter opener. In the panel below, are shown three models of parcel post and postal scales. At the extreme right below is the new Fairchild 8-station Office Collator designed especially for office duplicating department use.



FACTS ABOUT THE BUSINESS MACHINES DIVISION

Administrative and **manufacturing** functions of the **BUSINESS MACHINES DIVISION** are located in this modern 27,000 square foot building in Cleveland, Ohio.

This Division was established in June, 1961 for the development, manufacture and marketing of a complete line of office paper handling equipment. It is located in Cleveland, Ohio, a central point for shipment to the major urban areas of the country.

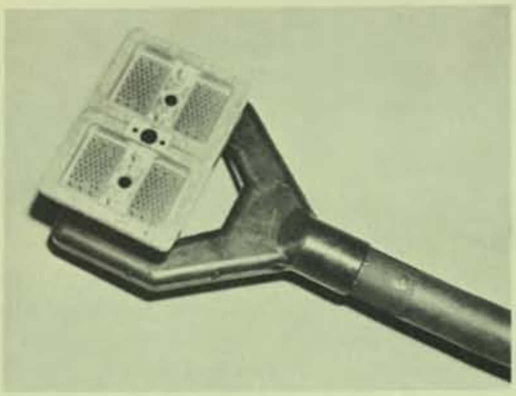
The Division is engaged in extensive research into the business machines field. Its engineers are designing new machinery to expedite office procedures and its production staff is exploring new methods of manufacture and quality control.

First of the line of office machinery to be offered by the Division is the Fairchild Office Collator. Designed for the duplicating department, this is an eight-station Collator which will handle all common duplicator stocks and intermixes weights and sizes. It gathers at the rate of 3,000 sets or 24,000 sheets per hour.

Among other products to be offered by the Division are postage meters in several sizes, postal scales from 4 lbs. to 70 lbs., and a quality line of inserters. Also under development are folding machines, letter openers, cutters and duplicating machines and microfilm cameras, processors and filing equipment.

The Division also is currently marketing Mail Room Furniture in modular units.

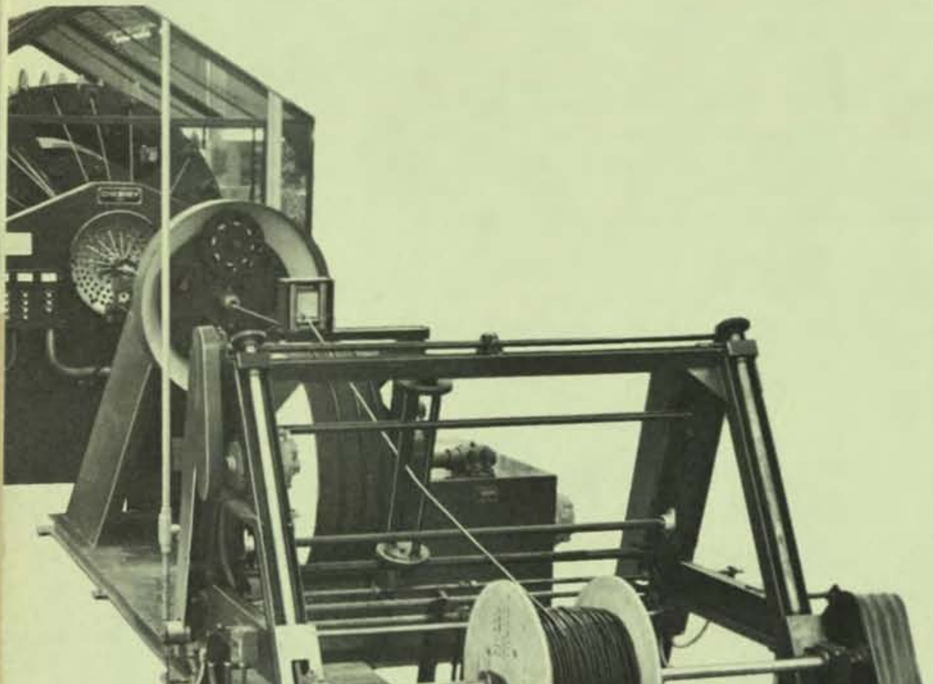
The Division is headquartered in Cleveland in a modern, completely air conditioned building of 27,000 square feet.



A molded termination of the checkout cable fabricated by the Cable Division for the GREEN QUAIL missile.

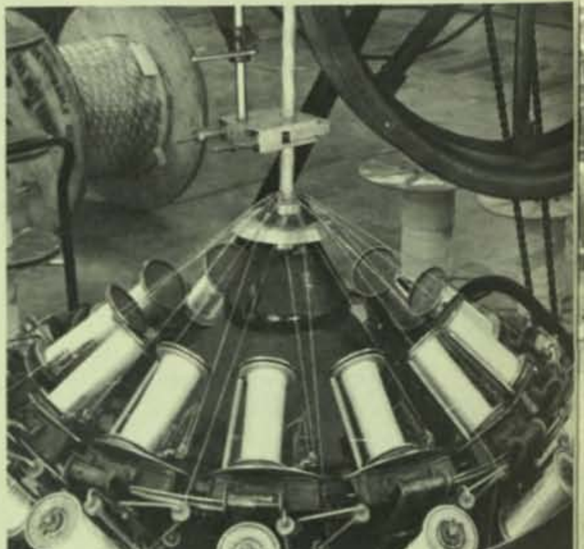
This entire cable, including molded junctions, was built at the Cable Division of the SERGEANT missile checkout interconnect hookup system.

Another one of the TITAN umbilical cables. This assembly has 107 conductors and the molded junction alone weighs about 60 pounds.



The cores of multi-conductor cables are assembled on this 36 gimbal planetary. This process is automatic — the twist in the conductors, taping and reeling. Cables four inches in diameter with as many as 216 conductors have been produced on this unit.

An Electronic Circuit Analyzer checks out a cable assembly fast and accurately.



When specifications call for electrical shielding this Braider automatically weaves a metal sheath over the cable.

FACTS ABOUT THE CABLE DIVISION

The **CABLE DIVISION** is housed in this modern, completely air-conditioned building. It occupies 68,000 square feet on 11 landscaped acres.

The Cable Division became part of Fairchild Camera and Instrument Corporation in February, 1961, with the acquisition of the Joplin, Missouri, facilities of Pacific Mercury Electronics. Acquisition of this facility further enlarges Fairchild's extensive capabilities in the field of electronics engineering and manufacturing.

The Cable Division is geared to meet the highly specialized cable and harness requirements of the aircraft and missile industries. Through modern manufacturing facilities and experienced personnel it is capable of producing a wide variety of cables ranging from multi-conductor cables to miniature cabling with sub-miniature connectors.

The Engineering Staff is comprised of specialists with wide experience in the design of ground check-out cabling, wiring harnesses, hot molded neoprene, rubber and plastic molded junctions, breakouts, and terminations, as well as special cable for military and sophisticated industrial applications. Modern production methods and close military-approved quality control throughout manufacture assure reliability of product performance and on-time deliveries.

Fairchild Cables have been specified on many of the latest missiles and aircraft as well as for several Atomic Energy Commission applications.

Neoprene hot molded cables similar to those supplied to the Atomic Energy Commission are shown being produced on this hydraulic press.

Cables are jacketed by this Extruder with a variety of tough, flexible plastics such as polyvinyl chloride, polyethylene, and nylon.

Many of the molds needed for production in the Cable Division are made in the plant machine shop.

Molded cable terminations and connectors are cured in the plant's specially built ovens. Curing requirements vary with each type of assembly.

Aerial Surveys services are used extensively in city planning. Fairchild Photomap (upper) and contour map (lower) indicate a section near the Hollywood Bowl of the Hollywood Cahuenga Pass traffic control project.

FACTS ABOUT

FAIRCHILD AERIAL SURVEYS DIVISION

Headquarters of the Division is in Los Angeles, California, where **Management, marketing, engineering** and **production** occupy 41,000 square feet.

Fairchild Aerial Surveys is one of the pioneers in aerial mapping and exploration. This organization, with its highly trained crews and specialized equipment, handles domestic or expeditionary surveys of almost any geographic proportion and world location. It provides all or any part of the service, from analysis to planning through final compilation of the most appropriate types of maps and reports.

The services offered by Surveys Division are many and varied, including: aerial photography of all types (standard vertical, dihedral, convergent and tri-metrogon) on standard panchromatic, infra red or color film as desired; the development of precise photomaps and/or topographic maps, planimetric maps, tax maps, relief models, or cross section data (for processing by electronic computers); ground survey data (horizontal positions and vertical elevations); airborne geophysical surveys using airborne magnetometer, scintillometer, AFMAG, electromagnetics, profile recorder or gravity meter—plus interpretation of this data; geophysical studies and underwater construction surveys by Marine Sonoprobe (R) beneath the surface of the sea; and consulting services for research and development with the Surveys engineering staff of specialists in photogrammetry, mathematics, electronics, geophysics, geology, photo-interpretation and tax and land use.

Always on the alert for new ideas and new equipment to improve the quality and precision of the work performed, Surveys consistently leads the field in introducing new and improved techniques. Shoran and Hiran electronic distance measuring systems are used for pinpointing the position of an aircraft in space as well as for establishing geodetic networks in remote countries by trilateration techniques; the Tellurometer has revolutionized traditional practices of ground surveying; the airborne profile recorder, a high precision radar altimeter, records an accurate topographic profile of terrain directly beneath the aircraft while in flight; in the map production laboratory automatic digital recording equipment has been joined to stereoscopic plotting instruments, Stereoplanigraph and Kelsh plotter, to produce cross section data in card form for direct processing by electronic computers for route planning — earth quantity measurements, etc.

An example of the Division's accomplishments is the precise topographic and photographic mosaic mapping of virtually the entire country of Afghanistan. This is the first time an entire country has been mapped by a commercial company in a few short years and the first time a ground control network for an entire nation has been established utilizing Shoran techniques.

Surveys owns and operates a fleet of specially modified aircraft ranging from Piper Cubs to high-flying Lockheed P-38 ex-fighters, 4-engine Boeing B-17 ex-bombers, twin-engine Lockheed Lodestars and twin-engine Beechcraft AT-11's, each suited to a particular type of operation. Headquarters is in Los Angeles, base of operations for aviation and electronics at Burbank, and there are sales and research offices all over the world.

Aerial mapping and exploration call for many skills and varied complex equipment. From top to bottom are: Kelsh Plotter with Benson Lehner automatic cross section equipment installed; the drawing table of the C-8 Stereoplanigraph with cross section equipment in operation; and the giant copying camera used to photograph large mosaics and maps.

FACTS ABOUT

FAIRCHILD INTERNATIONAL DIVISION

This division was originally organized as the Du Mont International Division. However, its scope of activities now has been broadened to encompass the overseas marketing of virtually all Fairchild U. S. divisions. The International Division fulfills the needs of Fairchild's increasing activity in world markets and coordinates most export functions and overseas negotiations.

The Division advises mamagement of overseas market, economic and political conditions as relate to Fairchild products in all areas of the world. It is consulted on required negotiations pertaining to field offices, subsidiaries and licensing of foreign companies to manufacture Fairchild products.

Personnel of the Division travel extensively in Europe and Latin America and occasionally to the other continents. Various members of the staff read, write and speak German, French, Spanish, Italian, Turkish and Portuguese.

The Division has established connections in New York, Washington and Miami, as well as overseas, with foreign government and industrial buying offices in consulates, embassies, and with American exporters.

The International Division's main offices are located in the heart of New York City, easily accessible to visitors from other countries. A Latin American regional office is maintained in Miami, Florida. European offices are in Milan, Italy.

Fairchild International Division directs the distribution of many Fairchild products to overseas markets. Typifying the breadth of its services are these advertisements which have appeared in various countries throughout the world.

CORPORATE OFFICES

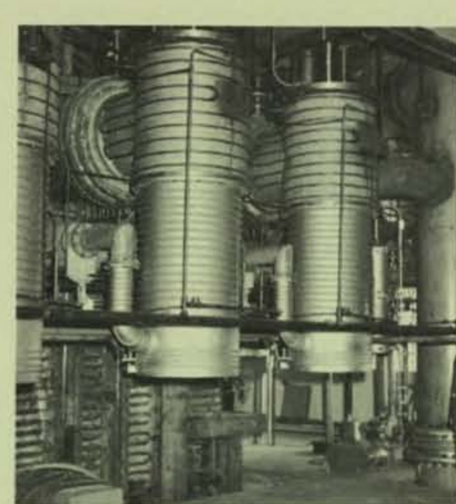
300 Robbins Lane, Syosset, L. I., N. Y.
WEIls 1-4500 • TWX OY BY NY 626
Cable "FAIRCAM SYOSSET"

FAIRCHILD CAMERA AND INSTRUMENT CORPORATION

DIRECTORY

DIVISION HEADQUARTERS

Subordinate Facilities and Branch Offices



DEFENSE PRODUCTS DIVISION

300 Robbins Lane, Syosset, L. I., N. Y.
WEIls 1-4500, TWX OY BY 626
Cable "FAIRCAM"
Robert Bruce, Jr.
Division General Manager

FACILITY OR BRANCH

Systems Management and Engineering

5 Aerial Way, Syosset, L. I., N. Y.
WEIls 1-4500, TWX OY BY 626
Cable "FAIRCAM"
Berthold Pollick

Du Mont Military Electronics Department

750 Bloomfield Ave., Clifton, N. J.
PRescott 3-2000, TWX PAS 1076

Curtis Optical Department

2718 Griffith Park Blvd.
Los Angeles, Calif.
NOrmandy 2-1176, TWX LA 368 U
Arthur Lochner

Washington Office

Suite 807, Cafritz Bldg.
1625 Eye Street, N.W., Washington, D. C.
NAtional 8-7770
Paul Larsen

Dayton Office

Third National Bank Bldg., Dayton, Ohio
BAldwin 2-7405, TWX DY 123
Herbert Meade

West Coast Sales and Service

2718 Griffith Park Blvd.
Los Angeles, Calif.
NOrmandy 2-1176, TWX LA 368 U
Charles H. Vickery, Jr.

Florida Office

618 E. South St., Orlando, Florida
CHerry 1-2596, TWX OR 7217

SEMICONDUCTOR DIVISION

545 Whisman Road, Mountain View, Calif.
YOrkshire 8-8161, TWX MNVW CAL 853
Dr. Robert N. Noyce
Division General Mgr.

FACILITY OR BRANCH

Transistor Plant

1625 Stierlin Rd., Mountain View, Calif.
YOrkshire 8-8101
C. E. Sporck

Research and Development

844 Charleston Rd., Palo Alto, Calif.
DAvenport 6-6695
G. E. Moore

Diode Plant

4300 Redwood Highway, San Rafael, Calif.
GReenfield 9-8000, TWX SRF 26
D. A. Beadling

Los Angeles Office

8833 Sunset Blvd., Los Angeles, Calif.
OLeander 5-6058, TWX BV 7085
Alan J. Bayley

Pennsylvania Office

100 Old York Road, Jenkintown, Pa.
TUrner 6-6623, TWX JNKTN 1056
Joseph A. Gattuso

Eastern Regional Sales Office

Franklin National Bank Bldg.
Roosevelt Field, L. I., N. Y.
PIoneer 1-4770, TWX GCY NY 5391
James P. Paris

Washington Office

1625 Eye St., N.W., Washington, D. C.
NAtional 8-7770, TWX WA 756

New York State Office

731 James St., Syracuse, N. Y.
GRanite 2-3391, TWX S 94

GRAPHIC EQUIPMENT DIVISION

Fairchild Drive, Plainview, L. I., N. Y.
WElls 8-9600, TWX HKVL NY 2602
Cable "FAIRGRAF PLAINVIEW"
J. A. V. Hyatt, Division General Manager

FACILITY OR BRANCH

Scan-A-Plate Plant

Robbins Lane at Aerial Way
Syosset, L. I., N. Y.
WEIls 1-4500
Henry Ahrens

N.E. District Office

Rm. 12
Midwestchester Professional Building
475 White Plains Road, Eastchester, N. Y.
DEerfield 7-2248
Frank Nardozzi

S.W. District Office

3120 Maple Dr., N.E., Atlanta, Ga.
CEdar 3-6752
Wallace C. Douglass, Jr.

Mid-West District Office

111 W. Washington St., Chicago, Ill.
RAndolph 6-5418
Robert C. McPherson

Western District Office

6111 East Washington Blvd.
Los Angeles, Calif.
RAymond 3-5191, TWX MTB 3850
Howard H. Carstensen

Joplin Mfg. Plant

Junge Blvd. and Maiden Lane, Joplin, Mo.
MAyfair 3-1775, TWX JO 8277
Milton Johnson

Canadian District Office

Fairchild Camera and Instrument Corporation of Canada, Ltd.
44-50 Wellington St., E.
Toronto, Ont., Canada
EMpire 4-3353
Leicester Oliver

Overseas Headquarters

Fairchild Camera En Instrumenten, MIJ., N.V.
J. W. Brouwersplein 7
Amsterdam, The Netherlands
020 793636
Cable "FAIRSAG AMSTERDAM"
Chandler J. Abbott

United Kingdom Office

Fairchild Camera and Instrument (U.K.) Ltd.
Grover House, 551 London Rd.
Isleworth, Middlesex, England
ISleworth 5941
Cable "FAIRSAG HOUNSLOW"
John L. Lafferty

Netherlands Mfg. Plant

Fairchild Camera En Instrumenten, MIJ., N.V.
Kapitein Nemo Straat 7
Emmen, The Netherlands
05910-1138, Cable "FAIRSAG EMMEN"

ALLEN B. DU MONT LABORATORIES

750 Bloomfield Ave., Clifton, N. J.
PRescott 3-2000, TWX PAS 1076
Roy A. Olerud, General Manager
Industrial Electronics Division
William B. Croxville, General Manager
Electronics Tube Division

FACILITY OR BRANCH

Northeast Office

49 Walnut St.
Wellesley Hills, Mass.
CEdar 5-7550

Southern Office

36 N.E. First St., Miami, Florida
FRanklin 9-5255

FAIRCHILD CONTROLS CORPORATION

225 Park Avenue, Hicksville, L. I., N. Y.
WEIls 8-5600, TWX Hicksville NY 1309
"FAIRCON"
H. E. Hale, Vice Pres. and Gen'l. Mgr.

FACILITY OR BRANCH

East Coast Division

225 Park Avenue, Hicksville, L. I., N. Y.
WEIls 8-5600, TWX Hicksville NY 1309
"FAIRCON"
John E. Carter

West Coast Division

6111 East Washington Blvd.
Los Angeles, Calif.
RAymond 3-5191, TWX MTB 3850
Robert August

INDUSTRIAL PRODUCTS DIVISION

580 Midland Avenue, Yonkers, N. Y.
GReenleaf 6-0201
R. G. Hennessey
Division General Manager

FACILITY OR BRANCH

Mid-West Office

111 W. Washington St., Chicago, Ill.
RAndolph 6-5418
Carroll Abernathy

West Coast Office and Plant

6867 Farmdale Avenue
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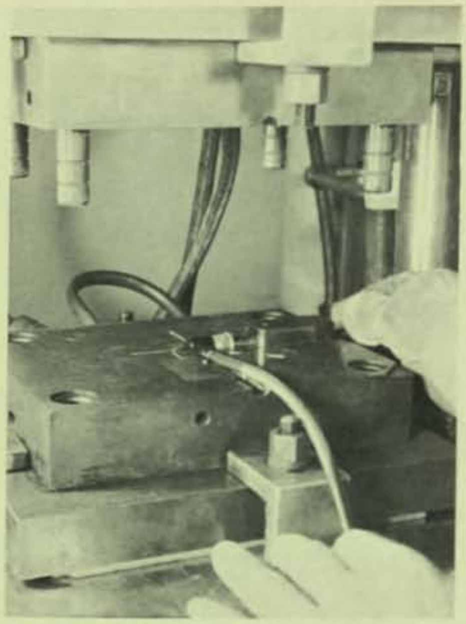

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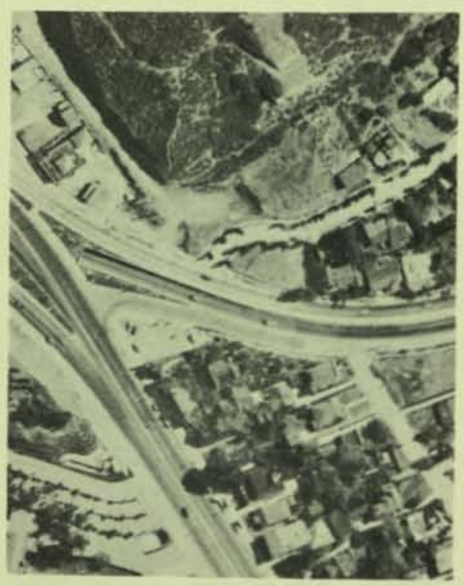

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FAIRCHILD PLANAR PROGRESS REPORT

■ The first Planar transistor was introduced by Fairchild at the I.R.E. show in March, 1960. It set new standards of reliability, performance and yield—the latter especially important in the economics of production, identified since that date with the growth of silicon semiconductor devices in general. It also opened the way for production of integrated circuitry.

Combined with such techniques as epitaxial growth of crystals and specialized geometries, it has led to product refinements and parameter combinations otherwise unobtainable. It has enabled silicon—with its more favorable temperature characteristics—to match and outdistance the performance of germanium.

The Planar process and extensions of its technology have a potential still being explored.

FAIRCHILD PLANAR PROGRESS REPORT

WAFER RECEIVES INTEGRAL SURFACE OF SILICON DIOXIDE

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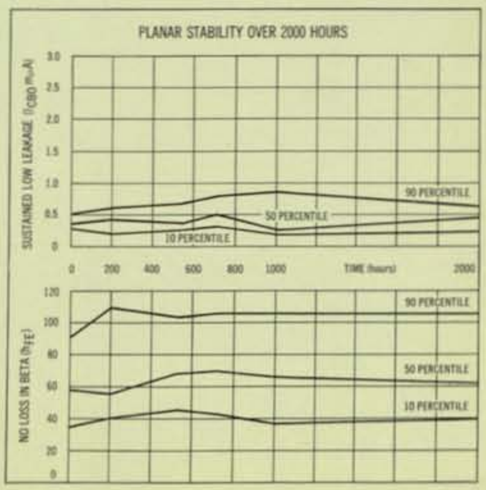
FAIRCHILD PLANAR PROGRESS REPORT

The advantages of the Planar process are derived from the first diffusion. Silicon wafers—from which diodes, transistors or microcircuits will be manufactured—are placed in an oxidizing atmosphere at 1200°C. A hard, silicon dioxide surface formed on the wafer is the key to Planar construction. It passivates the surface of the device and prevents contamination and associated parameter drift. It insulates the surface of the device and allows direct deposition of metal without electrical interference. As successive mask/etch/diffusion steps are performed, the wafer assumes the electrical characteristics gained from precisely controlled variations in collector, base, and emitter areas and junction perimeters. The Planar process assures uniformity, stability, and reliability. Important in simple devices, it is the key to production capability in complex integrated circuitry.

Uniformity: Diffusion of as many as two thousand individual dice in a typical wafer and hundreds of wafers in the same batch diffusion is coupled with the controlled timing, atmosphere and temperature of Fairchild Planar processing to produce devices of outstanding uniformity and optimum specifications with high yields.

Stability: The performance graphs illustrate the stability of Fairchild Planar devices over two thousand hours.

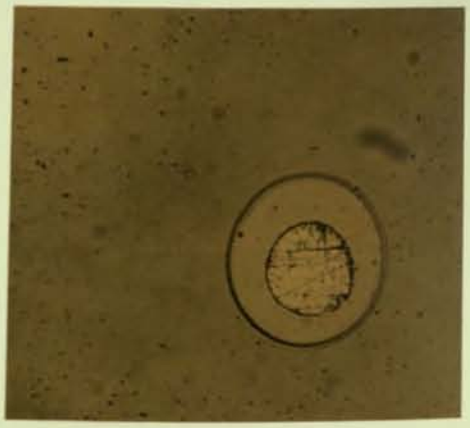
Reliability: The integral silicon dioxide surface of every Planar device is the key to Planar reliability. Each junction is formed beneath the oxide, thus never exposed to surface contaminants, microscopic particles or atmospheric variables which can cause degradation in devices with exposed junctions. Providing a large lead-attach area with electrically small devices permits the use of larger diameter lead wires and more reliable lead bonding in Micro-Planar devices.

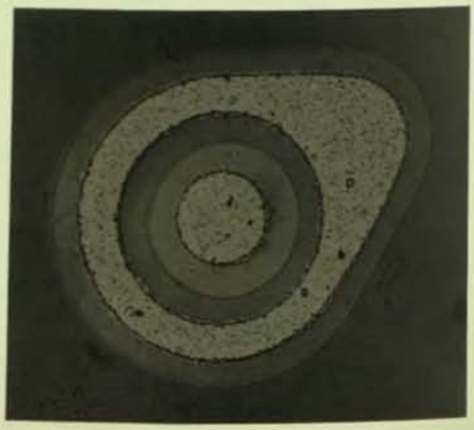


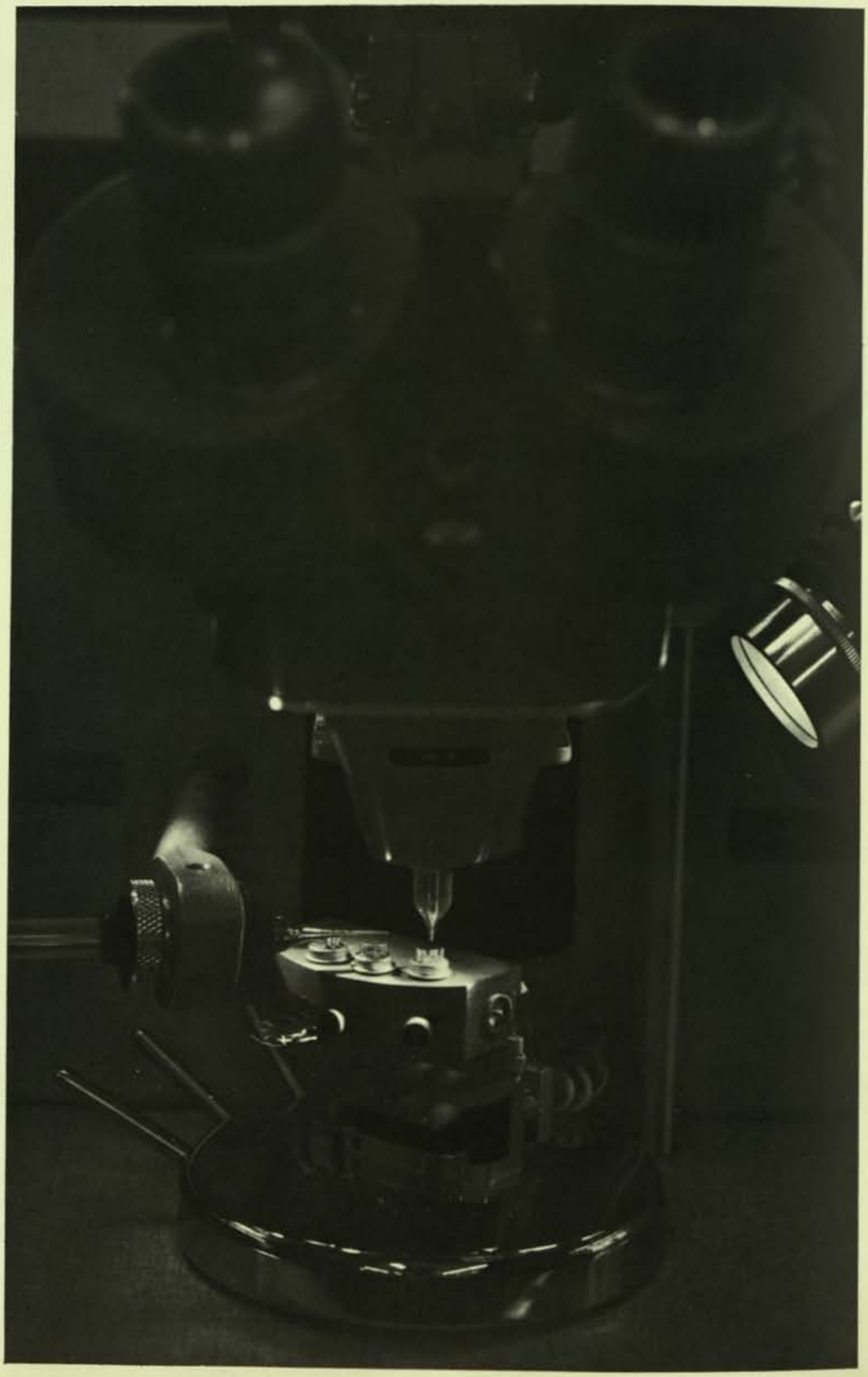
Planar Diodes exhibit a combination of electrical characteristics which cannot be duplicated through any other manufacturing technique: Fast switching speeds, high conductance, low capacitance, low leakage and high reverse voltages have been optimized in three basic diode types which encompass the specifications of a wide variety of competitive devices. From the basic diode types, FD 1, FD 2, and FD 3, Fairchild is able to ship to every major diode application. The uniformity and stability of these diodes has made them ideally suited to applications requiring matched pairs and quads. Combining Planar and epitaxial techniques has extended the range of diodes into very high conductance types. The new Adam package, featuring hermetic glass-to-metal seals and all-soldered connections, is available with all Fairchild Planar diodes where the application calls for miniaturization.

Transistors: With the introduction of the Silicon Planar 2N709, Fairchild broke the germanium speed barrier and there is no type of transistor available which cannot be made and made better through Planar processing. Planar and Planar epitaxial transistors have an exceptional combination of speed, power and low-saturation resistance. The stability, uniformity and reliability of Fairchild Planar devices dominate the application of all types of transistor—general purpose, amplifiers and switches. Amplifiers: high voltage, small signal, RF, VHF, UHF and power. Switches: high speed, high current, saturating and non-saturating. The precise control of the process which enabled Fairchild to produce these devices has also enabled the company to introduce similar types for industrial-commercial applications and to enter the entertainment market with a competitive edge—silicon's high performance at prices competitive to germanium.

Epitaxial techniques have been combined with the Planar process wherever it has offered an advantage in device performance. Particularly where higher currents are the object, and the combination of the two techniques has enabled Fairchild to produce small, high speed devices which still have the capability of handling high currents.

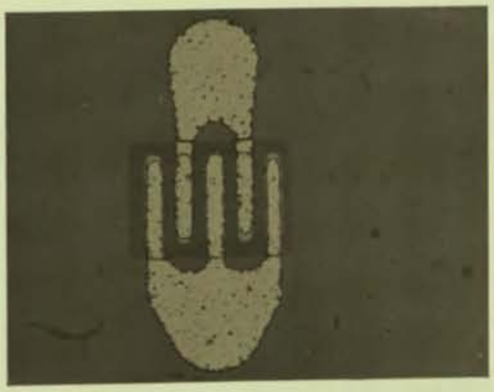


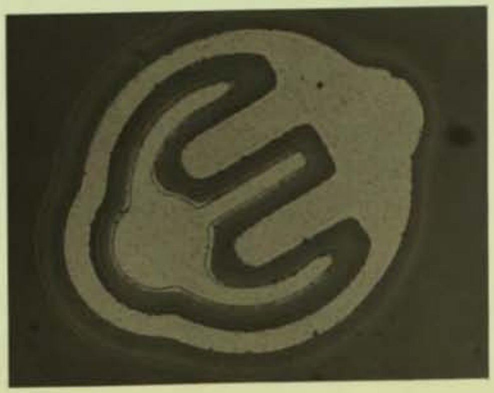




Geometries: Within the framework of the Planar process, the geometry or pattern of the diffusions and hence the junctions can be manipulated significantly, thus altering the electrical characteristics of the device. The original Planar transistors had the familiar 'teardrop' configuration shown on the previous page. The interdigitated geometry common to power devices and Fairchild's new 'trident' geometry feature long emitter-periphery to emitter-area ratio which results in good high current performance and low capacitance with high operating speeds and frequencies.

Multiple Assemblies: A unique advantage of the Planar process is demonstrated in a line of special products—multiple chip devices within a single package. Fairchild has had an established production line making special products for three years. The high yields of the Planar process made multiple assemblies economically feasible. The stability and uniformity of Planar devices makes it technically practicable to combine them with guaranteed matched electrical characteristics. Better thermal tracking between devices in one enclosure, in addition to Planar reliability, assures improved circuit reliability. This product line has helped designers achieve greater circuit performance and reliability especially where it is not economical to develop an integrated circuit for the application, but where reduced size, fewer interconnections and greater reliability are major considerations. The same chips which comprise Fairchild's basic product line are used in the manufacture of multiple assemblies. They are available in hundreds of configurations and in a variety of packages.





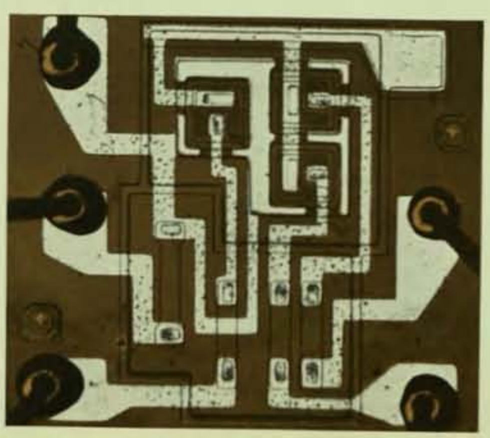
Micrologic: Within a year after introducing the Planar process, Fairchild produced the first practical microcircuit—integrating transistors and resistors, plus all the necessary interconnections, in a single, monolithic chip of silicon. A full spectrum of highly developed semiconductor skills was utilized: precision optics and mask-making; the Planar diffusion process; metal-over-oxide; mounting and lead bonding; testing and test equipment design and production.

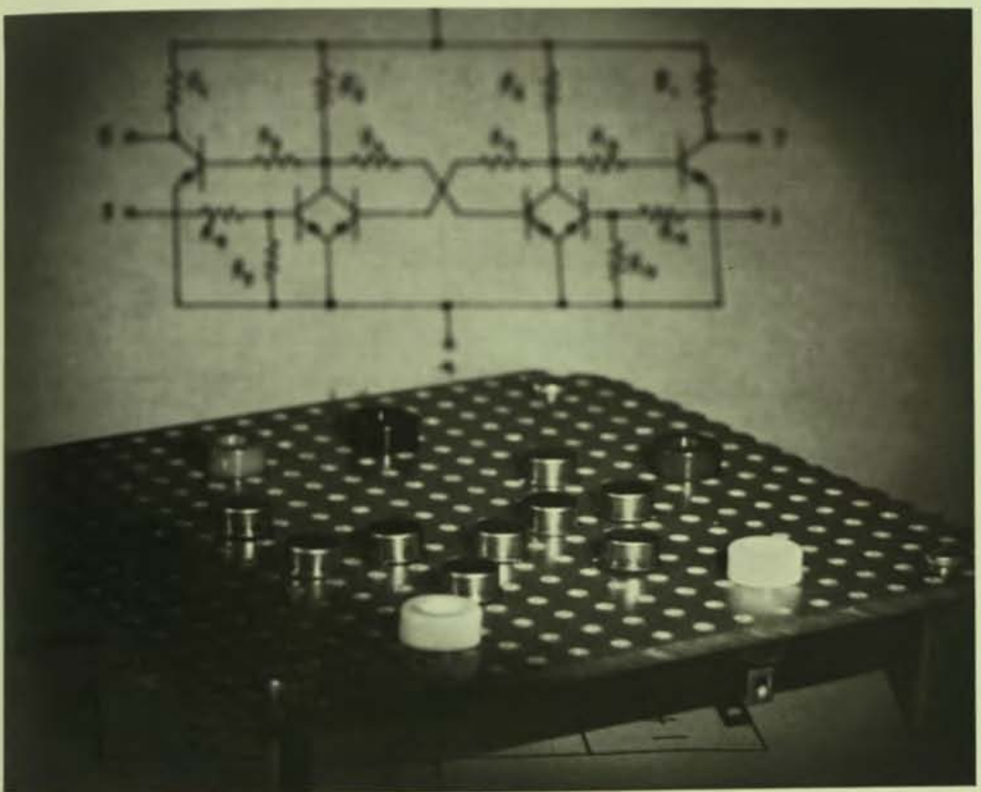
Fairchild's first offering was Micrologic—six compatible computer building blocks. This family of devices is sufficient to handle all of the logic-function requirements of a digital machine operating at bit rates up to 1 mc; no other components are required in the logic section of such a machine. The result is a smaller machine—requiring less power—which can be designed in less time—and cost far less to manufacture.

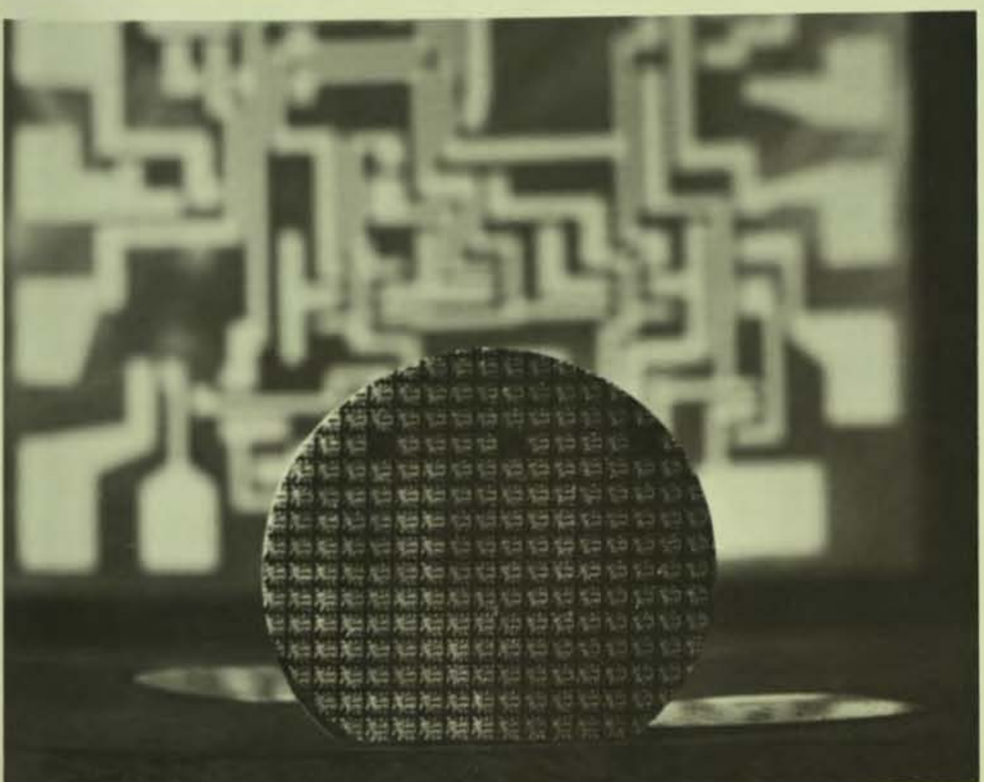
Micrologic utilizes modified DCTL (Direct Coupled Transistor Logic) circuitry and is designed to operate in a full military environment over a temperature range of −55° to plus 125°C. Worst-case propagation delay is 50 nanoseconds stage delay over the full temperature range.

Micrologic, and microcircuitry in general, offers the systems builder major reliability, and cost advantages besides the obvious one of decreased size. Improved reliability stems from many factors: The number of soldered connections may be reduced to one tenth the number required by standard components; power consumption is greatly reduced so less heat is generated; fewer dissimilar materials come into contact.

The improved cost picture stems from the major savings which can be realized in the use of Micrologic as opposed to the best contemporary single layer (printed circuit board) computer packaging techniques. With Micrologic, volume can be cut to one twentieth. Design time is one twentieth to printed circuit masters. The power requirement is one fourth—for equal speed and temperature ranges. Micrologic elements are handled exactly as transistors and can reduce the assembly costs to one tenth! And as the use of Micrologic has extended, the cost of the units versus the production volume relationship has brought the individual unit cost down. In total, these factors are expected to bring the cost of the logic section of a computer down to twenty or thirty percent of present costs. And all of these things are accomplished without sacrificing performance.







Custom Microcircuitry is a natural outgrowth of Fairchild's standard Micrologic product line. It derives from the development of successful, standard production microcircuits and the inherent flexibility of the Planar process. Within the broad framework of custom microcircuitry, there are two distinct groups—production circuits and Research and Development circuits. In designing custom microcircuits, the basic elements from which the designer works are discrete components, packaged separately and individually characterized with complete electrical data. The transistors, diodes, resistors and capacitors are available with complete specifications and breadboard for the designer to assemble an electrical mock-up of the circuit ultimately to be produced as a single silicon chip. When the design and specifications have been thoroughly proven, Fairchild begins its production cycle. The finished microcircuits — delivered in twelve weeks from acceptance of the schematic — are mass produced according to standard Fairchild procedure. This includes subjecting samples of each batch to a comprehensive quality assurance program. Fairchild also designs and builds special electrical equipment for inspecting the finished units. The custom microcircuits are manufactured in the same manner as Fairchild's Micrologic product line; the designer benefits from the advantages of having his own design built in microcircuitry and has the assurance of Fairchild's successful two years' experience in volume microcircuit production. The same equipment, the same highly skilled personnel and the same unique processes are employed.

Geri Hadley
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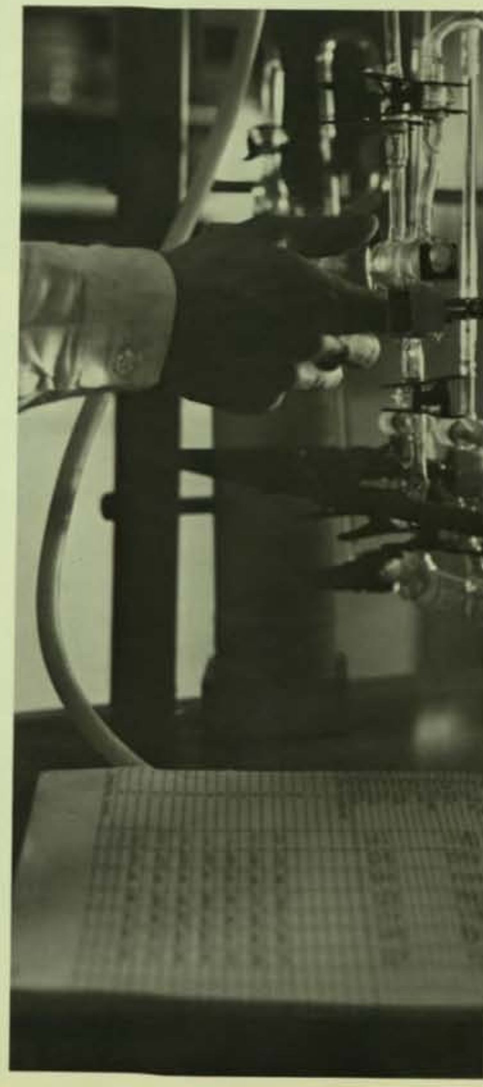
FAIRCHILD
SEMICONDUCTOR

Fairchild is now extending microcircuitry techniques to include the integration of NPN, PNP and field effect transistors within a single substrate. The technologies are in hand enabling Fairchild to produce microcircuits with operational and functional characteristics unattainable with the use of discrete components. Ultimately, these new devices will hold a relationship to present transistors similar to that which transistors now hold to vacuum tubes. The marriage of thin film and Planar epitaxial technologies in an integrated device is a technique which allows the fabrication of circuits in smaller devices, resulting in lower systems cost and improved systems reliability. Circuits of this type have the potential of greater switching speeds, frequencies and operation at higher currents—all with greater packaging densities. These are State-of-the-Art integrated circuits, a direct outgrowth of Fairchild's Planar process, the process which has brought about true versatility and economic practicality in silicon.



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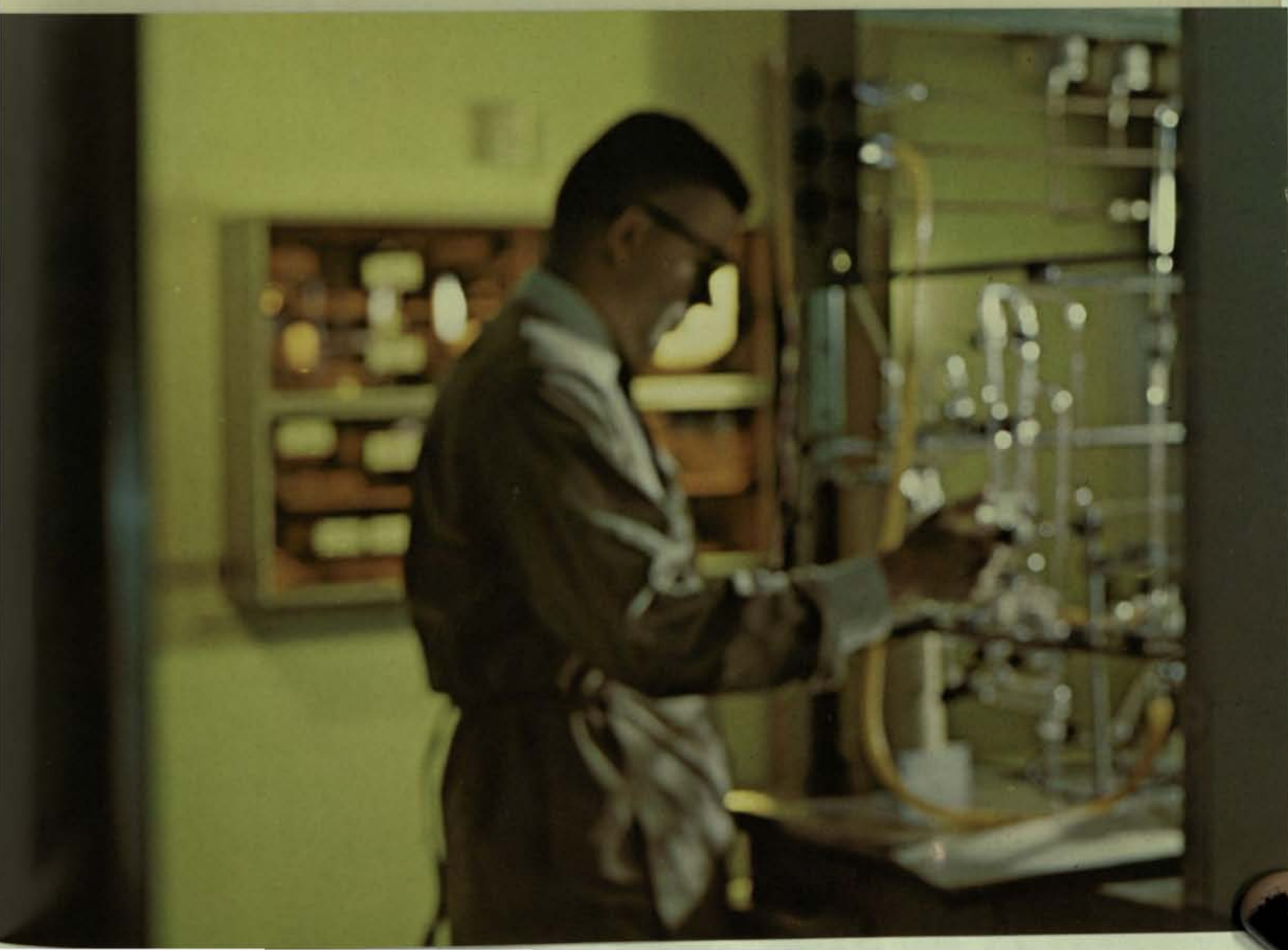

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A BRIEFING ON INTEGRATED CIRCUITS

This is the edited transcript of a special ½ hour color television program produced by Fairchild Semiconductor and telecast October 11, 1967.

The two principal speakers are Dr. Harry Sello, Manager of the Materials and Processes Department of Fairchild Semiconductor Research and Development Laboratory, and Dr. Jim Angell, Professor of Electrical Engineering and Director of the Solid State Electronics Laboratory at Stanford University, Palo Alto, California.

Sello: Hello. We're here to tell you about a recent revolution in electronics. Of course, there have been many recent revolutions in electronics. You hear about them all the time. Today, we'll tell you what an integrated circuit is; how to design it; we'll tell how it's made; and, finally, about just a few of its uses.

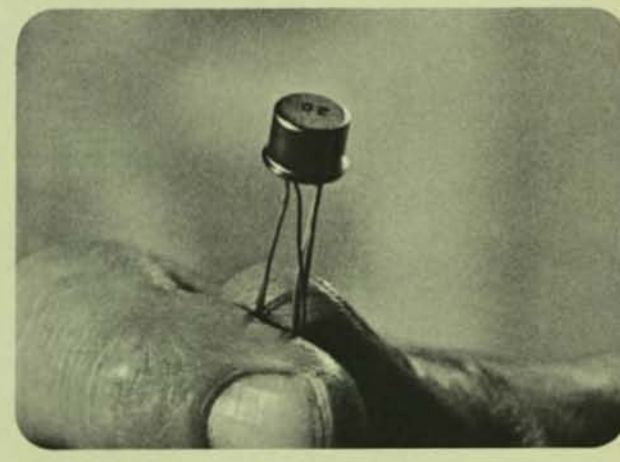
Well let's get started, Jim. What is an integrated circuit?

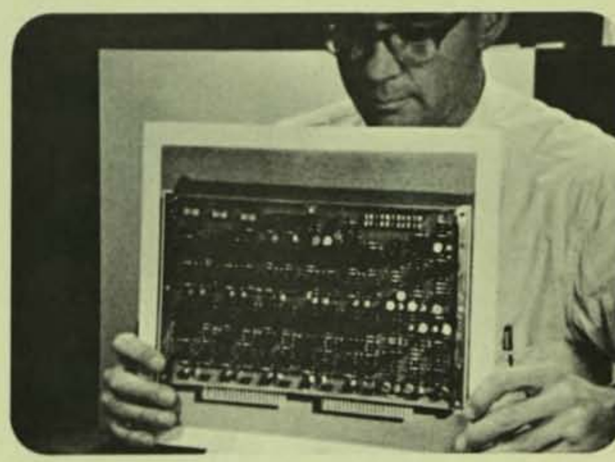
Angell: Here is a packaged integrated circuit. Inside this package is a chip of silicon which provides the electrical equivalent of many transistors, resistors, and diodes all interconnected to provide the desired function. Before we discuss in detail what's inside that package, I would like to show you some evolutionary examples of what integrated circuits can do for the appearance of electronic equipment. First, here's a photograph of a printed circuit board from a digital computer a la 1960.

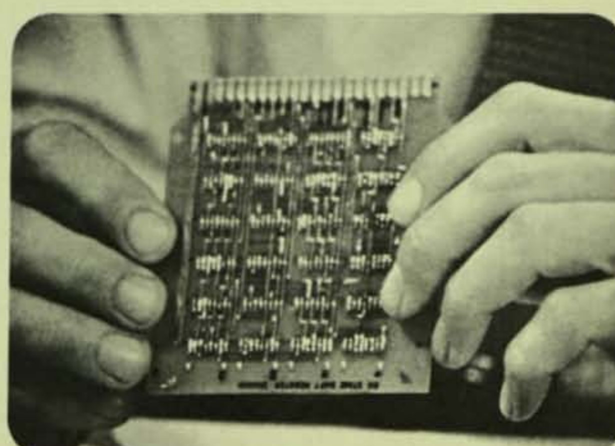
Sello: Prehistoric.

Angell: Right.

It's built out of transistors, separate resistors and diodes wired together on the printed circuit board. Next is the electrical equivalent of the 1960 circuit board, but built with integrated circuits. This one is vintage 1963. Notice how much smaller and simpler this board is.







Finally, here is a newer version using integrated circuits, containing in the upper left-hand corner eight outlined integrated circuits. These eight integrated circuits provide essentially the same function that was provided by either of the previous boards. 24 integrated circuits have been reduced to 8. Notice that the wiring on this newest package is extremely orderly and well organized.

Sello: I see fewer pin connections, too.

Angell: This is perhaps typical. We find that as we make a more complex function in one structure, the number of pins tends to go up only as roughly the square root of the complexity that's provided by the board.

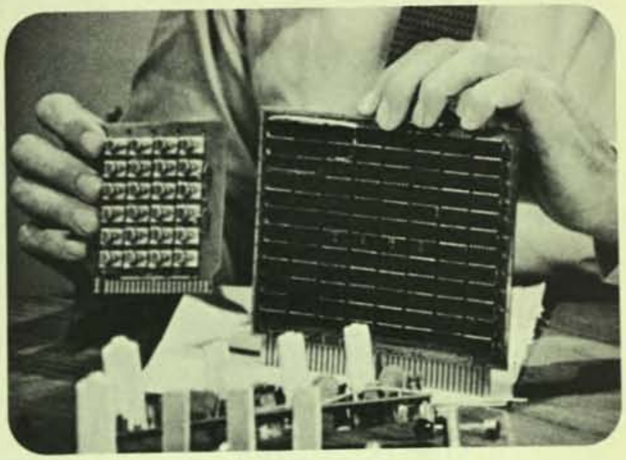
Now you've seen an evolution of transistors to early integrated circuits to modern ones. Here is a series of photographs which shows you what's inside the corresponding cans.

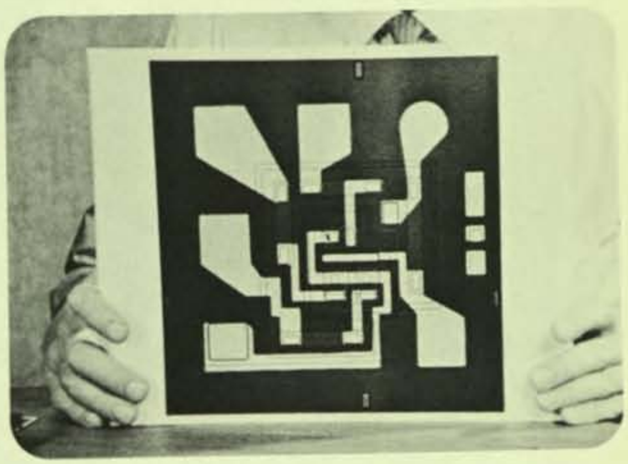
The first is a photograph of a single transistor chip such as we might find in the 1960 version of the computer board.

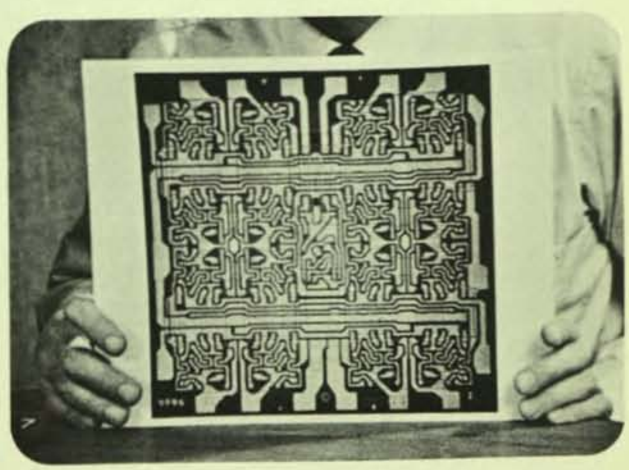
Sello: Old style again.

Angell: Here's the intermediate style. You remember the 1963 integrated circuit packages. Here's what would be in one of them; typically ten transistors.

This is a modern version of integrated circuits with many hundreds of components on this one chip. This particular function provides 16 bits of digital memory in this one package.







Now integrated circuits can be used not only for digital but also for linear circuits. Here is an i.f. strip. It's transistorized and hence perhaps three years old. Here is its integrated circuit counterpart, providing exactly the same function. Notice how much simpler it is. The wiring is roughly the same, the simplicity is greater. Hence, we can expect that it will not only be cheaper, but more reliable, and these are perhaps the most important contributions of integrated circuits.

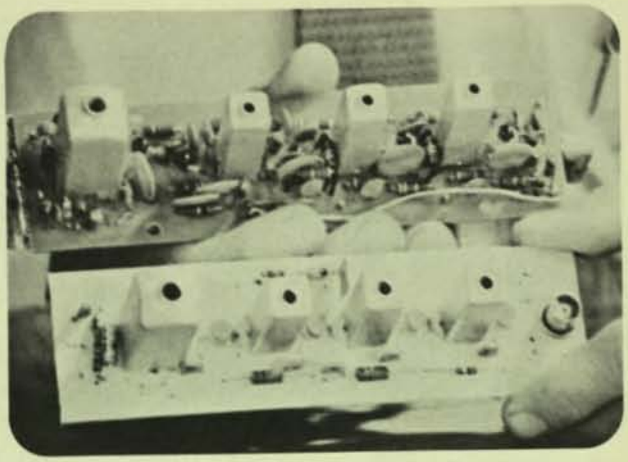
Sello: Let's get on to how to design an integrated circuit.

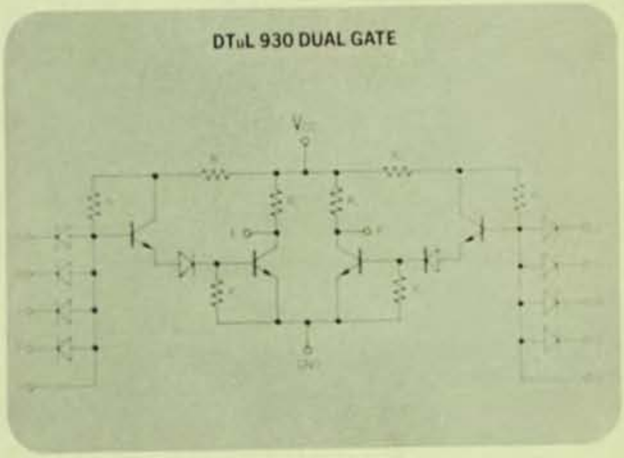
Angell: All right, let's do it by way of an example. Here we have a circuit for a typical structure which might be in integrated form. This particular circuit has 20 components — diodes, transistors, resistors. After the configuration has been chosen by usual techniques, the next step is to build a breadboard model in actual working form. On the breadboard we have separate transistors and other components all actually wired into a working circuit. The purpose of working with the breadboard is to try to optimize the numerical value of each of the components in the circuit. Once this optimization has been achieved, the next job is the design of the masks which will be used to make the integrated circuits.

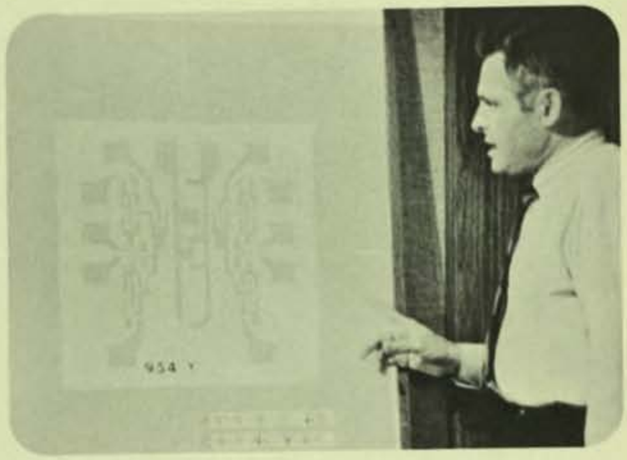
Sello: So, we made the engineer pick up a soldering iron — let's see if we can make an artist out of him by using yet another example.

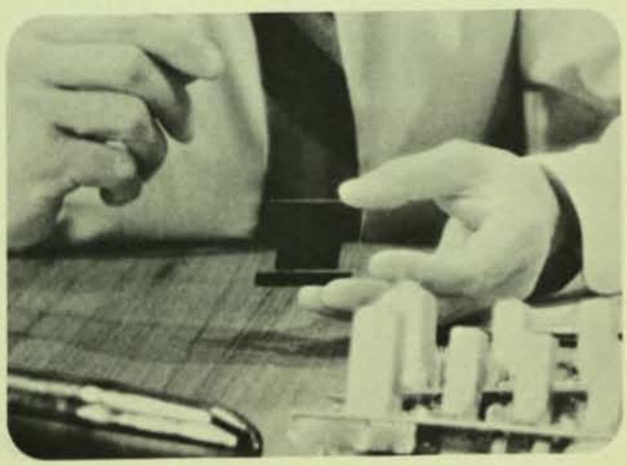
Here's a full-scale 30 x 30 inch piece of typical integrated circuit artwork which represents in a careful, precise form the interconnection pattern of an integrated circuit.

For example: these are the metal pads which interconnect to the outside world. Here we have the transistors and here are diodes and more interconnecting metals. The problem here is to convert this large-scale drawing into a small precise version on a 2 x 2 inch glass plate. This artwork is reduced 500 times by a process of high resolution photography to a glass plate upon which the pattern shown by the artwork is successively stepped and exposed all the way across the glass up to 1,500 times — which means, of course, 1,500 integrated circuits.

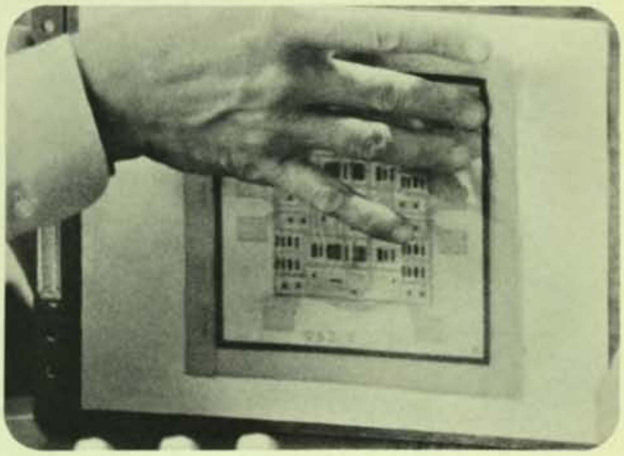




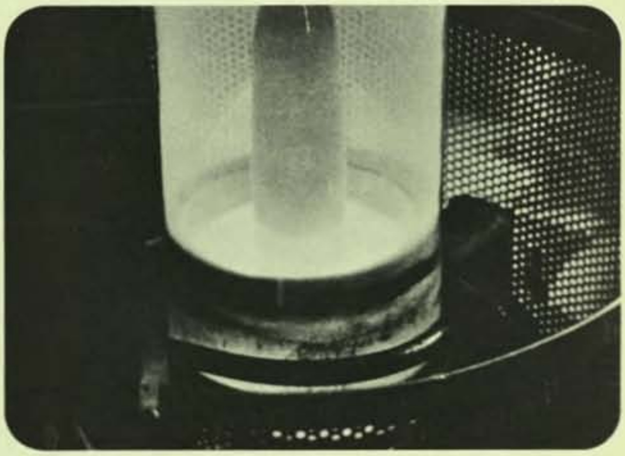




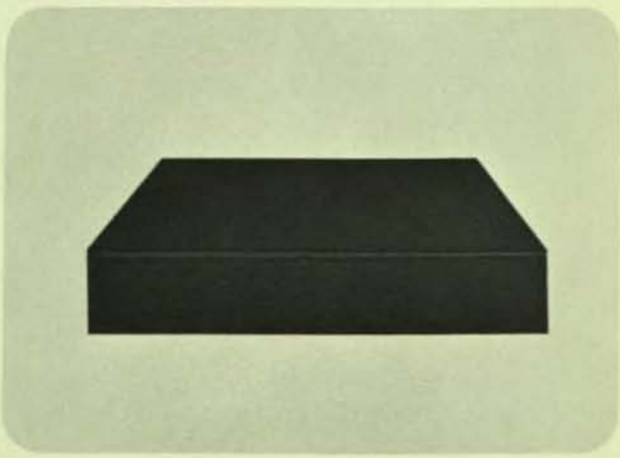
Now the artwork, which I showed, was only one potential mask. Here is the artwork, in reduced plastic overlay version, of a complete set needed to make an integrated circuit. There are five to seven or even more of these potential masks. All of these must align carefully and precisely.



Each of these will then be translated into another set of glass masks which will then be used for contact printing directly onto silicon wafers. In working with silicon, this is what you begin with. A silicon ingot. It's a glass-like material — very brittle, very much like diamond — in fact, it costs about like diamond and is a member of the diamond family. It is made in a series of long rods by a process known as crystal pulling. It cools as it is pulled. However, it is still very hot since it's been grown at a very high temperature — up around the region of 1,400 degrees Centigrade. We cut the rod into thin wafers about twelve/thousandths of an inch thick by using a diamond saw. After cutting, the wafers are very carefully polished so you end up with the mirror-like surface which is essential in the preparation of an integrated circuit. The finished chip is about five/thousandths of an inch thick.

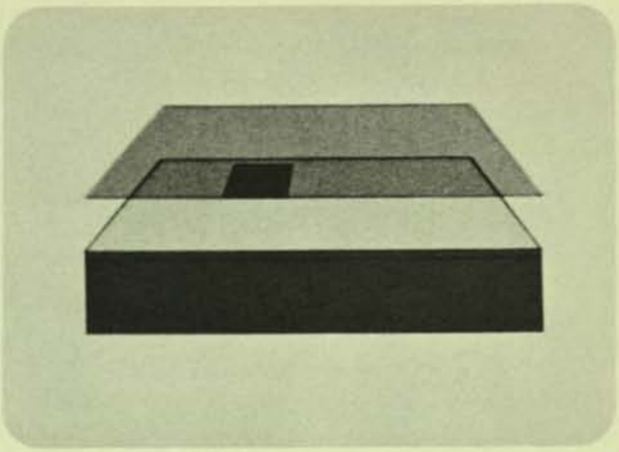


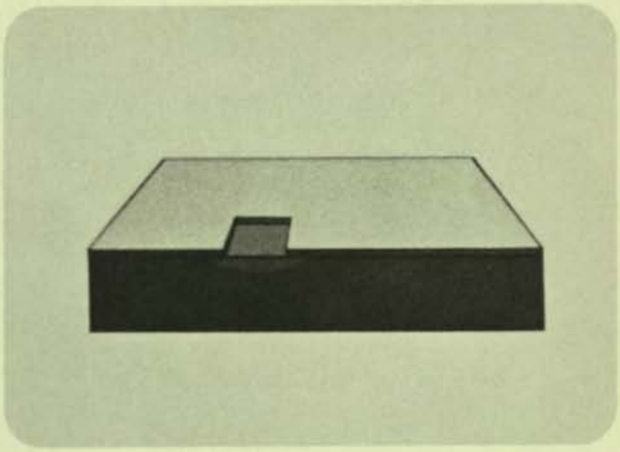
Let's take a look inside the silicon. This is a cross-section of the wafer we've just watched being made. To protect it from the outside world, we allow oxygen to react with the top surface and grow an oxide called the passivating silicon dioxide layer.

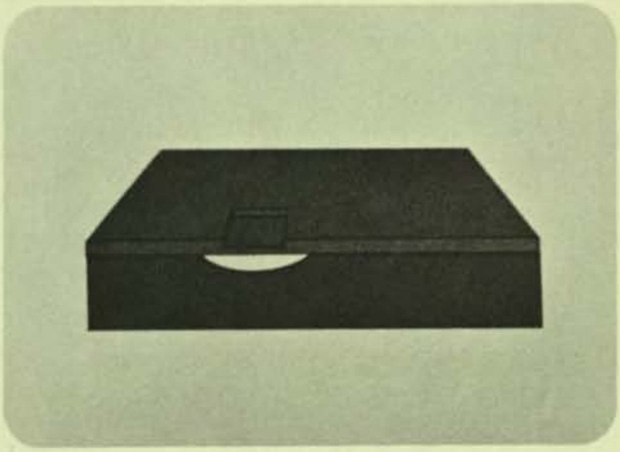


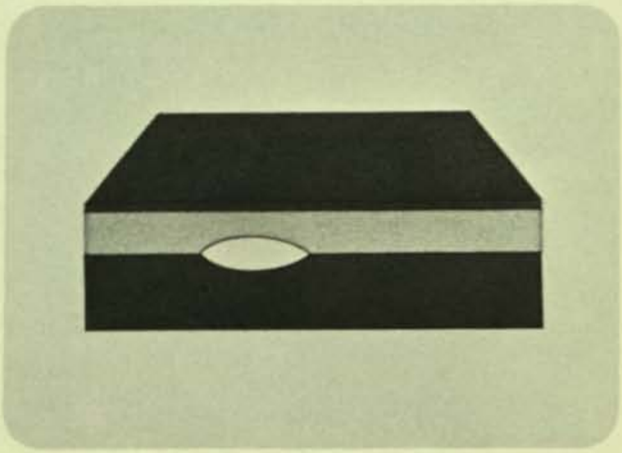
Now we're going to make use of the masks we made earlier. First the wafer is coated with a photosensitive resin; the mask is then placed on the wafer; and the system is exposed to light. As a result, the exposed resin hardens. The remaining resin can be simply rinsed away. The wafer is then exposed to acids. Those areas of the passivating layer not protected by the hardened resin are etched away. In the next operation, called diffusion, the wafer is exposed to a dopant. This impurity diffuses through the "window" just formed and into the silicon below forming the collector of a transistor in our integrated circuit. At the same time diffusion is taking place, more oxide is being formed. This is the essence of the Planar Process.

Now we're going to strip off the passivating layer and grow a new layer of silicon right on top of the diffused wafer by a process called epitaxial growth.



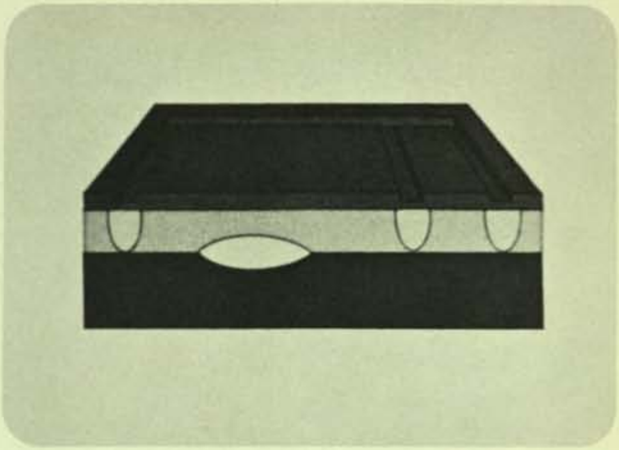


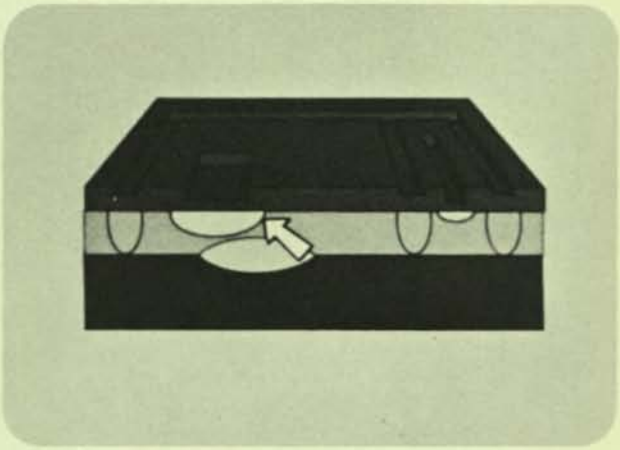


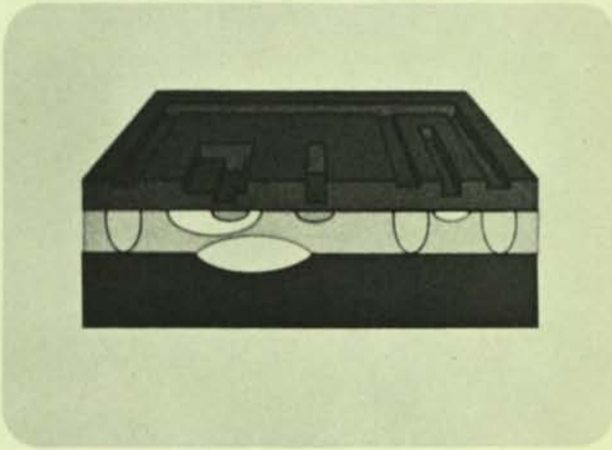


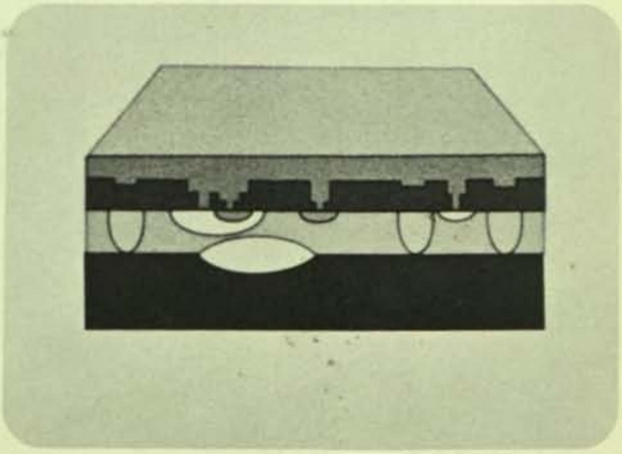
Now we form electrically isolated regions on the wafer by a process of diffusion — photosensitive coating, masking, exposure, rinsing, etching and diffusion. Next we prepare the individual parts of the integrated circuit. First a transistor base and a resistor. The same procedure is followed. Notice, diffusion takes place not only downward but also laterally under the oxide. As a result, the junction is formed beneath the passivating layer where it is protected from the outside world. The next diffusion forms an emitter and a collector contact to complete the transistor. Again, the same process.

The next step enables us to interconnect the various components and to make contact with them. Again, we'll etch windows in the oxide. But, instead of another diffusion, a layer of metal is deposited over the entire surface of the wafer.

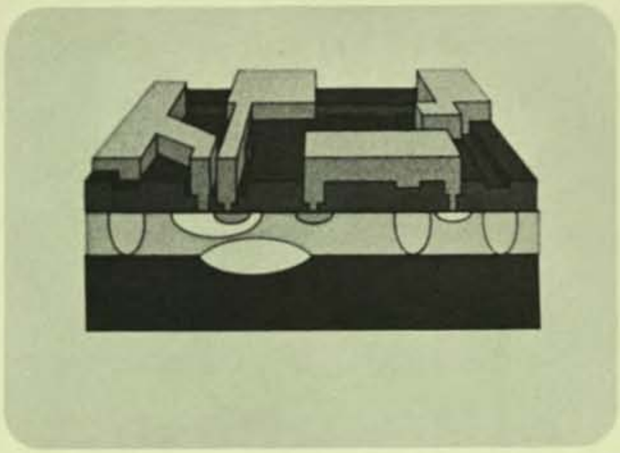




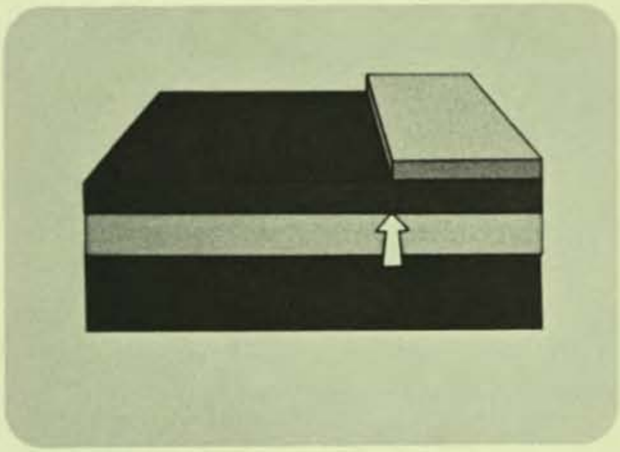




Then, by use of the proper mask, the excess metal can be etched away. Sometimes we like to make resistors a different way — by using the metal interconnection pattern. All you have to do is make the metal pathway a little narrower and it provides higher resistance. If we wish to make a capacitor, we take advantage of the fact that the oxide layer is an excellent dielectric material. A small area of metal is deposited forming one plate of a capacitor. The oxide is the dielectric and the silicon directly below the oxide forms the other plate.

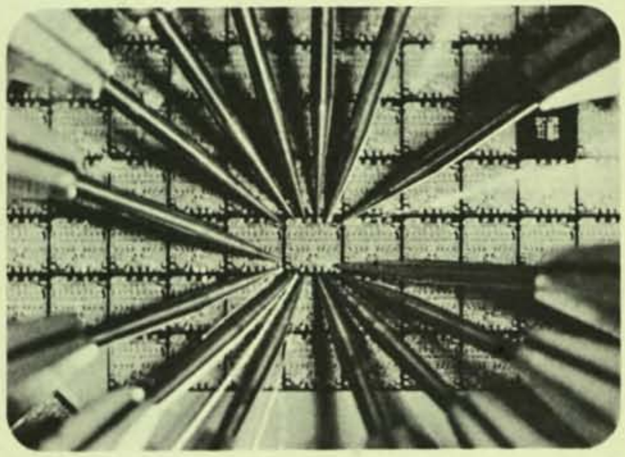


The series of schematic operations taking place on one structure that you just saw, actually takes place across a whole wafer. This results in a wafer containing many integrated circuits — up to 1,500 of them. Now comes the electrical testing of this wafer.



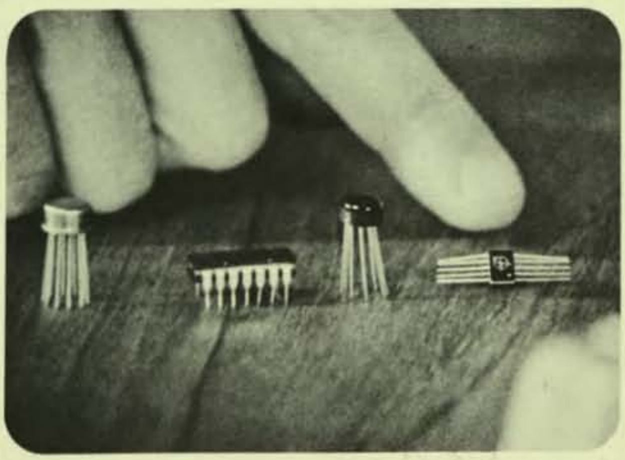
Angell: Even though we have been very careful in fabricating this wafer, containing many hundreds of integrated circuits, not all the circuits on the wafer are flawless. The first job is to determine and mark those circuits which are not good.

We test the wafers in a probe testing machine. We then scribe the wafers using a diamond point in a scribing machine. After separating, cleaning and drying the integrated circuits, we fish out the ones that are bad. If we have been successful to this point, we have a high yield of good ones.



From this point on, we are going to package the circuits. So whenever we throw one away, we are going to throw away a complete package.

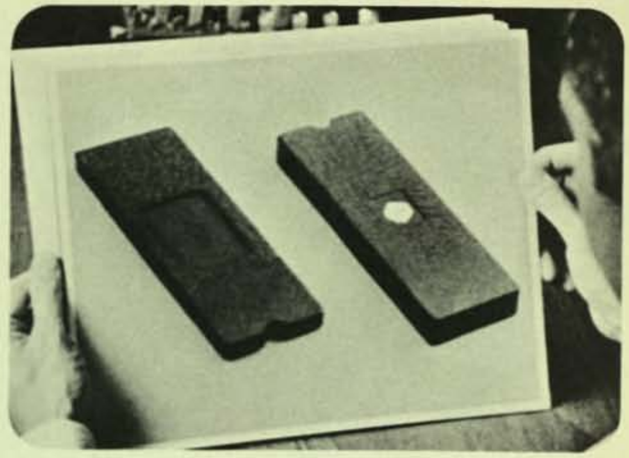
Sello: That's a good point, Jim. Let's look into this matter of packaging a little bit. You know we've exercised a lot of care in bringing the integrated circuit chips to this point in the processing and we've also done it economically because mostly we've processed them as wafers — 1,500 at a time. From here on out, we will be handling them as individuals, as you have pointed out, putting expensive packages around them. So, how we treat the packages is important.

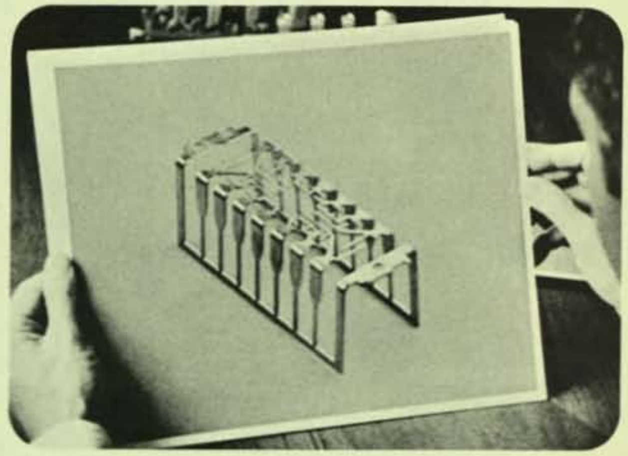


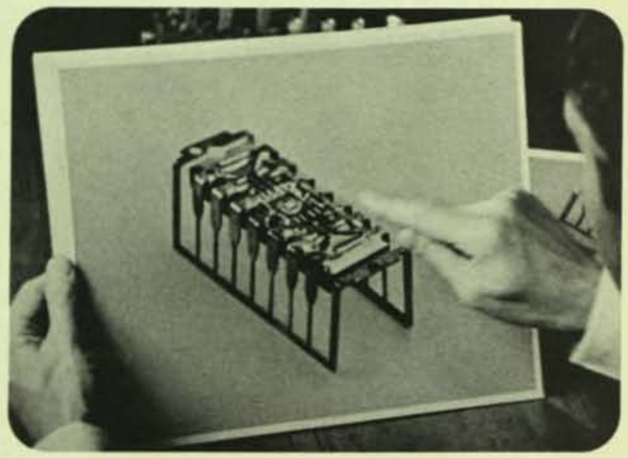
In the old days it was simple. We had a wide choice — two. Large and small. A TO-18, small, and the TO-5, larger. These days we have upwards of 250 varieties of packages, and the user can select any one of them. Here are three examples: a dual in-line package, a plastic package and a flatpak. The most nearly universal of these is the dual in-line package.

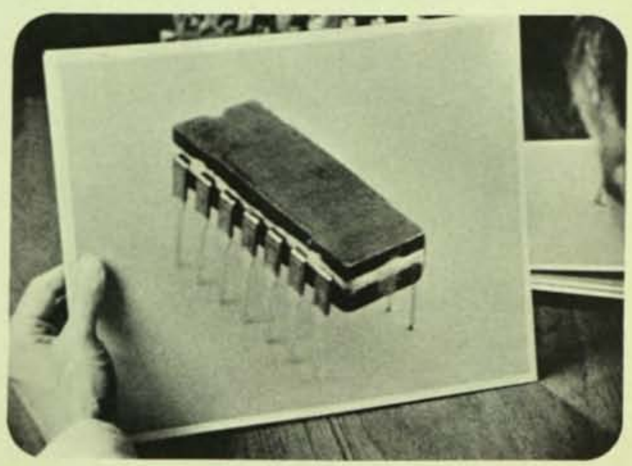
Let's take a closer look at just how it's made. You start out with the idea that you're going to build a tasty but inedible sandwich. Here are the two halves that you begin with: two ceramic parts between which the integrated circuit chip will be placed like meat. The two halves are glassed with a material which will form a solder that glues the two halves together later. A Kovar frame has been prepared in advance and cut out to the pattern necessary to connect the chip to the outside world. This Kovar frame will also be placed in the middle of the sandwich alongside of the chip, and here is the arrangement: chip in the center, Kovar frame around the outside. Notice that the tips of the frame have been metalized. These will be connected directly to the chip — as shown here where the lead bond wires connect each pad on the chip to a metalized tip on the Kovar frame. We complete the sandwich by putting the top half of the package right on top of the frame. The next operation is to clip the end of the frame; the package is now revealed in its magnificent beauty.

Solder glass is peeping out so we clean that up a little bit by sending the part through the furnace (along with many thousands of others) so that the solder glass is all melted and neatly in place. This is the finished dual in-line package.









Angell: Now that the circuit has been packaged, we must again test it substantially before we would dare ship it to the user. First there's a series of electrical tests, many of which use special test equipment which is itself built from integrated circuits. Many of the tests made on the integrated circuits at this point duplicate those tests which were made on the wafers. In addition, we must make some special tests such as frequency response (of a linear amplifier) or switching speed (of a digital circuit) before we would dare ship the goods. We can't make these tests on the wafer state due to the limitations of the probe testing machine. In addition to electrical tests, we perform a variety of mechanical tests such as shock, vibration and acceleration. Finally, we run a set of temperature tests at both high and low temperature to insure that the unit will work dependably in service.

Sello: Now let's look into some of the things we can do with integrated circuits.

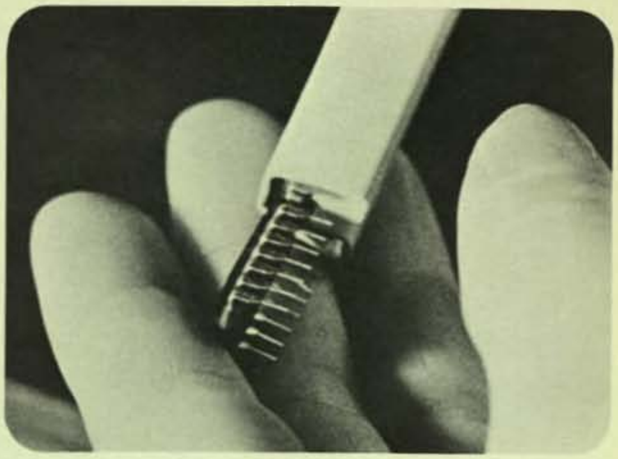
Angell: We've talked about how to design, build and test integrated circuits; let's look at some of the functions that are available now in integrated circuit form. Here is a list of readily available digital circuit functions. This list includes about all the circuits which are needed to build the electronics part of a digital computer. This list of linear functions includes a large variety of things. As you probably know, an operational amplifier, for example, is a rather precise amplifier used as the major building block of analog computers. The voltage comparator is a circuit which very accurately compares which of two voltages is the larger.

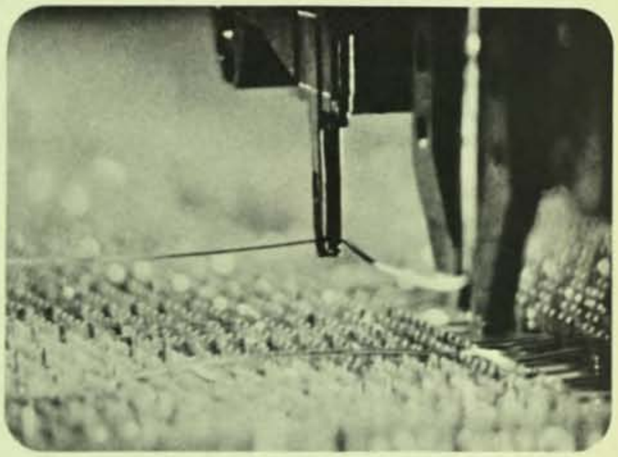
Sello: You know, it's exciting to think that all of these functions are here today — they can be used — they are available. And it's even more exciting when you consider the number of applications that they can be put to. You couldn't even begin to make a list of all of them. Actually, the uses of integrated circuits are limited only by the imagination of those who are designing their uses.

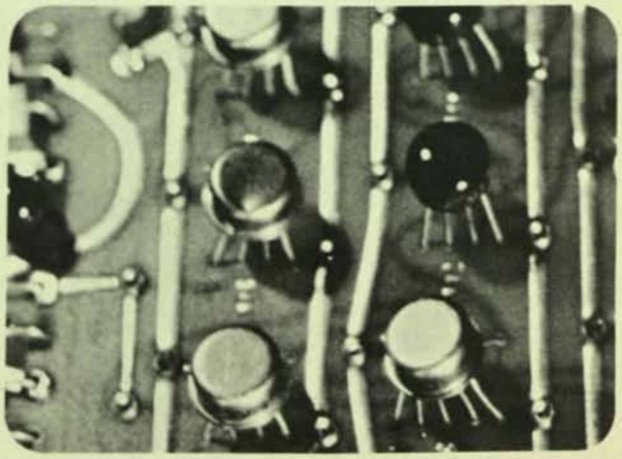
Let's take a deeper look into some of the present day applications of integrated circuits:

One of the many industrial companies using integrated circuits today is Burroughs Corporation. At Burroughs, integrated circuits in dual in-line packages are inserted in circuit boards automatically, thus affording more efficient production. Using this machine, which is proprietary with Burroughs, a single integrated circuit can be installed for about the same cost it previously took to install a discrete component. In order to automate the entire manufacturing process, Burroughs uses other advanced techniques such as flow soldering. This guarantees reliable connections to each integrated circuit. In addition, computerized wire wrapping machines are used to make the back plane interconnection so that the inherent reliability of the integrated design isn't compromised. The machine automatically cuts each wire to the correct length, strips the ends, routes the wires and makes the connections. Meanwhile, each completed circuit board is tested individually. Finally, circuit boards are installed in the computer frame, and the completed system is thoroughly tested. Burroughs is now committed to integrated circuits and, in fact, recently placed one of the largest single orders ever placed for these devices. For Burroughs, integrated circuits provide a significant cost reduction and a proven increase in reliability, both of which are real benefits to Burroughs customers.

Stromberg-Carlson is another company committed to integrated circuits. Their Data Products Division is now manufacturing the first in a line of new Stromberg-Carlson products built with I/C's. Integrated circuits, in this case in TO-5 packages (both metal and plastic) were used in the SC-1100 because of their low cost, size, reliability and, as Stromberg-Carlson says, "Because integrated circuits are here to stay."





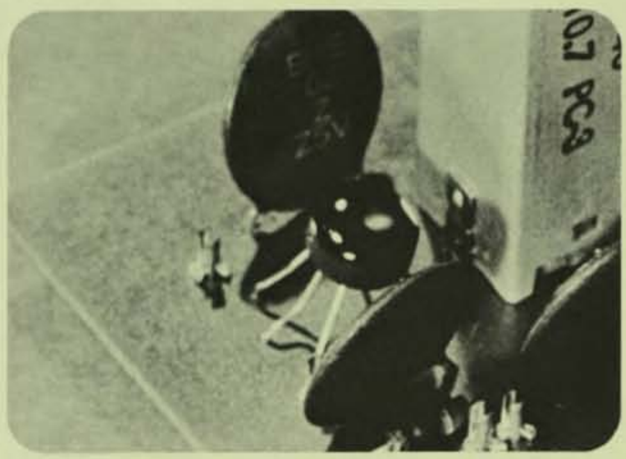


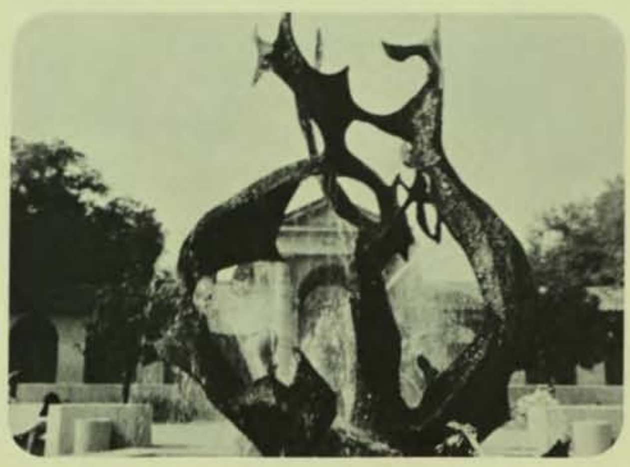
The SC-1100 system consists of up to 18 desk-top interrogators like this one which are handled by a single station control unit which in turn ties into the computer memory. The operator asks the computer a coded question via the interrogator. The computer responds with the requested information almost instantly; for instance, with an employee personnel record.

This is the Model 388 AM-FM stereo receiver built by H. H. Scott. It's only one of a new line of hi-fi components in which linear integrated circuits replace discrete transistors. Scott engineers have chosen IC's for one specific purpose — better performance. More stations can be pulled in with less noise and interference. Weak stations become loud and clear and outside interference is drastically reduced. But there are other benefits, too. A total of 37 discrete components in the receiver's i.f. strip have been replaced by only four IC's. This new approach to circuit design promises even more dramatic new products from the people at H. H. Scott.

We've seen some examples of how industry is putting integrated circuits to work today, but how about the future?

Angell: Well, that's a very exciting part of this story. Research is constantly going on to find new ways to use integrated circuits — not only in the R&D labs at semiconductor manufacturers, but also in universities, like here at the Solid State Electronics Laboratory of Stanford University at Palo Alto. The facilities that you see in this integrated circuits lab are made available by funds from many industrial organizations. Our lab at Stanford is a miniature of the production facilities you've seen in industry. It was built with the help of contributions from the majority of our nation's semiconductor manufacturers.





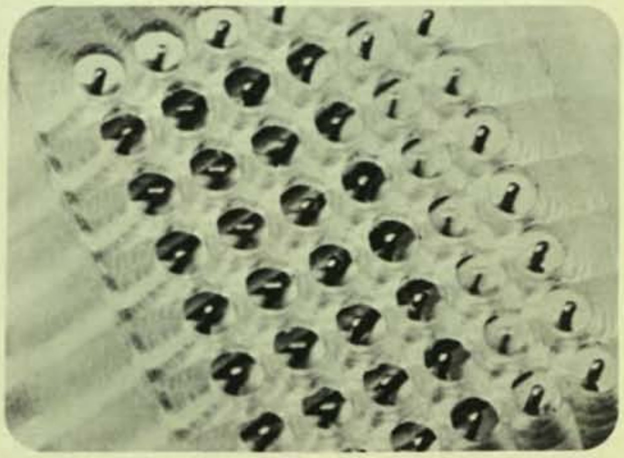
Right now we're working in several areas. We do basic research in integrated circuit technology. We're doing circuit research using the unique capabilities of integrated circuits. We also develop devices which incorporate IC's. And, we conduct research in several peripheral areas.

As an example of our research in IC technology, we're studying new ways of getting impurities into semiconductors. Normally, this is done by diffusion. We do the same thing by ion implantation. This machine takes individual ions and accelerates them, ramming them into semiconductor material much the same as you would shoot a bullet into a bale of hay. Right now this is much more expensive than diffusion, but it's a different technique. Here we're not interested so much in developing the technique as we are in learning the fundamentals — how heavily you can dope materials and what kinds of materials you can dope this way.

Let's look at an example in the field of medical electronics. Here we're using IC technology to develop an array of fine probes which a neurologist can implant down in a living brain to study the potential at different points on a single neuron.

Here, you're looking at one of the masks prepared by the student doing this research. We're developing probes — probably of gold — using the same technology as for the metalization patterns on IC's. This would have been impossible before IC technology.

One of the most dramatic devices being developed is this reading aid for the blind! This is a reading device in which ordinary printed material is converted to a tactile image which is presented by a closely spaced array of 48 piezoelectric reeds. By resting his finger on the vibrating reeds, the blind person can sense a vibrating and grainy facsimile of the material being viewed. The great advantage is that this machine enables a blind person to read the printed page. This version is relatively large, even though it incorporates integrated circuits. Ultimately, one 70 x 90 mil chip will take care of all the necessary electronics to drive one vibrating reed.



Sello: Certainly integrated circuits are used in many present day applications. One very important reason is the reliability of an integrated circuit. It is a reliable device. In the industry, we've logged almost 80-million element hours without a failure. That's reliability.

Angell: We've considered many different things regarding integrated circuits. One question we might ask is, "Why do people care about integrated circuits?" Well, there are many reasons. Certainly one of them is the reliability factor we were just considering. The second one is the fact that they are inexpensive. Even today it is often less expensive to perform a function with integrated circuits than it is with separate discrete components. The fact that they are small is important. This board here contains many functions — many, many more than we could get into this volume otherwise.

Finally, there are new functions which can be achieved with integrated circuits that just plain couldn't be achieved any other way.

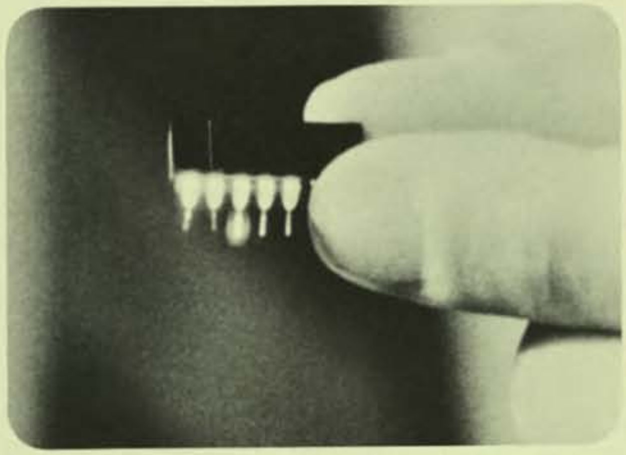
Angell: Harry, we've considered a large variety of topics on this program. I'm wondering if you'd be willing to summarize for us.

Sello: Yes, let's summarize.

We started off by telling you what an integrated circuit is. This is an integrated circuit. It is a piece of silicon into which have been built all of the necessary components to perform an electronic function. The piece of silicon, in a blow-up picture, looks like this: all of the functions are there.

We've taken you through the design and building of an integrated circuit from a circuit diagram, through masking, to wafer processing, and finally to the final packaging.

We've shown you that it takes a lot of extensive testing to prove out an integrated circuit. And finally, you've seen a lot of the uses — both present day and future — for integrated circuits. Hopefully, we've given you some ideas on how you can put integrated circuits to work for you.



Dave Hadley
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FAIRCHILD
SEMICONDUCTOR

A Division of Fairchild Camera and Instrument Corporation
313 Fairchild Drive, Mountain View, California 94040 (415) 962-5011 TWX: 910-379-6435

FAIRCHILD SEMICONDUCTOR

PRODUCTION OF INTEGRATED CIRCUITS

INTRODUCTION

Fairchild Semiconductor, a division of Fairchild Camera and Instrument Corporation, is the world's largest producer of silicon semiconductor devices used in military, industrial, and consumer-product markets. Headquartered in Mountain View, California, the division maintains manufacturing facilities of over 963,000 square feet, where a complete line of silicon transistors, diodes, and integrated circuits is manufactured. Fairchild pioneered the volume production of integrated microcircuits using the Fairchild-patented Planar process. Fairchild has engaged in extensive, company-sponsored research in perfecting manufacturing technology in the development of general utility and custom microcircuitry, and particularly in arriving at optimum packaging techniques netting consistently high yield.

Quality control is an integral part of Fairchild circuit production and is described in some detail in this presentation. In the routine manufacture of Fairchild Semiconductor products, quality control is inherently a part of the production cycle, and is reflected in the unusually and consistently high reliability of finished devices.

PRODUCTION CAPABILITIES

MANUFACTURING DEPARTMENT

The principal production of integrated circuits is accomplished at the Mountain View, California, and the South Portland, Maine plants. The Manufacturing Department uses 250,000 square feet of production area in the Mountain View plant and 48,000 square feet at the South Portland plant. (An addition of 100,000 square feet will be completed by June 1966 at South Portland.) Together these plants are equipped with every type of facility necessary for high-volume manufacturing of any type semiconductor device. This includes equipment for the growth of single-crystal silicon, slicing silicon crystals into wafers, lapping and polishing wafers, oxide passivation, epitaxial growth, mask making, masking diffusion, evaporated metal deposition, wafer dicing, die sorting, die attach, lead bond, final seal in a wide variety of packages, and in-process and final quality control inspection and test.

Approximately 2,500 section managers, supervising engineers, foremen, assemblers, inspectors, and supporting technical personnel at Mountain View, and 1,600 at South Portland produce the most complete line of silicon transistors, integrated circuits, and special semiconductor devices on the market. In Mountain View, about 500 direct operators are on the production lines during any one shift, and one-shift production of standard devices is over 500,000 units per month, with the capacity for double that quantity. Over 10,000 different devices have been manufactured here, and at any time there are 300 to 400 types of devices in production.

The Mountain View plant initiates production of all Fairchild transistors, integrated circuits, and special devices. In addition to the manufacture of finished products, it provides all of the completely processed silicon wafers, each of which contains from 200 to 2000 potential circuits, for the manufacture at the plant in South Portland. Fabrication processes and manufacturing methods and equipment for use in all Fairchild Semiconductor plants are developed and standardized in Mountain View.

MANUFACTURING SUPERIORITY

Fairchild Semiconductor's recognized leadership in the high-volume production of low-cost, high reliability semiconductor products results from a combination of unique elements:

1. **Research and Development**
   A continuing, heavy investment in research and development results in the constant flow of product and process innovations and improvements. Manufacturing efficiency is optimized by the initial pilot-line R&D production of devices and the close cooperation between R&D and the Manufacturing Department in trouble-shooting, in improving existing fabrication processes and techniques, and in developing new methods and equipment. The present 100,000 square foot Fairchild R&D facility with nearly 400 engineers and scientists will be increased to 200,000 square feet by December 1966 to accommodate the growing needs of Fairchild technological expansions.

2. **Experience**

Fairchild has long experience in the development and use of the universally adopted Fairchild Planar* process. This experience makes possible the efficient high volume production of close tolerance designs (hence, small chip size and high devices-per-wafer yield), close process control, skilled personnel, high production yield, and guaranteed product reliability.

3. **Quality Assurance and Reliability**

Fairchild manufacturing is a veritable QA operation. The seemingly disproportionate emphasis on quality assurance and reliability inspection, testing, and control at every step of manufacturing pays off in the elimination of defective material before expensive assembly operations, in high final yield, and in uniformly high product reliability.

4. **Flexible Production Capabilities**

Manufacturing efficiency is achieved by assigning different wafer fabrication processes to five specialized production sections and by channeling device assembly operations into a centralized production area and into separate assembly plants. At the same time, increased production of any specific device(s) can be distributed through any two or more wafer-fabrication or device-assembly facilities, as necessary to meet contractual requirements.

5. **Fairchild Test and Instrumentation Equipment**

The best semiconductor instrumentation and test equipment available is designed and made by the Fairchild Instrumentation Division to meet the Manufacturing Department's needs, and is also marketed worldwide. Special Test, fabrication, or instrumentation equipment can be made for manufacturing use within weeks.

6. **The Human Factor**

All personnel, from R&D scientist to production line assembler, are encouraged to contribute ideas for new and better processes, techniques, and equipment. At Fairchild, there are no implications that the existing ways of doing things are the best or only ways.

**Planar is a patented Fairchild process.*

ORGANIZATION

Manufacturing Organization

The Manufacturing Organization comprises an administrative headquarters (Operations) and two manufacturing departments, Integrated Circuit Operations and Transistor Operations. Under each operations manager are specialized production sections, each headed by a product manager. The product managers are responsible for production of devices assigned to their respective sections. Within each section supervisory authority and responsibility are delegated to one or more supervising engineers and further delegated to product engineers, each of whom is responsible for production of certain product types. Production line personnel are supervised by group or sub-line foremen, who are led by one or more general foremen. Each section has a production control group whose function includes planning, scheduling, record keeping, and other administrative duties. Quality control within each section is administered and supervised by one or more quality control engineers, QC inspectors, and QC technicians.

Production Sections

There are five sections that produce integrated circuits: (1) Proprietary Integrated Circuits Section; (2) Custom Integrated Circuits Section; (3) Linear Integrated Circuits Section; (4) Hybrid Integrated Circuits Section; and (5) Complex Integrated Circuits Section. These sections produce, from passivated wafers, over 125 different standard Fairchild Micrologic® integrated circuit device types in a variety of military and commercial grades and packages. In addition, the Custom Integrated Circuits Section has adequate facilities and capabilities for quickly fabricating, in quantity, any type of integrated circuit device to meet custom specifications. The many device types made are in nine general categories:

Resistor-Transistor Micrologic Integrated Circuits – RTμL
Diode-Transistor Micrologic Integrated Circuits – DTμL
Milliwatt Micrologic Integrated Circuits – MWμL
Complementary Transistor Micrologic Integrated Circuits – CTμL
Microamplifier Integrated Circuits – μA
Counting Micrologic Integrated Circuits – CμL
Transistor-Transistor Micrologic Integrated Circuits – TTμL
Micrologic MOS Integrated Circuits – μM
Low Power Diode Transistor Micrologic Integrated Circuits – LPDTμL

INTEGRATED CIRCUIT WAFER FABRICATION

Micrologic wafer fabrication processes are basically the same as those used to fabricate transistor wafers, but the number and sequence of the processes involved are somewhat different, as shown below.

Passivated Planar* P-type wafers
Mask 1 (transistor collector cutouts)

Micrologic® is a Fairchild trademark.
**Planar is a patented Fairchild process.*

Collector cutout predeposition (oxide etch)
Collector cutout N^+ type dopant diffusion
Pre-epitaxial passivation oxide removal (etch)
Epitaxial N-doped silicon growth
Passivation oxide growth
Mask 2 (isolation boundary)
Isolation boundary predeposition (oxide etch)
Isolation boundary P-type dopant diffusion
Mask 3 (transistor base and resistor cutouts)
Base and resistor cutout predeposition (oxide etch)
Base and resistor P-type dopant diffusion
Mask 4 (transistor emitter and collector contact cutouts)
Emitter and collector contact cutout predeposition (oxide etch)
Emitter and collector contact N-type diffusion
Mask 5 (intraconnection contacts)
Contact predeposition (oxide etch)
Aluminum evaporation-deposition
Mask 6 (circuit intraconnections)
Excess aluminum removal
Aluminum intraconnection alloying

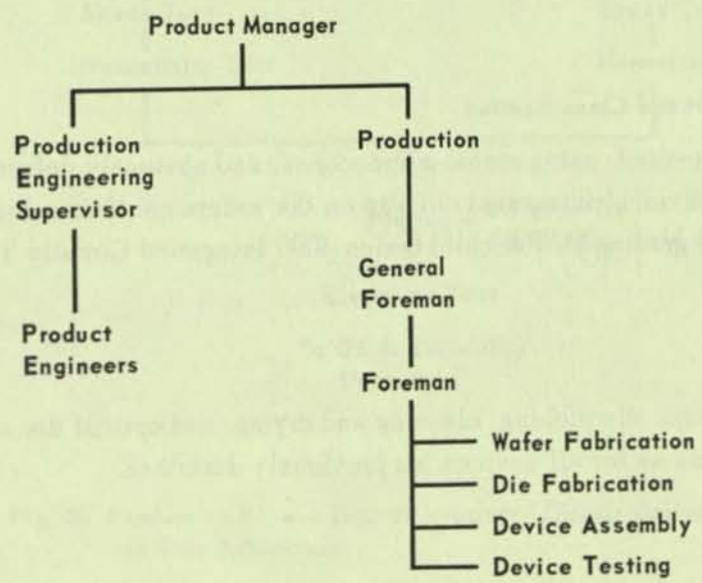


Fig. 2. Typical Manufacturing Production Section Organization Chart.

Mask Making

The cutout masks are made in the Process Development Section. This group has the skills and facilities to make any resolution photographic or etched metal masks required in the fabrication of the smallest or most complex semiconductor device. Step-and-repeat cameras and other advanced photographic equipment reduce large-scale drawings to produce masks with microscopic circuit patterns for 500 or more integrated circuits (and up to 2000 transistors) per 1-inch-diameter wafer.

Masking, Diffusion, Epitaxial Growth, and Metal Deposition

Extensive facilities making use of mask alignment and exposure, etching, diffusion furnace, and evaporated-metal deposition equipment are assigned to the production of integrated circuits. The masking, diffusion, and metal deposition processes are the same as for all semiconductor devices.

An intermediate epitaxial (N-doped silicon) growth process is performed in the epitaxy facility after the initial collector diffusion stage. The passivating surface of silicon dioxide is removed from the wafers by etching with hydrofluoric acid. The wafers are then placed within a thermal reaction chamber where volatile gases are introduced, and through chemical reactions, N-doped silicon is grown on the wafer surfaces, becoming an addition to or extension of the wafer material. Another oxide layer is grown on the epitaxial layer, forming a new passivation for the rest of the manufacturing process.

INTEGRATED CIRCUIT ASSEMBLY

The processes necessary in assembling and testing typical integrated circuit devices are shown in the production flow chart, Fig. 3.

In-Process Electrical Die Sort and Classification

Each wafer is visually inspected, using stereo-microscopes, and obviously defective or substandard circuits are discarded. Individual integrated circuits on the wafers are then subjected to complete final electrical testing and grading on Fairchild Series 4000 Integrated Circuits Testers.

Die Fabrication

Wafer scribing, die separation, die picking, cleaning and drying, and optical die sorting and inspection procedures are the same as for all devices, as previously described.

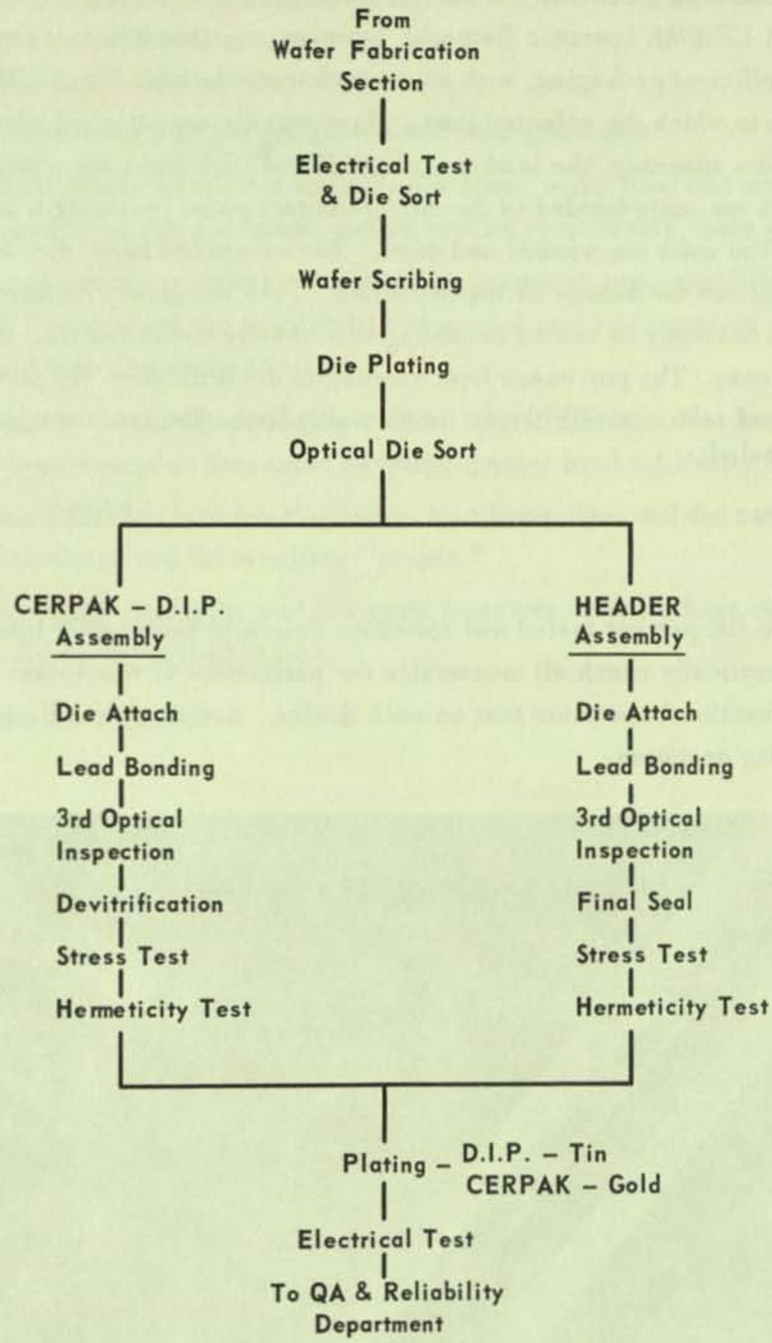


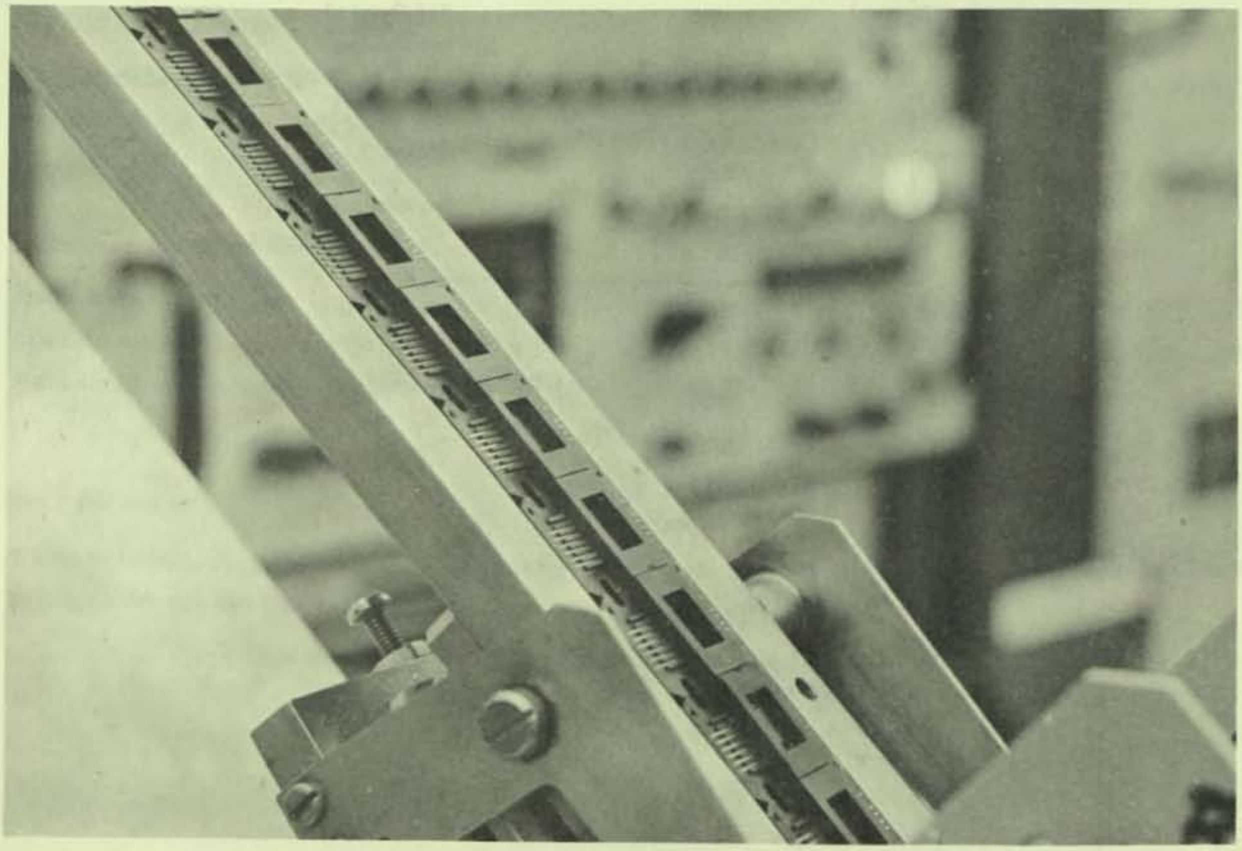
Fig. 3. Production Flow – Digital Integrated Circuit Device Assembly and Test Subsection.

Packaging

The assembly and final seal procedure for TO-type packages are the same as for all devices. Fairchild's patented CERPAK (ceramic flatpack), however, requires different procedures and provides better, more efficient packaging, with superior characteristics. The CERPAKS comprise a glazed ceramic base to which the selected lead preform and die are attached when the glaze is in a softened state. Before assembly, the lead tips of the Kovar® lead frame are aluminized. During assembly, the lead tips are sonic-bonded to the circuit contact pads, providing a superior aluminum-to-aluminum bond. The units are washed and dried. The assembled base, die, and lead frame are microscopically inspected for damage or imperfections. Then the glazed ceramic cap is positioned on the base, and the assembly is sealed according to a closely controlled time-temperature cycle in a devitrification process. The processes from washing to devitrification are perfomed under a positive-pressure hood, which covers the entire assembly line. The leads are gold plated after the package has been sealed.

TESTING

Finished devices are 100 percent tested and sorted on Fairchild Series 4000 Integrated Circuit Testers, which automatically check all measurable d-c parameters to worst-case limits, and also perform a thorough functional operation test on each device. Automatic handling equipment speeds the testing and sorting operation.



Outstanding Features of Fairchild Micrologic® Integrated Circuit Production

Fairchild's capability to mass produce superior integrated circuits at competitive prices is the result of several unique production features:

1. Fast masking and diffusion time.
2. Extensive experience with proven Fairchild Planar* processes.
3. Complete final electrical testing and classification, using final test equipment, at the in-process electrical die-sort stage, before expensive assembly costs are incurred.
4. Time and cost-saving, complete, data-logging, automatic-test capabilities of the Fairchild Series 4000 Testers, and the availability of special test equipment on short notice from the Fairchild Instrumentation Division.
5. Advantages of ultrasonic lead bonding in Fairchild CERPAKS: Non-heating of substrate; faster and less expensive than other methods; greater bond reliability.
6. All-aluminum CERPAK lead bonding (wire, lead frame tips, and die pads) eliminates gold-aluminum interfaces and the resulting "plague."
7. CERPAK assembly flexibility and low parts inventory, with package elements assembled around the die on the assembly line.

**Planar is a patented Fairchild process.*

QUALITY CONTROL

A principal objective of Fairchild is to provide effective assurance that all products delivered meet the intent and the detailed requirements of the customer. A second and equally important objective is to maintain the high quality of controls within the manufacturing organization to assure the quality of parts as they are manufactured.

QUALITY ASSURANCE DEPARTMENT

Fairchild Semiconductor has directed the Manager of Quality Assurance to provide a complete surveillance system over all phases of manufacturing and inspection to assure that good manufacturing practices are observed and that all contractual requirements are met. The Manager of Quality Assurance has been given authority to make decisions regarding shipment of product, acceptance or rejection of purchased materials or parts, and acceptance or rejection of parts or subassemblies manufactured by Fairchild Semiconductor.

The objectives are carried out by the department through the use of independent inspectors. Quality Assurance establishes quality criteria in conjunction with other departments directly concerned with manufacturing and inspection of the parts. Where contractual commitments differ from normal factory procedure, the contractual requirements take precedence. The independent inspectors are supervised directly by foremen from the appropriate sections of the Quality Assurance Department. It is the responsibility of these foremen to direct the inspectors' activities, interpret specifications, and to assure that their employees are provided with the latest drawings and change notices.

In addition, the Manager of Quality Assurance is in charge of the quality control function. Working under the direction of competent Process Control engineers and independent of production, QC is responsible for the entire quality effort on the manufacturing line. The process control inspectors, whose individual authority is described in detailed procedures, are working to quality criteria established by Quality Assurance. It is a responsibility of the Process Control Engineers to direct their activities and provide general guidance consistent with Company policies and applicable specifications.

QUALITY ASSURANCE POLICY

Reliability depends primarily on the initial design of the product. Tight Quality Assurance procedures assure that the inherent good reliability of products is not adversely affected by poor manufacturing procedures. Responsibility for making a fine quality product rests with the individual product managers. Responsibility for removal of defects rests both with the product managers and Quality Assurance. The former have responsibility for performing the last electrical inspection prior to submission to Quality Assurance. Responsibility for accepting material for shipment lies with Quality Assurance.

Specifically, Quality Assurance has responsibility for operating a receiving inspection function with full authority to accept or reject incoming parts. Where the decision is one involving economics only, as opposed to one where reliability is affected, a decision on disposition of parts is made jointly with the proper engineering personnel. Further, Quality Assurance provides surveillance inspection to assure the efficiency of the 100% inspections performed by the manufacturing groups. These surveillance inspections are informational or are accept-reject points, depending upon the operation being checked.

Quality Assurance provides an electrical test facility to sample-test lots being shipped to customers. This group operates on detailed internal instructions, or contractual requirements, where there are any. They have the responsibility for all life and environmental testing programs, both internal and under contract. Results of these test programs are analyzed by QA engineers for proper feedback of information.

Quality Assurance provides a defect analysis group which analyzes failures from life tests, environmental tests, field failures, and defects from all critical factory operations. This, again, is to provide proper feedback for corrective action. They provide inspection to assure the accuracy of the translation from customer contractual requirements to internal descriptions. They provide procedures for (1) assuring the development of procedures necessary to satisfy contract requirements, (2) checking compliance therewith by concerned personnel, and (3) making revisions when operating conditions point up the need.

In summary, the Quality Assurance Manager is responsible for quality assurance of all products and for providing feedback on quality problems both within the factory and between Fairchild Semiconductor and the customer. He has final determining authority on all matters pertaining to product quality, and reports directly to the Integrated Circuit Operations Manager.

In-Process Quality Control

These procedures insure control of quality characteristics for all production and assembly operations that effect the reliability and the cost of finished devices, and to establish the means to achieve this control. Important characteristics on each of the following operations are evaluated according to the appropriate inspection procedure. (See Fig. 4.)

Masking and Diffusion

Quality Control accepts or rejects runs based on sampling plans. Sampling plans are determined by economical quality levels. Defects are recorded by characteristics for each diffusion run. When appropriate, a formal rejection notice will be prepared and forwarded to the production foreman for corrective action. The product manager determines whether the rejected units are to be reworked or scrapped, where the decision is an economic one. Where reliability would be affected, Quality Control can override a decision by the product manager.

Chemical Mix Inspection

Chemical tests are performed on mixes used for etching during masking, diffusion, and die fabrication to assure the proper chemical content of the etching solution.

Quality Control Evaluation of Dice Before Assembly

Production personnel perform a dicing and inspection operation to assure use of good parts in subsequent operations. Quality Control performs an evaluation inspection by taking a random sample of inspected dice from each operator to assure inspection efficiency. A report of the quality evaluation is forwarded to the product manager for any necessary action.

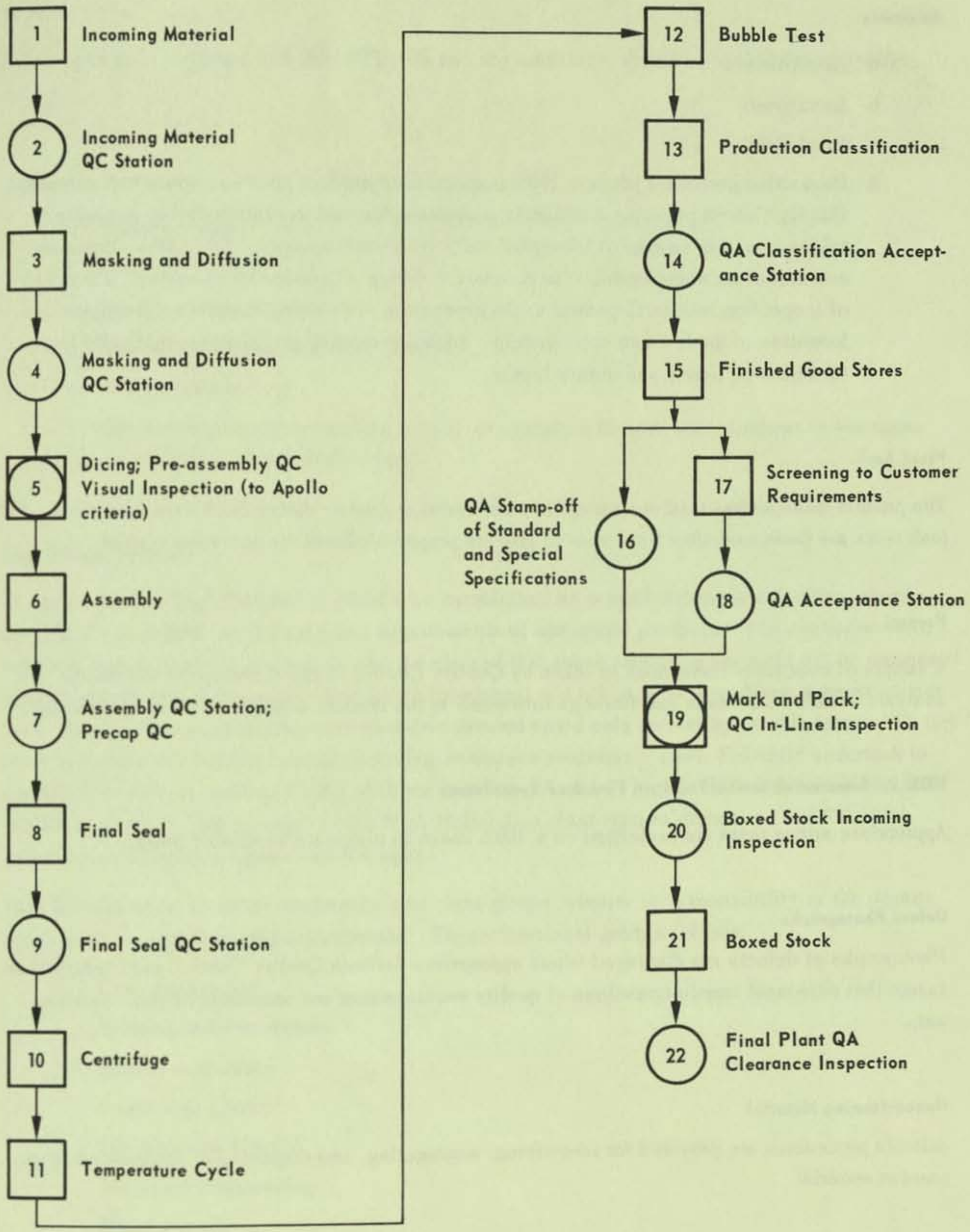


Fig. 4. Monolithic Integrated Circuit Process Quality Control Flow Diagram.

Assembly

a. Die Attach

b. Lead Bond

c. Lead Weld

d. Production personnel perform 100% inspection of product after each phase of assembly. Quality Control performs a separate evaluation for each operation during assembly by taking a random sample of inspected units from each operator. Evaluation charts are maintained on workmanship characteristics during all phases of assembly. This chart of inspection results is posted at the production station for immediate feedback of information to the foreman and operator. Summary reports are issued periodically for information on trends and defect levels.

Final Seal

The product manager has total responsibility for assuring quality during final seal operations. 100% leak tests are performed after final seal to provide proper feedback for operation control.

Presort

A sample of completed transistors is taken by Quality Control to check for opens and shorts. An analysis of defects is made and findings forwarded to the product manager for corrective action.

100% Environmental Stress Tests on Finished Transistors

Appropriate stress tests are performed on a 100% basis to eliminate unreliable parts.

Defect Photographs

Photographs of defects are displayed where appropriate for both Quality Control and Production to insure that personnel remain conscious of quality requirements and standards of good workmanship.

Nonconforming Material

Suitable procedures are provided for identifying, segregating, and disposing of nonconforming in-process material.

Sampling

Sampling is in accordance with MIL-STD-105 and any additional customer specification requirements.

Applicable Data Forms

a. Masking Report

b. Rejection Notice

c. Die Inspection Report

d. Assembly Percent Defective Charts

e. Presort Sample Log

f. Specific form numbers required for use at any point in time are called out in the appropriate 3000 series specifications.

High Reliability Plant

In August 1965, a High Reliability plant was established as a semi-autonomous facility, aimed specifically at satisfying the stringent requirements of aerospace products. With the increase in orders of high reliability devices, it was determined that these procurements could not be processed simultaneously with devices intended for entertainment and other, less demanding commercial markets. The impelling conclusions was that this demand could only be met by establishing a "Hi Rel" plant to service the needs of uncompromising aerospace programs. Thus, Fairchild undertook to provide this service, staffing Hi Rel with outstanding personnel, highly skilled in reliability and quality assurance. The manager of the High Reliability plant reports directly to the Fairchild Semiconductor Division Operations Manager.

High Reliability is divided functionally into eight groups, similar in responsibility to the departments within a manufacturing organization. These functional groups include:

Cost Accounting

Systems and Procedures

Quality Assurance

Production Control

Specification Control

Industrial Engineering

Manufacturing

Reliability

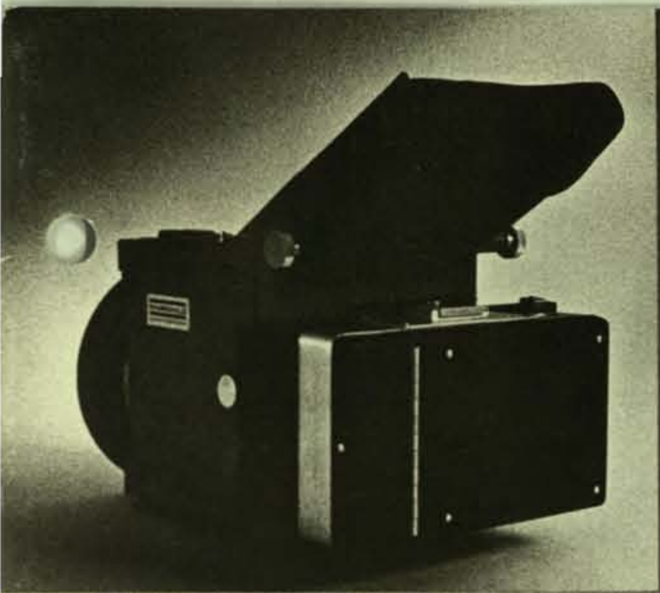
The facility is presently housed within the Mountain View manufacturing plant, where it occupies approximately 16,000 square feet.

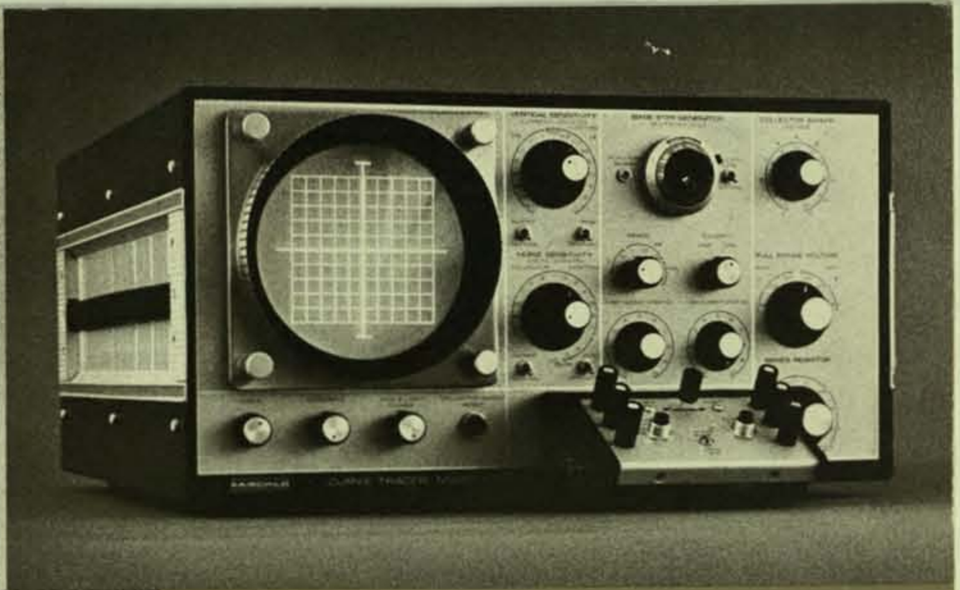
Operationally, the Hi-Rel Plant acquires devices from each of the respective Fairchild Semiconductor manufacturing plants, depending upon product requirements. These devices are then subjected to all of the additional 100-percent testing required by customer specifications beyond routine, manufacturing, quality assurance tests. In addition, the plant performs high reliability sampling according to customer special requirements, and can perform in-plant surveillance of special process requirements, with the authority to reject nonconforming parts. The plant is responsible for test and evaluation of the FACT (Fairchild Assured Customer Test) program. The plant also acts as liaison between Fairchild and all source inspectors.

[illegible] Hadley
650-327-4224

FAIRCHILD
SEMICONDUCTOR
A DIVISION OF FAIRCHILD CAMERA AND INSTRUMENT CORPORATION

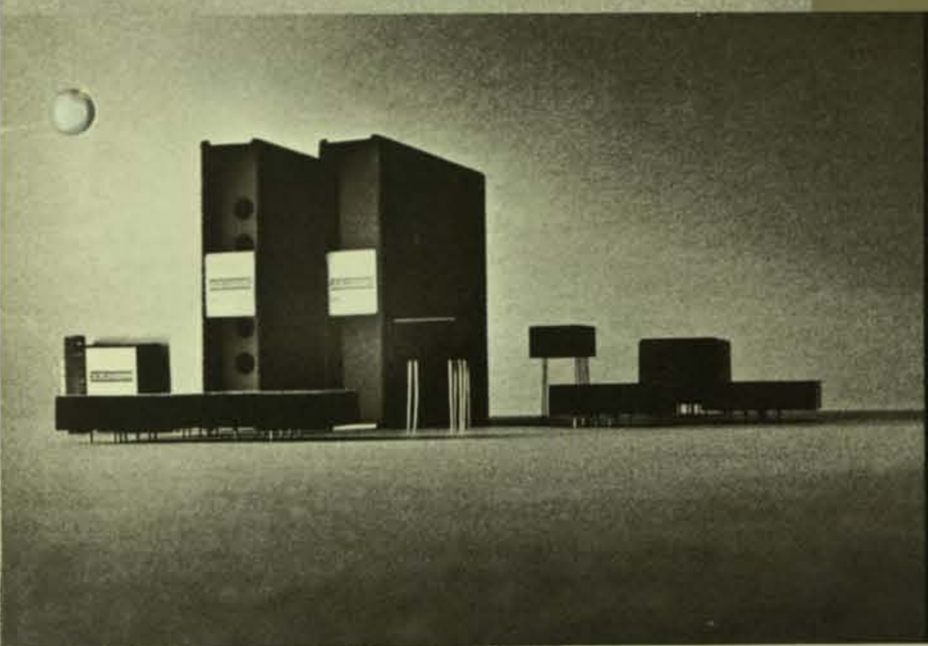
A Division of Fairchild Camera and Instrument Corporation
313 Fairchild Drive, Mountain View, Calif. 94041 / (415) 962-5011
TWX: 910-379-6435 / 2310-223-76 / 2M / Printed in U.S.A.
Initial edition published March 1966

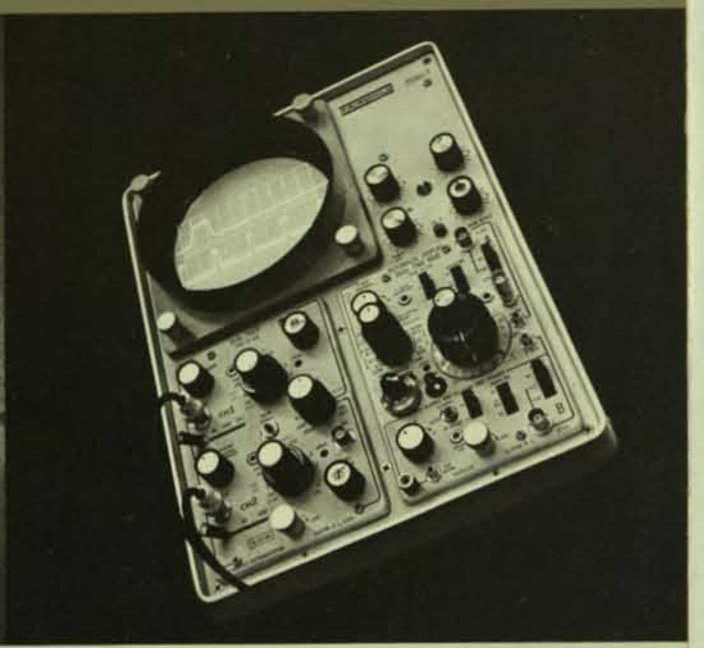


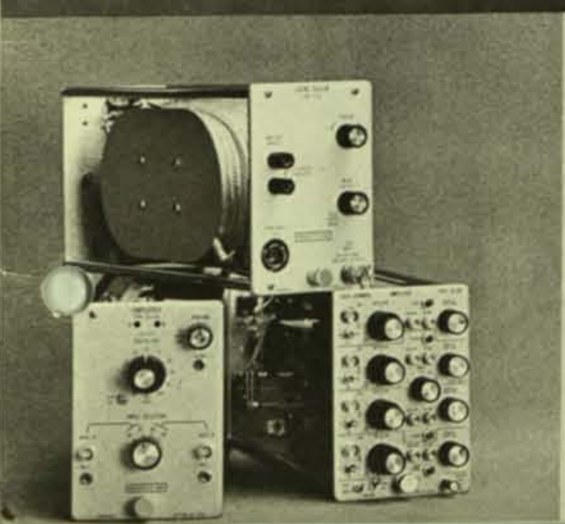


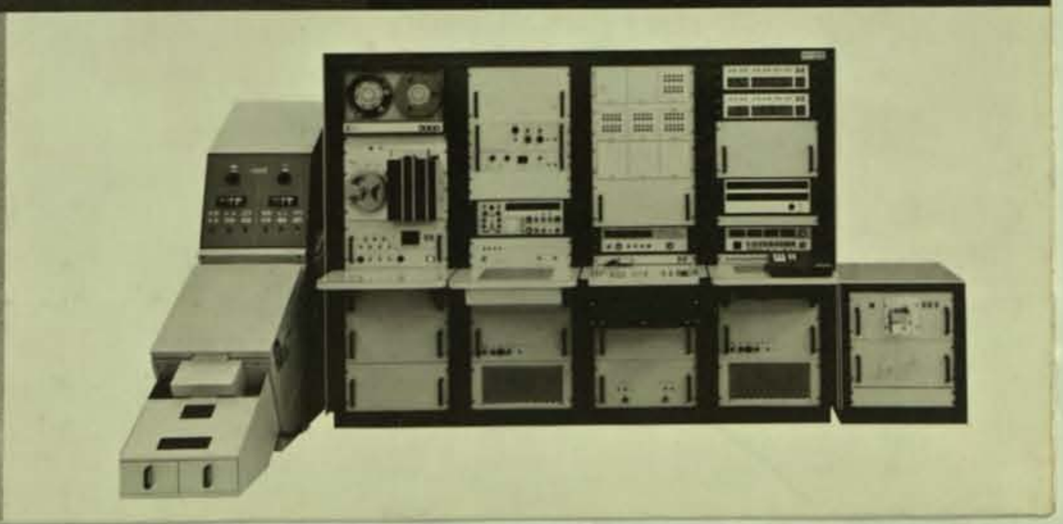
FAIRCHILD INSTRUMENTATION
Condensed Catalog

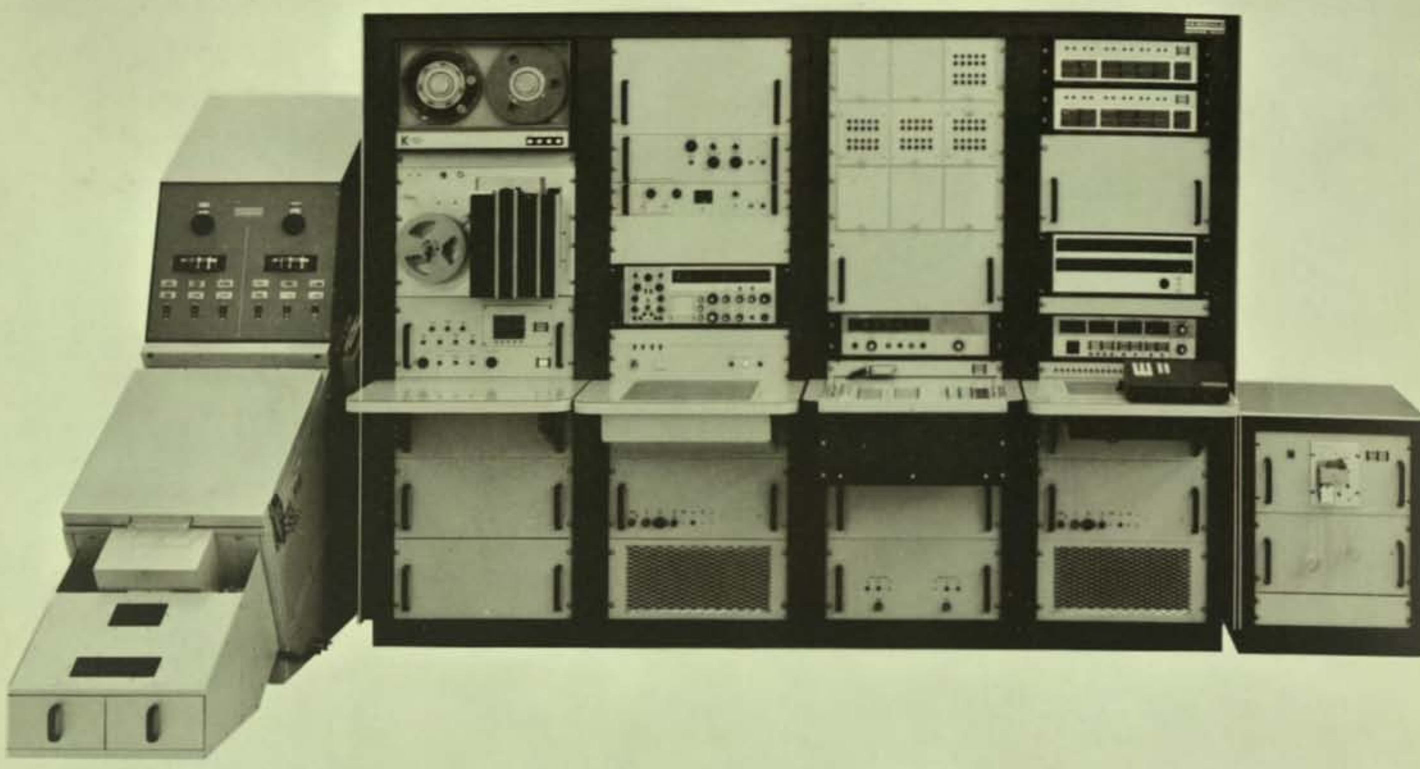
Test Systems
Instruments
Oscilloscopes
Components



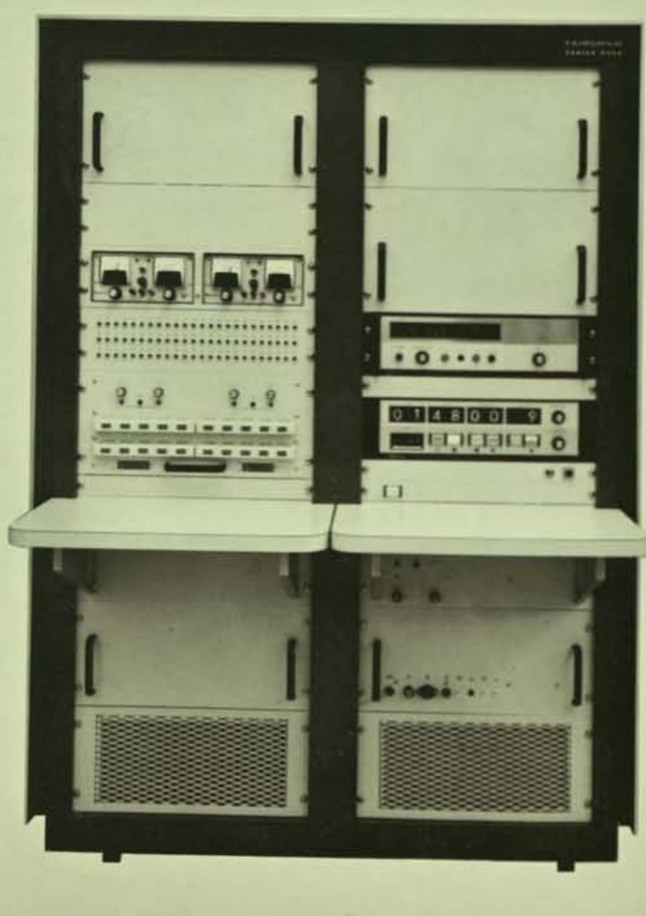








Series 4000M



Series 8000

Ceci Hadley
650 327-4224

Semiconducter Test Systems

Fairchild Instrumentation Test Systems are currently in use by most semiconductor manufacturers as well as by a large number of semiconductor users. Four basic series of test systems are available: Series 300 and 500 for testing discrete devices, Series 4000M for high-volume automatic testing of integrated circuits, and Series 8000 for testing of complex arrays and printed circuit cards with up to 144 connections.

FOR DISCRETE DEVICES

Series 300 — Series 300 testers are designed to perform GO/NO GO transistor and diode parameter tests for such applications as final production testing, incoming inspection, and QC testing and evaluation. The system is designed for operation by unskilled operators, and simplicity is stressed throughout. A lamp indicator and electromechanical sorter are provided for each of 12 sorting bins within easy operator reach. The system can be programmed to perform up to 20 parameter tests including tests for h_{FE}, breakdown voltage, saturation voltage, leakage, Zener voltage, and limiting voltage. Operating conditions may be varied over a wide range: I_C from 10μA to 5A, BV to 250V, BV current to 10mA, and pulse width from 350μsec. to 150msec. The system completes 20 parameter tests in about 2 seconds, and load time is minimized by dual test socket assemblies. Transistorized circuitry, pulse testing, and limit metering on dynamic load line are used to give the system a high degree of accuracy.

Main Features:*
High-speed testing
Accurate results
Programmable
Simple operation
Efficient sorting
Prices range from $15,000 to $30,000 depending on exact configuration and options.

Series 500 — Series 500 testers are ideal for production testing of transistors, diodes, SCRs, Zeners, and other discrete devices. The systems perform DC, pulsed, and 1kHz small signal tests, with up to 32 tests in one sequence. With magnetic disc storage or computer tie-in, the test capability can be multiplied hundreds or thousands of times. Direct digital readout has automatic decimal point and unit displays. Other readout options include automatic GO/NO GO readout, Hi/Lo limit testing, and data logging. Systems include readout auto-ranging to permit their operation by unskilled operators. Expandable modular design permits addition of capabilities such as environmental testing, data logging, etc.

Main Features:*
DC, pulsed, and 1kHz small signal tests
32 tests per sequence
Test type identification
Direct reading digit switch programming
Auto-ranging
Prices range from $30,000 to $50,000 depending on exact configuration and options.

FOR INTEGRATED CIRCUITS AND MODULES

Series 4000M — The Series 4000M test system is designed for high-volume testing of multi-lead solid state devices and modules. The system is fast, flexible, and accurate. A magnetic disc storage unit provides almost unlimited programming versatility, and digital design provides stable performance with repeatable results. The basic capabilities can be readily expanded to include a variety of special handling, testing, and data recording units. Simple keyboard programming is used to enter or alter test programs, eliminating hand-wired boards and cards. Operation is completely automatic after device insertion. 45 different test sequences, of 20 tests each, can be stored on a single disc, and the tester can perform them in any sequence required by the user, as well as transfer or skip sequences on the basis of intermediate results. The tester may also be operated under computer control. Results can be recorded on punched cards, tape, or typewriter, in addition to visual GO/NO GO and digital readouts. Additional capabilities include environmental testing, automatic handling, automatic and semi-automatic sorting, etc. The system will perform function, DC, linear and switching time tests at rates of up to 100 tests per second. It can be used for R&D engineering tests, incoming inspection, applications analysis, competitive analysis, quality control, production test and qualification, and in many other applications.

Main Features:*
Disc programming
Paper tape programming
Digitally programmed supplies
Infinite input impedance
Power and sensing leads on all pins
100 GO/NO GO tests per second
Program verification
Wide variety of special purpose programming, handling, testing, and data logging options including magnetic tape.
Prices range from $44,000 to $150,000 depending on exact configurations and options.

FOR COMPLEX ARRAYS AND PRINTED CIRCUIT CARDS

Series 8000 — The Series 8000 Array Test System performs functional logic tests on complex digital circuits. These circuits may be printed circuit cards, potted modules, integrated circuits, thin-film circuits, complex arrays, large scale integrated modules, and system subassemblies. The system has a 144 pin capacity, each one of which may be used for either input or output. It is capable of performing tests at a rate of 1000 per second — faster by an order of magnitude than any other system of its kind. An oscilloscope gives direct visual waveform readout of tests in progress, and a test lamp panel indicates which of the tested pins fails to conform to preset limits. Data logging options include card punch, paper tape punch, typewriter, and magnetic tape. The Series 8000 tester is ideal for applications such as device development, diagnostic testing, production line testing, quality control, and incoming inspection.

Main Features:*
1000 tests/second
Magnetic disc or computer programming
144 pin capacity
Any pin can be used for input or output
Visual waveform readout
Test result lamp panel
Complete data logging capabilities
Prices range from $45,000 to $125,000.

*For additional details, check appropriate box on attached postcard.


VERTICAL SENSITIVITY
BASE STEP GENERATOR
COLLECTOR SWEEP
HORIZ SENSITIVITY
FULL RANGE VOLTAGE
SERIES RESISTOR
FAIRCHILD
CURVE TRACER MODEL

6200B


0.0890
POWER
SAMPLING RATE
VOLTS
RATIO
OHMS
FAIRCHILD
INTEGRATING DIGITAL METER MODEL

7100A

6200B Curve Tracer — The Fairchild 6200B is a newly designed instrument capable of displaying the important characteristics of the latest solid-state devices. It has the necessary features to display curve families of high gain, low current transistors, FETS, MOS-FETs, unijunctions, SCRs, and, of course, all conventional devices. A programmable version is available that may be used for volume testing on a production line or in receiving inspection.

Main Features:*
All solid state except for CRT
Pulsed base operation
1000V, 100mA collector sweep
Display inverting capability
Continuously variable base step increments
Independent selection of both first and last steps
Base voltage steps to 35V
Base current steps as low as 100nA
Price: $1495.00

7100A Dual Slope Digital Meter — The Fairchild 7100A measures voltage, resistance and ratio. Dual Slope integration technique, developed by Fairchild, is used to give the instrument superior stability and noise rejection characteristics without the use of filter circuits. Construction is fully guarded, to further improve accuracy. Integrated circuitry is used throughout the unit to optimize cost/performance ratios. As a result the 7100A has features and performance characteristics usually found only in instruments costing up to twice its price.

Main Features:*
Dual Slope integration
Fully guarded construction
0.01% stability for 3 months
10μV resolution
0.01% performance
More than 1000 ohms input impedance
Display storage
Remote programming
BCD output (1-2-2'-4 or 1-2-4-8)
Auto-ranging and polarity
Crystal controlled integration time
Price: $2,075.00
Optional AC Plug-in: Full scales of 1V, 10V, 100V, 1000V
50% overranging without degradation
Price: $500.00

*For additional details, check appropriate box on attached postcard.

Components

Fairchild Instrumentation components include a line of silicon solid-state operational amplifiers (differential and chopper stabilized). Typical features and specifications are shown below, but you are invited to write for complete details on any or all of these products. Simply check the appropriate box on the

	SPECIFICATIONS	GENERAL PURPOSE		FET INPUT, 2.5 mA OUTPUT			FET INPUT, 20 mA OUTPUT		
	At 25°C ambient and rated supply unless specified	ADO-13 Low Cost	ADO-3A	ADO-21 Economy	ADO-23	ADO-25 Low Drift	ADO-20 Economy	ADO-22	ADO-24 Low Drift
GAIN	DC Voltage Gain (open loop):	40,000 (typ) 20,000 (min)	60,000 (typ) 20,000 (min)	50,000 (typ) 25,000 (min)	50,000 (typ) 25,000 (min)	50,000 (typ) 25,000 (min)	50,000 (typ) 25,000 (min)	50,000 (typ) 25,000 (min)	50,000 (typ) 25,000 (min)
	Gain-Bandwidth Product (min.):	1.3 MHz	1.6 MHz	5 MHz (10 MHz typ)	5 MHz (10 MHz typ)	5 MHz (10 MHz typ)	5 MHz (10 MHz typ)	5 MHz (10 MHz typ)	5 MHz (10 MHz typ)
	Gain Roll-Off:	6 db/octave	6 db/octave	6 db/octave	6 db/octave	6 db/octave	6 db/octave	6 db/octave	6 db/octave
	Slewing Rate (min.):	0.6 V/μsec	0.6 V/μsec	10 V/μsec	10 V/μsec	10 V/μsec	10 V/μsec	10 V/μsec	10 V/μsec
INPUT	Initial Equivalent Offset Voltage: (adjustable to zero)	— —	— —	5 mV	3 mV	2 mV	5 mV	3 mV	2 mV
	Input Bias Current:	+120 nA (typ)	+120 nA (typ)	−50 pA (max)	−50 pA (max)	−50 pA (max)	−50 pA (max)	−50 pA (max)	−50 pA (max)
	Input Difference Current:	— —	— —	— —	— —	— —	— —	— —	— —
	Equivalent Drift vs. Temperature[1] Voltage (max.):	±40 μV/°C	±10 μV/°C	50 μV/°C (typ) 100 μV/°C (max)	25 μV/°C (typ) 50 μV/°C (max)	10 μV/°C (typ) 20 μV/°C (max)	50 μV/°C (typ) 100 μV/°C (max)	25 μV/°C (typ) 50 μV/°C (max)	10 μV/°C (typ) 20 μV/°C (max)
	Current	— —	— —	Doubles every 10°C			Doubles every 10°C		
	Equivalent Drift vs. Time Voltage (max.):	±60 μV/8 hr	±50 μV/8 hr	±50 μV/8 hr	±25 μV/8 hr	±25 μV/8 hr	±50 μV/8 hr	±25 μV/8 hr	±25 μV/8 hr
	Current	— —	— —	— —	— —	— —	— —	— —	— —
	Drift vs. Supply	— —	— —	200 μV/V (typ)	200 μV/V (typ)	200 μV/V (typ)	200 μV/V (typ)	200 μV/V (typ)	200 μV/V (typ)
	Equivalent Noise (max.):	50 μV p-p (R_{in} = 1KR$_f$ = 100K)	40 μV p-p (R_{in} = 1KR$_f$ = 100K)	8 μV rms 10 Hz to 10 KHz	8 μV rms 10 Hz to 10 KHz	8 μV rms 10 Hz to 10 KHz	8 μV rms 10 Hz to 10 KHz	8 μV rms 10 Hz to 10 KHz	8 μV rms 10 Hz to 10 KHz
	Input Impedance (min.):	160 KΩ (diff) 10 MΩ (C.M.)	200 KΩ (diff) 10 MΩ (C.M.)	10^{11}Ω (diff) 4 pf (typ)	10^{11}Ω (diff) 4 pf (typ)	10^{11}Ω (diff) 4 pf (typ)	10^{11}Ω (diff) 4 pf (typ)	10^{11}Ω (diff) 4 pf (typ)	10^{11}Ω (diff) 4 pf (typ)
	Input Voltage (max.): Differential	5 V	5 V	— —	— —	— —	— —	— —	— —
	Common Mode	±10 V	±10 V	±10 V	±10 V	±10 V	±10 V	±10 V	±10 V
	Common Mode Rejection:	— —	— —	72 db (typ)	72 db (typ)	72 db (typ)	72 db (typ)	72 db (typ)	72 db (typ)
OUTPUT	Voltage Swing (max.):	±10 V	±10 V	±10 V	±10 V	±10 V	±10 V	±10 V	±10 V
	Load Current (max.):	2 mA	1 mA	2.5 mA	2.5 mA	2.5 mA	20 mA	20 mA	20 mA
	Output Impedance (open loop):	40 Ω	40 Ω	150 Ω	150 Ω	150 Ω	150 Ω	150 Ω	150 Ω
	Capacitive Loading: (X closed loop gain)	0.001 μf	0.001 μf	0.005 μf	0.005 μf	0.005 μf	0.005 μf	0.005 μf	0.005 μf
POWER	Supply Voltage (range):	±12 to ±18 V	±12 to ±18 V	±12 to ±18 V	±12 to ±18 V	±12 to ±18 V	±12 to ±18 V	±12 to ±18 V	±12 to ±18 V
	(rated):	±15 V	±15 V	±15 V	±15 V	±15 V	±15 V	±15 V	±15 V
	Supply Current (quiescent):	9 mA	9 mA	12 mA	12 mA	12 mA	12 mA	12 mA	12 mA
TEMP.	Temperature Operating:	−25 to +85°C	−25 to +85°C	−25 to +85°C	−25 to +85°C	−25 to +85°C	−25 to +85°C	−25 to +85°C	−25 to +85°C
	Storage:	−55 to +100°C	−55 to +100°C	−55 to +85°C	−55 to +85°C	−55 to +85°C	−55 to +85°C	−55 to +85°C	−55 to +85°C
PRICE	Quantity— 1-9:	$16	$55	$65	$75	$85	$85	$95	$105
	10-24:	$15	$48	$61	$69	$78	$77	$86	$95

[1] Averaged over specified temperature range

attached postcard. For your convenience, Fairchild Instrumentation components are stocked by selected distributor organizations. For the one nearest you consult the listing.

PREMIUM - 20 mA OUTPUT			SPECIAL PURPOSE	CHOPPER STABILIZED ±20 V to ±25 V				CHOPPER STABILIZED ±100 V to ±140 V	
ADO-41	ADO-40 Low Drift	ADO-43 Low Drift Low Offset	ADF-1 Fixed Gain Low Drift	AOO-4 Economy	AOO-6	AOO-10 Low Drift Low Offset	AOO-11 High Temp. Low Price	AOO-7	AOO-9 High Voltage
50,000 (min)	50,000 (min)	100,000 (min)	1000 ±1% (closed loop)	5 x 10^6 (min)	5 x 10^7 (min)	5 x 10^7 (min)	5 x 10^7 (min)	4 x 10^7 (min)	4 x 10^7 (min)
2 MHz	2 MHz	2 MHz	−3 db @ 30 KHz	2 MHz	1 MHz	1 MHz	1 MHz	1 MHz	1 MHz
6 db/octave	6 db/octave	6 db/octave	6 db/octave	6 db/octave	6 db/octave	6 db/octave	6 db/octave	6 db/octave (max)	6 db/octave (max)
0.6 V/µsec	0.6 V/µsec	0.6 V/µsec	4.5 V/µsec	4.8 V/µsec	1 V/µsec	0.6 V/µsec	1.2 V/µsec	10 V/µsec	3 V/µsec
— —	5 mV	5 mV	≤350 Ω to p.s. common required on each input.	±200 µV	±20 µV	±20 µV	±50 µV	±20 µV (max)	±20 µV (max)
+45 nA (max)	+45 nA (max)	−10 nA (max)	— —	±2 nA (max)	±20 pA (max)	±20 pA (max)	±50 pA (max)	±20 pA (max)	±20 pA (max)
±10 nA	±10 nA	±2 nA	— —	— —	— —	— —	— —	— —	— —
40 µV/°C	20 µV/°C	10 µV/°C	±1 µV/°C 0 to +60°C	±10 µV/°C	±0.5 µV/°C	±0.5 µV/°C	±1.5 µV/°C 0 to +55°C	±1 µV/°C	±1 µV/°C
±2 nA/°C (max)	±2 nA/°C (max)	0.5 nA/°C (max)	— —	±10 pA/°C (typ)	±0.5 pA/°C (typ)	±0.5 pA/°C (typ)	— —	±1 pA/°C (typ)	±1 pA/°C (typ)
±50 µV/24 hr	±50 µV/24 hr	±50 µV/24 hr	±10 µV/8 hr	±50 µV/8 hr	±1 µV/100 hr	±1 µV/100 hr	±2 µV/100 hr	±1 µV/100 hr	±2 µV/100 hr
±5 nA/24 hr (max)	±5 nA/24 hr (max)	±2 nA/24 hr (max)	— —	±50 pA/8 hr (typ)	±1 pA/100 hr (typ)	±1 pA/100 hr (typ)	— —	±1 pA/100 hr (typ)	±2 pA/100 hr (typ)
±5 nA/V ±100 µV/V (max)	±5 nA/V ±100 µV/V (max)	±4 nA/V ±100 µV/V (max)	— —	— —	— —	— —	— —	— —	— —
5 µV rms 10 Hz to 2 KHz	5 µV rms 10 Hz to 2 KHz	3 µV rms 10 Hz to 2 KHz	15 µV p-p	100 µV rms 10 cps to 1 Kc	5 µV p-p 0.1 to 1 cps 10 µV rms 10 cps to 1 Kc	5 µV p-p 0.1 to 1 cps 10 µV rms 10 cps to 1 Kc	10 µV p-p 0.1 to 1 cps 20 µV rms 10 cps to 1 Kc	10 µV p-p 0.1 to 1 cps 20 µV rms 10 cps to 1 Kc	10 µV p-p 0.1 to 1 cps 20 µV rms 10 cps to 1 Kc
300 KΩ (diff) 20 MΩ (C.M.)	300 KΩ (diff) 20 MΩ (C.M.)	600 KΩ (diff) 50 MΩ (C.M.)	200 KΩ (diff) 1 MΩ (C.M.)	970 k @ dc 500 k @ 50 cps	1 Meg @ dc 200 k @ 1 Kc	1 Meg @ dc 200 k @ 1 Kc	1 Meg @ dc 200 k @ 1 Kc	1 Meg @ dc 200 k @ 1 Kc	1 Meg @ dc 200 k @ 1 Kc
±10 V	±10 V	±15 V	5 V	— —	— —	— —	— —	— —	— —
±10 V	±10 V	±10 V	±5 V	— —	— —	— —	— —	— —	— —
86 db (max)	86 db (max)	86 db (max)	90 db @ 60 Hz	— —	— —	— —	— —	— —	— —
±10 V	±10 V	±10 V	40 V p-p (floating)	±20 V	±26 V	±25 V	±25 V	±100 V	±140 V
20 mA	20 mA	20 mA	1 mA	2 mA @ ±20 V 7 mA @ ±10 V	5 mA @ ±26 V 10 mA @ ±22 V	5 mA @ ±25 V 10 mA @ ±22 V	40 mA @ ±20 V 10 mA @ ±25 V	10 mA	40 mA @ ±100 V 10 mA @ ±140 V
50 Ω	50 Ω	50 Ω	100 Ω	30 Ω	10 Ω	100 Ω	100 Ω	100 Ω	500 Ω
— —	— —	— —	0.01 µf	0.001 µf	0.01 µf	0.01 µf	0.02 µf	0.001 µf (max)	0.005 µf (max)
±12 to ±18 V	±12 to ±18 V	±12 to ±18 V	— —	±28 to ±32 V	±28 to ±32 V	±28 to ±32 V	±28 to ±32 V	±115 to ±125 V	±160 to ±175 V
±15 V	±15 V	±15 V	±28 V	±30 V	±30 V	±30 V	±30 V	±120 V	±170 V
3 mA	3 mA	3 mA	7 mA	30 mA	27 mA	27 mA	12 mA	10 mA	20 mA
−25 to +85°C	−25 to +85°C	−40 to +100°C	−20 to +85°C	−20 to +85°C	0 to +55°C	0 to +55°C	−40 to +100°C	0 to +55°C	0 to +50°C
−55 to +125°C	−55 to +125°C	−55 to +125°C	−20 to +85°C	−55 to +85°C	−55 to +65°C	−55 to +65°C	−55 to +150°C	−55 to +65°C	−55 to +65°C
$38	$45	$65	$125	$85	$175	$170	$125	$155	$190
$35	$41	$59	$109	$74	$153	$147	$113	$135	$167

For additional details, check appropriate box on attached postcard.

Oscilloscopes

Fairchild Instrumentation makes a wide variety of oscilloscopes suitable for laboratory, field service, or manufacturing uses. Silicon planar solid-state devices and integrated circuits are used wherever practical to provide added performance and reliability at highly competitive prices.

GENERAL PURPOSE, LOW FREQUENCY SCOPES

Model 701 General Purpose Oscilloscope

Sensitivity 10mV/cm to 100V/cm
Bandwidth DC to 500kHz
Display 10 x 10 cm

Vertical Amplifier:
10mV to 10V/cm in 4 calibrated steps ±3%
10 to 1 vernier provides continuous adjustment to 100V/cm
Common mode rejection greater than 100 to 1 (40db) — 10mV/cm range
Common mode signal should not exceed 6V p-p or ±3V DC
X-Y phase shift adjustable to ±1° DC to 100kHz
Input impedance 1 megohm shunted by 40pf

Horizontal Amplifier:
100mV/cm to 100V/cm sensitivity in 3 calibrated steps
10 to 1 vernier provides continuous adjustment to over 100V/cm
Bandwidth DC to 350kHz, down 3db at 350kHz

Time Base:
5μsec/cm to 200msec/cm in 15 steps, 1, 2, 5 sequence ±2%
Pull variable extends slowest to 1 sec/cm
X10 expand extends fastest to .5μsec/cm

General:
115V or 230V, 48 to 450Hz line frequency, 145 watts
Operating temperature 0°C to 40°C
Height — 7⅝" (19.3cm)
Width — 16¾" (42.5cm)
Depth — 19½" (49.5cm)
Weight — 29½ lbs.

Price: $595.00

Model 702 Dual Trace Oscilloscope

Sensitivity 10mV/cm to 10V/cm
Bandwidth DC to 500kHz
Display 10 x 10 cm

Vertical Amplifier:
10mV/cm to 10V/cm in four calibrated steps ±3%
10 to 1 vernier adjustment provides continuous adjustment to 100V/cm

Modes of operation: Channel A only
Channel B only
A and B chopped
A and B alternate
A + B
A — B

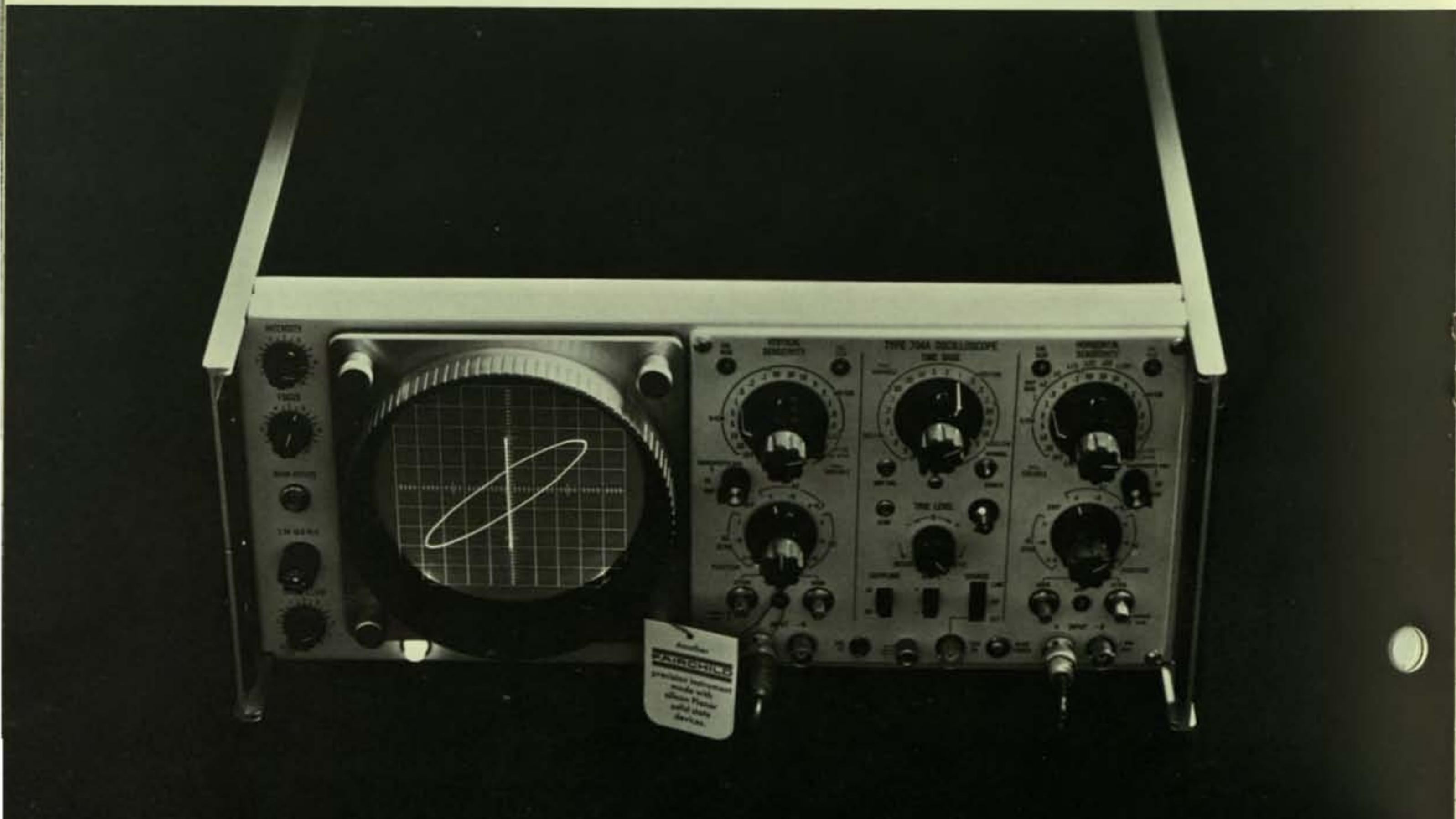
Common mode rejection greater than 100 to 1 (40db) — 10mV/cm range
Drift 2mV per hour with controlled ambient and line
Input impedance 1 megohm shunted by 44pf

Horizontal Amplifier:
Bandwidth DC to 350kHz ±3db
Sensitivity 100mV/cm to 100V/cm in 3 calibrated steps
A vernier is included to provide continuous adjustment to over 100V/cm

Time Base:
5μsec/cm to 200msec in 15 calibrated steps ±2%
Pull variable extends slowest to 1 sec/cm
X10 expand extends fastest to .5μsec/cm

General:
115V or 230V, 48 to 450Hz 170 watts
Height — 7⅝" (19.3cm)
Width — 16¾" (42.5cm)
Depth — 19½" (49.5cm)
Weight — 29 lbs.

Price: $850.00



704A

Model 704A 20μV X-Y Oscilloscope

Sensitivity 20μV/cm
Bandwidth DC to 500kHz at *all* sensitivities
Display 10 x 10 cm
Selectable vertical amplifier bandpass

Identical X-Y Amplifiers:

20μV to 20V/cm in 16 steps, 1, 2, 5 sequence
2.5 to 1 variable extends the 20V/cm range to 50V/cm
DC to 500kHz down 3db at 500kHz
A only, -B only or A-B switch selectable
Built-in calibrating signal, 1% accuracy
Common mode rejection at least 5,000 to 1 (74db) for 20μV/cm to 50mV/cm, attenuator settings
Phase shift X-Y adjusts to ±1° DC to 100kHz
DC or AC coupling, maximum input signal 600V p-p or DC
Input impedance 1 megohm shunted by 50 pf single ended, or 2 megohms shunted by less than 40 pf

Time Base:

Sweep calibrated 1μsec/cm to 5sec/cm in 21 steps, 1, 2, 5 sequence, 2% accuracy
Variable extends slowest sweep to 6sec/cm
7 step sweep expander from X1 to X100 accurate to 5% for rates to 1μsec/cm
Trigger from internal, external or line on positive or negative slopes
Internal trigger on 5mm of vertical deflection and 500mV p-p on external
Auto sync @ 50Hz
±10V trigger level range on external

General:

5" flat-faced CRT, mono-accel high brightness
P31 phosphor standard P2, 7, 11 optional
Accelerating potential 2.5kV
Pushbutton beam finder
Z axis input is standard
115 or 230V 170W, 48-450Hz
Storage temperature −40°C to +85°C
Operating temperature 0°C to +40°C
Height — 7⅝" (19.3cm)
Width — 16¾" (42.5cm)
Depth — 19½" (49.5cm)
Weight — 31 lbs.

Price: $895.00

Model 708A 10μV Dual Beam Oscilloscope

CRT dual gun, no time sharing
Sensitivity 10μV/cm
Rise time .7μsec
Bandwidth full 500kHz at *all* sensitivities
6 x 10 cm viewing area, each beam
5kV CRT acceleration
selectable vertical amplifier bandpass

Vertical Amplifiers:

10μV/cm to 10V/cm in 19 calibrated steps
Differential input on *all* ranges
Automatically stabilized on 10, 20, 50μV ranges
Common mode rejection always adjustable to better than 5000:1 (74db)
Phase shift adjustable to ±1° from DC to 100kHz
BNC input connectors
Input impedance 1 megohm shunted by 50 pf

Modes of operation:	**Upper Beam**	**Lower Beam**
	Input A	Input A
	Input −B	Input −B
	Differential A − B	Differential A − B
	Upper beam and lower beam vs time	
	Upper beam and lower beam vs "X"	
	Upper beam vs lower beam	

Time Base:

Sweep range 5μsec to 2sec/cm in 18 steps
Accuracy ±3%
Sweep magnifiers X1, X2, X5, X10, X20, X50
Magnifier accuracy — sweep rates: to 1μsec/cm ±5%
Trigger sensitivity, internal — 4mm vertical deflection
Trigger sensitivity, external — 500mV, p-p

Horizontal Amplifiers:

Sensitivity 20mV to 1V/cm in 6 steps
Bandwidth DC to 500kHz ±3db
Rise time .7μsec with less than 2% overshoot

General:

5" flat-faced CRT with 5kV accelerating potential
Pushbutton beam finder returns trace to center screen
115V or 230V, 48Hz to 1kHz line operation
Storage temperature −40°C to +85°C
Operating temperature 0°C to +40°C
Height — 7⅝" (19.3cm)
Width — 16¾" (42.5cm)
Depth — 20⅝" (52.5cm)
Weight — 35 lbs.

Price: $1045.00

Oscilloscopes

GENERAL PURPOSE, HIGH FREQUENCY SCOPES

Model 766H/F General Purpose Laboratory Oscilloscope

100MHz bandwidth
100mV/div sensitivity (10mV @ 90MHz)
3.5nsec rise time
Beam switching delaying sweep available
6 x 10 cm scan
13kV accelerating potential
Algebraic add
5nsec sweep

Amplifiers:
Interchangeable X-Y amplifiers
Accepts all high frequency plug-ins (see Page 12)
79-02A dual trace amplifier and 74-17A beam switching and delaying sweep recommended

Display:
5" flat-faced post accelerator tube with 13kV accelerating potential
P31 phosphor supplied, P2, P7 and P11 available as options
Display area is 6 x 10 cm
Adjustable edge lighting of graticule provided
Internal graticule anti-parallax tube optionally available

Z Axis Input:
Terminal for blanking CRT provided at rear of instrument
—15V input signal will dim the trace, —25V will blank it

Voltage Calibrator:
A pin jack on front panel provides 1V p-p 1% square wave which at known line frequencies will provide time calibration

General:
110V or 230V, 200W, 48Hz to 1kHz power line frequency
Storage temperature —40°C to +85°C
Operating temperature 0°C to +50°C
Altitude — Operational to 10,000'; storage to 50,000'
Height — 13¾" (35cm)
Width — 9¾" (24.8cm)
Depth — 20⅝" (52.5cm)
Weight — 37 lbs.

Price: 766H $650.00 766H/F $720.00

Other configurations available:

	767H Rack mount	767H/F Rack mount (100MHz Main Frame)
Height	7" (17.8cm)	7" (17.8cm)
Width	16¾" (41.5cm)	16¾" (41.5cm)
Depth	19" (51cm)	19" (51cm)
Price	$695.00	$770.00

Model 765MH/F Militarized Scope

Same as Model 766H/F electrically
Meets mil specs
Operates from —30°C to +60°C
Light and portable
Certificate of compliance included

Heater Strips:
200W thermostatic heater for operation at temperatures below 0°C

Temperature:
Storage —40°C to +85°C
Operating —30°C to +50°C without fan
—30°C to +60°C with fan (Mod 115 or 116)

Altitude:
Operational to 15,000'; storage to 50,000'

Humidity:
Operation to 40°C and to 95% relative humidity

Shock:
20G for 5msec, 15G for 11msec, 10G for 25msec

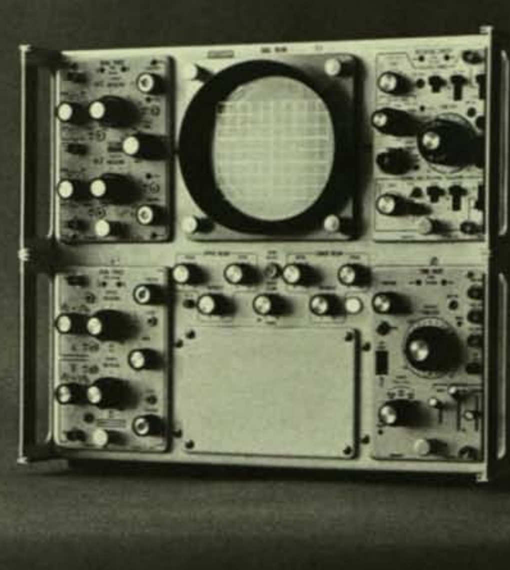
Vibration:
15 minute cycle 10-3000Hz @ .01" double amplitude p-p
Vibrated in 3 planes, 15 minutes in each plane

General:
Height — 8¼" (20.9cm)
Width — 17¾" (45cm)
Depth — (with cover) 23" (58.5cm)
Weight — 27 lbs.

Price:

765MH/F Main Frame	$1060.00
Mod 115 50-60Hz fan	$1155.00
Mod 116 50-450Hz fan	$1255.00

766H/F



777

Model 777 Dual Beam High Frequency Scope

Two independent beams, dual gun CRT
DC to 100MHz bandwidth
Four plug-in cavities accept all high frequency modules (see Page 12)

Display:
Dual gun CRT, 13kV accelerating potential
Display area 6 x 10 cm for each beam with 4 cm overlap
Each gun can be independently blanked, 20V required to dim
A switch provided for each beam enables switching from beam gate blanking to cathode gate blanking for single shot photography
Adjustable edge lighted graticule

General:
115V or 230V, 350W, 48 to 62Hz, or 48 to 450Hz with Mod 116 option
Storage temperature −40°C to +85°C
Operating temperature 0°C to +50°C
Operating altitude to 10,000'; storage to 50,000'
Height — 14" (35.6cm)
Width — 17" (43.2cm)
Depth — 25" (63.5cm)
Weight — 50 lbs.

Price:

Main Frame with Mod 115 option (50-60Hz)	$1600.00
100MHz operation	$1800.00

SPECIAL PURPOSE OSCILLOSCOPES

Model 737A Electrostatic X-Y Indicator

17" electrostatic rectangular CRT
88 square inches quality rectangle
Full 1MHz bandwidth on X, Y and Z axes
DC coupling all axes
10kV overall accelerating potential
High linearity
Uniform, small spot size
Bench or rack mount
Bandwidth (X & Y): DC coupled, DC to 1MHz down 3db measured at full screen deflection
Rise time 0.35μsec maximum measured 10% to 90% with less than 2% overshoot
Sensitivity (X & Y): .1 volt/div continuously variable to .5V/div
Deflection linearity: ±2% maximum overall within quality rectangle; ±10% maximum, 1 div increments
Phase shift between orthogonal systems ±0.1 degree maximum at 1kHz and ±1 degree maximum at 100kHz
Stability: less than .2 div drift per hour at maximum sensitivity (controlled ambient and line voltage conditions)
Positioning Range: Minimum of full screen
Z axis: DC coupled, 5V signal will blank or intensify the trace. + and − intensify inputs are provided
Display area: Quality rectangle 21cm x 28cm minimum, overall scan 25 x 30cm
AC power: 115V or 230V, 750W, 50 or 60Hz (50-450Hz optional)

Dimensions	Indicator Unit	Power Supply
Height	15¾" max.	7" max.
Width	16¾" max.	16¾" max.
Depth	18¾" max.	11" max.

Weight — 115 lbs. (Indicator and power supply)

Price:

No graticule	$3450.00
8 x 10 internal graticule	$3525.00
10 x 10 internal graticule	$3550.00

Model 977 Fiber Optics Scope

This special purpose oscilloscope is designed primarily for recording very fast single transients
Photographic writing rate over 3 x 10^{10} trace width per second
Two CRT's for recording a wide dynamic range of signals
High resolution: 350 trace widths in the vertical axis (20mm)
450 trace widths in the horizontal axis (30mm)
Minimum scan: 20mm x 30mm raster
Accelerating potential 10kV
Rugged construction

Vertical Preamplifier:
15Hz to 30MHz ±3db
12nsec rise time
25mV for full scale deflection (20mm)

Direct-to-Post Amplifier:
DC to 100MHz
3.5nsec rise time
2.5V for full scale deflection (20mm)

Time Base:
200nsec to 10msec full scale (30mm) in 13 steps
Accuracy better than 3%

General:
Power requirements: 28V DC or 115/230V AC (Mod 101) 48-400Hz
Storage temperature −50°C to +85°C
Operating temperature 30°C to +60°C

Price:

Model 977	$8200.00
With Mod 101 (AC operation)	Quotation upon request

Model 9570 High Writing Rate Oscilloscope System

Complete with 100MHz vertical module

Writing rate	Approximately 855cm/μsec
Bandwidth	DC to 100MHz
Rise time	3.5nsec
Spot size	8 mils

CRT P11 phosphor, 4 x 5 cm scan with 13kV accelerating potential
Horizontal scan 10 divisions of 4mm each
150 line vertical and 175 line horizontal resolution
Normal to fast single shot switch on front panel
CRT cutoff, cuts film fog on time exposures

Because of the high sweep speeds required for single transient photography, the selection of a 74-03A or 74-17A time base is recommended for use with this system. Both of these instruments can provide a fastest sweep speed of 5nsec/cm.

Z Axis:
Connector for blanking CRT provided at rear of instrument

General:
Storage temperature −40°C to +85°C
Operating temperature 0°C to +50°C
Thermostat cuts power when ambient limits reached
Altitude — Operational to 10,000'; storage to 50,000'
115V or 230V, 200W, 48-450Hz
Height — 7" (17.8cm)
Width — 19" (48.4cm)
Depth — 20" (52cm)
Weight — 30 lbs.

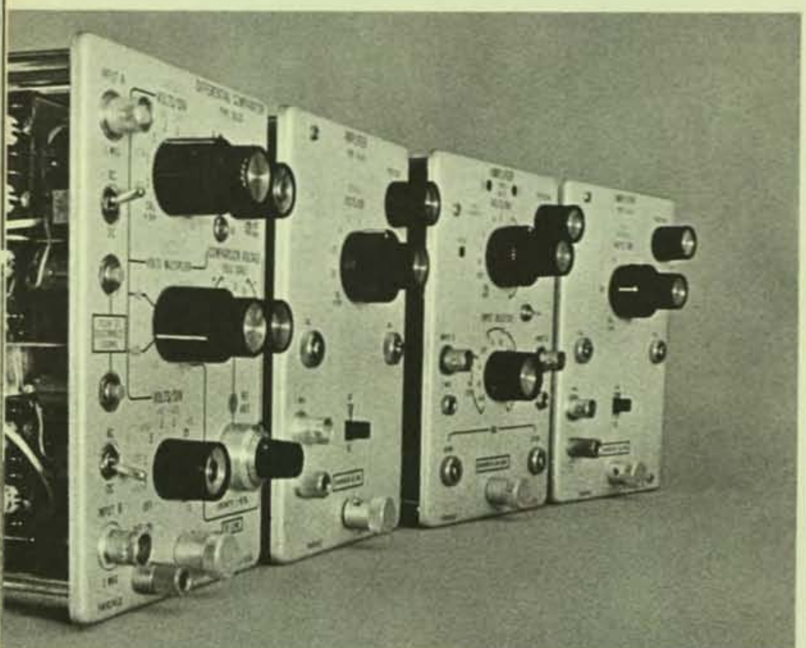
Price:

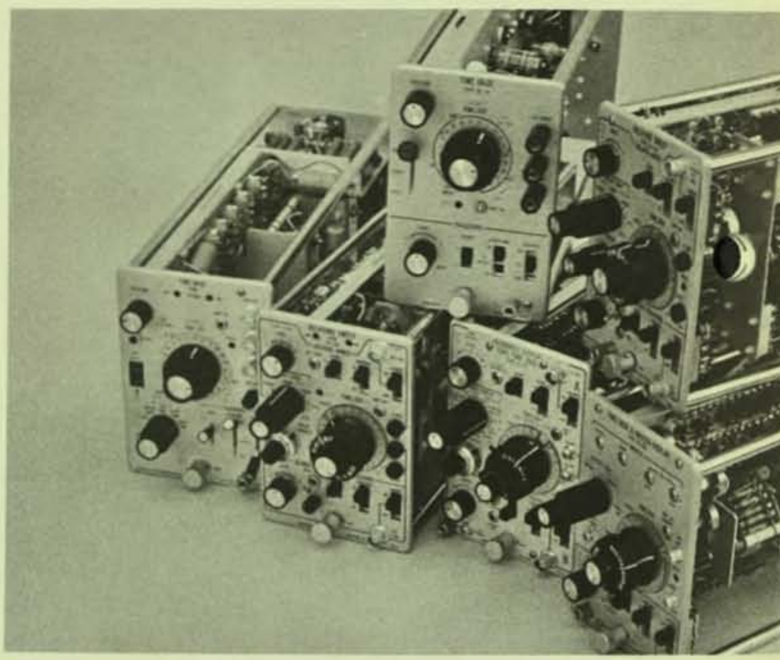
9570 System consisting of 957 Main Frame and 95-71 100MHz vertical module	$2200.00

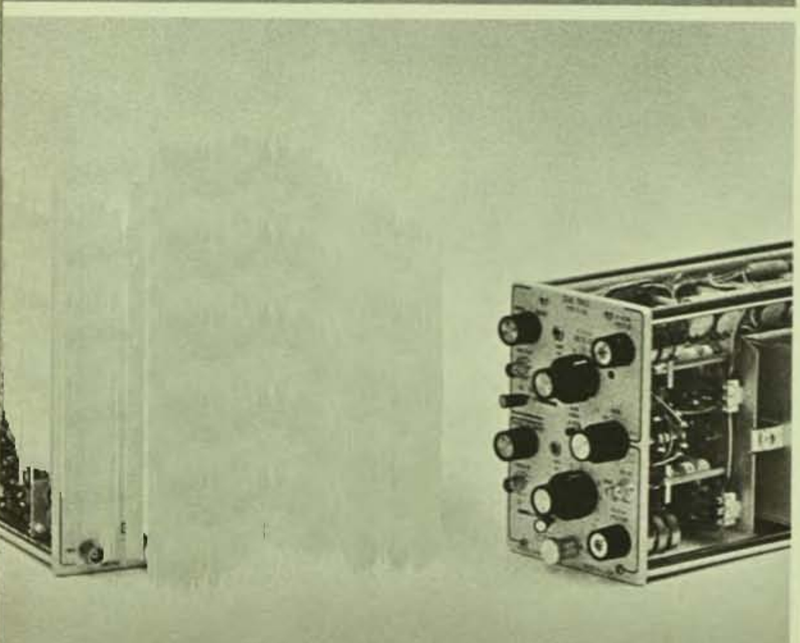
Plug-in Modules

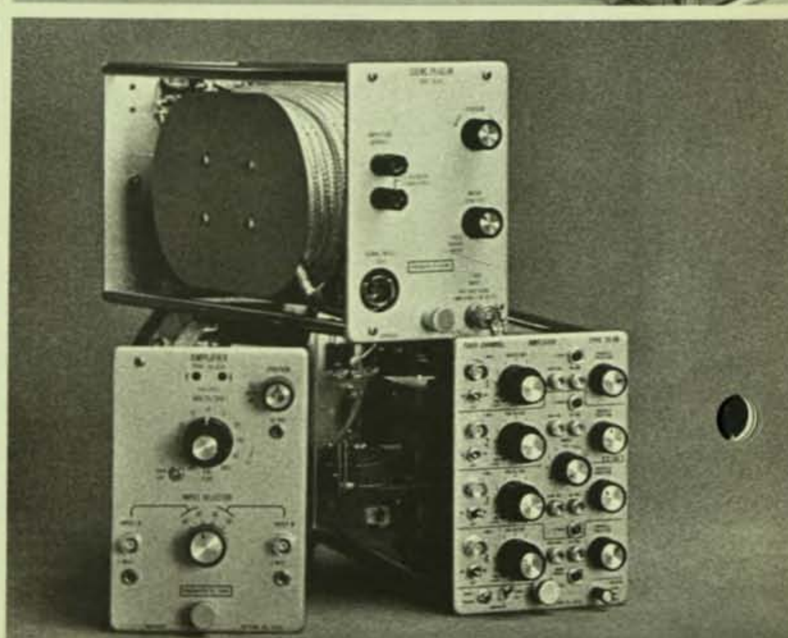
Number	Description	Price
Time Base Modules		
74-03A	General purpose, 5ns time base plug-in	$ 395.00
74-11A	Delaying sweep (uncalibrated delay)	Available on Special Order
74-13A	Delaying sweep with calibrated delay	750.00
74-14	General purpose time base	250.00
74-17A	Automatic beam switching delaying sweep with calibrated delay	1000.00

Number	Description	Price
Vertical Amplifier Modules		
74-12	1mV/cm differential amplifier 850kHz	$ 145.00
74-15	20mV, 1MHz amplifier	89.00
74-19A	Single trace, dc to 5MHz, 50mV/cm	175.00
76-01A	Single trace, 5mV/cm, 25MHz	315.00
76-02A	Dual trace, 5MV/cm, 25MHz	475.00
76-05	100MHz, single trace, 5V/cm, 50 ohms input	225.00
76-06	Four trace, 20mV/cm, 20MHz	695.00
76-08	Dual trace, 5mV/cm, 50MHz	650.00
79-02A	Dual trace, 100mV/cm, 100MHz	1200.00









Signal Sources

General Purpose Probes:

Probe Type	Resistance	Input Capacitance	Attenuation Ratio	Cable Length	Price
4289B	1 meg	59-91 pf	1:1	4'	$30.00
4290B	10 meg	10-13 pf	10:1	4'	30.00
4298B	10 meg	14-17 pf	10:1	8'	32.50
4299B	10 meg	12-15 pf	10:1	6'	32.50
4292B	10 meg	1.7-2.5 pf	100:1	4'	32.50
4309B	10 meg	9-16 pf	10:1	9'	32.50
7994B	10 meg	7 pf	10:1	4'	40.00
7999B	10 meg	13 pf	10:1	9'	45.00

Plexiglass Filters for 700, 701, 702, 704, 765H Series:

Type	Part Number	Phosphor Type	Price
Blue	4800 4512	P11	$ 1.25
	4800 5862	P7	1.25
Green	4800 4511	P1	1.25
	4800 5863	P2-P31	1.25
Amber	4800 5861	P7	1.25
Polaroid Plexiglass scale	4800 6101		2.50
Contrast Enhancing Filter	4800 6331	May be used w/all types of phosphors	14.50

Internal Graticule CRT's:

For Scope Type	Type No.	Factory Installed	Field Kit
701, 702, 704	7042	$15.00 additional	$ 75.00
765 Series, 5 kv	7060	35.00	110.00
765H Series, 13 kv	7061	35.00	175.00

Model 781A Time Mark Generator

14 time mark intervals 1μsec to 5sec
5, 10 and 50MHz sine wave outputs
0.001% accuracy
3/1,000,000/day oscillator stability
2 simultaneous outputs
Trigger rate generator: 1, 10 and 100Hz, 1, 10, 100KHz coincident with time marker
110 or 220V, 21W, 48-450Hz
Height — 5¼" (13.3cm)
Width — 8¼" (21cm)
Depth — 10½" (26.6cm)
Weight — 10 lbs.

Price: $620.00

Model 791A Square Wave Generator:

7Hz to 10MHz square wave output
3nsec fall time
6nsec rise time
40V open circuit

Trigger Output Characteristics:

10nsec maximum rise time @ 50 ohms
Select positive or negative polarity of square wave
5V into 50 ohms
110V or 220V, 20W, 48-450Hz
Height — 5¼" (13.3cm)
Width — 8¼" (21cm)
Depth — 10½" (26.6cm)
Weight — 7½ lbs.

Price: $395.00

Model 792A Double or Single Pulse Generator

10MHz pulse repetition rate
±10V into 50 ohms, 17V into 1000 ohms
Rise time 8nsec maximum
Fall time 8nsec maximum
Positive or negative polarity
Negligible pulse droop at all ranges
Undershoot and Overshoot: 5% or less at maximum amplitude
Single pulse: Single shot available with front panel pushbutton; double or single pulse for every trigger pulse
Delay: Continuously variable from 30nsec before to 5msec after trigger output pulse
Duty factor: 30%
External trigger-in: AC coupled, 3V minimum 600 ohms input impedance
Trigger-out: 4V minimum into 1k ohms, 2V minimum into 100 ohms
Power: 115V or 230V, 50 to 400Hz
Universal half rack configuration
Height — 5¼" (13.3cm)
Width — 8½" (21.6cm)
Depth — 11½" (29.2cm)
Weight — 10 lbs.

Price: $495.00

For additional details, check appropriate box on attached postcard.

Cameras

TYPE 450A

FILM TYPE AND PRINT SIZE	MODEL NO.	LENS AND SHUTTER ASSEMBLY DESCRIPTION	LENS TYPE	FILM HOLDER/ ADAPTER NO.	HOUSING NO.	PRICE
Polaroid 3¼" x 4¼" Film Pack	450A-1	f/1.9 Lens — Oscillo-Raptar 75mm, 1:1 thru 1:0.85 Object-to-Image Ratio	4511	4520B	4500A	$ 495.00
	450A-2	f/1.9 Lens — Oscillo-Raptar 63mm, 1:0.5 thru 1:0.45 Object-to-Image Ratio	4512	4520B	4500A	495.00
Polaroid and Conventional Film 4" x 5"	450A-3	f/1.9 Lens — Oscillo-Raptar 75mm, 1:1 thru 1:0.85 Object-to-Image Ratio	4511	4515	4500A	500.00
	450A-4	f/1.9 Lens — Oscillo-Raptar 63mm, 1:0.5 thru 1:0.45 Object-to-Image Ratio	4512	4515	4500A	530.00
35mm Single Frame Automatic Advance Recordings	450A-5 450A-6	f/1.5 Lens — Oscillo-Raptar 51mm, 1:0.22 fixed Object-to-Image Ratio	f/1.5 51mm	4530A 4560A	4500A 4500A	725.00 1625.00

TYPES 453/453A

FILM TYPE AND PRINT SIZE	MODEL NO.	LENS AND SHUTTER ASSEMBLY DESCRIPTION	LENS TYPE	FILM HOLDER/ ADAPTER NO.	HOUSING NO.	PRICE
Polaroid 3¼" x 4¼" Film Pack	453A-1	f/1.9 Lens — Oscillo-Raptar 75mm, 1:1 thru 1:0.7 Object-to-Image Ratio	4533	4520B	4503-A	$ 425.00
	453A-2	f/2.8 Lens — Amaton 75mm, 1:1 thru 1:0.7 Object-to-Image Ratio	4553	4520B	4503-A	385.00
Polaroid and Conventional Film 4" x 5"	453A-3	f/1.9 Lens — Oscillo-Raptar 75mm, 1:1 thru 1:0.7 Object-to-Image Ratio	4533	4515	4503-A	430.00
	453A-4	f/2.8 Lens — Amaton 75mm, 1:1 thru 1:0.7 Object-to-Image Ratio	4553	4515	4503-A	395.00
**35mm Single Frame Automatic Advance Recordings	453A-5 453A-6	f/1.5 Lens — Oscillo-Raptar 51mm, 1:0.22 fixed Object-to-Image Ratio	48004481	4530A 4560-A	4503-A 4503-A	695.00 1620.00

**Series 5 and 6 can be interlocked with "single-shot" oscilloscope system using Type 4564 accessory. Call factory or nearest sales representative for further information.

450A

453/453A

Accessories

TYPE NO.	DESCRIPTION
276C	Viewing Hood, molded rubber
2592B	Terminal Adaptor, binding post to female BNC
4002B	General Accessory Kit — low frequency
4283	Terminal Adaptor, "GR" to BNC male
4285A	50 OHM Termination
4286	Terminal Adaptor, UHF female to male BNC
4287	UG #306A/U 90° BNC elbow
4296A	Operational Accessory Kit for 765 series
4551	Bezel for Tektronix round type CRT oscilloscopes
4561	Bezel for Tektronix rectangular type CRT oscilloscopes
7001	Delay Line (230 nanoseconds) for 765H series plug-ins
7002	Delay Line for 76-06 plug-in
7010	2000 Hours Maintenance Kit
7011	2500 Hours Maintenance Kit with 5 kv CRT
7011H	2500 Hours Maintenance Kit with 13 kv CRT
7012	Capacitance Standardizer — nominal tuning range of 20 to 55 pf
7013	Tool Kit for 765H series maintenance
7020	Scope Traveler (size of top tray 10¾" x 22½")
7021	Scope Traveler Accessory Drawer only
7022	Scope Traveler Accessory Drawer and Plug-in Carrier, UL approved AC Outlet
7024	Plug-in Extension Cable (25" long extension cable for plug-ins in the 425 and 765H series scopes)
7030	Scope Traveler (size of top tray 17¾" x 22½")
7031	Scope Traveler Drawer (top tray 17¾" wide)
7035	Viewing Hood — round light shield
7400	Blank Plug-in Chassis for 765H series
7062	High Frequency Termination (for 765 series)

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Cameras

TYPE 450A

FILM TYPE AND PRINT SIZE	MODEL NO.	LENS AND SHUTTER ASSEMBLY DESCRIPTION	LENS TYPE	FILM HOLDER/ ADAPTER NO.	HOUSING NO.	PRICE
Polaroid 3¼" x 4¼" Film Pack	450A-1	f/1.9 Lens — Oscillo-Raptar 75mm, 1:1 thru 1:0.85 Object-to-Image Ratio	4511	4520B	4500A	$ 495.00
	450A-2	f/1.9 Lens — Oscillo-Raptar 63mm, 1:0.5 thru 1:0.45 Object-to-Image Ratio	4512	4520B	4500A	495.00
Polaroid and Conventional Film 4" x 5"	450A-3	f/1.9 Lens — Oscillo-Raptar 75mm, 1:1 thru 1:0.85 Object-to-Image Ratio	4511	4515	4500A	500.00
	450A-4	f/1.9 Lens — Oscillo-Raptar 63mm, 1:0.5 thru 1:0.45 Object-to-Image Ratio	4512	4515	4500A	530.00
35mm Single Frame Automatic Advance Recordings	450A-5 450A-6	f/1.5 Lens — Oscillo-Raptar 51mm, 1:0.22 fixed Object-to-Image Ratio	f/1.5 51mm	4530A 4560A	4500A 4500A	725.00 1625.00

TYPES 453/453A

FILM TYPE AND PRINT SIZE	MODEL NO.	LENS AND SHUTTER ASSEMBLY DESCRIPTION	LENS TYPE	FILM HOLDER/ ADAPTER NO.	HOUSING NO.	PRICE
Polaroid 3¼" x 4¼" Film Pack	453A-1	f/1.9 Lens — Oscillo-Raptar 75mm, 1:1 thru 1:0.7 Object-to-Image Ratio	4533	4520B	4503-A	$ 425.00
	453A-2	f/2.8 Lens — Amaton 75mm, 1:1 thru 1:0.7 Object-to-Image Ratio	4553	4520B	4503-A	385.00
Polaroid and Conventional Film 4" x 5"	453A-3	f/1.9 Lens — Oscillo-Raptar 75mm, 1:1 thru 1:0.7 Object-to-Image Ratio	4533	4515	4503-A	430.00
	453A-4	f/2.8 Lens — Amaton 75mm, 1:1 thru 1:0.7 Object-to-Image Ratio	4553	4515	4503-A	395.00
**35mm Single Frame Automatic Advance Recordings	453A-5 453A-6	f/1.5 Lens — Oscillo-Raptar 51mm, 1:0.22 fixed Object-to-Image Ratio	48004481	4530A 4560-A	4503-A 4503-A	695.00 1620.00

**Series 5 and 6 can be interlocked with "single-shot" oscilloscope system using Type 4564 accessory. Call factory or nearest sales representative for further information.

450A

453/453A

Accessories

TYPE NO.	DESCRIPTION	PRICE
276C	Viewing Hood, molded rubber	$ 14.00
2592B	Terminal Adaptor, binding post to female BNC	10.00
4002B	General Accessory Kit — low frequency	95.00
4283	Terminal Adaptor, "GR" to BNC male	7.50
4285A	50 OHM Termination	16.50
4286	Terminal Adaptor, UHF female to male BNC	3.50
4287	UG #306A/U 90° BNC elbow	3.50
4296A	Operational Accessory Kit for 765 series	95.00
4551	Bezel for Tektronix round type CRT oscilloscopes	4.50
4561	Bezel for Tektronix rectangular type CRT oscilloscopes	14.50
7001	Delay Line (230 nanoseconds) for 765H series plug-ins	75.00
7002	Delay Line for 76-06 plug-in	75.00
7010	2000 Hours Maintenance Kit	250.00
7011	2500 Hours Maintenance Kit with 5 kv CRT	395.00
7011H	2500 Hours Maintenance Kit with 13 kv CRT	450.00
7012	Capacitance Standardizer — nominal tuning range of 20 to 55 pf	12.50
7013	Tool Kit for 765H series maintenance	9.50
7020	Scope Traveler (size of top tray 10¾" x 22½")	65.00
7021	Scope Traveler Accessory Drawer only	30.00
7022	Scope Traveler Accessory Drawer and Plug-in Carrier, UL approved AC Outlet	34.50
7024	Plug-in Extension Cable (25" long extension cable for plug-ins in the 425 and 765H series scopes)	35.00
7030	Scope Traveler (size of top tray 17¾" x 22½")	75.00
7031	Scope Traveler Drawer (top tray 17¾" wide)	34.50
7035	Viewing Hood — round light shield	4.95
7400	Blank Plug-in Chassis for 765H series	35.00
7062	High Frequency Termination (for 765 series)	60.00
7064	High Frequency Termination (for 777 scope)	$200.00
7079	Rear Access Connectors for 767H and 757 rack mounted oscilloscopes	30.00
7080	Terminal Adaptor, BNC to binding post UG #1090/U	2.35
7081	UG #274/U BNC "T" Connector	3.50
7082	Cable, male BNC to male BNC, 42" length of 50 ohm coax	4.75
7083	Cable, male BNC to insulated alligator spring clips, 42" long	3.85
7084	Terminal Adaptor, male "C" to female BNC, UG #636/U	3.50
7085	Detented Tilt-Slide for the 700 and 765H series	40.00
7086	Rack Mount Ears for the 700 series and 767H series	5.00
7087	Luggage Type Carry Handle for 700 to 704 and 767H scopes	2.00
7088	Z Axis Modulation for 700, 701, 702 or 704 scopes (factory installation $3.00 additional)	8.75
7089	Rear Access Connectors for 700, 701, 702, 704 oscilloscopes	12.50
7090	Protective Cover for front of 700 to 704 and 767H	35.00
7091	Fitted Accessory Mounting Board for Type 7090 protective cover	10.00
7092	Storage Cabinet for all 765 series plug-ins	38.50
7093	5 to 1 Attenuator	16.50
7094	Protective Panel Cover for the 781 or 791	25.00
7095	Protective Cover, 5" high panel	30.00
7096	Rack Mount Ears for common 781-791 package	5.00
7097	Hardware Kit for common packaging of 781 with 791	15.00
7098	Blank ½ Rack Panel for full rack mounting of 781 or 791	25.00
7099	Rack Slides for 781 and 791	40.00
7651A	Self-Storing Plastic Insert, complete with accessories for 765 PortaScope	185.00

For additional details, check appropriate box on attached postcard.

GENTLEMEN:
Please send me complete information on the items I have checked, or written in, below:

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- ☐ Series 300
- ☐ Series 500
- ☐ Series 4000M
- ☐ Series 8000

Instruments:
- ☐ 6200B
- ☐ 7100A

Components:
- ☐ Amplifiers (specify numbers) ____________

Scopes:
- ☐ 701
- ☐ 702
- ☐ 704A
- ☐ 708A
- ☐ 766 H/F
- ☐ 765 MH
- ☐ 777
- ☐ 977
- ☐ Cameras and Accessories
- ☐ Other: ____________

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- ☐ Series 8000

Instruments:
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- ☐ 7100A

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- ☐ 708A
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- ☐ 765 MH
- ☐ 777
- ☐ 977
- ☐ Cameras and Accessories
- ☐ Other: ____________

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Instruments:
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- ☐ 766 H/F
- ☐ 765 MH
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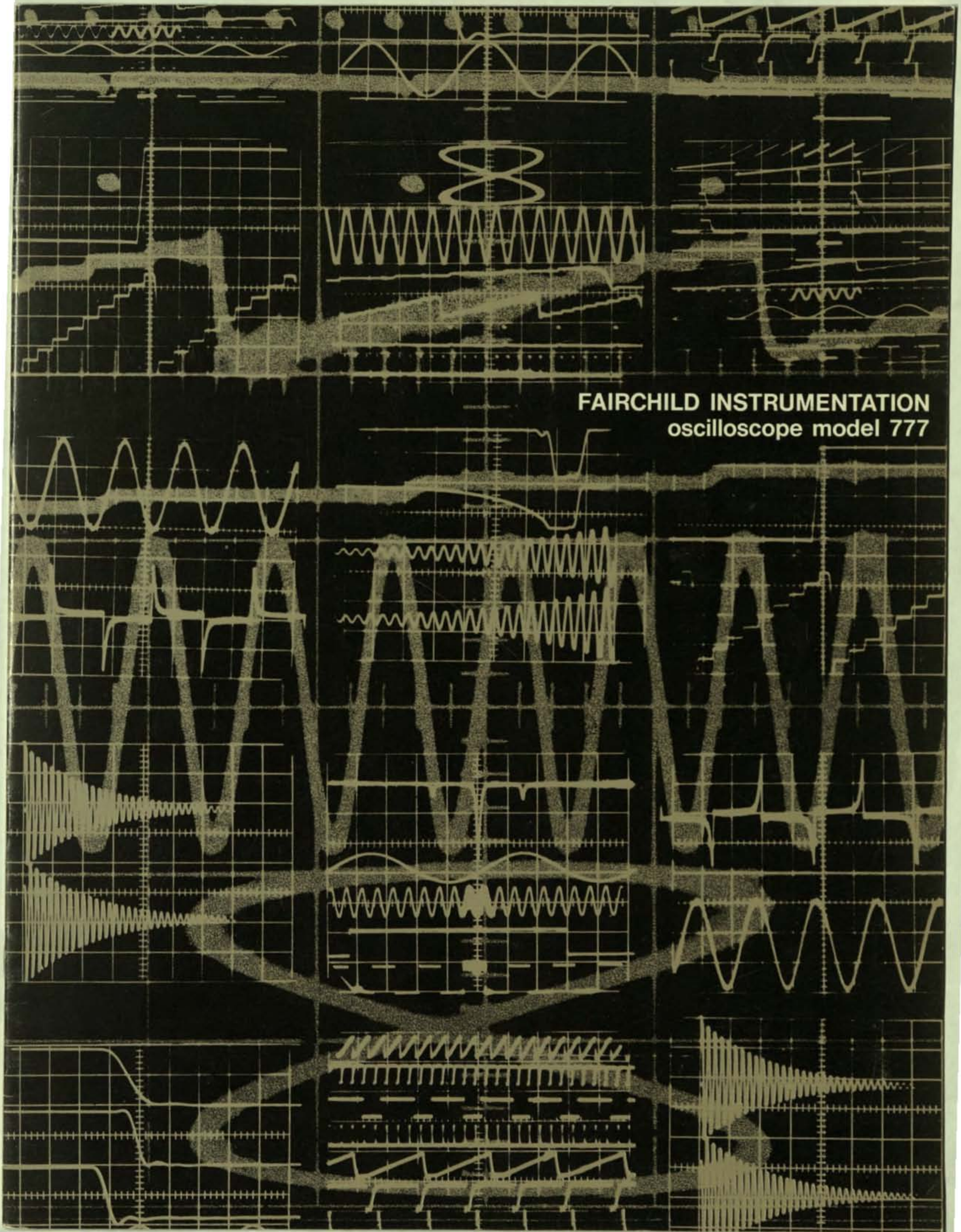
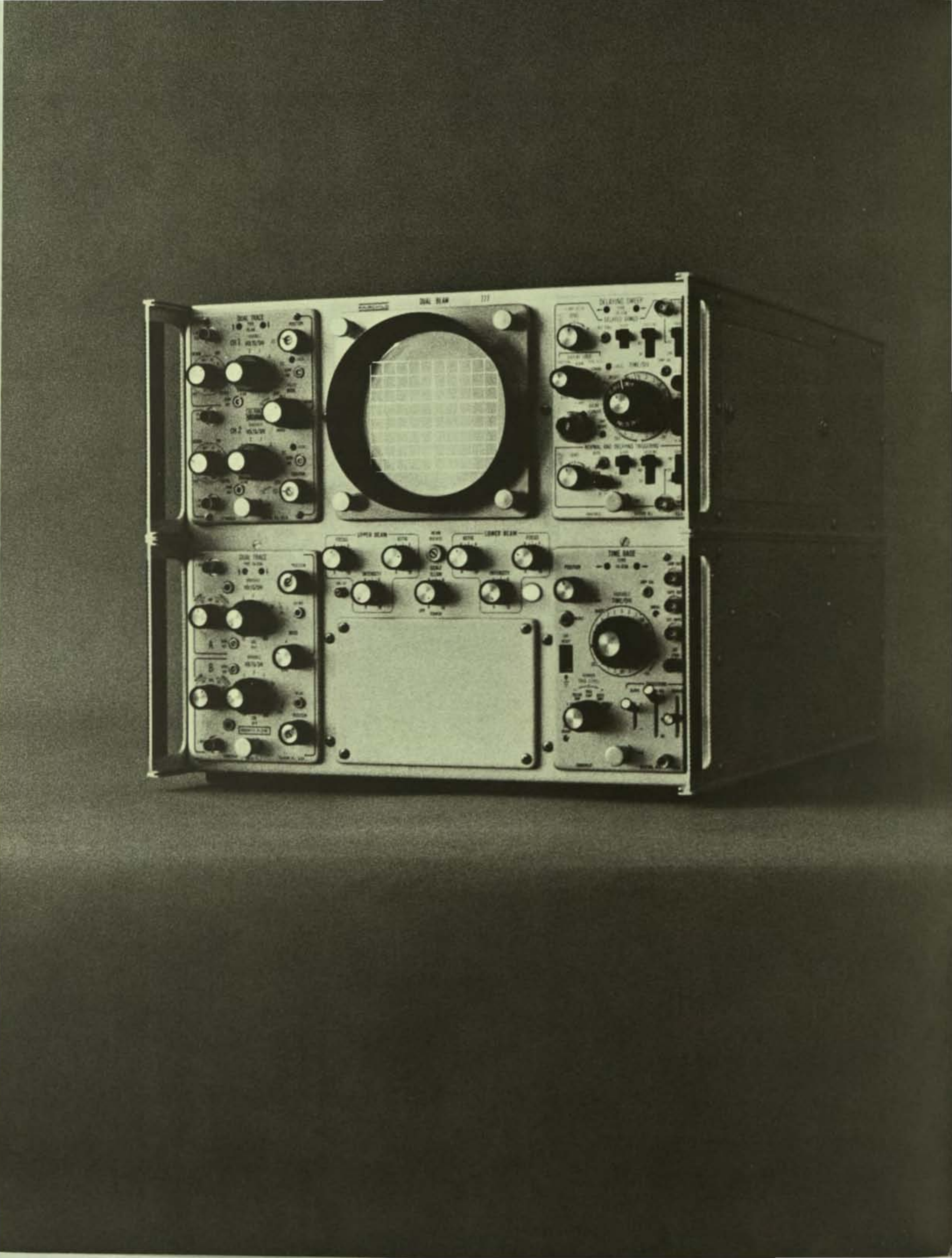
FAIRCHILD
INSTRUMENTATION

A Division of Fairchild Camera Instrument Corporation / 475 Ellis Street, Mountain View, California 94040

MONOLITHIC SEMICONDUCTOR RAMS FOR MAIN FRAME APPLICATIONS

PRODUCT (AVAIL.)	TECHNOLOGY	# BITS/CHIP	CHIP SIZE (Sq. Mils) (# Pins)	ACCESS TIME ns (Typ)	POWER mW	COST/BIT	
						1972	1975
4100 (Prod)	Bipolar (Partially Decoded)	256	17K/(16)	80	650	2.8¢	2.3¢
1101 Intel (Prod)	Silicon Gate Technology (Static)	256	10K/(16)	1000	500 50 Standby	3¢	2.5¢
4110 (3rd Qtr.'71)	Isoplanar (Fully Decoded)	256	9K/(16)	50	500	2¢	1.5¢
3532 (2nd Qtr.'71)	Silicon Gate Technology Static (Fully Decoded)	512	21K/(16)	450	140 50 Standby	1¢	0.7¢
1103 Intel (Prod)	Silicon Gate Technology Dynamic (Fully Decoded)	1024	16K/(18)	580	250	0.7¢	0.25¢
Developmental 2048 Bits (1st Qtr. '72)	Silicon Gate Technology Dynamic (Partialy Decoded)	2048	25K/(20)	250	400	0.5¢	0.20¢
Developmental 1024 Bits (1st Qtr. '72)	Isoplanar (Fully Decoded)	1024	21K/(16)	80	500	1.0¢	0.25¢


FAIRCHILD INSTRUMENTATION
oscilloscope model 777


DUAL BEAM
DUAL TRACE
CH 1
CH 2
DELAYING SWEEP
UPPER BEAM
LOWER BEAM
FOCUS
INTENSITY
TIME BASE

Cai Hadley
650-327-4224

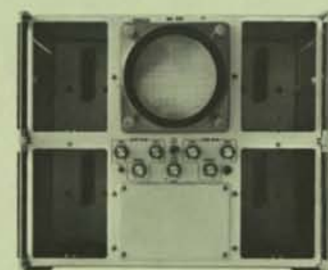
777 Scope

Dual Beam High Frequency Oscilloscope —

Two independent beams, dual gun CRT, dc to 100MHz passband capabilities

The 777 Main Frame

The 777 main frame contains a dual beam cathode ray tube and regulated power supplies. Four cavities on the frame accept a wide variety of plug-in modules providing an almost infinite number of capabilities.

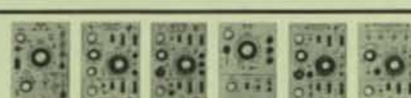


Main Frame Specifications

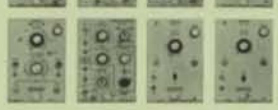
CRT	Dual gun; 13kv accelerating potential
Display Area	6 x 10cm for each beam with 4cm overlap between beams
Z Axis	Each gun can be independently blanked, 20 volts of signal is required to dim trace
Beam Intensifier	A switch provided for each beam enables switching from beam gate blanking to cathode gate blanking for high writing rate
Power Consumption	350 watts
Mounting	Rack mount ears are provided for rack mounting the frame
Weight	Net 44 pounds
Price	$1,600.00

The Plug-In Modules

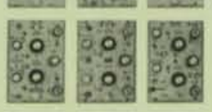
Time Base Modules (Pages 4 & 5)



Amplifier & Comparator Modules (Pages 6 & 7)

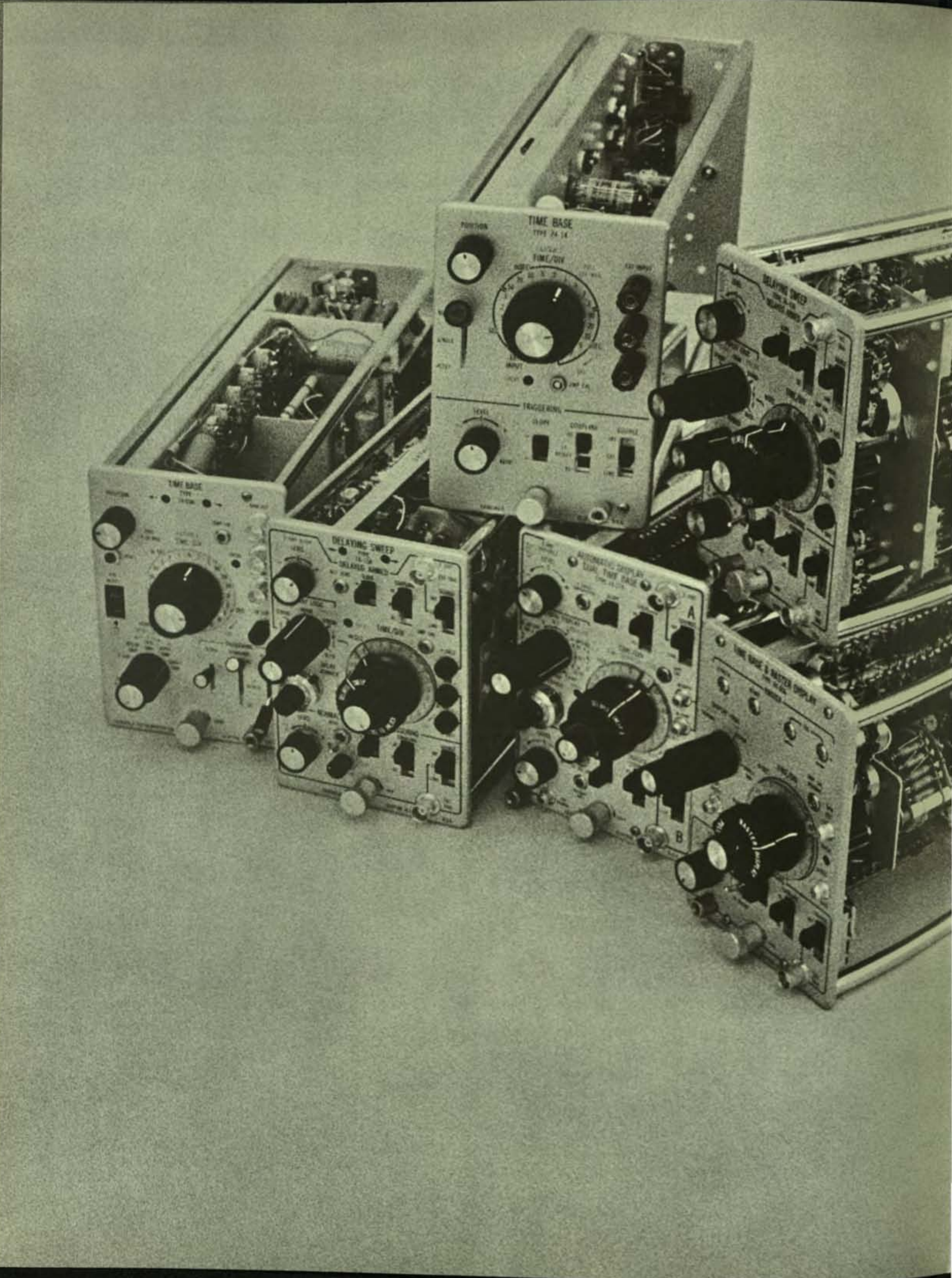


Dual Trace Modules (Pages 8 & 9)



Spectrum Analyzer Modules (Pages 10 & 11)

25MHz & 100MHz Modules
20MHz 4-Trace Module (Pages 12 & 13)


TIME BASE
POSITION
TIME/DIV
EXT INPUT
TRIGGERING
LEVEL
SLOPE
COUPLING
SOURCE
DELAYING SWEEP
TIME BASE
DELAYING SWEEP
DELAYED SWEEP
TIME/DIV
AUTOMATIC DISPLAY
DUAL TIME BASE
A
B
TIME BASE & RASTER DISPLAY

Time Base Plug-In Modules

74-03A Wide Range Time Base Generator — 5ns/cm, sensitive sync circuitry, 4MHz horizontal amplifier

74-11A Dual Time Base Delaying Sweep — 10ns/cm, fast tunnel diode trigging, X10 expander

74-13A Calibrated Delaying Sweep — 10ns/cm, precision delay interval, single shot operation

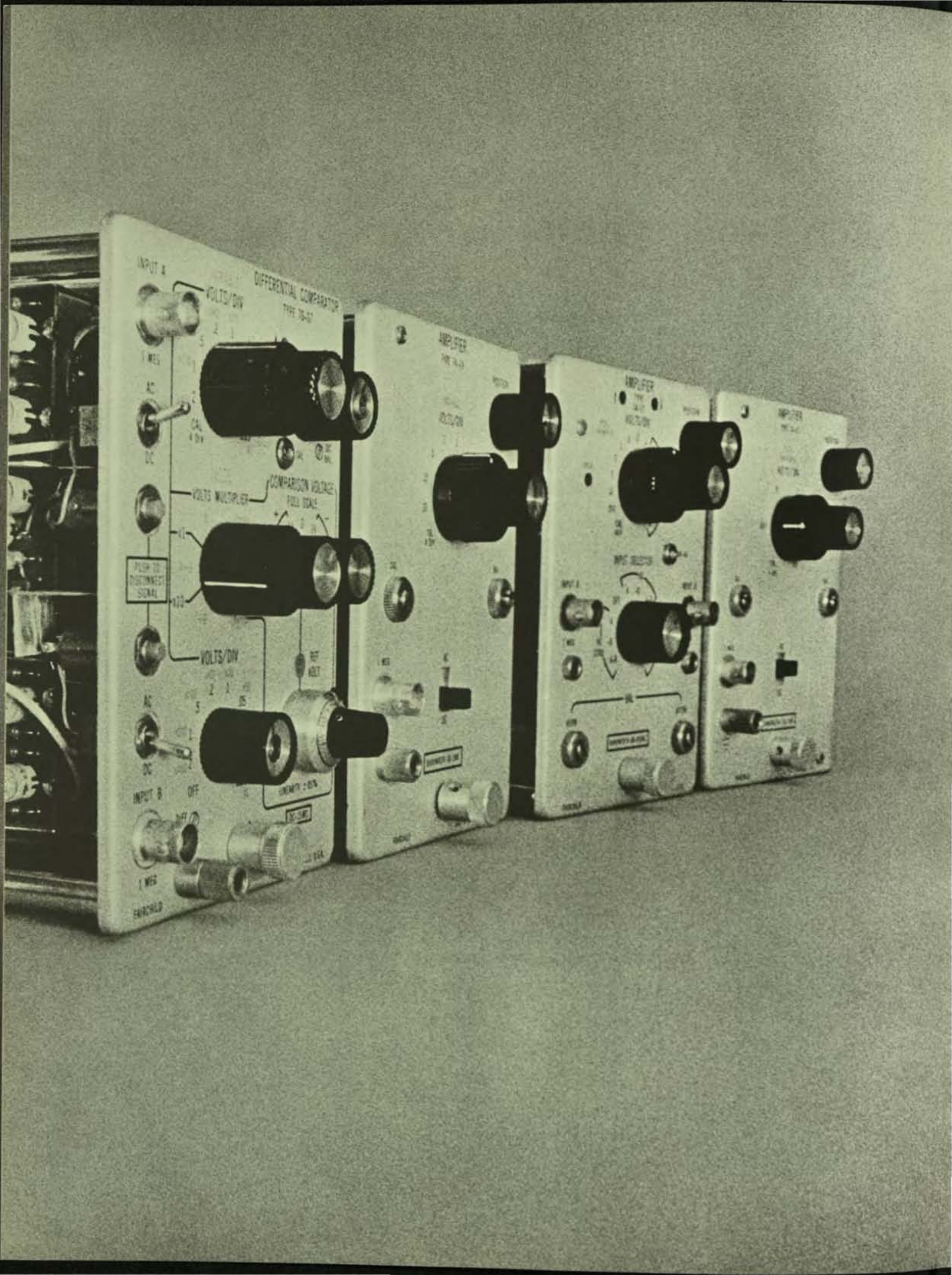
74-14 General Purpose Time Base Generator — 100ns/cm, single sweep capability

74-17A Automatic Beam Switching and Delaying Sweep—2 independent sweeps, 5ns/cm sweep rate

74-20 Time Base and Raster Display Generator — Resolve up to one part in 5000

Specifications

Features	74-03A	74-11A	74-13A	74-14	74-17A	74-20
Calibrated Sweep Ranges	2sec/cm to .05μsec/cm — 1, 2, 5 sequence in 24 steps	2sec/cm to .1μsec/cm — 1, 2, 5 sequence in 23 steps	2sec/cm to .1μsec/cm — 1, 2, 5 sequence in 23 steps	2sec/cm to 1μsec/cm — 1, 2, 5 sequence in 20 steps	2sec/cm to .05μsec/cm — 1, 2, 5 sequence in 24 steps	2sec/cm to .05μsec/cm — 1, 2, 5 sequence in 24 steps
Sweep Expander	X10 magnifier which makes fast sweep 5ns/cm	X10 magnifier which makes fast sweep 10ns/cm	X10 magnifier which extends to 10ns/cm	X10 magnifier which extends the fast sweep to 0.1μsec/cm	X10 magnifier which extends fast sweep to 5ns/cm	X10 magnifier which extends fast sweep to 5ns/cm
Display Modes	Xamp, recur swp., trig. swp., auto-swp., single swp.	5 modes, norm., dlyd. arm, dlyd. arm strobe, dlyd. trigger, dlyd. trig. strobe.	6 modes, norm., dlyd. arm, dlyd. arm strobe, dlyd. trigger, dlyd. trig. strobe, Xamp	3 modes norm. sweep, single sweep & Xamp	12 modes with display logic switch	4 modes single swp., norm. sweep, raster display, raster single swp.
Trigger Sensitivity	3mm p-p up to 1MHz	3mm p-p up to 100kHz ext. 250mV	3mm to 1MHz ext. 250mV 1MHz	5mm to 350kHz ext. 500mV to 350kHz	5mm to 10MHz ext. 500mV 10MHz	5mm to 10MHz ext. 500mV 10MHz
Sweep Accuracy	Within 3% with center 8cm	Within 3% with center 8cm	Within 3% with center 8cm	Within 3% with center 8cm	Always better than 3% norm. 1%	Within 3%
Trigger Source	Internal External Line freq.	Internal External Line freq.	Internal External Line freq.	Internal External Line freq.	Internal (on A External & B Sweep) Line freq.	Internal External Line freq.
Single Sweep	Can be re-armed by front panel reset button or ext. reset	Armed sweep can be used for single sweep	Armed sweep can be used for single sweep	Spring loaded reset provided	Single swp. with a reset button on front panel	Single swp. norm. single sweep raster
Horizontal Amplifier	4MHz with sens. of 100mV/div	No horiz. ampl. input	2.0MHz with sens. of 100mV/div	350kHz sens. with 1V and 10V/div	3MHz sens. 20mV/div	No horiz. ampl. input
Beam Position Indicator Lights	Yes	No beam posi. lights	Yes	No beam posi. lights	No beam posi. lights	No beam posi. lights
Output on Front Panel	Saw out, gate out	Dlyd. gate, norm. gate	Norm. gate out, norm. saw out, dlyd. gate out	No outputs on front panel	Normal gate out, normal saw out, dlyd. gate out	Gate out, saw out


DIFFERENTIAL COMPARATOR
INPUT A
1 MEG
VOLTS/DIV
AC
DC
CAL
VOLTS MULTIPLIER
COMPARISON VOLTAGE
FULL SCALE
PUSH TO DISCONNECT SIGNAL
VOLTS/DIV
INPUT B
OFF
1 MEG
FAIRCHILD
AMPLIFIER
AMPLIFIER
AMPLIFIER

Amplifier & Comparator Plug-In Modules

74-12 High Gain Differential Amplifier — 850kHz bandwidth, 500μV sensitivity, 40db common mode rejection

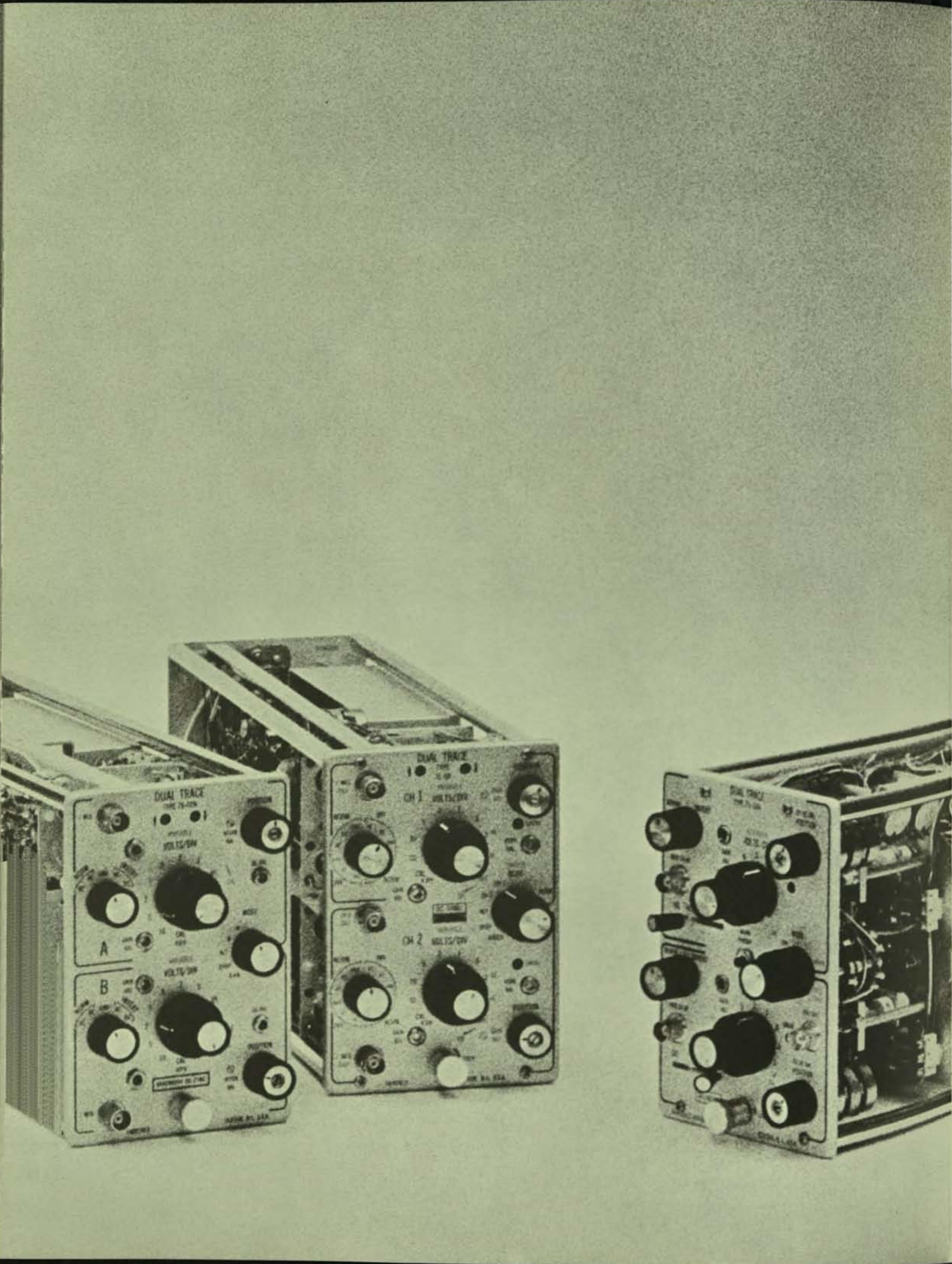
76-07 Calibrated Differential Comparator — 15MHz bandwidth, 5mV sensitivity, 100 volts common mode operation

74-15 1MHz Amplifier — 20mV/div sensitivity to 20V/div in four calibrated steps

74-19 5MHz Amplifier — 50mV/div sensitivity to 20V/div in nine calibrated steps. Stability nominally less than 1mV drift per hour.

Specifications

Features	74-12	76-07	74-15	74-19
Passband	850kHz	15MHz	1MHz	5MHz
Risetime	0.45μsec	23ns	0.35μsec	70ns
Sensitivity	1mV/div to 10V/div	5mV/div to 2V/div	20mV/div to 20V/div	50mV/div to 20V/div
Attenuator	1, 2, 5 sequence with 13 steps	1, 2, 5 sequence with 9 steps with 10:1 att. ext. 2V range to 20V/cm	4 decade steps	1, 2, 5 sequence with 9 calibrated steps
Input Impedance	1 meg shunted by 47pf	1 meg shunted by 47pf	1 meg shunted by 33pf	1 meg shunted by 40pf
Input Selector	AC, DC or AC stability for inputs +A, A-B & —B	A, A-VC, Test, VC-B, —B, A-B	AC or DC	AC or DC
Internal Calibrator	Cal Position on att. switch	Cal Position on att. switch	Cal Position on att. switch	Cal Position on att. switch
Variable Gain	Ext. Range to 25V/div	Ext. Range the basic range to 50V/div	Ext. Range to 200V/div	Ext. Range to 60V/div
Common Mode Rejection	Normally 120 to 1 on 1mV/div to 100mV/div	40,000 to 1 minimum		
Attenuator Accuracy	Within 2%	Within 2%	Within 2%	Within 2%
Delay Line	No	(Op.) (7001) 230ns	No	No
Price	$169.50	$695.00	$105.00	$175.00


DUAL TRACE
VOLTS/DIV
A
B
DUAL TRACE
CH 1
VOLTS/DIV
CH 2
VOLTS/DIV
DUAL TRACE

Dual Trace Plug-In Modules

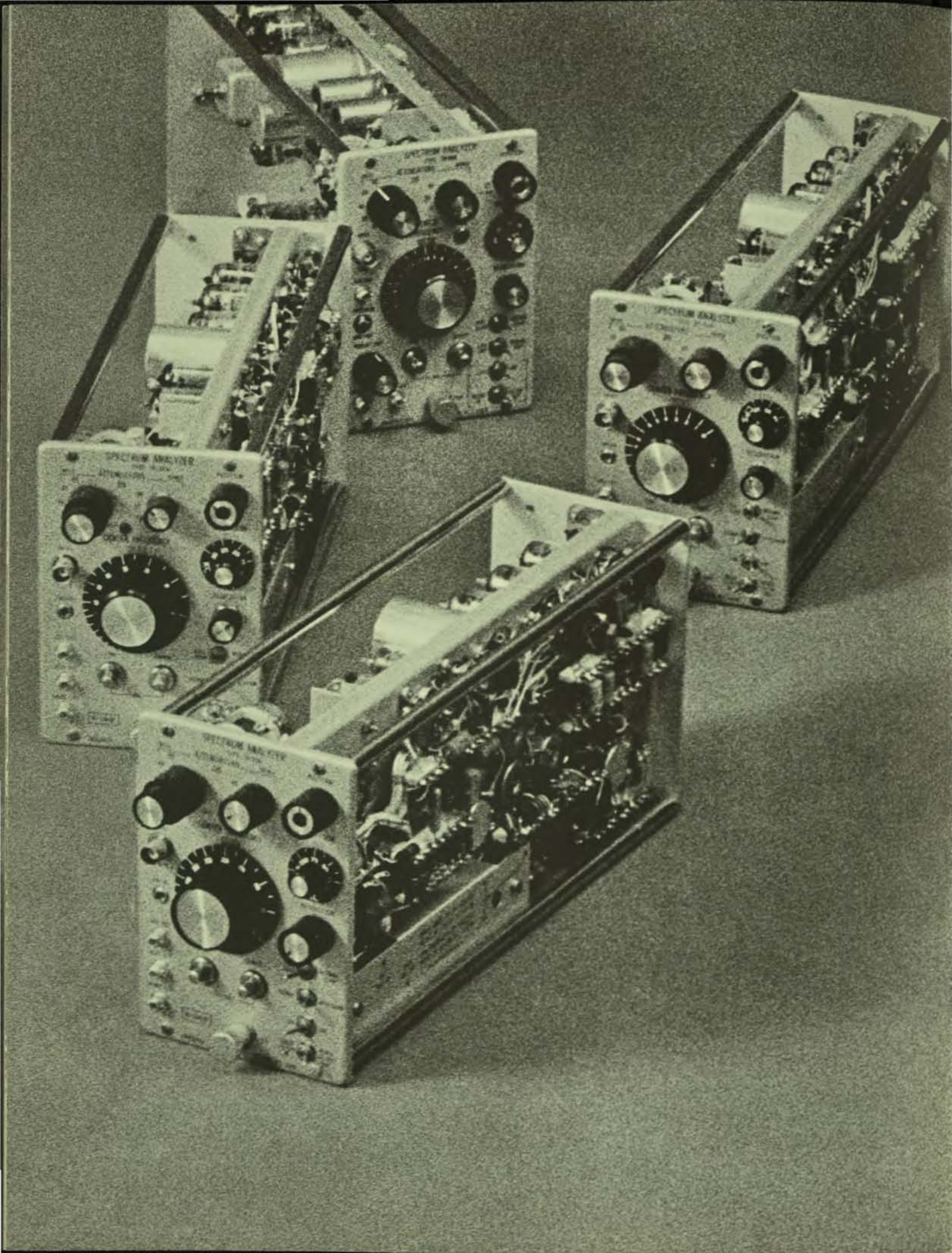
76-02A Dual Trace — dc — 25MHz passband sensitivity 5mV — 10V/div, 14.5ns risetime

76-08 Dual Trace — dc — 50MHz passband sensitivity 50mV — 20V/div, 7.5ns risetime

79-02A Dual Trace — dc — 100MHz passband sensitivity 100mV — 20V/div, 3.5ns risetime

Specifications

Features	76-02A	76-08	79-02A
Passband	dc — 25MHz	dc — 50MHz	dc — 100MHz
Risetime	14.5ns	7ns	3.5ns
Sensitivity	5mV — 10V/div	50mV — 20V	100mV — 20V 10mV — 2V in X10
Attenuator	11 steps @ 1, 2, 5 sequence	9 steps @ 1, 2, 5 sequence	8 steps @ 1, 2, 5 sequence
Attenuator Accuracy	2%	2%	2%
Input Selector	Norm/invert, ac/dc, gd	Norm/invert, ac/dc, gd	ac/dc or gd
Internal Calibrator	On attn. sw.	On attn. sw.	On attn. sw.
Input Impedance	1mΩ/40pf	1mΩ/23pf	1mΩ/14pf
Variable Gain Extends Range To	25V/div	50V/div	50V/div
Delay Line	Optional 230ns	230ns	230ns
Display Modes	A, B, Alt., Chop, A + B	1, 2, Alt., Chop, Added	1, 2, Alt., Chop, Added
Trace Position Indicators	Yes	Yes	No


SPECTRUM ANALYZER

Spectrum Analyzer Plug-In Modules

74-91A Manual sweep for exceptional accuracy, incidental

74-92A F.M. 1%, X-Y recorder outputs

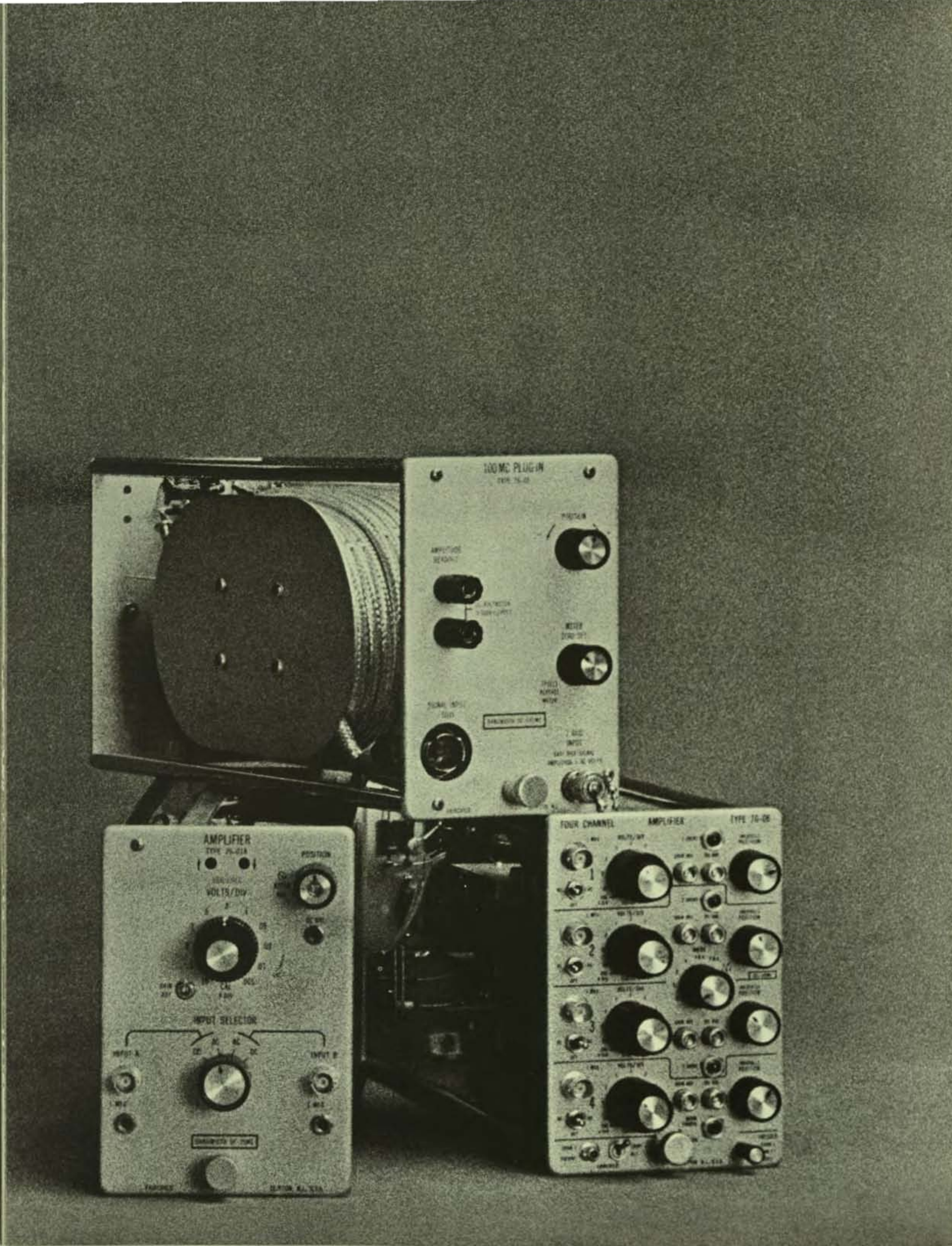
74-93A/74-94A Application includes:

1. Telemetry Analysis
2. Vibration Analysis
3. Sonar Analysis
4. Noise and Distortion
5. Energy and Spectral Distribution

Sensitivity:	45μV/cm
Input Impedance:	1m/50pf
Input Attenuator:	80db max in 20db steps
I.F. Attenuator:	40db max in 20db steps
Video Filter (Lo Pass):	50ms
Osc. Output:	1V p-p from 4.7k
Horizontal Output:	—1V from 10k
Vertical Output:	—.5V from 47k

Specifications

Features	74-91A	74-92A	74-93A	74-94A
Cent. Freq. Range	10Hz-20kHz	35Hz-100kHz	150Hz-500kHz	1kHz-2MHz
Cal. Dial Range	0-20kHz	0-100kHz	0-500kHz	0-2MHz
Dispersion	100Hz-6kHz	500Hz-30kHz	2.5kHz-150kHz	10kHz-600kHz
Resolution	10Hz-100Hz	35Hz-250Hz	150Hz-2kHz	1kHz-8kHz
I.F. Frequency	100kHz	262kHz	1.5MHz	10.7MHz
Osc. Frequency	120kHz-100kHz	362kHz-262kHz	2MHz-1.5MHz	12.7MHz-16.7MHz


100 MC PLUG-IN
AMPLIFIER
VOLTS/DIV
INPUT SELECTOR
FOUR CHANNEL
AMPLIFIER

Special Purpose Plug-In Modules

76-01A 25MHz Single Channel — 5mV/cm sensitivity, 14.5ns risetime

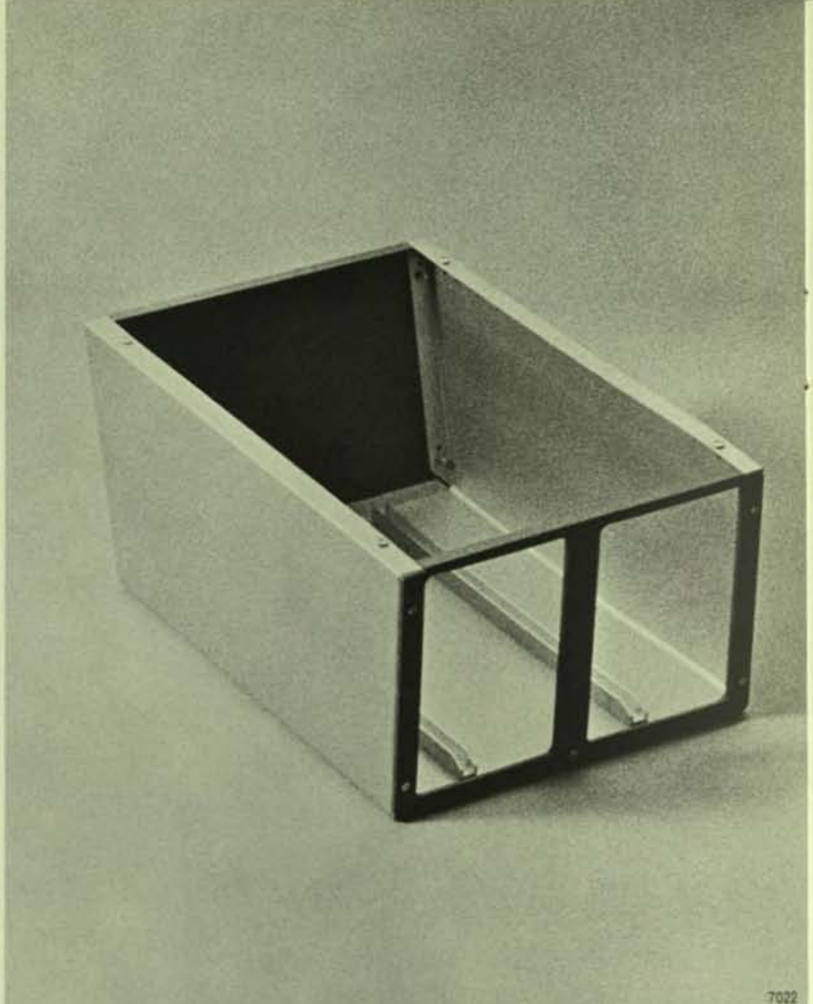
76-05 100MHz Plug-in — 5-7.5V/cm sensitivity, 3.5ns risetime

76-06 20MHz Four Trace Plug-in — 20mV/cm sensitivity, 17.5ns risetime, 9 modes of operation

Specifications

Features	76-01A	76-05	76-06
Passband	25MHz	100MHz	20MHz
Risetime	14.5ns	3.5ns	17.5ns
Sensitivity	5mV/div to 10V/div	5V/div to 7.5V/div	20mV/div to 10V/div
Attenuator	1, 2, 5, 10 sequence with 11 steps	None	1, 2, 5, 10 sequence with 9 steps
Input Impedance	1 meg shunted with 40pf	50 ohms	1 meg shunted with 35pf
Input Selector	A or B input with AC & DC	One input General Radio 874	AC or DC with an OFF position
Internal Calibrator	Cal Position on att. switch	Connects through front panel binding post	Cal Position on each att. switch
Variable Gain	Adjustable between 5mV/div to 25V/div	None	Adjustable between 20mV/div to 25V/div
Modes of Operation	One mode	One mode	Nine modes
Attenuator Accuracy	Within 3%	None	Within 3%
Delay Line	Optional (7001) 230ns	150ns	Optional (7002) 230ns
Price	$385.00	$225.00	$695.00


7020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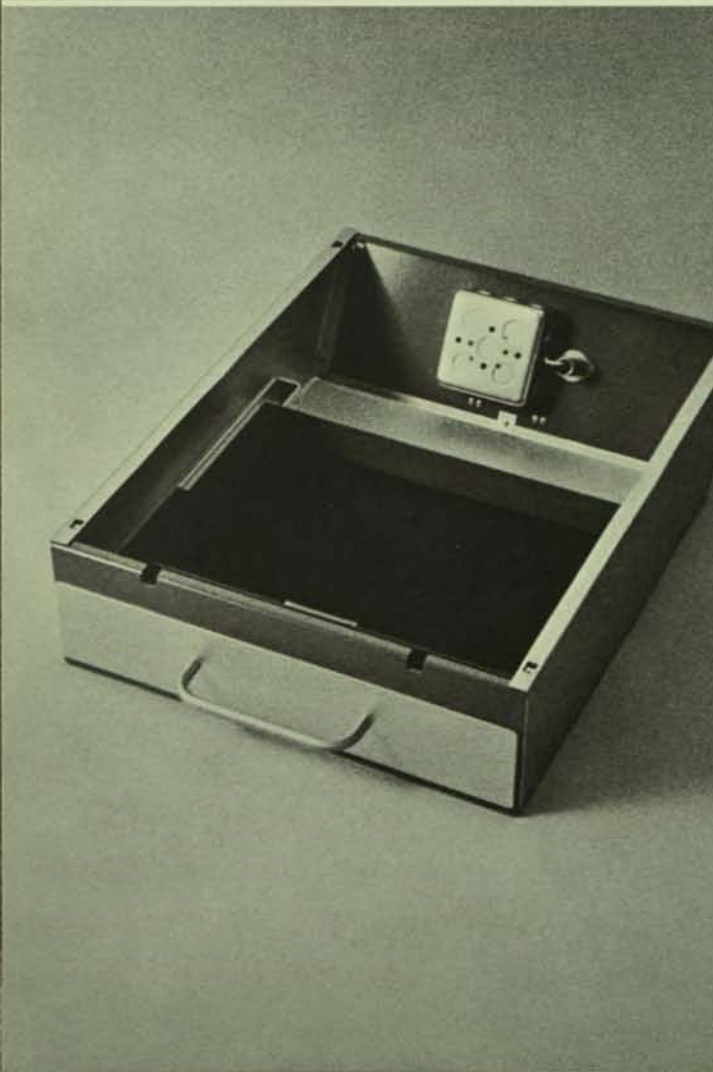
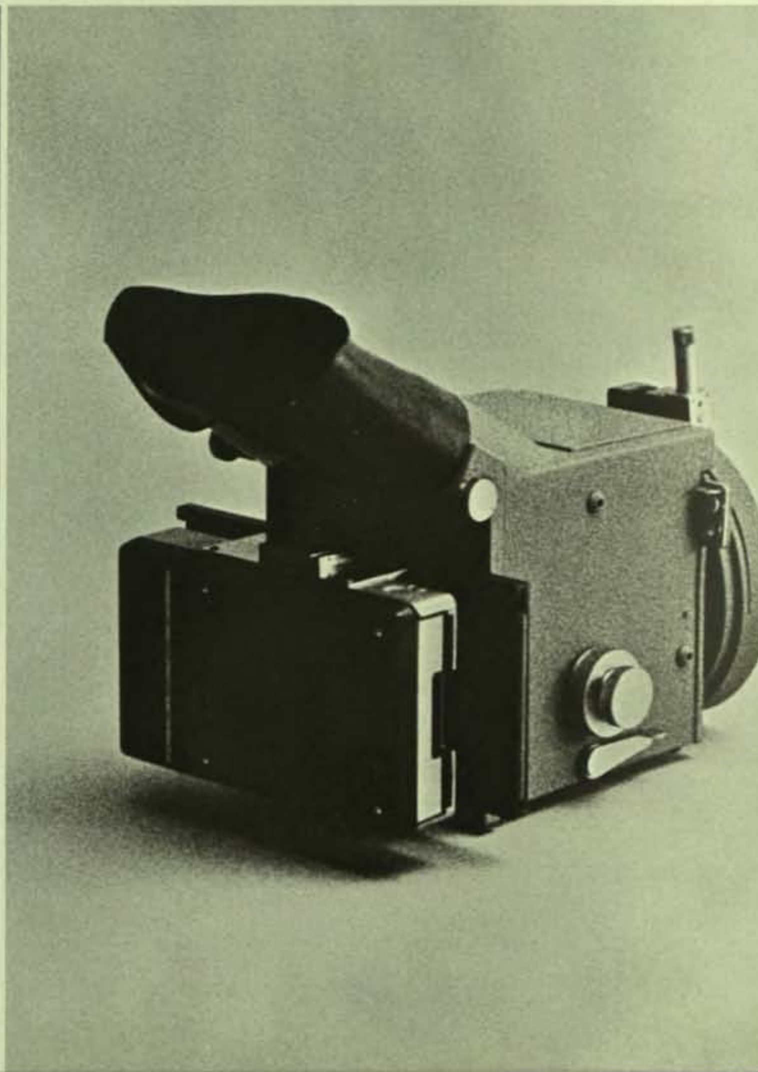

7031


450-A

Accessories

7020 Scope Traveler

1. Aluminum Construction
2. 35° of Continuous Tilt for Tray
3. Non-marking Swivel Casters (4)
4. Provided with U.L. approved A.C. outlets (Optional with 7022, 7031)
5. Tray size 10¾" x 22½" @ a height of 26½"
6. Drawers and plug-in cavities optional
7. Frame — Extruded and welded anodized aluminum
   Trays — Anodized aluminum covered with epoxy paint

7030 Scope Traveler (As above except #5)

5. Tray size 17¾" x 22½" @ a height of 32½"

7022 Drawer and Plug-In Cavity (For 7020 & 7030 Travelers)

Drawer —

1. Positive Stop
2. Felt Lined
3. Divided Compartment
4. Magnetic Catches
5. Nylon Rollers
6. All Aluminum

Plug-In Cavity —

1. Accepts all Fairchild Vertical Amplifiers and Time Bases
2. U.L. Approved A.C. Outlets (4)
3. All Aluminum
4. Two Cavities
5. Cord Storage on Rear

Finish —

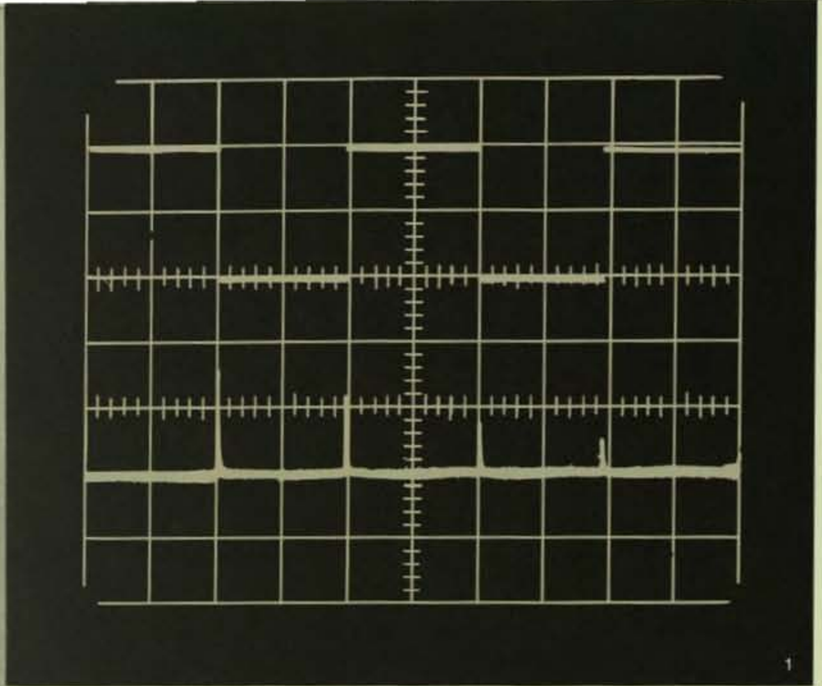
Anodized Aluminum and Epoxy Paint

7031 Accessory Drawer (For 7030 Traveler)

1. Positive Stop
2. Magnetic Catches
3. Nylon Rollers
4. Felt Lined
5. Divided Compartment
5. All Aluminum
7. U.L. Approved A.C. Outlets (4)
8. Cord Storage on Rear

450-A Oscilloscope Camera

1. Fits all Circular 5⅝" Bezels
2. Rubber-hooded, Binocular Viewing Port
3. Ratchet-type Clamping Ring
4. Swing-away and Lift-off Housing
5. Interchangeable Lenses
6. Electrical Solenoid Accessories
7. Wide-range of Film Sizes
8. Variable Image Reduction
9. Data Recording Facility
10. Sliding Back with 9 Detent Positions for Multiple Exposures on One Frame
11. Light Weight, All Metal, Die-cast Construction
12. Single Sweep Capability and Remote Control
13. Adjustable Focus
14. Jam-proof Shutters



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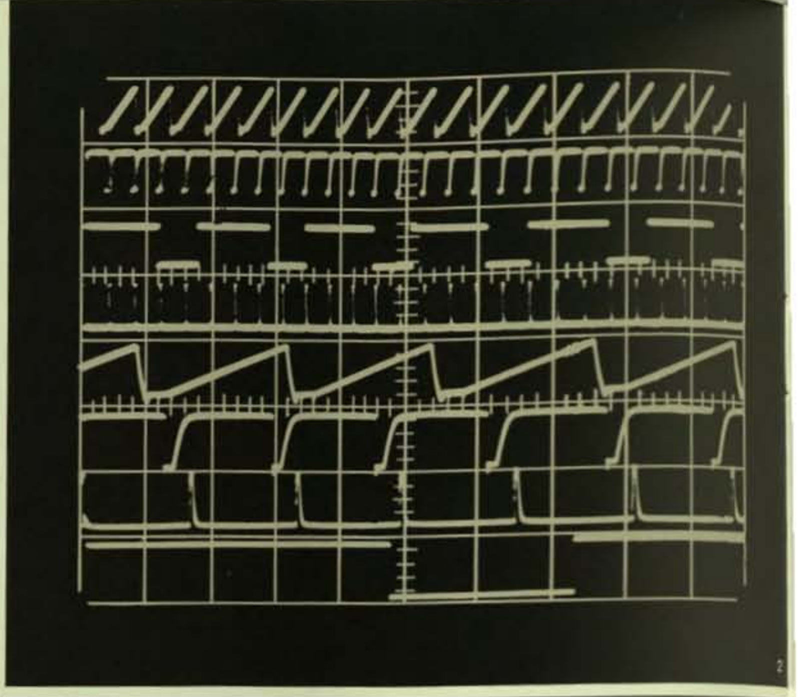

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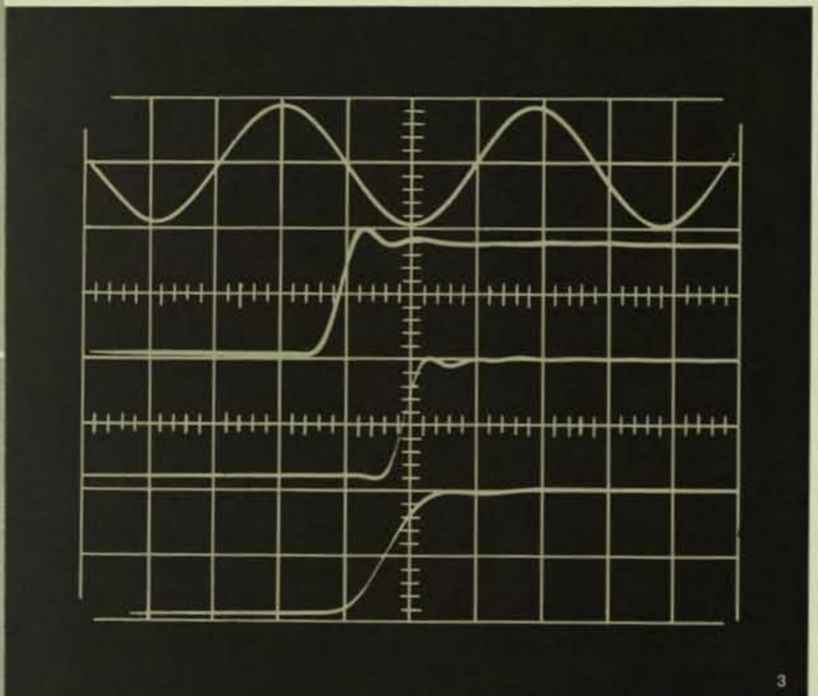

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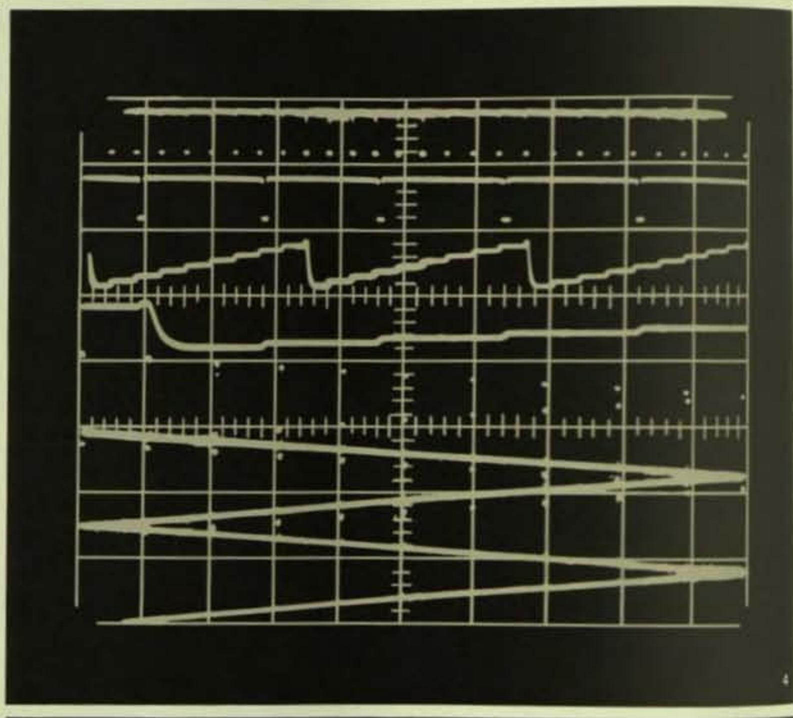

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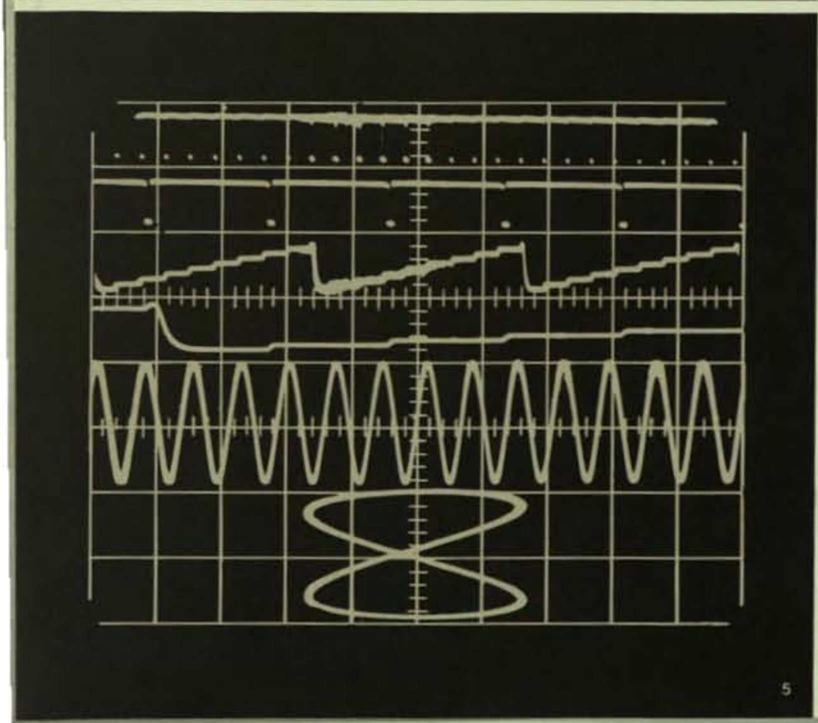

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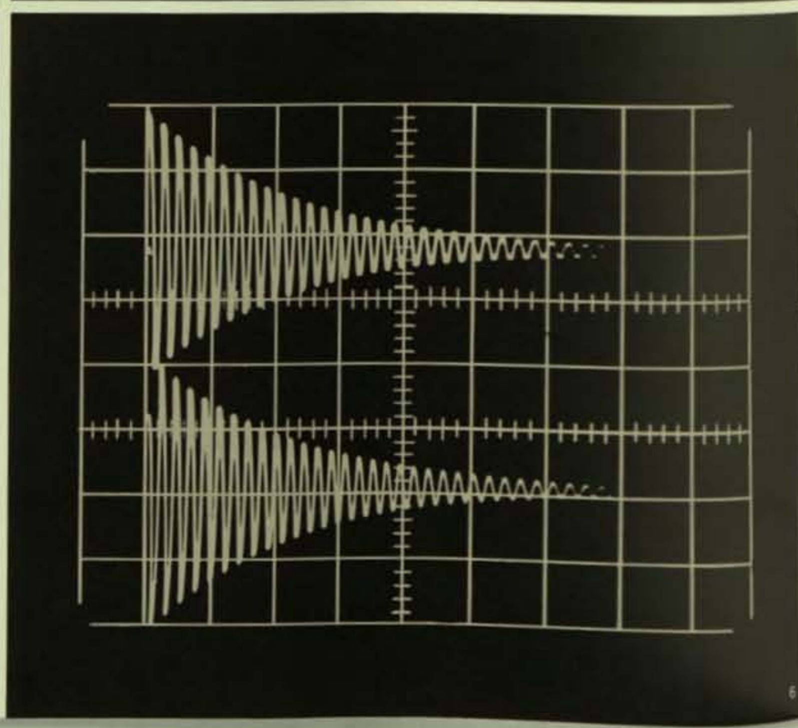


6

Display Capabilities

The Type 777 is a dual beam high frequency plug-in oscilloscope. The 777 frame will accept any of the 74-00 and 76-00 series plug-ins as well as the 79-02A. Two complete independent horizontal deflection systems and two complete independent vertical deflection systems make this a true dual beam scope.

With 13KV accelerating and with a Faraday shield, this unit provides high light output and with a 6CM by 10CM scan for each two beams.

With the horizontal and vertical cavities and a wide selection of plug-ins, this unit meets many requirements and provides versatility not found elsewhere.

1. With two 74-03A in the horizontal and a 76-08 in one vertical and a 74-94A in the other cavity. We can view a square wave on the 76-08 with the upper beam and with the 74-94A lower beam, we can view a spectrum analysis of the square wave at the same time.

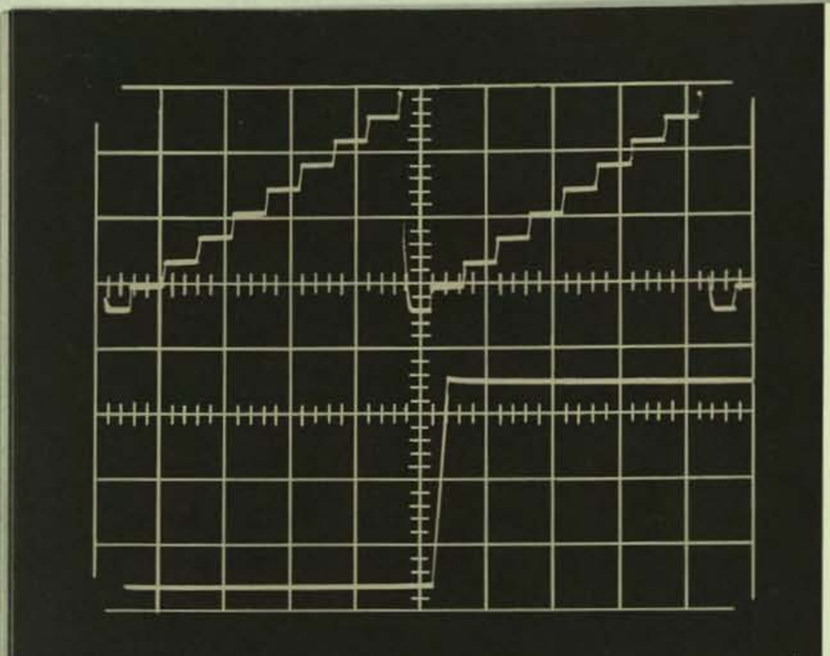
2. With two 76-06 in the vertical and one 74-03A and one 74-13A in the horizontal, we can view a combination of traces. We can view four traces on the upper beam with the 74-03A and four traces with the 74-13A delaying sweep. In the trigger strobe position, we can view any part of the sweep and expand it further by going to the delayed mode.

3. With two 79-02A's vertical amplifiers and two 74-03A in the horizontal, we can view any frequency up to 100MHz @ 200mV/div with a risetime of 3.5ns and with the amplifier used in the X10 mode 3.9ns risetime with 20mV/div sens.

4. With two vertical dual channel plug-ins and a 74-13A and a 74-20A in the horizontal with a normal display shown on the upper beam, we can also show a raster display at the same time. This enables the resolution to be increased up to 5000 times the normal sweep.

5. With two 74-17A in the horizontal and two dual channel plug-ins on the vertical, we can view four independent sweeps. With beam switching, we can view A sweep alternating with B sweep or we can view sine wave (Y) plotted against time and Y plotted against X.

6. With two 74-03A in the horizontal and two 76-08 vertical plug-ins, we can change the 777 into a high writing rate scope with the flip of a switch in each lower cavity. Shown is a single shot 50MHz ringing on each beam.



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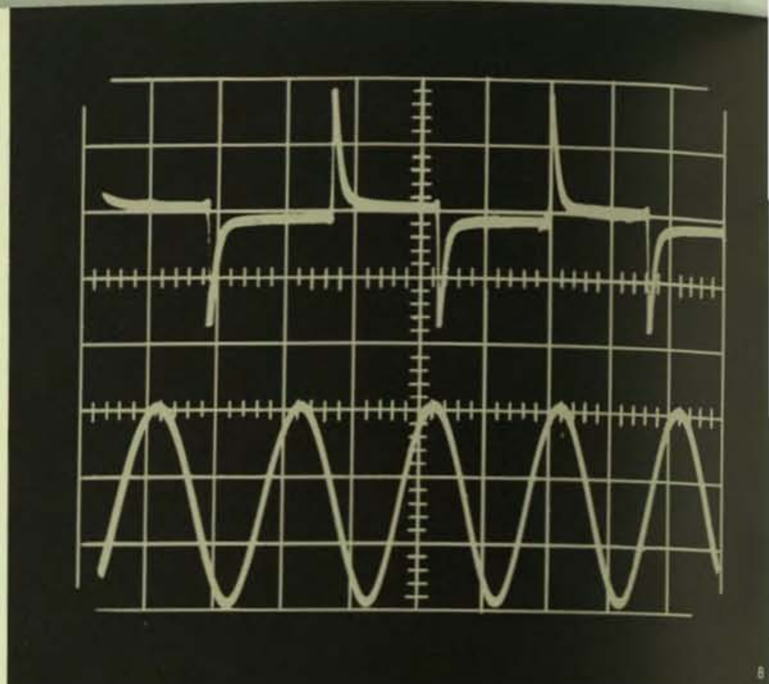

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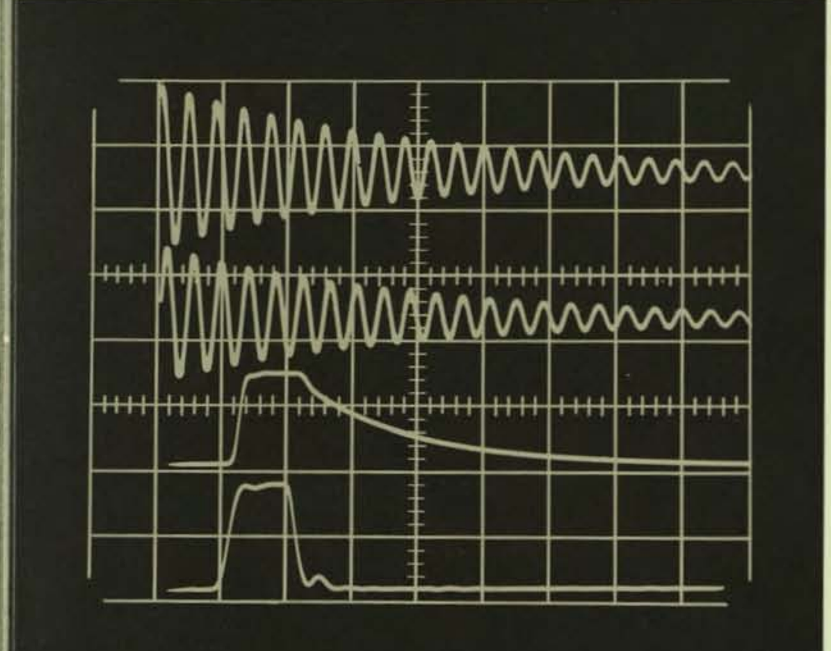

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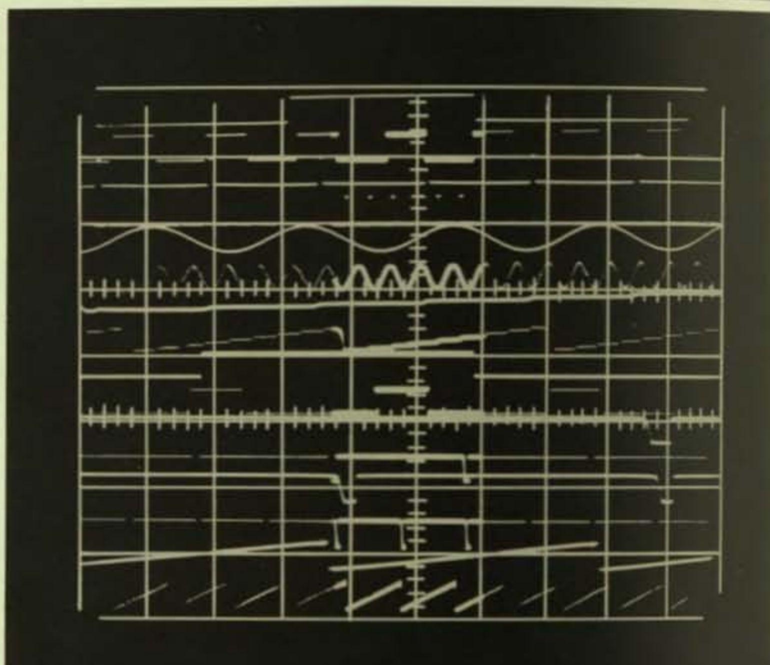

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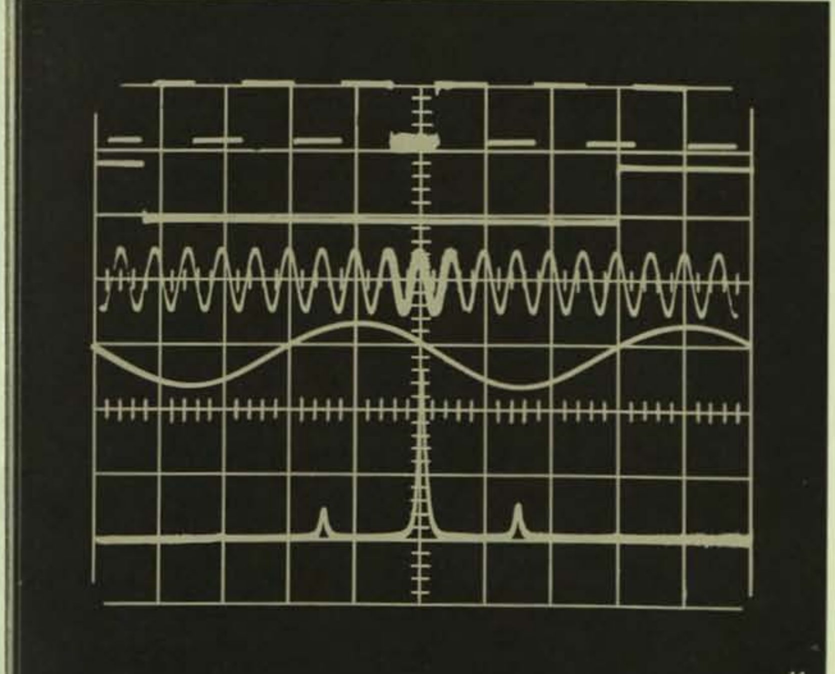


11

Display Capabilities

7. With two 74-03A in the horizontal and a 76-07 and another vertical amplifier in the system, we can look at a normal signal with low sensitivity on one channel, while at the same time, using the 76-07 with the slide back voltage, we can expand this signal to about 2000cm and examine some segment at a higher sensitivity.

8. With a 74-12 differential amplifier in one vertical cavity and a 74-15 single trace plug-in the vertical cavity with a 74-14 general purpose time base in one horizontal cavity and a 74-03A in the other cavity, gives us a low frequency, low cost dual beam scope.

9. With two 76-08's in the vertical cavity and with a 74-03A in one horizontal cavity and a 74-13A in the other horizontal cavity. With the 74-03A in single sweep mode, external trigger and the mode switch in the delayed armed sweep mode with external trigger, we can now look at single transients on the 74-13A delayed sweep. Then some time later, using the delayed gate output to trigger the 74-03A, we view a transient on the 74-03A.

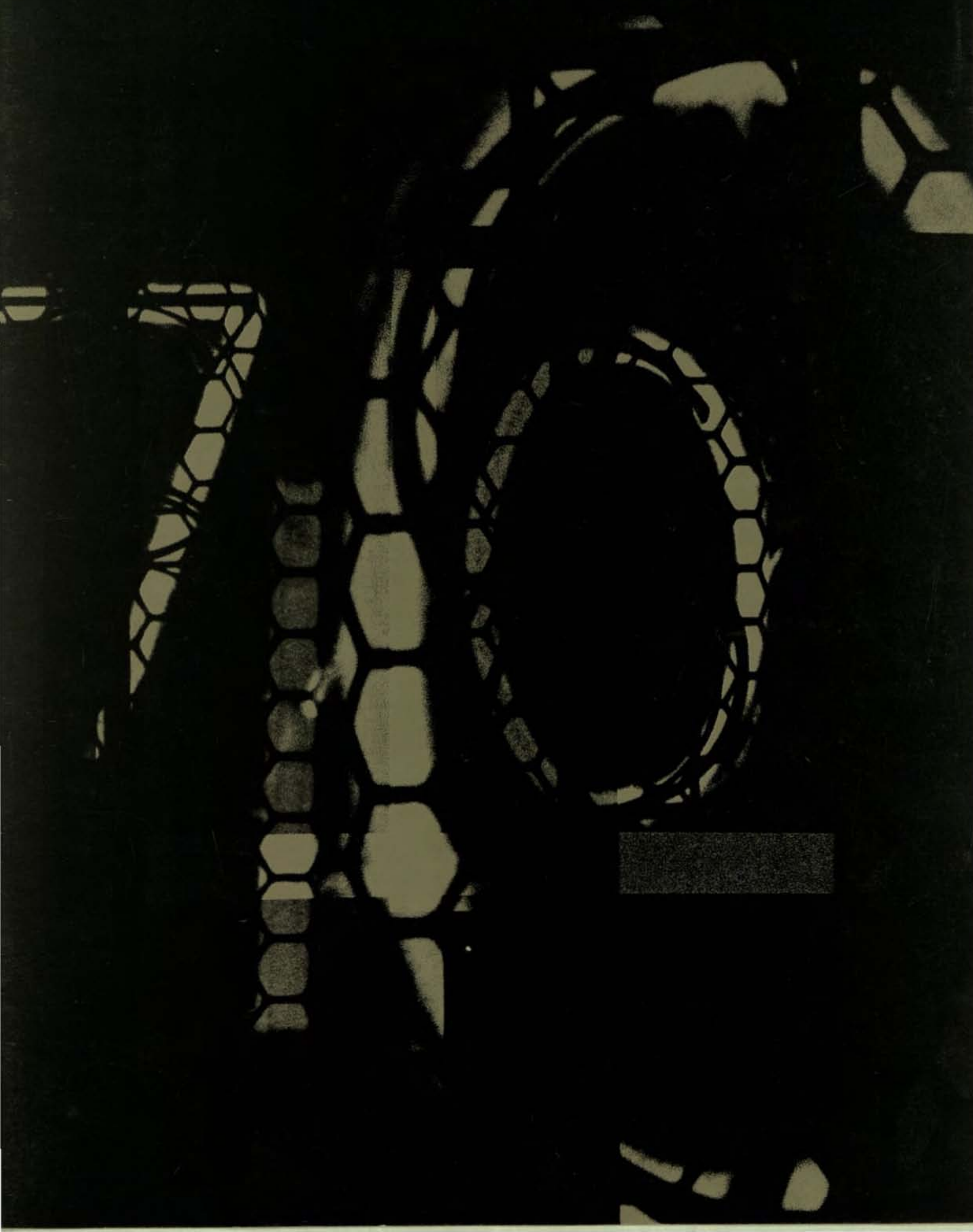
10. With two 76-06's in the vertical cavity and two 74-17A plug-ins on the horizontal cavity, we can now view sixteen traces at one time.

11. With a 76-08 in the upper vertical cavity with a 74-17A plug-in for the time base in the lower vertical cavity, we have a 74-91A spectrum analyzer with a 74-14 time base plug-in. With the 777 set up, we can view a sine wave with the 74-17A in the trigger strobe delayed with the B sweep intensified by A sweep and at the same time, we can make a spectral analysis of the sine wave.

FAIRCHILD
INSTRUMENTATION

A Division of Fairchild Camera and Instrument Corporation / 475 Ellis Street, Mountain View, California

FAIRCHILD INSTRUMENTATION | dual slope digital meter | series 7100




POWER
SAMPLING RATE
FAIRCHILD

Gus Hadley
650-327-4224

General Description

The Fairchild 7100 series Dual Slope integrating digital meters are precision instruments for measuring voltage, resistance, and ratio. Model 7100 provides volts, ohms, and ratio measurements, while the lower cost 7140 measures voltage only. Either instrument can be remotely programmed, and is suited to either laboratory or system applications. Auto-ranging is available as an option. Other options available include a high impedance module, and an AC/DC converter.

The 7100 and the 7140 utilize a new technique, known as Dual Slope integration. This technique was developed by Fairchild to improve the accuracy of digital voltage measurements. It combines the noise and hum rejection characteristics of integrating meters, with the long term stability of instruments which compare the input voltage to an internal standard. A detailed description of this technique is given on the following pages.

Another feature which contributes to the noise rejection of the 7100 series is guarded construction. The guard circuit, which is a box within a box, virtually eliminates the errors caused by common mode pick-up and allows the voltmeter to measure low level signals from thermo-couples, strain gauges, etc. The BCD output and remote programming signals are brought through the guard, so that they can be connected to ground referenced external equipment without degrading the common mode rejection, or eliminating the floating input.

Series 7100 meters incorporate a 150.00mV range in the basic unit, at no extra cost. The 10μV resolution is ideal for measuring low level signals.

The high accuracy of these instruments, 0.01% of reading ± 1 digit, makes them suitable for use in many applications where costly 5 digit instruments were previously required.

These superior characteristics are combined with solid-state integrated circuit reliability. Over two-thirds of the transistors in the 7100 series are contained in integrated circuits.

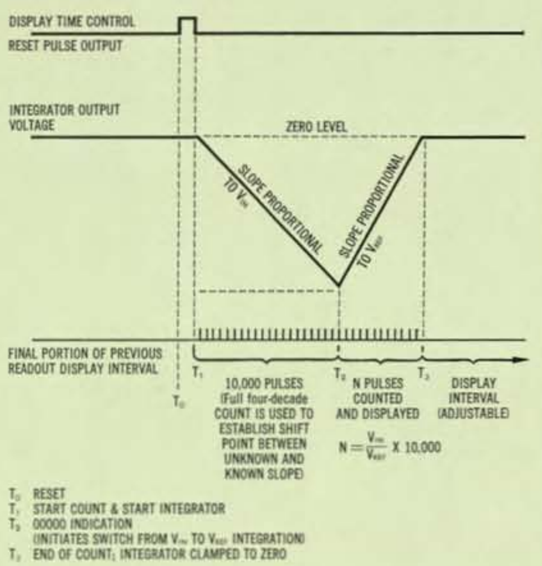
Series 7100 Dual Slope integrating digital meters are compact, versatile and accurate, offering optimum measuring capabilities for both laboratory and system applications.

Features:

Dual Slope Integration
Guarded Construction
10μV Resolution
0.01% Performance
Remote Programming
Auto-Ranging Option
Measures Volts-Ohms-Ratio-AC
Integrated Circuit Reliability

Dual Slope Integregation

Timing Diagram Illustrating Dual Slope
True Integration Performance



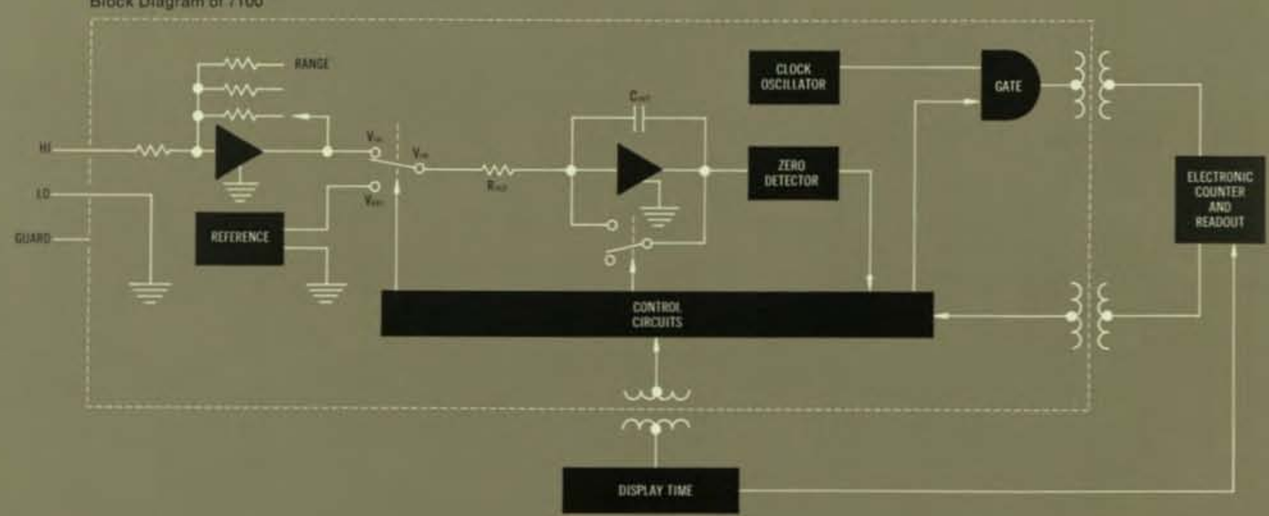
Dual Slope integration is a two step technique, as illustrated in the Timing Diagram and the Block Diagram. **In the first step** the unknown input is fed through an operational amplifier to an integrator. The integrator output is an increasing voltage with a slope that is proportionate to the input. The integration time is controlled by counting 10,000 pulses from a clock oscillator. **In step two,** the integrator input is switched to an internal reference and the integrator output is driven back to zero. The slope of the decreasing voltage is proportional to the reference, and the time required to return the voltage to zero is directly proportional to the unknown input. This time is measured by counting pulses from the same clock oscillator used in step one. The count is displayed as the digital readout.

Since the same integrating components and the same clock oscillator are used in both steps, any shifts in values of components, due to temperature changes or aging, become self-cancelling. And since the second step is a direct comparison to the internal reference voltage, the instrument has excellent long term stability. No hourly or daily calibration adjustments are required, and in fact the calibration controls have been removed from the front panel.

The Dual Slope technique provides all the advantages of integration. The reading represents the unbroken, true average. All hum and noise components, up to the full bandwidth of the input amplifier and integrator, are integrated and effectively reduced to zero. Even reverse polarity noise peaks are accommodated without error. The full-time integration thus provides better accuracy in the presence of hum and noise, and these are almost always present in practical measurements. Full time integration also permits the polarity indication to be based on the integrated input; the polarity indication is stable even in the presence of noise.

A bonus of the Dual Slope technique is the ability to make ratio measurements by substituting one of the inputs for the reference voltage. This arrangement retains all the advantages of integration, and adds to the versatility and usefulness of the instrument.

Block Diagram of 7100



Specifications

DC VOLTAGE MEASUREMENT

Ranges: ±150.00mV, ±1.5000V, ±15.000V, ±150.00V, ±1000.0V full scale.

Accuracy: ±0.01% of reading ±1 digit; 150mV range ±0.01% of reading ±2 digits.

Input Resistance: 1.0 megohm; 150mV range 100 kilohms.

Input Circuit: Floated and guarded, may be operated up to ±500V from chassis ground. Special 2-pin insulated BNC connector maintains guard shield at front panel. Separate banana jack for chassis ground.

Maximum Input: 1000V; 150mV range 300V.

Measurement Time: 50ms including polarity change; 150mV range 250ms.

Integration Time: 16⅔ms; 150mV range 83⅓ms.

Common Mode Rejection: 140db at DC; 120 db at all frequencies to 1kHz, measured with 1000 ohms between high side of source and voltmeter input.

Normal Mode Rejection: True-integration measurement rejects all noise which averages zero over the integration time. Noise peaks may exceed the signal level and zero crossovers are permissible.

Auto-Ranging (7101, 7141): Either of two cycles can be selected by an internal switch: 150mV, 1.5, 15, 150, 1000V ranges, 500V maximum input, 300ms maximum measurement time; 1.5, 15, 150, 1000V ranges, 1000V maximum input, 250ms maximum measurement time.

VOLTAGE RATIO MEASUREMENT

Ranges: ±1.5000:1 full scale.

Unknown Input: ±1mV to ±15V, input resistance 1.0 megohm.

Reference Input: +5V to +15V, input resistance ≥3 kilohms, 30V maximum input.

Accuracy: +10V reference: ±0.01% of reading ±1 digit. +9V to +15V reference: ±0.02% of reading ±1 digit.

RESISTANCE MEASUREMENT

Range: 15.000k, 150.00k, 1.5000M, 15.000M full scale.

Accuracy: ±0.02% of reading ±1 digit.

Measurement Current: 1mA, 100μA, 10μA and 1μA on the 15k through 15M ranges respectively.

Measurement Time: 50ms maximum.

Auto-Ranging (7101): 250ms maximum measurement time.

TEMPERATURE CHARACTERISTICS

Operating Range: 10°C to 50°C.

Stability: ±0.08 digits per °C (zero drift). ±0.002% of reading per °C (temperature coefficient) (above figures include reference drift and other effects). Reference voltage compensated to better than 0.0005% per °C.

READOUT

Visual: Amperex ZM-1030 numeric tubes; four full decades plus fifth digit give full scale readout to 15000. Polarity, decimal point, and measurement unit indicated.

Electrical: 122'4 BCD (Positive True); numerals and decimal point indicated by "0" state of +0.5V and "1" state of +30V, 20k source impedance; polarity indicated by +0.5V for positive input and +15V for negative input, 11k source impedance. Print command output +30V pulse.

EXTERNAL PROGRAMMING

Range and Mode: External NPN transistor gate or contact closure to ground corresponding to selected switch position.

Measurement Cycle: External contact closure in lieu of jumper to complete automatic start pulse circuit.

POWER

Standard: 105-125V or 210-250V selected by internal switch, 50-60Hz, approximately 50 watts.

MECHANICAL

Weight: 24 lbs. (11 kg); shipping approx. 33 lbs. (15 kg).

ACCESSORIES FURNISHED

5911-18: Power Cable, 7½ feet long.

5911-26: Input Cable, one furnished with each 7140 and 7141; two furnished with each 7100 and 7101.

6632-29: Connector, Winchester MRAC-50P-JTD-H8 wired for proper instrument operation. May be used for BCD output/remote programming by adding appropriate pins.

DM-01A: Standard Plug-In: Provides function control for the 7100, 7101, 7140 and 7141.

Accessories

DM-02 HIGH IMPEDANCE MODULE

Description: The Fairchild DM-02 High Impedance Module provides the 7100, 7101, 7140 and 7141 meters with an input impedance of greater than 1000 megohms; this high impedance is provided for all input voltages up to ±100 volts. In addition, the input is floating to permit differential voltage measurements and guarded to provide high common mode rejection.

The range switch in the DM-02 controls all input functions so that the regular input terminals may be used for 1000-volt, ratio, and ohms measurements.

SPECIFICATIONS

Input Impedance:	1000 megohms minimum.
Input Voltage:	±100 volts maximum. The input is automatically clamped at approximately ±100 volts. The maximum voltage that can be continuously applied to the input is ±500 volts; a 1 minute overload of 500 to 1000 volts is also acceptable. Any input in excess of these values may damage the plug-in.
Offset Current:	20 picoamperes maximum.
Offset Voltage:	20 microvolts maximum.
Noise:	30 microvolts or 50pA as indicated by 7100 readout.
Temperature Coefficient:	1 microvolt/°C.
Weight:	Net 3 lbs. (1.4 kg). Shipping, 6 lbs. (3 kg).

DM-03 AC/DC CONVERTER

Description: The Fairchild DM-03 AC/DC Converter adds AC voltage measurement to the basic capabilities of the 7100. The AC conversion produces readings which are proportional to the average value of the applied AC voltage; the readings are calibrated in rms based on the assumption of a sine wave input. Four manually selected AC ranges provide full scale readings of 1.0000, 10.000, 100.00, and 1000.0 volts. In addition, the 1, 10, and 100 volt ranges provide 50% over-range with full accuracy.

The input of the DM-03 is floating and guarded to permit accurate differential measurements and to provide high common mode rejection. A 5-foot input cable maintains the guard circuit as it enters the instrument and also protects the operator from exposure to the high common mode voltages frequently associated with differential AC measurements.

The DM-03 range switch controls the AC voltage ranges and also the DC volts, ratio, and ohms functions built into the Series 7100 instrument.

SPECIFICATIONS

AC Voltage Ranges:	Four manually selected full scale ranges of 1.0000, 10.000, 100.00, and 100.0 volts rms.
Over-Ranging:	50% on all ranges except 1000.0 volts.
Frequency Response:	30Hz-10kHz plus extended response to 30kHz (see table).
Accuracy:	(Reference condition 23°C±1°C) ±0.05% of reading ±0.02% of full scale. Below 10% full scale: ±0.03% of full scale.
Voltage Coefficient:	±0.0005%/volt for input signals above 500 volts rms.
Temperature Coefficient:	30Hz-8kHz ±0.005% of reading ±0.002% of full scale/°C. 8kHz-15kHz ±0.01% of reading ±0.004% of full scale/°C. 15kHz-30kHz ±0.02% of reading ±0.01% of full scale/°C.
Input Impedance:	5 megohms ±1% shunted by <50pf.
Weight:	Net 3 lbs. (1.4kg). Shipping, 6 lbs. (3kg).

ACCESSORIES FURNISHED

Input Cable:	5 ft. (170cm) long, <100pf.
Output Cable:	13" (33cm) long, 100pf.

EXTENDED RESPONSE

Range	Frequency			
	10kHz-15kHz	15kHz-20kHz	20kHz-25kHz	25kHz-30kHz
1 and 10V	±0.06% of Reading ±0.04% of Full Scale	±0.10% of Reading ±0.05% of Full Scale	±0.15% of Reading ±0.05% of Full Scale	±0.20% of Reading ±0.05% of Full Scale
100 and 1000V	±0.20% of Reading ±0.04% of Full Scale			

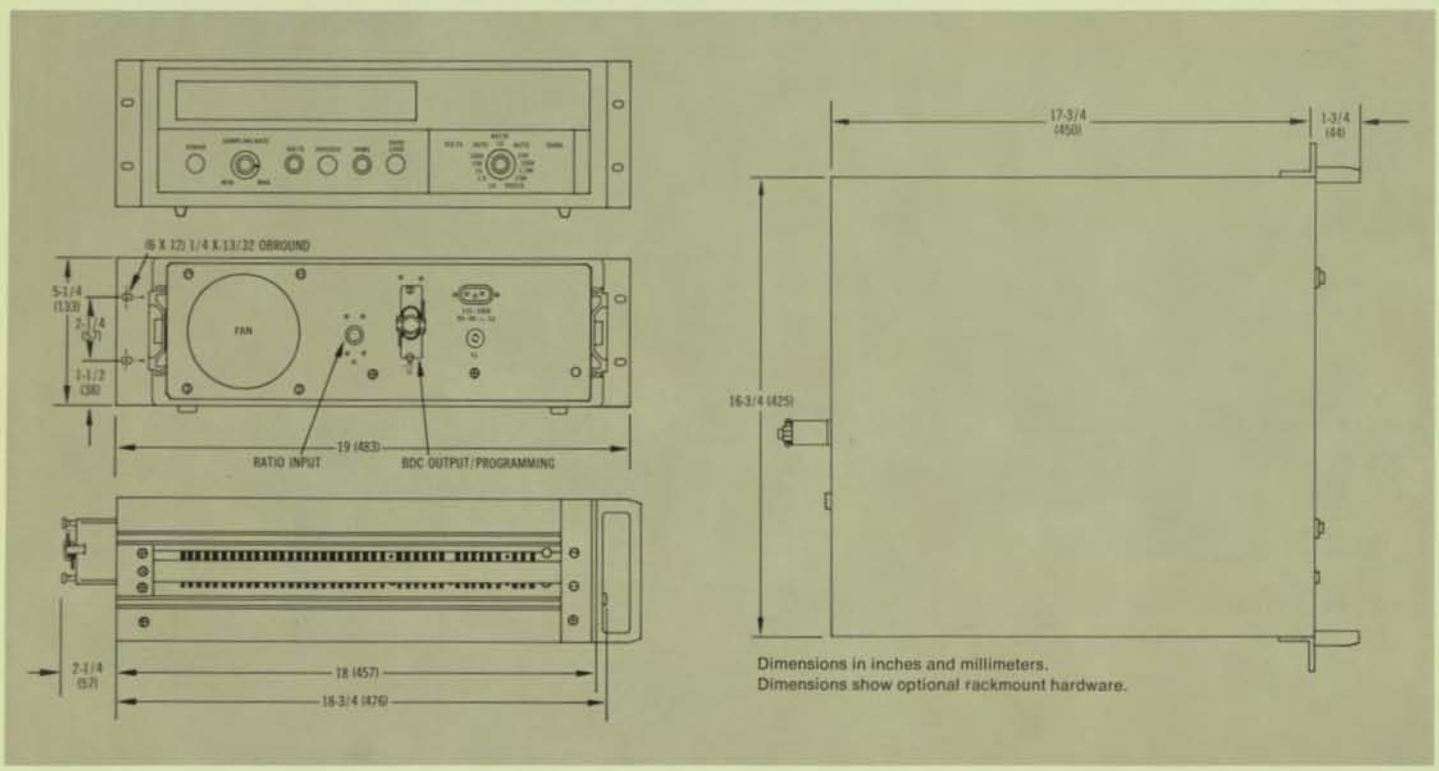
Notes: 1. Reference, rated, and extreme operating conditions per American Standard C39.6 except maximum humidity not to exceed 75% at rated accuracy.

Price List

6950-16	Connector, Winchester MRAC-50P-JTD-H8 with 50 1020P pins for BCD output/remote programming	$ 15.00
6950-27	Rackmounting Hardware with slides	65.00
6950-29	Rackmounting Hardware without slides	15.00
6950-30	Circuit Board Extender	15.00
6950-32	Probe Kit, Low Thermal EMF, Gold Plated — 2-Test Probes, 6 Alligator Clips, 3 Spade Lugs	20.00
7100	Volts/Ohms/Ratio	2650.00
7101	Volts/Ohms/Ratio, with autorange	2800.00
7140	Volts	1995.00
7141	Volts, with autorange	2145.00
DM-02	High Impedance Module	400.00
DM-03	AC/DC Converter	500.00

All prices F.O.B. Mountain View, California.
Data subject to change without notice.

Physical Dimensions



Dimensions in inches and millimeters.
Dimensions show optional rackmount hardware.

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INSTRUMENTATION

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