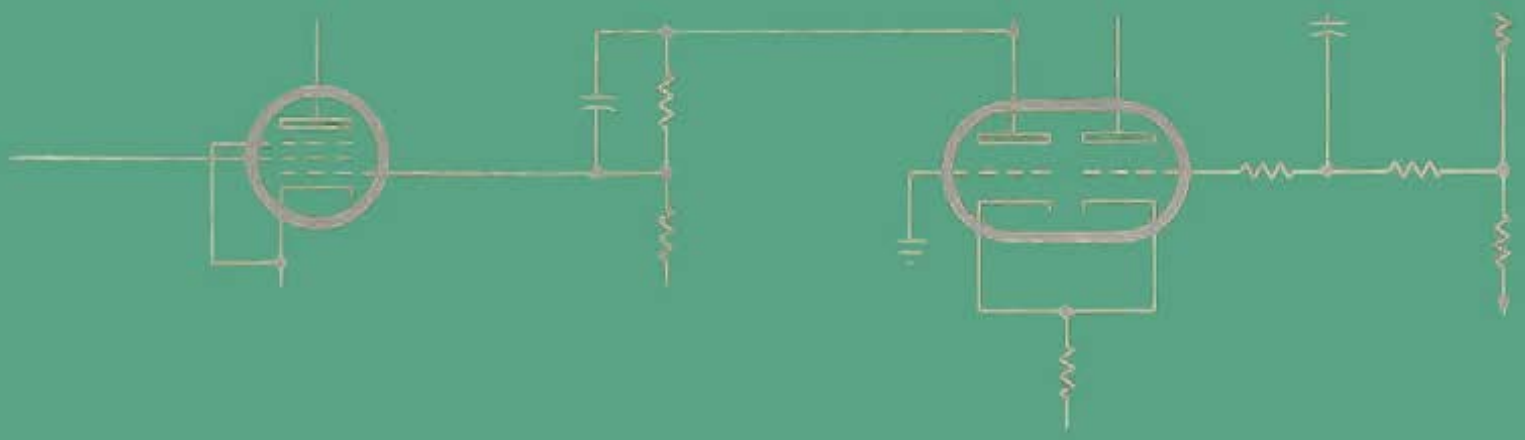
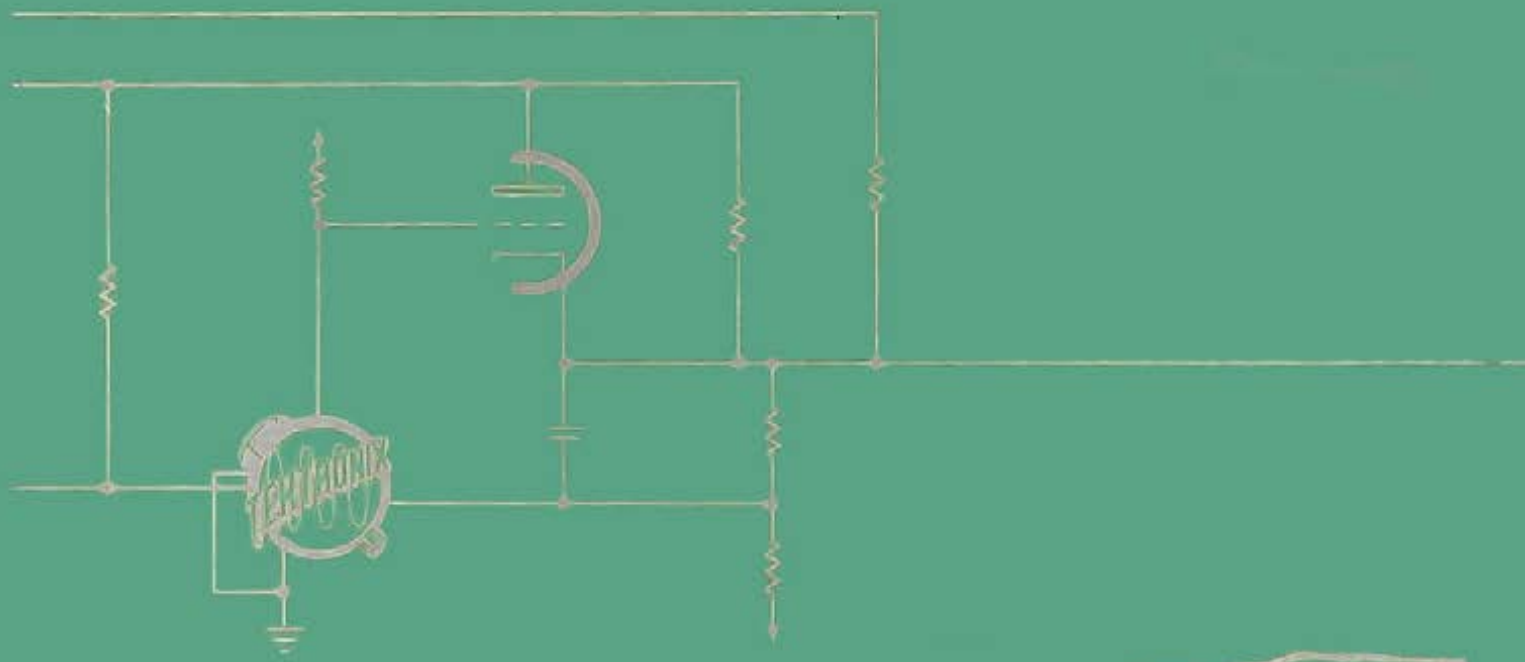
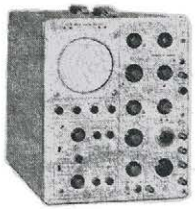




ABOUT TEKTRONIX

This booklet has been prepared to help tell the story of Tektronix to visitors.

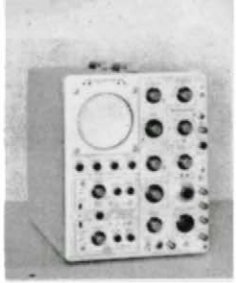
It can tell but a portion of the full story that should include hundreds of daily activities contributing to the production of a cathode-ray device for the ultimate user.



WELCOME!

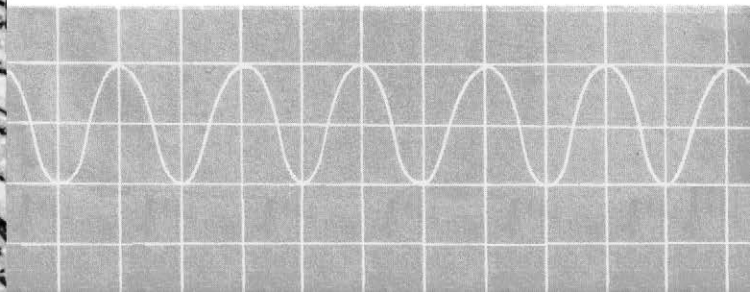
Whether you are a resident here becoming acquainted with Tektronix for the first time - or, are visiting our wonderful state of Oregon for the first time, - we're happy to greet you.

Please make yourself comfortable, and while you spend a few restful moments, we'd like to tell you something about TEKTRONIX.



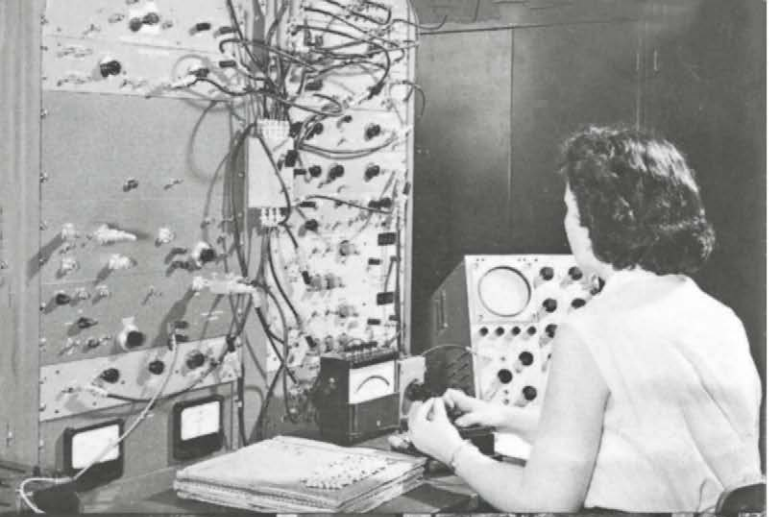
WHAT WE MAKE

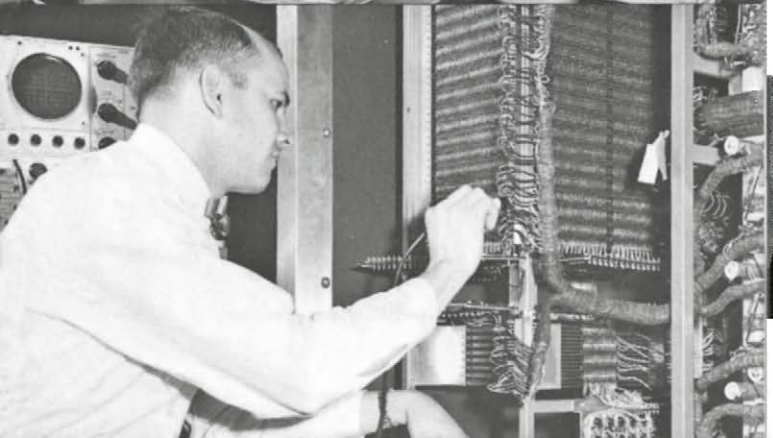
Cathode-Ray Oscilloscopes are our principal product—electronic instruments that provide a visible picture of changing phenomena, permitting accurate voltage and time-interval measurements.



HOW OSCILLOSCOPES ARE USED

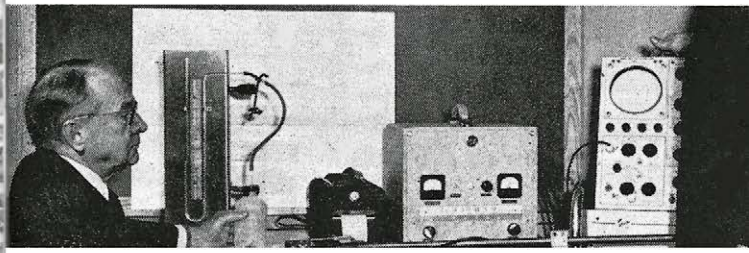
They are used to accurately measure voltage from hundreds of volts to less than a hundred thousandth of one volt. They measure time from minutes to a few billionths of one second.

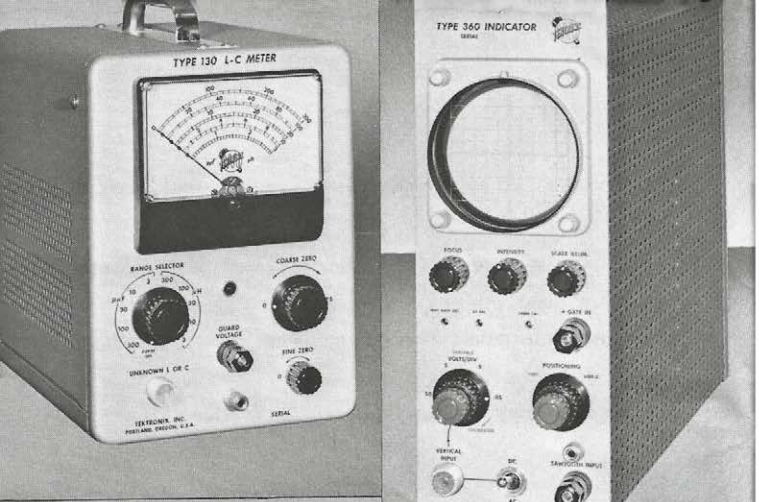




USERS OF OSCILLOSCOPES

The oscilloscope is the principal tool of engineers, scientists, and other specialists in the development of computers, electronic control equipment, radar, television and guided missiles; and in research in such fields as medicine, geology, biology, and nuclear physics.





OTHER PRODUCTS

Auxiliary electronic tools and accessories to broaden the use of the oscilloscope are also manufactured by Tektronix. In addition, many precision components used in our products are manufactured within our company.

The rest of the booklet will tell you how this is accomplished - but FIRST.....

THE HOME OF TEKTRONIX, INC.

In The Beautiful Tualatin Valley

and some history.....

TEKTRONIX, Inc. is an Oregon Corporation, founded in January of 1946.

Renewing a business association of long standing, Jack Murdock and Howard Vollum teamed up with some friends following World War II to pioneer the development of a laboratory type oscilloscope which they knew, if perfected, would fill a great need in the new era of electronics.

The very wide acceptance of the first Tektronix oscilloscope forecast the growth of the company which from a group of less than ten people in Portland who produced the first order of ten instruments, has 1959 grown to a rather large group of (over 2500) people serving Tektronix customers in nearly all of the free nations of the world.

The main factory and offices of Tektronix are located in the Tualatin Valley area west of Portland near Beaverton, Oregon.

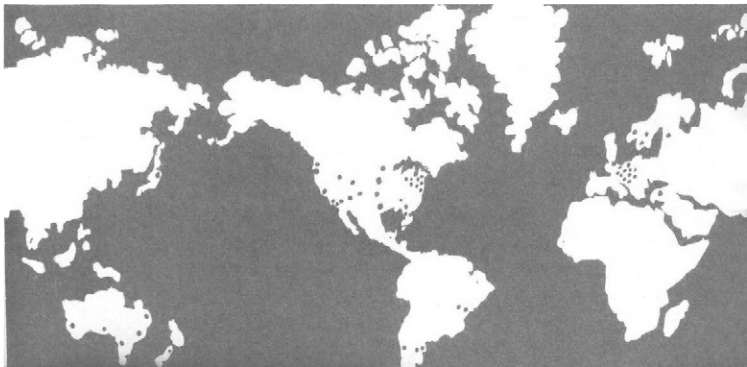
Field Engineering Offices are located near most of the large electronics industry centers in the United States.

An overseas facility for instrument assembly has been recently located at Guernsey, one of the Channel Isles between England and France.

Whether you happen to be: a prospective employee; a visitor to our state, city, or manufacturing plant; or, a visiting (supplier), we'd like you to become acquainted with what we do and with our methods of manufacture.

There are many operations to show you during your visit and we hope you'll find TEKTRONIX interesting and educational.

Please feel free to ask questions because we want you to know about our company, where one of our basic philosophies is respect for the dignity of each individual person.

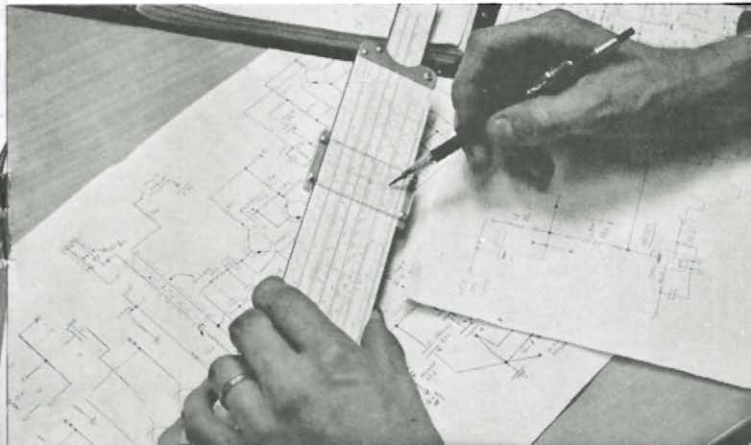


At Tektronix engineering activities cover a wide range but are oriented primarily on the production of an unexcelled cathode-ray device--the oscilloscope.

Design of instruments, mechanical and circuit design, cathode-ray tube design, component design and evaluation are some of the areas in which our Engineering Department work.

Engineering in the chemical and ceramics fields, semiconductors, electron devices and special products, systems and drafting are other activities.

Mechanical services, purchasing and clerical assistance support the engineers effort.



COMPONENTS

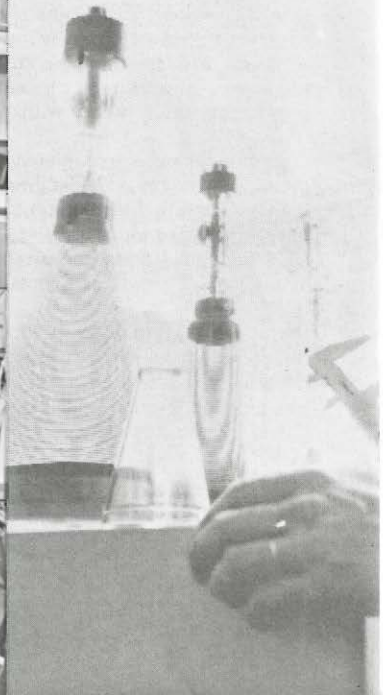
The next few pages will tell you of groups who make components for the oscilloscope. Most parts and raw materials are purchased but certain elements needed to improve instrument performance have been manufactured by Tektronix.

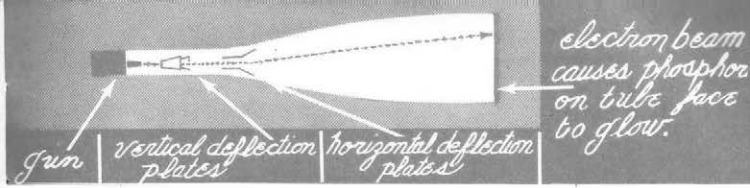
Capacitors made of aluminum foil and mylar plastic film are wound on machines developed here and soldered with a special solder manufactured here. The final product is a superior capacitor with a tolerance of +or- 1/4%. (Incidentally, we designate whether it is + or -.)

Resistors manufactured by Tektronix are at present wire-wound on mica plates, plastic or ceramic forms. Resistance wire varies in size from 1/2 mil to #17. In general, throughout our instrument where the resistor is critical to circuitry, a Tek-made resistor is used. It is interesting to watch the girls work with wire finer than human hair.

Potentiometers are also wire-wound and all parts, both metal and plastic, are made here. Simply a variable resistor, it is extremely difficult to manufacture because of its special characteristics of low capacity and controlled inductance. Dust free conditions and extensive use of stereomicroscopes are necessary for this precision problem child.

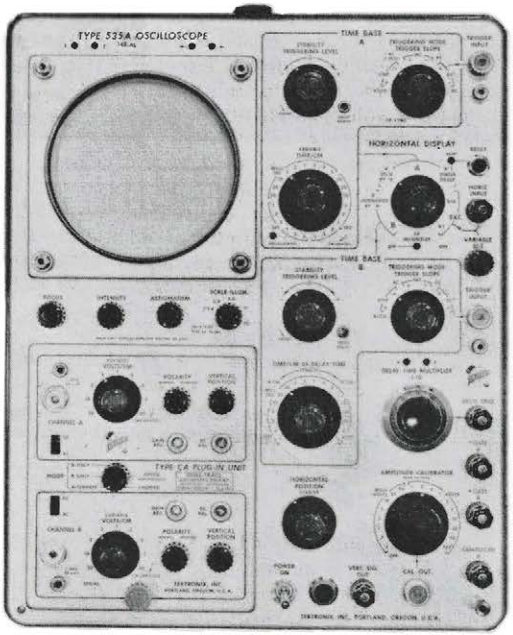
Ceramic parts of many kinds are used in the oscilloscope; the most familiar which is produced in great quantity is the ceramic mounting strip. Presently manufactured by both the extrusion and dry press methods, the ceramic strip is prepared for use in circuit wiring by the application of a silver paste which is fired onto the ceramic body. Silver solder used in wiring components to the strip makes the best possible electrical bond. The use of ceramic strips is not only functional, but also adds much to the orderly design of complex electronic circuitry.





Cathode Ray Tubes. Heart of the oscilloscope, this tube is manufactured by Tektronix to insure that the whole instrument will not be limited by the ability of other tube suppliers to produce a tube comparable to the high quality and engineering specifications demanded of our own cathode-ray tubes.

Very rigid quality checks are made on each phase of the cathode-ray tubes' manufacture. Electron gun assembly and wiring, glass preparation, phosphor settling, pumping, sealing and testing are all carried out with careful, painstaking precision.

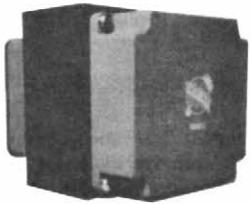


Front Panels of Tektronix instruments contribute to the "Look" which has become a hallmark in the electronic instrument field.

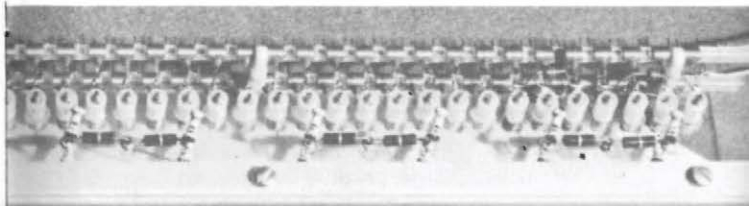
Mirror finish aluminum of the very finest grade is printed with calibration marks and switch designations, formed, punched, anodized and then painted. This is accomplished in a plant where complete attention is directed toward the production of a flawless front panel.

Transformers for Tektronix instruments are wound and completely manufactured in our Transformer and Coil Department. From the conventional outlet of commercial power, (usually 60 cycle alternating current at about 115 volts potential) the transformer steps voltages up to several hundred volts and also furnishes such low voltages for vacuum tube heaters as 6.3 volts. Transformers are also made to furnish several thousands of volts as accelerating potential for the CRT.

Workmanship and materials are quality controlled to such a high degree that Tektronix transformers carry an indefinite warranty.



Coils which provide the inductive portion of electronic circuits are wound on plastic cores of various diameters. Some are fixed values of inductance, others are variable. Not only are the diameters of the plastic cores critical, but the wire size and number of turns are very closely checked.



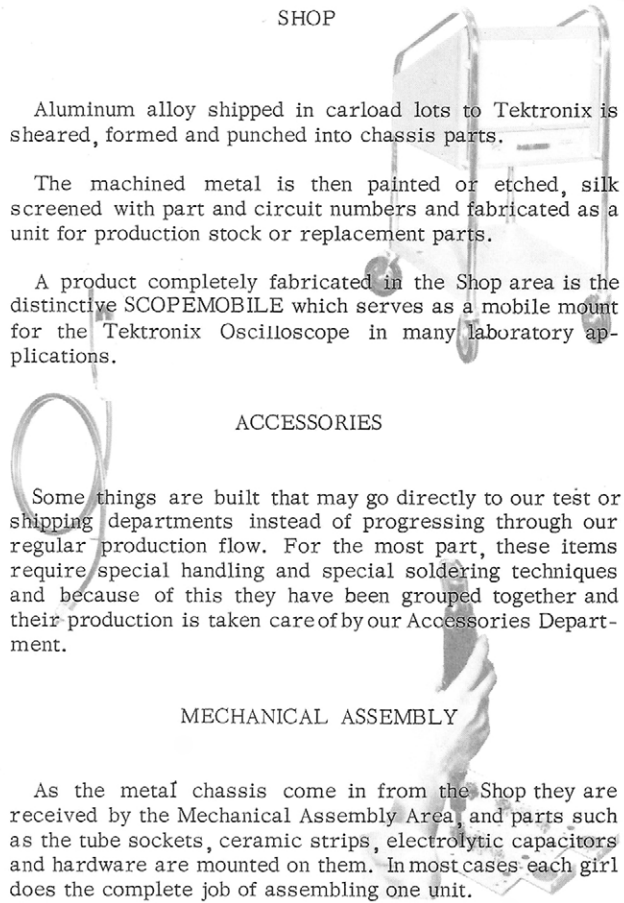
INSTRUMENT MANUFACTURING

From raw stocks of aluminum alloy, plastics, resins, wires, hardware, purchased components, vacuum tubes and our own manufactured parts the complete oscilloscope is fabricated, wired, tested, calibrated and cabinetized for shipment to the ultimate user--our customer.

The following pages describe activities typical of the production activity within our assembly plant.

Supporting activities of purchasing, stock requirements and material control, production engineering, preproduction, instrument manuals, quality control, production planning, and staff groups are all important in the final outcome--an instrument of high quality serving a satisfied customer.

SHOP



Aluminum alloy shipped in carload lots to Tektronix is sheared, formed and punched into chassis parts.

The machined metal is then painted or etched, silk screened with part and circuit numbers and fabricated as a unit for production stock or replacement parts.

A product completely fabricated in the Shop area is the distinctive SCOPEMOBILE which serves as a mobile mount for the Tektronix Oscilloscope in many laboratory applications.

ACCESSORIES

Some things are built that may go directly to our test or shipping departments instead of progressing through our regular production flow. For the most part, these items require special handling and special soldering techniques and because of this they have been grouped together and their production is taken care of by our Accessories Department.

MECHANICAL ASSEMBLY

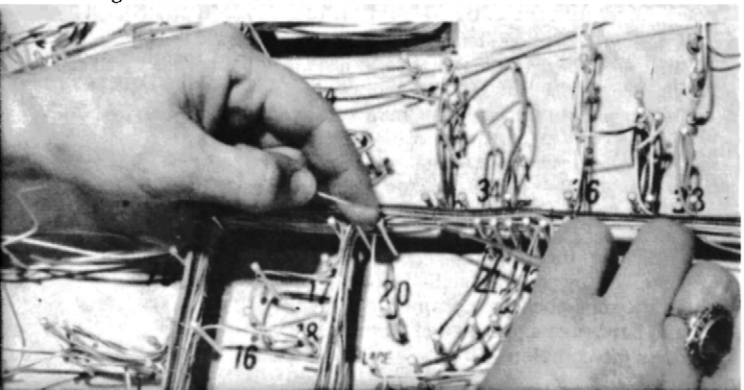
As the metal chassis come in from the Shop they are received by the Mechanical Assembly Area, and parts such as the tube sockets, ceramic strips, electrolytic capacitors and hardware are mounted on them. In most cases each girl does the complete job of assembling one unit.

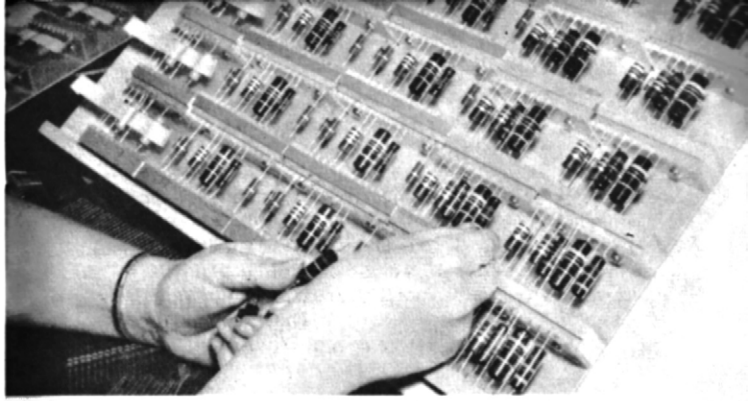
CABLING and WIRE PREPARATION

Connecting all of the electronic components within an instrument are wires that feed electricity to the various circuits. These wires are laced together in the form of a wire harness, or cable. The use of cable boards allows the girls to lay precut wires out with great accuracy, and to lace them together with plastic cord. They are cut to correct length and insulation is removed from the wire ends.

Wires used by the Cable Department as well as other wires used throughout the plant are cut by machines to a specified length and prepared for soldering.

The colored stripes are put on the wires by a special machine according to a color code specified in wiring diagrams of the instruments.





Kit Preparation and Component Test

The electrical parts that are built into our instruments often require bending or cutting before they can be installed. A special group does this and then sorts and counts the various components into a "Kit" which is composed of all the electrical components and related parts that are necessary to complete a particular unit.

In some circuits any fluctuation in the electrical value of a part cannot be tolerated. A selection is made from our purchased parts of certain ones which happen to be very close to the value indicated on the part. These parts are then marked and are used as "checked parts" where tolerances are critical.

Vacuum tubes are aged and selected for their performance. The ageing is done by operating them in cycling racks for prescribed periods of time and marking them.

UNIT WIRING

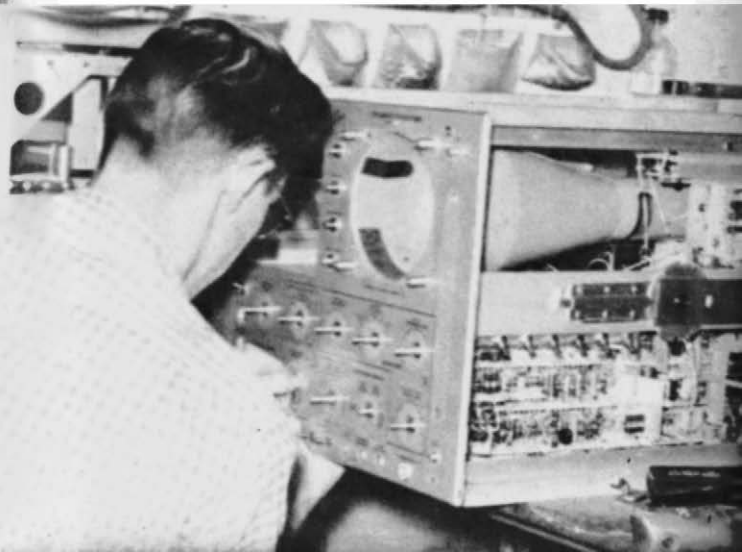
The mechanically assembled chassis, the "kit" of components and the wire cable are utilized by the Unit Wiring Department. All of the chassis we use and the smaller assemblies such as switches are wired, with use of solder, soldering iron and small hand tools.

After the wires and cable associated with a particular unit are mounted the correct connections are made, then the electrical components from the kit of parts are installed and wired onto the unit.

The complexity of work accomplished by this group ranges from a unit requiring a few minutes effort to those requiring ten hours to complete.

FINAL ASSEMBLY

The oscilloscope actually takes on its completed form at the final assemblers bench. Certain parts from Shop and Mechanical Assembly, and the unit-wired chassis are bolted together. Interconnecting wiring between various sub-assemblies are then soldered in place. Switches are mounted on sub-panels and finally the front panel and control knobs are mounted and aligned. Vacuum tubes are plugged into sockets, the largest of these being the cathode-ray tube which is covered and mounted in a shield.



PRODUCTION TEST

The final assembled instrument is first given a thorough electrical check by a pre-calibration group to make sure that the unit is operating as it should prior to a complete calibration. It is then operated on a time cycle to establish the units electrical stability.

Each instrument produced by Tektronix is given an exhaustive operational check and is calibrated so that it will function accurately within the limits of its design.

Quality Control is emphasized throughout every function at Tektronix, whether it be related directly to a production process or a related activity. The Quality Control group, watching the output of the Test Department, is the last technical group to see an instrument before it is packed and shipped to our customers. Their systematic and very careful scrutiny of all the work that has gone before helps guarantee the delivery of instruments unexcelled in performance.

SHIPPING

Following a final dressing of outside cabinet, removal of protective panel shields and general clean-up by a cabinetizing group, the instrument is placed on racks awaiting packing and shipment.

From the main factory and office location near Beaverton Oregon, Tektronix oscilloscopes are shipped throughout the free world.

MARKETING

First or last, our customer's order for an instrument is the life-blood and real reason for our success. To serve him, a wide selection of overseas distributors and U. S. and Canadian field offices are maintained.

The aim and purpose of our whole manufacturing facility and its many related supporting activities is summed up in a few words that has been accepted as a creed by the people of Tektronix.

OUR CONTINUING CREED

is that of serving Tektronix customers with products and policies that are unexcelled in the electronics industry and limited only by the current state of the art.


TEKTRONIX