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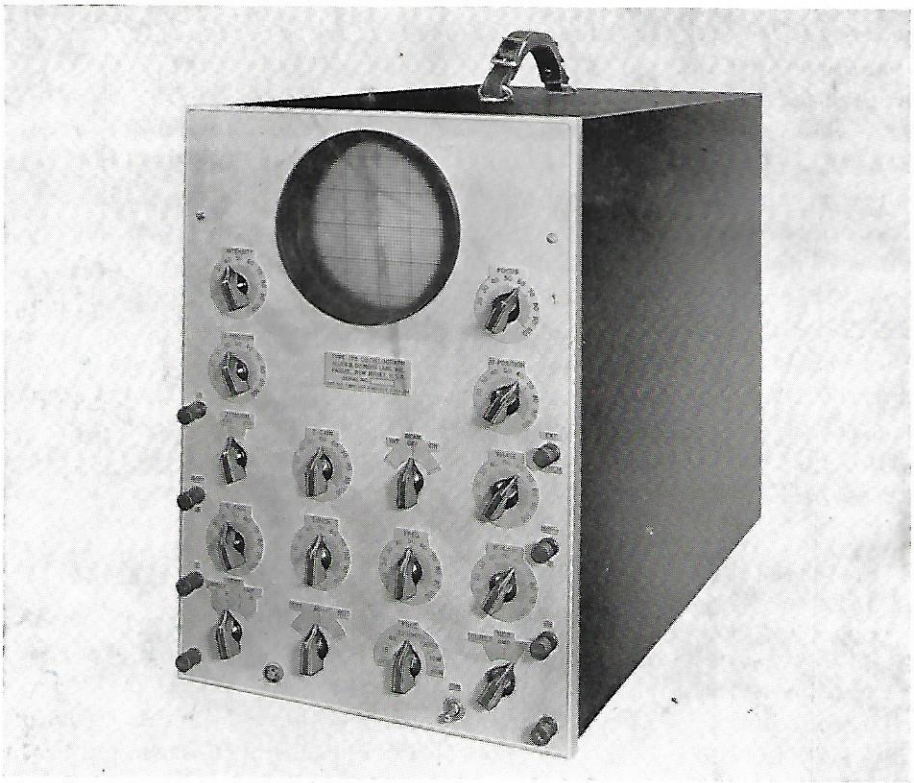


TYPE 175 CATHODE-RAY OSCILLOGRAPH

THE Type 175 Cathode-Ray Oscillograph has been designed to incorporate the many important advances in cathode-ray oscillography in the past few years into a composite unit providing convenient operation and flexibility in one complete instrument for laboratory, shop, and field. The extended frequency-response of the amplifiers of the Type 175 instrument makes it especially adaptable to the requirements of television research and development. It is available in two distinct models, the Type 175 which is an instrument for the study of high- and low-frequency recurrent phenomena, and the Type 175-A in which control circuits have been added to the sawtooth oscil-

later to permit single-sweep control of the horizontal deflection.

The low cost and extended operating range of this instrument have been made possible, to a great extent, by the development of the Type 54-11-T intensifier-type cathode-ray tube. This new tube represents one of the first fundamental developments affecting deflection sensitivity of cathode-ray tubes. By its use lower deflection voltage requirements from the amplifiers effect fundamental savings in amplifier design, and it permits the use of a lower voltage source for direct deflection of the cathode-ray tube when it is not desirable to employ the amplifiers in the instrument. Deflection voltage requirements of cathode-ray tubes are determined largely by the potential applied to the accelerating electrode of the electron gun. In the case of the Type 54-11-T, however, the greater part of the accelerating potential is applied to the intensifier electrode which accelerates the beam subsequent to deflection, thereby providing high brilliance with no decrease in deflection sensitivity. The high accelerating potential at which the cathode-ray tube is operated in the Type 175 Cathode-Ray Oscillograph insures good brilliance under adverse lighting conditions, and it facilitates the photography of phenomena at unusually fast writing rates.

High gain, wide-frequency-range amplifiers are provided for both horizontal and vertical axes of the Type 175 Cathode-Ray Oscillograph. The response of these amplifiers is uniform within ten percent from five to one-hundred thousand sinusoidal cycles per second. The inductive compensation employed has been proportioned so that the amplifier is approximately critically damped, and the most uniform frequency response consistent with satisfactory transient response has been obtained. There is a very slight overshoot introduced by the amplifiers when a high-frequency square-wave signal is passed through them.

To facilitate the study of phase relationships, horizontal and vertical amplifiers are identical so that any phase delay introduced by them is identical on both axes. Push-pull deflection amplifier stages are employed providing symmetric deflection of the cathode-ray tube to obviate spot defocusing at the extreme edges of the cathode-ray tube screen.

A new feedback circuit for supplying signal to the grid of the second tube of the push-pull deflection stage of each amplifier has been employed in this instrument. This circuit is so arranged that pattern shifts due to short-time power supply voltage fluctuations are balanced out, and the pattern remains steady on the oscillograph screen. Such fluctuations prove especially undesirable when photographing patterns from the screen of the cathode-ray tube.

With the high gain of the amplifiers in this instrument, it may be

satisfactorily operated, in many applications, directly from the output from vibration pickup units without the use of additional amplification. The Type 168-M microphone may also be used directly for visual study of waveforms of sounds and voice.

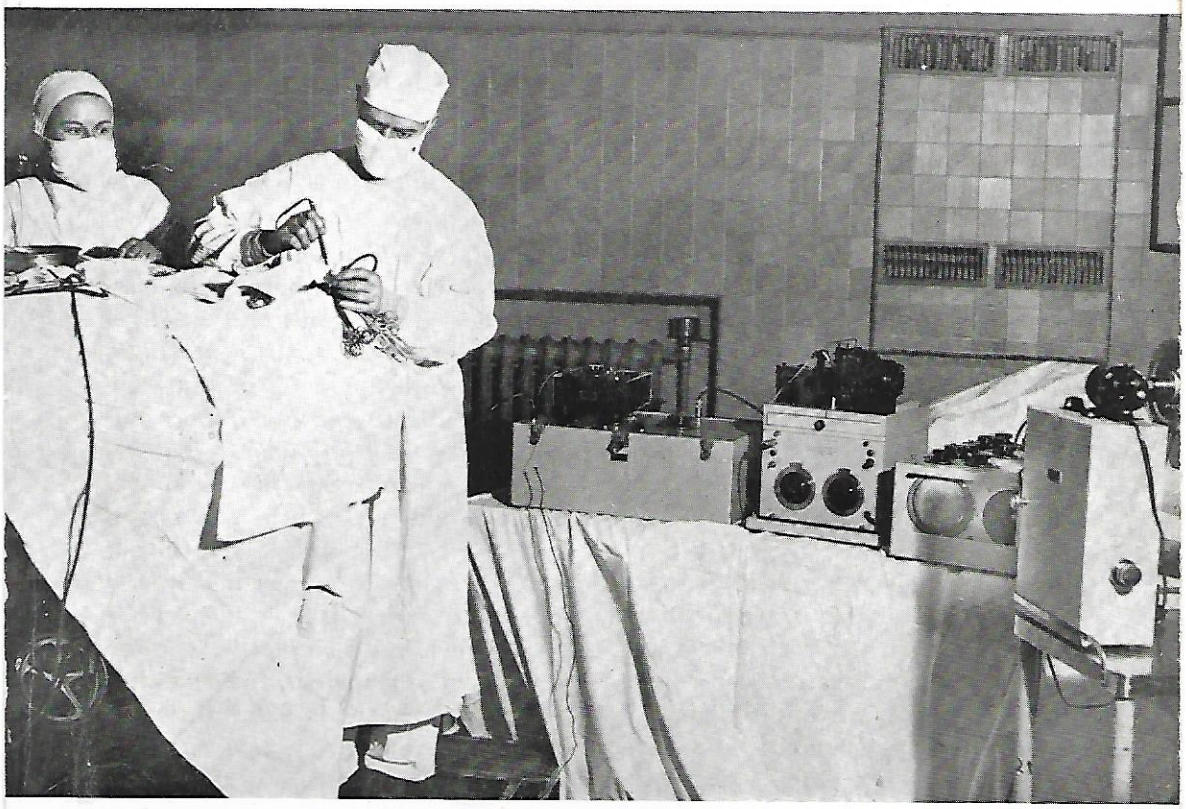
A sweep circuit providing essentially linear horizontal deflection, as a function of time and reading from left to right, over a repetition rate continuously variable from fifteen to thirty-thousand times per second is incorporated in the Type 175 Cathode-Ray Oscillograph. This sweep circuit is the amplified type, utilizing the horizontal deflection amplifier for amplification of the output of the relaxation oscillator. Its output is sufficient to permit horizontal expansion of high-frequency signals for fine-detail study of their patterns, and the return trace of the beam is blanked by a pulse fed to the grid of the cathode-ray tube.

An amplifier has been provided in the Type 175 Cathode-Ray Oscillograph for modulation of the grid of the cathode-ray tube by means of an externally provided signal to vary the light intensity of the beam. This form of timing has proven especially useful in the study of high-frequency pulses and in the adjustment of the timing of low-frequency equipment, such as welding machinery, by measuring the length of the operating cycle.

The Type 175-A Cathode-Ray Oscillograph is a modification of the Type 175 instrument in which there has been included a circuit for single-sweep control of the sweep to adapt the instrument to the study of transient phenomena.

The single-sweep circuit incorporated in the Type 175-A Cathode-Ray Oscillograph operates to control the sweep circuit so that it remains quiescent until a pulse is received on the grid of the discharge tube to cause a single, linear sweep of the beam. In the quiescent condition, the beam remains at one side of the screen until the initiating pulse is received, at which time the beam makes one complete sweep across the screen thus providing a single linear time base for the transient. The writing rate of the beam is determined by the coarse and fine sweep-frequency controls which are used for ordinary recurrent operation of the sweep circuit.

This single-sweep circuit will also prove valuable when short, recurrent, high-frequency pulses, of comparatively slow repetition-rate are to be investigated. For the study of such signals, the horizontal writing-rate of the sweep circuit may be adjusted so that the pulse is spread over a considerable area of the screen for fine-detail study, while the single-sweep is initiated recurrently at a periodicity corresponding to the repetition-rate of the signal. This method of operation essentially plots a signal of low repetition-rate against a high-frequency sweep so that the fine-detail structure of the pattern may be investigated.



Photograph Courtesy Electro-Medical Laboratory, Inc., Holliston, Mass.

THE dependability of Du Mont cathode-ray tubes is well exemplified in the above illustration showing their application in the Cathode-Ray Electroencephalograph developed by the Electro-Medical Laboratory, Holliston, Mass. Dr. Lovett Garceau, Director, describes the equipment as follows:

"In this operation, we record the oscillograms with special electrodes placed directly on the cortex of the exposed brain. Permanent records are made at low cost with the ink-writing oscillograph. These are too small to be seen easily by the surgeon from his position in the sterile field. The brilliant trace of the standing wave on the five-inch oscillotron shows him a clear image of the action currents produced in the brain cells.

"The instrument shown is the portable research Electroencephalograph, complete with moving film camera for recording also from the oscillotron."

The many operating advantages of Du Mont cathode-ray tubes is a leading factor in the selection of these tubes as the indicating and control devices in many of the new applications of electronics to industry.

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