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IN THIS ISSUE

NEW STROBOTAC®

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COVER

At Acoustic Research, Inc., of Cambridge, Massachusetts, the Strobotac casts new light on the performance of loudspeaker radiators.

NEW EYES FOR MODERN INDUSTRY

The Type 1531-A Strobotac®

WHAT IS THE STROBOTAC®?

The Strobotac® is a stroboscope, an instrument now familiar to nearly all mechanical and electrical engineers. It supplies intermittent illumination in the form of short, brilliant flashes of light, repeating at a controllable and known rate.

The word *stroboscope* comes directly from the Greek *strobos*, a whirling, and *scopos*, watcher. With the stroboscope, we can watch things that whirl (as well as things that vibrate and reciprocate), and from that watching we can derive a great deal of useful information about the thing that whirls.

By intermittent, periodic illumination of the whirling object, at a rate nearly equal to its rate of rotation, the object is seen in apparent slow motion, disclosing all the fine detail of its actual motion. When the rate of viewing is equal to the rate of rotation of the object, the object appears stationary, and, if the rate of illumination is known, the stroboscope becomes a tachometer. Hence the name *Strobotac®*, from *stroboscopic tachometer*.

The new TYPE 1531-A Strobotac represents the most important advance in commercial stroboscope design since 1935, when General Radio first introduced the now familiar Strobotac® stroboscopic tachometer. The new instrument offers a combination of performance characteristics not hitherto available in any commercial stroboscope, and it opens up many new fields of application for stroboscopic techniques.

A radically new Strobotron lamp, developed by Edgerton, Germeshausen & Grier, Inc., in cooperation with General Radio Company, provides three very important improvements in performance characteristics:

1. A white light flash, rather than red, produces higher contrast in the viewed image and makes objects appear in their natural colors. Also, the very much higher resolving power of the human eye for white light as compared to red light permits finer detail to be seen with less strain.

2. Higher light intensity, over 70 times as bright, allows effective use under normal room-lighting conditions and also allows objects deep inside a machine to be adequately illuminated.

3. Shorter flash duration, by a factor of 10 to 20 — 0.8 μsec at high flashing rates — allows a corresponding increase in the upper limit of speed of the viewed object.

Supporting this improved performance are many other major improvements in electrical performance and mechanical design, which contribute greatly to the utility, adaptability, and ease of handling of the new Strobotac.

4. Higher frequency range — from 110 rpm to 25,000 rpm in three ranges — permits direct measurement of 400-cycle devices.

5. Light beam is adjustable 180 degrees vertically and 360 degrees horizontally, so that the light beam can be aimed for best illumination of the object being viewed while the panel is positioned for convenient control manipulation and anti-parallax dial readings.

Figure 1. View of the Strobotac with case in totally open position. The convenient, large rpm dial is easily gripped by the hand for precise flash-rate setting.

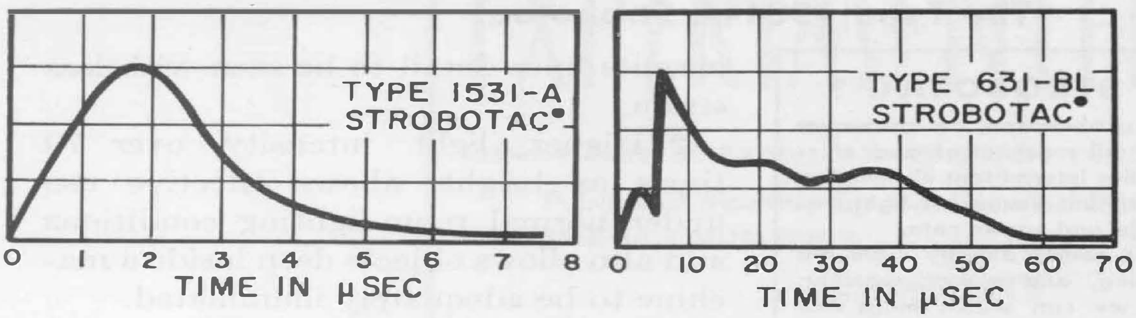


Figure 2. These plots show the marked improvement in flash duration in the new instrument. Both plots are for high-intensity, low-flash-rate conditions. Vertical scales are not comparable. Peak light intensity is about 70 times as great for the new instrument.

6. Flip-tilt case, which provides an adjustable stand for bench use and a permanently attached cover, which totally encloses the instrument for storage or transit.

7. Simplified controls—direct-reading rpm dial requires no multiplying factors, and only the range scale in use is visible.

8. Sensitive input circuit is easily triggered by an external mechanical contact or by electrical signals — only 6 volts, peak to peak, required.

9. Substantially smaller in size and lighter in weight, the new instrument can be held in one hand.

10. Neon calibrating lamp is located on panel, so that calibration can be easily checked at many speed settings.

New Strobotron Lamp

The new lamp produces a white light flash by an electrical discharge through xenon gas. Figure 2 shows a comparison of the light output pulses obtained from the new and old Strobotacs. Not only is the duration of the pulse much less for the new model, but the long tail characteristic of the neon Strobotron tube is not present in the new xenon tube, which results in much sharper definition of fast moving objects. Measured between the points at which the light intensity is one-third of peak light value, the light-pulse width of the TYPE 1531-A Strobotac is approximately 0.8 µsec, 1.2 µsec, and 3 µsec, on the low, medium, and high intensity positions, respectively.* On the other hand, the old TYPE 631-BL Strobotac has 11-µsec and 40-µsec pulse widths on the low- and high-intensity positions, respectively. The physical length of the arc is ⅜ inch, so that a narrow beam angle, with high illumina-

*Measured at 10 per cent of peak intensity, the durations are 1, 3, and 6 µsec.

Figure 3. Two views of the new Strobotac, showing *(left)* flip-tilt case closed for carrying and *(right)* open with panel locked in tilted position for convenient use.

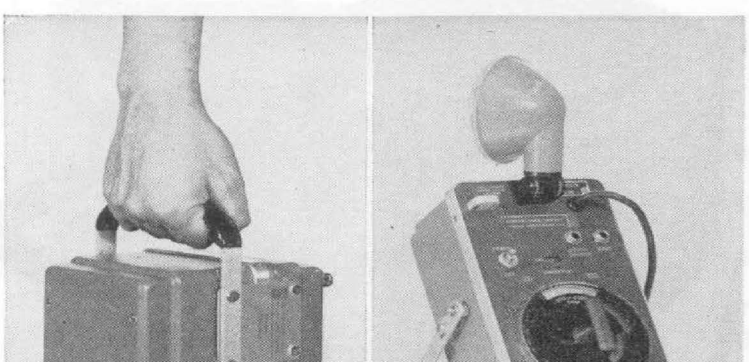
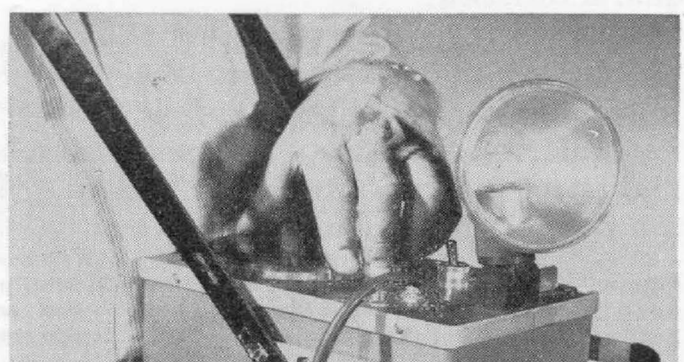


Figure 4. This adjustable neck strap supplied with the Strobotac frees the operator's hands for other functions.



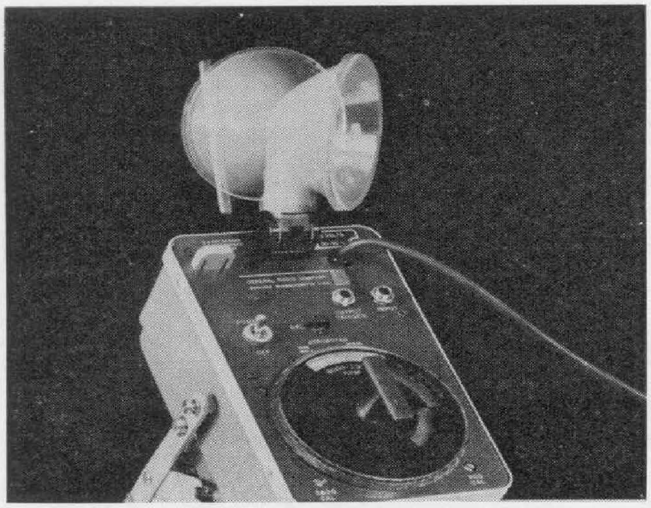


Figure 5. This multiple-exposure photograph illustrates the 360-degree reflector rotation. Hinged lamp assembly permits additional positioning in vertical plane.

tion of distant objects, can be achieved with a small diameter reflector. The life of the Strobotron is also improved, and the average user should be able to obtain between 500 and 1000 hours of operation before the lamp need be replaced.

Mechanical Features

The TYPE 1531-A Strobotac is housed in the flip-tilt case* now used for many new General Radio portable instruments. The permanently attached cover of this case can be locked in either the totally closed or the totally open positions, thus providing protection in storage or transit without being in the way when the instrument is in use. The tilting feature is very convenient when the instrument is to be used on a bench top. A neck strap is provided for supporting the instrument, so that the operator's hands can be free, if desired. (See Figures 3 and 4.)

The lamp arm is hinged to provide 180 degrees of travel, and the reflector rotates 360 degrees around a second, perpendicular axis to provide free aiming of the light beam. The multiple-exposure photograph (Figure 5) shows the reflector in three positions. The reflector is securely held to the lamp arm by means of a spring-loaded detent button, which allows the reflector to be removed easily for replacement of the Strobotron tube. A small amount of dispersion is built into the surface of the reflector, so that a nearly uniform light pattern is produced over the 10 degree width of the light beam.

*Patent pending.

All controls are located on a single panel, as shown in Figure 6. The range-selection switch and rpm control dial are concentric for ease of operation. Three rpm ranges provide flashing rates from 100 rpm to 25,000 rpm. The range in use is illuminated, while all others are covered by a mask attached to the range-selection knob to prevent confusion in reading the dial.

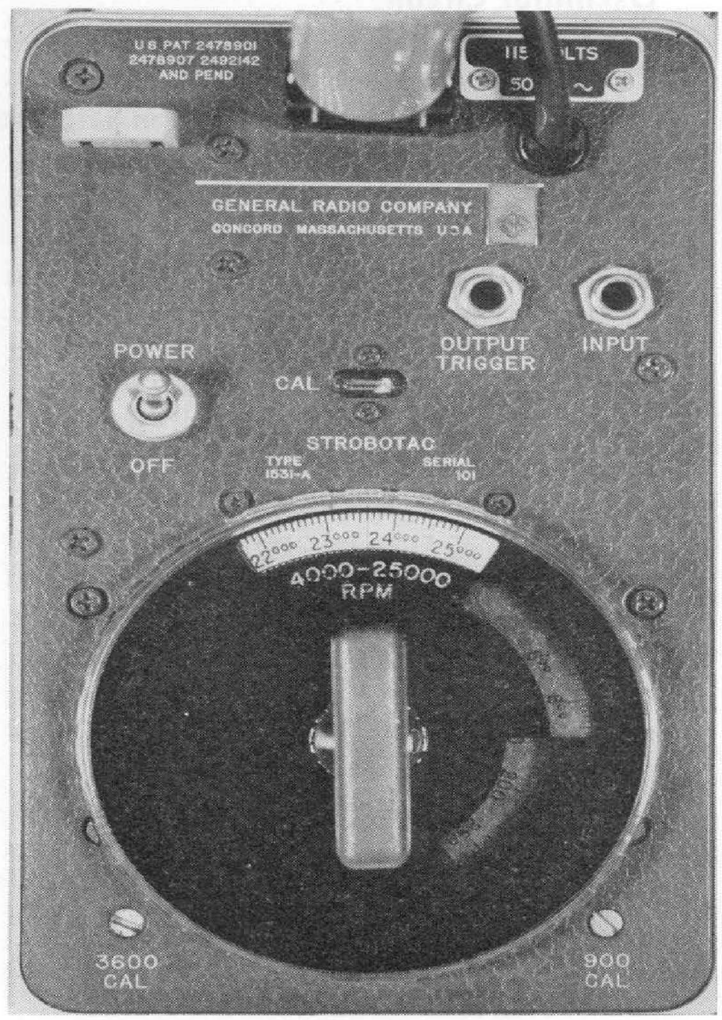


Figure 6. View of the panel, showing scale, mask, dial, and other conveniently arranged controls.

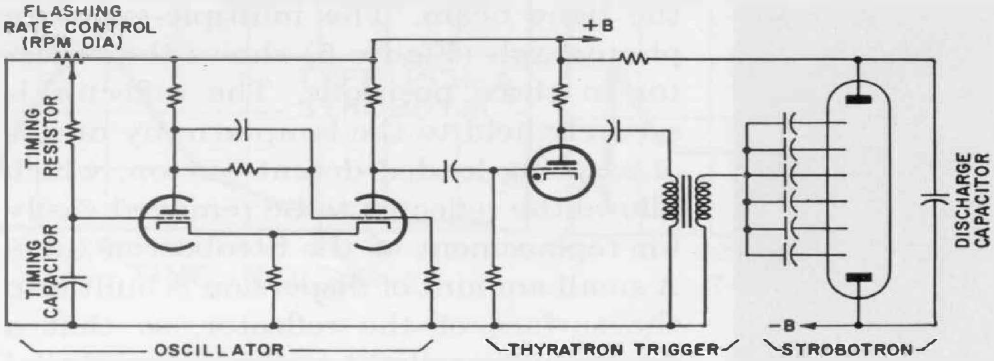


Figure 7. Elementary schematic of the circuit used in the Type 1531-A Strobotac.

A power switch is provided separate from the range-selector switch, and a six-foot power cord is permanently attached to the instrument. The cord can be conveniently stored when wrapped around the reflector housing and range knob (see Figure 6).

For maintenance or servicing, the instrument can be easily removed from the case. One etched board is hinged, so that all parts are readily accessible.

Oscillator Circuit

The internal oscillator used in the new Strobotac is a free-running, amplitude-sensitive, bistable circuit that is a modification of the familiar Schmitt circuit. The frequency at which this circuit operates is determined by a resistor-capacitor combination connected to the input and a variable dc voltage. When the dc voltage is changed, the charging rate of the capacitor and the time between output pulses change. The flashing-rate control (rpm dial) is a potentiometer, by means of which the dc voltage can be varied to produce a flashing-rate range of 6.25:1. The rpm scale is essentially linear with dial rotation. A 6-to-1 change in frequency is obtained between ranges by a corresponding change in the timing capacitor. Trimming resistors, set at the factory, are used to correct for small variations in capacitor values so the three ranges track properly.

External Trigger

When the range switch is set in any of the external-input positions, the oscillator circuit is converted into a conventional amplitude-sensitive Schmitt circuit. In these positions the flashing-rate control (rpm dial) adjusts the bias on the input grid and hence the sensitivity of the circuit.

It is possible to trigger the Strobotac from electrical input signals as well as from a mechanical contactor. An input signal of at least six volts, peak to peak, is necessary. When the input electrical signal is near the minimum required amplitude, satisfactory triggering is obtained by careful adjustment of the bias (rpm dial). If the input signal amplitude is large, satisfactory triggering will result over a wide range of rpm dial settings. With large-amplitude signals, a change of dial setting will vary the point on the positive-going edge of the signal that causes the Strobotron tube to fire. With a sine-wave input signal it is possible to vary the firing point over a range of approximately 120 degrees. This phase adjustment is not possible, obviously, with steep-wave-front signals.

Although the upper limit of the internal oscillator is 25,000 rpm, or approximately 420 cps, external triggering is usually possible at frequencies as high as 45,000 rpm (750 cps). The upper frequency limit depends on the characteristics of the individual Strobotron tube and will appear either as erratic operation of the tube or the formation of a low-intensity, continuous arc, called "hold-over."

For triggering by a mechanical contactor, part of a dc voltage divider is shorted by the contactor to generate the signal into the Schmitt circuit. Since a positive-going signal is necessary to produce the correct polarity trigger to operate the Strobotron, the light flash occurs on the *opening* of the mechanical contact, rather than on the closing. Because the time between opening and closing of the mechanical switch is usually sufficient for the Strobotron circuit to recover, care should be taken to eliminate contact bounce, which will produce unwanted extra flashes.

Calibration

Calibration is accomplished with a neon bulb rather than the vibrating reed used in the previous model. One element of the neon bulb is excited from the power-line voltage and the other element from the voltage across the Strobotron. As the flashing rate of the Strobotron approaches either the fundamental or a harmonic of the power-line frequency, the neon light intensity will vary at a rate equal to the difference frequency. Two front-panel adjustments are available for calibrating the rpm dial at 3600 rpm and 900 rpm*. Calibrations can also be made at other dial settings, between about 600 and 7200 rpm, which are integral or fractional multiples of the power-line frequency. When the best possible accuracy of speed measurement is desired, a calibration point can often be found near the speed setting used. Calibration is made difficult below 600 rpm by flicker and above 7200 by the low amplitude of the light-intensity variation.

*3000 and 750 rpm when the power-line frequency is 50 cycles, 24,000 and 6000 rpm when it is 400 cycles.

SPECIFICATIONS

Flashing-Rate Range: 110 to 25,000 flashes per minute in three direct-reading ranges, 110 to 690, 670 to 4170, and 4000 to 25,000. Speeds up to 250,000 rpm can be measured.

Accuracy: One per cent of dial reading after calibration on middle range.

Calibration: Two screw-driver adjustments are provided on the panel for calibration against power-line frequency.

Flash Duration: Approximately 0.8, 1.2, and 3 μsec for high-, medium-, and low-speed ranges, respectively, measured at 1/3 peak intensity.

Peak Light Intensity: 0.21, 1.2, and 4.2 million-beamcandlepower minimum on high-, medium-, and low-speed ranges, respectively; 7 million-beamcandlepower for single-flash.

Reflector Beam Angle: 10 degrees at half-intensity points.

Output Trigger: 600 to 800 volts negative pulse available at a panel jack.

External Triggering: Strobotac can be triggered with a mechanical contactor or 6-volt peak-to-peak signal. (2-volt rms sine-wave signal down to 5 cps.)

Power Supply: 105-125 (or 210-250) volts, 50-60 cycles or 400 cycles.

Maximum Power Input: 35 watts.

Tube Complement: 4-1N1695, 2-NE2H, 1-5965, 1-5727, 1-1531-P1 Strobotron.

Accessories Supplied: Adjustable neck strap, plug to fit input and output jacks, 3-wire to 2-wire power-cord adaptor, spare fuses.

Mounting: Aluminum case with attached cover and carrying handle, gray-wrinkle finish.

Dimensions: 10 5/8 x 6 5/8 x 6 1/8 inches, over-all, including handle.

Weight: 7 1/8 pounds.

Type		*Code Word*	*Price*
1531-A	**Strobotac®**	BELAY	**$260.00**
1531-P1	**Replacement Strobotron**	DRUID	**15.00**

U. S. Patent Numbers: 2,478,901; 2,478,907, and 2,492,142.
Patent Pending.
Licensed under designs, patents, and patent applications of Edgerton, Germeshausen & Grier, Inc.

THE STROBOTAC AT WORK

The original Strobotac of 25 years ago changed the stroboscope from a laboratory toy to a reliable, inexpensive, industrial instrument, which has become an important factor in the design, operation, and maintenance of mechanical and electromechanical equipment. The new TYPE 1531-A Strobotac, with its greatly improved light intensity and flash duration of a few microseconds, provides industry with a tool of increased effectiveness for the study of not only conventional machines but also of today's high-speed and miniaturized mechanisms. Studies can be conducted now in normal room lighting, and the greatly improved clarity produced by the "sharp" flash makes possible the study of fine details that hitherto could not be seen. Where the part to be studied is inaccessible, the Strobotac's strong beam of light can usually be made to reach it. This feature, coupled with the versatility provided by the pivoting lamp, permits the instrument to be located conveniently and operated by one man, while the same man observes the results without the aid of an assistant. Extensive field testing, carried out over the past year, has proved the complete acceptability of the new design and has brought to light many interesting new applications, a few of which are discussed below.

The new Strobotac operates satisfactorily from 400 cycle power lines as well as from 50-60 cycle lines, which is a great convenience in aircraft applications.

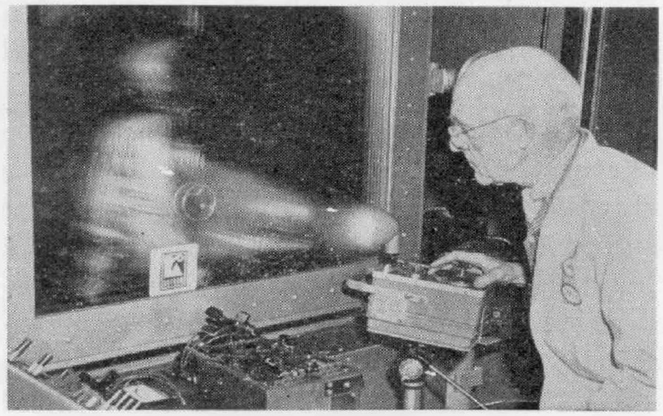


Figure 8. The Strobotac produces enough light to "stop" the motion of the fan through the eight layers of glass in the door of this altitude chamber. Some reflection is produced by the glass layers, but its effect is minimized by aiming the Strobotac flash into the chamber at an angle rather than head on. The new instrument's increased speed range now makes it possible to measure directly the speeds of fans operating at 400 cycles (24,000 rpm), which are commonly used in aircraft.

Low-Power Devices

Speeds of fractional-horsepower motors cannot be measured by ordinary tachometers, because the load of a conventional tachometer alters operating conditions. The Strobotac, because it requires no mechanical or electrical connection to the motor, is the ideal tachometer for this use. Its usable accuracy of one per cent is better than that of most ordinary tachometers.

Measurements are made to determine: normal operating speed, speed variation due to line-voltage changes, speeds at various conditions of overload and underload, torque-speed characteristics, and critical speeds at which vibration occurs. By slow-motion observations, brush action can be studied, and chattering caused by commutator eccentricity as well as vibration of frame and parts can often be detected.

Measurement of torque with the Strobotac is a widely used technique. When the motor and load shafts are connected by an elastic coupling, and the rotational motion is stopped by the stroboscope, the position of a pointer on the spring coupling will change as the driven shaft is loaded. With the addition of a calibrated scale, the system becomes a torque meter.

Air-Moving Devices

In the stroboscopic study of the operation of fans and blowers, vibration can be located, and air currents around the blades can be observed through the use of chemical "smokes" introduced into the air stream. This technique has led to a considerable improvement in fan design.

At Rotron Manufacturing Company, the Strobotac serves as the principal test instrument for speed measurements and the analysis of structural weaknesses of air-moving devices of all types. Blade resonances of developmental units are detected visually while the units are subjected to vibration on shake tables. Tests in altitude and pressure chambers are made to determine performance of fans that are to operate at high altitudes or are to push heavier-than-air gases. Other laboratory work includes dynamometer measurements and air-delivery tests in which it is important to measure speed accurately under pressure.

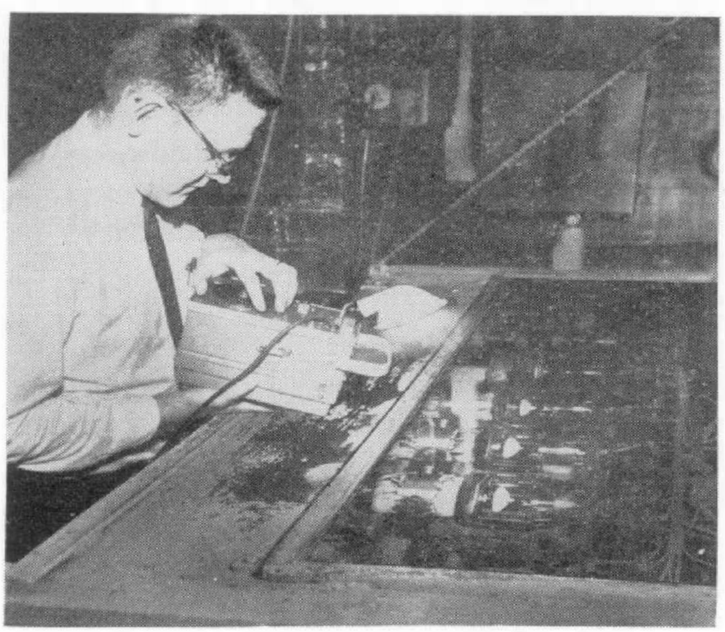


Figure 9. The bright Strobotac beam penetrates both an oil bath and the tube envelope to illuminate a rotating-anode X-ray tube at Machlett Laboratories.

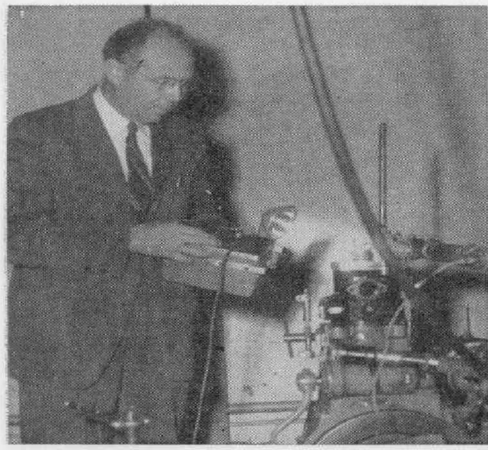


Figure 10. Dr. H. E. Edgerton watches the action of valve springs in an internal-combustion engine at the M.I.T. Automotive Laboratory.

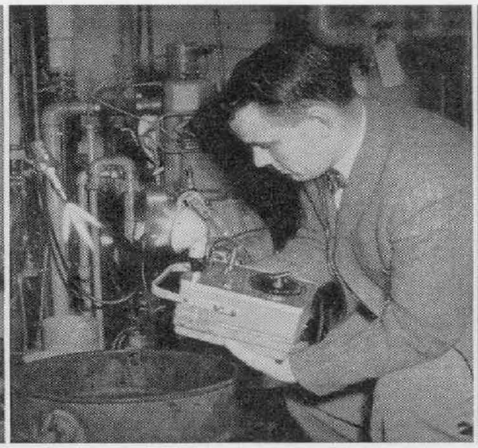


Figure 11. Watching fuel-injection sprays with the Strobotac. For a close-up of the spray, see page 10. The high-velocity droplets in the atomized spray can be studied in detail.

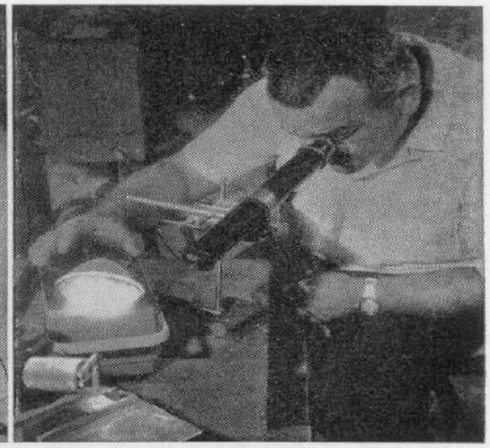


Figure 12. At General Electric's Small Aircraft Engine Department, engineers use the Strobotac to examine the vibratory modes in aircraft gas turbine blades. The short-duration white light gives excellent resolution. Mode shapes are clearly defined at various excitation frequencies produced by an electromagnetic driver.

Electronic and Electromechanical Equipment

With the Strobotac one can study tape-recorder mechanisms, relays, servos, and transducers of all types. Speaker voice-coil clearance, spider flexing, and cone performance are all susceptible to stroboscopic observation.

Acoustic Research, Inc., of Cambridge, Massachusetts, has used the new Strobotac to advantage in the study of a new hemispherical radiator for their AR-3 Loudspeaker System. In this technique, finely shredded rayon flock is applied on a radial line of glue along the radiator surface. The Strobotac is flashed at a rate differing slightly from an integral submultiple of the frequency of the driver, whereupon nodal points and the degree of vibration of the diaphragm can be determined by examination of the movement of the free ends of the flock under a magnifying glass (see cover photograph). Radiator break-up and other irregularities are readily revealed in this manner.

With the aid of this technique, uniform dispersion and a more uniform frequency response have been achieved for a new mid-range, hemispherical radiator. Whereas direct measurements were possible at radiator excitation frequencies to 1 kc with the older Strobotac, work can now be performed to 5 kc with the new model. The flocking technique extends this to 20 kc.

An unusual application was discovered in the development of a new X-ray tube of the rotating-anode type at Machlett Laboratories. In this new tube the anode rotates at 9000-10,000 rpm, which causes the target area to change continuously. This technique permits fine focusing of the X-rays without anode burn-out from excessive emission. Where other stroboscopes either do not have a repetition range that is high enough for this work or a light flash that is bright enough to penetrate the double window in the tank, the oil bath used for cooling, and the tube envelope, the Type 1531-A Strobotac has been found quite suitable (see Figure 9).

Large Machines and Engines

Uses in the automotive and large-machinery industries include studies of spring surge, valve operation, determination of the effect of flywheel mass on speed variation, studies of piston-ring action, and vibration studies to determine where shock mounts should be applied. For the study of reciprocating parts in an internal-combustion engine, the Strobotac is usually triggered by a contactor on the crankshaft. For the study of the action of pistons and other enclosed parts, a window is often cut in the side of an experimental engine.

The development and production testing of fuel-spray nozzles for diesels is greatly facilitated by the new Strobotac. The bright, short-duration flash makes possible detailed study of the action of rapidly moving parts and the formation of fuel-injection spray patterns. The Strobotac "freezes" the motion of the high-velocity droplets in the atomized spray, permitting the study of both droplet size and range. Figure 11 shows spray patterns under study at the M.I.T. Automotive Laboratories.

Vibration Studies

Vibratory motion and its effects can be readily studied with the aid of the very short light pulse from the Strobotac. Displacements in vibrating parts can be measured accurately with the aid of a microscope and cross hairs. This technique has been used by automotive and aircraft-power engineers in measuring crankshaft whip, vibrations, and turbine blade displacement.

Another important use is the detection of resonances in devices subjected to the cyclic forces produced by shake tables. Relays, fans, motors, and electronic equipment and systems — large and small — are subjected to the "dithering" action of shake tables while strobo-

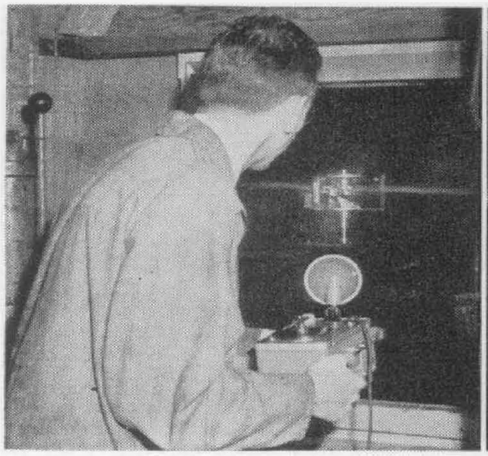


Figure 13. A model helicopter rotor in a wind tunnel is watched with the Strobotac. Blade lag and flapping are clearly observed in slow motion, just as they occur under various flight conditions. In addition to providing a good visual representation of the conditions encountered in flight, such studies serve as a visual check on vibration data provided by strain-gages mounted on the rotor head.

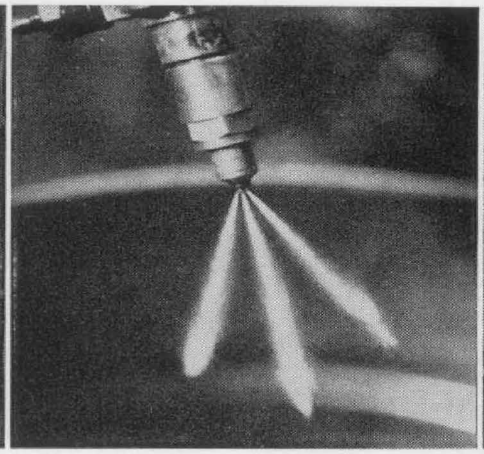


Figure 14. Strobotac single-flash photo of the fuel-injection spray of Figure 11. The bright, easily triggered flash makes it easy to take permanent records of observed phenomena.

Figure 15. The Strobotac and associated equipment for eye-movement studies by Dr. J. Y. Lettvin. Note the electrodes taped to the subject's face.

scopic light is used to detect damaging, self-created, vibratory conditions.

Printing

In the printing industry, the Strobotac can be used for all types of color registration. A manufacturer of gift-wrap paper has increased the production speed of a four-color rotogravure press to 450-500 ft./min. — twice that practical without the aid of stroboscopic light. One operator and his assistant are able to run this rotogravure press while they periodically check registration with the aid of the Strobotac. Stroboscopic observations not only show which of the four colors is off register, but also indicate the degree of correction required at the appropriate color stand. The result — more efficient utilization of production facilities.

Industrial Maintenance

In the operation of gears, cams, drills, saws, and cutting tools, the Strobotac will show misadjustments, misalignment, wear, sources of noise and vibration, etc., so that they can be corrected before failure of the machines occurs. Governor action, belt slip, lubrication, clearances, and the action of springs can be checked and measured.

Photography

It is possible to use the new Strobotac for photographing objects in motion, by either single-flash or multiple-flash techniques*. The diesel-spray pattern of Figure 14 was photographed with the camera shutter speed set to a value equal to the period between flashes, so that only one flash occurred during the exposure time. The ability to trigger the Strobotac from an external electrical signal greatly simplifies the techniques required to synchronize the flash of the Strobotac for single-flash photography. The output of a photocell or microphone, amplified if necessary, can be used.

Medical Applications

The new Strobotac has many applications in the medical, psychological, and physiological fields. The object of one such experiment conducted under supervision of Dr. J. Y. Lettvin of M.I.T. was to determine whether or not there was vision during eye movement. The subject's eye was connected by four circular silver electrodes to an oscilloscope, whose amplified output triggered a Strobotac each time an eye movement occurred. Thus, with the subject in a dark room, there was illumination only during periods of eye movement.

The white-light feature of the new Strobotac makes it an extremely effective aid for exploring other areas of vision such as color perception.

The instrument is also sutiable for use with tachistoscopes in psychological work. In conjunction with an external gated oscillator, the Strobotac can provide bursts of light pulses up to any burst duration (even continuous), with pulse rate during the burst well above flicker-fusion frequency.

Other medical uses include photic stimulation during electroencephalographic recording of brain waves and the inducing of epileptic-like seizures.

Neurologists have used stroboscopic equipment for a number of years in the study of seizures and temporary blackouts caused by a sensitivity to rhythmically interrupted light. This same type of flicker, caused by a revolving propeller interrupting the sun's rays at a critical rate, has long been suspected as the cause of mysterious pilot blackouts.

*A table of guide numbers for various film types is available upon request.

Other Uses

Among other applications are the dynamic balancing of rotors, study of slip between friction-driven members, determination of the speed at which jaws of centrifugal clutches begin to open, the timing of moving-picture projectors, and the calibration of watt-hour meters.

A complete list of the potential uses of the new TYPE 1531-A Strobotac would take many pages. This instrument is useful wherever there are machines and moving mechanisms, and this includes just about every industrial plant.

— M. J. FITZMORRIS
C. J. LAHANAS
W. R. THURSTON

TYPE 1532-C STROBOLUME

The Strobolume is still available and can be used with the new Strobotac®. While for most applications the very bright light emitted by the TYPE 1531-A Strobotac is more than adequate, the Strobolume will be found useful where large areas are to be illuminated or the particular requirements of the application dictate a very intense light.

The Strobolume, at maximum light intensity, can operate continuously at flashing rates up to 60 per minute and, for short periods of time, up to 1200. At greatly reduced light intensity, it will operate up to 3000 per minute continuously. The peak light is 10 million-beamcandlepower at 60 flashes per minute; its flash duration is 10 μsec at high intensity and 30 μsec at low intensity.

The electrical specifications are identical with those for the previous model, 1532-B. To connect the TYPE 1531-A Strobotac® to the Strobolume, the TYPE 1532-P3 Trigger-Cable and the TYPE 1532-P4 Adaptor are needed.

Type		*Code Word*	*Price*
1532-C	Strobolume	TITLE	$315.00
1532-P3	Trigger-Cable	TALLY	15.00
1532-P4	Adaptor	TIGER	5.00

INTERKAMA 1960

The International Congress and Exhibition for Instrumentation Control and Automation — INTERKAMA — will be held at the Düsseldorf Exhibition Grounds from October 19-26, 1960.

The General Radio Company will exhibit its latest instruments in Booth 2008, which is located in Building B. Our representative in Germany, Dr. -Ing. Günter Nüsslein, will be in attendance together with General Radio representatives from other European countries. Engineers from General Radio factory at West Concord, Massachusetts, U.S.A., who will attend are Dr. Donald B. Sinclair, Executive Vice President and Technical Director; Robert A. Soderman, Administrative Engineer, and Peter J. Macalka, Engineer.

We look forward to welcoming our many overseas friends at this exhibition.

NATIONAL ELECTRONICS CONFERENCE

Hotel Sherman, October 9-11, 1960

At the 1960 NEC General Radio products will be exhibited in Booths 205, 206, and 207, the same location that we have had in past years. New items on display include:

TYPE 1531-A Strobotac.®

TYPE 1557-A Vibration Calibrator, for the calibration of vibration pickups.

TYPE 1142-A Frequency Meter, a wide-range electronic frequency meter and linear low-noise discriminator.

Other timely and interesting displays:

The TYPE 1300-A Beat-Frequency Video Generator in a setup showing sweep tests on a transistor amplifier.

The TYPE 1607-A Transfer-Function and Immittance Bridge in the measurement of equivalent-circuit parameters of tunnel diodes.

The TYPE 1605-A Impedance Comparator set up for the rapid measurement of collector-to-base capacitance of transistors.

ELECTRONIC INSTRUMENT MANUFACTURERS' EXHIBIT

The mobile instrument displays operated by our field engineers are becoming increasingly popular with our customers. These exhibits, often held in customers' plants, sometimes in hotels, have been outstandingly successful because they bring to small groups of interested engineers the opportunity to see and to operate our newest instruments.

In October we plan to conduct our exhibit with five other quality electronics manufacturers, whose products complement, and are scientifically related to, our own. In this way we feel that we can perform a greater service to our customers and at the same time continue what has proved to be the best way to bring them up to date on the operational capabilities of our new instruments.

We shall be exhibiting with:

FXR, Incorporated, of Woodside, New York, manufacturers of precision microwave equipment that extends in frequency up to 220,000 Mc.

Lambda Electronics Corporation, of College Point, Long Island, the only power supply manufacturer whose complete line carries a 5-year guarantee.

Panoramic Radio Products Company, Incorporated, of Mount Vernon, N. Y., pioneers of spectrum analyzers and other automatic measurement instruments.

Sensitive Research Instrument Corporation, of New Rochelle, New York, specialists in laboratory standard meters and other calibration devices.

Tektronix, Incorporated, of Portland, Oregon, leading manufacturer of cathode-ray oscilloscopes and accessory equipment.

We plan to exhibit in five locations around the metropolitan New York and Philadelphia areas. We will exhibit from one to nine P.M. at:

Sagamore Room, Roosevelt Field Shopping Center, Long Island, Oct. 5 and 6

Treadway Inn, Norwalk, Connecticut, October 11

Nelson House, Poughkeepsie, New York, October 13

The Meadowbrook, Cedar Grove, New Jersey, October 17

Cherry Hill Inn, Moorestown, New Jersey, October 19 and 20

Each company will have factory engineers on hand to describe the instruments and to answer all your technical questions. We cordially invite you to attend.

General Radio Company

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