OPERATING INSTRUCTIONS

TYPE 1532-D, -DQ18

STROBOLUME

GENERAL RADIO COMPANY

OPERATING INSTRUCTIONS

TYPE 1532-D, -DQ18

STROBOLUME

Form 1532-0100-K
November, 1965

GENERAL RADIO COMPANY
WEST CONCORD, MASSACHUSETTS, USA

SPECIFICATIONS

Flashing Speed Range:

High Intensity: Up to 60 flashes per minute continuous, up to 1200 per minute intermittent.

Low Intensity: Up to 3000 flashes per minute continuous.

Peak Light Intensity: 10 million beam candles (10^7 lux measured at 1 meter distance at the center of the beam) from single flash to 60 flashes per minute; 0.14 million beam candles (1.4×10^5 lux at 1 meter distance at the center of the beam) at 3000 flashes per minute.

Flash Duration: Approximately 30 μs at high intensity, 10 μs at low intensity.

Beam Width: 45° at half-intensity points.

Guide Number: The guide number (distance in feet times aperture) for high intensity is approximately 25 with film speed of 100 (ASA).

Flashing Control: TYPE 1535-B Contactor, or TYPE 1531-A STROBOTAC electronic stroboscope with TYPE 1532-P3 Trigger Cable.

Accessories Supplied: TYPE CAP-22 Power Cord, Contactor Cable Assembly, and plug for connection to contactor.

Accessories Required: None if lamp is to be flashed manually by pushbutton. For stroboscopic work a TYPE 1535-B Contactor, or a TYPE 1531-A STROBOTAC electronic stroboscope with TYPE 1532-P3 Trigger Cable, is needed. For use with older TYPE 631-BL STROBOTAC, a TYPE 1532-P2B Transformer Cable is required.

Cabinet: Metal case. Lamp assembly is removable. Storage space for lamp cable is provided in case. Lamp housing has ¼-20 threaded socket for tripod.

Power Required: 105 to 125 V, 50 to 60 c/s; 230-V model, TYPE 1532-DQ18, is available. Power consumption on high intensity is 105 W at 60 flashes per minute, 500 W at 1200 flashes per minute; at low intensity, 120 W at 3000 flashes per minute.

Mechanical Data:

Width		*Height*		*Depth*		*Net Weight*		*Shipping Weight*	
in	*mm*	*in*	*mm*	*in*	*mm*	*lb*	*kg*	*lb*	*kg*
7½	190	11½	295	13	330	18½	8.5	26	12

See also *General Radio Experimenter*, May 1949 and September 1960.

WARNING

This instrument is supplied with a three-wire power cord for user safety and should always be powered from a three-wire ac outlet properly grounded. This precaution is particularly important when the instrument is used in humid environments.

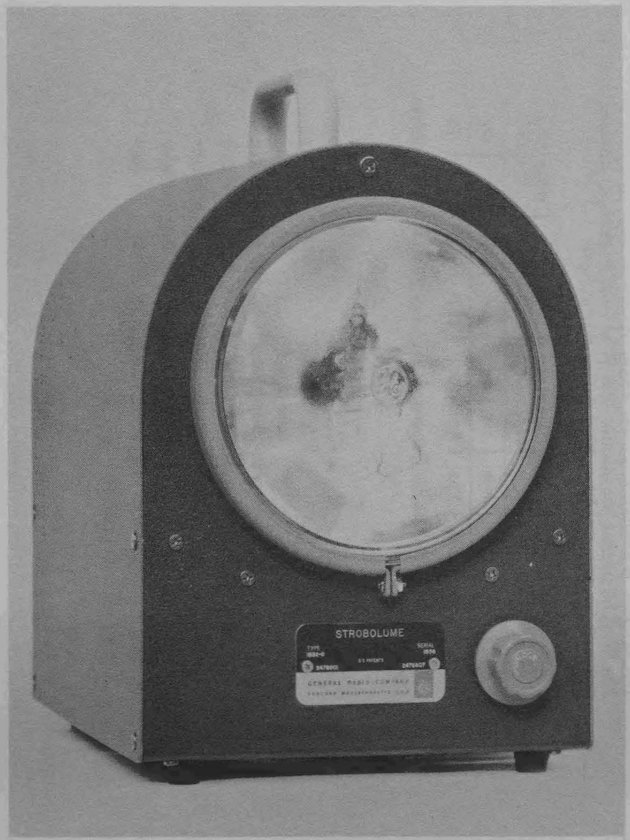


Figure 1. Type 1532-D Strobolume (front view)

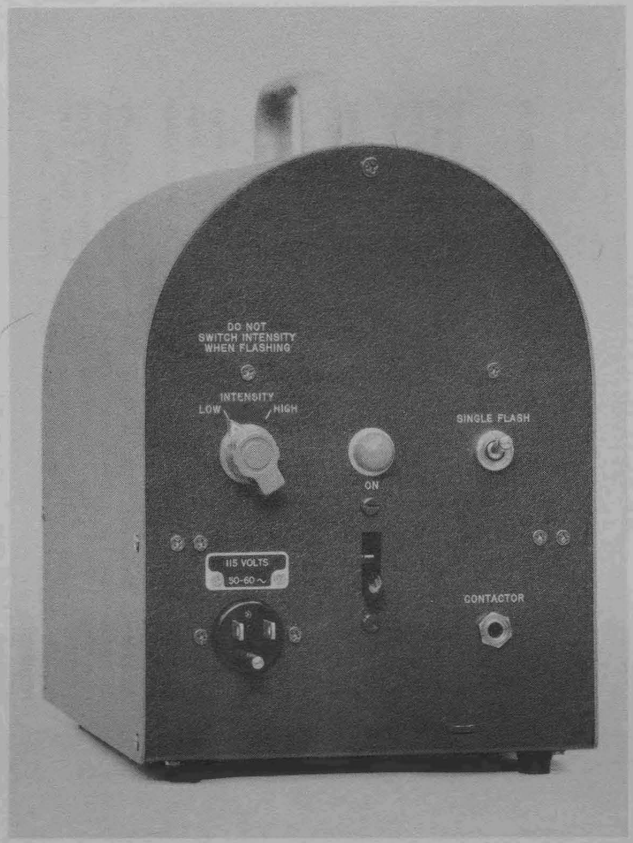


Figure 2. Type 1532-D Strobolume (rear view)

TYPE 1532-D STROBOLUME

Section 1
INTRODUCTION

1.1 PURPOSE. The Type 1532-D Strobolume (Figures 1 and 2) is a high-intensity light source useful in stroboscopic observations and photography. The illumination is short (between 30 and 40 microseconds) and bright enough to photograph considerable areas and relatively fast motion without blurring. It can be used either for single-flash work or for rates up to 1200 flashes per minute on HIGH INTENSITY for short periods, and up to 3000 flashes per minute on LOW INTENSITY. These ranges make possible the study of moderate-speed mechanisms, looms, and other textile machinery, fans, propellers, etc. The flashing rate can be controlled by an external contactor such as the Type 1535-B Contactor, or by the Type 1531-A Strobotac® Electronic Stroboscope (refer to paragraph 1.2.3.2).

1.2 DESCRIPTION.

1.2.1 GENERAL. (See Figure 3.) The elements of the Strobolume are: a high-voltage transformer and rectifier; a capacitor which is charged to about 2500 volts from the rectifier; and a lamp through which the capacitor is discharged to produce the flash. The discharge is initiated by a special trigger tube tripped by an external impulse. Either of two values of capacitance can be selected by a switch. The larger value is for flashing rates up to 1200 per minute with intense light for short periods, the smaller for rates up to 3000 with about 1/20th as much light. The entire assembly is mounted in a small metal case with handle.

1.2.2 CONTROLS AND CONNECTIONS. On the rear of the Strobolume are a three-pole socket for the power connection and a phone jack for the

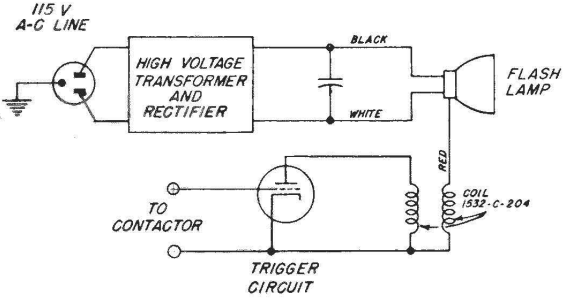


Figure 3. Elementary Schematic Diagram.

contactor control. A circuit-breaker type switch in the center of the rear panel serves both as power switch and overload protector. The Strobolume has been designed to withstand short-period overloads to enable the user to select high rates and provide great brilliance without fear of damage to components. The circuit breaker automatically disconnects the unit from the power line before damage can occur. If the breaker operates, from one to two minutes are required before it can be reset. Also on the rear panel are the HIGH - LOW INTENSITY selector switch and a SINGLE FLASH switch.

1.2.3 ACCESSORIES.

1.2.3.1 Supplied With Instrument. Supplied with the Strobolume are: a Type CAP-22 three-wire power cable, a Contactor Cable Assembly (Type 1532-2060), and a plug (Type CDSP-985) for use with an external contactor.

1.2.3.2 Other Accessories Required. If the Strobolume's flashing rate is to be controlled by means other than manual operation of the push button or panel switch, means must be provided for attaching the triggering device to the Strobolume. The Type 1535-B Contactor includes a cord and plug that attaches to the Strobolume CONTACTOR connector through a Type 1535-P5 Adaptor. A Type 1532-P3 Trigger Cable, available from General Radio, connects the Strobolume to the Type 1531-A Strobotac. External contactors other than the Type 1535-B can be connected by means of the extra plug (Type CDSP-985) supplied (refer to paragraph 1.2.3.1).

Section 2
OPERATING PROCEDURE

CAUTION

To prevent serious damage to the instrument, avoid direct connection to ac power lines supplying large inductive loads, such as large electric motors. The voltage transient occurring when such a motor is turned off can burn out the diodes in the rectifier circuit. If the Type 1532 and the motor must use the same power source, always turn off the Type 1532 before turning off the motor.

2.1 INSTALLATION. Before connecting the Strobolume to the power line, be sure that the line voltage and frequency correspond to those specified on the etched plate near the power receptacle on the rear panel. The standard Type 1532-D Strobolume operates from a source of 105 to 125 volts, 50 to 60 cycles, and consumes up to about 500 watts, depending on flashing rate. For information on the Type 1532-DQ18 Strobolume (230-volt model), refer to paragraph 2.6.

Always be sure the third wire of the three-wire power cable is connected to a good ground.

If the flashing rate is to be controlled by a Type 1531-A Strobotac, connect a Type 1532-P3 Trigger Cable between the Strobotac OUTPUT TRIGGER connector and the Strobolume CONTACTOR connector. If the older Type 631-BL Strobotac is used, the Type 1532-P2B Adaptor Cable is required.

If the flashing rate is to be controlled manually by the push button and cable assembly, connect the push-button control cable to the CONTACTOR connector.

If the flashing rate is to be controlled by an external contactor other than the Type 1535-B, connect the contactor leads to the CONTACTOR connector, using the extra plug provided.

After connecting power and contactor cables, select the intensity desired by throwing the INTENSITY switch to either HIGH or LOW; switch power ON (up), and unit is ready for operation, as evidenced by glowing pilot lamp.

2.2 TRIPOD MOUNTING OF LAMP ASSEMBLY. The lamp assembly can be removed from the case and mounted on a tripod, if desired. To remove the lamp from the case, turn the knob on the front panel counterclockwise to release the locking clamp. The lamp assembly includes a carrying handle and a hole tapped for a 1/4-20 thread for tripod mounting.

2.3 FLASH CONTROL. The simplest means of activating the flash is the SINGLE FLASH switch on the rear panel. The push button and cable assembly can also be used. With its cord plugged into the CONTACTOR connector, the push button will trigger the Strobolume each time it is pushed.

An external contactor, such as the Type 1535-B, can be used to trigger the flash by the action of a rotating member, such as a shaft on a machine under study. The Type 1535-B Contactor, mounted on a sturdy stand adjustable in height from 6 inches to 4 feet, uses a powerful magnetic clutch so that it can be quickly attached or removed while the machine is in operation. Auxiliary coupling devices are provided for nonmagnetic shafts.

If it is desired to observe the position of machine parts as a function of shaft angular position, a contactor with provision for phasing is necessary, with the phasing control preferably calibrated in degrees, as on the Type 1535-B, which has a range of 360 degrees.

Where control from a machine member is not required, a Type 1531-A Strobotac can be used as the flashing control. The pulse is obtained from the OUTPUT TRIGGER jack on the Strobotac and sent to the CONTACTOR connector on the Strobolume through the Type 1532-P3 Cable. The flashing range of the Type 1531-A Strobotac is from 110 flashes per minute to well beyond the maximum rates of the Strobolume. When flashing rates above 60 per minute are used, the operating time should be limited as indicated in Table 1.

2.4 FLASHING SPEEDS AND RATINGS.

2.4.1 HIGH INTENSITY. While the Strobolume is essentially a "slow-rate" flashing unit, it has been designed to provide relatively high rates for limited times. For instance, while the normal continuous rating is 60 flashes per minute, intense flashes may be obtained up to 1200 per minute for a very limited time. A thermal breaker switch makes this possible and usually provides adequate protection for the transformer and circuit elements. Because of this short-time overload rating, however, certain precautions should be taken to protect the instrument. Extra-high line voltage, low line frequency, and high ambient temperature all can reduce the safety factor. At flashing rates over 180 per minute, the breaker will give full protection. Between 60 and 180 flashes per minute the breaker action is borderline and depends on a number of variables such as instrument and room temperatures, etc. Table 1 is given as a guide for best safe operation at different flashing rates on high intensity. After opening, the breaker will require from 1 to 2 minutes to reset, depending on temperature conditions. If the breaker does not reset when the toggle switch is raised, return it to the lower (off) position and wait another 30 seconds. A distinct click is heard when the breaker resets. If the toggle switch is left in the up position before the breaker clicks "on", the breaker will turn the instrument on automatically after a few moments --- often an undesirable situation.

TABLE 1
115-VOLT OPERATION

Flashing rate per minute	Watts	Approx time for breaker to open - seconds
60	90	----
300	190	90
600	300	30
900	360	20
1200	500	15

2.4.2 LOW INTENSITY. With the intensity switch in the LOW position, rates as high as 3000 flashes per minute can be obtained but with a much lower light output. The input watts will not exceed 100 at the 115-volt 60-cycle input, and this is within safe limits for continuous operation.

2.4.3 LAMP LIFE. For maximum life of flashing lamp and tubes, the tripping circuit (contactor) should be closed only when light is desired, which is rarely more than a few seconds duration for observations or photographs. The use of a control switch (spring-operated type, such as the push-button switch furnished) in series with the contactor-to-trip circuit will greatly lengthen the life of the flash lamp and other elements, and will keep the operating temperature within safe limits. This is par-

ticularly advisable in the range from 60 to 180 flashes per minute. The power supply can be left on continuously without damage to the unit.

CAUTION

It is recommended that the INTENSITY switch setting be changed only when the power is off or when the unit is not flashing.

2.5 PHOTOGRAPHY.

2.5.1 GENERAL. The short duration of the Strobolume flash makes it possible to arrest rapid motion for single- or multiple-flash photography of moving objects. The many variables entering into this type of photography make it difficult to give specific instructions, but a few general rules are outlined here.

2.5.2 LIGHTING. Place the lamp unit as close as possible to the object being photographed. The arrangement of the lamp together with the painting of moving parts or background should be handled to give as much contrast as possible in the picture. A white cardboard reflector can sometimes be used to relieve the shadow side of a Strobolume photograph.

2.5.3 DARKROOM PROCEDURE. The darkroom procedure differs only slightly from standard photographic practice. The developing formula used for films, however, should be of the maximum-contrast type. Developers ordinarily used for positive motion-picture film build up contrast quite satisfactorily. An increase of 50 to 100 percent in development time is also recommended for increasing contrast. Correspondingly, in a number of instances the contact or enlarging paper from which prints are made should be of maximum-contrast grade.

2.5.4 TRIPPING TECHNIQUES. The mechanism for tripping the flash must usually be devised to fit the particular circumstances at hand. For single-flash photographs the push-button control or a contact on the camera shutter can trigger the flash. If camera contact is used it should have no time-delay features because the Strobolume flash is almost instantaneous. If more exact synchronization is required, a mechanical contact on some rotating shaft or moving part may be best.

For multiple photographs, a rotating contact or control from a Strobotac is probably the best tripping mechanism. If only a limited number of flashes is desired, a series push button in the control circuit can be used to start and stop the flashing. The Type 1535-B Contactor is arranged to provide one contact per revolution.

2.6 TYPE 1532-DQ18 STROBOLUME.

The Type 1532-DQ18 Strobolume is a standard unit modified for operation on 230-volt, 50- or 60- cycle lines. A special thermal breaker is adjusted to protect the instrument and flash tube from ordinary overloads. At flashing rates above 300 per min-

ute the breaker will automatically open in a few seconds (refer to Table 2). To reset the breaker, simply push the red button on the rear panel. The heater in the breaker requires about 30 to 45 seconds to cool enough to permit resetting.

TABLE 2
230-VOLT OPERATION

Flashing rate per minute	Approx time for breaker to open - seconds
60	----
300	120
600	16
900	6-10
1200	5-7

Prolonged operation at flashing rates between 100 and 300 flashes per minute should be avoided to assure long lamp life.

If the instrument is reconverted for 115-volt operation, the red button breaker should be omitted. The switch has adequate built-in protection for 115 volts.

Section 3
SERVICE AND MAINTENANCE

3.1 WARRANTY.

We warrant that each new instrument sold by us is free from defects in material and workmanship and that, used and serviced as directed by instructions, it will perform in full accordance with applicable specifications for a period of two years after original shipment. Any instrument or component that is found within the two-year period not to meet these standards after examination by our factory, district office, or authorized repair agency personnel will be repaired or, at our option, replaced without charge, except for vacuum tubes or batteries that have given normal service.

3.2 SERVICE.

The two-year warranty stated above attests the quality of materials and workmanship in our products. When difficulties do occur, our service engineers will assist in any way possible. If the difficulty cannot be elim-

inated by use of the following service instructions, please write or phone our Service Department (see rear cover), giving full information of the trouble and of steps taken to remedy it. Be sure to mention the serial and type numbers of the instrument.

Before returning an instrument to General Radio for service, please write to our Service Department or nearest district office, requesting a Returned Material Tag. Use of this tag will ensure proper handling and identification. For instruments not covered by the warranty, a purchase order should be forwarded to avoid unnecessary delay.

3.3 REMOVAL AND REPLACEMENT OF FLASHING LAMP.

WARNING

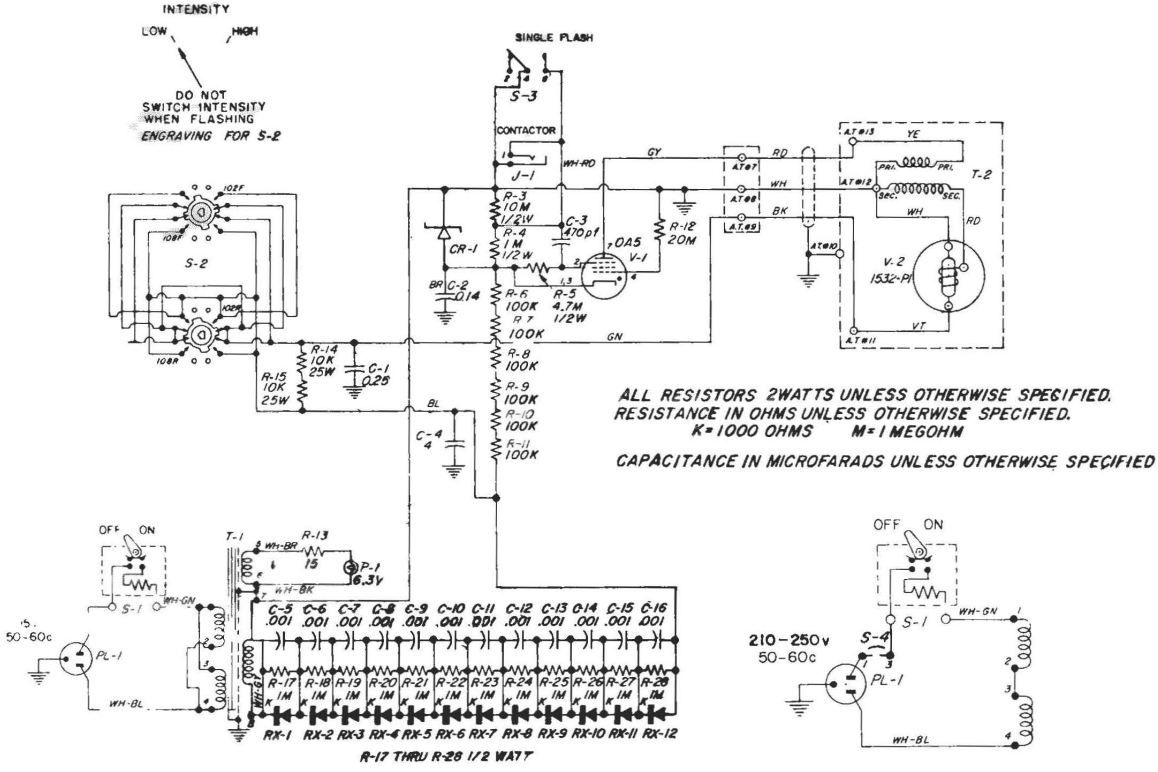
Up to 2500 volts are developed internally on the Type 1532. If the unit is to be opened for inspection, or for changing tubes or lamp, disconnect the power cord and allow about a minute for the capacitor to discharge.

To remove the flashing lamp, first disconnect the power cable and remove the lamp assembly from the unit by turning the knob on the front panel counterclockwise. Loosen the clamp screw and remove the clamp ring that holds the flash lamp in the housing. Three color-coded wires must be disconnected from the screw terminals on the back of the lamp. A replacement lamp must be installed by a reverse procedure.

PARTS LIST

REF NO.	DESCRIPTION	PART NUMBER
R3	RESISTOR, Composition, 10M ±5% 1/2w	6100-6105
R4	RESISTOR, Composition, 1M ±5% 1/2w	6100-5105
R5	RESISTOR, Composition, 4.7M ±5% 1/2w	6100-5475
R6 thru R11	RESISTOR, Composition, 100k ±10% 2w	6120-4109
R12	RESISTOR, Composition, 20M ±5% 2w	6120-6205
R13	RESISTOR, Composition, 15Ω	Part of P1 Socket
R14	RESISTOR, Power, 10k ±10% 25w	6640-3109
R15	RESISTOR, Power, 10k ±10% 25w	6640-3109
R17 thru R28	RESISTOR, Power, 1M ±5% 1/2w	6100-5105
C1	CAPACITOR, Oil, 0.25μf ±15%	Part of 4520-0900
C2	CAPACITOR, Oil, 0.14μf ±10%	4510-3800
C3	CAPACITOR, Ceramic, 470pf ±20%	4404-1479
C4	CAPACITOR, Oil, 4μf ±10%	Part of 4520-0900
C5 thru C16	CAPACITOR, Ceramic, 0.001μf +80% -20%	4404-2109
CR1	DIODE, UZ240	6083-1039
J1	JACK, Phone, open	4260-1500
P1	PILOT LIGHT, Incandescent, Mazda #44	5600-0700
PL1	PLUG, Power, 3-wire	4240-0700
RX1 thru RX12	RECTIFIER, Semiconductor, 1N3255	6081-1003
S1	SWITCH, Circuit breaker	5320-0100
S2	SWITCH, Rotary, 2-section 10-pos 4-pole	7890-0672
S3	SWITCH, Toggle, spdt	7910-0400
T1	TRANSFORMER, Power	0365-4570
T2	COIL, Assembly	1532-2040
V1	TUBE, Thyratron, OA5	8300-0400
V2	TUBE, Flashing lamp	1532-9601

NOTE: When ordering replacement parts, please specify the instrument type number as well as the part numbers of the items required.



Power Input Section for
Type 1532-DQ18 (230-v) Strobolume

Figure 4. Schematic Diagram.

GENERAL RADIO COMPANY

WEST CONCORD, MASSACHUSETTS 01781

617 369-4400 617 646-7400

SALES ENGINEERING OFFICES

NEW ENGLAND*
22 Baker Avenue
West Concord, Massachusetts 01781
Telephone 617 646-0550

METROPOLITAN NEW YORK*
Broad Avenue at Linden
Ridgefield, New Jersey 07657
Telephone N.Y. 212 964-2722
N.J. 201 943-3140

SYRACUSE
Pickard Building
East Molloy Road
Syracuse, New York 13211
Telephone 315 454-9323

PHILADELPHIA
Fort Washington Industrial Park
Fort Washington, Pennsylvania 19034
Telephone 215 646-8030

WASHINGTON* and BALTIMORE
11420 Rockville Pike
Rockville, Maryland 20852
Telephone 301 946-1600

ORLANDO
113 East Colonial Drive
Orlando, Florida 32801
Telephone 305 425-4671

CHICAGO*
6605 West North Avenue
Oak Park, Illinois 60302
Telephone 312 848-9400

CLEVELAND
5579 Pearl Road
Cleveland, Ohio 44129
Telephone 216 886-0150

LOS ANGELES*
1000 North Seward Street
Los Angeles, California 90038
Telephone 213 469-6201

SAN FRANCISCO
626 San Antonio Road
Mountain View, California 94040
Telephone 415 948-8233

DALLAS*
2600 Stemmons Freeway, Suite 210
Dallas, Texas 75207
Telephone 214 637-2240

TORONTO*
99 Floral Parkway
Toronto 15, Ontario, Canada
Telephone 416 247-2171

MONTREAL
1255 Laird Boulevard
Town of Mount Royal, Quebec, Canada
Telephone 514 737-3673

* Repair services are available at these offices.

General Radio Company (Overseas), 8008 Zurich, Switzerland
General Radio Company (U.K.) Limited, Bourne End, Buckinghamshire, England
Representatives in Principal Overseas Countries

Printed in USA