300 Baker Avenue
Concord, Massachusetts 01742

ATLANTA • 1 Dunwoody Park, Suite 107,
Atlanta, GA 30341 • Tel: 404 394-5380

***BOSTON** • (Sales) Bolton, MA 01740 • Tel: 617 646-0550
(Service) Concord, MA 01742 • Tel: 617 369-8770
TWX: 710 347-1051

***CHICAGO** • 9440 West Foster Avenue, Chicago, IL 60656
Tel: 312 992-0800 • TWX: 910 651-5486

DALLAS • 777 South Central Expressway, Suite 4-A,
Richardson, TX 75080 • Tel: 214 234-3357
TWX: 910 867-4771

DAYTON • 3300 South Dixie Drive, Dayton, OH 45439
Tel: 513 294-1500 • TWX 810 459-1785

***LOS ANGELES** • P.O. Box 19500, 17361 Armstrong
Avenue, Irvine Industrial Complex, Irvine, CA 92714
Tel: 714 540-9830 • TWX: 910 595-1762

***NEW YORK** • 380 Midland Avenue,
Saddle Brook, NJ 07662 • Tel: (NJ) 201 791-8990,
(NY) 212 964-2722 • TWX: 710 988-2205

SAN FRANCISCO • 2855 Bowers Avenue,
Santa Clara, CA 95051 • Tel: 408 985-0662
TWX: 910 338-0291

Alaska: Tel: 907 279-5741

***WASHINGTON, DC** • 15 Firstfield Road,
Gaithersburg, MD 20760 • Tel: 301 948-7071
TWX: 710 828-9741

***CANADA** • 307 Evans Avenue, Toronto, Ontario M8Z 1K2
Tel: 416 252-3395

Montreal: 514 747-1052 • **Ottawa:** Zenith 88630

***EUROPE, AFRICA, and NEAR EAST** • P.O. Box CH-8034,
Zürich, Switzerland • Tel: (01) 55 24 20

Paris: (01) 797 07 39 • **München:** (089) 40 18 01
Milano: (02) 20 92 57 • **Bourne End (UK):** (06285) 2 66 11

***ASIA, PACIFIC and LATIN AMERICA**
Concord, MA 01742 USA
Cable: GENRADCO CONCORD (MASS)

*Service facilities available

Printed in USA

INSTRUCTION MANUAL

GR1567

SOUND-LEVEL CALIBRATOR

CONCORD, MASSACHUSETTS 01742

ALTITUDES ABOVE SEA LEVEL FOR SELECTED CITIES

City	*Feet* Above Sea Level*
Adelaide, Australia	35
Amman, Jordan	2400
Amsterdam, Netherlands	16
Ankara, Turkey	2250
Athens, Greece	300
Belgrade, Yugoslavia	450
Berlin, Germany	115
Bombay, India	25
Brussels, Belgium	190
Buenos Aires, Argentina	45
Cairo, Egypt	98
Canberra, Australia	2000
Copenhagen, Denmark	25
Johannesburg, U.S. Africa	5689
Lahore, Pakistan	706
La Paz, Bolivia	12200
London, England	245
Manila, Philippines	25
Melbourne, Australia	30
Mexico City, Mexico	7349
Munich, Germany	1700
Paris, France	300
Prague, Czech.	575
Rome, Italy	95
Santiago, Chile	1800
San Paulo, Brazil	2700
Seoul, Korea	250
Stockholm, Sweden	35
Tokyo, Japan	30
Warsaw, Poland	240
Zurich, Switzerland	1360

*1 foot =0.3048 meters

INSTRUCTION MANUAL

GR1567

SOUND-LEVEL CALIBRATOR

This instrument carries U.S. Bureau of Mines Mining Enforcement Safety Administration approval for use in methane-air mixture only. Approval Number 2G-2516.

This instrument is capable of calibrating sound-level meters used for measurements required under Part 1910.95 "Occupational Noise Exposure," (Dept. of Labor) of the Code of Federal Regulations, Chap. XVII of Title 29 (36 F.R. 7006).

1567-0100-D
June, 1977
ID-0100

Condensed Operating Instructions

TO ACTIVATE THE INSTRUMENT:

- Slide the power switch ON.
- Check the BATTERY meter for an indication in the OK region. If REPLACE is indicated see procedure below.
- A 1000-hertz tone should be audible.

TO CALIBRATE A SOUND-LEVEL METER (SLM):

- Place the calibrator slowly over the microphone, until the microphone bottoms in the coupler cavity.
- Set the SLM to the 110 to 120 dB range, C weighting, slow meter response.
- Note the output indicated on the SLM (114 dB). Be sure to consider specified calibration accuracy, temperature and altitude before making corrections.
- Adjust the instrument under test to read correctly or note error and apply correction to reading.

TO REPLACE BATTERY:

- This is accomplished by unscrewing the knurled nut on the side of the case, slipping the cover off the instrument, and exchanging batteries. See para 4.5.1 for a more detailed discussion.

NOTE

To use with the 1563 SLM, pull the snap-in adaptor flange out of the coupler end of the calibrator and replace it with the coupler furnished with the 1563.

City	*Feet Above Sea Level*
Richmond, Virginia	84
Rochester, New York	509
Saint John, N.B.	21
Saint Louis, Missouri	460
Saint Paul, Minnesota	754
Salt Lake City, Utah	4300
Sacramento, California	30
San Antonio, Texas	657
San Francisco, California	50
Saskatoon, Sask.	1596
Savanah, Georgia	42
Scranton, Pennsylvania	757
Seattle, Washington	51
Shreveport, Louisiana	217
Sioux Falls, South Dakota	1405
South Bend, Indiana	718
Spokane, Washington	1905
Springfield, Massachusetts	101
Sydney, N.S.	10
Syracuse, New York	410
Tacoma, Washington	87
Toledo, Ohio	594
Toronto, Ontario	250
Topeka, Kansas	909
Tuscon, Arizona	2382
Tulsa, Oklahoma	700
Utica, New York	448
Vancouver, B.C.	18
Washington, D.C.	100
Wichita, Kansas	1285
Windsor, Ontario	580
Winnipeg, Man.	727
Youngstown, Ohio	832

City	Feet Above Sea Level
London, Ontario	804
Los Angeles, California	292
Loisville, Kentucky	454
Manchester, New Hampshire	210
Memphis, Tennessee	238
Miami, Florida	15
Milwaukee, Wisconsin	609
Minneapolis, Minnesota	826
Mobile, Alabama	15
Moncton, N.B.	50
Montgomery, Alabama	191
Montreal, P.Q.	110
Nashville, Tennessee	498
Newark, New Jersey	43
New Haven, Connecticut	21
New London, Connecticut	27
New Orleans, Louisiana	5
New York, New York	35
Norfolk, Virginia	38
Oakland, California	18
Omaha, Nebraska	1040
Ottawa, Ontario	200
Paterson, New Jersey	117
Peoria, Illinois	465
Philadelphia, Pennsylvania	150
Phoenix, Arizona	1085
Pittsburg, Pennsylvania	742
Portland, Maine	34
Portland, Oregon	69
Providence, Rhode Island	43
Quebec, P.Q.	20
Racine, Wisconsin	619
Regina, Sask.	1414
Reno, Nevada	4487

Specifications

ACOUSTIC OUTPUT:

Frequency: 1000 Hz: ±3%

Sound Pressure Level: 114 dB re 20 $\mu N/m^2$: accuracy at 23° C and 760 mm Hg is, for 1565-B, ±0.5 dB; and for 1563, ±1 dB. Temperature coefficient of output sound level is −.01 to −0.025 dB/° C, 23° C to 50° C; ±.01 dB/° C, 0 to 23° C. Pressure correction chart supplied (Figure 5).

ENVIRONMENTAL:

Temperature: 0 to 55° C operating −40 to 70° C storage (battery removed).

Humidity: 95% RH

Vibration: 0.03 in from 10 to 55 Hz

Shock: 30 G, 11 ms.

Drop: 30 in. (In shipping container)

SUPPLIED: Carrying case, adaptor for 1565-B, battery.

POWER: Battery operated (9 V Burgess 2U6 or equal): 100 h use.

MODEL	DIA.		HEIGHT		DEPTH		NET WEIGHT		SHIPPING WEIGHT	
	in	mm	in	mm	in	mm	lb	kg	lb	kg
1567-9701	2.375	60	4.44	114	—	—	1	0.5	4	1.9

GenRad

WARRANTY

We warrant that this product is free from defects in material and workmanship and, when properly used, will perform in accordance with applicable GenRad specifications. If within one year after original shipment it is found not to meet this standard, it will be repaired or, at the option of GenRad, replaced at no charge when returned to a GenRad service facility. Changes in the product not approved by GenRad shall void this warranty. GenRad shall not be liable for any indirect, special, or consequential damages, even if notice has been given of the possibility of such damages.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

GenRad policy is to maintain product repair capability for a period of ten years after original shipment and to make this capability available at the then prevailing schedule of charges.

City	*Feet Above Sea Level*
Dartmouth, N.S.	14
Davenport, Iowa	571
Dayton, Ohio	743
Denver, Colorado	5227
Des Moines, Iowa	626
Duluth, Minnesota	626
Edmonton, Alta.	2183
Elizabeth, New Jersey	28
Erie, Pennsylvania	709
Evansville, Indiana	380
Flint, Michigan	716
Fort Smith, Arkansas	445
Fort Wayne, Indiana	780
Fort Worth, Texas	600
Fredericton, N.B.	32
Galveston, Texas	28
Grand Rapids, Michigan	628
Great Falls, Montana	3309
Halifax, N.S.	59
Hamilton, Ontario	300
Harrisburg, Pennsylvania	355
Hartford, Connecticut	36
Houston, Texas	48
Huntington, West Virginia	565
Indianapolis, Indiana	749
Jackson, Mississippi	286
Jacksonville, Florida	25
Jersey City, New Jersey	44
Kansas City, Missouri	750
Knoxville, Tennessee	895
Lansing, Michigan	842
Lexington, Kentucky	966
Lincoln, Nebraska	1169
Little Rock, Arkansas	286

ALTITUDES ABOVE SEA LEVEL FOR SELECTED CITIES IN U.S. AND CANADA

City	*Feet Above Sea Level*
Akron, Ohio	950
Albany, New York	20
Allentown, Pennsylvania	320
Ashland, Kentucky	530
Atlanta, Georgia	1105
Augusta, Georgia	141
Baltimore, Maryland	81
Bangor, Maine	21
Bay City, Michigan	593
Binghamton, New York	865
Birmingham, Alabama	598
Boise, Idaho	2717
Boston, Massachusetts	45
Brandon, Man.	1204
Buffalo, New York	590
Burlington, Vermont	190
Bridgeport, Connecticut	12
Calgary, Alta.	3439
Cambridge, Massachusetts	80
Camden, New Jersey	30
Campbellton, N.B.	42
Charleston, South Carolina	13
Charlotte, North Carolina	734
Charlottetown, P.E.I.	8
Chicago, Illinois	604
Cleveland, Ohio	600
Colorado Springs, Colorado	6012
Columbus, Georgia	261
Columbus, Ohio	759
Council Bluffs, Iowa	989
Dallas, Texas	437

Introduction–Section 1

1.1 PURPOSE

The Type 1567 Sound-Level Calibrator is a convenient and accurate self-contained device for checking the calibration of sound-measuring instruments. Its intended use is for field calibration of the Type 1565 or 1563 Sound-Level Meters.

1.2 DESCRIPTION

1.2.1 General

Figure 1 shows the 1567 and Table 1 documents the type and function of the control, indicator and coupler.

Table 1

CONTROL, INDICATOR AND COUPLER

Fig. 1 Ref.	Name	Type	Function
1	OFF/ON	Slide switch	Turns instrument on/off.
2	BATTERY	Meter	Indicates status of battery – good in area to right; REPLACE in area to left.
3	Knurled nut	Tubular	Holds shield on instrument.
4	Coupler*	1 1/8-in diameter	Machined acoustic chamber that couples to microphone.

*Furnished with adaptor P/N 1562-6100 installed, to reduce diameter to 1-in. to fit the 1565 microphone.

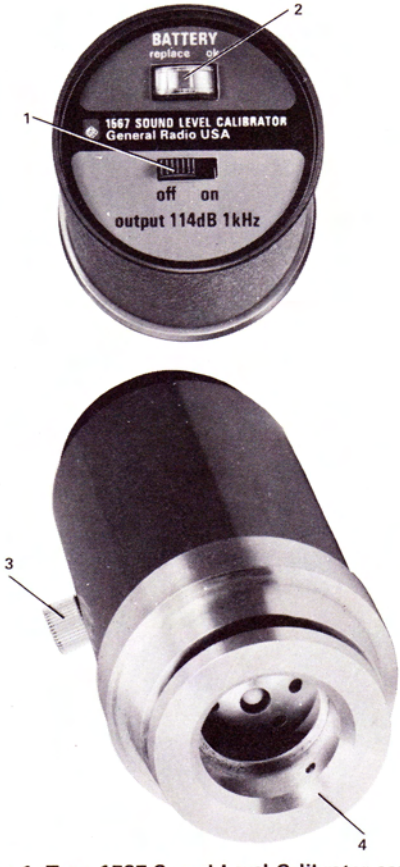


Figure 1. Type 1567 Sound Level Calibrator control and indicator (top); the acoustic chamber, viewed through coupler, is shown below (see Table 1).

FEDERAL MANUFACTURER'S CODE

From Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 (Name to Code) and H4-2 (Code to Name) as supplemented through August, 1968.

24446	G.E., Schenectady, N.Y. 12305
24655	General Radio Co, W. Concord, Mass. 01781
56289	Sprague Electric Co, N. Adams, Mass.
72982	Erie Technological Products Inc, Erie, Penn.
75042	IRC Inc, Philadelphia, Penn. 19108
80183	Sprague Products Co, No. Adams, Mass.
02606	Fenwal Lab Inc, Morton Grove, Ill.
09823	Burgess Battery Co, Freeport, Ill.
12040	National Semiconductor, Danbury, Conn.
14655	Cornell-Dubilier Electric Co., Newark, N.J.
71450	CTS Corp., Elkhart, Inc.

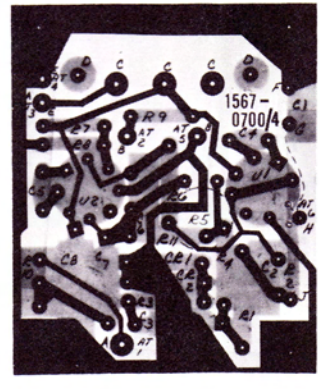


Figure 7. Etched circuit board viewed from foil side (P/N 1567-4700). The number on the foil side is not the part number.

1567-4700 (SOUND LEVEL CALIBRATOR BOARD)

Ref Des	Description	GR Part No.	Fed Mfg Code	Mfg Part No.
SWITCHES				
S1	Slide, PC	7910-1830	24655	7910-1830
TRANSDUCER				
A-SP1	Transducer	1562-0410	24655	1562-0410

MISCELLANEOUS MECHANICAL PARTS LIST

Description	GR Part No.	Fed Mfg Code	Mfg Part No.	Fed Stock No.
Screw		1567-6020	24655	1567-6020

As shown in the block diagram of Figure 2, the instrument consists of an oscillator that drives a loud-speaker to generate a high-level acoustic calibrating signal in a coupler that fits over the sound-level meter microphone (see Figure 3 for physical detail).

1.2.2 The Oscillator

The oscillator is a battery-operated phase-shift oscillator that generates an output frequency of 1000 hertz (Hz). The oscillator operates from a commonly available 9-V battery and is very stable, has low distortion and low noise.

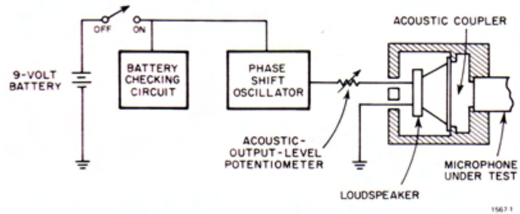


Figure 2. Block diagram of Type 1567 Calibrator.

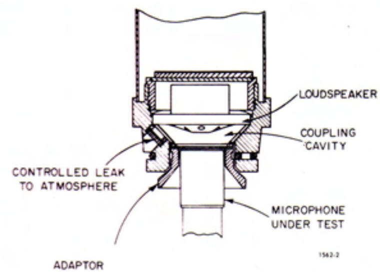


Figure 3. Details of calibrator-to-SLM-microphone coupling.

1.2.3 Acoustic Output

The oscillator drives a small controlled-reluctance magnetic loudspeaker. The loudspeaker drives one end of a small acoustic coupler. The other end of the coupler is closed by the microphone to be calibrated. The oscillator output voltage is adjusted in the factory to set the sound-pressure level in the coupler to 114 dB re 20 micronewtons per meter^2 ($\mu N/m^2$)* as measured by a laboratory standard microphone (W.E. type 640-AA).

1.2.4 Output Adaptors

An adaptor is supplied (installed) with the instrument that allows it to be coupled to the 1565 Sound-Level Meter. For use with the 1563 Sound-Level Meter, an adaptor is supplied with the 1563.

1.2.5 Battery-Status Indicator

The operation of the calibrator oscillator is independent of the battery voltage, as long as it remains at 7 V or higher. The battery-status indicator is included in the instrument so that the operator can quickly determine if his battery is safely in the operating range (to right on meter) or needs replacing (to left on meter).

A second adaptor (P/N 1562-6130) is supplied to fit the calibrator to the GR1981 and GR1983 SLM microphones.

*A newton per square meter is the unit of pressure and it is equal to 10 dynes per square centimeter. In the international system of units (SI), the equivalent unit is the pascal (Pa).

SOUND LEVEL CALIBRATOR PC BOARD P/N 1567-4700

REFDES		DESCRIPTION	PART NO.	FMC	MFGR PART NUMBER
C	1	CAP MICA 221PF 1PCT 100V	4710-3000	53021	D71F221FD
C	2	CAP MICA 453PF +-1PCT 100V	4710-3010	53021	D71F453FD
C	3	CAP TANT 1.0 UF 20PCT 35V S	4450-4301	56289	150D105X9035A2
C	4	CAP CER .1 SQ 33PF 5PCT 100V	4400-6485	72982	8101A100F330J
C	5	CAP MICA 221PF 1PCT 100V	4400-6485	72982	8101A100F330J
C	6	CAP TANT 4.7 UF 20PCT 10V	4710-3000	53021	D71F221FD
C	7	CAP TANT 68 UF 20PCT 15V	4450-4700	56289	150D475X0010A2
C	8	CAP TANT 68 UF 20PCT 15V	4450-5615	56289	150D686X0015A2
CR	1	DIODE 1N4154 25PIV IR.1UA SI	6082-1012	14433	1N4154
CR	2	DIODE 1N4154 25PIV IR.1UA SI	6082-1012	14433	1N4154
R	1	RES FLM 487K 1 PCT 1/4W	0350-3487	81349	RN60D4873F
R	2	RES FLM 499K 1 PCT 1/8W	0250-3499	81349	RN55D4993F
R	3	RES FLM 1K 1 PCT 1/8W	0250-1100	81349	RN55D1001F
R	4	RES FLM 1.33K 1 PCT 1/8W	0250-1133	81349	RN55D1331F
R	5	THERMISTOR 500 OHM 10 PCT	6740-1607	15801	LA25J1
R	6	RES FLM 348K 1 PCT 1/8W	0250-3348	81349	RN55D3483F
R	7	RES COMP 10 K 5PCT 1/4W	6099-3105	81349	RCR07G103J
R	8	RES FLM 14K 1 PCT 1/8W	0250-2140	81349	RN55D1402F
R	9	RES FLM 12.4K 1 PCT 1/8W	0250-2124	81349	RN55D1242F
R	10	POT CERM TRM 1K OHM 20 PCT 1T	6049-0314	80294	3386S-1-102
R	11	RES FLM 4.99K 1 PCT 1/8W	0250-1499	81349	RN55D4991F
R	12	POT CERM TRM 10K OHM 20 PCT 1T	6049-0317	80294	3386S-1-103
S	1	SWITCH SLIDE 2 POS SPST STEADY	7910-1830	79727	GG-351PC
U	1	IC LINEAR LM301A	5432-1004	12040	LM301AH
U	2	IC LINEAR LM301A	5432-1004	12040	LM301AH

For further trouble analysis, refer to the "Theory" section and consult the schematic diagram (Figure 8) for electrical details and the etched-circuit diagram (Figure 7), to locate detail parts.

CAUTION

If parts are replaced, the instrument may require calibration.

4.6 Calibration.

Special facilities are required to calibrate a Type 1567, so that it in turn can be used to calibrate ANSI type II sound level meters, in accordance with provisions of the Occupational Safety and Health Act or other noise-protection legislation that references as a standard ANSI S1.4-1971 "Sound-Level Meters". Such facilities are available at General Radio Company and they were used in the initial factory calibration performed prior to shipment.

Of primary importance is a Western Electric Co. type 640AA standard microphone, or equivalent, with a known output corresponding to 114 dB re 20 $\mu N/m^2$, that is traceable to the National Bureau of Standards.

Potentiometer R10 can be used to reset the output of the Type 1567, if it changes, for instance, as a result of repair. Normally this control is glyptolled in place at the time of original calibration and it should not be tampered with unless a full calibration facility is available.

R12 should be adjusted for a battery meter reading in the upper edge of the red area when an external supply is connected in place of the battery and set for 6 volts.

Free calibration checks are available at any GR Service Center.

Operation – Section 2

2.1 PRELIMINARY CHECKS

2.1.1 Battery Check

Install the battery in the instrument by releasing the knurled nut, removing the cover (para. 4.5), and connecting the battery to the battery clip. Then slide the battery into its mount and replace the cover.

To check the battery, turn the instrument on. The meter pointer must be in region to the right (OK) for proper operation. If the meter indicates in the area to the left (REPLACE), the battery must be replaced.

2.1.2 Operational Check

Turn the 1567 on and listen for a 1000-Hz tone that indicates the instrument is operating.

2.2 CALIBRATION OF SOUND-MEASURING INSTRUMENTS

The 1567 Sound-Level Calibrator is adjusted to develop a constant sound-pressure level of 114 dB re 20 $\mu N/m^2$ at 1000 Hz, when its acoustic coupler is placed over a high (acoustic) impedance sound-measuring microphone as shown in Figure 4.

Figure 4. Type 1567 in use calibrating a sound level meter.

4.5.3 Output Low

If the 1567 gives evidence of a definite acoustic output, but when checked as in paragraph 4.4 the level is out of tolerance the following points should be considered. The specification of 114 dB ±0.5 dB only applies at 23° C and 760 mm Hg. If the temperature or atmospheric pressure is different, then these factors must be taken into account. See instrument specifications for temperature coefficient information and Figure 5 for pressure correction data.

If the output is still out of tolerance when these points are considered check the electrical output at TP1, the wire loop that extends beyond the foil surface of the circuit board.

a. With a GR 1808 Millivoltmeter, look for 0.9 ± 0.1 V rms at TP1. An 1808-P1 accessory permits use of a Tektronix P6011 X1 Probe to facilitate tie-in to the test point.

b. With a GR 1192 counter, look for a 1 kHz ±30 Hz, also at TP1. A Tektronix P6006 Probe is recommended.

If the reading is within tolerance, but the acoustic output is low or missing, check the transducer circuit. Look for a reading of approximately 0.25 V at AT1. If the reading is low or absent, check R10. If the reading is present and correct, unsolder one side of the transducer A-SP1, and check for continuity. Replace A-SP1 if defective.

If an out-of-tolerance indication is found, at TP1, failure of a detail part mounted on the circuit board is the most likely cause. Examine the board for obvious defects, such as broken or discolored electrical parts, or failure in the printed-circuit wiring, and make the appropriate repairs. Use Figure 7 to identify parts.

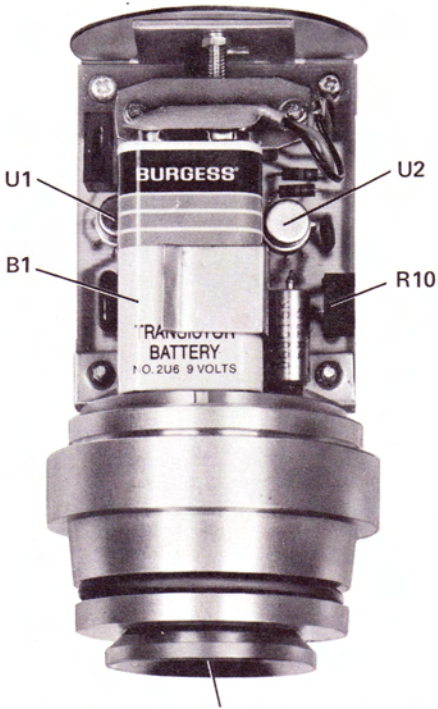


Figure 6. Interior view of Type 1567. TP1 is on the reverse surface of the etched board. The 1-in., diameter adaptor is shown in place in the acoustic coupler.

This level is established by adjusting the calibrator output to register a 114-dB sound pressure level on a sound-measuring system, using a carefully maintained laboratory standard microphone, such as the Western Electric 640-AA, with a pressure calibration determined by reciprocity and traceable to the National Bureau of Standards.

This calibration is performed at a temperature of 23° C and an atmospheric pressure of 760 mm of Hg. Normal variation of temperature and pressure will have negligible effect on the sound-pressure level developed. The specifications give the value of the temperature coefficient, and the curve in Figure 5 show the variation of sound-pressure level with atmospheric pressure.

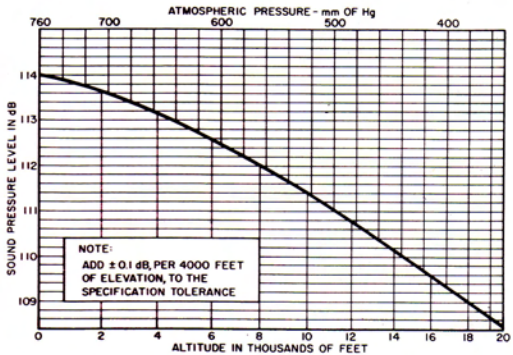


Figure 5. Reductions of sound-pressure level in relation to various altitudes and atmospheric pressures.

Theory–Section 3

3.1 THE PHASE-SHIFT OSCILLATOR

3.1.1 General

The oscillator circuit (Figure 8) consists of 3 sections. An input section (U1), which is a 2-pole active low-pass filter providing 90° of phase shift between input and output at the half-power frequency, an integrator section (U2) that provides an additional 270° of phase shift and the necessary loop gain to ensure oscillation, and a limiting section (CR1/CR2) that holds the amplitude constant.

3.1.2 Frequency and Stability

The operating frequency of the oscillator depends on the values of the components in the input section. This frequency-determining network has a transfer function:

$$\frac{E_o(s)}{E_i(s)} \quad \frac{1}{s^2 + \sqrt{2}\,\omega_o s + \omega_o^2}$$

where $\omega_o^2 = \frac{1}{R_1 R_2 C_1 C_2}$

$s = j\omega.$

When $\omega = \omega_o$, the condition for oscillation is met, i.e. the phase shift between input and output is 90°.

If the Type 1567 fails to perform within specifications, refer to para. 4.5.

CAUTION

Ascertain that the measurements are being made at sea level, at an atmospheric pressure of 760 mm Hg and at an ambient temperature of 23° C. Otherwise, apply the corrections from Figure 5 to the output indication.

4.5 TROUBLE ANALYSIS

4.5.1 Case Removal.

A necessary first step in any trouble-analysis or repair operation on the Type 1567 is removal of the cylindrical case. To do this release and remove the large knurled bright-metal nut on the side wall of the case. Then, slide the case back over the control end. Case installation is the reverse operation; the hole in the case must line up with the threaded mounting bushing.

4.5.2 Defective Battery

If the BATTERY meter fails to indicate in the OK region, use a Simpson 260 or equivalent and look for a reading across the battery in excess of 7.0 Vdc under load (Figure 6). If a lower readings occurs, replace the battery with a fresh 9-V unit, type 2U6 or equivalent.

manual), giving full information of the trouble and of steps taken to remedy it. Be sure to mention the serial, ID, and type numbers of the instrument.

4.3 INSTRUMENT RETURN.

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

4.4 MINIMUM PERFORMANCE STANDARDS

To perform a field check of the calibrator, as distinct from a calibration with NBS traceability:

a. Select the 1567 adaptor appropriate for the microphone on the mast of the GR 1933 Precision Sound Level Meter. Set the 1933 controls as follows:
SOURCE — 1-in. mike
MAX MIKE dB — see cover legend
Oct. Band Center Freq. — 1 kHz
METER SLOW — Depressed
ON/OFF — Depressed
dB LEVEL — 100 — 120 dB

b. Install the calibrator on the microphone, push its slide switch to ON, and observe the reading on the 1933 meter. It should be 114 ±0.5 dB.

For this condition the frequency of oscillation is given as:

$$f_o = \frac{1}{2\pi} \bullet \frac{1}{\sqrt{R_1 C_1 R_2 C_2}}$$

At this frequency, the gain of the input stage is:

$$\frac{E_o}{E_i} = \frac{\sqrt{2}}{2} \quad \angle -90^\circ$$

To insure oscillation, the gain of the integrator stage must be $\geq \sqrt{2}$ and an additional phase shift of 270° must be provided. The integrator stage has a transfer function given by:

$$\frac{E_o(s)}{E_i(s)} = -\frac{1}{R_6 C_6} \bullet \frac{1}{s}$$

$$= K_2 \angle -270^\circ$$

where $K_2 = \frac{1}{R_6 C_6}$.

There, the over-all transfer function at the frequency of oscillation (f_o) from the input section to the output of the integrator is:

$$\frac{E_o}{E_i} = \left[\frac{\sqrt{2}}{2} \angle -90\right]\left[K_2 \angle -270\right] = \frac{\sqrt{2}\,K_2}{2} \angle -360$$

and the circuit will oscillate at f_o, if the output is fed back to the input and $K_2 \geq \sqrt{2}$.

To provide amplitude stability, a diode limiter (R3, R4, R5, CR1, CR2) is placed between the output of the integrator and the input circuit. K_2 is then set to provide adequate closed-loop gain at the output of the limiter. The effects of ambient temperature are reduced by compensating the diode temperature coefficient with thermistor R5.

3.2 BATTERY-STATUS CIRCUIT

The battery-status circuit consists of milliameter M1 and dropping resistors R9 and R12. The circuit is a voltmeter that monitors the battery voltage whenever the instrument is in use.

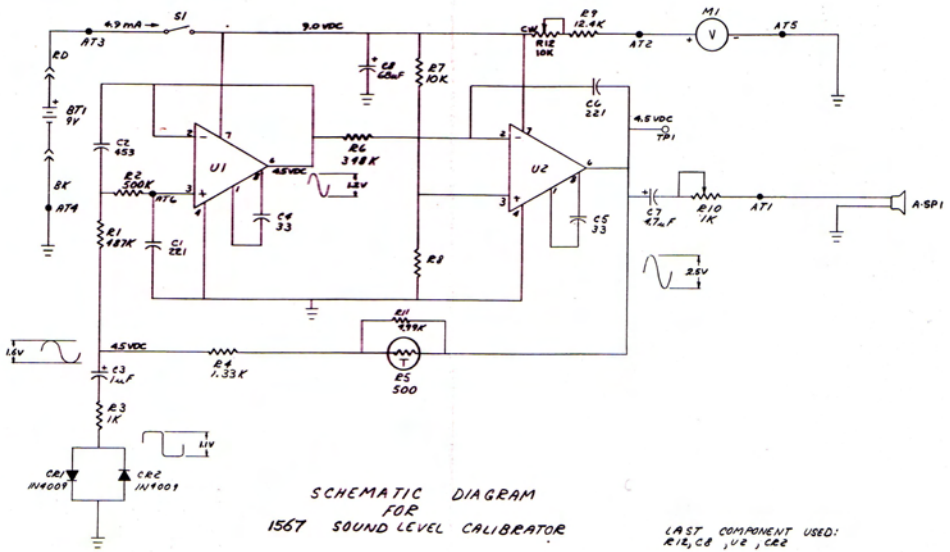
Service and Maintenance–Section 4

4.1 WARRANTY

We warrant that each new instrument manufactured and sold by us is free from defects in material and workmanship and that, properly used, it will perform in full accordance with applicable specifications for the warranty period. Any instrument or component that is found within the warranty period not to meet these standards after examination by our factory, Regional Center, or authorized repair agency personnel will be repaired or, at our option, replaced without charge, except for tubes or batteries that have given normal service.

4.2 GR FIELD SERVICE

The warranty 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 eliminated by use of the following service instructions, please write or phone our Service Department (see last page of



SCHEMATIC DIAGRAM
FOR
1567 SOUND LEVEL CALIBRATOR

LAST COMPONENT USED:
R12, C8, U2, CR2

BASE DIAGRAM
INTEGRATED CIRCUITS
BOTTOM VIEWS

U1, 2

RESISTANCE IS IN OHMS, K = 10^3, M = 10^6
CAPACITANCE IS IN FARADS, $\mu = 10^{-6}$, $p = 10^{-12}$
VOLTAGES EXPLAINED IN INSTRUCTION BOOK SERVICE NOTES
▭ = PANEL CONTROL ▭ = REAR CONTROL
Ø = SCREWDRIVER CONTROL WT = WIRE TIE TP = TEST POINT
COMPLETE REFERENCE DESIGNATION INCLUDES SUBASSEMBLY LETTER, C-R1, B-R1, ETC.

Figure 8. Schematic diagram for Type 1567 SLM Calibrator.

Appendix

USE OF THE NOMOGRAPH

CORRECTION OF BAROMETRIC PRESSURE TO STATION ALTITUDE.

To obtain a corrected barometric pressure for a station:

a. Determine the station's altitude above sea level (see chart later in Appendix).

b. Obtain a barometric pressure reading corrected to sea level from a barometer. (If the barometer reads only values in millimeters, find the corresponding value of millibars from the right-hand scales.

c. Place a straight-edge across the proper points on the center and left-hand scales of the nomograph, and read the actual pressure at the station, on the right-hand scales.

CONVERSION FROM MILLIMETERS OF MERCURY TO INCHES OF MERCURY.

To convert from millimeters of mercury to inches of mercury proceed as follows:

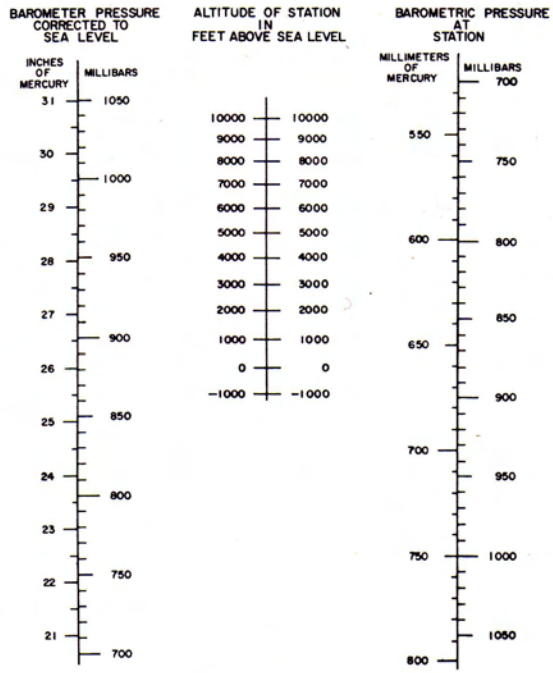
a. Find the barometric pressures value in millimeters of mercury on the right-hand scales.

b. Obtain the corresponding value in millibars from the same scales.

c. Move to the left-hand scales and find the millibar value obtained in step b.

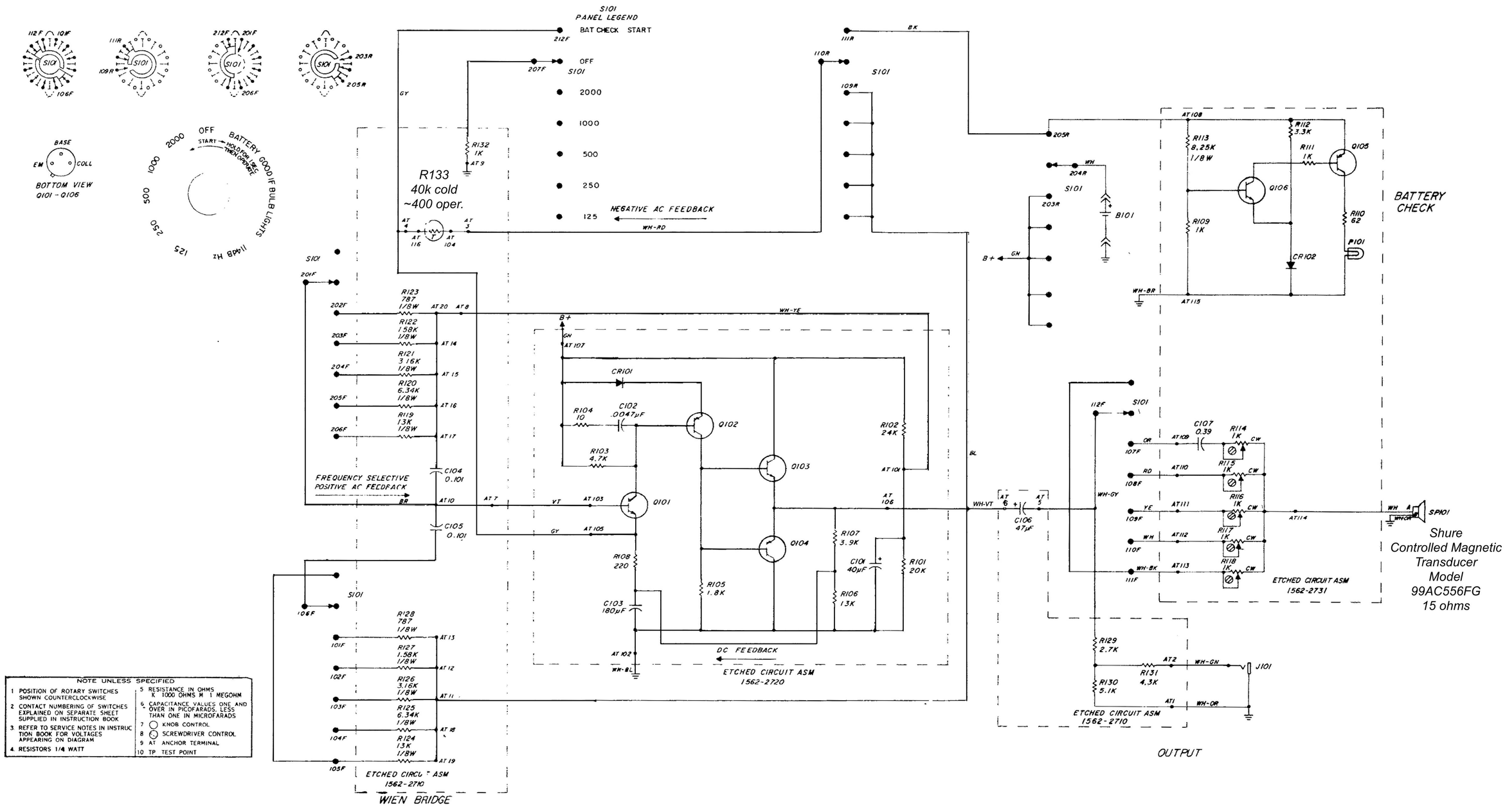
d. Read the corresponding value of barometric pressure in inches of mercury from the left-hand scales.

NOMOGRAPH FOR APPLYING ALTITUDE CORRECTION TO BAROMETRIC PRESSURE



NOTE

1 foot =0.3048 meters



NOTE UNLESS SPECIFIED

1. POSITION OF ROTARY SWITCHES SHOWN COUNTERCLOCKWISE
2. CONTACT NUMBERING OF SWITCHES EXPLAINED ON SEPARATE SHEET SUPPLIED IN INSTRUCTION BOOK
3. REFER TO SERVICE NOTES IN INSTRUCTION BOOK FOR VOLTAGES APPEARING ON DIAGRAM
4. RESISTORS 1/4 WATT
5. RESISTANCE IN OHMS K 1000 OHMS M 1 MEGOHM
6. CAPACITANCE VALUES ONE AND " OVER IN PICOFARADS, LESS THAN ONE IN MICROFARADS
7. ◯ KNOB CONTROL
8. ⊖ SCREWDRIVER CONTROL
9. AT ANCHOR TERMINAL
10. TP TEST POINT

Figure 4-5. Schematic diagram for Type 1562-A Sound-Level Calibrator.