



CALIBRATION PROCEDURE

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3340420
NO. _____

DATE September 18, 1992

MANUFACTURER	CODE	MODEL/PART NO.
GENRAD	GEB	1986

NOMENCLATURE:

OMNICAL SOUND LEVEL CALIBRATOR

(CALBR SND LVL)

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MEASUREMENT STANDARDS

QUALITY ASSURANCE

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1.0 INTRODUCTION:

- 1.1 This procedure describes the method used to calibrate the Genrad model 1986 Omnical Sound Level Calibrator. The Omnical Sound Level Meter is designed to permit field checking of sound level meters or other sound measuring systems. The calibrator includes tones at six different frequencies and five different sound pressure levels. For the remainder of this procedure the Omnical Sound Level Calibrator shall be referred to as the Test Instrument.
- 1.2 The laboratory ambient environment during the calibration shall be 25 +/-5 degrees C, relative humidity below 70% and normal atmospheric pressure.

TABLE 1 : CALIBRATION DESCRIPTION

<u>Test Instrument Characteristics</u>	<u>Performance Specifications</u>	<u>Test Method (As Applicable)</u>
Sound Pressure Level	114 dB @ 4 kHz +/-0.5 dB at other frequencies +/-0.3 dB at other sound pressure levels add +/-0.1 dB	Measured using a standard microphone against a known acoustical sound level calibrator.
Frequency	+/-3.0% of center frequency	Measured using a frequency counter.
Distortion	1.0% THD maximum	Measured using a distortion analyzer.
AC Output	230 mV +/-25 mV	Measured using a digital multimeter.
Crest Factor Burst Level	+6.58 dB 426 mV +/-6 mV	Measured using a digital multimeter.

2.0 APPLICABLE DOCUMENTS:

- 2.1 Omnical Sound Level Calibrator Operation/Service Manual, Model 1986, GenRad.

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- 2.2 Specifications for Acoustical Calibrators, ANSI S1.40-1984.
 (For Reference Only).
- 2.3 Specifications for Laboratory Standard Microphones, ANSI S1.12-1967.
 (For Reference Only).
- 2.4 Specifications for Octave-Band and Fractional Octave-Band Analog and
 Digital Filters, ANSI S1.11-1986. (For Reference Only).

3.0 EQUIPMENT REQUIRED (Or Equivalent:)

Item	Generic Term	Min. Use Spec.	Calib. Equipment
3.1	Standard Microphone	ANSI S1.12-1967 Type L	Brue1 & Kjaer 4144
3.2	Microphone Grid	No Substitute	Western Electric 640AA
3.3	Microphone Preamplifier	No Substitute	Brue1 & Kjaer 2627
3.4	Measuring Amplifier	Accuracy: +/-0.20 dB	Brue1 & Kjaer 2636
3.5	Bandpass Filter	ANSI S1.11-1986	Brue1 & Kjaer 1617
3.6	Sine Generator	Frequency Stability: <25 ppm Harmonic Distortion: <-96 dB Amplitude Linearity: +/-0.05 dB Output Impedance: 50 ohms	Brue1 & Kjaer 1051
3.7	Pistonphone Calibrator	Accuracy: +/-0.20 dB	Brue1 & Kjaer 4220
3.8	Digital Multimeter	Accuracy: +/-0.05% rdg	Fluke 8840A
3.9	TRMS Multimeter	Accuracy: +/-0.05% rdg	Fluke 8922A
3.10	Frequency Counter	Accuracy: +/-1 ppm	Fluke 7250A
3.11	Distortion Analyzer	THD+N < 0.03%	Tektronix AA501
3.12	Digital Pressure Gauge	Range: 28-32 inHg Accuracy: +/-0.05 inHg	Heise 901B

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4.0 PRELIMINARY OPERATIONS:

- 4.1 The Test Instrument shall be inspected for evidence of malfunction or external damage. If the Test Instrument shows signs of malfunction or external damage, it shall be repaired as required.
- 4.2 Refer to the Manufacturer Operation/Service Manual for a detailed description for the operation of the Test Instrument.
- 4.3 Ensure that the Test Instrument has been allowed to stabilize in the laboratory environment for a minimum of one hour.
- 4.4 Verify that the Test Instrument internal battery is adequately charged. If the Test Instrument internal battery is weak, replace it as required. Record the Test Instrument internal battery status on the calibration data sheet.
- 4.5 Setup calibration instrumentation as described in Figure 1.
- 4.6 Set the calibration instrumentation as follows;

Measuring Amplifier

Output Section Gain	: 1 V
Input Section Gain	: 100 mV
Input	: Preamp
Gain Control	: Cal
Reference	: Off
Polarization Voltage	: 200V
Detector Function	: RMS Fast
Filters	: Ext On
	22.4 Hz On
	22.4 kHz On

Bandpass Filter

Range	: Lin
Manual Filter Select	: 2k

- 4.7 Allow a thirty (30) minute warm-up prior to beginning the calibration process.
- 4.8 Read and record the ambient laboratory temperature, relative humidity and barometric pressure on the calibration data sheet.
- 4.9 Record the pistonphone calibrated sound pressure level on the calibration data sheet.

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- 4.10 Calculate and record on the calibration data sheet the barometric pressure correction factor which is calculated as follows:

$$\text{dB Correction} = 20 * \log [(\text{Barometric Pressure}) / 29.921]$$

- 4.11 Algebraically add the recorded values in para. 4.9 and 4.10. The sum is the corrected sound pressure level generated by the pistonphone. Record this value on the calibration data sheet.
- 4.12 Place the standard microphone in the pistonphone acoustic cavity. Verify that the standard microphone cartridge is correctly seated in the acoustic coupler.
- 4.13 Allow two (2) minutes for the system to stabilize and switch the pistonphone main power switch to ON. Allow the pistonphone to operate for a period of one (1) minute.
- 4.14 Adjust the input gain on the measuring amplifier to reflect the reference sound pressure level calculated in para. 4.11. Set the TRMS multimeter for a zero (0) dB indication.
- 4.15 Turn the pistonphone main power switch to OFF and remove the standard microphone from the pistonphone acoustic cavity.
- 4.16 Unscrew the protective grid from the standard microphone cartridge and replace with a 640AA microphone grid.

CAUTION: Do not touch the standard microphone diaphragm when the microphone grid has been removed. Damage to the standard microphone cartridge will result.

- 4.17 Place the standard microphone in the pistonphone acoustic cavity. Switch the pistonphone main power to ON. Allow the pistonphone to operate for a period of one (1) minute. Verify that the measuring amplifier reads +0.3 dB higher than observed in para. 4.15 due to the 640AA microphone grid.
- 4.18 Turn the pistonphone main power switch to OFF and remove the standard microphone from the pistonphone acoustic cavity.

5.0 **CALIBRATION:**

5.1 **FREQUENCY CALIBRATION:**

- 5.1.1 Place the standard microphone in the Test Instrument acoustic cavity. Verify that the standard microphone cartridge is correctly seated in the acoustic coupler.

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- 5.1.2 Allow two (2) minutes for the system to stabilize and switch the Test Instrument main power switch to ON.
- 5.1.3 Set the Test Instrument to a frequency of 1000 Hz at a sound pressure level of 114 dB. Allow the Test Instrument to operate for a period to one (1) minute.
- 5.1.4 Read and record the frequency counter indication on the calibration data sheet.

5.2 SOUND PRESSURE LEVEL CALIBRATION:

- 5.2.1 Read and record the measuring amplifier indication on the calibration data sheet.
- 5.2.2 Set the Test Instrument to the next sound pressure level indicated on the calibration data sheet. Allow the Test Instrument to operate for a period of one (1) minute.
- 5.2.3 Set the Test Instrument to each sound pressure level indicated on the calibration data sheet. At each sound pressure level, repeat the procedure described in para. 5.2.1.
- 5.2.4 Repeat the procedure described in section 5.1 and 5.2 for each frequency/sound pressure level combination indicated on the calibration data sheet.

5.3 DISTORTION CALIBRATION:

- 5.3.1 Set the Test Instrument to a frequency of 1000 Hz at a sound pressure level of 114 dB. Allow the Test Instrument to operate for a period of one (1) minute.
- 5.3.2 Read and record the distortion analyzer indication on the calibration data sheet.

5.4 AC OUTPUT:

- 5.4.1 Connect the TRMS multimeter to the electrical signal output connector on the Test Instrument.
- 5.4.2 Set the Test Instrument controls as follows:

Frequency	: 1 kHz
Level	: 114 dB
Variable SPL	: Calibrated SPL

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5.4.3 Read and record the digital multimeter indication on the calibration data sheet.

5.5 CREST-FACTOR BURST LEVEL:

5.5.1 Refer to the Manufacturer Operation/Service Manual and remove the screws securing the Test Instrument cover. Connect the digital multimeter to the designated Test point and ground with clip leads.

5.5.2 Set the Test Instrument controls as follows:

Frequency : 1 kHz
Level : 104 dB
Variable SPL : Set Crest Factor

5.5.3 Set the Test Instrument sound pressure level adjustment for a 200 mV indication on the digital multimeter.

5.5.4 Set the Test Instrument controls as follows:

Frequency : 1 kHz
Level : 104 dB
Variable SPL : Crest Factor

5.5.5 Read and record the digital multimeter indication on the calibration data sheet.

6.0 EVALUATION:

6.1 At a generated sound level pressure of 114 dB, the Test Instrument shall be within +/-0.5 dB at 4000 Hz and +/-0.3 dB at other frequencies. At sound pressure levels other than 114 dB the specified tolerance shall be increased by +/-0.1 dB.

6.2 The Test Instrument frequency of the sound generated in the acoustic coupler shall be within +/-3.0% of the design-center frequency.

6.3 The Test Instrument total harmonic distortion of the sound generated in the coupler shall not exceed 1.0%.

6.4 An Omnical Sound Level Calibrator which meets the requirements of this procedure shall have a GC 740A calibration label affixed to a conspicuous surface where it will not interfere with normal operation.

6.5 Calibration integrity labels GC 1499 shall be applied to the Omnical Sound Level Calibrator as required.

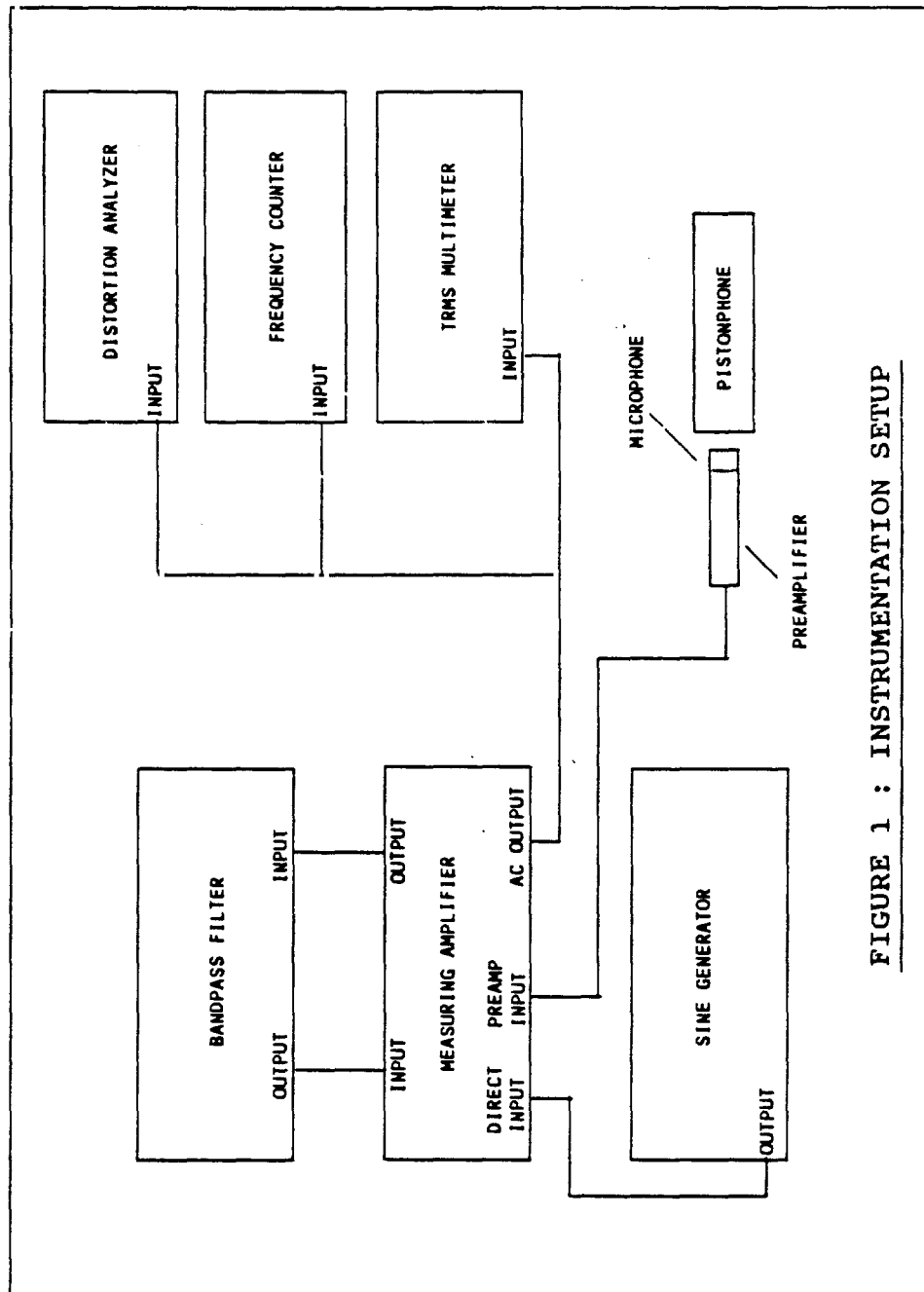


FIGURE 1 : INSTRUMENTATION SETUP

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BETHPAGE, NEW YORK 11714

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NOMENCLATURE OMNICAL SOUND LEVEL CALIBRATOR

MODEL NUMBER 1986

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CERTIFIED BY

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BATTERY TEST : PASS () , FAIL ()

STEP	FUNCTION	NOMINAL	TOLERANCE		MEASURED VALUES			
			MINIMUM	MAXIMUM	FIRST RUN	OUT	FINAL RUN	OUT
4.8	AMBIENT TEMPERATURE	-----	-----	----->	Deg F			
	RELATIVE HUMIDITY	-----	-----	----->	% RH			
	BAROMETRIC PRESSURE	-----	-----	----->	inHg			
4.9	CERTIFIED SPL	-----	-----	----->	dB			
4.10	CORRECTION FACTOR	-----	-----	----->	dB			
4.11	CORRECTED SPL	-----	-----	----->	dB			
5.1	FREQUENCY (@ 114 dB)	1000 Hz	970	1030	Hz			
5.2	SOUND PRESSURE LEVEL							
	(Vol Corr : -0.3 dB)	114.0 dB	113.7	114.3	dB			
	(" : -0.3 dB)	104.0 dB	103.6	104.4	dB			
	(" : -0.3 dB)	94.0 dB	93.6	94.4	dB			
	(" : -0.3 dB)	84.0 dB	83.6	84.4	dB			
	(" : -0.3 dB)	74.0 dB	73.6	74.4	dB			
5.3	FREQUENCY (@ 114 dB)	125 Hz	121	129	Hz			
	SOUND PRESSURE LEVEL							
	(Vol Corr : -0.3 dB)	114.0 dB	113.7	114.3	dB			
	(" : -0.3 dB)	104.0 dB	103.6	104.4	dB			
	(" : -0.3 dB)	94.0 dB	93.6	94.4	dB			
	(" : -0.3 dB)	84.0 dB	83.6	84.4	dB			
	(" : -0.3 dB)	74.0 dB	73.6	74.4	dB			
5.3	FREQUENCY (@ 114 dB)	250 Hz	242	258	Hz			
	SOUND PRESSURE LEVEL							
	(Vol Corr : -0.3 dB)	114.0 dB	113.7	114.3	dB			
	(" : -0.3 dB)	104.0 dB	103.6	104.4	dB			
	(" : -0.3 dB)	94.0 dB	93.6	94.4	dB			
	(" : -0.3 dB)	84.0 dB	83.6	84.4	dB			
	(" : -0.3 dB)	74.0 dB	73.6	74.4	dB			

Use remaining space above for Remarks-Calculations-repairs-equipment if not specified.

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STEP	FUNCTION	NOMINAL	TOLERANCE		MEASURED VALUES			
			MINIMUM	MAXIMUM	FIRST RUN	OUT	FINAL RUN	OUT
5.3	FREQUENCY (@ 114 dB)	500 Hz	485	515	Hz			
	SOUND PRESSURE LEVEL							
	(Vol Corr : -0.3 dB)	114.0 dB	113.7	114.3	dB			
	(" : -0.3 dB)	104.0 dB	103.6	104.4	dB			
	(" : -0.3 dB)	94.0 dB	93.6	94.4	dB			
	(" : -0.3 dB)	84.0 dB	83.6	84.4	dB			
	(" : -0.3 dB)	74.0 dB	73.6	74.4	dB			
5.3	FREQUENCY (@ 114 dB)	2000 Hz	1940	2060	Hz			
	SOUND PRESSURE LEVEL							
	(Vol Corr : -0.5 dB)	114.0 dB	113.7	114.3	dB			
	(" : -0.5 dB)	104.0 dB	103.6	104.4	dB			
	(" : -0.5 dB)	94.0 dB	93.6	94.4	dB			
	(" : -0.5 dB)	84.0 dB	83.6	84.4	dB			
	(" : -0.5 dB)	74.0 dB	73.6	74.4	dB			
5.3	FREQUENCY (@ 114 dB)	4000 Hz	3880	4120	Hz			
	SOUND PRESSURE LEVEL							
	(Vol Corr : -1.1 dB)	114.0 dB	113.5	114.5	dB			
	(" : -1.1 dB)	104.0 dB	103.4	104.6	dB			
	(" : -1.1 dB)	94.0 dB	93.4	94.6	dB			
	(" : -1.1 dB)	84.0 dB	83.4	84.6	dB			
	(" : -1.1 dB)	74.0 dB	73.4	74.6	dB			
5.4	DISTORTION							
	(1000 Hz @ 114 dB)	-----	----->	1.0%	%			
5.5	AC OUTPUT	230 mV	205	255	mV			
5.6	CREST FACTOR LEVEL	+6.58 dB	-----	----->	dB			
	(Adjust to 200 mV)	426 mV	420	433	mV			

Use remaining space above for Remarks-Calculations-repairs-equipment if not specified.