

# CAL250

## Calibrator Technical Reference



# Larson Davis

## **CAL250**

### **Technical Reference Manual**

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**Attn: Recycling Coordinator**

**1681 West 820 North**

**Provo, Utah, USA 84601-1341**



## Product Warranty

For warranty information, refer to our [Product Warranty page](#) at LarsonDavis.com.

# *Using the CAL250 Calibrator*

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## **Features of the CAL250**

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The Larson Davis Model CAL250 is a battery-operated precision microphone calibrator used for the calibration of sound level meters and other sound measurement equipment. The CAL250 delivers a full 114.0 dB level output signal @ 251.2 Hz. It has been designed for field or laboratory use and its accuracy has been calibrated to a reference traceable to the National Institute of Standards and Technology (NIST).

- Automatic compensation sensors provide accurate calibrations in extreme environments
- An effective volume of > 100 cm<sup>3</sup> (6 in<sup>3</sup>) ensures an accurate calibration, even if the microphone and microphone adapter are not fully seated
- An accurate tone is measured even with a weakened battery
- Special adapters make possible the use of 1/4", 3/8", 1/2" microphones, as well as 1" microphones without an adapter

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## **CAL250 Accessories**

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The CAL250 includes the following accessories:

- ADP019: adapter for 1/2" microphone
- CCS003: Storage case
- 9-Volt alkaline battery

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## **Optional Accessories**

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The following optional accessories are available:

- ADP020: 3/8" adapter
- ADP021: 1/4" adapter

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## Installing the Battery

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The CAL250 runs for approximately 100 hours on one 9-volt battery. This provides nearly 4,200 calibrations.

The CAL250 uses a 9-volt battery and it is recommended that you use an alkaline battery to extend the running time of your calibrator.

Follow the steps below to install the battery.

- Step 1** Locate the end cap at the bottom of the calibrator, as this functions as the battery door.
- Step 2** Unscrew the cap by hand, in a counterclockwise direction until battery is exposed.
- Step 3** Pull the battery out of the compartment and undo the battery from the clip.
- Step 4** Snap a new battery onto the clip, then place the battery back into the compartment.
- Step 5** Replace the battery cap and tighten using only finger/hand strength.

**FIGURE 1-1 Battery End Cap**

As the battery becomes weaker, the calibration tone will not deteriorate, but the operating time will decrease until the time is too short to accomplish an adequate calibration.



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## Microphone Calibration

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The CAL250 provides a nominal tone of 250 Hz at 114 dB. If the device being calibrated has only A-weighting, it should be calibrated to read 105.4 dB.

### WARNING

Do not remove the microphone grid cap while calibrating, as it may lead to microphone damage.

To calibrate the microphone, follow the steps below:

- Step 1** Place the instrument so that you can perform the calibration. The preferred method for calibrating with the CAL250 is to mount the preamplifier in a fixed, vertical position.
- Step 2** Insert the proper microphone adapter fully into the calibrator. Make sure it fits snugly.

**FIGURE 1-2 CAL250 with ADP019**

If using a 1" microphone, remove the 1/2" adapter in order to place the calibrator over the microphone.



- Step 3** Insert the microphone through the adapter until it is fully seated in the calibrator.

- Step 4** Press the CAL250 ON button. With a fresh battery, the calibrator will issue a tone for more than 60 seconds before automatically shutting off (see note below).
- Step 5** Make a reading. If the reading is not within tolerance, refer to the instrument's manual for instructions on how to adjust the instrument.

When making a sequence of measurements, a calibration check and an adjustment (if necessary) of the instrument should be made at the beginning. At the end of the measurement sequence, the calibration should be checked again. The inaccuracy of the measurements will be at least as large as the difference between the level measured for the initial calibration (or calibration check) and the level measured for the final calibration check.

## Turn Calibrator OFF

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The button on the CAL250 calibrator is not an ON/OFF button. Each time the ON button is pressed, the tone sound approximately 60 seconds on a fresh battery. In order for the calibrator to turn off, wait 60 seconds, do not press the ON button again. Wait until the calibrator times out.

## Calibration History

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Larson Davis strongly recommends that a history of each calibration adjustment be kept for each piece of equipment. Normally, most modern equipment requires little or no adjustment once the initial calibration is performed. Systematic drifts are possible, and these should be recorded for corrective action.

The Larson Davis Models 706, 720, 812, 814, 820, 824, 831, 870 and LxT sound level meters keep a history of each calibration change that can be printed before an overall reset.

## Environmental Precautions

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While the CAL250 will perform normally under a wide variety of gradually changing environmental conditions, some precautions should be taken when sudden changes occur:

- The temperature of the CAL250 should be stable. If the temperature changes suddenly, provide a stabilization time of 15 minutes. This will ensure that the temperature compensation sensors are at the same temperature as the rest of the unit.
- While humidity will not affect the CAL250, avoid condensing moisture. Also, avoid environments over 90%relative humidity, since condensation is possible.
- The CAL250 is insensitive to magnetic fields. However, the instrument being tested may be affected. We recommend calibrating instruments away from motors, dynamos, high voltage wires, or other sources of electromagnetic fields.

## Calibrator Calibration

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The American National Standards Institute says, “An acoustical calibrator should be recalibrated at least annually by the instrument manufacturer or an acoustical test laboratory qualified to perform calibration.” (American National Standards Institute. Specifications for Acoustical Calibrators. ANSI S1.40, 1984, par. 5.2)

Larson Davis believes the frequency of recalibration depends on the number of calibrators being used and the number of instruments being calibrated. With this in mind, the following guidelines are presented for your consideration:

- For one calibrator and one measurement instrument, the CAL250 should be certified at least yearly.



**NOTE:** If a systematic drift of several dB occurs, there is no reliable way to verify which instrument is at fault, even though it is more likely to be the measurement instrument.

- For one calibrator and several measurement instruments, one calibration a year is recommended. but if no systematic drift occurs, every two years might be satisfactory.
- For several calibrators and several instruments, one calibration a year is recommended.

NOTE: When utilizing the CAL250 to calibrate several instruments, the Calibration History (Adjustments entry) can usually show which instrument is drifting. If each measurement instrument is drifting in the same direction by an amount you consider significant, the calibrator should be recertified.

If several calibrators are in use, it's probably satisfactory to recertify only one of the calibrators each year.

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## *CAL250 Specifications*

The specifications contained in this chapter are subject to change without notice. Please refer to calibration and test results for data on a specific unit.

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### **Standards Met**

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- ANSI S1.40-2006, Specifications and Verification Procedures for Sound Calibrators, Class 1
- IEC 60942-2017, Class 1, Electroacoustics: Sound calibrators
- IEC 61010-1: 2001, Safety requirements for electrical equipment for measurement, control, and laboratory use--Part 1, General requirements
- IEC 61326-1: 2012 Electrical equipment for measurement control and laboratory use--EMC Requirements, Part 1, General requirements

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### **Microphone Compatibility**

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The CAL250 is for use with the following microphone types:

- 1" WS1P, WS1F and WS1D without any adapter
- 1/2" WS2P, WS2F and WS2D with ADP019 adapter (supplied)
- 1/4" WS3P, WS3F and WS3D with ADP021 adapter (optional)

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### **Size according to IEC 61094-1:2000**

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- 1" LS1P without any adapter
- 1/2" LS2P with ADP019 adapter (supplied)
- 1/8" with ADP023 adapter (optional)


## Technical Specifications

The limits expressed in these specifications do not include any allowance for the effects of measurement uncertainty. The product is determined to be in compliance with these specifications when the measured result is within or equal to the specified limit. When reporting test results, Larson Davis recommends reporting the limits, measured value, measurement uncertainty and a statement of compliance or non-compliance.

For new products, the measured results, measurement uncertainty and coverage factor are reported in the test results that ship with the product.

**Table A-1**

<b>Calibration Sound Pressure Level (Factory Specification &amp; Initial Accuracy)</b>	114.0 ± 0.1 dB re: 20µPa @ 101.3 kPa, 23 °C and 50% RH
<b>Calibration Sound Pressure Level (Accuracy after 1 year)</b>	114.0 ± 0.2 dB re: 20µPa @ 101.3 kPa, 23 °C and 50% RH
<b>Equivalent Free-field Level</b>	113.9 dB for 1/2" microphones, including 377B02 and other WS2F-compliant free-field microphones
<b>Frequency</b>	251.2 Hz ± 0.7%
<b>Total Harmonic Distortion</b>	< 2%
<b>Minimum stabilizing time after the microphone and the calibrator are coupled together</b>	10 seconds
<b>Stability After Pressing On</b>	± 0.1 dB after 2 seconds
<b>Static Pressure Range</b>	65 kPa to 108 kPa, SPL variation will be < ± 0.25 dB
<b>Temperature Range</b>	SPL variation < ± 0.3 dB and frequency variation < ± 2 Hz over the range -10 °C to 50 °C

<b>Humidity Range</b>	SPL variation $< \pm 0.3$ dB and frequency variation $< \pm 2$ Hz over the range 10% to 90% relative humidity (non-condensing)
<b>Influence of Load Volume</b>	$< 0.05$ dB
<b>Storage Temperature</b>	-40 °C to 60 °C
<b>Storage Humidity</b>	0% to 90% relative humidity (non-condensing)
<b>Effective Volume of Calibrator</b>	$> 100$ cm <sup>3</sup> (6.1 in. <sup>3</sup> ) Calibrator level is not affected by microphone volume.
<b>Dimensions</b>	Length 124 mm (4.9 in.) Diameter 44.5 mm (1.75 in.)
<b>Weight</b>	249 gm. (8.8 oz.)
<b>Battery</b>	9 V NEDA 1604A or IEC 6LR61
	CE-mark indicates compliance with: EMC directive. Note: The reference orientation for testing the effects of radio-frequency fields is with the radio-frequency field incident on the calibrator side (with the On button) and the electric field vector parallel to the axis of the microphone. This is also the orientation of maximum susceptibility and emissions
<b>EMC Emission</b>	EN 50081-1: Generic emission standard. Part 1: Residential, commercial and light industry
<b>EMC Immunity</b>	EN 50082-2: Generic immunity standard Part 2: Industrial environment

# Declaration of Conformity



## EU Declaration of Conformity PS078 In Accordance with ISO/IEC 17050

<b>Manufacturer:</b> PCB Piezotronics, Inc. 3425 Walden Avenue Depew, New York 14043 USA	<b>Authorized European Representative:</b> PCB Piezotronics Europe GmbH Porschestraße 20-30 41836 Hückelhoven, Germany
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**Certifies that type of equipment:** CALXXX Acoustic Calibrator

**Whose Product Models Include:** CAL150, CAL200, and CAL250

This declaration is applicable to all Acoustic Calibrators of the above series which have the CE mark on their data sheets and where those data sheets refer to this Declaration of Conformity. The data sheets for all model numbers referenced above which include the CE mark on such data sheets and refer to this Declaration of Conformity are hereby incorporated by reference into this Declaration.

Conform to the following EU Directive(s) when installed per product documentation:	2014/30/EU 2014/35/EU 2011/65/EU	EMC Directive Low Voltage Directive RoHS Directive
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### Standards to which Conformity is Declared:

<b>Harmonized Standards</b>	EN 61326-1:2013 EN 61326-2-3:2013 EN 61010-1:2010 EN 50581:2012	Electrical Equipment for Measurement, Control and Laboratory Use- EMC Electrical Equipment for Measurement, Control and Laboratory Use- EMC Safety Standard Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances
<b>Product Specific Standards</b>	EN/IEC 60942:2017	Sound Calibrators
<b>Emissions Test Standards</b>	EN 55011:2009 +A1:2010	Industrial, scientific and medical(ISM) radio frequency equipment Electromagnetic disturbance characteristics- Limits and methods of Measurement Class B
<b>Immunity Test Standards (Non-OJEU)</b>	EN 61000-4-2:2001 EN 61000-4-3:2006 EN 61000-4-8:2001	Electrostatic Discharge (ESD) immunity Radiated, radio-frequency, electromagnetic field immunity Power frequency magnetic field immunity, 80 A/m, 50/60 Hz
<b>Test Reports</b>	EMC and Safety Reports	D1244.0009, D1244.0021, D1244.0017

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) Standard(s)

Place: Provo, UT Date: 12/13/17

Signature: 

Name: Carrie Termin

Title: Regulatory Affairs and Product Certification Specialist

- ISO 9001 Certified PCB Piezotronics, Inc. Phone: 716-684-0001 FAX: 716-684-0987

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Larson Davis - a PCB Piezotronics division

LarsonDavis.com

**E-mail:** sales@LarsonDavis.com

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**Worldwide Corporate Headquarters**  
3425 Walden Avenue  
Depew, NY 14043-2495 USA

<b>Toll-free:</b>	888-258-3222
<b>Phone:</b>	716-926-8243
<b>Fax:</b>	716-926-8215