# CAL200

## User Manual


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I200.1 Rev. D

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Record of Serial Number and Purchase Date

CAL200 Serial #: _____ Purchase Date: _____

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where it will be accepted for disposal

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CHAPTER

# 1 Introduction

**The Larson Davis CAL200 Sound Level Calibrator is a battery operated precision microphone calibrator used for the calibration of sound level meters and other sound measurement equipment. It can provide an output level of either 94.0 or 114.0 dB (switch-selectable) at a frequency of 1 kHz. It has been designed for both field and laboratory use and the accuracy has been calibrated to a reference traceable to the National Institute of Standards and Technology.**

## About This Manual

This manual has 3 chapters and 1 appendix covering the following topics:

- *Chapter 1 - Introduction:* Orients the user to the contents of this user manual and the features, functions and measurement capabilities of the CAL200.
- *Chapter 2 - Using the CAL200:* Describes the setup and operation of the CAL200.
- *Appendix A - Specifications:* Presents the technical specifications of the CAL200.

# Special Features of the Electronic Version

There are a variety of special techniques for navigating through pdf documents which can greatly simplify finding specific items in this manual. Three of these, bookmarks, links and cross references are discussed below.

## Bookmarks

### Opening Bookmarks

Bookmarks are clickable navigation tools in pdf files. To open a bookmark, left click the upper tab on the left of the screen labeled **Bookmarks.** These will appear as shown FIGURE 1-1.

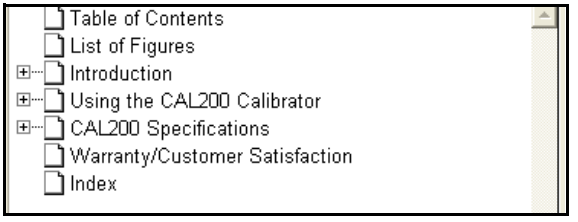


**FIGURE 1-1 Bookmarks**

In the unexpanded view, bookmarks lists the names and page numbers of chapters and appendixes in order of appearance, as well as the Table of Contents and the Index.

### Closing Bookmarks

To close bookmarks, simply left click the tab once more.

### Expanding Bookmarks

For any entry, if there is a + within the rectangle to the left, there are sub-entries which can be displayed upon expanding the tree by clicking the rectangle. For example, clicking the + to the left of any chapter will expand it into major headings and by clicking all the + symbols, the complete tree for that chapter will be shown. In the following figure

we can see the entry Measurement Setup completely expanded.

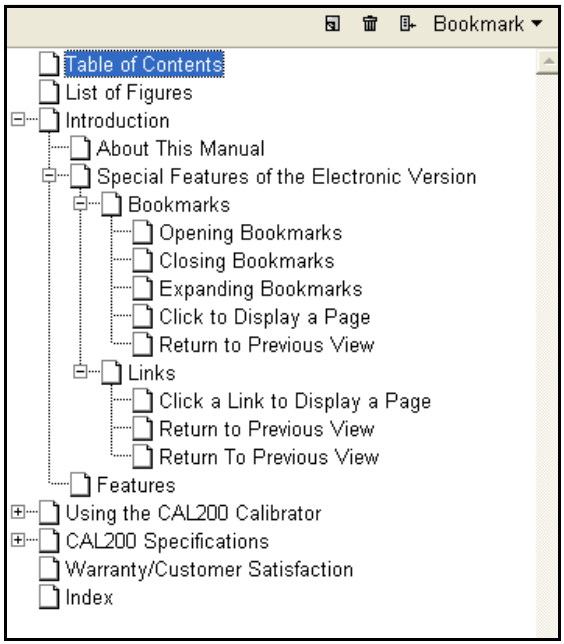


**FIGURE 1-2 Bookmarks Expanded**

### Click to Display a Page

Left click on any text field (Chapter name, Appendix name, Table of Contents, Index, or any sub heading) and the page displayed on the right will jump to the page associated with that text field.

### Return to Previous View

*There are several methods to return to a previous view. These methods differ in the various version of Adobe Reader. Refer to Help in your version of Adobe Reader.*

To return to the page which was displayed previous to clicking on a bookmark text line, click the “View Menu” in the menu bar. Click the “Goto” and then “Previous View” on the pop up menus.

## Links

### Click a Link to Display a Page

The Table of Contents and the Index have a page number associated with each item. For the Table of Contents, left click on the text line and that page will be displayed. For the Index, left click on the page number itself to display the page associated with that entry.

### Return to Previous View

To return to the page which was displayed previous to clicking on an item in the Table of Contents or a page number in the Index, click the “View Menu” in the menu bar. Click the “Goto” and then “Previous View” on the pop up menus.

### Return To Previous View

To return to the previously displayed page, click the “View Menu” in the menu bar. Click “Goto” and then “Previous View” on the pop up menus.

# Features

The Larson Davis CAL200 Sound Level Calibrator has the following features:

- Precision sound level calibrator
- Dual output levels: 94.0 dB and 114.0 dB (user selectable)
- Output frequncy 1 kHz
- Internal batteries for portable operation
- Opening for use with 1/2” microphones; adaptors available for use with 3/8” and 1/4” microphones

CHAPTER

# 2 Using the CAL200 Calibrator

## Installing the Battery

*The CAL200 will run for approximately 100 hours on one 9 volt battery when using the 114 dB output level. This will give you nearly 4200 calibrations.*

The CAL200 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** Slide the battery door on the lower section of the back panel down to remove it

**Step 2** Gently pull the battery connector clip sufficiently outside the interior to permit it to be snapped onto the battery terminals

**Step 3** Tuck the battery, with the battery connector clip attached, into the battery compartment

**Step 4** Slide the battery door back into place, pressing until the tab snaps the door securly shut

# Microphone Calibration

The CAL200 provides a nominal tone of 1 kHz, which requires no level correction when used with sound level meters utilizing A, B, C or Z (Flat) frequency weighting.

### Select the Output Level

The output level is user-selected to be 94.0 or 114.0 dB using the slide selector on the right side of the CAL200. Slide the switch to upper position for 114.0 dB or to the lower position for 94.0 dB, as indicated by the label on the upper right of the front panel.

### Perform the Calibration

To calibrate the microphone, follow the steps below:

**Step 1** Insert the proper microphone adapter fully into the calibrator. Make sure it fits snugly.

**Step 2** Insert the microphone fully into the adapter. Make sure it fits snugly.

*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.*

**Step 3** With the microphone connected to the instrument being calibrated, press the CAL200's 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 4** 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.*

NOTE: Each time the ON button is pressed, the CAL200 calibrator will run approximately 60 seconds on a fresh battery. In order for the calibrator to turn off do not press the ON button again. Wait until the calibrator times out. It is not an ON/OFF button.

## Calibration History

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.

Most Larson Davis sound level meters keep a history of each calibration change that can be printed before an overall reset. Please refer to the individual instrument manuals for details.

## Environmental Precautions

While the CAL200 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 CAL200 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 CAL200, avoid condensing moisture. Also, avoid environments over 90% relative humidity because condensation can easily take place.

- The CAL200 is insensitive to magnetic fields. However, the instrument being tested may not be. Therefore, calibration should not be done near motors, dynamos, high voltage wires, or other sources of electromagnetic fields.

## Calibrator Calibration

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 CAL200 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.

***NOTE:*** *If the CAL200 is being used to calibrate several instruments, then the history of calibration adjustments can usually pinpoint which instrument is drifting. If all the measurement instruments are drifting in the same direction by an amount you consider significant, the CAL200 should be recertified.*

- For several calibrators and several instruments, one calibration a year is recommended.

NOTE: If several instruments and several calibrators are in use, then the history of calibration adjustments would precisely pinpoint any problem pieces of equipment. Furthermore, it is probably satisfactory to recalibrate only one of the calibrators each year.

APPENDIX

# A CAL200 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.

## Standards Met:

- ANSI S1.40-1984, Specifications for Acoustic Calibrators
- IEC 60942-2003, Class 1, Sound Calibrators

## Technical Specifications

| | |
|---|---|
| Calibration sound pressure level (factory specification) | 94.0 and 114.0 dB ± 0.1 dB SPL re: 20µPa @ 1013 mBar, 23 º C and 50 % RH |
| Calibration sound pressure level after one year | 114.0 ± 0.2 dB under same conditions as above |
| Equivalent free-field level | -0.12 dB for 1/2" microphones |
| Frequency | 1 kHz ± 1% |
| Harmonic distortion | < 2 % |
| Stability | ± 0.1 dB after 2 seconds |
| Barometric pressure range | 650 to 1080 millibars, SPL variation will be < ± 0.3 dB |

**Table A- 1 CAL200 Specifications**

| | |
|---|---|
| Temperature range | SPL variation < ± 0.3 dB (typically ± 0.005 dB/º C)<br>Frequency variation < ± 2 Hz over the range -10 to 50º C |
| Humidity range | SPL variation < ± 0.3 dB over the range 10 to 90 % relative humidity (non-condensing)<br>Frequency variation < ± 2 % over the range 10 to 90 % relative humidity (non-condensing) |
| Storage temperature | -40º C to 60º C |
| Storage humidity | 0 to 90 % relative humidity (non-condensing) |
| Effective volume of calibrator and microphone | 4.15 $cm^3$ (0.253 $in.^3$) |
| Dimensions | Length 106.1 mm (4.18 in.)<br>Width 63.4 mm (2.5 in.)<br>Thickness 25.9 mm (1.02 in.) |
| Weight | 156 gm. (5.5 oz.) |
| Battery | 9 V NEDA 1604A or IEC 6LR61. With sufficient battery voltage, calibrator will run (after releasing ON button) for 1 to 1.5 minutes before automatic shutdown. With insufficient battery voltage, calibrator will not remain ON after release of button |
| Traceability | Utilize the Larson Davis 1/2” Model 2559 or 377A60 precision condenser microphone in conjunction with other traceable measuring instruments to establish traceability of the output level and frequency of the Model CAL200 |
| CE | CE-mark indicates compliance with EMC directive |
| EMC Emission | EN 50081-1: Generic emission standard. Part 1: Residential, commercial and light industry |
| EMC Immunity | EN 50082-2: Generic immunity standard. Part 2: Industrial environment. |

**Table A- 1 CAL200 Specifications**

APPENDIX

# B Warranty/Customer Satisfaction

**A. Total Customer Satisfaction**. Larson Davis, Inc. (“LD”) guarantees Total Customer Satisfaction. If, at any time you are not completely satisfied with any LD product, LD will repair, replace or exchange it at no charge, except as otherwise provided in this Limited Warranty. The employees of LD strive to provide superior, unmatched customer service. Should you find yourself dissatisfied with any LD product for any reason, consult a LD Application engineer or local representative/ distributor to discuss your situation.

**B. Purchase Price Refund/Limited Warranty.** LD warrants to the original purchaser (the "Buyer") that, unless otherwise expressly specified in writing by a LD officer, all LD products shall be free of defects in material and workmanship for a period of two (2) years from date of original purchase. In furtherance of LD's commitment to Total Customer Satisfaction, LD will, for a period of one (1) year from date of original purchase, refund 100% of the customer's purchase price for any LD product with which the buyer is not completely satisfied, subject to the exceptions contained in Paragraph J of this Limited Warranty. The option of a refund may be selected during this one (1) year period in lieu of repair, replacement or exchange of the product.

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**Service & Repair Limited Warranty.** In addition to the limited warranties set forth above, LD offers a 90-day parts and labor limited warranty for all repair work performed at the factory. This warranty is limited to parts repaired or replaced at the factory by LD. This warranty is also subject to the limitations as outlined in Paragraph J.

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**2.DAMAGE CAUSED BY ACTS OF GOD THAT INCLUDE, BUT ARE NOT LIMITED TO, HAILSTORMS, WINDSTORMS, HURRICANES, TORNADOES, SANDSTORMS, LIGHTNING, FLOODS AND EARTHQUAKES.**

**3.DAMAGE UNDER CONDITIONS CAUSED BY FIRE OR ACCIDENT, BY ABUSE OR BY NEGLIGENCE OF THE USER OR ANY OTHER PERSON OTHER THAN LD, BY IMPROPER INSTALLATION, BY MISUSE, BY INCORRECT OPERATION, BY "NORMAL WEAR AND TEAR", BY IMPROPER ADJUSTMENT OR ALTERATION, BY ALTERATIONS NOT COMPLETED BY AUTHORIZED SERVICE PERSONNEL, OR BY FAILURE OF PRODUCTS PARTS FROM SUCH ALTERATIONS.**

**4.COSTS OF REPAIRING DAMAGE CAUSED BY POOR OR IMPROPER MAINTENANCE OR UNAUTHORIZED REPAIR.**

**5.COSTS OF MODIFYING THE PRODUCT IN ANY WAY ONCE DELIVERED TO THE BUYER, EVEN IF SUCH MODIFICATIONS WERE ADDED AS A PRODUCTION CHANGE ON OTHER PRODUCTS MADE AFTER THE BUYER'S PRODUCT WAS BUILT.**

**Authority to Alter This Limited Warranty.** No agent, representative, distributor, or authorized dealer of LD has any authority to alter the terms of this Limited Warranty in any way. This Limited Warranty may be altered only in a writing signed by an authorized officer of LD.

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