

User Manual for the CR:511E Acoustic Calibrator



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Overview

Accurate calibration of Sound Level Meters and Sound Measurement equipment is essential before and after each measurement to ensure the validity of any values recorded. The CR:511E Acoustic Calibrator provides a cost effective yet accurate means of achieving this requirement.

The CR:511E unit can be used for all microphones suitable for this kind of calibration. It has the ability to accept different cavity adaptors. The CR:511E has a nominal cavity diameter of 1.125 inches. A standard QC:3 adaptor allows the unit to be used with a ½ inch microphone. Other adaptors are available. The approval by the German test office PTB is valid for the 1/2 inch adaptor.

The CR:511E provides two reference levels of 94dB(1 Pa) and 104 dB (3.16 Pa). It is therefore possible to judge the linearity of the instrument and to calibrate at high background noises.

The frequency is 1000 Hz, therefore the frequency weighting of the instrument has no influence on the accuracy of the calibration.

The CR:511E Acoustic Calibrator meets the requirements of IEC 942, it corresponds to type 1L, which means, it is type 1 if the correction values for the air pressure are observed.

Operation

The CR:511E acoustic calibrator has provision for the calibration of a variety of microphones of various diameters. The nominal cavity has a diameter of 1.125 inches. A standard QC:3 adaptor allows the unit to be used with a ½ inch microphone. Other adaptors are available for 1 inch, 1/4 inches, 20 mm and 10 mm.

The CR:511E unit is supplied with one adaptor as standard. Typically this is the QC:3 adaptor for ½" microphones. The sound pressure generated by the calibrators are 94dB and 104dB.

However, when calibrating a microphone which is to be used for free field measurements, a small correction may be necessary to compensate for the difference between the microphone's free field response at 'zero degrees' or 'head-on' incidence and the pressure level generated by the calibrator. The correction is typically -0.3dB for ½ inch microphones (making the effective calibration level 93.7dB).

A second correction is required if the barometric pressure is not 1013 hPa.

A table shows the correction values for the standard microphones of Cirrus Research plc

In order to adapt different microphones to the CR:511E at the accuracy stated the adaptors available from Cirrus Research plc should be used. For half inch microphones the type Q3 is available, with this adaptor the calibrator can be certified officially.

Calibrating a Sound Level Meter

Ensure that the batteries in both the calibrator and the Sound Level Meter are in good condition. Do not attempt to calibrate the Sound Level Meter if battery levels are low.

Push the microphone of the Sound Level Meter, with the appropriate adaptor if required, into the cavity at the end of the calibrator. Ensure the microphone is fully inserted into the cavity and is past the 'O' ring seal. The microphone should be parallel to the body of the calibrator.

Turn on the calibrator and select the reference level required. In most situations, this will be 94dB, although the CR:511E units provide an additional 104dB reference level. Check which level the Sound Level Meter is set to accept during calibration. Most modern Sound Level Meters have electronic calibration with the level adjusted automatically.

Adjust the Sound Level Meter to the correct level where applicable. There are several factors to be considered when correcting the value generated the calibrator. These are:

1. A correction for the type of microphone capsule.
2. A correction for any changes in barometric pressure from 1013mBar (1013 hPa).

In most situations, the Sound Level Meter will be fitted with a free field microphone. The correction required for the specific microphone fitted to the Sound Level Meter will be given in the operation manual for that instrument. However, the MK:215 and

MK:224 microphone capsules which are fitted to the majority of Cirrus Research Sound Level Meters have a correction of -0.3dB when used with the CR:511E.

The CR:511E Acoustic Calibrator is designed to be used mainly with ½" Microphone Capsules. Calibration corrections are listed below for the Cirrus Research plc ½" Capsules and two microphone capsules commonly used in test labs:

Microphone Type	Calibration Correction	Effective Calibration Level
MK:202	-0.3dB	93.7 dB
MK:215	-0.3dB	93.7 dB
MK:216	-0.3dB	93.7 dB
MK:226	-0.3dB	93.7 dB
MK:224	-0.3dB	93.7 dB
B&K 4134	0dB	94.0 dB
B&K 4180	0dB	94.0 dB

Example

An example of the procedure used to calculate the value required is shown below:

Level = 94.0dB + Microphone Correction + Barometric/Altitude Correction

Level = 94.0dB + (-0.3dB) + Correction for 700mBar

Level = 94.0dB + (-0.3dB) + (-0.8dB)

Level = 92.9dB

Different microphones will have different correction values. Also, the use of different calibrator adaptors may alter the final values required. Please check the operation manual for the Sound Level Meter or microphone concerned for details.

Changing the Battery

The CR:511E acoustic calibrator uses a single 9v battery. This type of battery is known as 6F22 or NEDA 1604. It is also commonly known as PP3.

1. Put a small rod, usually a screwdriver, through the two holes in the end cap and gently pull the cap from the body.
2. Pull out the end plate which has the switch and battery holder attached.
3. The battery, type 6F22 (PP3) can now be eased out of its holder and replaced. Make SURE you check the correct polarity of the battery, which clips into the press studs on the battery holder.

Battery type

One battery type 6F22 is used. This is called NEDA 1604 in the USA and parts of Asia. It is often called 'PP3' in the UK and the old Commonwealth.

The battery should preferably be an alkaline battery, not an ordinary dry cell. Whilst an ordinary cell is adequate for operation, the low price of long life batteries makes their use sensible.

A long life battery is not only more efficient, but is less prone to leak and damage the calibrator. The material of the end ring and cavity is easily eaten away by battery leakage. The battery is 9 volts when new and will operate the calibrator down to about 6 volts.

Performance Information.

Variation with Temperature.

The acoustic outputs of the CR:511E Acoustic Calibrator will alter with changes in temperature. The tolerances shown below are for reference conditions of 1013mBar (1013 hPa) and 65% Relative Humidity.

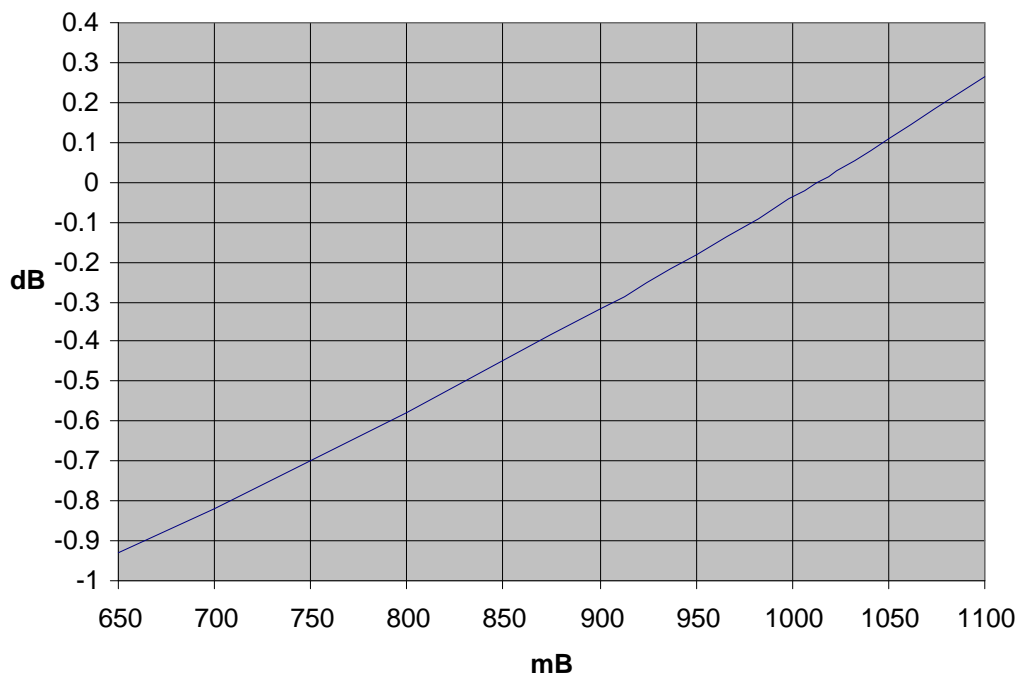
Class	Temperature Range	Tolerances
Class 1L	+5°C to +35°C	± 0.3dB

Barometric Pressure Correction for CR:511E.

The variation due to static pressure may be up to 0.7 dB from the nominal value and therefore, the static pressure must be known in order to make this correction. This figure can be obtained e.g. from your local airport.

However, if measurements are required to the highest accuracy, a barometer should be purchased. The CR:590 Barometer is available for use with the CR:511E Acoustic Calibrator.

CR:511E Barometric Pressure Correction



Specification.

Frequency	1kHz \pm 1.5%
Sound Level	94dB & 104dB re 20 μ Pa
Level Accuracy	\pm 0.3dB at 23 C and 101.3kPa
Standardisation	IEC 942 Class 1L
Distortion	Less than 2%
Variation with Temperature	To IEC 942 Class 1L
Variation with Barometric Pressure	See Curves or CR: 590 barometer
Operating humidity	10 to 90% rel.hum.
Operating Temperature	-10°C to +50°C
Storing temperature	-20°C to +60°C
Long Term Drift	Better than \pm 0.1dB
Effective Volume	40 cm ³
Cavity Diameter	1.125 inch with Q3 Adaptor for ½" Microphones
Battery	1 x 9v 6F22 (Neda 1604)
Weight with battery	220g
Dimensions	135mm x 48mm

Appendix 1 – Free Field Correction

When calibrating a microphone which is to be used for free field measurements, a small correction may be necessary to compensate for the difference between the microphone's free field response at 'zero degrees' or 'head-on' incidence and the pressure level generated by the calibrator.

The correction is typically -0.3dB for ½ inch microphones (making the effective calibration level 93.7dB).

The table below shows the correction values for the standard microphones of Cirrus Research plc.

Calibration corrections are listed below for the Cirrus Research plc ½" Capsules and three microphone capsules commonly used in Calibration Laboratories:

Microphone Correction Values

Microphone Type	Calibration Correction	Effective Calibration Level
MK:202	-0.3dB	93.7 dB
MK:215	-0.3dB	93.7 dB
MK:216	-0.3dB	93.7 dB
MK:226	-0.3dB	93.7 dB
MK:224	-0.3dB	93.7 dB
B&K 4134	0dB	94.0 dB
B&K 4180	0dB	94.0 dB
B&K 4192	0dB	94.0 dB

Example

An example of the procedure used to calculate the value for an MK:224 microphone is shown below :

Level = 94.0dB + Microphone Correction

Level = 94.0dB + (-0.3dB)

Level = 93.7dB

Different microphones will have different correction values. Please check the operation manual for the Sound Level Meter or microphone concerned for details.

CE Certificate of Conformity

Cirrus Research plc Hunmanby UK CE Certificate of Conformity



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Equipment Description

The following equipment manufactured after 1st January 2007:

CR: 511E Acoustic Calibrator

Along with their standard accessories

According to EMC Directives 89/336/EEC and 93/98/EEC

meet the following standards

EN 61000-6-3 (2001)

EMC : Generic emission standard for residential, commercial and light industrial environments.

EN 61000-6-1 (2001)

EMC : Generic immunity standard for residential, commercial and light industrial environments.

Signed

Dated 1st April 2022

Martin Williams
Chief Engineer

Warranty Information.

1. Every new product is provided with a 12-month no-quibble warranty. This covers everything we provide against failure, poor workmanship and accidental damage.
NB - European Union law states a product has to be fit for purpose for 24 months after purchase. This two-year period covers failure and poor workmanship only.
 2. If the product is calibrated by Cirrus Research or an authorised calibration and service centre, then the initial 12-month warranty is extended by a further 12 months, with the same conditions, for up to 15 years in total.
 3. If a product has not been calibrated annually by Cirrus Research or an authorised calibration and service centre, then you may buy back into the warranty scheme for a small fee, plus the cost of calibration. This can only be done once during the life of the product.
 4. If a microphone capsule fails under warranty and is physically damaged, we will replace it with a refurbished capsule.
 5. If you don't wish to have a refurbished capsule, then you can trade in your damaged capsule for a new one, which will incur a fee.
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Cirrus Research Offices

The addresses given below are the Cirrus Research plc offices. Cirrus Research plc also have approved distributors and agents in many countries worldwide. For details of your local representative, please contact Cirrus Research plc at the address below. Contact details for Cirrus Research authorised distributors and agents are also available from the Internet Web site at the address shown below.

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