

Precise, Simplistic



Calibration

AcoustiCal User Manual

3M™ AcoustiCal AC-300 Calibrator

Dangers, warnings and cautions



Danger!

Failure to observe the following procedures may result in serious personal injury

- Not for use in explosive or hazardous locations. This product is not intrinsically safe.
- Never place the AcoustiCal against your ear, harmful sound levels may be present.



Warning!

Failure to observe the following procedures could damage the instrument

- Read the manual before operation.
- Do not store in temperatures exceeding 65°C (149°F).
- Do not immerse in liquids.
- Condensation may damage your instrument.
- Substitution of components may impair the accuracy of the instrument. Repair should be done by authorized service personnel only.



Caution!

General

- Best results are achieved when the calibrator and sound measuring instrument are given time to acclimate to the current environment.
- For proper calibration the ambient sound level should be less than 88 dBA.
- A non-condensing environment is required for proper measurements.
- An annual laboratory calibration is recommended to ensure accurate calibration results. Between laboratory calibrations, or when there is an accuracy question, the AcoustiCal may be field checked by comparing the output with another AcoustiCal, or reference meter with similar specifications/accuracy.

Intended Use:

The AcoustiCal is intended to calibrate precision Class/Type 1 and Class/Type 2 instruments with a microphone input. Consult your company's safety professional for local standards, or call 3M at 1-800-243-4630.

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AcoustiCal

Models

The 3M™ AcoustiCal AC-300 is an acoustic calibrator for calibrating precision Class/Type 1 as well as general purpose Class/Type 2 sound level meters and noise dosimeters.

The AC-300 produces two signals either 250 Hz or 1000 Hz at a sound pressure level of 114.0 dB.



Note: The sound pressure level and combinations of frequency outputs conform to the requirements of the IEC standard 60942:2003-1 sound calibrators using all microphones listed (see "Supported microphones and adapters").

AcoustiCal display indicators

One of the following indicators may appear in the upper-left corner of the display when the calibrator is powered on.

	Low Battery indicator: If the low battery indicator is on, the battery should be replaced.
	Fault indicator: If the fault indicator is on, the level is incorrect. This may be due to the microphone not being inserted properly.

Powering and settings

1. Press the key to power on the calibrator. The frequency of 1000 Hz with a 114 dB level is displayed.



Display

Press to power on. Press again to change to 250 Hz (if needed). Press to power off. Note: at any time to power off, press and hold to power off.

Figure 1: Operating the calibrator

2. Press the key to select 250 Hz at 114.0 dB (if applicable).
3. To power off, press key.
 - At any time when powered on, you may also press and hold key for 2 seconds to power off.



Note: The AcoustiCal will automatically power off after 4 minutes from the last key press.

Battery

A 9-volt battery is used to supply power to the calibrator.

Low Battery

At a low battery condition, the low battery indicator will appear. If the battery level becomes too low, the calibrator will power off.

Changing the battery

The battery door is located on the top of the calibrator. You will need a Phillips screwdriver to change the battery.

1. Loosen the screw on the end of the calibrator with a screwdriver.
2. Lift the battery door off of the calibrator and remove the battery.
3. Replace the battery it according to the polarity diagram inside the unit.
4. To re-insert the battery door, place the battery door over the battery compartment ensuring that the foam pad is positioned over the battery (see Figure 2).

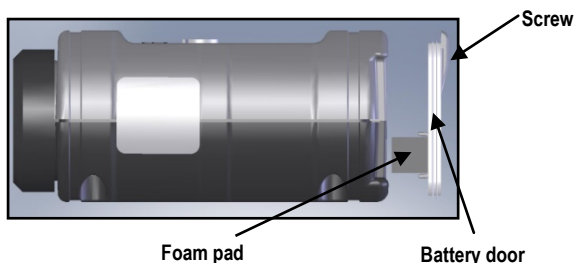


Figure 2: Re-inserting battery door

5. Using your index finger, push the battery door into the slot of the housing. (See Figure 3).

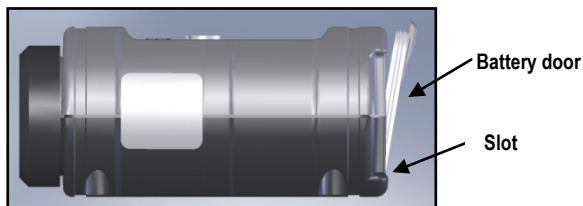


Figure 3: Closing battery door



6. Press the battery door into position and fasten the screw.

Performing a calibration

A microphone is sensitive to temperature and pressure changes. Calibrating before taking measurements assures that your level measurements are accurate for the current environment; and performing a calibration after use allows you to verify the integrity of both the calibrator and the sound level meter.



Note: Please refer to the instrument's user manual for details on calibrating.

1. Ensure the ambient noise level is less than 88 dBA.
2. Slowly insert the appropriate adapter (if needed) and microphone into the calibrator cavity ensuring the microphone is fully seated (or inserted).
3. Power on the calibrator and allow at least 10 seconds to stabilize.
4. Set the appropriate frequency on the AcoustiCal by selecting 250 Hz or 1000 Hz via the  key.
5. Perform the calibration with the sound level meter or dosimeter.
6. Power off when complete by pressing and holding the  key.



Note: The microphone orientation is displayed below for a noise dosimeter and a sound level meter.



Figure 4: Examples of performing a calibration

Factory service on the calibrator

3M recommends checking the performance and precision of your calibrator on an annual basis by sending it to a factory-authorized service center.

The AcoustiCal is calibrated at 3M Company with a Type L standard microphone and with special instrumentation traceable to NIST. The calibrators are very stable; however, they are used to calibrate other equipment, and should be checked periodically against laboratory standards.

Supported microphones and adapters

The AcoustiCal supports the following microphones used with the listed microphones, calibrator adapters. All microphones are supplied by 3M Company. Listed below are the 3M ID/Quest part numbers (Quest P/N).

Approved Microphones	Microphone 3M ID/Quest P/N	Calibration adapter 3M ID/Quest P/N
QE4110 microphone, 1/4" free-field condenser, Class/Type 1 • Uses QE1160 1/4" to 1/2" preamp adapter, Quest P/N: 059-488	• 3M ID: 70-0715-8299-6 • Quest P/N: 059-413	• 3M ID: 70-0715-8113-9 • Quest P/N: 056-988
QE4130 1/2" free-field condenser, Class/Type 1	• 3M ID: 70-0715-8298-8 • Quest P/N: 058-659	• 3M ID: 70-0715-8115-4 • Quest P/N: 056-990
BK4936 1/2" free-field electret, Class/Type 1	• 3M ID: 70-0715-8300-2 • Quest P/N: 059-523	• 3M ID: 70-0715-8115-4 • Quest P/N: 056-990
QE7052 microphone, 1/2" free-field electret Class/Type 2	• 3M ID: 70-0715-8290-5 • Quest P/N: 056-317	• 3M ID: 70-0715-8115-4 • Quest P/N: 056-990
QE4150 microphone, 1/2" free-field condenser, Class/Type 1	• 3M ID: 70-0715-8296-2 • Quest P/N: 058-489	• 3M ID: 70-0715-8290-5 • Quest P/N: 056-990
QE4170 microphone, 1" pressure condenser, Class/Type 1 • Uses 1/2" to 1" preamp adapter, Quest P/N: 058-376/3M ID: 70-0715-8112-1	• 3M ID: 70-0715-8295-4 • Quest P/N: 058-488	N/A
3M™ Edge Microphone, 1/4" free field electret Class/Type 2	• 3M ID: 70-0715-8304-4 • Quest P/N: 057-309	• 3M ID: 70-0715-8106-3 • Quest P/N: 053-753
Pendant microphone, Class/Type 2	• 3M ID: 70-0715-8304-4 • Quest P/N: 053-867	• 3M ID: 70-0715-8107-1 • Quest P/N: 053-884
Boom microphone, Class/Type 2 • Part number: 053-887	• 3M ID: 70-0715-8289-7 • Quest P/N: 053-887	• 3M ID: 70-0715-8107-1 • Quest P/N: 053-884
Microphone 1/2" SD-200, non-removable Class/Type 2	• 3M ID 70-0715-6546-2	• 3M ID 70-0715-8115-4 • Quest P/N: 56-990
Microphone used for certification of AC-300 per IEC 61094: B&K 4192, 1/2" Pressure Condenser, Class/Type 1 supplied by Bruel and Kjaer	N/A	• 3M ID 70-0715-8115-4 • Quest P/N: 56-990

Specifications

Conformance standards

ANSI S1.40- 2006 (R2011): Specifications and Verification Procedures for Sound Calibrators
IEC 60942 (2003-01): Electroacoustics, Sound Calibrators
CE, RoHS, WEEE, C-Tick

Physical characteristics

Size	10 cm x 5.8 cm x 4.6 cm
(Length x Width x Thickness)	3.9" x 2.3" x 1.8"
Weight	0.17 kg (6oz)

Outputs

Frequency	250 (251.2) Hz and 1000.0 Hz, +/- 0.5% with expanded uncertainty in environmental conditions
Sound pressure level	114.0 dB re 20μPA (1 Pa = 1 N/m ²)
Sound pressure level accuracy	+/- 0.4 dB with expanded uncertainty in the reference environment (initial difference) +/- 0.4 dB with expanded uncertainty in the operating environmental conditions, added to initial difference
Variation in output due to power	Less than +/- 0.1 dB

Reference environmental conditions

Temperature range	20°C to 26°C (68 °F to 79°F)
Pressure range	97kPa to 105kPa (29 to 31 inches of Hg)
Relative humidity range	40% to 65% humidity
Temperature settling time	Approximately 1 min/ °C (approximately 30 sec/°F)

Operating environmental conditions

Temperature range	-10°C to 50 °C (14°F to 122°F)
Pressure range	65kPa to 108kPa (19 to 32 inches of Hg) Approximate 3500m to -600m elevation relative to sea level (11500ft to -2000ft)
Relative humidity range	10% to 90%, non-condensing

Stabilization

- Stabilization time after powering the calibrator on and coupling to a microphone is 10 seconds.

Principal

- The principal sound pressure level is 114 dB.
- The principal frequency is 1 kHz.

Distortion

Less than 3% (all harmonics below 30.5 dB) within temperature and humidity at either operating frequencies, unless "overload" is showing.

Storage environmental conditions

Storage temperature range	-20°C to 65°C (-4 °F to 149°F) with battery removed.
Storage humidity range	0% to 90% non-condensing

Coupler volume coefficient

No effect until overload occurs.

Electromagnetic emissions and susceptibility

Emission better than CISPR 22, Class/Type B susceptibility better than 10 V/m, 150 kHz to 1GHz. 50/60 Hz magnetic immunity. No effect. 80 A/m

Background acoustic level

Requires greater than 25 dB signal-to-noise ratio, for optimum performance. If external noise is too high, it may reduce output level.

Power

Battery type	1 x 9v alkaline battery. (p/n 058-176, ANSI/NEDA 1604A, IEC 6LR61)
Battery life	The battery life will be approximately 18 hours (@ 1kHz) at reference environmental conditions, mounted on a microphone.

3M Service

Should your 3M equipment need to be returned for repair or for recalibration, please contact the service department at the following numbers or access the online form via the website.

- **In the United States Contact**

3M company

Service Department

1060 Corporate Center Drive, Oconomowoc, WI 53066

Phone: 262.567.9157 **Toll Free:** 800-245-0779 **Fax:** 262/567-4047

E-mail: 3Mdetectionmail@mmm.com

Internet: www.3M.com/detection

- **In Canada Contact**

Pylon Atlantic

A Division of Pylon Electronics, Inc.

31 Trider Crescent, Dartmouth, NS Canada B3B 1V6

Telephone: 902-468-3344 ext 235 **Fax:** 902-468-1203

Email: tbourgoi@pylonelectronics.com

- **In Europe Contact**

3M Service Centre

3M Health Care Limited

11 Seymour Court

Manor Park, Runcorn, Cheshire, WA7 1SY, ENGLAND

Office: 44 01928 532595 Triminet: 8227 2595

Email: Rnorton@mmm.com (Richard Norton, Service Centre Manager)

- **For Service Outside the United States, Canada and Europe**

Contact your locally authorized 3M Distributor. For assistance, email customer service: 3Mdetectionmail@mmm.com

Warranty

3M warrants our instruments to be free from defects in materials and workmanship for one year under normal conditions of use and service. For United States customers, we will replace or repair (our option) defective instruments at no charge, excluding batteries, abuse, misuse, alterations, physical damage, or instruments previously repaired by other than 3M. Microphones, sensors, printers, and chart recorders may have shorter or longer warranty periods. This warranty states our total obligation in place of any other warranties expresses or implied. Our warranty does not include any liability or obligation directly resulting from any defective instrument or product or any associated damages, injuries, or property loss, including loss of use or measurement data.

For warranty outside the United States, a minimum of one year warranty, applies subject to the same limitation and exceptions as above with service provided or arranged through the authorized 3M distributor or our 3M European Service Laboratory. Foreign purchases should contact the local 3M authorized sales agent for details.

About Us

3M Detection Solutions is a world class manufacturer of rugged, reliable instrumentation and software systems that help monitor and evaluate occupational and environmental health and safety hazards, including noise dosimetry, sound level monitoring, heat stress, indoor air quality and select toxic/combustible gases. The 3M Detection brand of instrumentation is used by safety and industrial hygiene professionals to help comply with applicable occupational standards and regulations.

About 3M Personal Safety

3M offers a comprehensive, diverse portfolio of Personal Safety solutions providing respiratory protection, hearing protection, fall protection, reflective materials for high visibility, protective clothing, protective eyewear, head and face protection, welding helmets, and other adjacent products and solutions such as tactical safety equipment, detection, monitoring equipment, active communications equipment and compliance management. In 2012, 3M celebrated 40 years of safety leadership – recognizing the company's respiratory and hearing protection solutions introduced in 1972. Visit www.3M.com/PPESafety or <http://m.3m.com/PPESafety> for details.



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