

ACOUSTICAL
CALIBRATOR
MODEL AC-300
USER MANUAL



ACOUSTICAL CALIBRATOR MODEL AC-300

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 calibrator 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 calibrator may be field checked by comparing the output with another AcoustiCal calibrator, or reference meter with similar specifications/accuracy.

Intended Use

The AcoustiCal calibrator 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 TSI at 1-800-680-1220 (USA) or (651) 490-2860, or 001 651 490 2860 (International).

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AcoustiCal Calibrator

Models

The TSI 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 (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 calibrator 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 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).

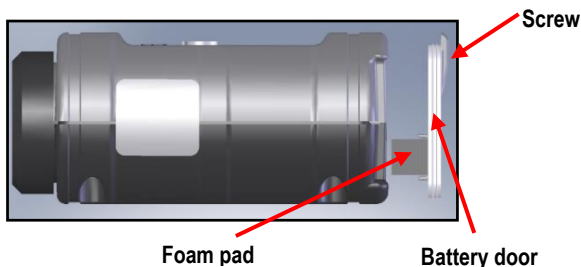


Figure 2: Re-inserting battery door

3 | Performing a calibration

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

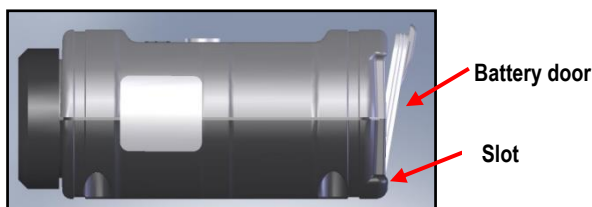


Figure 3: Closing battery door

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: 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 calibrator 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

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

The AcoustiCal calibrator is calibrated at TSI Incorporated 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 calibrator supports the following microphones used with the listed microphones, calibrator adapters. All microphones are supplied by TSI Incorporated. Listed below are the TSI part numbers.

Approved Microphones	Microphone ID / Part Number	Calibration Adapter ID / Part Number
QE4110 microphone, 1/4" free-field condenser, Class/Type 1 Uses QE1160 ¼" to ½" preamp adapter P/N: 059-488	059-413	056-988
QE4130 ½" free-field condenser, Class/Type 1	058-659	056-990
BK4936 ½" free-field electret, Class / Type 1	059-523	056-990
QE7052 microphone, 1/2" free-field electret Class/Type 2	056-317	056-990
QE4150 microphone, ½" free-field condenser, Class/Type 1	058-489	056-990
QE4170 microphone, 1" pressure condenser, Class/Type 1 • Uses ½" to 1" preamp adapter P/N: 058-376	058-488	N/A
TSI Edge Microphone, ¼" free field electret Class/Type 2	057-309	053-753
Pendant microphone, Class/Type 2	053-867	053-884
Boom microphone, Class/Type 2 • P/N: 053-887	053-887	053-884
Microphone ½" SD-200, non-removable Class/Type 2		56-990
Microphone used for certification of AC-300 per IEC 61094: B&K 4192, ½" Pressure Condenser, Class/Type 1 supplied by Bruel and Kjaer	N/A	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 (Length x Width x Thickness)	10 cm x 5.8 cm x 4.6 cm 3.9 in. x 2.3 in. x 1.8 in.
Weight	0.17 kg (6 oz.)

Outputs

Frequency	250 (251.2) Hz and 1000.0 Hz, $\pm 0.5\%$ with expanded uncertainty in environmental conditions
Sound pressure level	114.0 dB re 20 μ Pa (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	97 kPa to 105 kPa (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	65 kPa to 108 kPa (19 to 32 inches of Hg) Approximate 3500 m to -600 m elevation relative to sea level (11500 ft. to -2000 ft.)
Relative humidity range	10% to 90%, non-condensing

Operating environmental conditions

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.

Contact/Service information

This section gives directions for contacting TSI Incorporated for technical information and directions for returning the Model AC-300 Calibrator for service.

Technical Support Contacts

If you have any difficulty setting or operating the instrument, or if you have technical or application questions about this system, contact TSI's Technical Support.

North America and Asia Pacific	Europe, Middle East, and Africa
Telephone: 1-800-680-1220 (USA); +1 651-490-2860 (Outside USA) Fax: +1 651-490-3824 E-mail: technical.services@tsi.com	Telephone: +49 241-52303-0 Fax: +49 241 52303-49 E-mail: tsigmbh@tsi.com

Service Contact Information

If your instrument does not operate properly, or if you are returning the instrument for service, visit our website at <http://rma.tsi.com> for a Return Material Authorization, or contact Customer Service.

North America and Asia Pacific	Europe, Middle East, and Africa
TSI Incorporated 1060 Corporate Center Drive Oconomowoc, WI 53006-4828 Telephone: 1-800-680-1220 (USA); +1 651-490-2860 (Outside USA) E-mail: technical.services@tsi.com	TSI Instruments Ltd. Stirling Road Cressex Business Park High Wycombe, Bucks HP12 3ST United Kingdom Telephone: +44 (0) 149 4 459200 E-mail: tsiuk@tsi.com

Returning for Service

Visit our website at <http://rma.tsi.com> and complete the on-line "Return Merchandise Authorization" form or call TSI at 1-800-680-1220 (USA) or (651) 490-2860, or 001 651 490 2860 (International) for specific return instructions.

Customer Service will need the following information:

- The instrument model number
- The instrument serial number
- A purchase order number (unless under warranty)
- A billing address
- A shipping address

Use the original packing material to return the instrument to TSI. If you no longer have the original packing material, seal off any ports to prevent debris from entering the instrument and ensure that the display and the connectors on the instrument front and back panels are protected. This instrument is very fragile and must be packed in a manner appropriate for a precision instrument.

Warranty

(For country-specific terms and conditions outside of the USA, please visit www.tsi.com.)

Seller warrants the goods, excluding software, sold hereunder, under normal use and service as described in the operator's manual, to be free from defects in workmanship and material for **12 months**, or if less, the length of time specified in the operator's manual, from the date of shipment to the customer. This warranty period is inclusive of any statutory warranty. This limited warranty is subject to the following exclusions and exceptions:

- a. Hot-wire or hot-film sensors used with research anemometers, and certain other components when indicated in specifications, are warranted for 90 days from the date of shipment;
- b. Pumps are warranted for hours of operation as set forth in product or operator's manuals;
- c. Parts repaired or replaced as a result of repair services are warranted to be free from defects in workmanship and material, under normal use, for 90 days from the date of shipment;
- d. Seller does not provide any warranty on finished goods manufactured by others or on any fuses, batteries or other consumable materials. Only the original manufacturer's warranty applies;
- e. This warranty does not cover calibration requirements, and seller warrants only that the instrument or product is properly calibrated at the time of its manufacture. Instruments returned for calibration are not covered by this warranty;
- f. This warranty is **VOID** if the instrument is opened by anyone other than a factory authorized service center with the one exception where requirements set forth in the manual allow an operator to replace consumables or perform recommended cleaning;
- g. This warranty is **VOID** if the product has been misused, neglected, subjected to accidental or intentional damage, or is not properly installed, maintained, or cleaned according to the requirements of the manual. Unless specifically authorized in a separate writing by Seller, Seller makes no warranty with respect to, and shall have no liability in connection with, goods which are incorporated into other products or equipment, or which are modified by any person other than Seller.

The foregoing is **IN LIEU OF** all other warranties and is subject to the LIMITATIONS stated herein. **NO OTHER EXPRESS OR IMPLIED WARRANTY OF FITNESS FOR PARTICULAR PURPOSE OR MERCHANTABILITY IS MADE. WITH RESPECT TO SELLER'S BREACH OF THE IMPLIED WARRANTY AGAINST INFRINGEMENT, SAID WARRANTY IS LIMITED TO CLAIMS OF DIRECT INFRINGEMENT AND EXCLUDES CLAIMS OF CONTRIBUTORY OR INDUCED INFRINGEMENTS. BUYER'S EXCLUSIVE REMEDY SHALL BE THE RETURN OF THE PURCHASE PRICE DISCOUNTED FOR REASONABLE WEAR AND TEAR OR AT SELLER'S OPTION REPLACEMENT OF THE GOODS WITH NON-INFRINGEMENTS.**

TO THE EXTENT PERMITTED BY LAW, THE EXCLUSIVE REMEDY OF THE USER OR BUYER, AND THE LIMIT OF SELLER'S LIABILITY FOR ANY AND ALL LOSSES, INJURIES, OR DAMAGES CONCERNING THE GOODS (INCLUDING CLAIMS BASED ON CONTRACT, NEGLIGENCE, TORT, STRICT LIABILITY OR OTHERWISE) SHALL BE THE RETURN OF GOODS TO SELLER AND THE REFUND OF THE PURCHASE PRICE, OR, AT THE OPTION OF SELLER, THE REPAIR OR REPLACEMENT OF THE GOODS. IN THE CASE OF SOFTWARE, SELLER WILL REPAIR OR REPLACE DEFECTIVE SOFTWARE OR IF UNABLE TO

DO SO, WILL REFUND THE PURCHASE PRICE OF THE SOFTWARE. IN NO EVENT SHALL SELLER BE LIABLE FOR LOST PROFITS, BUSINESS INTERRUPTION, OR ANY SPECIAL, INDIRECT, CONSEQUENTIAL OR INCIDENTAL DAMAGES. SELLER SHALL NOT BE RESPONSIBLE FOR INSTALLATION, DISMANTLING OR REINSTALLATION COSTS OR CHARGES. No Action, regardless of form, may be brought against Seller more than 12 months after a cause of action has accrued. The goods returned under warranty to Seller's factory shall be at Buyer's risk of loss, and will be returned, if at all, at Seller's risk of loss.

Buyer and all users are deemed to have accepted this LIMITATION OF WARRANTY AND LIABILITY, which contains the complete and exclusive limited warranty of Seller. This LIMITATION OF WARRANTY AND LIABILITY may not be amended, modified or its terms waived, except by writing signed by an Officer of Seller.

Service Policy

Knowing that inoperative or defective instruments are as detrimental to TSI as they are to our customers, our service policy is designed to give prompt attention to any problems. If any malfunction is discovered, please contact your nearest sales office or representative, or call TSI's Customer Service department at 1-800-874-2811 (USA) or +001 (651) 490-2811 (International).



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