Piccolo SLM

Integrating Sound Level Meter & Data Logger

User Guide

Rev. 4.2

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Table of contents

INTRODUCTION

Congratulations on your purchase of the Piccolo Integrating Sound Level Meter. The Piccolo SLM with programmable integrating time (1 second to 24 hours) provides precise linearity over a professional and wide range (37 to 105 dB), and displays LEQ, SEL, SPL, LMAX and LMIN measurements. Response time (FAST and SLOW) and frequency weighting (A and C) are programmable. Statistical Analysis (L%) is available. The Piccolo SLM with PC Interface datalogs (stores) up to 10,000 readings for subsequent transfer to a PC. The Piccolo SLM makes use of a professional and newly developed MEMS microphone with advanced electronics. Compact and innovative, this meter will provide years of reliable service.

SUPPLIED MATERIALS AND OPTIONAL ACCESSORIES

SUPPLIED MATERIALS

1. Piccolo Unit
2. USB connection cable
3. 1 Lithium CR2450 battery
4. PC software
5. Carrying case
6. Windscreen

OPTIONAL ACCESSORIES

Silicone protective cover with removable belt clip

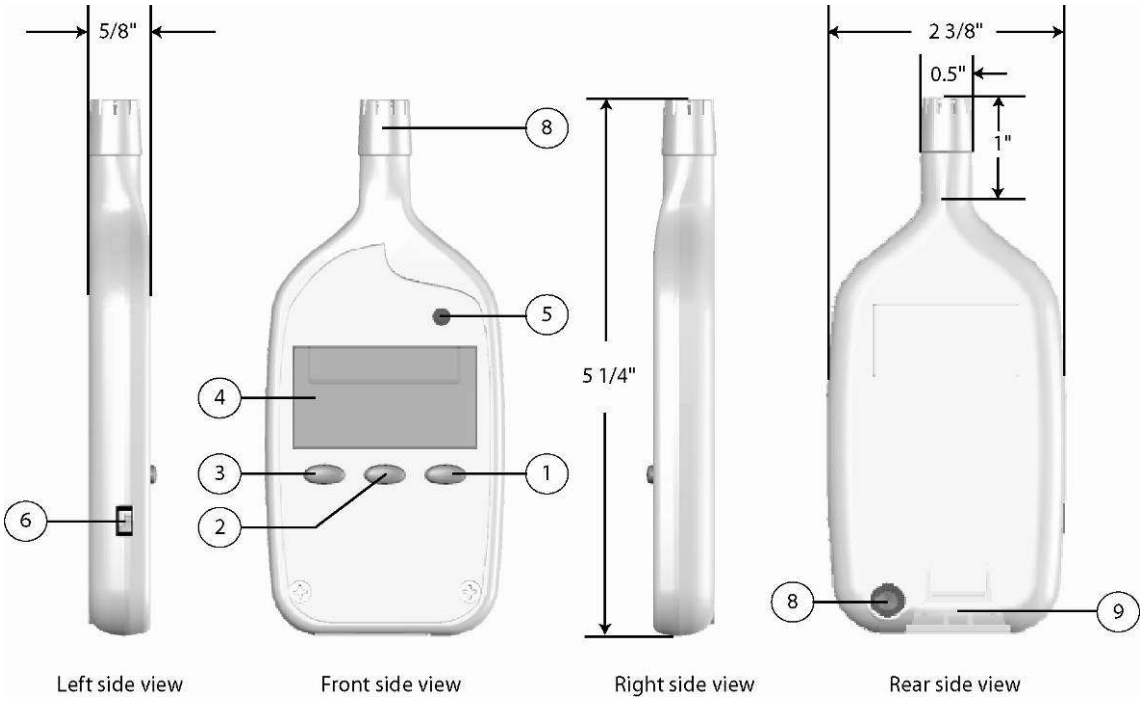
SPECIFICATIONS

Measurement types	LEQ, SPL, SEL, LMAX, LMIN and Statistical Analysis (L%)
Measurement range	37 to 105 dB
Frequency range	31 Hz to 8000 Hz
Frequency weighting	A and C
Response time	FAST and SLOW
Linearity range	68 dB
Display resolution	0.1 dB
Accuracy	±1.5 dB (94 dB @ 1 kHz)
Microphone	MEMS (Micro-Electrical Mechanical System) RANDOM incidence
Numeric display	4-digit LCD
Display update rate	4 times per second
Bar graph display	3 dB per step (24 segments)
Bar graph update rate	8 times per second
Display warnings	OVER/UNDER range LED Alarm and MEMORY FULL indicator
Power supply	1 Lithium CR2450
Battery life	approx. 300 hours at 20°C (less at lower temperature)
Operating conditions	32 to 140 ºF (0 to 60 ºC); 90 % relative humidity
Storage conditions	-4 to 158 ºF (-20 to 70 ºC); 75 % relative humidity
Dimensions	5 3/16" X 2 5/16" X 5/8" (132 mm X 59 mm X 15 mm)
Weight	Approximately 4.2 oz (120 grams)
Tripod mounting screw	3/8" (4.7 mm)
Standards	IEC 651/804 and ANSI S1.4 Type 2 for dBA and dBC

WARRANTY

SOFT DB INC. warrants this instrument to be free of defects in parts and workmanship for one year from date of shipment (a six-month limited warranty applies on sensors and cables). Should it become necessary to return the instrument for service during or beyond the warranty period, please contact us at (418) 686-0993 for authorization or visit our website at www.softdb.com (Click on Contact to get more information). A return authorization (RMA) must be issued before any product is returned to Soft dB. The sender is responsible for shipping charges, freight, insurance and proper packaging to prevent damage in transit. This warranty does not apply to defects resulting from actions of the user such as misuse, improper wiring, operation outside of specification, improper maintenance or repair, or unauthorized modifications. Soft dB specifically disclaims any implied warranties or merchantability or fitness for a specific purpose and will not be liable for any direct, indirect, incidental or consequential damages. Soft dB's total liability is limited to repair or replacement of the product. The warranty set forth is inclusive and no other warranty, whether written or oral, is expressed or implied.

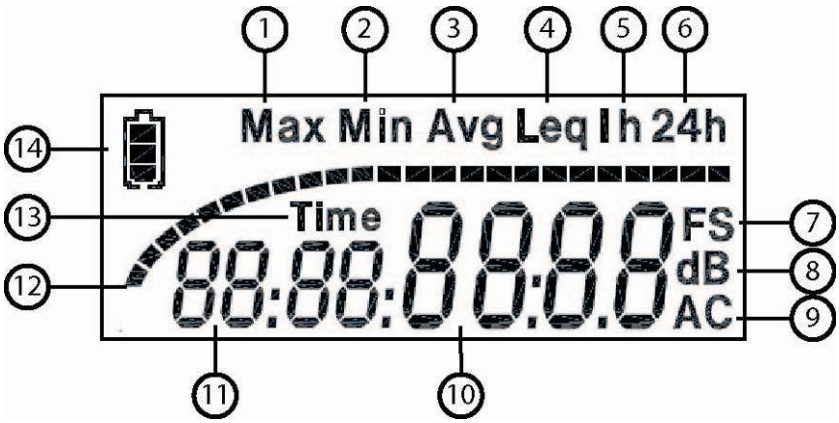
SOUND LEVEL METER DESCRIPTION



1. Power/Play/Stop button
2. Store/Auto-Store button
3. Display / Custom Action[1] button
4. LCD
5. Alarm LED
6. PC Interface Input connector
7. Microphone compartment
8. Tripod mounting screw
9. Battery compartment

[1] The custom action, which is selectable trough the software, makes it possible to either calibrate the Piccolo or switch between the dBA and dBC units.

DISPLAY DESCRIPTION



1. Maximum SPL Value
2. Minimum SPL Value
3. Measurement Average
4. Equivalent Continuous Level
5. LEQ 1 hr. completed
6. LEQ 24 hrs completed
7. Response Time (FAST / SLOW)
8. Units (dB)
9. Frequency weighting A or C
10. Elapsed Time (minutes / seconds)
    Measured value (37 to 105 dB)
    Low Battery
11. Elapsed Time (days / hours)
    Auto-Store
    High / Low range
    Memory Full / Time Lost
    SPL / SEL / Record Number
12. Bar Graph (65 dB range, 24 segments)
13. Measurement Time
14. Battery Life

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PICCOLO STANDALONE OPERATION

POWER-UP

To power ON the Piccolo meter, press and hold the *POWER* button for 3 seconds. Use the same procedure to power OFF the meter.

- Change Display: *Single press*
- Custom Action: *Hold for 3 sec* (dBA/dBC or Calib)

- Power ON/OFF: *Hold for 3 sec.*
- Start/Stop Measurement: *Single press*

- Single Store: *Single press*
- Auto-Store: *Hold for 3sec.*

When powered ON, the meter will start performing ***LEQ*** averaging. The ***LEQ*** level is displayed to the right of the LCD. The bar graph will move back and forth as a function of the instantaneous sound pressure level. The ***LEQ*** value is the average sound pressure level over a given period of time. The default measurement parameters are:

- Response time: Fast
- Frequency Weighting: A
- ***Leq*** averaging period: 1 hour
- Data Storing Selection: Leq, Lmin, Lmax and L% (2 dB resolution statistics)
- Custom Action: Switch frequency weighting (unit dBA or dBC)

To change these measurement parameters, see the **Measurement parameters Set-up** section.

PICCOLO STANDALONE OPERATION

MEASUREMENT

Two measurement modes are available:

- **Manual Start/Stop**: Single Leq period, manual record
- **Auto-Store**: Several Leq periods, automatic record

Manual Start/Stop measurements

Press the *Start/Stop* button to begin/end the ***Leq*** averaging measurement process.

After the averaging process is started, the Piccolo switches to the Leq display. The ***AVG*** indicator is also displayed to indicate that the average is in progress**.**

Once the averaging process is completed (or manually stopped), the Piccolo is forced to the Leq display once again (***Leq*** indicator appear). The ***AVG*** indicator does not appear anymore to indicate that there is no average in progress. With the default measurement settings, the manual averaging process will automatically stop after 1 hour.

Lmax, Lmin, Time (elapsed), ***SPL, SEL*** and ***Record number*** associated to the current averaging can also be displayed during the measurement process. See the **Display navigation** section below.

DATA Storage

Press the *Store* button at the end of the measurement process, or at any time during the measurement process to store the current data into the Piccolo's memory. Any manual averaging process would then be stopped.

The default data storing selection is:

- ***Lmax***, ***Lmin, Leq*** & ***SEL***
- ***L% (Statistics)***: Complete distribution of ***SPL*** over the averaging period, with a 2 dB resolution

To change these stored parameters, see the **Storage Set-up** in the **Setup menu** section of this guide.

Auto-Store measurements

1. Press and hold for 3 seconds the *Store* button. The ***Record number*** of the measurement is displayed for 3 seconds. The measurement starts and the ***AVG*** indicator blinks.
   At the end of every measurement periods, the data will be automatically stored into memory and a new measurement will automatically start again.
2. Press and hold the *Store* button for 3 seconds to stop measuring in *Auto-Store* mode. The ***Record number*** that corresponds to the measurement will be displayed again.

NOTES:

- By default, the averaging period of the *Auto-Store* mode is 1 hour. This measurement period can be set from 1 second to 24 hours. See the **Measurement parameters set-up** section to change the ***Leq*** averaging time and other measurement parameters for the *Auto-Store* mode**.**
- In *Auto-Store* mode, the *Start/Stop* function is disabled, but the *Power OFF* function can still be activated by the rightmost button on the unit.

PICCOLO STANDALONE OPERATION

DISPLAY NAVIGATION

Press the *Leq/Lx* button to successively display the ***Lmax***, ***Lmin***, ***Time*** (elapsed), ***SPL***, ***SEL*** and ***Record number*** of the current measurement.

Leq: The equivalent continuous sound level is the average level since the beginning of the average period.

Lmax: The maximum sound pressure level is the highest value recorded during the current averaging process.

Lmin: The minimum sound pressure level is the lowest value recorded during the current averaging process.

SPL: Sound Pressure Level: current noise level according to the time response settings. (FAST or SLOW)

SEL: The sound exposure value is the equivalent total sound energy of a measurement over 1 second. It is mostly used for fluctuating measurements over a short period of time, like a car passing by.

REC: Record number of the last stored data in the Piccolo's memory in *Manual* mode, or current data in the *Auto-store* mode.

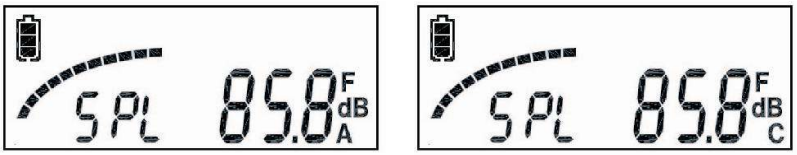
Time: Elapsed time of the current averaging process.

PICCOLO STANDALONE OPERATION

DISPLAY – ADDITIONAL INFORMATION

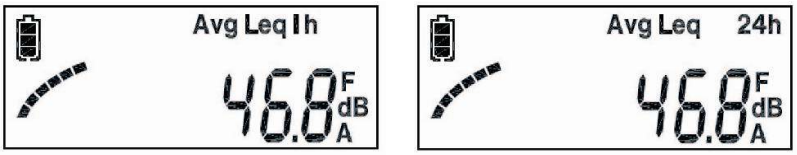
Average Indicator: The ***AVG*** indicator is displayed to indicate that an average measurement is in progress. A steady AVG indicator means that a Manual measurement is in progress. A blinking indicator means that an AutoStore measurement is in progress.

Frequency weighting: An **A** or **C** is displayed below the dB unit label as an indication of the selected frequency weighting.

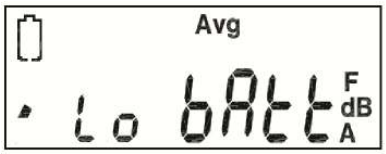


Fast/Slow response: An **F** or **S** is displayed over the dB unit label as an indication of the SPL exponential filter response. An F stand for fast (τ = 1/8 sec) and S for slow (τ = 1 sec).

Leq 1h and Leq 24h: For measurement periods of 1 or 24 hours, the ***Leq 1h*** or ***Leq 24h*** indicators are displayed at the end of the measurement period.

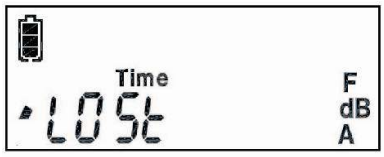


Battery Indicator: The battery indicator appear in the top left of the LCD display. The Piccolo unit will work normally when the level is at 1 bar out of 3 or more.
As the battery reaches the low level (0/3 bar), the remaining battery contour will blink to indicate that the battery needs to be replaced. Also, any AutoStore averaging would be stopped and saved. In battery low level, the user cannot record data nor recalibrate the unit. Any attempt of an executing a disabled function will result in a *Low Batt* indication. Measurements can still be done in Manual Play/Stop mode, but it would not be possible to record it.
As the battery reaches even lower than low level, the Piccolo unit simply close after displaying the *Low Batt* indication.



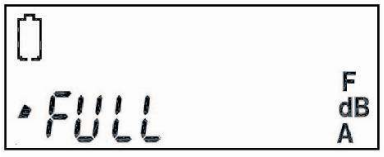
PICCOLO STANDALONE OPERATION

Time Lost Indication: If the time reference has been lost, a *Time Lost* indication will be displayed at the opening of the Piccolo unit. This means that further recordings will not have an exact timestamp. It generally occurs when the battery is removed while the unit is powered on. Therefore, it would be a good idea to power off the unit before replacing the battery. To set the clock on the Piccolo (and to make data post-processing more convenient), see the **Time Set-up** in the **Setup menu** section.

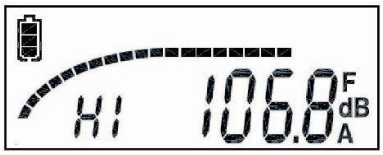


Note: The battery is a Lithium CR2450-3V. It lasts about 300 hours (12 days in measurement mode or up to half a year of about 1 hour/day). To replace the battery, open the compartment at the bottom rear, and tap the Piccolo in your hand slightly. If the battery does not come out, you can stick an adhesive tape on it and pull it out. The lithium CR2450 can be found in most general stores selling batteries for small electronic devices. The Lithium CR2450 is not rechargeable.

Memory Full: The memory full indicator is displayed when there is no more memory space available. The data will have to be erased to allow new recordings (see **Erasing Data** in the **Setup menu** section for instructions).



Low/High level: The low or high level indicators will be displayed on the left of the display when measurements are outside of the qualified linear range of the instrument. The indicator appears only in ***Leq*** and ***SPL*** displays. In conformity with the standards, the high level of the ***Leq*** display is triggered as high level is reached and will not be reset until a new measurement is started. In ***SPL*** display, low/high indicator appears as an instant result of the SPL level.



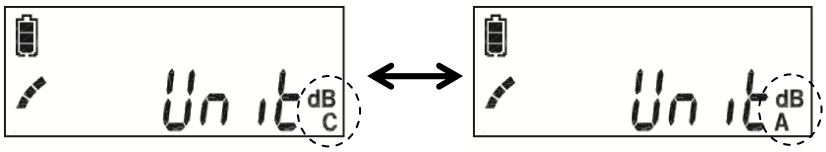
PICCOLO STANDALONE OPERATION

CUSTOM ACTION: DBA/DBC SWITCH

As for other parameters, the dBA/dBC units can be changed trough the software. It is also possible to switch between dBA and dBC units in standalone operation, but only if the custom action has previously been set to "dBA/dBC". This action is the the factory default.

To switch the units,

1. Press and hold the *Lx/Leq Display* button for 3 seconds
2. The meter will display the message "Unit" matched with a visual transition from the current units to the new units.
3. After the process, a Manual measurement is automatically started (Avg should appear).



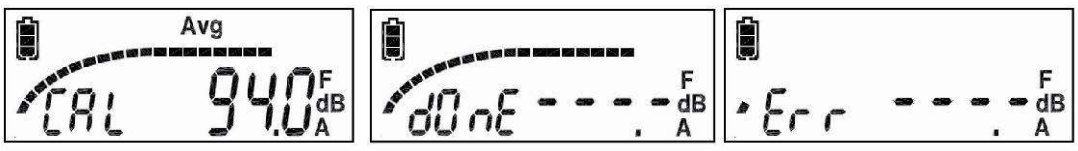
CUSTOM ACTION: CALIBRATION

The calibration of each Piccolo is done at the factory and the sensitivity is saved in the internal memory. It is however a good practice to verify the sensitivity of the equipment to ensure proper result.

The calibration of the Piccolo unit can be done trough the software (refer to the **Calibration Menu** section). It is also possible to calibration a unit in standalone operation, but only if the custom action has previously been set to "Calibration". Also, the standalone calibration only recalibrates the active frequency weighting (A or C).

To proceed to a new sensitivity calibration,

1. Insert the Piccolo into the acoustical calibrator generating a 94 dB at 1 kHz. (Equipment not provided)
2. Press and hold the *Lx/Leq Display* button for 3 seconds
3. The meter will display a blinking "CAL" and the current level measured by the Piccolo.
4. The Piccolo will then automatically adjust the sensitivity to obtain 94 dB and display "d*one*" when the process is completed (about 4 sec). If an error occurred during the process (for example, if no calibration signal is detected), the display will show "Err" and the sensitivity value will not be up-date.
5. After the process The Piccolo will switch to the SPL display. If the calibrator is still in place, the level should indicate 94 dB.



The Piccolo will go back to the standard Leq manual measurement mode after the process.

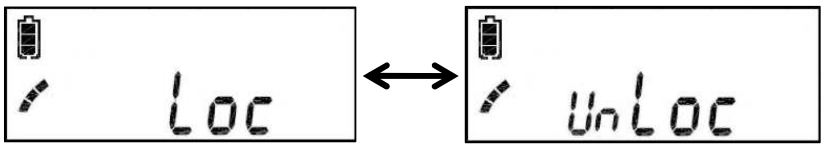
PICCOLO STANDALONE OPERATION

LOCK/UNLOCK BUTTONS

The normal operation of the buttons on the Piccolo unit can be disabled (locked). Then, the user would be unable to stop or close the unit unless it is unlocked first. This feature allows avoiding accidental actions during a measurement. The lock/unlock process has no effect on the measurements.

The procedure is the same for locking and unlocking the unit:

1. Press and hold the all three buttons for 3 seconds
2. The meter will display the message “loc” or “unloc” to indicate if the unit has been locked or unlocked.



If the user press one of the buttons once the unit is locked, the “loc” message will be displayed again.

PICCOLO PC OPERATION

INSTALLATION

Requirements: The Piccolo Software must be installed on the PC that will be used with the unit. **DO NOT CONNECT THE PICCOLO USB CABLE** before the Piccolo Software is installed on the PC (see the Quick Guide instructions to install the Piccolo Software).

Step 1: Connect the Piccolo SLM to a PC via the supplied Piccolo USB cable.

Note: The Piccolo USB cable is a unique cable with embedded electronic components. Do not attempt to use another cable with the Piccolo unit and do not use the Piccolo USB cable with other devices. Inappropriate use can break the Piccolo unit and/or the Piccolo USB cable. In such a case, the warranty will not apply.

Step 2: Start the Piccolo Software. The **SETUP** screen will appear on start-up.

Note: The remote keypad can be used to control the unit.

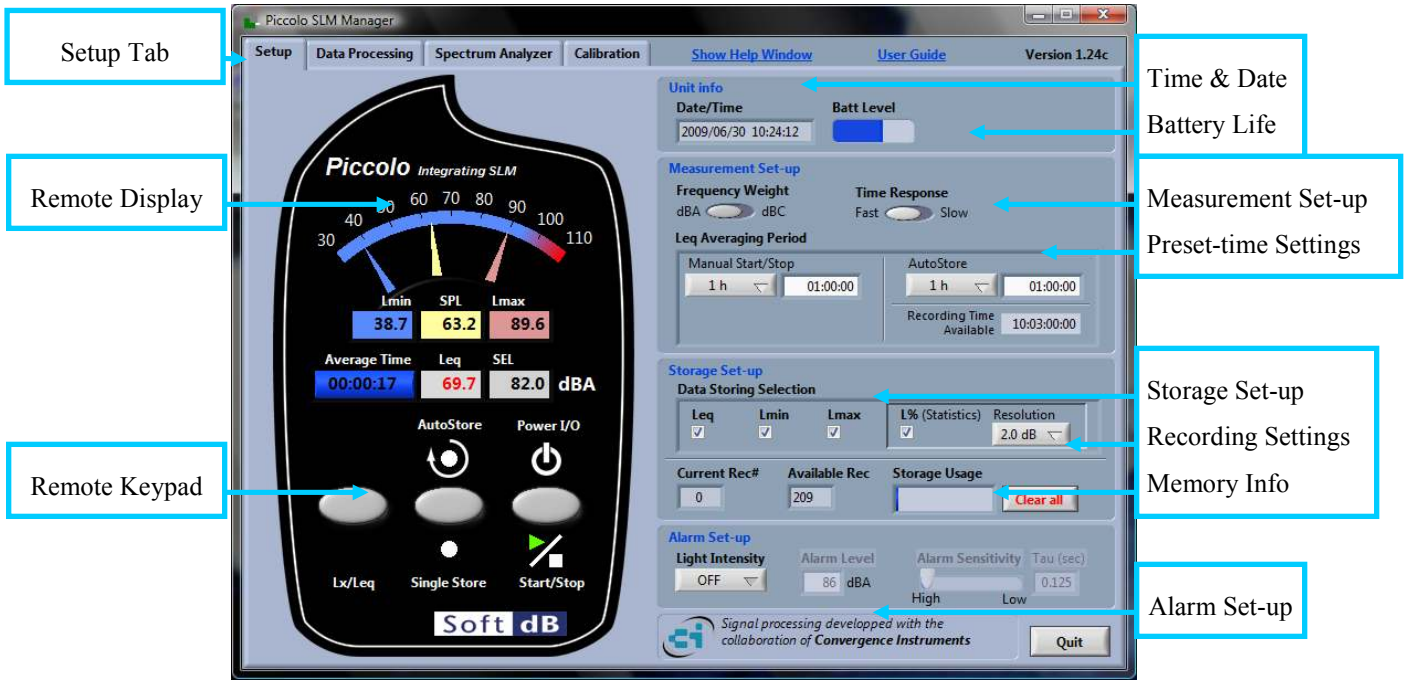


Figure 1: Setup menu (Main menu)

PICCOLO PC OPERATION

SETUP MENU

Time Setup

At start-up, the *Time & Date* on the Piccolo is automatically verified and adjusted if the clock's difference is greater than 5 minutes.

The *Time & Date* can be manually synchronized with the PC by right-clicking on the *Time & Date* field.

Note: If some stored data in the Piccolo do not have the proper time reference or are corrupted, the software application will request to save the current data in a file before erasing the data in the Piccolo's memory and setting the current *Time & Date*.

Measurement parameters Setup

Select the desired acoustical measurement parameters:

- Frequency weighting: dB(A) or dB(C)
- Time response: SLOW (1 sec.) or FAST (1/8 sec.)
- *LEQ* averaging time:

  A selection of averaging times and a custom time are available for both Manual and AutoStore measurement modes.

1 sec (AutoStore Only)	10 sec	1 min	5 min	10 min	30 min	1 h	8 h	24 h	**Custom**

Note: When the averaging process is running, (the ***AVG*** indicator is displayed on the LCD), measurement parameters cannot be modified on the **Setup menu**.

Storage Setup

Data Selection

Select the results to be stored: ***LMAX***, ***LMIN***, ***LEQ*** *(&* ***SEL****)*, and/or ***L%*** using the check boxes.

Record Time Available varies with the *Leq Averaging Period* and the selected data to be stored. For more recording space, unselect data types. ***L%*** is by far the data that uses the most memory. When ***L%*** is used, reducing the *Resolution* will allow more data storage space.

For an averaging period of 1 hour, storing all the data with a resolution of 2.5 dB for ***L%*** allows approximately 12 days of measurements. If only ***LMAX***, ***LMIN*** and ***LEQ*** data are stored, the total recording time would be up to 142 days[2]. The recording space varies greatly as a function of stored data and the averaging period.

Erasing data

When the meter's memory is full, the LCD will display the memory full indicator.

Use the *Clear All* action button to clear memory space. Before erasing memory, if desired, retrieve the current data in the memory using the **Data Processing menu**.

[2] The *Low Battery* event would normally occurs before the M*emory Full* event.

PICCOLO PC OPERATION

DATA PROCESSING MENU

Data Retrieval

When this page is called into function, the data in the Piccolo's memory will be retrieved and displayed automatically. The *Refresh recordings* action button can also be used to read the data again (this function can be useful when the Piccolo is in *Auto-Store* mode during data processing).

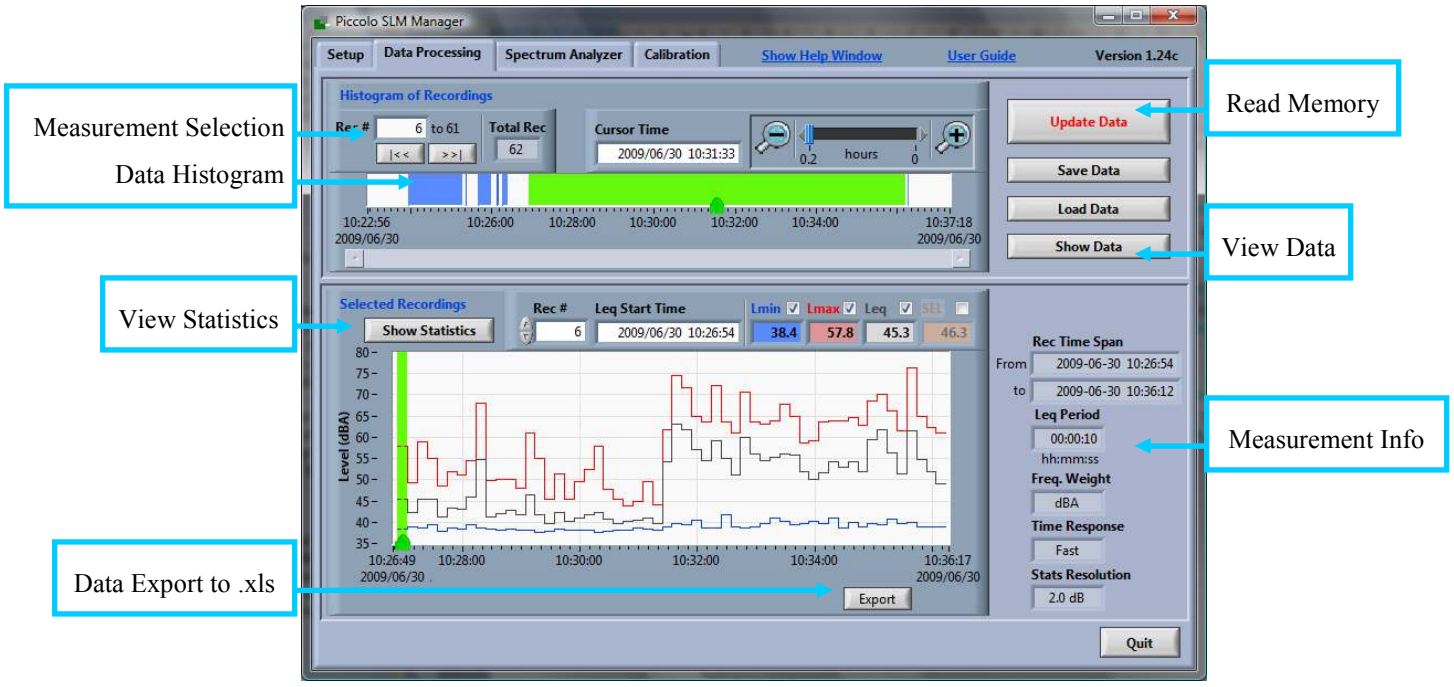


Figure 2: Data Processing menu

Data Analysis

Upper graph:

- Shows a history of the recorded data in the memory.
- Records obtained with the single store button (*Manual* mode) are represented by a single thin blue line.
- Records having 2 or more sets of data (generated by the *Auto-Store* mode) are represented by a block; the width of the block represents the length of the measurement.
- The green cursor allows selection of the record which is to be analyzed in the lower graph.
- The *Show Data* action button displays all the data recorded in the Piccolo's memory.

Lower graph:

- Value contained in the record selected on the upper graph: ***LEQ***, ***LMIN***, ***LMAX*** and/or ***SEL***.
- For a manual store, each record will contain only one set of data.
- Using the cursor on the lower graph allows selection of the data set for analysis.
- If ***L%*** statistics are available, the *Show Statistic* action button can be activated to get the statistical results.

PICCOLO PC OPERATION

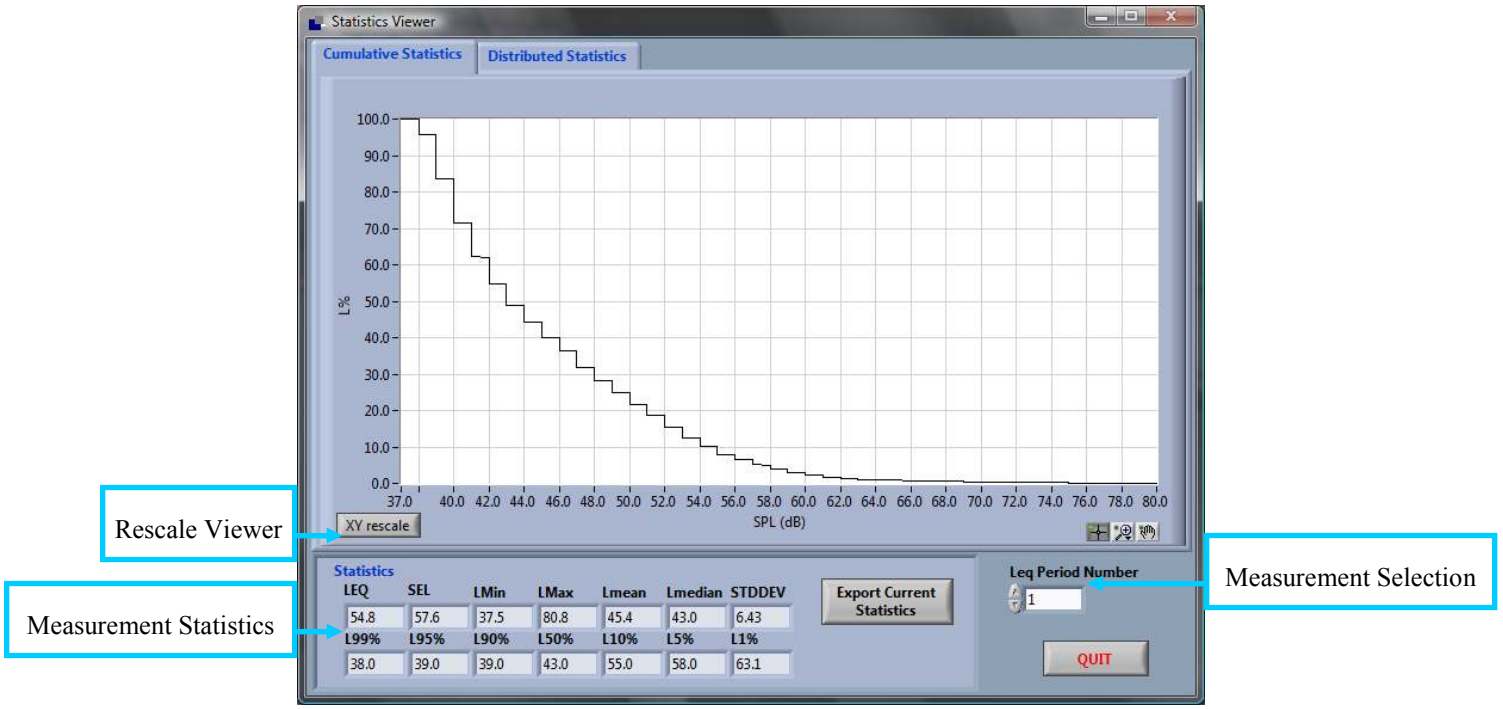


Figure 3: Cumulative Statistics Viewer

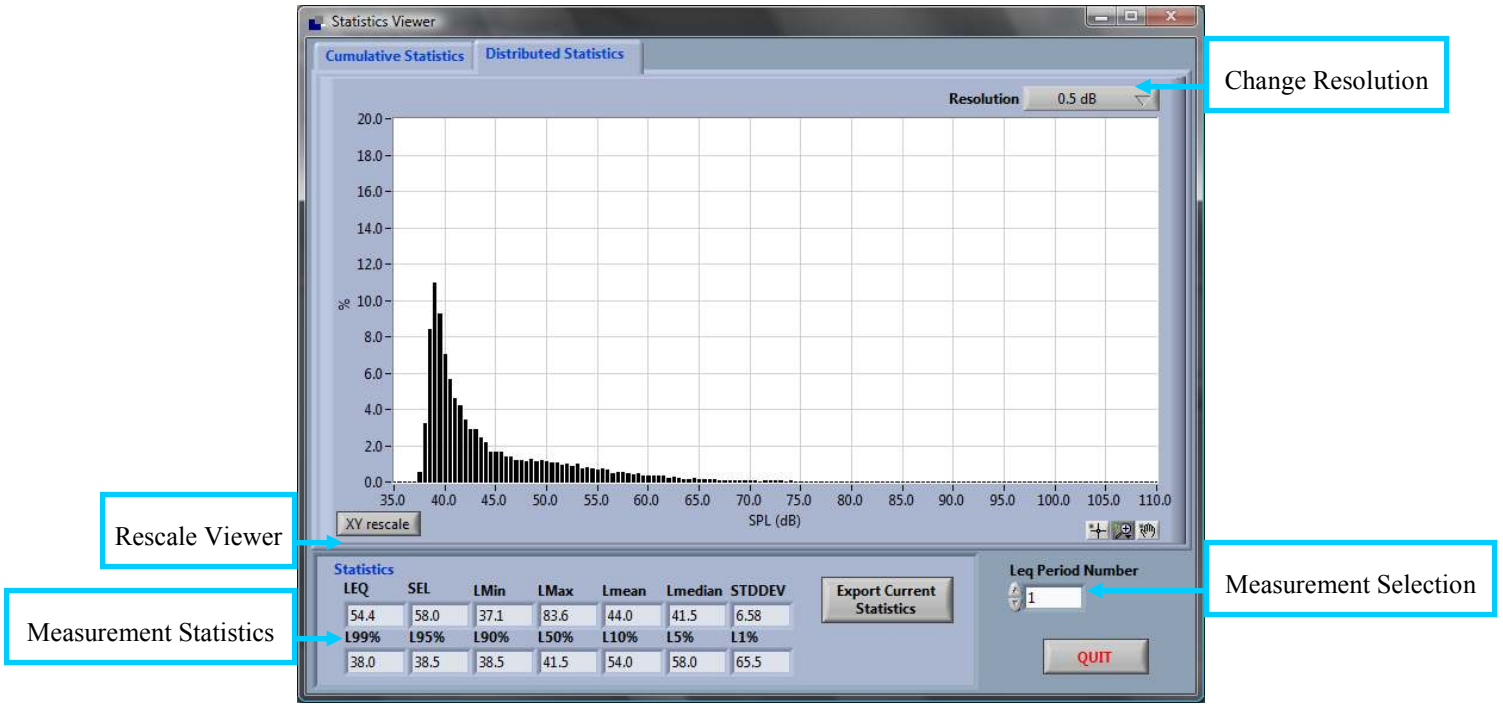


Figure 4: Distributed Statistics Viewer

PICCOLO PC OPERATION

SPECTRUM ANALYSIS

The Spectrum Analyzer tab allows Octave, 1/3 Octave and narrow band frequency analysis.

Step 1: Select the desired acoustical measurement parameters:

- Frequency weighting: dB(A) or dB(C)
- Average type*: Exponential or Linear*
- Number of averages (number of data considered in the exponential averaging process)

Step 2: Press the START/STOP button to begin or end current measurement.

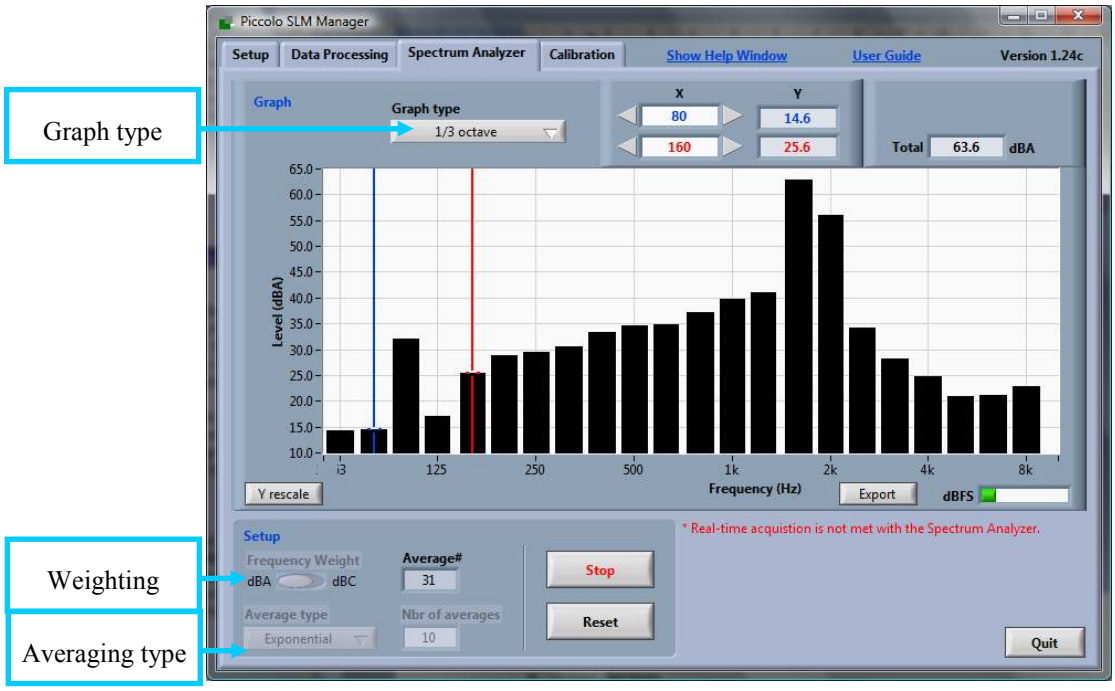


Figure 5: Spectrum Analyser menu

Graph types available are :

- Time Signal
- Instant Spectrum
- Auto Spectrum
- 1/3 Octave
- Octave

The averaging setup is not relevant when the *Instant Spectrum* graph type is display.

Value at specific frequency:

The blue and read cursors can be moved to get results from specific frequencies. For the spectrum graph types, the energy between the 2 cursors is also revealed.

Note: ***Real time analysis is not ensured due to PC communication delay (*****parts of the signal like impulses may not be considered during acquisition).**

PICCOLO PC OPERATION

CALIBRATION MENU

The sensitivity of Each Piccolo Integrating SLM unit is adjusted at the factory. The user can verify and/or proceed to a new calibration using the **Calibration menu**.

Note: Calibrating the Piccolo Integrating SLM requires an acoustical calibrator (not provided) that produces 94 dB at 1 kHz.

1. Verify that the meter reads 94 dB by configuring the meter as follows:
   - Display: ***SPL*** [dB(A)]
   - Time weighting mode: FAST
2. Insert the Piccolo into the acoustical calibrator and click on the *Calibration* tab. Select *Start Calibration*. Follow the on-screen steps to calibrate the Piccolo SLM microphone (see figure 6)
3. Save the calibration to the PC with the *Save calibration into file* button.

   Note: The calibration can also be loaded with the *Recall calibration from file* button.

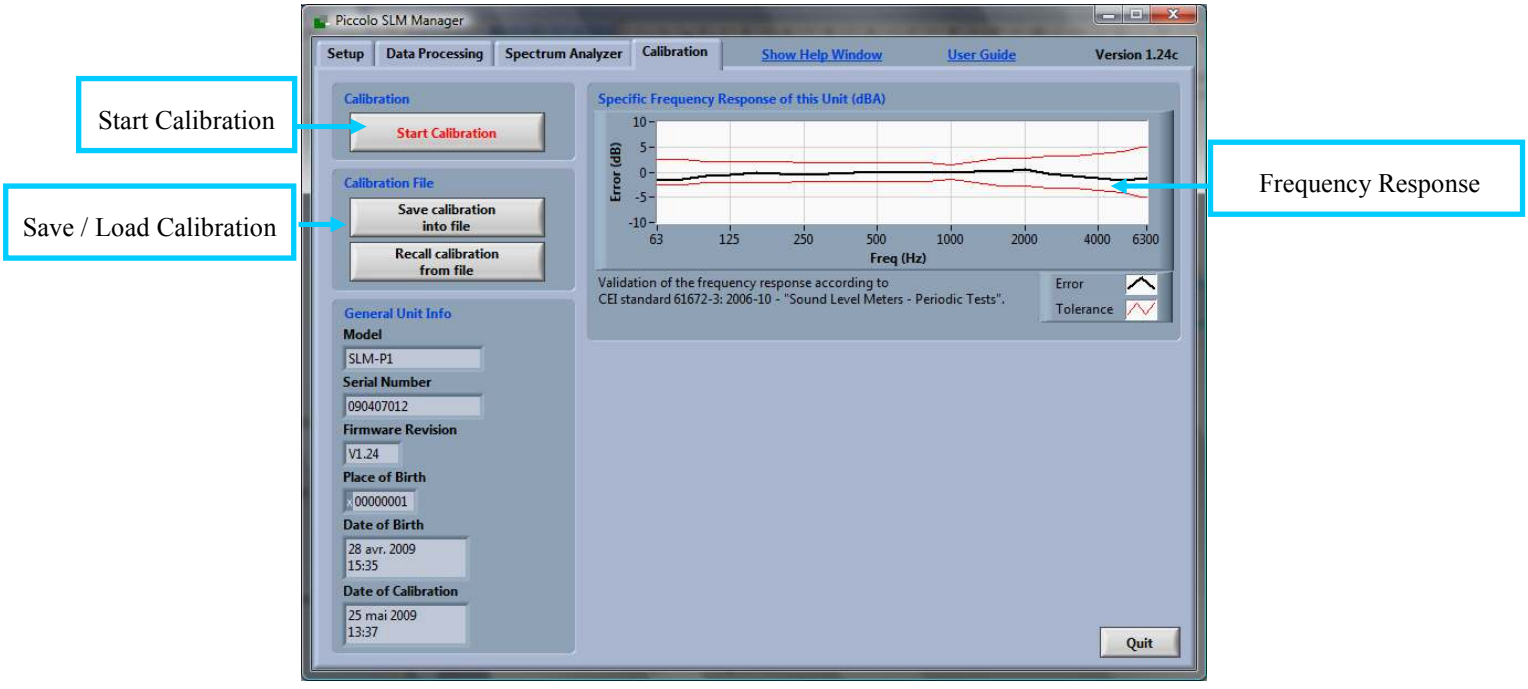


Figure 6: Calibration menu

Frequency response

The Frequency response of each Piccolo is measured at the factory according to CEI standard 61672-3: 2006-10 - "Sound Level Meters - Periodic Tests" and/or with a BK-4226 Multifunction acoustic calibrator.

The Frequency response of the unit is display on the upper graph of the Calibration Tab as the tolerance of the CEI standard.

PICCOLO PC OPERATION

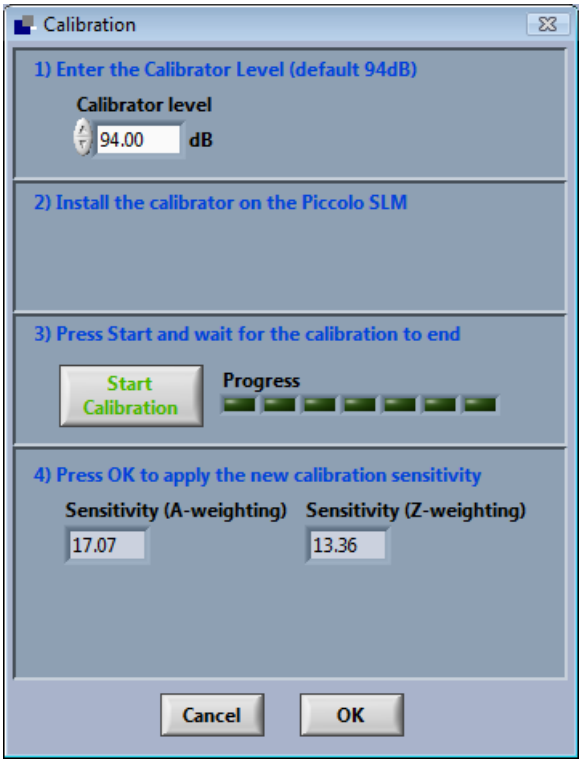


Figure 7: Software Calibration settings

ANNEX A : FREQUENCY WEIGHTING CURVES

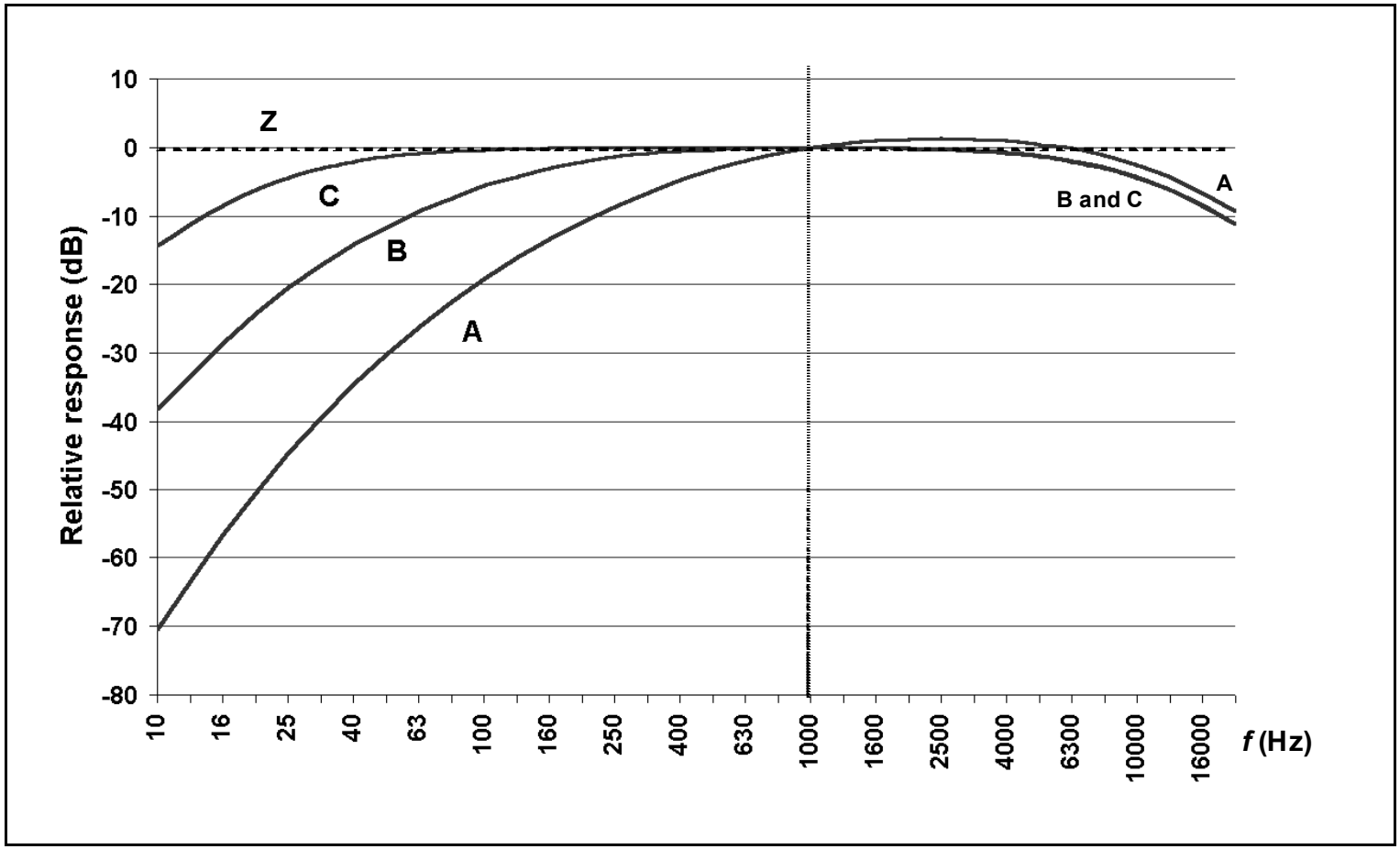


Figure 8: Frequency weightings A, B, C and Z