



ZX3300

Sound Level Analyzer

User Manual



Copyright

Copyright 2025-2028, by ZXONIC Technology, Inc. This manual is copyrighted, with all right reserved. The manual may not be copied in whole or in part for any use without prior written consent of ZXONIC Technology, Inc.

FCC Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- 1) This device may not cause harmful interference, and
- 2) This device must accept any interference received, including interference that may cause undesired operation. Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

Specific Absorption Rate (SAR) information:

This Device meets the government's requirements for exposure to radio waves. The guidelines are based on standards that were developed by independent scientific organizations through periodic and thorough evaluation of scientific studies. The standards include a substantial safety margin designed to assure the safety of all persons regardless of age or health. FCC RF Exposure Information and Statement the SAR limit of USA (FCC) is 1.6 W/kg averaged over one gram of tissue. The device has also been tested against this SAR limit. This device was tested for typical body-worn operations with the back of the device kept 0mm from the body. To maintain compliance with FCC RF exposure requirements, use accessories that maintain an 0mm separation distance between the user's body and the back of the device. The use of belt clips, holsters and similar accessories should not contain metallic components in its assembly. The use of accessories that do not satisfy these requirements may not comply with FCC RF exposure requirements, and should be avoided.

Health and Safety Consideration

This apparatus has been designed and tested in accordance with IEC/EN 61010 – 1. This manual contains information and warnings that must be followed to ensure safe operation and to retain the apparatus in a safe condition.

Safety Usage Consideration

When using the ZX3300 Sound Level Analyzer, it is crucial to adhere to safety guidelines to prevent fire hazards or personal injury. Ensure that you fully read and understand the safety notice before use. Always operate the device only for its intended purpose and refrain from unauthorized disassembly, as tampering may lead to malfunctions or unsafe conditions. If the device begins to overheat or show signs of malfunction, immediately cease operation to avoid potential risks. For any required repairs, always contact ZXONIC rather than attempting fixes yourself. Additionally, keep the device away from heat sources, open flames, or high-temperature areas to ensure safe and optimal acoustic performance.

Limited Warranty & Limitation of Liability

ZXONIC made every effort to ensure the accuracy of the information contained in this document. No responsibility is accepted for any errors or omissions herein. It is the responsibility of the user to ensure compliance with any legal or statutory requirements in the country of use. Data and legislation may change; therefore, users are advised to obtain copies of the most recently issued applicable regulations, standards, and guidelines.

The ZX3300 Multifunctional Sound Level Meter is warranted to be free from defects in material and workmanship under normal use and service. The warranty period is two (2) years from the date of shipment. Parts, product repairs, and services are warranted for ninety (90) days. This warranty is limited to the original purchaser and is not applicable to fuses or any product that, in ZXonic's sole discretion, has been subjected to misuse, alteration, neglect, contamination, accidental damage, or abnormal conditions of operation or handling.

ZXonic warrants that the software will operate substantially in accordance with its functional specifications for a period of ninety (90) days and that it has been properly recorded on non-defective media. ZXonic does not warrant that the software will be error-free or uninterrupted.

Warranty support is available solely for products purchased through ZXonic. ZXonic reserves the right to charge the buyer for costs related to repair or replacement parts.

ZXonic's warranty obligation is limited, at its discretion, to either a refund of the purchase price, free repair, or replacement of a defective product returned to ZXonic within the warranty period. To obtain warranty service, the buyer must contact ZXonic for return authorization and then send the product along with a description of the issue, postage, and insurance prepaid (FOB Destination). ZXonic assumes no responsibility for damage during transit.

Upon completion of warranty repair, the product will be returned to the buyer, transportation prepaid (FOB Destination). If ZXonic determines that the failure resulted from neglect, misuse, contamination, alteration, accident, abnormal operating conditions, overvoltage failure outside the specified rating, or normal wear and tear of mechanical components, ZXonic will provide an estimate of repair costs and seek authorization before proceeding with repairs. Following repairs, the product will be returned to the buyer, prepaid transportation, and the buyer will be responsible for payment of the repair costs and return shipping charges (FOB Shipping Point).

THIS WARRANTY SHALL CONSTITUTE THE BUYER'S SOLE AND EXCLUSIVE REMEDY AND SHALL BE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ZXONIC SHALL NOT BE LIABLE FOR ANY SPECIAL, DIRECT OR INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING LOSS OF DATA, ARISING FROM ANY CAUSE OR THEORY OF LIABILITY.

Some jurisdictions do not permit limitations on the duration of implied warranties or the exclusion or limitation of incidental or consequential damages, so the above limitations may not apply to all buyers. If any provision of this warranty is held to be invalid or unenforceable by a court or other competent authority, such holding shall not affect the validity or enforceability of the remaining provisions.

Revision History

Revision	Description	Revision Date
V 1.0	Initial Release	July 2025
V 1.1	Typo Error Fix	September 2025

Table of Contents

Copyright	- 1 -
FCC Caution	- 1 -
Health and Safety Consideration	- 2 -
Safety Usage Consideration	- 2 -
Limited Warranty & Limitation of Liability	- 3 -
Revision History	- 4 -
Table of Contents	- 5 -
1 Overview	- 9 -
2 Key Features	- 9 -
3 Main Performance Indicators	- 10 -
3.1 Basic Performance Indicators	- 10 -
3.2 Additional Features	- 11 -
3.3 Optional Features	- 11 -
4 Structural Features	- 14 -
5 Symbols and Abbreviations Definitions	- 17 -
5.1 Symbols displayed by the instrument and its definition	- 17 -
6 Use Instructions	- 20 -
6.1 Preparation Before Use	- 20 -
6.2 Powering On	- 20 -
6.3 Noise Measurement	- 20 -
6.3.1 Total Value Integration	- 21 -
6.3.1.1 Total Value Integration Home Screen	- 21 -
6.3.1.2 Starting Integration Measurement	- 25 -
6.3.1.3 Overload Indication	- 25 -
6.3.1.4 Time History Graph Interface	- 26 -
6.3.1.5 Total Value Integration Settings	- 26 -
6.3.1.6 Total Value Integration Data Review	- 28 -
6.3.1.6.1 Data Review Interface Description	- 29 -
6.3.1.6.2 Total Value Integration History Details	- 30 -
6.3.1.6.3 Total Value Integration Digital Recording Details	- 30 -
6.3.1.6.4 Total Value Integration Recording	- 31 -
6.3.1.6.5 Voice Annotation	- 32 -
6.3.2 Statistical Integration	- 32 -
6.3.2.1 Statistical Integration List Interface	- 32 -
6.3.2.2 Statistical Distribution Graph Interface	- 33 -
6.3.2.3 Cumulative Distribution Graph Interface	- 34 -
6.3.2.4 Additional Indicators	- 35 -
6.3.2.5 Statistical Integration Data Review	- 36 -
6.3.2.5.1 Statistical Integration History Details	- 36 -
6.3.2.5.2 Statistical Integration Digital Recording Details	- 37 -
6.3.2.5.3 Statistical Integration Recording	- 38 -
6.3.2.5.4 Voice Annotation	- 38 -
6.3.3 1/1 OCT Analysis	- 38 -
6.3.3.1 1/1 OCT Analysis List Interface	- 38 -

6.3.3.2 1/1 OCT Analysis Graph Interface	- 39 -
6.3.3.3 1/1 OCT Analysis Data Review	- 41 -
6.3.3.3.1 1/1 OCT Analysis History Details	- 41 -
6.3.3.3.2 1/1 OCT Analysis Digital Recording Details	- 42 -
6.3.3.3.3 1/1 OCT Analysis Recording	- 43 -
6.3.3.3.4 Voice Annotation	- 43 -
6.3.4 1/3 OCT Analysis	- 43 -
6.3.4.1 1/3 OCT Analysis List Interface	- 43 -
6.3.4.2 1/3 OCT Analysis Graph Interface	- 45 -
6.3.4.3 1/3 OCT Analysis Custom Weighting	- 46 -
6.3.4.4 1/3 OCT Analysis Data Review	- 47 -
6.3.4.4.1 1/3 OCT Analysis History Details	- 47 -
6.3.4.4.2 1/3 OCT Analysis Digital Recording Details	- 48 -
6.3.4.4.3 1/3 OCT Analysis Recording	- 48 -
6.3.4.4.4 Voice Annotation	- 48 -
6.3.5 FFT Analysis	- 48 -
6.3.5.1 FFT Analysis List Interface	- 48 -
6.3.5.2 FFT Analysis Graph Interface	- 49 -
6.3.5.3 FFT Window Function Settings	- 51 -
6.3.5.4 FFT Analysis Data Review	- 52 -
6.3.5.4.1 FFT Analysis History Details	- 53 -
6.3.5.4.2 FFT Analysis Recording Playback	- 54 -
6.3.5.4.3 Voice Annotation	- 54 -
6.3.6 24-Hour Measurement	- 54 -
6.3.6.1 24-Hour Measurement List Interface	- 54 -
6.3.6.2 24-Hour Measurement Graph Interface	- 54 -
6.3.6.3 24-Hour Measurement Overview Interface	- 55 -
6.3.6.4 24-Hour Measurement Settings	- 55 -
6.3.6.5 24-Hour Data Review	- 56 -
6.3.6.5.1 24-Hour Overview Details	- 56 -
6.3.7 Indoor Measurement	- 56 -
6.3.7.1 Indoor Measurement List Interface	- 56 -
6.3.7.2 Indoor Measurement Data Review	- 58 -
6.3.7.2.1 Indoor Measurement Historical Records	- 59 -
6.3.7.2.2 Indoor Measurement Digital Record Details	- 60 -
6.3.7.2.3 Indoor Measurement Recording	- 61 -
6.3.7.2.4 Voice Annotation	- 61 -
6.3.8 Reverberation	- 61 -
6.3.8.1 Key Performance Specifications	- 62 -
6.3.8.2 Impulse Response	- 63 -
6.3.8.3 1/1 Octave Band – Tabular View	- 64 -
6.3.8.4 1/1 Octave Band – Graphical View	- 65 -
6.3.8.6 1/3 Octave Band – Graphical View	- 66 -
6.3.8.7 Decay Curve View	- 67 -
6.3.8.8 Reverberation Measurement – Data Access	- 68 -
6.3.8.8.1 Playback of Reverberation Measurement Recordings	- 68 -

6.3.9 Simultaneous Measurement	- 69 -
6.3.9.1 Simultaneous Measurement Interface	- 69 -
6.3.9.2 Accessing Synchronized Measurement Data	- 71 -
6.3.9.3 Synchronized Measurement Playback	- 72 -
6.3.10 Speech Transmission Index (STI)	- 72 -
6.3.10.1 Performance Specifications	- 72 -
6.3.10.2 STI Measurement Interface	- 72 -
6.3.10.3 STI Data Access	- 73 -
6.3.10.3.1 STI Historical Details	- 73 -
6.3.11 Sound Exposure Level (Noise Dose Meter)	- 75 -
6.3.11.1 Sound Exposure Level List Interface	- 75 -
6.3.11.2 Sound Exposure Level Settings Interface	- 76 -
6.3.11.3 Noise Exposure Data Review	- 77 -
6.3.11.3.1 Noise Exposure Historical Details	- 78 -
6.3.11.3.2 Noise Exposure Digital Record Details	- 79 -
6.3.11.3.3 Noise Exposure Recording	- 80 -
6.3.11.3.4 Voice Annotation	- 80 -
6.4 Instrument Calibration	- 80 -
6.4.1 Calibration Interface	- 80 -
6.4.2 Calibration Settings	- 81 -
6.4.3 Calibration Records	- 82 -
6.4.4 Acoustic Calibrator Calibration Procedure	- 83 -
6.4.5 Pistonphone Calibration Procedure	- 84 -
6.5 Data Retrieval	- 85 -
6.5.1 Internal Data	- 85 -
6.5.1.1 Viewing Measurement History	- 85 -
6.5.1.2 Deleting Data	- 85 -
6.5.2 External Device Data	- 87 -
6.5.2.1 Viewing External Data	- 87 -
6.5.2.2 Deleting External Data	- 88 -
6.5.3 Data Printing	- 88 -
6.5.3.1 Connecting a Printer	- 88 -
6.5.3.2 Printer Connection Methods	- 89 -
6.5.3.3 Group Printing	- 89 -
6.6 Instrument Settings	- 90 -
6.6.1 Interface Overview	- 90 -
6.6.2 My Device	- 91 -
6.6.3 Network and Connectivity	- 92 -
6.6.4 Personal Setting	- 94 -
6.6.5 System and Device	- 96 -
6.6.6 Interface Settings	- 99 -
6.6.7 External Devices	- 100 -
6.6.8 Data Upload	- 100 -
6.6.9 Over-limit Alarm	- 101 -
6.6.10 Backup and Reset	- 102 -
6.6.11 Location Settings	- 104 -

6.7 Auxiliary functions- 105 -

6.7.1 Overview - 105 -

6.7.2 Location - 106 -

6.7.3 Glossary - 107 -

6.7.4 Audio Annotations- 108 -

6.7.5 Recording.....- 108 -

APPENDIX A — Directional Response- 111 -

APPENDIX B — Free-Field Response - 113 -

APPENDIX C — Windshield Influence Correction Values - 117 -

APPENDIX D — Enclosure Influence Correction Values - 119 -

APPENDIX E — Self-Generated Electrical Noise of Octave Bands under Z-Weighting- 121 -

APPENDIX F — Influence of Extension Cable - 122 -

1 Overview

The ZX3300 Sound Level Analyzer is a next-generation noise measurement instrument that employs digital signal processing (DSP) and network technology. It is capable of simultaneously measuring multiple evaluation parameters. Its modular design allows users to select appropriate modules based on their specific needs. The instrument features large-capacity data storage, audio recording, USB flash drive support, and a card reader. It also integrates wireless data transmission modules such as 4G, Wi-Fi, and Bluetooth, along with a positioning system, enabling noise measurement and geolocation data acquisition. An optional external micro-printer can be used for on-site printing of measurement results. This instrument is widely applicable in environmental protection, occupational hygiene, industrial enterprises, and research and education, supporting various noise measurement tasks, including environmental noise assessment, occupational noise exposure evaluation, and machinery noise analysis.

2 Key Features

- 1) 123 dB Ultra-Wide Dynamic Range – No need for manual range switching.
- 2) Advanced Digital Signal Processing (DSP) – Implements frequency weighting, time weighting, and detection using DSP technology.
- 3) 4.3-Inch Capacitive Touchscreen – Provides an intuitive user interface, enabling simultaneous measurement and real-time display of multiple parameters.
- 4) Reliable High-Capacity Storage – 16GB internal storage with expandable TF card support up to 64GB, ensuring secure data preservation.
- 5) Comprehensive Functionality – Supports total integration measurement, statistical integration, 24-hour monitoring, 1/1 octave band analysis, 1/3 octave band analysis, FFT analysis, indoor acoustic measurements, reverberation time measurement, Speech Transmission Index (STI) analysis, and sound exposure level (SEL) evaluation.
- 6) Integrated Wireless Communication Modules – Equipped with embedded Wi-Fi, 4G, and Bluetooth connectivity.
- 7) Built-in Beidou and GPS Positioning System – Provides precise location data alongside noise measurements.
- 8) Optional External Micro-Printer – Enables on-site printing of measurement results.
- 9) Precision Audio Recording – Captures high-fidelity audio recordings for playback and analysis on a computer.

3 Main Performance Indicators

3.1 Basic Performance Indicators

- 1) Microphone: Model ZX1023 with reference sensitivity level of -28 dB (0 dB reference to 1 V/Pa). All subsequent parameters are based on this sensitivity level
- 2) Preamplifier: Model ZX1901 with LEMO plug
- 3) Frequency Range: 10 Hz – 20 kHz
- 4) A/D Resolution: 24-bit
- 5) Sampling Frequency: 48 kHz
- 6) Internal Electrical Noise: <10 dB(A), <15 dB(C), <20 dB(Z); Self-generated noise < 18 dB(A).
- 7) Measurement Range at 1 kHz:
 - a. A-weighted: 20 dB – 143 dB
 - b. C-weighted: 25 dB – 143 dB
 - c. Z-weighted: 30 dB – 143 dB
 - d. C-weighted peak sound level: 60 dB – 146 dB
- 8) Linear Operating Range for Other Frequencies:
 - a. 31.5 Hz: 20 dB – 103 dB(A)
 - b. 4 kHz: 20 dB – 144 dB (A)
 - c. 8 kHz: 20 dB – 141 dB (A)
 - d. 12.5 kHz: 20 dB – 136 dB (A)
- 9) Time Weighting: Simultaneous processing of Fast (F), Slow (S), and Impulse (I) measurements
- 10) Frequency Weighting: Simultaneous processing of A, C, and Z weighting measurements
- 11) Detection Characteristics: True RMS digital detection
- 12) Compliance Standards:
 - a. Sound level meter: GB/T 3785.1—2023 Class 1 / IEC 61672-1:2013 Class 1
 - b. Filter: GB/T 3241—2010 Class 1 / IEC 61260-1:2014 Class 1
 - c. Personal sound exposure meter: GB/T 15952—2010 / IEC 61252:2017
- 13) Display: 4.3-inch capacitive touchscreen
- 14) Primary Display Information: Real-time measurement of more than 9 indicators, statistical distribution graph, integral distribution graph, 24-hour distribution graph
- 15) Primary Measurement Functions: Total integral, statistical integral, 24-hour automatic monitoring, 1/1 octave band analysis, 1/3 octave band analysis, FFT analysis (8192 lengths), sound exposure level (SEL), etc
- 16) Key Measurement Indicators: L_{xyp} , $L_{x\text{eq},T}$, $L_{x\text{eq},t}$, $L_{x\text{max}}$, $L_{x\text{min}}$, L_{xN} , SD, SEL, $L_{x\text{peak}}$, where $x = A, C, Z$; $y = F, S, I$; $N = 5, 10, 50, 90, 95$
- 17) Data Storage: 16 GB internal storage (~11 GB usable), expandable via TF card up to 64 GB
- 18) Output Interfaces: AC output, DC output, IO expansion port, USB port, 4G, Wi-Fi, Bluetooth
- 19) Calendar Clock: Monthly drift <1 min; clock resets if the lithium battery is removed
- 20) Power Supply: 3.7V 10,000 mAh lithium battery, 9VDC external power (20W fast charging), fully charged within 5 hours
- 21) Measurement Duration: Configurable from 1 second to 96 hours

- 22) Operating Conditions: Temperature -20°C to 60°C;
- 23) Relative humidity: 20% – 90%
- 24) Dimensions : 288 × 95 × 40 mm
- 25) Weight: approximately 510 g

3.2 Additional Features

- 1) Positioning Function: Measures longitude and latitude, storing this data alongside noise measurement results; Utilizes location data to calculate movement direction and the straight-line distance between two points
- 2) High-Capacity TF Card Storage:
 - a. Measurement results are saved as text files on the TF card, which can be opened directly using PC notepad software (externally modified files cannot be recognized by the instrument).
 - b. When connected to a computer via USB, the instrument functions as a USB drive, allowing direct access to the TF card.
- 3) Recording Function:
 - a. Recording Format: Selectable sampling rates of 24,000 Hz and 48,000 Hz, with 24-bit precision.
 - b. File Format: WAV.
 - c. Recording Duration: Unlimited, constrained only by available memory (continuous recording will segment files into one-hour intervals).
 - d. Playback: Audio can be played back using either the instrument or a PC.

3.3 Optional Features

- 1) Statistical Integration
 - a. Computes noise statistical distribution and integral distribution.
 - b. Allows flexible selection of frequency weighting and time weighting.
 - c. Supports standard statistical indicators L5, L10, L50, L90, L95, and provides an option to define up to 10 additional integral percentile noise level indicators.
- 2) 1/1 Octave Band Analysis Function (Refer to the table below)
- 3) 1/3 Octave Band Analysis Function (Refer to the table below)

Filter Type	1/1 Octave Band (1/1 OCT)	1/3 Octave Band (1/3 OCT)
Filter Mode	Parallel (Real-Time) Octave Band, $G = 10^{3/10}$	
Compliance Standards	IEC 61260-1:2014 Class 1	
Nominal Center Frequencies	8 Hz, 16 Hz, 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, 16 kHz	5 Hz, 8 Hz, 10 Hz, 12.5 Hz, 16 Hz, 20 Hz, 25 Hz, 31.5 Hz, 40 Hz, 50 Hz, 63 Hz, 80 Hz, 100 Hz, 125 Hz, 160 Hz, 200 Hz, 250 Hz, 315 Hz, 400 Hz, 500 Hz, 630 Hz, 800 Hz, 1 kHz, 1.25 kHz, 1.6 kHz, 2 kHz, 2.5 kHz, 3.15 kHz, 4 kHz, 5 kHz, 6.3 kHz, 8 kHz, 10 kHz, 12.5 kHz, 16 kHz, 20 kHz

Real-Time Analysis Speed	Simultaneously processes all center frequencies with A-weighting, C-weighting, and Z-weighting
Level Linearity Range	≥ 90 dB
Primary Measurement Interface	Graphical interface, list interface

4) FFT Analysis

- Frequency Range: 23.4 Hz – 19998.0 Hz with a bandwidth of 5.9 Hz
- Window Functions: Selectable options include Rectangular, Hanning, Blackman, and Flat-Top
- Real-Time Analysis Speed: Simultaneously performs frequency band analysis along with A-weighting, C-weighting, and Z-weighting
- Primary Measurement Interface: List-based interface, graphical interface
- Level Linearity Range: Greater than 70 dB.
- Key Measurement Indicators:
 - Bandwidth Instantaneous Sound Pressure Level (L_p)
 - Bandwidth Maximum Sound Pressure Level (L_{max})
 - Bandwidth Minimum Sound Pressure Level (L_{min})
 - Bandwidth Equivalent Continuous Sound Pressure Level ($L_{eq,T}$)

5) 24-Hour Measurement Function

- Time Range: 00 h – 23 h, visually displays hourly measurement values
- Key Measurement Indicators: L_{max} , L_{min} , $L_{eq,T}$, L_5 , L_{10} , L_{50} , L_{90} , L_{95} , SD
- Trigger Mode: Automatic, manual, scheduled
- Measurement Cycle: Repeat or single measurement
- Measurement Interface: List interface, graphical interface, full display interface

6) Reverberation Measurement Function

- Compliance Standards: ISO 3382-2:2008.
- Main Functions: Reverberation time (RT) and Early Decay Time (EDT) measurement
- Key Measurement Indicators: T20, T30, EDT
- Filter Bandwidth: 1/1 Octave Band or 1/3 Octave Band
- Impulse Response Recording Time: 10 seconds or 20 seconds

7) STI (Speech Transmission Index) Function

- Compliance Standards: ISO 3382-1, ISO 3382-2, ISO 3382-3, ISO 1996
- Key Measurement Indicators: L_{eq} , MTI, STI
- Single Recording Duration: 15 seconds
- Recording Precision: Sampling frequency of 48 kHz, 32-bit resolution
- Frequency Points: 125 Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, 8000 Hz.

8) Sound Exposure Level (SEL) Function

- Compliance Standards: IEC 61672-1:2013 Class 1
- IEC 61252:2017

- c. Noise Dose Measurement Range: 0% – 999.99%
- d. Exchange Rate Options: Selectable between 3, 4, 5, or 6
- e. Threshold Level: 40 dB – 90 dB
- f. Reference Standard Sound Level: 70 dB – 90 dB.
- g. Key Measurement Indicators: L_p , L_{max} , TWA, $L_{EX,8h}$, L_{Cpeak} , L_{Zpeak} , L_{min} , $L_{eq,T}$, L_{AVG} , DOSE, E ,
 $N_{LApeak>120\text{ dB}}$, $N_{LApeak>130\text{ dB}}$, $N_{LApeak>140\text{ dB}}$
- h. Measurement Interface: List interface

4 Structural Features



Figure 4.1 Physical appearance of ZX3300 Sound Level Meter.

Figure 4.1 shows the physical appearance of ZX3300 . It consists of a microphone, a preamplifier, and a main unit. The preamplifier is mounted on the instrument, and during normal operation, the microphone should be attached to the preamplifier. The top part of the sound level meter is tapered to minimize sound wave reflections. The nominal reflections effect of the enclosure and the directional characteristics of the sound level meter under different incidence angles are detailed in the Appendix.

The instrument's housing is molded from ABS+PC plastic, ensuring durability. It is powered by a 3.7V, 10000mAh lithium battery housed within a dedicated compartment. The display features a capacitive touchscreen with a 480×800 resolution, allowing all operations to be performed via touch, except for powering the device on and off. Once the instrument is powered on, the operation indicator light blinks every three seconds. The power button is designed to function with specific actions: pressing and holding it for three seconds powers the instrument on or off

while pressing and holding it for ten seconds forces a shutdown.

The top of the instrument features a LEMO 7-pin signal input socket, which is used to connect the preamplifier. The pin layout for this socket is shown in Figure 4.2. The bottom interface of the instrument is illustrated in Figure 4.3.

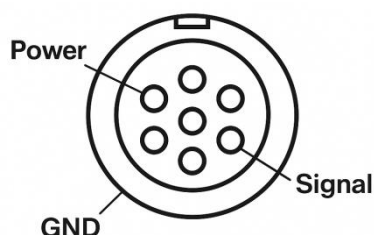


Figure 4.2 The physical connectivity of ZX3300 Sound Level Meter

- 1) DC Power Interface: Uses for fast charging of the instrument, with a maximum charging power of 20 W
- 2) USB Type-C Interface: When connected to a computer, the instrument functions as a USB flash drive for file operations
- 3) IO Expansion Interface: When connected via a serial adapter cable, it supports RS232 data communication. It allows real-time data transmission to a computer. When connected to a micro-printer, it can print measurement results and related graphs. When connected to a multi-function expansion unit, additional ports such as RS232, LAN, and USB can be utilized.
- 4) AC/DC Output Interface: It uses a stereo output plug with pin assignments, as shown in Figure 4.3.



Figure 4.3 Rear Panel Ports (Bottom View)

AC Output: Two adjustable amplitude levels with a 100× difference between levels. At 9.5 mV/Pa, the AC output pin produces approximately 9.5 mV for 1 Pa of sound pressure applied to the microphone. At 950 mV/Pa, the AC output amplitude increases proportionally.

However, at higher sound pressure levels, the AC output may exhibit distortion;

DC Output: The scaling ratio is 20 mV/dB. At 100 dB, the output voltage is 2 V. Maximum output voltage is 3.1 V.

Note: The reference sensitivity level is -28 dB.

Parameter	Value (Low Output)	Value (High Output)
AC Output Amplitude	9.5 mV/Pa	950 mV/Pa
Max Un-distorted Output Sound Pressure	100 Pa	1 Pa

- 5) TF Card Slot : The instrument supports TF card storage expansion with a maximum capacity of 64 GB.
- 6) SIM Card Slot: The instrument supports SIM cards, enabling remote data transmission when a SIM card is installed.
- 7) TF Card and SIM Card Insertion: The insertion method is shown in Figure 4-6, with both cards inserted gold contacts facing up.

5 Symbols and Abbreviations Definitions

5.1 Symbols displayed by the instrument and its definition

Symbols	Definition
T_s	Set integration measurement time
T_m	Actual elapsed measurement time
T_l	Remaining integration measurement time
Z_s	Voice annotation
24H	24-hour automatic monitoring mode
F	Fast-time weighting with a time constant of 125 ms
S	Slow-time weighting with a time constant of 1000 ms
I	Impulse time weighting with a rise time constant of 35 ms and a fall time constant of 1500 ms
$L_{Aeq,T}$	A-weighted equivalent continuous sound level
$L_{Ceq,T}$	C-weighted equivalent continuous sound level
$L_{Zeq,T}$	Z-weighted equivalent continuous sound level
SEL	Sound Exposure Level (SEL) = $L_{eq} + 10\log(T)$
L_{max}	Maximum sound pressure level
L_{min}	Minimum sound pressure level
L_5	5% of the sound pressure level exceeds the current sound pressure level
L_{10}	10% of the sound pressure level exceeds the current sound pressure level
L_{50}	50% of the sound pressure level exceeds the current sound pressure level
L_{90}	90% of the sound pressure level exceeds the current sound pressure level
L_{95}	95% of the sound pressure level exceeds the current sound pressure level
SD	Standard deviation
L_{AFp}	Maximum A-weighted sound level in 0.5s under F (Fast) time weighting
L_{ASp}	Maximum A-weighted sound level in 0.5s under S (Slow) time weighting
L_{AIp}	Maximum A-weighted sound level in 0.5s under I (Impulse) time weighting
$L_{Aeq,t}$	A-weighted equivalent continuous sound level over 1s
$L_{Ceq,t}$	C-weighted equivalent continuous sound level over 1s
$L_{Zeq,t}$	Z-weighted equivalent continuous sound level over 1s
L_{CFp}	Maximum C-weighted sound level in 0.5s under F time weighting
L_{CSp}	Maximum C-weighted sound level in 0.5s under S time weighting
L_{CIp}	Maximum C-weighted sound level in 0.5s under I time weighting
L_{ZFp}	Maximum Z-weighted sound level in 0.5s under F time weighting
L_{ZSp}	Maximum Z-weighted sound level in 0.5s under S time weighting
L_{ZIp}	Maximum Z-weighted sound level in 0.5s under I time weighting
L_{AFi}	Instantaneous A-weighted sound level under F time weighting
L_{ASi}	Instantaneous A-weighted sound level under S time weighting
L_{AII}	Instantaneous A-weighted sound level under I time weighting
L_{CFi}	Instantaneous C-weighted sound level under F time weighting
L_{CSi}	Instantaneous C-weighted sound level under S time weighting
L_{CIi}	Instantaneous C-weighted sound level under I time weighting
L_{ZFi}	Instantaneous Z-weighted sound level under F time weighting

L_{ZSi}	Instantaneous Z-weighted sound level under S time weighting
L_{Zli}	Instantaneous Z-weighted sound level under I weighting
L_d	Equivalent daytime sound level (06:00 - 22:00)
L_n	Equivalent nighttime sound level (22:00 - 06:00)
L_{dn}	Day-night equivalent sound level
L_{Cpeak}	Peak C-weighted sound level
L_{Zpeak}	Peak Z-weighted sound level
Exchange Rate	The allowable increase/decrease in noise exposure limit when noise exposure time doubles/halves
Threshold Level	Below this level, time-weighted sound pressure levels are not included in TWA or L_{AVG} calculations
Reference Standard Sound Level	If TWA exceeds this value, it indicates overexposure
Kurt	Kurtosis, a statistical measure of the sharpness of a data distribution curve (Kurt = 3 for normal distribution, >3 for peaked distribution, <3 for flat distribution)
E	Personal sound exposure, measured in Pa ² h
$L_{EX,8h}$	8-hour equivalent sound pressure level
L_{AVG}	Average sound pressure level
TWA	Time-weighted average sound pressure level
DOSE	Noise dose; values over 100% indicate overexposure
DOSi	Instantaneous noise dose
L_{inst}	Instantaneous sound pressure level
$N_{LApeak>120dB}$	Count of A-weighted peak levels exceeding 120 dB
$N_{LApeak>130dB}$	Count of A-weighted peak levels exceeding 130 dB
$N_{LApeak>140dB}$	Count of A-weighted peak levels exceeding 140 dB
OCT	Octave band analysis
U-weighting	User-defined frequency weighting
T-weighting	User-defined frequency weighting
T_{20}	Reverberation time obtained by extrapolating -5 dB to -25 dB decay range to -60 dB
T_{30}	Reverberation time obtained by extrapolating -5 dB to -35 dB decay range to -60 dB
EDT	Early decay time
STI	Speech Transmission Index
mi_1	Modulation Transfer Ratio at the first modulation frequency
mi_2	Modulation Transfer Ratio at the second modulation frequency
TI_1	Transmission Index at the first modulation frequency
TI_2	Transmission Index at the second modulation frequency
MTI	Modulation Transfer Index
Rank	Nominal rating level of STI
IOT	Internet of Things
Delay	In button-activated mode, the time interval between clicking start and beginning integration measurement
Latency	In threshold-triggered recording mode, the waiting time before recording starts after exceeding the preset limit

	TF Card Status
	Battery Level Display
	Low Battery Warning
	Charging Status
	Wi-Fi Connection
	4G Network Connection
	AC/DC Interface Connection
	Positioning in Progress
	Overload Indicator
	Bluetooth Connection
	Connected to Computer
	Scheduled Power-On Enabled

6 Use Instructions

6.1 Preparation Before Use

- 1) Remove the sound level meter from the carrying case.
- 2) Fully charge the sound level meter using the included charger to ensure uninterrupted operation within the required duration.
- 3) Attach the measurement microphone to the preamplifier, then align the LEMO plug of the preamplifier with the front socket of the main unit and insert it securely.
- 4) If necessary, install the windscreen onto the measurement microphone.

6.2 Powering On

Press and hold the power button located below the screen for 3 seconds until the function menu appears (see Figure 6.1). Check whether the battery icon in the upper right corner indicates a full charge. The function menu includes options such as Noise Measurement, Instrument Calibration, Data Review, Instrument Settings, and After-Sales Support. Additionally, the home screen carousel provides quick access to Terminology Explanation and User Manual by clicking the corresponding images.



Figure 6.1

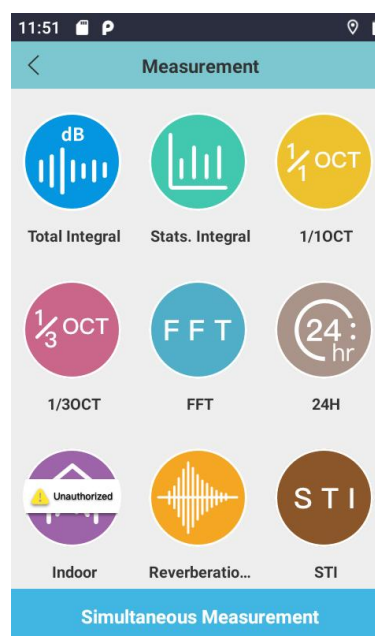


Figure 6.2

6.3 Noise Measurement

Tap "Noise Measurement" to access the noise measurement interface (see Figure 6.3). This interface allows users to select from various measurement modes, including Total Value Integration, Statistical Integration, 1/1 Octave Band Analysis (1/1 OCT), 1/3 Octave Band Analysis (1/3 OCT), FFT Analysis, 24-Hour Measurement, Indoor Measurement, Reverberation Measurement, Speech Transmission Index (STI), and Sound Exposure Level (SEL).

If a noise measurement module is not authorized, it will be unavailable for use. In this case, authorization must be obtained before proceeding. To request authorization, please contact the manufacturer.

Note: "Synchronized Measurement" refers to the simultaneous execution of all selected measurement options.

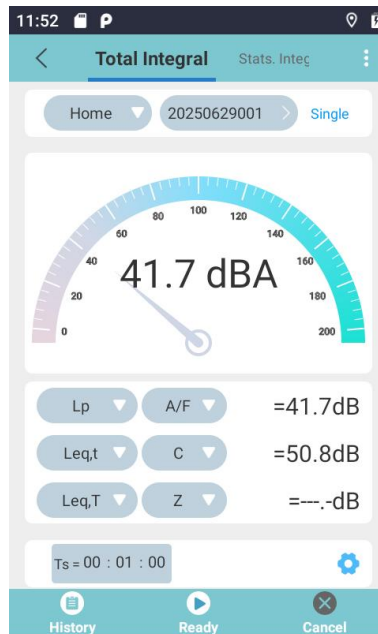


Figure 6.3

6.3.1 Total Value Integration

6.3.1.1 Total Value Integration Home Screen

Click "Total Value Integration" to enter the corresponding interface, which by default displays the Total Value Integration home screen, as shown in Figure 6-3-1-1.

- 1) Status Bar: Displays real-time status indicators, including
 - a. time, overload status "↑"
 - b. positioning status "📍"
 - c. Bluetooth status "📶"
 - d. 4G network status "4G 📶"
 - e. Wi-Fi status "📶"
 - f. battery status "🔋"

The exact icons and indicators vary based on the system configuration.

- 2) Title Section:
 - a. Title: The highlighted title displays "Total Value Integration", indicating the selected measurement mode.
 - b. Back Button: Clicking "<" returns to the Noise Measurement home screen. If a

measurement is paused or in progress, a confirmation prompt appears:

“Measurement is in progress. Are you sure you want to end the measurement and save the data?”

- c. Selecting Confirm will end the measurement and return to the Noise Measurement home screen. Selecting Cancel will keep the user on the current page.
- d. Auxiliary Functions: Clicking the top-right “” button opens the Auxiliary Functions menu (see Figure 6.3). Available options include Location, User Manual, Terminology Explanation, Voice Annotation, and Recording. Clicking on any of these options will navigate to the respective function page (refer to Section 6.7 for detailed operations).

3) File Name Display Area:

- a. Page Name: Displays the current page name, with the default set to Home.
- b. Group Name: A text box showing the measurement location name. By default, an automatic group name is generated based on the measurement date and a three-digit serial number (e.g., 20250629000). The serial number increments automatically with each measurement. If the serial number reaches its three-digit limit, an additional digit is automatically appended. Group Name Editing: Clicking the group name field allows the user to edit the name. The Group Name Editing Page (see Figure 6.4) offers two modes:

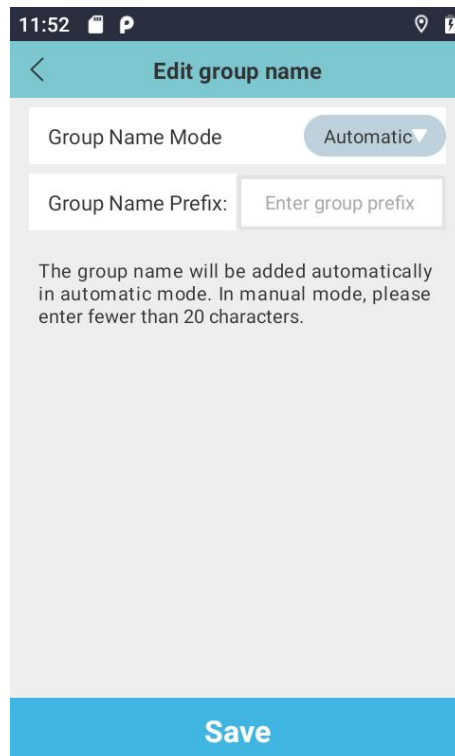


Figure 6.4

- a) Automatic Mode: Allows adding a group name prefix (default is empty). The prefix can contain up to 20 characters (Chinese characters, letters, or numbers). The final group name format will be “Prefix + Group Name” after saving.

- b) Manual Mode: The user can manually enter a custom group name (up to 20 characters, including Chinese characters, letters, or numbers). Once set, the manually assigned name remains unchanged throughout the measurement process.
- 4) Measurement Area
 - a. Graphical Real-Time Display: The display range is 0.0 dB to 200.0 dB. Displays LAFp dynamic bar graph and instantaneous measurement values, refreshing every 0.5 seconds.
 - b. List Indicator Selection: The drop down options include Leq,t, Lmax, Lmin, Lp, Lpeak, Leq,T, and SEL. The default indicators displayed are LAeq,T, LAFmax, and LCpeak.
Note: Before starting a measurement, Lmax, Lmin, Lpeak, Leq,T, and SEL are displayed as 0.0 dB or show the results from the previous measurement without changing.
 - c. List Weighting Selection: If the selected list indicators are Leq,t, Lpeak, Leq,T, or SEL, the frequency weighting options are A, C, and Z, independent of time weighting. If the selected indicators are Lmax, Lmin, or Lp, the available options are: A/F, A/S, A/I, C/F, C/S, C/I, Z/F, Z/S, Z/I (where F = Fast, S = Slow, I = Impulse).
- 5) Button Operations
 - a. Start Measurement :
 - a) The initial state is "Ready"  (blue icon).
 - b) Clicking the start button changes the state to "Measuring"  (blue icon).
 - c) Clicking the pause button changes the state to "Paused"  (orange icon).
 - d) When the measurement is completed, the state changes to "Ended"  (red icon).
 - b. System Behavior When Clicking "Start"
 - a) Ts Calculation: At measurement startup, the system calculates the integration value based on the actual integration time.
 - b) Synchronized Measurement Check: If Synchronized Measurement is enabled, the Start/Pause button applies to all synchronized modules (see Section 6.3.9). If not synchronized, the Start/Pause button affects only the current measurement module.
 - c) Startup Mode Check: When "Startup Mode = Manual" :
 - i. If Voice Annotation and Delay Time > 0, the system records a voice annotation first, then starts measurement after the countdown.
 - ii. If only Voice Annotation > 0, the system records audio before starting measurement.
 - iii. If only Delay Time > 0, the system starts measurement after the countdown.
 - iv. When "Startup Mode = Threshold-Based": Voice Annotation is disabled, and manual start is not allowed. Measurement automatically starts when the indicator value exceeds the threshold. Within Ts, no further threshold checks are made until the measurement ends.
 - v. When "Startup Mode = Interval-Based": Voice Annotation is disabled. Startup behavior follows Section 6.3.1.5.

- vi. When "Startup Mode = Scheduled": Voice Annotation is disabled, and manual start is not allowed. The system automatically starts the measurement at the scheduled time.
- d) ④ Recording Check:
If recording is enabled in the Auxiliary Functions menu: For threshold-based start, recording begins when the instantaneous value exceeds the limit, with the recording duration set according to the configured recording time. For synchronized measurement, recording starts simultaneously with measurement, and files are saved in the corresponding folder.
- e) ⑤ Digital Recorder Check:
If the digital recorder is enabled, the system records data based on the selected indicators.
- c. Cancel Measurement
 - a) If the measurement state is "Ready", the button is grayed out and inactive.
 - b) If the measurement is "Paused" or "Measuring" :
 - i. clicking Cancel prompts: "Measurement is in progress. Are you sure you want to end the measurement and save the data?"
 - ii. Selecting Confirm saves the data and ends the measurement. The "Ready" button turns red, indicating the measurement has ended.
 - iii. Selecting Cancel resumes the current measurement.
 - c) If synchronized measurement is enabled, the Cancel button affects all synchronized modules; If synchronized measurement is not enabled, the Cancel button affects only the current module.
- 6) Data History
Redirects to the Data Review interface, automatically filtering records by source type based on predefined categories.
- 7) Measurement Settings Area
 - a. Measurement Time Switching : The default display shows Ts (Total Value Integration setting). When the measurement status is "Measuring" or "Paused", the display shows Tm (Elapsed Measurement Time).
Clicking the time display toggles between the following states:
Tm → TI (Remaining Measurement Time) ($TI = Ts - Tm$)
TI → Ts (Total Measurement Time)
Ts → Tm
 - b. Settings Button : Clicking the Settings button opens the Total Value Integration Settings page.

Users can configure Ts, Startup Mode, Digital Recorder settings, and more. (See Section 6.3.1.5 for details.) If the measurement status is "Measuring", clicking Settings triggers a prompt: "Measurement is in progress. Entering the settings page will end the current measurement. Do you wish to continue?" Selecting Confirm ends the measurement and opens the Settings page. Selecting Cancel returns to the current screen, keeping the measurement active.

6.3.1.2 Starting Integration Measurement

Upon entering the Total Value Integration measurement module, the initial status is "Ready" "▶" (blue icon). At this stage, all displayed indicators, except Lp and Leq,t, will show 0.0 dB or the previous measurement values.

Before starting measurement, users should configure parameters such as measurement duration (Ts), startup mode, frequency weighting, time weighting, group name, voice annotation, and recording as required by standards or specific needs. Once settings are confirmed, clicking the start button changes the instrument status to "Measuring" "||" (blue icon). The device will simultaneously calculate all measurement indicators, and upon reaching the preset measurement time (Ts), the measurement automatically terminates, freezing the displayed values and saving the results. Users can scroll up or down to view different measurement values, and saved data can be accessed through the "History Records" function.

If the user needs to pause measurement, clicking the pause button "||" (orange icon ■) will stop updating all measurement data except for instantaneous values, which will continue to reflect real-time noise levels.

To stop measurement and save results, users can:

- 1) Click the cancel button on the measurement page.
- 2) Click the return "<" button in the top-left corner.
- 3) Use the forced return by pressing the power button (note: this method does not save data).

To resume measurement, press the start button again. Once the measurement is complete, the status changes to "Ended" "▶" (red icon).

Users can freely switch between different measurement modules and display modes without affecting the ongoing measurement.

If available storage drops below 10% during measurement, the instrument will automatically stop the measurement and return to the home screen. If the storage is already below 10% before starting a measurement, entry into any noise measurement module is restricted, and a warning message will be displayed. In this case, data must be deleted to free up storage before proceeding.

6.3.1.3 Overload Indication

When the measured noise level exceeds the instrument's measurement range, an "Overload" (↑) indicator appears at the top of the display. The duration of the overload indication matches the actual overload condition but is never shorter than 1 second.

The overload indication is based on peak signal evaluation. If the peak factor of the signal is high, an overload may occur even if the displayed sound pressure level is below the measurement limit.

6.3.1.4 Time History Graph Interface

In the Total Value Integration interface, selecting the "Time History" toggle button switches the display to the Time History Graph interface. Once measurement starts, the interface appears as shown in Figure 6.5, displaying the variation of instantaneous sound levels over time.

- 1) Vertical Axis (Y-Axis): Sound pressure level (SPL) range: 0.0 dB – 150.0 dB.
- 2) Horizontal Axis (X-Axis): Represents time, displaying measurements continuously. If the integration time (Ts) exceeds 10 minutes, the display refreshes every 10 minutes.
- 3) Indicator Selection: A dropdown menu allows selection of the following indicators: LAFp, LAsp, LAIp, LCFp, LCSp, LCIp, LZfp, LZSp, LZIp. The Time History List Interface expands on this interface and functions as the digital recording detail interface.
- 4) Viewing Past Data: If Ts exceeds 10 minutes, users can scroll through pages to review previously recorded time history data.
- 5) Activation Mode: The Time History Graph is only available in Manual Start mode



Figure 6.5

6.3.1.5 Total Value Integration Settings

Click the "Settings" ("⚙️") button to enter the Total Value Integration Settings interface, as shown in Figure 6.6.

Note: Parameter settings cannot be accessed while a measurement is in progress.

- 1) Ts Setting: Time selection control, default 10 s, with a range of 00h : 00m : 01s – 96h:59 m:59 s. If set to 00:00:00 (only supported in manual start mode), the measurement will continue running until manually stopped.
- 2) Startup Mode Setting: The drop-down menu provides the options "Manual, Threshold-Based,

Interval-Based, Scheduled”, with “Manual” as the default mode, as shown in Figure 6.7. Selecting different modes will display additional configuration options.

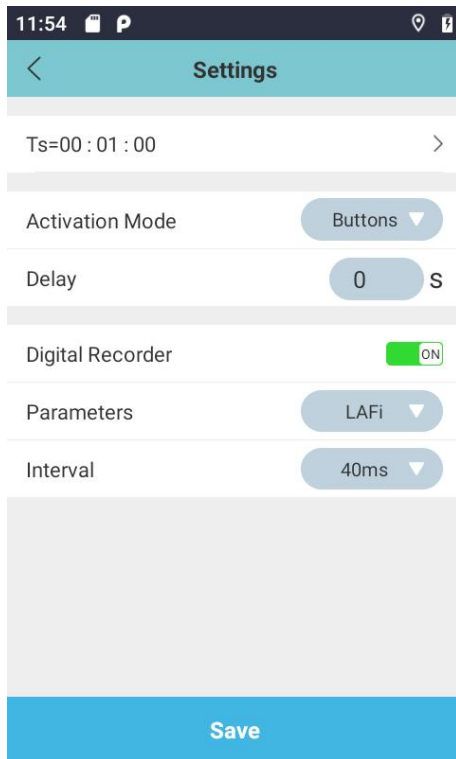


Figure 6.6

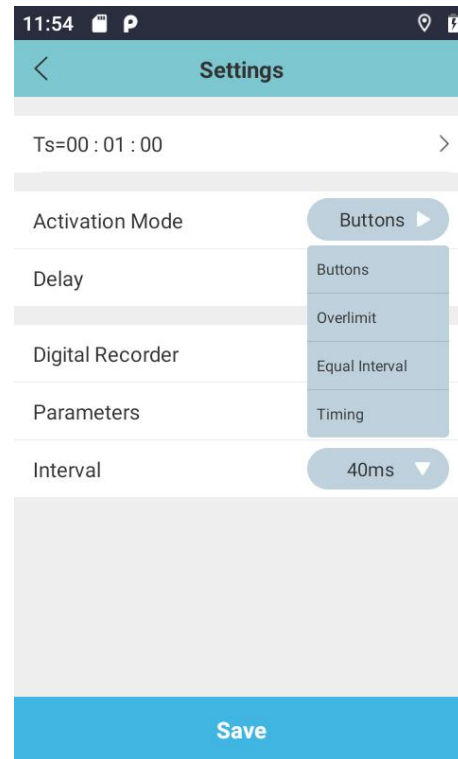


Figure 6.7

- a. When "Startup Mode = **“Buttons”**", clicking the "Start" button initiates the measurement. A delay can be set using the numeric keypad, allowing values between 0 s – 99 s.
- b. When "Startup Mode = **“Overlimit”**", the measurement starts automatically when the measured value exceeds the specified indicator and threshold.
 - a) Indicators: Available options include “LAFp, LAsp, LAIp, LCFp, LCSp, LCIp, LZFP, LZSp, LZIp”.
 - b) Threshold: Default value: 100 dB; Input range: 10 – 140 dB (integer values only).
- c. When "Startup Mode = **“Equal Interval”**", the system starts the first measurement at the nearest full minute and repeats the measurement at a fixed interval (ΔT); Interval Options (ΔT): 10 s, 30 s, 1 min, 2 min, 5 min, 10 min, 20 min, 30 min, 1 h.
 - a) Example: If $\Delta T = 1 \text{ min}$, the system starts at every full minute (e.g., 08:00:00, 08:01:00, etc.). If $\Delta T = 5 \text{ min}$, the system starts at every 5-minute mark (e.g., 08:00:00, 08:05:00, 08:10:00, etc.).
 - b) Note: If T_s (measurement duration) exceeds the interval (ΔT), the actual start interval will be extended.
 - c) Example: If $\Delta T = 5 \text{ min}$ but $T_s = 6 \text{ min}$, the system starts at 08:00:00, measures for 6 minutes, and then begins the next measurement at 08:10:00 instead of 08:05:00.
- d. When "Startup Mode = **“Timing”**"
 - a) **“Only Once”**., starts at the specified date and time and ends after the T_s duration.

- b) **“Per Hour”**: as shown in Figure 6.9, starts at the specified date and time and repeats every hour until the end time.
- c) **“Per Day”**: starts at the specified date and time and repeats every day until the end time.
- d) **“Per Month”**: starts at the specified date and time and repeats every month until the end time.

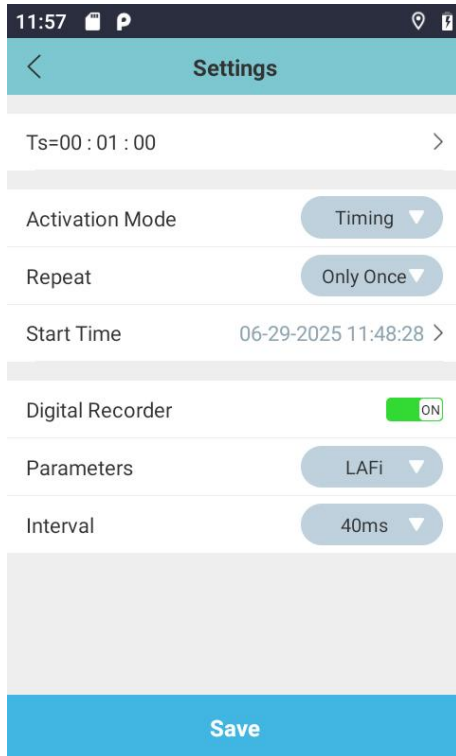


Figure 6.8

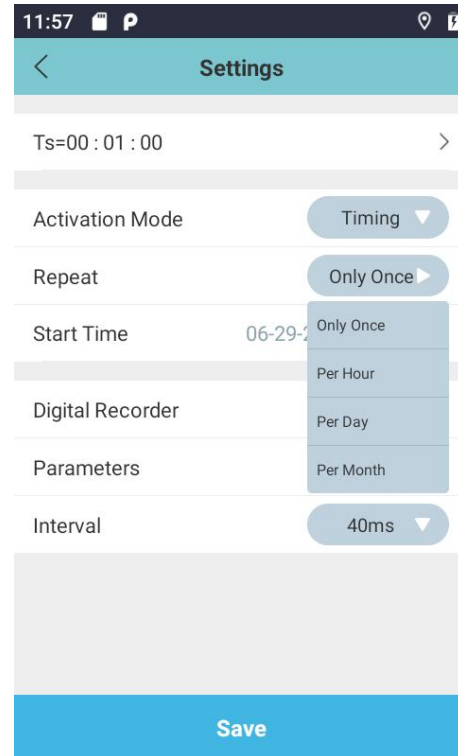


Figure 6.9

- 3) Digital Recording Settings : The digital recorder is disabled by default. When enabled, the system records selected indicators at predefined intervals and stores the data in the history records.
 - a. Indicators : Available options include “All, LAFi, LASi, LAli, LAeq,t, LCFi, LCSi, LCli, LCEq,t, LZFi, LZSi, LZli, LZeq,t”. Multiple indicators can be selected simultaneously.
 - b. Recording Interval (ΔT) : Range: 20 ms – 5000 ms
 - c. Step Size : Multiples of 20 ms

6.3.1.6 Total Value Integration Data Review

Click the "History" icon to enter the data history. This interface displays stored total value integration history data, with the start time of each measurement group shown as the recorded time. The group name corresponds to the user-defined name, and the source is labeled as Total Value Integration.

Users can select individual records, multiple records, or all records to perform actions such as deletion and printing. Clicking on any file opens the historical measurement view interface, as

shown in Figure 6.10.

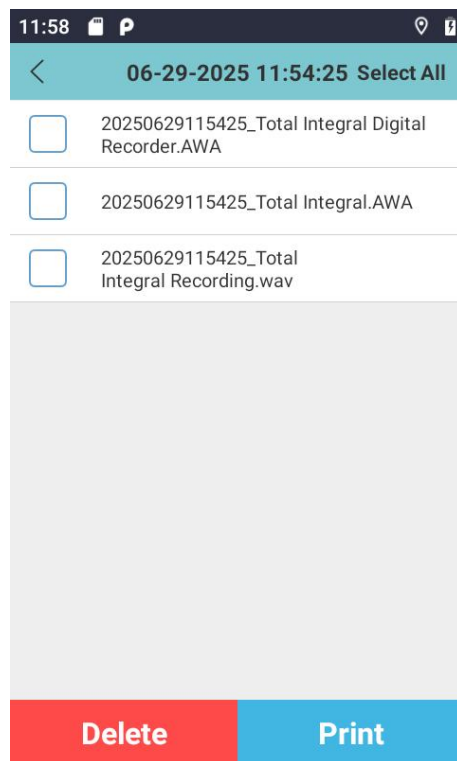


Figure 6.10

6.3.1.6.1 Data Review Interface Description

- 1) Return: Click "<" to return to the Total Value Integration Measurement interface.
- 2) Select All: Click to select all records in the list. Clicking again deselects all records.
- 3) Search: Click "▼" to search by "Time" or "Group Name".
 - a. Time Search:
 - a) Select an appropriate start time and end time.
 - b) Conditions:
 - i. Start time < End time
 - ii. Start time < Current time
 - b. Group Name Search:

The group name search box allows input of up to 20 characters, including Chinese characters, letters, and numbers.

Filter Search Button ("🔍"): Click to search for data matching the specified time range or group name. If no matching data is found, a message "Search returned 0 results" will be displayed.
- 4) List: The list is sorted in descending order by time. Users can scroll up to load more records and select a single record, multiple records, or all records.
- 5) "Delete" Button: Click the "Delete" button to remove selected data. For detailed steps, refer to Section 6.5.2.2.
- 6) "Print" Button: Click the "Print" button to print the selected data. For detailed steps, refer to

Section 6.5.3.

6.3.1.6.2 Total Value Integration History Details

Click the “Total Value Integration” file to enter the Total Value Integration History Details interface, as shown in Figure 6.11.

1) Measurement Details:

Includes measurement point name, measurement mode, measurement start time, Ts, Tm, instrument model, serial number, calibration time, sensitivity level, calibration sound pressure level, latitude and longitude, and measurement range. These details can be expanded or collapsed using the control in the bottom-right corner.

2) List of Indicators:

Displays measurement indicators including:

LAFmax, LCFmax, LZFmax, LASmax, LCSmax, LZSmax, LAImax, LCImax, LZImax, LAFmin, LCFmin, LZFmin, LASmin, LCSmin, LZSmin, LAImin, LCImin, LZImin, LAeq,T, LCEq,T, LZeq,T, LApeak, LCpeak, LZpeak, SELA, SELC, SELZ.

The list of indicators can be expanded or collapsed using the control next to “List”.

Note: Latitude and longitude data require the device to be connected to the network; otherwise, location data will not be displayed in the history records.

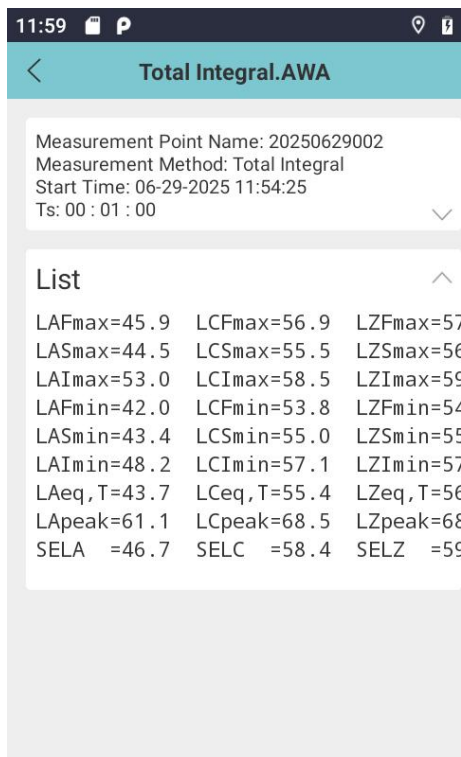


Figure 6.11

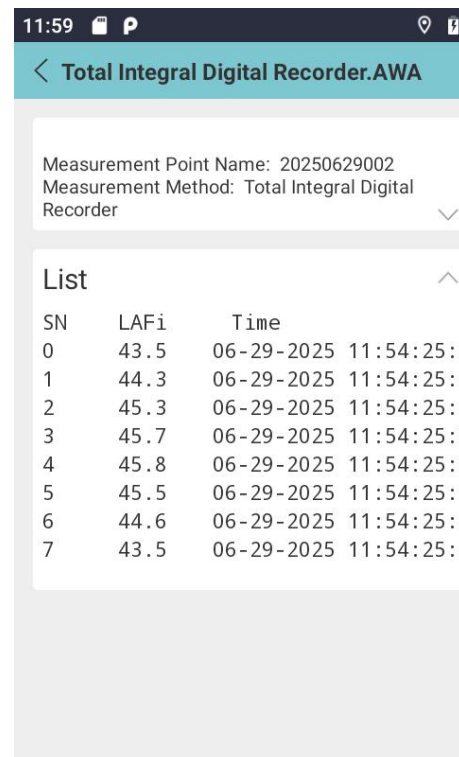


Figure 6.12

6.3.1.6.3 Total Value Integration Digital Recording Details

Click the “Total Value Integration Digital Recording.AWA” file to enter the Total Value Integration Digital Recording Details interface, as shown in Figure 6.12.

- 1) Measurement Details: Includes measurement point name, measurement mode, measurement start time, Ts, Tm, instrument model, serial number, calibration time, sensitivity level, calibration sound pressure level, latitude and longitude, sampling interval, and measurement range. These details can be expanded or collapsed using the control in the bottom-right corner.
- 2) List of Indicators: Displayed according to the Total Value Integration Digital Recorder settings. Users can scroll up to view more indicators, and the list can be expanded or collapsed using the control next to "List".

6.3.1.6.4 Total Value Integration Recording

Click any "Total Value Integration Recording.wav" file to start playback. The interface appears as shown in Figure 6.13.

To listen to the recording, insert a monitoring headset into the AC output interface located at the bottom of the instrument. Select the desired audio file and click to begin playback.

- 1) Only the left audio channel is available for playback.
- 2) Adjust the volume using the "Volume +" or "Volume -" buttons.
- 3) Use the "Fast Forward" or "Rewind" buttons to control playback progress.
- 4) The playback position can also be adjusted by dragging the progress bar.

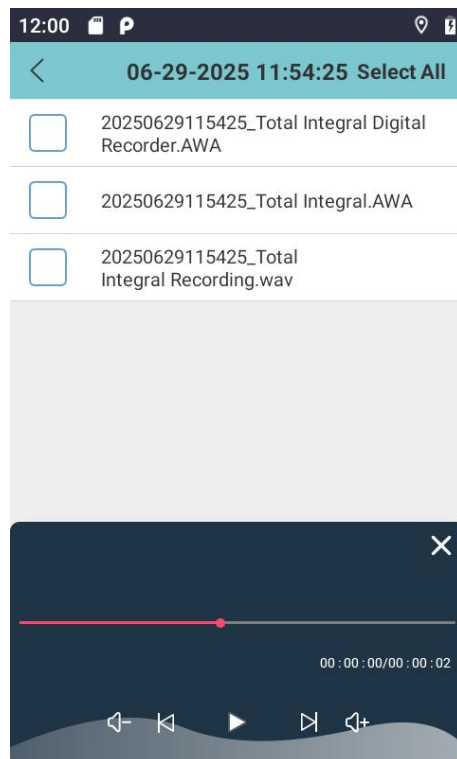


Figure 6.13

6.3.1.6.5 Voice Annotation

For details, refer to Section 6.7.5 Voice Annotation.

6.3.2 Statistical Integration

6.3.2.1 Statistical Integration List Interface

Click “Statistical Integration” to enter the Statistical Integration interface, where the default display is the Statistical Integration List Interface, as shown in Figure 6.14.

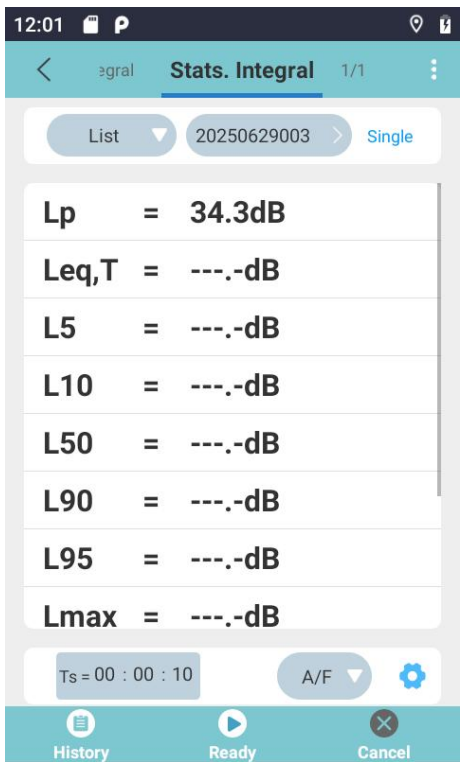


Figure 6.14

The status bar, title area, name display area, and button operation area function identically to those in the Total Value Integration Interface.

The measurement area displays the statistical integration measurement values, with the following indicators: Lp, Leq,T, L5, L10, L50, L90, L95, Lmax, Lmin, SEL, and SD. Users can scroll up and down to view the displayed values. Time and frequency weightings are selected via the weighting button, with the default setting as A/F weighting. Ts calculation and display are configured via the "Settings" button.

The start, pause, and stop procedures for integration measurement are the same as those in Total Value Integration Measurement.

Clicking the "Settings" button opens the Statistical Integration Settings Interface, where users can configure Ts, startup mode, and digital recording settings (Note: Parameter settings cannot be accessed while measurement is in progress).

Weighting Options: A/F, A/S, A/I, C/F, C/S, C/I, Z/F, Z/S, Z/I (Default: A/F).

Using the toggle button in the Statistical Integration Interface, users can select "Additional Indicators", switching to the Additional Indicator Settings Interface, as shown in Figure 6.15.

The Additional Indicators feature enables the calculation and display of other cumulative percentile sound levels (LN) beyond those shown in Figure 6.16.

To view additional indicators, the feature must first be enabled in "Settings", as detailed in Section 6.3.2.4.

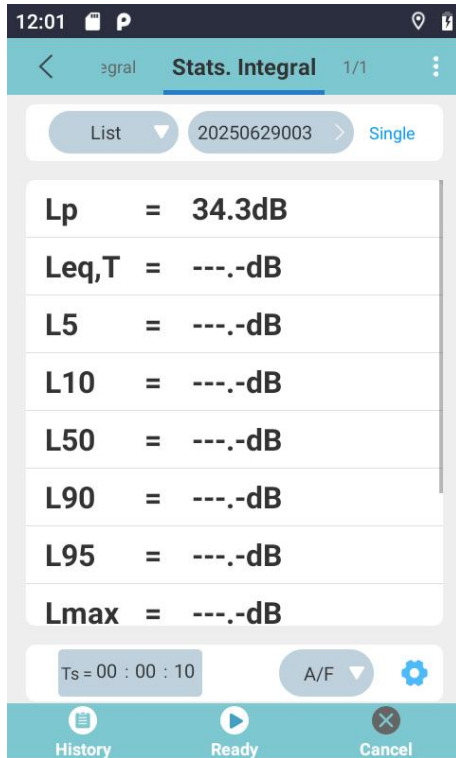


Figure 6.15

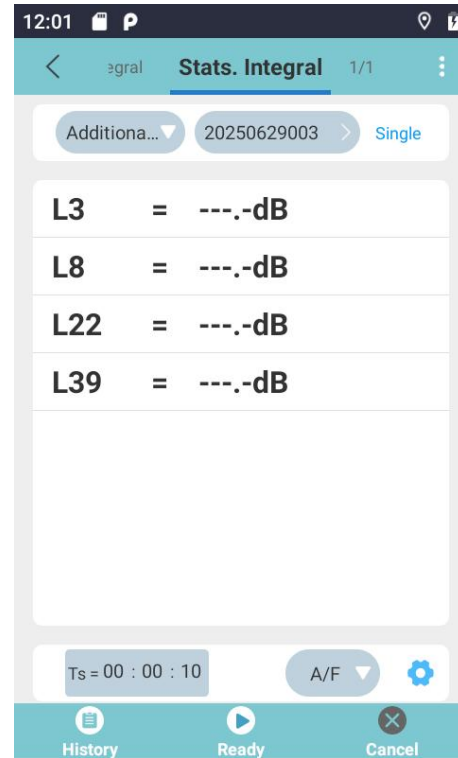


Figure 6.16

6.3.2.2 Statistical Distribution Graph Interface

In the Statistical Integration List Interface, users can switch to the Statistical Distribution Graph Interface by selecting "Statistical Distribution Graph" via the toggle button, as shown in Figure 6.17. This graph provides a visual representation of the proportion of each sound pressure level (SPL) throughout the measurement process.

- 1) Vertical Axis (Y-Axis): Displays percentage values, ranging from 0.0% to 100.0%.
- 2) Horizontal Axis (X-Axis): Represents sound pressure level (SPL), ranging from 0.0 dB to 150.0 dB. Users can manually zoom in or out by adjusting the axis scale.

The data in the graph is calculated based on the selected frequency weighting, time weighting, and Tm (elapsed measurement time) in Statistical Integration Measurement. It allows users to analyze the percentage of time each SPL level occurred during the measurement period. Users can select a specific sound pressure level within the 0 dB – 150 dB range by sliding the selector. Once selected, the system calculates and displays the percentage of time that SPL level was present during each time interval of the integration process, as illustrated in the bottom three rows of Figure 6.17.

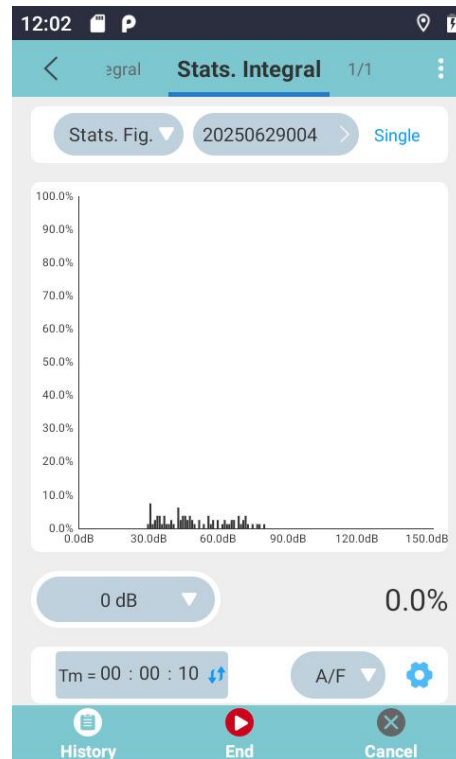


Figure 6.17

6.3.2.3 Cumulative Distribution Graph Interface

In the Statistical Integration Interface, users can switch to the Cumulative Distribution Graph Interface by selecting “Cumulative Distribution Graph” via the toggle button, as shown in Figure 6-3-2-4. This graph is used to calculate and display cumulative percentile sound level distributions.

For example:

- 1) L5 = 70.4 dB means that 5% of the measured sound pressure levels exceeded 70.4 dB during the integration period.
- 2) L90 = 51.8 dB means that 90% of the measured sound pressure levels exceeded 51.8 dB during the integration period.
- 3) Vertical Axis (Y-Axis): Displays percentage values, ranging from 0% to 100%, corresponding to L0 – L100.
- 4) Horizontal Axis (X-Axis): Represents sound pressure level (SPL), ranging from 0.0 dB to 150.0 dB. Users can manually zoom in or out by adjusting the axis scale.

The data in the graph is calculated based on the selected frequency weighting, time weighting, and Tm (elapsed measurement time) in Statistical Integration Measurement, allowing users to analyze the cumulative percentage of time each SPL level occurred.

Users can select a specific SPL level within the 0 dB – 150 dB range by sliding the selector. Once selected, the system calculates and displays the cumulative percentage of time that SPL level was exceeded, as shown in Figure 6.18.

Clicking the "Settings" button opens the Statistical Integration Settings Interface, as shown in

Figure 6.19, where users can configure Ts, startup mode, digital recording, and additional indicators (Note: Parameter settings cannot be accessed while measurement is in progress). The functionality and operations are the same as in Total Value Integration Measurement Settings. Clicking the "History Records" button opens the History Interface, where users can view past statistical integration data. The interface and operations are detailed in Section 6.3.2.5 Statistical Integration History Review. Users can access Statistical Integration History Details and Statistical Integration Digital Recording Details, with selection, deletion, and printing rules identical to those in the Total Value Integration History Interface.

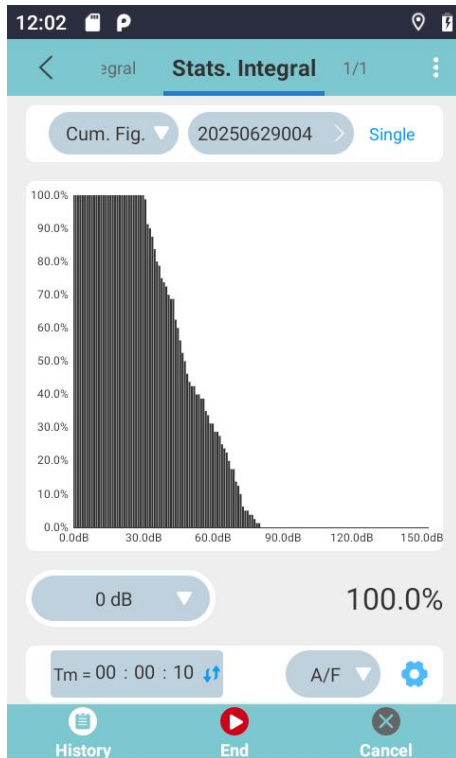


Figure 6.18

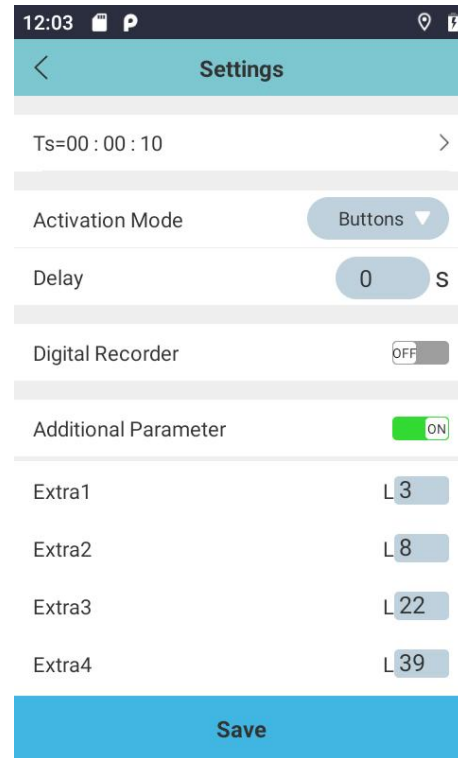


Figure 6.19

6.3.2.4 Additional Indicators

In the Statistical Integration Settings Interface, the Additional Indicators feature is disabled by default. When disabled, the function list does not display additional indicators.

To enable this feature, click "Enable", then input an integer between 1 and 99 (excluding 5, 10, 50, 90, and 95) into the text input fields labeled Additional 1 to Additional 10. These correspond to L1 – L99, as shown in Figure 6.20.

Rules for Additional Indicators:

- 1) Values must be between 1 and 99.
- 2) Duplicate values are not allowed.
- 3) Default state is empty, requiring manual user input.

Once enabled, the Additional Indicators can be selected in the Statistical Integration Function List, as shown in Figure 6.19.

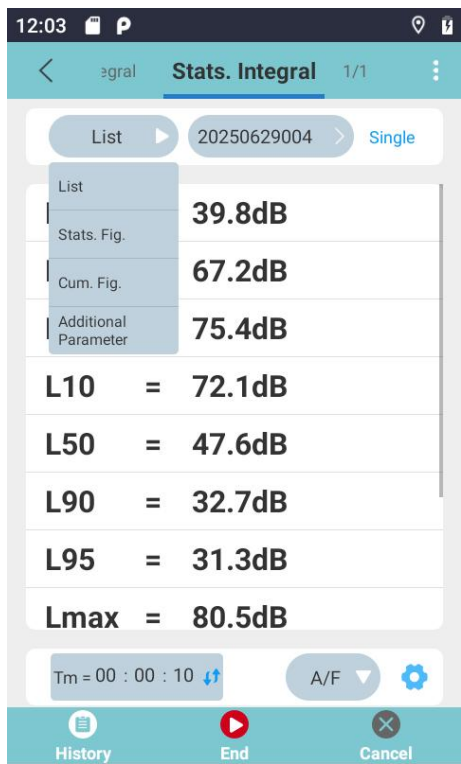


Figure 6.20

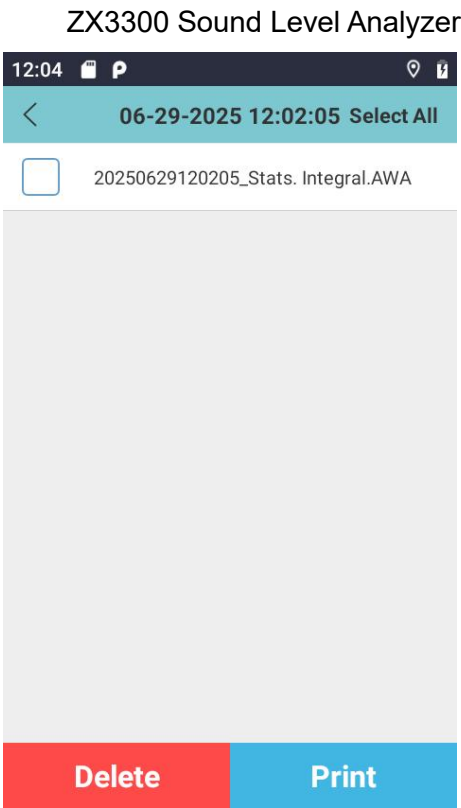


Figure 6.21

6.3.2.5 Statistical Integration Data Review

Click the "History Records" button to enter the Data Review interface. This interface displays stored statistical integration history data, where the recorded time represents the measurement start time of each data set. The group name corresponds to the user-defined name, and the source is labeled as Statistical Integration.

Users can select individual records, multiple records, or all records to perform actions such as deletion and printing. Clicking on any file opens the Historical Measurement View interface, as shown in Figure 6.21. From this interface, users can select single or multiple records for printing or deletion. The deletion and printing functions are detailed in Section 6.5.

6.3.2.5.1 Statistical Integration History Details

Clicking a "Statistical Integration.AWA" file opens the Statistical Integration History Details interface, as shown in Figure 6.22 and Figure 6.23.

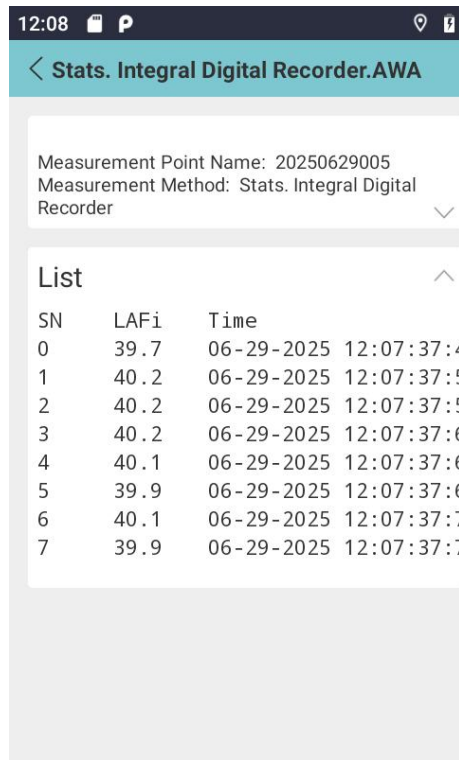


Figure 6.22

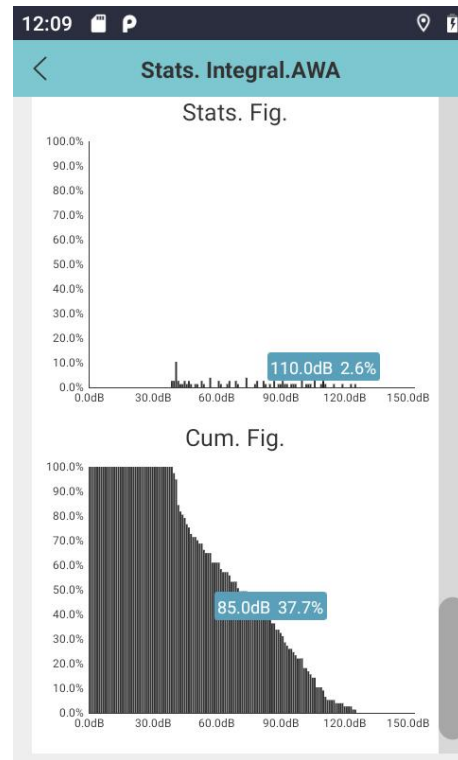


Figure 6.23

1) Measurement Details:

Includes measurement point name, measurement mode, measurement start time, Ts, Tm, instrument model, serial number, calibration time, sensitivity level, calibration sound pressure level, weighting, latitude and longitude, and measurement range. These details can be expanded or collapsed using the control button.

2) List of Indicators: L5, L10, L50, L90, L95, SD, Lmax, Lmin, SEL, Leq,T.

If additional indicators were enabled, they will also be displayed. The indicator list can be expanded or collapsed using the control next to "List".

3) Graphical Indicators:

Includes Statistical Distribution Graph and Cumulative Distribution Graph. Users can scroll on the right side of the screen to view the corresponding graphs. The graphical indicators can be expanded or collapsed using the control next to "Graph".

6.3.2.5.2 Statistical Integration Digital Recording Details

Click the "Statistical Integration Digital Recording.AWA" file to enter the Statistical Integration Digital Recording Details interface, as shown in Figure 6.24.

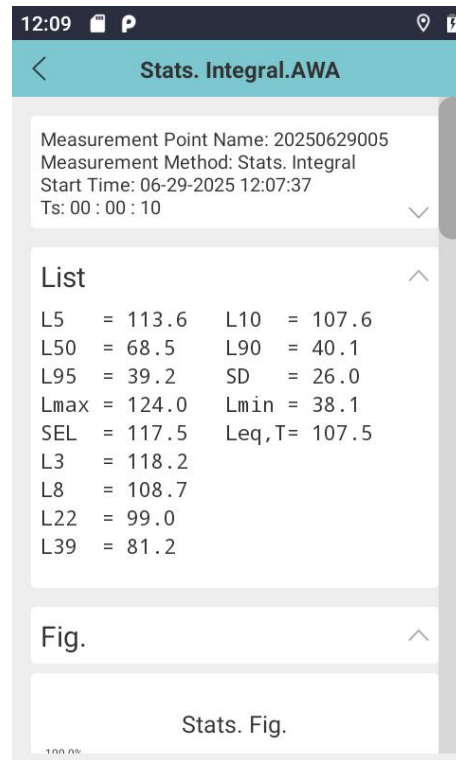


Figure 6.24

1) Measurement Details:

Includes measurement point name, measurement mode, measurement start time, Ts, Tm, instrument model, serial number, calibration time, sensitivity level, calibration sound pressure level, weighting, latitude and longitude, sampling interval, and measurement range. These details can be expanded or collapsed using the control in the bottom-right corner.

2) Detailed Indicators:

Displayed according to the Statistical Integration Settings. Users can scroll up to view more indicators, and the indicator list can be expanded or collapsed using the control next to "List".

6.3.2.5.3 Statistical Integration Recording

Click an .wav file to start playback. The interface and operation are the same as in Total Value Integration Measurement.

6.3.2.5.4 Voice Annotation

For details, refer to Section 6.7.4 Voice Annotation.

6.3.3 1/1 OCT Analysis

6.3.3.1 1/1 OCT Analysis List Interface

Click "1/1 OCT" to enter the 1/1 OCT Analysis Interface, as shown in Figure 6.25.

The status bar, title area, name display area, button operation area, and measurement settings area function identically to those in the Total Value Integration Interface.

The measurement area displays 1/1 OCT Analysis measurement values, structured as follows:

- 1) Vertical Axis: Displays SPL(A), SPL(C), SPL(Z) and 1/1 OCT center frequencies (8 Hz, 16 Hz, 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, 16 kHz).
- 2) Horizontal Axis: Displays measurement indicators: Lp, Lmax, Lmin, Leq,T, calculated based on time weighting, frequency weighting, and Ts settings.
- 3) The start, pause, and stop measurement procedures are the same as those in Total Value Integration Measurement.

Clicking the "Settings" button opens the 1/1 OCT Analysis Settings Interface, where users can configure Ts, startup mode, digital recording, etc. (Note: Parameter settings cannot be accessed while measurement is in progress). The functionality and operations are the same as in Total Value Integration Measurement Settings.

Weighting Options:

- 1) Default: Z/F
- 2) Drop down options: A/F, A/S, C/F, C/S, Z/F, Z/S

Clicking any record opens a dialog box displaying the values for that entry, as shown in Figure 6.26. Clicking "Confirm" will close the dialog box.

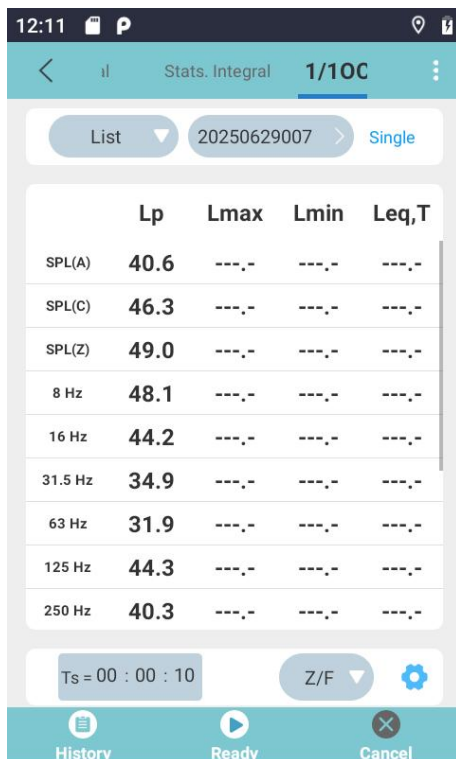


Figure 6.25

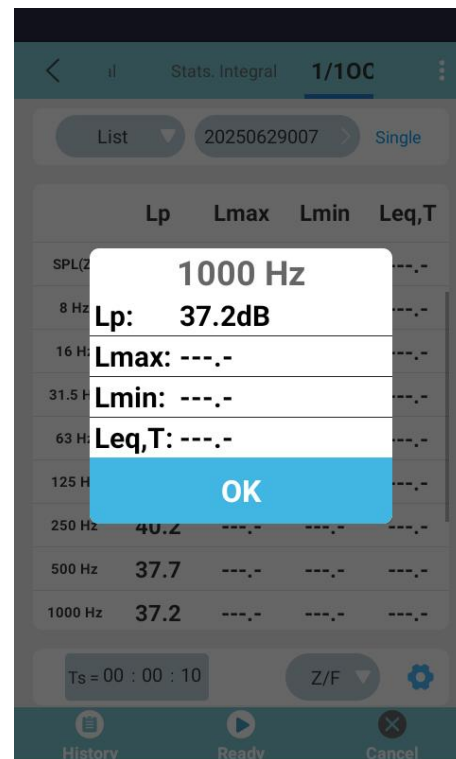


Figure 6.26

6.3.3.2 1/1 OCT Analysis Graph Interface

In the 1/1 OCT Analysis List Interface, selecting "Graph" via the toggle button switches to the

1/1 OCT Analysis Graph Interface, as shown in Figure 6.27. This graph displays the sound pressure levels (SPL) of each 1/1 OCT frequency band during the measurement process.

- 1) Vertical Axis (Y-Axis): Represents sound pressure levels, ranging from 0.0 dB to 150.0 dB.
- 2) Horizontal Axis (X-Axis): Displays the center frequency points of each 1/1 OCT band and A, C, Z-weighted sound levels. Users can manually zoom in or out on the frequency axis.

Users can select the frequency weighting and time weighting via the “Weighting” option.

The displayed graph indicators can be selected via a drop down menu, including: Lp, Lmax, Leq,T, Lmin, All. The graph displays each selected indicator in a different color.

If “All” is selected, the values for each center frequency will be overlapped with different colors, as shown in Figure 6.28.

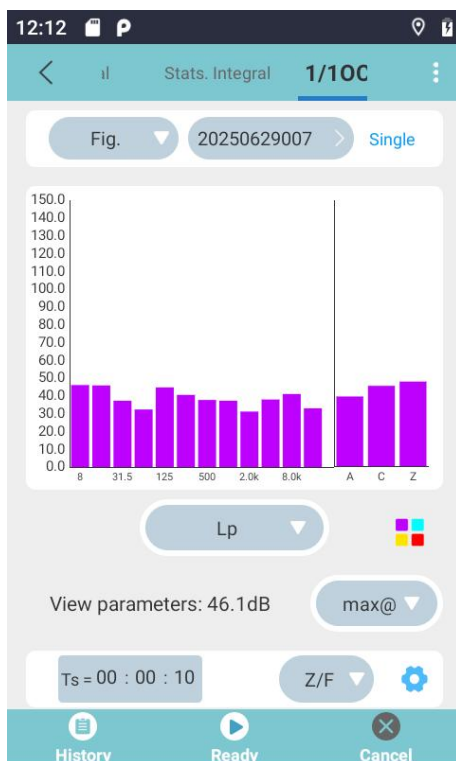


Figure 6.27

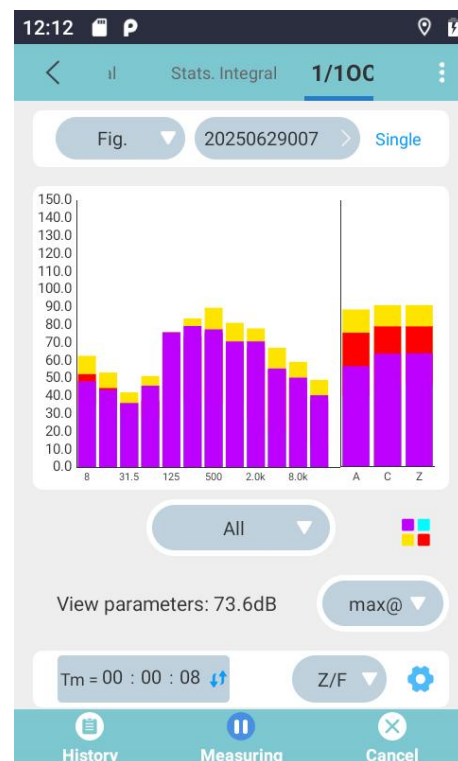


Figure 6.28

Clicking the color icon allows users to view the corresponding indicator for each color, as shown in Figure 6.29. Clicking “Got it” closes the dialog box.

To view detailed values for each weighting SPL and frequency band SPL, users can scroll and select from: max@, SPL(A), SPL(C), SPL(Z), and each 1/1 OCT center frequency. Clicking any selection opens a dialog box displaying the value, as shown in Figure 6.30. Clicking “Confirm” closes the dialog box.

Note : max@ represents the maximum value among Lp, Lmax, Lmin, and Leq,T for each center frequency point.

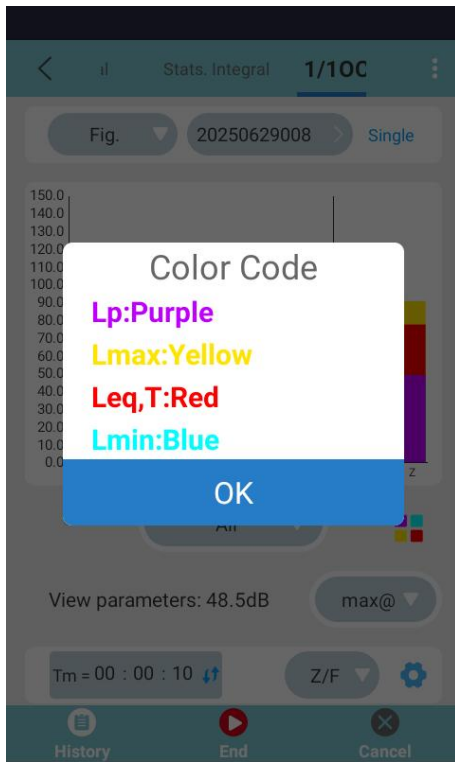


Figure 6.29

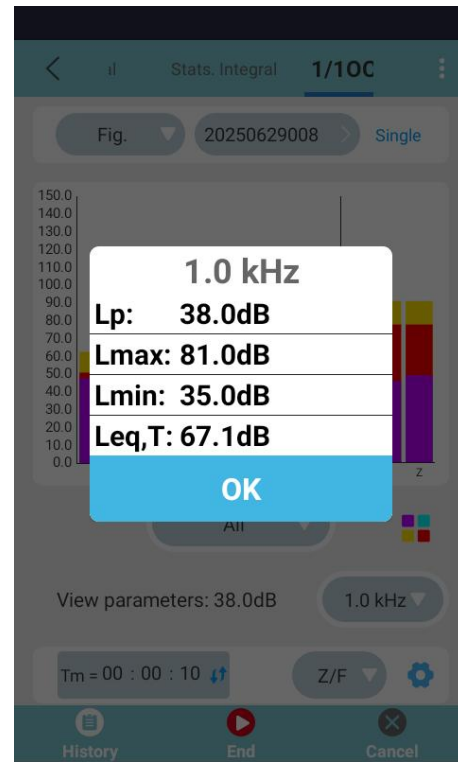


Figure 6.30

6.3.3.3 1/1 OCT Analysis Data Review

Click the "History Records" button to enter the Data Review interface. This interface displays stored 1/1 OCT analysis history data, where the recorded time represents the measurement start time of each dataset. The group name corresponds to the user-defined name, and the source is labeled as 1/1 OCT.

Users can select individual records, multiple records, or all records to perform actions such as deletion and printing.

Clicking on any file opens the Historical Measurement View interface. Users can select single or multiple records for printing or deletion. The deletion and printing functions are detailed in Section 6.5.

6.3.3.3.1 1/1 OCT Analysis History Details

Click the "1/1 OCT.AWA" file to enter the 1/1 OCT Analysis History Details interface, as shown in Figure 6.31 and Figure 6.32.

1) Measurement Details:

Includes measurement point name, measurement mode, measurement start time, Ts, Tm, instrument model, serial number, calibration time, sensitivity level, calibration sound pressure level, weighting, latitude and longitude, and measurement range. These details can be expanded or collapsed using the control button.

2) List of Indicators:

Displays SPL(A), SPL(C), SPL(Z), and Lmax, Lmin, Leq,T for each 1/1 OCT frequency band. Users can scroll up to view more indicators, and the indicator list can be expanded or

collapsed using the control next to “List”.

3) Graphical Indicators:

Displays the 1/1 OCT Analysis Graph, which can be viewed by scrolling on the right side of the screen. The graphical indicators can be expanded or collapsed using the control next to “Graph”.

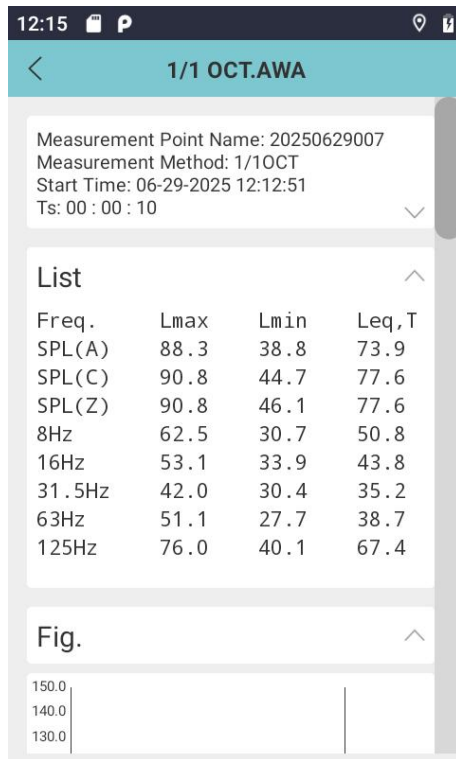


Figure 6.31

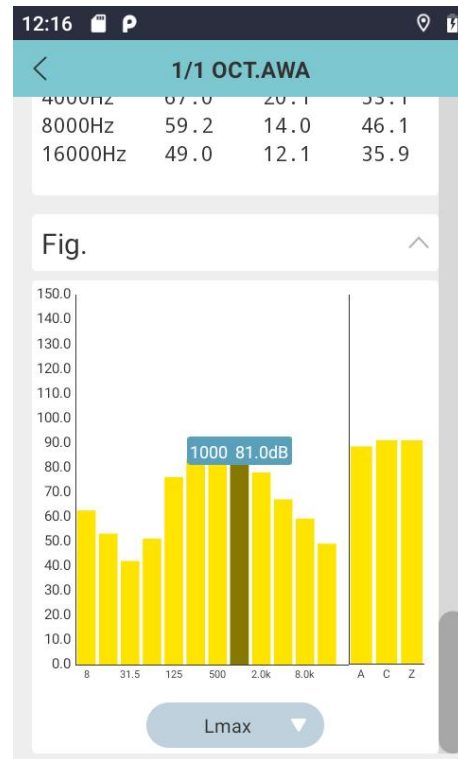


Figure 6.32

6.3.3.3.2 1/1 OCT Analysis Digital Recording Details

Click the “1/1 OCT Digital Recording.AWA” file to enter the 1/1 OCT Digital Recording Details interface, as shown in Figure 6.33.

The screenshot shows the '1/1 OCT Digital Recorder.AWA' interface. At the top, the status bar shows '12:17'. Below the title bar, there are three lines of measurement details: 'Measurement Point Name: 20250629008', 'Measurement Method: 1/1OCT Digital Recorder', and 'Start Time: 06-29-2025 12:16:34'. A collapse button (downward arrow) is to the right. Below this is a section titled 'List' with an expand button (upward arrow). The list contains eight rows of data with columns for SN, SPL(A), and Time.

SN	SPL(A)	Time
0	39.7	06-29-2025 12:16:34
1	39.5	06-29-2025 12:16:34
2	39.6	06-29-2025 12:16:34
3	39.7	06-29-2025 12:16:35
4	39.4	06-29-2025 12:16:35
5	39.2	06-29-2025 12:16:35
6	39.5	06-29-2025 12:16:35
7	39.5	06-29-2025 12:16:35

Figure 6.33

- 1) Measurement Details: Includes measurement point name, measurement mode, measurement start time, Ts, Tm, instrument model, serial number, calibration time, sensitivity level, calibration sound pressure level, weighting, latitude and longitude, sampling interval, and measurement range. These details can be expanded or collapsed using the control button.
- 2) List of Indicators: Displayed according to the 1/1 OCT Analysis Settings. Users can scroll up to view more indicators, and the indicator list can be expanded or collapsed using the control next to "List".

6.3.3.3.3 1/1 OCT Analysis Recording

Click any .wav file to start playback. The interface and operation are the same as in Total Value Integration Measurement.

6.3.3.3.4 Voice Annotation

For details, refer to Section 6.7.4 Voice Annotation.

6.3.4 1/3 OCT Analysis

6.3.4.1 1/3 OCT Analysis List Interface

Click "1/3 OCT Analysis" to enter the 1/3 OCT Analysis List Interface, as shown in Figure 6.34.

The status bar, title area, name display area, button operation area, and measurement settings area function identically to those in the Total Value Integration Interface.

The measurement area displays 1/3 OCT Analysis measurement values, structured as follows:

- 1) Vertical Axis: Displays SPL(A), SPL(C), SPL(Z), SPL(T), SPL(U) and the 1/3 OCT
- 2) Center frequencies, including: 5 Hz, 6.3 Hz, 8 Hz, 10 Hz, 12.5 Hz, 16 Hz, 20 Hz, 25 Hz, 31.5 Hz, 40 Hz, 50 Hz, 63 Hz, 80 Hz, 100 Hz, 125 Hz, 160 Hz, 200 Hz, 250 Hz, 315 Hz, 400 Hz, 500 Hz, 630 Hz, 800 Hz, 1 kHz, 1.25 kHz, 1.6 kHz, 2 kHz, 2.5 kHz, 3.15 kHz, 4 kHz, 5 kHz, 6.3 kHz, 8 kHz, 10 kHz, 12.5 kHz, 16 kHz, 20 kHz.
- 3) Horizontal Axis: Displays measurement indicators, including: Lp, Lmax, Lmin, Leq,T, calculated based on time weighting, frequency weighting, and Ts settings in Integration Measurement Settings.

Note: SPL(T) and SPL(U) represent user-defined frequency weighting results. For custom weighting, refer to Section 6.3.4.3.

The start, pause, and stop measurement procedures are the same as those in Total Value Integration Measurement.

Clicking the "Settings" button opens the 1/3 OCT Analysis Settings Interface, where users can configure Ts, startup mode, digital recording, and custom weighting (Note: Parameter settings cannot be accessed while measurement is in progress). The functionality and operations are the same as in Total Value Integration Measurement Settings.

Weighting Options: Default: Z/F; Drop down options: A/F, A/S, C/F, C/S, Z/F, Z/S

Clicking any record opens a dialog box displaying the values for that entry, as shown in Figure 6.35. Clicking "Confirm" will close the dialog box.

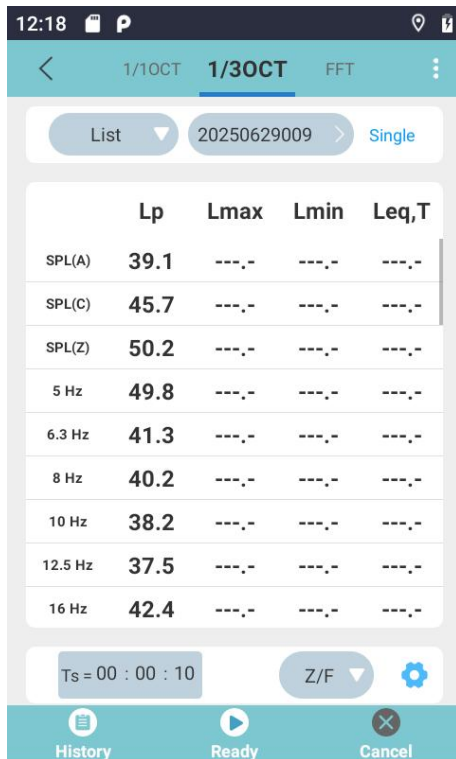


Figure 6.34

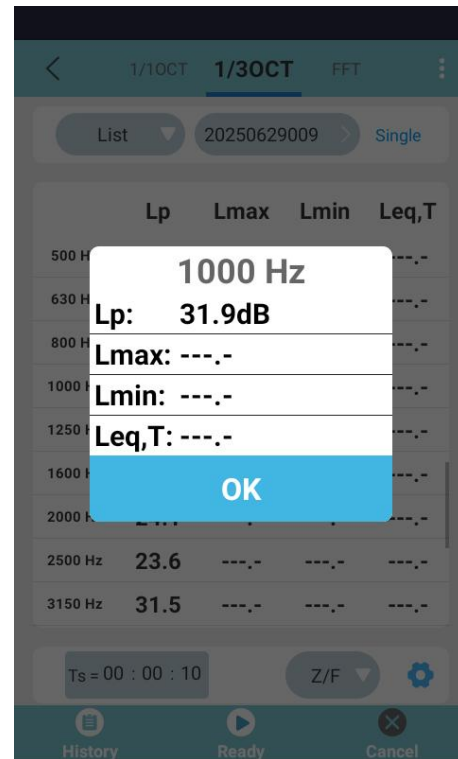


Figure 6.35

6.3.4.2 1/3 OCT Analysis Graph Interface

In the 1/3 OCT Analysis List Interface, selecting “Graph” via the toggle button switches to the 1/3 OCT Analysis Graph Interface, as shown in Figure 6.36. This graph displays the sound pressure levels (SPL) of each 1/3 OCT frequency band during the measurement process.

- 1) Vertical Axis (Y-Axis): Represents sound pressure levels, ranging from 0.0 dB to 150.0 dB.
- 2) Horizontal Axis (X-Axis): Displays the center frequency points of each 1/3 OCT band and total SPL values for SPL(A), SPL(C), SPL(Z), SPL(T), and SPL(U). Users can manually zoom in or out on the frequency axis.

Users can select the frequency weighting and time weighting via the “Weighting” option. The displayed graph indicators can be selected via a drop down menu, including: Lp, Lmax, Leq,T, Lmin, All; The graph displays each selected indicator in a different color.

If “All” is selected, the values for each center frequency will be overlapped with different colors, as shown in Figure 6.37.

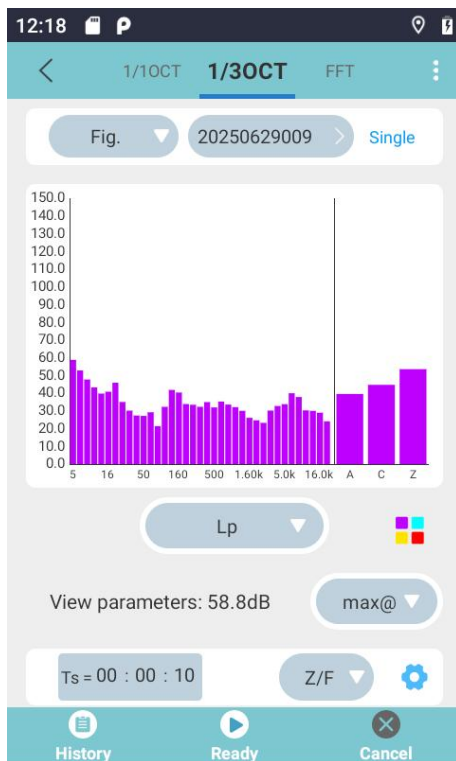


Figure 6.36

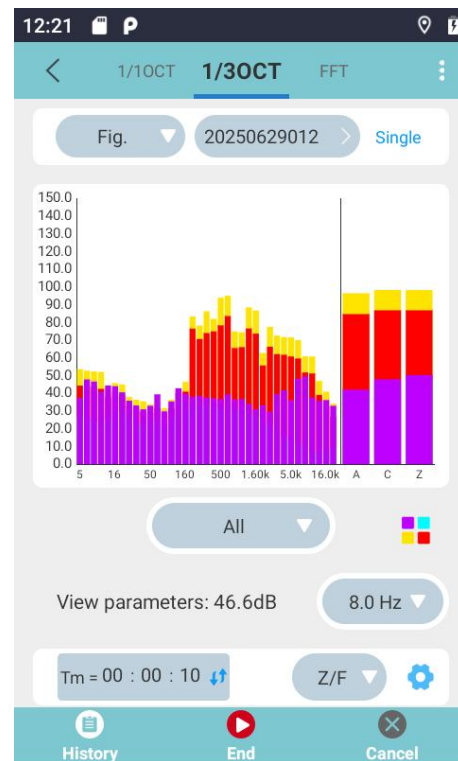


Figure 6.37

Clicking the color icon () allows users to view the corresponding indicator for each color, similar to Figure 6.34. Clicking “Got it” closes the dialog box. To view detailed values for each weighting SPL and frequency band SPL, users can scroll and select from: max@, SPL(A), SPL(C), SPL(Z), SPL(T), SPL(U), and each 1/3 OCT center frequency.

Clicking any selection opens a dialog box displaying the value, similar to Figure 6.35. Clicking “Confirm” closes the dialog box.

6.3.4.3 1/3 OCT Analysis Custom Weighting

Click the "Settings" () button to enter the 1/3 OCT Analysis Settings Interface, where users can configure custom weighting, as shown in Figure 6.38.

Note: Parameter settings cannot be accessed while measurement is in progress.

Once custom weighting is enabled, the interface appears as shown in Figure 6.39. Users can modify the U-weighting and T-weighting values for the 33 center frequency points ranging from 12.5 Hz to 20 kHz. The default factory-set weighting values for these two weightings are listed in Table 1.

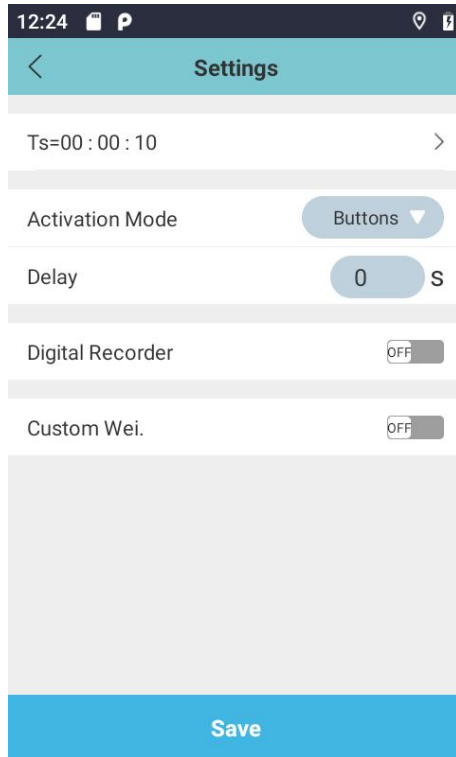


Figure 6.38

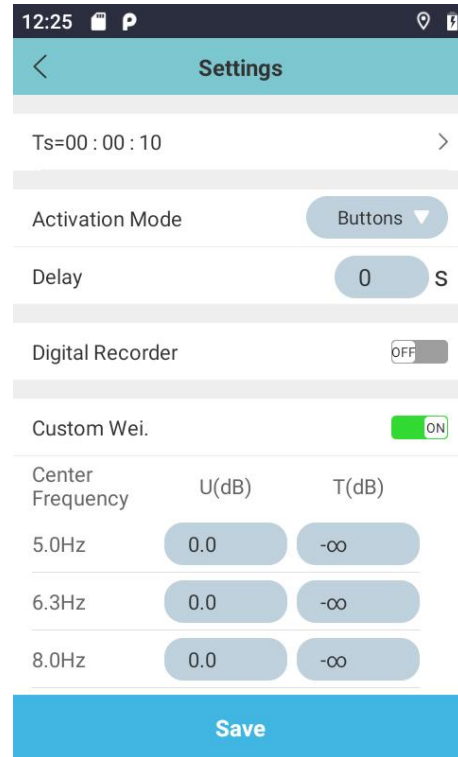


Figure 6.39

Users can set custom U-weighting and T-weighting values for each 1/3 OCT center frequency, representing the difference from an unweighted measurement:

- 1) Negative values indicate attenuation.
- 2) Positive values indicate amplification.

After configuration, the 1/3 OCT Analysis List Interface and Graph Interface will display:

- 1) SPL(T) and SPL(U) values based on the current frequency weighting and time weighting.
- 2) Corresponding values for Lp, Lmax, Lmin, and Leq,T.

Table 1: Factory Default Values for Custom Frequency Weighting

Center Frequency (Hz)	U Weighting (dB)	T Weighting (dB)	Center Frequency (Hz)	U Weighting (dB)	T Weighting (dB)
5	0	-∞	400	0	-∞

6.3	0	$-\infty$	500	0	$-\infty$
8	0	$-\infty$	630	0	$-\infty$
10	0	$-\infty$	800	0	$-\infty$
12.5	0	$-\infty$	1000	0	$-\infty$
16	0	-56.7	1250	0	$-\infty$
20	0	-50.5	1600	0	$-\infty$
25	0	-44.7	2000	0	$-\infty$
31.5	0	-39.4	2500	0	$-\infty$
40	0	-34.6	3150	0	$-\infty$
50	0	-30.2	4000	0	$-\infty$
63	0	-26.2	5000	0	$-\infty$
80	0	-22.5	6300	0	$-\infty$
100	0	-19.1	8000	0	$-\infty$
125	0	-16.1	10000	0	$-\infty$
160	0	-13.4	12500	0	$-\infty$
200	0	-10.9	16000	0	$-\infty$
250	0	$-\infty$	20000	0	$-\infty$
315	0	$-\infty$	\	\	\

Note: The factory default values for custom T frequency weighting correspond to the A-weighted values from 20 Hz to 200 Hz. These values are specifically designed for low-frequency noise evaluation in Taiwan.

6.3.4.4 1/3 OCT Analysis Data Review

Click the "History Records" button to enter the Data Review Interface. This interface displays stored 1/3 OCT analysis history data, where the recorded time represents the measurement start time of each data set. The group name corresponds to the user-defined name, and the source is labeled as 1/3 OCT.

Users can select individual records, multiple records, or all records to perform actions such as deletion and printing.

Clicking on any file opens the Historical Measurement View interface. Users can select single or multiple records for printing or deletion. The deletion and printing functions are detailed in Section 6.5.

6.3.4.4.1 1/3 OCT Analysis History Details

Click the "1/3 OCT.AWA" file to enter the 1/3 OCT Analysis History Details interface, similar to Figure 6.31 and Figure 6.32.

- 1) **Measurement Details:** Includes measurement point name, measurement mode, measurement start time, Ts, Tm, instrument model, serial number, calibration time, sensitivity level, calibration sound pressure level, weighting, latitude and longitude, and measurement range. These details can be expanded or collapsed using the control

button.

- 2) List of Indicators: Displays SPL(A), SPL(C), SPL(Z), SPL(T), SPL(U), and Lmax, Lmin, Leq,T for each 1/3 OCT frequency band. Users can scroll up to view more indicators, and the indicator list can be expanded or collapsed using the control next to "List".
- 3) Graphical Indicators: Displays the 1/3 OCT Analysis Graph, which can be viewed by scrolling on the right side of the screen. The graphical indicators can be expanded or collapsed using the control next to "Graph".

6.3.4.4.2 1/3 OCT Analysis Digital Recording Details

Click the "1/3 OCT Digital Recording.AWA" file to enter the 1/3 OCT Digital Recording Details interface, similar to Figure 6.33.

- 1) Measurement Details: Includes measurement point name, measurement mode, measurement start time, Ts, Tm, instrument model, serial number, calibration time, sensitivity level, calibration sound pressure level, weighting, latitude and longitude, sampling interval, and measurement range. These details can be expanded or collapsed using the control button.
- 2) List of Indicators: Displayed according to the 1/3 OCT Analysis Settings. Users can scroll up to view more indicators, and the indicator list can be expanded or collapsed using the control next to "List".

6.3.4.4.3 1/3 OCT Analysis Recording

Click any .wav file to start playback. The interface and operation are the same as in Total Value Integration Measurement.

6.3.4.4.4 Voice Annotation

For details, refer to Section 6.7.4 Voice Annotation.

6.3.5 FFT Analysis

6.3.5.1 FFT Analysis List Interface

Click "FFT Analysis" to enter the FFT Analysis Interface, which by default displays the FFT Analysis List Interface, as shown in Figure 6.40.

The status bar, title area, name display area, button operation area, and measurement settings area function identically to those in the Total Value Integration Interface.

The measurement area displays FFT measurement values, structured as follows:

- 1) Vertical Axis: Displays SPL(A), SPL(C), SPL(Z) and the frequency range from 23.4 Hz to 19998.0 Hz.
- 2) Horizontal Axis: Displays measurement indicators, including: Lp, Lmax, Lmin, Leq,T, calculated based on time weighting, frequency weighting, and Ts settings.

The start, pause, and stop measurement procedures are the same as those in Total Value Integration Measurement.

Clicking the "Settings" button opens the FFT Analysis Settings Interface, where users can

configure Ts, startup mode, window function, and frequency range limits (*Note: Parameter settings cannot be accessed while measurement is in progress*). The functionality and operations are the same as in Total Value Integration Measurement Settings.

Weighting Options: Default: Z/F; Drop down options: A/F, A/S, C/F, C/S, Z/F, Z/S

Clicking any record opens a dialog box displaying the values for that entry, shown in Figure 6.41. Clicking "Confirm" will close the dialog box.

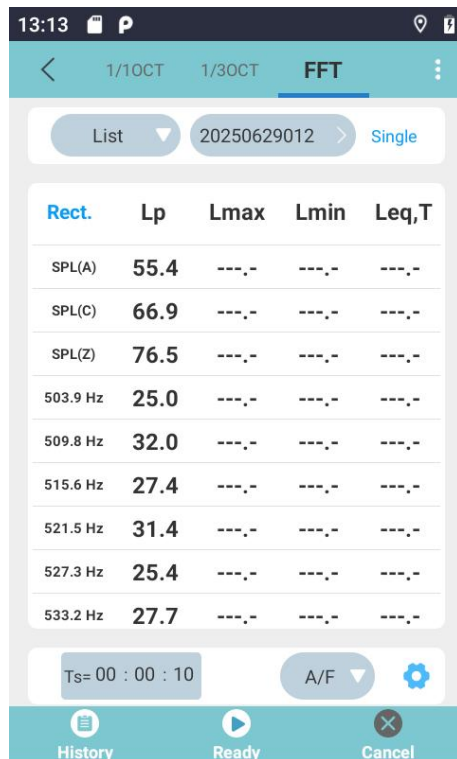


Figure 6.40

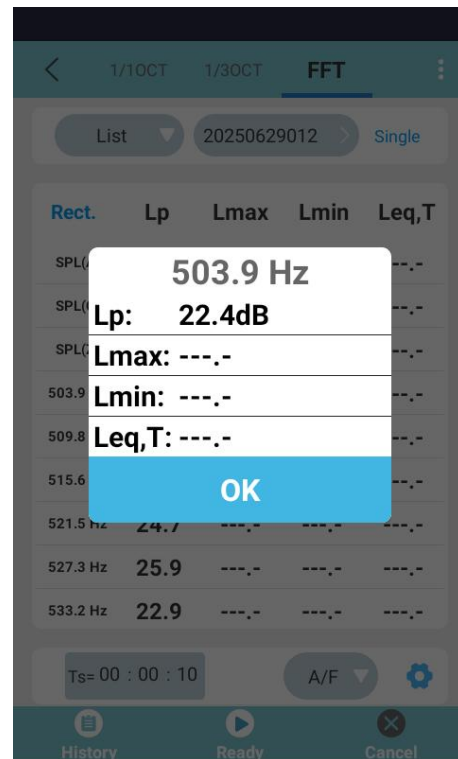


Figure 6.41

6.3.5.2 FFT Analysis Graph Interface

In the FFT Analysis List Interface, selecting "Graph" via the toggle button switches to the FFT Analysis Graph Interface, as shown in Figure 6.42. This graphical representation helps users visually analyze narrow-band frequency sound pressure levels (SPL) during the measurement process.

- 1) Vertical Axis (Y-Axis): Represents sound pressure levels, ranging from 0.0 dB to 150.0 dB.
- 2) Horizontal Axis (X-Axis): Displays center frequency points from 23.4 Hz to 19998.0 Hz and the overall SPL values (SPL(A), SPL(C), SPL(Z)). Users can manually zoom in or out on the frequency axis.

Users can select the frequency weighting and time weighting via the "Weighting" option.

The displayed graph indicators can be selected via a drop down menu, including: Lp, Lmax, Lmin, Leq,T, All; The graph displays each selected indicator in a different color.

If "All" is selected, the values for each center frequency will be overlapped with different colors, as shown in Figure 6.43.

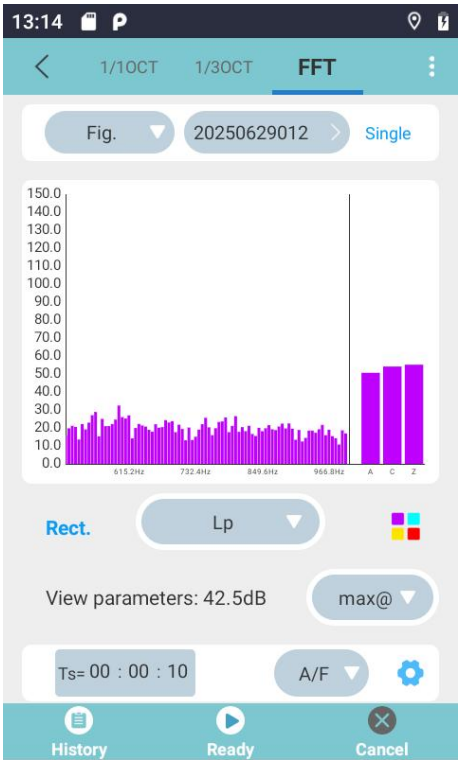


Figure 6.42



Figure 6.43

Clicking the color icon () allows users to view the corresponding indicator for each color, as shown in Figure 6.44. Clicking “Got it” closes the dialog box.

To view detailed values for each weighting SPL and frequency band SPL, users can scroll and select from: Center frequency range (23.4 Hz–19998.0 Hz), SPL(A), SPL(C), SPL(Z).

Clicking any selection opens a dialog box displaying the value, similar to Figure 6.41. Clicking “Confirm” closes the dialog box.

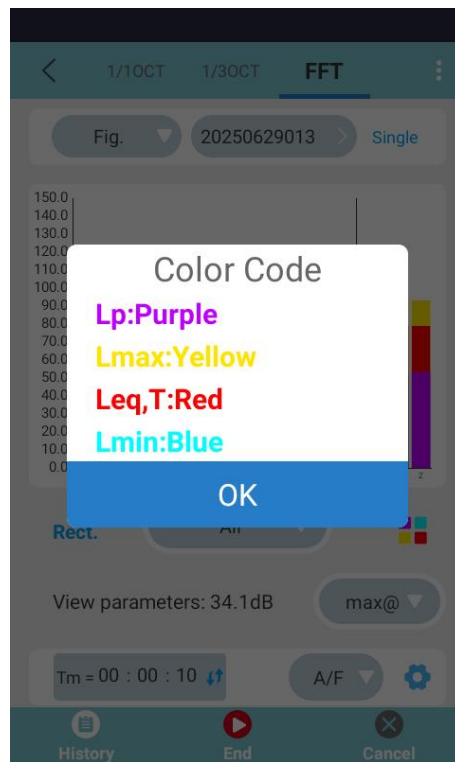


Figure 6.44

6.3.5.3 FFT Window Function Settings

Click the "Settings" button to enter the FFT Settings Interface, as shown in Figure 6.45. The window function can be selected from the drop down menu, which includes: Rectangular; Hanning; Blackman; Flat-Top.

This selection interface is shown in Figure 6.46.

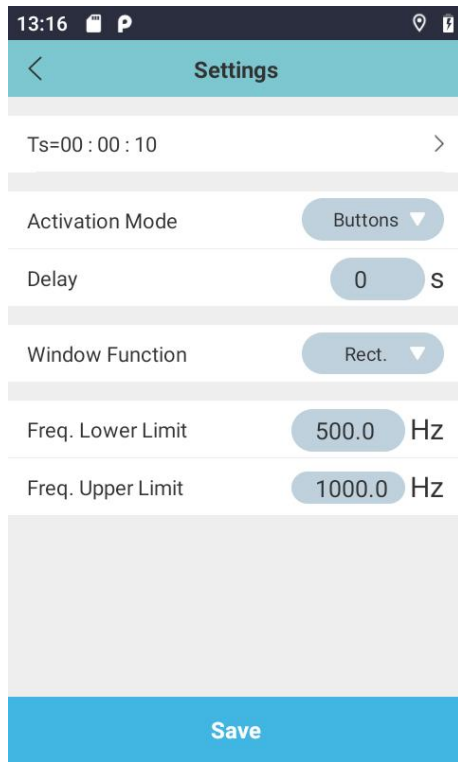


Figure 6.45

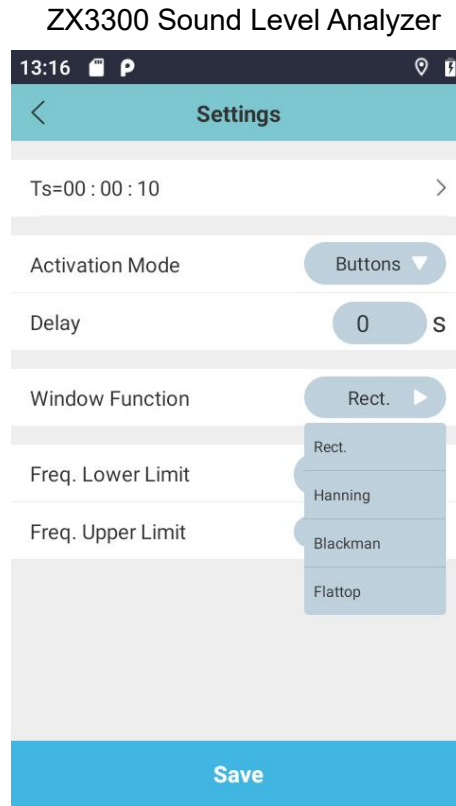


Figure 6.46

Once upper and lower frequency limits are set, the list and graph interfaces will only display measurement values within the selected frequency range.

Note: The remaining settings are identical to those in Total Value Integration Measurement. Additionally, parameter settings cannot be accessed while measurement is in progress.

Since FFT can only transform finite-length time-domain data, it inevitably causes spectral leakage. To minimize this leakage error, a window function is applied. Here are the characteristics of different window functions:

- 1) Rectangular: Concentrates most energy in the main lobe.
- 2) Hanning Window: An improved raised cosine window. Main lobe is slightly wider, but with lower side lobes and faster attenuation, making it a better choice for reducing leakage. Can be considered as the sum of three rectangular windows, effectively canceling high-frequency interference and reducing energy leakage.
- 3) Blackman Window: Narrow main lobe and low side lobes. Provides high-frequency resolution, making it suitable for identifying closely spaced frequency components.
- 4) Flattop Window: As the name suggests, it has very low pass-band ripple when viewed in the frequency domain. Ideal for precise amplitude measurements.

6.3.5.4 FFT Analysis Data Review

Click the "History Records" button to enter the Data Review Interface.

This interface displays stored FFT analysis historical data, where:

- 1) The recorded time represents the measurement start time of each data set.
- 2) The group name corresponds to the user-defined name.

- 3) The source is labeled as FFT Analysis.

Users can select individual records, multiple records, or all records to perform actions such as deletion and printing.

Clicking on any file opens the Historical Measurement View interface. Users can select single or multiple records for printing or deletion. The deletion and printing functions are detailed in Section 6.5.

6.3.5.4.1 FFT Analysis History Details

Click the "FFT.AWA" file to enter the FFT Analysis History Details interface, as shown in Figure 6.47 and Figure 6.48.

- 1) Measurement Details:

Includes the following parameters: Measurement point name, Measurement mode, Measurement start time, Ts (Integration Time), Tm (Elapsed Time), Instrument model and serial number, Calibration time, Sensitivity level, Calibration sound pressure level, Weighting (A, C, Z), Latitude and longitude, Sampling frequency, Window type, Window analysis line count, Measurement range; These details can be expanded or collapsed using the control button.

- 2) List of Indicators: Displays SPL(A), SPL(C), SPL(Z) and Lmax, Lmin, Leq,T for each FFT frequency point ; Users can scroll up to view more indicators; The indicator list can be expanded or collapsed using the control next to "List".

- 3) Graphical Indicators: Displays the FFT Analysis Graph, which can be viewed by scrolling on the right side of the screen; The graphical indicators can be expanded or collapsed using the control next to "Graph".

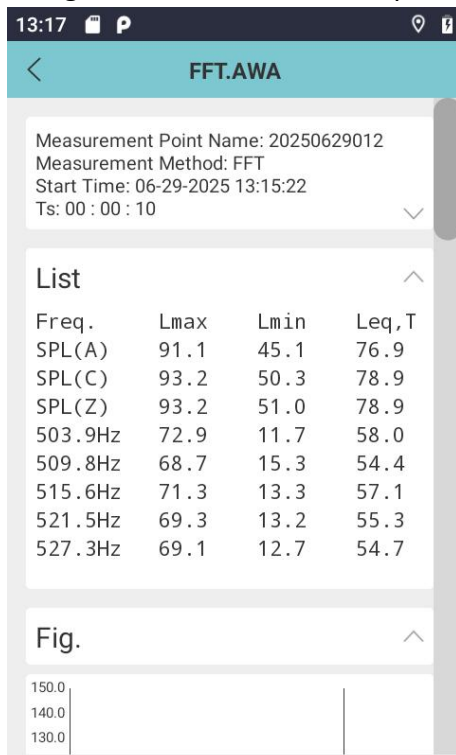


Figure 6.47

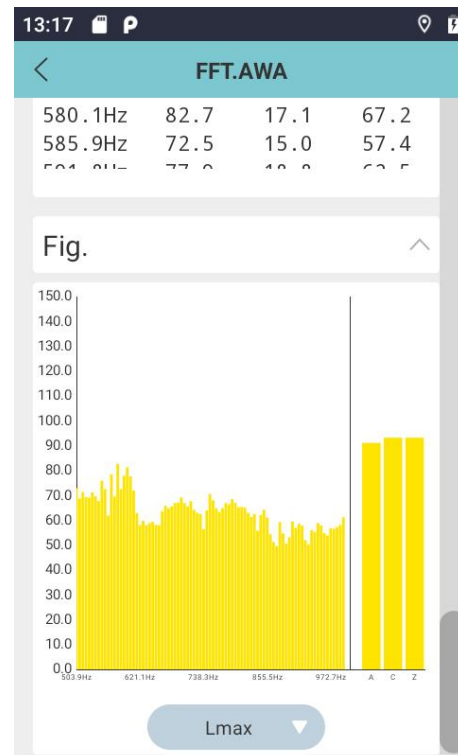


Figure 6.48

6.3.5.4.2 FFT Analysis Recording Playback

Click any .wav file to start playback. The interface and operation are the same as in Total Value Integration Measurement.

6.3.5.4.3 Voice Annotation

For details, refer to Section 6.7.4 Voice Annotation.

6.3.6 24-Hour Measurement

6.3.6.1 24-Hour Measurement List Interface

Click "24-Hour Measurement" to enter the 24-Hour Measurement List Interface.

The status bar, title area, and name display area function identically to those in the Total Value Integration Interface. The measurement area displays the current measurement values for the 24-hour period, with the following indicators: Linst (Instantaneous Sound Level); Leq,T (Equivalent Continuous Sound Level); Lmax (Maximum Sound Level); Ld (Daytime Equivalent Sound Level); Ln (Nighttime Equivalent Sound Level); Ldn (Day-Night Equivalent Sound Level).

These values are calculated based on the time weighting, frequency weighting, and Ts settings.

- 1) Automatic Mode (Default Mode): Upon entry, the system displays a prompt "Measurement started. Automatic mode. Measurement will begin on the hour." The initial status is "Waiting" (icon , displayed in blue).
- 2) Manual Mode: The initial status is "Ready" (icon , displayed in blue).
- 3) Scheduled Mode: The initial status is "Ready" (icon, displayed in blue). Once measurement starts, the status changes to "Measuring" (icon , displayed in blue). Clicking again prompts a confirmation dialog box: "Measurement is in progress. Are you sure you want to end the measurement and save the data?". Once "Confirm" is selected, the measurement ends, and the status returns to "Ready" (icon , displayed in blue).

If "Cancel" is selected, the measurement continues. Battery Level Check During Measurement: If the battery level is below 80% and the instrument is not charging, a warning appears: "Battery level must be above 80%." Settings and Configurations: Clicking the "Settings" button opens the Settings Interface, where users can configure: Ts (Integration Time); Startup Mode; Measurement Cycle.

Note: Settings cannot be changed during an active measurement session. If the instrument is in Waiting Mode, measurement must first be canceled before accessing the Settings Interface.

Weighting Options: Default: A/F; Drop down Options: A/F, A/S, A/I, C/F, C/S, C/I, Z/F, Z/S, Z/I.

6.3.6.2 24-Hour Measurement Graph Interface

In the 24-Hour Measurement List Interface, selecting "Graph" via the toggle button switches to the 24-Hour Measurement Graph Interface, which displays the 24-hour sound pressure level distribution chart. The Y-axis represents the sound pressure level, and the X-axis represents the hour of the day (00 h – 23 h), divided into 24 columns, as shown in Figure 6-3-6-2.

- 1) Y-Axis (Vertical Axis): Represents sound pressure levels (SPL). Default range: 0.0 dB – 150.0 dB.
- 2) X-Axis (Horizontal Axis): Represents hours of the day (00 h – 23 h, 24 columns total). The coordinate data is calculated and displayed based on the selected Ts (Integration Time), Frequency Weighting, Time Weighting, and Indicator settings.
- 3) Indicators: Available drop down options: Leq,T, Lmax, Lmin, L5, L10, L50, L90, L95, as shown in Figure 6-3-6-3.
- 4) Hourly Data Review: Scroll selection box (00 h – 23 h) allows users to select an hour. Selecting an hour opens a dialog box displaying the corresponding value, as shown in Figure 6-3-6-4. Click "Confirm" to close the dialog box.

6.3.6.3 24-Hour Measurement Overview Interface

In the 24-Hour Measurement List Interface, selecting “Overview” via the toggle button switches to the 24-Hour Measurement Overview Interface. This interface is designed to provide an intuitive display of measurement values for each hour.

- 1) Horizontal Indicators: Displays the following measurement parameters: Time, Leq,T, Lmax, L5, L10, L50, L90, L95, Lmin, SD. Users can scroll left or right to view more horizontal indicators.
- 2) Vertical Indicators: A total of 24 rows, each representing an hour of the day (00:00 – 23:00). Users can scroll up or down to view more vertical indicators.
- 3) Popup Box: Clicking on any time record opens a dialog box displaying the corresponding values. Click "Confirm" to close the dialog box.

6.3.6.4 24-Hour Measurement Settings

Click the Settings button to enter the 24-Hour Measurement Settings Interface.

Note: Parameter settings cannot be accessed while measurement is in progress.

- 1) Ts (Integration Time): Time selection control, default: 10 s. The measurement duration (Ts) must be greater than 00:00:00 and less than or equal to 01:00:00.
- 2) Startup Mode: Options: “Automatic, Manual, Scheduled”. Automatic: Enables the 24-hour function and enters “Waiting” mode. Measurement will automatically start on the hour. In Automatic Mode, saving settings or re-entering the 24-Hour Measurement Interface will immediately switch to "Waiting" mode.
 - a. Manual: Measurement starts when the Measurement Button is clicked.
 - b. Scheduled: users can set a scheduled start time for the 24-hour measurement function. When the system reaches the scheduled start time, measurement will begin automatically.
- 3) Measurement Cycle: “Repeat” and “Once” options.
 - a. Repeat: After one 24-hour measurement session ends, the system immediately starts the next 24-hour session.
 - b. Once: After completing the 24-hour measurement, the system does not restart measurement automatically.

- 4) **Measurement Data Handling:** The first-time startup or exiting the 24-hour interface will clear the previous 24-hour measurement data. If the system is in Waiting Mode, data will not be cleared.

6.3.6.5 24-Hour Data Review

Click the "History Records" button to enter the Data Review Interface.

This interface displays stored 24-hour historical data, where:

- 1) The recorded time represents the measurement start time of each dataset.
- 2) The group name corresponds to the user-defined name.
- 3) The source is labeled as 24-Hour Measurement.

Users can select individual records, multiple records, or all records to delete or print. Clicking on any file opens the Historical Measurement View Interface. The Historical Measurement View displays the 24 recorded measurement groups from the current session. If the measurement duration is less than 24 hours, only the recorded hourly groups will be displayed. The 24-hour summary list is sorted in reverse chronological order, with the most recent data at the top. Users can scroll up to view more records. Users can select single or multiple records for printing or deletion. The deletion and printing functions are detailed in Section 6.5.

6.3.6.5.1 24-Hour Overview Details

Click the "Twenty-Four Hours.AWA" file to enter the 24-Hour Overview History Details Interface.

Measurement Details: Displays measurement point name, measurement mode, measurement start time, Ts (integration time), instrument model, serial number, calibration time, sensitivity level, calibration sound pressure level, weighting type, and latitude/longitude. These fields can be expanded or collapsed using the control button.

Data List: Horizontal indicators include L5, L10, L50, L90, L95, Lmax, Lmin, Leq,T, and SD. Vertical indicators display 24 recorded measurement groups, with an option to scroll up for more records. If no measurement was performed at a specific hour, the corresponding indicators will display as 0.

6.3.7 Indoor Measurement

6.3.7.1 Indoor Measurement List Interface

Click Indoor Measurement to enter the indoor measurement list interface, as shown in Figure 6.49:



Figure 6.49 Indoor Measurement List Interface

The interface consists of the status bar, title bar, name display area, operation button area, and measurement setting area, with functions equivalent to the “Integrated Measurement” interface.

The measurement display area shows the indoor measurement data, with the ordinate being SPL (A) and the abscissa being frequency bands: 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz.

The horizontal indicators include: Lp, Lmax, Lmin, Leq, and Limit.

The lower part of the screen shows the standard limit values of 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz.

When the measurement result exceeds the set limit value, the value will be highlighted in yellow or red, indicating an alarm condition.

Click the room type drop-down menu to switch the room classification, as shown in Figure 6.50. Room types follow GB 12348-2008 and GB 22337-2008 requirements. The first category corresponds to residential rooms, numbered 0, 1, 2, 3, 4 in the table, with the second column being the room type code. For example:

“0/D/A” means the current measurement applies to Class 0, daytime, Room Type A standard.

Click the Settings button to enter the indoor measurement settings interface, where you can configure Ts, Tm, startup mode, digital recording, etc. (Note: parameters cannot be modified during measurement). See Figure 6.51. Select any item in the record, and a dialog box will appear displaying the value. Click OK to close.

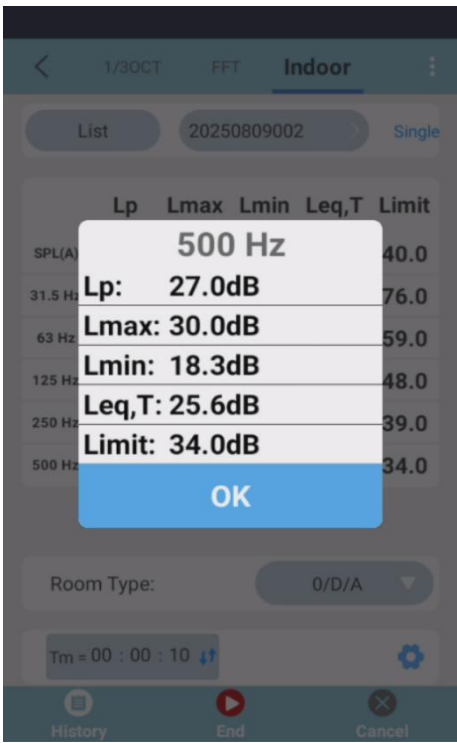


Figure 6.50

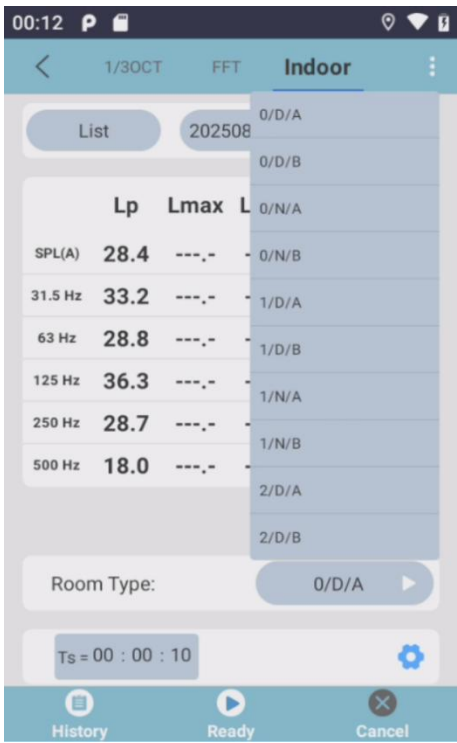


Figure 6.51

6.3.7.2 Indoor Measurement Data Review

Click the History Records button to enter the data review interface, as shown in Figure 6.52. This interface displays stored indoor measurement history data.

- The displayed time represents the start time of the measurement for the selected group.
- The group name corresponds to the preset group name.
- The source indicates that the data is from indoor measurement.

You may select a single group, multiple groups, or all records. Operations such as Delete and Print are available.

Click any file to enter the historical measurement viewing interface, as shown in Figure 6.53. Within this interface, you may again select a single group, multiple groups, or all records for Print or Delete operations.

For details of the Delete and Print functions, see Section 6.5.

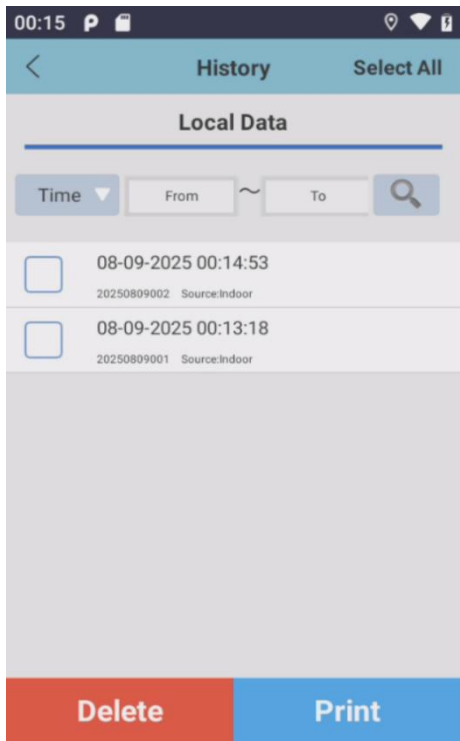


Figure 6.52 History viewing interface.

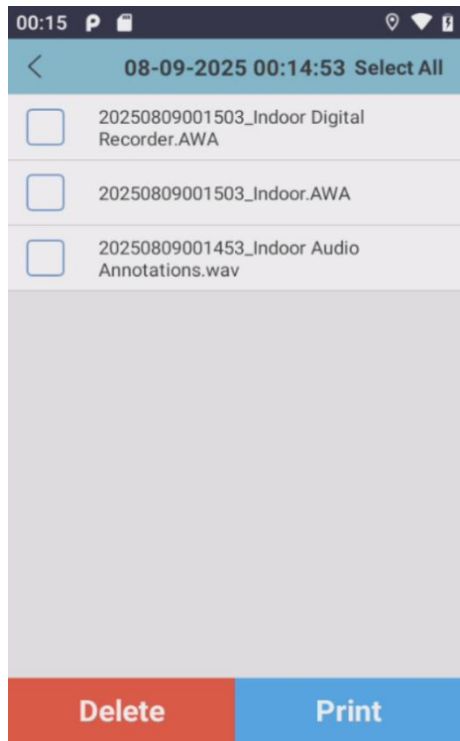


Figure 6.53 Historical Measurement Files

6.3.7.2.1 Indoor Measurement Historical Records

Click Indoor Measurement.AWA file to enter the 1/1 OCT analysis history interface, as shown in Figure 6.54.

(1) Measurement information: measurement name, mode, start time Ts, duration Tm, instrument serial number, machine number, calibration time, calibration level, operator, room type, measurement range. Click the expandable arrow to view details.

(2) Data list: SPL (A), 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz of Lmax, Lmin, Leq, T. You can swipe left/right to view previous or next indicators. Columns can be expanded/collapsed via the “List” option.

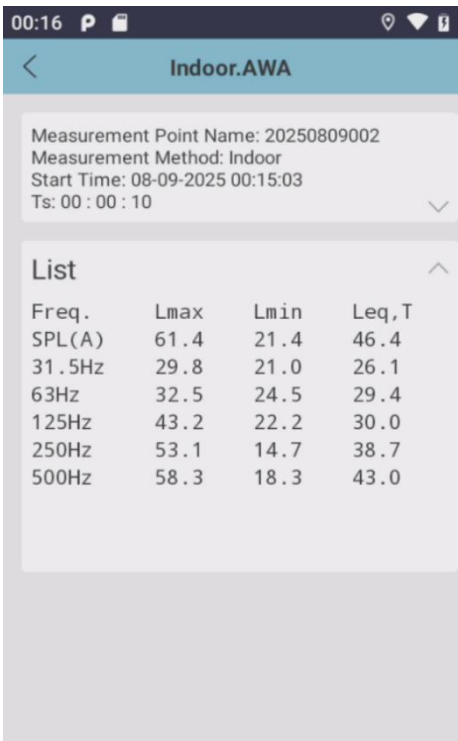


Figure 6.54 Indoor measurement data.

6.3.7.2.2 Indoor Measurement Digital Record Details

Click Indoor Measurement Digital Record.AWA file to enter the digital record details, as shown in Figure 6.55.

(1) Measurement information: measurement name, mode, start time Ts, duration Tm, instrument serial number, machine number, calibration time, calibration level, operator, room type, measurement range. Click the expandable arrow to view details.

(2) Data list: indicators displayed according to the measurement settings. Scroll up/down to view more. Columns can be expanded/collapsed via the “List” option.

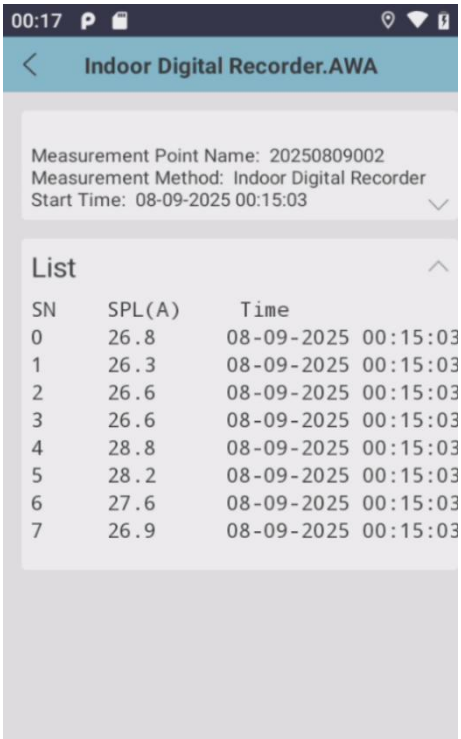


Figure 6.55 Recording Details.

6.3.7.2.3 Indoor Measurement Recording

Click the .wav file to start recording playback. The interface and operation are identical to the “Integrated Measurement” function.

6.3.7.2.4 Voice Annotation

See Section 6.7.4 *Voice Annotation*.

6.3.8 Reverberation

When the ZX3300 sound level analyzer is equipped with reverberation time measurement software, it is capable of performing room reverberation time measurements using the impulse response integration method in accordance with ISO 3382-2:2008.

The method obtains the room’s sound pressure decay curve by performing a backward integration of the squared impulse response. This backward integration method employs modern digital signal processing techniques, offering improved convenience and speed. More importantly, in theory, the impulse response integration method provides greater stability and repeatability compared to the interrupted noise source method, particularly in the low-frequency range (below 250 Hz).

The impulse response integration method is recommended whenever possible. ISO 3382-2:2008 states that a single backward integration measurement can achieve comparable

accuracy to the averaged result of ten measurements using the interrupted noise method. Furthermore, this method requires only an impulsive sound source—such as a balloon burst, bamboo clap, or starter pistol—making the sound source smaller, lighter, easier to operate, and yielding higher test efficiency.

6.3.8.1 Key Performance Specifications

- 1) Primary Functions
 - a. Measurement of Reverberation Time
 - b. Early Decay Time (EDT)
- 2) Standards Compliance
 - a. ISO 3382-2:2008
 - b. IEC 61672-1:2013 Class 1
 - c. IEC 61260-1:2014 Class 1
- 3) Measured Parameters
 - a. T20, T30, EDT
- 4) Impulse Response Recording Duration
 - a. 10 s or 20 s
- 5) Impulse Response Recording Resolution
 - a. 48 kHz sampling frequency, 32-bit precision
- 6) Measurement Duration Options
 - a. 10 s or 20 s
- 7) Filter Bandwidth Options
 - a. 1/1 octave or 1/3 octave
- 8) Center Frequency Bands
 - a. 1/1 octave: 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, 8000 Hz, 16000 Hz
 - b. 1/3 octave: 40 Hz, 50 Hz, 63 Hz, 80 Hz, 100 Hz, 125 Hz, 160 Hz, 200 Hz, 250 Hz, 315 Hz, 400 Hz, 500 Hz, 630 Hz, 800 Hz, 1000 Hz, 1250 Hz, 1600 Hz, 2000 Hz, 2500 Hz, 3150 Hz, 4000 Hz, 5000 Hz, 6300 Hz, 8000 Hz, 10000 Hz, 12500 Hz, 16000 Hz

Note: Frequency bands below 100 Hz are extended bands for reference only.
- 9) Reverberation Time Measurement Using Impulse Response Integration

The ZX3300 employs the impulse response integration method for room reverberation time measurement. Users only need to supply an impulsive sound source such as a balloon burst, firecracker, or starter pistol. These sources are compact, lightweight, easy to operate, and enable efficient testing.
- 10) Microphone Placement

In accordance with ISO 3382, the measurement microphone of the ZX3300 should be placed at the designated test position, typically 1.2 meters above the floor. The minimum spacing between microphones should be 2 meters, and each microphone should be at least 1 meter away from the nearest reflecting surface. Microphones should not be positioned too close to the sound source.
- 11) Additional Considerations

The spectral characteristics of the impulse source have a significant impact on measurement results. The selected impulse source must produce a sufficiently broad frequency spectrum, ensuring that the sound pressure level in each frequency band is at least 35 dB higher than the corresponding background noise level. Failure to meet this

requirement may result in inaccurate reverberation time measurements for certain frequency bands.

If a reverberation time of 0.0 is displayed, this indicates that the measurement at that center frequency is invalid or not possible.

During the decay curve analysis, the system applies a least-squares linear fit and will automatically determine whether the fitting error exceeds the acceptable threshold. If the error is too large, reverberation time estimation will not be provided.

6.3.8.2 Impulse Response

Click “Reverberation” to enter the impulse response measurement interface. The screen will appear as shown in Figure 6.56.

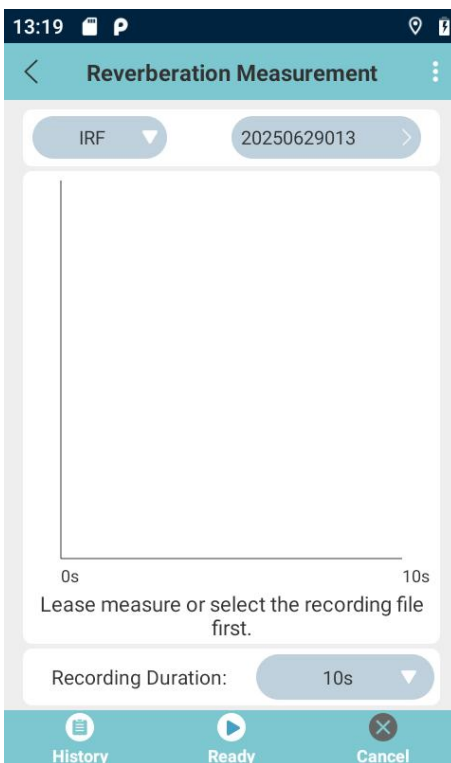


Figure 6.56

Upon entry, the initial status is “Ready” (indicated by a blue play icon). During this state, the page switching function is disabled, and an on-screen message will display: “Switching is unavailable until the measurement is complete.” At this stage, you may either perform a direct measurement or load a previously recorded audio file.

1) Direct Measurement

Select the desired recording duration. The default waveform recording time is 20 seconds, but users can choose between 10 s and 20 s.

After preparing the impulsive sound source, press “Start” to begin measurement. The status will change to “Measuring” (blue pause icon). At this time, trigger the impulse—such as igniting a firecracker, bursting a balloon, or activating another impulsive source—and wait for the measurement to complete.

Note that pause is not supported during measurement. Once the system is in

Measuring mode, the “Recording Duration” setting cannot be changed.

When the preset recording duration elapses, the device transitions to Analyzing, waits for approximately 1 second, and then automatically proceeds to the 1/1 Octave Band List screen. The system status will update to “Analysis Complete” (red ► icon), as shown in Figure 6.50.

2) Load Recording File

Navigate to the data retrieval section and locate a previously recorded .wav file from the Reverberation Measurement category.

Press and hold the file name for 3 seconds. A message will appear: “Please wait...” After the 3-second processing period, the system will automatically analyze the file and redirect to the 1/1 Octave Band List screen, with status set to “Analysis Complete” (red icon), as shown in Figure 6.57.

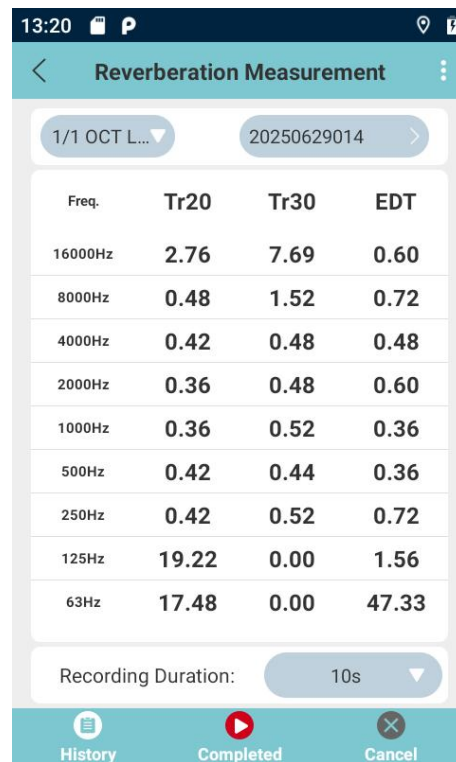


Figure 6.57

Once analysis is complete, the “Recording Duration” field becomes locked. You can now navigate between the following display views using the page toggle buttons: Impulse Response, 1/1 Octave Band Graph, 1/3 Octave Band Graph, 1/3 Octave Band List, Decay Curve.

To initiate a new measurement, press the “Completed” button. This will reset the interface to the Impulse Response Ready state.

6.3.8.3 1/1 Octave Band – Tabular View

Upon completion of the analysis, the system will automatically navigate to the 1/1 Octave Band List interface. Alternatively, users may manually select “1/1 OCT List” using the page navigation buttons to switch to the same view, as shown in Figure 6.50.

This display presents the calculated reverberation parameters Tr20, Tr30, and EDT

corresponding to the following center frequencies: 16000 Hz, 8000 Hz, 4000 Hz, 2000 Hz, 1000 Hz, 500 Hz, 250 Hz, 125 Hz, 63 Hz.

To prepare start a new measurement, press the “Completed” button. This resets the system to the Impulse Response Ready state, at which point the recording duration can be modified as needed.

6.3.8.4 1/1 Octave Band – Graphical View

From any page within the Reverberation Measurement module, selecting “1/1 OCT Graph” from the page navigation menu will switch the interface to the 1/1 Octave Band Graph view, as shown in Figure 6.58.

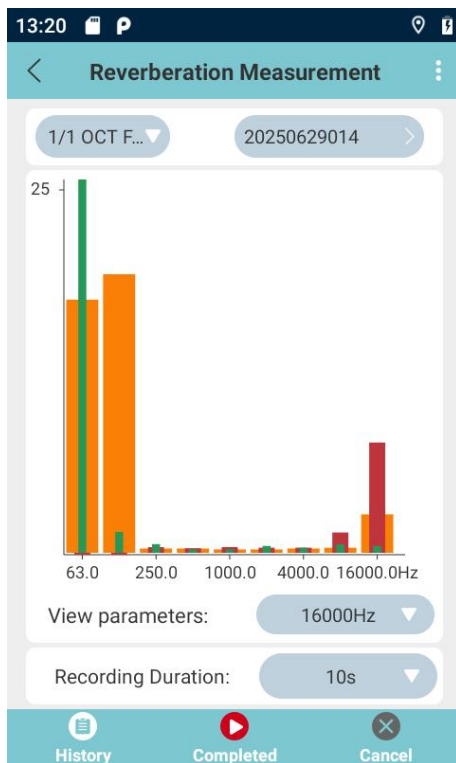


Figure 6.58

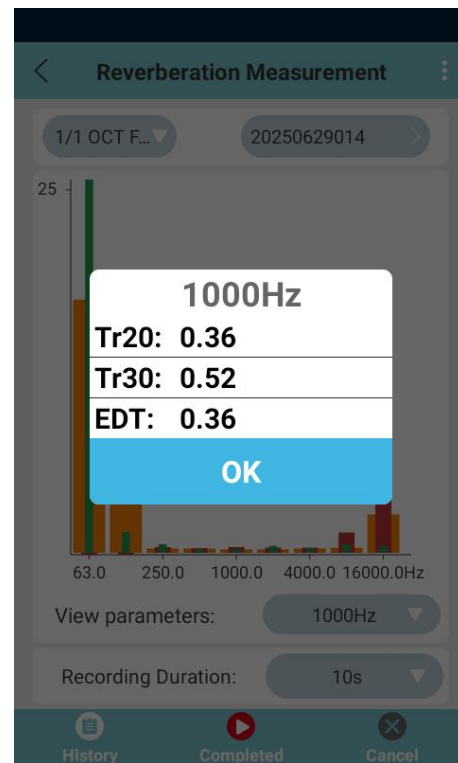


Figure 6.59

The X-axis displays the following center frequencies: 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, 8000 Hz, 16000 Hz. The graph uses color-coded bars to represent each reverberation parameter:

- 1) Green: EDT (Early Decay Time)
- 2) Red: Tr30
- 3) Orange: Tr20

To inspect values for specific frequency bands, users may tap on any of the following frequency labels: 16000 Hz, 8000 Hz, 4000 Hz, 2000 Hz, 1000 Hz, 500 Hz, 250 Hz, 125 Hz, 63 Hz. Upon selection, a dialog box will appear displaying the numerical values for the selected band, as shown in Figure 6.59. Press “OK” to close the dialog.

To conduct a new measurement, press the “Completed” button to reset the interface to the Impulse Response Ready screen. You may then adjust the recording duration for the next test.

6.3.8.5 1/3 Octave Band – Tabular View

From any screen in the Reverberation Measurement module, selecting “1/3 OCT List” using the page navigation buttons will switch to the 1/3 Octave Band List view, as shown in Figure 6.60.

This interface displays the calculated values for Tr20, Tr30, and EDT across the following center frequencies: 16000 Hz, 12500 Hz, 10000 Hz, 8000 Hz, 6300 Hz, 5000 Hz, 4000 Hz, 3150 Hz, 2500 Hz, 2000 Hz, 1600 Hz, 1250 Hz, 1000 Hz, 800 Hz, 630 Hz, 500 Hz, 400 Hz, 315 Hz, 250 Hz, 200 Hz, 160 Hz, 125 Hz, 100 Hz, 80 Hz, 63 Hz, 50 Hz, 40 Hz. Users can scroll vertically to view the full list.

To prepare for a new measurement, click the “Completed” button to reset to the Impulse Response Ready page. You may then adjust the recording duration for the next test.

Freq.	Tr20	Tr30	EDT
16000Hz	2.76	6.09	0.48
12500Hz	2.04	2.00	0.72
10000Hz	0.90	1.92	0.72
8000Hz	0.42	1.84	0.72
6300Hz	0.48	0.76	0.84
5000Hz	0.48	1.16	0.72
4000Hz	0.48	0.52	0.60
3150Hz	0.36	0.44	0.60
2500Hz	0.36	0.44	0.60

Figure 6.60

6.3.8.6 1/3 Octave Band – Graphical View

From any screen in the Reverberation Measurement module, selecting “1/3 OCT Graph” will switch to the 1/3 Octave Band Graph view, as shown in Figure 6.60.

The X-axis displays the following center frequencies: 40 Hz, 50 Hz, 63 Hz, 80 Hz, 100 Hz, 125 Hz, 160 Hz, 200 Hz, 250 Hz, 315 Hz, 400 Hz, 500 Hz, 630 Hz, 800 Hz, 1000 Hz, 1250 Hz, 1600 Hz, 2000 Hz, 2500 Hz, 3150 Hz, 4000 Hz, 5000 Hz, 6300 Hz, 8000 Hz, 10000 Hz, 12500 Hz, 16000 Hz. For color indicators, green: EDT (Early Decay Time), red: Tr30, and orange: Tr20.

To inspect specific band values, tap the desired frequency. A dialog box will pop up displaying the corresponding values (see Figure 6.62). Click “OK” to close the dialog.

Click “Completed” to return to the Impulse Response Ready page, where you can adjust recording duration before initiating a new measurement.

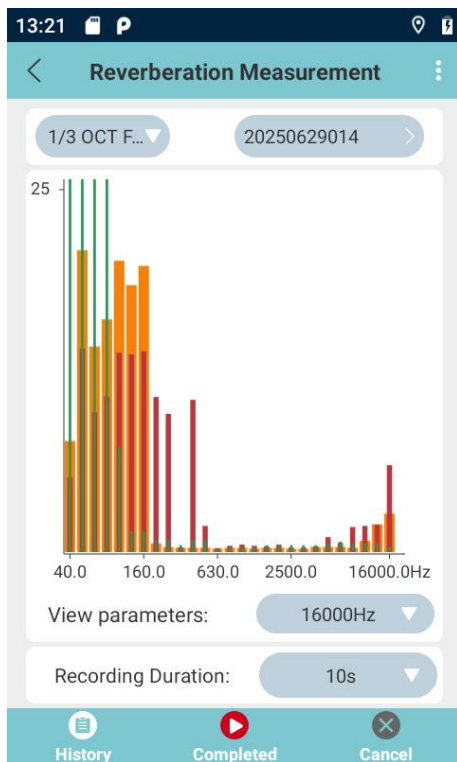


Figure 6.61

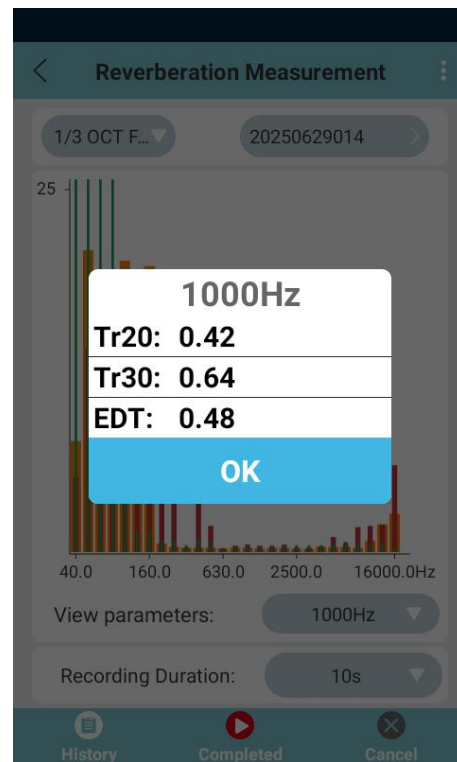


Figure 6.62

6.3.8.7 Decay Curve View

From any screen within the Reverberation Measurement module, selecting “Decay Curve” will switch to the Decay Curve Interface, as shown in Figure 6.63. Configuration Options:

- 1) Decay Range: Selectable between 20 dB and 30 dB, depending on the measurement requirement.
- 2) Filter Bandwidth: Switchable between 1/1 Octave and 1/3 Octave.
- 3) Frequency Selection: If using 1/1 Octave, the available frequency bands match those listed in Section 6.3.9.3. If using 1/3 Octave, the frequency bands correspond to those in Section 6.3.8.5. Changing the filter bandwidth will automatically set the frequency to the first band available in the selected bandwidth. Users may then choose the desired frequency manually.
- 4) Decay Curve: Displays the decay slope based on the selected decay range, filter bandwidth, and frequency.
- 5) Reverberation Time: Displays the corresponding reverberation time based on the current curve settings.

Click “Completed” to return to the Impulse Response Ready screen. You may adjust the recording duration for the next measurement.



Figure 6.63

6.3.8.8 Reverberation Measurement – Data Access

Press the “History” button to enter the Data Access interface, as shown in Figure 6.64. This screen displays the saved reverberation measurement history data. Each record is labeled with:

- 1) The timestamp indicating when the measurement started
- 2) The group name, as previously defined by the user
- 3) The source, which will be listed as Reverberation Measurement

You can tap to select: A single entry, Multiple entries, or use the Select All function. Once selected, the records can be deleted. For details on the delete function, refer to Section 6.5.

6.3.8.8.1 Playback of Reverberation Measurement Recordings

Tap any file to enter the History Measurement View, as shown in Figure 6.65. To play back a recorded file, tap on any .wav file. The system will launch the audio playback interface, which functions similarly to that used in Total Value Integration Measurement mode.

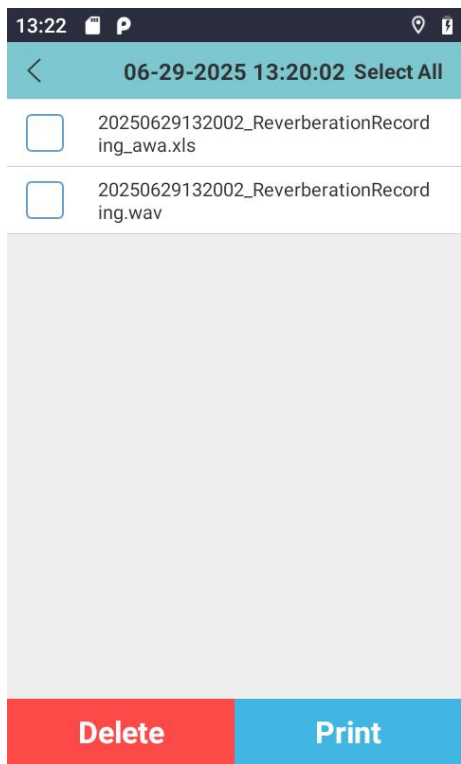


Figure 6.64

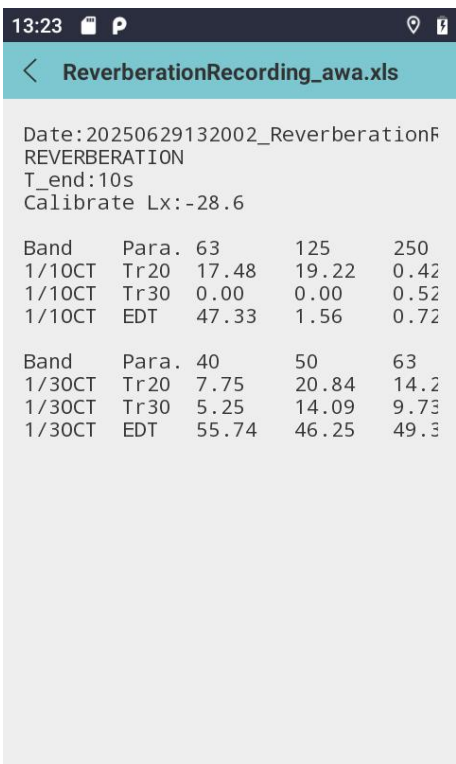


Figure 6.65

6.3.9 Simultaneous Measurement

6.3.9.1 Simultaneous Measurement Interface

Press “Synchronized Measurement” to enter the synchronized measurement setup interface, as shown in figure 6.66. This mode allows multiple functional modules to be triggered simultaneously, enabling synchronized data collection for more efficient analysis. The user interface and button logic are consistent with the Total Value Integration Measurement interface. All activated modules share the same control buttons for start, pause, and stop.

The screenshot shows the 'Simultaneous Measurement' configuration interface. At the top, the status bar displays '13:23'. Below the title bar, a group name '20250629014' is shown with a right arrow. The main area contains a list of modules, each with a toggle switch set to 'OFF':

- Total Integral
- Stats. Integral
- 1/1OCT
- 1/3OCT
- FFT

Below the module list, the sampling interval is set to 'Ts=00:00:10' with a right arrow. The 'Activation Mode' is set to 'Buttons' with a dropdown arrow. The 'Delay' is set to '0' seconds. At the bottom, there is a large blue 'Save' button.

Figure 6.66

The title bar displays “Synchronized Measurement.” Group name rules are identical to those used in Total Value Integration mode. Once generated or modified, the group name applies to all activated modules. It can only be edited within the Synchronized Measurement interface.

Attempting to modify the group name in any individual module will prompt the message: “Synchronized measurement does not allow independent group name modification.” To initiate measurement, tap the toggle button in the function area. Authorized modules that can be included are: Total Value Integration, Statistical Integration, 1/1 Octave Analysis, 1/3 Octave Analysis, FFT Analysis, Room Acoustic Measurement. Selected modules will inherit the sampling interval (Ts) and start mode as defined in the synchronized setup. These parameters follow the same configuration rules as in Total Value Integration.

Press “Save” to proceed to the measurement interface. The parameters will be automatically assigned to each enabled module. If you attempt to modify settings for any module during synchronized measurement, the system will display the message: “Synchronized measurement does not allow independent parameter modification.” (See Figure 6.67.)

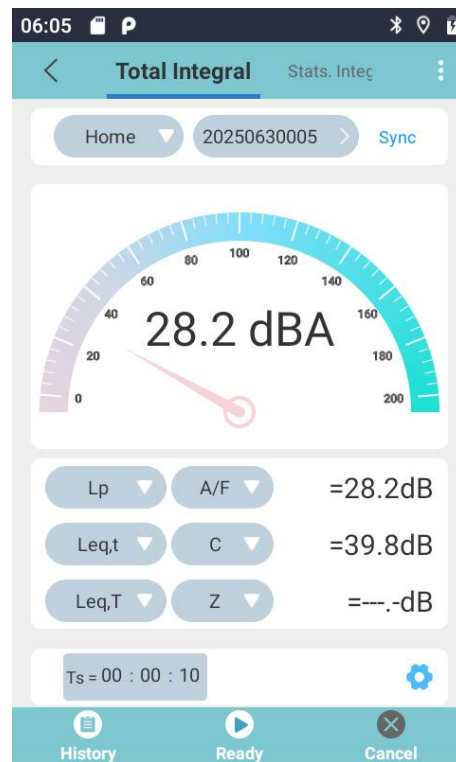


Figure 6.67

The sync icon appears in the upper-left corner, indicating synchronized mode. Upon each measurement completion, all synchronized module data is saved into a single folder. The source will be labeled as Synchronized Measurement. These records are only accessible through the Data Access section on the main interface.

Synchronized measurement can be initiated from any enabled module's screen, and the operation is identical to initiating measurement in standalone mode. All modules begin in Ready state (blue icon). Before starting, most indicators (except Lp) may show 0.0 dB or retain values from the previous measurement. Tap "Start" to enter Measuring state (blue icon). Tap again to pause (orange icon). Once complete, the status changes to Finished (red icon). Start, pause, and stop behavior is identical to that in Total Value Integration Measurement.

6.3.9.2 Accessing Synchronized Measurement Data

To view Simultaneous measurement records, press the "Data" button on the main interface. Each record shows:

- 1) The timestamp of measurement initiation
- 2) The group name
- 3) The source, labeled as Synchronized Measurement

You can select a single, multiple, or all entries, perform deletion or printing operations (see Section 6.5), and tap any record opens the Synchronized Measurement Summary screen, displaying all enabled modules in that session, audio recordings and voice annotations, if applicable. Options include printing, select all, delete, and playback of audio files. Tapping a specific module (e.g., TotalValue.AWA) opens the historical detail screen for that measurement type. See the corresponding section in the Noise Measurement module for more information.

6.3.9.3 Synchronized Measurement Playback

To play a recorded file, tap any .wav file. The playback interface and controls are identical to those used in Total Value Integration Measurement.

6.3.10 Speech Transmission Index (STI)

STI (Speech Transmission Index) is an objective metric that predicts speech intelligibility by evaluating how clearly speech is transmitted from the speaker to the listener through a given environment. It offers a rapid and objective means to assess the quality of speech transmission, especially when acoustic conditions change.

6.3.10.1 Performance Specifications

- 1) Primary Function: STI Measurement
- 2) Standards Compliance:
 - a. IEC 60268-16
 - b. ISO 3382-1, ISO 3382-2, ISO 3382-3
 - c. ISO 1996
- 3) Measured Parameter: STI
- 4) Single Measurement Duration: 15 seconds
- 5) Recording Precision: 48 kHz sampling rate, 32-bit
- 6) Frequencies Measured: 125 Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, 8000 Hz
- 7) Additional Notes: Standard STIPA test signals are based on male speech spectral characteristics.

6.3.10.2 STI Measurement Interface

Tap “STI” to enter the STI measurement interface (Figure 6.68). The status bar, title area, and naming display operate similarly to those in Total Value Integration mode.

Measurement Workflow:

- 1) A complete STI session consists of six measurements
- 2) The average STI value is computed from all six runs
- 3) Display Table:
 - a. Vertical axis: Frequency bands 125 Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, 8000 Hz
 - b. Horizontal axis: Metrics: Leq (dB), mi1, mi2, TI1, TI2, MTI
- 4) Upon entering the STI interface, the instrument starts in Ready state (blue  icon). Displayed values will be zero or those from the previous session. Tap “Start” to begin measurement. The status will switch to Measuring (blue  icon), and each measurement lasts for 15 seconds.
- 5) After each measurement, the system automatically proceeds to the next measurement screen in Ready state. After six runs, it stops and remains on the final page (Figure 6.69).
- 6) Tap “Average” in the step area to view the STI values, rank, and average, as shown in Figure 6.69. You may also tap individual step numbers to review their results.

Note:

- 1) STI results are not saved automatically
- 2) After six runs, press “Save” to store the session

- 3) Data can be accessed later via the History function
- 4) Measurement cannot be paused. To terminate mid-session, either:
 - a. Tap “Stop”, or
 - b. Use the “<” return button or the physical power/exit button on the device

Masking Note:

Masking refers to the phenomenon where one sound is obscured by another simultaneous sound. For example, a strong low-frequency tone can mask higher-frequency sounds if the sound level difference exceeds a certain threshold, rendering the higher tones inaudible.

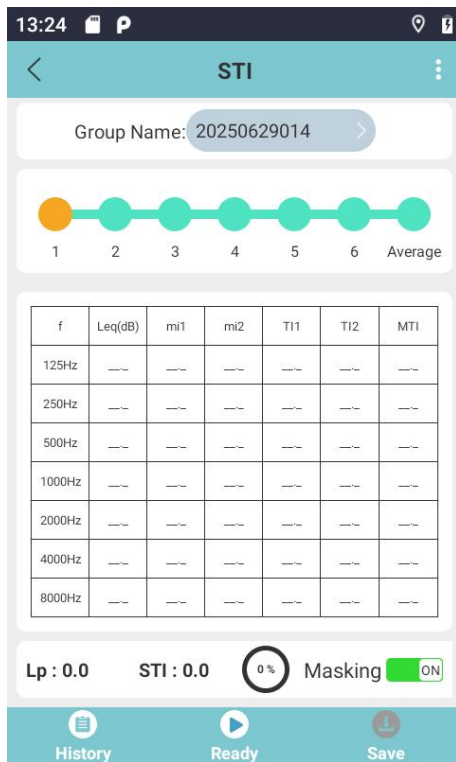


Figure 6.68

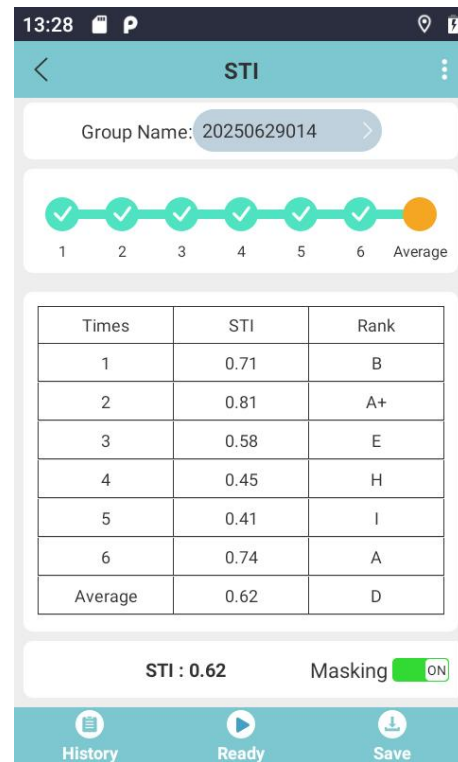


Figure 6.69

6.3.10.3 STI Data Access

Press the “History” button to enter the Data Access interface. This screen displays saved STI measurement history data. Each entry shows:

- 1) The timestamp corresponding to the time the data was saved
- 2) The group name, as previously defined by the user
- 3) The source, which will be listed as STI

Users can select a single record, multiple records, or all entries, perform print and delete operations (refer to Section 6.5 for details), tap any file to enter the STI Historical View (see Figure 6-3-10-5). Within this screen, you may again select single or multiple entries to perform batch operations such as printing or deletion.

6.3.10.3.1 STI Historical Details

Tap the “STI.AWA” file to enter the STI Historical Detail View, as shown in Figure 6.70 and Figure 6.71.

- 1) Measurement Metadata: The top section displays detailed information about the

measurement, including:

- a. Measurement point name
- b. Measurement mode
- c. Sampling interval (Ts)
- d. Measurement duration (Tm)
- e. Instrument model
- f. Serial number
- g. Calibration timestamp
- h. Microphone sensitivity level
- i. Calibration sound pressure level
- j. GPS coordinates (latitude and longitude)
- k. Measurement range
- l. Tap the corresponding control elements to expand or collapse each information block.

2) Measurement Results – List View

The bottom section provides scrollable lists for both the average STI values and individual results from all six measurements. Tap the control icon next to “List” to expand or collapse the detailed table view.

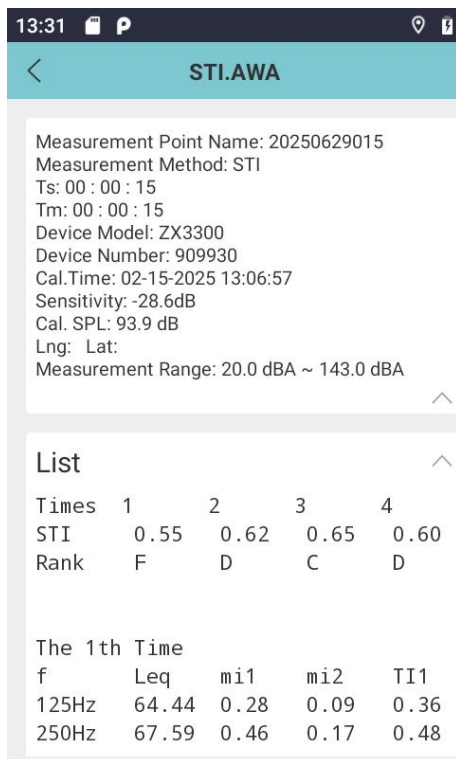


Figure 6.70

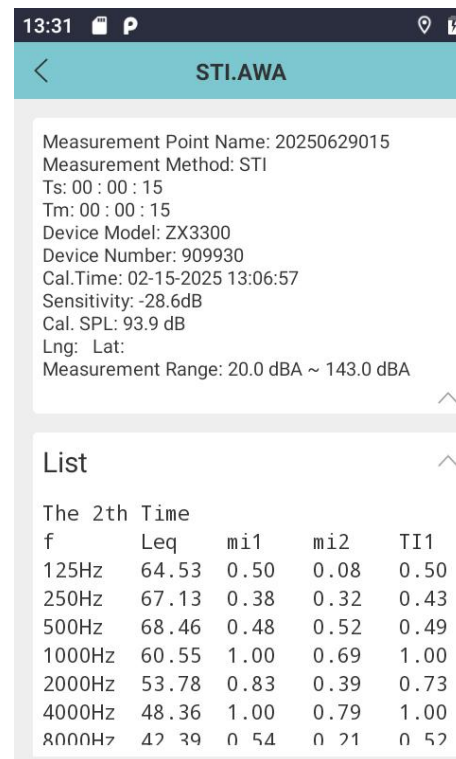


Figure 6.71

6.3.11 Sound Exposure Level (Noise Dose Meter)

6.3.11.1 Sound Exposure Level List Interface

Click Sound Exposure to enter the noise exposure list interface, as shown in Figure 6.72.

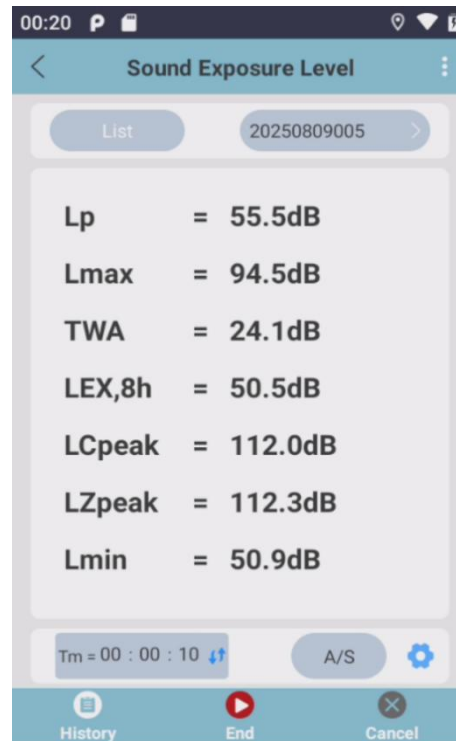


Figure 6.72 Noise Exposure List Interface

The functions of the status bar, title bar, name display area, and operation button area are identical to those of the Integrated Measurement interface.

The measurement area displays the noise exposure measurement data, including the following indicators: Lp, Lmax, TWA, LEX,8h, LCpeak, LZpeak, Lmin, Leq, T, LAVG, DOSE, Kurtosis (Kurt), E.

You can swipe up and down to view more indicators. Ts (measurement start time) and calculated values are displayed.

Press the Settings button to enter the settings menu.

Start, Pause (including Auto-Pause), and Stop functions in the noise exposure program operate the same as in Integrated Measurement.

The meter defaults to A/S weighting.

Click Settings to enter the noise exposure settings interface, where you may configure:

- Ts (measurement start time)
- Tm (measurement duration)
- Startup mode
- Threshold level
- Exchange rate
- Standard for exposure
- Auto-pause
- Digital recording, etc.

(Note: parameters cannot be modified during an active measurement.)

6.3.11.2 Sound Exposure Level Settings Interface

Click Settings () to enter the sound exposure level settings interface, as shown in Figure 6.73 and 6.74. The settings for Ts and startup mode are consistent with those in the Integrated Measurement settings.

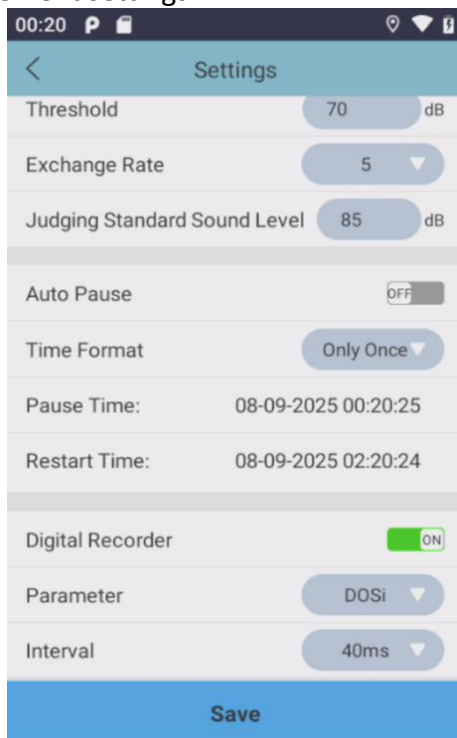


Figure 6.73 Settings Interface 1

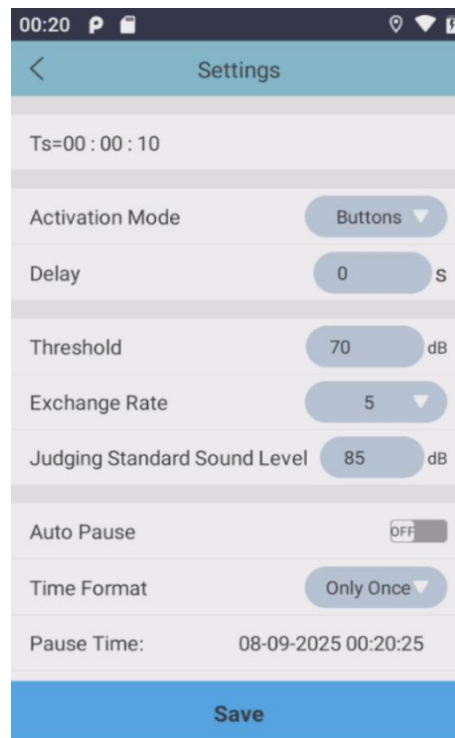


Figure 6.74 Settings Interface 2

- 1) Threshold Level: Range 40 dB–90 dB. Durations with levels lower than this threshold are excluded from TWA and LAVG calculations.
- 2) Exchange Rate: Options are 3, 4, 5, or 6.
- 3) Evaluation Criterion Level: Range 70 dB–90 dB. When TWA exceeds this criterion, an over-limit indication will be displayed.
- 4) Auto-Pause: Default is OFF. When enabled, you can configure time format, pause time, and restart time, as shown in Figure 6.66.
- 5) Time Format: Options include “Once,” “By Year,” “By Month,” “By Day,” and “By Hour.” Automatic pausing is only active when the format is set to “By Key”; other formats will not auto-pause.
 - a. Pause Time: Measurement pauses at the set time.
 - b. Restart Time: Measurement resumes at the set time.
 - c. If the instrument is already in a paused state, restart is not possible.
 - d. Specific cases:
 - (1) Once: Measurement pauses at the specified date and time, then resumes at the specified restart date and time.
 - (2) By Year: Measurement pauses annually at the specified date/time, resumes at the specified restart date/time each year.
 - (3) By Month: Measurement pauses monthly at the specified date/time, resumes at

- the specified restart date/time each month.
- (4) By Day: Measurement pauses daily at the specified time, resumes at the specified restart time each day.
 - (5) By Hour: Measurement pauses hourly at the specified minute, resumes at the specified restart minute each hour.
 - (6) By Second: Measurement pauses every minute at the specified second, resumes at the specified restart second each minute.
- 6) Digital Recording Settings:
- a. Digital recording is enabled by default.
 - b. When enabled, the system saves recorded indices and values in sync with the measurement settings, as shown in Figure 6.67.
 - c. Drop-down menu options include: DOSi, Linst, Leq,t, and Li&Leq.
 - d. Sampling interval can be set between 20 ms and 5000 ms, with a default of 100 ms.

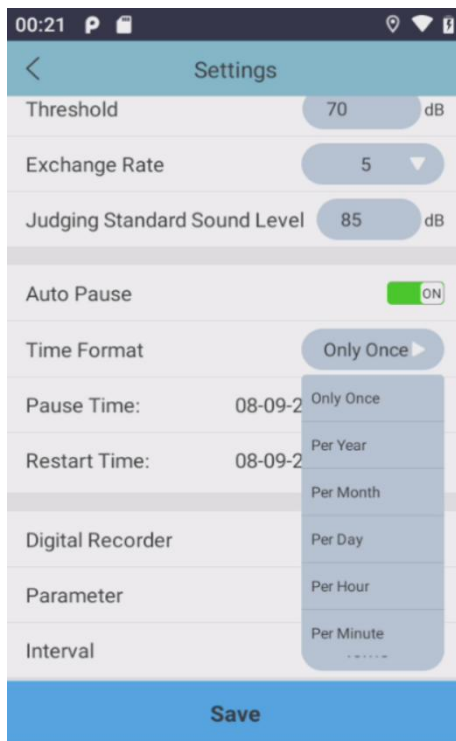


Figure 6.75 Auto-Pause Settings

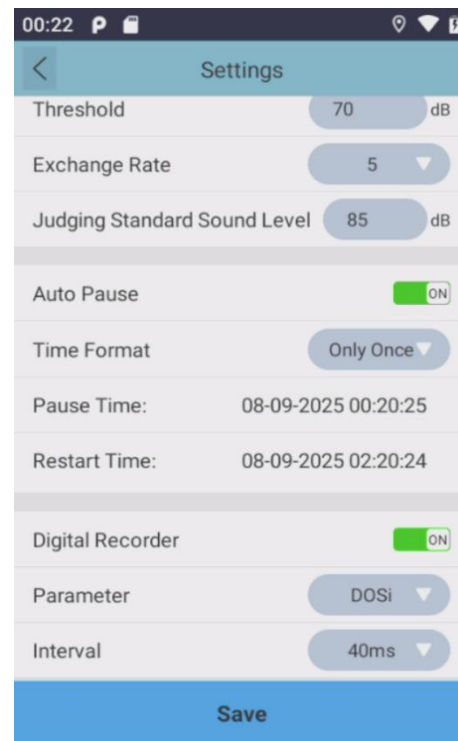


Figure 6.76 Digital Recording Settings

6.3.11.3 Noise Exposure Data Review

Click History to enter the data review interface, as shown in Figure 6.77. This interface displays stored noise exposure history data. The displayed time corresponds to the measurement start time of the group. The group name is shown according to the preset group name. The data source is sound exposure level.

You may select a single group, multiple groups, or all groups for deletion. Click any file to enter the historical measurement viewing interface, as shown in Figure 6.78. Within this interface, you may again select a single group, multiple groups, or all groups for deletion. For details of the Delete function, see Section 6.5.

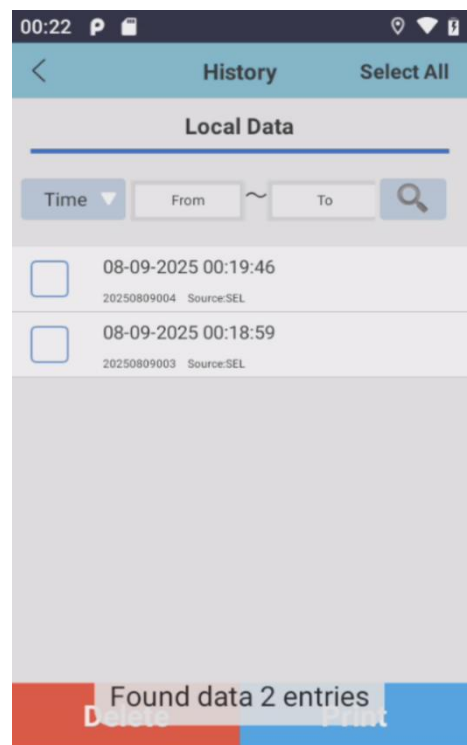


Figure 6.77 Noise Exposure Data Review Interface

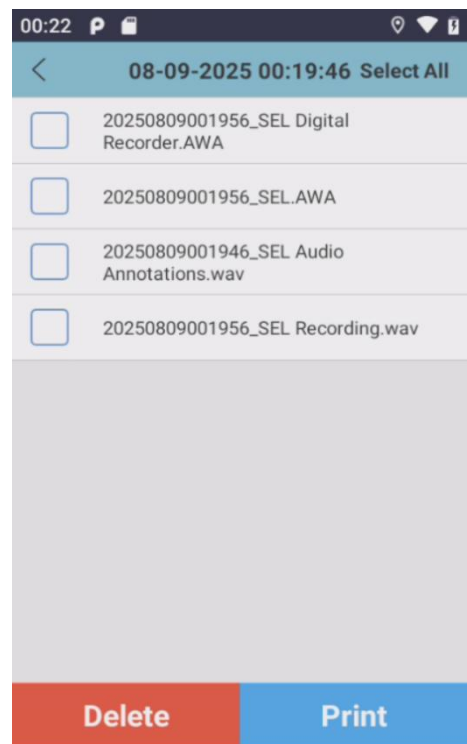


Figure 6.78 Historical Measurement Viewing Interface

6.3.11.3.1 Noise Exposure Historical Details

Click the Noise Exposure.AWA file to enter the noise exposure historical interface, as shown in Figure 6.79.

Measurement Details: Measurement point name, measurement mode, measurement start time, Ts, Tm, instrument model, serial number, calibration time, sensitivity level, calibration sound pressure level, weighting, latitude/longitude, overload status, threshold, exchange rate, evaluation criterion level, measurement range. Fields can be expanded/collapsed via the control button.

Data List Indicators: Lmax, TWA, LEX,8h, LCpeak, LZpeak, Lmin, Leq, T, LAVG, DOSE, Kurt, E, N_{LAp peak}>120 dB.

These indicators can be viewed by scrolling up/down. Columns can be expanded/collapsed via the “List” control.

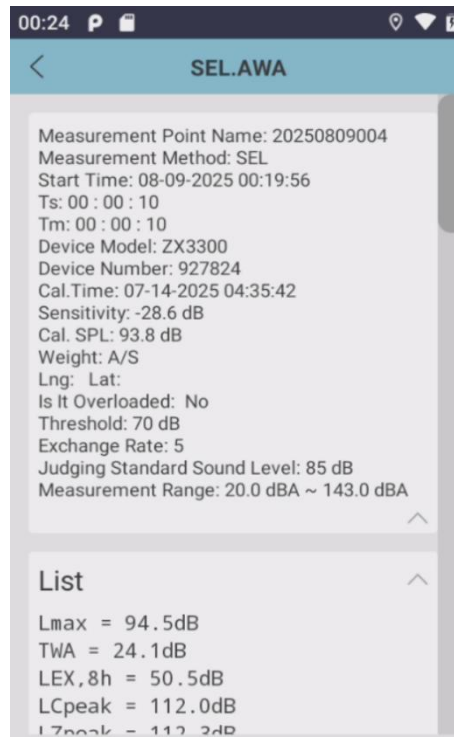


Figure 6.79 Sound Exposure Level Historical Interface

6.3.11.3.2 Noise Exposure Digital Record Details

Click the Noise Exposure Digital Record.AWA file to enter the digital record details, as shown in Figure 6.80.

Measurement Details: Measurement point name, measurement mode, measurement start time, Ts, instrument model, serial number, calibration time, sensitivity level, calibration sound pressure level, weighting, latitude/longitude, overload status, threshold, exchange rate, evaluation criterion level, sampling interval, and measurement range. Fields can be expanded/collapsed via the control button.

Data List Indicators: Displayed according to noise exposure settings. More indicators can be viewed by scrolling up. Columns can be expanded/collapsed via the “List” control.

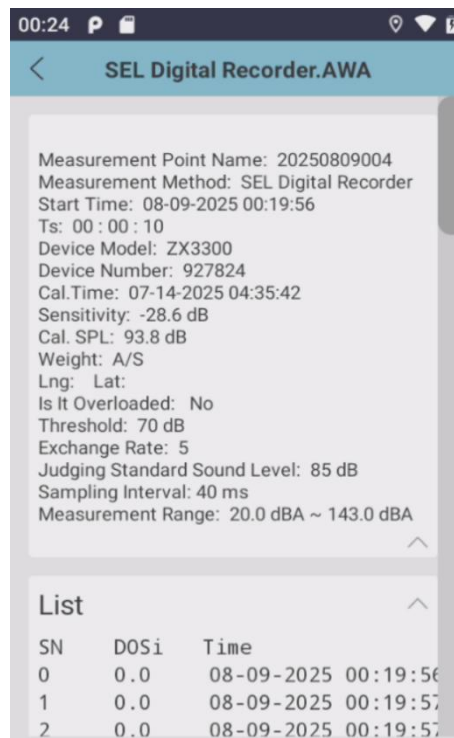


Figure 6.80 Sound Exposure Level Digital Recording Interface

6.3.11.3.3 Noise Exposure Recording

Click any .wav file to play back the recording. The interface and operation are identical to the Integrated Measurement function.

6.3.11.3.4 Voice Annotation

For details, see Section 6.7.5 Voice Annotation.

6.4 Instrument Calibration

6.4.1 Calibration Interface

Tap "Instrument Calibration" from the main menu to enter the calibration interface, as shown in Figure 6.81. The interface includes the following fields and functions:

- 1) Current Sound Pressure Level
- 2) Read-only. Displays the current ambient noise level.
- 3) Default unit is dB(C). Switchable to dB(A) via drop down.
- 4) Sensitivity Level reflects the saved sensitivity of the measurement microphone from the last calibration. Unit: dB (referenced to 1 V/Pa; for example, -28.0 dB corresponds to 39.8 mV/Pa).
- 5) Free-field Correction Value: the correction applied to account for the difference between the microphone's free-field (or diffuse-field) response at the calibration frequency and the pressure-field response of the calibrator. Default value is from the last saved setting (e.g., 0.20 dB for a ½" free-field microphone at 1 kHz). Adjustable range: 0.00 to 2.00 dB.

- 6) Calibrator Sound Pressure Level
 - a. Default: 94.0 dB
 - b. Adjustable range: 70.0 to 130.0 dB
- 7) Measurement Range
 - a. Default: 20.0 dB to 143.0 dB
 - b. The range automatically adjusts based on the microphone sensitivity.
- 8) Start Calibration Button
 - a. Default state is Ready (blue icon).
 - b. Tap to begin calibration; a 10-second countdown will appear.
 - c. Once complete, the button changes to Finish, and status reverts to Ready when tapped again.
- 9) Save Calibration Button
 - a. Tap to save the current calibration record.
 - b. Required whenever the calibrator level is changed.

Note: The instrument is factory-calibrated. The displayed values represent either the factory data or the last saved calibration.

Re-calibration is recommended before use, especially when required by measurement standards or after extended storage.

Use a Class 1 acoustic calibrator compliant with IEC 60942 (e.g., ZX8601) or a pistonphone (250 Hz).

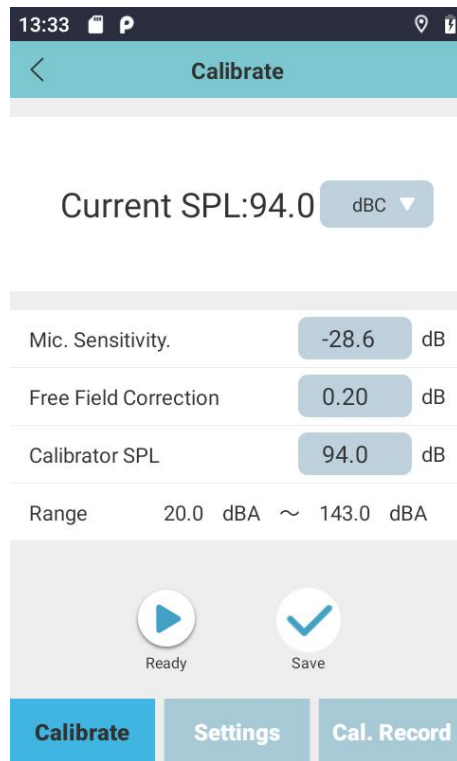


Figure 6.81

6.4.2 Calibration Settings

Tap "Settings" below the Instrument Calibration option to enter the manual calibration settings interface (Figure 6.82).

You may manually adjust microphone sensitivity level, free-field correction, calibrator sound

pressure level.

Tap “Save” to store the new sensitivity value and create a calibration record. Subsequent measurements and calibrations will be based on this saved value. The newly calibrated sensitivity can differ from the previous saved value by more than ± 3 dB.

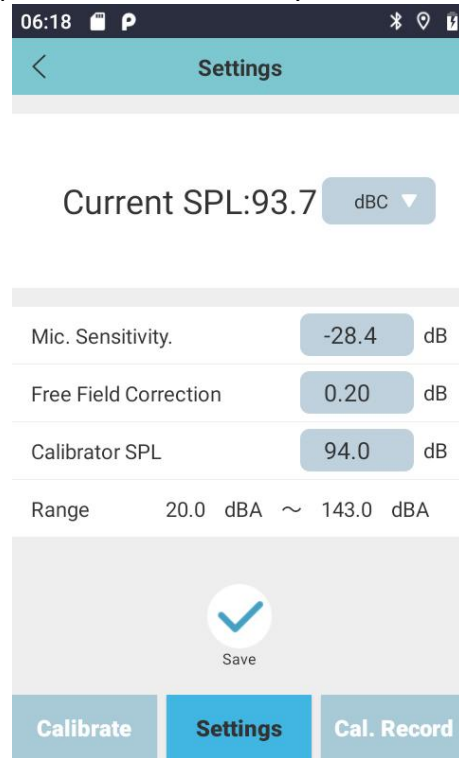


Figure 6.82

6.4.3 Calibration Records

Tap “Calibration Records” in the lower-right corner of the calibration interface to access calibration history (Figure 6.83). Functions include

- 1) List Sorting: Records are sorted in reverse chronological order (latest first). Scroll upward to load additional entries.
- 2) Selection: Supports single, multiple, or all-entry selection.
- 3) Delete Button: If data is selected: prompts “Delete selected items?” (Figure 6.84). Tap “Confirm” to delete; “Cancel” to return. If no data is selected: prompts “Please select at least one item.”
- 4) Print Button: Printing functions are the same as for measurement records (see Section 6.5).
- 5) Details Page: Tap a record to view detailed information (Figure 6.85), including:
 - a. Calibration time
 - b. Free-field correction
 - c. Microphone sensitivity
 - d. Measurement range
 - e. Calibrator level
 - f. Calculated SPL during calibration
 - g. Exit. Tap “Exit <” to return step-by-step to the main calibration interface.

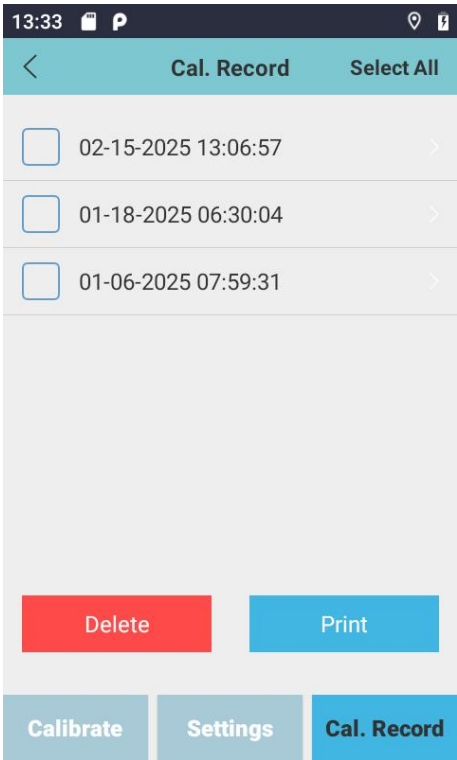


Figure 6.83

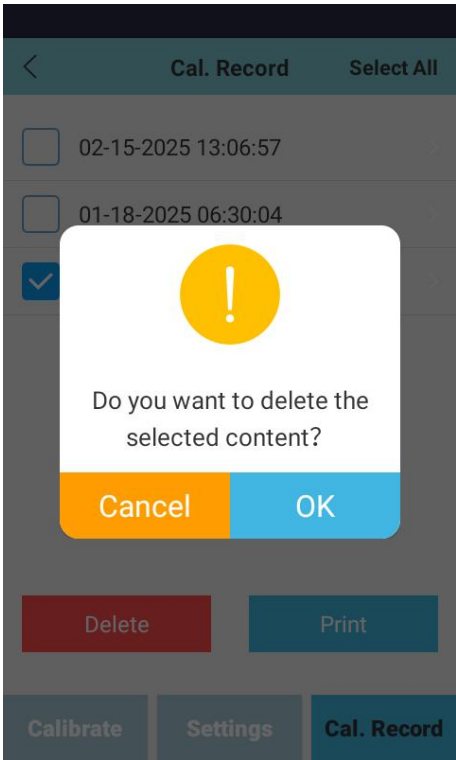


Figure 6.84

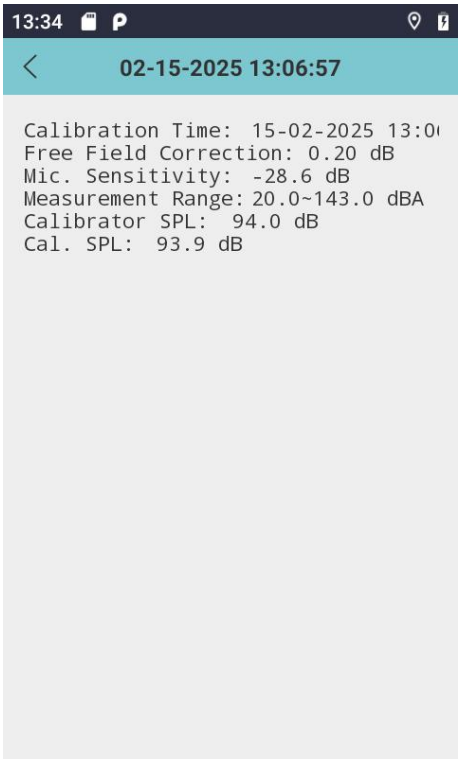


Figure 6.85

6.4.4 Acoustic Calibrator Calibration Procedure

To perform calibration using an acoustic calibrator, attach the calibrator to the measurement microphone and power it on. After allowing the output to stabilize (stabilization time may vary

by model), tap “Start” to begin calibration. A 10-second countdown begins (see Figure 6.86).

The Current SPL field will display the measured SPL at the microphone. It should equal the calibrator’s nominal SPL plus the correction factor. For example, 94.0 dB (calibrator) – 0.20 dB (free-field correction) = 93.8 dB. Tolerance: ± 0.1 dB (Figure 6.87).

Once the countdown ends, tap “Save” to store the new microphone sensitivity. If the new sensitivity differs from the last by less than ± 3 dB, saving proceeds with confirmation. If the difference exceeds ± 3 dB, a warning appears: “Difference exceeds ± 3 dB. Please confirm calibration is correct.” Then, you should: Verify that the calibrator is correctly mounted and active. Check for microphone damage or replacement. If the microphone was replaced, enter the new sensitivity value manually and tap “Save”.

Note: If you exit the calibration screen without pressing “Save”, the calibration record will not be stored and the sensitivity will revert to the previous value.

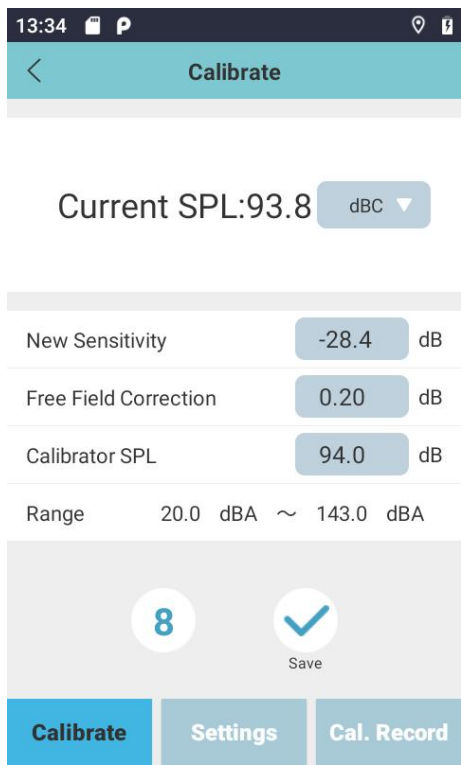


Figure 6.86

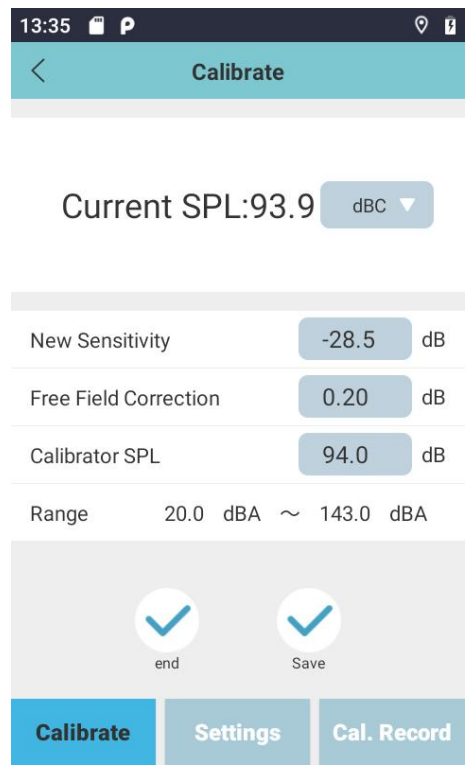


Figure 6.87

6.4.5 Pistonphone Calibration Procedure

To perform calibration using a pistonphone, with typical output: 124 dB SPL at 250 Hz. Set Calibrator Sound Pressure Level to 124.0 dB. Set unit to dB(C). Set Free-field Correction to 0.00 dB (the correction for 250 Hz is typically 0 dB). All remaining steps follow the same procedure as described in Section 6.4.4.

6.5 Data Retrieval

6.5.1 Internal Data

6.5.1.1 Viewing Measurement History

To access measurement history, tap “Data Retrieval” from the main menu, as shown in Figure 6.88. Historical measurement data can be reviewed from the Data Retrieval page or by selecting the “History” button within each measurement module. Note the following:

- 1) The “History” button only displays data relevant to the selected module.
- 2) The “Data Retrieval” function displays all historical measurement records, including synchronized measurement history, which is only accessible here.
- 3) A maximum of 200 records is displayed per page; scroll up to load more.
- 4) Each record shows timestamp, group name, measurement method, and other key details.
- 5) Tap any record to view detailed information.

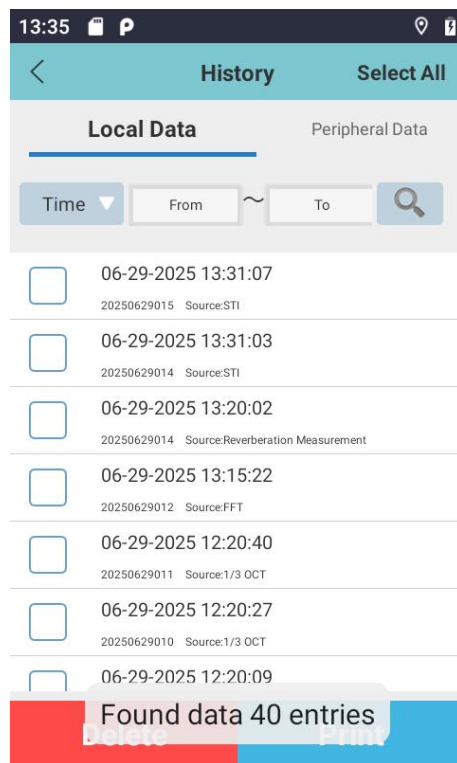


Figure 6.88

6.5.1.2 Deleting Data

Data can be deleted from either the Data Retrieval page or the detailed view. You may delete individual, multiple, or all records. If no data is selected, the prompt “Please select at least one record” will appear. If data is selected, the system will allow deletion.

- 1) Single Record Deletion:
 - a. Select any record (see Figure 6.89) and tap the Delete icon.
 - b. A prompt will appear: “Data deletion is irreversible. Do you want to permanently delete this data?”.
 - c. Tap OK to confirm or Cancel to return to the list.

- 2) Multiple Record Deletion:
 - a. Select multiple records (see Figure 6.90) and tap the Delete icon.
 - b. Confirm the same prompt as above.
- 3) Delete All Records:
 - a. Tap the Select All icon in the upper right corner (see Figure 6.91), then tap Delete. Confirm as prompted.

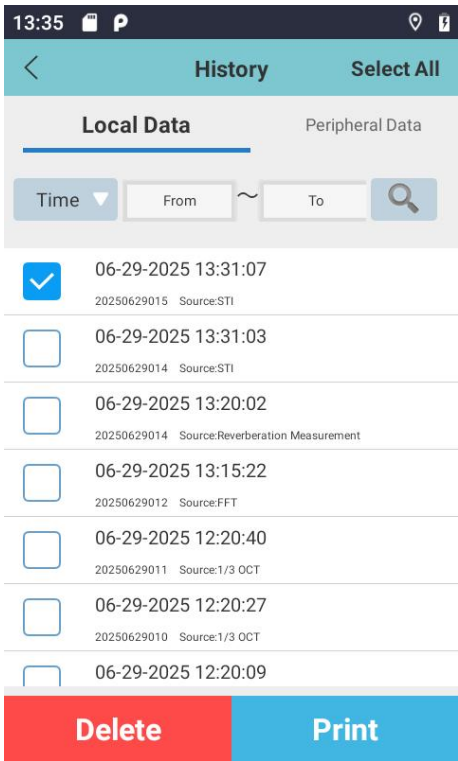


Figure 6.89

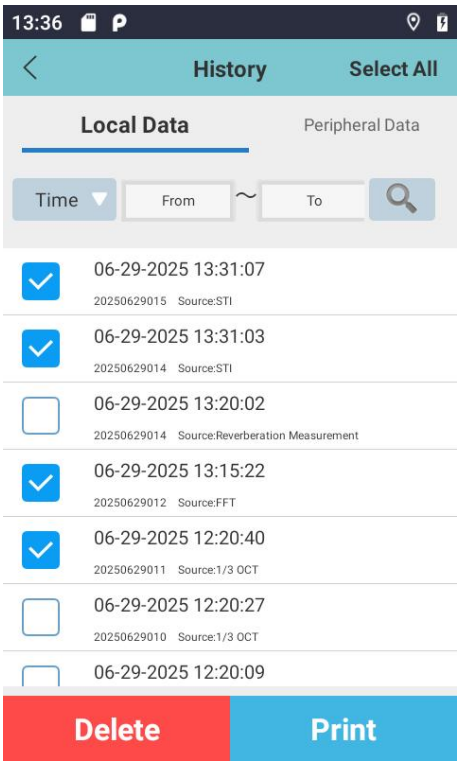


Figure 6.90

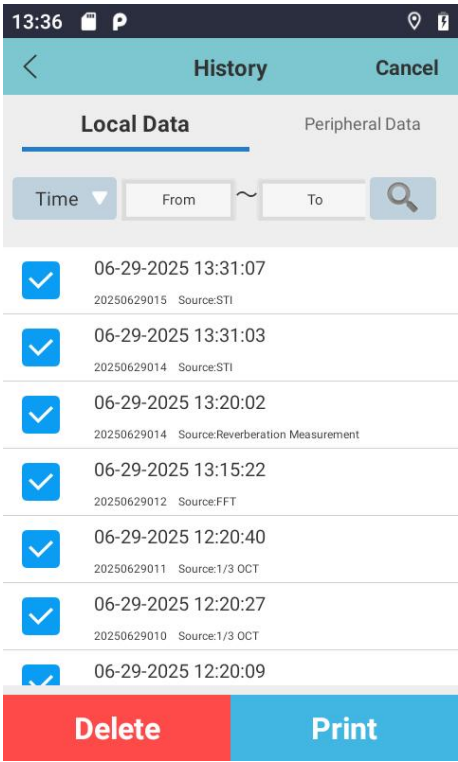


Figure 6.91

6.5.2 External Device Data

6.5.2.1 Viewing External Data

From the Data Retrieval page, tap the “External Data” tab (Figure 6.92). When the external device function is enabled in the instrument settings, data from connected devices during integrating noise measurements is automatically stored in this section. Up to 200 records per page are displayed. Scroll up to load more. Each entry shows the measurement time and other metadata. Tap any record to view detailed information.

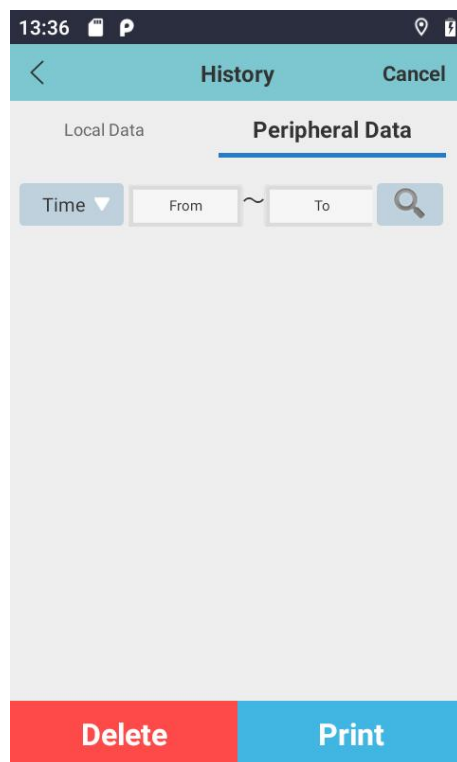


Figure 6.92

6.5.2.2 Deleting External Data

External data can be deleted individually, in groups, or all at once. The procedure is identical to internal data deletion.

6.5.3 Data Printing

6.5.3.1 Connecting a Printer

Measurement results and calibration records can be printed using the AH73R micro printer. Ensure the printer is properly connected and powered on. The online indicator must be lit. Upon tapping Print, the system will check for printer connection. If a printer is found, output fields will follow the selected print template. If not, a prompt will appear: "Printer not found. Please check the printer connection!" (see Figure 6.93).

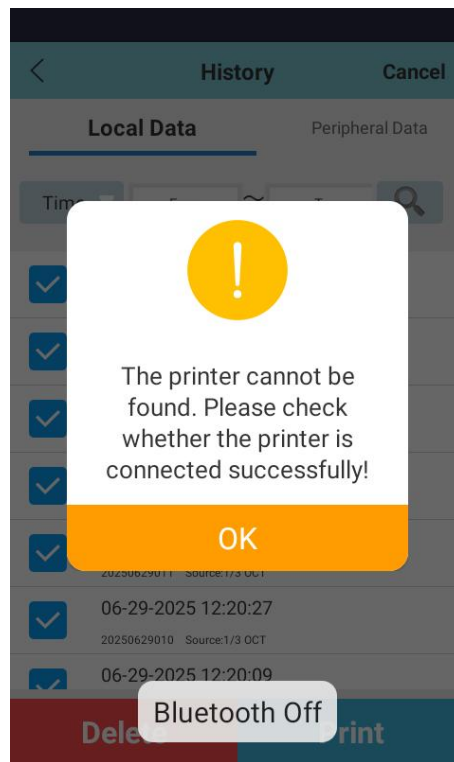


Figure 6.93

6.5.3.2 Printer Connection Methods

- 1) Bluetooth Connection
 - a. Navigate to Instrument Settings > Printer and select Bluetooth.
 - b. Use either the Bluetooth settings page or the "Settings" button to connect to the ZX3300.
 - c. Once connected, return to the Data Retrieval or Details page, select a record, and tap Print.
 - d. If no printer is found, a prompt will appear.
- 2) Serial Port Connection:
 - a. Connect the instrument to a compatible serial printer via the serial port.
 - b. Navigate to Instrument Settings > Printer and choose Serial.
 - c. Use Serial Settings or the "Settings" button to configure the connection.
 - d. Enable flow control. Set baud rate to 115200
 - e. Notes for Serial Mode. Graphical printing may experience approximate 5s delay. Large datasets (e.g., FFT or Digital Recorder data) may cause character corruption due to overflow. Bluetooth is recommended in such cases. An incorrect baud rate will result in errors or corrupted output. Always set to 115200.

6.5.3.3 Group Printing

- 1) Single Item Printing: Access any detail page, select a specific item, and tap Print.
- 2) Single Group Printing: From the Data Retrieval page, select any group (containing one or more items), then tap Print.
- 3) Multiple Group Printing: From the Data Retrieval page, select multiple groups and tap Print.

6.6 Instrument Settings

6.6.1 Interface Overview

Tap “Instrument Settings” from the main menu to enter the settings interface, as shown in Figure 6.94, 6.95, and 6.96.

This section allows users to configure and view key hardware, software, and connectivity information related to the ZX3300.

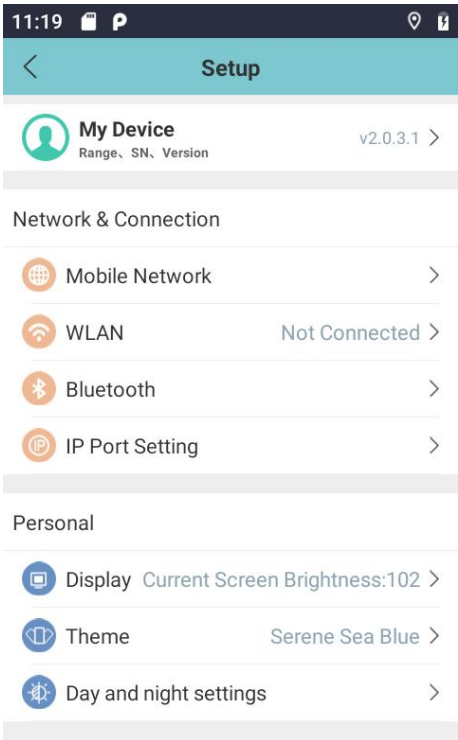


Figure 6.94

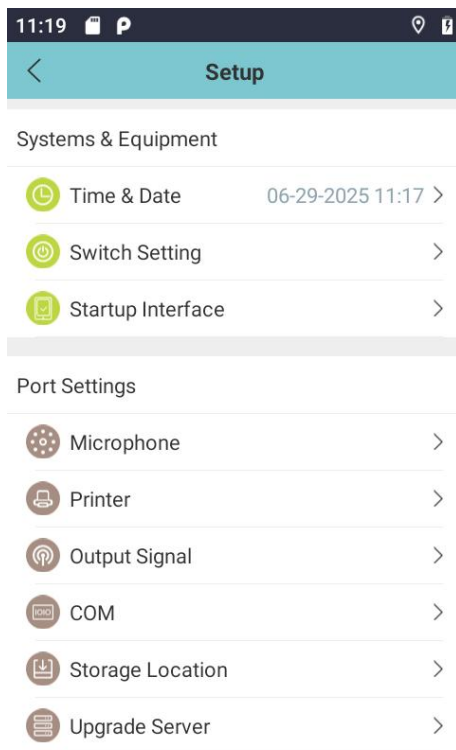


Figure 6.95

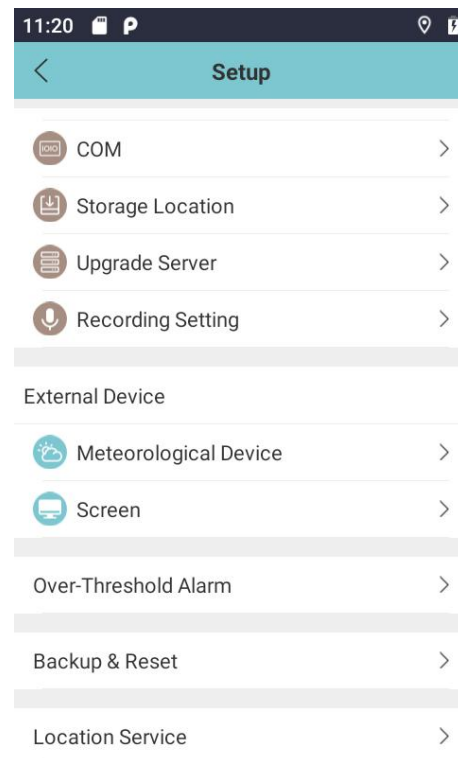


Figure 6.96

6.6.2 My Device

Tap “My Device” in the system settings menu to access the detailed device information screen, as shown in Figure 6.97.

The following device attributes are displayed:

- 1) Device Model: Model of the device (ZX3300).
- 2) Device Name: The assigned name of the device (Sound Level Meter).
- 3) Serial Number: Unique serial number of the device.
- 4) Measurement Range: Current full-scale measurement range of the device.
- 5) Hardware Version: Current hardware version number.
- 6) Software Version: Installed firmware/software version. Tap to view version details. Update prompts will appear if a newer version is available.
- 7) Acquisition Board Version: Version of the data acquisition board. Tap to view details. If a mismatch is detected, an update may be required.
- 8) Microphone Model: Indicates the model of the connected measurement microphone.
- 9) Microphone Serial Number: Serial number of the microphone.
- 10) Microphone Type: Type or category of the measurement microphone.
- 11) CPU ID: CPU identifier unique to the device
- 12) Total Storage: Device’s total internal storage capacity.
- 13) Available Storage: Current available (free) storage space
- 14) Certification Information: (In development).



Figure 6.97

6.6.3 Network and Connectivity

- 1) Mobile Network: Tap “Mobile Network” to enter the mobile network settings interface, as shown in Figure 6.98. Enable or disable the mobile network connection using the toggle switch. Mobile connectivity is handled in a manner similar to Android smartphones.
- 2) WLAN (Wi-Fi): Tap “WLAN” to access the Wi-Fi settings interface, as shown in Figure 6.99. Enable or disable the Wi-Fi connection using the toggle switch. Scan and connect to available Wi-Fi networks. Wi-Fi connectivity works similarly to Android-based systems. Connection example shown in Figure 6.100.

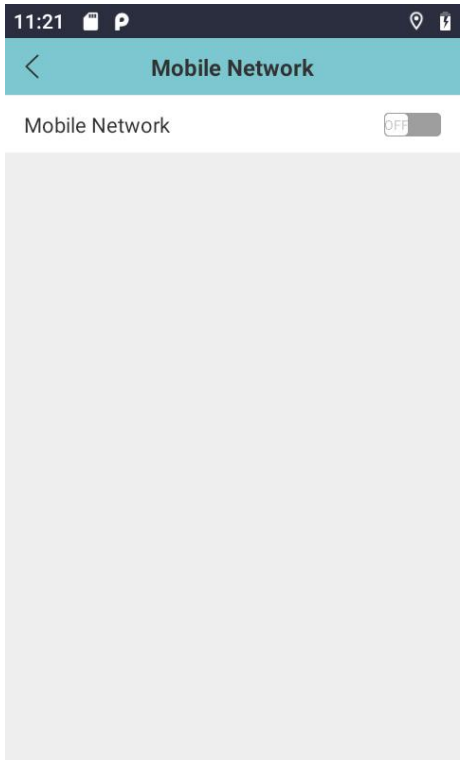


Figure 6.98

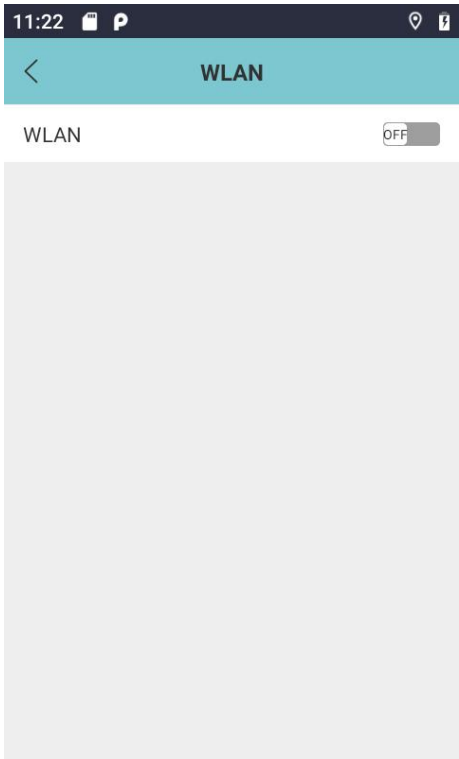


Figure 6.99

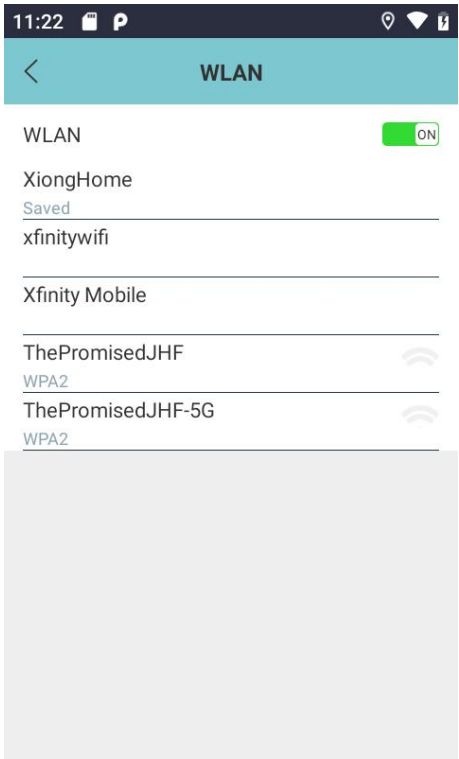


Figure 6.100

- 3) Bluetooth: Tap “Bluetooth” to enter the Bluetooth settings interface, as shown in Figure 6.101. Enable or disable Bluetooth using the toggle switch. Scan and connect to available Bluetooth devices. Bluetooth connection functions similarly to Android smartphones.

Connection example is shown in Figure 6.102.

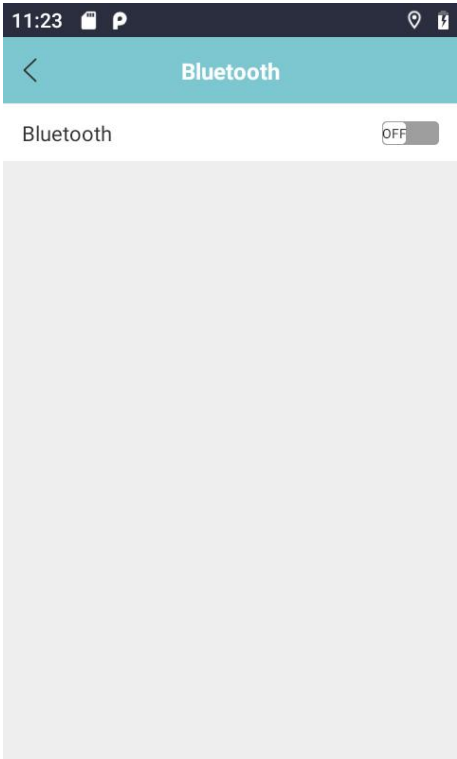


Figure 6.101

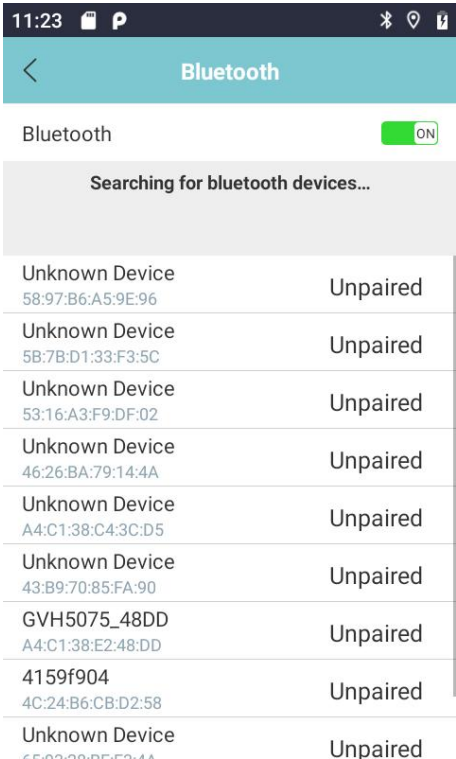


Figure 6.102

4) IP Port Settings: (In development).

6.6.4 Personal Setting

- 1) Display: Tap “Display” to access screen display settings, as shown in Figure 6.103. Adjust screen brightness using the slider; changes take effect immediately. If no user interaction occurs, brightness will automatically reset to 50% after 1 minute.
- 2) Theme: Tap “Theme” to enter the theme customization interface (Figure 6.104). Two themes are available: Deep Sea Blue (default), Serene Sea Blue. Upon selecting a new theme, the following message will appear: “Switching themes will reset all pages and may take about one minute. Do you want to proceed?” Tap “Confirm” to apply the new theme. The switch will complete in approximately one minute.
 - a. Deep Sea Blue homepage example: Figure 6.105
 - b. Serene Sea Blue homepage example: Figure 6.106

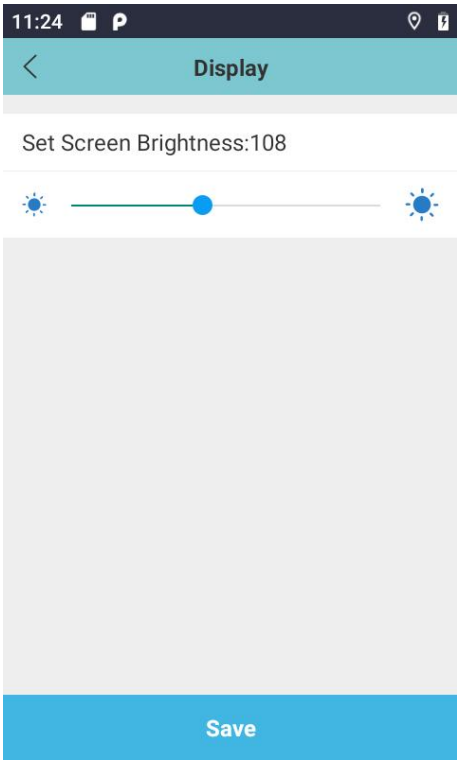


Figure 6.103

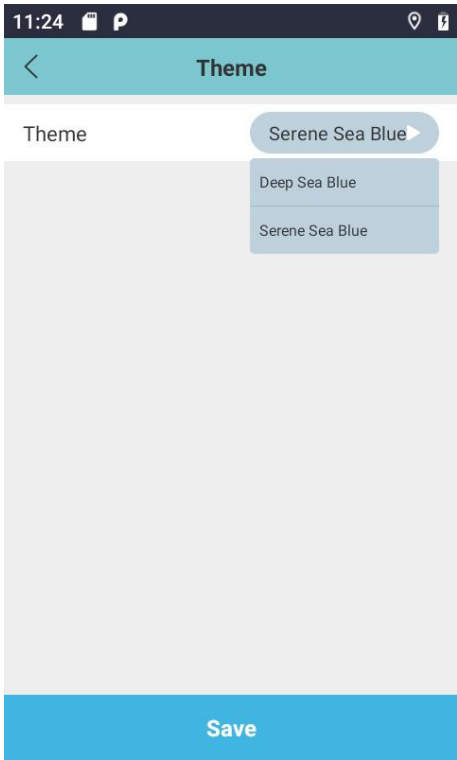


Figure 6.104



Figure 6.105



Figure 6.106

- 3) Day/Night Mode: Tap “Day/Night Settings” to configure automatic time-based display modes, as shown in Figure 6.107. Default daytime: 06:00 to 22:00. Default nighttime: 22:00

to 06:00. You can modify the daytime start between 03:00 and 07:00; the system will automatically adjust the corresponding daytime end and nighttime intervals. Tap “Confirm” to save the configuration. The day/night schedule affects features such as 24-hour monitoring, over-limit recording, and threshold alarms.

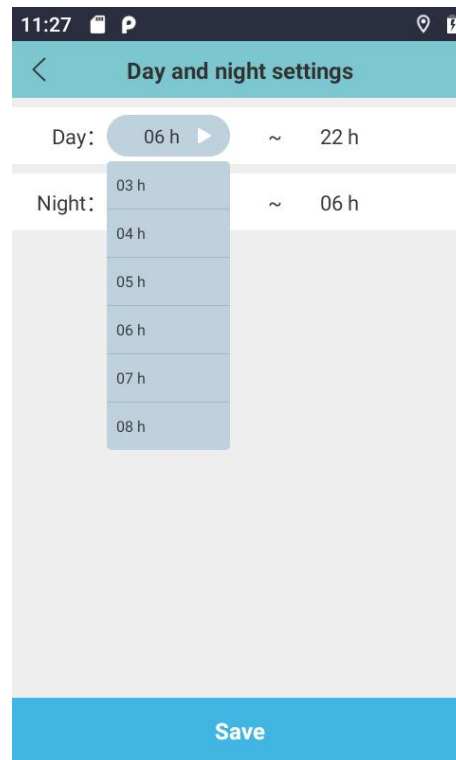


Figure 6.107

6.6.5 System and Device

- 1) Time and Date: Tap “Time and Date” to open the system clock interface (Figure 6.108). Current system time is displayed. Tap the date/time control to adjust settings.

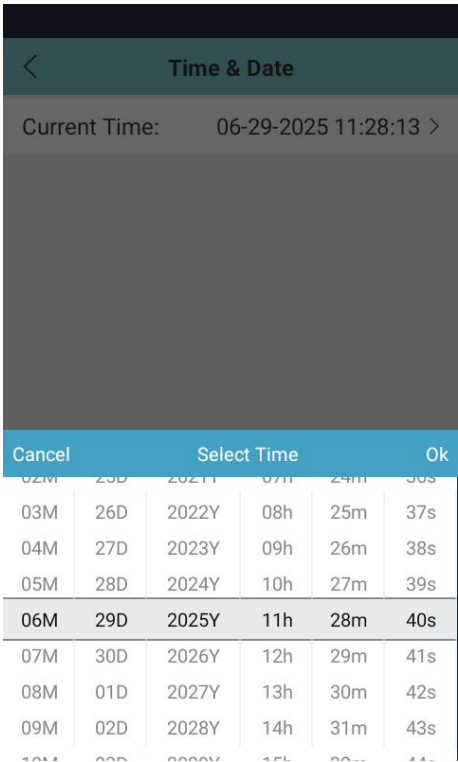


Figure 6.108

- 2) Power Scheduling: Tap “Power On/Off Settings” to enter the scheduled power management interface (Figure 6.109). Enable Scheduled Power-On and/or Scheduled Power-Off (Figure 6.110). It is recommended that scheduled power-on time be set at least 10 minutes before the measurement start time. Scheduled power-on will only occur once per setting. Scheduled power-off only works when the device is powered on. If the device is manually powered off and on again, the previous power-off schedule will no longer apply.

Note: Scheduled power-on time must be at least 10 minutes ahead of the current time. Scheduled power-off must be at least 3 minutes ahead of the current time. Otherwise, the system will not allow the settings to be saved

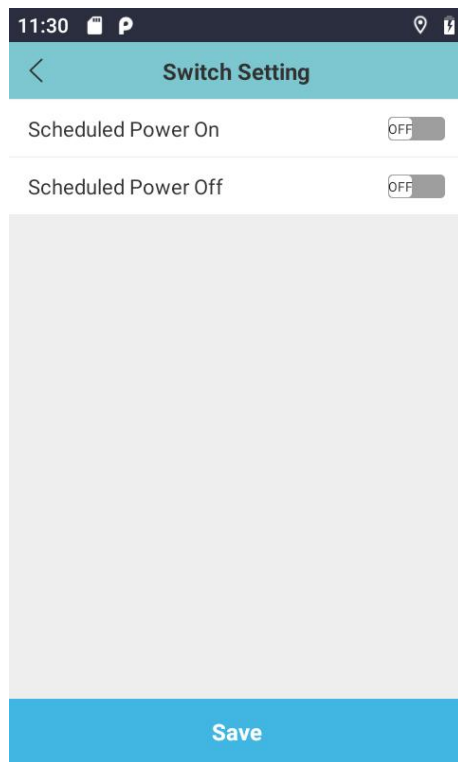


Figure 6.109

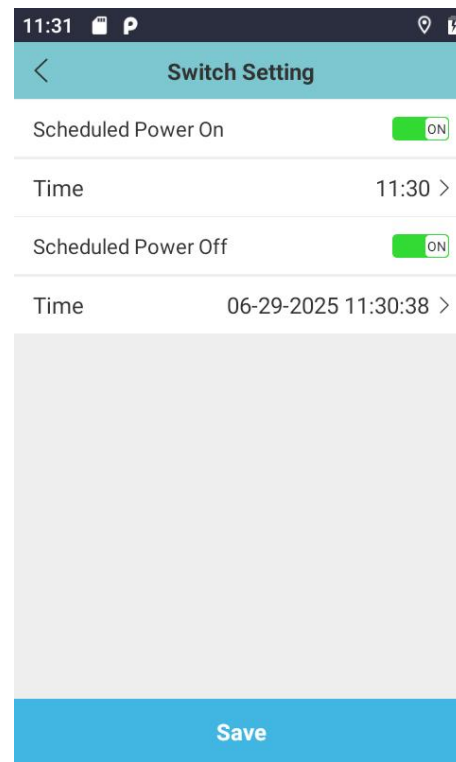


Figure 6.110

3) Startup Page: Tap “Startup Page” to set the default screen the instrument loads after booting (Figure 6.111). Available options include:

- a. Homepage
- b. Total Value Integration
- c. Statistical Integration
- d. 1/1 Octave Analysis
- e. 1/3 Octave Analysis
- f. FFT Analysis
- g. 24-Hour Measurement
- h. Indoor Measurement
- i. Reverberation Measurement
- j. STI
- k. Sound Exposure Level

Once set, the instrument will enter the selected module each time it is powered on.

Combine this with the Scheduled Power-On and Startup Page module settings to enable automatic measurement immediately upon startup.

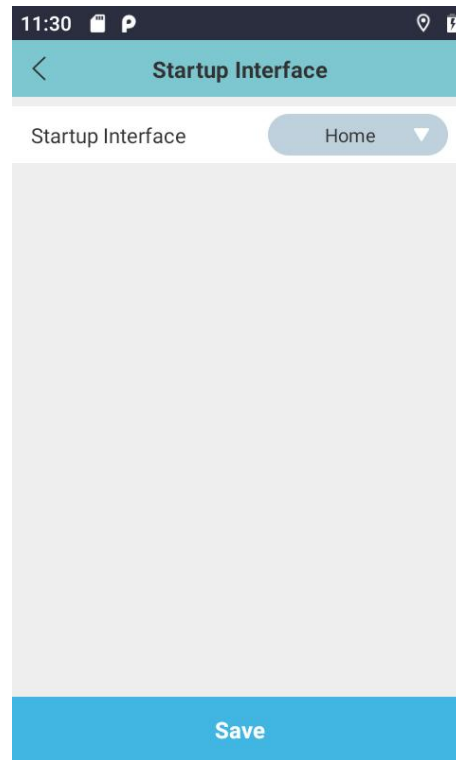


Figure 6.111

6.6.6 Interface Settings

- 1) Microphone: Tap “Microphone” to enter the microphone configuration page. The default measurement microphone type is 0° incidence (Free-field). Available types: 0° incidence (Free-field), 90° incidence (Pressure-field), Diffuse-field. Correction values for Pressure-field and Diffuse-field microphones can be found in Appendix B.
- 2) Printer: Tap “Printer” to enter the printer settings interface. Supported connection types: Bluetooth, Serial Port. For detailed setup, refer to Section 6.5.3.2. If image printing is required, enable the “Print Graphics” toggle. Otherwise, graphics will not print. Available print template fields include: Measurement point name, Measurement mode, Start time, Ts (sampling interval), Tm (measurement duration), Device model, Serial number, Calibration time, Weighting, Sensitivity, Calibration SPL, GPS coordinates, Measurement range, Sampling rate, Window type, FFT line count, Room type, Weather conditions, Threshold, Evaluation standard, Exchange rate, Overload status. Before printing, select desired fields in this interface to define the print template.
- 3) Output Signal: Tap “Output Signal” to enter signal output settings. Enable AC Signal Output to access the following weighting options: A-weighted, C-weighted, Z-weighted. AC Output Levels: 9.5 mV/Pa, 950 mV/Pa (Figure 6-6-6-4). Enable DC Signal Output to select from: LAFp, LAsp, LAIp, LAeqt, LCFp, LCSp, LCIp, LCEqt, LZFP, LZSp, LZIp, LZeqt, 1/1 Octave frequency bands, 1/3 Octave frequency bands.
- 4) Serial Port: Tap “Serial Port” to access serial communication settings. Enable Flow Control to access additional options. Supported baud rates: 4800, 9600, 115200 (Figure 6-6-6-6). When Expander is enabled, the system can connect to multiple peripherals simultaneously (e.g., meteorological sensors, displays, printers).
- 5) IoT Connectivity: Tap “IoT” to configure cloud platform connection. Default server address:

121.196.124.117. Default port: 1883. Users typically do not need to modify these settings. When network is available and this function is enabled, data can be uploaded to the our Cloud Platform for real-time monitoring. Note: Enabling IoT increases power consumption. It is recommended to use this feature only while connected to external power.

- 6) Storage Location: Tap “Storage Location” to configure storage settings. Options: Internal Memory, External TF Card, Data and audio can be stored on either medium (Figure 6-6-6-9). Changing the storage location will restart the application. Storage rules: If no TF card is inserted, storage defaults to internal memory. If a TF card is inserted, users may select it for data and audio storage. When storage is full on both media, data must be manually deleted via: The instrument’s Delete Data feature. A computer via USB connection, followed by a system restart. Storage will not auto-switch between internal and TF card. If TF card fills up, users must manually delete data, replace the card, or switch to internal memory.
- 7) Recording Settings: Tap “Recording Settings” to configure audio recording parameters. Available sample rates: 24000 Hz, 48000 Hz (default). The selected sampling rate applies to voice annotations, synchronized recording, and over-limit recording.

6.6.7 External Devices

Used for integrating with other external hardware.

- 1) Meteorological Equipment: Tap “Meteorological Device” to enter the setup interface. Enable the feature and select the appropriate model and serial port. Once the ZX3300 measurement module starts, it will log weather data at the configured interval. Supported models: WS-6P, AH-6P, AH-2P. Note: AH-2P only supports wind speed and wind direction.
- 2) Display Screen: Tap “Display Screen” to configure connected display modules. Enable the function and select: Model, Serial port, Display type. Data updates on the external display every 1 second.

6.6.8 Data Upload

Tap “Data Upload” to access the cloud data upload interface. This section allows configuration of upload settings for: Measurement Data, System Events, External Devices, Upload Interval. Each function is described below:

- 1) Data:

Tap “Data” to enter the data upload interface. Use this option to enable or disable the measurement data upload module. When connected to the AIHUA Acoustic Analysis Cloud Platform, the system can automatically upload: Instantaneous data (e.g., LAFp, LAeq, etc.), Integrated data (e.g., statistical and time-weighted averages). Enabling this feature allows for real-time remote monitoring and long-term data storage on the platform.

- 2) Events:

Tap “Events” to enter the event upload configuration interface. This section allows users to configure which system events are uploaded to the AIHUA Acoustic Analysis Cloud Platform. When enabled, the system will automatically upload relevant events upon triggering. Supported event types include:

- 1) Noise Over-limit

When the measured noise level exceeds the threshold defined in the Over-limit Alarm settings (e.g., 80 dB), an over-limit event will be uploaded to the platform.

2) External Power Loss

An event will be uploaded both when external power is disconnected and when it is restored.

3) Acoustic Calibration

Calibration start and end events are logged and uploaded.

4) Storage Error

If the device encounters an error while saving measurement data, an event will be triggered and uploaded.

5) Low Battery Voltage

When the instrument's battery voltage falls below the safe operating threshold, a low voltage event is recorded and uploaded.

These event logs support remote diagnostics, fault detection, and compliance monitoring when integrated with our Cloud Platform. Configures the frequency of real-time and external device data uploads.

3) External Devices

Tap “External Devices” to enter the external device data upload interface. This setting is used to enable or disable the upload of data from connected external modules. When integrated with the AIHUA Acoustic Analysis Cloud Platform, data collected from external devices (e.g., weather sensors, displays) will be transmitted to the cloud in real time, provided the corresponding module is enabled.

4) Upload Interval

This option controls the upload frequency for both: Instantaneous sound level data, External device data. Users can configure the time interval between data transmissions to the cloud platform based on application requirements and network availability.

6.6.9 Over-limit Alarm

Tap “Over-limit Alarm” to configure threshold-based alerts (Figure 6.112). Set daytime/nighttime limits and delay duration (Figure 6.113). When LAFp exceeds the threshold, the uploaded value will be highlighted in red on the AIHUA Cloud Platform. If the exceedance persists longer than the configured delay, an over-limit event is triggered and uploaded.

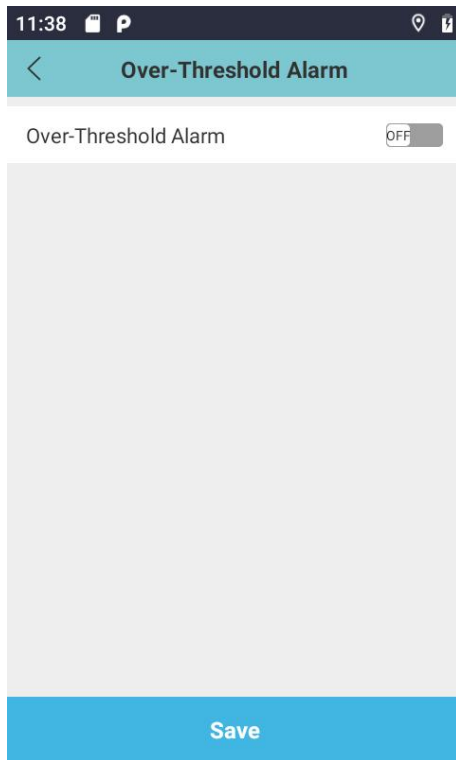


Figure 6.112

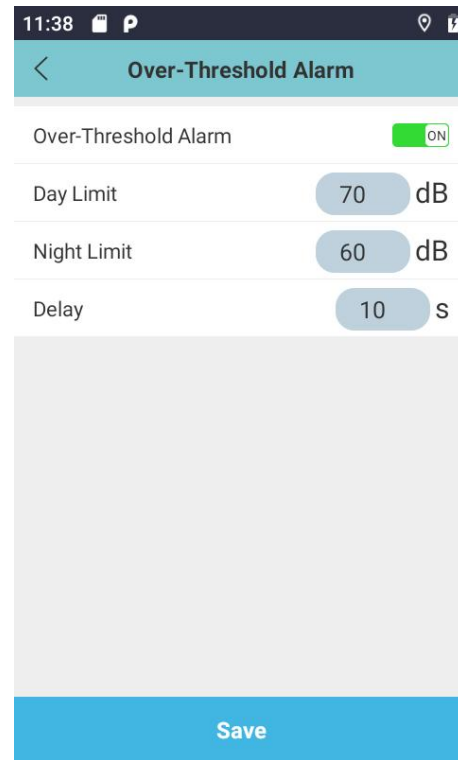


Figure 6.113

6.6.10 Backup and Reset

Tap “Backup and Reset” to enter the backup and reset settings interface (see Figure 6.114). This menu provides access to functions such as USB backup, factory reset, data deletion, software restart, and device shutdown. Details are as follows:

- 1) USB Backup (under development): This function is currently under development and not yet available.
- 2) Restore Factory Settings: Tap “Restore Factory Settings” to enter the reset screen (see Figure 6.115). Tap “Confirm” to proceed. The instrument will restore factory defaults, excluding the following: Microphone sensitivity level, Stored measurement data, Calibration records, Internal clock settings, Group names.
 - a. Caution: This operation is irreversible. All other settings will be reset. The instrument will automatically reboot once the process is complete.

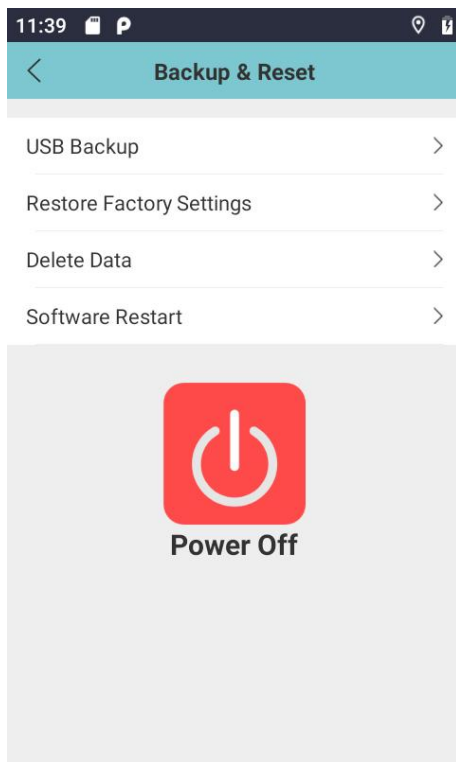


Figure 6.114

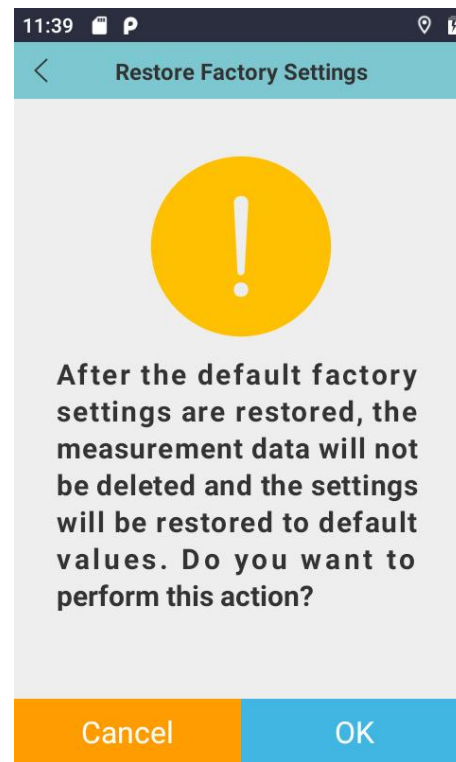


Figure 6.115

- 3) Delete Data: Tap "Delete Data" to access the data deletion interface (see Figure 6.116). A confirmation prompt will appear: "All measurement data will be permanently deleted and cannot be recovered. Are you sure you want to proceed?". Tap "Confirm" to delete all measurement records.
 - a. Caution: Please perform this action with care. This operation permanently removes all saved data.
- 4) Software Restart: Tap "Software Restart" to reboot the instrument's software (see Figure 6.117). A confirmation dialog will appear: "The software will restart. Do you wish to continue?". Tap "Confirm" to proceed with the software reboot.
- 5) Shutdown: Tap "Shutdown" to power off the instrument.

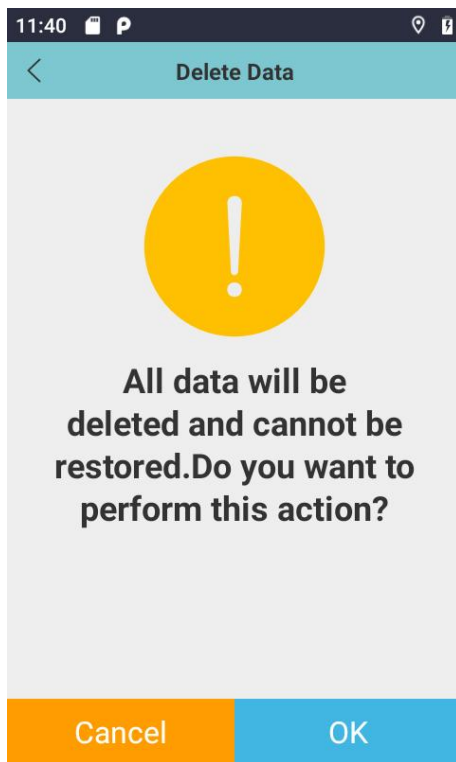


Figure 6.116

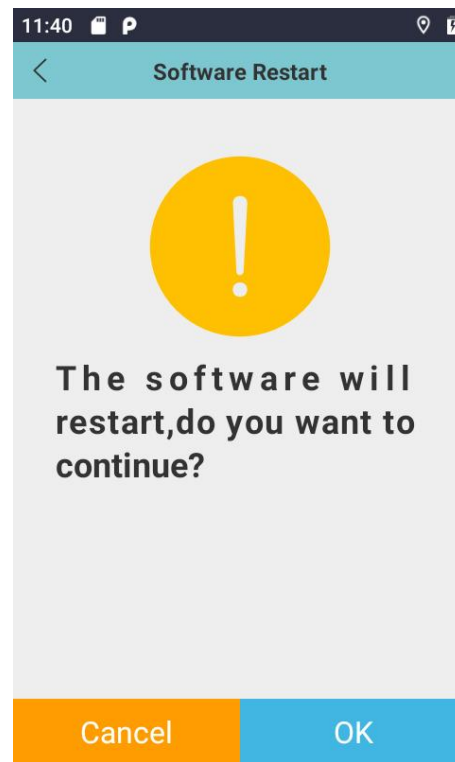


Figure 6.117

6.6.11 Location Settings

Tap “Location Settings” to enter the positioning configuration interface (see Figure 6.118). This function allows the user to configure how the instrument acquires and uploads location data. By default, the system uses BeiDou + Network Positioning.

Disabling the location switch will prevent the instrument from uploading any location data to our Acoustics Noise Monitoring Platform. The following positioning modes are available (see Figure 6.119):

- 1) BeiDou Only: Location data is obtained exclusively from the built-in BeiDou satellite module, regardless of network status.
- 2) BeiDou + Network Positioning

If a network connection is unavailable, the instrument defaults to BeiDou satellite positioning. If a network connection is active, the system uses either BeiDou or network positioning—whichever provides a faster and more accurate fix.

- 3) Network Positioning Only: Location data is acquired solely through the network. No positioning will be available when the instrument is offline.

Note: Selecting an appropriate positioning method ensures accurate time-stamped and geotagged measurements, especially for environmental noise monitoring applications.

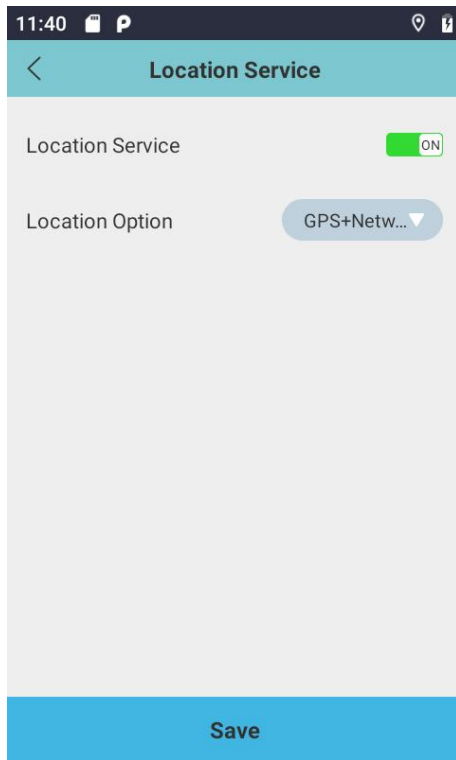


Figure 6.118

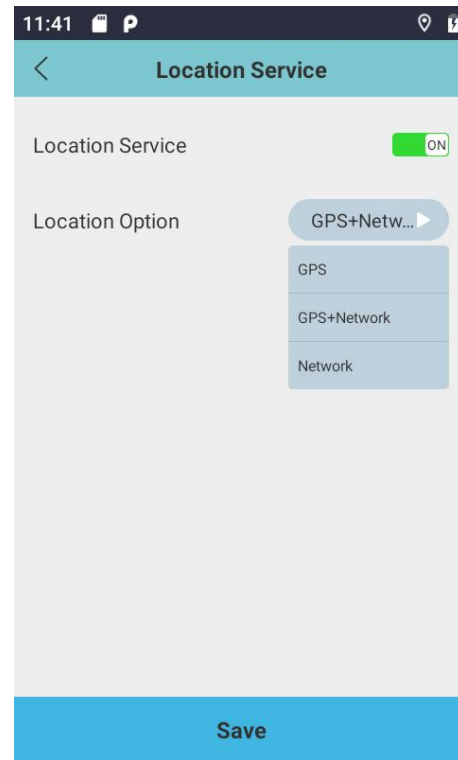


Figure 6.119

6.7 Auxiliary functions

6.7.1 Overview

When entering any measurement interface, such as Total Value Integration, Statistical Integration, 1/1 OCT Analysis, 1/3 OCT Analysis, FFT Analysis, 24-Hour Measurement, Indoor Measurement, Reverberation Measurement, STI, and Sound Exposure Level, clicking the upper-right button (“⋮”) will bring up the auxiliary functions interface, as shown in Fig. 6.120.

The available auxiliary functions include Location, Glossary, Audio Annotations, and Recording. Clicking any of these options will direct the user to the corresponding interface.

Note: The 24-hour measurement, reverberation measurement, and STI functions do not support voice annotation or recording.

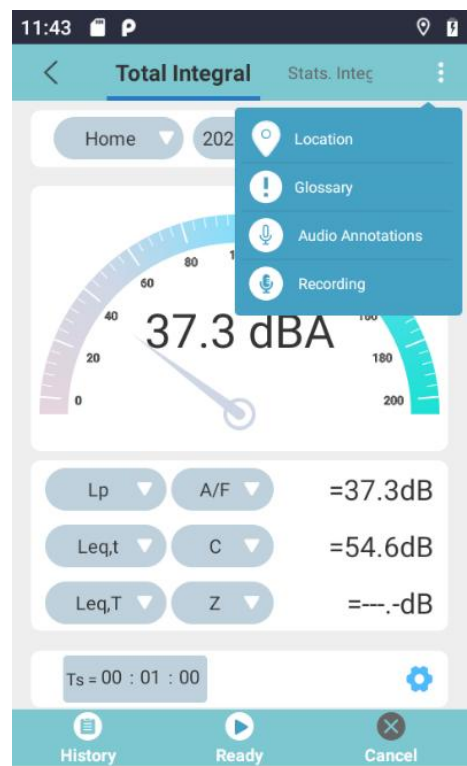


Figure 6.120

6.7.2 Location

Click "Location" to enter the location interface, as shown in Fig. 6.121. This function displays the user's current location and supports online maps. When the device is connected to the network or used outdoors, latitude and longitude data will be recorded during measurements.



Figure 6.121

6.7.3 Glossary

Click "Glossary" to access the glossary interface, as shown in Fig. 6.122 Users can search for and view definitions of terms relevant to their measurements.

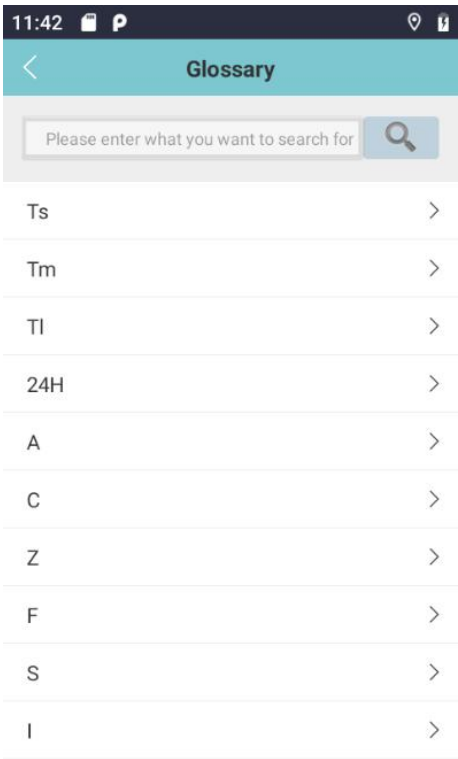


Figure 6.122

6.7.4 Audio Annotations

Click "Audio Annotation" to enter the audio annotation settings interface. By default, voice annotation is disabled.

Clicking "Duration" allows users to set the recording duration to Off, 10 seconds, or 20 seconds, as shown in Figure 6.123. Audio annotation is only effective when the start mode is set to "Manual Button". It does not work in other measurement modes.

If audio annotation is set to "Off", the feature remains inactive. If voice annotation is set to 10 seconds, then when the user starts measurement using the manual button, the system first records a 10-second voice annotation file before proceeding with the measurement. After measurement completion, a 10-second voice annotation file will be saved in the history and can be played back. If voice annotation is set to 20 seconds, the annotation duration will be 20 seconds.

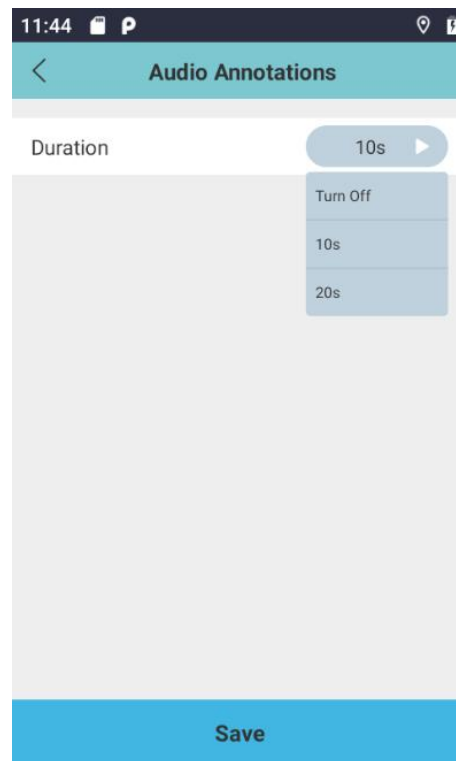


Figure 6.123

6.7.5 Recording

Click "Recording" to enter the recording settings interface, as shown in the left panel of Fig. 6.124. After enabling the "Recording Button," users can configure the recording module and recording start mode, as shown in the center left panel of Fig. 6.125. Recording only takes effect within the selected recording module and according to the specified recording start mode. Available modules include Total Integration, Statistical Integration, 1/1 OCT Analysis, 1/3 OCT Analysis, FFT Analysis, Indoor Measurement, and Simultaneous Measurement, as shown in the center right panel of Fig. 6.126. The activation modes available are Synchronized and Overlimit.

The Sound Exposure Level and 24-hour measurement modules have separate recording handling, where the default and only possible recording module is "Sound Exposure Level" or

"24-hour measurement."

When Activation Mode is set to Synchronized. If synchronized measurement is enabled, the "Recording Module" must be set to "Synchronized Measurement." When synchronized measurement starts, recording will automatically start simultaneously, and the recording file will be saved in the synchronized measurement folder.

To access synchronized measurement recordings, go to "Data Review" from the main page. If synchronized measurement is disabled, selecting other modules will ensure that recording starts automatically when the respective module's measurement begins. The recording file is saved in the respective module's folder and can be accessed through the history records or data review.

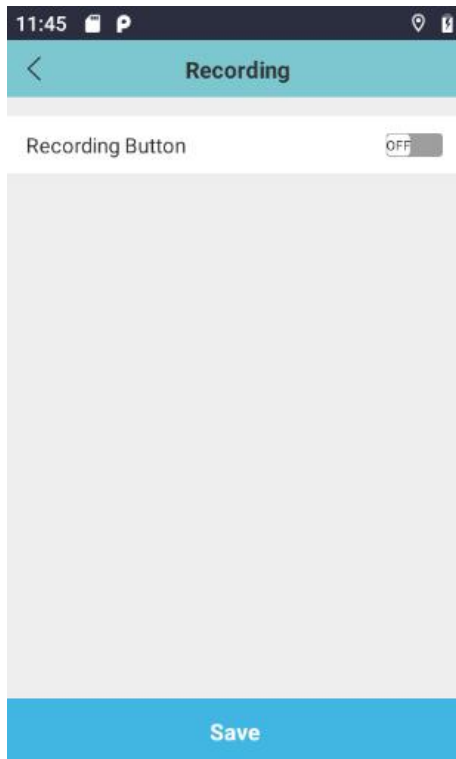


Figure 6.124

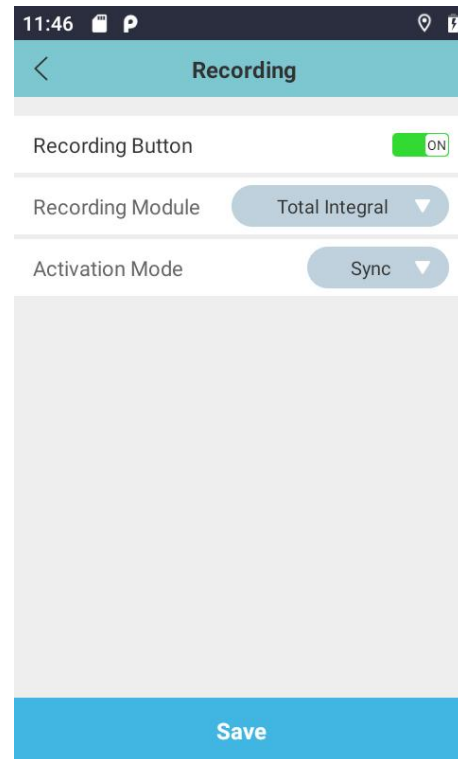


Figure 6.125

When Activation Mode is set to Over-limit. The interface displays Day Limit, Night Limit, Delay, and Recording Duration, as shown in the right panel of Fig. 6.115. Once the set over-limit duration is reached, recording will automatically start. If LAFp continuously over the limit for longer than the set "delay time," recording starts immediately after the delay ends. The recording duration equals the set "Recording Duration". If the measurement ends before reaching the full recording duration, recording continues until the set duration is completed. If the recording duration exceeds 1 hour, the system automatically splits the recording into 1-hour segments.

Notes: Example from the center left panel in Fig. 6.127, if the Total Value Integration measurement starts, recording starts simultaneously. When the Total Value Integration measurement ends, the recording also stops and is saved in the corresponding folder. The recording duration matches the measurement duration T_m .

Example from the right panel in Fig. 6.115, if LAFp exceeds the limit for 5 seconds, exceedance recording starts automatically. When the recording reaches 10 seconds, it automatically stops and is saved in the Total Value Integration folder. File Size Considerations:

- 1) Enabling recording generates large files.
- 2) 1 hour of continuous recording produces approximately 660 MB of data.
- 3) If recording continues for 15 hours, the system's storage may run out, leading to performance issues or data storage failures.
- 4) To prevent storage overflow, users should delete large recording files as needed.
- 5) Use caution when enabling recording for extended measurements.

24-hour measurement, only supports Over-limit Recording. If LAFp exceeds the limit beyond the set delay time, recording starts automatically. The recording duration follows the configured setting. If measurement ends before the full recording duration, recording also stops. All recording files are saved in the corresponding measurement folder.

Note: Recording Time Limitation: Due to the exceedance recording requiring time-based conditions, the valid recording duration range is 10s - 3599s.



Figure 6.126

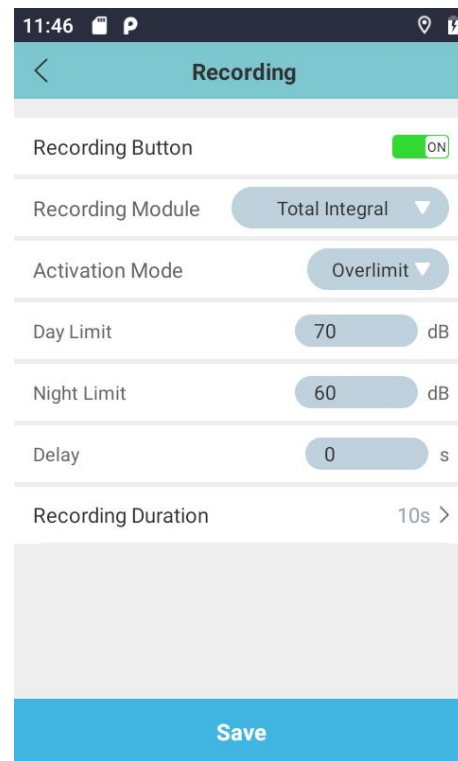


Figure 6.127

APPENDIX A — Directional Response

When the ZX3300 Sound Level Meter is used with the ZX1901L preamplifier, the system exhibits the following directional (angular) response characteristics.

Frequency (Hz)	30° A	30° C	30° Z	90° A	90° C	90° Z	150° A	150° C	150° Z
250	0.1	0.1	0.1	0.0	0.0	0.0	0.3	0.3	0.4
315	0.3	0.1	0.1	0.1	0.1	0.1	0.5	0.5	0.5
400	0.2	0.3	0.3	0.1	0.2	0.2	0.4	0.5	0.5
500	0.4	0.3	0.3	0.2	0.1	0.1	0.6	0.6	0.6
630	0.3	0.3	0.4	0.1	0.2	0.1	0.4	0.4	0.5
800	0.1	0.1	0.1	0.6	0.6	0.6	0.1	0.1	0.1
1000	0.3	0.3	0.3	0.1	0.0	0.0	0.8	0.7	0.7
1250	0.4	0.4	0.5	1.0	1.0	1.0	0.9	1.0	1.0
1600	0.3	0.3	0.3	1.0	1.0	1.0	1.1	1.1	1.1
2000	0.1	0.1	0.1	0.9	0.9	0.9	2.2	2.2	2.2
2239	0.1	0.0	0.0	2.1	2.1	2.1	1.4	1.4	1.5
2500	1.0	1.0	1.0	2.0	2.0	2.0	4.6	4.6	4.6
2818	0.5	0.5	0.4	3.7	3.6	3.6	4.2	4.2	4.2
3150	0.1	0.2	0.2	0.4	0.4	0.4	4.6	4.6	4.5
3548	0.0	0.0	0.0	1.9	1.9	1.9	5.2	5.3	5.3
4000	0.5	0.6	0.6	2.1	2.1	2.1	5.6	5.7	5.6
4467	0.4	0.4	0.5	1.8	1.8	1.8	6.8	6.8	6.8
5000	0.6	0.6	0.6	0.1	0.1	0.1	6.2	6.2	6.2
5623	0.1	0.1	0.2	3.7	3.7	3.6	8.3	8.3	8.3
6300	0.8	0.0	0.1	2.5	2.5	2.6	2.7	2.7	2.8
7079	0.9	0.9	0.9	5.0	4.5	4.8	6.0	6.0	6.0
8000	0.7	0.7	0.7	4.8	4.7	4.8	3.9	4.0	3.6

8414	0.4	0.5	0.4	3.1	3.1	3.1	8.8	8.8	8.8
8912	0.3	0.3	0.3	3.8	3.7	3.8	9.0	8.8	9.0
9441	0.1	0.0	0.1	3.7	3.7	3.7	10.1	10.1	10.0
10000	0.2	0.2	0.2	2.8	2.8	2.8	10.0	9.9	10.0
10593	0.3	0.4	0.2	4.1	4.1	4.1	11.1	11.2	11.1
11220	0.3	0.3	0.3	4.3	4.2	4.3	11.5	11.5	12.0
11885	0.5	0.6	0.5	7.0	7.0	7.0	10.5	9.9	10.3
12500.0	0.0	0.1	0.0	6.2	6.2	6.2	11.5	11.5	11.7

Table A-1 — Frequency response corrections (in dB) for different incidence angles (30°, 90°, 150°) under A-weighting, C-weighting, and Z-weighting.

Note: Directional response refers to the variation in measured sound pressure level as a function of the angle of incidence of the sound wave, typically measured in a free-field condition using a standardized sound source.

APPENDIX B — Free-Field Response

When the ZX3300 sound level meter is equipped with the ZX1025 1/2 inch measurement microphone and the ZX1901L preamplifier, under 0° incidence of sound waves, the free-field response characteristics are as shown in the figure below and listed in the table.

Frequency(Hz)	10	12.5	16	20	25	31.5	40	50	63
A-weighting	-69.2	-62.6	-57.7	-50.9	-45.4	-39.9	-34.8	-30.6	-26.6
C-weighting	-14.5	-11.8	-9.8	-6.7	-5	-3.4	-2.2	-1.5	-1.2
Z-weighting	0	-0.3	-1.3	-0.4	-0.5	-0.3	-0.2	-0.9	-0.4
Frequency(Hz)	80	100	125	160	200	250	315	400	500
A-weighting	-22.8	-19.6	-16.4	-13.6	-11.1	-8.8	-6.8	-5	-3.1
C-weighting	-0.9	-0.7	-0.4	-0.4	-0.4	-0.3	-0.2	-0.3	0.2
Z-weighting	-0.4	-0.4	-0.2	-0.3	-0.2	-0.3	-0.2	-0.3	0.2
Frequency(Hz)	630	800	1000	1250	1600	2000	2500	3150	4000
A-weighting	-2	-0.9	0	0	1	1.6	1.6	1.3	0.5
C-weighting	-0.1	-0.1	0	-0.6	-0.1	0.2	0	-0.4	-1.3
Z-weighting	-0.1	-0.1	0	-0.5	0	0.3	0.3	0.1	-0.6
Frequency(Hz)	5000	6300	8000	10000	12500	16000	20000	-	-
A-weighting	0.7	-0.2	-0.6	-3.5	-7.5	-15.1	-27.5	-	-
C-weighting	-1.2	-2.1	-2.5	-5.5	-9.5	-17.1	-29.5	-	-
Z-weighting	0	-0.1	0.6	-0.4	-1.4	-3.1	-3.6	-	-

Table B.1 — Free-field response data (0° incidence) for ZX3300 with ZX1025 1/2" microphone and ZX1901L preamplifier.

Free-field Response (0° incidence) — ZX3300 with ZX1025 1/2" Mic + ZX1901L Preamp

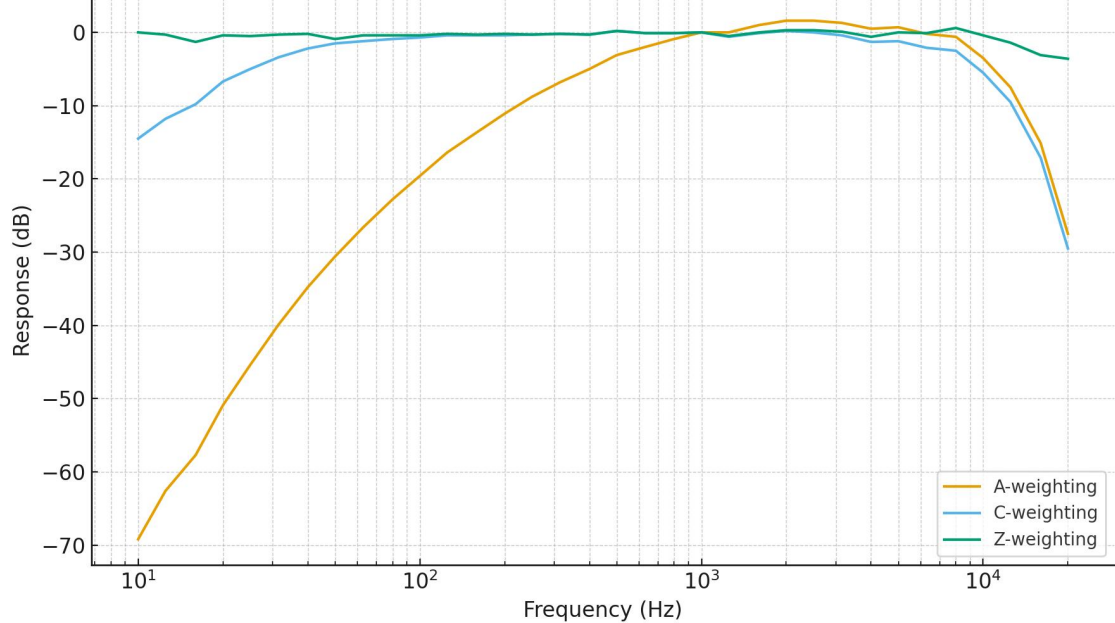


Figure B.1 — Free-field response (0° incidence) of ZX3300 with ZX1025 1/2" microphone and ZX1901L preamplifier (A-, C- and Z-weighting).

The Z-weighting free-field response of the ZX3300 sound level meter equipped with the ZX1025 1/2" microphone and ZX1901L preamplifier was measured at 90° incidence.

Table B.2 lists the numerical response values across the frequency range from 500 Hz to 20 kHz, while Figure B.2 illustrates the corresponding response curve.

Frequency (Hz)	Response (dB)	Frequency (Hz)	Response (dB)
500	0	4000	1
630	0	5000	1.5
800	0.1	6300	2.1
1000	0.1	8000	3.1
1250	0.1	10000	4.3
1600	0.2	12500	5.7
2000	0.3	16000	7.6
2500	0.4	20000	9
3150	0.6	-	-

Table B.2 — Z-weighting free-field response at 90° incidence

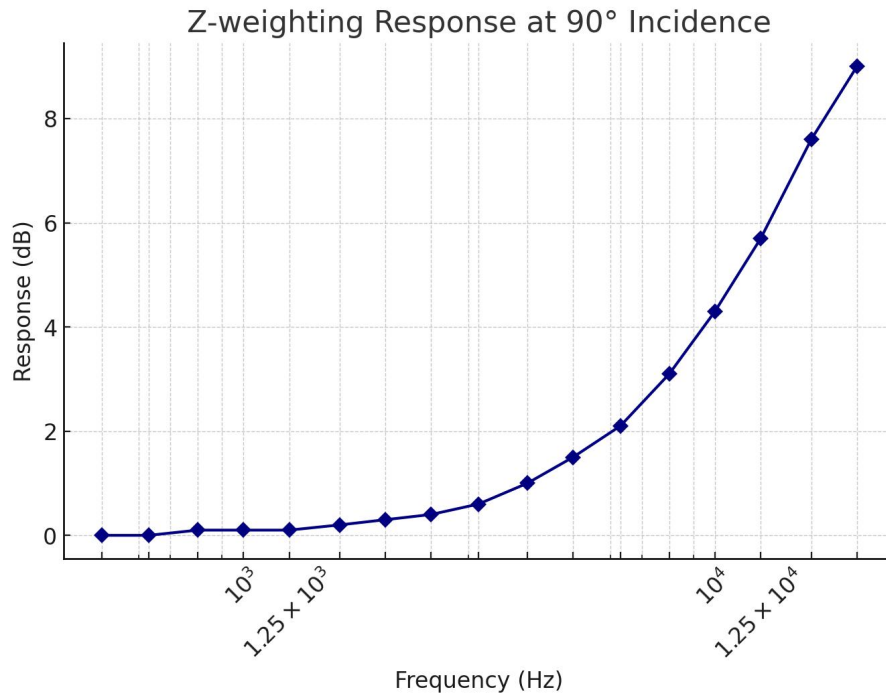


Figure B.2 — Z-weighting response curve at 90° incidence

The Z-weighting diffuse-field response of the instrument was measured using the ZX3300 sound level meter with the ZX1025 1/2" microphone and ZX1901L preamplifier.

Table B.3 provides the numerical diffuse-field response values, while Figure B.3 shows the corresponding response curve.

Frequency (Hz)	Response (dB)	Frequency (Hz)	Response (dB)
250	0	2500	0.3
315	0	3150	0.5
400	0	4000	0.7
500	0	5000	1.1
630	0	6300	1.7
800	0	8000	2.6
1000	0	10000	3.9
1250	0.1	12500	5.9
1600	0.1	16000	7.9
2000	0.2	-	-

Table B.3 — Z-weighting diffuse-field response

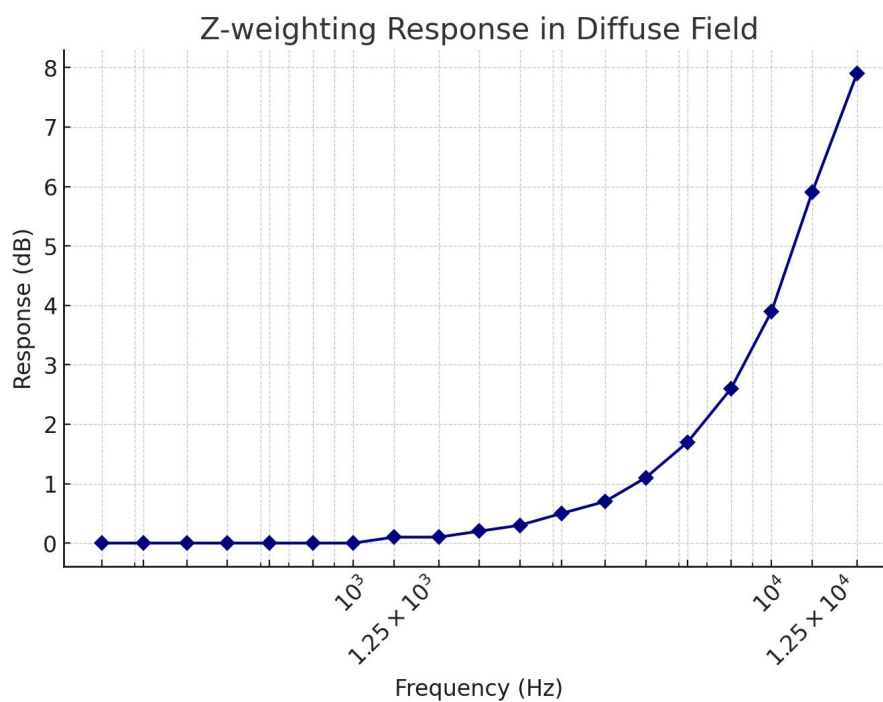


Figure B.3 — Z-weighting response curve in diffuse field

APPENDIX C — Windshield Influence Correction Values

When there is no wind, the average correction value of the influence of the S80 windscreen on the frequency weighting response of the ZX3300 in the reference direction is as follows.

Frequency (Hz)	Z-weighting Correction (dB)	Frequency (Hz)	Z-weighting Correction (dB)
500	-0.1	8000	0.4
630	-0.2	8414	0.5
800	-0.2	8912	0.2
1000	-0.2	9441	0.6
1250	-0.2	10000	0.6
1600	-0.3	10593	1
2000	-0.4	11220	0.4
2239	-0.3	11885	1.1
2500	-0.3	12500	0.8
2818	-0.1	13335	0.9
3150	0	14125	1.3
3548	0.1	14962	1.3
4000	0	16000	1.3
4467	0.1	16788	1.2
5000	0.2	17783	1.1
5623	0.2	18836	1.4
6300	0.2	20000	1.7
7079	0.6		

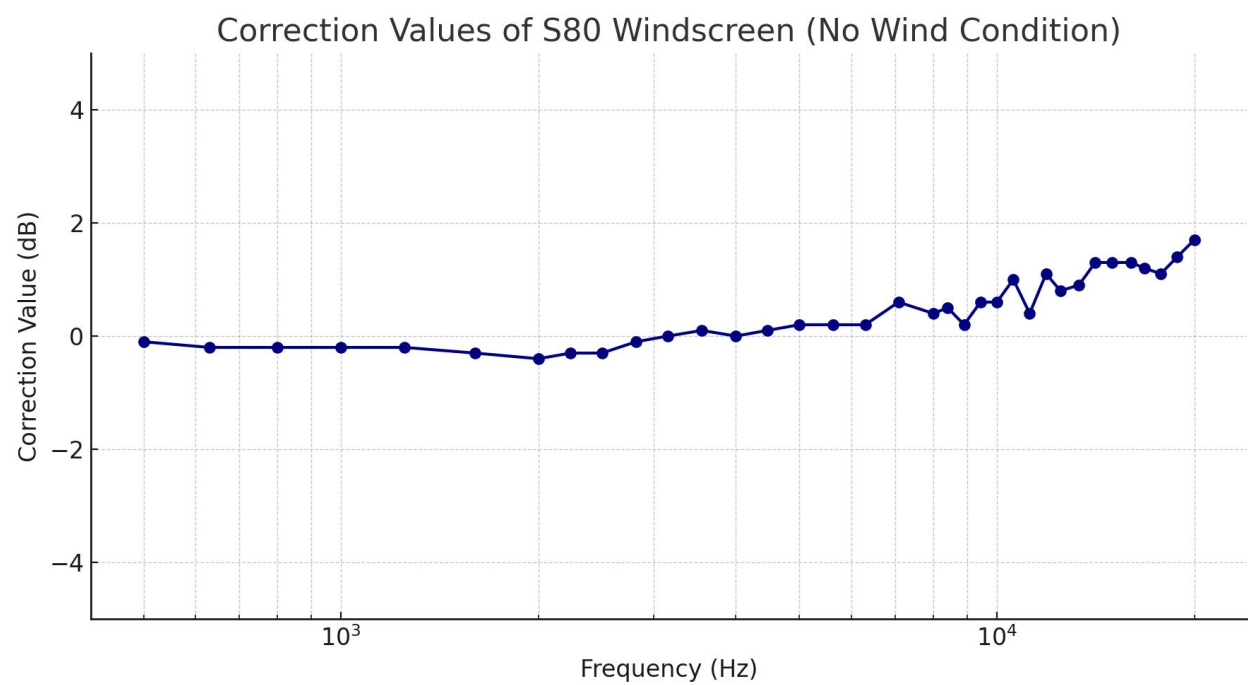


Figure C.1 — Windscreen Correction Curv

APPENDIX D — Enclosure Influence Correction Values

Frequency (Hz)	A(dB)	C(dB)	Z(dB)	Frequency (Hz)	A(dB)	C(dB)	Z(dB)
63	-0.1	0.3	0.3	4467	-0.3	-0.2	-0.2
80	-0.1	0.1	0.1	5000	0.4	0.4	0.4
100	-0.2	-0.2	-0.2	5623	0.2	0.3	0.3
125	0.4	0.5	0.5	6300	0.2	0.2	0.2
160	0.1	0.2	0.2	7079	0.2	0.2	0.2
200	0.7	0.3	0.3	8000	0.8	0.8	0.8
250	0.2	0.2	0.2	8414	-1.4	-1.5	-1.5
315	0.3	0.2	0.2	8912	0.8	0.8	0.8
400	0.2	0.3	0.3	9441	-0.8	-0.8	-0.8
500	0.2	0.2	0.2	10000	-0.6	-0.6	-0.6
630	0.2	0.3	0.3	10593	0.1	0.1	0.1
800	-0.1	0.1	-0.1	11220	0.4	0.4	0.4
1000	0.2	0.2	0.2	11885	1.4	1.3	1.3
1250	0.4	0.3	0.3	12500	-0.2	-0.2	-0.2
1600	0.2	0.3	0	13335	0.4	0.4	0.4
2000	0.3	0	0	14125	0.2	0.2	0.2
2239	0.2	0.2	0	14962	-0.2	-0.2	-0.2
2500	-0.3	-0.3	-0.3	16000	-1.7	-1.7	-1.7
2818	-0.1	-0.3	0.3	16788	-1.7	-1.7	-1.7
3150	0.4	0.3	0.3	17783	-1.7	-1.7	-1.7
3548	0.2	0.2	0.2	18836	0.1	0	0
4000	0.3	0.3	0.3	20000	0.7	0.6	0.6

Table D.1 — Enclosure influence correction values (A-, C-, Z-weighting).

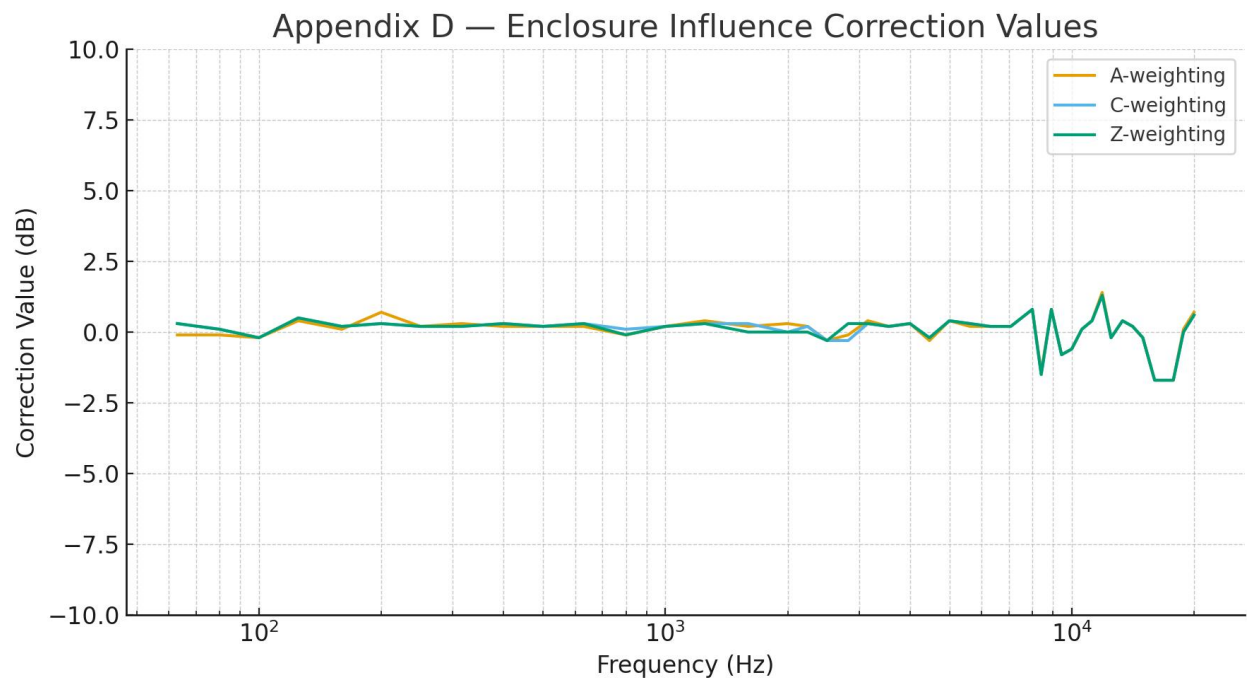


Figure D.1 — Enclosure influence correction curves (A-, C-, Z-weighting).

APPENDIX E — Self-Generated Electrical Noise of Octave Bands under Z-Weighting

Frequency (Hz)	Self-noise (dB)
8	< 10
16	< 10
31.5	< 10
63	< 8
125	< 8
250	< 8
500	< 5
1000	< 2
2000	< 1
4000	< 1
8000	< 3
16000	< 5

APPENDIX F — Influence of Extension Cable

Attenuation values (dB) at different extension cable lengths when the nominal sensitivity input signal is 140 dB.

Frequency (Hz)	5 m	10 m	15 m	20 m	30 m	40 m	50 m
250	0	0	0	0	0	0	0
315	0	0	0	0	0	0	0
400	0	0	0	0	0	0	0
500	0	0	0	0	0	0	0
630	0	0	0	0	0	-0.1	-0.1
800	0	0	0	0	0	-0.2	-0.2
1000	0	0	0	0	-0.1	-0.2	-0.3
1250	0	0	0	0	-0.2	-0.4	-0.8
1600	0	0	-0.1	-0.1	-0.4	-0.7	-1.3
2000	0	0	-0.1	-0.2	-0.7	-0.9	-1.9
2500	0	0	-0.2	-0.2	-1.2	-1.5	-2.5
3150	0	-0.1	-0.4	-0.7	-1.7	-2.6	-3.5
4000	0	-0.2	-0.7	-1.1	-2.4	-3.4	-4.4
5000	0	-0.4	-1.2	-1.6	-3.1	-4.3	-5.7
6300	-0.2	-0.7	-1.7	-2.4	-3.9	-5.3	-6.5
8000	-0.4	-1.3	-2.4	-3.4	-5	-6.5	-7.9
10000	-0.6	-1.9	-3.6	-4.6	-6.6	-8.5	-9.7
12500	-0.7	-2.6	-4	-5.3	-7.8	-9.7	-11.4

Note: The signal attenuation at different cable lengths is related to the input voltage:

- The higher the input voltage, the greater the attenuation.
- The values given above correspond to attenuation at a nominal input sound pressure level of 140 dB.