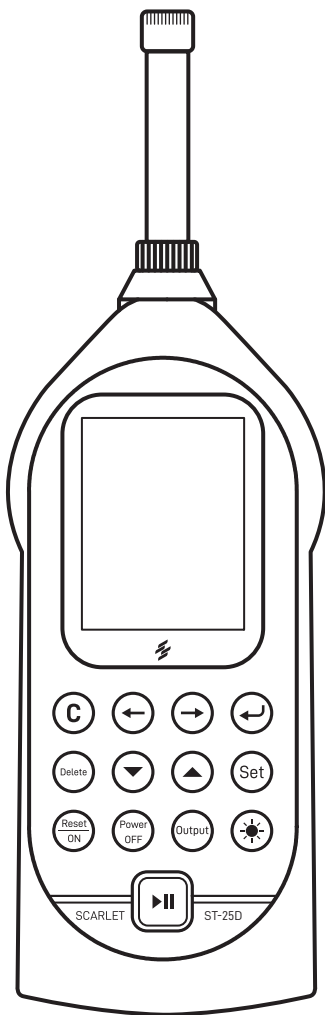




SCARLET | TECH



ST-25D

Sound Level Meter

User Guide

Precaution

- * Use the sound level meter gently, especially for microphone part, microphone is delicate sensor that require careful handling, please avoid any crashing, knocking and hitting, no water or oil entering.
- * If choose to use alkaline batteries, please use high capacity of alkaline batteries. And remember to remove the batteries when don't use sound level meter for more than one week.
- * Do calibration before and after measurement if needed.
- * Keep sound level meter powering on status at least 8 hours every month for charging internal clock battery.

Contents

| | |
|--|----|
| 1. General Introduction | 1 |
| 2. Specification | 2 |
| 3. Structure Features and Function | 3 |
| 4. Preparation | 9 |
| 4.1 Preparation before using | 9 |
| 4.2 Use of windscreen | 9 |
| 4.3 External power supply | 9 |
| 4.4 Check and change battery | 9 |
| 5. Calibration | 10 |
| 5.1 Sound calibration Interface | 10 |
| 5.2 Use ST-120 to calibrate | 12 |
| 5.3 Directly input sensitivity level | 12 |
| 5.4 Calibration record | 13 |
| 6. Operation | 14 |
| 6.1 Main menu | 14 |
| 6.2 Measurement interface | 14 |
| 7. Setup | 25 |
| 7.1 RTC | 26 |
| 7.2 Analyzer setup interface | 26 |
| 7.3 Basic setup interface | 30 |
| 8. Data Recall | 38 |
| 8.1 Once measurement result | 39 |
| 8.2 24H automatic monitoring result recall | 40 |
| 8.3 Integral measurement result recall | 42 |
| 8.4 Delete data | 43 |
| 8.5 Change to U-disk mode and recall | 44 |
| 8.6 File Format Description | 45 |
| 9. GPS Positioning Measurement | 46 |
| 9.1 Distance measurement | 47 |
| 9.2 Calibrate the RTC | 47 |
| 9.3 GPS positioning measurement | 48 |
| 10. Data Export | 49 |
| 11. Overload Indication | 54 |
| 12. Annex | 55 |
| 12.1 Response characteristics | 55 |
| 12.2 GPS overview | 57 |
| 12.3 Filter attenuation characteristics | 58 |
| 13. Safety, Handling, & Maintenance | 59 |

1. General Introduction

Model ST-25D has advantages of low power dissipation, powerful function, friendly and colorful display screen and abundant content. The instrument can measure A, C, Z frequency weighting and F, S, I time weighting, and it can also measure multiple assessment indexes at the same time. Its dynamic range is higher than 122dB.

The instrument enables statistics and integral analysis functions.

The design of low power dissipation and the automatic switchover of battery and the external power can support the instrument to work for a long time. With embedded 32 MB flash memory turns ST-25D a reliable data logger. It also has a pre-installed 32GB SD card for WAV recording function.

The instrument can be applied in environment protection, labor health, industrial enterprise and research and teaching etc. It can also achieve measurement of environmental noise, sound power level, machine equipment noise and building acoustics.

2. Specification

| | |
|---------------------------------------|---|
| Model | ST-25D |
| Fulfil Standard | IEC 61672 Class 2 / IEC 61260 Class 2 / IEC61252:2002 |
| Normal Frequency | 20 Hz ~ 12.5kHz \pm 1 dB (not including microphone) |
| Measurement Range | 28dB-133dB (145dB Peak) |
| Measurement Level | Z(FLAT): 38 ~ 130dB / C peak: 145dB / Z(FLAT): peak: 145dB |
| Resolution | 0.1dB |
| Frequency Weighting | A, C, Z parallel (synchronous) |
| Time Weighting | F, S, I, parallel (synchronous), peak, Lin. Average |
| Main Parameters of Measurement | [Statistical] L _{xyi} , L _{xyp} , L _{xeq} , L _{xymax} , L _{xymin} , L _{xN} , SD. [Integral] L _{xyi} , L _{xyp} , L _{xeq,t} , L _{xeq,T} , L _{xymax} , L _{xymin} , L _{xpeak} , LAE, LC-A, SEL. Note1: x is A, C, Z; y is F, S, I; L _{xN} has five parameters, the user can define them and N is chosen from 1 to 99. Note2: 24H Measurement indexes : L _d , L _n , L _{dn} besides the indexes above |
| Datalogging | 32MB Flash memory |
| Audio recording | 48kHz, 32bit; 8kHz, 8bit |
| GPS | Location, Transport speed |
| Bluetooth | Build-in; Support print measurement data |
| Power Supply | 4 x AA Batteries or USB 5V external power supply |
| Output Interface | AC*, DC**, RS-232, USB *AC: Chosen between AC and 1 kHz. Its output can be connected to 8 Ω earphone (output power: 150mW, harmonic distortion: <0.1%). **DC: Output the instantaneous sound pressure level of three frequency weighting (A, C, Z) and three time weighting (F, S, I), output scale: 15mV/dB. For 100dB, its output voltage is 1.54V (sensitivity level:-28dB) |
| Run Mode | Key, Limit, Clock, Interval |
| Dimensions | 260 x 80 x 30 mm |
| Display | 2.6-inch color display with 240*320 resolution |
| Graphic | Statistic distribution graph, Accumulative distribution graph |
| Weight | 0.35kg |
| Operation Environment | Air temperature: - 15°C ~ + 55°C Relative humidity: 20% ~ 90% |
| Package Contents | Sound Level Meter, Calibration Certificate, ½" Prepolarized Condenser Microphone(Pre-installed), Windscreen, SD card(Pre-installed), RS-232 Cable, Mini USB Cable, 5V Power Adapter, AA Batteries, User Manual, Waterproof Carry Case |

3. Structure Features and Function

The outline of the Sound Level Meter is shown in Figure 1. It consists of microphone, preamplifier and the main unit. During normal operation, the measuring microphone and the preamplifier are installed on the head of the main unit, connected with the main unit through knurled nut. Extension cable can also be used between the main unit and the preamplifier. The function of the connector's pin between preamplifier and the sound level meter is shown in Figure 2.

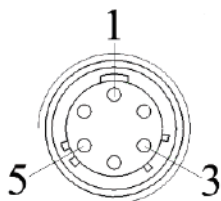
The outline of the sound level meter is sharp to reduce the reflection of the sound wave. The nominal influence caused by the reflection on the shell and the indication features under different incidence direction can be found in annexes. The shell is mold with ABS plastic. The batteries are put in battery box, which is very convenient for users to replace the batteries just by taking off the battery cover plate. All buttons are located at the central of the obverse side. Measuring results are shown on the 240×320 OLED display.

The GPS antenna slot, SD card slot and SD card indicator are located on the side, AC output (3.5mm phone jack), GPS and Status indicator, RS-232 and mini USB port are on the bottom of the device, the detail definition and function of pins is shown in the following figures.

Fig 1 Main structure

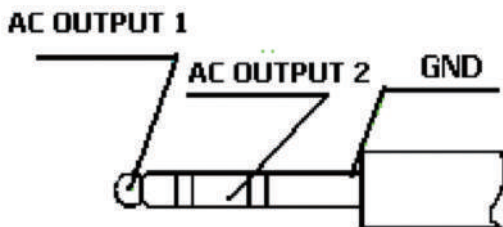


Fig 2 Preamplifier-Main device connector (X9 socket)



| Pin | Definition |
|-----|---------------|
| 1 | Power supply |
| 2 | Not connected |
| 3 | Signal input |
| 4 | Not connected |
| 5 | Signal ground |
| 6 | Not connected |

Fig 3 AC output (3.5mm phone jack/stereo socket)



AC output signal's amplitude won't exceed 1V. Its relationship with input signal is shown in the table below:

| AC output | AC | AC |
|-----------|-------------------------|-----------------------|
| 1 | input signal minus 10dB | 0.44V, 1kHz sine wave |
| 2 | input signal plus 10dB | 0.7V, 1kHz sine wave |

Fig 4 Mini USB port

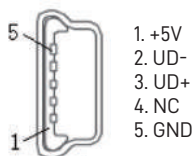
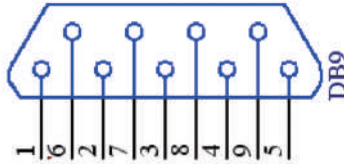


Fig 5 RS232 port



| Pin | Definition |
|-----|---------------|
| 1 | Power |
| 2 | RXD |
| 3 | TXD |
| 4 | Online |
| 5 | Ground |
| 6 | DC Output |
| 7 | Not connected |
| 8 | Not connected |
| 9 | Not connected |

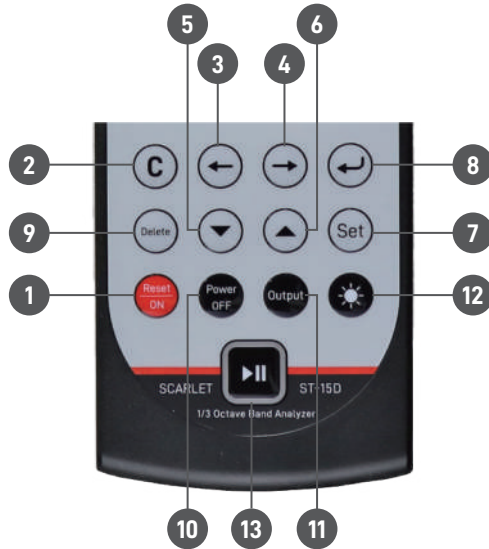
Fig 6 LED indicators



| Working status indicator | |
|--------------------------|---------------------|
| LED behavior | Status |
| Flashes | Measurement starts |
| Static On | Measurement paused |
| Off | Measurement Stopped |











| GPS status indicator | |
|---------------------------|--|
| LED behavior | Status |
| Flashes in every 1 second | Positioning information is available |
| Off | GPS module is not installed or in sleep mode |

Fig 7 Keypad



| No | Button | Definition |
|----|-----------|--|
| 1 | On/Reset | Power on; Restart the instrument |
| 2 | Cancel | Return to previous menu from the current menu |
| 3 | Left | Move the cursor to left |
| 4 | Right | Move the cursor to right |
| 5 | Up | The value is added by 1; Page up; Change option |
| 6 | Down | The value is decreased by 1; Page down; Change option |
| 7 | Set | Enter the settings interface |
| 8 | Enter | Enter the current operation |
| 9 | Delete | Delete the current data or cancel the current operation; Load the default parameters in the main menu interface |
| 10 | Off | Power off the instrument |
| 11 | Output | Finish the measurement ahead of time and save the measurement data |
| 12 | Backlight | Turn on/off the backlight |
| 13 | On/pause | Start or pause the measurement |

Fig 8 Status bar & icon definition

| No | Displayed content | Meaning | Remark |
|----|---|---|--|
| 1 | Statistics | Analysis mode | |
| | Integral | Analysis mode | |
| | GPS (Optional) | GPS positioning measurement | |
| 2 |  | The number of working analyzers | The bars from the left: Statistics, Integral |
| |  | Statistics & Integral are measuring | Color: white means open, red means startup status |
| | Overload | Overload | There is overload indicator when exceeds the measurement upper limit |
| 3 | Calendar Clock | The upper line shows hour, minute and second, the bottom line shows year, month and day | |
| 4 |  | Status of power supply, means the instrument is powered by external power supply | Power supply switchover: When the battery and external power supply power the instrument meanwhile, battery power is cut-off completely, the analyzer first uses external power source. When external power is low and cutoff, the instrument switches back to battery power and the instrument won't close down |
| |  | Status of power supply, means the instrument is powered by battery. | |
| |  | Status of power supply, means the voltage of external power supply and the battery is low | |
| 5 | List | Display interface | Statistics, integral |
| | All | Display interface | The measuring interface of 24H in statistics |
| | Fig. | Display interface | Statistics, integral |
| | Big | Display interface | Integral |
| | Huge | Display interface | Integral |
| | Sim. | Display interface | Integral |
| 6 | Once | Measuring mode | Statistics |
| | 24H | Measuring mode | Statistics |
| | LAFp, LASp, LAIp, LZFp, LZSp, LZIp, LCFp, LCSp, LCIp | Measuring index | Integral |
| | Wei: A, Wei: C, Wei: Z, one of them | Frequency weighting | Integral |
| 7 | Ts | The setting measuring time | Pressing ⊖ key in the measuring interface can choose the measuring time by grade |
| | Tm | The start-up measuring time | |
| | Tl | The remaining time | |
| 8 | Ready | The measurement is not started | Mini-printer is optional |
| | R: -(number) | The remaining time of voice note | |
| | W: (number) | The remaining time of run mode of key and delay | |
| | Run | The measurement is going on. | |
| | End | The measurement is finished. | |
| | Pause | The measurement pauses. | |
| | ATE | Sending data to mini-printer | |
| 9 |  | SD card | A SD card installed |
| |  | 48k 32bit record | |
| |  | 8k 8bit record | |
| 10 |  (Optional) | Slave mode of Bluetooth | |
| |  | Master mode of Bluetooth | |

4. Preparation

4.1 Preparation before using

- ① Check whether the microphone has been installed correctly.
- ② Check whether battery has been put in.
- ③ If necessary, calibrate it with a sound calibrator. Regular method is in chapter 5.
- ④ The meter should be tested by relevant department regularly (such as one year), so as to ensure its accuracy.

4.2 Use of windscreen

If windy, you may use a windscreen to reduce the influence of wind noise. There are different models for you to choose. Windscreen can reduce noise about 10-15 dB · See Appendix D the influence of free-field responses for a meter with a windscreen when there are no wind.

4.3 External power supply

The Sound Level Meter can be connected with external power through the USB socket at the lower right of the instrument. At this time, the inner battery will be cut-off automatically. The voltage range of the external power supply is 4.3 V~6.5 V. The shell of plug is the cathode and the core of plug is the anode. When the Sound Level Meter is used for long time continuously, it is recommended to use external power supply.

4.4 Check and change battery

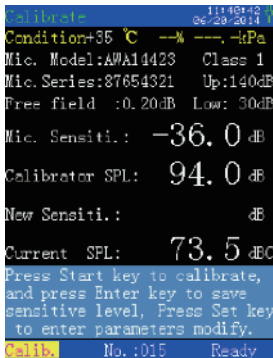
While operating, the meter will check battery power automatically, if it is low, the under-voltage indicator on will be lighted, which reminds to change battery. After you change the battery, the meter will operate normal again.

5. Calibration

There are two interfaces: calibrate and record. The instrument can save sound calibration record of 256 groups.

5.1 Sound calibration Interface

When the user enters the "Calibrate" submenu from main menu, shown below:



"Condition": the temperature of the environment.

"Mic. Model", "Mic. Series" and "Class 2" are preset when the meter leaves the factory, which can't be changed by the user.

"Up" is the upper limit of measurement when the instrument is equipped with the current sensitivity of microphone. The upper limit is defined according to the maximum RMS value of 1kHz sine wave.

"Low" is the lower limit of the instrument under the current sensitivity of microphone which is 7dB more than self-generated noise.

"Free field" is set according to the microphone that the instrument is equipped. The amendment value of free field is 0.2dB which also can be changed by the user.

"Mic. Sensiti." is the sensitivity level of the microphone after last calibration. This sensitivity level includes the preamplifier's attenuation.

"Calibrator SPL" is the actual level after calibration by the sound level calibrator.

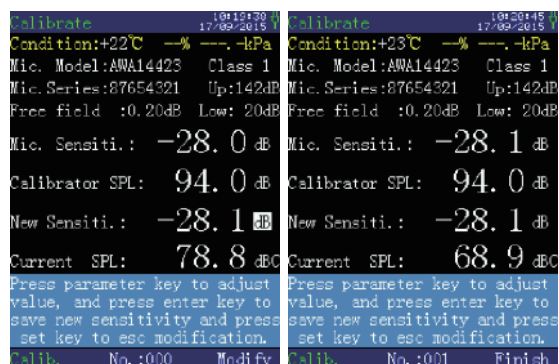
"New Sensiti" is the sensitivity level of the microphone after new calibration or the modification by hand.

"Current SPL": is changing with the environment which is shown as dBA or dBC. When the instrument is calibrated by 1kHz calibrator, the unit of Current SPL is recommended to use dBA. And when calibrated by 250Hz pistonphone, the unit is recommended to use dBC.

Function of main keys is shown below:

- : Press key to calibrate.
- : Press key to save the new sensitivity level.
- : Press key to enter the modified parameters.

In the current mode, the cursor can only be moved on "dBA" at the right side of "Current SPL" and "Calib.". If the user wants to modify the parameters, they should press (Set) Key, shown below:



The status changing from "Ready" to "Modify" allows the user to modify "Free field", "Calibrator SPL", and "New Sensiti." by pressing (Up) or (Down) key. When (Left) key is pressed, the modified content will be saved.

When the new sensitivity level that is calibrated differs from the last one by more than 4dB, then the new sensitivity level can't be saved. And the instrument should be recalibrated according to the prompt, if the microphone is verified with no problem (such as change the microphone), the user can set the new sensitivity level manually and calibrate it again.

5.2 Use ST-120 to calibrate

At the first time of sound calibration, set the "calibrator's sound pressure level" according to the certificate of inspection of the corresponding sound level calibrator. Generally, the sound level calibrator's sound pressure level is 94.0dB. If the sound pressure level is not 94.0dB, set it according to the actually inspected result.

Take 94.2dB for example, press (Set) key, and press (Left) or (Right) key to move the cursor to "Calibrator", and then adjust the value to 94.2 by (Up) or (Down) key. At last, press (Left) to save the Calibrator SPL.

Every time the user presses (Up) or (Down) key, the value increases or decreases by 0.1dB. When the user presses and holds (Up) or (Down) key, the value increase or decreases by 1dB. The adjustment continues till the key is released. The above steps can be performed only when the displayed sound pressure level differs from the used sound pressure level.



Insert the 1/2 inch microphone to the hole of ST-120 sound calibrator, turn on the power supply. Press **[M]** key. The meter automatically starts calibration. The sound pressure level is displayed after "Current SPL". This sound pressure level is approximately equal to the calibrator's sound pressure level minus free field correction. The sensitivity level is displayed after "New Sensiti.".

During calibration, a number is displayed on the bottom right corner of the screen, which changes from 0 to 21 and then stops. Then the user presses **[←]** key, the new microphone sensitivity level will be saved.

```

Calibrate 01126187
26-01-2018
Condition+29 °C --> --> -4Pa
Mic. Model:AWA14423 Class 1
Mic. Series:1710 Up:135dB
Free field :0.20dB Low: 23dB
Mic. Sensiti.: -31.2 dB
Calibrator SPL: 94.0 dB
New Sensiti.: -25.3 dB
Current SPL: 93.8 dB
Press parameter key to adjust
value, and press enter key to
save new sensitivity and press
set key to esc modification.
Calib. No.:005 Cali.13
  
```

If the newly calibrated sensitivity level differs from the last saved sensitivity level by over 4dB, the meter will prompt "As the sensitivity level difference exceeds 4dB, it can't be saved. Please check whether the calibration is correct.". The user should check whether the microphone is damaged. If the user doesn't press **[←]** key, the meter will still use the original microphone sensitivity level.

```

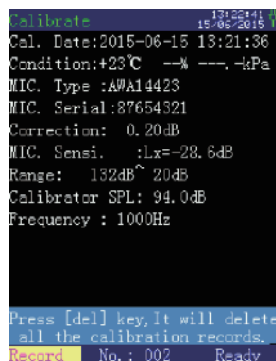
Calibrate 01126187
26-01-2018
Condition+29 °C --> --> -4Pa
Mic. Model:AWA14423 Class 1
Mic. Series:1710 Up:135dB
Free field :0.20dB Low: 23dB
Mic. Sensiti.: -31.2 dB
Calibrator SPL: 94.0 dB
New Sensiti.: -25.4 dB
Current SPL: 61.9 dB
Calib. No.:005 End
  
```

5.3 Directly input sensitivity level

If no calibrator is available, the user can also directly input the microphone's sensitivity level. Press **[Set]** key, and press **[←]** or **[→]** key to move the cursor to "New Sensiti.", and then adjust the value by **[▲]** or **[▼]** key until it arrives the expected value. At last, press **[←]** to save the Calibrator SPL.

5.4 Calibration record

When the cursor is moved to the "Calibrate" and press the \uparrow or \downarrow key to enter the Calibration record interface, shown below:



```
Calibrate 13:25:41
15-06-2015
Cal. Date:2015-06-15 13:21:36
Condition:+23°C --% ---, -hPa
MIC. Type :AWA14423
MIC. Serial:87654321
Correction: 0.20dB
MIC. Sensi. :Lx=-28.6dB
Range: 132dB~ 20dB
Calibrator SPL: 94.0dB
Frequency : 1000Hz


Press [del] key, It will delete
all the calibration records.
Record No.: 002 Ready
```

The interface displays the calibration message of current serial number, move the cursor to the "No", and press \uparrow or \downarrow key to view the calibration message of the other serial number. The message includes: calibration date, environment condition, type and serial number of microphone, correction value in free field, sensitivity level of microphone, measurement range and so on.





6. Operation

There are four display interfaces in the main menu interface: measurement interface, setup interface, recall interface and calibration interface.


6.1 Main menu

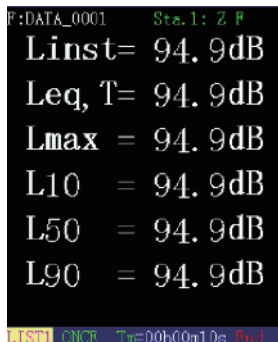
When the user presses  key for above 2s and then releases it, the meter goes to the main menu:



In the main menu, there are four submenus: Measurement, Setup, Recall, and Calibrate. The bottom shows status bar of storage space, the blue indicates the used space. When the user presses  key, the system parameters are restored to the default values. The  and  keys allow the user to move the cursor leftwards/rightwards. When pressing  key, the user can go to the corresponding submenu. There are two submenus in setup interface: analyzer setup and basic setup.

6.2 Measurement interface

When the cursor is on the "Measure", if the user presses  key, the meter goes to the measurement interface which consists of statistical analysis interface, integral measurement interface and GPS positioning interface.



Note: The green options mean the menu status can be changed by \odot , \ominus and \odot , \ominus keys.

The blue background frame at the first line respectively displays from left to right: current analyzer mode, work status, calendar clock and power indication. When the cursor is moved to the option of "Statistics", the user can use \odot or \ominus key to change the menu options. Power indication displays socket icon which means the instrument is powered by external power supply, and battery icon means the instrument is powered by batteries. The power voltage symbol can accommodate up to 16 lines. When these 16 lines are filled, the power voltage is about 5.6V. When the power voltage is lower than 3.6V, the indication is changed to "⚡", which means the meter is in under-voltage status.

The black background frame in the middle shows measurement content. The blue background frame at the bottom line respectively displays from left to right: display mode, measurement mode, measurement time and measurement status. The measurement status includes: Ready, Start, Pause, Wait, Print and Over. The cursor can stay on "LIST1", "ONCE" and "Ts", the user can use \odot or \ominus key to change the menu options.

6.2.1 Statistic Analyzer

At Main menu, pressing the \odot key when the cursor is at "Measure" will enter the measuring interface. In the Statistic analyzer, there are two mode: Once and 24H.

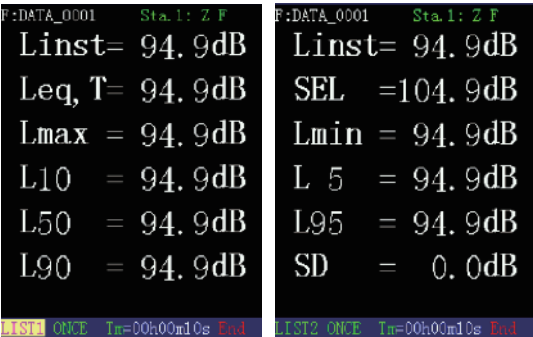
The setup parameters can't be changed in measurement interface but they can be displayed by turn. The parameters of "Sta.1" and "Sta.2" only can be changed in "Setup" -> "Analyzer" -> "Statistic".

6.2.1.1 Once measurement interface

In the noise measurement interface, when the menu in the measurement mode displays "Once", the meter goes to "Once" measurement mode. In the "Once" measurement interface, there are two display modes: List and Fig. interface.

6.2.1.1.1 List measurement interface

The list interface has two pages: List1 and List2. In this interface, the meter synchronously displays six measurement indexes on one screen. The display content includes Instantaneous value and Statistic value, shown below:



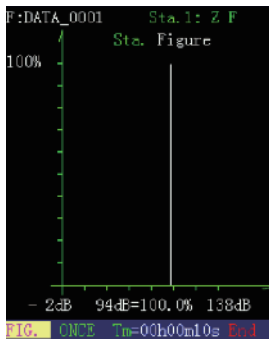
"Sta.1: A F:" means the current weighting is A frequency weighting and F time weighting. When the cursor is on "Sta.1: A F", the user can press \uparrow or \downarrow keys to enter "Sta.2: Z F" measurement interface which means the current weighting is Z frequency weighting and F time weighting. "Sta.1" and "Sta.2" open at the same time in the measurement interface which can be displayed switchover, and the operation won't affect the measurement result.

The black background frame in the middle shows six measurement indexes of the current frequency weighting and time weighting in the "List1": Linst, Leq,T, Lmax, Lmin, L10, L50 and L90. The indexes shown in "List2" include: Linst, Lmin, L5, L95, SEL and SD.

6.2.1.1.2 Fig. measurement interface

When the cursor is on "List2", the user can enter Fig. display interface by pressing \uparrow or \downarrow keys. The statistic distribution graph and accumulative distribution graph is displayed in the interface. When the measurement is started, the statistic distribution graph and accumulative distribution graph are calculated at the same time and refreshed every 0.5 second.

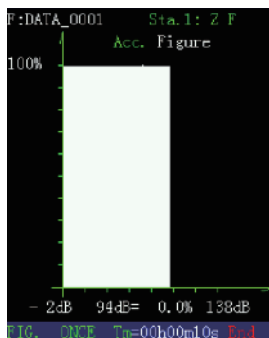
1) Statistic distribution graph



Note: The green options mean the menu status can be changed through cursor and parameters key.

In the middle is "Sta. Figure", the y-ordinate is percentage, and the x-ordinate has 140 points, every point represents 1dB. When the cursor is moved to "94dB", the user can view the percentage that every sound pressure level takes up by pressing the \uparrow or \downarrow key.

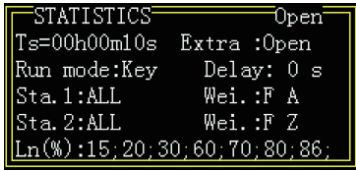
2) Accumulative distribution graph



In the middle is "Acc. Figure". The y-ordinate of the graph is percentage, and the x-ordinate is the sound pressure level which has 140 points, every point represents 1dB. When the cursor is moved to "94dB", the user can view the accumulative percentage that every sound pressure level takes up by pressing the \uparrow or \downarrow key. We can figure out any statistical sound pressure level with this method.

6.2.1.1.3 Extra interface

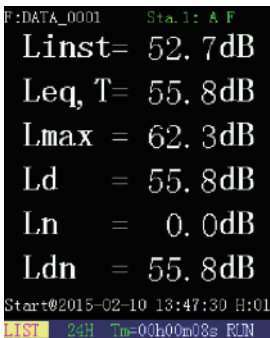
The option of extra Ln is open in the analyzer setup, the measurement interface of STA will add an interface named EXTRA, shown below



6.2.1.2 24H automatic measurement interface

24H measurement means that the measurement automatically starts every one hour at integral o'clock, totally 24 times. The measurement duration of every one hour can be set by the user. It must be bigger than 1min and less than 59min. If it is not within this range, the meter will automatically adjust it to 1min-1h. During 24H measurement, Ld, Ln and Ldn are calculated synchronously. 24H measurement mode consists of List, All and Fig. display interface.

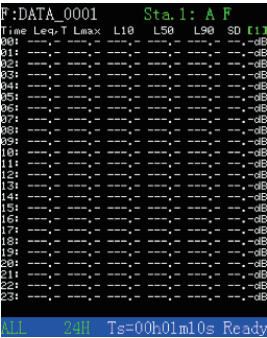
6.2.1.2.1 List measurement interface



There are six measurement indexes: Linst, Leq,T, Lmax, Ld, Ln, Ldn in the current frequency weighting and time weighting. The bottom line "Start@2015-02-10 13:47:30" in the black background is the first time of starting the measurement. "H01" is the first time section.

Note: Don't start the 24H measurement by hand, it will start the measurement automatically at the hour.

6.2.1.2.2 ALL measurement interface







"Time Leq,T Lmax L10 L50 L90 SD" at the second line in the black background is the current measurement indexes, the corresponding 24 lines below are the measurement data.

"[1]" is the first page of measurement indexes, when the cursor is moved there, this can be changed to "[2]" by pressing \uparrow or \downarrow keys and the measurement indexes are changed to "Time Leq,T Lmin L5 L50 L95 SD". The part of "---.-" in the middle means the measurement has not reached the period.

6.2.1.2.3 Fig. display interface





The Fig. display interface can display 24h sound pressure level chart. The y-coordinate is sound pressure level and the x-coordinate is hour, totally 24 columns. "Leq,T" means that the currently displayed index is Leq,T. When the cursor is moved to this place, press the  or  keys to change it to Lmax, Lmin, L5, L10, L50, L90, and L95 etc.





"Time Leq,T Lmax Lmin L5 [1]" under the graph are measurement indexes at the current page. When the cursor is on "[1]", press Up and Down keys to display "Time L10 L50 L90 L95 [2]". The line below is the measurement data at specified period. When the cursor on period "08", by pressing the  or  keys, the user can view the measurement results of other periods.





6.2.2 Statistics Measurement

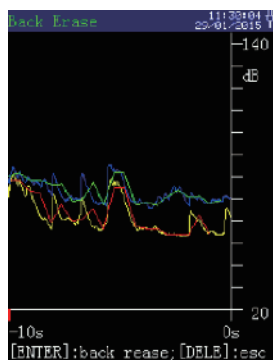
6.2.2.1 Once measurement

According to the specific requirement, after checking and adjusting the clock, set the time and run mode (See details in Settings), frequency weighting and time weighting used in statistics and group name etc. In the measurement menu, when the cursor is moved to the bottom line in blue background, change the second menu option to "Once" to go to one measurement interface.

Press the  key to start measurement. In this case, the meter's status display line prompts "Start". And the color of Status bar in the first line will turn white to red. 

After starting the measurement, the meter synchronously calculates all measurement indexes. The user can switch among different display contents and display modes, which will not affect the measurement. In the measurement process, if the user wants to pause the measurement, the user can press the  key again. The meter's status display line prompts "Pause". And the meter pauses the statistic analysis and integral measurement; the statistic sound level and equivalent sound level stop refreshing; but the instantaneous value still changes with the measured noise. To stop measurement and save the current measurement result, the user can press the  key. To stop measurement and delete the current measurement result, the user can press the  key. To continue the measurement, the user can press the  key again.

If there is unexpected noise during the once measurement, press the  key, and press the  key according to the prompt given by the instrument, the noise changing curve of the last 10s will be displayed. Pressing the cursor key and  key can choose to delete the data in the last 5s or 10s, and then press the  key the measurement will go on.



6.2.2.2 24H automatic monitoring

According to the specific requirements, after checking and adjusting the clock, set the time and run mode, frequency weighting and time weighting used in statistics and group name etc. In the measurement menu, when the cursor is moved to the bottom line in blue background, change the second menu option to "24H" to go to the 24H automatic measurement interface. In this case, the meter's status display line displays "Ready". When the calendar clock reaches the integral o'clock, the meter automatically starts the measurement. When its duration reaches the measurement time, the measurement stops and the measurement in one period ends. The meter's status display line displays "Wait" till the next integral o'clock. It stops automatically till the measurements in 24 time periods are completed. In the 24h automatic monitoring process, the user can't pause the operation. For the first period, the user can start the measurement with the **key**. However, for the other periods, the meter automatically starts the measurement when it reaches the same integral time point. If the user hopes the instrument will continue the next 24H measurement automatically after a "24H" measurement, the run mode of should be set as "Continuous". Doing so, the instrument will proceed the 24H measurement constantly until the data storage is fulfilled.

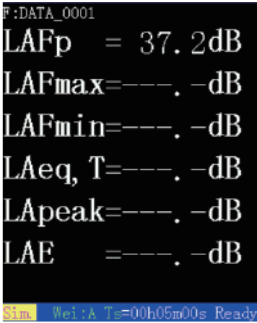
Note1: The other analyzers can't go started when the 24H mode is going on.

Note2: If there is a overload in the measurement, the "overload" indication will be displayed for a while.

6.2.3 Integral Annalyzer

Pressing the **key** when the cursor is at "Measure" will enter the measuring interface. In the integral analyzer, there are four mode: Sim., Big, List, Huge.

6.2.3.1 Sim. interface



From the third to the eighth line are measurement content which is concerned about frequency weighting in the current measurement interface, and the details are shown below:

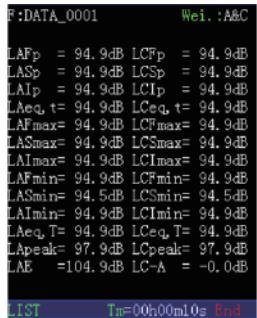
| Wei (frequency weighting) | Measurement indexes |
|---------------------------|--|
| A | LAFp , LAFmax , LAFmin , LAeq,T , LApeak , LAE |
| C | LCFp , LCFmax , LCFmin , LCeq,T , LCpeak , LCE |
| Z | LZFp , LZFmax , LZFmin , LZeq,T , LZpeak , LZE |

6.2.3.2 List interface

Move the cursor to the "Sim.", press the  or  key to enter the "List" interface. The displayed measurement indexes in this interface are shown below:

| Frequency weighting | Measurement indexes |
|---------------------|--|
| A | LAFp , LASp , LAIp , LAFmax , LASmax , LAImax , LAFmin , LASmin , LAImin , LAeq,T , LApeak , LAE |
| C | LCFp , LCSp , LCIp , LCFmax , LCSmax , LCImax , LCFmin , LCSmin , LCImin , LCeq,T , LCpeak , LCE |
| Z | LZFp , LZSp , LZIp , LZFmax , LZSmax , LZImax , LZFmin , LZSmin , LZImin , LZeq,T , LZpeak , LZE |

The List display interface is shown below:



"Wei: A&C" is the frequency weighting in the current measurement interface which shows the indexes of A and C weighting. When the cursor is on "Wei", the user can choose two weightings of A, C and Z by pressing \blacktriangle or \blacktriangledown keys, and the measurement content will change in response.

In the middle are 26 measurement indexes of the current frequency weighting, there are 13 measurement indexes at every frequency weighting.

6.2.3.3 Big interface

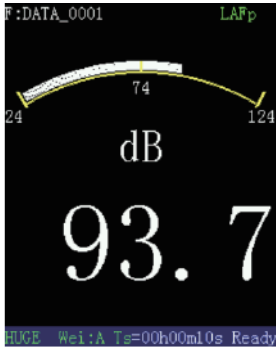


The big characters in the black background are measurement content, and there are three measurement indexes: LAFp, LCFp and LZFp. Pressing \blacktriangle or \blacktriangledown key when the cursor is at the three indexes. The measurement result is refreshed every 0.5 second and changing with the environmental noise.

The graph displayed on the lower display screen is the progress graph that instantaneous value used in statistic analysis changing with time. Each graph is displayed 20 s, the displayed index is corresponding with the index names in the lower blue background. When the cursor is moved to index name "LAFp", the progress graph can be changed to the displayed content of other index names.

6.2.3.4 Huge interface

When the cursor is on "List3", the user can enter "Fig." display interface by pressing \uparrow or \downarrow keys, shown below:



The big characters and dial figure in the middle black background are the measurement result of index "LAFp" at the second line, and the data is changing with the environment every 0.5s.

When the cursor is there, other index names can be displayed of the current frequency weighting.

If we want to display the indexes of other frequency weighting, move the cursor to the "Wei: A" at the bottom line in the blue background. And the user can enter "Wei: C" and "Wei: Z" measurement interface by pressing \uparrow or \downarrow keys.

6.2.3.5 Integral measurement

After checking and adjusting the clock, set the time and run mode, frequency weighting and time weighting used in statistics and group name etc. Enter the statistic measurement menu, the meter's status display line displays "Ready".

Pressing the \square key, the meter automatically starts the measurement, and the status bar displays "Start". After starting the measurement, the meter synchronously calculates all measurement indexes.

The user can switch among different display contents and display modes, which will not affect the measurement.

In the measurement process, if the user wants to pause the measurement, the user can press the \square key again. The meter's status display line prompts "Pause". And the meter pauses the statistic analysis and integral measurement; the statistic sound level and equivalent sound level stop refreshing; but the instantaneous value still changes with the measured noise.

7. Setup



The second line is the version of software and hardware; the middle is the two setup options with icon. The user moves the cursor to any option and press \rightarrow key, then will go into the setup interface of the option.

Below the icon options are the options of time and language, the cursor can stay at the year, month, day, hour, minute and second option, the user can setup the calendar clock by pressing \uparrow or \downarrow key.

The bottom line is the message of power supply, "Vusb" is the voltage of external power supply, "Vcc" is the voltage of battery (the instrument will be powered by external power supply when the battery is not connected.), "Vbat" is the voltage of backup battery (the instrument will be powered by external power supply when the backup clock battery is not connected.).

7.1 RTC

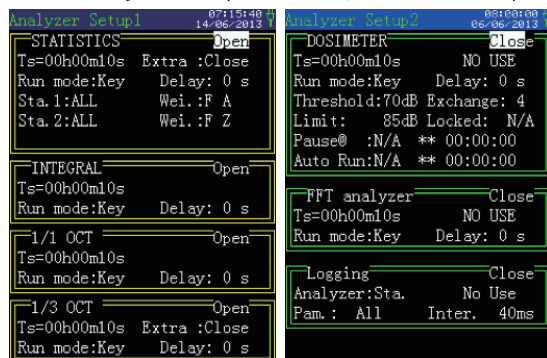
RTC option: the cursor can be moved among year, month, day, hour, minute and second. Press \uparrow or \downarrow key to set the RTC.

The bottom line shows the message of battery voltage. "Vusb" is the voltage of USB socket, "Vcc" is the voltage of battery, "Vbat" is the voltage of backup battery socket. When GPS is authorized, it's recommended to use the GPS to calibrate the RTC, and it's with higher precision. RTC of GPS is the UTC time which is earlier than UTC+8 time. When the instrument is connected to the satellite, press the \leftarrow key to finish the calibration.

When the instrument is turned off, the RTC is relied on the backup clock battery. The backup battery can support the RTC for 1 month continuously, and the backup battery is rechargeable when the instrument is turned on. When the voltage of backup battery is less than 2V, the RTC will be disabled and needs setup again. 8 hours of continuous working every month is recommended.

7.2 Analyzer setup interface

In the analyzer setup interface, user can set up statistics and integral analyzers.



At the left upper side of double line frame is analysis mode. "Open" at the right upper side is the switch of the corresponding analysis module, when the cursor is moved there, the user can choose open or close by pressing \uparrow or \downarrow key. When the Open status is chosen, the color of the frame is yellow, and close status is green. Only supported analyzer can be setup in the analysis module.

7.2.1 Setup of measurement time

"Ts=00h00m10s" is the pre-setting measurement time, Ts=00h00m00s means the measurement time doesn't have limit (Hand) until the integral result exceeds the measurement range. When the cursor is on "Ts", the user can choose the time among 00h00m00s, 00h00m10s, 00h01m00s, 00h05m00s, 00h10m00s, 00h20m00s, 00h30m00s, 01h00m00s, 02h00m00s, 04h00m00s, 08h00m00s, 16h00m00s and 24h00m00s by pressing \uparrow or \downarrow key. When the cursor is moved to h, m and s, the time can be set from 1s to 99h59m59s arbitrarily.

When the measurement is started, once getting the time, the instrument will finish the measurement and save the measurement result.

In the analyzer setup interface, "Ts" in every module can be set independently.

7.2.2 Run mode setup


"Run mode": the trigger source to startup, there are four modes that can be chosen: Key, Time, Limit and Interval. The use of the startup trigger source is shown below:

| No | Source | Remark |
|----|-------------|--|
| 1 | Key + Delay | Press the key and startup is delayed for a while |
| 2 | Clock | Startup at a certain time |
| 3 | Interval | Startup after the same interval time |
| 4 | Limit | Startup when exceeding the setting limit |



a) Key

When the mode of "Key" is chosen, shown below:

Run mode:Key Delay: 0 s

"Delay": press  key and the startup is delayed for a while. When the delay time is 0s, the measurement will be started right now. When the cursor is moved to "Delay", the parameter can be chosen from 0 to 99.



Note: When the user chooses the other startup trigger modes, the measurement can be started by pressing  key in the measurement interface.



When the cursor is moved to "Run mode", the user can enter setup interface of time run mode by pressing  or  key.

b) Clock

When the mode of "Clock" is chosen, shown below:

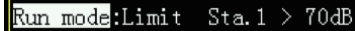
Run mode:Clock 00-00-00 00:00:00

At the left is calendar, and the right is clock, the user can set a time here. When the calendar clock arrives the time, the instrument will be started. The cursor can moved to year, month, day, hour, minute and second which are adjustable by pressing  or  key. When one of the options is adjusted to end, there will display "***", which means this option won't take part in the compare. Doing so, the instrument will be started every hour, every day, every month.....

When the cursor is moved to "Run mode", the user can enter setup interface of Limit run mode by pressing  or  key.

c) Limit

When the mode of "Limit" is chosen, shown below:



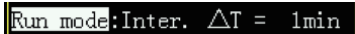
Run mode: Limit Sta. 1 > 70dB

"Limit": When the value exceeds the setting limit, the instrument will be started. The value can be chosen from 0 to 180.

When the cursor is moved to "Run mode", the user can enter setup interface of Interval run mode by pressing \uparrow or \downarrow key.

d) Interval

When the mode of "Interval" is chosen, shown below:



Run mode: Inter. $\Delta T = 1\text{min}$

"Inter. $\Delta T=1\text{ min}$ ": the time between startup of two measurements, the user can choose among 10s, 30s, 1min, 2min, 5min, 10min, 20min, 30min and 1hour. 1min means the instrument will be started at the exact minute, 5min means the instrument will be started at the exact 5 minute

Note1: The instrument will save the measurement data automatically after the measurement is finished, during this period, the instrument won't response to the order of measurement startup, so the T_s should better shorter than ΔT .

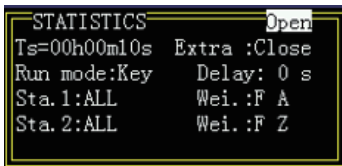
Note2: When the setting measurement time T_s is longer than interval, the measurement time will be T_s , and the interval will be prolonged.

7.2.3 Analyzer setup

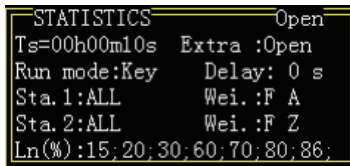
Analyzer setup includes: Statistics, integral. Other options are valid only with authorization.

a) Statistics

The setup of T_s and Run mode is seen in the previous section.



STATISTICS Open
Ts=00h00m10s Extra :Close
Run mode:Key Delay: 0 s
Sta. 1:ALL Wei. :F A
Sta. 2:ALL Wei. :F Z



STATISTICS Open
Ts=00h00m10s Extra :Open
Run mode:Key Delay: 0 s
Sta. 1:ALL Wei. :F A
Sta. 2:ALL Wei. :F Z
Ln(%):15; 20; 30; 60; 70; 80; 86;

"Extra": close, the basic percentile levels are L5, L10, L50, L90 and L95. If the "Extra" is open, besides the 5 basic ones, there are 7 percentile level including L1, L99 and five user defined levels. And the measurement interface of Statistics will have one more interface: EXTRA.

```
F:DATA_0001      Sta.1: A F
L 1  =---. -dB
L15  =---. -dB
L20  =---. -dB
L30  =---. -dB
L60  =---. -dB
L70  =---. -dB
L80  =---. -dB
L85  =---. -dB
L99  =---. -dB
EXTM CMR Ts=00h00m02s R=adv
```

Analysis mode: Total value

Time weighting: F, S and I can be chosen.

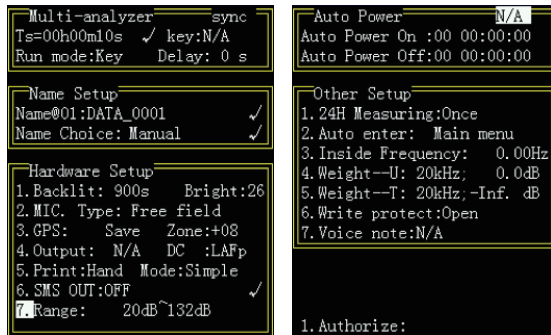
Frequency weighting: A, C and Z can be chosen.

b) Integral analyzer

Only Ts and Run mode are adjustable.

7.3 Basic setup interface

There are three pages in the basic setup interface: "Basic Setup1", "Basic Setup2" and "Basic Setup3".

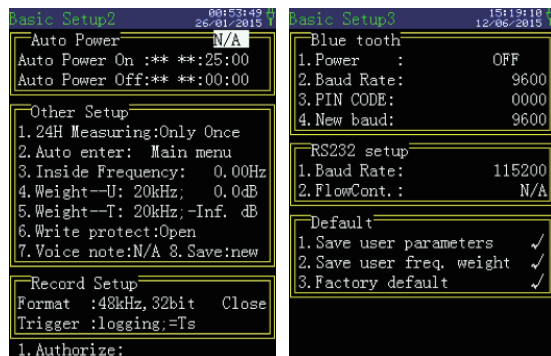


In the Setup interface, move the cursor to "Basic" and enter the "Basic Setup1" interface, and press (Set) key to switch.





There are five analyzer setup options from up to down respectively: "Multi-analyzer", "Name Setup", "Hardware Setup", "Auto power" and "Other Setup". The boundary between each other is yellow double lines.

"Basic Setup2" interface has four options: Auto Power, Other setup and Authorize.

"Basic Setup3" interface has three options: Bluetooth, RS232 setup and Default.





7.3.1 Multi-analyzer Setup



"sync": Press  key, each analyzer will start measurement at the same time. Press  or  key to change "sync" to "async", and press  key, the instrument will only start the analyzer at the current measurement interface.

"Ts": Ts is the measurement time, the setup method is seen in Chapter 7.2.1.

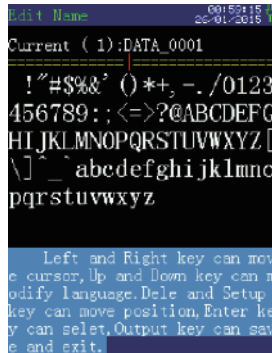
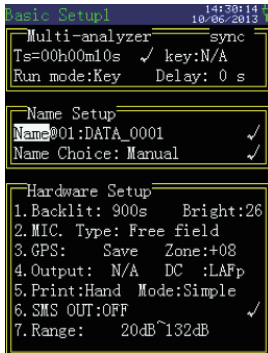
"Run mode": the trigger source to startup, see details in Chapter 7.2.2.

"Key:N/A" or "Key:Modify": "Key:Modify" means in the measuring interface, we can press the  key to change the measurement time before and after measurement. And "Key:N/A" means we can't change the measurement time by pressing the  key.

7.3.2 Name Setup

"Name @01: DATA_0001" is the name used for saving the current measurement result. 01 means the first group, and the name doesn't affect the measurement result. When the cursor is moved to Group name, the user can choose the other names between 01 and 64 by pressing  or  key.

"Name choice" has two options: Manual and Auto. If Manual is chosen, the group name is the current saved name at every turn of measurement. If Auto is chosen, every turn of statistic integral measurement, the group name changes automatically. The meter can save up to 64 group names.



■ 7.3.3 Hardware setup

"Backlit" can be set as "Open" constantly or selected within 10s-900s with 10s intervals. When the user doesn't press any keys in the specified time, the Backlight is automatically turned off.

"Bright": default value is 25 which can be chosen between 4 and 49. When the value is greater, the backlight is brighter.

"Mic. Type": free field (0°), pressure field (90°) and random can be chosen. The microphone used in sound level meter is the type of free field, and it should point to sound source when we take measurement which is incidence of 0°, and the microphone mode should be set as free field (0°). But under some circumstances, the sound source only can income at 90°, and the directivity of the microphone at high frequency will affect the accuracy, the microphone mode should be set as pressure field (90°). The user can use the function to change the free field microphone to pressure field microphone. The influence that the three options of response frequency is seen in Annex.

"GPS": GPS power has three options: Open, Save, Close. If "Open", GPS module's power supply keeps running all the time, the power consumption is high, but the positioning is fast. If "Save", GPS module's power supply is turned on when necessary. Every time that GPS module's power supply is turned on, it needs several seconds to make repositioning. When the GPS positioning signal is poor, it needs long time to make repositioning. It is suggested that the user set it to "Open". When the user doesn't needs the GPS positioning information, "Close" may be set to save energy.

"Zone+8": the time zone where is the instrument is the difference between the local time and the GMT or UTC. GMT+8 means the local time is 8h earlier than then GMT, the instrument will automatically add 8h to the UTC of GPS as the local time when is doing the GPS calibration.

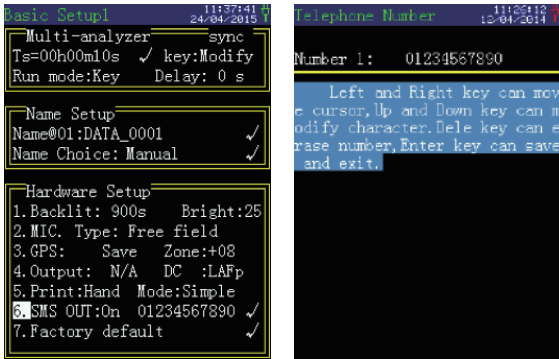
"Output": the type of output signal on AC output interface which can be chosen among N/A, AC and 1 kHz. If 1 kHz is chosen, the meter's self-noise is increased by 3-5 dB. The 1 kHz Output signal will be closed when the measurement is in Oct analysis mode. And the "N/A" means no output.

"DC": can be chosen among LAFp, LASp, LAIp, LAeq,t, LCFp, LCSp, LCIp, LCEq,t, LZSp, LZIp, LZe,q,t, 11 center frequencies of 1/1 OCT and 33 center frequencies of 1/3 OCT.

"Print": "Hand" and "Auto" can be chosen. If "Hand" is chosen, it doesn't print out the measurement result after the measurement. If "Auto" is chosen, the analyzer will print out the measurement result automatically after the end of the measurement. In this case, the printer shall be connected and its power supply shall be turned on.

"Mode": "Simple", "No Pic.", "Picture" and "Screen" can be chosen. If "No Pic." is chosen, the measurement result is printed only with text. If "Picture" is chosen, the measurement result is printed with statistic chart, accumulative chart, spectrogram etc. If "Screen" is chosen, the printed content is the same with the display screen. If "Sim." is chosen, the printed content will not include the picture, the serial number, mode number and the message of calibration.

"Range": the instrument has two measurement range, L and H. The L range is from 20dB to 132dB. And when the cursor is here, press the ⬆ or ⬇ key to change L to the H range: 30dB~142dB.



According to the notice, press ⬆ key after entering phone number to save it.

7.3.4 Auto Power Setup

"Auto Power": "Yes" and "N/A" can be chosen. When "Yes" is chosen, the instrument can open and off at the specified time shown below.

"Auto Power On": the form is "day, hour, minute and second".

"Auto Power Off": the form is "day, hour, minute and second".

When one of the options is adjusted to end, there will display "***", which means this option won't take part in the compare. The cursor can moved to year, month, day, hour, minute and second which are adjustable by pressing \leftarrow or \rightarrow key.

```
Auto Power      N/A
Auto Power On  **:25:00
Auto Power Off **:00:00
```

7.3.5 Other Setup

"24H measuring": "only once", "Inaccessible" and "Continuous" can be chosen.

"Auto enter": the instrument will enter the interface when it opens, which includes Main menu and measuring.

"Inside frequency": 0.00Hz and 11 center frequencies of 1/1 OCT can be chosen. When "0.00Hz" is chosen, this means the "Inner calibration" hasn't open.

"Weighting--U": the frequency weighting that defined by the user. When the cursor is on "4." at the left side, the cursor can choose within 33 center frequencies between 12.5Hz and 20 kHz. "dB" at the right side is the weighting value which means the D-value of weighting and non-weighting at the frequency. The negative value of weighting means attenuation, and the positive means amplification, the attenuation at every frequency can be setup by pressing \uparrow or \downarrow key.

"Weighting--T": the frequency weighting that defined by the user. When the cursor is on "5." at the left side, the cursor can choose within 33 center frequencies between 12.5Hz and 20 kHz. But the attenuation at the frequency between 20Hz and 200Hz can be setup whose default value is the same with that of A weighting. The attenuation can be setup by pressing the \uparrow or \downarrow key, the attenuation at other frequencies is infinite great.

"Write protect": when the user write the icon image with the transmission software, the option will be changed to close. The default setting is open.

"Run[off]/Protect": "Run[off]" means the instrument can be turned off by pressing the \odot key when the measurement is going. And "Protect" means the instrument can't be turned off when measurement is going.

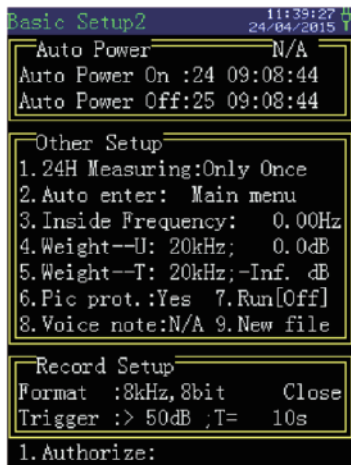
"Voice note": N/A, 10s, 20s. When 10s is selected, there will be 10 s left for user to say something to express the measurement before the measurement is started.

```
Other Setup
1. 24H Measuring: Only Once
2. Auto enter: Main menu
3. Inside Frequency: 0.00Hz
4. Weight--U: 20kHz; 0.0dB
5. Weight--T: 20kHz; -Inf. dB
6. Pic prot.: Yes 7. Run[Off]
8. Voice note: N/A 9. New file
```

FIG. ONCE Ts=00h01m20s R:-13

When the status bar at the right corner shows "R:-13", the remaining time for voice note is 13s.

Note: the WAV file for voice note has precision of 8k Hz sampling, so it's only recommended for subject listening.



7.3.6 Record Setup

"New file/Same file": "New file" means the measurement data file of STA and integral will be saved in the new file in SD card. And "Same file" means they will be saved in the same file.

"Record format": 48 kHz sampling frequency, 32bit or 8kHz, 8bit.



"Close": the record function is turned off. Press or key to change it to open.

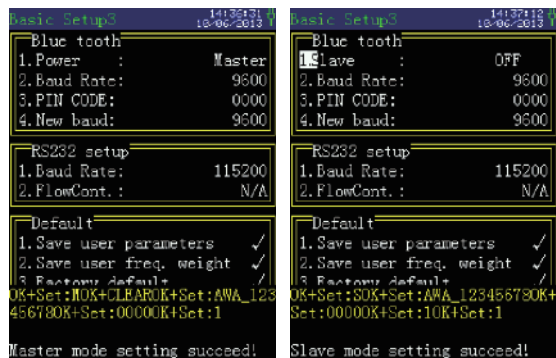
"Trigger": "logging; =Ts" means the instrument will record the noise along with the measurement. ">72dB; T=80s" means when the SPL exceeds 72dB, the instrument will record the noise for 80s.





Notice: The 8k Hz sampling is only for subject listening and 48kHz is for post-calculation.

7.3.7 Bluetooth (Optional)

"Power": Master, Slave and off. Press  key to open the slave mode and press  key to open the master mode. The master mode can also be connected to the Bluetooth printer to print the measurement result. When the mode is set successfully, the left corner will prompt the master or slave mode is setting.



When the Bluetooth is set successfully, there will be corresponding icon displayed in the measuring interface. The icon  means slave mode and  means master mode. The color of icon presents different status, such as green color means the communication status and the white color means wait status.

"Baud rata": 9600, 115200 and 1.382M.

"PIN Code": the code when communicate to other device with default value of 0000.

"New baud": 9600, 115200 and 1.382M.


Note: 115200 is recommended.

7.3.8 RS232 setup


"Baud rate": 4800, 9600 and 115200.

"FlowCont.": When the control flow is yes, then the instrument will check the voltage of pin DB9-7 before transmitting data to RS232. And low voltage means the outer device is busy and the instrument won't send data to RS232.


7.3.9 Default

"1. Save user parameter": the setting the user prefers can be saved as default user settings. Move the cursor to the option and press  key to save the settings. Then the instrument will show "OK" which means the setting is successful.

"2. Save user freq. weight": the user-defined frequency weight.

"3. Factory default": Move the cursor to "Factory default", and press  key, the settings will recover to the default value when it left the factory.






When the cursor is at "3." and press the  or  key to switch to "Load user default".

"3. Load user default" : And press  key to load the parameters saved in the "1. Save user parameter" and "Save user freq. weighting".

8. Data Recall

ST-25D Sound level meter has 32MB flash memory which assures reliable data storage, and the data stored in the instrument can be transferred to the computer by RS-232, USB, or printed out by mini-printer.

Also, a pre-installed 32 SD card enables ST-25D large capacity storage and WAV recording function. The data stored in SD card can be viewed directly by accessing to data recall interface, also can through change SD card to U disk mode to viewing on computer.

When user enter the "Recall" submenu from main menu, each page displays 15 groups of data, press  or  button to move the cursor and press  or  button to view the measuring name, data, time and analyzer, then press  to view the detail of measuring result.

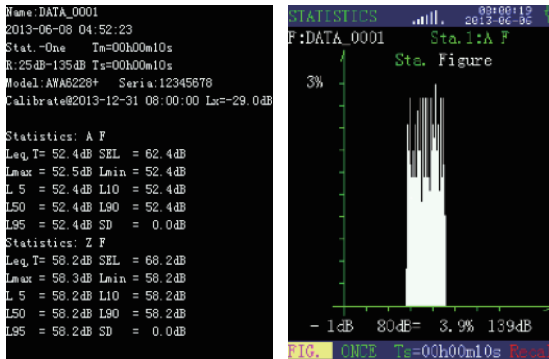
| | | | |
|--------------------------------|------------|---------------------------------|------------|
| 0: 2014~15 11:41:15 20/08/2015 | | 1: 20150820 12:44:15 20/08/2015 | |
| Name | Date | Name | Date |
| [F]INDEX | 08/20/2015 | [F]INDEX | 08/20/2015 |
| [D]20150820 | 08/20/2015 | [F]00010001.WAV | 08/20/2013 |
| [D]20150818 | 08/18/2015 | [F]L_I_0001.AWA | 08/20/2013 |
| [D]20150819 | 08/19/2015 | [F]STA_0001.AWA | 08/20/2013 |
| [D]SPCTLI~1 | 08/17/2015 | [F]NUM_0001.AWA | 08/20/2013 |
| [D]SYSTEM~1 | 08/20/2015 | [F]ALL_0001.AWA | 08/20/2013 |
| | | [F]OCT_0001.AWA | 08/20/2013 |
| | | [F]1_3_0001.AWA | 08/20/2013 |
| | | [F]FFT_0001.AWA | 08/20/2013 |
| | | [F]DOSI0001.AWA | 08/20/2013 |
| | | [F]TR_0004.AWA | 08/20/2015 |
| | | [F]24H_0001.AWA | 08/19/2015 |
| | | [F]ANN_0005.AWA | 08/20/2015 |

The definition of measuring method:

- Stat.-One: Once mode of Statistics
- Stat.-24H01: the first time section of 24H measuring mode of Statistics
- ALL-LOG: logging data of integral
- OVERALL-INT: measuring data of Integral

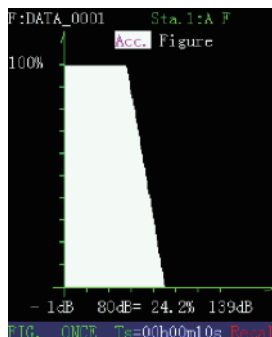
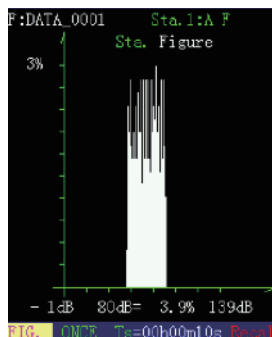
8.1 Once measurement result recall

When the recalled data is the result measured in the one measurement method, the method displays "STA.-One". Press \leftarrow key to go into the list interface, and press \rightarrow key again to enter the Fig. interface, shown below:



The list interface shows the information of measurement name, date, start time, measurement method, analyzer mode, instrument model, series, calibration date and sensitivity level etc.

In the Fig. interface, move the cursor to weighting selection "Sta.1" at the second line, and press \uparrow or \downarrow key to enter the Fig. interface of "Sta.2", shown below (Left). Move the cursor to "Statistics" distribution graph at the third line, and press \uparrow or \downarrow key to enter the accumulative distribution graph, shown below (Right):



In the sta. Figure and Acc. Figure display interface, the user can move the cursor to the middle "dB" under the graph, press \odot or \ominus key to view the statistic percentage and accumulative percentage of different sound pressure level.

If the extra Ln is open in the analyzer setup interface of STA, the measurement data will add L1, L99 and 5 user-defined Ln, shown below:

```
Name:DATA_0001
2015-06-15 09:19:16
Stat.-One Tm=00h00m10s
R:23dB-135dB Ts=00h00m10s
Model:AWA6228+ Serial:12345678
Calibrate@2015-04-20 14:40:20 Lx=-31.1dB

Statistics: A F
Leq,T= 55.6dB SEL = 65.4dB
Lmax = 64.7dB Lmin = 49.3dB
L 5 = 61.6dB L10 = 59.6dB
L50 = 52.2dB L90 = 50.0dB
L95 = 49.6dB SD = 3.7dB
L 1 = 64.2dB L99 = 49.4dB
L15 = 58.2dB L20 = 57.0dB
L30 = 54.8dB L60 = 51.6dB
L70 = 51.2dB L80 = 50.6dB
L85 = 50.4dB
Statistics: Z F
Leq,T= 63.4dB SEL = 73.2dB
```

```
Lmax = 68.4dB Lmin = 60.1dB
L 5 = 66.0dB L10 = 65.0dB
L50 = 63.0dB L90 = 61.6dB
L95 = 61.4dB SD = 1.4dB
L 1 = 68.0dB L99 = 60.6dB
L15 = 64.6dB L20 = 64.2dB
L30 = 63.8dB L60 = 62.6dB
L70 = 62.4dB L80 = 62.0dB
L85 = 61.8dB
```

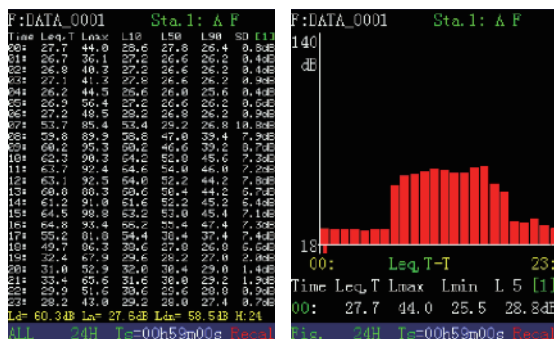
8.2 24H automatic monitoring result recall











When the measurement result is monitored automatically in 24 hours, the method displays "24H". Press \odot key to display the following screen:

| No. | Time | Mode |
|------|----------|-------------|
| 0001 | 16:00:00 | Stat.-24H01 |
| 0002 | 17:00:00 | Stat.-24H02 |
| 0003 | 18:00:00 | Stat.-24H03 |
| 0004 | 19:00:00 | Stat.-24H04 |
| 0005 | 20:00:00 | Stat.-24H05 |
| 0006 | 21:00:00 | Stat.-24H06 |
| 0007 | 22:00:00 | Stat.-24H07 |
| 0008 | 23:00:00 | Stat.-24H08 |
| 0009 | 00:00:00 | Stat.-24H09 |
| 0010 | 01:00:00 | Stat.-24H10 |
| 0011 | 02:00:00 | Stat.-24H11 |
| 0012 | 03:00:00 | Stat.-24H12 |
| 0013 | 04:00:00 | Stat.-24H13 |
| 0014 | 05:00:00 | Stat.-24H14 |
| 0015 | 06:00:00 | Stat.-24H15 |

| |
|--|
| Name: DATA_0001 |
| 2014-06-17 10:29:23 |
| Stat.-24H01 Ts=00h01m09s |
| R=23.4B-133.4B Ts=00h01m10s |
| Model:AWA6228+ Serial:12345678 |
| Calibrate@2013-12-31 08:00:00 Lx=-29.0dB |
| Statistics: A F |
| Leq-T= 40.8dB SEL = 59.2dB |
| Lmax = 41.1dB Lmin = 40.1dB |
| L 5 = 41.0dB L10 = 41.0dB |
| L50 = 40.6dB L90 = 40.4dB |
| L95 = 40.4dB SD = 0.2dB |
| Statistics: Z F |
| Leq-T= 46.8dB SEL = 65.2dB |
| Lmax = 47.1dB Lmin = 46.1dB |
| L 5 = 47.0dB L10 = 47.0dB |
| L50 = 46.6dB L90 = 46.4dB |
| L95 = 46.4dB SD = 0.2dB |

Press  key in the interface to display the graph of Leq-T, shown below:



In this interface, when the cursor is moved to "Leq_T", by pressing  or  key, the user can view Lmax, L5, L10, L50, L90, L95-T chart.  or  key can move the cursor. When the cursor is on "21:", the user can view the data of each period via  or  key. When the cursor is on "Ld", the user can press  or  key to view Ln and Ldn, and press  key to return to the List display location. In the List display interface, press  key to go to the statistic graph and accumulative graph display interface. For the operation, see the graphic view part in "8.1 Once measurement result recall".

If the extra Ln is open in the analyzer setup interface of STA, the measurement data will add L1, L99 and 5 user-defined Ln, shown below:

```

Name: DATA_0001
2015-06-15 09:19:16
Stat -One T=00h00m10s
R:23dB-135dB Ts=00h00m10s
Model:AWA6228+ Serial:12345678
Calibrate@2015-04-20 14:40:20 Lsc=-31.1dB

Statistics: A F
Leq,T= 55.6dB SEL = 65.4dB
Lmax = 64.7dB Lmin = 49.3dB
L 5 = 61.6dB L10 = 59.6dB
L50 = 52.2dB L90 = 50.0dB
L95 = 49.6dB SD = 3.7dB
L 1 = 64.2dB L99 = 49.4dB
L15 = 58.2dB L20 = 57.0dB
L30 = 54.8dB L60 = 51.6dB
L70 = 51.2dB L80 = 50.6dB
L85 = 50.4dB
Statistics: Z F
Leq,T= 63.4dB SEL = 73.2dB


```

```

Lmax = 68.4dB Lmin = 60.1dB
L 5 = 66.0dB L10 = 65.0dB
L50 = 63.0dB L90 = 61.6dB
L95 = 61.4dB SD = 1.4dB
L 1 = 68.0dB L99 = 60.6dB
L15 = 64.6dB L20 = 64.2dB
L30 = 63.8dB L60 = 62.6dB
L70 = 62.4dB L80 = 62.0dB
L85 = 61.8dB

```

8.3 Integral measurement result recall

When the recalled data is the result measured in the integral measurement method, the method displays "OVERALL-INT". Press  key to go into the list interface, shown below:

```

Name: DATA_0001
2013-12-22 14:23:36
OVERALL-INT T=00h00m18s
R:25dB-135dB Ts=00h00m18s Unit: dB
Model:AWA6228+ Serial:12345678
Calibrate@2013-12-31 08:00:00 Lsc=-32.0dB


LAFmax= 67.7 LCFmax= 77.0 LZFmax= 77.3
LASmax= 62.4 LCSmax= 71.5 LZSmax= 71.8
LAImax= 69.6 LCImax= 78.3 LZImax= 78.5
LAFmin= 39.3 LCFmin= 48.5 LZFmin= 51.2
LASmin= 40.8 LCSmin= 50.6 LZSmin= 55.0
LAImin= 43.3 LCImin= 52.7 LZImin= 58.8
LAeq,T= 52.3 LCeq,T= 61.5 LZeq,T= 63.1
LApeak= 79.9 LCpeak= 86.3 LZpeak= 86.9
LAE = 70.8 LC-A = 9.3 SEL = 81.6


```

8.4 Delete data

In the data recall interface, the user can choose to delete several groups of data or delete all data.


8.4.1 Delete all data


In the data recall interface, whatever the number is the cursor at, as long as you press  key, there will a notice on the screen: "Clear all data?", shown below:


| No. | Name | Date | Clear all the data? |
|------|-----------|-------------|---|
| 0001 | DATA_0001 | 2013-06-08 |  |
| 0002 | DATA_0001 | 2013-06-08 | |
| 0003 | DATA_0001 | 2013-06-08 | |
| 0004 | DATA_0001 | 2013-06-08 | |
| 0005 | DATA_0001 | 2013-06-08 | |
| 0006 | DATA_0001 | 2013-06-08 | |
| 0007 | DATA_0001 | 2013-06-08 | |
| 0008 | DATA_0001 | 20**--**-07 | |
| 0009 | DATA_0001 | 20**--**-07 | |
| 0010 | DATA_0001 | 20**--**-07 | |
| 0011 | DATA_0001 | 20**--**-07 | |
| 0012 | DATA_0001 | 20**--**-07 | |
| 0013 | DATA_0001 | 20**--**-07 | |
| 0014 | DATA_0001 | 20**--**-07 | |
| 0015 | DATA_0001 | 20**--**-07 | |

Press  key to delete all data, and press the other keys to return the recall interface.

8.4.2 Delete single group of data

In the data recall interface, whatever number is the cursor at, as long as you press the  key, there will a notice on the screen: "delete this file?" shown below:

| Name: DATA_0001 | Delete this file? |
|---|--|
| 2013-06-08 04:52:23 |  |
| Stat.-One Tm=00h00m10s | |
| R:25dB-135dB Ts=00h00m10s | |
| Model:AWA6228+ Serial:12345678 | |
| Calibrate@2013-12-31 08:00:00 Lnc=-29.0dB | |
| Statistics: A F | |
| Leq.T= 52.4dB SEL = 62.4dB | |
| Lmax = 52.5dB Lmin = 52.4dB | |
| L 5 = 52.4dB L10 = 52.4dB | |
| L50 = 52.4dB L90 = 52.4dB | |
| L95 = 52.4dB SD = 0.0dB | |
| Statistics: Z F | |
| Leq.T= 58.2dB SEL = 68.2dB | |
| Lmax = 58.3dB Lmin = 58.2dB | |
| L 5 = 58.2dB L10 = 58.2dB | |
| L50 = 58.2dB L90 = 58.2dB | |
| L95 = 58.2dB SD = 0.0dB | |

Press  key to delete this file, and press the other keys to return the recall interface.

8.4.3 Delete multi-group of data

In the data recall interface, press **Set** key to choose the number, then the background color of this number will be blue. If the user presses **Set** key again, the number won't be chosen. The user can choose more than one group once, and press **Done** key, then there is a notice: "Do you sure to delete the chosen data?" shown below:

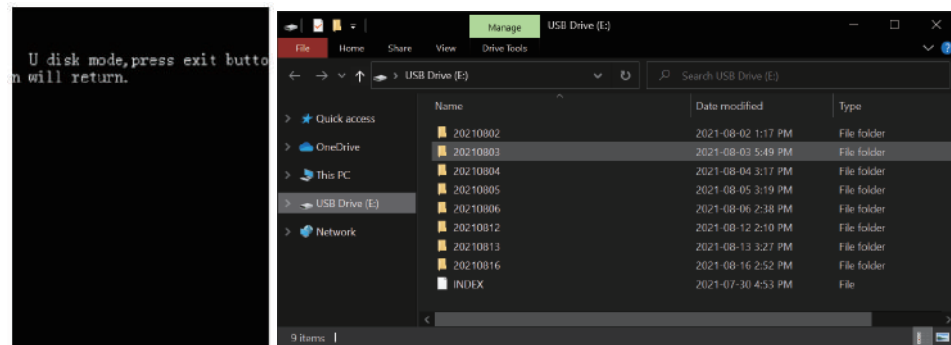
| No. | Name | Date |
|------|-----------|------------|
| 0001 | DATA_0001 | 2014-11-12 |
| 0002 | DATA_0001 | 2014-12-12 |
| 0003 | DATA_0001 | 2014-12-12 |
| 0004 | DATA_0001 | 2014-12-15 |
| 0005 | DATA_0001 | 2014-11-12 |
| 0006 | DATA_0001 | 2014-11-12 |
| 0007 | DATA_0001 | 2014-12-12 |
| 0008 | DATA_0001 | 2014-12-12 |
| 0009 | DATA_0001 | 2014-12-12 |
| 0010 | DATA_0001 | 2014-12-12 |
| 0011 | DATA_0001 | 2014-12-12 |
| 0012 | DATA_0001 | 2014-11-12 |
| 0013 | DATA_0001 | 2014-11-12 |
| 0014 | DATA_0001 | 2014-11-12 |
| 0015 | DATA_0001 | 2014-11-12 |

Delete the selected data?

Press **Done** key to delete them and press other keys to go back to the main menu of recall.

8.5 Change to U-disk mode and recall

If you want to download data to your computer, firstly connect the sound level meter to a computer via an USB cable, then go to "Recall" interface, the instrument screen prompts a dialog "change to U disk?", please press **↶** key then the sound level meter will change to U disk mode and with a message "U disk mode, press exit button will return". Now it will pop U-disk on your computer, you can download the data after that. If you need to exit the U disk mode, please just press **C** key.



8.6 File Format Description



The sound level meter is using FAT table for file management, and supports FAT16, FAT32 format, when formatting the SD card, it will turn to default FAT32 format. All saved measurement result files are saved in a folder, user can name the folder. Measurement results are saved in a file with the extension name "AWA". Record file is WAV format which can be opened through an audio player. Extension name "AWA" file is a kind of standard text file format, it is recommended to use EXCEL to open the files. The unrepeatable file name is automatically generated by the instrument every time during measurement. For file name, usually the first three characters represent the saved content of the file, and the last four characters represent the sequential number of measurement events. Each time the statistical analysis generates two files, "STA.AWA" and "NUM.AWA". If the sequential number of the last four characters is the same, the measurement results are generated from the same measurement event.

| File name | Stored content | Remarks |
|--------------|--------------------------------------|--|
| STAXXX.AWA | Statistics analysis result | XXXX is sequential number in current folder |
| NUM_XXXX.AWA | Statistical Distribution of SPL data | XXXX is sequential number in current folder |
| L_TXXXX.AWA | Time history of SPL data | XXXX is sequential number in current folder |
| 24H_XXXX.AWA | 24h measurement result | XXXX is sequential number in current folder |
| XXXXYYYY.WAV | Record file | XXXX is sequential number in current folder YYYY is sequential number of WAV file in current folder |
| ALL_XXXX.AWA | Integral measurement result | XXXX is sequential number in current folder |

9. GPS positioning measurement (Optional)



When the instrument has GPS module, it can be used for positioning measurement and calibrating the RTC which is with higher precision.

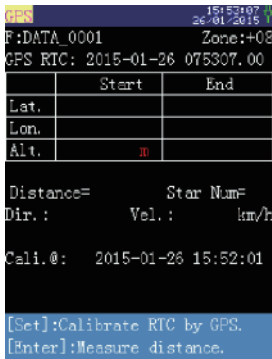
Firstly, connect to the external antenna, and put the antenna outside the room where the antenna can directly receive the satellite signal. The time of searching the GPS signal for the first time will cost 1 minute.

Open the instrument, and enter the basic setup interface, set the GPS option as "Save" or "Open" mode. In the noise measuring interface, move the cursor to the "Statistics" and press  or  key to enter the GPS interface. The interface is shown as below when the antenna is not connected to the satellite.

"Zone:+08" in the second line is the Greenwich time, which is same with UTC , +8 means GMT means local time is 8 hours earlier than GMT. "GPS RTC" at the third line is the current time of GPS. Below the table are the latitude, longitude and altitude of the measurement starting point and finishing point. The unit of latitude and longitude is degree (°), and the unit of altitude is meter (m). The last English character of latitude and longitude means: "N" is North altitude, "S" is South altitude, "E" is East longitude, and "W" is West longitude.

"Star Num" below the table is the number of satellite which is connected successfully. "Distance" is the distance between starting point and finishing point. "Dir.:" is the angle calculated clockwise with the north direction as 0 degree. "Vel.:" is the moving speed from starting point to finishing point. "Cal.@" is the time of last calibration.

In this interface, and press the  key to calibrate the time of instrument by GPS time. Press the  key to change the site and measure the distance between the two points.



9.1 Distance measurement

When the antenna is connected to the satellite, the message of GPS time, the current position (starting point) and the working satellites. In this interface, press \odot key to show the position message of finishing point and the displacement and velocity of the starting point. Press \odot key again, the position of this moment of pressing the \odot key will be taken as the start point, and the finishing point shows the message of current position.

```
GPS 15:52:04 26-01-2015
F:DATA_0001 Zone:+08
GPS RTC: 2015-01-26 075802.00



|      | Start       | End |
|------|-------------|-----|
| Lat. | 30.217338N  |     |
| Lon. | 119.958418E |     |
| Alt. | 28.4 m      |     |



Distance= Star Num=05
Dir.: 147.91 Vel.: 0.3612km/h

Cali.@: 2015-01-26 15:52:01

[Set]:Calibrate RTC by GPS.
[Enter]:Measure distance.
```

```
GPS 16:00:04 26-01-2015
F:DATA_0001 Zone:+08
GPS RTC: 2015-01-26 080002.00



|      | Start       | End         |
|------|-------------|-------------|
| Lat. | 30.217349N  | 30.217348N  |
| Lon. | 119.958456E | 119.958458E |
| Alt. | 6.5 m       | 7.1 m       |



Distance= On Star Num=07
Dir.: Vel.: 0.393 km/h

Cali.@: 2015-01-26 15:52:01

[Set]:Calibrate RTC by GPS.
[Enter]:Measure distance.
```

9.2 Calibrate the RTC

In the interface of GPS, the GPS RTC shows the RTC, and press \odot key to finish the calibration.

```
GPS 15:52:07 26-01-2015
F:DATA_0001 Zone:+08
GPS RTC: 2015-01-26 075307.00



|      | Start | End |
|------|-------|-----|
| Lat. |       |     |
| Lon. |       |     |
| Alt. |       |     |





Distance= Star Num=
Dir.: Vel.: km/h

Cali.@: 2015-01-26 15:52:01

[Set]:Calibrate RTC by GPS.
[Enter]:Measure distance.
```

9.3 GPS positioning measurement

In the noise measuring interface, move the cursor to the "Statistics" and press  or  key to enter the GPS interface. Open the GPS module and startup it, the position message of the starting point will be shown in the interface. The message of GPS refreshes every second. In the process of measuring noise, the measurement interface can switch to GPS interface, and it won't affect the result of statistics and integral measurement. The positioning message of last second will be saved along with the measurement result of statistics and integral, the last four line shows the message of position and velocity.

```
Name: DATA_0001
2014-12-23 09:39:13
OVERALL-TMT Tm=00h01m00s
R: 22dB-132dB Ts=00h01m00s Unit: dB
Model: AWA6228+ Serial: 00106693
Calibrate@2013-12-31 08:00:00 Ls=-29.0dB

LAFmax= 71.8 LCFmax= 73.4 LZFmax= 82.0
LASmax= 64.0 LCSmax= 68.3 LZSmax= 86.1
LAFmin= 75.4 LCFmin= 75.9 LZImax= 83.5
LAFmin= 48.7 LCFmin= 56.2 LZFmin= 58.6
LASmin= 50.4 LCSmin= 58.2 LZSmin= 60.3
LAFmin= 53.5 LCFmin= 58.8 LZImin= 61.9
LAeq,T= 56.8 LCFeq,T= 62.0 LZeq,T= 73.3
LPeak= 87.3 LCpeak= 86.2 LZpeak= 94.7
LAE = 74.5 LC-A = 5.2 SEL = 91.0
Latitude: 3013.02653N
Longitude: 11957.49602E
Altitude: 87.3m
Velocity: 0.160km/h
```

10. Data Export

ScarletSound for Scarlet Tech Sound Level Meter delivers easy-to-use, intuitive data monitoring and management with Windows based PC.

10.1 Software download and installation

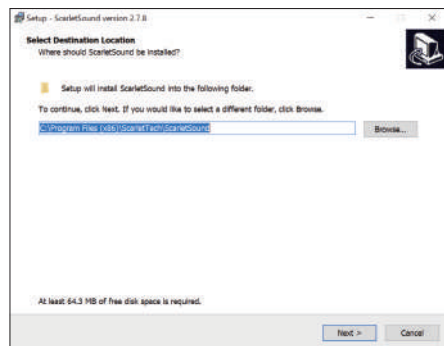
1. Connect the USB drive comes with the package to your PC to find ScarletSound installer.

Alternatively, go to Scarlet Download Center on the official website or go to the following url to download the latest version of ScarletSound.

<https://scarlet-tech.com/wp-content/uploads/ScarletSound/ScarletSound.zip>

2. Extract and run the program, ScarletSound.exe. If running Windows Vista (or later), you will need to Right-Click on the ScarletSoundSetup.exe file and choose to Run As Administrator.

3. Select destination folder to install ScarletSound application and install.

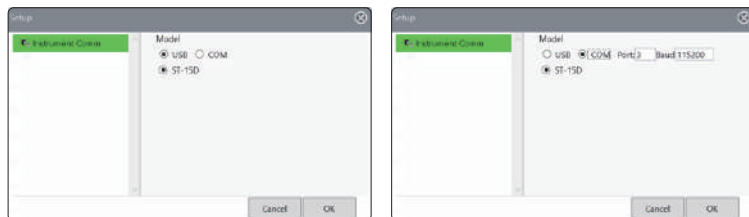


4. After installation finishes, double click to run ScarletSound application.

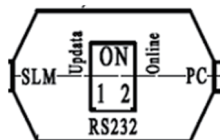


10.2 Settings

The data stored in the sound level meter of ST-25D can be transmitted to the computer by RS232 and USB. Connect the device to the PC by RS-232 or USB cable, and then run the ScarletSound Application. Click Setup to go to Setup menu.



Select the transmission method and click the OK to save the settings. When the COM is selected, the default baud rate is 115200. The working modes of RS-232 are listed below.



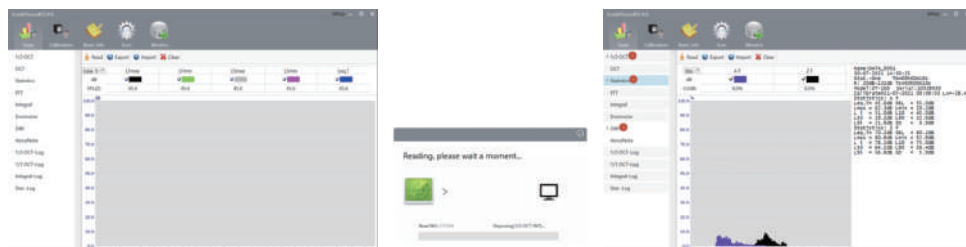
| Switch | | Working mode | Note |
|--------|-----|-------------------|---|
| 1 | 2 | | |
| OFF | OFF | RS232 | Data transmission |
| ON | OFF | Firmware update | The Dfuse software should be installed and updating needs USB cable. |
| ON | ON | Online monitoring | The instrument will boot automatically when powered on and can also used for data transmission. |
| OFF | ON | | |

Note: The SLM side is connected to the sound level meter and the PC side is connected to the computer.

10.3 Download Data

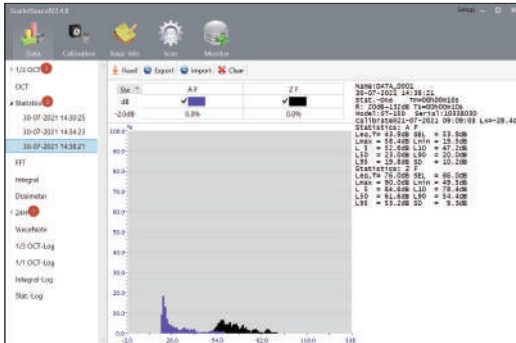
Download data from the instrument

Click the option of "Read" to download the data from the instrument, and the data will be shown in the interface of the software.



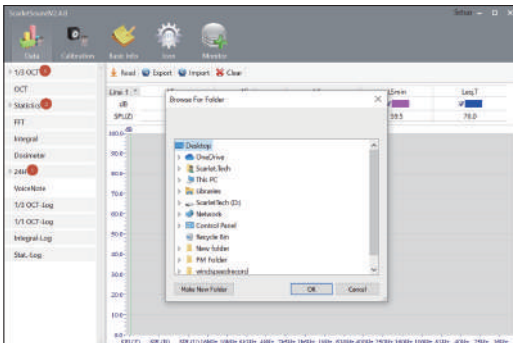
10.4 Recall the data

Select desired file named "dd-mm-yyyy hh:mm:ss", the distribution graph and the data will be displayed in the right side.



10.5 Save the data to PC

Save the data as the format of .xls by ScarletSound by clicking "Export".



Read data from files

Click "Import" to restore data files previously stored in the installation directory "DataRecord".

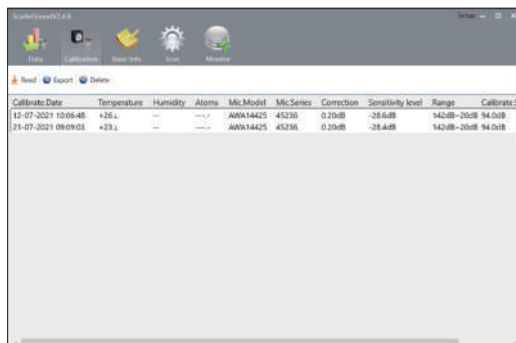
10.6 Clear data displayed at the software

When the data in the instrument is deleted, the displayed data in the software won't disappear, by clicking "Clear" or restart the software to clear the displayed data.

10.7 Calibration record

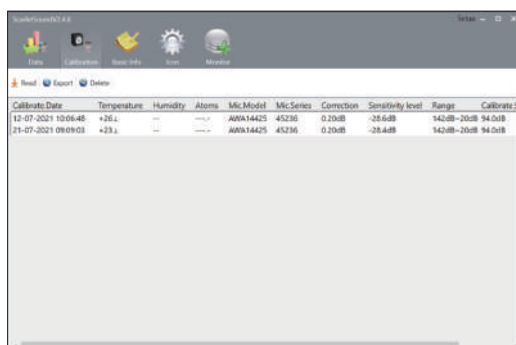
Read the calibration record

Go to Calibration page, click the option of "Read" to download the calibration record from the instrument, and the data will be shown in the interface of the software.



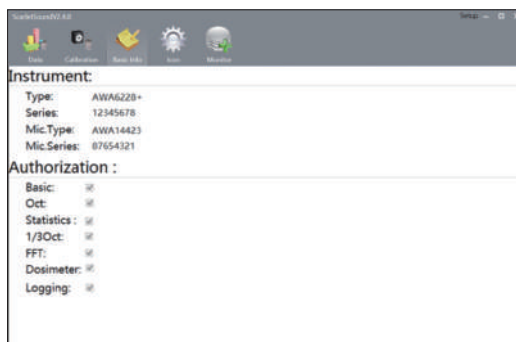
Save the calibration record to PC

Click "Export" to save the calibration record to PC by text filetype.



10.8 Basic Information

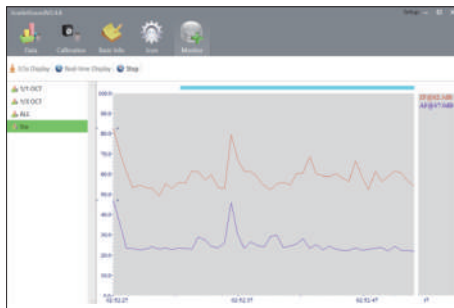
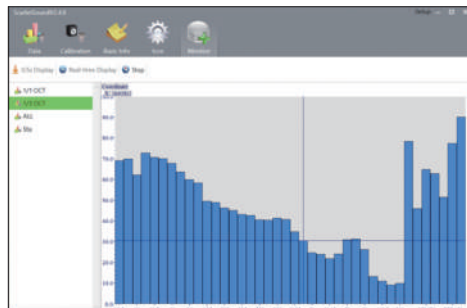
When the device is connected to PC by RS-232 cable, click "Basic Info" to go to Information page. Serial number of the instrument and microphone will show up.



Note: The USB port communication method don't support for reading the basic information

10.9 Online Monitoring

The instantaneous SPL and 0.5s displayed SPL can be monitored. Firstly, set the interval of logging in analyzer setup 2 to at least 100ms. And enter the measurement interface, make sure the corresponding analyzer is open.



1/3 OCT: 12.5Hz, 16Hz, 20Hz, 25Hz, 31.5Hz, 40Hz, 50Hz, 63Hz, 80Hz, 100Hz, 125Hz, 160Hz, 200Hz, 250Hz, 315Hz, 400Hz, 500Hz, 630Hz, 800Hz, 1kHz, 1.25kHz, 1.6kHz, 2kHz, 2.5kHz, 3.15kHz, 4kHz, 5kHz, 6.3kHz, 8kHz, 10kHz, 12.5kHz, 16kHz, 20kHz, SPL(D), SPL(B), SPL(A), SPL(C), SPL(Z)
ALL: LApeak, LCpeak, LZpeak, LA0.5, LAIp, LASp, LAFp, LC0.5, LCIp, LCSp, LCFp, LZ0.5

- Note:*
1. when the upper limit of y-axis is less than the max of the displayed parameters, click the Y-axis to adjust the range of the Y-axis.
 2. Don't switch the 0.5s and real-time directly, click the "Stop" firstly.
 3. Double-click the center frequency in the graph, then the value of the SPL will be displayed on the right side.
 4. When download the data from the instrument, please don't operate the instrument before finishing reading.
 5. If you want to change the transmission method, like from RS232 to USB, please reopen the software and reopen the instrument.

11. Overload indication

When the noise to be measured exceeds for sound level above the upper limit of meter's measurement range, the meter may display "Overload" on the top. The overload indication is presented as long as the overload condition exists or 1s. In the statistical analysis process, if overload appears, the overload indication will latch until the measurement results are reset or next time measurement are started. The overload indication judges the peak value of signal. When the signal's peak value factor is high, the sound pressure level displayed on the meter is lower than measurement upper limit, but overload occurs possibly.

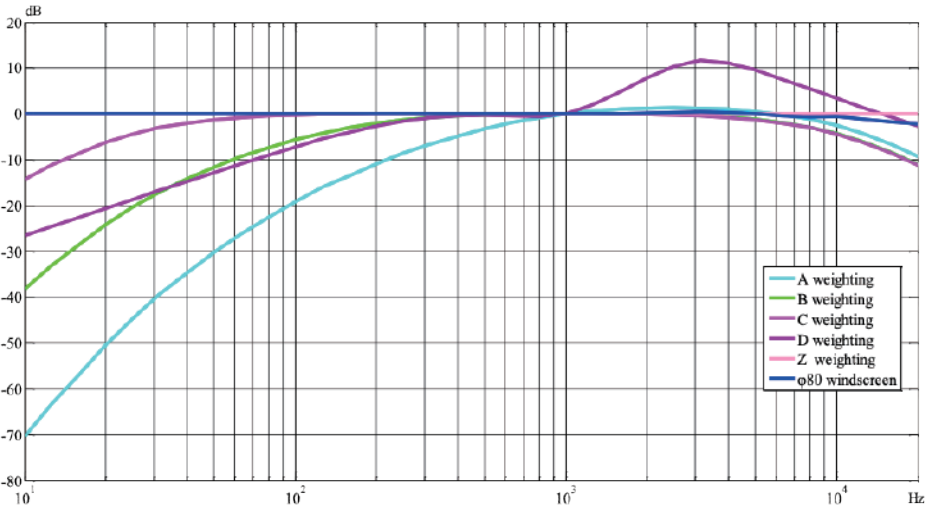
12. Annex

Annex 1 Response characteristics

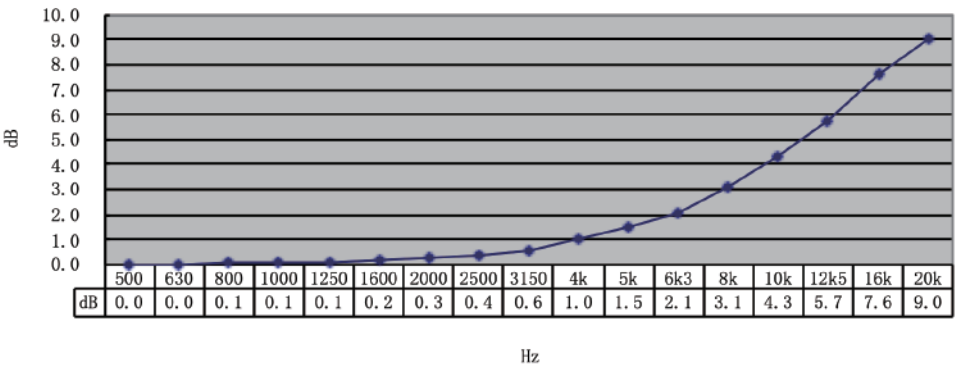
Annex 1-1 Directional response

| Frequency (Hz) | (dB) | | | | | | | | | | | |
|-------------------|------|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| | 15° | 30° | 45° | 60° | 75° | 90° | 105° | 120° | 135° | 150° | 165° | 180° |
| 500 | 0.3 | 0.1 | 0.2 | 0.2 | 0.1 | 0.3 | 0.7 | 0.7 | 0.5 | 0.5 | 0.4 | 0.5 |
| 630 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.1 | 0.6 | 0.9 | 0.8 | 0.6 | 0.6 | 0.2 |
| 800 | 0.1 | 0.1 | 0.1 | 0.3 | 0.2 | 0.1 | 0.1 | 0.4 | 0.4 | 0.7 | 0.6 | 0.3 |
| 1000 | 0.1 | 0.1 | 0.0 | 0.2 | 0.2 | 0.3 | 0.0 | 0.4 | 0.8 | 1.3 | 1.1 | 0.5 |
| 1250 | 0.3 | 0.4 | 0.2 | 0.1 | 0.2 | 0.1 | 0.2 | 0.1 | 0.2 | 1.3 | 1.8 | 1.0 |
| 1600 | 0.4 | 0.7 | 0.8 | 0.8 | 0.4 | 0.5 | 0.2 | 0.1 | 0.2 | 1.0 | 1.0 | 2.0 |
| 2000 | 0.7 | 0.7 | 0.8 | 0.8 | 0.9 | 1.2 | 1.1 | 1.0 | 0.6 | 0.9 | 2.8 | 2.7 |
| 2500 | 0.4 | 0.6 | 0.7 | 1.7 | 1.8 | 2.1 | 1.9 | 2.2 | 2.0 | 1.5 | 3.2 | 3.6 |
| 3150 | 0.4 | 0.3 | 0.9 | 0.6 | 0.5 | 1.1 | 1.2 | 1.1 | 1.7 | 1.2 | 2.7 | 4.2 |
| 4000 | 1.0 | 0.7 | 1.3 | 1.6 | 0.9 | 2.4 | 1.9 | 1.6 | 0.8 | 1.6 | 1.9 | 2.5 |
| 5000 | 1.8 | 1.9 | 2.7 | 3.1 | 4.1 | 2.8 | 5.0 | 4.2 | 2.8 | 3.7 | 3.1 | 4.6 |
| 6300 | 1.7 | 2.3 | 2.3 | 2.9 | 3.0 | 4.8 | 4.0 | 5.4 | 3.0 | 5.0 | 3.2 | 5.3 |
| 8000 | 1.1 | 1.0 | 2.0 | 2.7 | 4.0 | 3.7 | 4.0 | 5.3 | 6.2 | 4.4 | 4.8 | 6.2 |
| 10000 | 1.2 | 1.6 | 2.0 | 3.6 | 3.6 | 4.9 | 7.2 | 5.2 | 7.3 | 6.0 | 7.0 | 8.0 |
| 12500 | 0.1 | 0.5 | 1.3 | 3.1 | 3.4 | 4.3 | 7.2 | 8.9 | 7.4 | 8.4 | 9.0 | 8.5 |
| 16000 | 0.1 | 0.0 | 0.8 | 2.3 | 3.3 | 5.1 | 8.8 | 10.0 | 7.0 | 10.0 | 8.7 | 14.3 |
| 20000 | 0.4 | 0.2 | 1.1 | 3.2 | 5.1 | 8.4 | 9.6 | 11.1 | 13.4 | 12.8 | 13.0 | 17.3 |

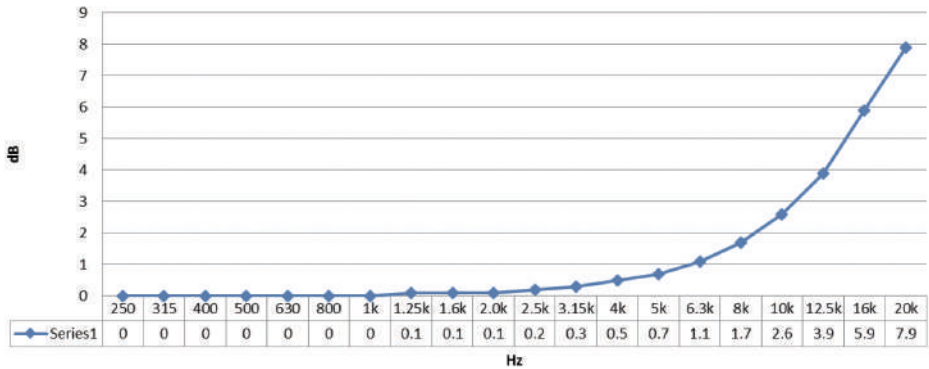
1-2 Free field response



Z weighting response when directivity is 90 degree:



Z weighting response when microphone type is random:



Annex 2 GPS overview

GPS is short for Global Positioning System. It utilizes 28 satellites flying around the earth to measure the precise position and time of random point on earth. Generally, its position precision is in 20m-1m and its time precision is in 60ns-5ns. It is developed by U.S. Department of Defense for military and civil. The civil signal can be used without charge. 28 satellites are running along six different tracks at a height of 20180km far from the earth. They can make sure any location on the earth is monitored by at least four satellites.

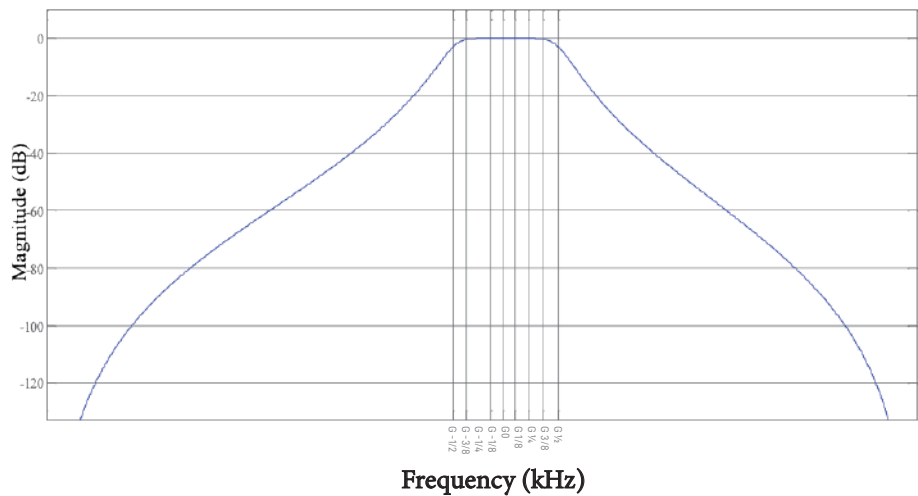
GPS positioning precision is related to the quality of the received signal. The positioning precision means the result measured by satellite analog signal generator in the lab. The satellites' transmission power is not high and the signal is easy to be blocked or reflected, which affect positioning precision. Therefore, the receiving sensitivity of the receiver shall be high. The meter's embedded GPS module has high receiving sensitivity, so it can receive weak signal for positioning in city center or indoor. As the receiver's catching sensitivity is lower than the tracking sensitivity, so the user can firstly move the receiving antenna to signal-stronger place (such as outside the window) when using it indoor or in the weak-signal environment. After the receiver catches 4 satellites' signal and positioning can be made correctly, move the antenna to the place to be positioned.

GPS positioning measurement of ST-25D mainly measures longitude, latitude, altitude, movement speed, movement direction and straight-line distance between two points. The unit of longitude and latitude is degree. The user can find the satellite pictures of relevant longitude and latitude through inputting the following content on the internet. <http://maps.google.com/maps?t=k&hl=en&ie=UTF8&z=18&ll=25.0309073,121.5431877&ll=25.0309073,121.5431877>. In the "&ll=25.0309073,121.5431877", the 25.0309073 is latitude and 121.5431877 is longitude. It is required to change by users themselves.

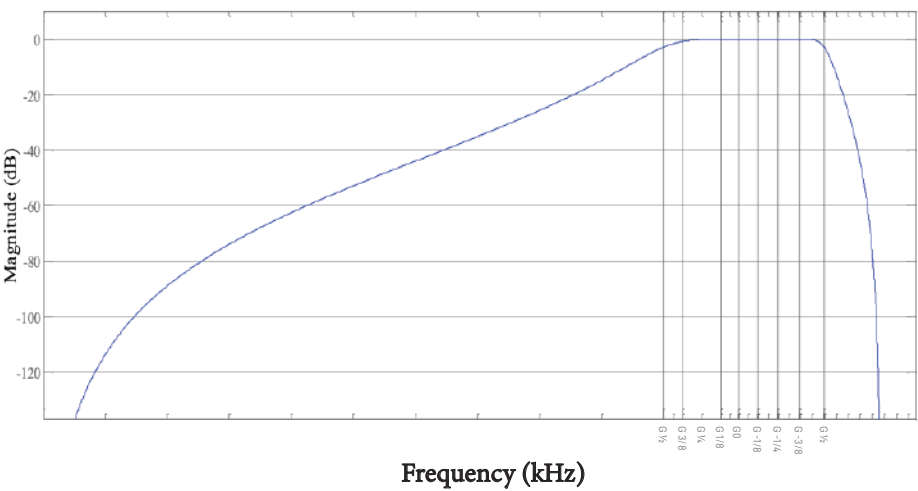
The altitude error is larger, and the movement speed and movement direction are calculated by the distance between two points within fixed interval. When the movement speed is lower or in static state, the two data errors are much larger. The movement speed error is about $\pm 3.6\text{km/h}$. To reduce the error caused by satellite movement, it is suggested for the user to measure the distance within shortest time as can as possible.

Annex 3 Filter attenuation characteristics

Relative attenuation of 1/3 octave band pass filter at 12.5kHz center frequency



Z weighting response when microphone type is random:



13. Safety, Handling, & Maintenance

Important safety information

WARNING: Failure to follow these safety instructions could result in fire, electric shock, or other injuries, or damage to sound level meter or other property. Read all the safety information below before using sound level meter.

Operate Avoid using instrument in humid or wet places. Make sure that humidity is within the limits indicated in the next section. Avoid using meter in presence of explosive gas, combustible gas, steam or excessive dust.. Be sure to turn it off after use. If you expect not to use the instrument for a long period remove batteries to avoid leakages of battery liquid which could damage the its inner components.

Handling Handle the meter with care. It is made of sensitive electronic components. The meter can be damaged if dropped, burned, punctured, or crushed, or if it comes in contact with liquid. Don't use a damaged meter, such as one with a cracked screen, as it may cause injury.

Important handling information

Cleaning Clean instrument immediately if it comes in contact with anything that may cause stains—such as dirt, ink, makeup, or lotions. To clean:

- Disconnect all cables and turn instrument off.
- Use a soft, lint-free cloth.
- Avoid getting moisture in openings.
- Don't use cleaning products or compressed air.

Operating temperature The instrument is designed to work in ambient temperatures between 5° and 40° C (41° and 104° F) and stored in temperatures between -10° and 60° C (14° and 140° F). The instrument can be damaged and battery life shortened if stored or operated outside of these temperature ranges. Avoid exposing the instrument to direct sunlight even the the air temperature is within the limits.

Operating humidity The instrument is designed to work in humidity < 80%rh and stored in dry place where humidity is less than 70%rh.

Store microphone carefully Microphone is the key component of the instrument and keep it dry and avoid severe shake or vibration.



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