

Model AWA6228

Multifunction Sound Level Meter

# Instruction Manual

Hangzhou Aihua Instruments Co., Ltd, China

# Contents

1. Overview .....	1
2. Features .....	1
3. Specifications .....	1
4. Structure .....	3
5. Definition of symbol and abbreviation .....	4
6. Keys .....	5
7. Key display interfaces .....	5
7.1 Main menu.....	5
7.2 Measurement interface .....	6
7.2.1 Noise measurement interface .....	6
7.2.1.1 One measurement interface .....	6
7.2.1.2 24h automatic measurement interface.....	8
7.2.2 Positioning measurement interface.....	9
7.2.3 Octave-band spectrum analysis interface.....	9
7.2.3.1 OCT list interface.....	9
7.2.3.2 Big interface.....	9
7.2.3.3 Graphic interface.....	10
7.2.4 Airport noise measurement interface.....	10
7.3 Setup interface.....	10
7.4 Recall interface.....	11
7.5 Calibration interface.....	12
8. Operation.....	12
8.1 Parameter setup.....	12
8.1.1 Calendar clock adjustment.....	12
8.1.2 Measurement time setup.....	13
8.1.3 Group name input and selection.....	13
8.1.4 Group name view .....	13
8.1.5 Statistic frequency weighted mode selection.....	13
8.1.6 LCD display contrast adjustment.....	14
8.1.7 SMS setup.....	14
8.2.1 One noise measurement.....	14
8.2.2 Scientific back erase function.....	14
8.3 24h automatic monitoring.....	14
8.4 Noise spectrum analysis.....	15
8.5 Airport noise measurement.....	15
8.6 Data recall.....	15
8.6.1 One measurement result recall.....	15
8.6.2 24h automatic monitoring result.....	16
8.6.3 OCT analysis result recall.....	16

8.7 Data print.....	16
8.7.1 Single-group printout of one measurement result.....	16
8.7.2 Multi-group printout of one measurement result.....	17
8.7.3 24h measurement result printout.....	17
8.7.4 Statistic and cumulative chart printout.....	17
8.8 Calibration.....	18
8.9 GPS positioning measurement.....	18
9. High capacity SD card function.....	19
9.1 High capacity data storage.....	19
9.2 Record and replay.....	20
9.3 U disk function.....	20
9.4 Other considerations .....	21
10. Measurement range and self-generated noise correction .....	21
11. Overload indication.....	22
Annex 1 Packing list.....	23
Annex 2 GPS overview.....	23
Annex 3 Directional response.....	24
Annex 4 Free field response.....	24
Annex 5 Influence of extension cable.....	25
Annex 6 Filter attenuation characteristics.....	26

# Modification record and version explanation

version	time	explanation
V1.0	2008-08-10	
V1.1	2008-10-10	Add OCT self-generated electric noise, airport noise measuring and related instructions
V1.2	2009-03-20	Add equal interval setup and auto-start and auto-end function
V1.3	2009-06-17	Add indoor measuring interface, automatically judge if over the international stipulated value
V1.4	2009-08-01	Add time zone setting, indication setup; add the direction of both longitude and latitude of GPS positioning information.
V1.5	2009-9-30	The range is divided into 4 rear under spectrum analysis interface, add peak value frequency displayed under graphic interface, add Leq,1 of A weighting and Z weighting under recording interface, user can set Overrun start or same Intervals start when do recording.
V1.6	2010-3-1	When press output key under OCT interface, it will only print 5 frequency values. Add the operation instruction of 1/3 OCT function.
V1.7	2010-5-6	Turn off when the instrument is in measuring process, it will save the measuring results first, the turn off.
V1.8	2010-7-24	Add integrating record mode when the SD card module required, it can save the integrating results in the same file. The working current reduce15% when under Once and 24H measuring mode.

## 1. Overview

Model AWA6228 Multifunction Sound Level Meter is a noise measurement instrument developed with digital signal processing technology. By means of three parallel (synchronous) frequency weighted modes (A, C, Z) and three parallel (synchronous) time weighted modes (F, S, I), it can synchronously measure multiple assessment indexes. Its dynamic range is higher than 110dB. Its FLASH RAM can store the measurement result reliably. The user may also store the data with SD card. The meter has many functions including high capacity storage, record, U disk, and card reader etc. With modularized design, the user can buy the corresponding modules based on the specific needs. It can be embedded with GPS (optional). At the same time of noise measurement, it can also provide position information and speed measurement function. With external mini-printer (optional), it can print out the measurement result on site. With GSM wireless data transmission module (optional), it can send the measurement result to the specified mobile phone or computer by SMS. This meter can be widely used for environmental noise measurement, machine noise measurement and building acoustics measurement in many fields such as environmental protection, labor sanitation, industrial enterprise, research and teaching etc.

## 2. Features

- 2.1 110dB dynamic range, no need to switch the measuring range
- 2.2 Frequency weighted modes, time weighted modes and detection are realized by the digital signal processing technology. Three frequency weighted modes (A, C, Z) and three time weighted modes (F, S, I) are available
- 2.3 128×128 3" LCD, large display screen and rich display content
- 2.4 FLASH RAM can store the measurement result reliably. The user may also store the data with high capacity SD card (optional)
- 2.5 It can measure and display 12 indexes in a real-time (synchronous) manner
- 2.6 Character and icon menu make operation easier
- 2.7 With strong function, it can directly display Statistic chart, cumulative chart and 24h chart
- 2.8 The adjustable LED ray and working status indicator allow the user to monitor at night and observe the meter working status at a long distance
- 2.9 It can automatically modify the self-generated noise, and improve the accuracy of measurement at low sound level
- 2.10 The dynamic bar chart and oscillogram can intuitively reflect the noise change trend

2.11 The user can input the measuring point name randomly in English.

2.12 The meter can store the last 128 acoustic calibration records

2.13 AC output can be connected with earphone for subjective evaluation

2.14 The user can configure microphones with different sensitivities to realize different measurement ranges

2.15 With embedded GPS positioning system, at the same time of noise measurement, it can also provide accurate position information and speed measurement function (optional)

2.16 With mini-printer, it can print out the measurement result (optional) on site

2.17 With external GSM wireless data transmission module, it can send the measurement result to the specified mobile phone or computer (optional) by SMS

2.18 With external solar battery module (optional), it can work for a long time in the wild

2.19 It supports high capacity SD card up to 2GB (optional)

2.20 With record function, it can record up to one hour (high capacity SD card module required). The record result can be transmitted to the computer for spectrum analysis or replay (relevant analysis software required)

2.21 U disk function can change the SD card into U disk when the meter is connected to the computer via USB interface (high capacity SD card module required)

2.22 It can transmit FAT16/32 format content in the SD card to the computer (high capacity SD card module required)

### 3. Specifications

3.1 Microphone: pre-polarized measuring capacitor microphone, sensitivity level: -46dB~-26dB (ref. 1V/Pa)

3.2 Frequency range: 10Hz~20kHz±1dB (excluding microphone)

3.3 A/D bits: 24 bits

3.4 Sampling frequency: 48kHz

3.5 Background electrical noise: <A weighted 3μV, C weighted 4μV, Z weighted 5μV (excluding preamplifier, direct short circuit with 50Ω resistor)

3.6 Measurement upper limit: subject to the microphone's sensitivity. It may be estimated as per "94-microphone sensitivity level"

3.7 Dynamic range: >110dB (A weighted), need not to switch the measuring range

3.8 Time weighted modes: F, S, I parallel (synchronous)

3.9 Frequency weighted modes: A, C, Z parallel (synchronous)

3.10 Detection characteristics: true effective value digital detection

3.11 Fulfills standards: IEC61672 class 1, When Model AWA14602 preamplifier and Model AWA14421 microphone are used, it is class 2

3.12 Display: 128×128 LCD, 16 contrast levels, LED backlight

3.13 Display content: it can measure and display over 12 indexes, Statistic chart, cumulative chart and 24h chart in a real-time manner

3.14 Measurement function: Statistic analysis, 24h automatic monitoring, airport noise measurement

3.15 Measurement indexes:  $L_{xyi}$ ,  $L_{xyp}$ ,  $L_{xeq}$ ,  $L_{xmax}$ ,  $L_{xmin}$ ,  $L_{xN}$ , SD, SEL, E,  $L_{Cpeak}$ ,  $T_d$ ,  $L_{EPN}$  etc.  
 Note: x is A, C, Z; y is F, S, I; and N is 5, 10, 50, 90, 95  
 $L_{Cpeak}$  measurement lower limit is measurement upper limit minus 60dB.

3.16 Data storage: 128 groups of Statistic analysis results with chart

3.17 Output interface: AC, DC, RS-232C to computer or mini-printer, USB interface (high capacity SD card module required)

1) AC output: the output signal amplitude may be Small signal, Large signal, AC, or 1kHz. Its output may be connected to 8Ω earphone (output power: 150mW, harmonic distortion: <0.1%).

2) DC output: instantaneous sound pressure level of three frequency weighted modes (A, C, Z) and three time weighted modes (F, S, I), output scale: 20mV/dB. For 100dB, its output voltage is 2V, and the maximum output voltage is 3.3V.

3) RS232 interface: when connected to the computer, it can output the instantaneous sound pressure level of three frequency weighted modes (A, C, Z) and three time weighted modes (F, S, I), 1s maximum sound pressure level, 1s integral sound pressure level, and stored measurement result in a real-time manner; when connected to AH40 mini-printer, it can print out the measurement result and relevant charts.

4) USB interface: it is available only when the user has high capacity SD card module. When the meter is connected to the computer via USB cable, the meter is changed into an external U disk. It complies with USB1.1 standard and is compatible with USB 2.0 standard.

3.18 Calendar clock: error lower than 1 min per month, GPS timing and calibration, imbedded standby battery

3.19 Power supply: 4×LR6 alkaline battery or 5V external power supply. Its working current is about 120mA, and the maximum value is about 200mA.

3.20 Statistic analysis function: frequency weighting/time weighting can be selected, sampling rate: 47 times/s

3.21 Measurement time: manual, 1s-99h or grade

3.22 Environment :

Working temperature: -10°C~50°C

Relative humidity: 20%~90%

Atmospheric pressure: 65 kPa~108kPa

3.23 Dimensions (mm): 260×80×30

3.24 GPS positioning function (optional): Measure longitude, latitude, altitude, movement speed, which can be recorded together with the noise measurement result. The GPS positioning information can also be used to measure the movement direction and linear distance between two points.

1) Receiver type: 16 channels

2) Update rate: 1 Hz

3) Positioning precision: 2.5 m

4) Start time: Hot start <3.5 s

Warm start 33 s

Cold start 34 s

5) Receiving sensitivity:

Follow-up -158dBm

Capture -148dBm

Cold start -142dBm

6) Timing precision: 50 ns

7) Running limit: Altitude <18000 m

Speed <515 m/s

3.25 High capacity SD card function (optional):

1) The measurement results are stored in the SD card in the text file format. These files can be opened in the EXCEL directly

2) During the statistic analysis, it can also synchronously record the instantaneous value or 1s integral value and change of positioning information with time

3) FAT table is used for file management. It supports FAT16/FAT32 format, and supports SD card capacity up to 2GB

4) When connected to the computer via USB interface, it changes SD card into U disk

3.26 Record function (High capacity SD card module required)

Record format: 48000 sampling frequency, 16-bit precision

File format: WAV format, containing calibration information

Record time: 1s-1h

Replay: by the meter or computer

3.27 Octave-band spectrum analysis function (optional)

Filter type: parallel (real-time) octave-band, G=2

Fulfile standard: IEC61260 class 1, Filter center frequency: 16Hz, 31.5Hz, 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz, 4kHz, 8kHz, 16kHz (For class 2, no 16Hz and 16kHz)

Octave-band sound pressure level index mean time constant: for the center frequency 16Hz and 31.5Hz, is 350ms; for other center frequencies, it is 125ms

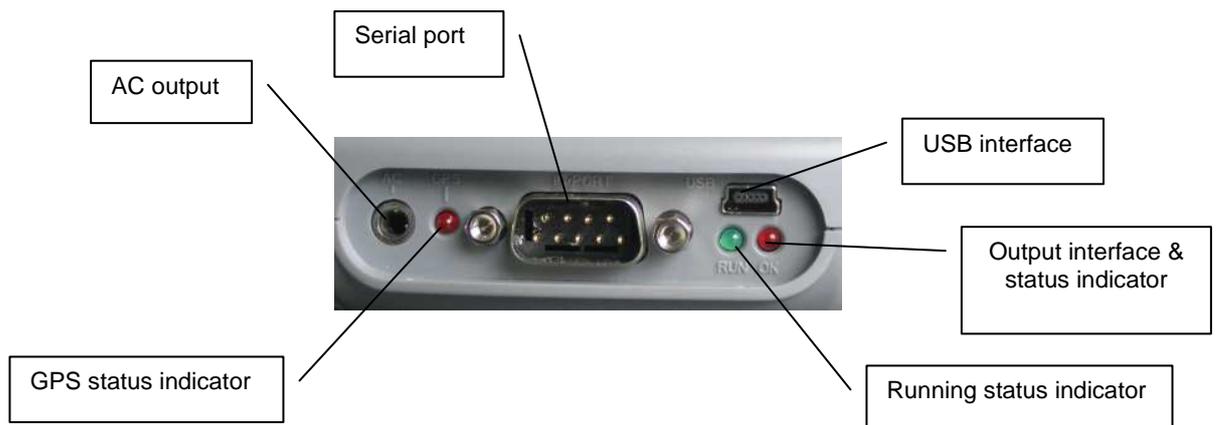
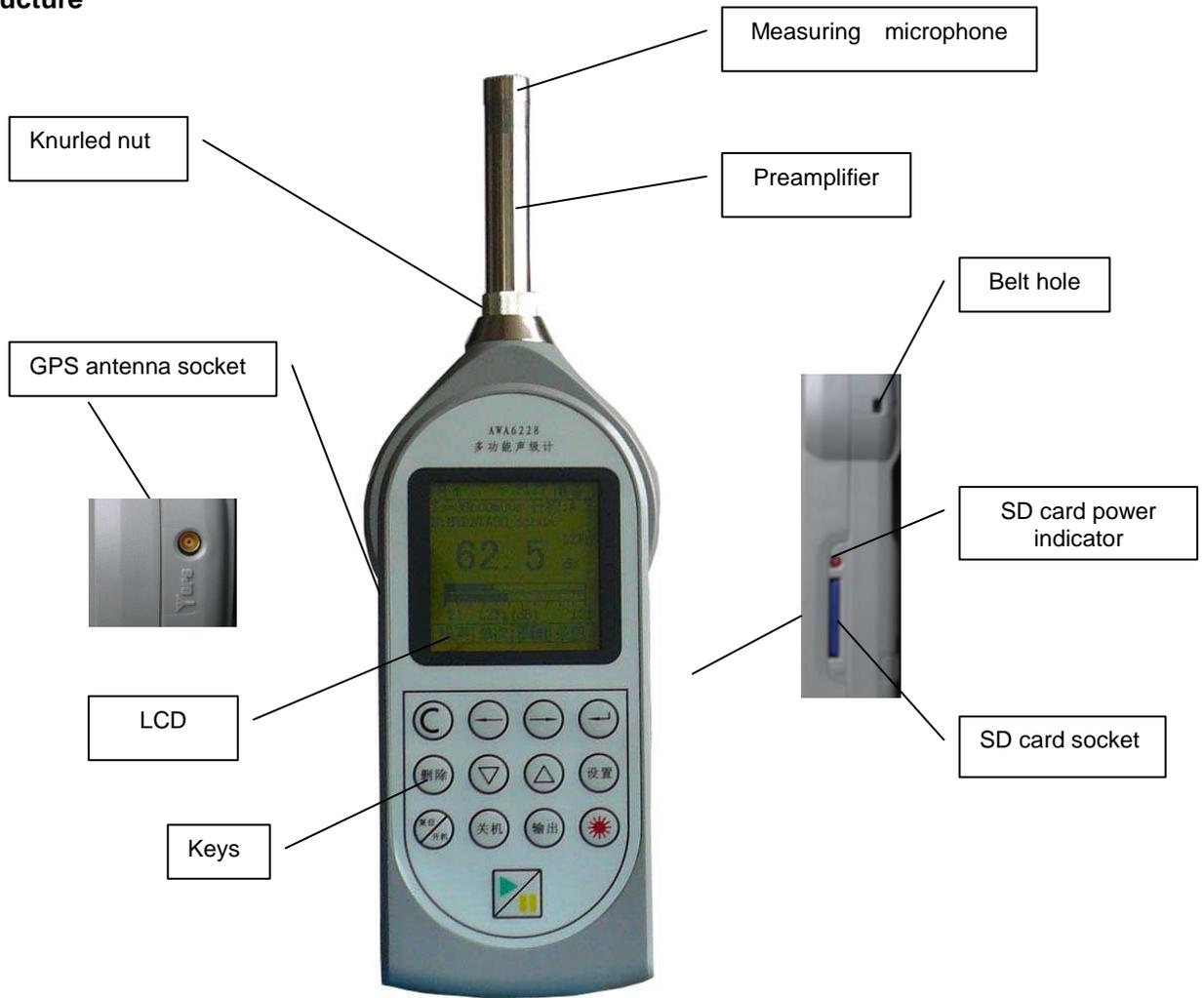
Real-time analysis speed: approx. 47 times/s, synchronously complete all center frequency and A weighted, C weighted, Z weighted operations

Measurement interfaces: list interface and graphic interface. The list interface and graphic interface can synchronously display the band sound pressure level of 11 center frequencies as well as A, C and Z weighted sound pressure level

Level linear range: Above 70dB

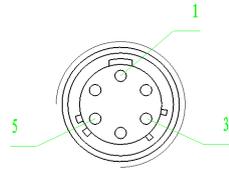
Measurement indexes:  $L_{fmi}$ ,  $L_{fmeq,1s}$ ,  $L_{fmeq,T}$

#### 4. Structure



The front of the meter is model X9-6z signal input socket. For the layout of the socket pins, see the figure below. Their functions are respectively:

- Pin 1 Power supply
- Pin 2 NC
- Pin 3 Signal input
- Pin 4 NC
- Pin 5 Signal ground
- Pin 6 NC

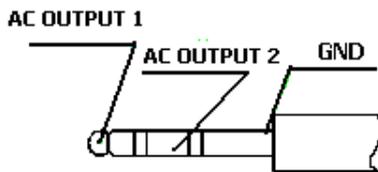


The rear of the meter is output interface. Its left is AC output interface. AC output signal's amplitude doesn't exceed 2V. Its relationship with input signal is shown in the table 1:

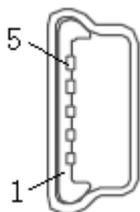
Table 1 AC output relationship with input signal

AC output	Small signal	Large signal	AC	1kHz
AC output 1	Equal to 10 times of input signal	Equal to input signal	Equal to 10 times of input signal	1V , 1kHz sine wave
AC output 2			Equal to input signal	

This socket is stereo socket. When it is matched with the plug, all pins of the plug are defined below:



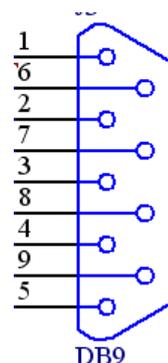
The middle part is DB9 socket's RS232 interface. The right part is USB interface, which is also the external power interface. There are two indicators under USB interface, respectively working status indicator and USB interface status indicator.



- 1. +5V
- 2. UD-
- 3. UD+
- 4. NC
- 5. GND

DB9 pins' definition:

- 1. Power
- 2. RXD
- 3. TXD
- 4. NC
- 5. GND
- 6. DC Output
- 7. NC



- 8. NC
- 9. NC

Working status indicator: When the measurement starts, the indicator flashes. When the measurement is paused, the indicator is On. When the measurement stops, the indicator is Off.

GPS status indicator: When correct positioning information is available, this indicator flashes every one second. When GPS module is not installed or GPS module is in sleep status, it is Off.

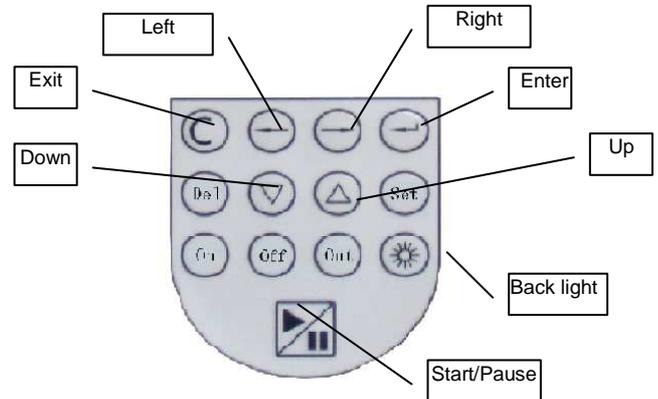
### 5. Definition of symbol and abbreviation

- Ts Preset integral measurement time
- Tm Actual measurement duration
- Nm Actual statistic analysis' sampling number
- GPS Global positioning system
- N: Name of group or measuring point entered by the user
- H: Number of current time period at 24h automatic monitoring
- 24H 24h automatic monitoring mode
- STA One Statistic analysis mode
- F Time weighting F, time constant: 125ms
- S Time weighting S, time constant: 1000ms
- I Time weighting I, rising time constant: 35ms, falling time constant: 1500ms
- R@ Start time of first group at 24h automatic monitoring's
- Lpx Sensitivity level of Microphone
- LAeq A weighted equivalent sound level
- LCeq C weighted equivalent sound level
- LZeq Z weighted equivalent sound level
- SEL Sound exposure level =Leq+10Log(T)
- E Personal sound exposure, in Pa<sup>2</sup>h
- Lmax Maximum sound pressure level
- Lmin Minimum sound pressure level
- L5 5% of sound pressure level exceeds this sound pressure level
- L10 10% of sound pressure level exceeds this sound pressure level
- L50 50% of sound pressure level exceeds this sound pressure level
- L90 90% of sound pressure level exceeds this sound pressure level
- L95 95% of sound pressure level exceeds this sound pressure level
- SD Square deviation (standard deviation)
- LAFp Maximum A sound level within one second measured in F weighting
- LASp Maximum A sound level within one second measured in S weighting
- LAlp Maximum A sound level within one

	second measured in I weighting
LA1s	1s A weighting equivalent sound level
LCFp	Maximum C sound level within one second measured in F weighting
LCSp	Maximum C sound level within one second measured in s weighting
LCIp	Maximum C sound level within one second measured in I weighting
LC1s	1s C weighting equivalent sound level
LZFP	Maximum Z sound level within one second measured in F weighting
LZSp	Maximum Z sound level within one second measured in S weighting
LZIp	Maximum Z sound level within one second measured in I weighting
LZ1s	1s Z weighting equivalent sound level
LAFi	Instantaneous A sound level measured in F weighting
LASi	Instantaneous A sound level measured in S weighting
LAli	Instantaneous A sound level measured in I weighting
LCFi	Instantaneous C sound level measured in F weighting
LCSi	Instantaneous C sound level measured in S weighting
LCli	Instantaneous C sound level measured in I weighting
LZFi	Instantaneous sound pressure level measured in F weighting
LZSi	Instantaneous sound pressure level measured in S weighting
LZli	Instantaneous sound pressure level measured in I weighting
Ld	Daytime equivalent sound level, time interval: 6:00-22:00
Ln	Night equivalent sound level, time interval: 22:00-6:00
Ldn	Daytime & night equivalent sound level
LCpk	Peak value C sound level
Lat	Latitude, in degree
Lon	Longitude, in degree
Alt	Altitude
Vel	Velocity
SMS	Short Message Service
UTC	Universal Time Coordinate time, 8 hours later than Beijing time
OCT	Octave-band spectrum analysis

	Battery level display
	Battery under-voltage
	GPS positioning signal
	SD card inserted
	SMS sent successfully
	90 angle incident direction

## 6. Keys

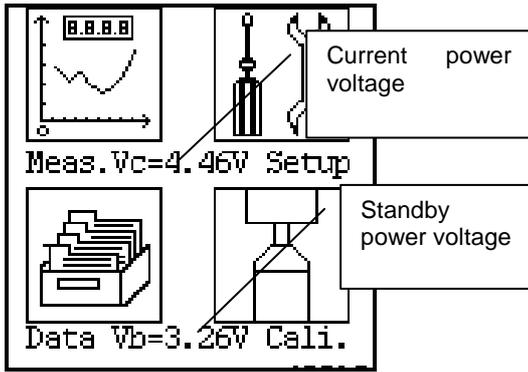


Power On /	Turn on the power or reset the meter
Reset	
Power Off	Turn off the power. When starting the measurement, if this key is pressed, the meter will prompt the user whether turn off the meter?
Left	The cursor is moved leftwards
Right	The cursor is moved rightwards
Up	Data increase by one or page up
Down	Data decrease by one or page down
Setup	Go to the parameter setup interface
Enter	Input the current operation
Delete	Delete the current measurement result or input data
Exit	Exit from the current menu
Output	Print the current measurement result or terminate the current measurement in advance and save the measurement result
Start/Pause	Press it to start measurement, and press it again to pause measurement
Ray	Turn on/off the LCD's backlight

## 7. Key display interfaces

### 7.1 Main menu

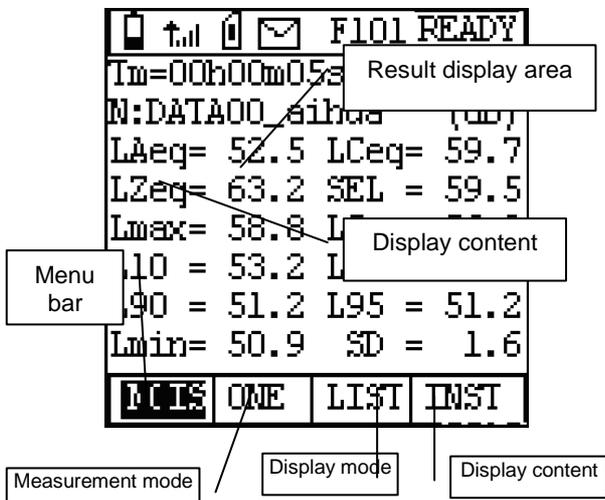
When the user presses the Power On/Reset key for above 2s and then releases, the meter displays the Logo of Hangzhou Aihua Instruments Co., Ltd., and then goes to the main menu:



In the main menu, there are four submenus: Measurement, Setup, Data, and Calibration. The Cursor key allows the user to move the cursor leftwards/rightwards. When pressing the Enter key, the user can go to the corresponding submenu. When the user presses the Delete key, the system parameters are restored to the default values.

## 7.2 Measurement interface

When the cursor is on the "Measurement", if the user presses the Enter key, the meter goes to the measurement interface which consists of Noise measurement interface and GPS positioning measurement interface. Only when GPS module is installed, the user can go to the positioning measurement interface.



The first line is working status line, respectively displaying left to right: power voltage, GPS signal, SD card, SMS, available groups (overload indication) and measurement status. The power voltage symbol can accommodate up to 10 lines. When these 10 lines are filled, the power voltage is about 5.6V. When the power voltage is lower than 3.6V, it is blank inside, which means the meter is in under-voltage status. When GPS module is installed, the GPS indication is displayed. When correct GPS positioning information is received, it displays the received

signal. When SD card is detected when the meter is started, the SD card indication is displayed. When the measurement result is sent by the GSM wireless data transmission module, the SMS indication is displayed. When the measured signal exceeds the measurement upper limit, the overload indication is displayed. The measurement status includes: Ready, Run, Pause, Wait, Print, and End.

The last line is menu bar. The Cursor key allows the cursor to stay on each menu option. By the Up and Down keys, the user can change the menu option.

### 7.2.1 Noise measurement interface

In the noise measurement interface, there are One measurement mode and 24h measurement mode.

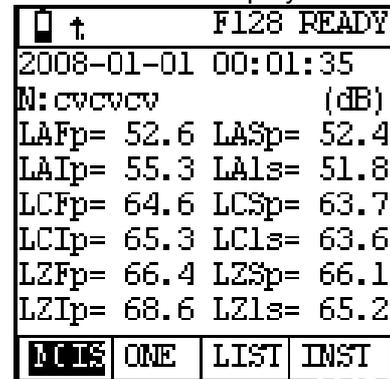
#### 7.2.1.1 One measurement interface

In the noise measurement interface, when the menu in the measurement mode displays "One", the meter goes to One measurement mode. In the One measurement interface, there are three display modes: List, Graphic, and Big.

##### 1) List measurement interface

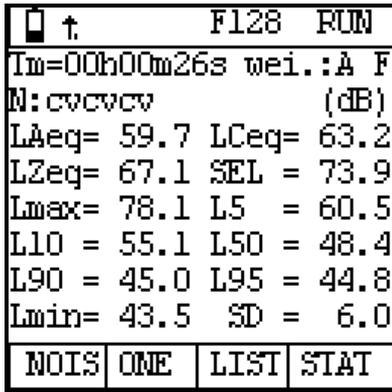
In this interface, the meter can synchronously display multiple measurement indexes on one screen. The display content includes Instantaneous value and Statistic value.

- Instantaneous value display interface



The first line is status display line. The second line is the current calendar clock line. The third line is group name (measuring point name). The middle part displays 12 measurement results from three frequency weighted modes and three time weighted modes. The last line is menu bar. The 12 measurement results refresh every one second, and change with the measured noise. When the cursor is on the "Instantaneous", by the Up and Down keys, the user can go to the Statistic value display interface.

- Statistic value display interface

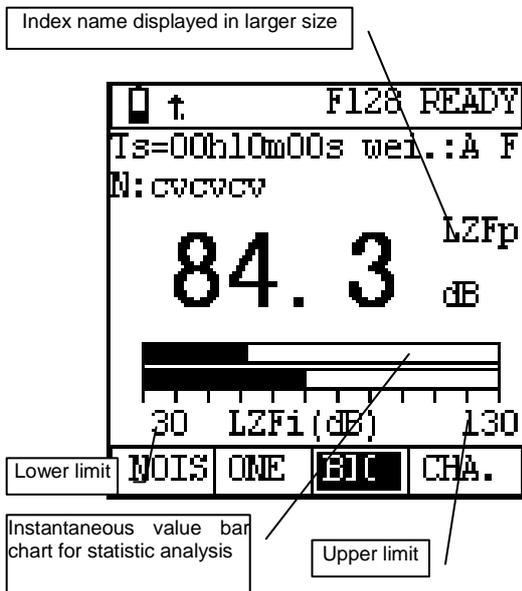


The first line is working status display line. Ts in the second line is the current measurement time. When the cursor is on Ts, press the Up and Down keys to change it to Tm (measurement duration) or Nm (total sampling number). "Weighting: A F" in the second line means the current statistic sound level is frequency weighting A and time weighting F. When the cursor is moved to this place, the user can change it to other frequency weighting and time weighting. However, in the measurement starting process, it can't be changed. The third line is the measuring point name. The middle part displays the integral result and statistic result. When the meter is in the Ready status, these values are 0. When the meter starts measurement, these values are calculated and refresh every one second. When Tm is equal to Ts, the measurement stops and these values keep unchanged. When the cursor is moved to "List", by pressing the Up key, the user can go to the Big display interface.

## 2) Big display interface

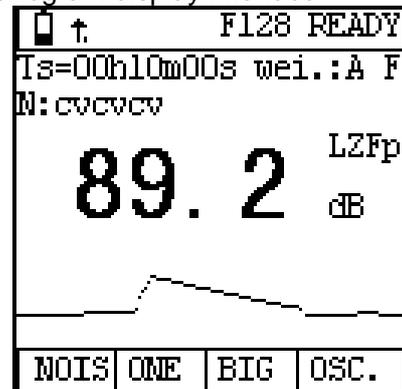
In the Big display interface, the values are displayed in larger size with dynamic bar chart or oscillogram for easy observation of the noise's change trend.

- Bar chart display interface



The first line is status display line. Ts in the second line is the current measurement time. When the cursor is on Ts, press the Up and Down keys to change it to Tm (measurement duration) or Nm (total sampling number). "Weighted: A F" in the second line means the current statistic sound level is frequency weighting A and time weighting F. When the cursor is moved to this place, the user can change it to other frequency weighting and time weighting. However, in the measurement starting process, it can't be changed. The third line is the measuring point name. The large values in the middle part are the measurement results, which refresh every one second. "LAFp" is the name of the index. When the cursor is moved to this place, the user can change the index sequence to: LZSp, LZIp, LCFp, L<sub>C</sub>Sp, L<sub>C</sub>Ip, LAFp, LASp, LAIp, LA1s, LC1s, LZ1s, LAeq, L<sub>C</sub>eq, LZeq, Lmax, Lmin, L5, L10, L50, L90, L95, SD, SEL, E, LCpk etc. Under the content, there are two bar charts that refresh 10 times every one second. The upper bar chart corresponds to the instantaneous value for statistics. The lower bar chart can be specified by the user. When the cursor is moved to LZFi, by pressing the Up and Down keys, the user can change the bar chart's sequence to: LZFi, LZSi, LZli, LCFi, LCSi, LCli, LAFi, LASi, LAli. When the cursor is moved to the "Bar chart", by pressing the Up and Down keys, the user can go to the oscillogram display interface.

- Oscillogram display interface



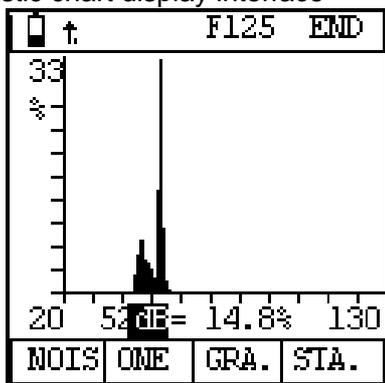
This display interface similar with the bar chart display interface, only those two dynamic bar charts changed into oscillogram. At the lower part of the screen, it displays the time chart of instantaneous value for statistic analysis. One chart can display 128 instantaneous values. The sampling interval for statistic analysis is 1/47s. One chart can display the change condition of instantaneous value within about 3s.

## 3) Graphic display interface

When the cursor is on the "Big" or "List", by pressing Up and Down key, the user can go to the graphic display interface. This interface can

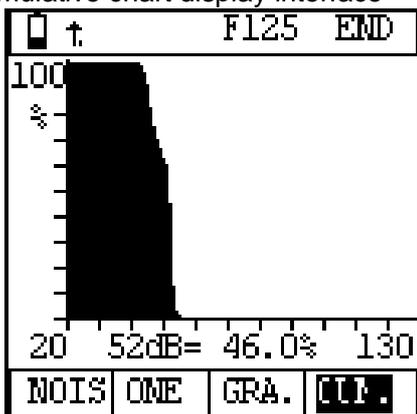
display statistic chart and cumulative chart. In the measurement process, the statistic chart and cumulative chart can refresh every one second.

- Statistic chart display interface



The first line is status display line. The middle part displays the statistic chart. In the statistic chart, its y-coordinate is percentage and its x-coordinate is sound pressure level. The x-coordinate has 110 points, 1dB for each point. When the cursor is moved to "52dB", by pressing Up and Down keys, the user can view the percentage at all sound pressures level.

- Cumulative chart display interface



The first line is status display line. The middle part displays the cumulative chart. In the cumulative chart, its y-coordinate is percentage and its x-coordinate is sound pressure level. The x-coordinate has 110 points, 1dB for each point. When the cursor is moved to "52dB", by pressing the Up and Down keys, the user can view the cumulative percentage at all sound pressures level. This method can be used to calculate any statistic sound level.

### 7.2.1.2 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 higher than 1min and lower than 58min. If it is not within this range, the meter will automatically adjust it to 1min-58min. During 24h measurement, Ld, Ln and Ldn are calculated synchronously. 24h measurement mode consists

of list display interface and graphic display interface.

### 1) List measurement interface

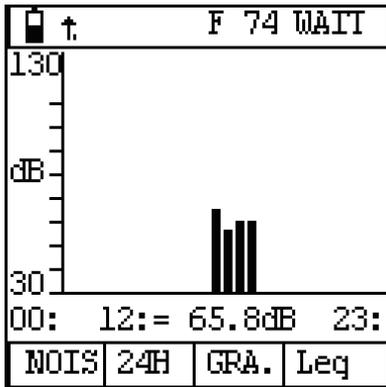
ts	F128	RUN
Tm=00h00m07s wei.:A F		
N:cvcvcv H: 1		
2008-01-01 00:05:07		
Lp = 46.6 dB		
R@2008-01-01 00:05:00		
Ld = 0.0 dB		
Ln = 51.2 dB		
Ldn = 61.2 dB		
NOIS	24H	LIST Page0

The first line is status display line. Ts in the second line is the current measurement time. When the cursor is on Ts, pressing the Up and Down keys to change it to Tm (measurement duration) or Nm (total sampling number). "Weighted: A F" in the second line means the current statistic sound level is frequency weighting A and time weighting F. When the cursor is moved to this place, the user can change it to other frequency weighting and time weighting. However, in the measurement starting process, it can't be changed. The third line is the measuring point name. "H: 1" after the measuring point name means the first time measurement is ongoing. The fourth line is the current calendar clock. The fifth line is the specified frequency weighting and time weighting sound pressure level. The sixth line is the starting time of the first measurement. The last line is menu bar. When the cursor is moved to "Page 0", by pressing the Up and Down keys, the user can switch it to other pages. Page 1 displays 00:-05: measurement results. Page 2 displays 06:-11: measurement results. Page 3 displays 12:-17: measurement results. Page 4 displays 18:-23: measurement results.

ts	F 75	RUN
N:MYDATA00_aihua H: 4		
Time	Leq	Lmax Lmin<>
12:	65.8	88.9 50.4
13:	57.4	69.6 51.6
14:	60.9	76.6 53.0
15:	59.9	76.4 54.5
16:	0.0	0.0 0.0
17:	0.0	0.0 0.0
NOIS	24H	List Leq

When the cursor is moved to the "<>", by pressing the Up and Down keys, the user can view L5, L10, L50, L90, L95 and SD. When the cursor is on the "List", by pressing the Up and Down keys, the user can go to the graphic display interface.

### 2) Graphic display interface



The graphic display interface can display 24h sound pressure level chart. The y-coordinate is sound pressure level and the x-coordinate is hour, totally 24 rows. "Leq" in the last line means that the currently displayed index is Leq. When the cursor is moved to this place, press the Up and Down keys to change it to Lmax, Lmin, L5, L10, L50, L90, and L95 etc. "12:=65.9dB" means 12: measurement result is 65.8dB. When the cursor is moved to "12:", by pressing the Up and Down keys, the user can view the measurement results of other periods.

### 7.2.2 Positioning measurement interface

When the meter is equipped with GPS module and connected with external antenna (placed outdoors), it can directly receive the signal from the positioning satellite. The user can go to the GPS positioning measurement interface. In the noise measurement interface, when the cursor is moved to the "Noise", by pressing the Up and Down keys, the user can go to the GPS interface:



In the first line, the left part displays the power voltage and the right part displays the current working status. The second line displays the current calendar clock. The third line is group name. The group name doesn't exceed 14 characters. The last line is menu bar. When the cursor is on the "GPS", by pressing the Up and Down keys, the user can exit from the GPS interface and go to the noise measurement interface. The latitude and longitude are calculated in degree. The angle is calculated clockwise with the north direction as 0 degree. When the cursor is moved to the "Coordinate", by

pressing the Up and Down keys, the user can go to the distance measurement interface:

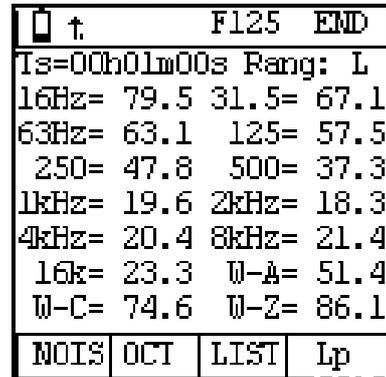


When the meter is moved to the starting point, press the Enter key. After the meter is moved to the ending point, the user can view the coordinates of the two points and their linear distance.

### 7.2.3 Octave-band spectrum analysis interface

When the meter is equipped with octave-band filter module, the user can go to the octave-band spectrum analysis interface. In the noise measurement interface, when the cursor is moved to the "One" or "24H", by pressing the Down or Up keys, the user can realize the octave-band spectrum analysis function. It has three display interfaces: List, Big, and Graphic. The list interface is shown as below:

#### 7.2.3.1 OCT list interface



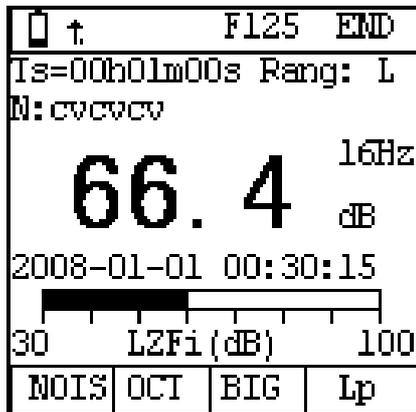
The first line is status display line. The second line is the preset integral time and measuring range. The middle part displays 11 center frequencies and A, C, Z frequency weighted sound pressure levels. The last line is menu bar. The 14 measurement results refresh every one second, and change with the measured noise. When the cursor is moved to "Ts", press the Parameter key to display "Tm" and "Nm". When the cursor is moved to "Lp", press the Up and Down keys to change it to "Leq", "Lmax" and "Lmin". Leq means the integral mean result of one time period. If the integral measurement is not started, all results are 0. Lmax means the maximum value in the

measurement time. Lmin means the minimum value in the measurement time. When the cursor is moved to the "List", by pressing the Up key, the user can go to the Big display interface.

In order to improve the precision of the frequency spectrum analysis, enter the frequency spectrum analysis interface of AWA6228, there're four gears: respectively showed behind of "Range": L, ML, MH, H. The corresponding measurement range seeing below:

Range	Upper limit(dB)	Lower limit(dB)
H	Upper limit of the instrument	Upper limit of the instrument -70
MH	Upper limit of the instrument -10	Upper limit of the instrument -70
ML	Upper limit of the instrument -20	Upper limit of the instrument -70
L	Upper limit of the instrument -30	Lower limit of the instrument

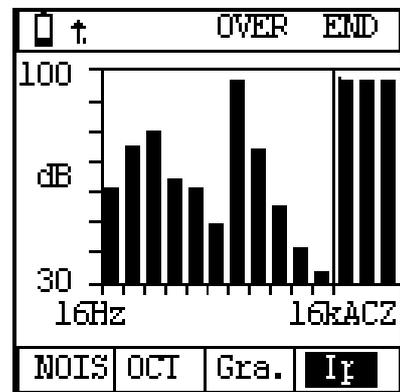
### 7.2.3.2 Big interface



The first line is status display line. The second line is the preset integral time and measuring range. The third line is group name (measuring point name). The middle big number displays some sound pressure level between 11 center frequencies and A, C, Z frequency weighting sound pressure levels. The user can select any measured indexes. After the big number, it displays the index name. Below the big number, it displays the calendar clock and dynamic bar chart. The last line is menu bar. The results refresh every one second. The bar chart refreshes every 0.1s. When the cursor is moved to the "Ts", press

the Parameter key to display "Tm" and "Nm". When the cursor is moved to the "Rang", by pressing the Parameter key, the user can change the measuring range L or H. When the cursor is moved to the "Lp", by pressing the Up and Down keys, the user can change it to "Leq", which displays the integral mean result of one time period. If the integral measurement is not started, all results are 0. When the cursor is moved to the index name, press the Parameter key to view other measurement indexes. When the cursor is in the index name, press the Parameter key to display the dynamic bar chart of other frequency weighting and time weighting instantaneous sound pressure levels. When the cursor is moved to the "Big", by pressing the Up key, the user can go to the graphic display interface.

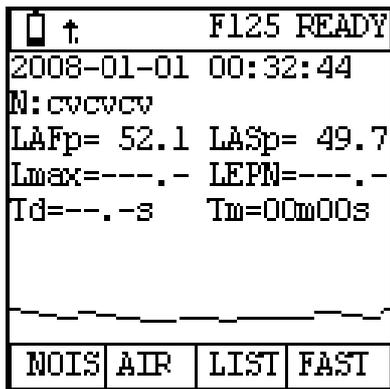
### 7.2.3.3 Graphic interface



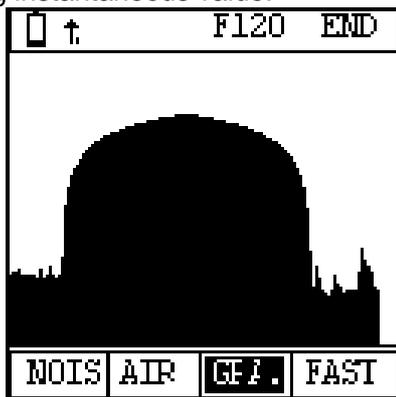
The first line is status display line. The middle part displays the spectrum chart of 11 center frequencies and A, C, Z frequency weighted sound pressure levels. The last line is menu bar. When the cursor is moved to "dB" on the left of the y-coordinate press the Parameter key to change the measuring range. When the cursor is moved to "Lp", press the Up and Down keys to change it to "Leq", which displays the integral mean result of one time period. When the cursor is moved to "Graphic", by pressing the Up key, the user can go to the list display interface.

### 7.2.4 Airport noise measurement interface

In the one measurement interface, when the cursor is moved to the "One", by pressing the Down key, the user can go to the airport noise measurement interface. If the user has OCT analysis module, when the cursor is moved to the "OCT", by pressing the Up key, the user can also go to the airport noise measurement interface. In the airport measurement interface, the sampling interval is 0.1s. The measurement time is up to 60s. After the measurement, it automatically calculates Td, Lmax and LEPN, and save them. There are two display interfaces:



The curve below is the curve of specified time weighting instantaneous value.

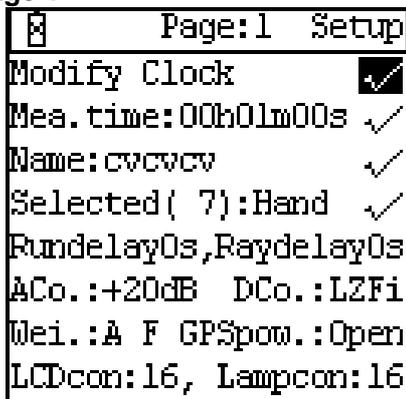


F means that it records the sound pressure level on F weighting and measures LEPN. When the cursor is moved to F weighting, press the Up and Down keys to change it to S weighting. The curve displayed in the middle part is the change curve of instantaneous value.

### 7.3 Setup interface

In the main menu or measurement submenu, press the Setup key to directly go to the Setup interface. However, in the measurement starting process, the user can't go to the Setup interface.

#### 7.3.1 Page 1

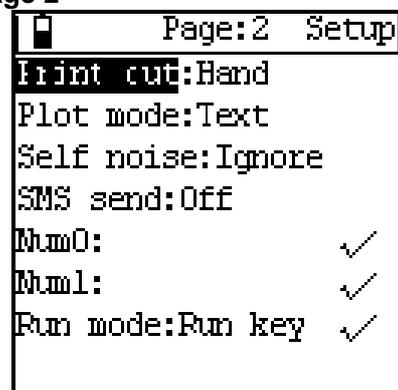


The first line is status display line. "✓" after the second line means the Enter key here is valid. By pressing the Enter key, the user can go to the calendar clock adjustment interface. The measurement time on the third line means the current measurement time for statistic analysis. The fourth line is group name. The measuring

point name used for saving the current measurement result doesn't affect the measurement result. The group name selection has two options: Hand and auto. If Auto, every time of statistic integral measurement, the group name changes automatically. The meter can save up to 64 group names. "Run delay" can be selected within 0-9s. If 0s, by pressing the Start key, the user can start the measurement. If other values are selected, the measurement starts after the specified delay time. "Ray delay" can be selected within 0-9s. If 0s, press the Ray key to turn the ray on and press it again to turn it off. When other values are selected, the ray is automatically turned off after the specified time. "AC" means the type of output signal on AC output interface: Large signal, Small signal, AC, and 1kHz. If 1kHz, the meter's Self noise is increased by 3-5dB. "DC" may be of the nine instantaneous sound levels from three frequency weighting (A, C, Z) and three time weighting (F, S, I). "Weighting" means the frequency weighting and time weighting selected during the statistic analysis. GPS power has three options: Open, Save, Off. 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 "On". When the user doesn't need the GPS positioning information, "Off" may be set to save energy.

The Cursor key can move the cursor leftwards/rightward. The Parameter key can modify the parameter where the cursor is located. The Delete key can restore the system parameter to the default value. By pressing the Setup key again, the user can go to Page 2.

#### 7.3.2 Page 2



**Print out:** "Hand" and "Auto". If "Hand", it doesn't print out the measurement result after the measurement. If "Auto", it automatically print out

the measurement result after the measurement. In this case, the printer shall be connected and its power supply shall be turned on.

**Plot mode:** "Text" and "Chart". If "Text", the measurement result is printed only with text. If "Chart", the measurement result is printed with statistic chart, cumulative chart, spectrogram etc.

**Self-generated noise:** When low-level noise is measured, as the meter's self-generated noise may affect the measurement result, the user can select "Modification". The maximum modification is 3dB. e.g. the meter's self-generated noise is 20dB. When 25dB environment noise is measured, the measurement result displays 26.2dB. After "Modification" is selected, the measurement result displays 25.0dB.

**SMS send:** "On" and "Off". If "On", the meter will try to send the measurement result to the specified mobile phone via SMS after the measurement.

Num0,Num1: Specified mobile phone number, up to 11 bits.n

**Run mode:** "Run key", ">xxdB" and "ΔT=". If "Run key", the measurement starts only when the Start key is pressed. If ">xxdB", the meter will automatically judge whether the currently selected weighted instantaneous value for statistics exceeds the specified limit value xx. If it exceeds the value, the measurement starts immediately. If "Δ T =", whenever calendar clock can be devided exactly, the meter will automatically start. Time interval has 5 min, 10 min, 20 min, 30 min, 1 h optional, each time interval of time measurement according to Ts. The user can press the Enter key to select the two options, and press the Up and Down keys to change the limit value.

**Record switch:** When the user has high capacity SD card module and the SD card is inserted, the meter automatically displays this option. If "On", the instantaneous value or 1s integral value is recorded into the file synchronously during the statistic analysis.

**Mode:** "Simple", "Complex", "1S" and "LeqT". "Simple" means that the instantaneous value for statistics is recorded during the statistic analysis. "Complex" means that 9 instantaneous values from three frequency weighting (A, C, Z) and three time weighting (F, S, I) are recorded synchronously during the statistic analysis. "1s" means that 1s integral value of three frequency weighting(A, C, Z) and GPS positioning information are recorded synchronously during the statistic analysis. "LeqT" means save statistic results or integral results in a same file without sound level distribution table. Note: In 24h automatic monitoring mode, the record function is invalid.

The cursor can be moved, parameters can be modified by pressing Up and Down key. While press the delete key system parameters can be restored to the default, press set key can enter setup interface page 3.

### 7.3.3 Page 3

Auto-start: there are 2 options, start and end, when choose "start" the instrument can transfer from standby to working status automatically at the preseted time shown as the line below.

Auto-end: there are 2 options, start and end, when choose "start" the instrument can end automatically at the preseted time shown as the line below :

```
Page:3  Setup
Auto Start:off
2009-07-30 14:24:27
Auto End:off
2009-07-30 14:24:27
Zone:GMT+ 8 Direct:0
```

After choose auto-start, press "off" key, the instrument will enter standby status, operating light on but screen off, power supply for GPS module off, the power consumption cut to half then. Other keys don't work except the "reset" key. The instrument will transfer to working status at the preseted time. If the instrument is not under the measuring interface when shutting off, it will go to the measuring interface automatically. The auto-start and over limit set up or equal time set up function can appoint the setup time randomly. The cursor key can move the cursor right and left, parameter key can modify the parameter where the cursor points. Press the delete key to recover the system parameter to the default, press set key to back to the first page of the set interface.

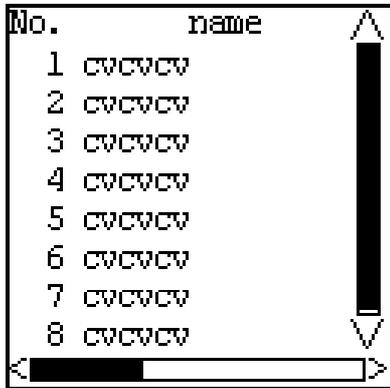
Time zone: the time zone where is the instrument is the difference between the local time and the GMT or UTC. GMT+8 means the local time is 8h earlier than then GMT, the instrument will automatically add 8h to the UTC of GPS as the local time when is doing the GPS calibrating.

Indication: "0°" and "90°" are optional. The microphone of the sound level meter is the free field response, it should point to the sound source when measuring, that's "0°" incidence, so it should be set as "0". Sometimes sound source can only be 90° graze incidence, because the direction of microphone at high frequency will influence the accuracy of the measuring, so set 0

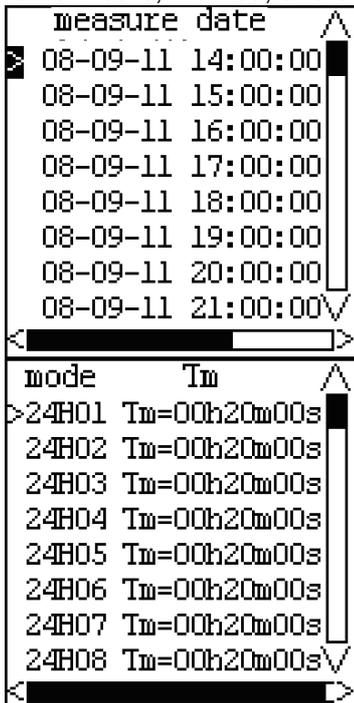
then. This function can transfer the free field response to sound pressure response. For the influence to frequency of "0°" and 90° incidence, please see the appendix.

### 7.4 Recall interface

In the main menu, the user can go to the recall submenu:

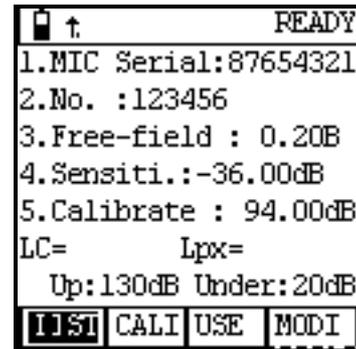


The first row is group number. The second row is group name (measuring point name). The right vertical bar chart reflects data number inside the meter and the position of the current page. By pressing the Setup key again, the user can view the measurement date, method, and duration.



The Cursor key can move the cursor. The Parameter key can make page up/down. The Enter key can view the measurement result where the cursor is located. The Output key can print out the data of and after the cursor; The Delete key can delete all measurement results stored in the meter.

### 7.5 Calibration interface



"1. MIC Serial", "2. No." and "3. Free-field" are preset when the meter leaves the factory, which can't be changed by the user. The sensitivity level is that of the microphone of last calibration. This sensitivity level includes the preamplifier's attenuation. Calibrator sound pressure level is the actual level after calibration by the sound level calibrator. The sixth line is calibration result display line. The meter is calibrated in C weighted mode. The current calibrated microphone sensitivity level is displayed after "Lpx=". Up means the meter's measurement upper limit, it is defined as the maximum effective value of 1kHz sine wave for the current microphone sensitivity,. Under means the meter's self electrical noise. For the relationship between it and the measurement lower limit, see "10. Measurement range and self noise correction". Generally, 10dB is added as the measurement's lower limit. The last line is screen button bar. "LIST" button is used to view the calibration record. "CALI" button is used to start the sound calibration. "USE" button is used to save the calibration result, and use new sensitivity level in the future measurement. "MODI" button allows the user to modify the free field correction, microphone sensitivity level, and calibration sound pressure level. When the Enter key is pressed, the screen button where the cursor is located is pressed.

## 8. Operation

### 8.1 Parameter setup

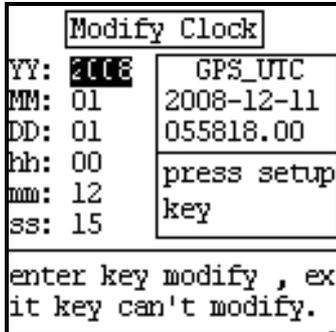
When the user uses the meter for the first time, the relevant system parameters like measurement time, frequency weighting for statistics shall be set according to the measurement requirements. After the system parameters are set, the meter will automatically record them, and load them automatically next time. After pressing the Power On/Reset key, move the cursor on the "Setup" and press the Enter key to go to the setup interface. In the measurement interface, by pressing the Setup key, the user can also directly go to the setup interface.

**Note:** In the measurement starting process, the user can't go to the parameter setup

interface.

### 8.1.1 Calendar clock adjustment

After go to the setup interface, when the cursor is moved to adjustment calendar clock, by pressing the Enter key, the user can go to the modify clock interface:



When the user doesn't have GPS module or GPS module doesn't have correct UTC time, the screen doesn't display GPS clock. The Parameter key can change the value where the cursor is located. The Cursor key can move the cursor. After the change operation, press the Enter key to change the meter's calendar clock. If the user doesn't want to change the original clock, press the Exit key. When GPS module is installed, it is suggested to use GPS calibration with high precision. GPS clock is UTC time, 8 hours earlier than Beijing time.

When the meter is in shutdown status, the meter's clock is power by the internal standby battery. The standby battery can support the meter clock running for above one month. The standby battery is rechargeable battery that is charged when the meter is running. When the standby battery's voltage is lower than 2V, the meter's clock will lose. It shall be set again. It is suggested that the user keep the meter running for above 8 hours every month to recharge the standby battery.

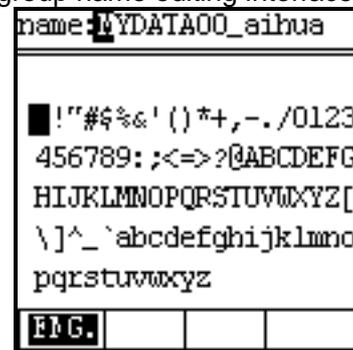
### 8.1.2 Measurement time setup

In the setup interface, when the cursor is moved to h, m and s, the user can set the measurement time randomly by the Parameter key, or select the measurement time in steps by pressing the Enter key. When the measurement time in steps is selected, the meter saves the set time, otherwise it saves the measurement time. Ts=00h00m00s means that the measurement time is unrestricted (hand) till the integral time exceeds the range. The measurement time in steps includes: 00h00m00s, 00h00m10s, 00h01m00s, 00h05m00s, 00h10m00s, 00h20m00s, 00h30m00s, 01h00m00s, 02h00m00s, 04h00m00s, 08h00m00s, 16h00m00s, 24h00m00s. The measurement time shall be set according to the measurement standard's requirements. The set measurement time is displayed next time when the meter is started.

### 8.1.3 Group name (measuring point name) input and selection

The meter can store 64 group names for the user using and modifying in the measurement. It can also store 256 group names in FLASH RAM, which must be entered by the computer. The user can import it into the group name in all group name list display interfaces. For each on, only 64 group names can be imported by order. If there is no group name or the stored group names have been imported, the meter will automatically generate 64 nonrepeated group names.

The user can select group name for each measurement result. The group name is also the measuring point name. It can be set by the user, not exceeding 14 characters. In the setup interface, when the cursor is moved to "Group name:", by pressing the Enter key, the user can go to the group name editing interface:



The first line displays the current group name. The highlight means the current position of the cursor. The middle part is character zone. The last line is input method menu. The group name can be entered by the user randomly in English or Chinese. When the last line prompts "English", it means that it is in English input status. By pressing the Cursor key, the user can move the cursor in the character zone. When it is moved to the character to be selected, press the Enter key to select this character. The selected character replaces the character at the position of the first line cursor. The Setup key can make the cursor move rightwards. The Delete key can make the cursor move leftwards. The Output key can delete the current measuring point name. After the input operation, by pressing the Exit key, the user can exit from the group name editing status and return to the setup interface.

### 8.1.4 Group name view

The meter can store 64 group names. In the setup interface, the number in the back bracket of the "Group name selection" means the sequence number of the currently used group name. When the cursor is in this place, by pressing the Enter key, the user can go to the group name list display interface:

```

1 MYDATA00_aihua
2 MYDATA01_aihua
3 MYDATA02_aihua
4 MYDATA03_aihua
5 MYDATA04_aihua
6 MYDATA05_aihua
7 MYDATA06_aihua
8 MYDATA07_aihua
9 MYDATA08_aihua
10 MYDATA09_aihua

```

The first row is group name number. The second row is group name. The user can input the measuring point name into the meter via the computer in advance. In the measurement site, selection can be made before the measurement based on the specific needs. The group name selection can be set to auto mode to make the meter automatically select the next group name after every data measurement. One screen can only display 10 group names. The user can view other group names by pressing the Up and Down keys. When the “Delete” key is pressed, the meter prompts the user “Whether import other stored file names?”. If the user presses the “Enter” key, a group name is imported from the stored group name zone. The original change to the group name will lose.

#### 8.1.5 Statistic frequency weighting selection

The meter can synchronously perform the measurement of the instantaneous sound pressure level of three frequency weightings (A, C, Z) and three time weightings (F, S, I), and integral mean measurement of three frequency weightings (A, C, Z). For the statistic analysis, the user needs to specify the frequency weighting and time weighting. Every time when the meter is started or reset, it makes statistic analysis to the sound pressure level of A weighting and F weighting by default. Before starting the statistic analysis, the user can change to other frequency weightings or time weighting for statistic analysis.

#### 8.1.6 LCD display contrast adjustment

When LCD monitor’s contrast is too high/low, the user can press the Parameter key the main menu to make adjustment. Alternately, the user can go to the setup menu and move the cursor the “Contrast”, and then press the Parameter key to make adjustment.

#### 8.1.7 SMS setup

When the user has GSM wireless data transmission module and wants to send the measurement result to the specified mobile phone, the user can go to the setup menu. Press the Setup key again to go to the page 2 setup interface. When the cursor is moved to the “SMS

send”, set it On with the Parameter key. Afterward, move the cursor to “num0”, and then press the Enter key to go to the mobile phone number input interface:

```

Left and Right key ca
n move cursor,Up and
Down key can modify c
haracter.Delete key ca
n erase number,Enter k
ey can save and exit.

```

Input the mobile phone number according to the screen prompt. If the user wants to synchronously send it to the second mobile phone, the user can move the cursor to “num1”, and then input the second mobile phone number in the above method.

### 8.2 One noise measurement

#### 8.2.1 Measurement

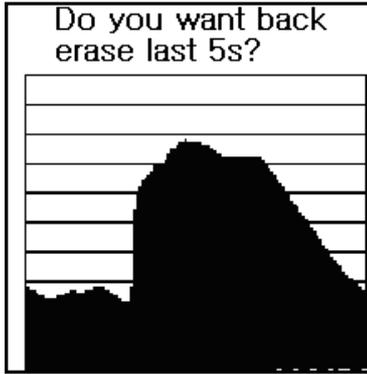
According to the standard’s requirements, set the measurement time in the setup interface (see 8.1.2). Based on the specific needs, set other parameters such as statistic frequency weighting, group name, print function, SMS and starting method etc. In the measurement menu, when the cursor is moved to the menu bar in the last line, change the first menu option to “Noise” and change the second menu option to “One” to go to one measurement interface. Press the Start/Pause key to start measurement. In this case, the meter’s status display line prompts “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 Start/Pause 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 Output key. To stop measurement and delete the current measurement result, the user can press the Delete key. To continue the measurement, the user can press the Start/Pause key again.

For the measurement for the second time, if the relevant system parameters are the same, the user can directly press the Start/Pause key to start the measurement.

### 8.2.2 Scientific back erase function

In the integral measurement process, in case of abnormal noise, the user can erase this noise by the scientific back erase function.

After occurrence of the abnormal noise, the user can press the Delete key. In this case, the meter prompts "Press the Enter key to back erase the last 5s, or press other keys to delete the current measurement result". If the Enter key is pressed, the meter displays as below:



The figure above displays the change of the instantaneous value with time in the last 5s. Press the Enter key to delete them. The meter will recalculate the equivalent sound level and statistic sound level, and continue the measurement.

*Note: If it is less than 5s after starting or back erasing operation, the meter prompts back erase function is unavailable.*

### 8.3 24h automatic monitoring

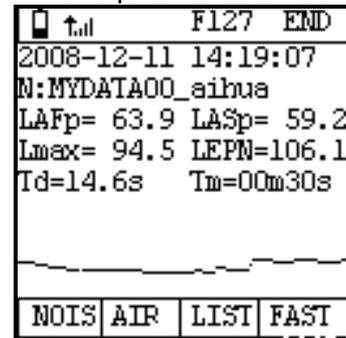
In the main menu, press the Setup key to go to the setup interface. According to the specific needs, set the parameters such as measurement time, statistic frequency weighting, and group name etc. Check and adjust the clock. In the measurement menu, when the cursor is moved to the menu bar on the last line, change the first menu option to "Noise" and 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 Start/Pause key. However, for the other periods, the meter automatically starts the measurement when it reaches the same integral time point.

### 8.4 Noise spectrum analysis

In the noise measurement status, the cursor is moved to the second option of the menu bar. Change it to "OCT" with the Parameter key. After several seconds, observe whether "Overload" is displayed in the status display line on the top line. If it appears, the cursor is moved to the "Rang", change it to "H" with the Parameter key. After several seconds, the user can directly observe the readings. If the spectrum result fluctuates greatly, the user can measure the integral mean result of one period. Press the Setup key to go to the Setup interface. After setting the parameters such as measurement time and group name according to the specific requirements, exit from the setup and return to the spectrum analysis interface. Then press the Start key to start the integral measurement. After it reaches the preset measurement time, it automatically stops and the measurement result is saved. In the measurement process, the user can pause, restart, end in advance or delete the current measurement result. For the operation, see "8.2.1 One noise measurement".

### 8.5 Airport noise measurement

In the airport noise measurement status, the cursor is moved to the last option of the menu bar. According to the standard's requirements, set the time weighting. When the airplane comes, press the Start key; when the airplane leaves, press the Pause key. When the Output key is pressed, the meter automatically calculates  $L_{max}$ ,  $T_d$  and  $L_{EPN}$  according to the requirements of ISO 3891:



### 8.6 Data recall

In the main menu, when the cursor is moved to the "Data", the user can go to the data recall submenu. The screen displays the list of all measurement results. Move the cursor to the group number to be viewed, and then press the Enter key to view the detailed measurement result. Press the Setup key to view other information like measurement time and method.

#### 8.6.1 One measurement result recall

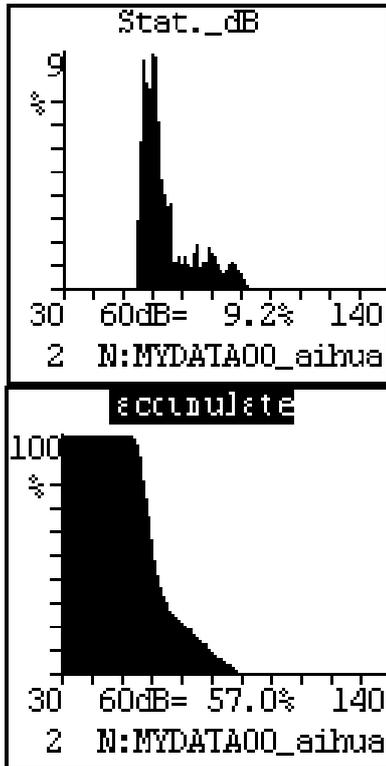
When the recalled data is the result measured in the one measurement method, the method

displays STA. The two numbers after STA are preset time code. Press the Enter key to display the following screen:

```

MYDATA00_aihua
2008-07-30 12:47:04
STA00 Tm=00h00m52s
R:10dB-120dB WEI:A F
LAeq= 50.5 LCeq= 56.7
LZeq= 62.0 SEL = 67.6
Lmax= 70.0 L5 = 54.0
L10 = 50.3 L50 = 44.3
L90 = 42.8 L95 = 42.6
Lmin= 41.7 SD = 4.7
LCpk= 78.2
    
```

When the meter is not installed with GPS module or there is no GPS positioning signal during the noise measurement, there is no information of Lat, Lon, Alt, and Vel. Press the Enter key or Setup key again to display the statistic chart and cumulative chart.



The user can press the Parameter key to view the statistic percentage and cumulative percentage of different sound levels in the statistic chart and cumulative chart display interface.

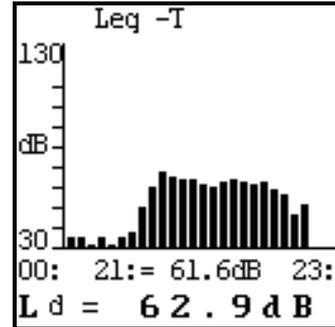
### 8.6.2 24h automatic monitoring result recall

When the measurement result is monitored automatically in 24 hours, the method displays 24H. The two number after 24H are the measured period. Press the Enter key to display the following screen:

```

MYDATA00_aihua
2008-09-28 21:00:00
24H01 Tm=00h58m00s
R:20dB-130dB WEI:A F
LAeq= 61.6 LCeq= 68.2
LZeq= 73.6 SEL = 81.7
Lmax= 86.6 L5 = 67.7
L10 = 64.6 L50 = 55.0
L90 = 50.7 L95 = 50.2
Lmin= 49.1 SD = 6.0
LCpk= 82.5
    
```

In this interface, press the Enter key to display Leq-T chart:



In this interface, when the cursor is moved to "Leq\_T", by pressing the Parameter key, the user can view Lmax, L<sub>5</sub>, L<sub>10</sub>, L<sub>50</sub>, L<sub>90</sub>, L<sub>95</sub>-T chart. The Cursor key can move the cursor. When the cursor is on "21:", the user can view the data of each period via the Parameter key. When the cursor is on "Ld", the user can press the Parameter key to view Ln and Ldn, and press the Enter key to return to the list display location. In the list display interface, press the Setup key to go to the statistic chart and cumulative chart display interface. For the operation, see the graphic view part in "8.6.1 One measurement result recall".

### 8.6.3 OCT analysis result recall

When the measurement result is measured by OCT, the method displays "OCT". When the cursor points to the measurement result of this method, press the Enter key to display the following screen:

```

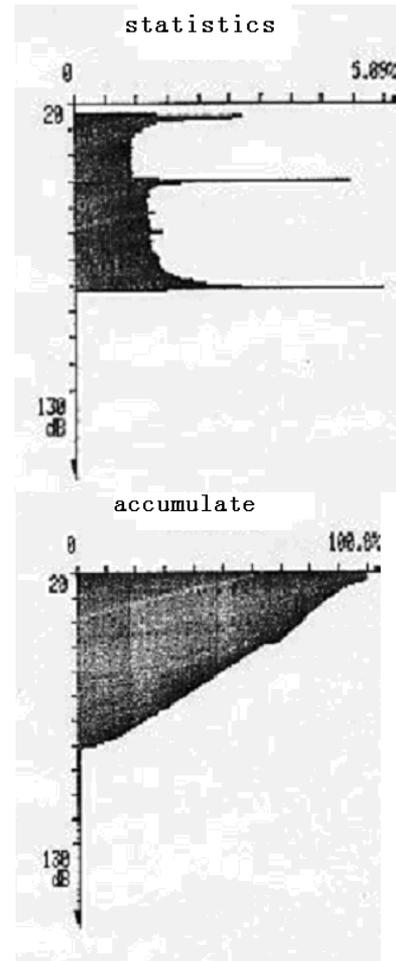
MYDATA00_aihua
2008-09-18 00:51:49
OCT01 Tm=00h00m10s
R:30dB-100dB
F0|( dB )    F0|(dB)
16Hz= 32.7 31.5= 29.3
63Hz= 30.1 125= 27.3
250= 26.9 500= 26.2
1kHz= 28.2 2kHz= 30.2
4kHz= 35.4 8kHz= 40.1
16k= 43.3 W-A= 42.9
W-C= 41.9 W-Z= 47.8
    
```

The above displays the equivalent sound pressure level of each center frequency. Then

press the Enter key to display the octave-band spectrogram. Press the Parameter key to display the maximum and minimum values.

### 8.7 Data print

The meter's measurement result can be printed out with AH40 mini-printer. Before the printing operation, AH40 mini-printer shall be connected to the meter, and its power supply shall be turned on with the connection indicator in On.



#### 8.7.1 Single-group printout of one measurement result

When the user sets the printing function to “Auto” in the setup interface, after the measurement, it can sent the measurement result to AH40 mini-printer and print it out.

The user can also press the Output key after the measurement to print out the measurement result. Go to the data recall menu, and select the group number to be printed. Press the Enter key to display the measurement result. Press the Output key to print out the currently displayed content.

The printing format is shown below. If the user sets the print mode to “Text” in the setup interface, the printed result has not statistic chart or cumulative chart.

```

05.004      0:MDATA39 01700
2007-09-25  11:14:23
Mode:STAT04  Ta=02h06m59s
R:20dB-130dB  WEIGHT:A F
Leq= 82.1dB  LCoq= 82.1dB
LZeq= 82.2dB  SEL =100.3dB
Lmax= 91.1dB  L5 = 98.4dB
L10 = 88.7dB  L50 = 68.4dB
L90 = 28.6dB  L95 = 25.3dB
Lmin= 23.3dB  SD = 21.4dB
    
```

#### 8.7.2 Multi-group printout of one measurement result

In the data recall menu, when the cursor is moved to the first group of data to be printed, press the Output key to print out the group where the cursor is located and its following groups.

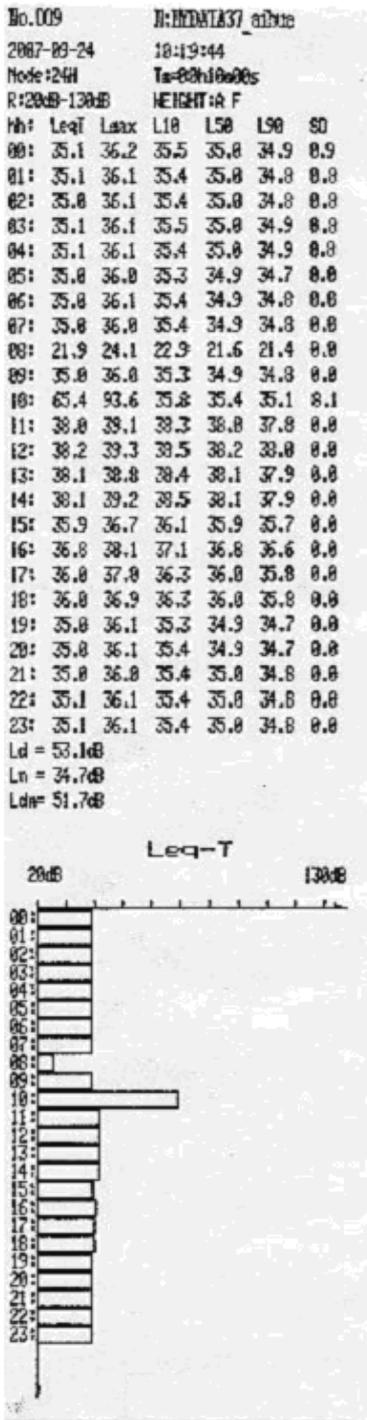
#### 8.7.3 24h measurement result printout

After the measurements in 24 periods, the meter can automatically print the measurement result into the 24h list result and Leq-T chart via AH40 printer.

After 24h automatic measurement, when the user presses the Output key, the meter prints the 24h list result and Leq-T chart via AH40 printer.

In the data recall menu, when the cursor is moved to any period of the 24h measurement result to be printed, press the Enter key to display Leq-T chart, and then press the Output key to print the 24h list result and Leq-T chart.

24h printing format is shown below:



### 8.7.4 Statistic and cumulative chart printout

When the user sets the printing mode to "Chart" in the setup interface, the statistic chart and cumulative chart will be printed out.

In the recall process, the user can recall the statistic chart or cumulative chart, and press the Output key to print out the chart.

### 8.8 Calibration

The meter has been calibrated before it leaves the factory. If the measurement standard requires or a long time passes, sound calibration shall be made before the measurement. For the sound calibration, Model AWA6221A sound level

calibrator or other equivalent sound level calibrator shall be used. The sound level calibrator's working frequency shall be 1000Hz±2%, and its harmonic distortion shall be lower than 3%. Pistonphone can also be used for the calibration. The meter can save 16 calibration records.

In the main menu, when the cursor is moved to calibration, by pressing the Enter key, the user can go to the calibration interface. For its display content, see 7.5.

#### 8.8.1 AWA6221A (or B) used for sound calibration

For the sound calibration for the first time, set the "calibrator's sound pressure level" according to the Certificate of Inspection of Model AWA6221A(or B) 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, move the cursor to the "Modify" button, and then press the "Enter" key; move the cursor to "5.", and then adjust the value to 94.2 by "Δ" and "▽"keys. Every time the user presses "Δ" or "▽"key, the value increases or decreases by 0.1dB. When the user presses and holds "Δ" or "▽" key, the value increase or decreases by 1dB. The adjustment continues till the key is released. When the cursor is moved to the "Modify" button, press the "Enter" key. The above steps can be performed only when the displayed sound pressure level differs from the used sound pressure level.

When Model AWA6221A sound level calibrator is covered on the microphone, turn on the power supply. After several seconds, move the cursor to the "Calibration" button, and then press the "Enter" key. The meter automatically starts calibration. The sound pressure level is displayed after "LC". This sound pressure level is approximately equal to the calibrator's sound pressure level minus free field correction. The sensitivity level is displayed after "Lpx". A number is displayed on the top right corner of the screen, which changes to 9 from 0 and then stops. When the cursor is moved to the "Use" button, if the user presses the "Enter" key, the new microphone sensitivity level is saved. If the newly calibrated sensitivity level differs from the last saved sensitivity level by over 3dB, the meter will prompt "As the sensitivity level difference exceeds 3dB, it can't be saved. Please check whether the calibration is correct.". The user shall check whether the microphone is damaged. If the user doesn't move the cursor to the "Use" and press the "Enter" key, the meter will still use the original microphone sensitivity level.

#### 8.8.2 Pistophone used for calibration

The pistophone's working frequency is 250Hz. In

this frequency, the free field correction of free field response microphone is 0, therefore the free field correction shall be changed to 0. Move the cursor to the “Modify” button, and then press the “Enter” key; move the cursor to “2.”, and then adjust the value to the target value by “Δ” and “▽” keys. Every time the user presses “Δ” or “▽” key, the value increases or decreases by 0.01dB. When the user presses and holds “Δ” or “▽” key, the value increase or decreases by 1dB. The adjustment continues till the key is released. Move the cursor to “5.”, and then adjust the value to the pistophone’s sound pressure level by “Δ” and “▽” keys. Every time the user presses “Δ” or “▽” key, the value increases or decreases by 0.1dB. When the user presses and holds “Δ” or “▽” key, the value increase or decreases by 1dB. The adjustment continues till the key is released when it reaches 124.00.

When the pistophone covered on the microphone, turn on the power supply. After several seconds, move the cursor to the “Calibration” button, and then press the “Enter” key. The meter automatically starts calibration. After the calibration, when the cursor is moved to the “Use” button, if the user presses the “Enter” key, the new microphone sensitivity level is saved.

#### 8.8.3 Directly input sensitivity level

If no calibrator is available, the user can also directly input the microphone’s sensitivity level. Move the cursor to the “Modify” button, and then press the “Enter” key; Move the cursor to “4.”, and then adjust the value to the target value by “Δ” and “▽” keys. Every time the user presses “Δ” or “▽” key, the value increases or decreases by 0.1dB. When the user presses and holds “Δ” or “▽” key, the value increase or decreases by 1dB. The adjustment continues till the key is released. When the cursor is moved to the “Use” button, if the user presses the “Enter” key, the new microphone sensitivity level is saved.

### 8.9 GPS positioning measurement

In the measurement menu, when the cursor is moved to the menu bar of the last line, change the first menu option to “Positioning”. The meter goes to the GPS positioning measurement interface. When the user sets GPS power to the “Save” mode in the setup interface, the meter prompts the user “Starting GPS module... please wait” before going to the GPS positioning interface. When GPS module can’t correctly receive the positioning signal within 20s, it exits from the GPS positioning measurement and returns to the noise measurement status. The GPS positioning information refreshes every one second. In the noise measurement process, it can switch to GPS positioning measurement interface, which doesn’t

affect the noise integral and statistic measurement. When the statistic analysis measurement result is saved, the positioning information of the last one second is also saved.

### 9 High capacity SD card function

When the user has high capacity SD card module, the meter has many auxiliary functions like high capacity storage, record, U disk and card reader etc. For the description below, the user needs to install high capacity SD card module and insert SD card.

#### 9.1 High capacity data storage

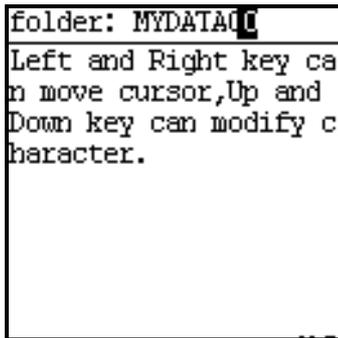
The meter makes file management on the SD card with FAT table. It supports FAT16/32 format. In the format process, it formats the SD card into FAT32 format. All files that store the measurement results are saved in the folder. The folder name can be set by the user. The measurement results are saved in files with an extension of “AWA”. The files are in standard text format. It is suggested that the user open them with Excel in the computer. For each measurement, the file name is generated by the meter automatically without repetition. Generally, the first three characters mean the content saved in the file, and the last four characters mean the sequence number of the measurement. One time of statistic analysis can synchronously generate 2-3 files. As long as the sequence numbers of the last four characters are the same, it means that they are the results of the same time of measurement.

Table 2 File names and content

File name	Content	Note
STAXXX.AWA	Statistic analysis result	XXXX is the sequence number in the current folder
NUMXXX.AWA	Sound level chart	XXXX is the sequence number in the current folder
L_TXXX.AWA	Sound level record with time	XXXX is the sequence number in the current folder
24hXXX.AWA	24h measurement result	XXXX is the sequence number in the current folder
HXXX_YY.AWA	Sound level chart in each time period of 24h measurement	XXXX is the sequence number in the current folder YY is the number of time period

### 9.1.1 Power-On Self Testing (POST)

When the user inserts the SD card and presses the Power On key, the meter shows its model and software version number, and promotes: "SD card is initializing. Find a SD CARD.". Then, the meter creates one folder with the first eight characters of the current group name in the SD card's root directory. If this folder has existed, the meter prompts: "The SD card has existed...Please input one folder again". Then, the meter goes to the project name (folder) input interface:



After the user inputs the project name and presses the Enter key, the meter prompts "The measurement results are saved in...folder". The meter creates one new folder in the SD card's root directory. In the measurement interface, in the working status display line of the first line displays the SD card icon. In the project name input interface, the user can also press the Exit key to save the measurement result in the original folder.

### 9.1.2 Data recall and printout

The meter makes file management with FAT table. All measurement results are saved in files that are placed in specified folder (project name). The folder is placed in the root directory. In the main menu, move the cursor to the Data menu, and press the Enter key:

```
A: \
-----
[D] MYDATA06
[D] MYDATA05
[D] MYDATA07    <--
[D] MYDATA02
[D] MYDATA00
```

[D] means this line is the folder name (project name).

"<--" means this folder is the folder where the measurement results are saved currently.

The Cursor key can make the cursor move among different folders. The Up and Down keys can make page up and down. The Delete key can delete all files in the folder and this folder. The

Start key can reformat the SD card. Before the format operation starts, the meter promotes the user to make confirmation. By pressing the Enter key, the user can go to the corresponding folder:

```
A:\MYDATA06
-----
[F] INDEX      .
[F] L_T       0 .AWA
[F] STA       0 .AWA
[F] NUM       0 .AWA
[F] 24H       1 .AWA
[F] H         1_01.AWA
[F] H         1_02.AWA
```

[F] means this line is file name. The first line displays the current folder. INDEX file is an index file of the measurement sequence number. Don't delete it.

The cursor key can make the cursor move among different folders. The Up and Down keys can make page up and down. The Delete key can delete the file where the cursor is located. The Enter key can display the content of the corresponding file. By pressing the Exit key, the user can return to the root directory.

When the file content is displayed, the user can make page up and down by pressing the Up and Down keys; move the window leftwards and rightwards by pressing the Left and Right keys; print out the file content with AH40 printer by pressing the Setup key; print out the measurement result according to the file's content by pressing the Output key (for the printing format, see 8.6); display 24h chart or statistic (accumulative) chart according to file's content by pressing the Enter key. For the operation in 24h chart or statistic (accumulative) chart, see 8.5.1 and 8.5.2.

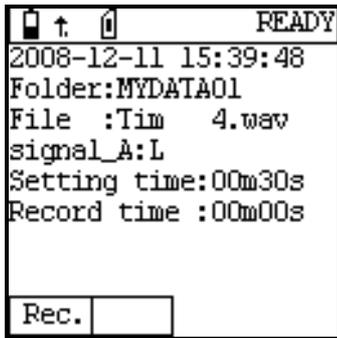
### 9.1.3 Data record

In the Setup menu, press the Setup key to go to the page 2 setup menu. The last line prompts "Record switch" and "Mode". For the functions of relevant options, see 7.3.2. The user only needs to set the record switch to "Open" to synchronously record the noise change with time during the statistic analysis. The recorded data has three options.  
10.

## 9.2 Record and replay

### 9.2.1 Record

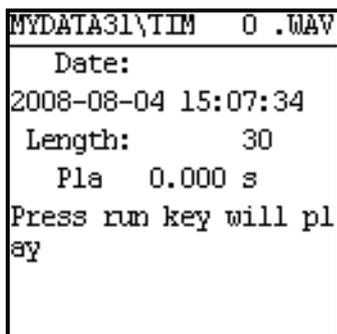
After the post-on self testing, the meter goes to the measurement interface. When the cursor is moved to "Measurement" in the menu bar, by pressing the Up and Down keys, the user can change it to "Record":



The second line is the current calendar clock. The third line displays the name of the directory (folder) where the current record file is located. The fourth line is the file name of the current record result. The meter saves the record result in WAV format. The cursor can move among “Record”, “Signal Amplitude”, “m” and “s”. The signal amplitude means the range of the signal to be recorded. If the amplitude of the signal to be recorded is small, this value is Small, otherwise Large. The record setting time can be set within 1s~1 hour. When 00m00s is set, the record time is 1 hour. After setting the signal amplitude and record setting time, press the Start key to start record. The meter prompts “Recording...please wait”, and displays the record duration. When it reaches the preset time, the record automatically stops.

### 9.2.2 Replay

Insert the earphone in AC output interface at the bottom of the meter. When the cursor is moved to Data menu, find the folder where the record file is saved and press the Enter key. Find the file where the record result is saved, and press the Enter key:



Press the Run key to play this record file.

### 9.3 U disk function

Turn on the meter's power supply, and go to the Data menu. Insert the USB cable's mini B end into the USB interface at the bottom of the meter, and insert its other end to the computer's USB interface. The computer prompts that a new hardware is found, and starts automatically installing the corresponding driver. Finally, it map the meter into one U disk.

By double-clicking this U disk drive icon, the user can see the folders and files saved in the meter.

The user can directly read the measurement result or copy them to other hard disks. The user can also copy other files to this U disk. Therefore, the meter functions as one U disk. When the meter is connected to the computer, its measurement function doesn't work. After exit from the Data menu, the meter will automatically shut down the USB interface. It is suggested that the user delete U disk on the computer before making other operations to the meter. When writing files to the meter from the computer, the meter's Data menu doesn't display the newly written file name immediately. The user must reset the meter before finding it on the meter. The user can directly open \*.AWA file saved in the meter with Excel, and can make the corresponding charts in Excel.

### 9.4 Other considerations

9.4.1 The meter manages the files in SD card using FAT table. When the files in SD card are much, read/write file's speed will drop. It is suggested to format SD card regularly.

9.4.2 As the FAT table system only supports 8.3 format file name, the files with long file name copied in by user through computer only displays part of file name during the meter recall.

9.4.3 The meter only supports primary sub-directory (folder). When the files copied in by the user through computer have multi-level directory, the meter can only display the most primary sub-directory.

9.4.4 SD card can be inserted as the meter starts. While, if the SD card is inserted after the power is on, the meter may not correctly identify SD card. Press the Reset for identification.

9.4.5 When the meter inserts computer and in U disk mode, it is suggested not to operate the files in SD card on the meter. In this case, don't delete the file or folder in SD card through the meter and don't format the SD card through the meter.

### 10. Measurement range and self-generated noise correction

This meter's measurement range is subject to the sensitivity of the microphone. When its sensitivity is high, the upper limit and lower limit of measurement are low. When its sensitivity is low, the upper limit and lower limit of measurement are high. The measurement upper limit and lower limit can be displayed under “Calibration” menu, and the display result does not reserve the value after decimal point. The meter's measurement upper limit can be estimated by the following formula:

Measurement upper limit=94 - microphone sensitivity level (dB)

The measurement upper limit means the maximum A weighted sound level measured at 1 kHz frequency. In this case, the overload indicator

starts to be lighted. The sound level linearity error is lower than the requirements of IEC61672. When the signal is not 1kHz, it's A sound level and C sound level's measurement upper limit will drop. The dropped sound pressure levels comparing with 1kHz are shown as the table 3.

Table 3 Drop value of A sound level measurement upper limit at different frequencies

Frequency (Hz)	16	31.5	63	125	250
Drop (dB)	57	40	26	16	9
Frequency (Hz)	500	2k	4k	8k	16k
Drop (dB)	3	0	0	1	7

$$\text{Microphone sensitivity level} = 20 \log \frac{S_M}{1000} \quad (\text{dB})$$

$S_M$ ---microphone sensitivity in mV/Pa, When the microphone sensitivity is 50mV/Pa, its sensitivity level is -26dB (generally, the microphone sensitivity level is negative number).

After the microphone sensitivity is determined the meter's measurement lower limit is mainly determined by the meter's self-generated noise. The self-generated noise refers to the sound pressure level displayed on the meter when the meter is placed in a low-level sound field that dose not add significantly to the self-generated noise. Self-generated noise consists of two parts: microphone's thermal noise and the meter's self electrical noise. Generally, microphone's thermal noise level is set as 15dBA-20dBA. This meter's electrical noise A weighted is lower than 4.5μV, C weighted is lower than 8μV and Z weighted is lower than 15μV when matching with model AWA14601 preamplifier. If the microphone with 50mV/Pa sensitivity is selected, the corresponding electrical noise level is 13dBA, 18dBC and 23dB(Z). If the microphone with 16mV/Pa sensitivity, the corresponding electrical noise level is 23dBA, 28dBC and 33dB(Z).

Due to the existing self-generated noise may affect lower sound pressure level, so when the measured sound pressure level is over 13dB higher than self-generated noise, the effect is little that is ignorable. Under setup the menu, the self-generated noise correction can be set up. If it is selected, A weighted measurement result will be automatically corrected as per the following formula:

$$L_{Aa} = 10 \log (10^{0.1L_{Am}} - 10^{0.1L_{Ab}})$$

where

$L_{Aa}$  is Actual A sound level

$L_{Am}$  is Measured A sound level

$L_{Ab}$  is A weighted self noise

Note: when  $L_{Am} - L_{Ab} < 3$ , calculate as per the  $L_{Aa} = L_{Am} - 3$ .

When the user measures lower sound pressure level, the effect of the meter's self-generated noise shall be considered. There adds 7 dB on the Self-generated noise as measurement lower limit for 1 level meter, and adds 5 dB on the Self-generated noise as measurement lower limit for 2 level the meter.

Table 4 The total measuring range matching with different microphones

Microphone sensitivity level	Microphone thermal noise	Self-generated noise	Measurement upper limit	measurement lower limit	Corrected measurement lower limit
-26dB	17dBA	18dB A	120dB	25dBA	22dBA
-36dB	20dBA	23dB A	130dB	30dBA	27dBA
-46dB	20dBA	33dB A	140dB	40dBA	37dBA

Note 1: The above microphone sensitivity level contains preamplifier's attenuation.

Note 2: C weighted measurement lower limit: A weighted measurement lower limit adds 5dB, and Z weighted measurement lower limit: A weighted measurement lower limit adds 10dB.

Table 5 Octave-band self-generated electrical noise level

(When the microphone sensitivity level is -26dB)

Frequency (Hz)	16	31.5	63	125	250	500
noise level (dB)	5	6	12	8	7	6
frequency (Hz)	1k	2k	4k	8k	16k	
noise level (dB)	4	5	7	10	13	

## 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 statistic 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. 1/3 OCT analysis software

1/3 OCT analysis software is optional and the following chapter make sense only after you purchase it.

## 12.1 Specifications

Filter type: parallel (real time) OCT, G=2  
 Standard fulfilled: IEC61260 class 1  
 Filter center frequency: 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 (12.5Hz, 16Hz, 20Hz, 12.5kHz, 16kHz are not applied to class 2).  
 Exp. average time constant: about 125ms  
 Real time analysis speed: 47 times per second  
 Level linearity range: above 70dB  
 Main measuring index: instant sound level of band (L<sub>fmi</sub>), 1 second equivalent sound level of band (L<sub>fmeq,1s</sub>), equivalent continuous sound level of band (L<sub>fmeq,T</sub>), maximal and minimal sound level of band.

### 12.2.1 1/3 OCT analysis interface

Only after the 1/3 OCT analysis software is purchased can enter into the 1/3 OCT analysis measuring interface. Under the noise measuring interface, move the cursor to one on the menu bar, press ▼ key then turn to 1/3 OCT analysis function, there are three showing interfaces: List, Big, Graph, please see below:

#### 12.3.1 1/3 OCT analysis list interface

F 30 Ready			
Ts=00h01m00s Rang: H			
12.5=	25.9	16Hz=	28.8
20Hz=	27.5	25Hz=	37.9
31.5=	26.9	40Hz=	25.5
50Hz=	34.6	63Hz=	28.8
80Hz=	25.9	100=	31.0
125=	23.0	160=	28.1
Page: 0		Weight: Z	
Noise	1/3	List	Lp

The first line is status line, the second line is to set the integrating time and measuring range, the middle line is 12 center frequency sound level. Page 0 means what showed is the first page, Weight Z means the current frequency weighting is Z weighting, the last line is the menu bar. The 12 center frequency sound level will refresh every second, and fluctuate as the environmental noise. Move the cursor to Ts, press the ▼ key can see T<sub>m</sub>, N<sub>m</sub>. Move the cursor to Range, press the ▼ key can change the measuring range. Move the cursor to Weight, press the ▼ key can change the weighting to A or C, that's means there will be A or C weighting before the frequency analysis for

the signal. Move the cursor to L<sub>p</sub>, press the ▼ key can change to L<sub>eq</sub>, L<sub>max</sub> and L<sub>min</sub>, L<sub>eq</sub> means the integrating average result of a period, all results will be 0 if not integrating measured. L<sub>max</sub> means the maximal exponential average value during the measuring time. L<sub>min</sub> means the minimal exponential average value during the measuring time. Move the cursor to the List, press the ▼ key can enter into the Big interface.

F 30 Ready			
Ts=00h01m00s Rang: H			
12.5=	25.9	16Hz=	28.8
20Hz=	27.5	25Hz=	37.9
31.5=	26.9	40Hz=	25.5
50Hz=	34.6	63Hz=	28.8
80Hz=	25.9	100=	31.0
125=	23.0	160=	28.1
Page: 1		Weight: Z	
Noise	1/3	List	Lp

F 30 Ready			
Ts=00h01m00s Rang: H			
12.5=	25.9	16Hz=	28.8
20Hz=	27.5	25Hz=	37.9
31.5=	26.9	40Hz=	25.5
50Hz=	34.6	63Hz=	28.8
80Hz=	25.9	100=	31.0
125=	23.0	160=	28.1
Page: 2		Weight: Z	
Noise	1/3	List	Lp

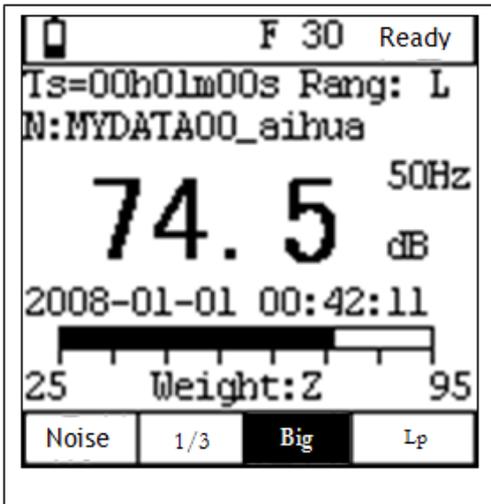
W<sub>U</sub> means user-defined frequency weighting result; the user-defined frequency weighting can be modified on the 3rd page of set menu.

$$W_U = 10 \log[\sum_{10} (L_{fm} + W_{fm}) / 10] \quad (\text{dB})$$

Where

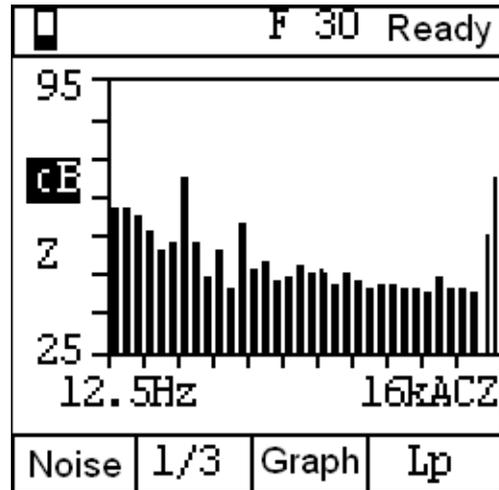
L<sub>fm</sub> is the sound level of each center frequency  
 W<sub>fm</sub> is the weighting of each center frequency

### 12.2.2 Bigger letters interface



The first line is the status line, the second line is the set integrating time and measuring range, the third line is group name (measuring name), the bigger letters in the middle is each center frequency and A,C and Z frequency weighting sound level, users can select any of them, behind the bigger letters is the index name, under the bigger letters is the calendar time and dynamic bar chart. Weight means the frequency weightings added before the frequency analysis. The last line is the menu bar. The data refresh every second, the bar chart refresh every 0.1 second. Move the cursor to Range, press the ▼ key can change the measuring range. Move the cursor to Lp, press the ▼ keys can change to Leq, Lmax, Lmin, showing the integrating average result, maximal value and minimal value. All will results will be 0 if not integrating measured. Move the cursor to the index name; press the ▼ key can turn to see other measuring indexes on this page. Move the cursor to the index name under the bar chart; press the ▼ key can see the instantaneous sound level dynamic bar chart of other frequency weighting and time weighting. Move the cursor to Big, press the ▼ key can enter into the Graph interface.

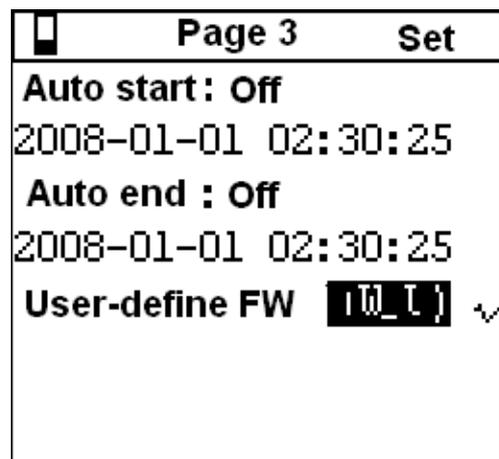
### 12.2.3 Graph interface



The first line is the status line, the middle line is the sound level frequency chart of 11 center frequencies and A,C and Z frequency weighting. The last line is the menu bar. Move the cursor to the dB of the left side of y-axis; press the ▼ key can change the measuring range. Move the cursor to the Z of the left side of the y-axis, press the ▼ key can change the frequency weighting to A or C before the frequency analysis. Move the cursor to Lp, press the ▼ key can change to Leq, showing the integrating average result of a period. Move the cursor to Graph, press the ▼ key can enter into the List interface.

### 12.3 User-defined frequency weighting setting

After the user enter into the 1/3OCT analysis interface, press the set key into the set interface , press the set key twice, shown as below:



Move the cursor to (W\_U), press enter key, can enter into the user-define frequency weighting interface. Shown as below:

12.5=-INF.	16Hz=-INF.
20Hz=-50.5	25Hz=-44.7
31.5=-39.4	40Hz=-34.6
50Hz=-30.2	63Hz=-26.2
80Hz=-22.5	100=-19.1
125=-16.1	160=-13.4
200=-10.9	250=-INF.
315=-INF.	400=-1NF.
500=-INF.	1kHz=-1NF.
1k25=-INF.	1k6=-1NF.
2kHz=-INF.	2k5=-1NF.
3k15=-INF.	4kHz=-1NF.
5kHz=-INF.	6k3=-1NF.
8kHz=-INF.	10k=-1NF.
12k5=-INF.	16k=-1NF.

The content shown above is the default value of the instrument, when the weighting is negative means attenuation, when the weighting is positive means magnification. -INF means attenuation is infinite. Press the parameter keys can change the weighting under the frequency marked by the cursor, press the parameter for a time can speed up the modulation speed of the weighting. Press delete can make all the center frequency weighting to be 0. Press the C key will turn to set interface without saving the result. Press enter key will save the result can turn back to the set interface. Press the delete key under the set interface can call in the default weighting of the instrument.

## Annex 1:

### Packing list (standard configuration)

Name and Model	Qty	Remark
Main meter (including microphone and preamplifier)	1	
S 60 windscreen	1	
Aluminum case	1	
RS232 transmission cable	1	
5V external power supply	1	
AA alkaline battery	4	
CD	1	
Operating Instructions	2	
Certificate of Compliance	1	
Report of test	1	
License of Imbedded Software	1	

### Optional modules and accessories

Name and Model	Qty	Remark
High capacity SD card module	1	Installed inside the meter, with 1GB SD card
GPS module	1	Installed inside the meter, with external antenna
AH40 mini-printer	1	Print measurement result on site, including 5V external power supply
GSM wireless data transmission / solar battery module	1	The measurement result is sent to the specified mobile phone via SMS/including 4500mAh Li battery, charged by solar or external 5V power supply.
AWA6221B sound level calibrator	1	Make acoustic calibration on sound level meter class 2
AWA6221A sound level calibrator	1	Make acoustic calibration on sound level meter class 1
Tripod	1	For fixing the meter
Extension cable (5m, 10m, 20m)	1	Extension microphone and preamplifier
Earphone	1	For monitoring and replay monitoring

## 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 imbedded 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.

AWA6228 GPS positioning measurement is 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=30.278605,120.123096&spn=0.003178,0.00486&om=1>

In the "&ll=30.278605, 120.123096&", the 30.278605 is latitude and 120.123096 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  $\pm 3.6$ 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.

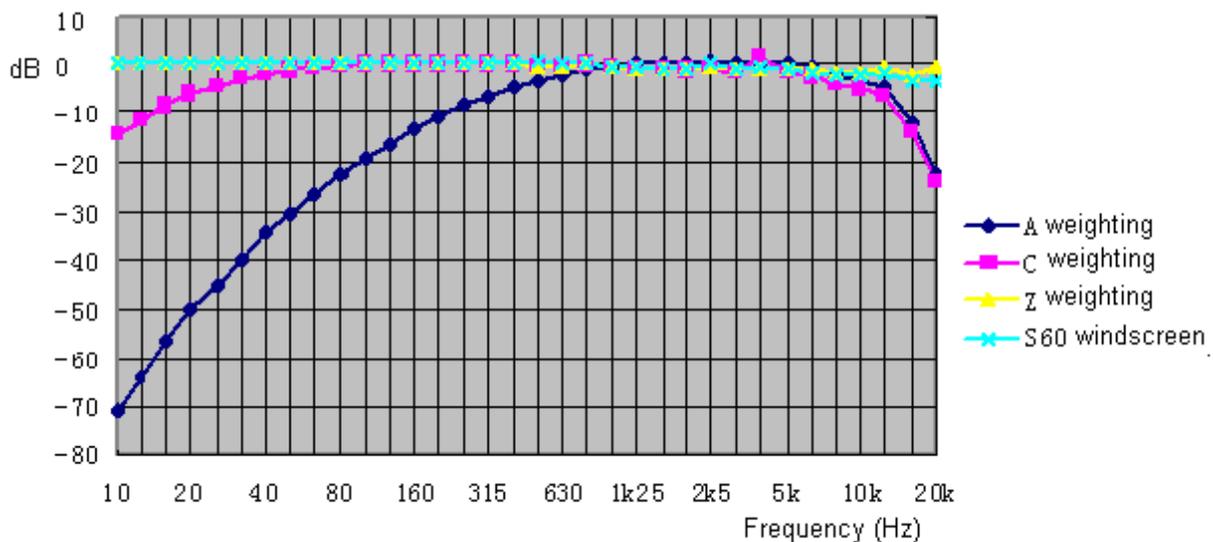
### Annex 3 Directional response

When Model AWA6228 multi-function sound level meter matches with Model AWA14601 preamplifier , it has the following directional response.

Frequency (Hz)	Maximum absolute difference in displayed sound levels at any two sound-incidence angles within $\pm\theta^\circ$ degrees from the referenced direction (dB)												
	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°	0°
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	0.6	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	0.6	0.3
1000	0.1	0.1	0	0.2	0.2	0.3	0	0.4	0.8	1.3	1.1	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	1.8	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	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	2.8	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	3.2	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	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	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	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	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	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	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	9.0	8.5
16000	0.1	0	0.8	2.3	3.3	5.1	8.8	10.0	7.0	10.0	8.7	8.7	14.3
20000	0.4	0.2	1.0	3.2	5.0	8.4	9.6	11.1	13.4	12.8	13	13	17.3

### Annex 4 Free field response

When Model AWA6228 multifunction sound level meter matches with Model AWA14601 preamplifier, it has the following free field response characteristics.

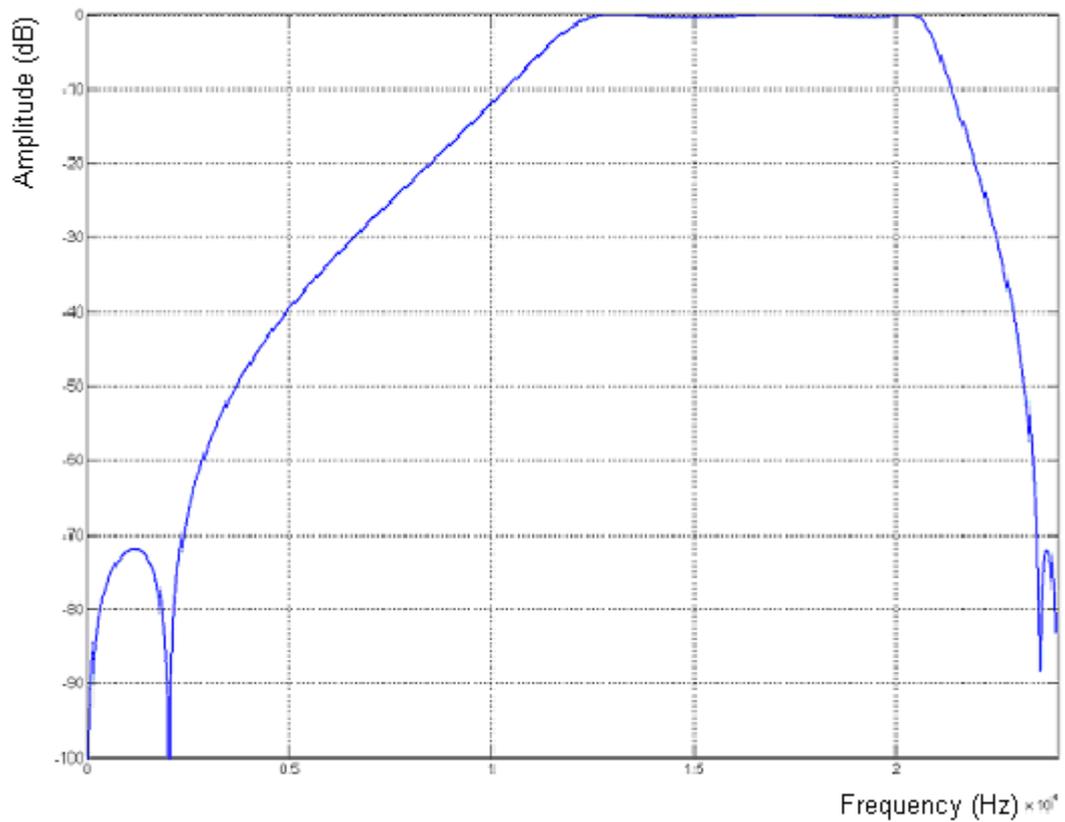


Free-field response of Model AWA6228

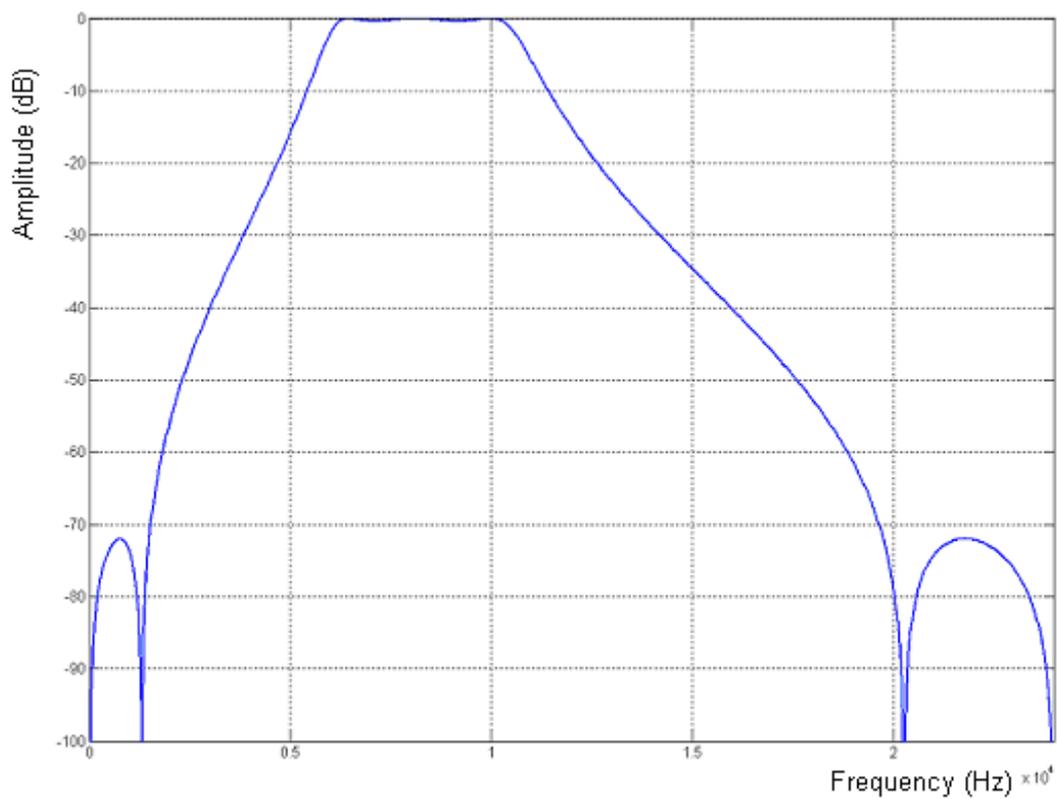
## Annex 5 Influence of extension cable

Frequency Hz	Model AWA14601 Preamplifier							Model AWA14602 Preamplifier						
	5m	10m	15m	20m	30m	40m	50m	5m	10m	15m	20m	30m	40m	50m
500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
630	0	0	0	0	0	0	0	0	0	0	0	0	0	0
800	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1250	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1600	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3150	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4000	0	0	0	0	0	0	-2	0	0	0	0	0	0	0
5000	0	0	0	0	0	-2	-3	0	0	0	0	0	0	0
6300	0	0	0	0	-2	-3	-5	0	0	0	0	0	0	-1
8000	0	0	0	-1	-4	-5	-7	0	0	0	0	0	-1	-4
10000	0	0	0	-3	-5	-7	-9	0	0	0	0	-1	-3	----
12500	0	0	-2	-4	-7	-9	-11	0	0	0	-1	-3	---	----
16000	0	-1	-4	-6	-10	-11	-14	0	0	-1	-6	----	---	----
20000	0	-2	-6	-8	-12	-13	-16	0	0	-4	-----	----	----	----
Note:	The data in the table are the D-values between the highest sound pressure level and the meter measurement upper limit of different lengths of extension cables when the error is lower than 0.7dB.							The data in the table are the D-values between the highest sound pressure level and the meter measurement upper limit of different lengths of extension cables when the error is lower than 1dB.						

## Annex 6 Filter attenuation characteristics



Relative attenuation of octave band pass filter at 16 kHz center frequency



Relative attenuation of octave band pass filter at 8kHz center frequency