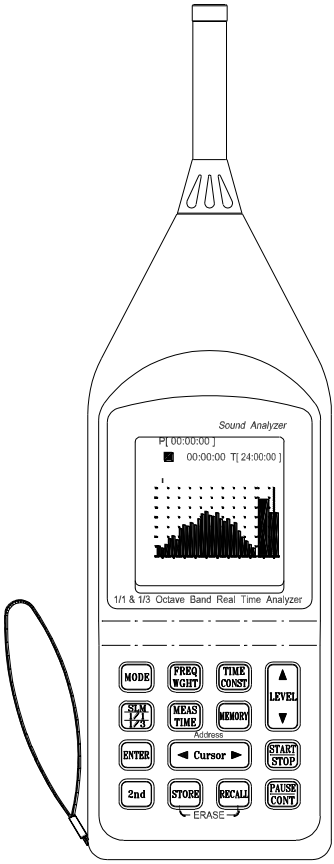
Sound Analyzer

Real Time 1/1 & 1/3 Octave band Analysis

TES-1358

INSTRUCTION MANUAL



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Ⅰ. SAFETY INFORMATION

- ❑ Read the following safety information carefully before attempting to operate or service the meter.
- ❑ Use the meter only as specified in this manual; otherwise, the protection provided by the meter may be impaired.
- ❑ Environment conditions
  - ① Altitude up to 2000 meters
  - ② Relative humidity 90% max.
  - ③ Operation Ambient 0 ～40℃
- ❑ Maintenance & Clearing
  - ① Repairs or servicing not covered in this manual should only be performed by qualified personnel.
  - ② Periodically wipe the case with a dry cloth. Do not use abrasives or solvents on this instrument.
- ❑ Safety symbols

CE Comply with EMC

II. GENERAL & FEATURES

The sound analyzer meter allows digital 1/1-octave and 1/3-octave analysis in real time.

- Five measured parameters SPL (Sound Pressure Level), Leq (Equivalent Continuous Sound Pressure Level), L_E (Sound Exposure Level), Lmax (Maximum Sound Pressure Level), Lmin (Minimum Sound Pressure Level)
- RS-232 interface with PC.
- Data Logger function.
- Real time clock with calendar.
- Both AC and DC signals output is available for level recorder, graphic recorder.
- Auto-Ranging for SPL function.

III. SPECIFICATIONS

- Standard applied : IEC 60651 type2, 60804 type 2, ANSI S1.4 type2, IEC 1260 (1995).

- Display : Backlit LCD, 160×160 dots.
  Sound level meter mode
  Numeric display : 4 digits, update rate 0.5S, resolution 0.1 dB.
  Bar graph display :100dB range, update rate 0.125S, resolution 1dB.
  Frequency analysis mode
  Numeric display : 4 digits, update rate 0.5S, resolution 0.1dB.
  Bar graph display : 70dB range, update rate 0.125S, resolution 1 dB.

- Accuracy : ±1.5dB (ref 94dB @1kHz)
- Measurement Frequency range : 25Hz – 10KHz
- Dynamic range : 100dB (Sound level meter mode)
  70dB (Frequency analysis mode)
- Measurement range : 30dB – 130dB
- Sound Pressure Level range:
  Sound level meter mode (display range 100dB) :
  30 – 130dB

  Frequency analysis mode (display range 70dB) :
  20–90dB, 30–100dB, 40–110dB, 50–120dB, 60–130dB
- Frequency weighting : A, C, P (Flat)
- Time weighting : Fast, Slow
- Microphone : 1/2 inch electret condenser microphone.
- Display warning indicator :
  OVER indicator (Input signal over the upper limit)
  UNDER indicator (Input signal under the lower limit)
- Warm-up time : Less than 20min
- Memory capacity : Manual store block and auto store block (separate).

Store mode / Mode	Manual	Auto
Sound level meter	1024 data sets	10000 data sets
1/1-octave analysis	1024 data sets	6140 data sets
1/3-octave analysis	1024 data sets	3070 data sets

- AC output : 2 Vrms at FS (full scale).
  output impedance approx. 600Ω.

- DC output : 10mV/dB.
  output impedance approx. 100Ω.

- Power : 4 pcs of C size 1.5V (LR14) alkaline batteries.
  External DC power supply : 6 Vdc, 1A.

- Battery life : Approx. 2hours

- Operating Temperature/Humidity : 0℃ to +40℃,10 to 90%RH.

- Storage Temperature/Humidity : -10℃ to +60℃,10 to 75%RH.
  (battery removal)

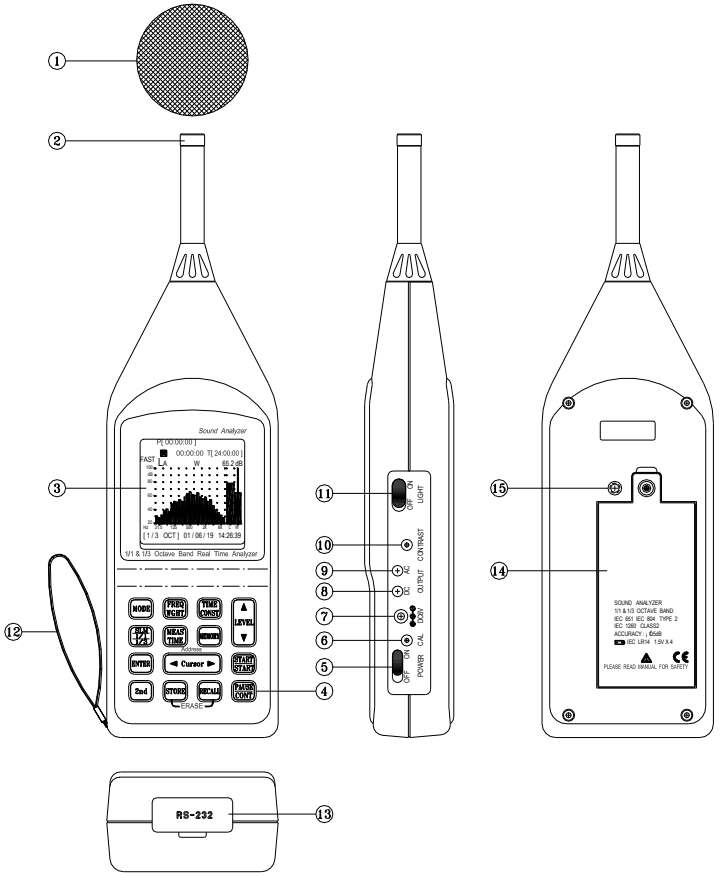
- Dimensions & Weight : 34.5(H) × 10(W) × 6(D) cm
  Approx.950g (including batteries).

- Accessories : Instruction manual, Alkaline battery × 4, Hard carry case, CD-ROM, RS-232 cable, (9 pin to 25 pin gender changer), Adjustment screw driver, Windscreen, 3.5ϕ plug, AC adaptor.

- Optional accessories : Microphone extension cable (5m or 10m), Sound level calibrator, Tripod.

Ⅳ. CONTROLS AND FUNCTIONS

4-1 Parts description

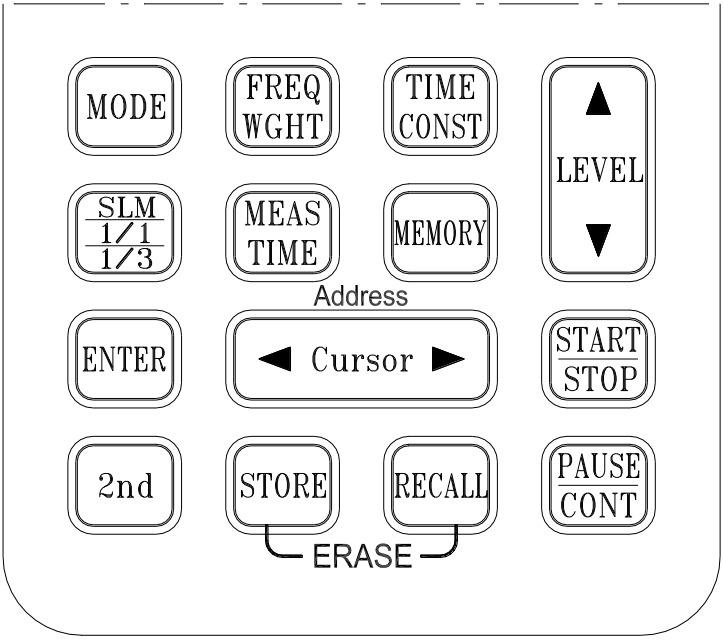


1. Windscreen
   If you operate at wind speed over 10m/sec. Please put windscreen in front of the microphone.

2. Microphone
   The microphone assembly can be removed from the sound level meter and connected via an optional extension cable, for measurements a distance.

3. Display
   The backlit liquid crystal display has a resolution of 160×160 dots.
4. Operation keys
5. Power switch
   This sliding switch serves to turn the unit on and off.
6. Calibration adjust knob
   Serves to carry out calibration, using the supplied adjustment screwdriver.
7. DC 6V jack
   The AC adaptor can be plug here for powering the unit from an AC outlet for long term measurements.
8. DC output jack
   A DC signal corresponding to the sound pressure level is available at this output.
9. AC output jack
   A AC signal corresponding to the sound pressure is available at this output.
10. LCD contrast adjust knob
    Serves to adjust the display contrast. Use the supplied adjustment screwdriver for the adjustment.
11. LCD backlight switch
    Serves to turn the display backlight on and off.
12. Hand strap
    The strap should be used to safely carry the unit during field work.
13. RS-232 interface connector
    Serves for input and output of control signals and measurement data. A computer can be connected here.
14. Battery compartment
    The unit uses four batteries.
15. Tripod mounting screw
    For long term measurements, the unit can be mounted on the tripod.

4-2 Operation keys



a.) [MODE] key
Serves to call up the various processing results on the display.

For display items are sound pressure level (L), equivalent continuous sound pressure level (Leq), Sound exposure level (L_E), maximum sound pressure level (Lmax), and minimum sound pressure level (Lmin).

b.) [FREQ WGHT] key
Selects the frequency weighting characteristic. Available settings are “A” weighting (A), “C” weighting (C), and flat frequency response (P).

c.) [TIME CONST] key
Selects the time weighting. Available settings are “FAST” and “SLOW”.

d.) [▲LEVEL▼]
Serves to select the sound pressure level ranges on 1/1 and 1/3 octave band frequency analysis mode. (20~90dB, 30~100dB, 40~110dB, 50~120dB and 60~130dB, total 5 ranges)

e.) [SLM/ 1/1/ 1/3] key
This key switches the operation mode between sound level meter (SLM), 1/1-octave frequency analysis (1/1), and 1/3-octave frequency analysis (1/3).

f.) [MEAS TIME] key
① Sets the Leq, L_E, Lmax and Lmin measurement time : 24h→1s→3s→10s→30s→1m→5m→8m→10m→15m→ 30m→1h→8h

② [2nd] + [MEAS TIME] : Enter to setting the date and time mode.

g.) [MEMORY] key
① Enter to memory mode.

② [2nd] + [MEMORY] : Enter to data record interval time setting : 0 (no record) →1s →3s→10s →30s→1m→5m→8m→10m→15m→ 30m→1h→62.5ms

h.) [ENTER] key
Store the new date and time, the time clock is start.

i.) [◀ Cursor ▶] key
① Serve to move the octave frequency band marker during frequency analysis.

② 2nd+ [◀ Cursor ▶] : In recall mode to select the memory address in which to store the measurement data.

j.) [START/STOP] key
Press to start and to terminate the Leq, L_E, Lmax and Lmin

sound pressure level measurement.

k.) PAUSE/CONT key

Server to the measurement temporarily pause (⏸ display) or resume (▶ display).

l.) 2nd key

Press to shift key to second function.

m.) STORE key

In manual memory mode, store the measured data into the memory.

n.) RECALL key

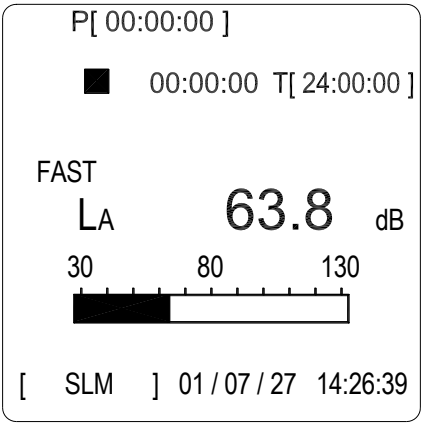
In manual memory mode, recall the stored memory data.

o.) STORE + RECALL key (Erase memory data)

Turn off the meter, press and hold down STORE and RECALL two keys, then turn on the meter, until the LCD display “ALL memory are erased”.

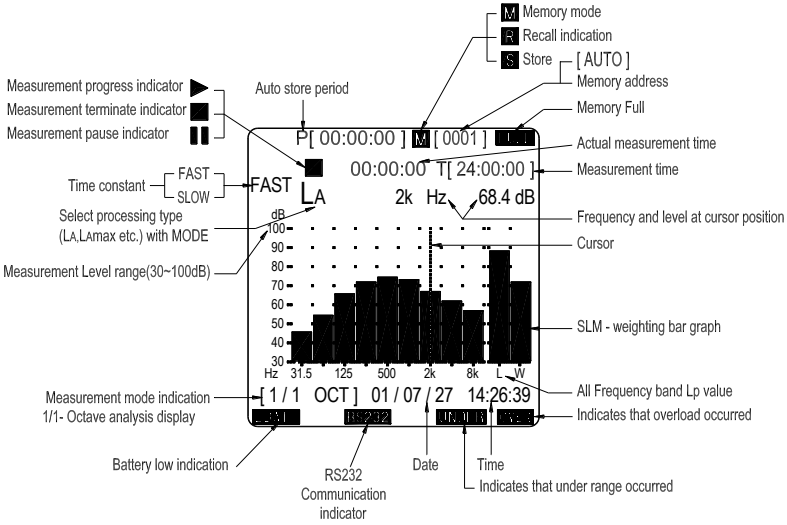
4-3 Measurement screen

1. Sound pressure level measurement screen



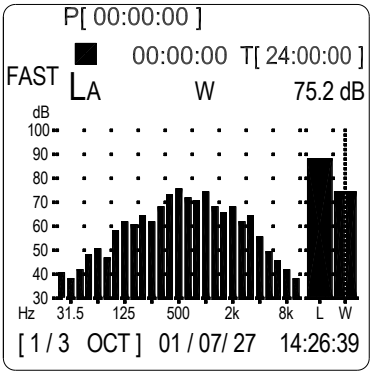
2. 1/1-octave analysis screen

The staircase shape on the display represents the 1/1-octave analysis result. From left, the bars correspond to 31.5, 63, 125, 250, 500, 1k, 2k, 4k, 8kHz. To read the levels at these frequencies, use the ◀ Cursor ▶ key to move the cursor to the desired point. The frequency and level are then shown on the upper of the screen.



3. 1/3-octave analysis screen

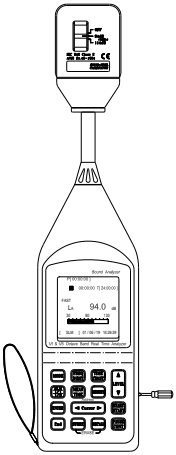
The staircase shape on the display represents the 1/3-octave analysis result. From left, the bars correspond to 25, 31.5, 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1k, 1.25k, 1.6k, 2k, 2.5k, 3.15k, 4k, 5k, 6.3k, 8k, 10kHz. To read the levels at these frequencies, use the ◂ Cursor ▸ key to move the cursor to the desired point. The frequency and level are then shown on the upper of the screen.



Ⅴ. CALIBRATION PROCEDURES

Using a standard acoustic calibrator such as the TES-1356.

1. Make the following switch settings.
   Display : SLM (L_A)
   Time weighting : FAST
2. Insert the microphone housing carefully into the insertion hole of the calibrator.
3. Turn on the switch of calibrator and adjust the CAL potentiometer of the unit so that the display indicates the desired level.
   Our products are all well calibrated before shipment.
   Recommended recalibration cycle : 1 year.



Caution : Ambient sources of noise or vibration can cause a false calibration.

VI. MEASUREMENT PREPARATION

1. Battery loading
   Remove the battery cover on the back and put in four 1.5V C size battery.

   Note : Take care to observe battery polarity.

2. Battery replacement
   When the battery voltage drops below the operation voltage. LBATT appears and flashes in the display. If it appears the batteries should be replaced with new batteries.

3. AC adaptor connection
   When the AC adaptor is used, insert the plugs of the adaptor into the DC 6V jack on the side panel.

VII. SETTING THE DATE AND TIME

Date and time information is stored with each record you save. Therefore, it is important to make sure this information is correct. Set the date and time as described below :

1. Press [2nd] key one time then press [MEAS TIME] key, enter to setting the date and time mode.
   The display screen in second location will be flicker.
2. Press [▲LEVEL▼] key to set the numbers increase or decrease.
3. Press [◀ Cursor ▶] key, move flicker number location to year/month/day/hour/minute/second setting location.
4. Press [▲LEVEL▼] key to set the number.
5. When the setting is correct, press [ENTER] key to exit this mode and the time clock is start.

   Note : When no change the date and time or no press [ENTER] key about one minute, will leave setting the date and time mode, the original setting date and time is no changed.

Ⅷ. SOUND PRESSURE LEVEL MEASUREMENT

8-1 Technical notes

1. The decibel (dB)
   The range over which the human ear responds to sound pressure (noise) is extremely large ; 20μPa (the threshold of hearing) to 100 Pa (the threshold of pain). The measurement of sound pressure is made manageable by use of the decibel, which is logarithmic. This is good for ease of reference, however it means that decibels are not linear and so can not be added together. A simple rule is that doubling the noise causes the level to rise by 3dB.

2. SLM-sound level meter
   Instantaneous sound pressure level (SPL) is used for spot checks to establish instantaneous noise levels that might be of concern and is defined by the logarithmic equation :

   $$\text{SPL (in dB)} : 20 \log_{10} \frac{P}{P_0}$$

   Where P = rms measured sound pressure level
   P_0 = rms reference sound pressure level (deemed to be 20μ Pa)

3. Leq-level equivalent (continuous)
   Leq is used to assess the rms average noise level over a preset period of time, often the starting point of a noise assessment.
   To make an Leq measurement the period of time over which it is to be made be selected. The longer the period of measurement, the more accurate the Leq reading, a typical period used is 8 hours (the length of a working day).

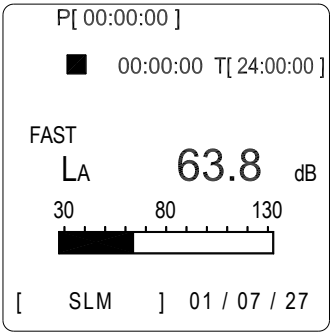
4. L_E – Sound exposure level
   L_E measurements are almost identical to Leq measurements but normalised or compressed in to 1 second. This allows the total sound energy of an event, such as train passing a

platform, to be evaluated. Another event, such as the next train, which lasts for a different amount of time can be measured in the same way. The two readings can be compared to assess how much total noise the passengers standing at the platform were exposed to by each train. To make an L_E measurement either a preset time period must be selected on the instrument, or the PAUST/CONT key must be used to stop and start measurement of a specific event.

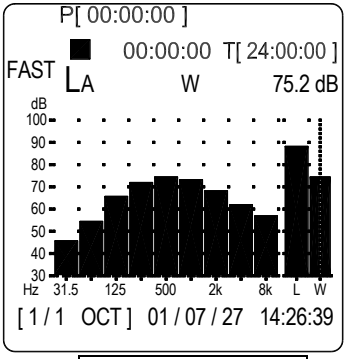
8-2 Instantaneous sound pressure level measurement (L_A, L_C, L_P)

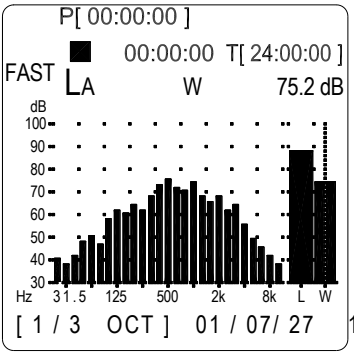
To perform a measurement, carry out the following steps.

1. Set the power switch to ON and wait until the measurement screen appears.



2. Press the SLM/ 1/1/ 1/3 key to select desired SLM, 1/1 or 1/3 octave band sound pressure level measurement screen.

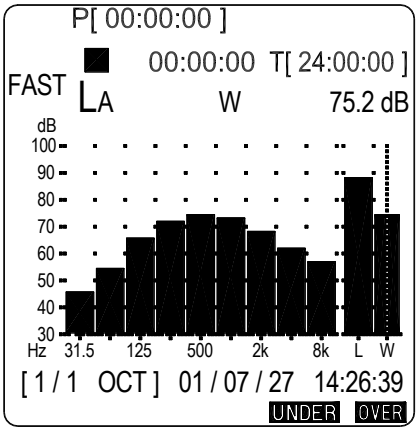




3. Use the FREQ WGHT key to select the desired L_A , L_C or L_P frequency weighting setting.

4. Use the TIME CONST key to select the desired FAST or SLOW time constant setting. Normally, the “FAST” setting should be used.

5. Use the ▲LEVEL▼ key to select the level range . Choose a setting in which the “OVER” and “UNDER” indications do not appear. In SLM mode, the dynamic range is 30~130dB, so the ▲LEVEL▼ key is not activate.



8-3 L_{eq} and L_E measurement

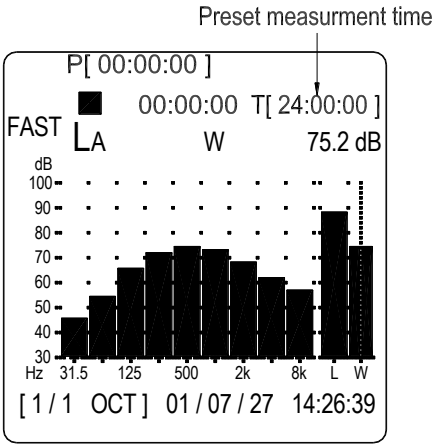
To perform a measurement, carry out the following steps.

1. Set the power switch to ON and wait until the measurement screen appears.
2. Press the MEAS TIME key, setting the preset measurement time for a fixed time period (know as the integral time), after which measurement automatically stops.

There are 13 preset time settings available :

- 1s
- 3s
- 10s
- 30s
- 1min
- 5min
- 8min
- 10min
- 15min
- 30min
- 1h
- 8h
- 24h

Note : The setting will wrap around from 24h to 1s.



3. Use the [SLM/ 1/1/ 1/3] key to select desired SLM, 1/1 or 1/3 octave band sound pressure level measurement screen.

4. Use the [FREQ WGHT] key to select the desired L_A, L_C or L_P frequency weighting setting.

5. Use the [TIME CONST] key to select the desired FAST or SLOW time constant setting. Normally, the “FAST” setting should be used.

6. Use the [▲LEVEL▼] key to select the level range. Choose a setting in which the “OVER” and “UNDER” indications do not appear. In SLM mode, the dynamic range is 30~130dB, so the [▲LEVEL▼] key is not activate.

7. Press the [START/STOP] key. The “ ▶ ” mark on the display and the equivalent continuous sound pressure level measurement begins.

8. At the any measurement conditions “ ▶ measuring”, “▌▌ pause” or “■ terminate”. Can be use [MODE] key to select view the any other parameter L, Leq, L_E, Lmax or Lmin measure value.

9. When the measurement time set in step 2 has elapsed, the measurement terminate automatically.

10. When wish to terminate the measurement earlier, press the [PAUSE/CONT] key to paused measuring, the “ ▌▌ ” mark will appear on the display. Press [PAUSE/CONT] key again will resume measuring.

11. Press the [START/STOP] key to stop measuring, the “■” mark will appear on the display.

12. Press the [MODE] key to display the L_{Aeq} , L_{AE} or other parameter value.

Note : In this measurement, can not change frequency weighting, time weighting and SLM/ 1/1/ 1/3 mode.

IX. MEMORY FUNCTION

The sound analyzer incorporates a memory that allows manual and automatic storing of measurement data. Stored measurement results can be displayed by pressing the RECALL key.

MANU (manual store)

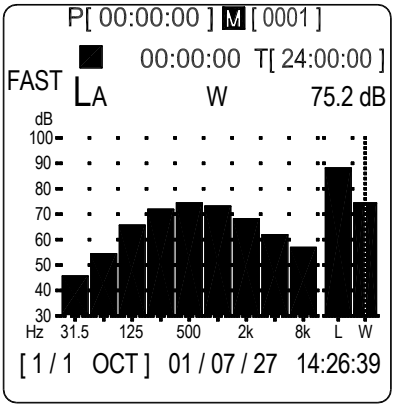
Measured instantaneous value data and processing results can be stored manually by the operator.

AUTO (automatic store)

Automatically store measuring data at the measurement time interval.

9-1 Manual storing data in memory (1024 data sets)

1. Set the power switch to ON.
2. Use the SLM/ 1/1/ 1/3 key to desired SLM, 1/1 or 1/3 octave band sound pressure level measurement screen.
3. Press MEMORY key, enter to memory mode, display M [0001] first data record memory address number.



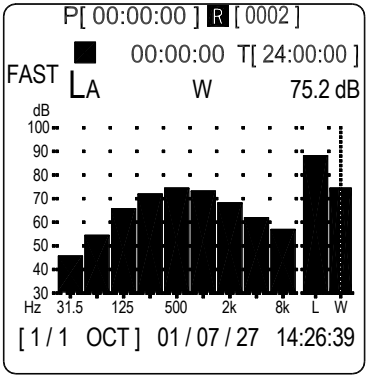
4. Press STORE key, one set of data is stored in the [0001] memory address. The address counter is in cremented by one . By repeating this procedure, more data can be stored in memory.

5. Press MEMORY key again, exit the memory mode.

9-2 Reading from memory

1. Press [MEMORY] key, enter memory mode, display [M] [****].

2. Press [RECALL] key, display [R] [****] record number and data value. If no data record in memory, Press [RECALL] key is no active.



3. Press [2nd] key, the [2ND] annunciator at the upper left of the screen will display.

4. Press [◂ Cursor ▸] key to select the memory address from which you want to display data.

5. If in the 1/1 or 1/3 octave band screen, Press [2nd] key to remove [2nd] annunciator, then press [◂ Cursor ▸] key, the frequency and level display at the upper of the screen change to desired point value.

6. Press [2nd] key to remove [2nd] annunciator.

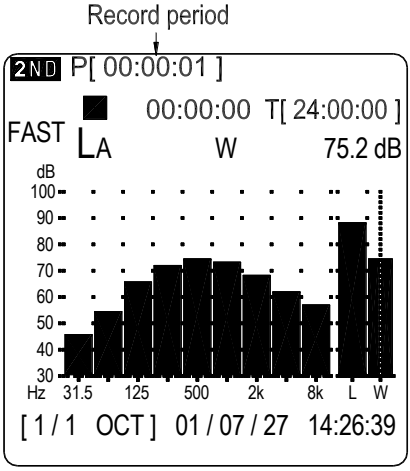
7. Press [RECALL] key, will exit reading mode.

8. Press [MEMORY] key, exit memory mode.

9-3 Auto storing data in memory

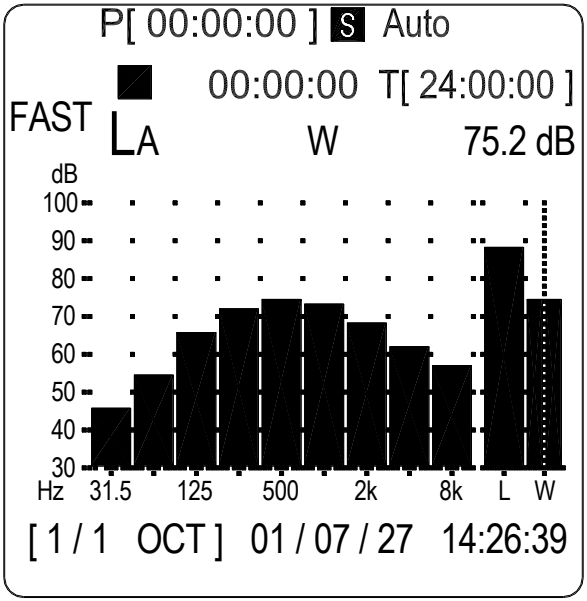
Before auto store data, first need setting record interval period. When in auto store data function, can not view other parameter measurement.

1. Setting record interval period : Record interval period value default value is “0”, can not auto store. Press [2nd] key, then press [MEMORY] key to select the desired setting time, the period time is : 0sec (No record) →1sec→3sec→ 10sec→30sec→1min→ 5min→ 8min →10min →15min→ 30min →1hr→8h→62.5ms. Example : Record period time setting to 1 second, display P [00:00:01].



2. Press [2nd] key, the [2ND] annunciator will disappear from the screen.
3. Use the [SLM/ 1/1/ 1/3] key to desired SLM, 1/1 or 1/3 octave band sound pressure level measurement screen.
4. Setting the preset measurement time (refer to 8-3-2).
5. Press [MEMORY] key, enter to memory mode, the upper of the screen shown “ [M] [****] ”.

6. Press [START/STOP] key, then auto storing display data to memory. The upper of the screen shown " [S] Auto " and ▸ annunciator.



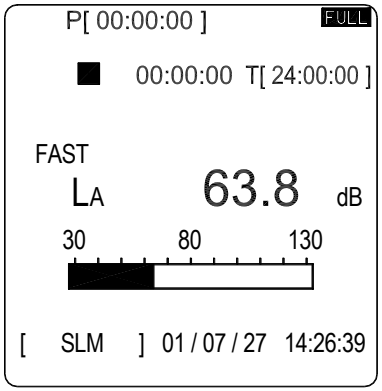
CAUTION : When in auto store mode, can not change any parameter setting. (Such as frequency weighting, time constant, [▲LEVEL▼])

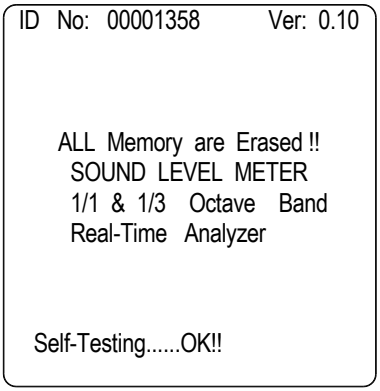
7. When the measurement time set in the preset measurement time has elapsed ; or the memory record is full ; or press [PAUSE/CONT] key ; or press [START/STOP] key, will terminated auto storing.

8. Getting the auto storing data, only use PC download method.

9-4 Erase memory data

1. When the instrument memory is full, the FULL annunciator appears in the upper right hand corner of the screen.





2. Turn off the meter, press hold down STORE and RECALL two key, then turn on the meter, until display “ALL Memory are Erased !!” , will erase all memory data.

X. RS-232 INTERFACE, SOFTWARE INSTALLATION and OPERATION

- For the detailed instruction, please refer to the content of attached CD-ROM, which has the complete instruction of RS-232 interface, software operation and relevant information.
- RS-232 protocol : are enclosed within the content of CD-ROM, please open the CD-ROM for details.

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