EXTECH ®

INSTRUMENTS

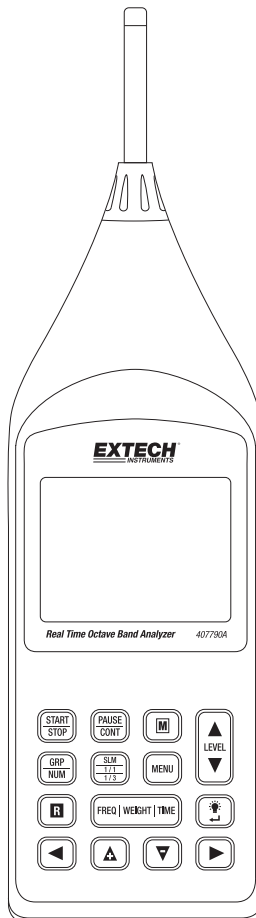# Real Time Octave Band Analyzer

Model 407790A

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1. Introduction

Congratulations on your purchase of the Extech 407790A Real Time Octave Band Analyzer. This auto ranging Type 2 integrating sound level meter features 1/1 and 1/3 Octave Band real-time noise analyses. The 407790A offers five measurement parameters: SPL (Sound Pressure Level), Leq (Equivalent Continuous Sound Pressure Level), SEL (Sound Exposure Level), Lmax (Maximum Sound Pressure Level), and Lmin (Minimum Sound Pressure Level). The built-in memory stores 12,280 data records in sound level mode and 1024 records in Octave mode. The stored data can be easily transferred to a PC with the 407790A software and USB cable. This meter permits choice of 'A', 'C', or Flat 'Z' weighting and Slow / Fast /impulse response times. AC and DC analog output signals are available for chart recorders and other external recording devices. Careful use of this device will provide years of reliable service.

1.1 Instrument Care

- Do not attempt to remove the mesh cover from the microphone as this will cause damage and affect the accuracy of the instrument.

- Protect the instrument from impact. Do not drop it or subject it to rough handling. Transport it in the supplied carrying case.

- Protect the instrument from water, dust, extreme temperatures, high humidity and direct sunlight during storage and use.

- Protect the instrument from air with high salt or sulfur content, gases and stored chemicals, as this may damage the delicate microphone and sensitive electronics.

- Always switch the instrument off after use. Remove the batteries from the instrument if it is not to be used for a long period of time. Do not leave exhausted batteries in the instrument, as they may leak and cause damage.

- Clean the instrument only by wiping it with a soft, dry cloth or, when necessary, with a cloth lightly moistened with water. Do not use solvents, abrasives, alcohol or cleaning agents

1.2 Features

The Sound Level Meter complies with the requirements of IEC 61672-1:2003 standard for a Class 2 instrument. See specifications section for more applicable standards that apply to this meter.

- 1/1 octave band analysis from 31.5Hz to 8kHz
- 1/3 octave band analysis from 25Hz to 10kHZ
- Can perform 1/1 and 1/3 octave band analysis simultaneously
- 4GB Micro SD card
- USB interface
- Datalogging function
- AC/DC signal output available for level and graphic recorder
- Comparator output function
- External trigger input function
- Real time clock with calendar
- Main channel (sound meter, analyzer mode)
- Sub Channel (sound level meter mode)

The 407790A allows the following quantity measurements.

Simultaneous measurements of all items with selected time weighting and frequency characteristics.

- Sound level   Lp
- Equivalent continuous sound   Leg
- Sound exposure level   SEL
- Maximum sound level   Lmax
- Minimum sound level   Lmin
- Percentile sound level L^N (L05, L50, L90, L95) calculated from Lp
- Frequency rating   A, C, Z
- Time weighting
  Main Channel   Fast, Slow, 10ms, impulse
 Sub Channel   Fast, Slow, 10ms, impulse

Safety Symbol: $C\,E$ Complies with EMC

2. Descriptions

2.1 Meter Description

Refer to the diagram below for the following descriptions.

1. Windscreen
2. Microphone
3. Display
4. Operation keys
5. 6VDC adapter jack
6. DC analog output jack
7. AC analog output jack
8. Comparator output jack

9. Trig IN jack
10. Micro SD card slot
11. Power switch
12. Hand strap
13. USB port
14. Battery compartment
15. Tripod mounting screw
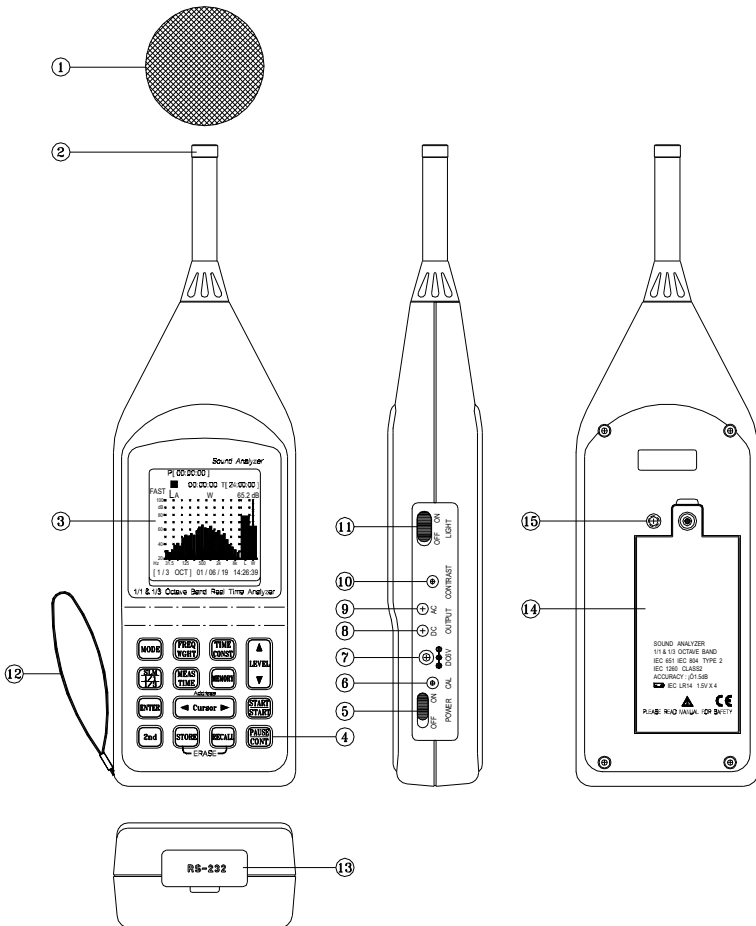
2.2 Operation Buttons
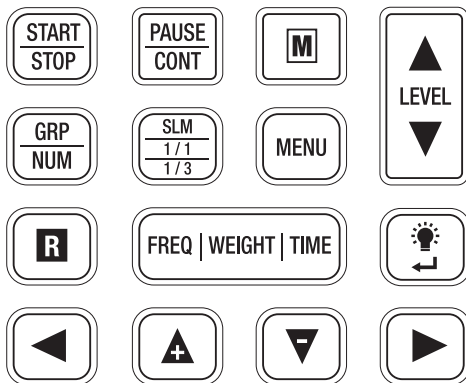
START/STOP button

Press to start or stop for recording the sound pressure measurement.

PAUSE/CONT button

Press to temporarily pause (▮▮) a measurement) or resume (▶) measurement.

M button

Press to scroll through and select different processing modes.

▲ LEVEL ▼

Press to select the level range for measurement. The following five settings are available.
20 to 90 dB, 20 to 100 dB, 20 to 110 dB, 30 to 120 dB, 40 to 130 dB.

GRP/ NUM button

Press to switch between graph and numeric display for Octave measurements.

SLM 1/1 1/3 button

Press to switch to select the sound level meter display and analysis screen.
(SLM, 1/1, 1/3, 1/1&1/3)

MENU

Press to enter menu screen to setup various menu parameters. Press again to close the
menu.

R button

Start or stop the auto Record process or press to manually store the measurement data into
memory.

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◀/▶
    Press to move the octave frequency band marker during frequency analysis.

Ⓐ/▼
    Press to select and set items in various menu screens. Holding the buttons down will cause faster scrolling.

FREQ WEIGHT TIME button
    The FREQ WEIGHT selects the frequency weighting for the main channel. "A" weighting (A), "C" weighting (C), and flat frequency response (Z).

    The TIME WEIGHT selects the time weighting function for the main channel. (F, S, 10ms, I) Fast: 125ms; Slow: 1000ms; 10ms; Impulse: 35ms

    Note: The frequency and time weighting for the sub channel can be selected by accessing the menu screen.
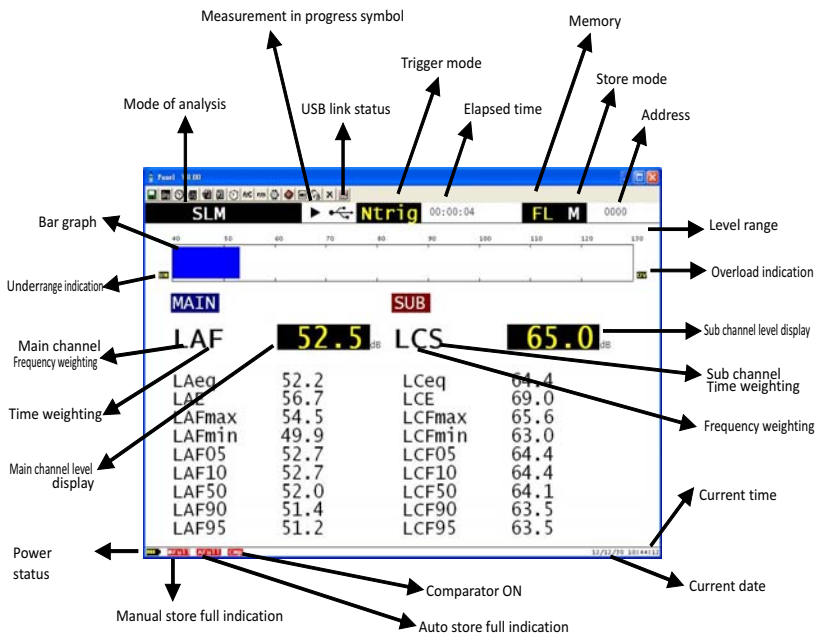
☼ button (Backlight/Enter)
    Backlight powers on the display backlight. Press the button again to turn backlight off. When automatic Backlight Off function is selected from the menu screen, the backlight will turn itself off automatically after the preset time.

    Enter button will finalize a setting of an item in a menu or any other setting.

2.3 Display Screen

1. **Mode of analysis:** Indicates the condition of the display screen.

SLM: Sound level meter display

1/1 OCT: Octave band analysis screen

1/3 OCT: 1/3 Octave band analysis screen

1/1 and 1/3 OCT: Simultaneous octave and 1/3 octave band analysis screen

2. **Measurement in progress:** When a measurement recording is in progress or during auto store the ▶ symbol flashes. During measurement pause the ❚❚ symbol is displayed on the screen.

3. **USB Link Status:** Shows if the USB is enabled or disabled.

4. **Trigger Mode:** Controls the measurement and memory auto store start behavior. Available modes are: Level 1 (LV1), Level 2 (LV2), EXT (EXT), and time (TIME).

5. **Elapsed Time:** Displays the elapsed time in seconds during processing and storing memory.

6. **Memory:** Displays the selected memory for storing data.

F_L: The data will be stored in the internal memory of the meter.

Sd: The data will be stored on the micro SD card

7. **Store mode:** Displays the selected mode for storing data in memory

M: Manual store

A: Auto store

8. **Address:** Displays current number of data surveys stored in memory.

9. **Bar graph:** Displays the sound level as a bar graph. (The display is updated every 100ms)

10. **Level range:** Displays the upper and lower limit of the bar graph. Can be changed with the ▲ LEVEL ▼ button.

11. **Under-range indication:** When a signal is under-range the UN symbol will appear on the screen. Use the ▲ LEVEL ▼ button to decrease the level range setting. If processed data is under-range the UN indication will remain on the screen until the next processing measurement is started.

12. **Overload indication:** When a signal overload is detected, the screen will display OV for at least 1 second. Use the ▲ LEVEL ▼ button to increase the level range setting. If processed data is over range the OV indication will remain on the screen until the next processing measurement is started.

13. **Main channel frequency weighting:** Indicates the main channel frequency characteristic. A: A-weighting, C: C-weighting, Z: Z-weighting (flat response)

14. **Main channel time weighting:** Indicates the main channel time weighting characteristic. F: Fast (125ms), S: Slow (1000ms), τ: (10ms), I: Impulse (35ms)

15. **Main channel level display:** Displays the measured sound level in the main channel. (The display is updated every second).

16. **Sub channel frequency weighting:** Indicates the sub channel frequency weighting characteristic. A: A-weighting, C: C-weighting, Z: Z-weighting (Flat response). The sub channel frequency weighting can be set from the menu screen.

17. **Sub channel time weighting:** Indicates the sub channel time weighting characteristic. F: Fast (125ms), S: Slow (1000ms), τ: (10ms), I: Impulse (35ms)

18. **Sub channel level display:** Shows the measured sound level in the sub channel. (The display is updated every second)

19. **Power status:** When operating the meter on battery power the yellow segments will decrease as the battery power drains. When the segment starts to flash, replace batteries.


Yellow   Yellow   Yellow   Yellow   Red
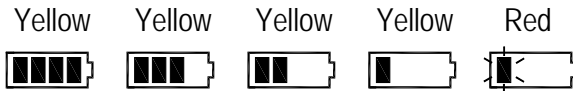
Battery good ---------------------------> Replace   Segment flashes (critical)

20. **Manual store full:** When the manual stored memory is full, the MFul symbol is displayed. The manual data store capacity is 250 sets.

21. **Auto store full:** When the auto store memory is full, the AFul symbol is displayed. The auto store capacity is 250 blocks.

22. **Comparator ON:** When the comparator function has been set to ON and a signal exceeds the comparator output jack, the indicator Cmp will appear on the display. A signal will output from the comparator output jack on the side panel (open collector).

23. **Current date:** Displays the current date

24. **Current time:** Displays the current time

2.4 Analysis screen

An example for the 1/1 & 1/3 OCT analysis screen is shown below.

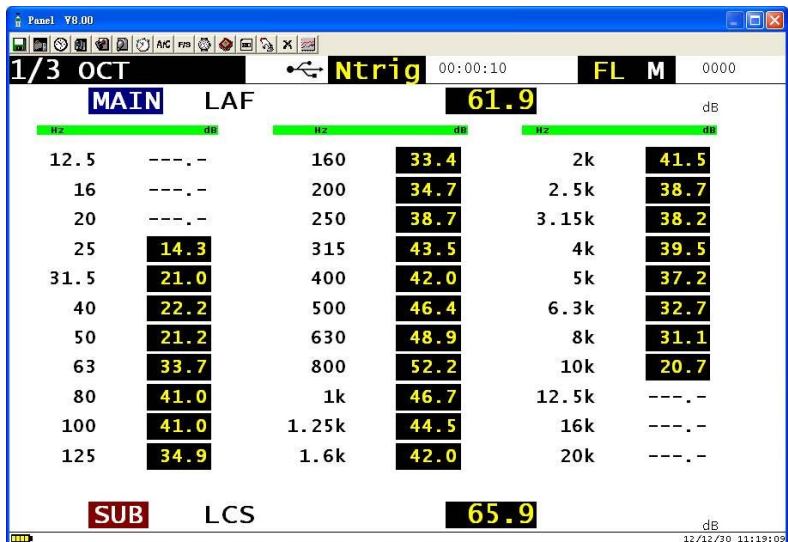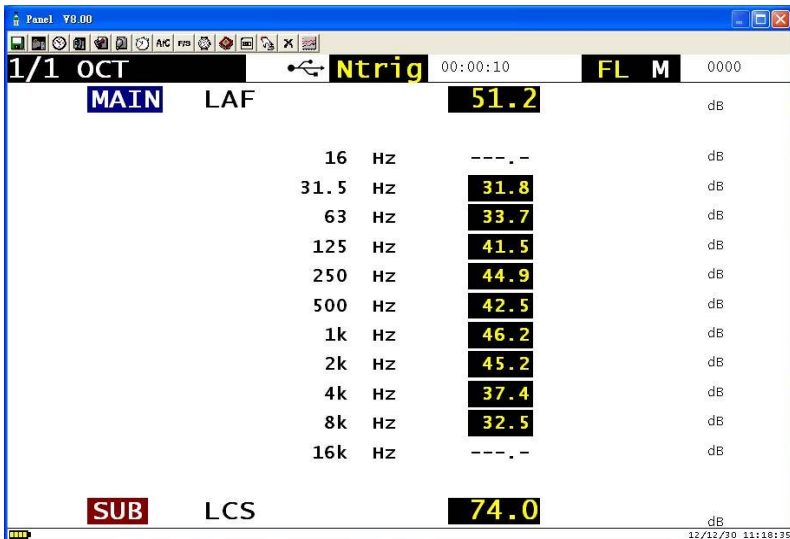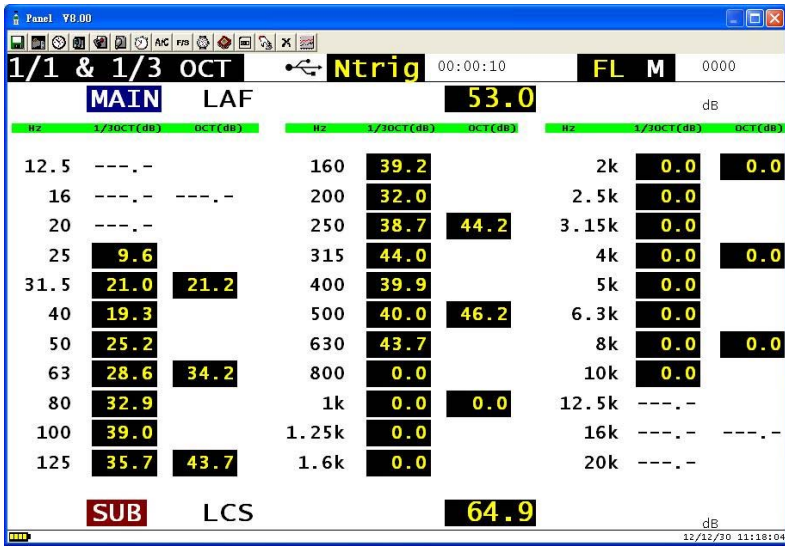Use the ◀ and ▶ buttons to move the cursor to the target frequency band.
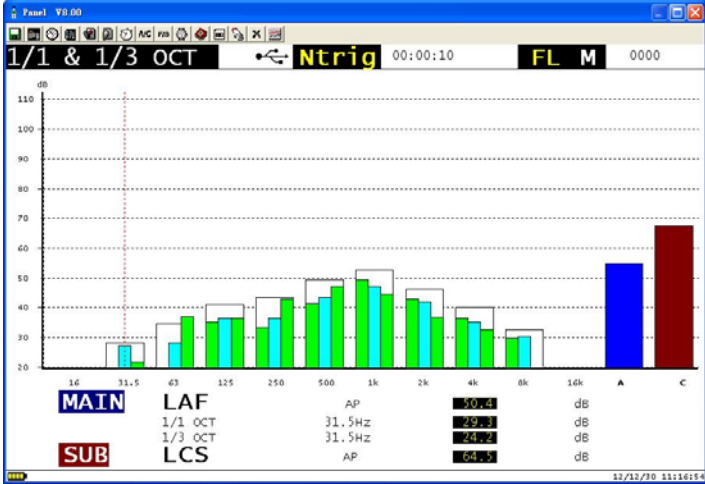
1/1 and 1/3 analysis screen

2.5 Numeric Display screen

Example for 1/1 OCT, 1/3 OCT, and 1/1 & 1/3 OCT analysis screen are shown below.
Use the ◀ and ▶ buttons to view a frequency that is not displayed.

3. Measurement Preparation and Setup

1. Battery installation: Remove the rear battery cover as shown below and insert (4) 1.5V 'C' size alkaline batteries. Take care to observe battery polarity. Replace the battery cover.

2. Battery replacement: When the battery voltage drops below operating voltage,

battery symbol flashes on the display.

3. AC adaptor connection: Insert the adaptor in the DC 6V jack on the side panel. When the AC adapter is connected, the meter will be powered from the adapter even if batteries are installed.

Notes:

To prevent the risk of damage, use only the factory supplied AC adapter.

To prevent the risk of battery leakage, remove the batteries from the meter when the meter is not in use.

3.1 Setting the Date and Time

Date and time information is stored with each record saved. Set the date and time as follows:

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

2. Press the MENU button. The menu list screen will display.

3. Press the $\boxed{\blacktriangle}$ / $\boxed{\blacktriangledown}$ button to select "**D) Date setting (Y/M/D)**" and then press the enter ⏎ button.

4. Press the $\boxed{\blacktriangle}$ / $\boxed{\blacktriangledown}$ button to set the value. Press ⏎ button to confirm.

5. Continue pressing the above buttons to scroll through and set each option for date and time. The meter will continue to scroll through setup for date Y/M/D and then the time settings h/m/s.

6. When the settings are correct, press the ↵ button to exit the setting mode. The clock will start running with the new settings.

7. Press MENU button to return to the measurement screen.

Note: The clock has an error of about 1 minute per month. Before taking measurement, be sure to check and set the time if required.

Date

```
MENU-1                    F_L M  0068
   A). Measurement Time    00h01m10s
   B). Storage                  FLASH
   C). Storage Mode            AUTO1
      - Interval Time        00h00m01s
   D). Date Setting (Y/M/D)  2012/12/30
   E). Time Setting (h/m/s)  11 : 06 : 41
   F). Backlight Auto Off          OFF
   G). Sub Time Weight                I
   H). Sub Freq Weight               C
   I). Lmax/Lmin Type            Band
                        12/12/30    13:00:26
```

Time

```
MENU-1                    F_L M  0068
   A). Measurement Time    00h01m10s
   B). Storage                  FLASH
   C). Storage Mode            AUTO1
      - Interval Time        00h00m01s
   D). Date Setting (Y/M/D)  2012/12/30
   E). Time Setting (h/m/s)  11 : 06 : 41
   F). Backlight Auto Off          OFF
   G). Sub Time Weight                I
   H). Sub Freq Weight               C
   I). Lmax/Lmin Type            Band
                        12/12/30    13:00:26
```

3.2 SD Memory Card

Measurement data can be stored on a removable SD memory card for later use.
Note: Power OFF the meter before inserting or removing the memory card.

Use only a 4GB micro SD card. Removing SD card or powering the meter off while data is storing to the card can cause internal data to be destroyed.

1.   Insert the card taking care to observe the correct orientation. Push the card in carefully, until it is properly sealed.

2.   To remove, push the card. The SD card with pop out and can be removed.

3.3 Setting the Backlight Auto Off time

1. Press the ⌖ to turn the backlight on or off.

2. Press the MENU key to bring up the menu list screen.

3. Use the ▲ / ▼ key to select "**Backlight Auto Off**" then press the ↵ key.

4. Use the ▲ / ▼ key to select the automatic turn off time then press the ↵ key. Options are: 30 seconds, 1 minute, 3 minutes or OFF (without automatic turn - off function).

5. Press MENU key to return to the measurement screen.

To turn the backlight off before the automatic turn - off time, press the ⌖ key.

MENU-1	FₗM 0068
A). Measurement Time	00h01m10s
B). Storage	FLASH
C). Storage Mode	AUTO1
- Interval Time	00h00m01s
D). Date Setting (Y/M/D)	2012/12/30
E). Time Setting (h/m/s)	11 : 06 : 41
F). Backlight Auto Off	OFF
G). Sub Time Weight	30s
H). Sub Freq Weight	1m
I). Lmax/Lmin Type	3m

12/12/30   13:00:26

3.4 Sub Channel Settings

To access the sub menu setting press the following buttons.

1. Press the MENU button to enter the menu list screen.

2. Use the [▲] / [▼] buttons to select "**G). Sub Time Weight**" then press ↵ button.

3. Use the [▲] / [▼] button to select the desired time weighting
   F, S, τ (10ms) or I (Impulse 35ms), then press ↵ button.

4. Press the [▲] / [▼] buttons to select "**H). Sub Freq Weight**" then press ↵ button.

5. Press the [▲] / [▼] buttons to select the desired frequency weighting A, C or Z, then press ↵ button.

6. Press MENU button to return to the measurement screen.

Note: There is no frequency analysis function for the sub channel. Only the all - pass value is measured.

3.5 Selecting the Lmax/Lmin type

Band - (Band maximum/band minimum):

The analysis result applies to the point where the level for each frequency band was maximum or minimum within the sampling period.

AP - (All-pass maximum/all-pass minimum):

The analysis result applies to the sub channel all-pass and band-pass level values taken at the point where the all-pass level in the main channel was maximum/minimum within the sampling period.

AP (S) - (All-pass maximum/all-pass minimum):

The analysis result applies to the band-pass level values (excluding the sub channel all-pass levels) taken at the point where the all-pass level in the main channel was maximum/minimum within the sampling period. The sub channel all-pass level is taken at the maximum/minimum point within the sampling period, independently of the main channel level.

1. Press the MENU button to enter the menu list screen.

2. Use the △ / ▽ buttons to select "**I)· Lmax/Lmin Type**" then press ↵ button.

3. Use the △ / ▽ buttons to select the desired Band, AP or AP (S) type then press ↵ button.

4. Press MENU button to return to the measurement screen.

This setting is effective in SLM mode and Octave band analyzer mode.

```
MENU-1                      F L M  0068
   A). Measurement Time     00h01m10s
   B). Storage                  FLASH
   C). Storage Mode             AUTO1
      - Interval Time       00h00m01s
   D). Date Setting (Y/M/D)  2012/12/30
   E). Time Setting (h/m/s)  11 : 06 : 41
   F). Backlight Auto Off          OFF
   G). Sub Time Weight
   H). Sub Freq Weight           Band
   I). Lmax/Lmin Type              AP
                                  AP(S)
   ▮▮▮▮▯          12/12/30    13:00:26
```

3.6 Comparator Output Operation

The comparator output is an open collector output that can be used to control external equipment.

1. Press the MENU button to enter the menu list screen.

2. Use the [▲] / [▼] buttons to select "**J). Comparator**" then press ↵ button to display the ON/OFF setting.

3. Press the [▲] / [▼] buttons to select "**ON**" then press ↵ button.

4. Press the [▲] / [▼] buttons again to select "**1). Comparator Level**". Set the desired level then press ↵ button. (Setting range 25 to 130dB, 1 - dB steps)

5. Follow the above steps to select "**2). Comparator Band**". Set the band to desired level then press ↵ button. (MAIN AP/31.5Hz/63Hz/…8kHz or 1/3 octave bands).

6. Press the MENU button to return to the measurement screen.

```
MENU-2                          FLM  0068
  J). Comparator                     OFF
      1). Comparator  Level          ON
      2). Comparator  Band          APHz
  K). Trigger                       TIME
      1). Trigger Level             70dB
      2). Trigger Band              APHz
      3). Trigger Time          06 : 00 : 00
      4). Slope Type               Slope+
  L). Clear Record               MANUAL
  M). Recall
  ▮▮▮▮              12/12/30        13:00:26
```

```
MENU-2                        F L M   0068
   J). Comparator                    ON
        1). Comparator  Level      ⬍70dB
        2). Comparator  Band        APHz
   K). Trigger                      TIME
        1). Trigger Level           70dB
        2). Trigger Band            APHz
        3). Trigger Time       06 : 00 : 00
        4). Slope Type             Slope+
   L). Clear Record            MANUAL
   M). Recall
   ▮▮▮▮              12/12/30        13:00:26
```

```
MENU-2                        F L M   0068
   J). Comparator                    ON
        1). Comparator  Level       70dB
        2). Comparator  Band      ⬍ APHz
   K). Trigger                      TIME
        1). Trigger Level           70dB
        2). Trigger Band            APHz
        3). Trigger Time       06 : 00 : 00
        4). Slope Type             Slope+
   L). Clear Record            MANUAL
   M). Recall
   ▮▮▮▮              12/12/30        13:00:26
```

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Comparator output:

In the SLM mode, only the AP is selected as comparator band.

In the 1/1 OCT mode, only the AP or 1/1 octave band is selected as comparator band.

Comparator output: Open- collector output; band-level determination;
Max. applied voltage: 24VDC; Max. drive current: 50mADC
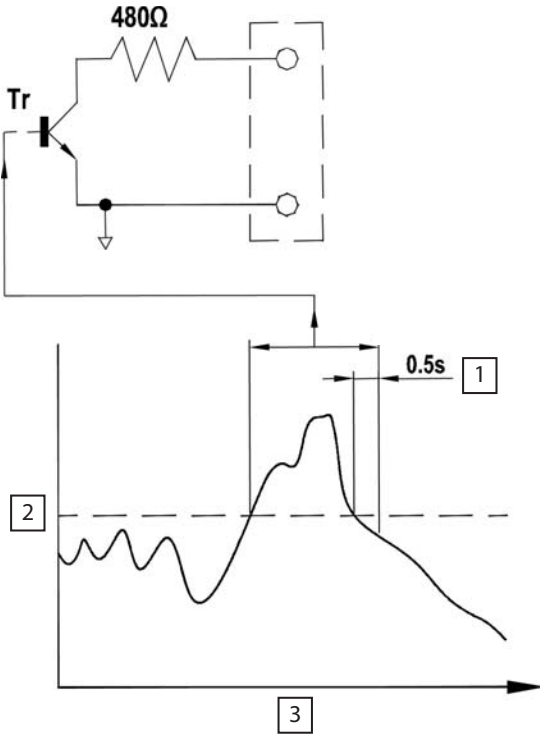
1. Comparator signal output continues for 0.5 seconds after the signal crosses the threshold level

2. Comparator Level

3. Time

3.7 Trigger Mode Setup and Operation

A measurement can be initiated by one of three triggers: time trigger (time-controlled triggering), level trigger (sound level controlled triggering), and external trigger (triggering by an external signal).

Level trigger 1: Measurement starts when the trigger level is exceeded and ends after the measurement time.

The trigger level is valid at any time.

Setting items:

Trigger Slope Type: +, -

Trigger Level: 25 to 130dB, 1-dB steps.

Trigger Band: MAIN **AP**/31.5Hz/63Hz/125Hz….8kHz (1/3 octave bands)

Level trigger 2: Single measurement is made when trigger level is exceeded.

The trigger level is valid at any time.

Setting items:

Trigger Level: 25 to 130dB, 1-dB steps.

Trigger Band: MAIN **AP**/31.5Hz/63Hz/125Hz…8kHz (1/3 octave bands).

Time trigger: This is a reoccurring trigger timer that starts a measurement after a trigger timer.

The measurement ends after the measurement time.

The trigger timer is valid at all times.

Setting items:

Trigger Time: h:m:s

External trigger: A Measurement starts at falling edge of a logic-level (0 to 5V logic) signal at the external trigger input. A Pulse width of 1ms or more is required.

The external trigger is valid at all times.

Trigger Operation - example
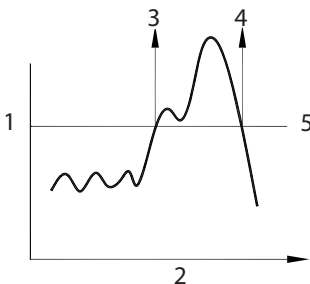
1. Sound Level
2. Time
3. Slope   + Trigger
4. Slope   - Trigger
5. Trigger Level

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3.7.1 Trigger Setup

1. Chose trigger operation [off, Level 1, Level 2, External, or Time].

2. Set the Trigger Band: AP or Octave band frequency

3. For Level 1 and 2: chose the Trigger level in dB.

4. External Trigger, chose slope (+ or -)

```
MENU-2                          F_L M  0068
   J). Comparator                    ON
       1). Comparator  Level        70dB
       2). Comparator  Band         APHz
   K). Trigger                       OFF
       1). Trigger Level            LEVEL1
       2). Trigger Band             LEVEL2
       3). Trigger Time              EXT
       4). Slope Type                TIME
   L). Clear Record              MANUAL
   M). Recall
 ▮▮▮▮▯              12/12/30        13:00:26
```

3.7.2 External Trigger Setting

1. Press the MENU button to enter the menu list screen.

2. Use the [▲] / [▼] buttons to select "**K)· Trigger**" then press the ↵ button.

3. Use the [▲] / [▼] buttons to select "**EXT**" then press the ↵ button.

4. Press the MENU button to return to the measurement screen.

3.7.3 Trigger Time Setting

This is a reoccurring Triger that will start a meter recording at a specific Trigger delay time setting and the recording will stop at the set Measurement time and then start up again at the trigger wait time.

1. Press the MENU button to enter the menu list screen.

2. Use the [▲] / [▼] buttons to select **K).** "**Trigger**" then press the ↵ button.

3. Use the [▲] / [▼] buttons to select "**TIME**" then press the ↵ button.

4. Use the [▲]/[▼] buttons to select "**2)· Trigger Band**" then press the ↵ button.

5. Use the [▲]/[▼] and ↵ buttons to set the value to **AP** then press the ↵ button.

6. Use the [▲]/[▼] buttons to select "**3)· Trigger Time**" then press the ↵ button.

7. Use the [▲]/[▼] and ↵ buttons to set the value of the reoccurring trigger timer Hour:Minute:Second then press the ↵ button.

8. Press the MENU button to return to the measurement screen.

```
MENU-2                          FLM  0068
   J). Comparator                    ON
      1). Comparator  Level        70dB
      2). Comparator  Band         APHz
   K). Trigger                     TIME
      1). Trigger Level            70dB
      2). Trigger Band             AP Hz
      3). Trigger Time        ⬍06 : 00 : 00
      4). Slope Type             Slope+
   L). Clear Record            MANUAL
   M). Recall
   ▮▮▮▮▯                 12/12/30      13:00:26
```

3.7.4 Trigger Level Setting

The Triger can be set to start a meter recording at a specific Trigger dB level setting.

1. Press the MENU button to enter the menu list screen.

2. Use the [▲]/[▼] buttons to select "**K)· Trigger**" then press the ↵ button.

3. Use the [▲]/[▼] button to select the desired option "**LEVEL1**" or "**LEVEL2**" then press the ↵ button.

4. Use the [▲]/[▼] buttons to select "**1)· Trigger LEVEL**" then press the ↵ key.

5. Use the [▲]/[▼] buttons to set the desired trigger level value (25 to 130). Then press the ↵ button.

6. Use the [▲]/[▼] buttons to select "**2)· Trigger Band**" then press the ↵ button.

7. Use the ▲ / ▼ buttons to select the desired trigger band then press the ↵ button.

8. Use the ▲ / ▼ buttons to select "**4)· Slope Type**" then press the ↵ button.

9. Use the ▲ / ▼ buttons to select the desired trigger slope + or Slope-. Then press the ↵ button.

    Note: For LEVEL 2 trigger, ignore the slope setting and only use the Slope+ trigger.

10. Press the MENU button to return to the measurement screen.

11. Press the R button on the meter to start automatic recording. The meter will start recording when the trigger level is exceeded.

```
MENU-2                        F_L M   0068
  J). Comparator                      ON
      1). Comparator  Level         70dB
      2). Comparator  Band          APHz
  K). Trigger                     LEVEL1
      1). Trigger Level            ⇕70dB
      2). Trigger Band               APHz
      3). Trigger Time         06 : 00 : 00
      4). Slope Type               Slope+
  L). Clear Record              MANUAL
  M). Recall
 ▮▮▮▮            12/12/30         13:00:26
```

4.Measurements

All processing functions provided by the meter (Leq, SEL, Lmax, Lmin, Ln) are carried out simultaneously. For example, when equivalent continuous sound level measurement is selected, the sound exposure level and percentile level are also determined.

4.1 Sound Level Measurements

1. Press the power button to power on the meter. After the power-on screen displays the SLM measurement screen will appear.

The measurement parameter settings that were active before the meter was turned off will be saved.

2. Use the FREQ WEIGHT TIME button to select the Main Channel frequency weighting characteristic. For normal sound level measurements, select the "A" setting.

3. Use the FREQ WEIGHT TIME button to select the Main Channel time weighting characteristic. For normal sound level measurements, select the "F" (Fast) setting.

4. Use the ▲ LEVEL ▼ buttons to set the dB level range. Choose a setting in the middle of the display range of the main channel bar graph indicator.

If the "**OV**" or "**UN**" indicators appear, change the level range setting.

5. The Main channel and Sub channel level indicators display the currently measured sound pressure levels. The reading is updated once every second.

6. The PAUSE/CONT button can be used to stop and resume the updating of the level indication. In sound level meter mode, the bar graph indication will stop during pause.
In the pause condition, a pause symbol (❙❙) appears on the display.

4.2 SEL, Leq, Lmax, Lmin, LN Measurements

1. Power on the meter. After the power-on screen displays, the SLM measurement screen appears.

2. Use the FREQ WEIGHT TIME button to select the frequency weighting characteristic. For normal sound level measurements, select the "A" setting.
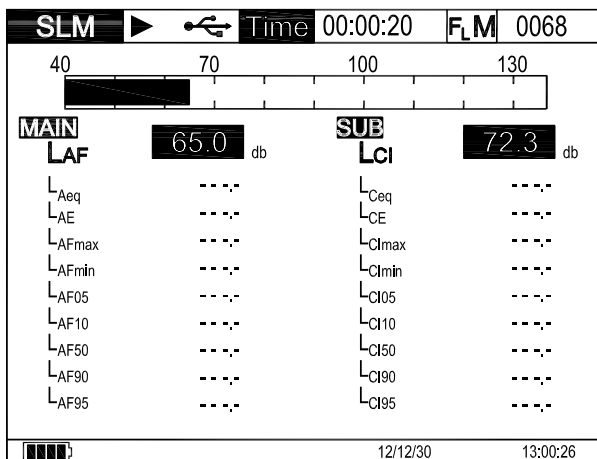
When "C" (C-Weighting) is selected, the equivalent continuous sound pressure level (LCeq) is measured.

3. Use the FREQ WEIGHT TIME button to select the time weighting characteristic. For normal sound level measurements, select the "F" (Fast) setting.

(This setting does not affect a measurement result of continuous sound level mode.)

Note: The meter performs high-speed sampling of the sound pressure waveform to determine Leq and SEL. It is not affected by the time weighting characteristics.

4. Use the ▲ LEVEL ▼ buttons to set the level range. The main channel bar graph indicator should be in the middle of the range.

If the "OV" or "UN" indicators appear, change the level range setting.

5. Set the measurement time from the menu. Press the MENU button to enter the menu list screen.

6. Use the ▲ / ▼ buttons to select "A)· **Measurement Time**" then press ↵ button.

7. Use the ▲ / ▼ and ↵ buttons to set the desired measurement time from 1s to 23h 59m 59s.

```
MENU-1                          FL    0068
  A). Measurement Time   ⇕00h01m00s
  B). Storage                     FLASH
  C). Storage Mode                AUTO1
     - Interval Time          00h00m00s
  D). Date Setting (Y/M/D)    2012/12/30
  E). Time Setting (h/m/s)    11 : 06 : 41
  F). Backlight Auto Off            OFF
  G). Sub Time Weight                I
  H). Sub Freq Weight                C
  I). Lmax/Lmin Type              Band
  ▐▐▐▐▌            12/12/30      13:00:26
```

8. Press the ↵ button to exit the measurement time setting.

9. Press MENU button to return to the measurement screen.

10. Press the START/STOP button to start the measurement. Previously measured values will be cleared. While the measurement is in progress, the ▶ symbol will flash and the elapsed time will display on the screen. When the measurement time has elapsed, the measurement is terminated automatically.

To terminate the measurement before the allocated time, press the START/STOP button.

If signal overload or an under-range occurs at least once during the measurement, the "**OV**" or "**UN**" symbols will appear on the screen. This will indicate that overload or under-range data are comprised in the processed values.

During measurement, the PAUSE/CONT key can be used to paused and resume the measurement. During pause, the pause (❚❚) symbol is shown. (The paused interval is not included in the measurement time.)

Important: During measurement, the ▲ LEVEL ▼ button, FREQ WEIGHT TIME button, TIME WEIGHT and SLM/RTA function are disabled. Be sure to complete all settings before starting the measurement.

11. When the measurement is completed, the ▶ symbol will disappear.

The main channel and sub channel measured values of the Leq, SEL (L_E), Lmax, Lmin, L05, L10, L50, L90 and L95 are displayed.

If the indicator "**OV**" is shown, the processed data includes data where the sound level signal caused an overload condition.

If the indication "**UN**" is shown, the processed data includes data where the sound level signal caused an under-range condition.

The bar graph only shows the sound level value.
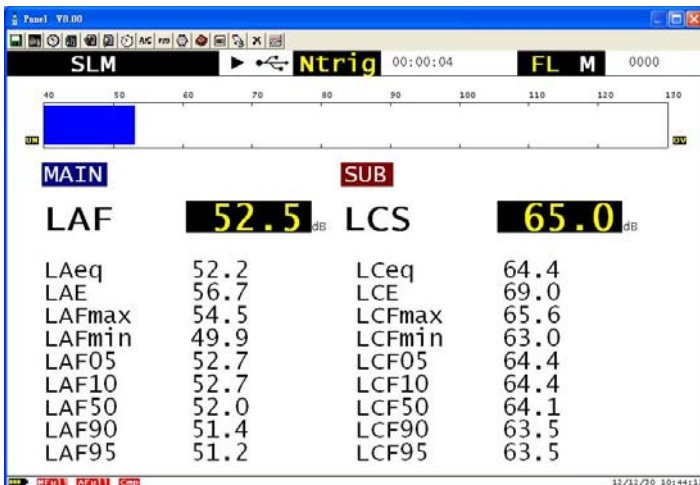
4.3 Sound Level and Octave Band Analysis Measurement

1. With the power ON wait until the SLM measurement screen appears on the display.

2. Use the $\boxed{\text{SLM 1/1 1/3}}$ button to select the desired 1/1 OCT, 1/3 OCT or 1/1 & 1/3 OCT band or SLM measurement screen.

3. Use the $\boxed{\text{FREQ WEIGHT TIME}}$ button to select the frequency weighting characteristic. For normal sound level measurements, select the "A" setting.

4. Use the $\boxed{\text{FREQ WEIGHT TIME}}$ button to select the time weighting characteristic. For normal sound level measurements, select the "F" (Fast) setting.

5. Use the $\boxed{\blacktriangle \text{ LEVEL } \blacktriangledown}$ buttons to set the level range.

Select a setting in which the main channel all-pass value indicator is in the middle of the range.

If the "**OV**" or "**UN**" indicators appear, change the level range setting.

6. The level indicator displays the currently measured Sound band level.

Use the $\boxed{\text{GRP/NUM}}$ button to toggle the measurement screen between graph and numeric display.

If the graph display is selected, use the $\boxed{\blacktriangleleft}$ and $\boxed{\blacktriangleright}$ buttons to move the cursor to the desired frequency band.

In the 1/1 & 1/3 OCT numeric display, frequencies that are currently not displayed can be called up with the $\boxed{\blacktriangleleft}$ and $\boxed{\blacktriangleright}$ buttons.

To stop or resume updating the band level indication press the $\boxed{\text{PAUSE/CONT}}$ button. When pause is selected, a pause symbol (**❚❚**) appears on the display.

Important: During sound band measurement, do not press the $\boxed{\text{MODE}}$ key or other parameter symbols will be displayed.

The sound band level is being displayed when there is no character string after the basic indicator.

LAF: Sound band level is being displayed.

LAeq: Sound band level is not being displayed.

Panel V8.00

1/1 & 1/3 OCT ⦿ **Ntrig** 00:00:10 **FL M** 0000

	MAIN	LAF		AP	50.4	dB
		1/1 OCT		31.5Hz	29.3	dB
		1/3 OCT		31.5Hz	24.2	dB
	SUB	LCS		AP	64.5	dB

12/12/30 11:16:54

Panel V8.00
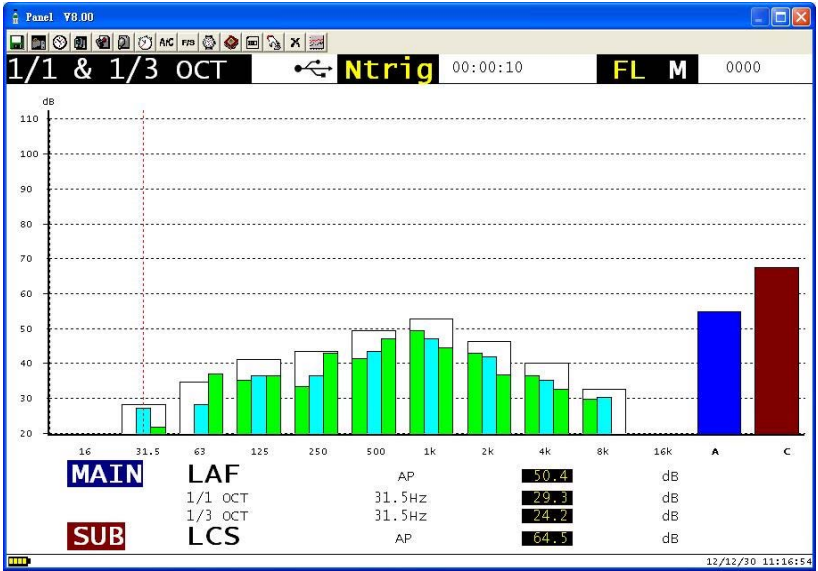
1/1 & 1/3 OCT ⦿ **Ntrig** 00:00:10 **FL M** 0000

MAIN   LAF   53.0   dB

Hz	1/3OCT(dB)	OCT(dB)	Hz	1/3OCT(dB)	OCT(dB)	Hz	1/3OCT(dB)	OCT(dB)
12.5	---.-		160	39.2		2k	0.0	0.0
16	---.-	---.-	200	32.0		2.5k	0.0	
20	---.-		250	38.7	44.2	3.15k	0.0	
25	9.6		315	44.0		4k	0.0	0.0
31.5	21.0	21.2	400	39.9		5k	0.0	
40	19.3		500	40.0	46.2	6.3k	0.0	
50	25.2		630	43.7		8k	0.0	0.0
63	28.6	34.2	800	0.0		10k	0.0	
80	32.9		1k	0.0	0.0	12.5k	---.-	
100	39.0		1.25k	0.0		16k	---.-	---.-
125	35.7	43.7	1.6k	0.0		20k	---.-	

SUB   LCS   64.9   dB

12/12/30 11:18:04

4.4 Sound Band - Leq, SEL, Lmax, Lmin and LN Analysis Measurement

1. Power on the meter and wait until the SLM measurement screen appears.

2. Use the SLM 1/1 1/3 button to select the desired 1/1 OCT, 1/3 OCT or 1/1 & 1/3 OCT band or SLM measurement screen.

3. Use the FREQ WEIGHT TIME button to select the frequency weighting characteristic. For normal measurements, select the "A" setting.

4. Use the FREQ WEIGHT TIME button to select the time weighting characteristic. For normal measurements, select the "F" (Fast) setting.

5. Use the ▲ LEVEL ▼ buttons to set the level range. Select a setting in which the main channel all-pass value indicator is in the middle of the range.

If the "**OV**" or "**UN**" indicators appear, change the level range setting.

6. Set the measurement time from within the menu. Press the MENU key to bring up the menu list screen.

7. Use the ▲ / ▼ buttons to select "**A)· Measurement Time**" then press the ↵ key.

8. Use the ▲ / ▼ and ↵ buttons to select the desired measurement time from 1s to 23h 59m 59s.

9. Press the ↵ key to exit the measurement time setting.

10. Press MENU key to return to the measurement screen.

11. Press the START/STOP key to start the measurement. The previous measurement values will be cleared. While the measurement is in progress, the ▶ symbol flashes and the elapsed time is displayed. When the measurement time has elapsed, the measurement is terminated automatically.

To terminate the measurement before the allocated time, press the START/STOP key.

If the indicator "**OV**" is shown, the processed data includes data where the sound level signal caused an overload condition.

If the indication "**UN**" is shown, the processed data includes data where the sound level signal caused an under-range condition.

During measurement, the PAUSE/CONT key can be used to pause and resume the measurement. During pause, the pause (**‖**) symbol is shown. (The paused interval is not included in the measurement time.)

Important

During measurement, the ▲ LEVEL ▼ button, FREQ WEIGHT TIME button, TIME WEIGHT and SLM/RTA functions are disabled. Be sure to complete all settings before starting the measurement.

12. When the measurement is completed, the ▶ symbol disappears.

If "**OV**" is displayed, the processed data includes data where the sound level signal caused an overload condition.

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If the indication "**UN**" is shown, the processed data include data where the sound level signal caused an under-range condition.

13. Press the M button to cycle through the Lp→ Leq→ L^E (SEL) → Lmax→ Lmin→L05→L10→L50→L90→L95 measured value on the screen.

Pressing the GRP/NUM button switches the measurement screen between graph and numeric display.

In graph display, use the ◄ and ► buttons to move the cursor to the desired frequency band.

In the 1/1 & 1/3 OCT numeric display, frequencies that are not displayed can be called up with the ◄ and ► buttons.

The PAUSE/CONT button can be used to stop and resume the updating of band level indication. In the pause condition, a pause symbol (▐▐) appears on the display. (The pause interval is not included in the measurement time.)

During measurement, you can use the MODE key to check the measured values as currently calculated.
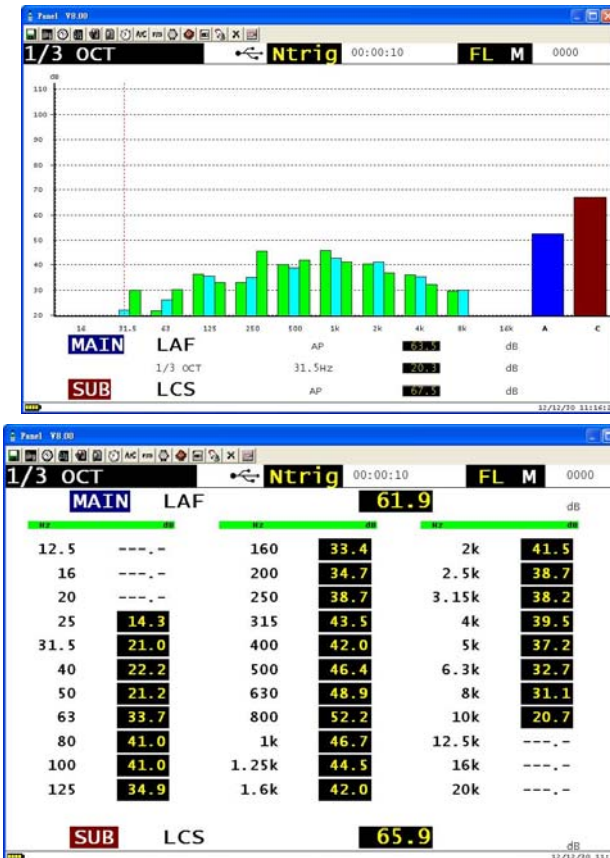
5. Storing Data to Memory

The meter can store measurement data in the internal memory or on a micro SD card. There are three different ways of storing data, as listed below.

Manual:

In this mode, the operator stores the measured sound level data and processed value data into the memory manually.
Press the $\boxed{R}$ record button to cause the current sound level and processed values derived from the measurement, as well as the measurement parameters and time of recording to be recorded in a single measurement.

Memory capacity: max. 250 data sets

Manually stored data can be recalled by the meter.

Auto 1:

Sound level meter mode

Continuous store of main channel and sub channel all-pass values as 1 set, at preset record interval times.

Octave Analyzer mode

Continuous store of main channel sound level Lp values for each band and all-pass values, sub channel all-pass values as 1 set at preset record interval time.

Auto 2:

Sound level meter mode

Continuous store of main channel and sub channel all-pass values as 1 set at preset measurement integrate time.

Octave Analyzer mode

Continuous store of main channel sound level Lp values for each band and all-pass values, sub channel all-pass values as 1 set at preset measurement integrate time.

Automatically recorded data can be retrieved using the supplied software.

5.1 Manual Memory Storage

Memory Store:

Press the store key to store the current sound level and processing values. Only the sound level is stored when the $\boxed{R}$ button is pressed. There will be no processing values displayed when the meter is powered on.

1. Power on the meter.

2. Press the $\boxed{\text{MENU}}$ button to enter the menu list screen.

3. Use the $\boxed{\blacktriangle}$ / $\boxed{\blacktriangledown}$ buttons to select "**B)· Storage**" then press the ↵ key.

4. Use the $\boxed{\blacktriangle}$ / $\boxed{\blacktriangledown}$ buttons to select "**FLASH**" or "**SD Card**" then press the ↵ key.

Selecting FLASH will store the data in the internal memory.

Selecting SD Card will store the data on the SD CARD.

5. Use the [▲] / [▼] buttons to select "**C)· Store Mode**" then press the ↵ key.

6. Use the [▲] / [▼] buttons to select "**MANUAL**" then press the ↵ key.

7. Press the MENU button to return to the measurement screen.

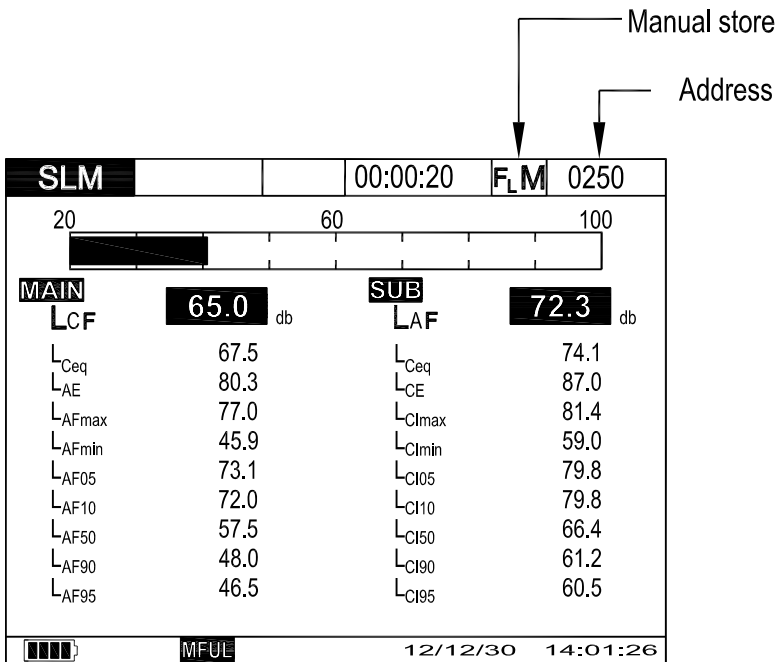8. Press the R button. The sound level will be recorded. If processing was being carried out, the processed values at the point where the R key is pressed will also be recorded.

The store process takes about 1 second. When it is completed, the address is incremented by one step, which allows you to record multiple data simply by pressing the R key repeatedly.

Note: When address 250 is reached, the MFul symbol will be displayed and no more data can be stored.

MENU-1	F$_L$M 0002
A). Measurement Time	00h01m10s
B). Storage	FLASH
	SD Card
C). Storage Mode	
- Interval Time	00h00m01s
D). Date Setting (Y/M/D)	2012/12/30
E). Time Setting (h/m/s)	11 : 06 : 41
F). Backlight Auto Off	OFF
G). Sub Time Weight	I
H). Sub Freq Weight	C
I). Lmax/Lmin Type	Band
	12/12/30 13:00:26

MENU-1 F$_L$M 0002

A). Measurement Time	00h01m10s
B). Storage	FLASH
C). Storage Mode	**MANUAL**
	AUT01
- Interval Time	AUT02
D). Date Setting (Y/M/D)	
E). Time Setting (h/m/s)	11 : 06 : 41
F). Backlight Auto Off	OFF
G). Sub Time Weight	I
H). Sub Freq Weight	C
I). Lmax/Lmin Type	Band

12/12/30   14:01:26

Manual store

Address

SLM   00:00:20   F$_L$M 0250

20   60   100

MAIN   **SUB**

L$_{CF}$ **65.0** db   L$_{AF}$ **72.3** db

L$_{Ceq}$	67.5	L$_{Ceq}$	74.1
L$_{AE}$	80.3	L$_{CE}$	87.0
L$_{AFmax}$	77.0	L$_{CImax}$	81.4
L$_{AFmin}$	45.9	L$_{CImin}$	59.0
L$_{AF05}$	73.1	L$_{CI05}$	79.8
L$_{AF10}$	72.0	L$_{CI10}$	79.8
L$_{AF50}$	57.5	L$_{CI50}$	66.4
L$_{AF90}$	48.0	L$_{CI90}$	61.2
L$_{AF95}$	46.5	L$_{CI95}$	60.5

MFUL   12/12/30   14:01:26

5.2 Recalling Manually Stored Data

1. Power on the meter.

2. Press the MENU button to enter the menu list screen.

3. Use the ▲ / ▼ buttons to select "**M)· Recall**" then press the ↵ button.

4. Use the ▲ / ▼ buttons to select the store address whose data you want to recall, then press the ↵ button. The data stored in memory will display.

5. In analyzer mode, the GRP/NUM key can be used to switch between numeric display and graph display.

6. Press the ↵ button and ▲ / ▼ or ◄/ ► buttons to select a different store address whose data you want to recall.

7. Press the MENU button two times to exit this mode.

RECALL Select File		
FileName	Date	Time
M_0001.FL	2012 / 12 /30	19:02:49
M_0002.FL	2012 / 12 /30	19:02:52
M_0003.FL	2012 / 12 /30	19:02:54
M_0004.FL	2012 / 12 /30	19:02:56
M_0005.FL	2012 / 12 /30	19:03:02
M_0006.FL	2012 / 12 /30	19:03:14

Return ->   MENU
Measurement Screen ->   Enter

▮▮▮▮   12/12/30   20:00:26

RECALL Store File : M_0002. FL

MAIN LCζ   65.0 dB
SUB   LAF   59.2 dB
                   51.2 dB

12/12/30   20:00:26

SLM ▶ ⟿ Time 00:00:20 F_L M 0068

40   70   100   130

MAIN   SUB
L_{AF} 65.0 db L_{CI} 72.3 db

L_{Aeq}	67.5	L_{Ceq}	74.1
L_{AE}	80.3	L_{CE}	87.0
L_{AFmax}	77.0	L_{CImax}	81.4
L_{AFmin}	45.9	L_{CImin}	59.0
L_{AF05}	73.1	L_{CI05}	79.8
L_{AF10}	72.0	L_{CI10}	79.8
L_{AF50}	57.5	L_{CI50}	66.4
L_{AF90}	48.0	L_{CI90}	61.2
L_{AF95}	46.5	L_{CI95}	60.5

12/12/30   13:00:26
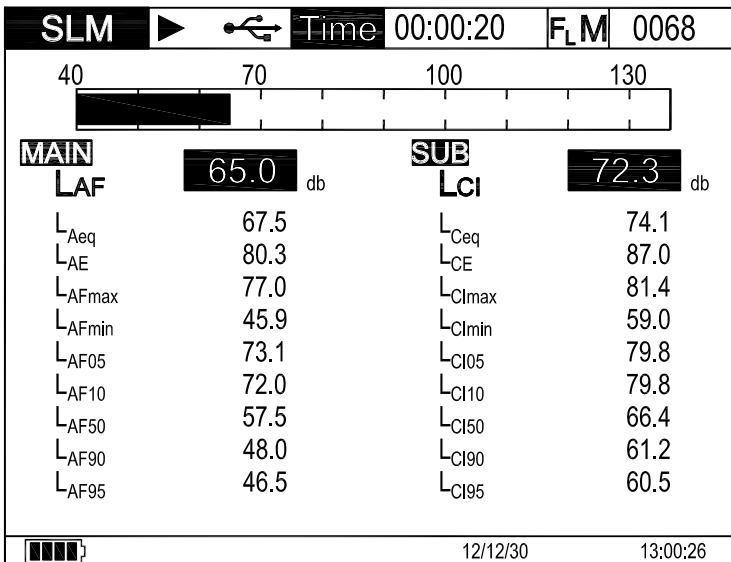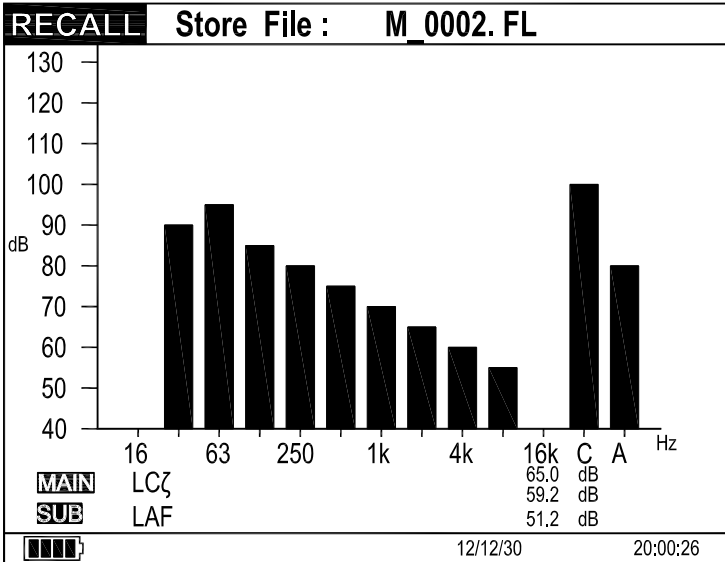
5.3 Erasing Manually Stored Data

1. Press the MENU button to enter the menu list screen.

2. Use the ▲ / ▼ buttons to select "**L)· Clear Record**" then press the ↵ button.

3. Use the ▲ / ▼ buttons to select "**MANUAL**" then press the ↵ button.

A confirmation message will appear. To erase the data, press the ↵ button. To cancel the process, press the MENU button.

Note: you can also erase the manual memory from the software.

```
MENU-2                         Fʟ M   0068
   J). Comparator                       ON
      1). Comparator  Level           70dB
      2). Comparator  Band            APHz
   K). Trigger                        TIME
      1). Trigger Level               70dB
      2). Trigger Band                APHz
      3). Trigger Time         06 : 00 : 00
      4). Slope Type                 Slope+
   L). Clear Record                   AUTO
   M). Recall                       MANUAL
  ▐▌▌▌▌▌▘              12/12/30        13:00:26
```

```
MENU-2                         Fʟ M   0068
   J). Comparator                       ON
      1). Comparator  Level           70dB
      2). Comparator  Band            APHz
   ┌──────────────────────────┐    TIME
   │ Do you  want  to  clear  the │  70dB
   │ records ?                    │  APHz
   │                              │
   │ Yes -> [Enter]  No -> [Menu] │  0 : 00
   └──────────────────────────┘
      4). Slope Type                 Slope+
   L). Clear Record                   AUTO
   M). Recall
  ▐▌▌▌▌▌▘              12/12/30        13:00:26
```

5.4 Auto 1 Memory Storage

Memory Store

Continuously store the current measured data as 1 set, at preset record interval times.

1. Power on the meter.

2. Press the MENU button to enter the menu list screen.

3. Use the ▲ / ▼ buttons to select "**B)· Storage**" then press the ↵ button.

4. Use the ▲ / ▼ buttons to select "**FLASH**" or "**SD Card**" then press the ↵ button.

Selecting FLASH will store the data in the internal memory.

Selecting SD Card will store the data on the SD CARD.

5. Use the ▲ / ▼ buttons to select "**C)· Store Mode**" then press the ↵ button.

6. Use the ▲ / ▼ buttons to select "**AUTO 1**" then press the ↵ button.

7. Use the ▲ / ▼ buttons to select "**Interval Time**" then press the ↵ button.

8. Use the ▲ / ▼ buttons and the ↵ button to set the desired record interval time from 1 second to 23h59m59s, then press the ↵ button.

9. Use the ▲ / ▼ buttons to select "**A)· Measurement time**" then press the ↵ button.

10. Use the ▲ / ▼ and ↵ button to set the desired measurement time from 1 second to 23h59m59s, then press the ↵ button.

Note: Measurement Time must be greater than or equal to the set Interval Time

11. Set the other measurement parameters (trigger mode, sub channel etc.) as required, using the MENU button to select setting items.

12. Press the MENU button to return to the measurement screen.

13. Press the STORE button to start the measurement. If a trigger has been set, measurement will start when the trigger conditions are met.

Important: During recording, only the START/STOP , PAUSE/CONT , ☼ , STORE , and M buttons are operative. Other keys such as the FREQ WEIGHT TIME and ▲ LEVEL ▼ button have no effect. Be sure to complete all settings before starting the store process.

If the trigger mode is "**OFF**", storing of measurement data will stop when the end of the measurement time is reached.

To stop the process earlier, press the START/STOP or the R key.

When the store is completed or stopped, the memory block address is incremented by one step.

Note: When memory block address 250 is reached, the **AFul** symbol is displayed and no more data can be stored.

The AUTO recording of data can only be read by PC, it cannot be recalled by the meter.
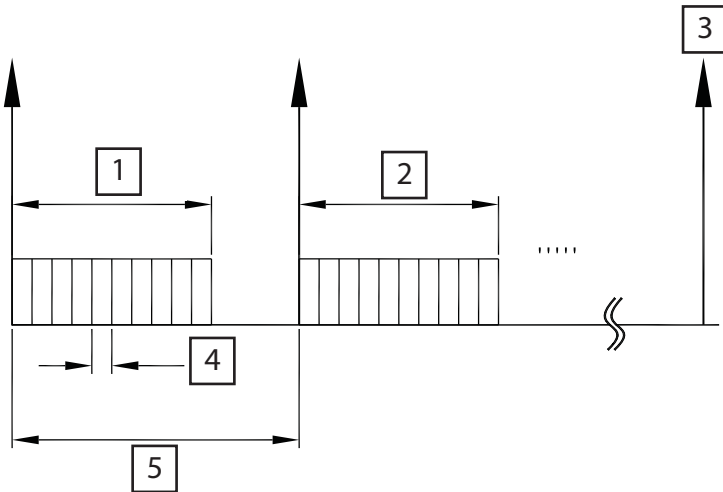
1. Measurement time (duration of test)
2. Measurement time (duration of test)
3. Measurement Stop or Memory full is reached (AFu)
4. Interval time (sample time)
5. Trigger time or Trigger event

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```
MENU-1                          F_L A   0250
 A). Measurement Time     00h01m10s
 B). Storage                        FLASH
 C). Storage Mode              AUTO1
       - Interval Time        ⇕00h00m01s
 D). Date Setting (Y/M/D)   2012/12/30
 E). Time Setting (h/m/s)   11 : 06 : 41
 F). Backlight Auto Off            OFF
 G). Sub Time Weight                 I
 H). Sub Freq Weight               C
  I). Lmax/Lmin Type           Band
 ▮▮▮▮             12/12/30        13:00:26
```

```
MENU-1                          F_L A   0250
 A). Measurement Time  ⇕00h01m10s
 B). Storage                        FLASH
 C). Storage Mode              AUTO1
       - Interval Time         00h00m01s
 D). Date Setting (Y/M/D)   2012/12/30
 E). Time Setting (h/m/s)   11 : 06 : 41
 F). Backlight Auto Off            OFF
 G). Sub Time Weight                 I
 H). Sub Freq Weight               C
  I). Lmax/Lmin Type           Band
 ▮▮▮▮             12/12/30        13:00:26
```

```
1/1 OCT          LV1  00:00:00   F_L A   0250
 MAIN   L_AF              55.0        dB
         16  Hz        ---- -        dB
       31.5 Hz        29.3          dB
         63  Hz        35.3          dB
        125 Hz        47.4          dB
        250 Hz        46.5          dB
        500 Hz        51.4          dB
         1k  Hz        48.2          dB
         2k  Hz        43.9          dB
         4k  Hz        39.9          dB
         8k  Hz        36.7          dB
        16k Hz        ---- -        dB
 SUB    L_AF              55.0        dB
 ▮▮▮▮     AFul           12/12/30        13:00:26
```

5.5 Auto 2 Memory Storage

Memory Store

Continuously store the processed data at a preset measurement integrated time.

1. Power on the meter.

2. Press the MENU button to enter the menu list screen.

3. Use the ▲/▼ buttons to select "**B)· Storage**" then press the ↵ button.

4. Use the ▲/▼ buttons to select "**FLASH**" or "**SD Card**" then press the ↵ button.

Selecting FLASH will store the data in the internal memory.

Selecting SD Card will store the data on the SD CARD.

5. Use the ▲/▼ buttons to select "**C*)· Store Mode**" then press the ↵ button.

6. Use the ▲/▼ buttons to select "**Auto 2**" then press the ↵ button.

7. Use the ▲/▼ buttons to select "**Integrate Time**" then press the ↵ button.

8. Press the ▲/▼ and the ↵ buttons to set the desired measurement integrated time from 1 second to 23h59m59s, then press the ↵ key.

9. Use the ▲/▼ buttons to select "**A)· Measurement time**" then press the ↵ button.

10. Use the ▲/▼ and ↵ buttons to set the desired measurement time from 1 second to 23h59m59s, then press the ↵ button.

Note: Measurement Time must be greater than or equal to the set Interval Time

11. Set the other measurement parameters (trigger mode, sub channel etc.) as required, using the MENU button to select settings.

12. Press the MENU button to return to the measurement screen.

13. Press the R button to start the measurement. If a trigger has been set, measurement will start when the trigger conditions are met.

The AUTO recording of data can only be read using the PC software.
It cannot be recalled by the meter.

5.6 Erasing Auto Stored Data

1. Press the MENU button to enter the menu list screen.

2. Use the ▲ / ▼ buttons to select "**L)· Clear Record**" then press the ↵ button.

3. Use the ▲ / ▼ buttons to select "**Auto**" then press the ↵ button.

A confirmation message appears. To erase the data, press the ↵ button. To cancel the process, press the MENU button.

Note: you can also erase the manual memory from the software.

```
┌─────────────────────────────────────────────┐
│ MENU-2                          F L M  0068  │
│   J). Comparator                        ON   │
│       1). Comparator  Level           70dB   │
│       2). Comparator  Band          12.5Hz   │
│   K). Trigger                         TIME   │
│       1). Trigger Level               70dB   │
│       2). Trigger Band              12.5Hz   │
│       3). Trigger Time          06 : 00 : 00 │
│       4). Slope Type                 Slope+  │
│   L). Clear Record                    AUTO   │
│   M). Recall                        MANUAL   │
│   ▮▮▮▮⎬             12/12/30       13:00:26   │
└─────────────────────────────────────────────┘
```

```
┌─────────────────────────────────────────────┐
│ MENU-2                        F L M  0068     │
│   J). Comparator                       ON     │
│      1). Comparator  Level          70dB      │
│      2). Comparator  Band         12.5Hz      │
│   K). Trigger                        TIME     │
│      1). Trigger Level              70dB      │
│      2). Trigger Band             12.5Hz      │
│      3). Trigger Time         06 : 00 : 00    │
│      4). Slope Type                Slope+     │
│   L). Clear Record                   AUTO     │
│   M). Recall                      MANUAL      │
│  ▮▮▮▮▯            12/12/30        13:00:26     │
└─────────────────────────────────────────────┘
```

6. Software Download and Installation

The 407790A software is available for free download from the WWW.EXTECH.COM web page, located under the Software downloads section.

SAVE the 407790A software to your PC.

Perform an "Extract All" to unZIP the files.

Run **ExtechInstaller.exe** to install the software.

There is no USB driver, as the meter attaches as a Human Interface device.

The software has a Help manual available to understand the full operation.

7. Sound Pressure Level - Technical notes

1. <u>The decibel (dB)</u>

The range over which the human ear responds to sound pressure (noise) is extremely large; in Pascals (Pa) it is $20\mu Pa$ (the threshold of hearing) to 100 Pa (the threshold of pain). The measurement of sound pressure has been made more convenient by the use of the decibel, which is logarithmic. However, decibels are non-linear and therefore cannot be added together. A simple rule is that doubling the amplitude of the noise under test causes the level to rise by 3dB.

2. <u>SLM-sound level meter</u>: Instantaneous sound pressure level (SPL) is used for spot checks to establish instantaneous noise levels. SPL is defined by the logarithmic equation:

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

Where P = rms measured sound pressure level

P_0 = rms reference sound pressure level (20μ Pa)

3. <u>Leq-level equivalent (continuous)</u>: 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 take a Leq measurement the period of time over which it is to be made must be selected. The longer the period of measurement time, the more accurate the Leq reading will be, a typical period is 8 hours (the length of a working day).

4. <u>SEL – Sound exposure level (L_E)</u>

SEL measurements are almost identical to Leq measurements but normalized or compressed 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.

8. Calibration

Calibrating the 407790A requires an acoustical calibrator such as the Extech Model 407766 or 407744 that can provide 94.0dB or 114dB at 1kHz.

1. Set the power switch to the OFF position.

2. Press and hold the ▲ and ▼ buttons then turn the power ON until CAL appears on the screen.

3. Insert the microphone into the opening of the acoustical calibrator.

4. Switch the calibrator ON (1kHZ 94dB or 114dB)

5. Use the ▲ and ▼ buttons to adjust the reading of the meter to match the sound calibrator's output value. (adjust range from -12.8 to 12.7dB).

6. Press the ↵ button to store the calibrated value.

7. Switch the calibrator and sound meter OFF.

8. Remove the calibrator from the microphone very slowly to avoid damaging the microphone.

```
 SLM                    00:00:00  FLM  0068
    30         60         90        120
   ┌─────────────────────────────────────┐
   │████████████████████████              │
   └─────────────────────────────────────┘


          LAF         94.0   dB


          CAL  ⬍       3.6   dB


   ▐████▌                12/12/30    13:00:26
```
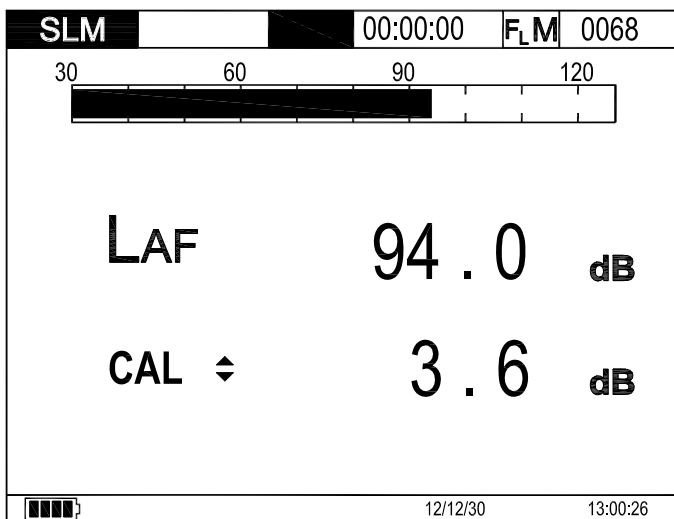
9. Specifications

Applicable Standards: IEC 61672-1: 2013 Class 2, IEC 61260-1: 2014 Class 2, ANSI S1.11: 2004 Class 2, ANSI S1.4: 1983 Type 2, ANSI S1.43: 1997 Type 2

Measurement functions: Simultaneous measurement of main channel and sub channel. Frequency weighting and time weighting are set independently for main and sub channel.

- **Sound level meter mode:** All-pass processing for the measurement items listed below is carried out separately for the main channel and sub channel

- **Analyzer mode:** For the main channel, octave, octave 1/3 or simultaneous octave, 1/3 octave band real-time processing and all-pass processing are carried out.

o   For the sub channel, only all-pass processing is carried out.

Processing types in each operation mode

	Channel	Main	Sub
Sound level meter mode	AP/OCT	AP	AP
	Frequency weighting	A/C/Z	A/C/Z
	Time weighting	F/S/10ms/I	F/S/10ms/I
	Measurement values	Lp, Leq, SEL, Lmax, Lmin, L^N	Lp, Leq, SEL, Lmax, Lmin, L^N
Analyzer mode	AP/OCT	AP, OCT	AP
	Frequency weighting	A/C/Z	A/C/Z
	Time weighting	F/S/10ms/I	F/S/10ms/I
	Measurement values	Lp, Leq, SEL, Lmax, Lmin, L^N	Lp, Leq, SEL, Lmax, Lmin, L^N

Measurement time: 1 to 59 seconds, 1 to 59 minutes, 1 to 24 hours

Microphone: ½ inch electret condenser type

Display: Backlit color TFT LCD (320×240 dot matrix)

   Update frequency: 100ms

Accuracy: ±1.0dB (ref 94dB @1kHz)

Measurement Frequency range: Octave analysis 31.5 Hz to 8 kHz; 1/3 Octave analysis 25 Hz to 10kHz

Frequency weighting: 'A', 'C', 'Z'

Inherent noise: A-weighting max. 17dB; C-weighting max. 25dB; z-weighting max. 30dB

Time weighting:

Main channel: Fast (125ms), Slow (1000ms), 10ms, Impulse (35ms)

Sub channel: Fast (125ms), Slow (1000ms), 10ms, Impulse (35ms)

Measurement level range:

A-weighting: 25 to 130dB

C-weighting: 33 to 130dB

Z-weighting: 38 to 130dB

Total meter range: 25dB to 130dB (A-weighting, 1kHz)

Linear operating range: 90dB

Level Range: 20 to 90dB, 20 to 100dB, 20 to 110dB, 30 to 120dB, 40 to 130dB

Sampling cycle: 20.8 µS (L^N: 100ms)

Trigger function: Controls measurement and memory store start

Level 1: Trigger level (1-dB steps) serves as threshold for starting measurement

Level 2: Single measurement is carried out when trigger level is exceeded

EXT: External trigger connector for logic-level signal with falling edge detection

TIME: Trigger event recurrence interval (trigger time) is set.

Store: Sound level values and processing results are stored in manual store or auto store mode. Data can be stored in internal memory or on micro SD card.

Manual store: Data for measurement results and measurement start time are stored manually, in single address increments.

Data store capacity: max. 250 data sets.

Auto store: Measurement results are stored continuously at the preset record interval time (for Auto 1) or the preset measurement integrated time (for Auto 2), and the measurement time.

Data store capacity: Memory capacity can be divided to 250 blocks max.

Memory capacity: See Table below (Manual/Auto storage blocks are separate)

Storage type / Mode	Flash	SD card
Sound level meter	25087 data sets	29992366 data sets
1/1-octave analysis	16185 data sets	19944162 data sets
1/3-octave analysis	9466 data sets	11942248 data sets
1/1 and 1/3 OCT mode	7839 data sets	9946834 data sets

Data recall: Allows viewing of the manually stored data.

AC output: 1 Vrms at FS (full scale); Output impedance approx. 5kΩ; Load impedance ≥100kΩ

DC output: 10mV/dB; Output impedance approx. 5kΩ; Load impedance ≥100kΩ

External trigger input: Detection of 0 to 5V logic- level signal, falling edge trigger, pulse width 1ms or more

USB: Allows connection to a computer as storage device, or use a communication device for unit control via communication commands.

Power: Four (4) C size 1.5V alkaline batteries

Battery Life: Approx. 2 hours

External DC power supply: 6 VDC, 1A

Operating Temperature/Humidity: 14 to 122ºF (-10 to 50℃); 10 to 90%RH

Storage Temperature/Humidity: 14 to 140ºF (-10 to 60℃); 10 to 75%RH

Environment conditions: Altitude up to 2000 meters

Dimensions & Weight: 13.6 (H) x 4.0 (W) x 2.4 (D)" (34.5 × 10 × 6cm); Approx.33.5 oz. (950g) including batteries

Accessories: Four (4) C 1.5V batteries, hard-shell carrying case, CD-ROM, USB cable, 4GB micro SD card, Windscreen, 3.5mm plug, and AC adaptor

Optional accessories: Microphone extension cable (4.7m (15ft), p/n 407764-EXT), Sound level calibrator, Tripod

10. Warranty

*FLIR Systems, Inc. warrants this Extech Instruments brand device to be free of defects in parts and workmanship for **one year** from date of shipment (a six month limited warranty applies to sensors and cables). If it should become necessary to return the instrument for service during or beyond the warranty period, contact the Customer Service Department for authorization. Visit the website www.extech.com for contact information. A Return Authorization (RA) number must be issued before any product is returned. The sender is responsible for shipping charges, freight, insurance and proper packaging to prevent damage in transit. This warranty does not apply to defects resulting from action of the user such as misuse, improper wiring, operation outside of specification, improper maintenance or repair, or unauthorized modification. FLIR Systems, Inc. specifically disclaims any implied warranties or merchantability or fitness for a specific purpose and will not be liable for any direct, indirect, incidental or consequential damages. FLIR's total liability is limited to repair or replacement of the product. The warranty set forth above is inclusive and no other warranty, whether written or oral, is expressed or implied.*

Calibration, Repair, and Customer Care Services

FLIR Systems, Inc. offers repair and calibration services for the Extech Instruments products we sell. We offer NIST traceable calibration for most of our products. Contact our Customer Service Department for information on calibration service availability. Annual calibrations should be performed to verify meter performance and accuracy. Technical support and general customer service is also provided, refer to the contact information provided below.

Support Lines: U.S. (877) 239-8324; International: +1 (603) 324-7800

Technical Support: Option 3; E-mail: support@extech.com

Repair & Returns: Option 4; E-mail: repair@extech.com

Product specifications are subject to change without notice

Please visit our website for the most up-to-date information

www.extech.com

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