Noise Sentry RT

User's Manual

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1   Introduction

Noise Sentry RT is a new generation of smart integrating sound-level meter/datalogger. It includes a digital MEMS microphone, an accurate date/time clock and a non-volatile 128 Mb recording memory. It can record sound pressure levels autonomously for a week. Connected to an external USB charger it can record for months. Its very small size allows it to be attached to or embedded within the monitored equipment.

The *Noise Sentry RT* includes the following features:

- Digital very sensitive MEMS microphone (31 dBA typical noise floor)
- Completely sealed weatherproof enclosure designed for outdoors applications.
- All-digital design.
- Ultra stable sensitivity (field recalibration is easily done, but seldom required)
- Very low sensitivity variation due to temperature changes
- Very low sensitivity to vibrations
- A and C weighting curves.
- *Integrating* Sound-Level Meter, records L-max, L-min and Leq levels.
- Software function calculates global Leq and/or dose, according to ISO and OSHA methods.
- Adjustable response time.
- Preprogrammed recording start date/time.
- Integrated oscilloscope function that can show the acoustic signal in real time.
- Integrated spectral analyzer function that can show the spectrum in real time.
- Allows the observation of recorded levels while the recording is ongoing.
- Works standalone, or USB connected for setup and data transfer to PC.
- Long life internal rechargeable battery that recharges from USB and most USB chargers.
- Can be field-calibrated.
- Observes and records 100% of the acoustic signal (no missed samples).
- Editable individual custom ID for easier instrument management.
- LabVIEW driver available

2   Applications

- Sound level and acoustic dose measurement and recording.
- Monitoring of safe working conditions.
- Email alarms.
- Activity detection and recording.
- Long-term measurement and recording of acoustic levels for environmental impact studies.
- Specially designed for long-term outdoors applications.

3   Warnings

⚠️   ***Never blow air at the microphone***

⚠️   ***Avoid over-discharging the battery***

- *Recharge the instrument immediately if the LED indicates a low-battery condition*

- *Even if the instrument is Idle all or most of the time, recharge it fully at least once every 6 months.*

⚠️ ***Do not store or operate the instrument at temperatures exceeding the following limits***

- *-20 degC to 60 degC (-4 degF to 140 degF)*

⚠️ ***When using outside, make sure the USB connector is facing down*** *like in* <u>*Figure 3*</u>. *This way rain will not accumulate in the connector and microphone port.*

4 Getting Started

4.1 Software Installation

Run *Noise_Sentry_RT_Manager_Installer.exe*. This installs the *Noise_Sentry_RT_Manager* application, as well as its USB driver and documentation.

Note: Perform the software installation above BEFORE connecting the instrument to the PC.

4.2 Hardware Installation

1. Connect the instrument to an available USB port on the PC

2. Verify that the PC properly detects the instrument and loads the driver. In case of doubt see section <u>***Troubleshooting***</u>.

4.3 Initial Test and Configuration

1. Upon connection to the PC, the *charge* LED should light-up yellow (charging) or green (charged). The *operating* LED should blink once per second.

2. Go into *Start\All Programs\Noise_Sentry_RT_Management* and run *Noise_Sentry_RT_Manager.exe*. The front-panel described in <u>***Figure 4***</u> appears, and the application tries to connect to the instrument. If it fails to find the instrument it indicates *No Device Found*. If this is the case see section <u>***Troubleshooting***</u>

3. Otherwise the application switches-on the *Noise Sentry RT* and starts communicating with it.

4. If the Time and Date in the upper right corner of the application window are not properly adjusted the application asks if you want the instrument time to be synchronized to the PC time. Only say YES if the PC time is correct.

5. In the front-panel of the application you should see the acoustic signal display in real-time.

5 Instrument Functions and Description

The instrument connects to a PC on a USB port. The *Noise_Sentry_RT_Manager* application is used to set its operating parameters and download recorded data.

Figure 1   *Noise Sentry RT*

1. Charge LED
2. Operation LED
3. USB Connector
4. Reset Button

6   Principle of Operation

6.1   Power Consumption

The *Noise Sentry RT* is always on. However, when not in operation it only measures time, which only takes a tiny operating current. In that *Idle* state it can stay on for up to one year. When the *Noise Sentry RT* is actively measuring, its power consumption allows it to record for 1 week.

In applications where the *Noise Sentry RT* must record for longer periods of time, it can be connected to a USB charger. For outdoor-use, photovoltaic USB chargers such as the *Solar Joos* http://solarjoos.com/ can be used to operate the instrument outdoors indefinitely.

6.2   Battery Charging

The battery charges whenever the following conditions are met:

- The battery has not reached full-charge
- The instrument is connected to a PC's USB port and the PC is not in standby, or
- The instrument is connected to a USB charger.

While charging, the charge LED is orange. When fully charged, the LED changes to green.

The charge time from a completely discharged state varies with the amount of power the PC allows the instrument to draw. It is normally around 2H30. If the PC does not allow the fast charge current, the charge time can increase up to 5 to 6 hours.

> *Note: When connected to a PC, battery charging stops while the PC is in standby.*

> *Note: It is OK to leave the instrument connected to a PC or USB charger all the time. The smart charger inside the instrument will stop charging as soon as the battery reaches full-charge.*

6.3   Modes of Operation

The *Noise Sentry RT* has three modes of operation:

Mode	Operation	Power Consumption
Idle	Disconnected from USB and not actively recording - Only keeps time.	Minimal: can stay on for up to 1 year.
Active	Connected to USB – Not recording – Instrument is fully on and measuring	Instrument draws power from USB to power itself, and if necessary recharge its battery. Battery is not depleted.
Recording	USB-connected or not - Fully on and recording.	If USB-connected, power comes from USB. If not, power comes from the battery. If not connected the instrument can record for up to 7 days.

Table 1

6.4   LED Indicators

The *Noise Sentry RT* has two LED indicators:

6.4.1   Charge LED

The charge LED is always fully on or off.

LED State	Meaning
Off	Instrument is disconnected, or is connected to a PC that is in standby.
Green	Instrument is connected to a PC or USB charger, and the battery is full.
Orange	Instrument is connected to a PC or USB charger, and the battery is charging.

Table 2

6.4.2   Operation LED

LED State	Meaning
Off	Instrument is in *Idle* mode.
1-blink/second	Instrument is in *Active* mode, but is not actively recording.
2-blinks/second	Instrument is actively recording.
4-blinks/second	Battery is low. Recharge as soon as possible. If the battery level becomes critical the instrument will go to *Idle* mode (LED-off) in order to safeguard the battery against over-discharge as much as possible.

Table 3

6.5   Frequency Response

*Figure 2* shows the typical spectral error in dB-A and dB-C, together with the standard type II limit lines.
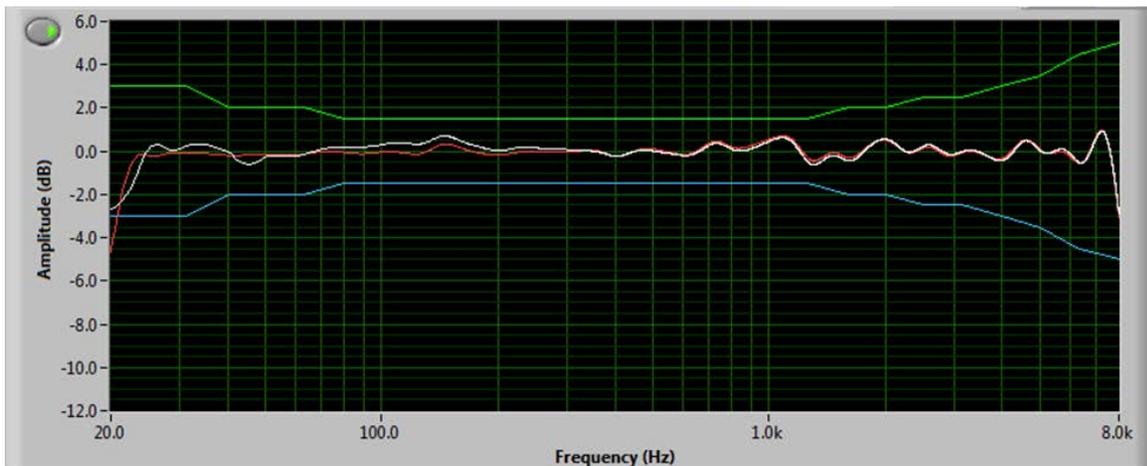
Figure 2

That frequency response is measured at the angle of incidence as shown in *Figure 3*.

Free-field calibration
angle of incidence
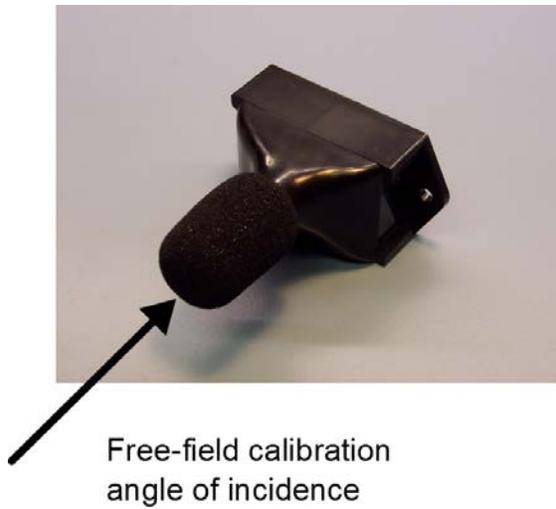
Figure 3

6.6 Noise Floor

Weighting Curve	Noise
dB-A	31 dB (typical)
dB-C	37 dB (typical)

Table 4

6.7 Saturation Level

Weighting Curve	Saturation Level
dB-A	117 dB @ 1 kHz (typical)
dB-C	114 dB @ 1 kHz (typical)

Table 5

6.8 Calibration

The instrument can be field-calibrated using a calibrator with a standard 1/2" opening.

Field calibration is performed by the *Noise Sentry RT Manager* application. Simply press the *Calibrate* button and follow the on-screen instructions.

6.9 Scale

The *Noise Sentry RT* records sound levels with a resolution of 1/10th of a dB.

6.10 Recording

Every time a recording is started, a new record is created in memory and filled until the recording is stopped. That record is time-stamped, so the signals can be displayed with respect to absolute date/time. Records are stored sequentially in the instrument's memory. There is no limit to the number of records that the memory can contain, only a limit to the total size of the data recorded. The *Noise_Sentry_RT_Manager* application displays the total memory recording time as a function of the various setup parameters.

After (or while) recording, the records contained in memory can be downloaded from the instrument and observed or exported. In case a recording is ongoing the last record is only displayed up to the present time.

The recording is stopped automatically when the recording memory is exhausted. This way a new record will not overwrite an old one.

The recording memory is non-volatile, so there is no risk of losing the data that has already been recorded, even in the case of a battery failure.

> Note: It is perfectly legal to find empty records in memory. That occurs typically when a recording is started and stopped quickly, before any data could be written to memory. In that case only the time-stamp is written to memory.

6.10.1 Sound Level Calculation

After extracting the signal power, the calculated sound levels are low-pass filtered (smoothed) using an adjustable time constant. A typical short time constant (around 100ms and lower) allows the measurements to track sharp changes, while a longer time constant (around 1s and longer) provides more stable (cleaner) RMS values.

The sound level statistics (L-min, L-max and Leq) are gathered for an adjustable *log-interval* before being written to the recording memory. The log-interval represents the interval at which the selected statistics are written to memory. Therefore a longer log-interval uses less memory, while a shorter log-interval provides better time resolution and allows the user to distinguish events that occurred close together. The statistics (L-min, L-max and Leq) are reset at the beginning of each log-interval. Then the statistics are gathered sample-by-sample during the log-interval. At the end of each log interval the calculated statistics are written to memory, and the next log-interval is started.

To record sound levels proceed as follows:

1. Select the statistics to be recorded (L-min, L-max and/or Leq).

2. Select the log-interval. Note that the total recording time is automatically calculated and displayed by the *Noise_Sentry_RT_Manager* application, as a function of the log-interval and statistics selected. The log-interval is adjustable in 125 ms increments, from 125 ms up to 2H.

3. Select the time constant used to smooth the measured sound levels. Choose a short time constant (100 ms or lower) to be able to track fast changes. Choose a longer time constant (1 s or higher) to provide cleaner more stable sound levels.

4. When ready to start a recording immediately simply press the *Record* button. Press *Record* again to stop the recording.

5. Or to set a start time/date:

- Check to make sure that the instrument time is correct. If that is not the case press the Sync button in order to automatically set the instrument time to the PC time.

- Press the *Timer* button. Set a start time and date using the calendar.

- Click OK to arm the trigger.

7 Noise_Sentry_RT_Manager Application
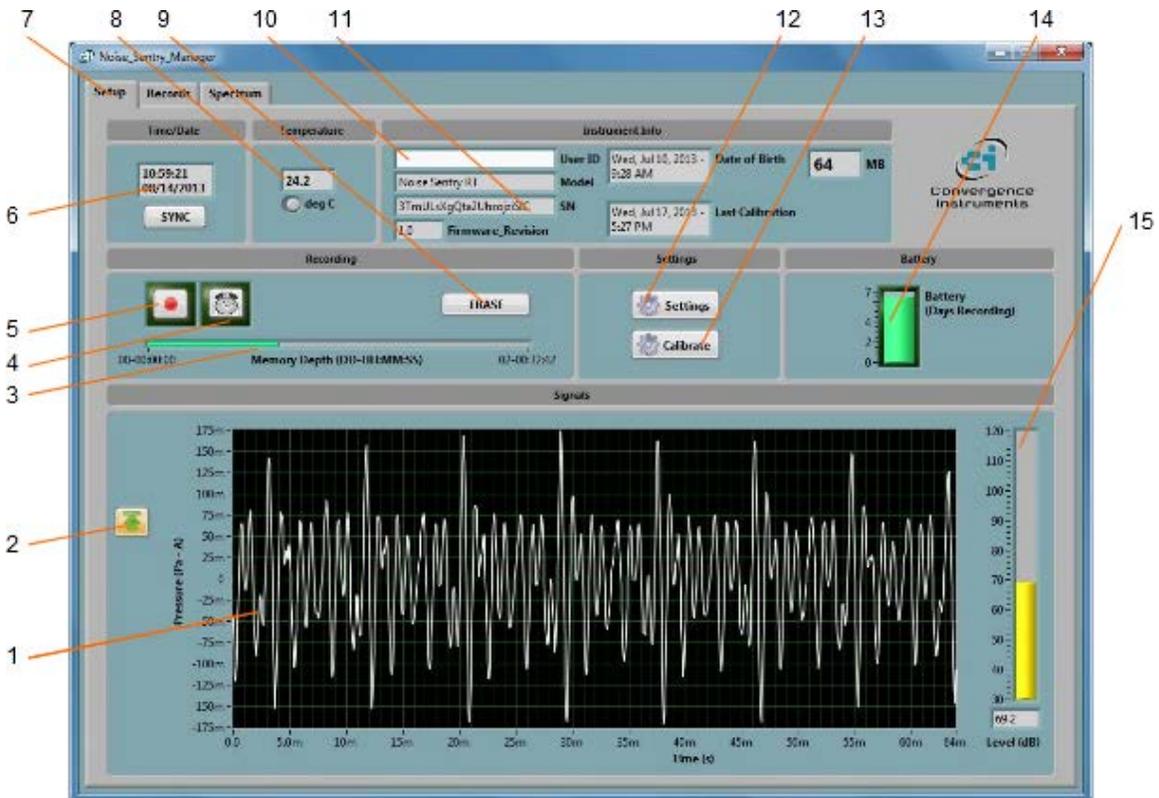
**Figure 4   Setup Tab**

1. Acoustic signal
2. Auto-Range button
3. Memory fill indicator
4. Timer button
5. Record button
6. Instrument Time indicator
7. Tab selector
8. Instrument Temperature indicator
9. Erase button
10. Instrument Custom ID
11. Instrument Information
12. Settings button
13. Field calibration button
14. Battery Condition, Charge and Recording Time Field
15. Sound Level indicator
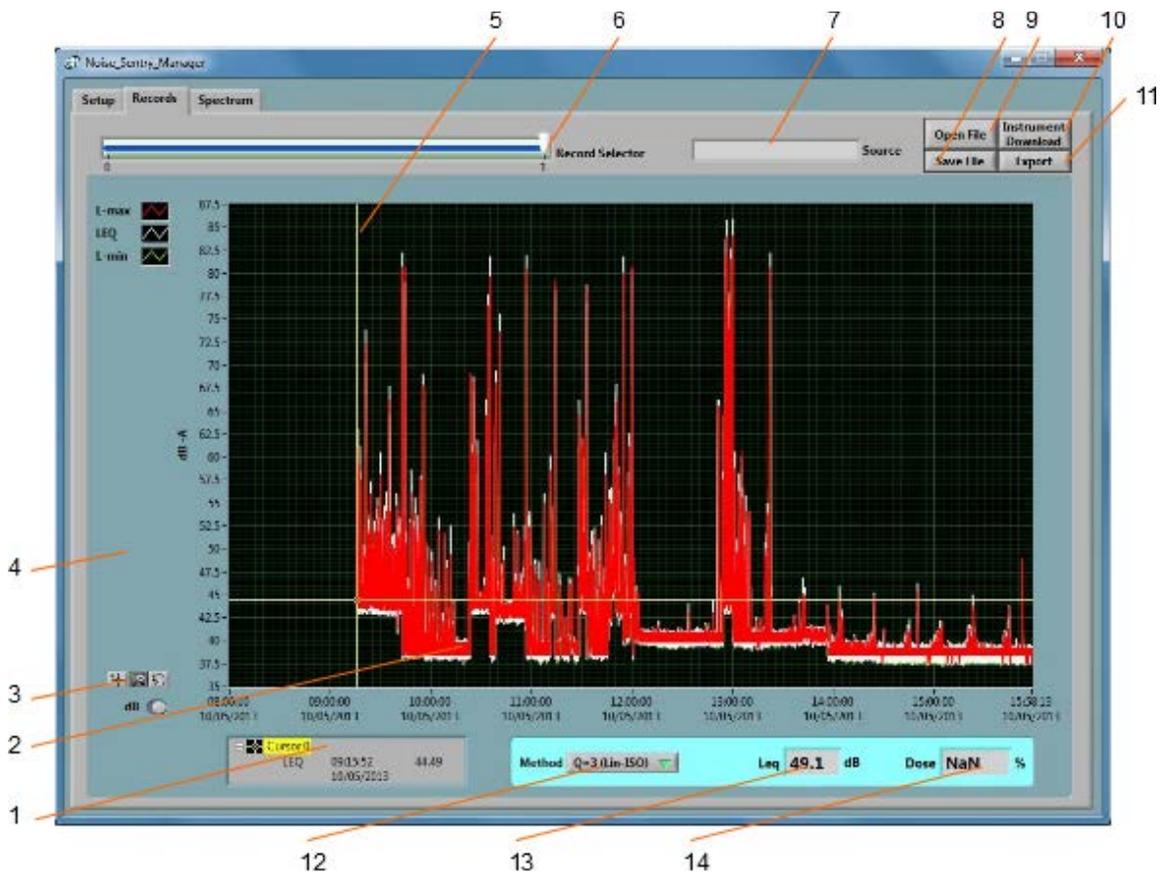
Figure 5   Record Tab

1. Cursor field
2. Recorded levels
3. Pan and zoom buttons
4. dB/Lin button
5. Cursor
6. Record number selector
7. Data source
8. File Save button
9. File Open button
10. Instrument Download button
11. Export button
12. Global level/dose calculation method
13. Global Level/Time-Weighted-Average value
14. Global Dose value
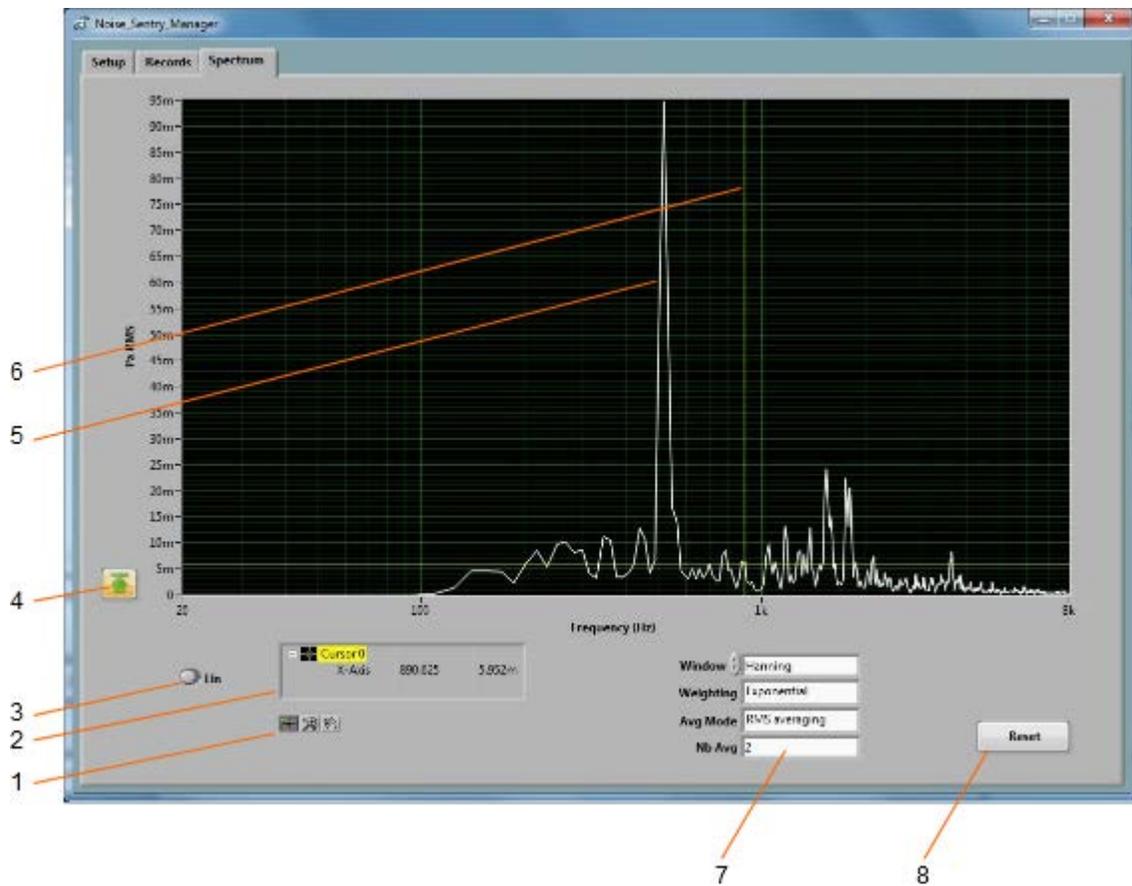
Figure 6   Spectrum Tab

1. Cursor, Zoom and Pan controls
2. Cursor values display
3. dB/Lin button
4. Auto-scale button
5. Spectrum
6. Cursor
7. Spectral controls
8. Spectrum reset button
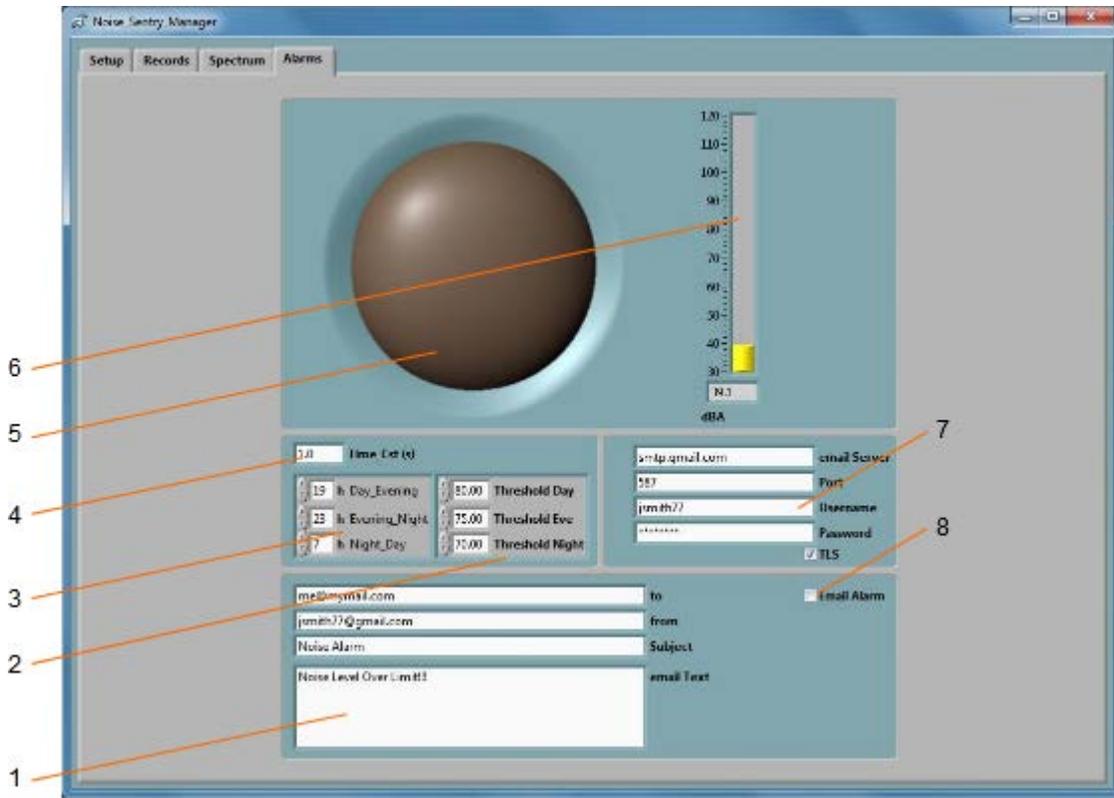
Figure 7   Alarms Tab

1. Email setup
2. Thresholds
3. Time-Periods
4. Alarm time constant
5. Visual alarm
6. Real-time level display
7. Email server setup
8. Email enable control

7.1   Starting the Application

The application can be run with or without a *Noise Sentry RT* connected. When a *Noise Sentry RT* is not connected the application can only be used to display and analyze a previously saved log file. All the controls and indicators related to the instrument are grayed out.

To control a *Noise Sentry RT* using the *Noise_Sentry_RT_Manager,* proceed as follows:

1. Connect the instrument to an available USB connector on the PC.

2. Make sure that the charge LED lights-up yellow or green, and that the operation LED starts blinking. If not, review the installation procedure, or see section ***Troubleshooting.***

3. Go into *Start\All Programs\Noise_Sentry_RT_Manager*, and run *Noise_Sentry_RT_Manager.exe*.

4. The front-panel described in *Figure 4* appears, and the application tries to connect to the instrument. If it fails to find the instrument it indicates *No Device Found*. If this is the case see section *Troubleshooting*

5. Otherwise the application immediately starts communicating with the *Noise Sentry RT*.

7.2 Main Functions

The application has three main tabs:

- **The *Setup* Tab:** Is used to setup the instrument and monitor real-time measurements (see *Figure 4*).
- **The Records Tab:** Is used to download, display and export the data from the Noise Sentry RT (see *Figure 5*).
- **The Spectrum Tab:** Is used to display a real-time power spectrum from the Noise Sentry RT (see *Figure 6*).

7.3 Setup Tab

The setup tab is seen in *Figure 4*. It is divided into seven fields.

7.3.1 Time and Date Field

This field displays the internal time of the instrument. If the instrument time is not properly adjusted, press *Synchronize*. This synchronizes precisely the instrument time to the PC time. Make sure the PC time is accurate before synchronizing the instrument.

Note: Time synchronization is not allowed while the instrument is recording.

7.3.2 Temperature Field

This field is used to display the instrument's internal temperature in degC or degF. It is normal for the internal temperature to rise slightly while the instrument is charging.

7.3.3 Instrument Info Field

The instrument info field provides instrument information, such as instrument model, serial number and firmware revision. In addition the *User-ID* field may be used to assign a custom identifier to the instrument.

To set, modify or delete the *User-ID*, simply place the cursor in the *User-ID* box and write a new identifier or clear the text. The new identifier is written to the instrument's memory as soon as *return* or *enter* is pressed, or if the mouse is left-clicked outside of the box.

The *User-ID* is written to non-volatile memory, so it is retained even in the event of a battery failure.

7.3.4 Recording Field

The recording field has three buttons:

- **Record** The *Record* button is used to immediately create a new record and start recording. The new record is placed in memory immediately after the last one. The recording

stops when the memory is exhausted, or when the *Record* button is pressed again. The recording parameters, such as number and types of values recorded…etc. must be adjusted prior to starting the recording.

- **Timer** The *Timer* button is used to set a time and date to start the recording automatically. This is only allowed when a recording is not already in progress. To set the timer, press the *Timer* button. Then set the recording date and time, and press the *OK* button to arm the timer.

- **Erase** The *Erase* button erases unconditionally all the data that has been recorded in the instrument, making room for new records.

The *Memory Depth* bar provides two indications:

- The percentage of memory already used (indicated by the green bar). The bar is completely grey when the memory is empty and completely green when the memory is full.
- The total memory time, in Days-Hours-Minutes-Seconds. The total memory time is displayed at the right extremity of the scale. It is calculated as a function of the instrument settings, such as log interval, statistics recorded…etc. Therefore it will change dynamically as the settings are modified, to reflect the new overall memory time.

7.3.4.1 Timer Setting

When the *Timer* button is pressed, the timer settings panel appears.

Either use the direct entry field (*Figure 8* (4)), or press the *Calendar View* button (*Figure 8* (3)) to set the date and time when the recording must start.

Press the *OK* button to exit and arm the timer.

Press the *Cancel* button, or the *Window-Close* button to exit without arming the timer.
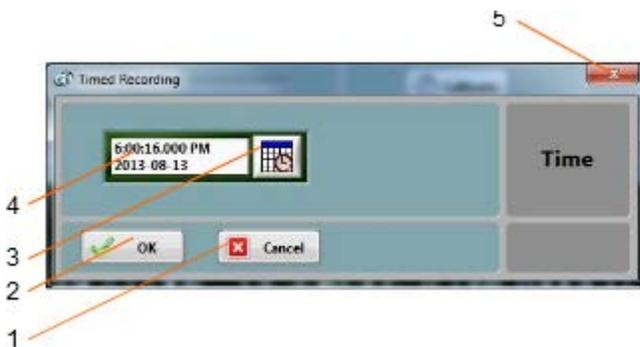

Figure 8 Timer Settings Panel

1. Cancel button – Closes the window without arming the timer
2. OK button – Closes the window and arms the timer
3. Calendar button – Brings the calendar view to enter date and time
4. Date/Time field – Can be used to enter date and time directly
5. Window close button - Closes the window without arming the timer
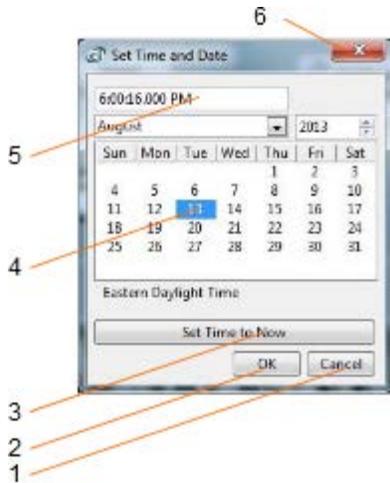
Figure 9   Calendar View

1.   Cancel button – Closes the window without changing the date/time setting
2.   OK button – Closes the window and accepts the newly set date/time
3.   Set to Now button – Set the time and date to the present time
4.   Date setting field – Click a date to set
5.   Time setting field – Use the field to set a new time
6.   Window close button - Closes the window without changing the date/time setting

7.3.5   Settings Field

The settings field contains the *Settings* and *Calibration* buttons.

7.3.5.1   Instrument Settings Panel

The instrument settings panel opens when the user presses the *Settings* button. Changing the settings is only allowed when the instrument is not actively recording.
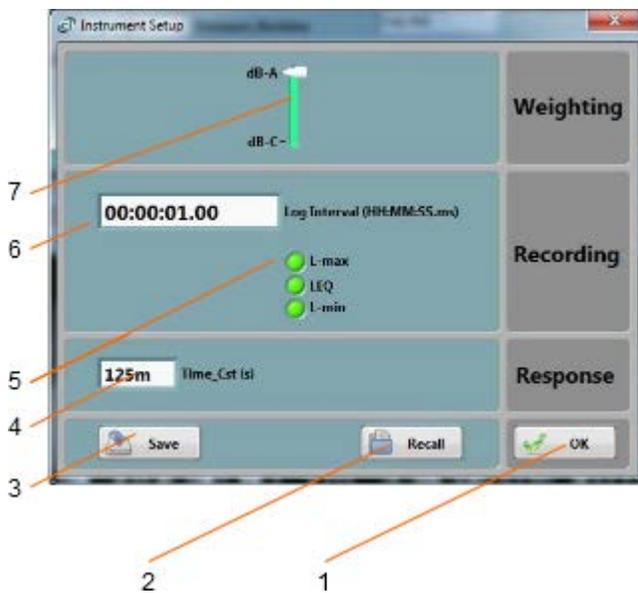
Figure 10   Instrument Settings Panel

1. OK button   –   Closes the window
2. Recall Button   –   Recalls a configuration from a configuration file
3. Save Button   -   Saves a configuration to a configuration file
4. Time constant for sound level measurement
5. Statistics selector
6. Log interval control
7. dB-A/dB-C selector

7.3.5.1.1 dB-A/dB-C Selector

Use this selector to choose the weighting curve. The default is dB-A, which approximates the sensitivity of human hearing.

7.3.5.1.2 Log Interval

The log interval defines the time between two successive recorded points. When recording, the L-min, L-max and Leq are reset at the beginning of each log interval. Then the instrument observes the signals for the duration of the log interval, and updates the L-min, L-max and Leq accordingly. At the end of the log interval the selected levels are written to memory. Then the next log interval is started… and so on until the recording is stopped or the memory is exhausted.

The log interval can be adjusted from 125 ms to 2 H in increments of 125 ms.

The amount of memory consumed is inversely proportional to the log interval. The *Memory-Depth* indicator in the *Setup* panel automatically calculates the overall recording time as a function of the selection.

7.3.5.1.3 Statistics Selectors

The statistics selector specifies the type of statistic to record. To select a statistic, simply press on the corresponding green indicator to light it up. By default, all statistics (L-min, L-max and Leq) are selected.

The amount of memory consumed while recording is proportional to the number of statistics selected. The *Memory-Depth* indicator in the *Setup* panel automatically calculates the total recording time as a function of the selection.

7.3.5.1.4 Time Constant

When measuring sound levels, the instantaneous RMS levels are low-pass-filtered with an adjustable time constant.

A shorter time constant should be chosen to be able to track rapid changes. Otherwise the measurements will be smoothed out. On the other hand, when the RMS levels are slowly varying, a longer time constant will provide more precise values.

Typical fast time constants are 100ms and under.

Typical slow time constants are 1s and over.

7.3.5.1.5 Closing the Window

Each adjustment is implemented in the instrument at the time the corresponding control is modified.

After all the adjustments have been made the window can be closed using the *OK* button or the top-right corner of the window. There is no difference between the two.

7.3.5.2 Calibration

To field-calibrate the instrument place the microphone port into a ½" calibrator and press the *Calibrate* button. Then follow the on-screen instructions.

7.3.6 Battery Field

This battery condition field indicates the remaining battery capacity. The indicator is surrounded by a yellow indicator that lights-up when the battery is charging.

The battery condition indicator is scaled to indicate the approximate number of days of recording time remaining in the battery.

7.3.7 Signals Field

The signals field provides information about the acoustic signal and sound level.

- The graph presents the acoustic signal as it is measured in real-time. When selected, the auto-scale button allows the scale to be dynamically adjusted so that all the signals fit in the graph. When deselected, the scale is fixed. When using a fixed scale, the scale can be adjusted manually by double-clicking and writing new values directly in the top-most and bottom-most marker values of the vertical scale. The acoustic signal is scaled in *Pa.*
- The vertical bar to the right of the graph show the sound level measured in real time. The sound level is scaled in dB (dB-A or dB-C, depending on the weighting curve).

7.4 Records Tab

The *Records* tab is seen in **Figure 5**. It is used to retrieve the recorded information from the *Noise Sentry RT* or from a saved file, and to display and optionally export the recorded logs.

7.4.1 Instrument Download

To download data from the instrument press the *Instrument Download* button. The whole contents of the instrument's memory are downloaded, and the newest record is displayed in the graph.

The *Record Selector* at the top-left of the page indicates how many records have been downloaded. It shows one separate tick per record downloaded. Use the white slider to select the desired record. When selecting a record the indication *No-Data* is displayed on top of any empty graph.

> *Note: It is legal for a record to contain no data at all. That usually means that the recording was started and stopped before any data had time to be recorded. In such a case the time-stamp is still valid and can be used to determine when that recording occurred.*

The *Source* indicator shows the *User-ID* of the instrument, if any has been set.

The Y-scale can be displayed in dB or linear (Pa) scale.

The graph shows up to three curves:

- L-max in red

- Leq in white

- L-min in green

7.4.2 File Save

Pressing the *Save File* button saves all the records downloaded from the instrument to a file on the PC. In addition to the whole contents of the recording memory the file also contains ancillary information, such as calibration, instrument information…etc.

The file is saved in a proprietary format with the extension *.cil.*

By default the file is saved with a name that contains the *User-ID* of the instrument, if any has been set, as well as the present date and time.

7.4.3 File Open

Pressing the *Open File* button recalls all the records previously saved to a *.cil* file. The function works very much like the *Instrument Download* function, except that the data comes from a previously saved file.

The *Source* field shows the *User-ID* of the instrument the data comes from.

That function works even when no instrument is connected to the PC, so it can be used to examine data that was recorded elsewhere and sent as a file.

7.4.4 Exporting Data

The data of the record being viewed can be exported for further display or processing. The data is exported to a tab-delimited text format that can be imported in *Excel* and other spreadsheet applications.

7.4.5 Global Level Calculations

The application automatically calculates the global levels or equivalent dose corresponding to the displayed data.

The global values can be calculated according to several methods. At the time of this writing we offer the linear (ISO – Q=3) method, as well as the OSHA (Q=5) method. Other methods may follow.

> *These global values are calculated from the Leq curve (white curve). In order to obtain the global values, the Leq MUST BE among the recorded statistics.*

> *The global values are calculated from the VISIBLE part of the graph only. Play with the zoom and pan functions to eliminate portions at the beginning and end of the recording from the calculation.*

7.4.6 Graph Controls

The graph can be adjusted and analyzed using the following techniques:

7.4.7 Cursor Control

A cursor can be used to precisely measure the level at a particular point in time.

To the bottom-left of the graph is a three-button control. The left-most looks like a cross. In order to use the cursor proceed as follows:

- Press on the button that looks like a cross (see *Figure 5* (3))

- Place the mouse over the point where the X and Y cursor lines meet and left-click. This grabs the cursor.

- Drag the cursor to the specific curve and time of interest. The cursor can jump from one curve to the other.

- Read the X and Y values in the cursor field underneath the graph.

7.4.7.1   Zoom Control

To use the zoom control, simply press the button that looks like a magnifying glass and choose one of the following zoom functions:

- Zoom X-Y

- Zoom X

- Zoom Y

- Zoom-Extents

After choosing the function, the cursor changes to a magnifying glass. Click and drag on the graph to apply the required zoom.

7.4.7.2   Pan Control

To pan a graph left, right up or down, first press on the *Hand* button to the left of the graph. Then position the mouse over the graph. Left-click to "grab" the graph, and move the mouse to pan the graph as desired.

7.4.7.3   X-Y-Scale Direct Modification

Another way to zoom a graph is to directly change its scale. To do that, simply click on the value for left-most or right-most marker of the X-scale, and select its value. Type a new value to replace the old one. The scale is adjusted so that that new value is used at the beginning or end of the scale.

The same technique can be applied to the bottom-most or top-most values of the Y-scale of the graph.

7.5   Spectrum Tab

The *Spectrum* tab is shown on *Figure 6*. When that tab is selected the time-domain signals captured by the instrument are presented in the form of averaged power spectra. The processing is as follows:
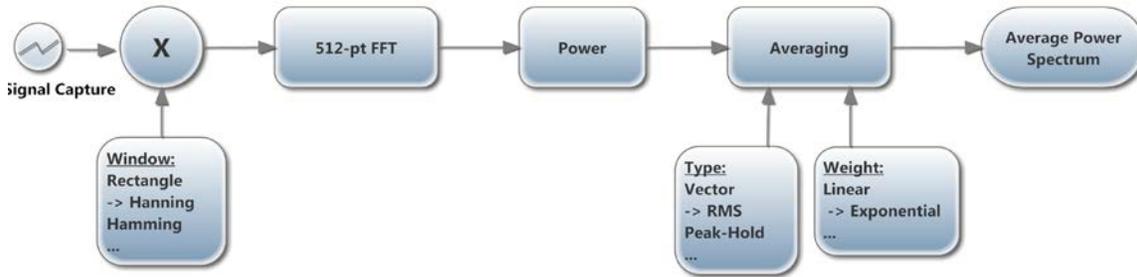
Figure 11 *(-> shows the defaults)*

7.5.1 Window

The type of window chosen has an impact on the spectral resolution. The *Hanning* window is generally a good choice that provides good spectral selectivity.

7.5.2 Weighting

The averaging can be exponential or linear.

- **Exponential Averaging** is comparable to a low-pass time filtering of the spectrum. In other words each spectral line is low-pass filtered so that the resulting spectrum is smoothed out over time. In that case the *Nb_Avg* represents an equivalent averaging time constant, expressed in number of successive spectra. The averaging is continuous and does not stop. Each successive spectrum is taken into account in the calculation. A larger value of *Nb_Avg* produces a spectrum that is more stable, but also averages-out short-lived transients.

- **Linear Averaging** takes an equal-weight average of *Nb_Avg* successive spectra. After the *Nb_Avg* spectra have been observed the result is frozen.

In both cases the *Reset* button discards the present display and restarts the averaging from zero.

The *Averaging Mode* can be chosen from several choices:

- **No Averaging** Only presents instantaneous power spectra, irrespective of the other settings.

- **Vector Averaging** Vector averaging eliminates noise from synchronous signals. Vector averaging computes the average of complex quantities directly. The real part is averaged separately from the imaginary part. Averaging the real part separately from the imaginary part can reduce the noise floor for random signals because random signals are not phase coherent from one time record to the next. The real and imaginary parts are averaged separately, reducing noise but usually requiring a trigger.

- **RMS Averaging** RMS averaging reduces signal fluctuations but not the noise floor. The noise floor is not reduced because RMS averaging averages the power of the signal. *RMS Averaging* is the most common type.

- **Peak-Hold** Peak hold averaging retains the peak levels of the measured spectra. Peak hold averaging is performed at each frequency line separately, retaining peak levels from one FFT record to the next.

Note: All the FFT calculation is performed on the PC. The raw time-signals are transferred from the instrument to the PC, where the FFT and averaging calculations are performed.

7.5.3 Scale

The power spectra can be displayed in dB or linear (Pa) scale. Changing the scale does not restart the averaging.

7.5.4 Cursor, Zoom and Pan

Cursor, Zooming and Panning is done the same way as in the *Records* graphs. See section *Global Level* Calculations

The application automatically calculates the global levels or equivalent dose corresponding to the displayed data.

The global values can be calculated according to several methods. At the time of this writing we offer the linear (ISO – Q=3) method, as well as the OSHA (Q=5) method. Other methods may follow.

These global values are calculated from the Leq curve (white curve). In order to obtain the global values, the Leq MUST BE among the recorded statistics.

The global values are calculated from the VISIBLE part of the graph only. Play with the zoom and pan functions to eliminate portions at the beginning and end of the recording from the calculation.

Graph Controls. The auto-scale button can be pressed or released to obtain an automatic or fixed vertical scale. When the graph is in fixed scale, writing directly in the values of the end-scale markers sets the scale to fit those values.

7.6 Alarms Tab

It is important to understand that the alarm and email features are functions of the *Noise_Sentry_RT_Manager* application, not of the instrument itself. So in order to work the instrument must be connected to a PC, and the PC must be running the *Noise_Sentry_RT_Manager* application. In order for the email to work, the PC must also be connected to the internet of course.

7.6.1 Alarm Types

There are two main types of alarms:

- Visual Alarms

- Email Alarms

The email alarm can be disabled using the *Email Alarm* control (8 in *Figure 7*).

7.6.2 Alarm Triggers

Alarms are only triggered when the instantaneous RMS level exceeds a preset threshold. There can be up to three different thresholds, depending on the time of day (2 and 3 in *Figure 7*). You can adjust both the thresholds, and the limits between the three times of day:

- Day

- Evening

- Night

7.6.3 Alarm Timing

The visual alarms always last for a minimum of three seconds. If the alarm condition is maintained (RMS level is above the threshold) then the visual alarm will stay active.

In order to avoid filling-up a user's mailbox in case of a maintained alarm condition, the email alarms are only triggered when the alarm has been inactive (below the threshold) for at least 1 minute. So when an RMS level exceeds the set threshold and is maintained, an initial email will be sent when the alarm first triggers. A new alarm will only be sent after the level falls back to the inactive level, is maintained for at least 1 minute and rises back up above the threshold.

7.6.4 Time Constants

The alarms trigger only on the instantaneous value of the measured RMS level. However in some applications it is useful to filter-out short transients and only trigger when the RMS level is maintained above the threshold for some time. In order to do that, the *Time-Constant* of the alarm needs to be adjusted to a value adequate for the application.

It is worth noting that, contrary to the time constant that is adjusted as part of the instrument settings (see section *Time Constant*), this "alarm time constant" is implemented at the level of the application, not at the level of the instrument. Therefore it does not affect the data that the instrument may be recording.

For instance *Figure 7* shows a *Time_Cst* of 1 second. That is independent of the instrument's time constant that may be set to a much shorter value, say 100ms.

7.6.5 Email Setup

In order for email alarms to work, the PC that runs the application must of course be connected to the internet. It must be able to connect to an outgoing email server and account. That is usually the email account of your internet service provider, or an email service account, such as *Gmail*.

Emails are sent using the SMTP protocol. The email setup is not always easy. You should know and understand the settings that your outgoing email server requires.

The complete email setup is similar to the configuration of any email application. It includes the following:

- **Email server**   The internet name of the outgoing email server.

- **Port number**   The TCP port number of the email service. This is usually:

  - **25**   for an "open" (no security) account.

  - **465**   for SSL security

  - **587**   for TLS security

- **User-name**   The account name

- **Password**   The account password (leave blank for an "open" (no security) account).

- **TLS**   The security setting. This is the only secure mode supported. Uncheck for an "open" (no security) account.

In addition to these settings, the email alarms settings let you set:

- **One or Several Recipients**   The recipient line (*to* line in *Figure 7*) can hold more than one recipient. Multiple recipient addresses must be separated by space, tab, return or semi-colon.

- **The sender's address**

- **The subject line**

- **The email text**   In addition to the text written in the *email-Text* box, the email text will contain the *User-Name* attributed to the instrument (if one has been set), the detected level and the time and date. This way if multiple instruments are being monitored, the user can determine which of those triggered the alarm by looking at the user name on the first line of the email.

The application by default shows the settings for a fictitious secure *Gmail* account (see *Figure 7*). These settings of course need to be changed to reflect the user's own email account settings.

7.6.6 Sending Alarms While Recording

There is nothing that precludes the instrument from being recording and at the same time monitoring and sending alarms. This way, long after an alarm has been sent, the instrument's data can be downloaded to determine how loud the event that triggered the alarm was.

8 Maintenance

8.1 Battery Care

The following factors affect battery life:

- Prolonged use at extreme temperatures (close to the limits of *-20 degC and +60 degC (-4 degF to 140 degF)* will shorten the life of the battery.
- Over-discharge of the battery will shorten the life of the battery. Always fully recharge the battery when it is low or at least every 6 months, whichever comes first.

8.2 Reset Procedure

In the unlikely case where the instrument's firmware crashes a hardware reset can be performed by inserting a small rod into the reset hole and pushing until a slight click is felt. There is no risk of losing any recorded data by resetting the instrument. However a hardware reset will reset the instrument's settings to their default value.

8.3 Operation Outdoors

Thanks to its potted construction, the *Noise Sentry RT* is weather-proof. It can safely be used outdoors provided that the temperature is always within the safe limits. However when using it outdoors with a risk of rain or snow, make sure its USB connector is facing down, so water will not accumulate in the connector and microphone port.

8.4   Cleaning

Use a damp sponge or soft cloth.

> *Note: Do not use solvents.*
>
> *Do not submerge in water.*

8.5   Software and Firmware Upgrades

Software upgrades are found on our web site: www.convergenceinstruments.com.

After upgrading the software, if a firmware upgrade is required it will be applied automatically when the upgraded *Noise_Sentry_RT_Manager* application is started. In that case <u>do not disconnect</u> the instrument until the upgrade is completely over. Failure to do that will put the instrument in a state where it no longer works.

> *Note: A firmware upgrade will not lose any recorded data, but will reset the instrument's settings.*

> *Note: When upgrading the instrument's firmware always make sure that <u>only one instrument is connected to the PC</u>.*

9   Troubleshooting

9.1   USB Power Limitation

In some instances a PC will not allow the instrument to connect to one of its USB port because it cannot provide the battery charge current requested by the instrument. If you suspect that this may be a factor, try connecting the instrument to the output of an <u>externally-powered</u> USB hub that is capable of providing a full USB load (500 mA).

9.2   USB Driver Installation

If the *Noise_Sentry_RT_Manager* application is unable to communicate with the *Noise Sentry RT* it may be because the USB driver failed to install properly. To check the USB driver installation follow the procedure below:

1. Disconnect the USB cable.

2. If necessary take the PC out of stand-by.

3. Reconnect the instrument to an available USB port on the PC.

4. Make sure the charge LED lights-up green (charged) or yellow (charging). If not, make sure that the PC's USB port is functional and that the USB cable is not damaged. If necessary try on a different PC, and/or with a different USB cable. The charge LED is just an indication that the port is powered. It should light-up, even if the USB driver is not installed properly.

5. Make sure that the operation LED starts blinking. If not go to step 6.

6. Open the *Device Manager* on the PC. This is usually found in *Control Panel – System and Maintenance*.

7. Just after connecting the instrument to the PC, observe that the *Device Manager* window refreshes.

8. Verify that an item named *DDCI Platform* or *Noise Sentry RT* has been created in the list of devices.

9. If an unknown item appears, or an item named *DDCI Platform* or *Noise Sentry RT* is found but has an exclamation mark (indicating a problem) beside it, disconnect the device and try re-installing the driver (see step 10).

10. To re-install the driver disconnect the *instrument from the PC*. Then Go into *Start\All Programs\Noise_Sentry_RT_Management\Driver*, and run *DDCI_Driver_Install.exe*. This re-installs the USB driver. When installing on Windows XP, follow the procedure detailed in *Noise_Sentry_RT_XPDriver_Install.pdf*

9.3 Connection Problems

Failure to communicate with the PC can also be caused by poor USB cable contacts. Make sure the USB connector is fully inserted into the socket of the *Noise Sentry RT.* Inspect the inside of the socket in the instrument. If dirt is lodged in the socket, use dry compressed air to expel it.

10 Specifications

Category	Specification
Bandwidth	• 25 Hz to 8 kHz
Microphone Sensor	• Digital MEMS
Precision Class	• Type II
Saturation Level (typical @ 1 kHz)	• 117 dB-A • 114 dB-C
Temperature Error	• Better than 0.1 dB (0 degC < T < 60 degC) • Better than 0.5 dB (-20 degC < T < 60 degC)
Sensitivity to Vibrations	• 60 dB$_{SPL}$/g (20 dB lower than typical measurement microphone)
Weighting Curve	• dB-A • dB-C
Noise-Floor (Typical)	• 31 dB-A • 37 dB-C
Recording Resolution	• 0.1 dB
Duty Rate of Signal Capture	• 100% - No Missed Samples
Real-Time Spectral Display	• 512-point Power Spectrum – dB or Lin Scale.

Calibration	• Field-calibrated using a 1/2" calibrator
Connectivity	• USB
Battery Type	• Integral Li-Poly - USB-Rechargeable
Recharge Time	• 2 H 30 (Typical)
Battery Autonomy	• 7 days while recording
Battery Life	• > 300 Charge/Discharge Cycles
Temperature Range	• -20 degC to 60 degC (-4 degF to 140 degF)
Recording Memory	• Non-Volatile Flash Memory
Recording Memory Capacity (NSRT128 Model)	• 128 Mb • Ex: can continuously record Lmax, Lmin and Leq levels at 1s intervals for 32 days, or 10s intervals for 320 days.
Recording/Erasure Cycles	• Greater than 100 000
Data Retention	• Greater than 20 Years
Dimensions	• 76.2 mm x 39.4 mm x 59 mm • (3" x 1.55" x 0.81")
Weight	• 100 g
Construction	• Integrally Potted Weather-Proof ABS Enclosure

Table 6

11 Software Specifications

Category	Specification
Compatibility	• Windows XP, Windows Vista, Windows 7, Windows 8
Configuration	• Instrument Internal Time • User ID • Weighting curve • Recording Interval • Recording Statistics • Time constant for level measurement • Start Date/Time
Display	• Instrument Internal Time • Instrument Internal Temperature • Instrument Information (Serial Number, User-ID, Calibration…etc.)

	• Real-Time Acoustic Signal • Real-Time Sound Level • Real-Time Spectrum • Recorded Sound Levels • Battery Level and Charge • All graphs can be viewed in dB or Lin scale
Record Management	• Record Manual Start/Stop • Recording Memory Download (Even while recording) • Recording Memory Clear • Auto-Calculation of Memory Depth
Data Export	• Export to Tab-Delimited Format for Use with Spreadsheet Applications

Table 7