INSTRUCTION MANUAL

Software version 2.0

nor850

SOFTWARE

Norsonic

Nor850 User Guide

Im850 Software_1Ed2R0En - sofware v 2.0 January 2017

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nor**850**

SOFTWARE

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Startup

Start the program by double-clicking the 'Nor850' icon normally placed on the desktop of the PC.

Then power up the measurement modules (Nor850 multichannel racks and/or Nor140 units) and make sure they are all connected to the PC via LAN or USB interfaces.

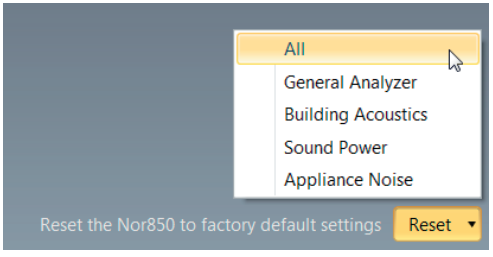
Alternatively, start the program from the C:/Program-Files/Norsonic/Nor850/ folder. The start-up window will appear showing the available measurement modes in the current installation.

PLEASE NOTE: After installation of the software, and before making any attempt to measure or calibrate, it is essential for the operation that all required microphones, preamplifiers etc. are entered into the Sensor Administration database as described in section 3 of this manual.

Reset the Nor850 to factory default settings

As you are our Norsonic AS customer, you will have the right to upgrade the system version frequently. However, you may experience the settings of the system has been changed, in order to manipulate the software correctly and efficiently, we suggest you rest the Nor850 to factory default settings each time.

To reset the system, you can just press the "Reset" button in the lower right corner as showed in the following and select any of the measurement mode to reset.

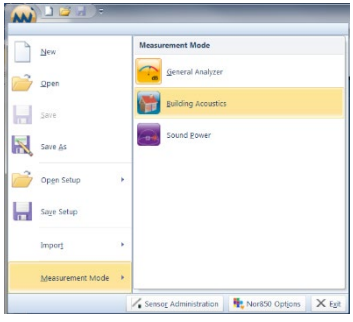


Selecting Measurement mode

The version 2.0 of the Nor850 software offers three measurement modes: General Analyzer and the optional Building Acoustics and Sound Power. Click on the desired mode, and the start-up display of the selected mode will be displayed on the screen.

Switching Measurement Mode

Switching from one measurement mode to another is possible by clicking on the Nor850 button , selecting Measurement Mode in the menu list and then clicking on the desired measurement mode. The start-up display of the selected mode will then be displayed on the screen.

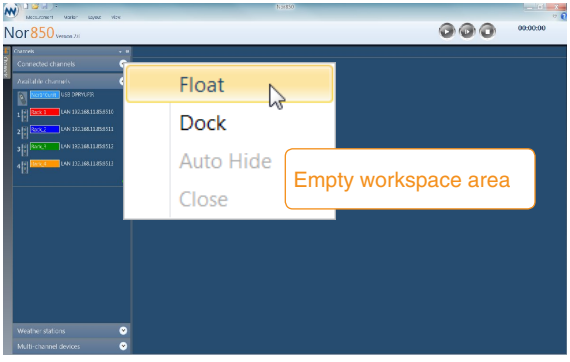


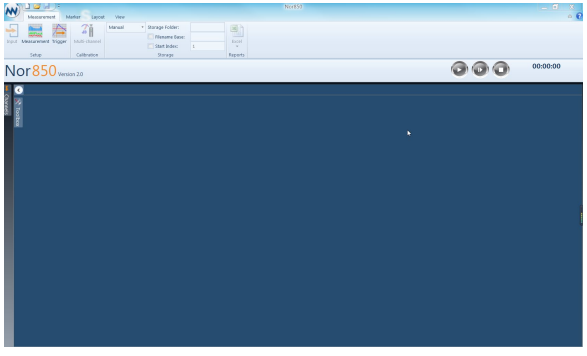
Universal features for all modes

Available measurement channels

The first time the Nor850 system is started, the screen will show an empty workspace as this.

You can just move the cursor on the “Channels” and the screen will show with the Available channels list to the left. The default display setting for this “Channels” bar is Auto Hide, that means when you move the cursor away from the “Channels” bar, it will hide automatically. However, you can ‘dock’ the “Channels” bar by clicking the pin icon or Float the “Channels” bar by right click the mouse and select the corresponding submenu. Later, the Workspace area will contain the selected display windows from the previous use.



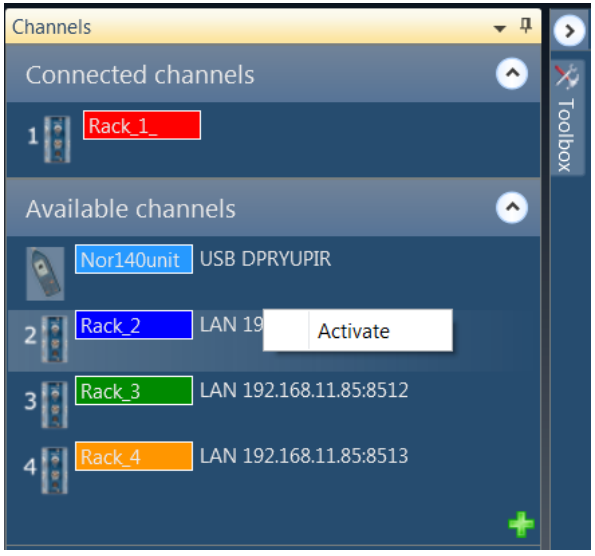


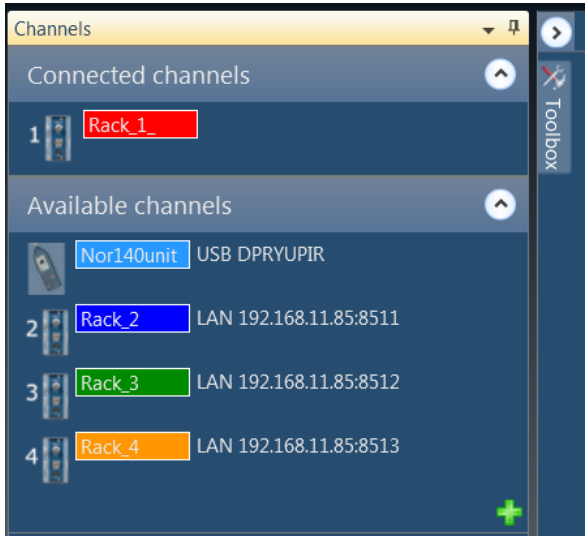
Activating channels

All measurement channels found on the PC's Local Area Network (LAN) and USB interfaces are displayed in the ***Available channels*** list on the left hand side of the screen. Should additional PCs running the Nor850 software be connected to the same LAN, all measurement channels connected through the LAN interface will be listed in the same way on the other PC's.

Logically, each measurement channel can only be controlled by one specific PC. Hence, those measurement channels used in the actual measurement task must be activated by the PC in control. This is done by simply clicking on the selected available channels and dragging them into the Connected channels area at the upper left side of the screen. More channels can be selected simultaneously by holding down the Ctrl key while clicking the channels. Alternatively, right-click on the desired channels and select the Activate feature in the displayed menu. The graphical icons for the selected measurement channels will then be moved into the Connected channels area and removed from the Available channels area on all PCs connected to the LAN system. Hence, these channels area only available for the PC which has activated them.

In the General Analyzer mode, all activated measurement channels will be used in the measurement independently of the selected ***Display Windows***.



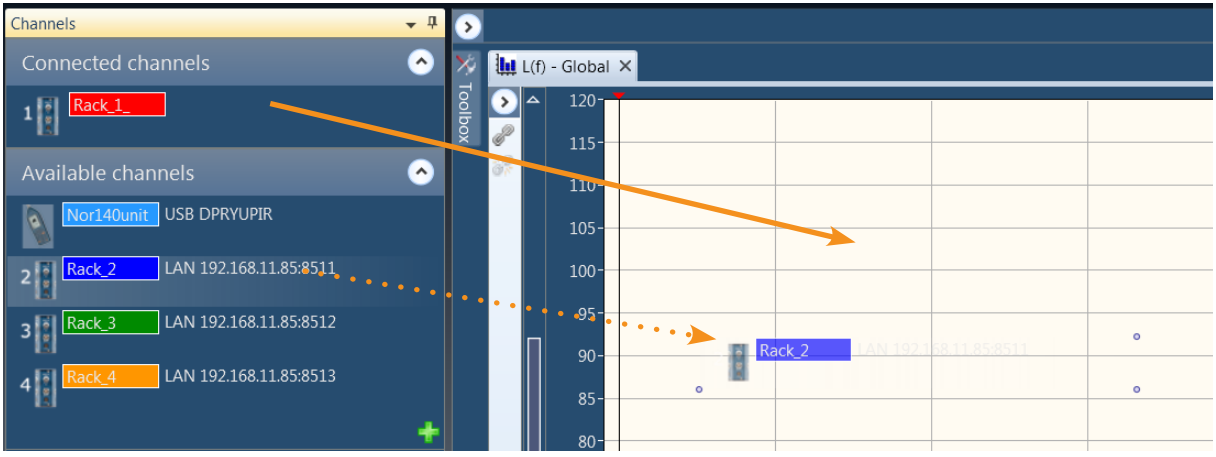


Displaying the measurements

In order to view the running and final measurement results, the activated measurement channels must be connected to the desired Display Window. This is simply done by clicking on the desired activated channels and dragging them into the desired Display Window. One or more measurement channels may be dragged into each window.

The real-time SPL frequency spectrum or time profile will now be displayed in the Display Window connected to the channels.

It is also possible to click and drag any of the Available channels directly into a selected Display Window. Thereby, the selected channels will automatically appear in the Connected channels area.

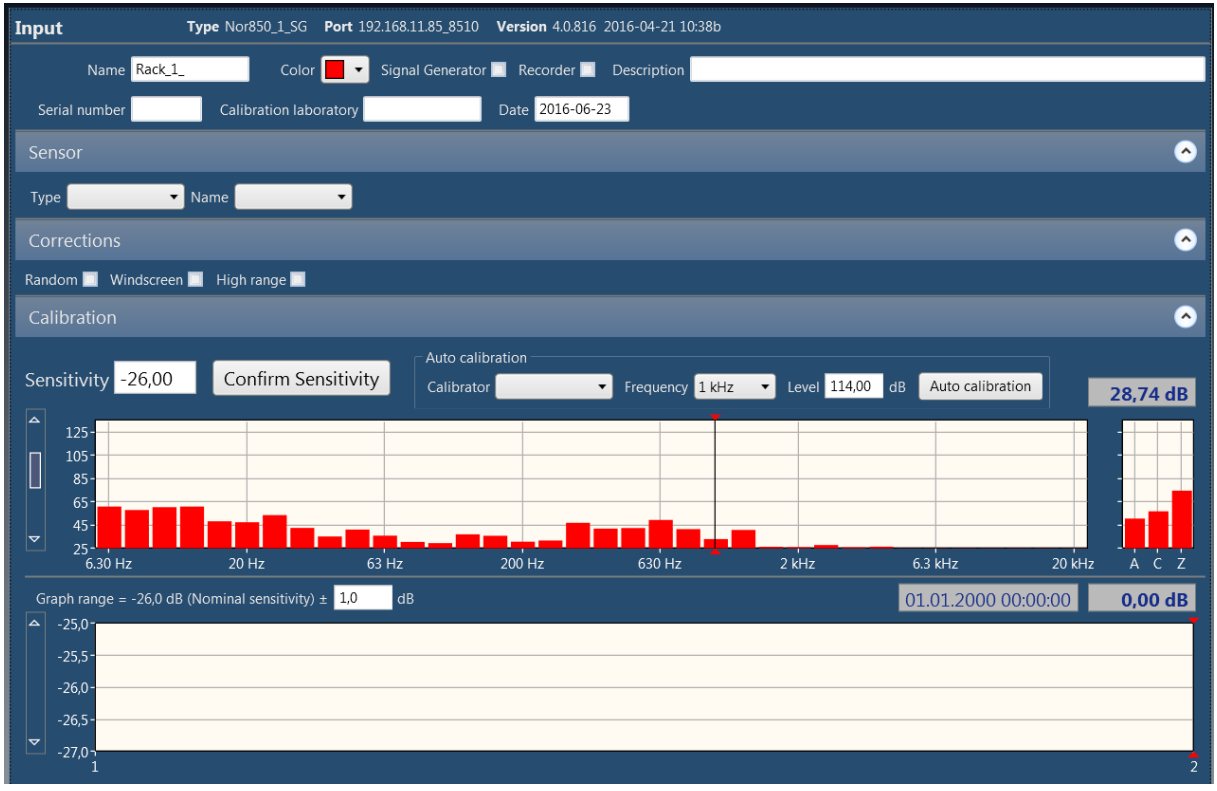


The input menu

For each activated channel, there is a configuration menu which is opened either by double-clicking the channel icon, or right-clicking it and selecting 'View configuration'.

The input menu contains:

- Information about the instrument (type, connected port and software version)
- User-defined information (name, serial number, calibration laboratory/date and description)
- Check-boxes for activating the recording function and signal generator
- A drop-down menu for selecting the connected Sensor, and the most important information about the selected Sensor
- Check-boxes for selecting whether Random incidence, Windscreen or High range corrections should be applied'
- The calibration menu

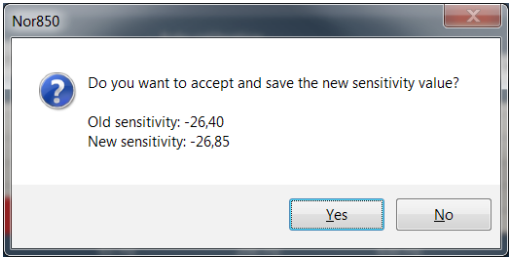


Calibrating the sensor

In the last part of the Input menu, you will find the menu for calibrating the sensor. It is important that a new sensor is correctly calibrated.

Normally, the previous calibration value will be shown in the 'Sensitivity' field. However, if a sensor is to be calibrated for the first time, one may need to pre-set the sensitivity before calibrating (normally -26,0dB for a 50mV/Pa microphone). This is because the calibration will only work if the measured calibrating level is within +/- 2dB of the previously stored sensitivity.

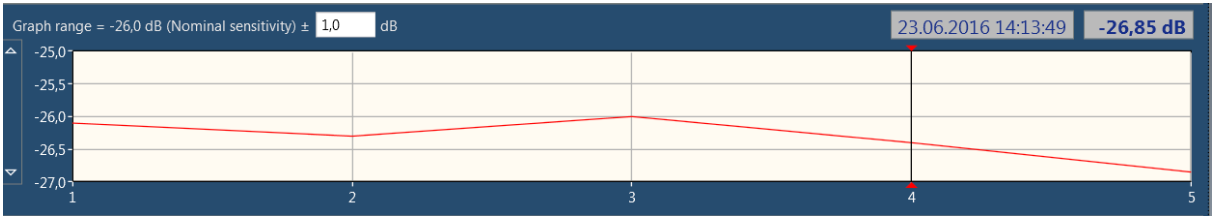
Select a calibrator sensor from the drop-down menu. If a calibrator sensor is not available, a new sensor will have to be defined in the Sensor Administration. Select the calibrator frequency, calibrator level and click 'Auto calibration'. Connect and switch on the calibrator. The Nor850 system will now continuously monitor the channel input and when it senses the calibrator tone, it will automatically calibrate the sensor.



A pop-up window will ask the user to accept the new sensitivity value, and the 'Sensitivity' field and calibration history will be updated.

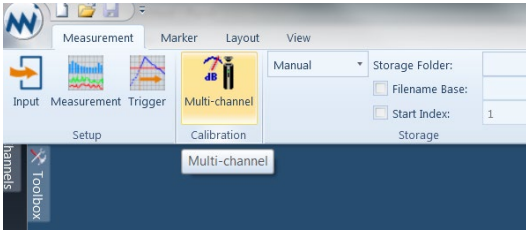
If the calibration cannot be performed automatically and the measured calibrating level is out of the +/- 2dB of the previously stored sensitivity, then you have to set in the measured calibrating level manually in the 'Sensitivity' field for further measurement with this microphone sensor.

The calibration history is shown in the Input menu (as well as in the Sensor Administration). The red line shows the laboratory verified sensitivity and the blue line shows the user calibration history. Click various points in the calibration history to view the previous sensitivity values as well as the date of calibration:



Multi-channel calibration

A practical option in the Nor850 software is the multi-channel calibration. Click the ‘Nor850’ button and select ‘Multi-Channel’:

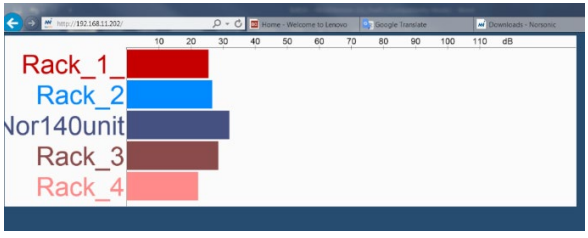


The multi-channel calibration window will appear:

To do the calibration, choose calibrator sensor, frequency and level. Click 'Start' to initiate calibration. A bar indicating that the calibration process has started will be shown to the right for each channel. Walk around and connect the calibrator to the different microphones. Wait for a few seconds and the Nor850 will automatically calibrate the microphone you have connected. When you return to the PC, a green tick mark will appear to the left of the channel name, and the graph will show the calibration history instead of the SPL frequency spectrum. Press 'Stop & Save' to accept all calibrated values. Alternatively, press 'Stop' to cancel the calibration.

If the calibration of a sensor has not completed (i.e. the time bar is still showing and no green tick has appeared), there could be several reasons. Either the microphone has not been properly connected to the calibrator or the calibrator has not been connected for a long enough time. It could also be that the level has not reached +/- 2dB of the previous calibration value which indicates that something is wrong with the sensor or the sensor has been replaced with a different one. Reconnect the calibrator and inspect the instantaneous level.

A nice feature with the multi-channel calibration is the web server which serves a web site containing the most relevant information about the calibration procedure. To access it, open a web browser and enter the URL which is shown at the bottom of the multi-channel calibration window in Nor850.



The SPL of non-calibrated channels is shown at the top, and the channels will appear at the bottom when they are calibrated, showing the verified, max/min and current calibration values.

However, when you will perform measurements in Building Acoustics Mode or in Sound Power Mode, there is a alternative feature in Nor850 and you can select signal generator to give sound when calibrated.

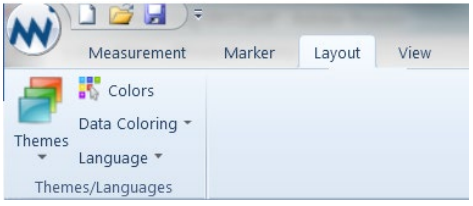
You should first add signal generator for from Racks, and it will pop out an indication "Select signal generator to give sound when calibrated" as you perform Multi-channel Calibration. You just tick on the Racks you want to use and set in the Gain factor for the loudspeaker before your multi-channel calibration work. After the begin of calibration process, you will hear a beep from the loudspeaker which is an indication that the calibration work for one channel is finished, and you can move the calibrator to another channel for further calibration.

This feature can save a lot of working time for the measurement operator, since he don't need to run back and forth between the laboratory and the test room again and again. The default factor for gain is -30dB, and the factor should always be minus, which can attenuate the sound intensity from loudspeaker, otherwise it will do harm to the hearing system for the operators. In addition, the gain factor defined here is only for feedback systems in calibration, it has no any relationship to signal generator system during measurement time.


Channels
Connected channels
Rack_1_
Rack_1_
Rack_2
Rack_2
Rack_3
Available channels
192.168.10...
LAN 192.168.10.12:4001
Rack_4
LAN 192.168.11.81:8513
Weather stations
Multi-channel devices
Multi-channel Calibration
Calibrator
Frequency
1 kHz
Level
114,00
dB
Start
Stop
Save
Select signal generator to give sound when calibrated
Rack1_
Rack2
Gain
-30
dB
Rack_1_
-0,12 dB
Connected Idle
Rack_2
9,91 dB
Connected Idle
Rack_3
3,07 dB
Connected Idle
120
100
80
60
40
20
50 Hz
80 Hz
125 Hz
200 Hz
315 Hz
500 Hz
800 Hz
1.25 kHz
2 kHz
3.15 kHz
5 kHz
A C Z
Url for Webserver: Sorry, calibration at web is not available!
Close

Graphical function design, colours, themes and languages

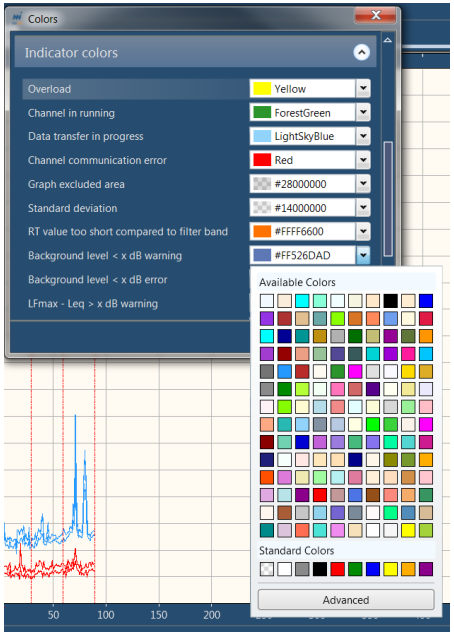
To change the colours, themes and languages for the Nor850 system, click the Layout tab in the top left hand corner of the screen:



To choose between the two main themes, ‘Blue’ and ‘Black’, click the Themes button and select a theme.

The Nor850 system has a set of colour codes assigned to different warnings and messages. These colours can be changed by clicking the Layout tab in the top left hand corner of the screen. Then click the Indicator colours button. A new window will appear which shows the colours selected for the different messages. It is possible to assign new colours from a pre-defined set by clicking the down arrow to the right of the colour, or assign user-defined colours by clicking Advanced.

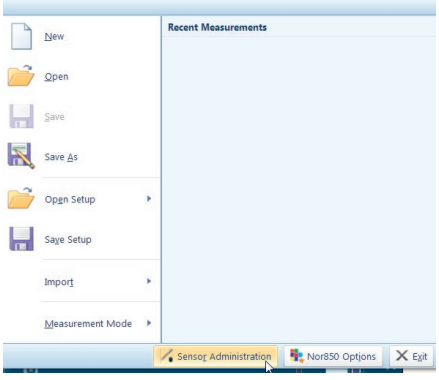
Finally, it is possible to select language by clicking the Language button (only English and Deutsch are supported in version 2.0).



Sensor Administration

The ‘Sensor Administration’ (in short SA) menu is found by clicking on the Norsonic logo in the upper left corner:

The SA is a small database that contains all sensors that the users have available including calibration and verification data. These sensors are available in the Input menu for each measurement channel by selecting the given name for each sensor. On the left hand side of the SA menu, the user will find a list of all sensors currently entered into the system.



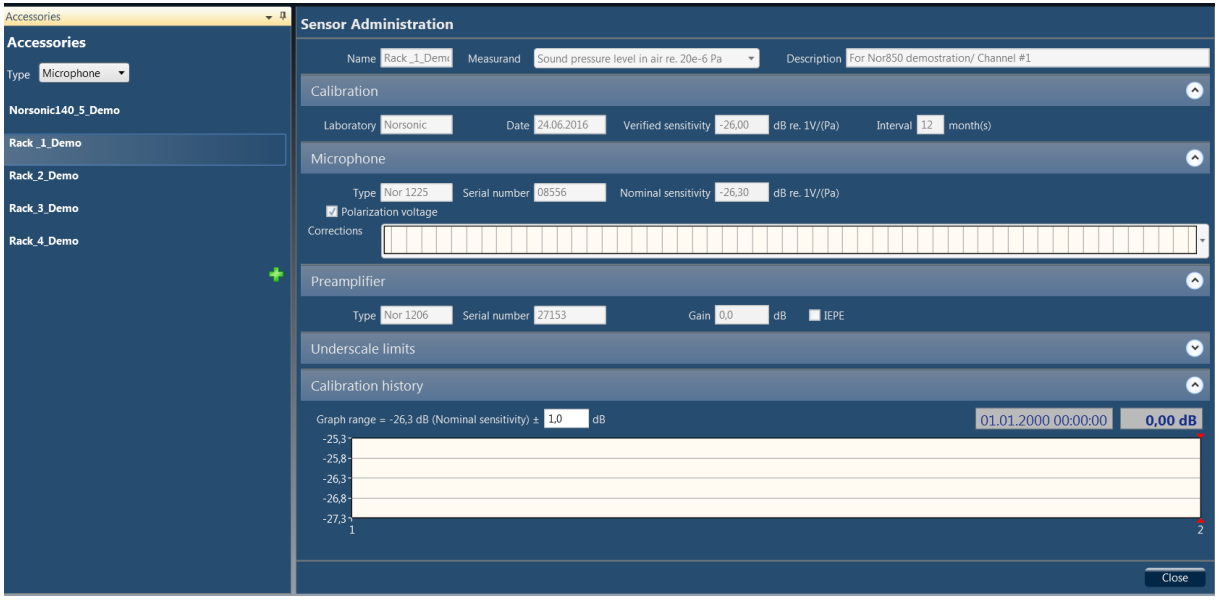
PLEASE NOTE: After installing the Nor850 software suite to a new computer, make sure that all relevant sensor information are entered into the Sensor Database before starting to use the system for new measurements.

This listed is sorted according to the type of sensor which divide the sensors in the following groups:

- Microphone
- Line
- Outdoor
- Vibration
- Calibrator
- RSS

Calibrators and RSS (Reference Sound Sources) are of course not real “sensors”, but from a practical point-of-view it is very handsome to put these into the same database.

Each sensor type has its dedicated menu containing the most important properties for this kind of sensor. For all kinds the top of the menu contain the user defined name and an addition text string which may be used



for a more detailed description. The rest of the menu is dependent on the type of sensor, and the user may quickly view the current data by clicking on the different existing sensor in the list along the left hand side.

New sensors are entered by selecting the desired type and then clicking on the green + sign on the left hand side. This will open an 'empty' sensor menu in which the operators key-in all relevant data. When all data are entered, simply click the 'OK' key in the lower right corner, and the new sensor is added to the list of sensors along the left side.

All data entry fields are then normally locked from modification. However, existing sensors may be modified, deleted or partly copied by a right mouse-click onto any of the existing sensor names along the left hand side. When copying data for an existing sensor, a new name is always required. This feature is handsome when entering a new microphone/preamplifier combination using an existing preamplifier with another microphone capsule, or, entering another correction response characteristic for an existing combination.

Copying existing Sensor Databases

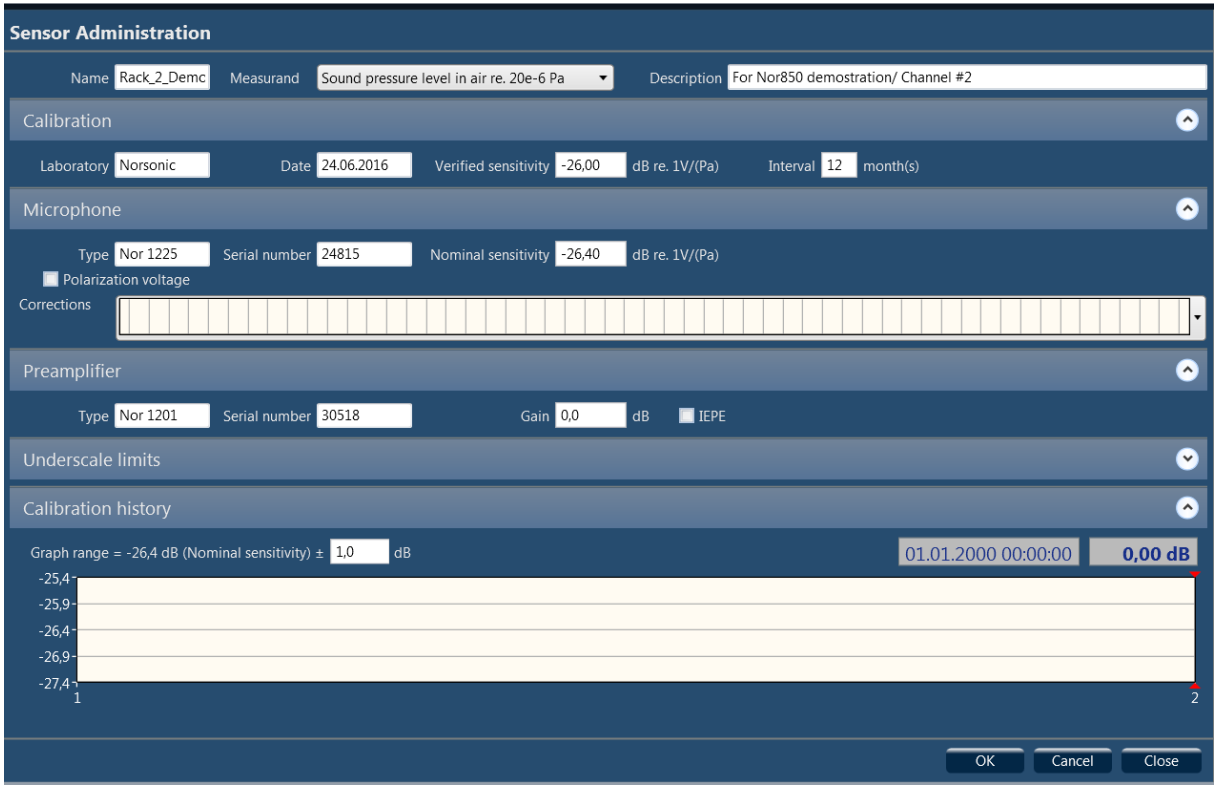
An existing database in one computer may be copied to another computer as an alternative to entering all the detailed information once again. The SA is stored at the location C:\ProgramData\Norsonic\Nor850\Setups in your computer. In addition to all Sensors, this folder contain all channel input data, all schedulers, and more. By copying the entire folder onto a new PC, all setting

known from the previous computer will be available also in the new computer at once.

Alternatively, sort the existing Setups folder for all 'Accessory-*********' files and copy only these files to the same location in the new computer. Then, only the content of the Sensor Database is copied. If you only want to copy the Microphone sensors, sort the existing folder for all 'Accessory-Microphone-*********' files and copy only these.

Microphone sensor

The microphone sensor menu contains the following data. All calibration and verification data are valid for the combination of the entered microphone cartridge and preamplifier:



Calibration

- *'Laboratory'* is used for the verification laboratory used at the latest periodic verification
- *'Date'* is used for the date of the latest periodic verification
- *'Verified sensitivity'* is used for the measured sensitivity of the latest periodic verification
- *'0 dB ref'* is the setting of the reference for the given sensitivity
- *'Interval'* is the selection for how many months the current verification is valid. After this period, the system will give a warning if the selected sensor is out of date.

Microphone

- *'Type'* is the producer and model of the microphone cartridge
- *'Serial number'* is the given serial number on the microphone cartridge
- *'Nominal sensitivity'* is used for the nominal sensitivity given by the producer
- *'Polarization voltage'* is used to indicate whether this microphone is depending on 200V polarization voltage or not (i.e. pre-polarized microphones). If selected 'On' the polarization voltage in the Nor140, Nor150 unit or Nor850-1 Module will be turned on automatically upon selecting this sensor in the Input menu.
- *'Correction'* is containing correction response or frequency linearity information about this microphone. This correction is NOT added to the measurement result unless selected in the appropriate measurement mode (such as 'diffuse field correction' in the Building Acoustic mode). To enter the given correction response, click on the down arrow on the right hand side of the graph and enter the correct value for each frequency band.

Preamplifier

- *'Type'* is the producer and model of the preamplifier
- *'Serial number'* is the given serial number on the preamplifier
- *'Gain'* is the actual internal gain for the preamplifier (typically 0,1 – 0,2 dB). This value is added in the calculation of sensitivity for each performed calibration.

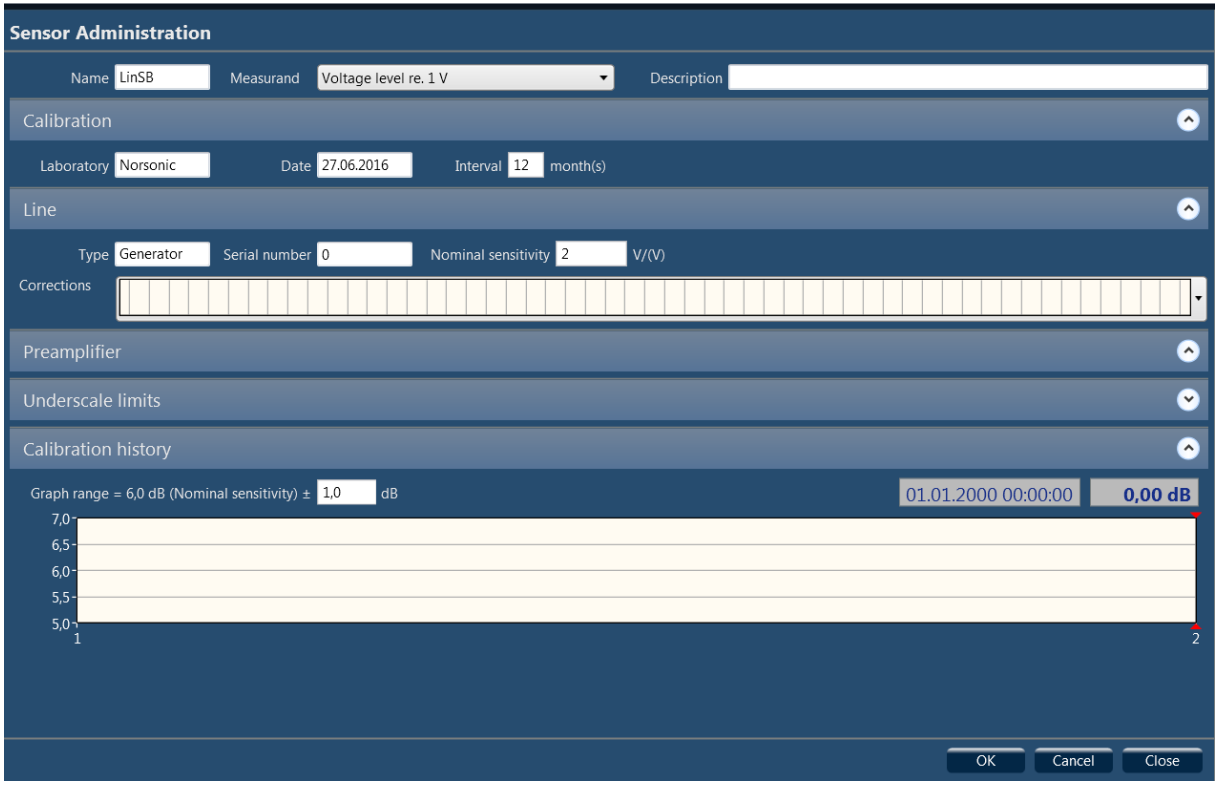
Calibration history

- *'Graph range'* is the selected +/- range with reference to the given nominal sensitivity
- The mouse may be used to click on any part of the displayed graph along the x-axis in order to view the date, time and sensitivity for any previous calibration in the upper right part of the graph

Line sensor

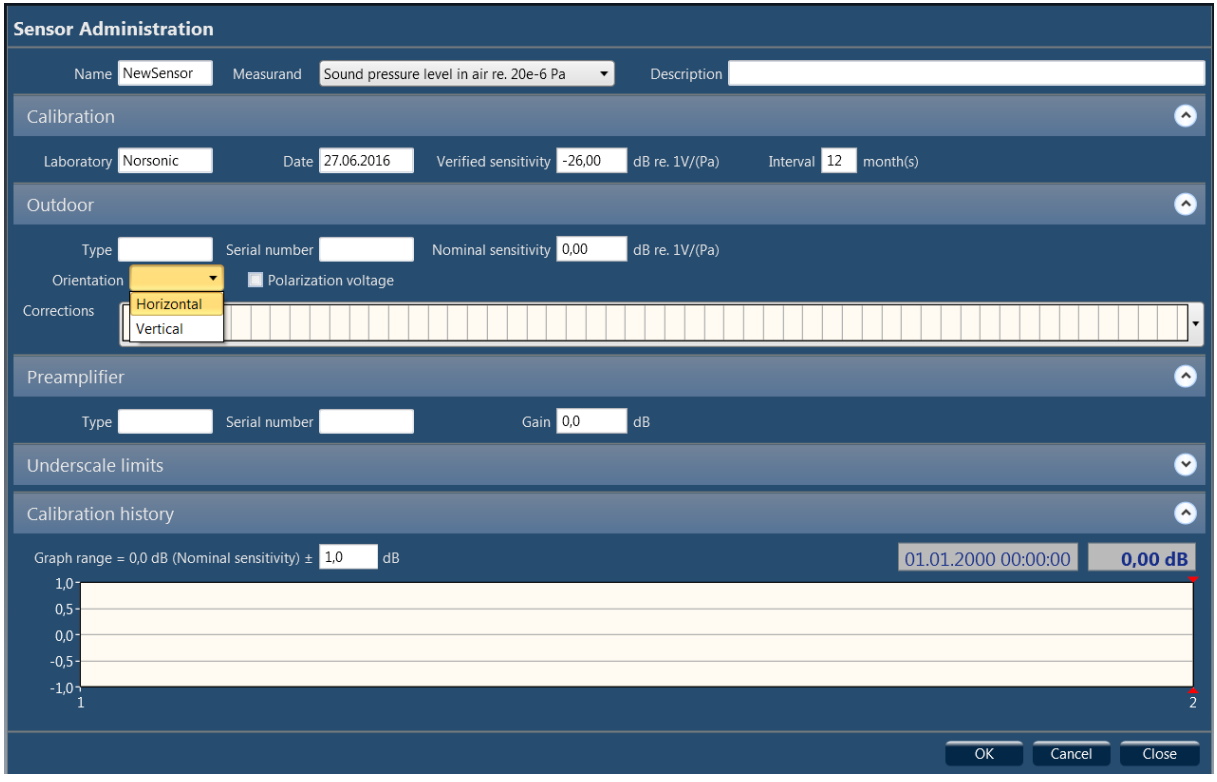
The line sensor is used when a line source is connected to the channel:

The line sensor menu is not much different from the microphone sensor menu, except from the ‘Verified Sensitivity’, ‘Polarization Voltage’ and Preamplifier fields, which are obviously not needed for the line sensor.



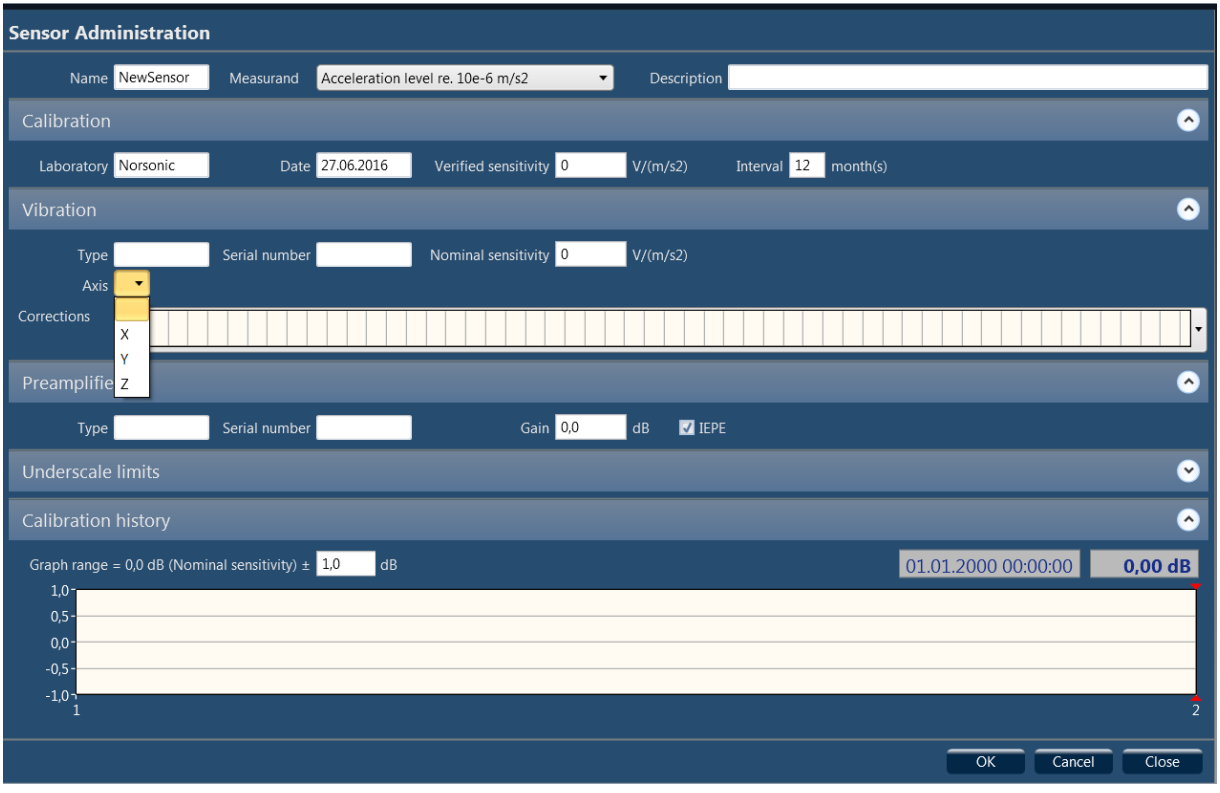
Outdoor sensor

The Outdoor menu is essentially the same as the microphone sensor menu. However, we have a new field called ‘Orientation’. This can be set to either Horizontal or Vertical, depending on the applied frequency compensation.



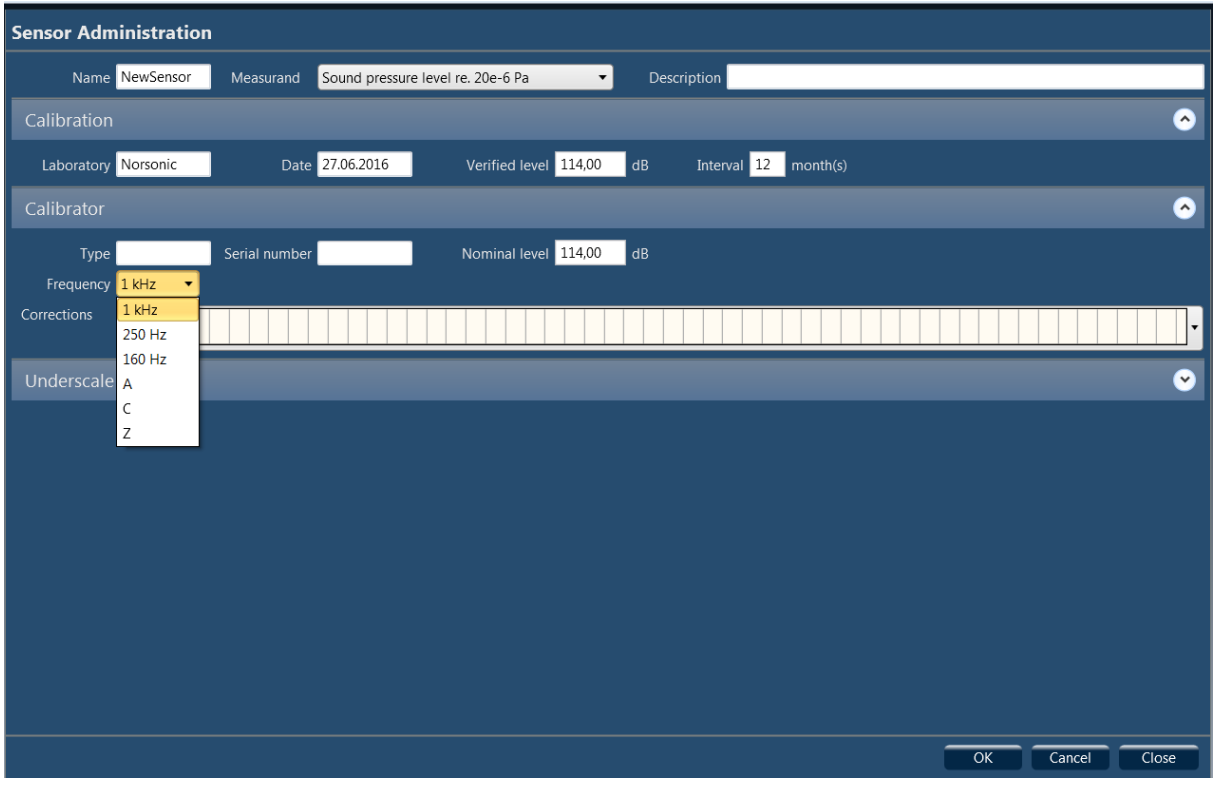
Vibration sensor

We also have vibration menu in sensor administration. There is not much different from the microphone sensor menu, except for the new field 'Axis', which is obviously used for description of vibration source direction.



Calibrator

The calibrator sensor menu contains the following data:



Calibration

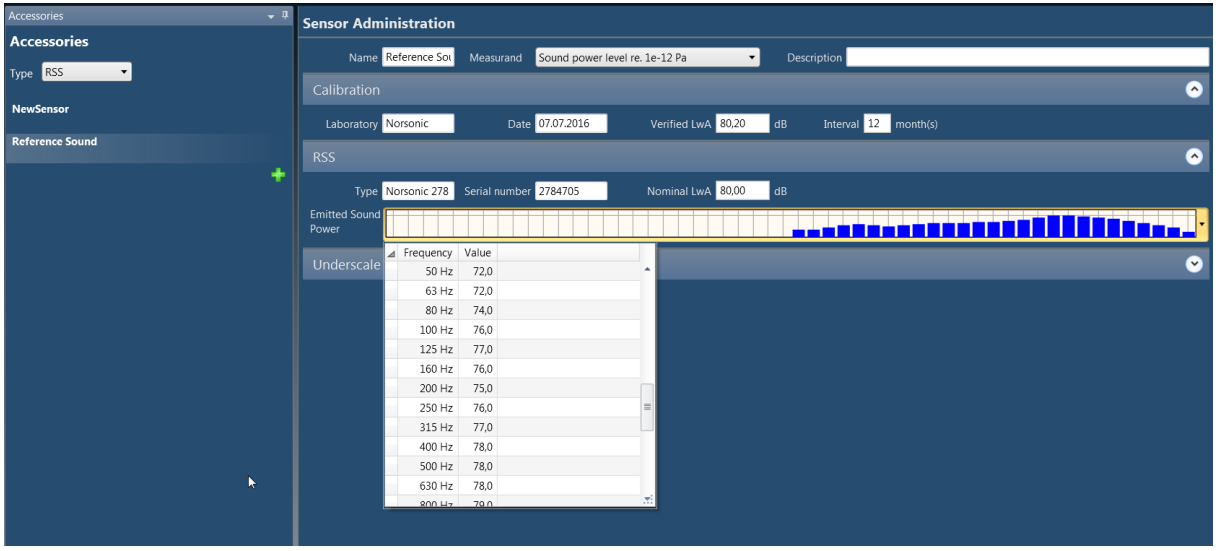
- *'Laboratory'* is used for the verification laboratory used at the latest periodic verification
- *'Date'* is used for the date of the latest periodic verification
- *'Verified level'* is used for the measured level of the latest periodic verification
- *'Interval'* is the selection for how many months the current verification is valid. After this period, the system will give a warning if the selected sensor is out of date.

Calibrator

- *'Type'* is the producer and model of the calibrator
- *'Serial number'* is the given serial number on the calibrator
- *'Nominal level'* is used for the nominal sound pressure level given by the producer
- *'Frequency'* is the frequency which the Nor850 system will calibrate for. '1kHz', '250Hz', 'A', 'C', 'Z' are possible options.
- *'Correction'* is containing correction response or frequency linearity information about this calibrator.

RSS (Reference sound source)

The RSS sensor menu contains the following data:



Calibration:

- *'Laboratory'* is used for the verification laboratory used at the latest periodic verification
- *'Date'* is used for the date of the latest periodic verification
- *'Verified LwA'* is used for the measured sound power level of the latest periodic verification
- *'Interval'* is the selection for how many months the current verification is valid. After this period, the system will give a warning if the selected sensor is out of date.

RSS:

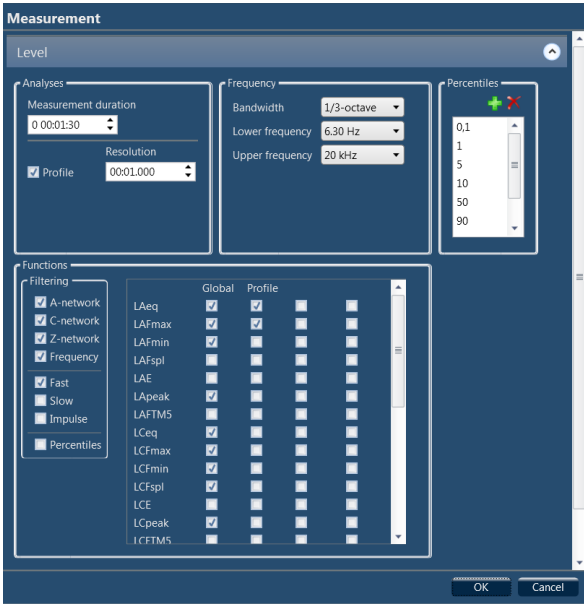
- *'Type'* is the producer and model of the RSS
- *'Serial number'* is the given serial number on the RSS
- *'Nominal LwA'* is used for the nominal sensitivity given by the producer
- *'Emitted Sound Power'* is containing the Lw values of the RSS for 1/3-octave frequency bands.

General analyser mode

Measurement setup

The actual functions and parameters for the measurement are all set in the Measurement menu. Click on the ‘Measurement’ tab in the task bar and select Measurement setup.

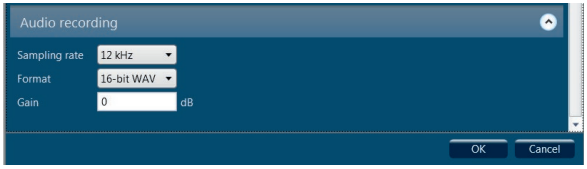
The Measurement menu contains two sub areas, Level and Audio recording:



The Level area contains the following parameters:

- *'Measurement duration'* sets the time before the measurement automatically stops. Measurements can be stopped before by clicking the 'Stop' button.
- The *'Profile'* check box sets whether the function level profile will be measured or not. Profile means measuring the selected function at regular time intervals, and logging it to a graph, while Global means measuring the average (or peak/max/min) over the whole measurement period, which gives a single number as a result.
- *'Resolution'* is the sampling interval when the Profile measurement is enabled.
- *'Bandwidth'* is the spectrum resolution, 1/1- or 1/3-octave.
- *'Lower'/'Upper frequency'* is the frequency limits for the spectrum measurements.
- *'Filtering'* is limiting to available function list to only to desired frequency weightings an time constants.
- The last box contains two function columns, *'Global'* and *'Profile'*. The checked boxes for the functions (L_{Aeq}, L_{AFmax}, L_{AFmin}, etc) will be measured.
- *'Percentiles'* will measure the statistics every time. The user-editable percentiles can be set to anything in the range 0.1-99.9%, both extremes included.

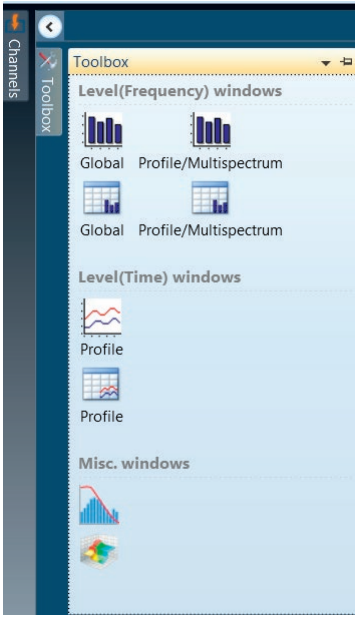
Note that if a measurement is done when a function is not checked in the measurement setup menu, this function will not be recorded, and it is not possible to recover it at a later time!



The *'Audio Recording'* area contains the *'Sampling rate'* and *'Format'* fields, where 12kHz / 48kHz sampling rates and 8/16/24 bits resolutions are possible. The *'Gain field'* adjusts the digital gain of the recording.

Display Windows

The various Display Windows are selected from the Toolbox menu available upon clicking the Toolbox icon.



There are several different formats available:

For Level(Frequency)windows

- Level global versus Frequency Window, ‘L(f)’
- Level profilen/multispectrum versus Frequency Window, ‘L(f)’
- Level global versus Frequency Numerical Table, ‘NumL(f)’
- Level profilen/multispectrum versus Time Numerical Table, ‘NumL(f)’

For Level(Time)windows

- Level profile versus Time Window, ‘L(t)’
- Level profile versus Time Numerical Table, ‘NumL(t)’

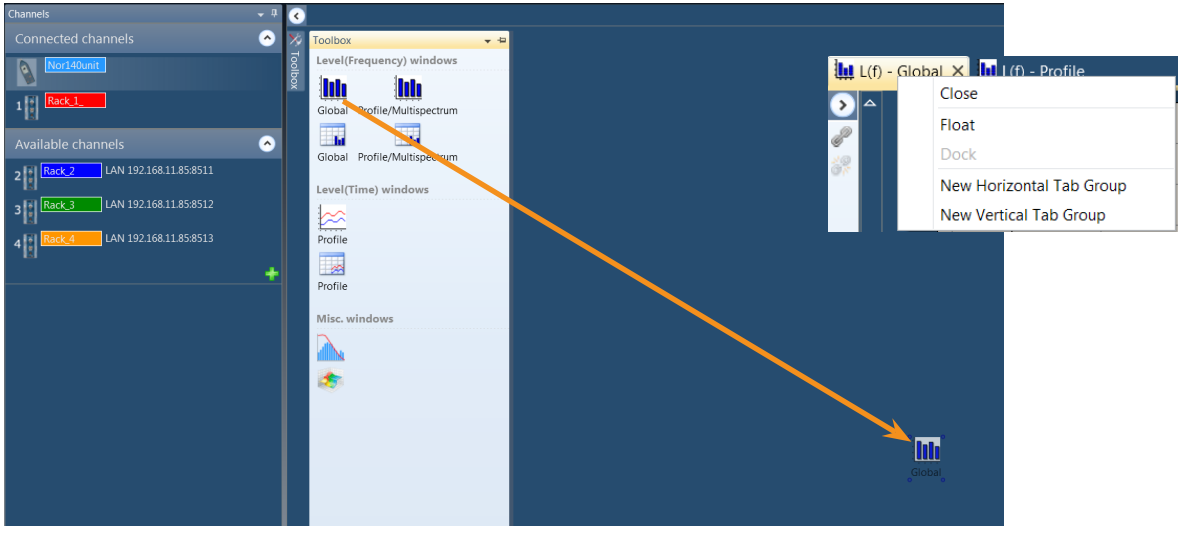
For Misc. windows

- Distribution chart-diagram
- Level new L(t,f) 3D chart-diagram

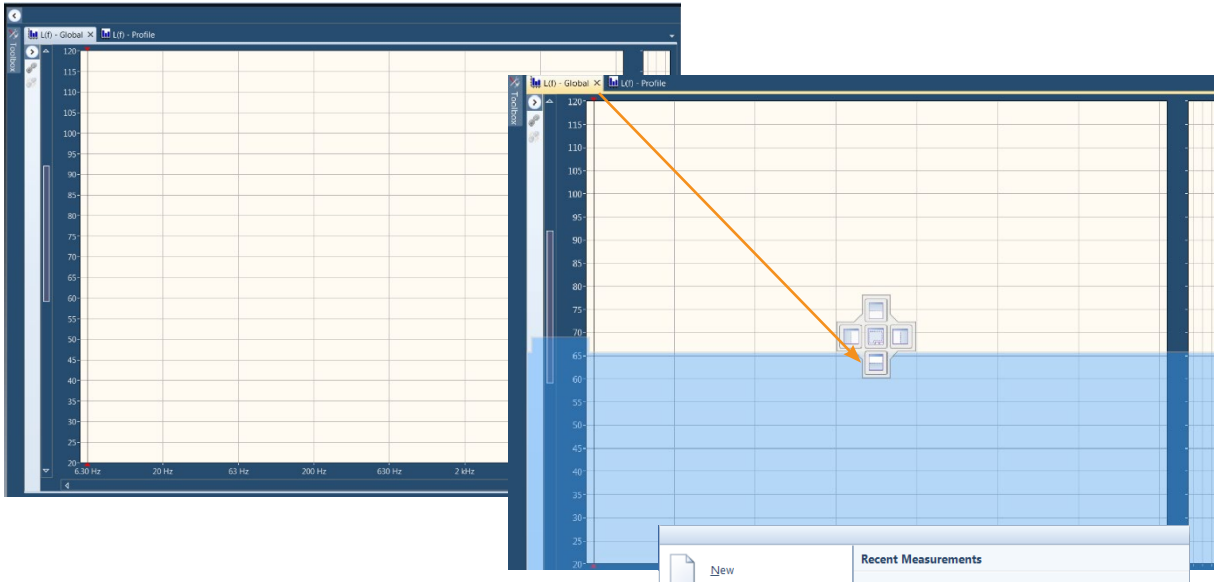
Click on the desired format and drag the selected window icon into the Workspace area.

The selected window will then appear in the free space, or at the top of the existing previously selected display windows.

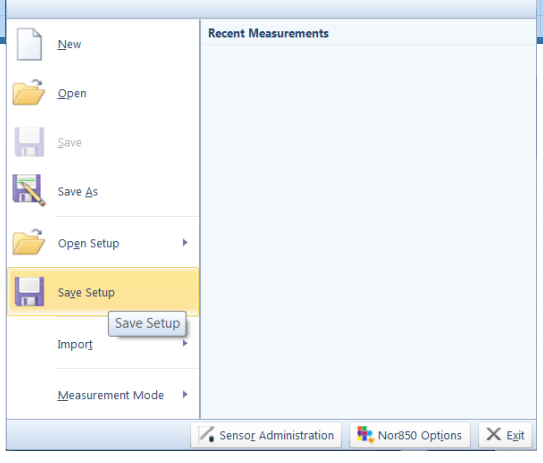
Each of the windows has a tab in the upper left corner showing the window format. With a right click on this tab, the user may choose to move the window to the horizontal or vertical, or let the window float on the PC screen. The floating is particularly useful when using a PC with multiple screens.



Alternatively, the user may click on the tab and drag the window onto the transparent guide that appears. By putting the window to the right or left, to the upper or lower, or to the middle, the selected window will appear respectively within the Workspace.

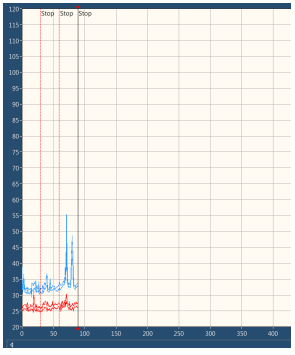


For multiple display windows measurement setups, it is advisable to save the final window configuration as a Setup for later use. Thereby the user does not need to go through this window setup procedure again each time the same measurement task shall be used. The Save Setup feature is found in the menu list displayed upon clicking the Application button in the upper left corner of the screen.

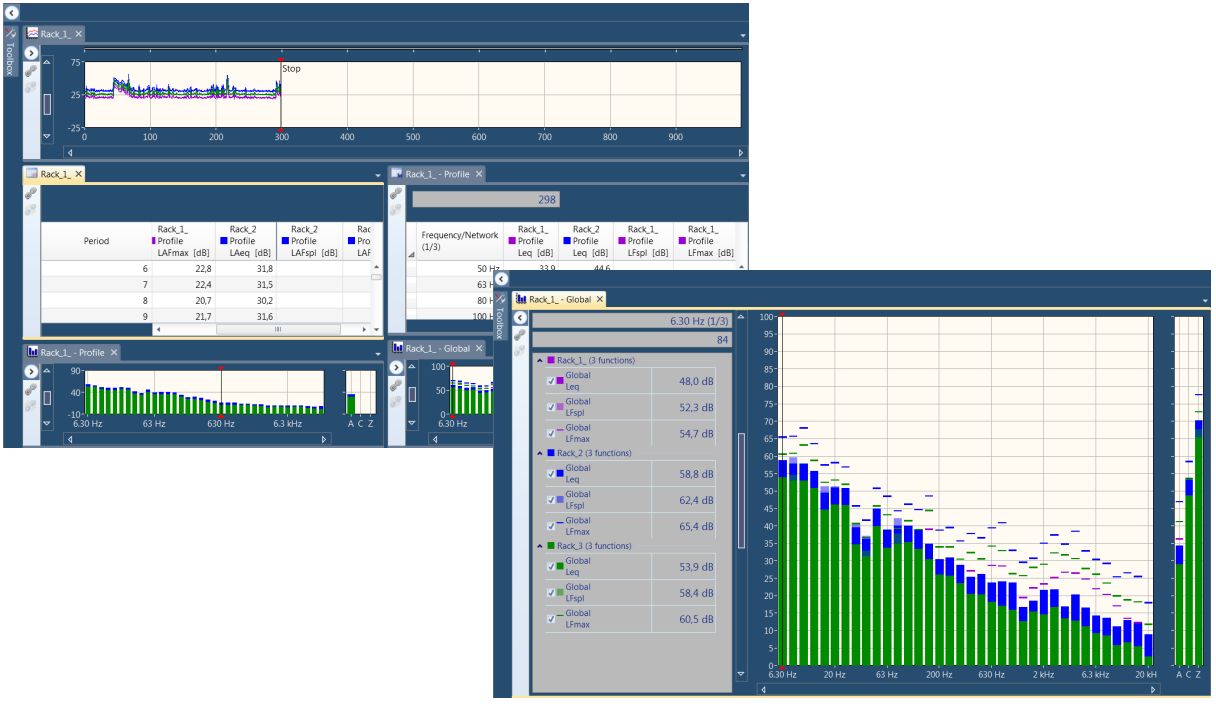


Making measurements

To make a measurement, simply click the ‘Start’ button in the top right corner of the screen. Measurements can be stopped with the stop button to the right and continued with the continue button in the middle. The elapsed time is displayed to the right of the buttons.

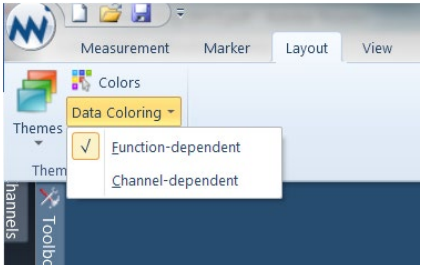


When a measurement is stopped, a stop marker will be displayed in the L(t) windows. Continuing and stopping the measurement will add more stop markers.



Graphical design

In General Mode, the Nor850 system has two main pre-set choices for the colour scheme used for the displayed measurements: Channel dependent or Function dependent. To choose the pre-set, click the Data colouring button in the Layout menu.



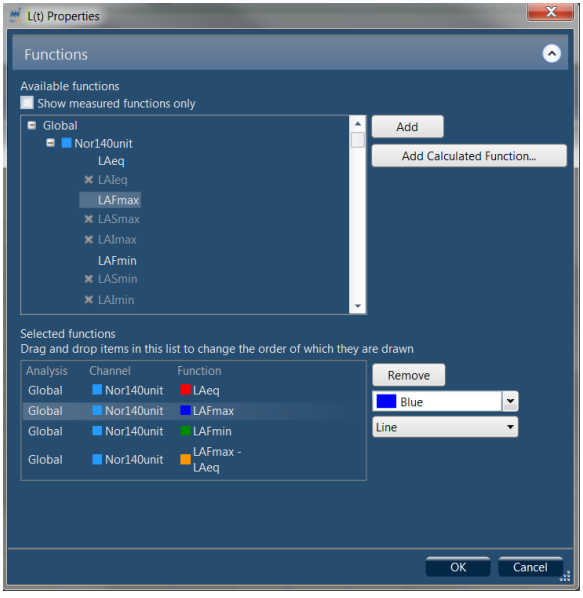
When the Function dependent colour scheme is selected, all measurement functions of the same kind (i.e. Leq or Lmax, etc) will appear with the same colour for all activated channels. Hence it will be easy to distinguish between Leq and Lmax from the same channel, or to rapidly compare the same function within multiple display windows.

When the Channel dependent colour scheme is selected, each activated channel will use the same pre-selected colour on all measurement functions for this particular channel. Hence, it is easy to distinguish measurement results from one channel to another channel even when both are displayed in the same window.

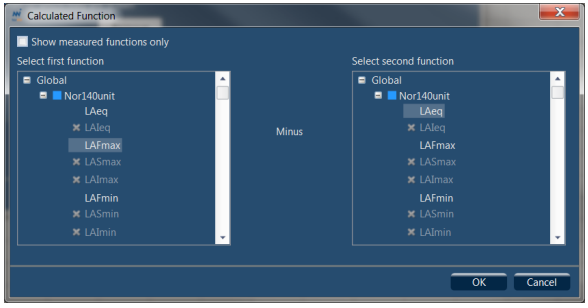
L(t) Properties

To open the L(t) Display Properties menu, right-click the Display Window and choose Functions. A new window appears:

The 'Functions' tab shows which functions are available (in the 'Available functions' box) and displayed in the L(t) graph (in the 'Selected functions' box). It is possible to change which functions are shown by clicking a function and using the Add/Remove buttons. (The functions which are not measured are greyed out and marked with an 'X'. Adding these channels will thus not yield any results without enabling the function in the Measurement menu.) Here it is possible to choose the graphical display ('Step-line','Line or' HiLo-line') of each measurement function. It is also possible to assign custom colours to the functions. Note that this overrides the Data colouring selection done in the Layout menu.

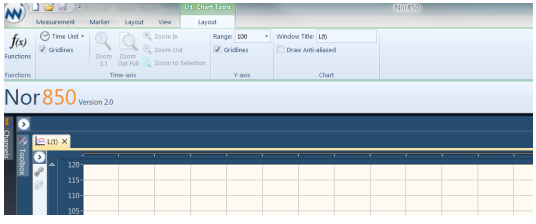


Also it is possible for you to perform some calculated functions plotting when you want to know the difference between two functions either between two different channels or within the same channel. By using “Add Calculated Function…”, you will see



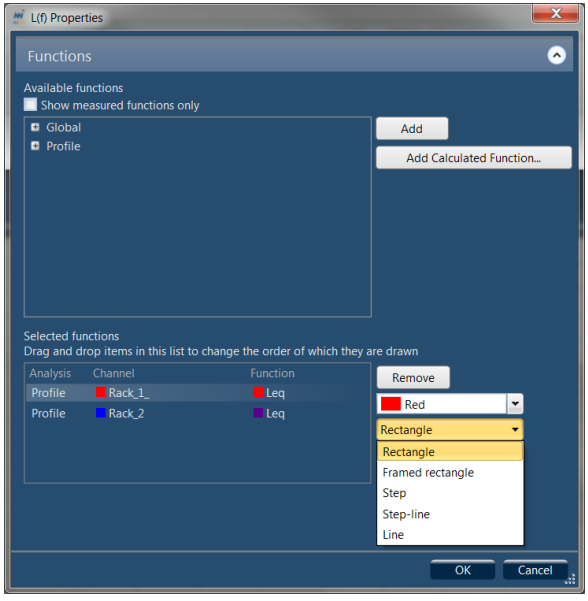
The ‘L(t) Chart Tools Layout’ tab enables you to change the properties of the X- and Y-axis display. The Time Unit selection box sets whether the X-axis is numbered with Absolute time, Relative time or sample Periods. The Range defines the distance from the minimum to the maximum displayed Y axis value (i.e. -20 to 80dB at Range 100). The X- and Y-axis grid lines can be toggled on and off by checking the Grid-lines boxes.

All of these L(t) properties can be altered at any time.

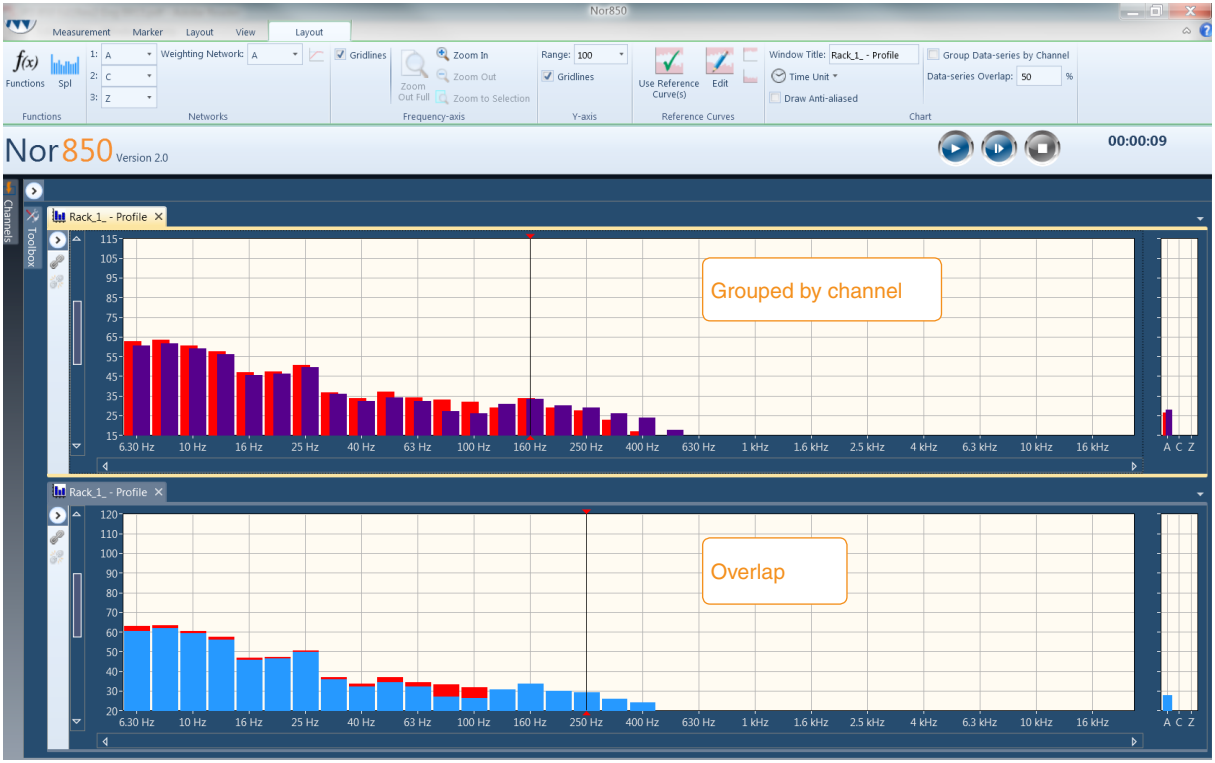


L(f) Properties

The L(f) Properties are basically the same as the L(t) Properties, but with a few more options. The graphical display can be set to ‘Rectangle’, ‘Framed rectangle’, ‘Step, ‘Step-line’ or ‘Line’.



In addition, it is possible to display the channel bar graphs next to each other by checking the ‘Group data-series by channel’ box in the “L(f) Chart Tools Layout”. The channel bars may also be set to overlap with a given percentage.

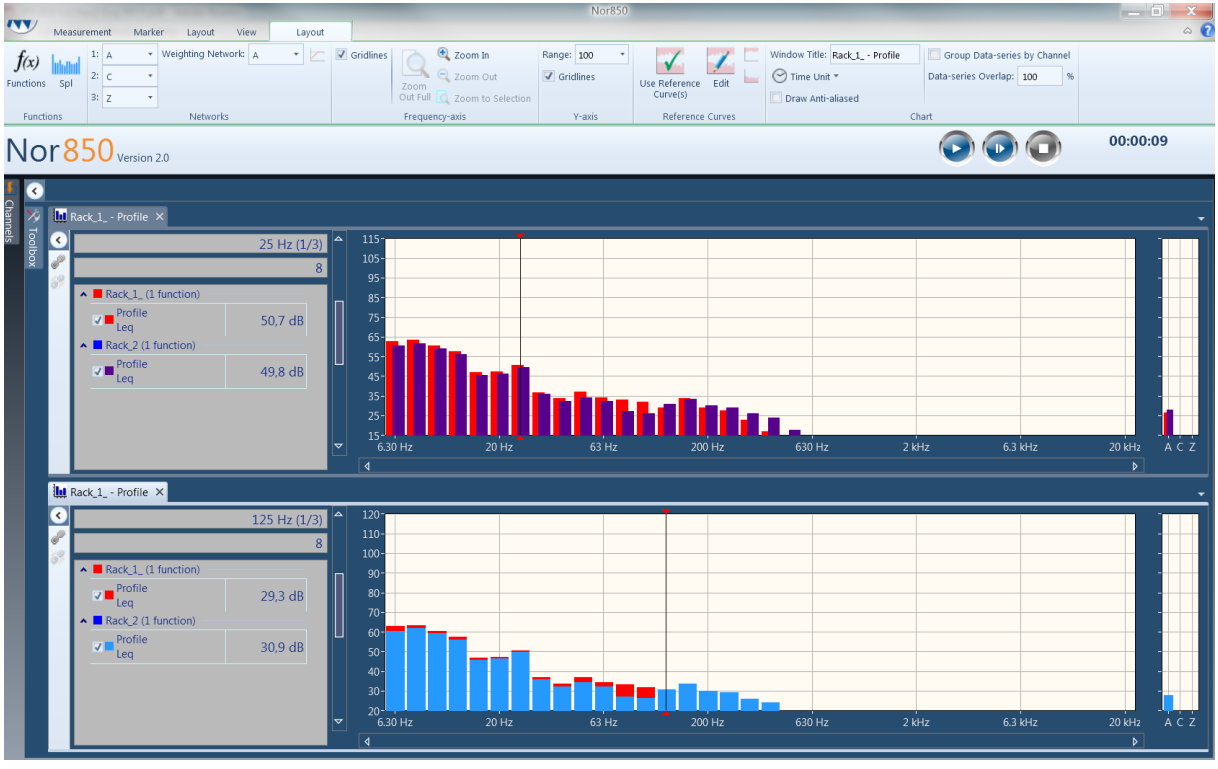


The additional ‘Layout’ tab defines which weighting networks (A, C, Z) which should be displayed in the right part of the Display Window.

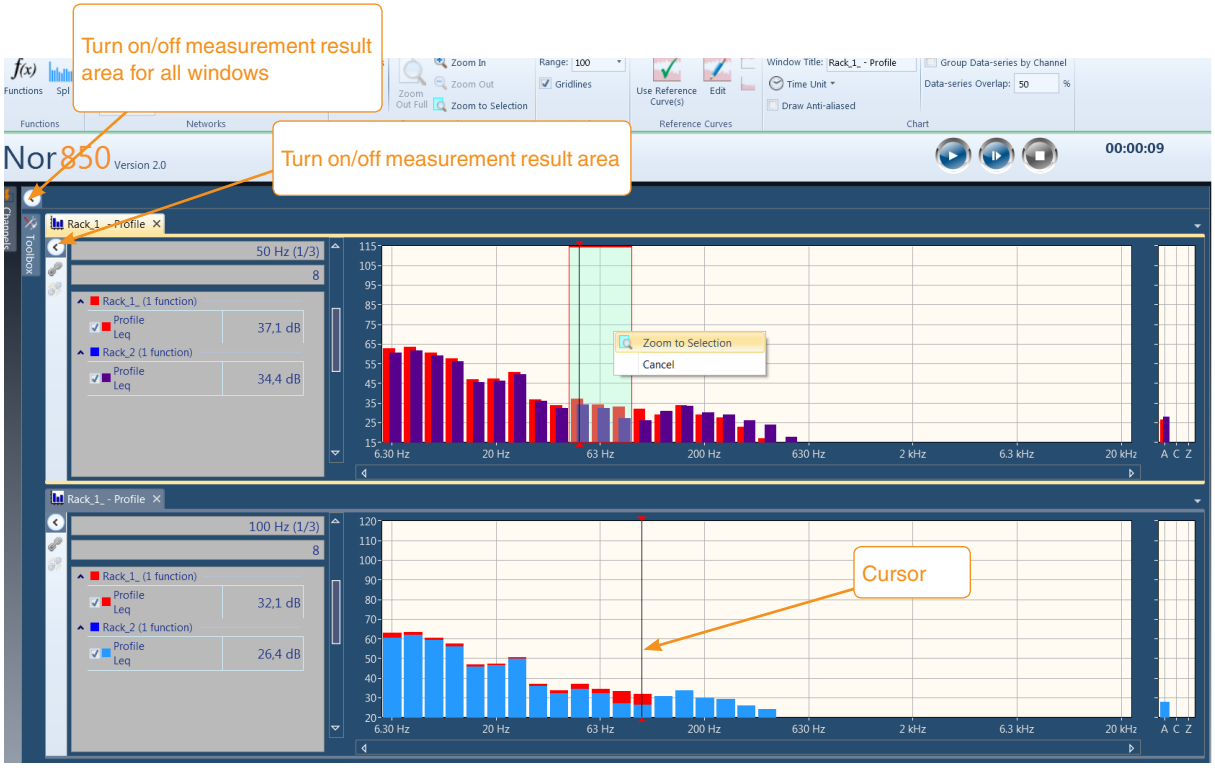
Cursor position measurement values

Both the L(f) and the L(t) graphical window contain a cursor that can be moved to specific positions along the frequency or time axis. Simply click on the desired position, or use the left/right arrow to select the specific cursor position. To view the exact position of the cursor as well as the measurement values of all selected functions, click the arrow on the left hand side of the window, and a table showing the cursor position and function values.

There is also an overall closing/opening arrow for all windows which is found in the upper left corner of the Workspace area.



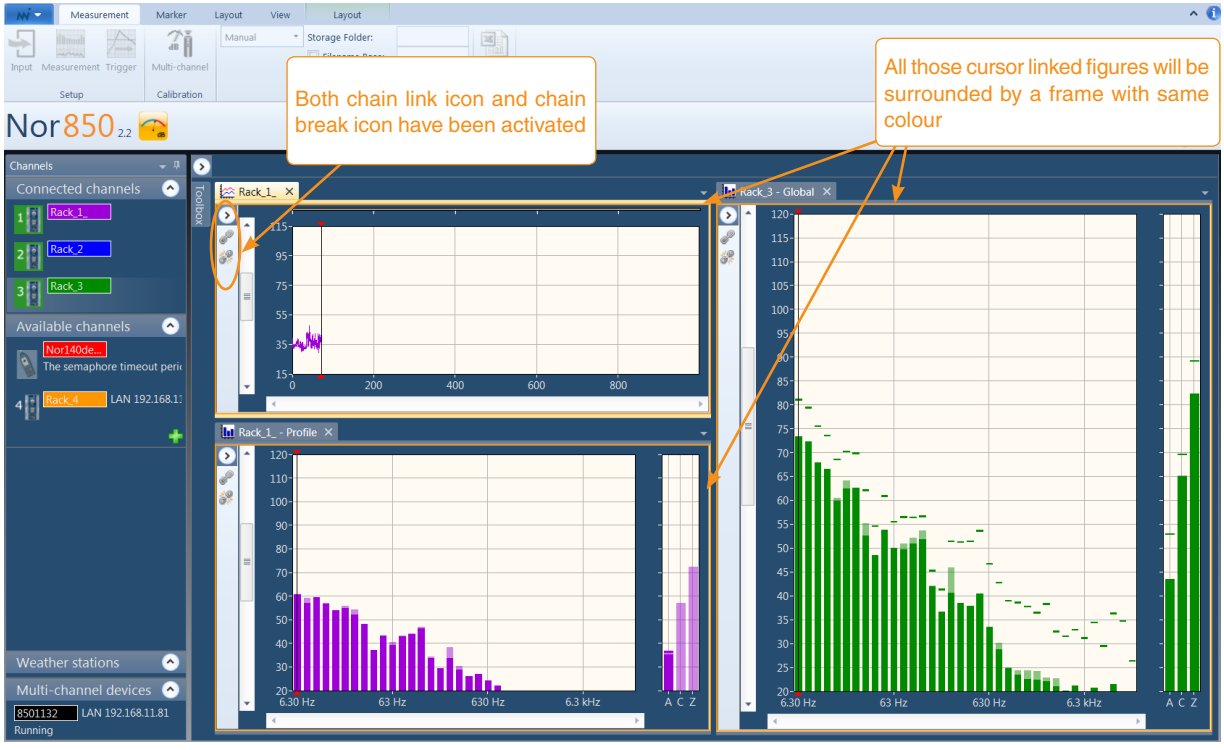
To zoom in the Display Windows, use the +/- magnifying glasses at the left hand of the window. There is also a ‘Zoom out full’ and ‘1:1’ button for quick zooming. To view a specific part of the measurement, click&drag to choose a part of the measurement, and click ‘Zoom to selection’.

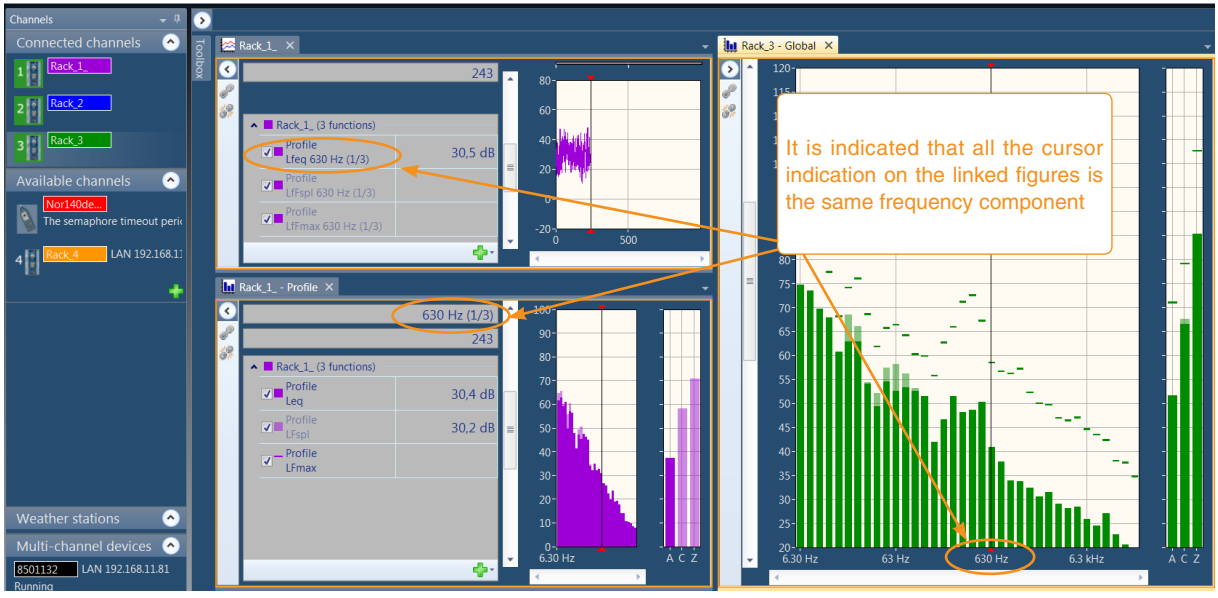


Cursor link for measurements

For Nor850 system, the user can utilize a new feature as was called Cursor link for comparing the same frequency component signal for several channels simultaneously, which is a powerful analysing approach for General Analyzer mode. By adopting the Cursor link feature, the user can check the inner relationship between two or more measurement channels or compare the level variation in different frequency band correctly and efficiently.

The user may have set up several measurement channels for a project, all those signals from those channels can be displayed either in time domain or in frequency domain. You can click & drag the chain icon from one figure and drop in other figures, then you will see that all those related figures will be surround by a frame with same colour, meanwhile all those related figures will have both the chain link icon and the chain break icon activated.





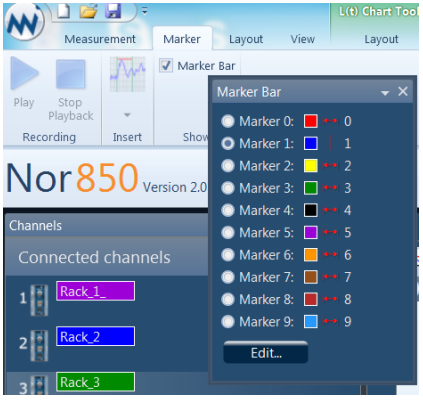
The Cursor link feature is very flexible for practical application. You can simply break the cursor link connection by clicking the chain break icon on the figure, then the cursor in that figure will be a free one again. You can handle the cursor as you want, for example, make cursor link again with another measurement figure.

Marker for Measurements

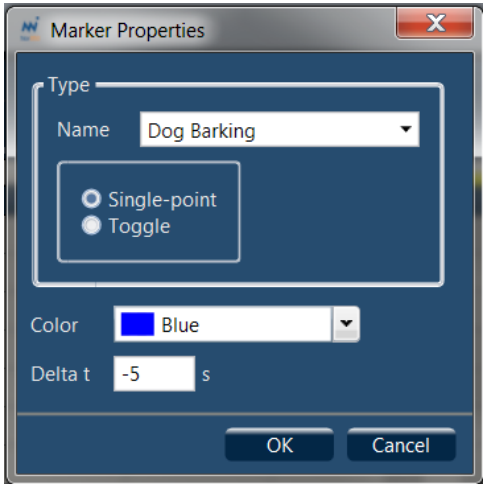
Have you ever made a measurement where you later found out that your desperately need to identify the cause of the level? In Nor850 system, you can use 10 user defined markers as marker 0~9 to tag or code sources as they happen. All these markers can be defined as one of the two types of markers, one is called Single-point marker and the other is call Toggle marker.

The detailed procedure to define markers and marker application in measurements is as follows:

From the menu bar, you just select Marker, and tick on the marker Bar. It will pop out the marker bar list which is consisted of 10 markers.



Tick on one of the 10 listed markers (Her as an example, we selected Marker #1), and click on “Edit”, then it will pop out Marker Properties submenu and you can define the corresponding marker. For each of these markers you can name it, select the marker type, select the marker color and define the delta time.



We should make a short interpretation for one of the definition as “Delta t” here in this chapter. Since we always encounter some unexpected noise during our whole measurement time, for example, a dog can bark loudly and randomly near our measurement site, we will of course delete those sharp noise from our measurement background, however it has been recorded in our data already, then how can we deal with that? We noticed this typical demand from our customer and development this Delta feature for markers.

We can use Pause function and Marker function to deal with this problem. Here we only describe how we deal with it by using Delta time in Marker, and we will describe how to deal with it by adopting Pause function in the following passage.

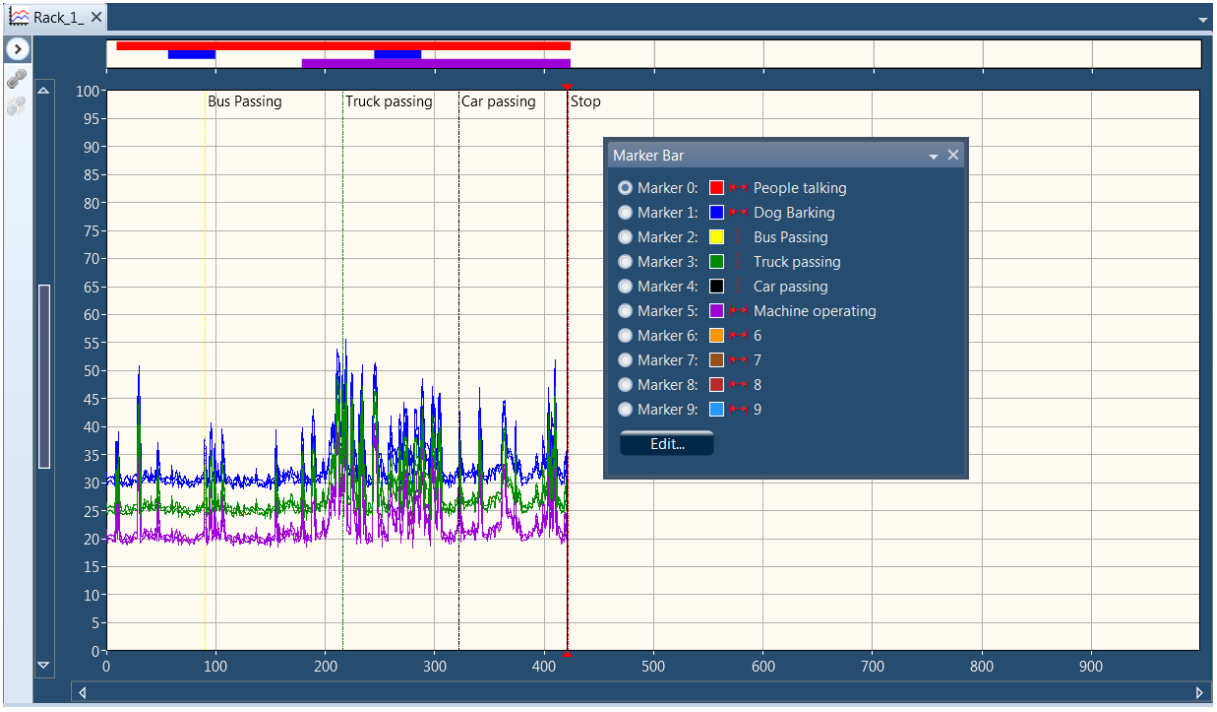
We can set in some advance time or delay time in the Delta time option (Here we have set -5 seconds as advance time to delete dog bark noise). For advance delta time marker, it should be set in minus time, while

for delay delta time marker, it should be set in positive time. When you heard the bark noise from the dog, no worry about that, you can start setting marker 1 in your profile measurement data, and it will back-erase 5 seconds automatically in your profile data in global mode. 5 seconds time period is long enough to cover the dog barking noise interval.

As an inhabitation noise measurement example, there are several noise sources in this area. Traffic noise from driving buses, trucks and cars on the road, speaking noise from inhabitants during day time with random dog barking noise and a steady machine operating noise.

Her we define traffic noise from busses, trucks and cars as Single-point marker, while people talking noise, dog barking noise and machine operating noise as toggle marker.

As you perform the noise measurement on site, you can press Ctrl+0 from start, since this talking noise lasted from the whole measurement time from the start to the end. Then you will see a red bar runs continuously in the upper of the profile graph.

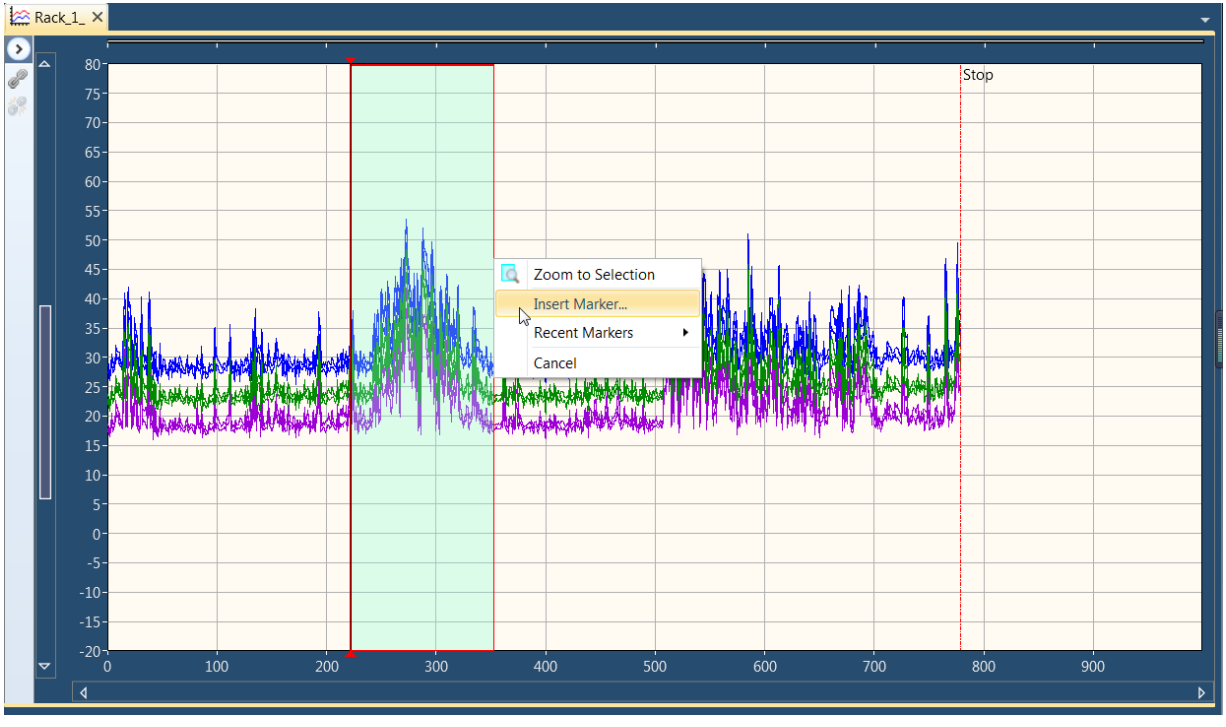


When you notice a bus passes, you just press Ctrl+2, it will display a marker line in the profile graph along with word indication “Bus Passing”. If you see a truck passes, you press Ctrl +3, for a car, press Ctrl +4. All those Single-point markers line and word indication will be displayed in the profile graph correspondingly.

Occasionally, you can hear dog barking noise, Press Ctrl+1, a blue toggle bar will be appeared continuously in the upper of the profile graph. When the barking noise stops, you should press Ctrl +1 again to stop this toggle marker. Similarity, you press Ctrl+4 when you notice the machine is running to start Toggle marker 4, and press Ctrl+4 again as the machine stops to exit this toggle marker.

As you can see, all those markers can be used simultaneously to describe various events during your measurement time.

Also you can select part of the measurement data from the profile curve, it will pop out a submenu automatically, then you can select “Insert Marker…” to define a special toggle marker to describe a related event took place during this measurement period.



There are also some system markers for Nor850, those are Recording, Measurement Stop, Measurement Pause, Work Overload, Signal Overload, Event and Comment.

Pause: Indicates that the measurement has been paused. Toggle-marker and a corresponding gray area in the L(t) graph.

Stop: Marks the last measurement-period in the measurement. Single-point-marker.

Overload: Indicates that the measurement has had a signal-overload. Toggle-marker.

Audio-recording: Indicates that an audio-recording has been performed. Toggle-marker.

Comment: Indicates that a spoken comment exists. Single-point- and toggle-marker.

Work-overload: Indicates that the measurement device detected that it would not be able to perform all measuring tasks, and has switched off one or more measurement parameters to be able to complete the measurement. Toggle-marker.

In addition, we have these markers. They can currently only be seen when opening a measurement taken by the Nor150.

Text: Indicates that a written comment exists. Single-point-marker.

Picture: Indicates that a picture has been taken. Single-point-marker.

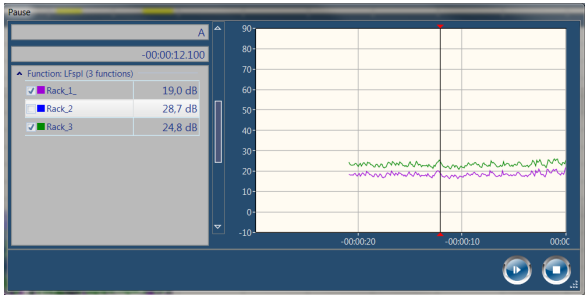
Battery: Indicates that the measurement device has been running on batteries. Toggle-marker.

You can skip the Event-marker. It is not displayed in the Nor850.

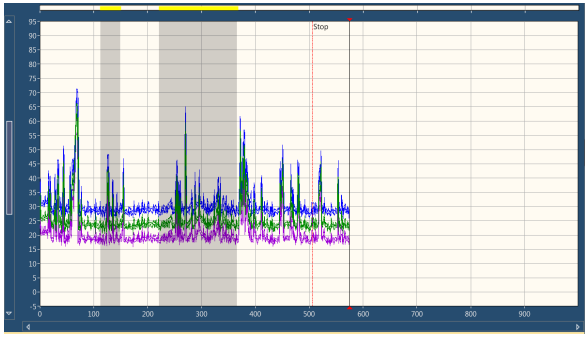
Marker for Pause

Extensive pause and continue functions are available. When paused, the instrument will produce and display the time profile for the last 20 seconds of the measurement. The time cursor can then be moved backwards to remove the unwanted noise and resumed. Data acquired to the right of the time cursor in the pause picture will be removed from the global measurement. This applies to the statistical values in global as well. If there was an overload in the selected time span, this will also be deleted from the overall measurement.

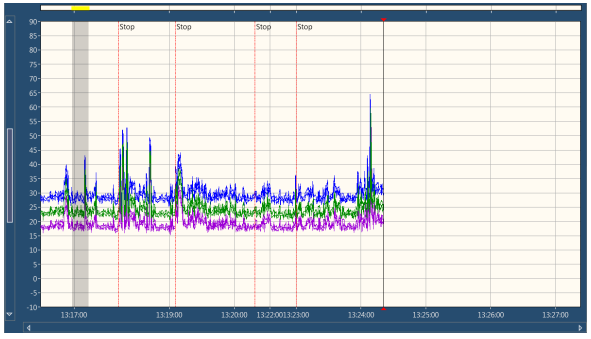
After your pressing of Pause/Continue, it will pop out a Pause graph as follows, which contains signal weighting type (here it can only be used as A-weighting), back-erase time period (which can be selected by moving cursor by yourself and the maximum of back-erase time span is 20 seconds). You can select which of the channel signal should be displayed in the window as a time profile in the last 20 seconds. However, you should also remember that Pause signal is affected for all used channels, even some of the channels are not displayed in the present window.



The data removed in the pause picture is not removed from the time profile. The back-erase function is very important as it can be adopted to erase the unexpected dog barking noise in inhabitant areas as we mentioned in our former example. Instead a pause marker is inserted in the time profile for easy identification of the paused area. The markers are also can be transferred to the post processing and reporting program Norview. The picture below shows a paused area which is indicated by a greyish background followed by a yellow horizontal marker line.



It is also possible to resume a measurement after Stop is pressed. Once you press Stop, the Continue function becomes available. Opposite to Pause/Continue, the Stop/Continue sequence also removes data from the time profile in addition to Global. A red single marker labelled Stop is inserted in the time profile as show in the picture. Notify the discontinuity in the time axis at the Continue marker.

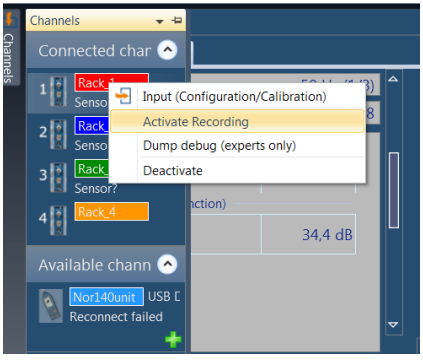


Audio Recording

In the General Analyser mode, it is possible to record from the connected Nor140/Nor850 MF1 channels while measuring, for later analysis. The available recording time depends on the sampling rate / bit resolution and the available space on the device's SD card.

Note that since the device uses a FAT32 file system, the maximum file size is limited to 4GB (in addition the WAV format is limited to this size), which corresponds to roughly 12 hours recording time at 48kHz/16bit.

To make a recording, a channel must be activated for recording. This is done by right-clicking an activated channel and clicking 'Activate recording':



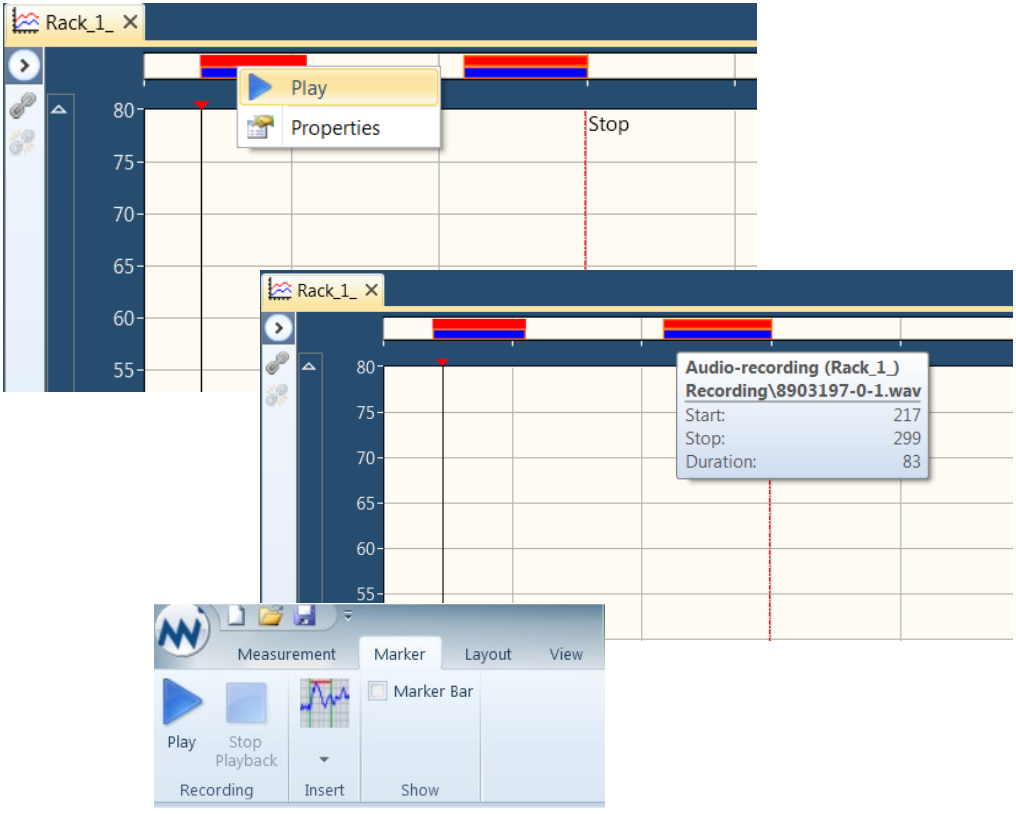
All recording-activated channels will appear with a musical note in stave along with the channel's icon:

To start recording audio, Open an L(t) window and add the channels you want to record, and start the measurement. A recording can then be started/stopped by pressing the Ctrl+R keys. Multiple recordings can be done during one single measurement (for example, during a traffic measurement, the recording can be manually started when a car is passing and stopped when there is no traffic). For optimization the display window of recordings, you can drag the bar in the left side up and down until it fits for your ideal perspective viewing.

The recordings will appear as solid lines at the top of the Display Window, coloured by the channel colour. It is thus possible to record multiple channels simultaneously.

To listen to a recording, right-click the solid line and click 'Play', or click it and use the Space Bar key to start/stop the recording. In addition, the recording can be started/stopped in the 'Marker' menu at the top left corner of the screen.

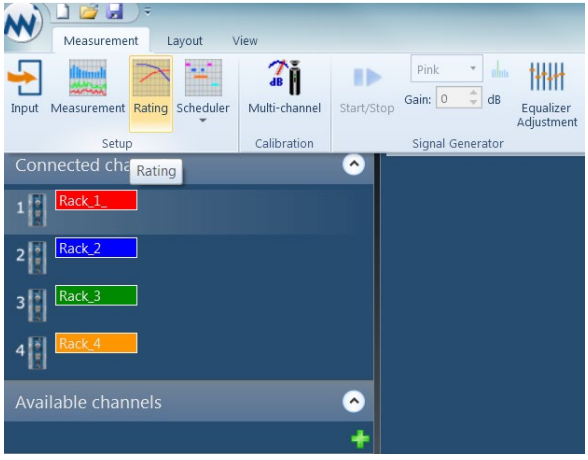
The recorded WAV-files can be found in the \Nor850\ data\Project_Name\Recording folder on your hard drive.



Building Acoustic Application Mode

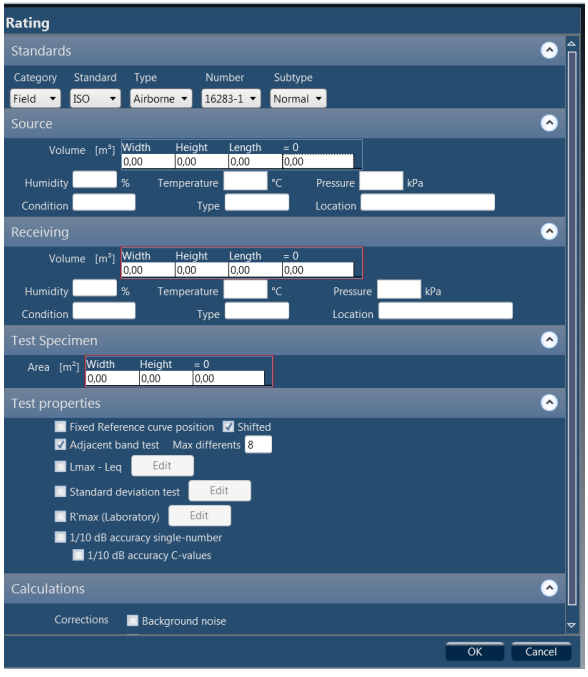
The Building Acoustic application mode is selected either by clicking the ‘Building Acoustics’ button on the opening screen, or, by selecting the Measurement Mode menu found by clicking on the Norsonic logo in the upper left corner.

As soon as the application software is loaded, the ‘Rating’ menu containing the settings for the actual sound insulation calculation is presented by clicking the ‘Measurement’ button in the upper left corner.



Rating menu

This ‘Rating’ menu contains several sub-sections for setting the different properties of the upcoming sound insulation calculation, or, for pre-entering text descriptions for the final test report document. Some of these are mandatory for the selected Standard which is indicated by a red line around the actual property box until a legal value is entered. The line then turns light blue. The different sub-sections may be closed by clicking the up/down arrow in the right part of the sub-section header.



Standard

- ‘Category’ is used for selection among the pre-defined Standard categories Field, Laboratory or Others
- ‘Standard’ is used for selecting the different Standard group such as ISO, ASTM or other national groups
- ‘Type’ is the selection of Airborne, Impact, Façade or similar.
- ‘Number’ is used for the selection of possible multiple Standard numbers within the set Category, Standard and Type
- ‘Subtype’ is used when required in cases such as selecting between Rooms or Element version of the ISO 140-4

Source

- ‘Volume’ is the actual volume in the source room given in m3
- ‘Humidity’ is the humidity in the source room measured in %
- ‘Temperature’ is the air temperature measured in ˚C
- ‘Pressure’ is the air pressure measured in kPa
- ‘Condition’ may be used for describing the condition of the source room
- ‘Type’ may be used for describing the actual type of source room
- ‘Location’ may be used for describing the location of the source room

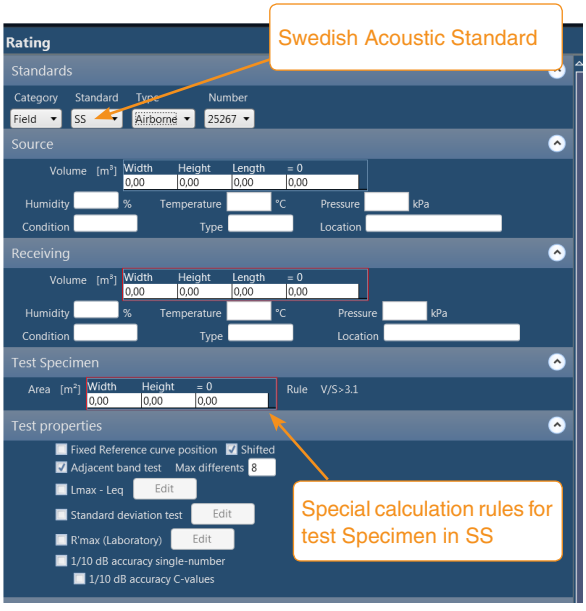
Receiving

- 'Volume' is the actual volume of the receiving room given in m^3. For the receiving room, this value is calculated based on entered values for width, height and length of the actual room. If the room is non-square, and the final volume is known, the user may simply enter '1' for width and height and the actual volume as length to get the correct volume for the calculations. Alternatively, use the down-arrow on the keyboard to get additional calculation lines which then will produce the final volume based on several sub-volumes. Entering a negative value into one of these lines will make it possible to subtract the volume of construction beams etc. The additional line may be removed again by deleting all values in the line.

- 'Humidity' is the humidity in the receiving room measured in %
- 'Temperature' is the air temperature measured in ˚C
- 'Pressure' is the air pressure measured in kPa
- 'Condition' may be used for describing the condition of the receiving room
- 'Type' may be used for describing the actual type of receiving room
- 'Location' may be used for describing the location of the receiving room

Test Specimen

- 'Area' is the actual area in the test specimen given in m2. This value is calculated based on entered values for width and height of the actual test specimen. For non-square objects, additional calculation lines may be added as described for the receiving room volume.
- When you adopt some special standard, for example Swedish Standard, then on the right hand side of this sub-section, any special calculation rules for the area used in the calculations are indicated. One example is the use of the maximum value of either entered Test Specimen area S or the entered Receiving Room volume divided by 7,5.



Test properties

- 'Fixed Reference curve position' tick-boxes may be selected to Shifted. This allow the user to draw the red reference curve according to the pre-set fixed position in the selected Standard, and/or, according to the calculated position for the final sound insulation index.
- 'Adjacent band test' tick-box along with 'Max differents' value is used for activating the check of the neighbouring frequency bands differences for the average level in the source room. The smiley faces on the left hand side of the tabular view may then show a neutral face when this check is active.
- 'Lmax – Leq' tick-box is used for activating the check of maximum differences between the Lmax and the Leq values for the different measurement positions. This is handy for evaluation of any possible short-term external noise during the measurement duration. The user may specify the maximum differences for each frequency band by opening the sub-menu by clicking 'Edit'. The smiley faces on the left hand side of the tabular view May then show a neutral face when this check is active.
- 'Standard deviation test' tick-box is used for describing a measure that is used to quantify the amount of variation or dispersion of all measured values.
- 'R'max(Laboratory)' tick-box is used for setting in the maximum sound reduction index of the test stand for building acoustic test, each acoustic laboratory has its own R'max index, the user should test it by himself and keep these values on hand.
- '1/10 dB accuracy single-number' & '1/10 dB accuracy C-values' tick-box is used for making the final sound insulation index calculation in 1/10 dB step instead of the normal 1 dB step for either measurement values or criteria values. This is handy when making small adjustment to the test object that cannot be measured with 1 dB final resolution.

Calculations

- 'Corrections' is used for activating corrections to the measured values in the final calculations. By activating the tick-box named 'Background noise', the receiving room average values will be corrected for the measured background noise level when measured. The selected Standard is automatically giving the details for such corrections; It can also be corrected by enabling tick-box 'Use sensor correction'.

When all required and desired properties are entered, a click on the 'OK' key initiates the Nor850 system for the desired sound insulation calculations in accordance with the selected Standard.

Measurement menu

As soon as the details in the Rating menu are entered, the Nor850 system is ready for the measurements. However, the user may choose to adjust different parameters for the measurements by opening the 'Measurement' menu. Select the Measurement/Measurement in the upper menu bar.

The Measurement menu contains the following features and settings for the measurements of level and reverberation time:

General

- 'SweptSine method' tick-box is used for activating the sweeping sine measurement technique. Use of this technique is different from the traditional method, and described in a separate section. Please observe the SweptSine method do only work with Nor850 MF-1 Rack front end or with Nor140 units.
- 'Bandwidth' enables the user to switch between 1/3- and 1/1-octave measurements. Please note that for all currently supported building acoustic testing Standards in the Nor850 system, only the 1/3-octaves are selectable.
- 'Lower frequency' is used for selecting the lowest frequency band to be measured. In the BA mode, the minimum is 50 Hz for 1/3-octaves.
- 'Upper frequency' is used for selecting the highest frequency band to be measured. In the BA mode, the maximum is 20 kHz for 1/3-octaves.
- 'Duration Level' is used for pre-setting the measurement duration for the source and/or receiving room level measurements. Most Standards require 16s for measurements down to 50Hz and 6s for measurements down to 100Hz.
- 'Duration Background noise' is used for pre-setting the measurement duration for the background noise in the receiving room.
- When the SweptSine method is selected, the user can choose between a pre-defined measurement duration of either 60s, 336s or 672s, depending of the background noise conditions. In addition, the signal-to-noise requirement is to be specified in 6dB.

Reverberation

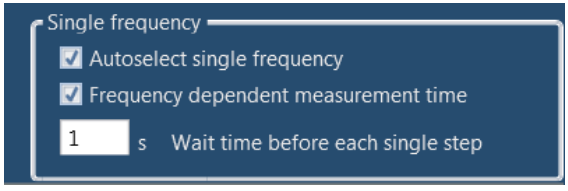
- 'Excitation Type' is used for selecting the actual method for detecting the correct decay. Noise is used for operation with the external noise generator, and Impulse is used for operation with an external impulsive noise. When several measurement channels are connected simultaneously, the Nor850 system will automatically operate such multi-channel systems with activated signal generators in some channels and non-activated signal generators in others. Note that when the SweptSine method is selected, this is the only choice for the reverberation excitation type.
- 'Duration' is setting the duration of the active noise excitation before the decays are measured.
- 'Trigged at' is setting the minimum threshold level before the decay measurements are triggered. It should be either 5dB level below or after 100-300ms as the sound stops.
- 'Max Expected RT' is setting the maximum reverberation time to be measured. In reality, this setting controls the period length of each sample along the decay. The available settings of 4s, 8s, 16s and 32s are corresponding to sample periods of 5ms, 10ms, 20ms and 40ms respectively.
- 'RT function priority' is used for selecting between the reverberation time functions T20, T15, T30 or Tmax. For impulse excitation, Tmax feature is replaced with EDT (Early Decay Time. All functions are presenting the result as the time for the theoretical 60dB decay time, but the calculation ranges are individual for each function. EDT starts at 0 dB below the excitation level and end -10 dB below. All the other functions start at -5 dB below the excitation level, but ends at -25, -20 and -35 dB respectively.
- 'Min distance to noise floor' is setting the minimum difference between the lower calculation range for the selected RT function and the background noise level. The background noise level for the RT calculation is handled individually for each frequency band, and is set identical to the horizontal part of the decay measurement after the decays have decreased below the RT calculation range.
- 'Ensemble averaging'tick-box is used for ensemble averaging for all the reverberation time functions.

Signal Generator

- 'Type' is used to select between White noise or Pink noise, or alternatively SweptSine when in SweptSine mode. All connected measurement channels with activated signal generator will get the same type of noise.
- By ticking the 'Autoselect single frequency' option, the Nor850 system will automatically select the single frequency bands where the receiving room level is less than 10dB higher than the background noise level. The user can then choose to measure these bands with 1/3-octave band-limited noise. Note that the auto select function will only work if background noise measurements are performed first.
- By ticking the 'Frequency dependent measurement time' option, then you should also set in how many seconds as waiting time before each single step.
- 'Gain' is used to set the output signal level in the range from 0 to -50 dB, where 0dB corresponds to 1 Vrms. All activated signal generators will get the same output gain setting.
- 'Pre start time' is used to start the signal generator before the measurement is initiated. This is used to build up the sound level to a steady state before starting the level measurement.

Also you can tick on the 'Autoselect single frequency' tick-box, when you think the signal-to-noise ratio to some frequency band in the receiving room is too low to get a qualified result and you will have to perform single frequency measurements in 'Reverberation time' afterwards.

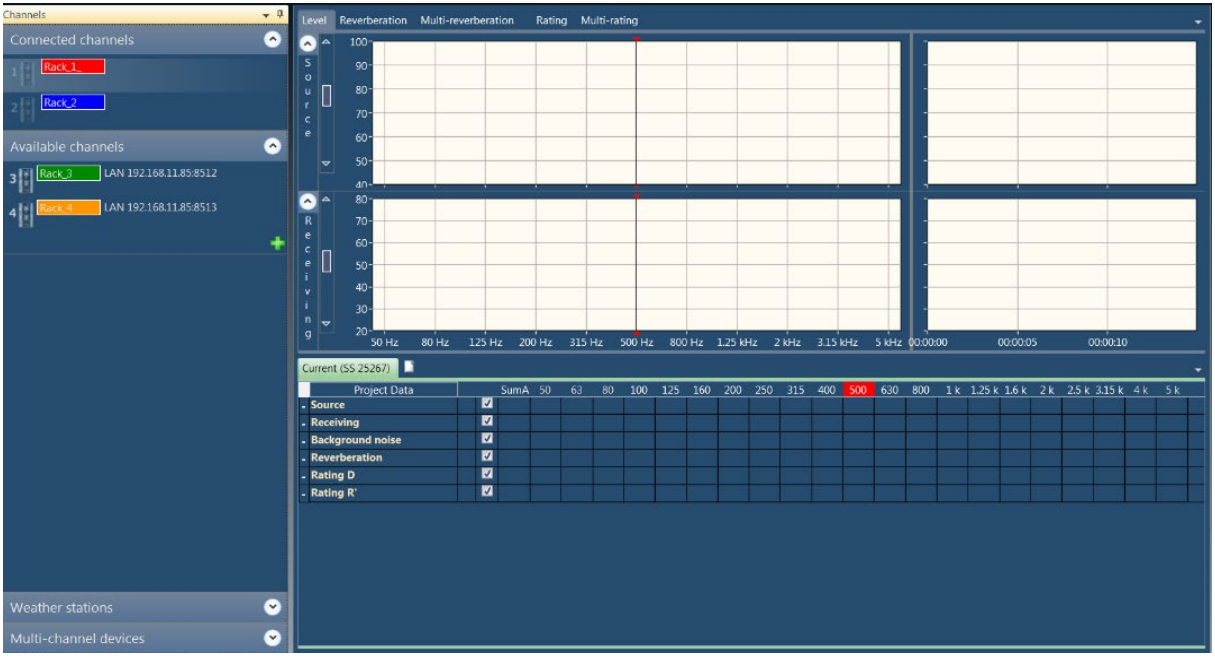
Generally speaking, it will take longer time for taking reverberation time measurement in lower frequency band than in higher frequency band, by ticking on 'Frequency dependent measurement time' tick -box, you can set different measurement time corresponding to different frequency band, then you can save much time when you perform several frequency band measurements automatically later. Normally, people will set in some seconds as waiting time between each single measurement step.



When all required and desired properties are entered, a click on the 'OK' key initiates the Nor850 system for the desired sound insulation measurement setup desired by the operator.

Normal measurement display view

As soon as the user has selected all proper settings in the Rating and Measurement menus, the Nor850 system is ready to perform the Building Acoustics tests. The PC screen now shows a display with 3 - 4 main sections:



To the very left, all connected and/or available measurement channels are listed

- The lower mid and right part shows a table view containing all measurement and calculation values
- The upper mid and right parts contain different views depending on the actual measurement mode or selected tab. The possible tabs are found in the upper left corner of the mid-section. The various contents of this section are normally as follows:

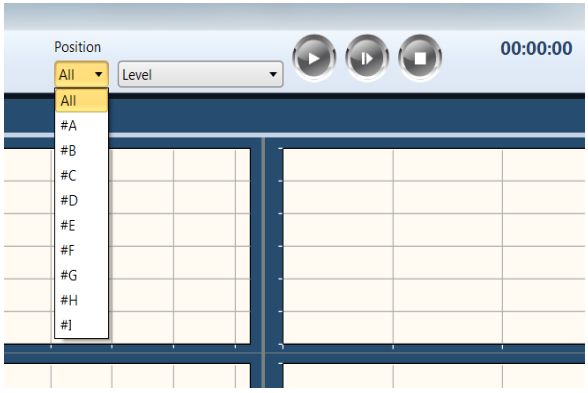
'Level' contains the spectrum of the source room (upper part) and receiving room (lower part) in the mid-section and the corresponding level vs time during the measurement duration for the selected cursor frequency in the corresponding right-sections. For background and impact level measurements, the lower part is normally stretched onto the upper part as only the receiving room information is desired.

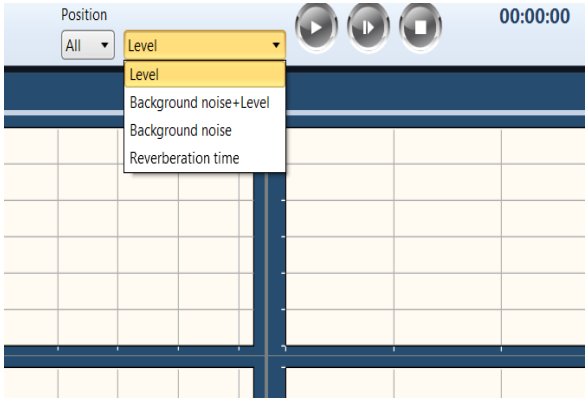
'Reverberation' contains the calculated RT spectrum as a function of frequency in the mid-section, and the corresponding level vs time decay for the selected cursor frequency in the corresponding right-sections.

'Multi-reverberation' contains the calculated RT corresponding level vs time decay in the mid-section for the 1/3 octaves frequency.

'Rating' contains the graphical view of the measured sound insulation including the reference curve and the calculated index in the entire upper mid-sections. In this tab it is also possible to enable/disable the background noise correction by toggling the 'Background noise' checkbox. Thus the user can see how much the background noise is influencing the measurements. In the upper right-sections, you can also fill in the related test information as 'Date of test', 'Client', 'Description', 'Objection', 'Company', 'No. of test report', 'Uncertainty' and some 'Remarks'.

- On the very top section, the operator finds the measurement mode selector, the Start/Pause Continue/Stop measurement push buttons as well as the measurement duration indicator. You can select either one of the loudspeaker positions or 'All' loudspeakers positions from the position selector, the maximum loudspeaker number you can select is 9, which is marked as '#A', '#B', ……., '#I'. While the measurement mode selector is used to select which kind of measurement to perform when hitting the Start button. Normally the selection is Level, Background noise +Level, Background noise or Reverberation time, but these will alter with the preselected Standard.

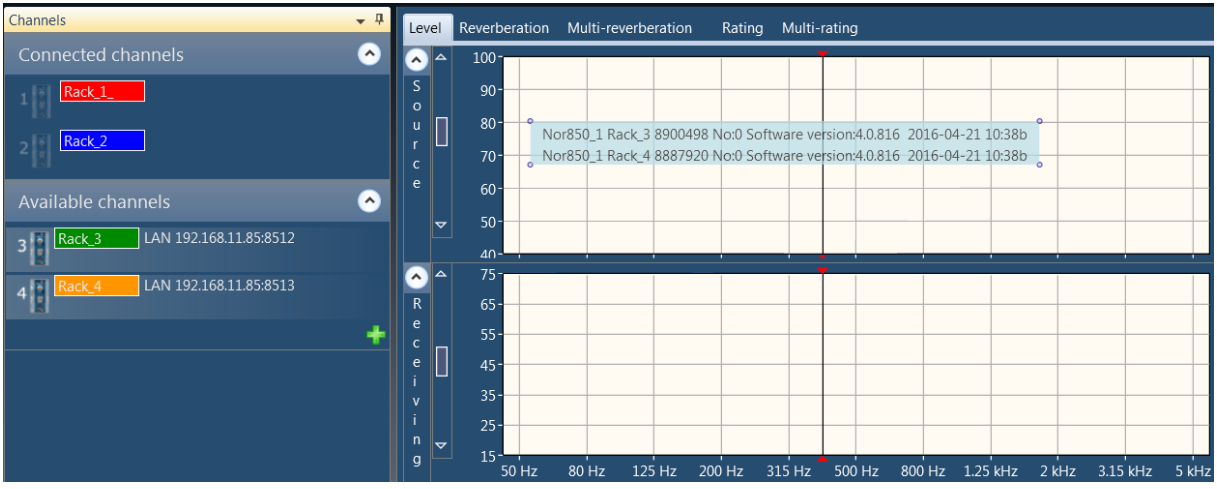




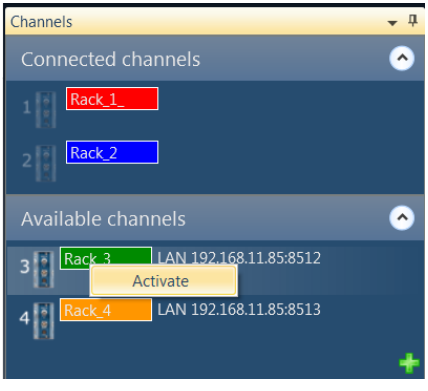
Activating the available measurement channels

In order for the Nor850 measurement system to operate correctly, the channels in use must be placed either in the source room or in the receiving room. This is done by click & drag on any of the available channels onto the source or receiving room area in the upper mid-section of the display.

As soon as the connection is well established, this channel will be found under the 'Connected channels' in the upper left part of the display. For a multiple channel system, the user may put as many channels as desired into both the source and the receiving room.

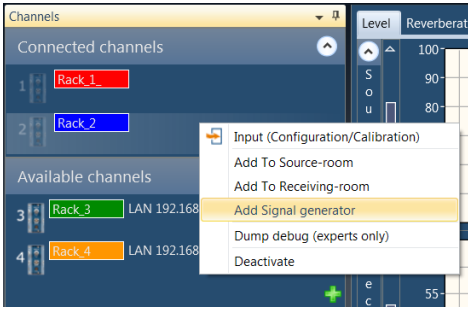


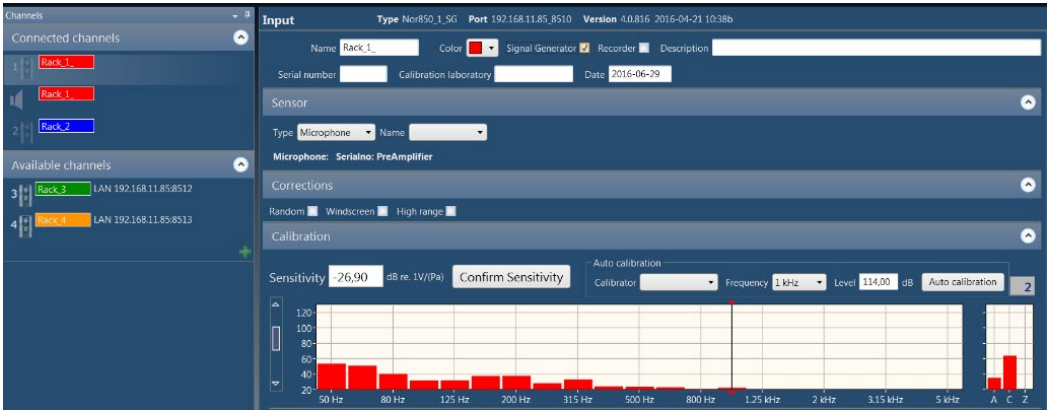
Alternatively, the user may first activate any available channel into the 'Connected channels' area, and then place the activated channel into the source or receiving room by click & drag. The activation of the channels is either done by click & drag, or, by right-click and selecting the Activate command in the dialogue box.



Activating the signal generator of a measurement channel

To activate the signal generator of any of the measurement channels, the desired channel must first be activated in the Nor850 system. The users must then right-click on this connected channel and select the 'Add signal generator' in the display dialogue menu, or select the 'View Configuration' and tick-on the Signal Generator in the Configuration menu. Alternatively, the channel Configuration menu can be opened by double-clicking the channel. The 'Connected channels' list will contain extra rows for each of the activated signal generators.



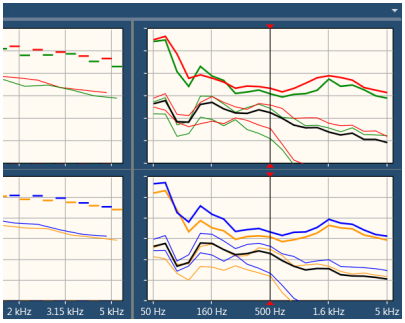


When channels with activated signal generator are placed in the source or receiving rooms, the operation of the signal generators will automatically follow the selected measurement mode. That means produce excitation signal in the source room channels during level measurements and excitation signal in the receiving room channels during reverberation time measurements.

Making the Level measurements

Set the measurement mode selector to level, and push the Start key in the upper right corner. The display will then show the frequency spectrum of the source and/or receiving room in the upper mid-section and the level vs time of the selected cursor frequency in the upper right-section. In the frequency spectrum, the SPL values are shown as filled bar graphs, the L_{eq} values as a line, and the L_{max} values as a step-line.

When the pre-set measurement duration is ended, or the Stop key is pushed, the upper right-section will change to present the last measured spectrum (thick lines) together with the possible previously measured microphone positions. In addition, a thick black line will indicate the average level of the previously measured positions. To the left of the measurement mode selector, the display now presents 'Accept' and 'Cancel' keys for the acceptance or cancellation of the last performed measurement.



In the tabular section, the measured values are presented in a yellow colour. Upon accepting the measurement, these values are turned into white and put into the calculation of the average level. Cancellation of the measurement will remove all the last measured values from the memory.

Additional level measurement positions may now be measured by a new click on the Start key.

Current (SS 25267)

Project Data		SumA	50	63	80	100	125	160	200	250	315	400	500	630	800	1 k	1.25 k	1.6 k	2 k	2.5 k	3.15 k	4 k	5 k
- **Source**		**42,8**	**41,6**	**43,0**	**33,6**	**33,4**	**41,3**	**42,2**	**39,3**	**37,5**	**37,3**	**38,9**	**37,6**	**35,1**	**32,1**	**30,9**	**31,0**	**29,0**	**27,7**	**28,5**	**25,7**	**25,7**	**24,3**
+ *#1*	*14:02:13*	*34,4*	*40,1*	*38,7*	*33,3*	*31,4*	*32,7*	*33,8*	*32,7*	*35,3*	*34,2*	*32,1*	*30,5*	*23,6*	*16,5*	*14,5*	*11,5*	*9,4*	*8,2*	*8,6*	*8,6*	*8,1*	*7,9*
+ *#2*	*14:02:13*	*32,0*	*37,1*	*37,0*	*27,1*	*28,3*	*35,6*	*34,6*	*31,8*	*34,5*	*30,1*	*28,4*	*26,0*	*21,2*	*14,4*	*11,4*	*9,4*	*8,8*	*8,0*	*8,4*	*8,8*	*8,7*	*9,0*
+ *#3*	*14:03:42*	*46,3*	*44,1*	*46,1*	*36,9*	*36,3*	*42,2*	*44,8*	*42,2*	*40,2*	*39,1*	*41,7*	*41,0*	*39,5*	*35,1*	*35,3*	*35,3*	*32,9*	*31,8*	*32,0*	*29,3*	*29,5*	*27,0*
+ *#4*	*14:03:42*	*44,8*	*42,4*	*44,3*	*32,2*	*33,7*	*45,0*	*44,9*	*41,5*	*37,8*	*39,9*	*41,4*	*39,5*	*35,5*	*35,1*	*31,8*	*32,0*	*30,8*	*29,1*	*30,9*	*27,9*	*27,7*	*27,4*
+ *#5*	*14:04:27*		*70,0*	*71,6*	*63,8*	*52,9*	*54,4*	*53,0*	*51,2*	*48,5*	*49,5*	*49,2*	*48,4*	*46,9*	*48,4*	*50,7*	*53,2*	*54,0*	*53,3*	*52,1*	*48,8*	*47,6*	*46,5*
+ *#6*	*14:04:27*		*69,3*	*70,0*	*55,9*	*49,3*	*58,2*	*53,9*	*52,0*	*46,2*	*46,8*	*47,7*	*46,0*	*44,6*	*45,8*	*46,1*	*47,6*	*52,6*	*49,4*	*49,9*	*47,8*	*45,1*	*44,1*
- **Receiving**		**38,0**	**36,4**	**37,8**	**26,8**	**28,6**	**38,0**	**37,8**	**34,8**	**32,4**	**32,9**	**34,2**	**32,9**	**29,5**	**26,8**	**25,0**	**25,7**	**25,6**	**22,7**	**22,1**	**22,0**	**21,4**	**20,6**
+ *#1*	*14:02:13*	*29,5*	*34,3*	*34,4*	*24,4*	*26,9*	*33,3*	*32,2*	*29,2*	*32,2*	*27,8*	*25,8*	*23,3*	*17,6*	*11,3*	*8,3*	*6,8*	*6,1*	*5,4*	*5,4*	*6,1*	*5,9*	*6,2*
+ *#2*	*14:02:13*	*26,1*	*31,4*	*30,3*	*23,3*	*20,1*	*26,7*	*26,4*	*24,8*	*27,0*	*25,1*	*23,6*	*21,9*	*14,1*	*8,7*	*7,4*	*5,7*	*4,9*	*5,0*	*4,8*	*5,3*	*5,3*	*5,6*
+ *#3*	*14:03:42*	*41,9*	*39,8*	*41,6*	*29,3*	*32,3*	*42,7*	*42,2*	*39,0*	*35,3*	*37,3*	*37,9*	*36,4*	*32,8*	*31,5*	*28,4*	*29,4*	*29,9*	*26,7*	*26,4*	*26,1*	*25,6*	*24,7*
+ *#4*	*14:03:42*	*39,3*	*35,8*	*37,8*	*27,7*	*27,9*	*36,3*	*37,5*	*34,8*	*31,6*	*31,9*	*35,7*	*34,8*	*32,0*	*26,8*	*27,4*	*27,9*	*26,8*	*24,3*	*23,0*	*23,5*	*22,5*	*21,8*
+ *#5*	*14:04:27*		*66,6*	*67,2*	*52,7*	*48,1*	*55,9*	*51,9*	*49,5*	*43,6*	*44,5*	*45,0*	*43,3*	*41,6*	*43,2*	*43,4*	*45,5*	*49,4*	*47,6*	*47,0*	*44,3*	*42,1*	*41,3*
+ *#6*	*14:04:27*		*62,1*	*63,3*	*54,0*	*43,4*	*48,8*	*45,3*	*43,9*	*39,8*	*41,1*	*41,5*	*40,9*	*38,7*	*39,6*	*40,9*	*42,9*	*46,5*	*45,3*	*44,8*	*41,9*	*40,7*	*39,4*

Making the Background noise + Level measurements

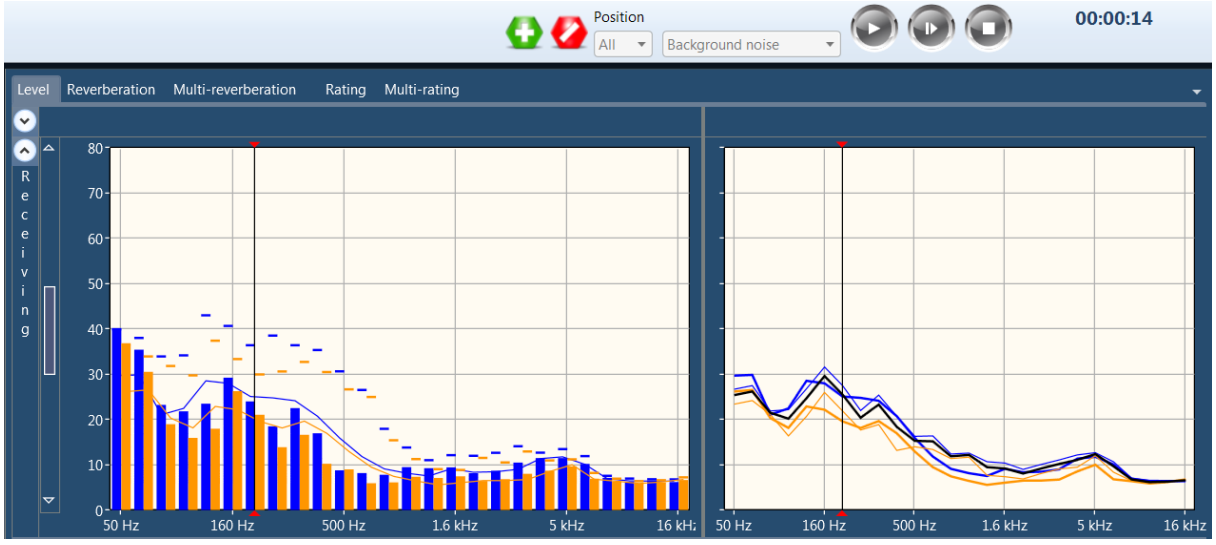
When you set the measurement mode selector to Background noise + Level, and push the Start key in the upper right corner. The display will first show the background noise frequency spectrum of the receiving room and then perform the normal level measurements in the source room and receiving room simultaneously with noise source turned on. In the right-section, the measured background noise spectrum along with the last measurement spectrum will be presented together with the average normal level measurement in order to evaluate the difference between the measured receiving levels and the background noise levels.

This function will be very useful when you will experience a long time measurement task while the background noise will vary greatly during the whole process.

The Background noise + Level measurements must be accepted or cancelled in the same way as the level measurements. Additional Background noise + Level measurement positions may now be measured by a new click on the Start key.

Making the Background noise measurements

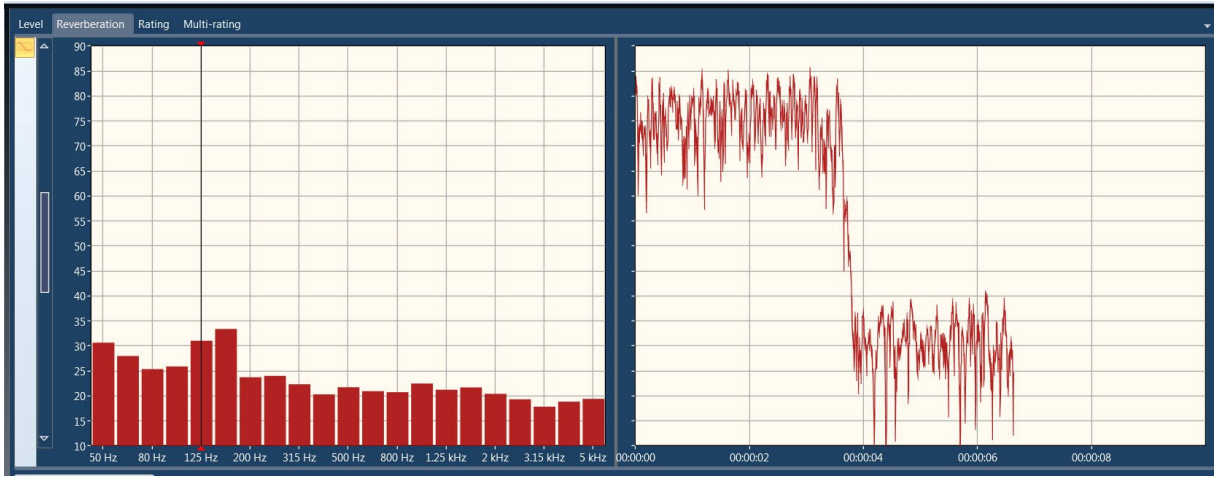
Set the measurement mode selector to Background noise, and push the Start key in the upper right corner. The display will then show the frequency spectrum of the receiving room in the same way as for the level measurements. In the right-section, the measured background noise will be presented together with the average normal level measurement in order to evaluate the difference between the measured receiving levels and the background noise levels.The Background noise measurements must be accepted or cancelled in the same way as the level measurements. Additional background noise measurement positions may now be measured by a new click on the Start key.



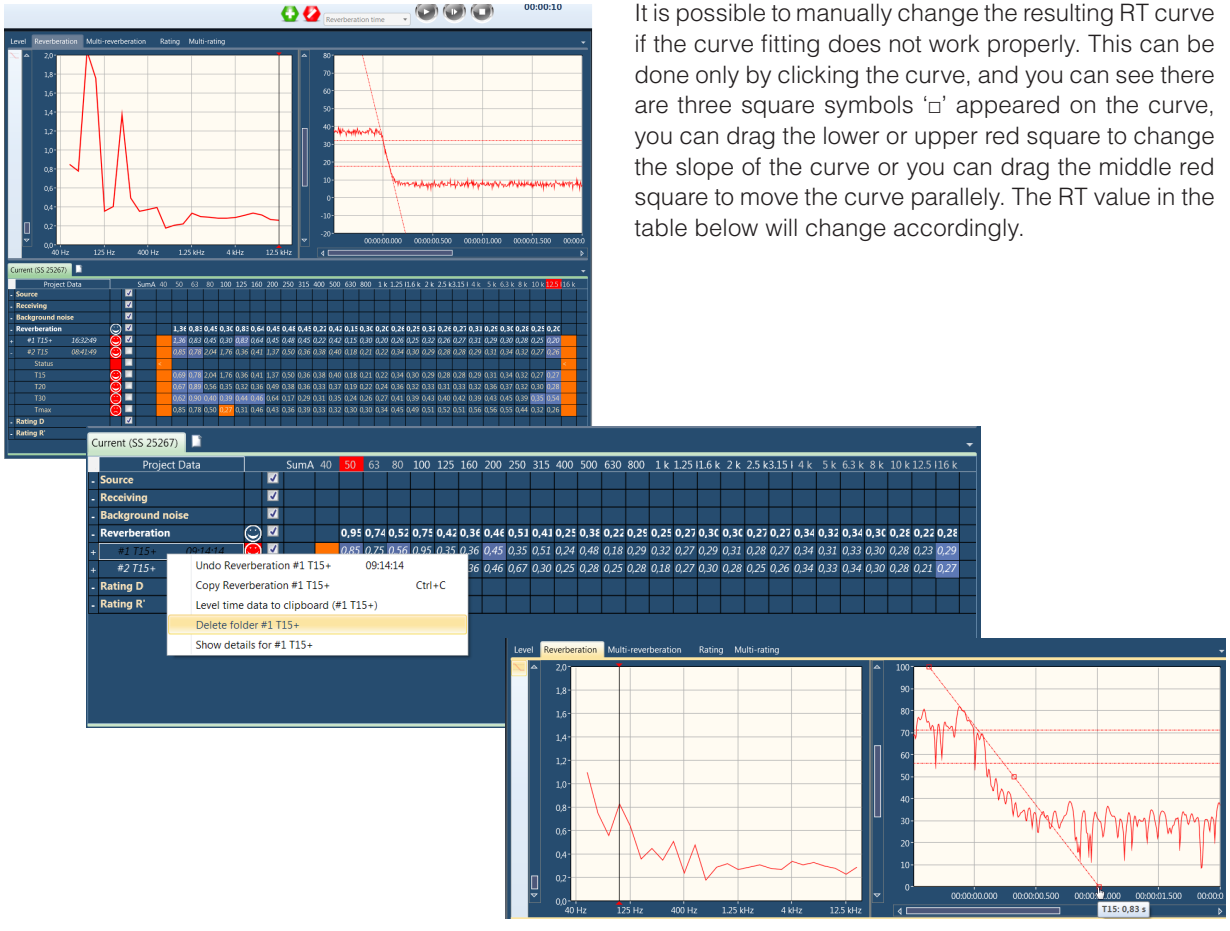
Making the Reverberation time measurements

Ensure the loudspeakers are set in the receiving room and set the measurement mode selector to Reverberation time, then it will pop out the 'Reverberation' tab automatically and when you press the Start key.
The Nor850 system will now automatically use the noise generator connected to the receiving room instead of the noise generator connected to the source room.

During the measurement, the upper mid-section will show the SPL frequency spectrum, while the upper right-section will show the level vs time of the noise level.



As soon as the reverberation time measurements is ended, the display will turn to show the calculated reverberation times as a function of frequency in the mid-section and the decay with the calculated decay-line and indicator lines for the T15/ T20/ T30/Tmax decay calculation ranges for the in the right-section. The user should now accept or cancel the last measurement in the same manner as for the previous measurements.



After the reverberation measurements data being either accepted or cancelled, and you still don't think one of the former measurements is satisfied, you can delete that measurement by right click it and select 'Delete folder #1 T15+' in the down-right section tab. Additional selections such as 'Undo Reverberation #1 T15+', 'Copy folder #1 T15+', 'Level time data to clipboard (#1 T15+)' or 'Show details for #1 T15+'.

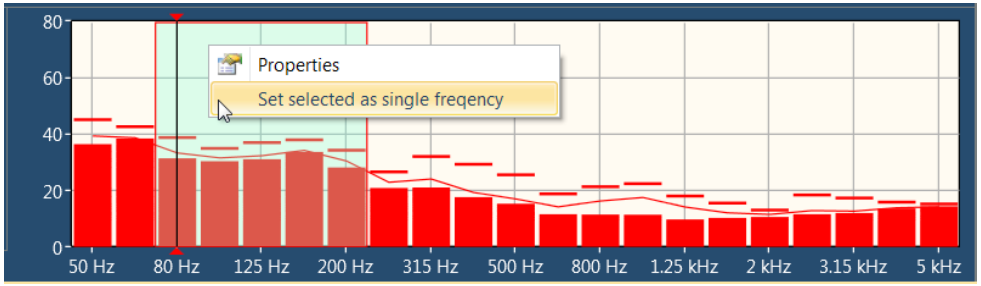
It is possible to manually change the resulting RT curve if the curve fitting does not work properly. This can be done only by clicking the curve, and you can see there are three square symbols '□' appeared on the curve, you can drag the lower or upper red square to change the slope of the curve or you can drag the middle red square to move the curve parallely. The RT value in the table below will change accordingly.

Single frequency measurements

For the Level and Reverberation time measurements, the signal-to-noise ratio might be to low even the loud-speaker is operating at full power. The Nor850 system can in such cases measure with 1/1- or 1/3-octave band limited noise instead of pink or white noise. Thus the frequency bands with low signal-to-noise ratio can be measured sequentially. This results in approxi-mately 15dB of increased signal level in the selected frequency bands.

Remember to tick on the 'Autoselect single frequency' tick-box in the Measurement menu/ Signal Generator/ Single frequency/ Autoselection single as we mentioned in the Measurement menu before.

To do single frequency measurements, first make a normal Level or Reverberation time measurement. Before accepting the measurement, click the desired frequency bands to be measured in the spectrum window. Alternatively, click & drag to select multiple frequencies:



Then, right-click in the spectrum window and select 'Set selected as single frequency' to do the measurements. The Nor850 system will now measure the selected fre-quency bands automatically, according to the standard. The SPL, Lmax and Leq will be shown for the single frequency while performing Level measuring. And the corresponding level in the table in the down-right sec-tion will be modified after each single frequency band measurement was finished.

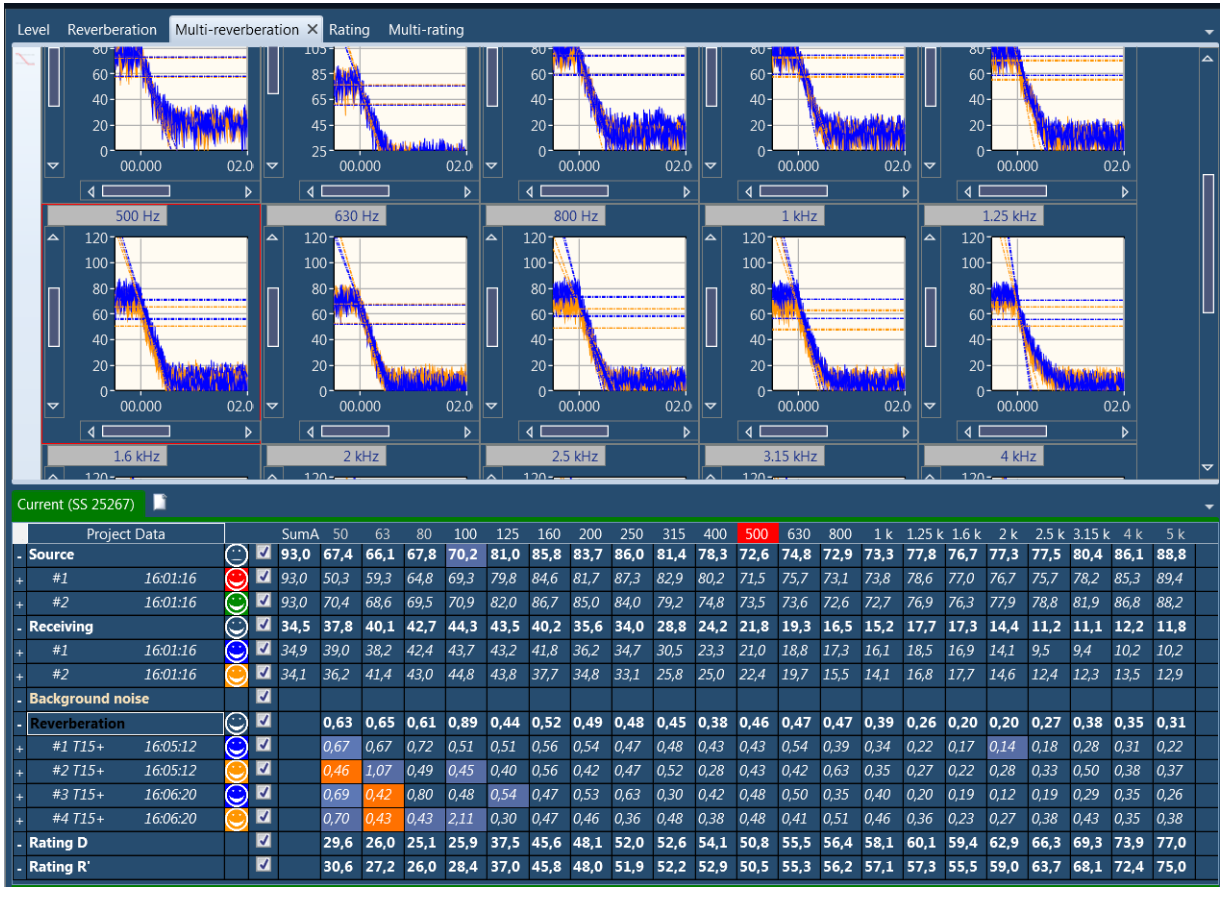
The single frequency selection will now be stored and automatically performed for the following measure-ments, since the same measurement settings must be used for all other measurement positions.

The single frequency measurement procedure is the same when measuring Reverberation time.

Evaluating the results in the Multi-reverberation display

As soon as the reverberation time measurements is ended, the display will turn to show the decay with the calculated decay-line and indicator lines for the T15/ T20/ T30/Tmax decay calculation ranges in the right-section.

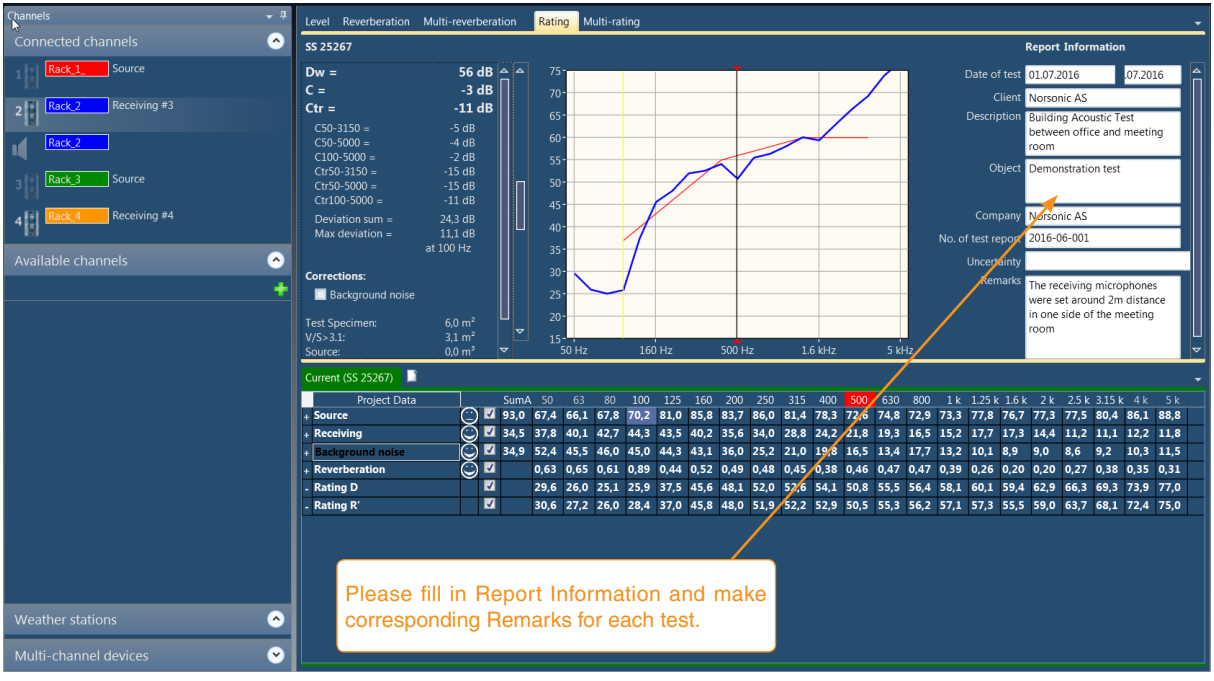
The user should now accept or cancel the last measurement in the same manner as for the previous measurements.



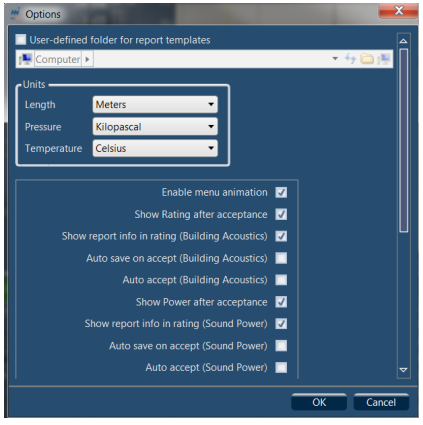
Project Data			SumA	50	63	80	100	125	160	200	250	315	400	500	630	800	1 k	1.25 k	1.6 k	2 k	2.5 k	3.15 k	4 k	5 k
- Source			93,0	67,4	66,1	67,8	70,2	81,0	85,8	83,7	86,0	81,4	78,3	72,6	74,8	72,9	73,3	77,8	76,7	77,3	77,5	80,4	86,1	88,8
+ #1	16:01:16		93,0	50,3	59,3	64,8	69,3	79,8	84,6	81,7	87,3	82,9	80,2	71,5	75,7	73,1	73,8	78,6	77,0	76,7	75,7	78,2	85,3	89,4
+ #2	16:01:16		93,0	70,4	68,6	69,5	70,9	82,0	86,7	85,0	84,0	79,2	74,8	73,5	73,6	72,6	72,7	76,9	76,3	77,9	78,8	81,9	86,8	88,2
- Receiving			34,5	37,8	40,1	42,7	44,3	43,5	40,2	35,6	34,0	28,8	24,2	21,8	19,3	16,5	15,2	17,7	17,3	14,4	11,2	11,1	12,2	11,8
+ #1	16:01:16		34,9	39,0	38,2	42,4	43,7	43,2	41,8	36,2	34,7	30,5	23,3	21,0	18,8	17,3	16,1	18,5	16,9	14,1	9,5	9,4	10,2	10,2
+ #2	16:01:16		34,1	36,2	41,4	43,0	44,8	43,8	37,7	34,8	33,1	25,8	25,0	22,4	19,7	15,5	14,1	16,8	17,7	14,6	12,4	12,3	13,5	12,9
- Background noise																								
- Reverberation				0,63	0,65	0,61	0,89	0,44	0,52	0,49	0,48	0,45	0,38	0,46	0,47	0,47	0,39	0,26	0,20	0,20	0,27	0,38	0,35	0,31
+ #1 T15+	16:05:12			0,67	0,67	0,72	0,51	0,51	0,56	0,54	0,47	0,48	0,43	0,43	0,54	0,39	0,34	0,22	0,17	0,14	0,18	0,28	0,31	0,22
+ #2 T15+	16:05:12			0,46	1,07	0,49	0,45	0,40	0,56	0,42	0,47	0,52	0,28	0,43	0,42	0,63	0,35	0,27	0,22	0,28	0,33	0,50	0,38	0,37
+ #3 T15+	16:06:20			0,69	0,42	0,80	0,48	0,54	0,47	0,53	0,63	0,30	0,42	0,48	0,50	0,35	0,40	0,20	0,19	0,12	0,19	0,29	0,35	0,26
+ #4 T15+	16:06:20			0,70	0,43	0,43	2,11	0,30	0,47	0,46	0,36	0,48	0,38	0,48	0,41	0,51	0,46	0,36	0,23	0,27	0,38	0,43	0,35	0,38
- Rating D				29,6	26,0	25,1	25,9	37,5	45,6	48,1	52,0	52,6	54,1	50,8	55,5	56,4	58,1	60,1	59,4	62,9	66,3	69,3	73,9	77,0
- Rating R'				30,6	27,2	26,0	28,4	37,0	45,8	48,0	51,9	52,2	52,9	50,5	55,3	56,2	57,1	57,3	55,5	59,0	63,7	68,1	72,4	75,0

Evaluating the final results in the Rating display

To evaluate the final calculated rating, select the rating display by clicking the ‘Rating’ tab in the upper left part of the mid-section.

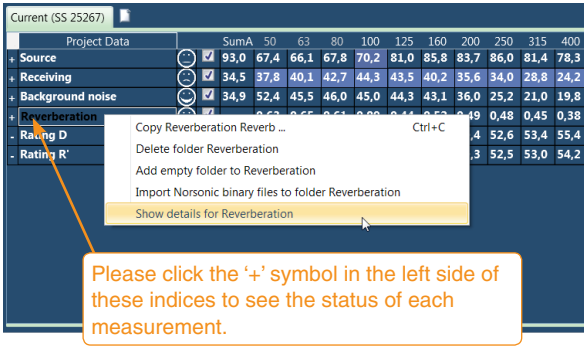


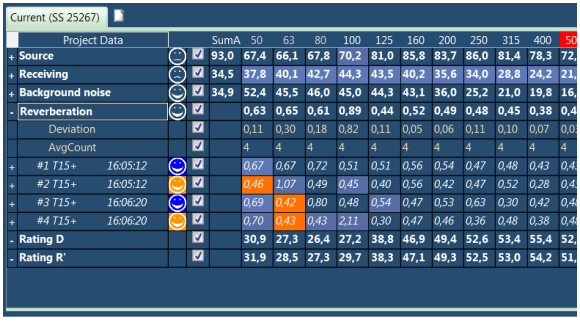
Alternatively, turn on the automatic rating view selector to allow the system to switch automatically to the rating view each time new measurements are accepted. The ‘Show Rating after acceptance’ switch is found in the ‘Nor850 Options’ menu available after clicking the Norsonic logo in the upper left corner.



The Rating display contains the measured resulting level difference after correction for the reverberation time, background noise, etc. The final rating index is shown in the left part of the upper section. Should the selected Standard allow more indices, the required index is selected by a click on the desired line in the lower part of the tabular display.

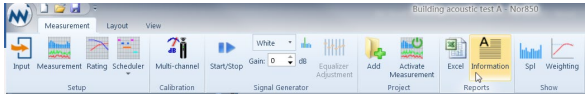
Also you can check the details for these index by click the ‘+’ in the left side of these indices and then right click these index and select ‘Show details for these index’, you can get the deviation value, average times and also measured resulting values in each 1/3 oct frequency band.





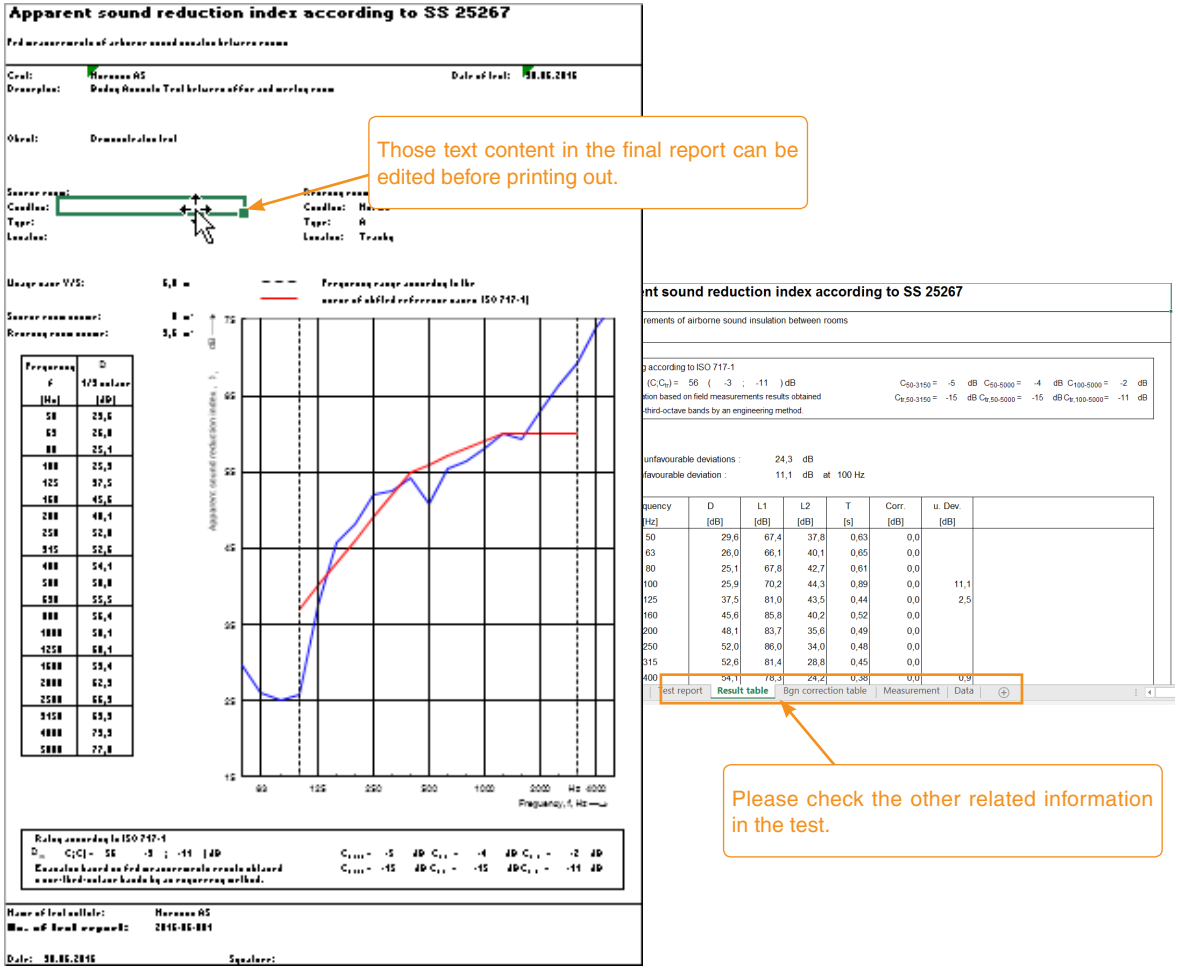
The calculated index may be viewed with or without background noise correction. Simply activate the function by a click in the ‘Background noise’ tick-box in the left part of the upper-section.

In the upper-right side of ‘Rating’ tab, you can fill in Report Information such as ‘Date of Test’, ‘Client Name’, ‘Description’, etc; these information can also be filled by select Measurement/Information in the menu bar before performing the building acoustic test.



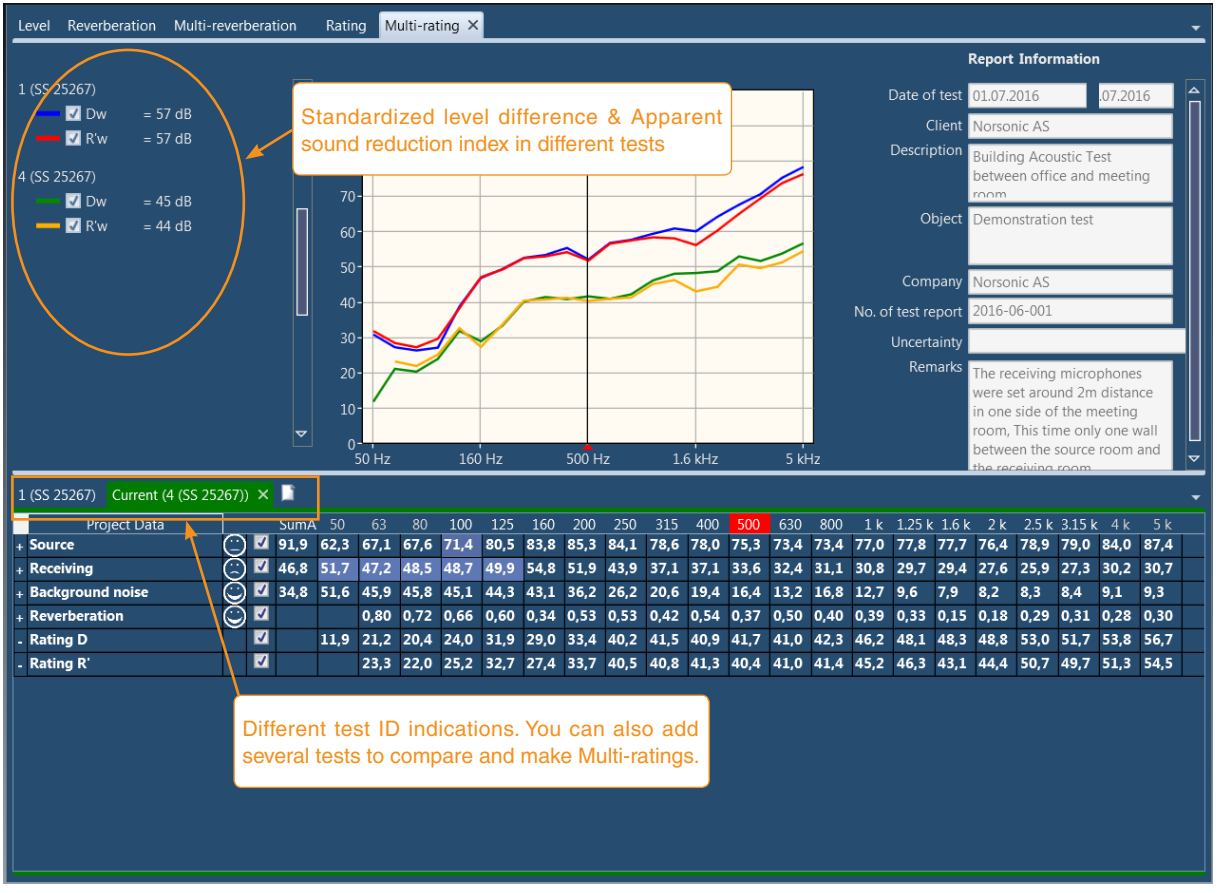
After saving the measurements, you may produce the final excel report of the sound insulation test, select the Measurement/Excel Reports feature in the menu bar. In the excel report draft, you can still edit and modify the text of the file.

In addition, you can also check the other information of ‘Result table’, ‘Back Ground Noise correction table’, ‘Measurement’ and ‘Data’.



Comparing the different building acoustic tests in the Multi-rating display

For some clients, they want to compare the results from two or more acoustic tests, this can also be performed by clicking the 'Multi-rating' tab in the upper left part of the mid-section.

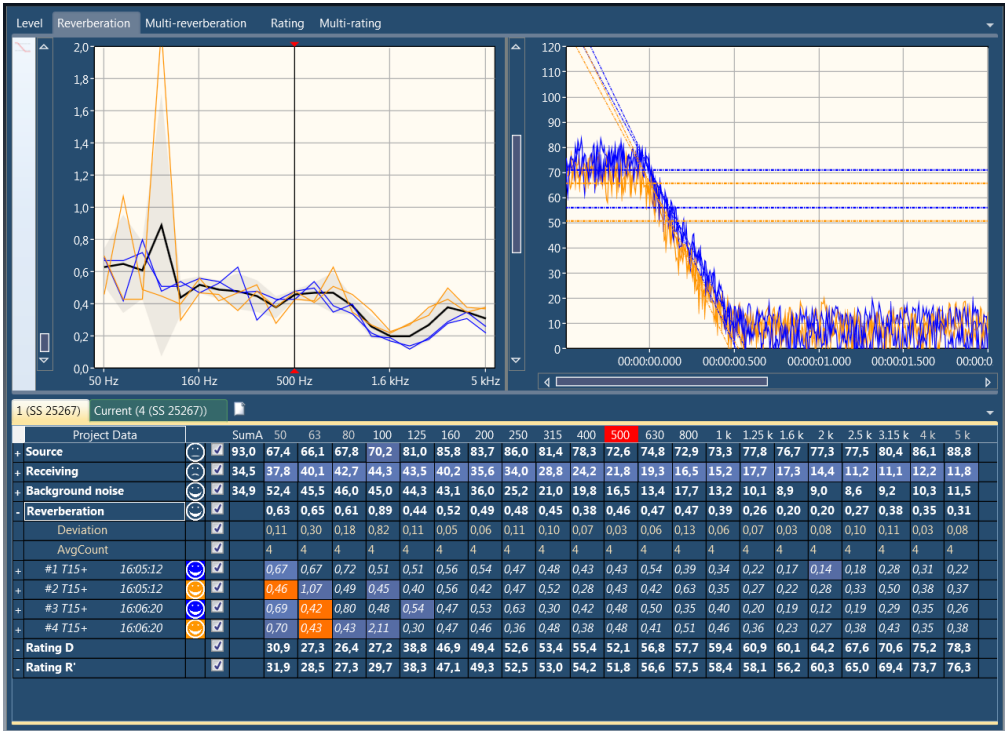


Project Data	SumA	50	63	80	100	125	160	200	250	315	400	500	630	800	1 k	1.25 k	1.6 k	2 k	2.5 k	3.15 k	4 k	5 k
+ Source	91,9	62,3	67,1	67,6	71,4	80,5	83,8	85,3	84,1	78,6	78,0	75,3	73,4	73,4	77,0	77,8	77,7	76,4	78,9	79,0	84,0	87,4
+ Receiving	46,8	51,7	47,2	48,5	48,7	49,9	54,8	51,9	43,9	37,1	37,1	33,6	32,4	31,1	30,8	29,7	29,4	27,6	25,9	27,3	30,2	30,7
+ Background noise	34,8	51,6	45,9	45,8	45,1	44,3	43,1	36,2	26,2	20,6	19,4	16,4	13,2	16,8	12,7	9,6	7,9	8,2	8,3	8,4	9,1	9,3
+ Reverberation			0,80	0,72	0,66	0,60	0,34	0,53	0,53	0,42	0,54	0,37	0,50	0,40	0,39	0,33	0,15	0,18	0,29	0,31	0,28	0,30
- Rating D		11,9	21,2	20,4	24,0	31,9	29,0	33,4	40,2	41,5	40,9	41,7	41,0	42,3	46,2	48,1	48,3	48,8	53,0	51,7	53,8	56,7
- Rating R'			23,3	22,0	25,2	32,7	27,4	33,7	40,5	40,8	41,3	40,4	41,0	41,4	45,2	46,3	43,1	44,4	50,7	49,7	51,3	54,5

Detailed analysis of the tabular result display

To evaluate the details of the measured data, the tabular view in the lower part of the screen is giving the user many possibilities. The table is organized in accordance with the selected Standard in a kind of folder system where the Source, Receiving, Background Noise and Reverberation time measurements represent the folders. In addition, the calculated ratings are found in the rows below the main folders.

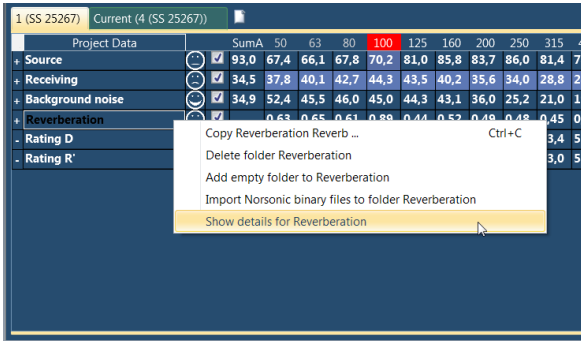
Double-clicking on any of the folders will change the content of the upper part display. Generally, a double-click on the Source or Receiving folder will change the upper part to show all the measurement made in level mode. Double-clicking the Background Noise folder will show the background noise measurements with the additional results from the receiving room. Please note that the thick black line represents the average result from all the individual measurement positions, and the grey area indicate the measurement deviation for each index in frequency. Finally, double-clicking the Reverberation folder will initiate the view of the reverberation time as a function of frequency plus the decay of all the measurements at the frequency cursor position.



Project Data	SumA	50	63	80	100	125	160	200	250	315	400	500	630	800	1 k	1.25 k	1.6 k	2 k	2.5 k	3.15 k	4 k	5 k
+ Source	93,0	67,4	66,1	67,8	70,2	81,0	85,8	83,7	86,0	81,4	78,3	72,6	74,8	72,9	73,3	77,8	76,7	77,3	77,5	80,4	86,1	88,8
+ Receiving	34,5	37,8	40,1	42,7	44,3	43,5	40,2	35,6	34,0	28,8	24,2	21,8	19,3	16,5	15,2	17,7	17,3	14,4	11,2	11,1	12,2	11,8
+ Background noise	34,9	52,4	45,5	46,0	45,0	44,3	43,1	36,0	25,2	21,0	19,8	16,5	13,4	17,7	13,2	10,1	8,9	9,0	8,6	9,2	10,3	11,5
- Reverberation		0,63	0,65	0,61	0,89	0,44	0,52	0,49	0,48	0,45	0,38	0,46	0,47	0,47	0,39	0,26	0,20	0,20	0,27	0,38	0,35	0,31
Deviation		0,11	0,30	0,18	0,82	0,11	0,05	0,06	0,11	0,10	0,07	0,03	0,06	0,13	0,06	0,07	0,03	0,08	0,10	0,11	0,03	0,08
AvgCount		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
+ *#1 T15+ 16:05:12*		*0,67*	*0,67*	*0,72*	*0,51*	*0,51*	*0,56*	*0,54*	*0,47*	*0,48*	*0,43*	*0,43*	*0,54*	*0,39*	*0,34*	*0,22*	*0,17*	*0,14*	*0,18*	*0,28*	*0,31*	*0,22*
+ *#2 T15+ 16:05:12*		*0,46*	*1,07*	*0,49*	*0,45*	*0,40*	*0,56*	*0,42*	*0,47*	*0,52*	*0,28*	*0,43*	*0,42*	*0,63*	*0,35*	*0,27*	*0,22*	*0,28*	*0,33*	*0,50*	*0,38*	*0,37*
+ *#3 T15+ 16:06:20*		*0,69*	*0,42*	*0,80*	*0,48*	*0,54*	*0,47*	*0,53*	*0,63*	*0,30*	*0,42*	*0,48*	*0,50*	*0,35*	*0,40*	*0,20*	*0,19*	*0,12*	*0,19*	*0,29*	*0,35*	*0,26*
+ *#4 T15+ 16:06:20*		*0,70*	*0,43*	*0,43*	*2,11*	*0,30*	*0,47*	*0,46*	*0,36*	*0,48*	*0,38*	*0,48*	*0,41*	*0,51*	*0,46*	*0,36*	*0,23*	*0,27*	*0,38*	*0,43*	*0,35*	*0,38*
- Rating D		30,9	27,3	26,4	27,2	38,8	46,9	49,4	52,6	53,4	55,4	52,1	56,8	57,7	59,4	60,9	60,1	64,2	67,6	70,6	75,2	78,3
- Rating R'		31,9	28,5	27,3	29,7	38,3	47,1	49,3	52,5	53,0	54,2	51,8	56,6	57,5	58,4	58,1	56,2	60,3	65,0	69,4	73,7	76,3

For viewing one single measurement position, a double-click on the required position will present only this single measurement result. It is additionally possible to view the status of each measurement by making a right-click and select the 'Show details for Pos X' command.

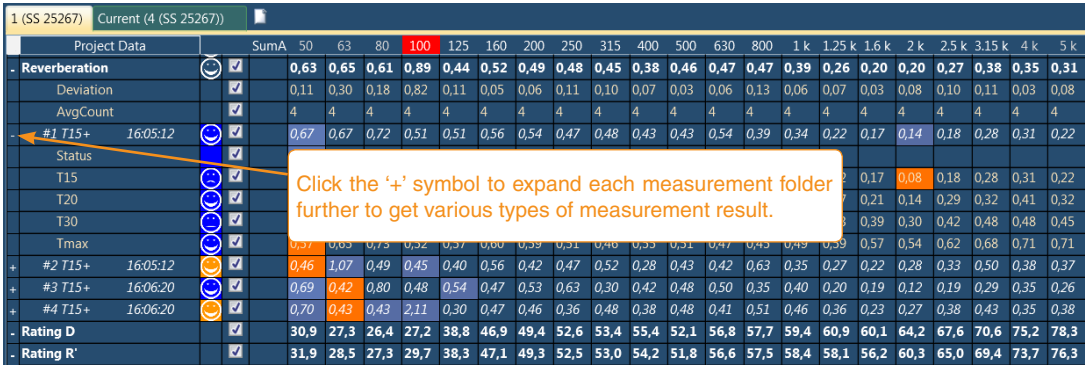
For a best possible evaluation of the average results, a click on the '+' symbol left side of the folder names opens a dialogue box in which the user may activate extra rows showing the details for the folder with the number of averaged positions as well as the calculated standard deviation from this averaging process. Those as we have mentioned before.

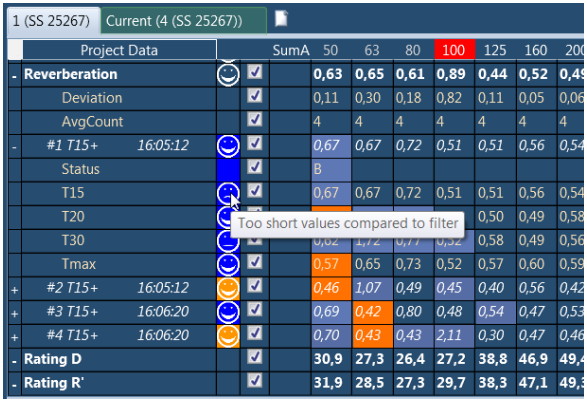


The right-click dialogue boxes additionally give the possibility to delete, copy the measurement positions, add empty folder or import Norsonic binary files to folder.

Depending of the quality of the measurements, the table view additionally contains different colour background in the various cells. Generally, the orange colour represents an error such as too short reverberation time for the actual frequency band, and the blue colours represent various warnings such as high background noise or too high Lmax – Leq differences.

Along the left hand side of the table view, small smiley indicates the overall status for each measurement position. If no warning or errors are detected for any frequency band, the smiley smiles! Depending on possible warnings or errors, the smileys shows a neutral face or a negative face. To get information about the reason behind the non-smiling smileys, simply put the mouse on the top and read the tool-tip which appears.



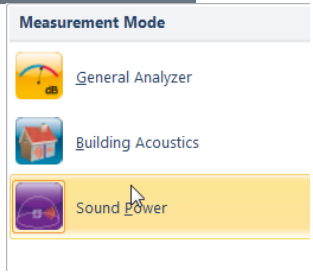


The tool-tip feature is also available on the top of any table cell for detailed information about the status for this particular frequency band at this particular measurement position.

The user may key-in new values manually by double-clicking in the required cell and enter the desired value from the keyboard. This will then be logged as a hand-made value in the status row.

Sound Power Application Mode

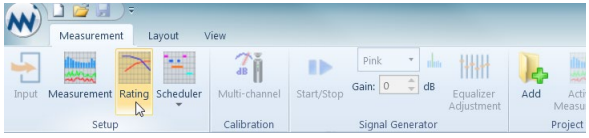
The Sound Power application mode is selected either by clicking the 'Sound Power' button on the opening screen, or by selecting the 'Sound Power' Measurement Mode menu found by clicking on the Norsonic logo in the upper left corner.



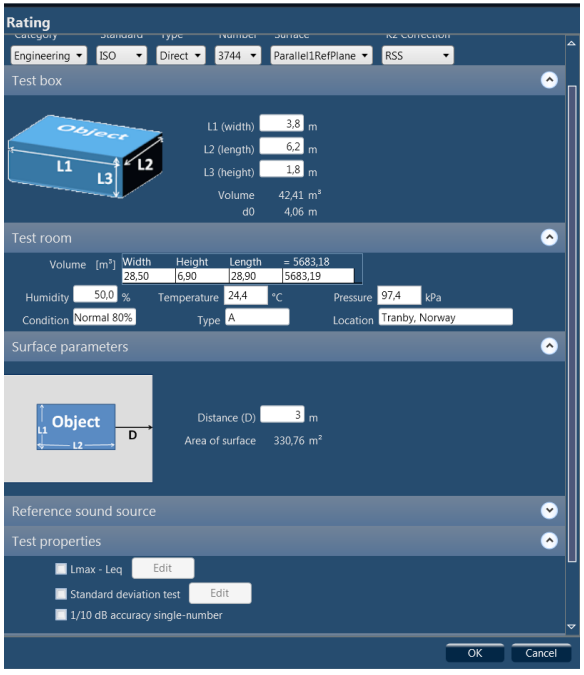
As soon as the application software is loaded, the 'Rating' menu containing the settings for the actual sound power measurement is presented.

Rating menu

By selecting Measurement menu/ Rating, you can get the 'Rating' menu.



This 'Rating' menu contains several sub-sections for setting the different properties of the upcoming sound power measurement, and for pre-entering text descriptions for the final test report document. Some of these are mandatory for the selected Standard which is indicated by a red line around the actual property box until a legal value is entered. The line then turns light blue. The different sub-sections may be closed by clicking the up/down arrow (□/∀) in the right part of the sub-section header.

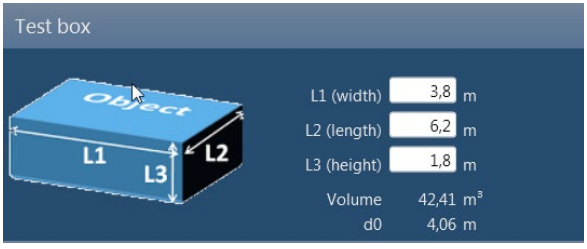


Standards

- 'Category' is used for selection among the pre-defined Standard accuracy grades Precision, Engineering, Survey, Room A+B or Others.
- 'Standard' is used for selecting the different Standardization groups. In Sound Power mode, only ISO Standards are available.
- 'Type' is the selection of Direct or Comparison, which indicated whether the sound power is to be measured directly or with a reference sound source (RSS).
- 'Number' is used for the selection of possible multiple Standard numbers within the set Category and Type.
- 'Surface', when using a Direct type measurement, defines the measurement surface which is used to measure the source, such as Hemisphere or Cylindrical.
- 'K2Correction' is the type of K2 correction factor which will be used for the calculations. RSS, Reverberation or User input K2 are the possible choices.

Test Box

- When using Engineering or Survey grade, the Test Box tab defines the dimensions of the object which is to be measured. Here one simply enters the length, width and height of the object. 'd0' is the characteristic source dimension which is the distance from the origin of the co-ordinate system to the farthest corner of the reference box.

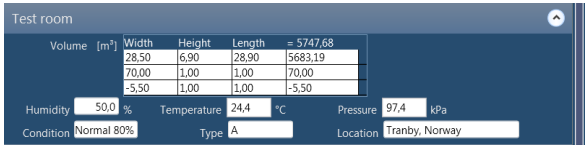


Test Room

- 'Volume' is the actual volume of the measurement room given in m3. This value is calculated based on entered values for width, height and length of the actual room. If the room is non-square, and the final volume is known, the user may simply enter '1' for width and height and the actual volume as length to get the correct volume for the calculations. Alternatively, use the down-arrow on the keyboard to get

additional calculation lines which then will produce the final volume based on several sub-volumes.

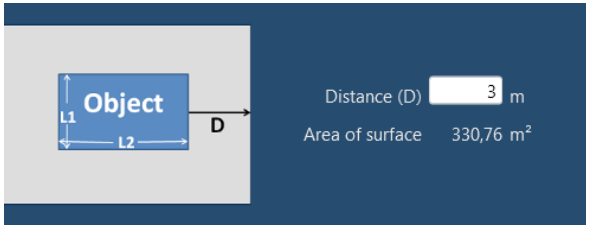
Entering a negative value into one of these lines will make it possible to subtract the volume of construction beams etc. The additional line may be removed again by deleting all values in the line.



- 'Humidity' is the humidity measured in %
- 'Temperature' is the air temperature measured in ˚C
- 'Pressure' is the air pressure measured in kPa
- 'Condition' may be used for describing the condition of the measurement room
- 'Type' may be used for describing the actual type of measurement room
- 'Location' may be used for describing the location of the measurement room

Surface Parameters

- This tab shows the measurement and object surfaces as defined in the 'Standards' tab. A figure shows the shape of the surface and distances which must be entered.
- Depending on the choice of surface, the user must enter either the distance from the measured object to the surface or the radius of a hemispherical surface or the radius and height of a cylindrical surface.
- Note that the value '0' is not accepted for a parallelepiped surface, because this indicates that the microphone is placed directly at the object surface.
- The measurement surface area is automatically calculated.



Reference Sound Source

- When the Comparison type measurement is chosen, or the RSS is used for the K2 correction factor, the user needs to choose one of the reference sound sources from the drop-down list. The nominal A-weighted level, as well as the spectrum correction values is displayed for the chosen RSS.
- New RSS sensors can be added in the Sensor Administration menu.

User input

- If the K2 correction value has been set to User Input, the user needs to enter the K2 correction values manually in this field. Both the A-weighted and 1/3-octave spectrum values have to be entered.

Test properties

- Her can we also perform three test properties, they are ‘Lmax-Leq’, ‘Standard devitation test’ and ‘1/10 dB accuracy single-number’.

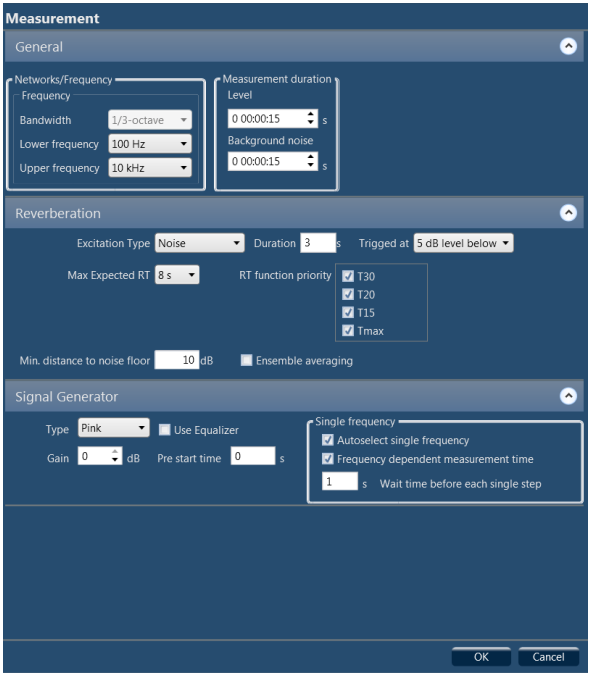
Calculations

- ‘Corrections’ is used for activating corrections to the measured values in the final calculations. By activating the tick-box named ‘Background noise’, the sound power values will be corrected for the measured background noise level when measured. The selected Standard is automatically giving the details for such corrections.

  When all required and desired properties are entered, a click on the ‘OK’ key initiates the Nor850 system for the desired sound power measurements in accordance with the selected Standard.

Measurement menu

As soon as the details in the Rating menu are entered, the Nor850 system is ready for the measurements. However, the user may choose to adjust different parameters for the measurements by opening the ‘Measurement’ menu. Select the Measurement/Measurement in the upper menu bar.



The Measurement menu contains the following features and settings for the measurements of level and reverberation time:

General

- 'Bandwidth' enables the user to switch between 1/3- and 1/1-octave measurements. Please note that for all currently supported sound power measurement Standards in the Nor850 system, only the 1/3-octaves are selectable.
- 'Lower frequency' is used for selecting the lowest frequency band to be measured. In the Sound Power mode, the minimum is 50 Hz for 1/3-octaves.
- 'Upper frequency' is used for selecting the highest frequency band to be measured. In the Sound Power mode, the maximum is 20 kHz for 1/3-octaves.
- 'Duration Level' is used for pre-setting the measurement duration for the level measurements.
- 'Duration Background noise' is used for pre-setting the measurement duration for the background noise in the measurement room.

Reverberation

- 'Excitation Type' is used for selecting the actual method for detecting the correct decay. Noise is used for operation with the external noise generator, and Impulse is used for operation with an external impulsive noise. When several measurement channels are connected simultaneously, the Nor850 system will automatically operate such multi-channel systems with activated signal generators in some channels and non-activated signal generators in others.
- 'Duration' is setting the duration of the active noise excitation before the decays are measured.
- 'Trigged at' is setting the minimum threshold level before the decay measurements are triggered.
- 'Max expected RT' is setting the maximum reverberation time to be measured. In reality, this setting controls the period length of each sample along the decay. The available settings of 4s, 8s, 16s and 32s are corresponding to sample periods of 5ms, 10ms, 20ms and 40ms respectively.
- 'RT function priority' is used for selecting between the reverberation time functions T30, T20, T15 or Tmax. All functions are presenting the result as the time for the theoretical 60dB decay time, but the calculation ranges are individual for each function. These functions start at -5 dB below the excitation level, but ends at -35, -25 and -20 dB respectively, while EDT (Early Decay Time) starts at 0 dB below the excitation level and end -10 dB below.
- 'Min distance to noise floor' is setting the minimum difference between the lower calculation range for the selected RT function and the background noise level. The background noise level for the RT calculation is handled individually for each frequency band, and is set identical to the horizontal part of the decay measurement after the decays have decreased below the RT calculation range.

Signal Generator

- 'Type' is used to select between White noise or Pink noise. All connected measurement channels with activated signal generator will get the same type of signal.
- 'Gain' is used to set the output signal level in the range from 0 to -50 dB, where 0dB corresponds to 1 Vrms. All activated signal generators will get the same output gain setting.
- 'Pre start time' is set the waiting start time before signal excitation.

- In Single frequency, by ticking the 'Autoselect single frequency' option, the Nor850 system will automatically select the single frequency bands where the source level is less than 10dB higher than the background noise level. The user can then choose to measure these bands with 1/3-octave band-limited noise. The single frequency option will explained more thoroughly later in this document. Note that the auto select function will only work if background noise measurements are performed first.

  Generally speaking, it will take longer time for taking measurement in lower frequency band than in higher frequency band, by ticking on 'Frequency dependent measurement time' tick -box, you can set different measurement time corresponding to different frequency band, then you can save much time when you perform several frequency band measurements automatically later. Normally, people will set in some seconds as waiting time between each single measurement step.

When all required and desired properties are entered, a click on the 'OK' key initiates the Nor850 system for the desired sound power measurement setup desired by the operator.

Normal measurement display view

As soon as the user has selected all proper settings in the Rating and Measurement menus, the Nor850 system is ready to perform the Sound Power measurements. The PC screen now shows a display with 3 main sections:

- To the very left, all connected and/or available measurement channels are listed
- The lower mid and right part shows a table view containing all measurement and calculation values
- The upper mid and right part contains different views depending on the actual measurement mode or selected tab. The possible tabs are found in the upper left corner of the mid-section. The various contents of this section are normally as follows:

  'Level' contains the spectrum of the measured surface, RSS or background levels in the mid-section and the corresponding level vs time during the measurement duration for the selected cursor frequency in the corresponding right-sections.

  'Level' contains the measured spectrum as a function of frequency in the mid-section, and the corresponding level vs time decay for the selected cursor frequency in the corresponding right-sections.

  '*Reverberation*' contains the calculated RT spectrum as a function of frequency in the mid-section, and the corresponding level vs time decay for the selected cursor frequency in the corresponding right-sections.

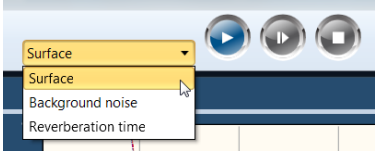
  'Multi-reverberation' contains the calculated RT corresponding level vs time decay in the mid-section for the 1/3 octaves frequency.

  'Sound Power' contains the graphical view of the measured sound power spectrum including the calculated total A-weighted sound power level. Here, the user will get a warning if the K1 and/or K2 factor

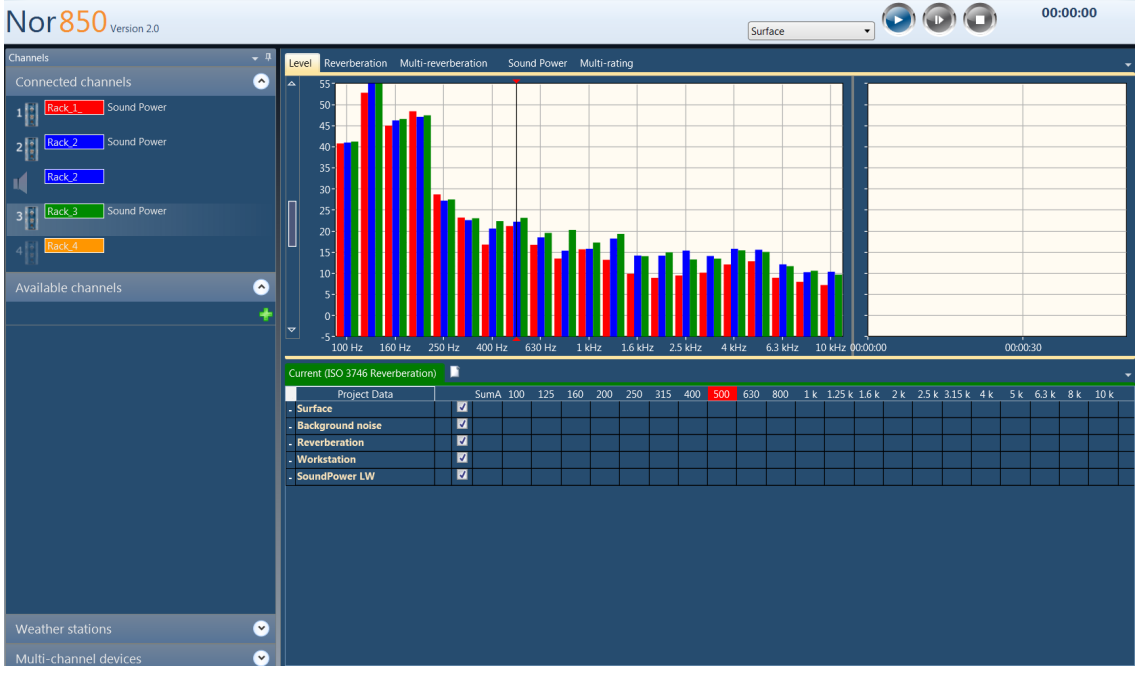
is too high. In this tab it is also possible to enable/disable the background noise correction by toggling the 'Background noise' checkbox. Thus the user can see how much the background noise is influencing the measurements. The C1 and C2 correction factors are also displayed.

'Multi-rating' contains the comparison results from two or more sound power tests in the upper left part of the mid-section for the 1/3 octaves frequency.

- On the very top section, the operator finds the measurement mode selector, the Start/Stop, Pause/Continue push buttons as well as the measurement duration indicator. The measurement mode selector is used to select which kind of measurement to perform when hitting the Start button. Normally the selection is Surface, Background noise, Reference Sound Source or Reverberation time, but these will alter with the preselected Standard.

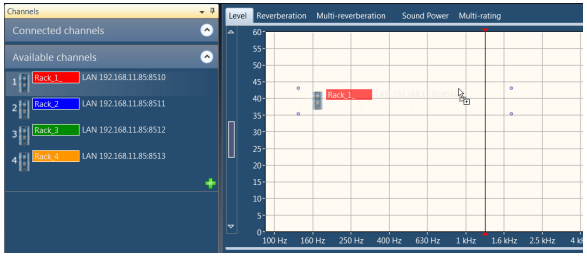


Normal measurement display view

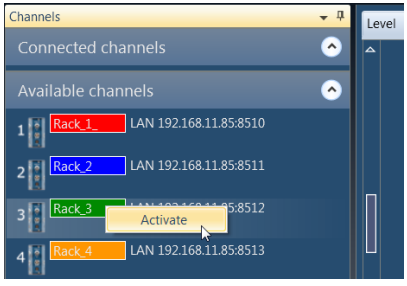


Activating the available measurement channels

In order for the Nor850 measurement system to operate correctly, the channels in use must be placed in the measurement room. This is done by click&drag on any of the available channels onto the test room area in the upper mid-section of the display. As soon as the connection is well established, this channel will be found under the 'Connected channels' in the upper left part of the display. For a multiple channel system, the user may put as many channels as desired into the room.

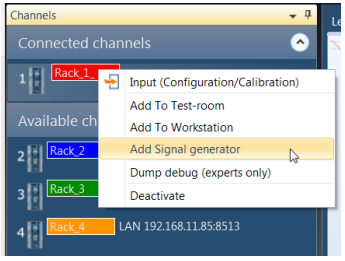


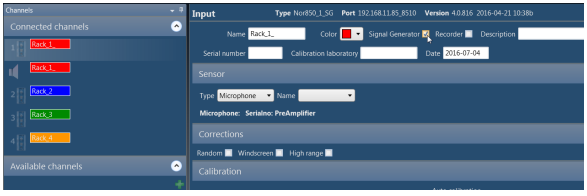
Alternatively, the user may first activate any available channel into the 'Connected channels' area, and then place the activated channel into the measurement room by click&drag. The activation of the channels is either done by click&drag, or, by right-click and selecting the Activate command in the dialogue box.



Activating the signal generator of a measurement channel

To activate the signal generator of any of the measurement channels, the desired channel must first be activated in the Nor850 system. The users must then right-click on this connected channel and select the 'Add signal generator' in the display dialogue menu, or select the 'View Configuration' and tick-on the Signal Generator in the Configuration menu. Alternatively, the channel Configuration menu can be opened by double-clicking the channel. The 'Connected channels' list will contain extra rows for each of the activated signal generators.

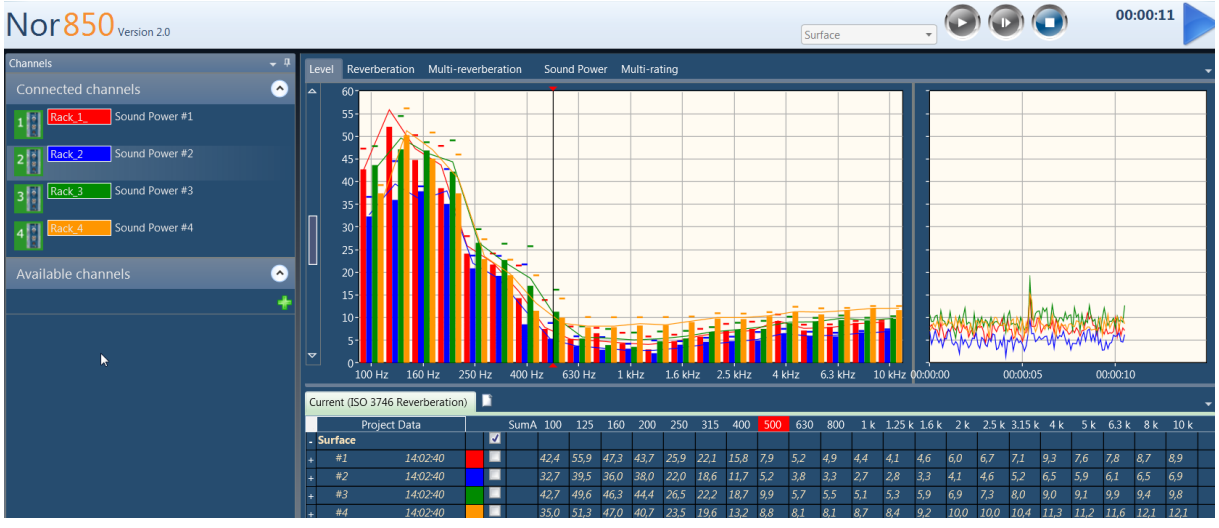




Making the surface level measurements

To measure the measurement surface levels, set the measurement mode selector to surface, and push the Start key in the upper right corner. The display will then show the frequency spectrum of the measured SPL in the upper mid-section and the level vs time of the selected cursor frequency in the upper right-section. In the frequency spectrum, the SPL values are shown as filled bar graphs, the Leq values as a line, and the Lmax values as a step-line.

When the pre-set measurement duration is ended, or the Stop key is pushed, the upper right-section will change to present the last measured spectrum (thick lines) together with the possible previously measured microphone positions. In addition, a thick black line will indicate the average level of the previously measured positions. To the left of the measurement mode selector, the display now presents 'Accept' and 'Cancel' keys for the acceptance or cancellation of the last performed measurement.



In the tabular section, the measured values are presented in a yellow colour. Upon accepting the measurement, these values are turned into white and put into the calculation of the average level. Cancellation of the measurement will remove all the last measured values from the memory.

Additional surface measurement positions may now be measured by a new click on the Start key.

Current (ISO 3746 Reverberation)

Project Data			SumA	100	125	160	200	250	315	400	500	630	800	1 k	1.25 k	1.6 k	2 k	2.5 k	3.15 k	4 k	5 k	6.3 k	8 k	10 k
- **Surface**			**38,4**	**41,1**	**51,4**	**45,5**	**43,1**	**23,5**	**17,0**	**13,5**	**12,1**	**11,3**	**8,4**	**7,5**	**6,6**	**7,3**	**7,6**	**7,8**	**8,2**	**8,7**	**8,8**	**9,5**	**9,4**	**9,4**
+ *#1*	*14:59:25*		*41,3*	*43,6*	*55,6*	*46,8*	*44,1*	*24,3*	*17,3*	*13,8*	*12,6*	*11,1*	*9,0*	*8,1*	*5,9*	*6,7*	*6,5*	*7,3*	*7,5*	*7,8*	*7,6*	*7,8*	*8,2*	*8,1*
+ *#2*	*14:59:25*		*30,0*	*33,5*	*39,0*	*34,9*	*38,3*	*20,8*	*14,2*	*9,8*	*10,4*	*8,0*	*6,4*	*6,1*	*4,5*	*5,2*	*4,6*	*5,0*	*5,4*	*5,9*	*5,9*	*6,1*	*6,4*	*6,5*
+ *#3*	*14:59:25*		*38,3*	*43,5*	*49,3*	*45,8*	*44,9*	*25,8*	*19,3*	*15,8*	*15,2*	*10,7*	*10,3*	*7,5*	*6,7*	*7,6*	*7,5*	*7,8*	*8,3*	*8,5*	*8,8*	*10,5*	*9,2*	*9,4*
+ *#4*	*14:59:25*		*38,2*	*36,1*	*50,9*	*47,0*	*41,4*	*21,6*	*15,2*	*12,0*	*11,1*	*10,9*	*9,2*	*9,7*	*8,8*	*9,7*	*10,1*	*10,2*	*10,5*	*11,1*	*11,2*	*11,6*	*12,0*	*11,9*
+ *#5*	*14:59:46*		*41,2*	*43,6*	*55,2*	*46,9*	*44,6*	*23,8*	*17,3*	*13,4*	*11,3*	*13,2*	*7,6*	*6,9*	*5,5*	*5,9*	*6,4*	*6,9*	*7,1*	*7,6*	*7,5*	*7,7*	*8,1*	*8,1*
+ *#6*	*14:59:46*		*30,1*	*33,0*	*38,6*	*35,0*	*38,6*	*20,4*	*14,2*	*9,9*	*8,1*	*12,3*	*5,8*	*4,3*	*3,7*	*4,2*	*4,4*	*4,7*	*5,1*	*5,7*	*5,8*	*6,1*	*6,3*	*6,4*
+ *#7*	*14:59:46*		*38,5*	*43,5*	*49,0*	*45,9*	*45,4*	*25,8*	*19,6*	*16,8*	*13,7*	*11,2*	*8,4*	*6,4*	*6,3*	*6,6*	*7,3*	*7,4*	*7,9*	*8,4*	*8,8*	*10,4*	*9,2*	*9,4*
+ *#8*	*14:59:46*		*38,4*	*35,9*	*50,6*	*47,5*	*42,0*	*21,7*	*15,0*	*11,5*	*10,6*	*11,5*	*8,9*	*9,0*	*8,7*	*9,4*	*10,1*	*10,1*	*10,3*	*11,1*	*11,2*	*11,5*	*11,9*	*11,9*
+ *#9*	*15:20:09*			*43,8*	*55,3*	*47,0*	*43,6*	*28,3*	*25,7*	*26,4*	*25,8*	*20,8*	*20,5*	*20,3*	*19,0*	*15,6*	*13,5*	*19,3*	*22,8*	*15,4*	*11,8*	*8,6*	*8,4*	*8,2*
+ *#10*	*15:20:09*			*33,3*	*38,9*	*35,1*	*37,8*	*24,4*	*24,3*	*22,1*	*20,3*	*18,8*	*16,4*	*16,0*	*14,9*	*12,1*	*10,1*	*14,8*	*18,9*	*11,7*	*8,5*	*6,6*	*6,6*	*6,5*
+ *#11*	*15:20:09*			*43,9*	*49,0*	*45,9*	*44,4*	*29,4*	*28,8*	*30,3*	*26,3*	*21,9*	*20,2*	*17,5*	*18,1*	*15,6*	*12,7*	*17,8*	*20,3*	*14,4*	*11,1*	*10,7*	*9,3*	*9,4*
+ *#12*	*15:20:09*			*36,4*	*50,5*	*47,2*	*41,0*	*27,0*	*25,6*	*23,2*	*22,3*	*20,6*	*18,6*	*17,8*	*18,2*	*14,9*	*13,7*	*18,9*	*21,8*	*15,6*	*13,5*	*12,1*	*12,1*	*12,0*

Making the Background noise and RSS level measurements

The background noise and RSS level measurements works exactly the same way as the surface level measurements. Set the measurement mode selector to Background noise or Reference Sound Source, and push the Start key in the upper right corner. The display will then show the frequency spectrum of the measured levels in the same way as for the surface measurements. In the right-section, the measured background noise will be presented together with the average surface/RSS level measurement in order to evaluate the difference between the measured surface/RSS levels and the background noise levels.

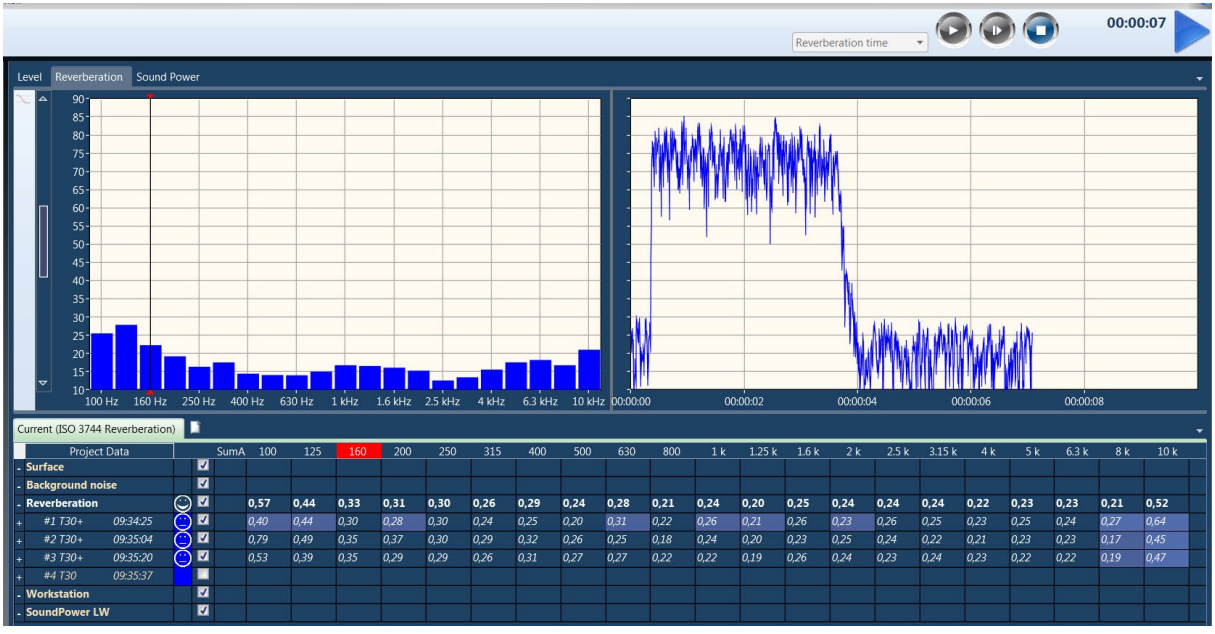
The background noise/RSS measurements must be accepted or cancelled in the same way as the surface measurements. Additional measurement positions may now be measured by a new click on the Start key.

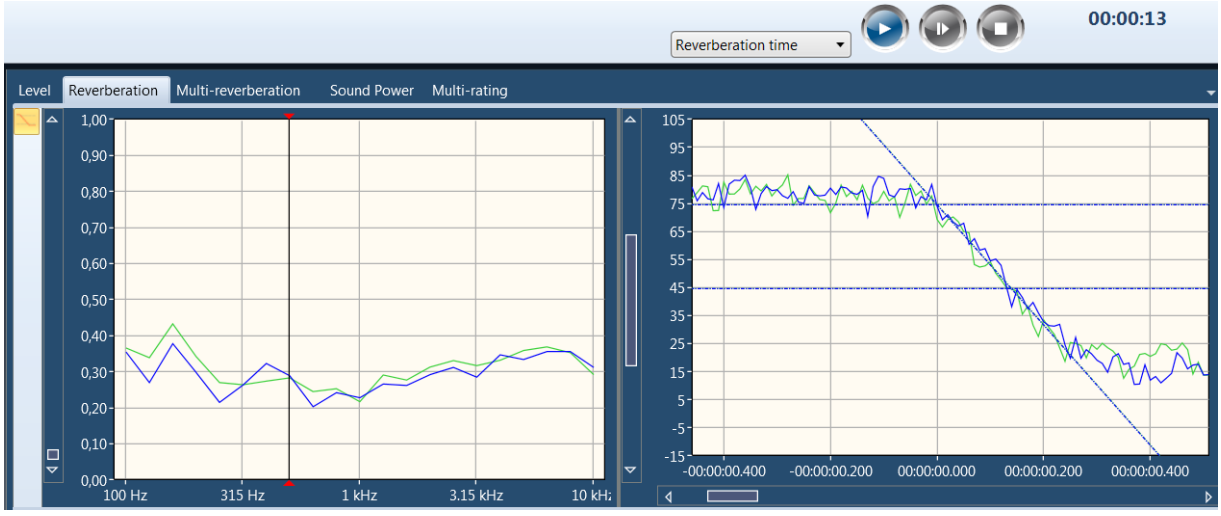
Making the Reverberation time measurements

Set the measurement mode selector to Reverberation time, and press the Start key. The Nor850 system will now automatically use the noise generator connected to the measurement room.

During the measurement, the upper mid-section will show the SPL frequency spectrum, while the upper right-section will show the level vs time of the noise level.

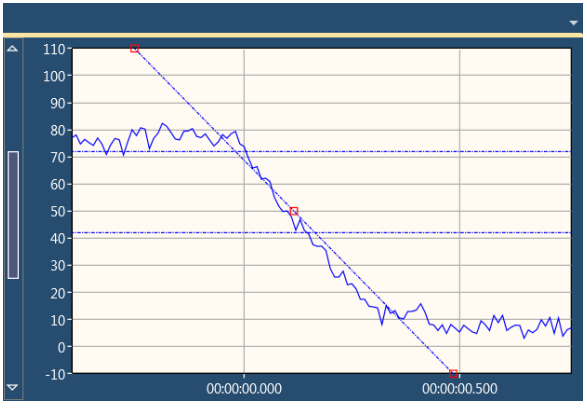
As soon as the reverberation time measurements is ended, the display will turn to show the calculated reverberation times as a function of frequency in the mid-section and the decay with the calculated decay-line and indicator lines for the T30/ T20/ T15/Tmax decay calculation ranges for the in the right-section. The user should now accept or cancel the last measurement in the same manner as for the previous measurements.





It is possible to manually change the resulting RT curve if the curve fitting does not work properly. This can be done only by clicking the curve, and you can see there are three square symbols ‘ν appeared on the curve, you can drag the lower or upper red square to change the slope of the curve or you can drag the middle red square to move the curve parallely. The RT value in the table below will change accordingly.

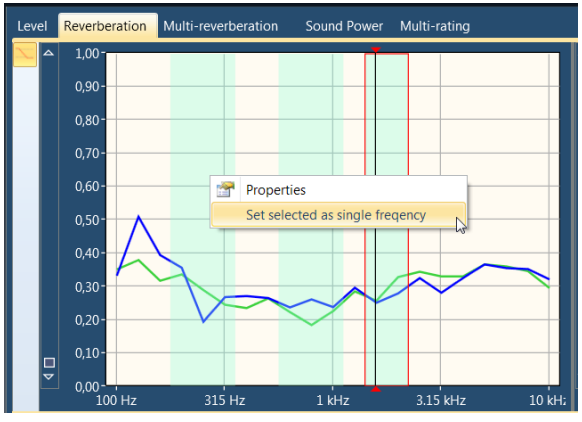
To change the slope of the curve, click&drag the lower or upper red square. The RT value in the table below will change accordingly.



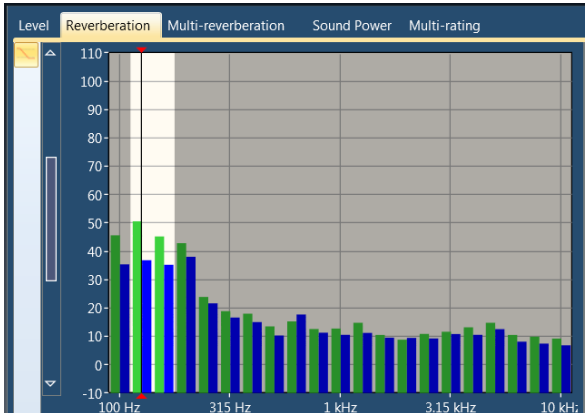
Single frequency measurements

For the reverberation time measurements, the signal-to-noise ratio might be to low even if the loudspeaker is operating at full power. The Nor850 system can in such cases measure with 1/1- or 1/3-octave band limited noise instead of pink or white noise. Thus the frequency bands with low signal-to-noise ratio can be measured sequentially. This results in approximately 15dB of increased signal level in the selected frequency bands.

To do single frequency measurements, first make a normal reverberation time measurement. Before accepting the measurement, hold down the Ctrl key and click the desired frequency bands to be measured in the spectrum window. Alternatively, click&drag to select multiple frequencies (and hold down the Ctrl key to select multiple groups of frequencies):



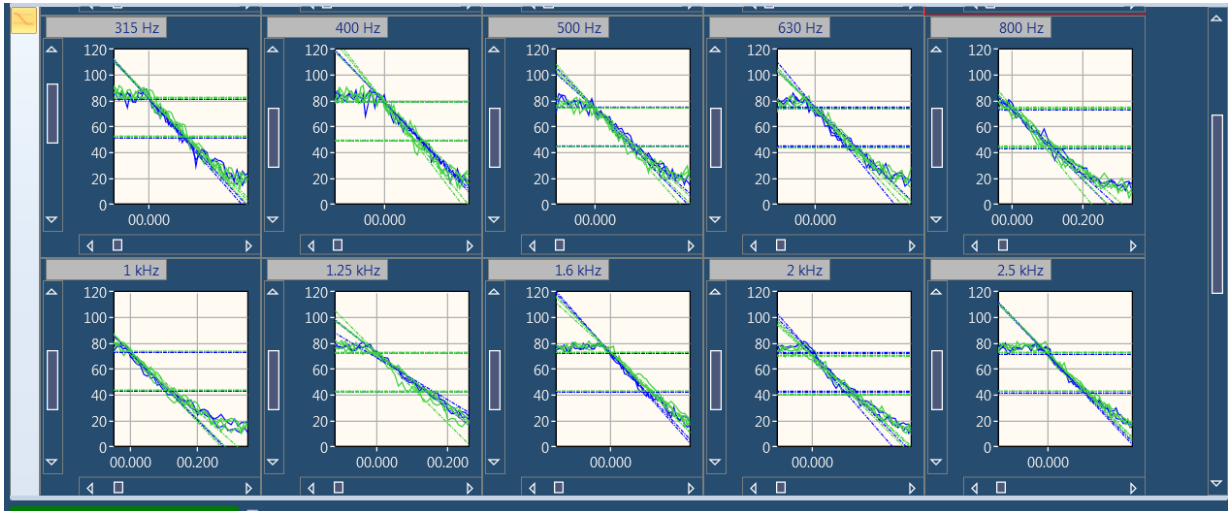
Then, right-click in the spectrum window and select 'Set selected as single frequency', and click the Accept button to do the measurements. The Nor850 system will now measure the selected frequency bands automatically, according to the standard. The SPL will be shown for all frequencies while measuring.



The single frequency selection will now be stored and automatically performed for the following measurements, since the same measurement settings will probably be needed for all other measurement positions.

Evaluating the results in the Multi-reverberation display

As soon as the reverberation time measurements is ended, the display will turn to show the decay with the calculated decay-line and indicator lines in each 1/3-octave frequency band for the T_{15}/ T_{20}/ T_{30}/T_{max} decay calculation ranges in the right-section. The user should now accept or cancel the last measurement in the same manner as for the previous measurements.



Current (ISO 3746 Reverberation)

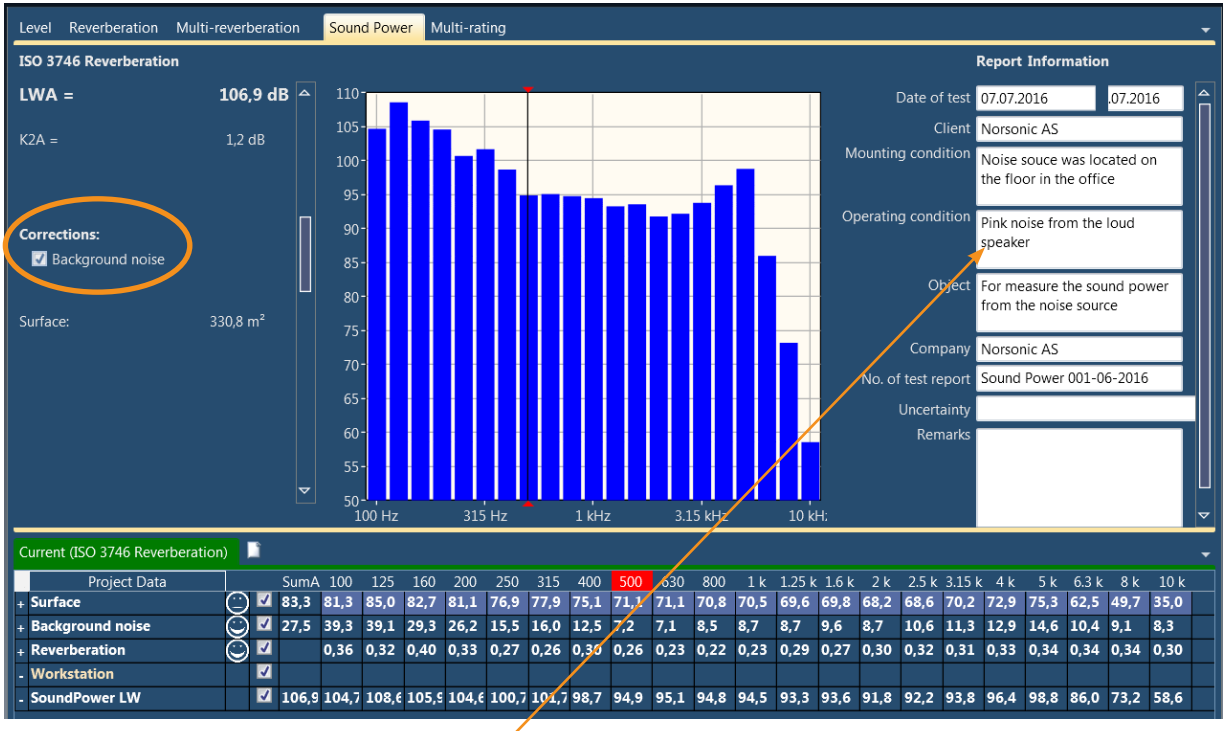
Project Data		SumA	100	125	160	200	250	315	400	500	630	800	1 k	1.25 k	1.6 k	2 k	2.5 k	3.15 k	4 k	5 k	6.3 k	8 k	10 k
+ Surface		28,4	39,3	39,7	31,0	27,3	17,9	18,5	14,7	13,2	10,0	10,3	10,7	12,0	12,3	10,2	12,2	12,5	13,2	14,7	10,5	9,1	8,3
+ Background noise		27,5	39,3	39,1	29,3	26,2	15,5	16,0	12,5	7,2	7,1	8,5	8,7	8,7	9,6	8,7	10,6	11,3	12,9	14,6	10,4	9,1	8,3
- Reverberation			0,35	0,31	0,39	0,33	0,26	0,26	0,30	0,26	0,23	0,22	0,23	0,29	0,28	0,29	0,32	0,31	0,34	0,35	0,35	0,34	0,30
+ *#1 T30+ 16:17:07*			*0,31*	*0,36*	*0,42*	*0,36*	*0,27*	*0,28*	*0,33*	*0,26*	*0,24*	*0,22*	*0,23*	*0,22*	*0,28*	*0,29*	*0,33*	*0,33*	*0,36*	*0,36*	*0,36*	*0,35*	*0,31*
+ *#2 T30+ 16:19:29*			*0,37*	*0,34*	*0,43*	*0,34*	*0,27*	*0,26*	*0,27*	*0,28*	*0,25*	*0,25*	*0,22*	*0,29*	*0,28*	*0,31*	*0,33*	*0,32*	*0,33*	*0,36*	*0,37*	*0,35*	*0,29*
+ *#3 T30+ 16:19:29*			*0,36*	*0,27*	*0,38*	*0,32*	*0,22*	*0,26*	*0,32*	*0,29*	*0,20*	*0,24*	*0,23*	*0,37*	*0,26*	*0,29*	*0,31*	*0,29*	*0,35*	*0,33*	*0,36*	*0,36*	*0,31*
+ *#4 T30+ 09:44:11*			*0,35*	*0,33*	*0,41*	*0,33*	*0,31*	*0,27*	*0,25*	*0,23*	*0,22*	*0,18*	*0,26*	*0,28*	*0,31*	*0,32*	*0,32*	*0,33*	*0,34*	*0,35*	*0,34*	*0,33*	*0,27*
+ *#5 T30+ 09:44:11*			*0,34*	*0,26*	*0,33*	*0,31*	*0,25*	*0,25*	*0,31*	*0,25*	*0,25*	*0,22*	*0,23*	*0,28*	*0,25*	*0,25*	*0,32*	*0,30*	*0,34*	*0,34*	*0,34*	*0,32*	*0,32*
- Workstation																							
- SoundPower LW		49,0	59,7	60,3	51,3	47,8	38,7	39,3	35,3	35,7	31,0	31,3	31,7	33,0	33,0	30,9	32,8	33,1	33,7	35,1	30,9	29,6	28,9

Evaluating the final results in the SoundPower display

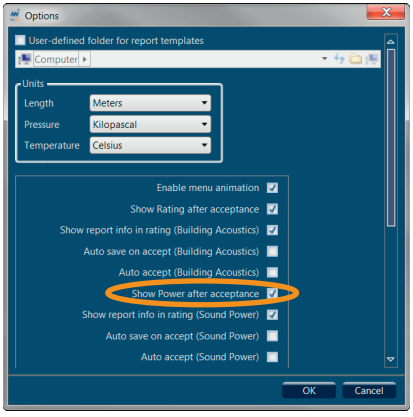
To evaluate the finally calculated rating, select the rating display by clicking the 'SoundPower' tab in the upper left part of the mid-section.

Report Information:

The eight text field areas named 'Client', 'Date of test', Mounting condition', 'Operation condition', 'Object', 'Company', 'No. of test report' and 'Date of signature' are all for free text entry by the user. These texts will then automatically appear in the final Excel Report.



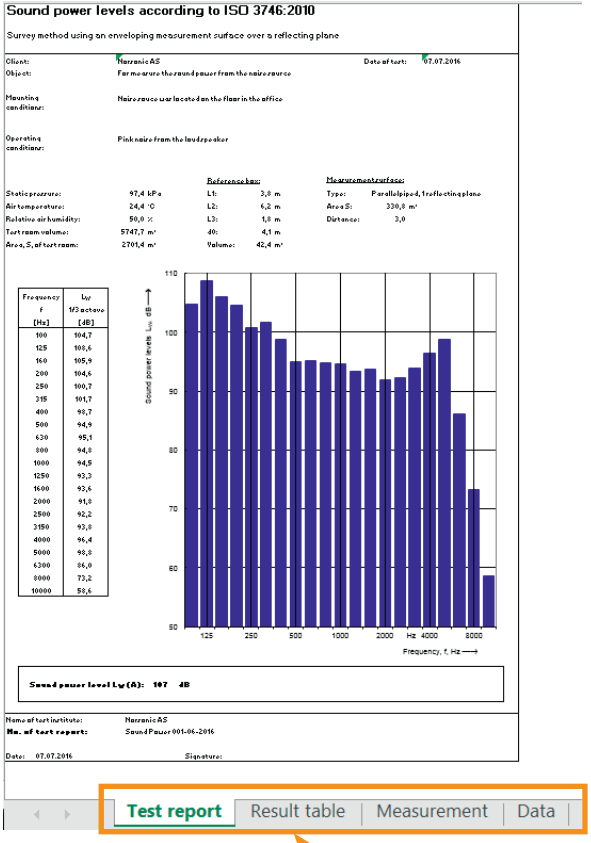
Alternatively, turn on the automatic sound power view selector to allow the system to switch automatically to the rating view each time new measurements are accepted. The ‘Show Power after acceptance’ switch is found in the ‘Nor850 Options’ menu available after clicking the Norsonic logo in the upper left corner.



The SoundPower display contains the measured resulting Sound Power spectrum after correction for the reverberation time, background noise, etc. The final A-weighted level is shown in the left part of the upper section

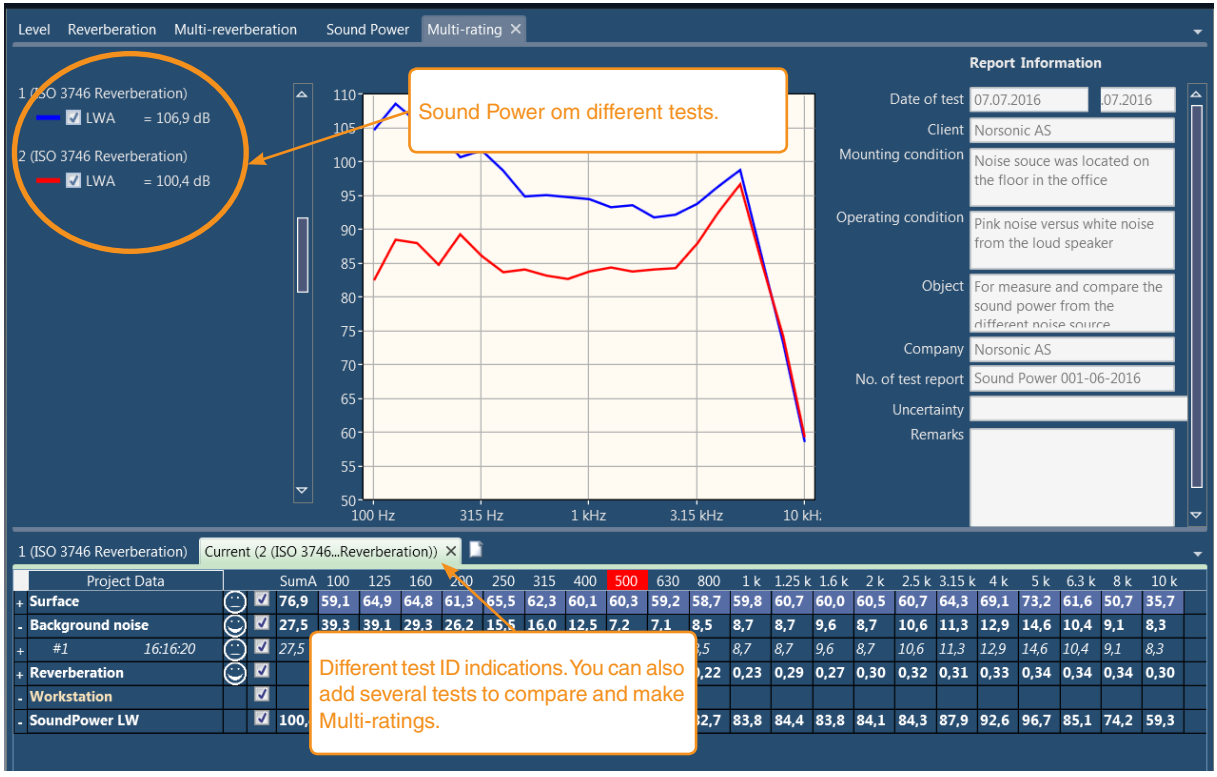
The calculated sound power may be viewed with or without background noise correction. Simply activate the function by a click in the ‘Background noise’ tick-box in the left part of the upper-section.

After storing the measurement, the user may produce the final excel report of the sound power measurement, select the Measurement/Excel Reports feature in the menu bar.



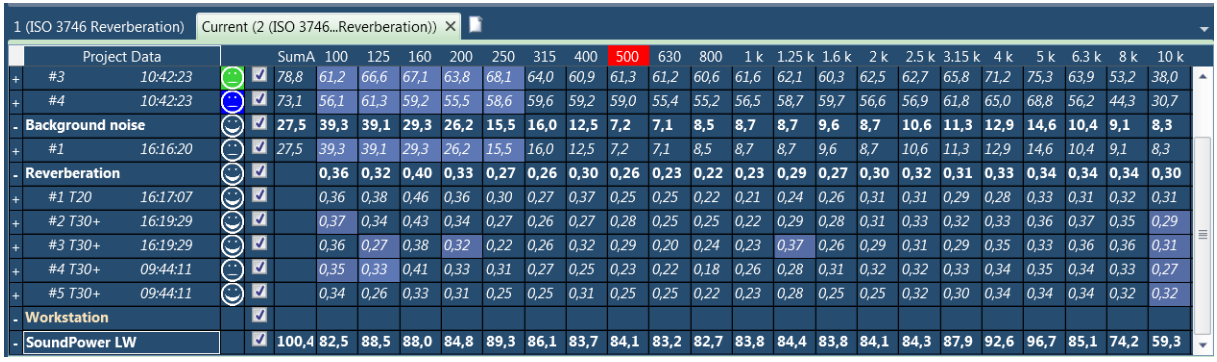
Comparing the different sound power tests in the Multi-rating display

For some clients, they want to compare the results from two or more acoustic tests, this can also be performed by clicking the 'Multi-rating' tab in the upper left part of the mid-section.



Detailed analysis of the tabular result display

To evaluate the details of the measured data, the tabular view in the lower part of the screen is giving the user many possibilities. The table is organized in accordance with the selected Standard in a kind of folder system where the Surface, ReferenceSoundSource, BackgroundNoise and ReverberationTime measurements represent the folders. In addition, the calculated sound power levels are found in the row below the main folders

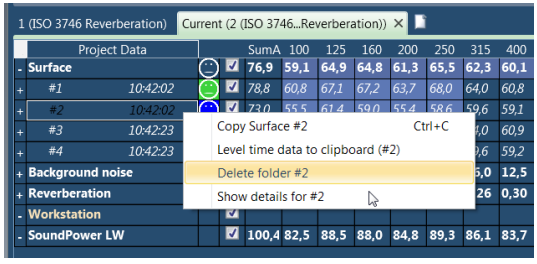


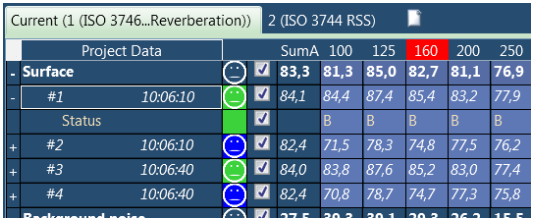
1 (ISO 3746 Reverberation) | Current (2 (ISO 3746...Reverberation))

	Project Data		SumA	100	125	160	200	250	315	400	500	630	800	1 k	1.25 k	1.6 k	2 k	2.5 k	3.15 k	4 k	5 k	6.3 k	8 k	10 k
+	*#3 10:42:23*		*78,8*	*61,2*	*66,6*	*67,1*	*63,8*	*68,1*	*64,0*	*60,9*	*61,3*	*61,2*	*60,6*	*61,6*	*62,1*	*60,3*	*62,5*	*62,7*	*65,8*	*71,2*	*75,3*	*63,9*	*53,2*	*38,0*
+	*#4 10:42:23*		*73,1*	*56,1*	*61,3*	*59,2*	*55,5*	*58,6*	*59,6*	*59,2*	*59,0*	*55,4*	*55,2*	*56,5*	*58,7*	*59,7*	*56,6*	*56,9*	*61,8*	*65,0*	*68,8*	*56,2*	*44,3*	*30,7*
-	**Background noise**		**27,5**	**39,3**	**39,1**	**29,3**	**26,2**	**15,5**	**16,0**	**12,5**	**7,2**	**7,1**	**8,5**	**8,7**	**8,7**	**9,6**	**8,7**	**10,6**	**11,3**	**12,9**	**14,6**	**10,4**	**9,1**	**8,3**
+	*#1 16:16:20*		*27,5*	*39,3*	*39,1*	*29,3*	*26,2*	*15,5*	*16,0*	*12,5*	*7,2*	*7,1*	*8,5*	*8,7*	*8,7*	*9,6*	*8,7*	*10,6*	*11,3*	*12,9*	*14,6*	*10,4*	*9,1*	*8,3*
-	**Reverberation**			**0,36**	**0,32**	**0,40**	**0,33**	**0,27**	**0,26**	**0,30**	**0,26**	**0,23**	**0,22**	**0,23**	**0,29**	**0,27**	**0,30**	**0,32**	**0,31**	**0,33**	**0,34**	**0,34**	**0,34**	**0,30**
+	*#1 T20 16:17:07*			*0,36*	*0,38*	*0,46*	*0,36*	*0,30*	*0,27*	*0,37*	*0,25*	*0,25*	*0,22*	*0,21*	*0,24*	*0,26*	*0,31*	*0,31*	*0,29*	*0,28*	*0,33*	*0,31*	*0,32*	*0,31*
+	*#2 T30+ 16:19:29*			*0,37*	*0,34*	*0,43*	*0,34*	*0,27*	*0,26*	*0,27*	*0,28*	*0,25*	*0,25*	*0,22*	*0,29*	*0,28*	*0,31*	*0,33*	*0,32*	*0,33*	*0,36*	*0,37*	*0,35*	*0,29*
+	*#3 T30+ 16:19:29*			*0,36*	*0,27*	*0,38*	*0,32*	*0,22*	*0,26*	*0,32*	*0,29*	*0,20*	*0,24*	*0,23*	*0,37*	*0,26*	*0,29*	*0,31*	*0,29*	*0,35*	*0,33*	*0,36*	*0,36*	*0,31*
+	*#4 T30+ 09:44:11*			*0,35*	*0,33*	*0,41*	*0,33*	*0,31*	*0,27*	*0,25*	*0,23*	*0,22*	*0,18*	*0,26*	*0,28*	*0,31*	*0,32*	*0,32*	*0,33*	*0,34*	*0,35*	*0,34*	*0,33*	*0,27*
+	*#5 T30+ 09:44:11*			*0,34*	*0,26*	*0,33*	*0,31*	*0,25*	*0,25*	*0,31*	*0,25*	*0,25*	*0,22*	*0,23*	*0,28*	*0,25*	*0,25*	*0,32*	*0,30*	*0,34*	*0,34*	*0,34*	*0,32*	*0,32*
-	**Workstation**																							
-	**SoundPower LW**		**100,4**	**82,5**	**88,5**	**88,0**	**84,8**	**89,3**	**86,1**	**83,7**	**84,1**	**83,2**	**82,7**	**83,8**	**84,4**	**83,8**	**84,1**	**84,3**	**87,9**	**92,6**	**96,7**	**85,1**	**74,2**	**59,3**

Double-clicking on any of the folders will change the content of the upper part display. Generally, a double-click on the Surface folder will change the upper part to show all the measurement made in surface mode. Double clicking the RSS folder (when using a standard with an RSS) will show the surface and RSS measurements together. Double clicking the Background Noise folder will show the surface, RSS and background noise measurements. Please note that the thick black line represents the average result from all the individual measurement positions. Finally, double-clicking the Reverberation folder (when using a standard with reverberation time) will initiate the view of the reverberation time as a function of frequency plus the decay of all the measurements at the frequency cursor position.

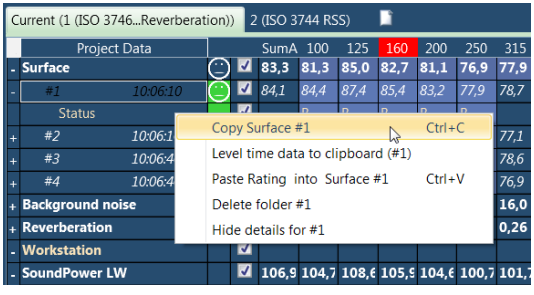
For viewing one single measurement position, a double-click on the required position will present only this single measurement result. It is additionally possible to view the status of each measurement by making a right-click and select the ‘Show details for Pos X’ command.





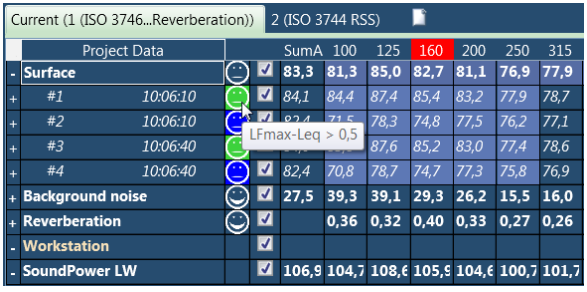
For a best possible evaluation of the average results, a right-click on the folder names opens a dialogue box in which the user may activate extra rows showing the details for the folder with the number of averaged positions as well as the calculated standard deviation from this averaging process.

The right-click dialogue boxes additionally give the possibility to delete or copy the measurement positions.



Depending of the quality of the measurements, the table view additionally contains different colour background in the various cells. Generally, the orange colour represents an error such as too short reverberation time for the actual frequency band, and the blue colours represent various warnings.

Along the left hand side of the table view, small smiley indicates the overall status for each measurement position. If no warning or errors are detected for any frequency band, the smiley smiles! Depending on possible warnings or errors, the smileys shows a neutral face or a negative face. To get information about the reason behind the non-smiling smileys, simply put the mouse on the top and read the tool-tip which appears.



The tool-tip feature is also available on the top of any table cell for detailed information about the status for this particular frequency band at this particular measurement position.

The user may key-in new values manually by double-clicking in the required cell and enter the desired value from the keyboard. This will then be logged as a hand-made value in the status row.

Sound power measurement for earth-moving machinery

For the version 2.2 of Nor850, it also has the new feature for measuring the sound power emitted to the environment by earth-moving machinery in terms of the A-weighted sound power level while those machineries are working under dynamic.

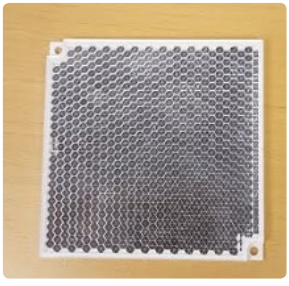
The related international standard is applicable to earth-moving machinery as defined in ISO 6165 and annex A of ISO 6395 with an engine net power of 500kW (at rated speed as defined in ISO 9249).

Measurement hardware setup:

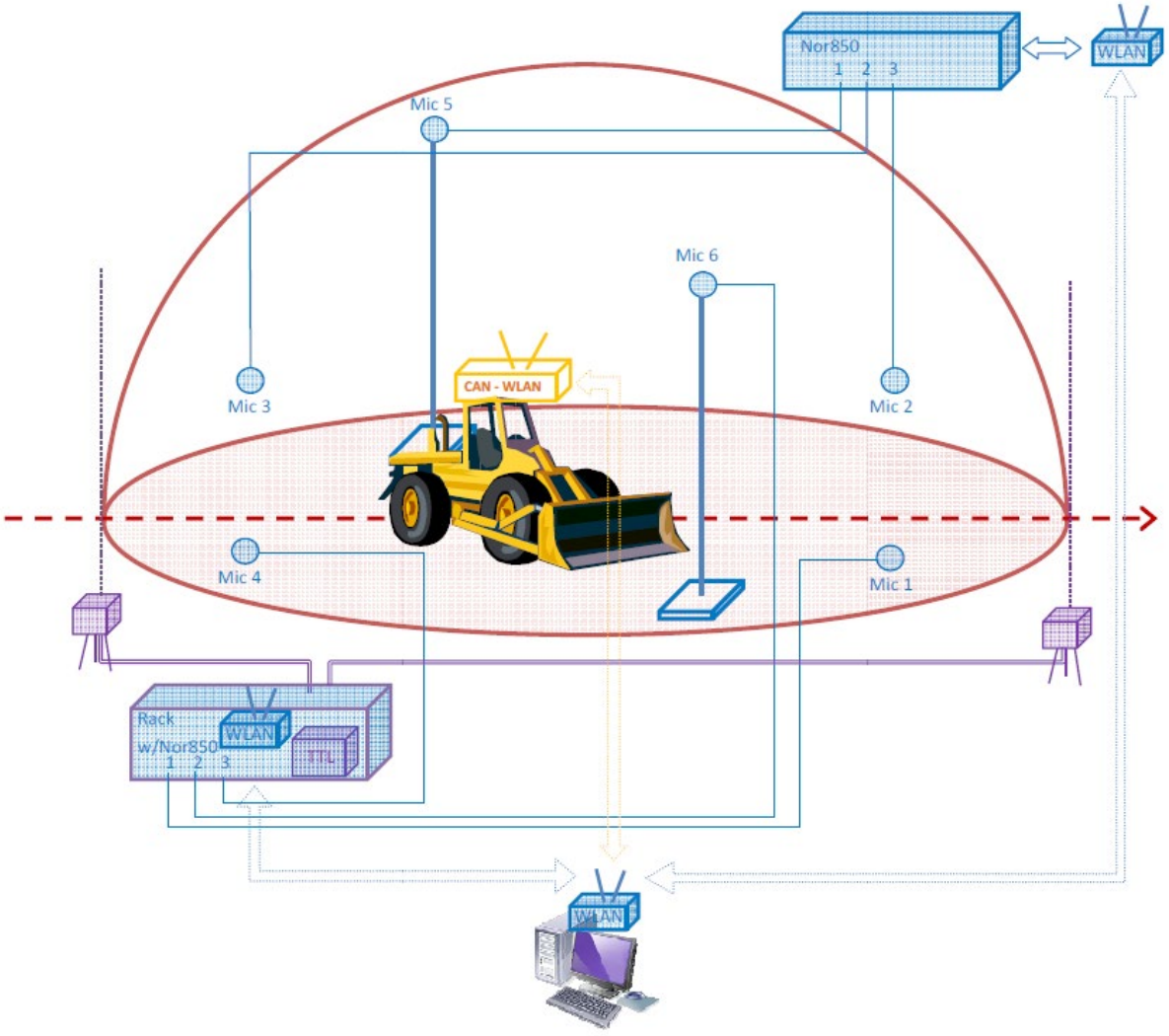
In order to measure the sound power from earth-moving machinery. User should set up the measurement hardware attached to Nor850-MF1 on the measurement site. They should set up two Light Barriers on two tripods in the open test area on site and connect two trigger cables between Light Barrier and Nor850-MF1. In addition, user should fast two Laser Reflective Plate on the earth-moving machinery on each side. In order to receive reflective signal from the Laser Reflective Plate reliably, the installation height of the Laser Reflective Plate on the machinery should be on the same height as the Light Barrier.

The two trigger cables should be plugged into the socket of the Nor850-1/TRIG of the Nor850-MF1.

Laser Reflective Plate

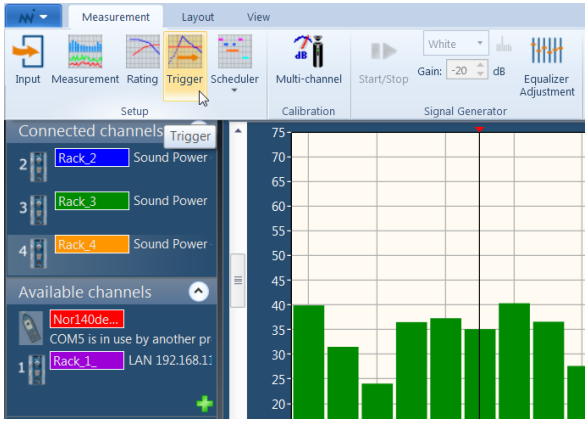


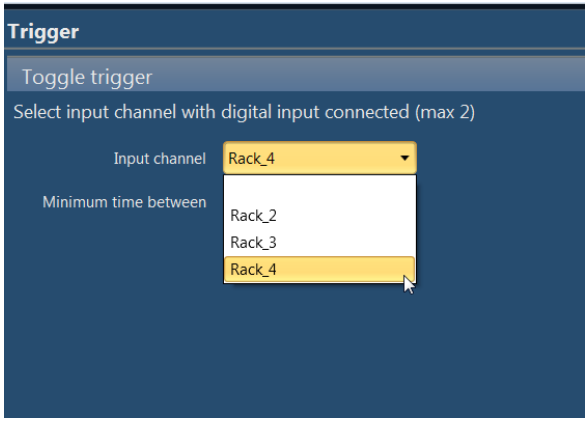
According to the ISO Standard, Earth-moving machinery -Determination of sound power level noise emissions -Dynamic test conditions, six measuring positions shall be used during measurement. The microphone positions along with the measurement hardware setup is illustrated in the following figure. If the user has adopted six microphones simultaneously on site, then the machinery driver only need to drive one time from A to B direction during one measurement sequence, which can save much time. Otherwise, let us say, the user has only arranged three microphones on the measurement site, then the machinery driver will have to drive the machinery reverse back from B to A again to finish the whole measurement work in a complete sequence Measurement software setup:

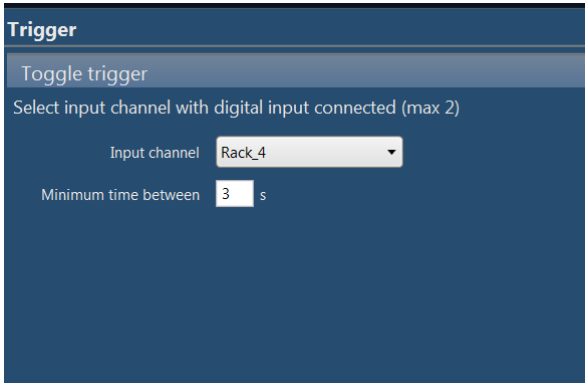

Nor850
1 2 3
WLAN
Mic 5
Mic 6
Mic 3
Mic 2
CAN - WLAN
Mic 4
Mic 1
Rack
w/Nor850
1 2 3
WLAN
WLAN

Trigger Setup

For Nor850-MF1, the trigger is always set in the last input channel, for example, we have now set 4 input channels in the Rack, and we have activated the channel Rack-2, Rack-3, Rack-4. So the trigger channel should be set on the Rack-4. From the menu bar, we select Measurement/ Trigger and then choose the Input channel and set the parameter for Minimum time between.

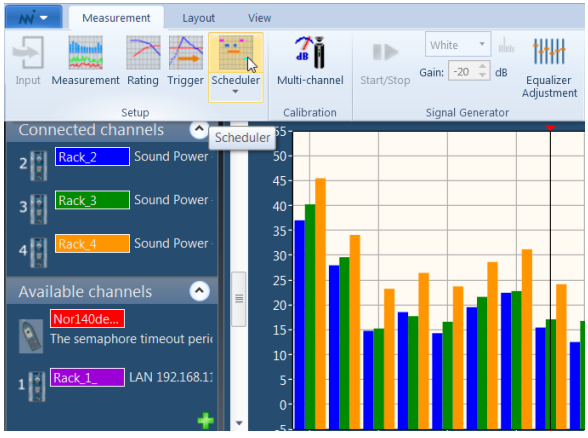


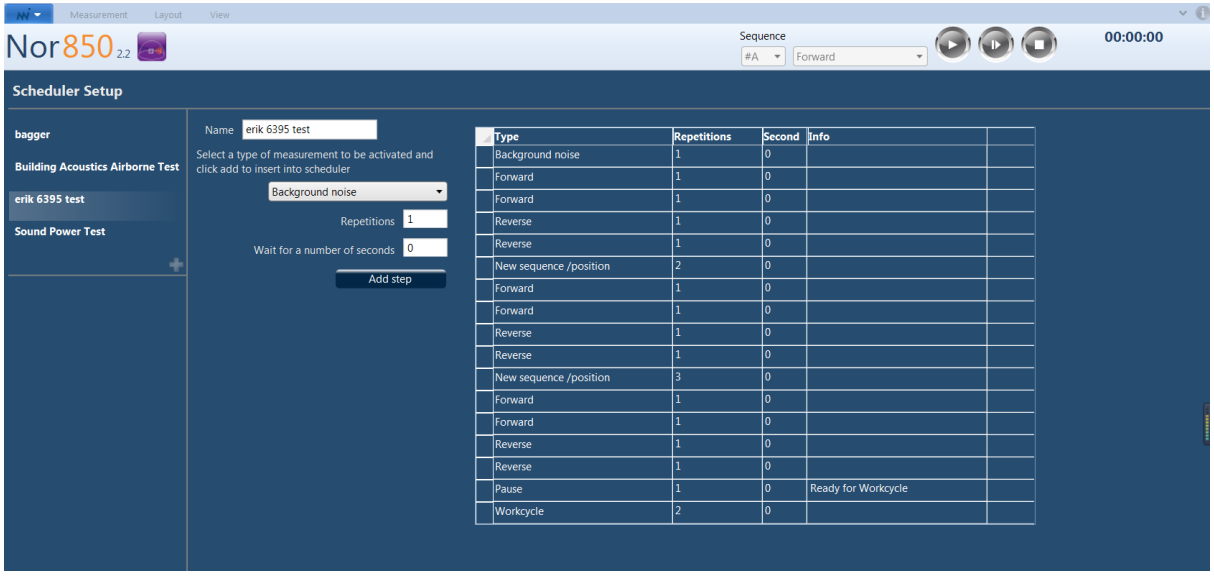




Scheduler setup

More most of the dynamic test for earth-moving machinery, there should be some certain test schedulers which should be described by the user in advance. For example, if we have installed only 3 microphones on the site, as we mentioned before, the machinery driver should drive the machinery from A to B, and then drive reverse back from B to A to perform a whole test schedule. According to ISO 6395, these test schedule should be performed three times and then followed by a machinery work cycle condition. Then we can make a whole test schedule “Erik 6395 test” as follows. The detailed Scheduler Setup can be referenced in the following chapter.

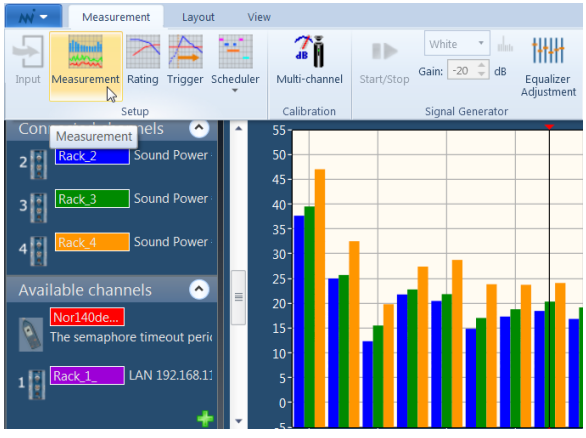


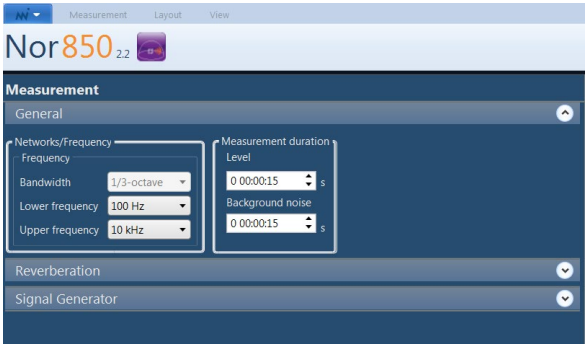


Type	Repetitions	Second	Info
Background noise	1	0	
Forward	1	0	
Forward	1	0	
Reverse	1	0	
Reverse	1	0	
New sequence /position	2	0	
Forward	1	0	
Forward	1	0	
Reverse	1	0	
Reverse	1	0	
New sequence /position	3	0	
Forward	1	0	
Forward	1	0	
Reverse	1	0	
Reverse	1	0	
Pause	1	0	Ready for Workcycle
Workcycle	2	0	

Measurement setup

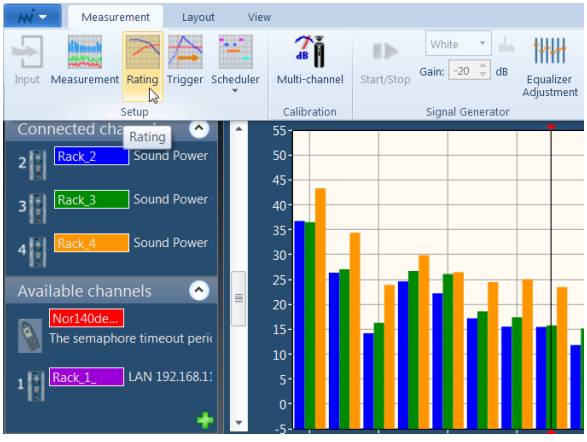
The measurement setup can also be setup from Menu bar as Measurement/Measurement. The user only need to fill in the general information as Networks/ Frequency and Measurement duration as follows, the user doesn't need to care about the parameter in the Reverberation and Signal Generator Tab.





Rating setup

The rating setup described the related sound power measurement standard for the earth-moving machinery; Surface parameters; User input K2 and other test properties. The Rating setup can also be activated from the Measurement menu.

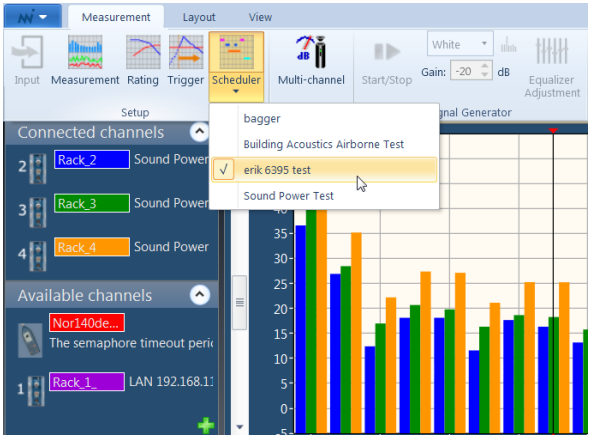


For the Rating setup information, user doesn't need to set in the Volume information of the Test room, while the weather condition information is necessary for the sound power measurement. For most of the measurement condition, the earth-moving machinery is being driven on the hard reflecting ground, the environment correction K2 should be set to 0. So the A-weighted and Spectrum should be set to 0, this will be a default parameter input and they will be there even the user take the Sound Power Mode afterwards.

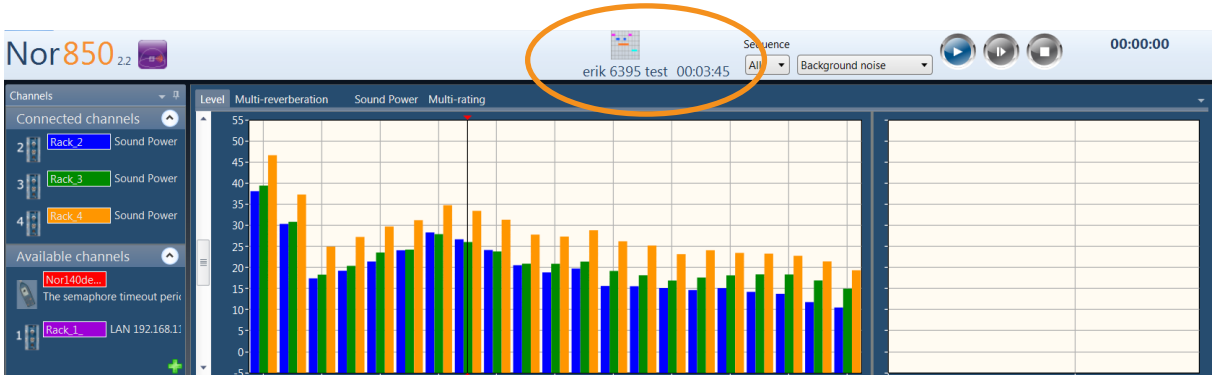
Sound power measurement

Select the prescribed scheduler

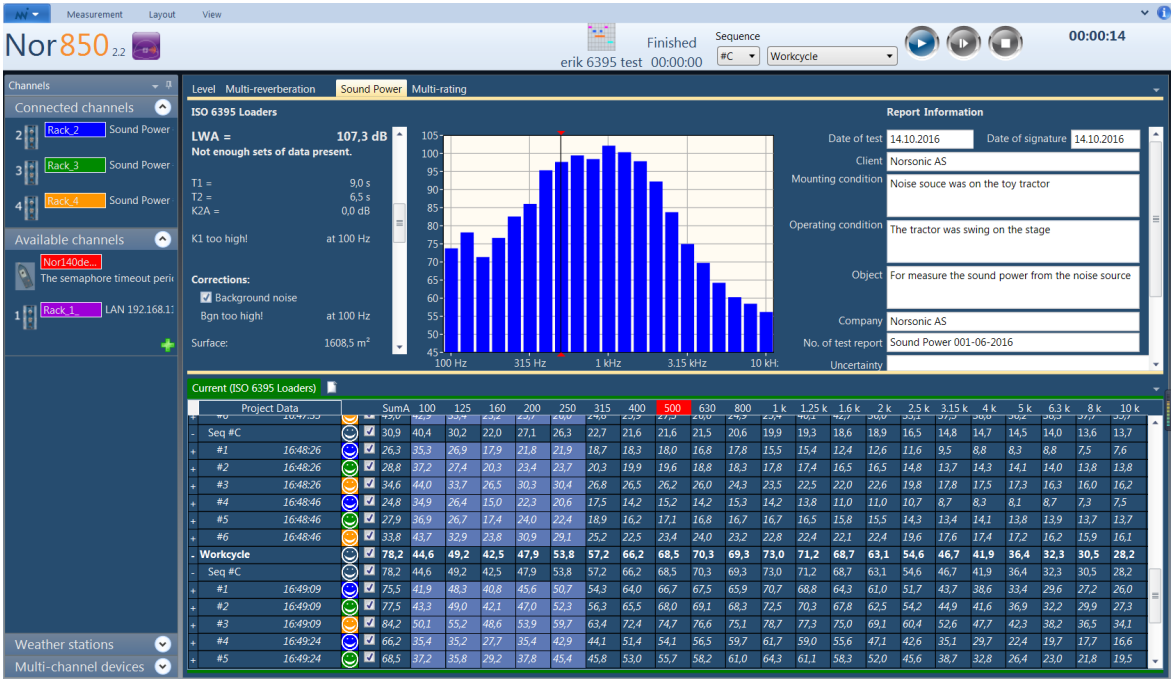
For several prescribed schedulers, the user can select any of them to perform the corresponding test. From the Menu bar, select Measurement/Scheduler, click on the downward arrow and then double click the desired schedule from the available list. It will appear the name of that schedule on the upper of the displaying graph.



Then you can press on the start button to perform the sound power test. As it was prescribed in the scheduler before, it will first perform the background noise measurement at once. When the moving machinery drive passing the Light Barrier A, it will trigger and start the machinery sound power measurement continuously until it stops measurement as the moving machinery passing the Light Barrier B etc. All those procedures will be performed one by one in the desired scheduler.



When the test scheduler was finished, the measurement result and the measurement report will be appeared on the display graph.

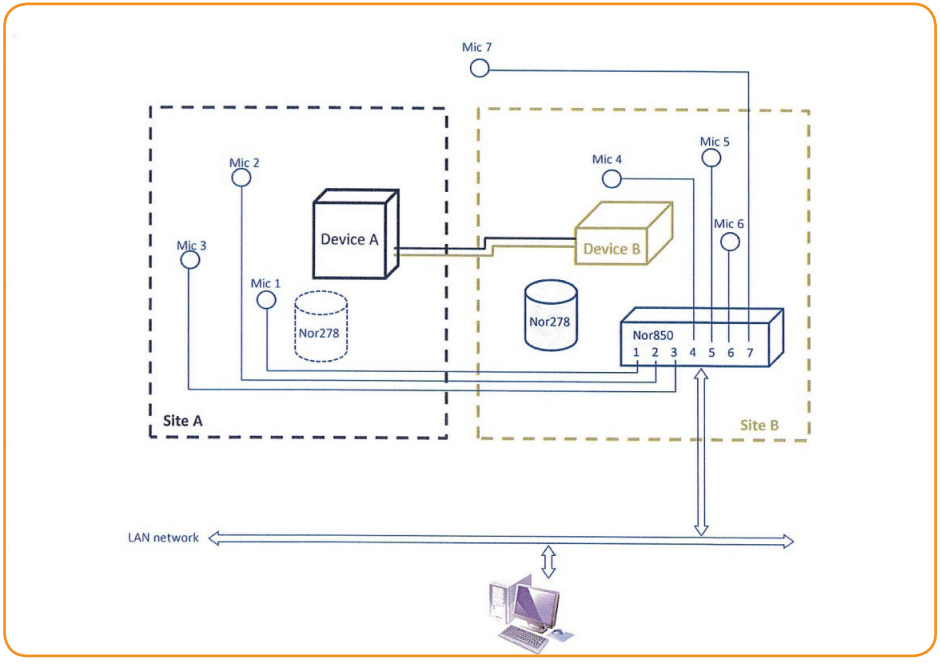


Simultaneously sound power measurement in two adjacent rooms

For some project applications, we have two device components, Device A and Device B, located in two adjacent rooms, and the inside climate condition difference in these two rooms is so huge and we should always keep such difference during the whole noise measurement procedure. However, it is always difficult to keep so much inside climate difference for a long time, therefore, we should perform noise measurement simultaneously and quickly. Nor850 Version 2.0 has the new feature for measuring the sound power in two adjacent rooms simultaneously. The related international standard is applicable to sound power measurement is ISO 3744.

Measurement hardware setup

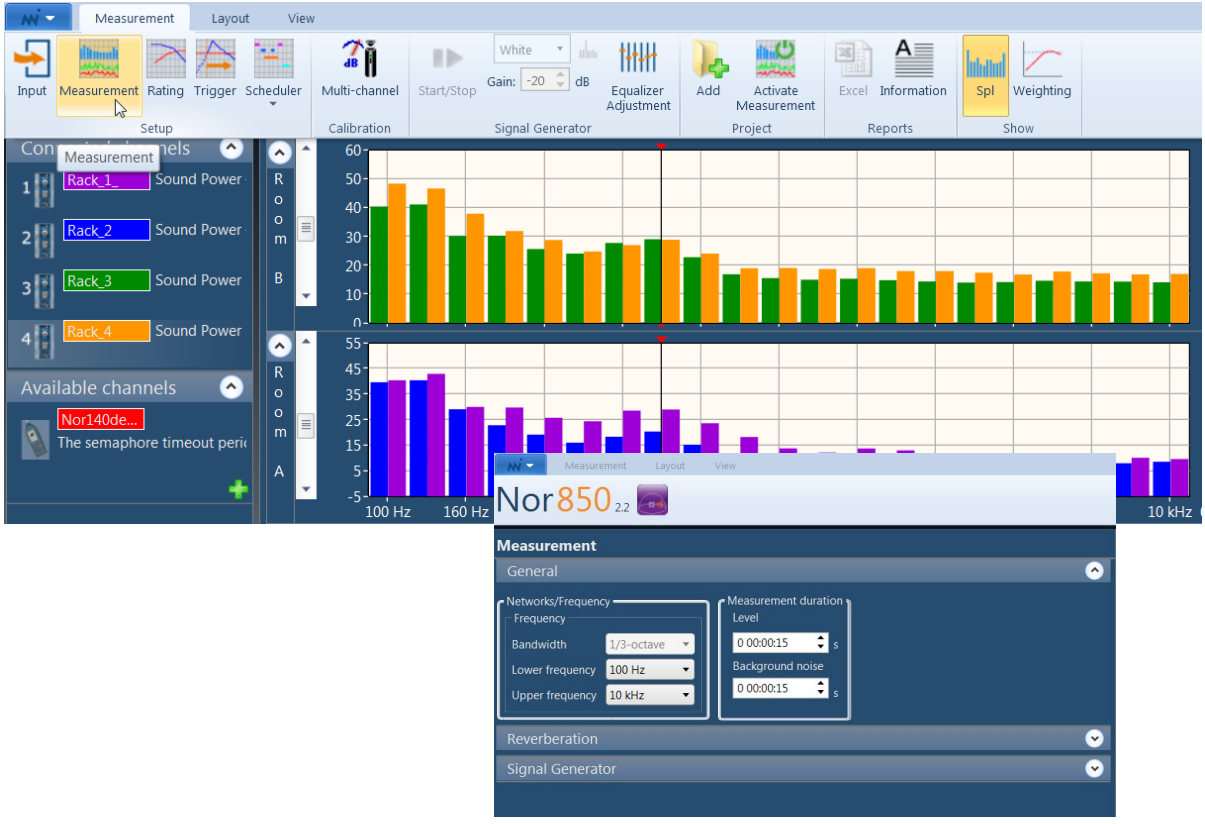
For most of the similar project application, Device A and Device B is running simultaneously and they are located in Room A and Room B respectively. We should arrange measurement hardware in measurement rooms as in the following figure. The detailed setup is set 3 microphones in the Room A (Site A) and another 3 microphones in Room B (Site B), meanwhile, you should set two Reference Sound Source Nor278 in each of the test room. In some cases, the user may also interest in the noise level in some certain work station, then you can also set a reference microphone #7 in that specific position.



Measurement software setup

Measurement setup

The measurement setup can be setup from Menu bar as Measurement/Measurement. The user only need to fill in the general information as Networks/Frequency and Measurement duration as follows, the user doesn't need to care about the parameter in the Reverberation and Signal Generator Tab.

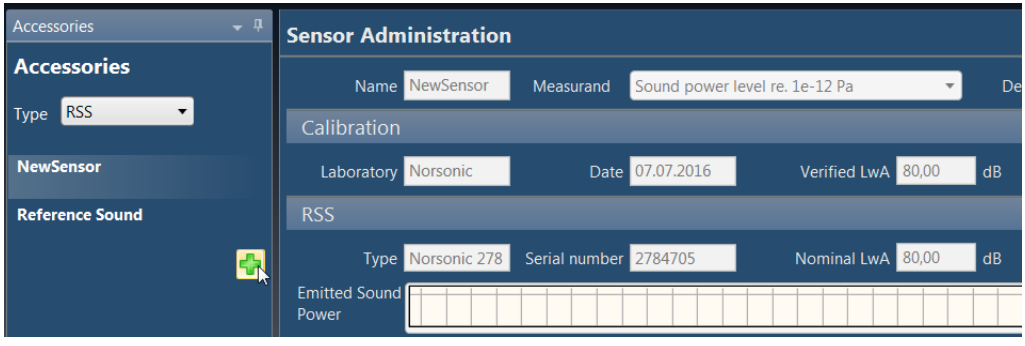


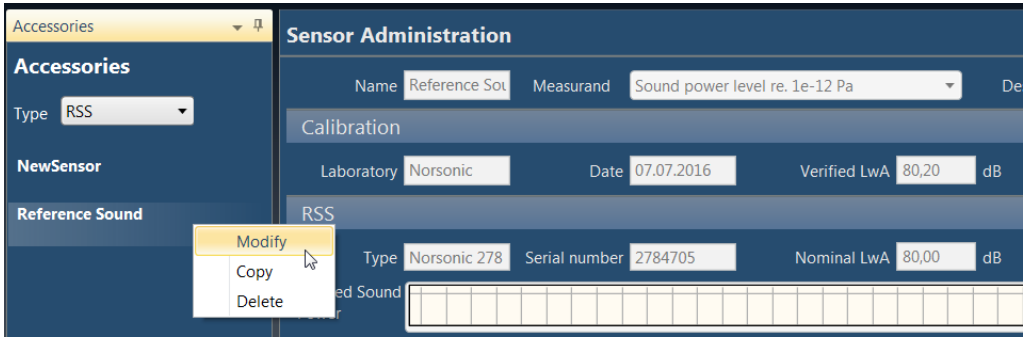
Rating setup

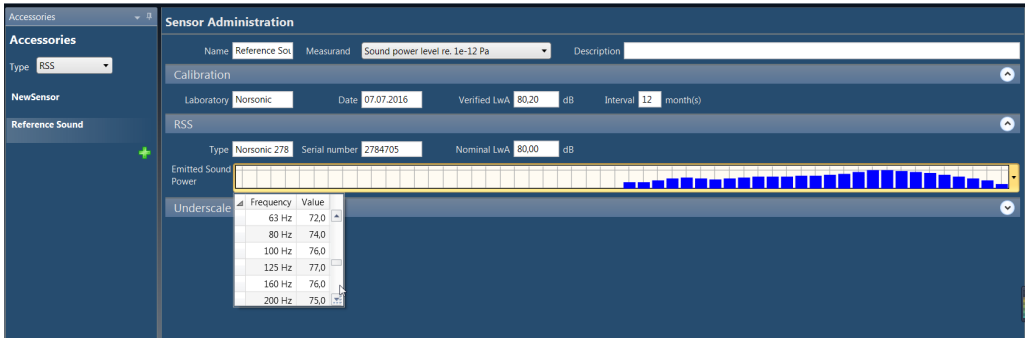
The Rating setup described the related sound power measurement standard for two devices in two adjacent room; devices dimensions; test room dimensions; surface parameters and reference sound sources in each room. The Rating setup can also be activated from the Measurement menu, which is the same as we have described in the former section.

For the Rating setup information, user need to fill in the Reference Sound Source spectrum both in Room A and in Room B, since these spectrum values will be used to evaluate the environmental influences by determine the magnitude of the environmental correction factor K2 afterwards.

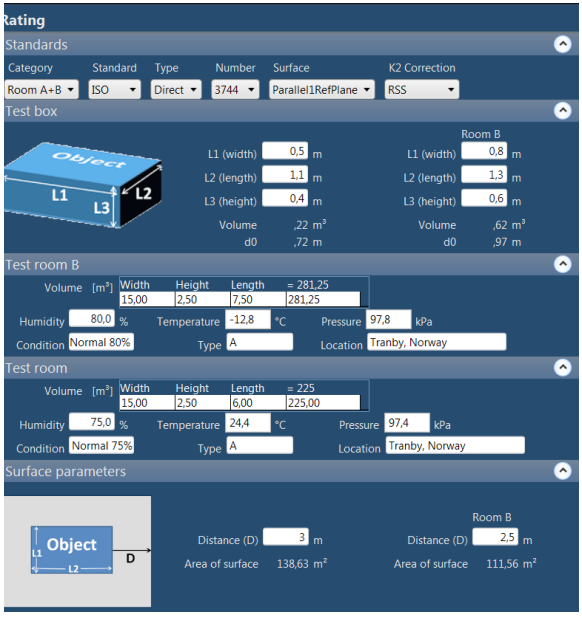
You can set Emitted Sound Power of the Reference Sound Source from Start/Sensor Administration/ Accessories/ Type/ RSS. You can define a new Reference Sound Source by clicking the green plus " "; otherwise you can select an exist Reference Sound Source name, and right click, to select modify and edit the sound power levels in 1/3 oct frequency band. If you use Nor278 as your RSS, those typical sound power levels can be found in instruction manual of Nor278 Reference Sound Sources.





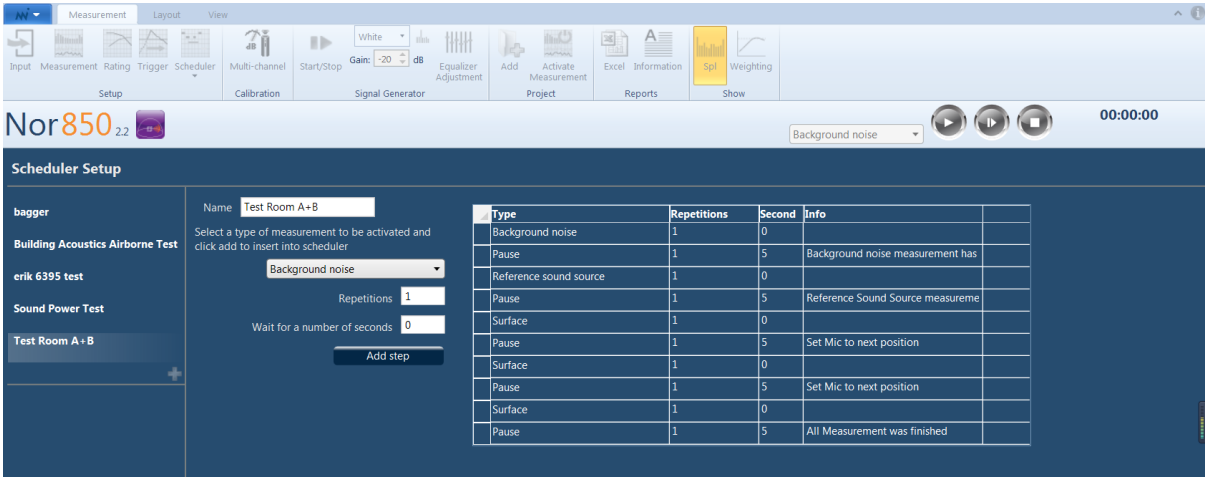


The user should fill in all those measurement parameters for the environment and measurement source one by one, these are necessary input information both for the measurement work itself and the report work afterwards.



Scheduler setup

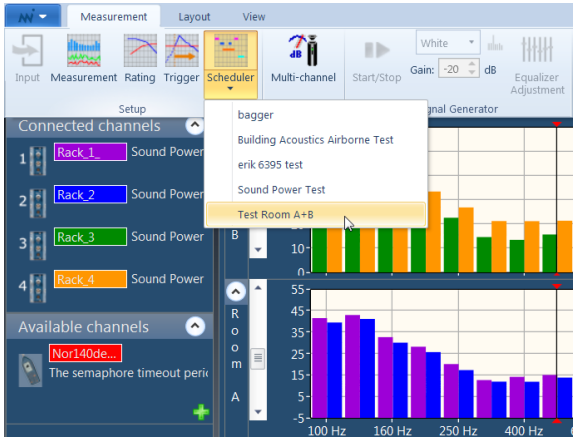
One of the most advantage for Nor850 is that the user can describe some certain test schedulers for the measurement in advance, as which we have illustrated in the former section. The user should read through the related measurement standard and set up his own measurement system, hence can he arrange his own measurement scheduler. The detailed Scheduler Set-up can be referenced in the following chapter.



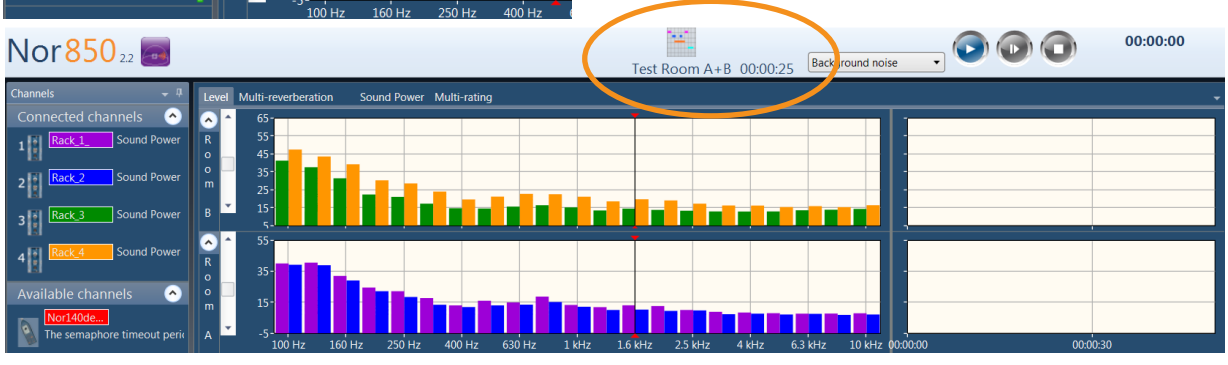
Sound power measurement

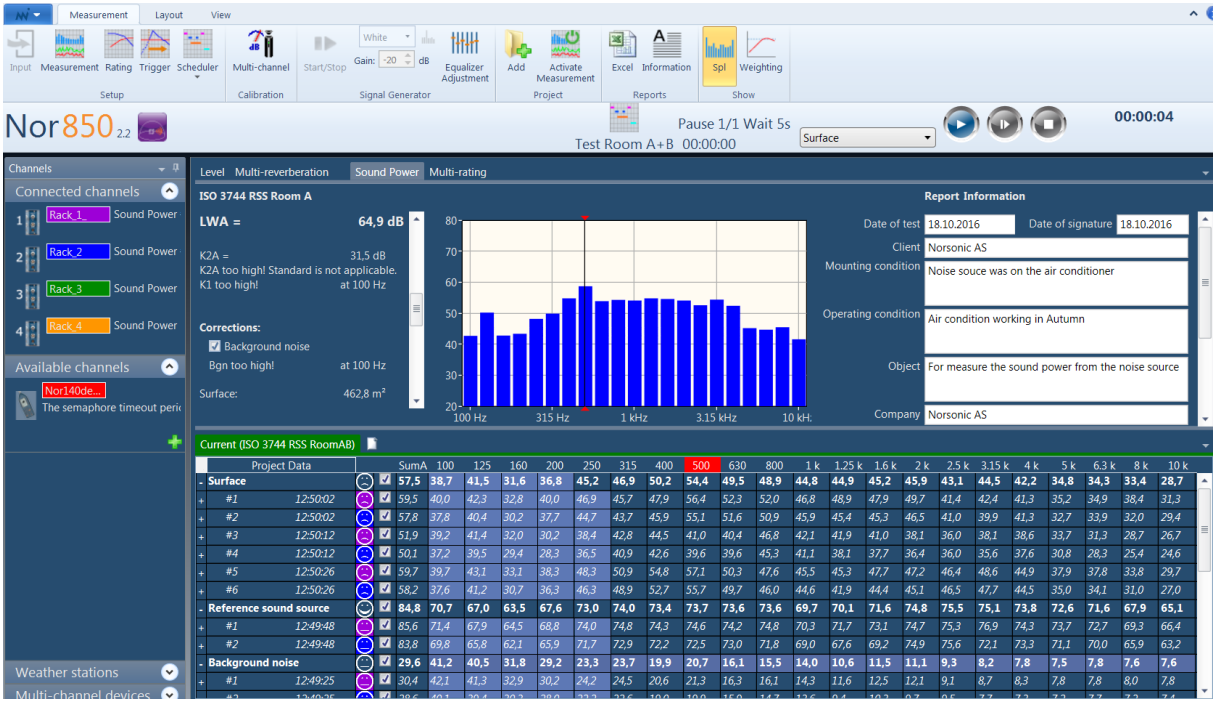
Select the prescribed scheduler

For several prescribed schedulers, the user can select any of them to perform the corresponding test. From the Menu bar, select Measurement/Scheduler, click on the downward arrow and then double click the desired schedule from the available list. It will appear the name of that schedule on the upper of the displaying graph. All those procedure has been illustrated in the former section.



When the test scheduler was finished, the measurement result and the measurement report will be appeared on the display graph.





Project Data		SumA	100	125	160	200	250	315	400	500	630	800	1 k	1.25 k	1.6 k	2 k	2.5 k	3.15 k	4 k	5 k	6.3 k	8 k	10 k
- **Surface**		**57,5**	**38,7**	**41,5**	**31,6**	**36,8**	**45,2**	**46,9**	**50,2**	**54,4**	**49,5**	**48,9**	**44,8**	**44,9**	**45,2**	**45,9**	**43,1**	**44,5**	**42,2**	**34,8**	**34,3**	**33,4**	**28,7**
+ *#1*	*12:50:02*	*59,5*	*40,0*	*42,3*	*32,8*	*40,0*	*46,9*	*45,7*	*47,9*	*56,4*	*52,3*	*52,0*	*46,8*	*48,9*	*47,9*	*49,7*	*41,4*	*42,4*	*41,3*	*35,2*	*34,9*	*38,4*	*31,3*
+ *#2*	*12:50:02*	*57,8*	*37,8*	*40,4*	*30,2*	*37,7*	*44,7*	*43,7*	*45,9*	*55,1*	*51,6*	*50,9*	*45,9*	*45,4*	*45,3*	*46,5*	*41,0*	*39,9*	*41,3*	*32,7*	*33,9*	*32,0*	*29,4*
+ *#3*	*12:50:12*	*51,9*	*39,2*	*41,4*	*32,0*	*30,2*	*38,4*	*42,8*	*44,5*	*41,0*	*40,4*	*46,8*	*42,1*	*41,9*	*41,0*	*38,1*	*36,0*	*38,1*	*38,6*	*33,7*	*31,3*	*28,7*	*26,7*
+ *#4*	*12:50:12*	*50,1*	*37,2*	*39,5*	*29,4*	*28,3*	*36,5*	*40,9*	*42,6*	*39,6*	*39,6*	*45,3*	*41,1*	*38,1*	*37,7*	*36,4*	*36,0*	*35,6*	*37,6*	*30,8*	*28,3*	*25,4*	*24,6*
+ *#5*	*12:50:26*	*59,7*	*39,7*	*43,1*	*33,1*	*38,3*	*48,3*	*50,9*	*54,8*	*57,1*	*50,3*	*47,6*	*45,5*	*45,3*	*47,7*	*47,2*	*46,4*	*48,6*	*44,9*	*37,9*	*37,8*	*33,8*	*29,7*
+ *#6*	*12:50:26*	*58,2*	*37,6*	*41,2*	*30,7*	*36,3*	*46,3*	*48,9*	*52,7*	*55,7*	*49,7*	*46,0*	*44,6*	*41,9*	*44,4*	*45,1*	*46,5*	*47,7*	*44,5*	*35,0*	*34,1*	*31,0*	*27,0*
- **Reference sound source**		**84,8**	**70,7**	**67,0**	**63,5**	**67,6**	**73,0**	**74,0**	**73,4**	**73,7**	**73,6**	**73,6**	**69,7**	**70,1**	**71,6**	**74,8**	**75,5**	**75,1**	**73,8**	**72,6**	**71,6**	**67,9**	**65,1**
+ *#1*	*12:49:48*	*85,6*	*71,4*	*67,9*	*64,5*	*68,8*	*74,0*	*74,8*	*74,3*	*74,6*	*74,2*	*74,8*	*70,3*	*71,7*	*73,1*	*74,7*	*75,3*	*76,9*	*74,3*	*73,7*	*72,7*	*69,3*	*66,4*
+ *#2*	*12:49:48*	*83,8*	*69,8*	*65,8*	*62,1*	*65,9*	*71,7*	*72,9*	*72,2*	*72,5*	*73,0*	*71,8*	*69,0*	*67,6*	*69,2*	*74,9*	*75,6*	*72,1*	*73,3*	*71,1*	*70,0*	*65,9*	*63,2*
- **Background noise**		**29,6**	**41,2**	**40,5**	**31,8**	**29,2**	**23,3**	**23,7**	**19,9**	**20,7**	**16,1**	**15,5**	**14,0**	**10,6**	**11,5**	**11,1**	**9,3**	**8,2**	**7,8**	**7,5**	**7,8**	**7,6**	**7,6**
+ *#1*	*12:49:25*	*30,4*	*42,1*	*41,3*	*32,9*	*30,2*	*24,2*	*24,5*	*20,6*	*21,3*	*16,3*	*16,1*	*14,3*	*11,6*	*12,5*	*12,1*	*9,1*	*8,7*	*8,3*	*7,8*	*7,8*	*8,0*	*7,8*

Scheduler Setup for reportable measurement tasks

The measurement scheduler setup is a very important function for complex measurement tasks in detail in Building Acoustics mode and Sound Power application mode.

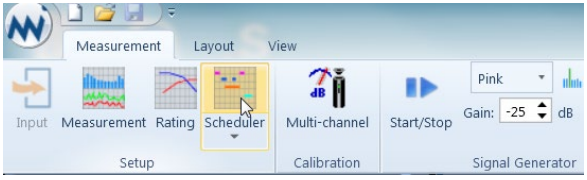
By arranging the measurement scheduler in advance according to the related measurement standard or the detailed measurement task, we can get a clear overview for those measurement procedures. Those can ensure we get a reliable measurement result even those measurements were performed in different places and by different people.

The measurement scheduler function for Nor850 also can degrade the requirement for the measurement operators, they don't need have to special academic theory for measurement work and remember the corresponding measurement procedure. What they need to do for these measurement work is only press the start button or running the reference source and operating machinery as the indication in the measurement scheduler.

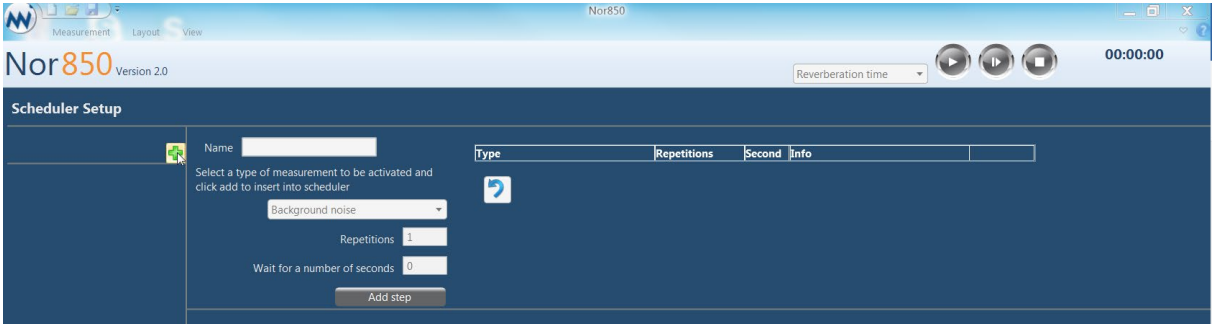
Those measurement scheduler functions can easily be edited, modified or deleted in the Nor850 software. However, the measurement scheduler function is only attached to Building Acoustics Mode and Sound Power Mode.

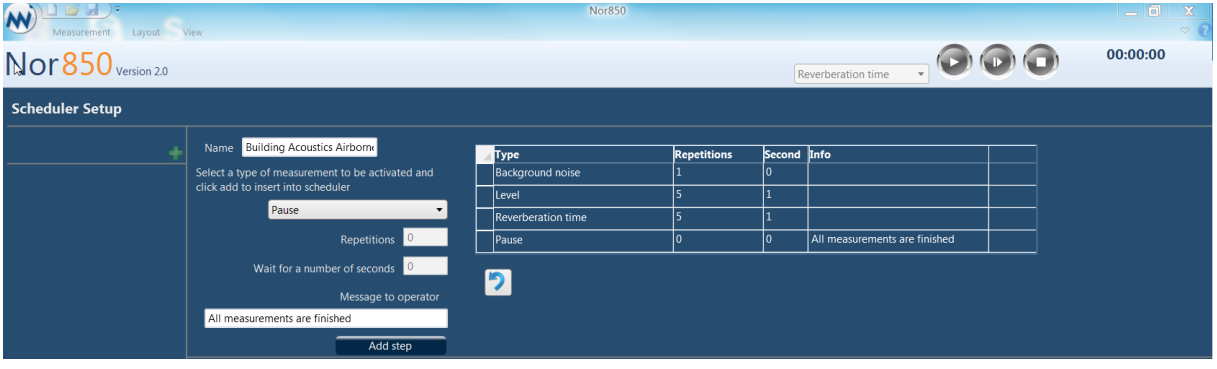
Scheduler menu

By selecting the Building Acoustic Mode or the Sound Power Mode, you can get the 'Scheduler' menu. As soon as the application software is loaded, the 'Scheduler' is activated by editing the measurement procedure for the measured tasks.



The scheduler function is selected by clicking the ‘Scheduler’ button on the Measurement menu bar. In order to create a valid scheduler, one should press on the green “+” in the upper left. And then one should name the scheduler setup; select a type of measurement to be activated and click add to insert into scheduler; repetition times and wait for a number of seconds. And press “Add step” in the end.





During the edit process of Scheduler Setup, one can also press the Restore button to restore the Scheduler Setup. After finished editing the Scheduler Setup, just press OK button and then Close button in the lower right to quit.

Also one can modify or delete one used Scheduler by selecting the Schedule name and then right click to modify or even delete it.

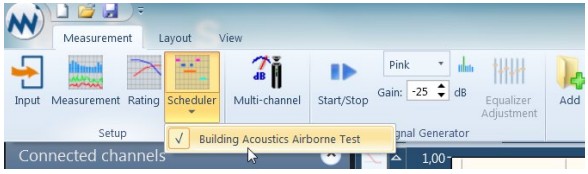
Scheduler functions in Building Acoustics Mode and Sound Power Mode

All those scheduler functions listed in the Building Acoustics Mode and Sound Power Mode are prescribed in the following table:

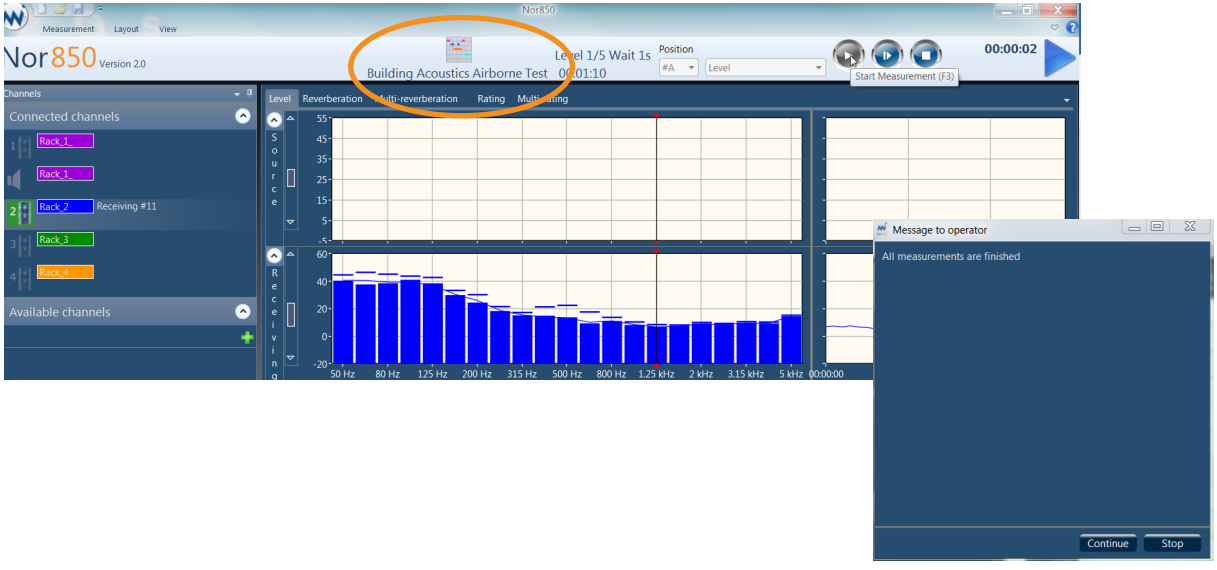
No.	Scheduler Function	Function prescriptions	Remarks
1	Level	Sound level in the source room and/or in the receiving room	Both for Building Acoustics and Sound Power Mode
2	Background Noise	Background noise in the receiving/ machinery room	Both for Building Acoustics and Sound Power Mode
3	Reverberation Time	Reverberation time in receiving/ machinery room	Both for Building Acoustics and Sound Power Mode
4	Airborne Corrections	Airborne noise level for impact measurements	Only for Building Acoustics Mode
5	Background Noise Corner	Corner measurement of background noise for airborne test (ISO 16283-1)	Only for Building Acoustics Mode
6	Reverberation Time Reference	Reverberation time measurement of the empty room for absorption tests	Only for Building Acoustics Mode
7	Surface	Take sound level measurement on the envelop surface of the operation machinery for sound power measurements	Only for Sound Power Mode
8	Reverberation Time Corner	Corner measurement of reverberation time for airborne test (ISO 16283-1)	Only for Building Acoustics Mode
9	Workstation	Noise level at the operator position for sound power test	Only for Sound Power Mode
10	Reverberation Time Room B	Reverberation time measurement in Room B for sound power testing	Only for Sound Power Mode
11	Reference Sound Source	Sound level measurement on the envelop surface of the reference sound source	Only for Sound Power Mode
12	Level Corner	Corner measurement of level for airborne test (ISO 16283-1)	Only for Building Acoustics Mode
13	Background Noise + Level	Background noise in the receiving room followed by Sound level in the source room and/or in the receiving room	Only for Building Acoustics Mode
14	Forward	Level measurements on forward moving vehicles	Only for Sound Power Mode
15	Reverse	Level measurements on reverse moving vehicles	Only for Sound Power Mode
16	Workcycle	Level measurements of loading device mounted on the moving vehicle	Only for Sound Power Mode
17	Wait for a number of seconds	Wait for a number of seconds before next action	Both for Building Acoustics and Sound Power Mode
18	Pause	During pause period, one can set in information message as indication to measurement operators	Both for Building Acoustics and Sound Power Mode

Running “Scheduler”

By completing the edition of Scheduler, one can run scheduler in the corresponding measurement project. One can only tick on the name in the edited scheduler name.



And then press on the start button on the upper right to execute the measurement project. It will perform the measurement step by step until it pops out a message to operator that all measurements are finished.



Control the Microphone Boom

Nor850 also has an important function to control the microphone boom. The microphone boom (MicBoom) can be connected to Nor850 through the Nor850 mainframe unit (Serial IO card), by Lan to Serial unit like Moxa or by directly Serial interface to pc with Nor850 Software.

By controlling the microphone boom, one can perform level measurement or reverberation time measurement.

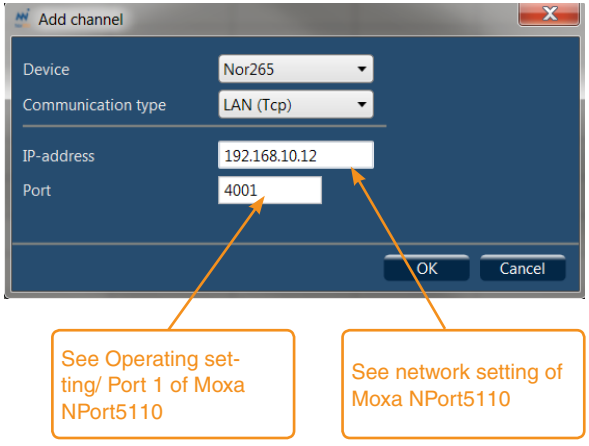
Panel Setting on the Microphone Boom

Upon connecting Microphone Boom Nor265 to Nor850, proper setting should be made on the front panel on Nor265. Please turn on the power supply and switch to ‘Remote’ position.

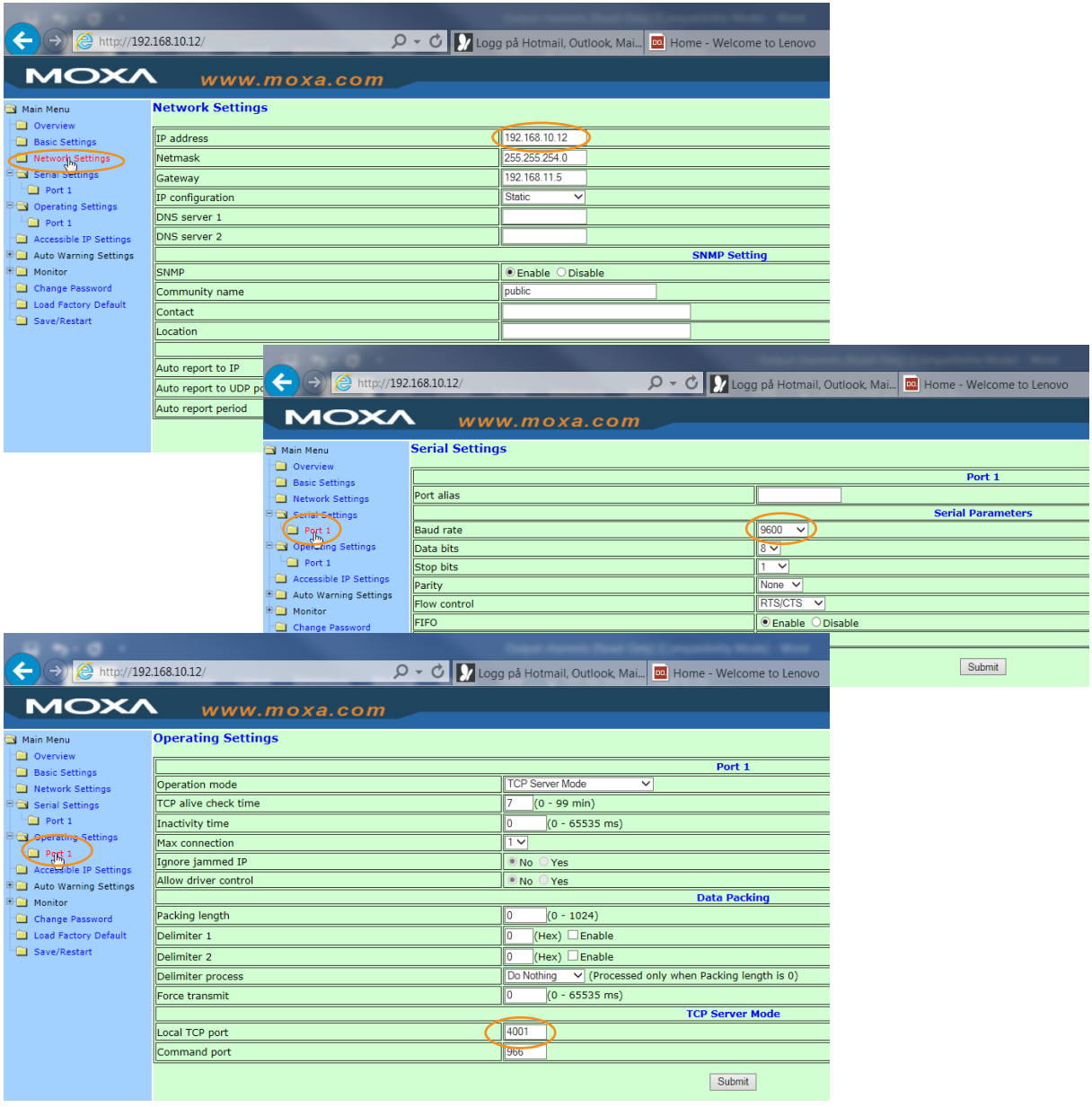
Active the Microphone Boom

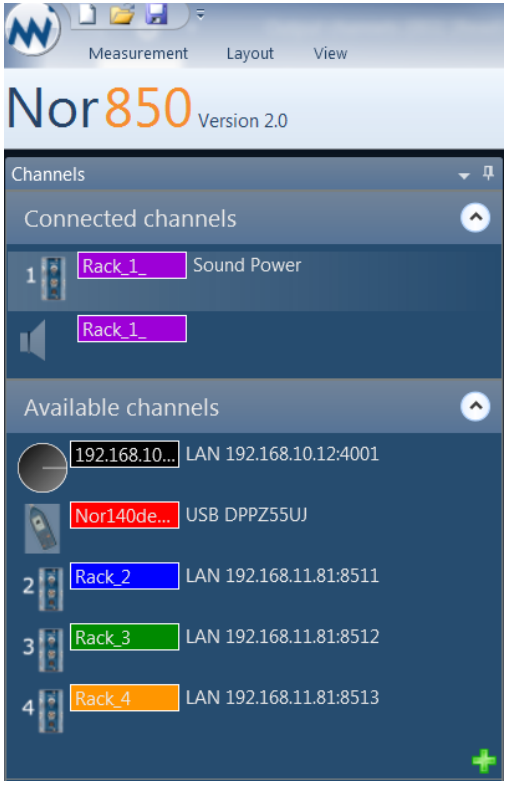
Click on the green '+' on the available channels to select the Microphone Boom.

It will pop out an Add channel tab as follows, please set in Device as Nor265, Communication type as LAN(Tcp), IP-address and Port. If you select the Lan Serial unit as Moxa, the default port should be 4001.

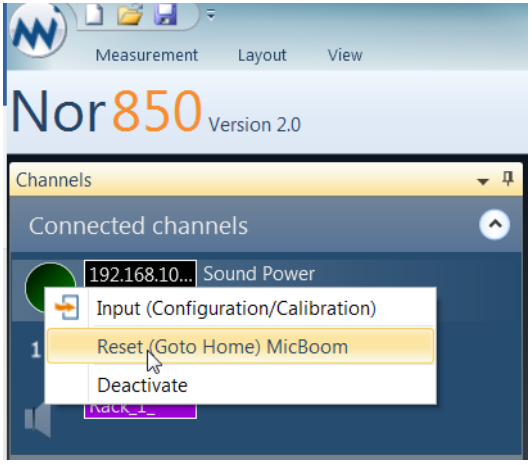


One can get his local IP address from the Network settings of http://192.168.10.12 and port number from Operating settings/ Port 1. One should also check whether the Baud rate of Serial setting is fit for the settings in software of Nor850.


http://192.168.10.12/
Logg på Hotmail, Outlook, Mai...
Home - Welcome to Lenovo
MOXA
www.moxa.com
Main Menu
Overview
Basic Settings
Network Settings
Serial Settings
Port 1
Operating Settings
Port 1
Accessible IP Settings
Auto Warning Settings
Monitor
Change Password
Load Factory Default
Save/Restart
Network Settings
IP address
192.168.10.12
Netmask
255.255.254.0
Gateway
192.168.11.5
IP configuration
Static
DNS server 1
DNS server 2
SNMP Setting
SNMP
Enable
Disable
Community name
public
Contact
Location
Auto report to IP
Auto report to UDP
Auto report period
Serial Settings
Port 1
Port alias
Serial Parameters
Baud rate
9600
Data bits
8
Stop bits
1
Parity
None
Flow control
RTS/CTS
FIFO
Enable
Disable
Submit
Operating Settings
Port 1
Operation mode
TCP Server Mode
TCP alive check time
7
(0 - 99 min)
Inactivity time
0
(0 - 65535 ms)
Max connection
1
Ignore jammed IP
No
Yes
Allow driver control
No
Yes
Data Packing
Packing length
0
(0 - 1024)
Delimiter 1
0
(Hex)
Enable
Delimiter 2
0
(Hex)
Enable
Delimiter process
Do Nothing
(Processed only when Packing length is 0)
Force transmit
0
(0 - 65535 ms)
TCP Server Mode
Local TCP port
4001
Command port
966
Submit



When you activate the MicBoom (show as “Connected channels”), the boom will go to Home position, If the Home position is not defined, the MicBoom will not be activated



Configuration Menu

In the configuration menu, you may define different setups/behavior for Level- and Reverberation time measurements. To handle automatic actions from Mic-Boom, you must select “Automatic” from drop-down. Otherwise it will be manually handled.

Type of action is:

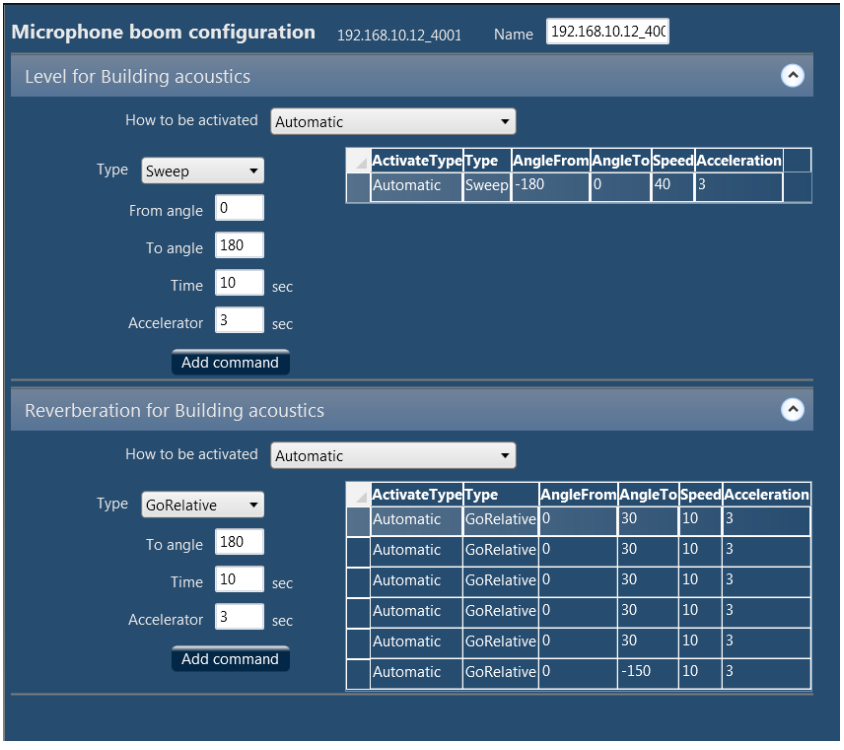
- Sweep - Sweep between two degrees in given time. To avoid twisted cables, the Sweep must be set to a negative position (The MicBoom returns to Home the wrong way). When MicBoom was set in sweep mode, the MicBoom will return back to the original position as soon as possible after the measurement was finished, so the sweep time duration of the Mic-Boom should be fit for the measurement duration.
- GoTo - Go to an absolute position in given time.
- GoRelative - Go to position relative to existing position in given time.
- PositiveRotation - Rotate clockwise with given speed.

- NegativeRotation - Rotate counterclockwise with given speed.
- Stop - Stop rotating and goes to Home position.

The type will have 2 different behaviors when running. “Sweep”, “PositiveRotation” and “NegativeRotation” will be activated while measurement runs, the others will be activated when measurement is completed.

The normal selection will be Sweep, Goto and GoRelative.

Each line of Commands, will be run in sequence to measurement number. The first line for the first “Start of measurement”. The second line for the second “Start” etc. When the last command is reached, the next start of measurement will use the first command again.

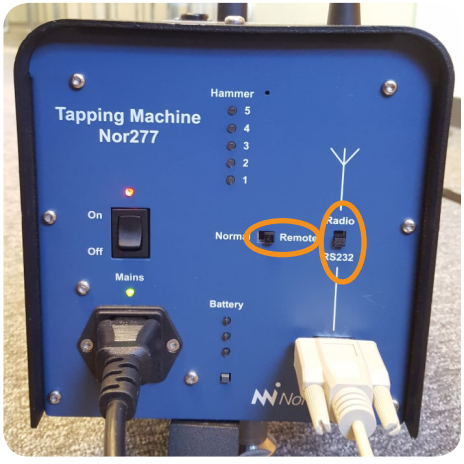


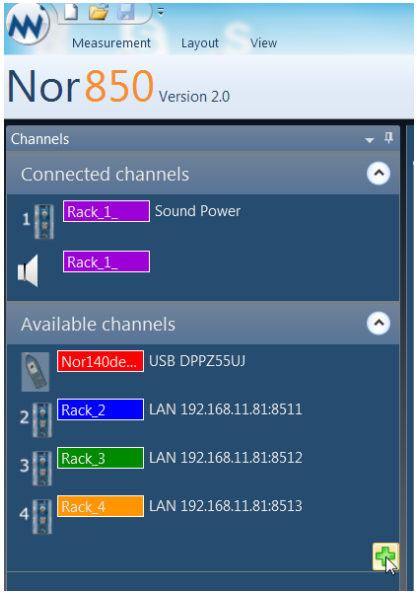
Control the Tapping Machine

Tapping machine can be connected to Nor850 for noise measurement in Building Acoustics Mode through the Nor850 mainframe unit (Serial IO card), by Lan to Serial unit like Moxa or by directly Serial interface to pc with Nor850 Software.

Panel Setting on the Tapping Machine

Upon connecting Tapping Machine Nor277 to Nor850, proper setting should be made on the front panel on Nor277. Please turn on the power supply and switch to 'Remote' position together with 'RS232' Position.

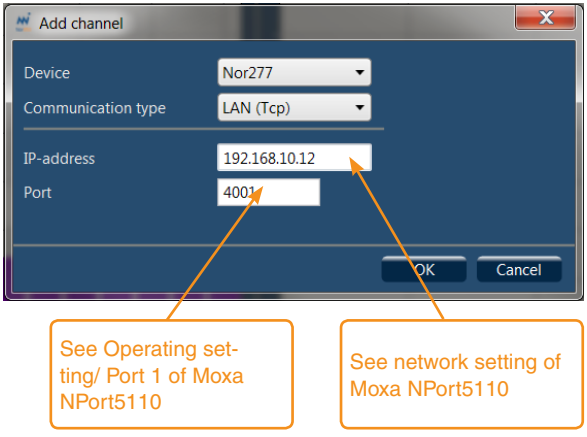


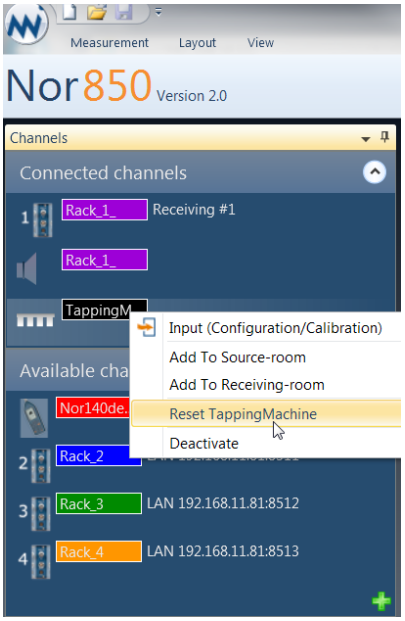


Active the Tapping Machine

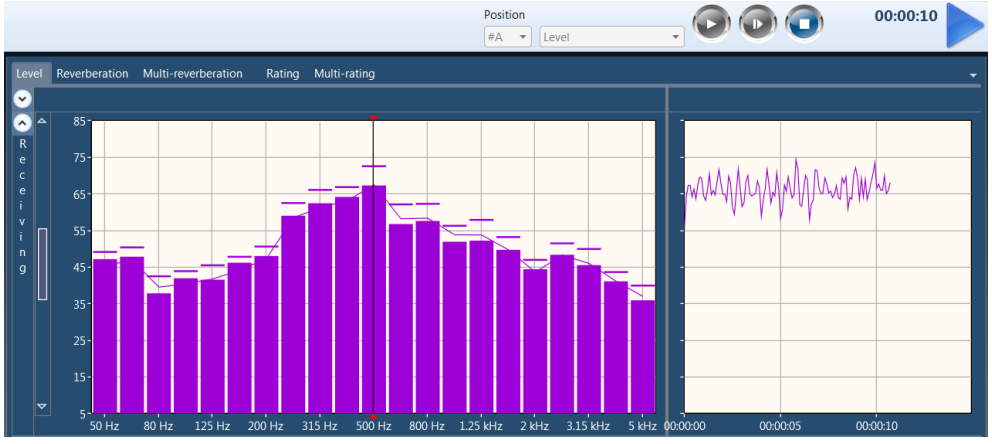
Click on the green '+' on the available channels to select the Tapping Machine.

It will pop out an Add channel tab as follows, please set in Device as Nor277/ Tapping Machine, Communication type as LAN(Tcp), IP-address and Port. If you select the Lan Serial unit as Moxa, the default port should be 4001. Then pressing OK to confirm the setting in the end. All those procedures are the same as listed in " Control the Microphone Boom".





When you activate the Tapping machine (show as "Connected channels"), Please right click it and reset the Tapping Machine. No more configuration or calibration for tapping machine is needed for testing.
Just select the level from the down list and press on the start button, the tapping machine will begin to start running and get ready to noise measurement.



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Norsonic AS supplies a complete range of instrumentation for acoustics – from sound calibrators, microphones and preamplifiers; via small handheld sound level meters to advanced, yet portable, real time analysers, but also spectrum shapers, building acoustics analysers and complete community, industry and airport noise monitoring systems. Contact your local representative or the factory for information on our complete range of instrumentation.