INSTRUCTION MANUAL

Software version 2.3

nor**850**

SOFTWARE

Norsonic

Nor850 User Guide

Im850 Software_1Ed2R2En - sofware v 2.3 July 2017

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nor**850**

SOFTWARE

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SOFTWARE

Startup

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

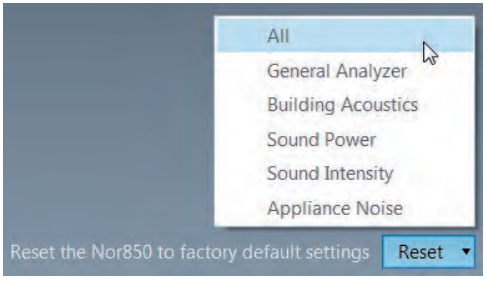
Then power up the measurement modules (Nor850 multichannel racks and/or Nor140 units/ or Nor150 units) and make sure they are all connected to the PC via LAN or USB interfaces.

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.

Nor850 Factory default settings

When starting the Nor850 software for the first time, the various features have their individual default setting. As the system are in use, these settings are normally changed to fulfill the various demands from the operator. To restore the original factory default settings, use the ‘Reset’ button in the lower right corner of the startup window. Factory settings will then be restored for all modes, or only for one selected mode, depending of the operator choice.



Norsonic recommend resetting all modes to default factory settings after making a software upgrade in order to avoid potential problems due to new implemented features in the new software version.

Selecting Measurement mode

Nor850 software offers five measurement modes:

General Analyzer, the optional Building Acoustics, Sound Power, Sound Intensity and Appliance Noise.

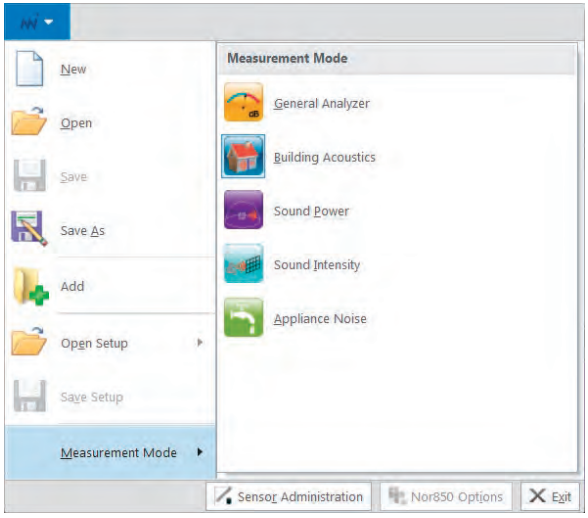
Click on the desired mode, and the start-up display of the selected mode will be displayed on the screen.

The latest version can be downloaded from:

www.norsonic.com/downloads.

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.

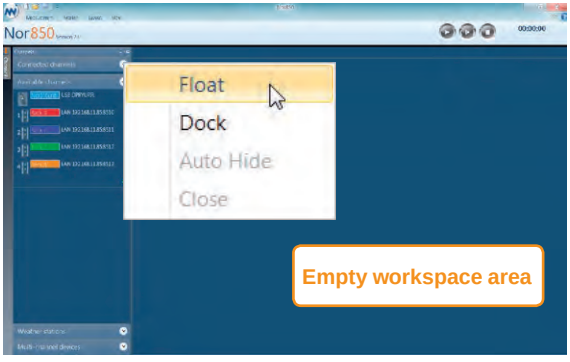


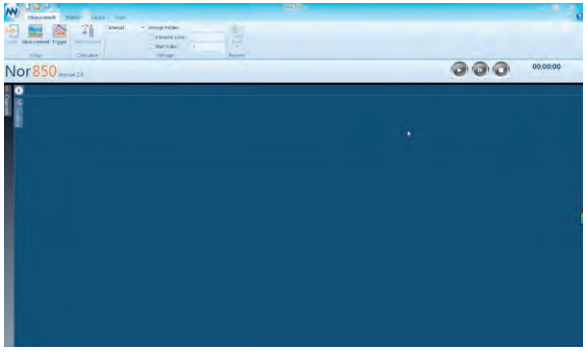
Universal features for all modes

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.

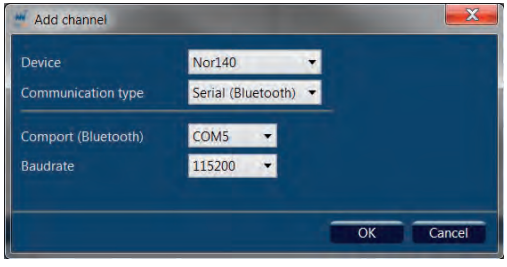


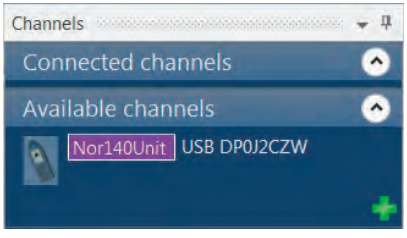


Adding measurement channels from Nor140

It is also possible to add Nor140 or Nor150 as additional measurement channels. These features for Nor850 is a great advantage for customers, as these can save the measurement resources for you, since you may have already bought our instrument before. Meanwhile, these can expand the numbers for measurement channels while performing large measurement projects.

When you want to add Nor140 as an additional measurement channel, just connect the Nor140 to Laptop with a USB data cable. Press the green "**+**" icon on the bottom of the *Available channels*, it will pop out a Tab of *Add channel*, then select the corresponding options from them, and after pressing OK to confirm in the end, it will see that Nor140 will be available in the available channels list.





Adding measurement channels from Nor150

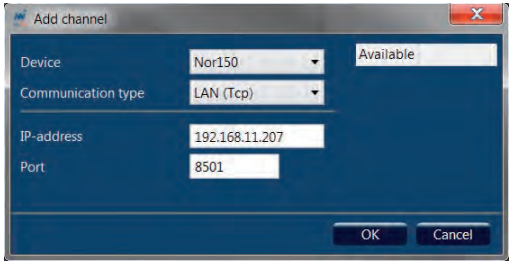
Nor850 supports the use of Nor150 v2.0 dual channel instrument as additional measurement channels. For some customers, this will be a quite popular feature for performing building acoustics measurement. Since there are several approaches to establish a data transfer connection between Nor150 and Nor850, customer can select their favorite connection mode from USB, LAN, or WLAN.

When establishing LAN connection between Nor150 and Nor850, first connect Nor150 with a net cable to the Local Area Network. Press the green "**+**" icon on the bottom of the *Available channels*, it will pop out a Tab of *Add channel*, then select the corresponding options from them

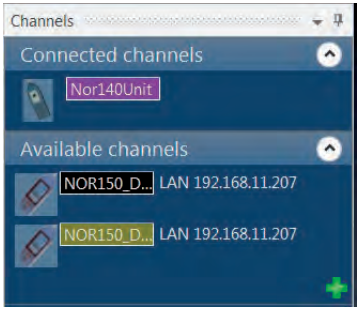
Device: Nor150

Communication: LAN(TCP)

IP-address:192.168.11.207 (Here is only an example, the user can get this IP-address from Nor150, **SETUP**> *Instrument*>*Communication*>LAN>Automatic IP Address, press √ softkey on the screen, then you can get the Auto IP Address: 192.168.11.207 from the screen) Port:8501,'

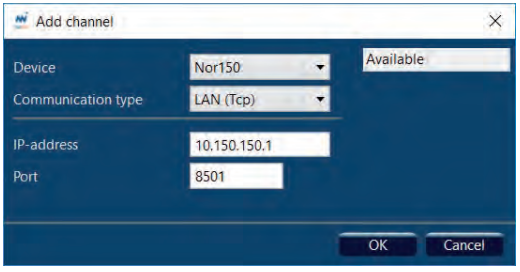


and after pressing OK to confirm in the end, it will see the Nor150 will be available in the available channels list. Two icons representing for the dual measurement channels in Nor150 will be appeared in the Available Channels list, when the connection is established successfully.



For establishing WLAN connection between Nor150 and Nor850, the detailed process is almost the same, except that you need insert a Mini WiFi dongle into the socket in Nor150 first, and select a reliable WLAN account with password protection. You can also get the IP address from the screen.

And the USB connection type is also frequently adopted by many customers, as we described before in the former section, you should first use a USB data cable for connecting Nor150 and Laptop together. And you should also fill in 10.150.150.1 as the IP-address for USB connection, which is a mandatory requirement.

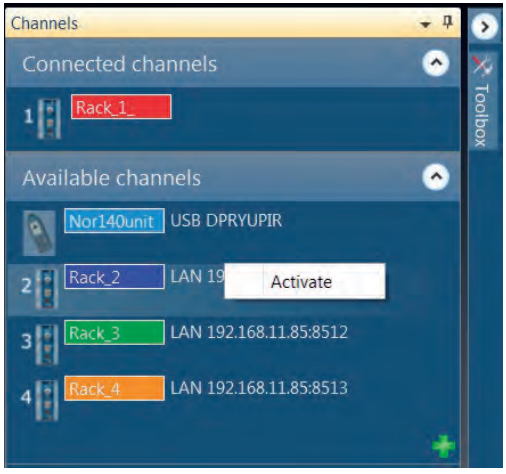


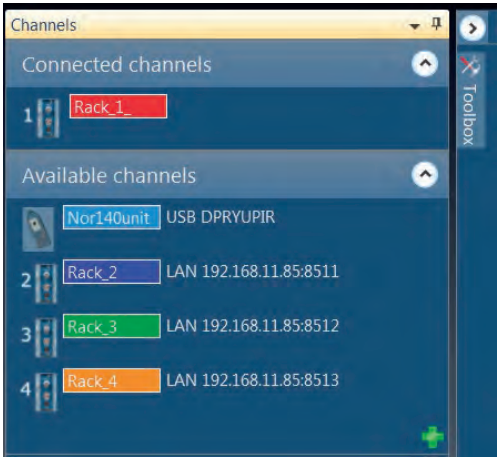
Activating channels

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.





If a Nor140 measurement channel has been activated, then a message indication *Running in slave mode!* will be displayed on the screen of Nor140 instrument.

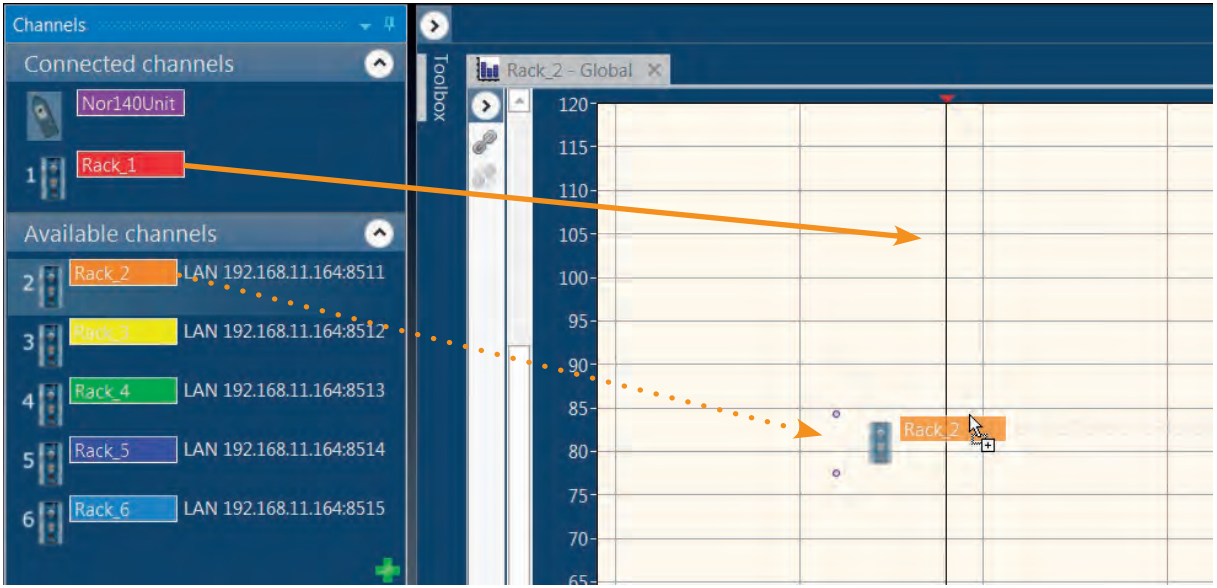
In the General Analyzer mode, all activated measurement channels will be used in the measurement independently of the selected *Display Windows*.

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.

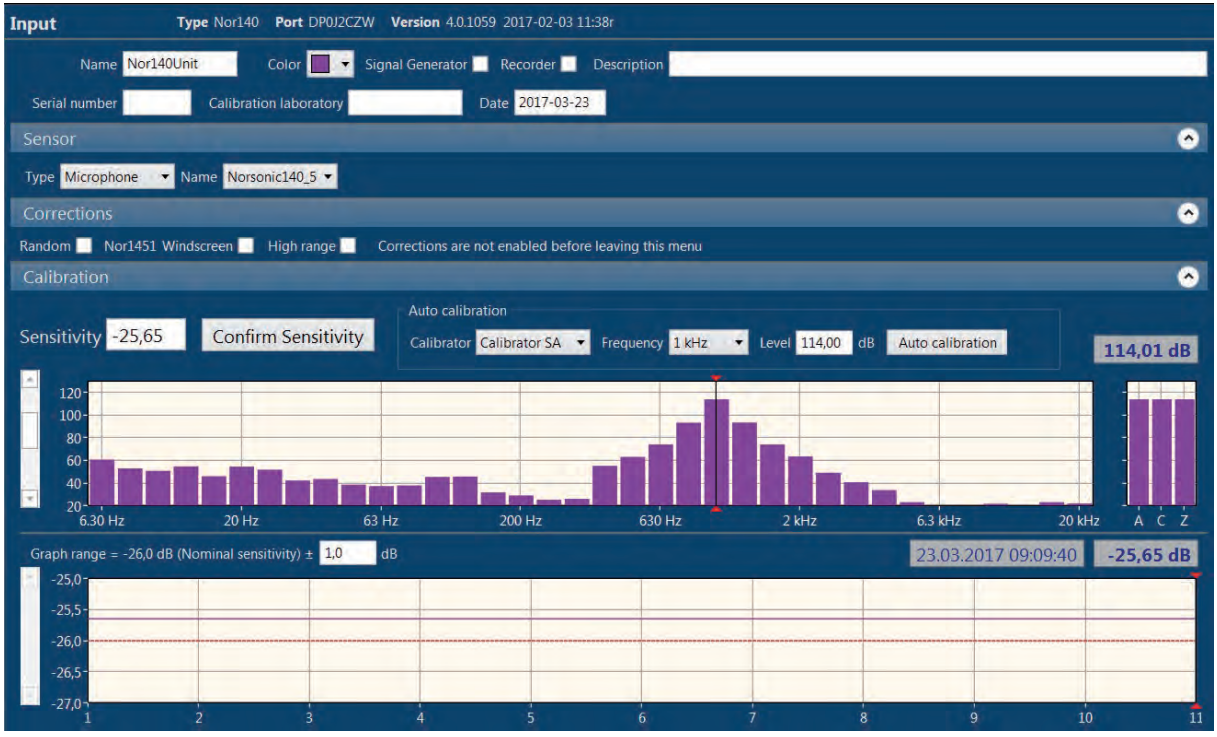


The input menu

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 *Input (Configuration/Calibration)*.

The input menu contains:

- Information about the instrument (type, connected port and the firmware version of the measurement channel)
- 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

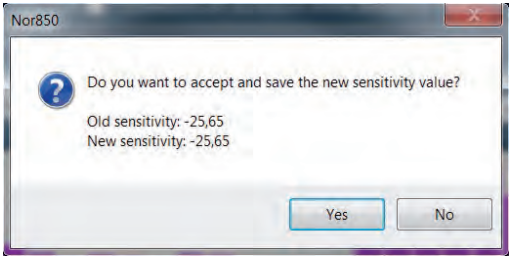


Calibrating the sensor

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.

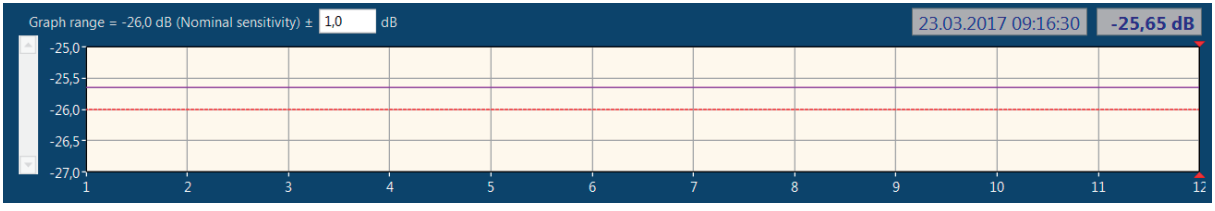
Select a calibrator sensor from the drop-down menu. If a calibrator sensor is not available, a new sensor will have to be defined in the Sensor Administration. Select the calibrator frequency, calibrator level and click *Auto calibration*. Connect and switch on the calibrator. The Nor850 system will 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.

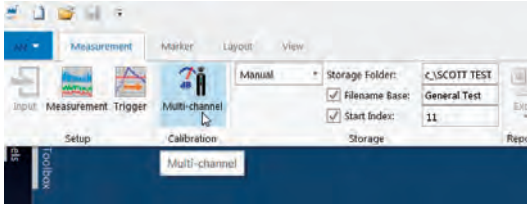
If the calibration cannot be performed automatically and the measured calibrating level is out of the +/- 2dB of the previously stored sensitivity, then you have to set in the measured calibrating level manually in the *Sensitivity* field for further measurement with this microphone sensor.

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

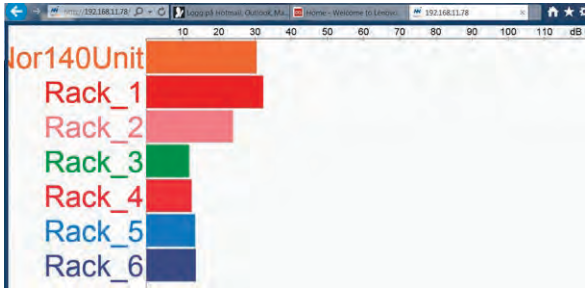
A practical option in the Nor850 software is the multi-channel calibration. Click the *Measurement* button and select *Multi-Channel*:



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.

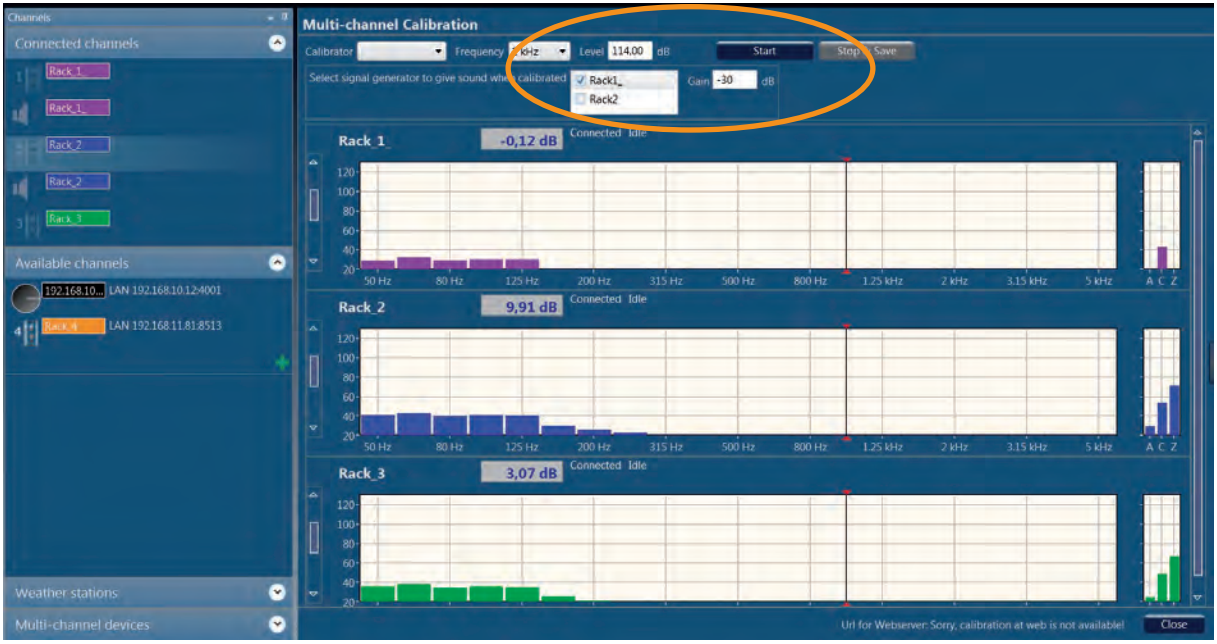


A nice feature with the multi-channel calibration is the web server which serves a web site containing the most relevant information about the calibration procedure. To access it, open a web browser and enter the URL which is shown at the bottom of the multi-channel calibration window in Nor850.

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.

When performing sensor calibrations in typical laboratory situations, the Nor850 additionally have an alternative approach. Any connected signal generator may give a short low-level burst to indicate a successful calibration. This feature is activated by ticking of the desired signal generator(s) displayed at the top of the multi calibration menu, and selecting the appropriate output level (typically -40 - -30 dB) in order not to make any hearing damage to the people in the same room. For each successful sensor calibration, the signal generator will then send a short noise burst to the connected loudspeaker system. The selected low output level will not influence the normal use of the signal generator during the measurements.

This approach allow the operator to walk around to all the connected microphone sensors and perform the calibration without returning to the PC to check the status of each individual calibration.


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 while 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

Run Nor850 as an Administrator or an Operator

When a customer will perform a large measurement project for a few days on site, they may use several persons to work together. Some of them may have studied the related measurement standard already or are familiar with the measurement system very well, while the others are maybe freshmen for involving this project temporary.

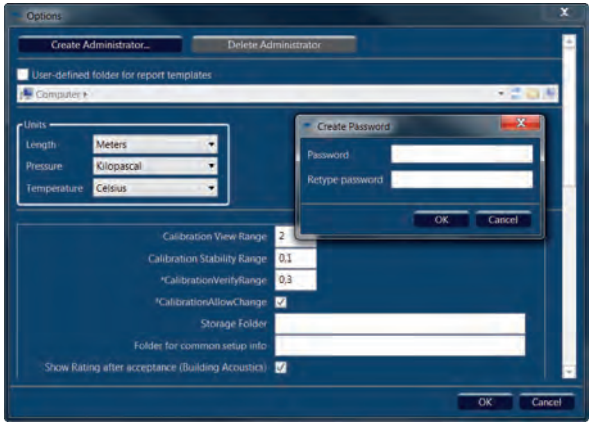
Nor850 has set up an Administrator privilege for that person who knows the measurement standard and system very well, and he has the right to calibrate the measurement sensor, select standard or perform rating for the measurement project, while the other person can only execute the measurement operation, without any right to set up measurement parameters etc.

The Administrator and Operator feature of Nor850 is only applied to Building Acoustics Mode and Sound Power Mode.

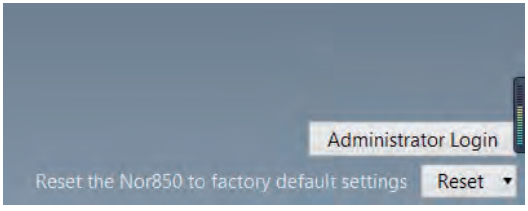
Only in the Administrator mode. Can customers add/delete measurement channels or add/delete measurement schedules etc. The most features for Nor850 has been disabled in operator mode.

Create Administrator Account

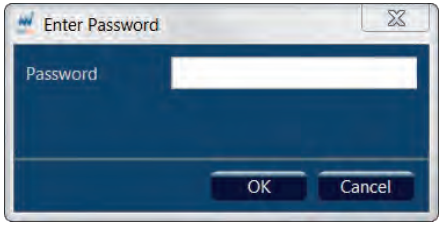
Click Windows Start menu, and find Norsonic-Nor850 icon, right click Nor850 icon and *Run as administrator*; click *Nor850 Button* and then *Nor850 Options*; In the popped out Option Tab, click *Create Administrator*; Set in Password for your administration account.

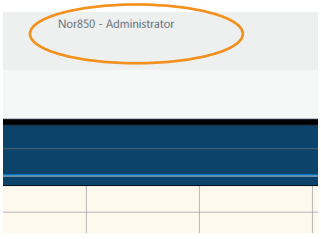


When you Restart Nor850 again, you will see an indication message *Administrator Login* appear in the right down corner of the front page.

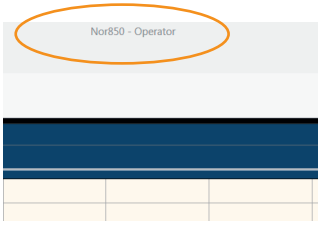


Click *Administrator Login* and set in password in the pop-up tab. Press *OK* to enter, it will confirm with you that the administrator mode is enabled and now you can handle the measurement software as an administrator. You may also notice there is a “Nor850-Administrator” indication on top of the screen.





After you restart Nor850 again, you can also neglect the *Administrator Login* and click one measurement mode button directly, then you are logged in as an operator.

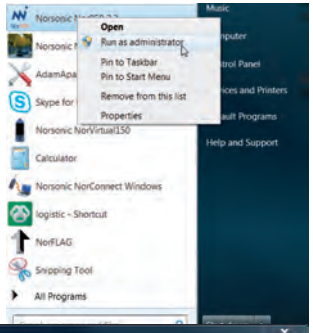


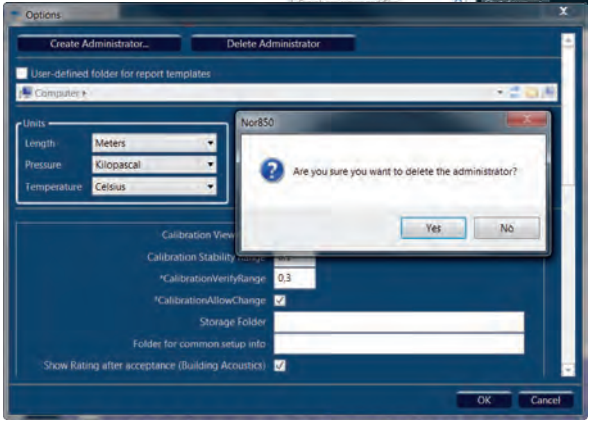
Restricted features when logged in as an operator

If the customer has logged in as an operator, then some of the features in Nor850 was blocked. For examples, operator cannot set in most of the vital parameters in Input Tab, Measurement Tab or Rating Tab. This privilege difference between administration and operator can ensure the measurement result is correct and comparable, even it is performed by different people, in different places or on different date.

Delete Administrator Account

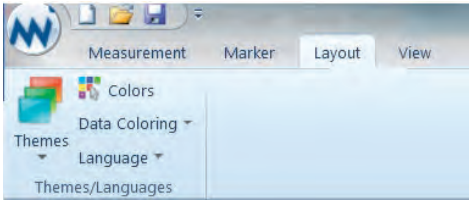
If you want to delete administration account, please click *Windows Start menu*, and find Norsonic-Nor850 icon, right click *Nor850 icon* and *Run as administrator*; click *Administrator Login* and log in as admin, open *Nor850 Options*; In the popped out Option Tab, click *delete Administrator*; click *OK* to confirm your delete administration.





Graphical function design, colours, themes and languages

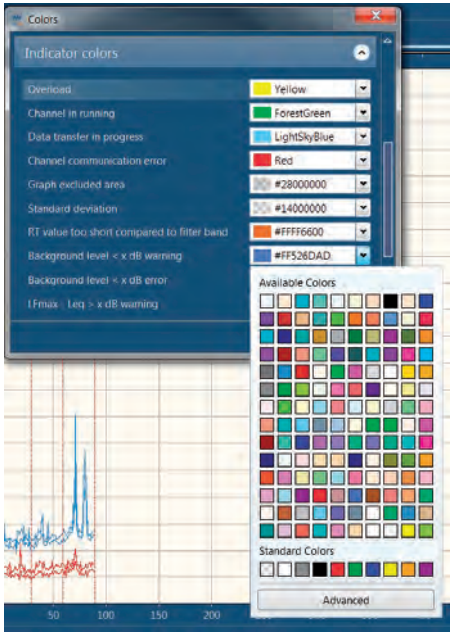
To change the colours, themes and languages for the Nor850 system, click the *Layout tab* in the top left hand corner of the screen:



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

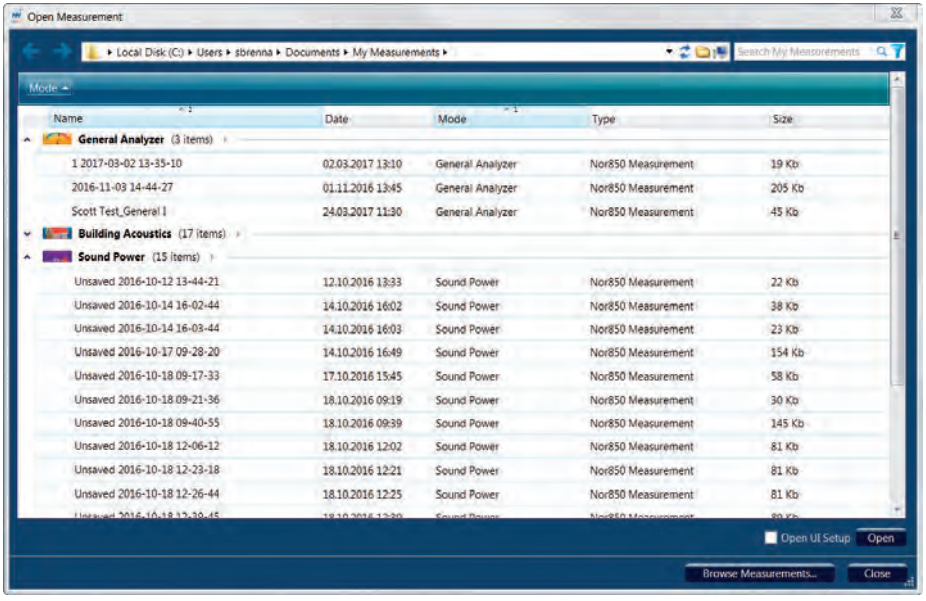
The Nor850 system has a set of colour codes assigned to different warnings and messages or functions. These colours can be changed by clicking the Layout tab in the top left hand corner of the screen. Then click the *Indicator colours* button. A new window will appear which shows the colours selected 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 (English, French and German are supported).



Improved file browser for existing measurements

Nor850 software offers an improved file browser for existing measurements. When you click on the *Nor850 Button*, and Open measurement, you will get a new file browser, which is similar our freeware NorConnect.



A file browser shows the content of all the measurements performed in Nor850. In the default view, the files are conveniently grouped by the mode in which they are made: General Analyzer, Building Acoustics, Intensity, Sound Power, and so on…

With each mode, default sorting applied when browsing the Nor850 memory is by *Mode* then *Name*. This is marked with a small number 1 and 2 in the header of the columns as shown in the figure.

However, you may change and set your own sorting preference by Shift + click on the column header. Then If you set *Date* as the first sort criteria, when you browsing the measurement data, which means that the view always shows the last measured file first.

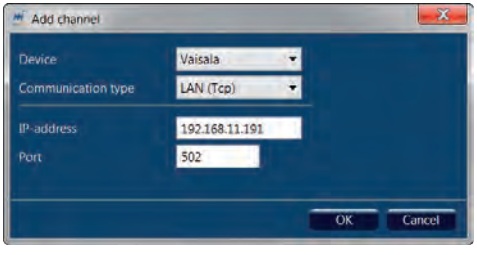
You can also change the default grouping for the browser, this is only by drag a column header up to group that column.

Automated read in of temperature, air pressure and humidity into BA and SP reports

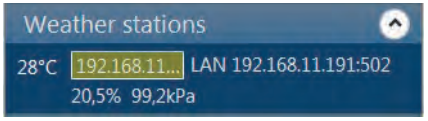
For some measurement projects, the noise results may be sensitive to climate parameters. All those climate parameters can be acquired by a Vaisala equipment, and then can be communicated by LAN system.

Customers can click the green `+´ icon on the *Available channels* to add a Vaisala data acquisitor.

The IP address for Vaisala should be determined by the customers' network administrator.



Then it will appear an icon in the *Weather stations* list in the down-left side of the screen, all the acquired climate parameters will also be listed.



When you perform measurement, all those climate parameters will be appeared in the Measurement/ Rating/Test room, along with in the Excel report automatically.

Save setup files with schedule configuration

For most advanced customers who have used Nor850 for measurements many times, they maybe have already developed several measurement schedules. Those special schedules are based on their own test conditions, measurement hardware or special measurement standards, even they have modified their measurement setup later, they still want to adopt the predefined schedules.

In Nor850 there is a feature to save schedules as part of the setup files. If you already have several schedules in a measurement mode, when you save measurement setup for your measurement task, you will save the related schedules at the same time. Even if you upgrade the software or copy the setup files to another system, you can still adopt those schedules, or just modify the old ones to form a new schedule.

Synchronized scheduler handling of output channels

Nor850 is a complicated system which can combine with microphone boom or relay controlled switches togethers for measurements. Nor850 can synchronize or coordinate the behavior of microphone boom and relay controlled switches. For example, the relay controlled switches can keep that state for a certain period and then start the movement of the microphone boom again.

Based on this feature, customer can develop advanced measurement schedules, which can be adopted in various automation measurement conditions and enhance the measurement efficiency greatly.

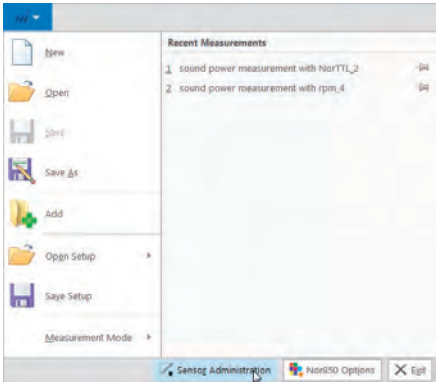
Improved handling of the `expand/ collapse´ feature in the tabular windows in BA and SP Modes

When you perform measurements in one certain measurement mode, you can execute several times for one measurement condition, for example, *Reverberation*, and all those measured results will be listed in the *Project Data* tabular windows. You can click on the `-´ icon in front of *Reverberation* to obscure those data, or click on the `+´ icon in front of *Reverberation* to unfold those data. The 'obscure / unfold' state in the tabular windows in BA and SP Modes will always be kept, even if you switch between various measurement tabs to view different measurement curves.

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.



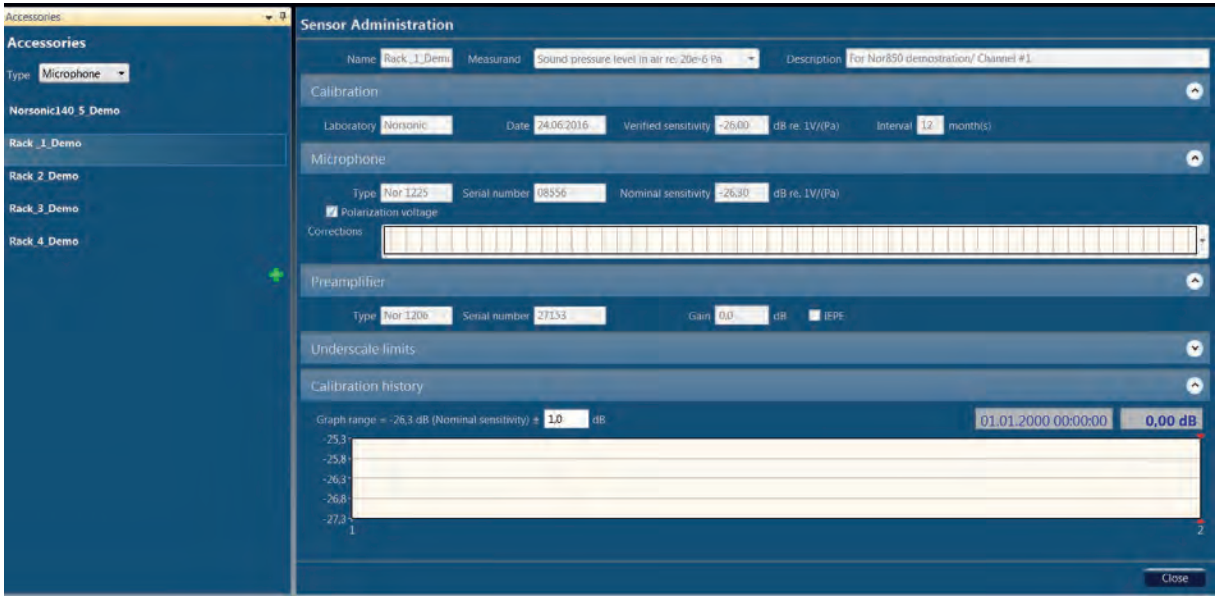
PLEASE NOTE: After installing the Nor850 software suite to a new computer, make sure that all relevant sensor information are entered into the Sensor Database before starting to use the system for new measurements.

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

- Microphone
- Line
- Outdoor
- Vibration
- Intensity
- 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 of sensorts, 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

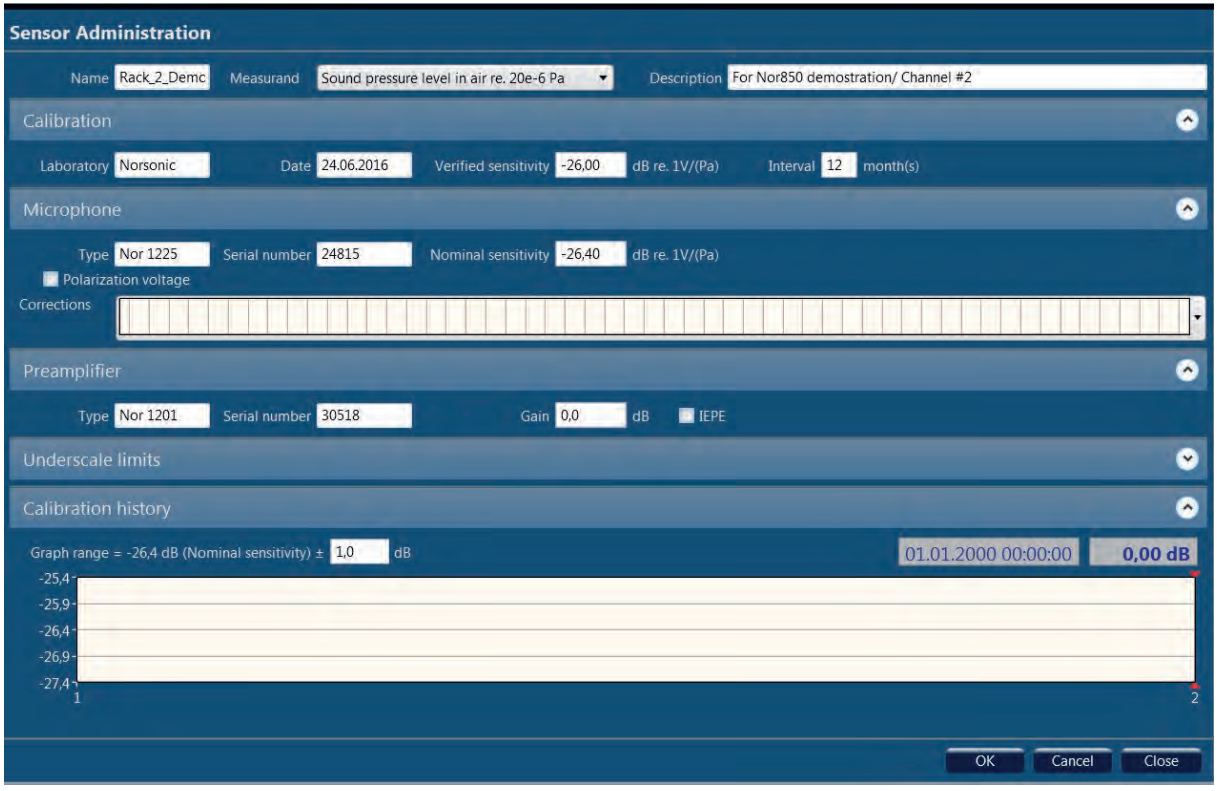
An existing database in one computer may be copied to another computer as an alternative to entering all the detailed information once again. The SA (Sensor Administration) is stored at the location C:\ProgramData\Norsonic\Nor850\Setups in your computer. In addition

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

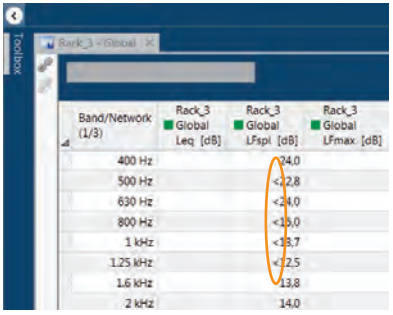
- *Type* is the producer and model of the microphone cartridge
- *Serial number* is the given serial number on the microphone cartridge
- *Nominal sensitivity* is used for the nominal sensitivity given by the producer
- *Polarization voltage* is used to indicate whether this microphone is depending on 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.

Underscale limits

- Here can you set in the underscale limits for networks, 1/1-octave, 1/3-octave. These values can from the microphone suppliers' technical handbook or set in manually by the customer yourself.
- When these sensors with under scale limits take measurements, you will notice a `<´ icon appears in front of the measured values randomly, which means the measured value is lower than the underscale limits.



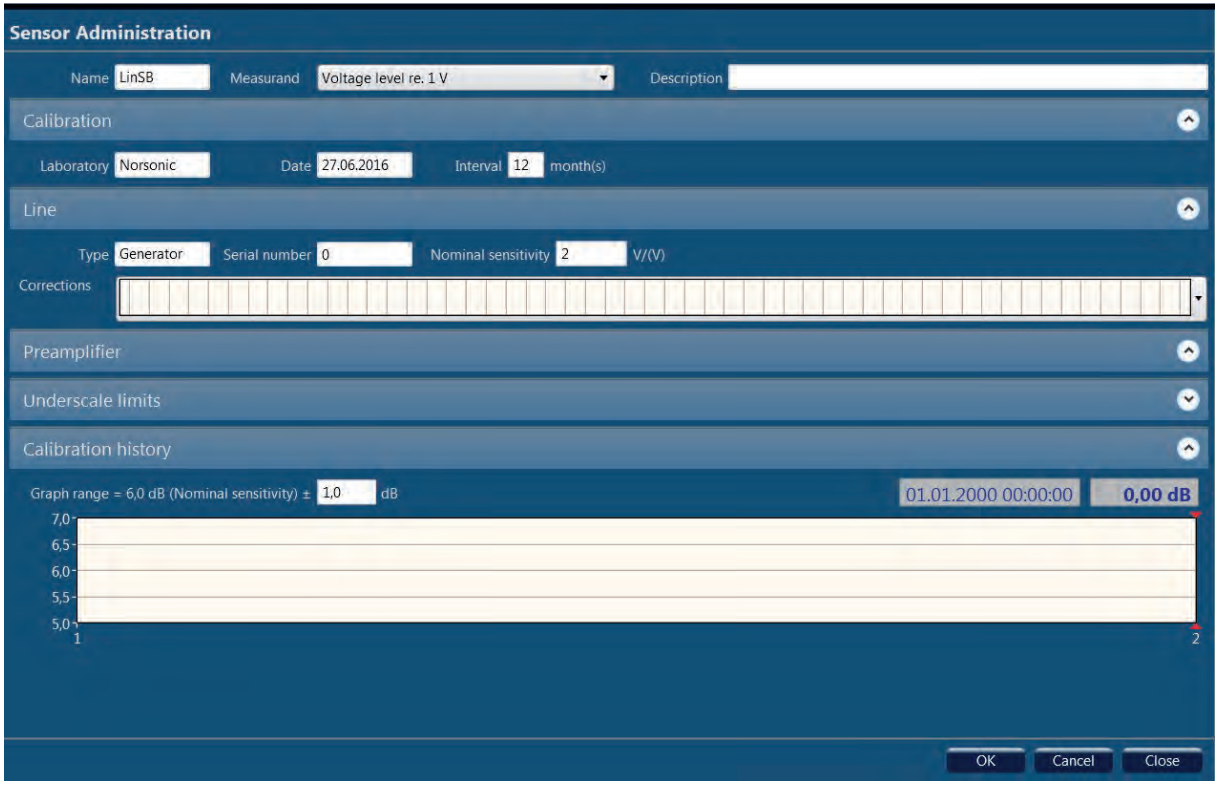
Calibration history

- *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

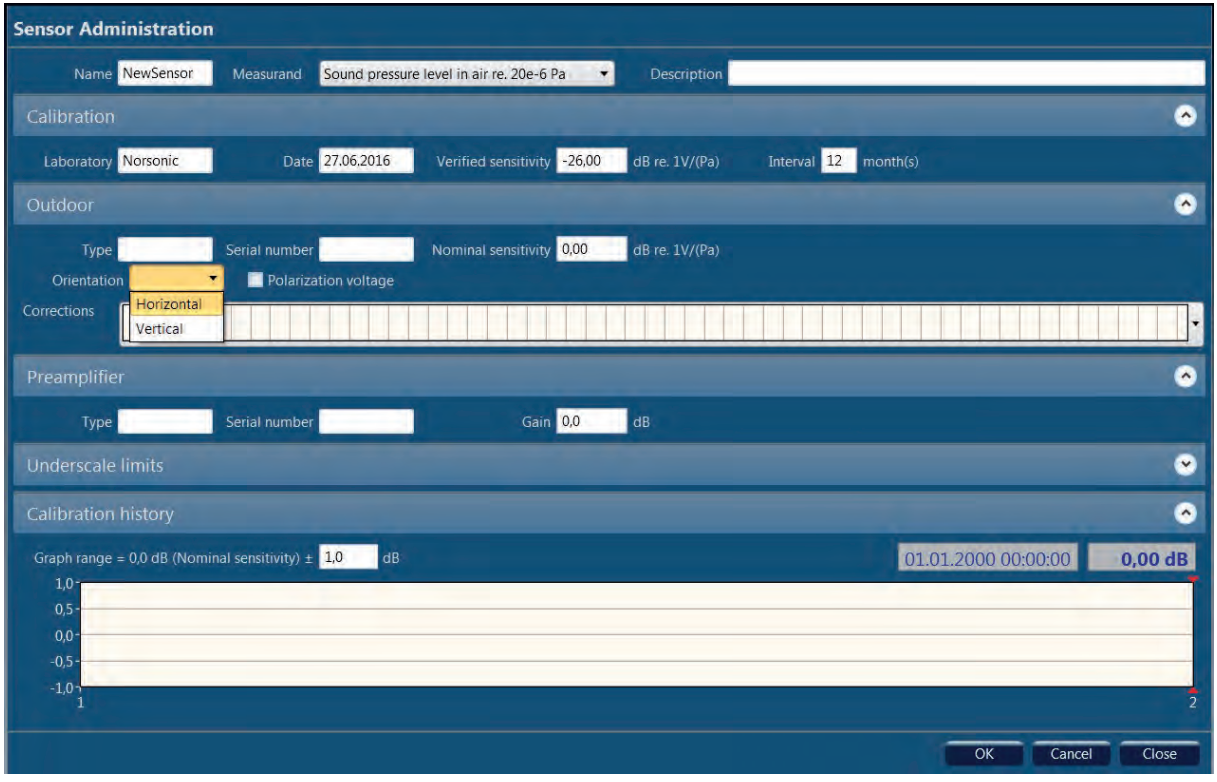
The line sensor is used when a line source is connected to the channel:

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.



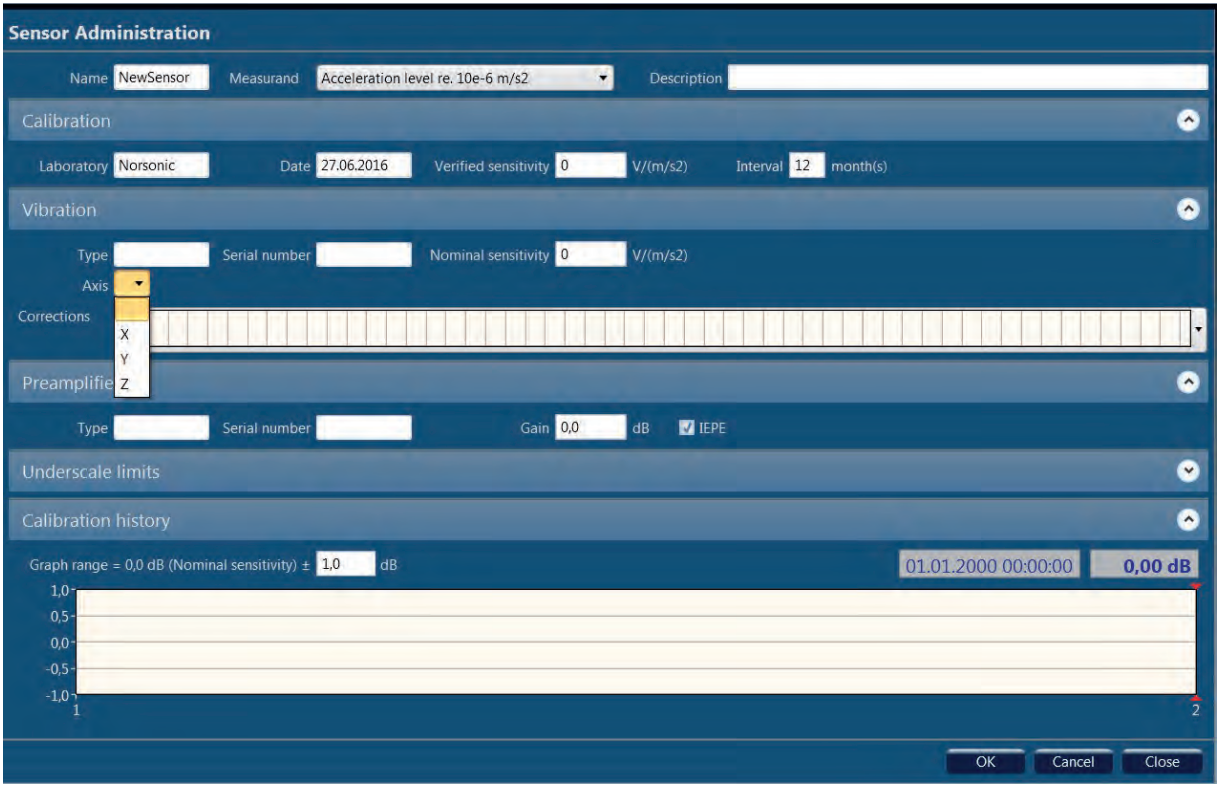
Outdoor sensor

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.



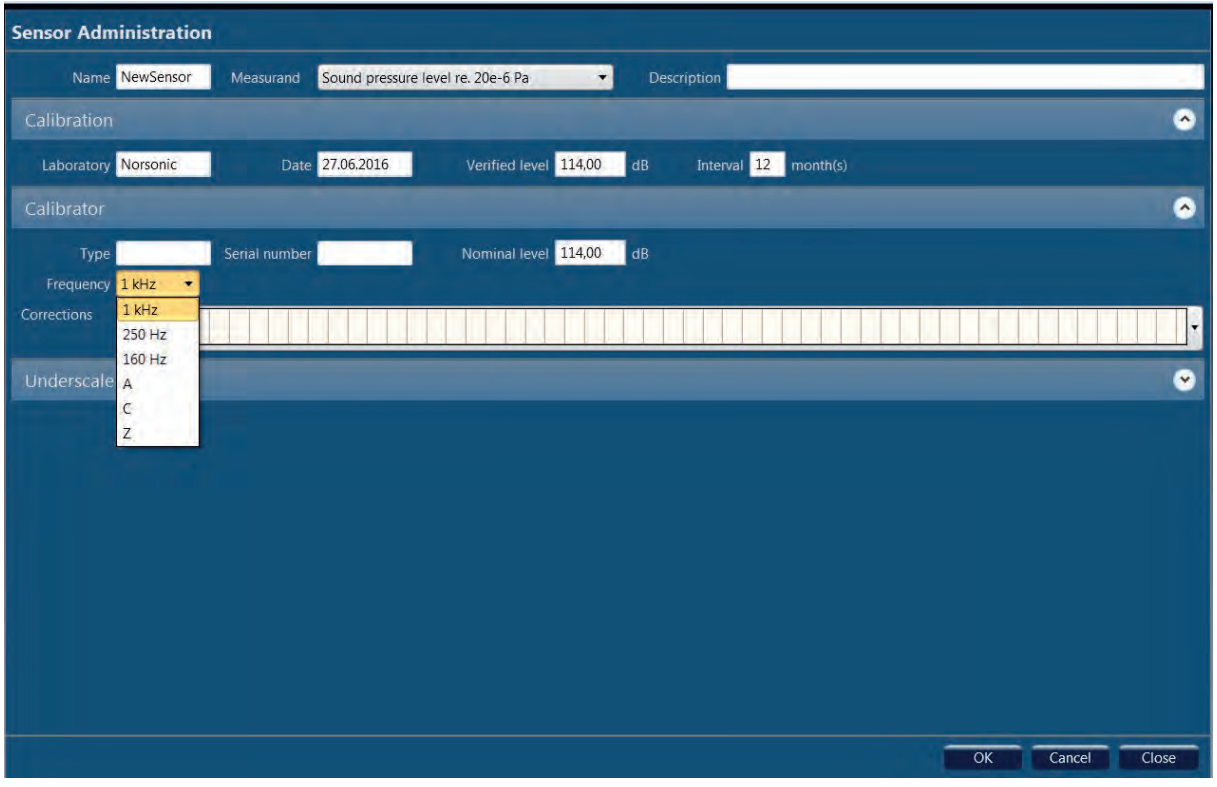
Vibration sensor

We also have vibration menu in sensor administration. There is not much difference 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

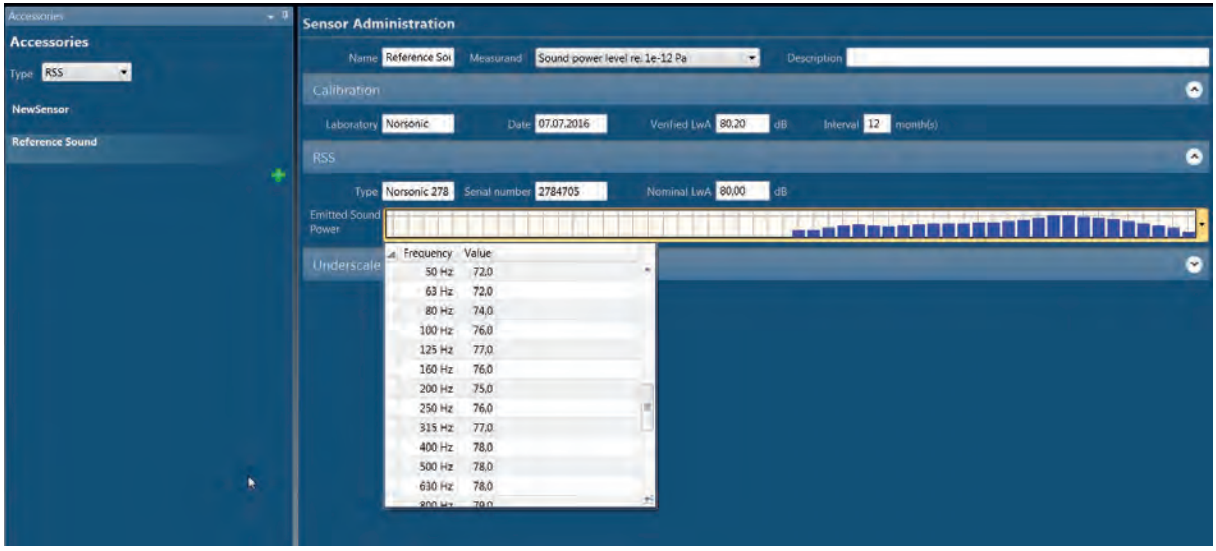
- *Laboratory* is used for the verification laboratory used at the latest periodic verification
- *Date* is used for the date of the latest periodic verification
- *Verified level* is used for the measured level of the latest periodic verification
- *Interval* is the selection for how many months the 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:

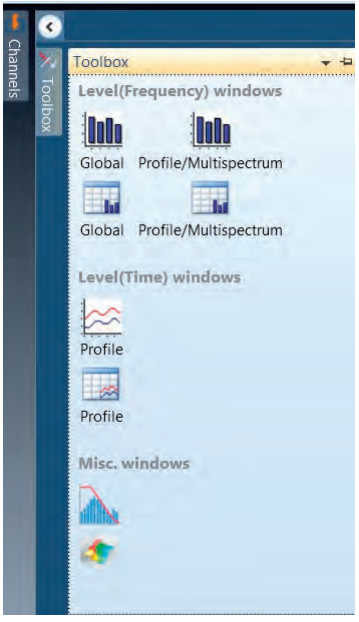
- *Measurement duration* sets the time before the measurement automatically stops. Measurements can be stopped before by clicking the *Stop* button.
- The *Profile* check box sets whether the function level profile will be measured or not. Profile means measuring the selected function at regular time 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 and 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 profile/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)'

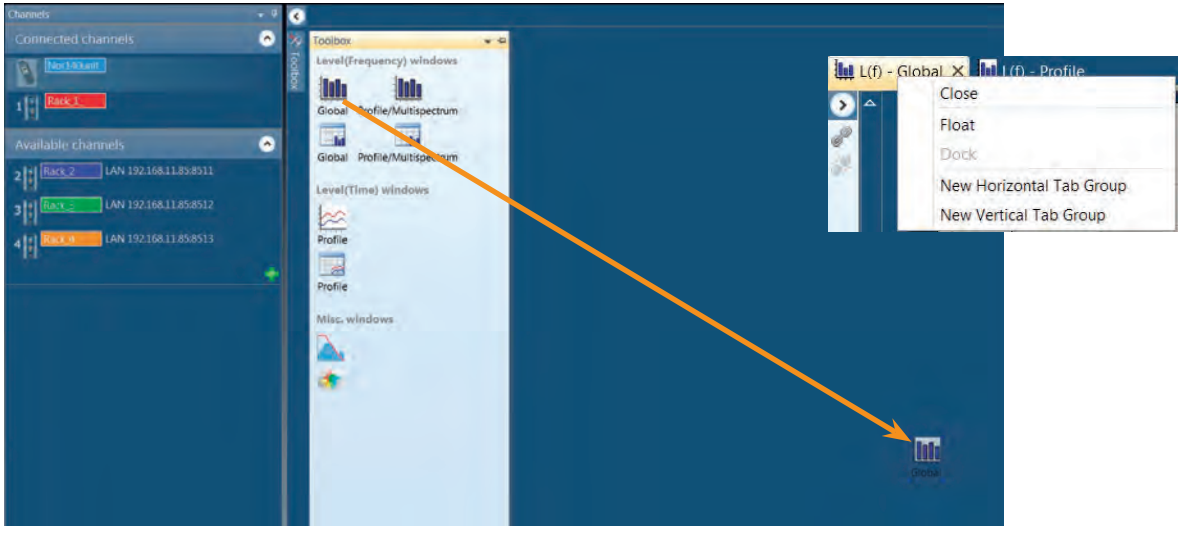
For Misc. windows

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

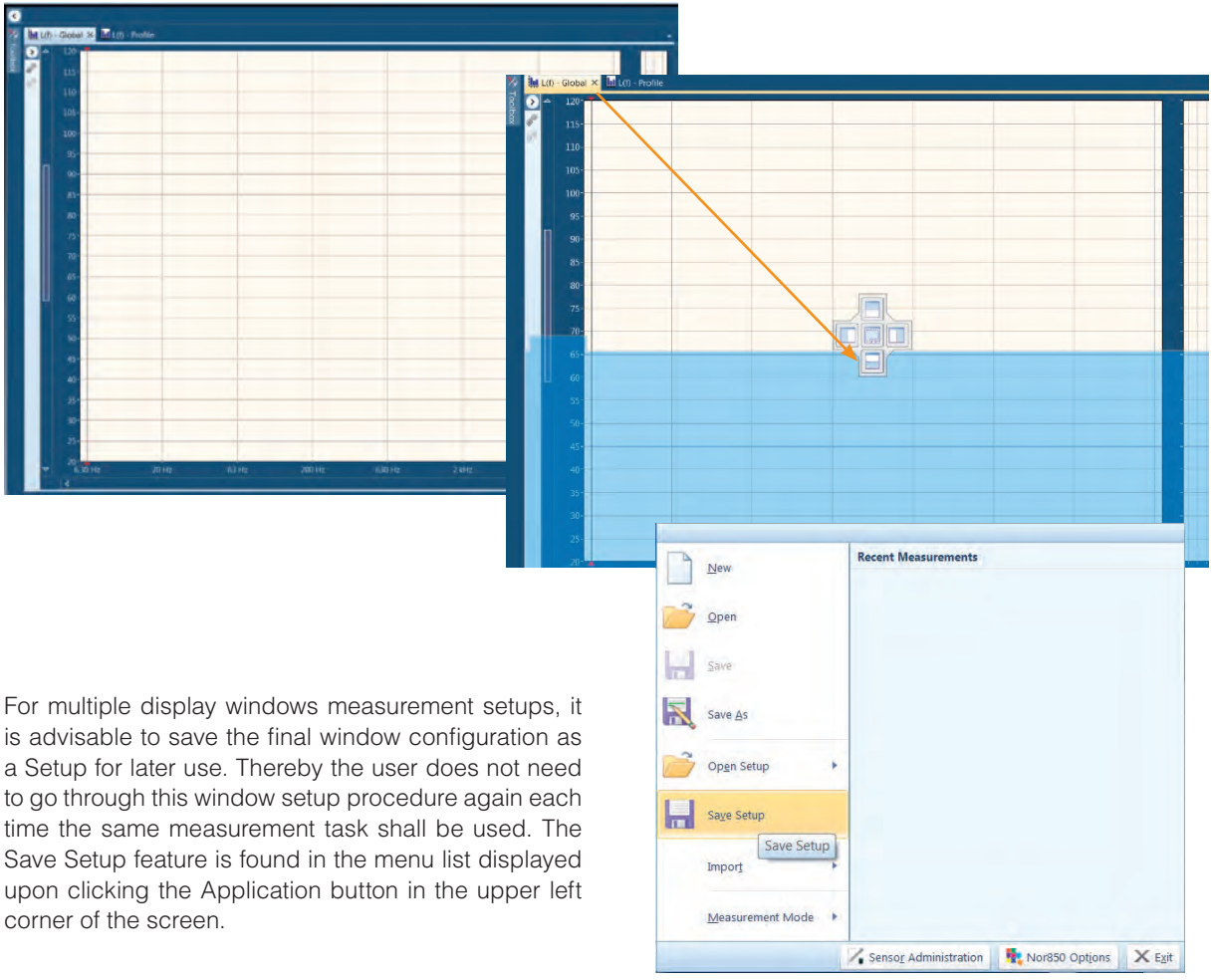
Click on the desired format and drag the selected window icon into the Workspace area.

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.



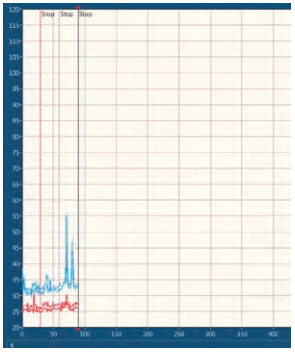
Alternatively, the user may click on the tab and drag the window onto the transparent guide that appears. By putting the window to the right or left, to the upper or lower, or to the middle, the selected window will appear respectively within the Workspace.



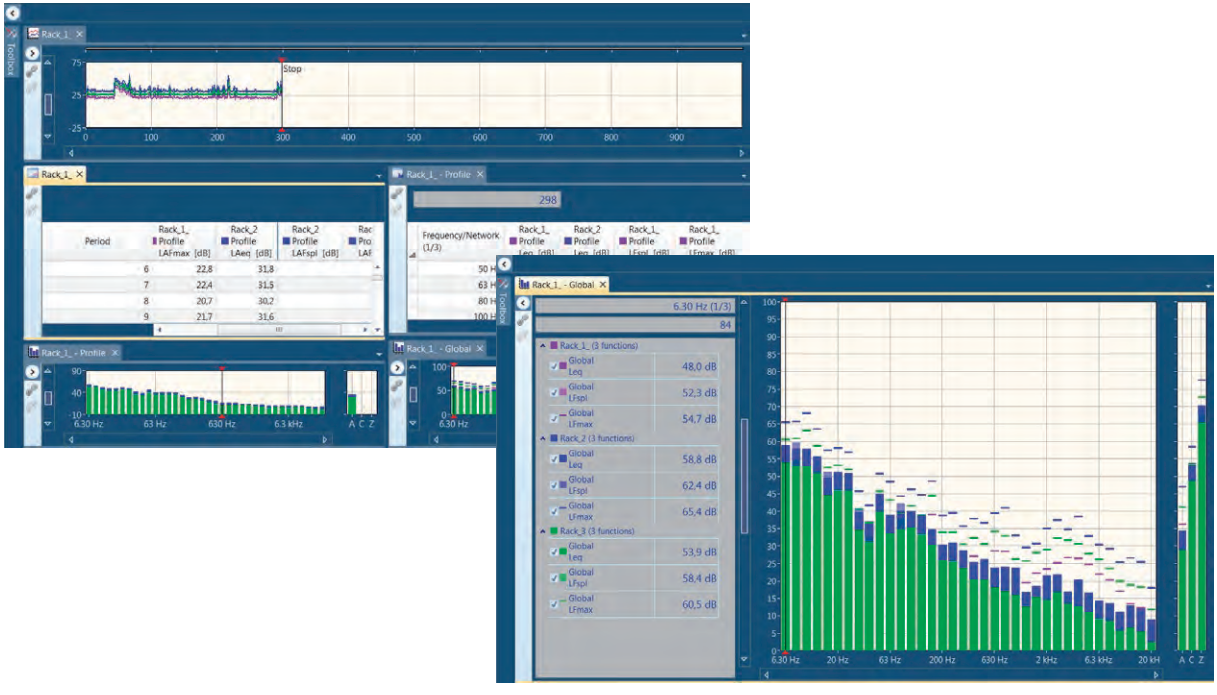
For multiple display windows measurement setups, it is advisable to save the final window configuration as a Setup for later use. Thereby the user does not need to go through this window setup procedure again each time the same measurement task shall be used. The Save Setup feature is found in the menu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

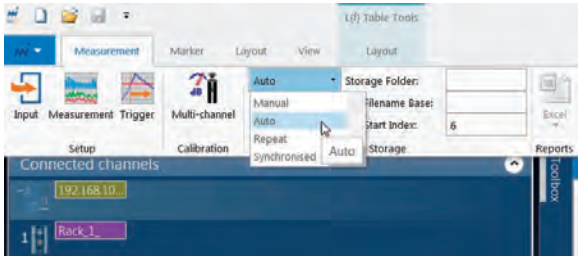


When a measurement is stopped, a stop marker will be displayed in the L(t) windows. Continuing and stopping the measurement will add more stop markers.



Storing a measurement result

It is important for the customers to know the different storage modes and what features Nor850 can offer. The configuration of the storage mode is set in *Measurement menu*.



A short description of the storage mode is as below;

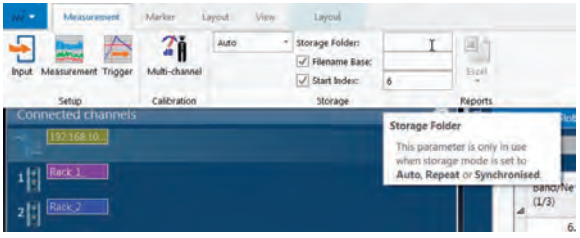
Manual - Results are not stored. If you want to keep the results then you have to save them manually by pressing the Manual button and the measurement results will be saved in the default file folder, where the customer used for saving measurement results last time. Of course, the customer can also select a new file route, file folder and file name to save measurement result.

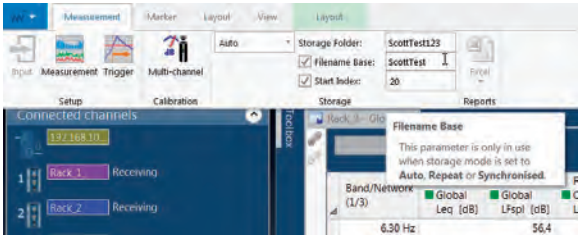
Auto - Every measurement is automatically stored after it is finished. There are guidelines in the lower frame on how new file names are supposed to be generated.

Repeat - The results are saved and a new measurement similar to the first one is immediately started.

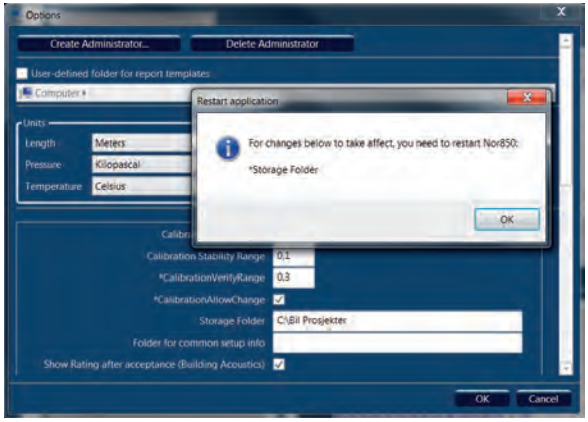
Synchronised - Similar as Repeat, but the next measurement is synchronized with the clock.

When the measurement storing mode is set to Auto, Repeat or Synchronised, the default storage file route is where the customer last time be there for storing measurement result. Still the customer must define Storage Folder, Filename Base and Start Index.

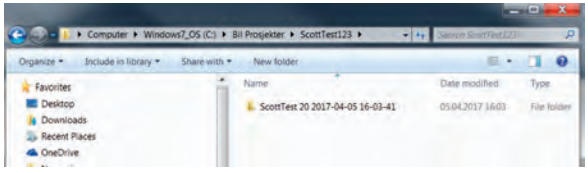




However, customers can also set up the Storage Folder in advance while you want to adopt *Auto, Repeat and Synchronised* storage mode. To perform this, please log in Nor850 as an administrator first, click on the *Nor850 Button*, and then *Nor850 Options* followed by filling in the destination *Storage Folder*, then restart Nor850 as required.

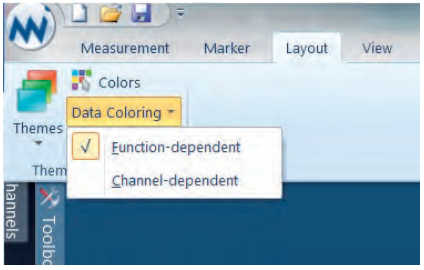


When you start measurement project, all the related measurement results will be saved in designated file folder, filename base as the prescribed start index.



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. L_{eq} or L_{max}, etc) will appear with the same colour for all activated channels. Hence it will be easy to distinguish between L_{eq} and L_{max} 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

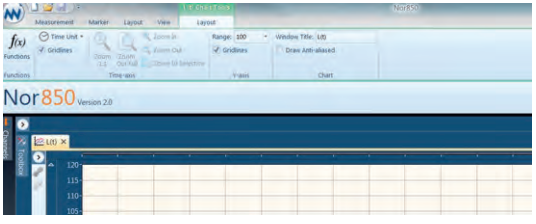
To open the L(t) *Display Properties menu*, right-click the *Display Window* and choose *Functions*. A new window appears:

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

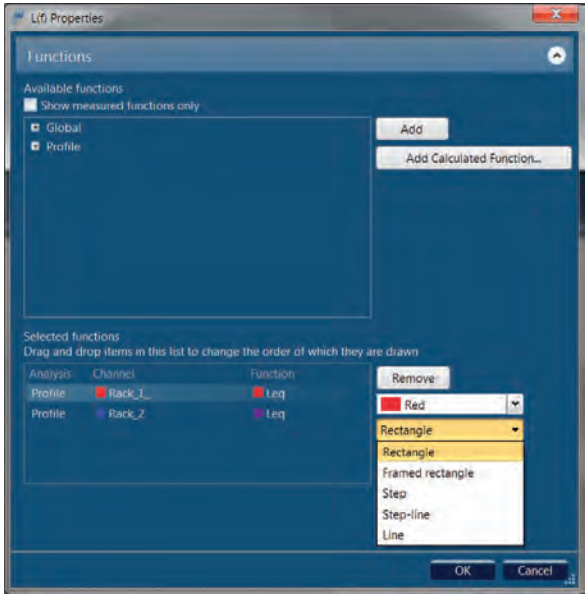
The *L(t) Chart Tools Layout* tab enables you to change the properties of the X- and Y-axis display. The Time Unit selection box sets whether the X-axis is numbered with Absolute time, Relative time or sample Periods. The Range defines the distance from the minimum to the maximum displayed Y axis value (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.



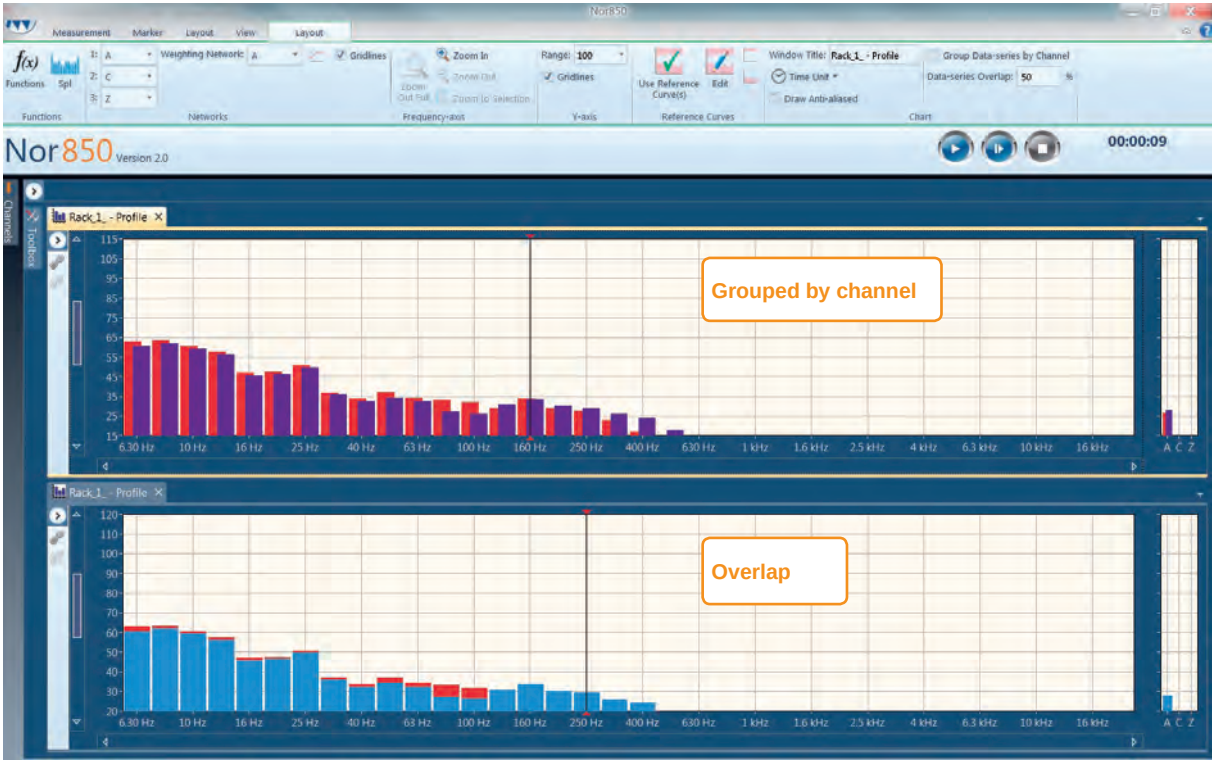
L(f) Properties

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.

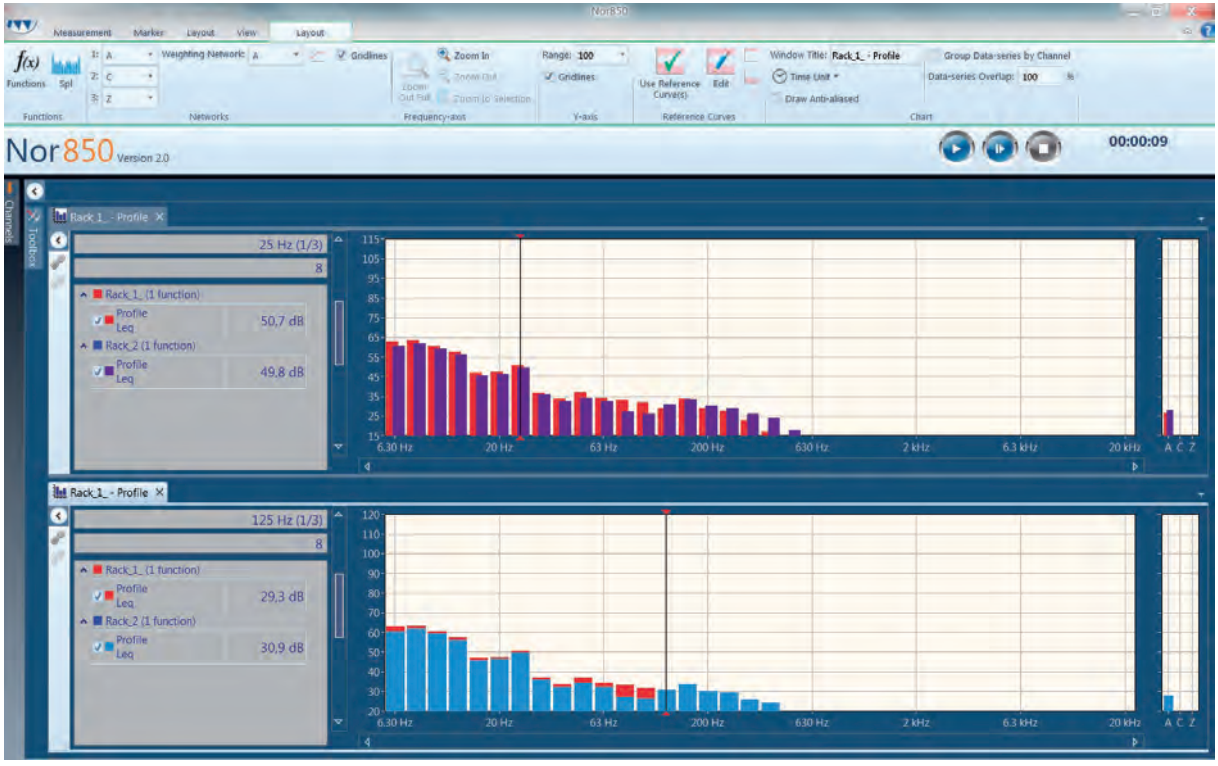


The additional *Layout* tab defines which weighting networks (A, C, Z) which should be displayed in the right part of the Display Window.

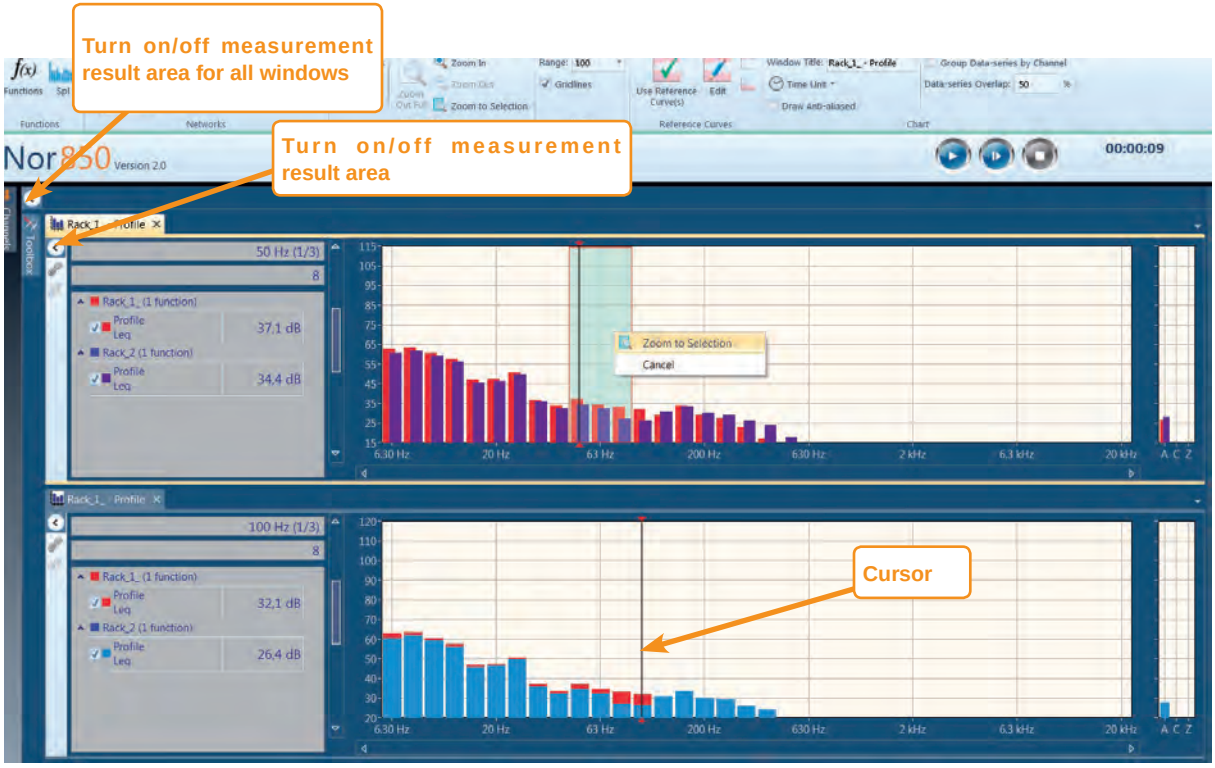
Cursor position measurement values

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.



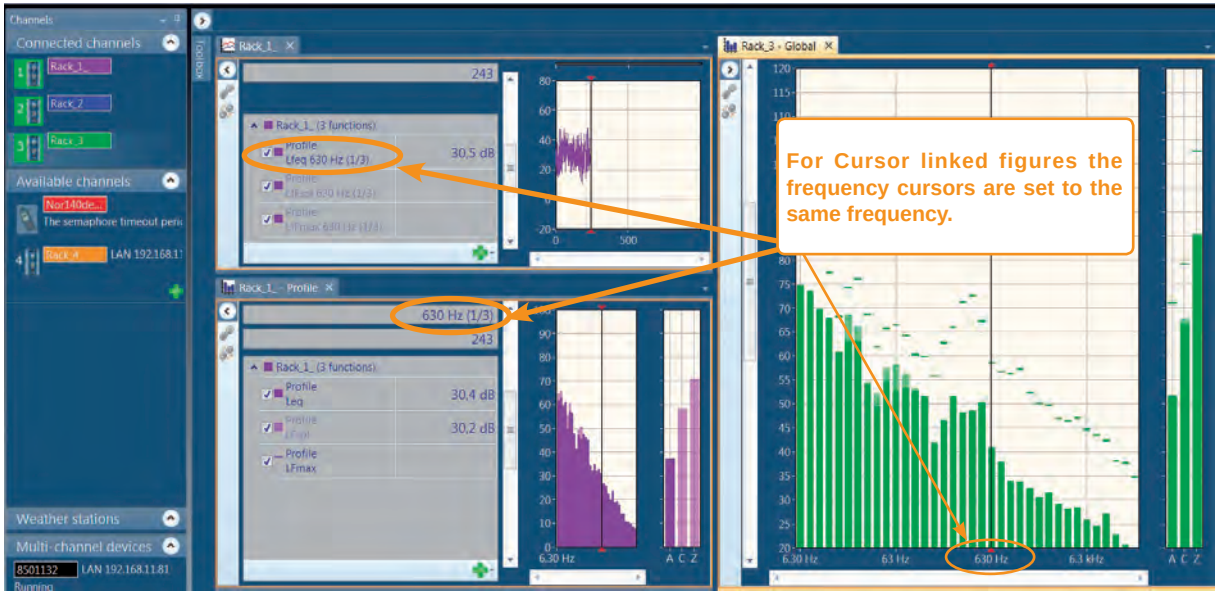
To zoom in the Display Windows, use the +/- magnifying glasses at the left hand of the window. There is also a *Zoom out full* and *1:1* button for quick zooming. To view a specific part of the measurement, click&drag to choose a part of the measurement, and click *Zoom to selection*.



Cursor link for measurements

For the Nor850 system, the user can utilize a new feature 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 internal 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, and all these 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 surrounded by a frame with same colour, meanwhile all those related figures will have both the chain link icon and the chain break icon activated.



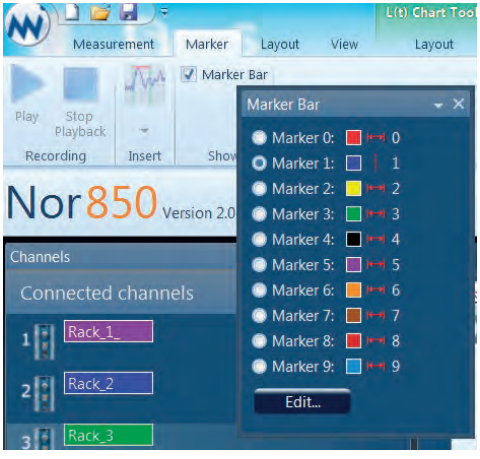
The Cursor link feature is very flexible for practical application. You can simply break the cursor link connection by clicking the chain break icon on the figure, then the cursor in that figure will be a free one again. You can handle the cursor as you want, for example, make cursor link again with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

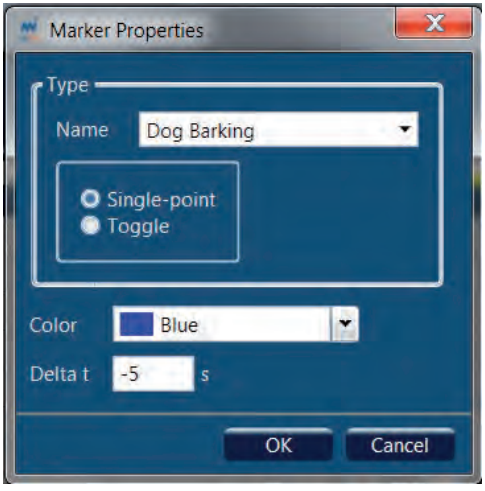
Measurement Markers

Measurement markers are effective tools for keeping track with the various noise sources that might appear during a measurement. And it helps to identify the causes of the overall noise level in the final measurement report. 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 are defined either as “Single-point” marker or as “Toggle” marker.

To pre-define the markers, select *Marker* in the menu bar and tick on the *Marker Bar*. The *Marker Bar* will then pop up.

Tick on any of the 10 listed markers (in the example, Marker 1 is selected), and click on *Edit*. The *Marker Properties* submenu will appear. For each of the markers you can define the name, select the marker type, select the marker colour and define the *Delta time*.





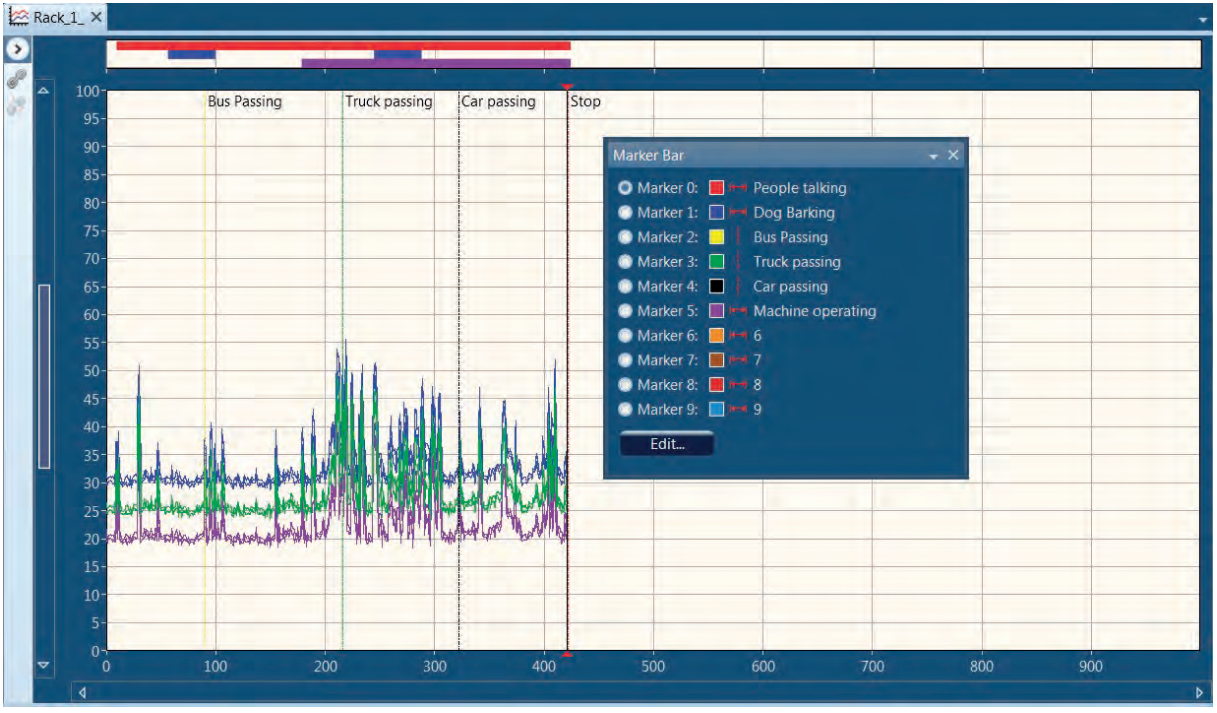
The *Delta t* feature is used for setting the marker earlier or later than the operator perform the actual setting. This is useful when unexpected noise events appear during the measurement, such as, for example, a dog barking loudly and randomly near our measurement site. This noise event could thereby easily be deleted from the overall measurement in the final report.

If the *Delta t* is set with a ‘-‘ (minus), the corresponding marker will be set before the actual time, and if it is set without it will appear later (i.e. with a delay). In the example, it has been set to -5 seconds as appropriate for dog bark noise. When the operator hear the bark noise from the dog, pushing Ctrl+1 buttons will set the marker 5 seconds before the button is pressed.

In an external noise measurement situation, there are several noise sources in the area. Traffic noise from driving buses, trucks and cars on the road, speaking noise from inhabitants during daytime with random dog barking noise and possibly machine operating noise. To prepare for such a measurement, the Marker Bar should be setup as in the example below. Here markers are defined for traffic noise from busses, trucks and cars as Single-point marker, while people talking, dog barking and machine operating noise sources as Toggle marker.

All markers may be used individually and simultaneously during the measurement duration. This is illustrated in the following example:

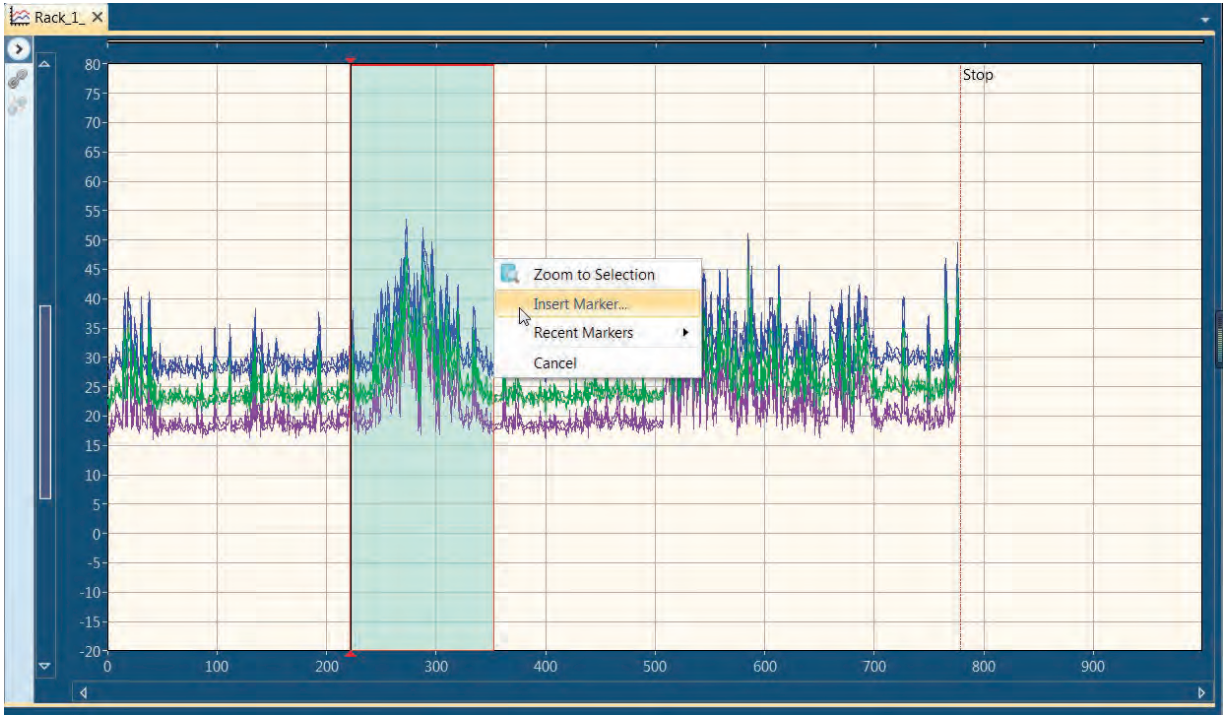
As soon as the noise measurement is started on site, Ctrl+0 may be pressed since this talking noise last for the whole measurement duration. This can be seen as the red bar running continuously in the upper part of the profile graph. When a bus passes, press Ctrl+2 and a new marker line appear in the profile graph along with word indication “Bus Passing”. If a truck passes, press



Ctrl +3, and for a car, press Ctrl +4. All these Single-point marker lines and word indication will be displayed in the profile graph accordingly.

Occasionally, if a dog is barking, Press Ctrl+1, and a blue toggle bar will appear in the upper part of the profile graph. When the barking noise stops, press Ctrl +1 again to stop this toggle marker. Similarly, press Ctrl+4 when the machine is running to start Toggle marker 4, and press Ctrl+4 again as the machine stops to end this toggle marker.

Should any unexpected noise sources appear during the measurement, the operator may select a part of the measurement data from the profile curve, which will open a submenu automatically. Use the “Insert Marker…” feature in this submenu to make a dedicated marker for this special event.



In addition to the above described user defined markers, there are some system markers that may be inserted automatically during the measurement:

Pause: This Toggle-marker indicates that the measurement has been paused, and a corresponding grey area is shown in the L(t) graph.

Stop: This Single-point-marker is set at the last period in the measurement.

Overload: This Toggle-marker indicates the measurement has had a signal-overload.

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

Work-overload: This Toggle-marker indicates that the measurement device detected it would not be able to perform all selected measuring tasks, and as a consequence the system has switched off one or more measurement parameters.

In addition, there are possible special markers only when opening a measurement taken by the Nor150.

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

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

Comment: This marker indicates that a spoken comment exists. Appear as Single-point marker if the comment is made prior to the measurement start, or as Toggle-marker for comments made during the measurement.

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

Pause/Continue Marker

The Nor850 offer a special Pause / Continue function with user defined back-erase of the last part of the measurement data. This feature is very useful for removing unwanted noise events from the overall measurement results.

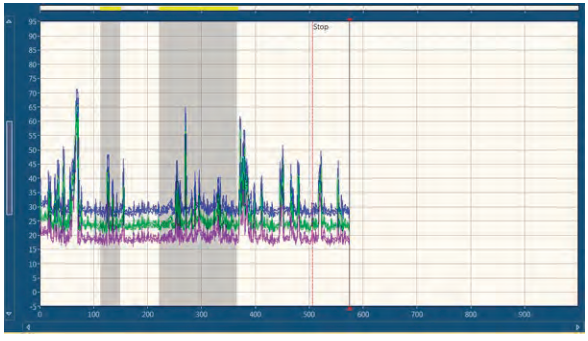
When paused, the instrument display the A-weighted time profile for the last 20 seconds of the measurement. The operator may then move the time cursor backwards to the left of the unwanted noise event and resumed by pushing the *Continue* button. Measurement data acquired for the Global functions to the right of the time cursor in the pause picture will be removed from the Global measurement. So will the measurement data taken between the push of the Pause button until the push of the *Continue* button. This applies to the statistical values as well. If there was an overload in the selected time span, this will also be deleted from the overall measurement. However, all data taken for the Profile measurements will remain, but with a special "Pause" Toggle-marker as well as a grey background in the display.

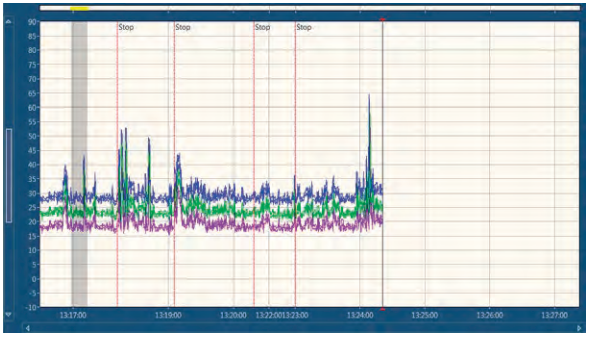
The user may select which of the measurement channels that should be displayed in the Pause-window as a time profile of the last 20 seconds. Please note, though, that Pause feature will affected all used channels, even those not displayed in the present window.

The back-erase feature is very useful as it can be adopted to erase unexpected noise such as dog barking noise in inhabitant areas as mentioned in a former example. By pushing the Pause within the first 20 seconds after the unwanted noise event, moving the cursor to the left side of the event and pressing Continue, the unwanted event is removed from the Global measurement functions. And the Pause marker is inserted in the time profile for easy identification of the paused area. The Pause markers are transferred to the post processing and reporting program NorReview which produce the final report. In this software the unwanted noise may even be included in the Global measurement data again should that be found necessary due to the fact that the Profile measurement data still exists.

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.



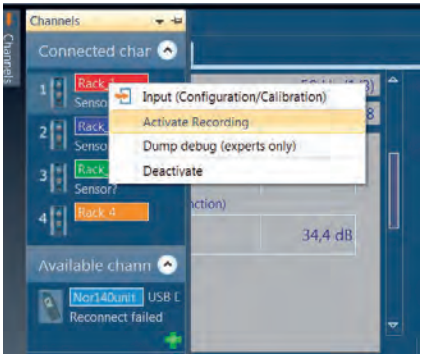


Audio Recording

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.

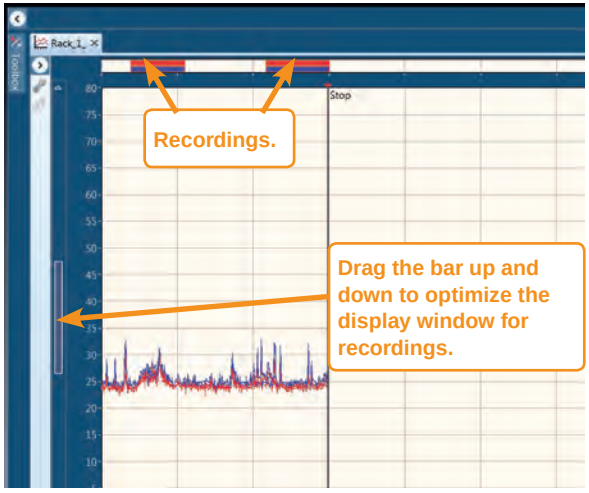
To make a recording, a channel must be activated for recording. This is done by right-clicking an activated channel and clicking *Activate recording*:



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

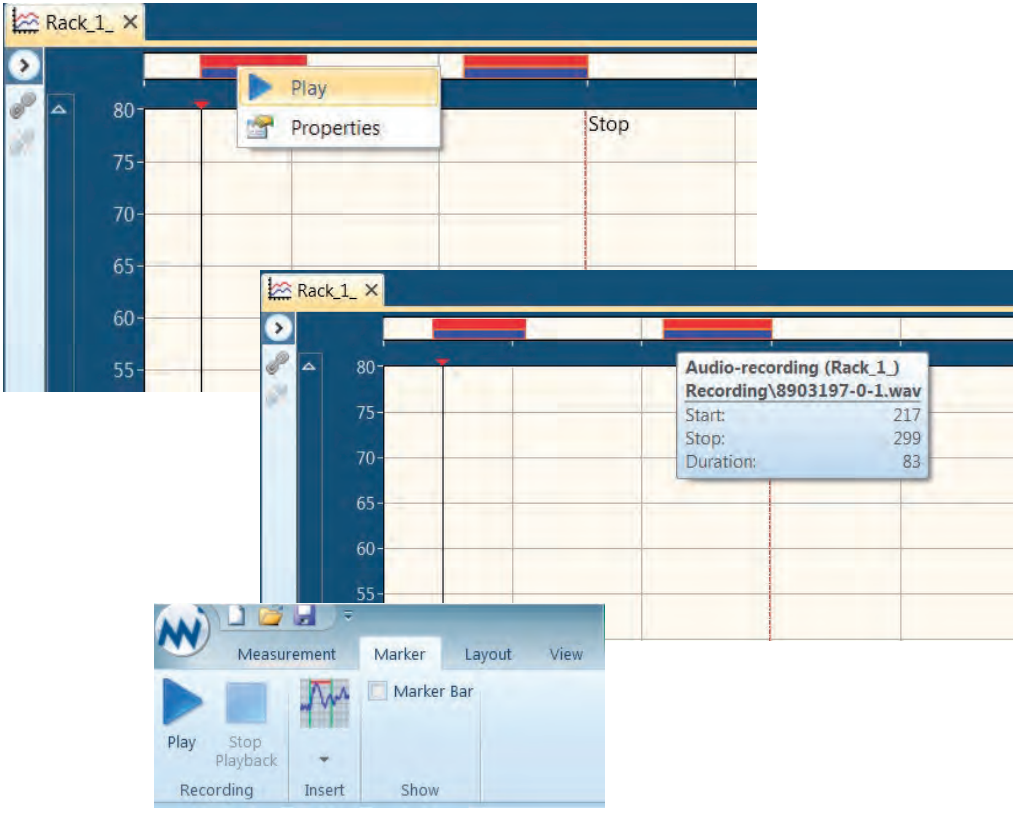
To start recording audio, Open an L(t) window and add the channels you want to record, and start the measurement. A recording can then be started/stopped by pressing the Ctrl+R keys. Multiple recordings can be done during one single measurement (for example, during a traffic measurement, the recording can be manually started when a car is passing and stopped when the car has disappered.

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.

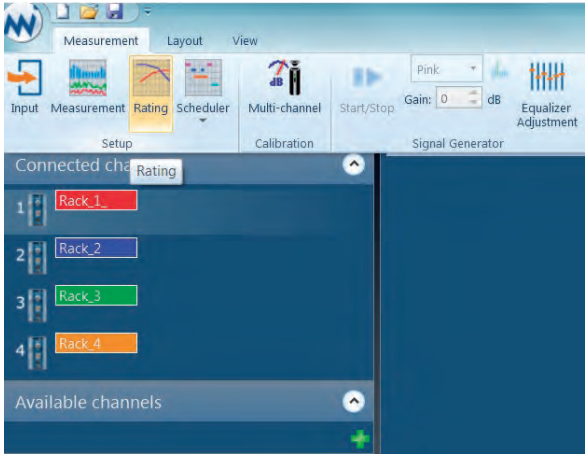
The recorded WAV-files can be found in the *\Nor850\data\Project_Name\Recording folder* on your hard drive.


Rack_1_
Play
Properties
Stop
80
75
70
65
60
55
Rack_1_
Audio-recording (Rack_1_)
Recording\8903197-0-1.wav
Start: 217
Stop: 299
Duration: 83
Measurement
Marker
Layout
View
Play
Stop Playback
Marker Bar
Recording
Insert
Show

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

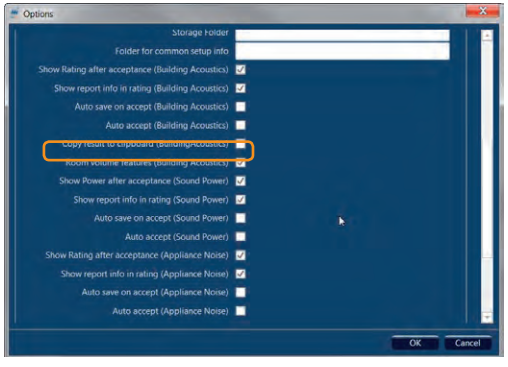
This *Rating* menu contains several sub-sections for setting the different properties of the upcoming sound insulation calculation, or, for pre-entering text descriptions for the final test report document. Some of these are mandatory for the selected Standard which is indicated by a red line around 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

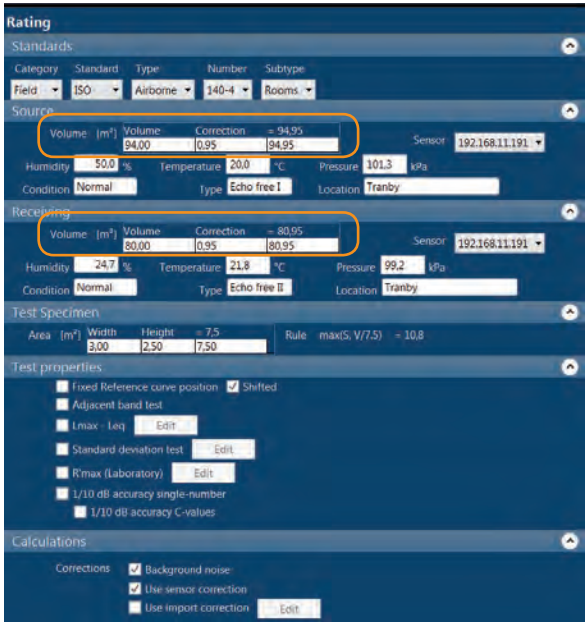
- *Category* is used for selection among the pre-defined Standard categories Field, Laboratory or Others
- *Standard* is used for selecting the different Standard group such as ISO, ASTM or other national groups
- *Type* is the selection of Airborne, Impact, Façade or similar.
- *Number* is used for 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
- In version 2.3 of Nor850, it is also implemented of the German standard DIN 4109-4 for Hall-room and Staggered rooms

Source

- *Volume* is the actual volume in the source room given in m^3
- If you open the Nor850 options in Nor850 Button, and tick *Room volume features (Building Acoustics)*.



Then you can set Volume correction in both Source and Receiving room. This is just fit for the volume correction due to adopt in test specimens with various thickness.



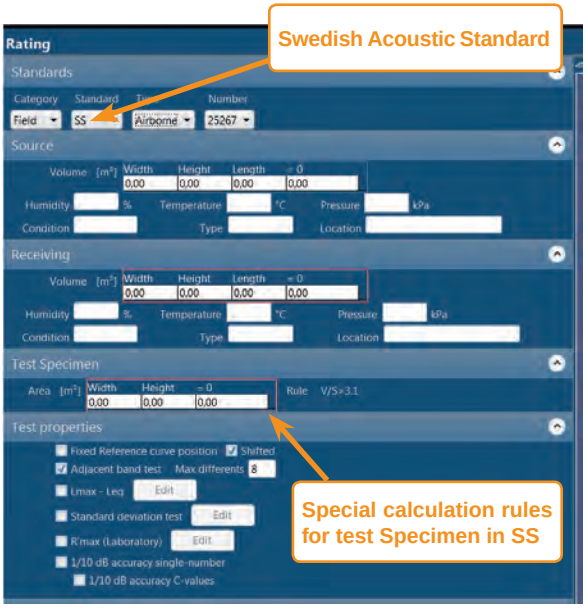
- *Humidity* is the humidity in the source room measured in %
- *Temperature* is the air temperature measured in ˚C
- *Pressure* is the air pressure measured in kPa
- *Condition* may be used for describing the condition of the source room
- *Type* may be used for describing the actual type of source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



- For some laboratory standard, it is also possible to set various numbers of samples in Test Specimen in the sound absorption measurement.

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.

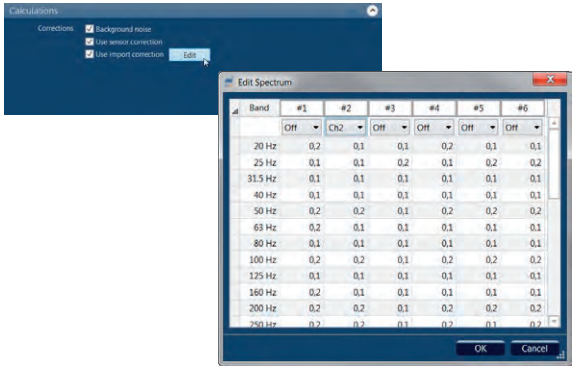
- *$L_{max} - L_{eq}$* tick-box is used for activating the check of maximum differences between the L_{max} and the L_{eq} values for the different measurement positions. This is handy for evaluation of any possible short-term external noise during the measurement duration. The user may specify the maximum 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 will 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*.
- In Nor850, there is a correction mode *Use import corrections*. This is a very necessary correction mode when you import a *.nbf measurement files, which is performed by another equipment and another microphone sensor before.

  Please click on the *Edit* button on the screen, and set in the correction values for all the microphones on hand in case the customer has more than one instrument with microphone.

  In this case, you should key in the corrections for all microphones available. But before you import the *.nbf files you have to make sure only the column corresponding with the microphone in charge is activated and all others are OFF.



  The correction values can be applied to both channel 1 and channel 2. They are added to the corresponding measurement values during the data import.

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

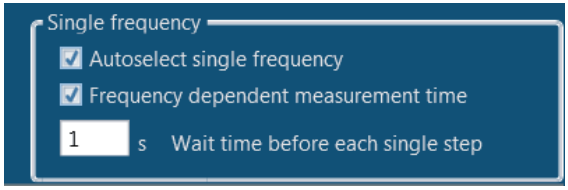
- *Excitation Type* is used for selecting the actual method for detecting the correct decay. Noise is used for operation with the external noise generator, and Impulse is used for operation with an external impulsive noise. When several measurement channels are connected simultaneously, the Nor850 system 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 a*t 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 T_{20}, T_{15}, T_{30} or T_{max}. 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.

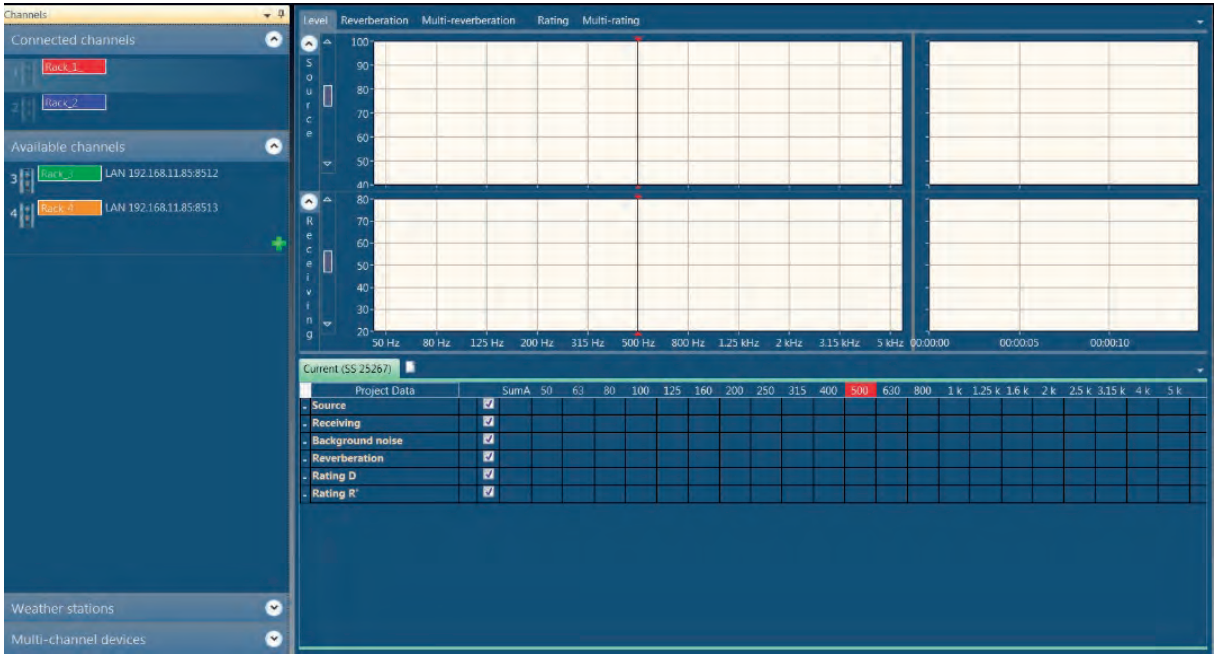
Generally speaking, it will take longer time for taking reverberation time measurement in lower frequency band than in higher frequency band, by ticking on *Frequency dependent measurement time* tick -box, you can set different measurement time corresponding to different frequency band, then you can 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.

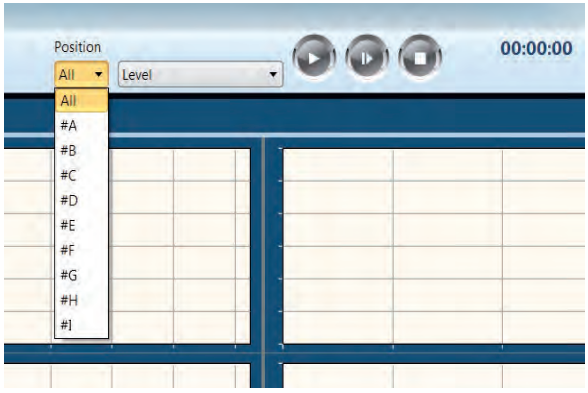
Multi-reverberation contains the calculated RT corresponding level vs time decay in the mid-section for the 1/3 octaves frequency.

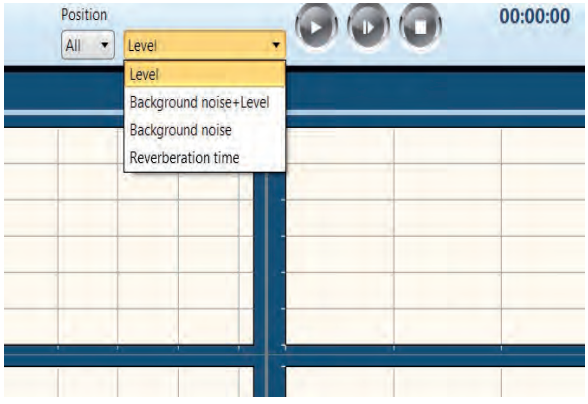
Rating contains the graphical view of the measured sound insulation including the reference curve and the calculated index in the entire upper mid-sections. In this tab it is also possible to enable/disable the background noise correction by toggling the *Background noise* checkbox. Thus the user can 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*.

- In the very top section, the operator finds the *Measurement Mode* selector, the l*oudspeaker Position* selector, the *Start/Continue/Stop* push buttons, and the measurement duration indicator.

  Measurement Mode selector is used to select which kind of measurement to perform upon hitting the Start button. The normal choices are Level, Reverberation time, Background noise, and Background noise + Level. However, the range of selections will vary with the various Standards.

  Position selector is used to identify which loudspeaker position that is used for the upcoming measurement. This is necessary when performing tests which requires multiple loudspeaker positions with individual rating calculations (such as the ISO 10140-2 and ISO 16283-1). The Position selector may be used for the various Tapping Machine positions during Impact tests as well. Up to 9 different positions is possible, and the measurement data will automatically be grouped accordingly in the tabular view. If no such grouping of measurement data is required, use the *All* setting.

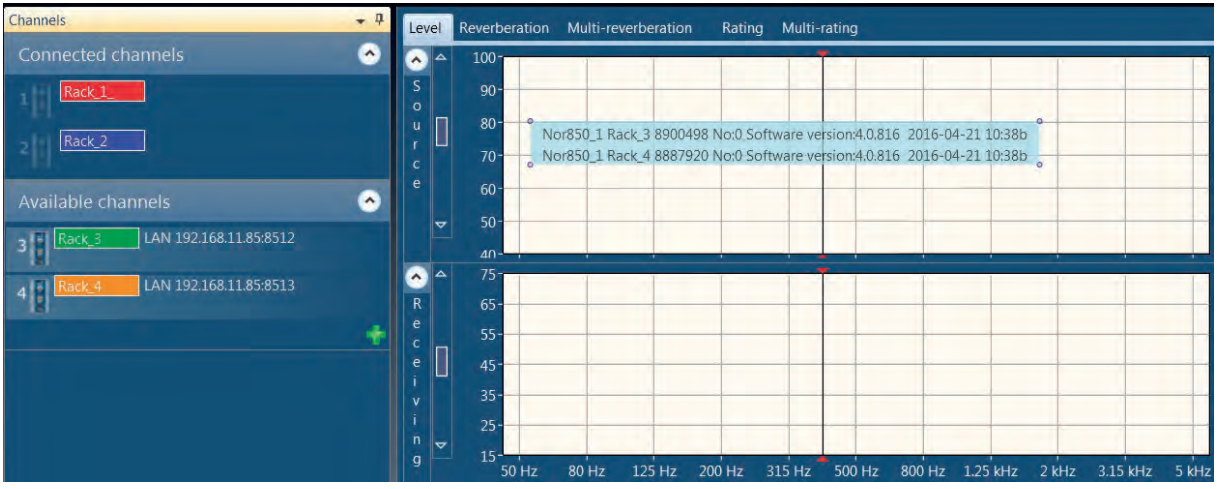




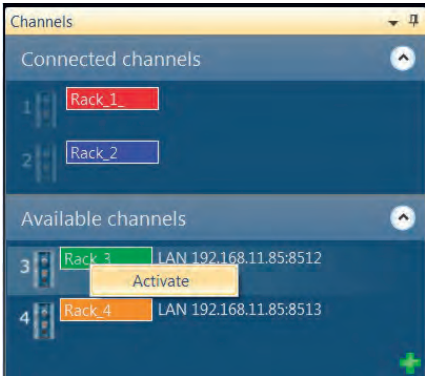
Activating the available measurement channels

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.

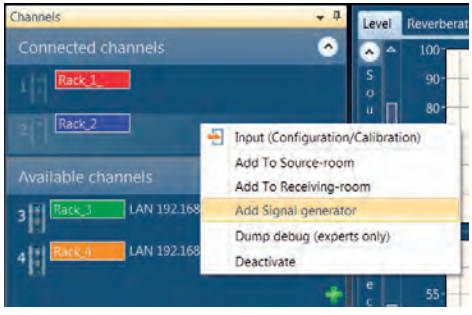


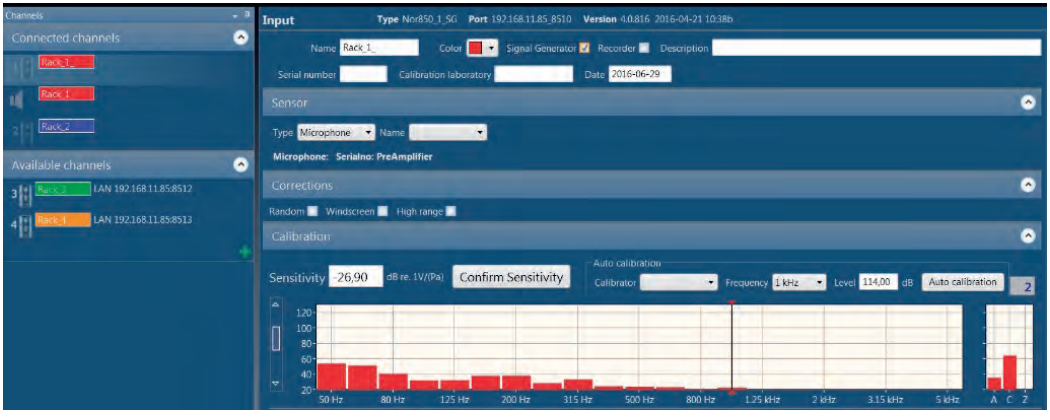
Alternatively, the user may first activate any available channel into the *Connected channels* area, and then place the activated channel into the source or receiving room by click & drag. The activation of the channels is either done by click & drag, or, by right-click and selecting the *Activate command*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





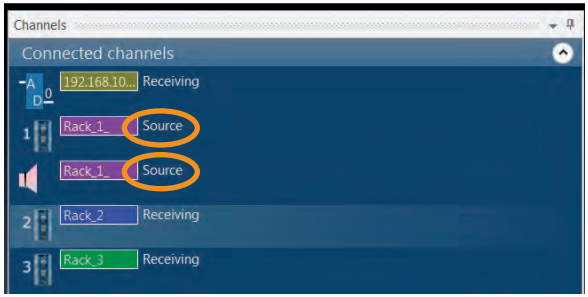
When channels with activated signal generator are placed in the source or receiving rooms, the operation of the signal generators will automatically follow the selected measurement mode. That means produce excitation signal in the source room channels during level measurements and excitation signal in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

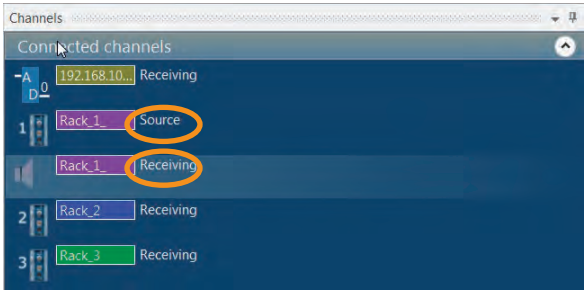
Signal generators can be used either in Source room or in Receiving room independent of measurement channel positions

We usually set a measurement channel in one room (for example, Source room), and add signal generator to that channel, which means that both measurement channel and signal generator position are located in, the same room, Source room.

However, for some customers, if they have not so much spare measurement channels on hand, then they have to separate the measurement channel and signal generator in different locations.

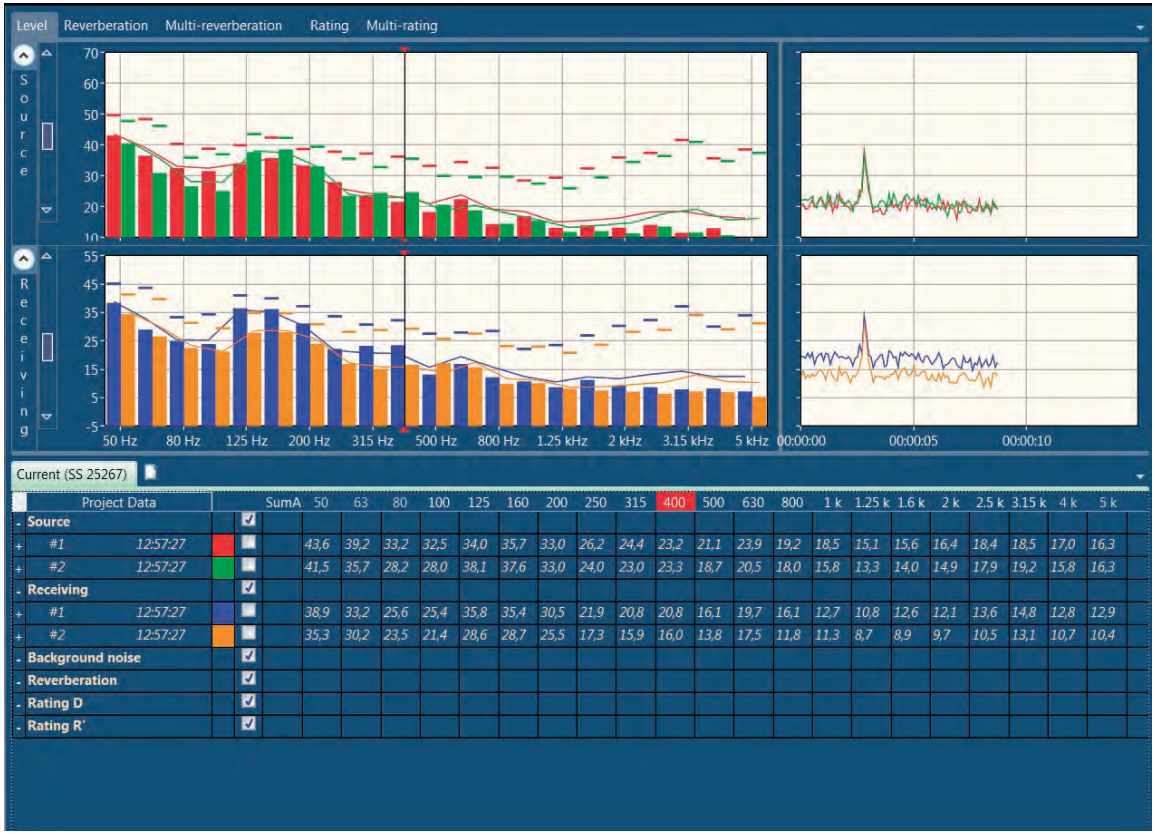
Since this feature is mostly used in Building Acoustics Mode, you can just drag the signal generator Rack_1 into Receiving room and now the signal generator can be used in Receiving room for measurement work.



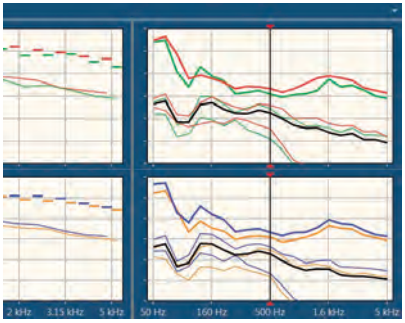


Making the Level measurements

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, 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 useful when using long time measurement duration while the background noise mayl vary during the whole procress.

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

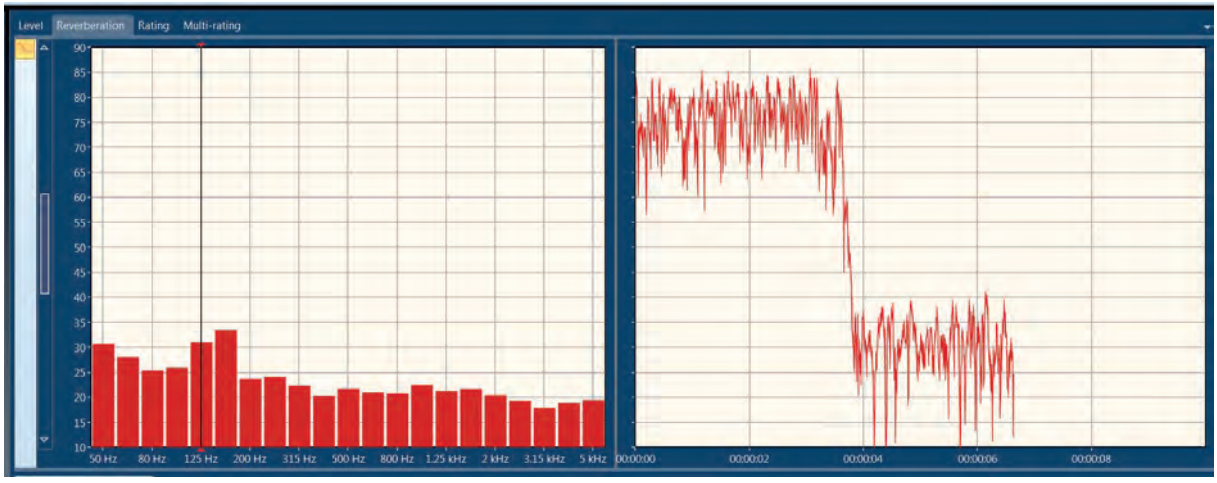
Set the measurement mode selector to Background noise, and push the *Start* key in the upper right corner. The display will then show the frequency spectrum of the receiving room in the same way as for the level measurements. In the right-section, the measured background noise will be presented together 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

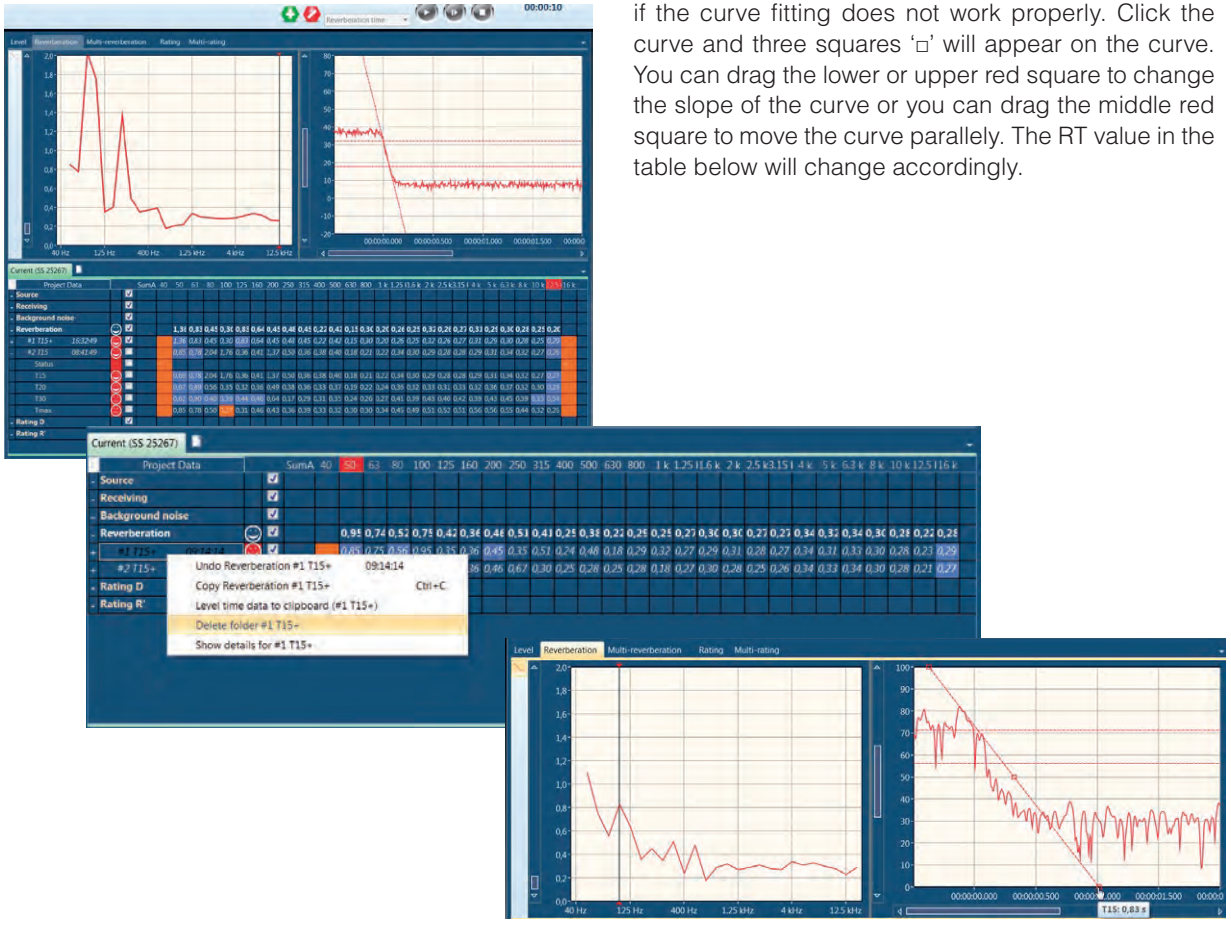
The loudspeaker connected to the signal generator of the measurement channel dedicated to the receiving room must be in place, and the measurement mode selector must be set to *Reverberation time* prior to the reverberation time measurements. Pressing *Start* will initiate the measurement.

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 T_{15}/ T_{20}/ T_{30}/T_{max} 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.



When the reverberation measurements data has been accepted, and you later decide opposite, you can delete the measurement by right click it in the table 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 clip-board (#1 T15+)' or 'Show details for #1 T15+'.

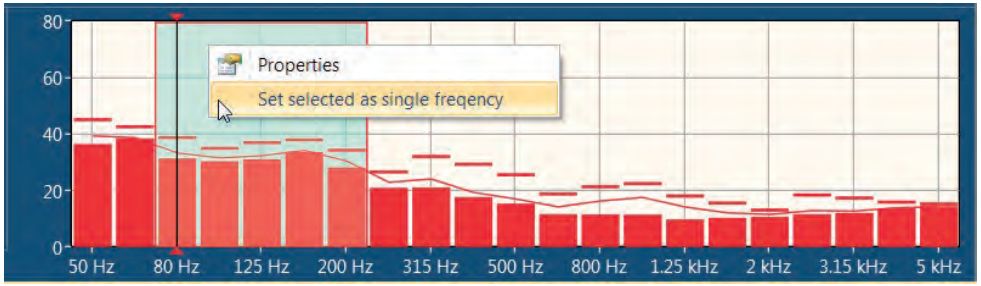
It is possible to manually change the resulting RT curve if the curve fitting does not work properly. Click the curve and three squares '□' will appear on the curve. You can drag the lower or upper red square to change the slope of the curve or you can drag the middle red square to move the curve parallely. 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 too low even 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.

Remember to tick on the *Autoselect single frequency* tick-box in the *Measurement menu/ Signal Generator/ Single frequency/ Autoselection* single as 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 frequency 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 section will be modified after each single frequency band measurement was finished.

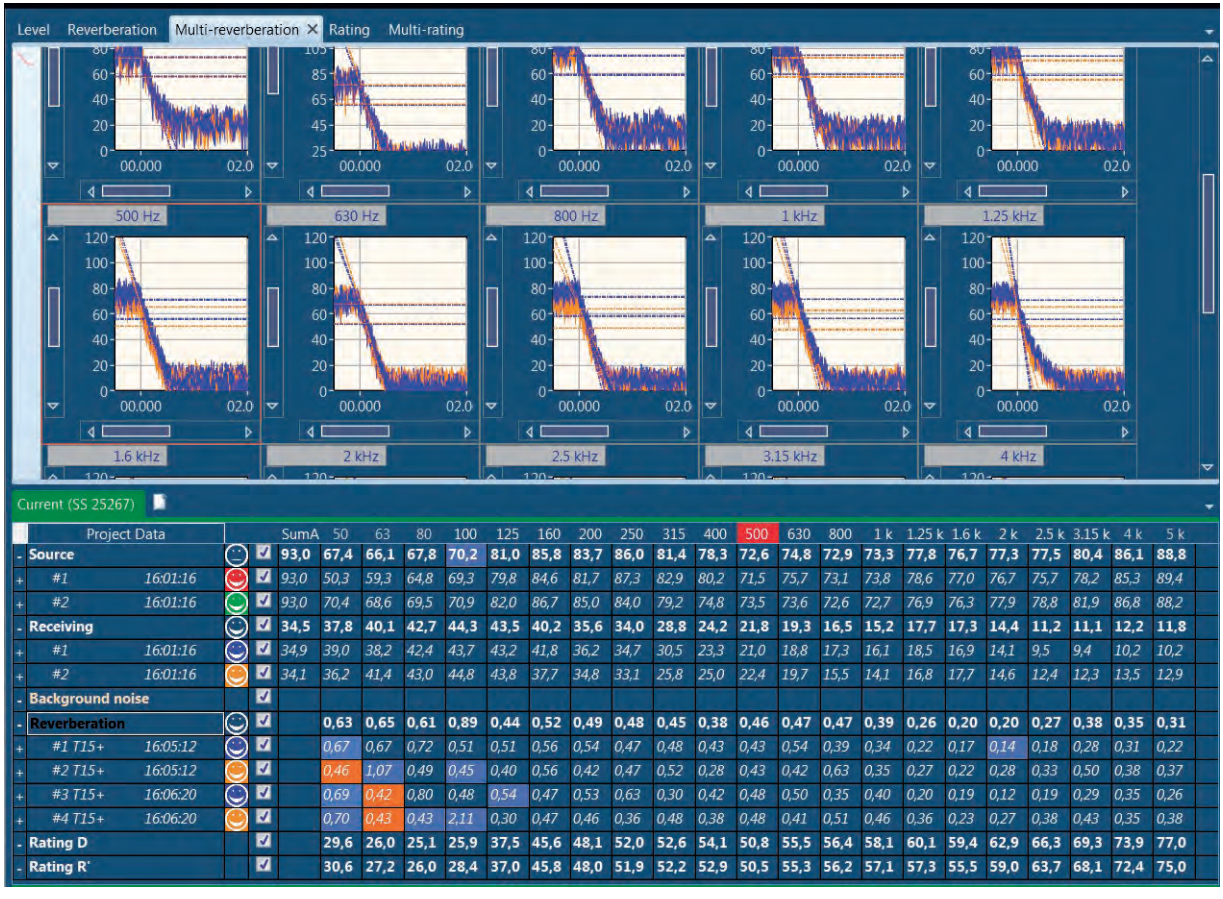
The single frequency selection will now be stored and automatically performed for the following measurements, since the same measurement settings must be used for all other measurement positions.

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 $T1_5$/ 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.



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

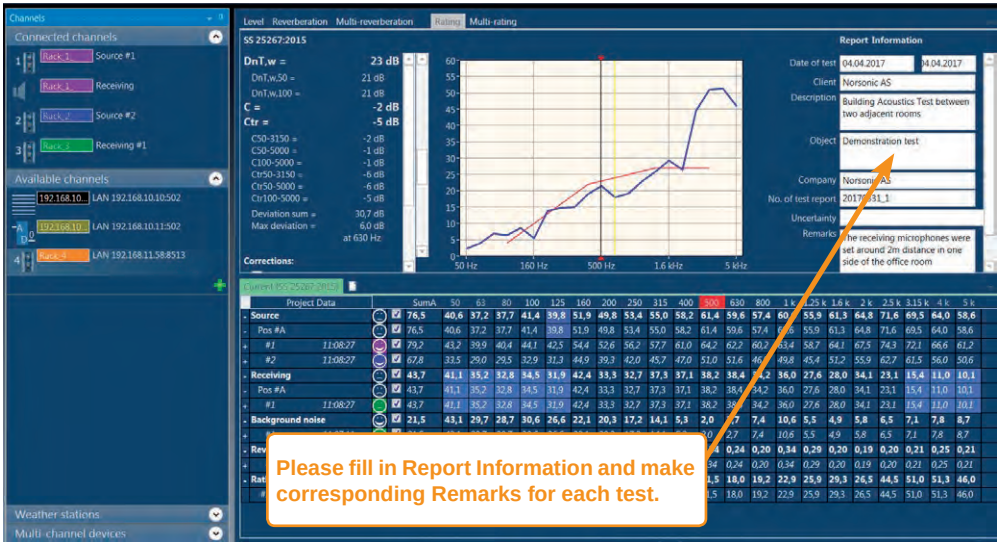
Evaluating the final results in the Rating display

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

In order to fit for the Swedish Standard, Nor850 also provides the rating parameter as DnT,w,50, DnT,w,100 (If measurement standards is as follows, Category: Field; Standard: SS; Type: Airborne; Number: 25267:2015 or 25267). The relationship between them is as follows:

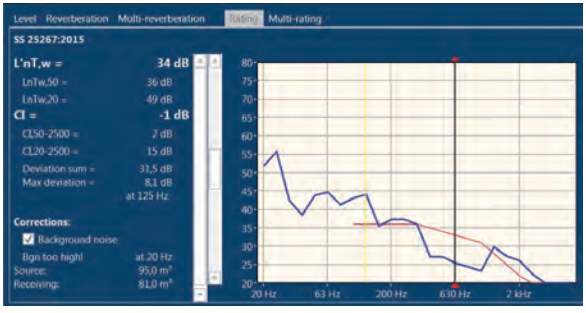
$$DnT,w,100 = DnT,w+C$$
$$DnT,w,50 = DnT,w+C50-3150$$

and LnT,w,50, LnT,w,20 (If measurement standards is as follows, Category: Field; Standard: SS; Type: Impact; Number: 25267:2015 or 25267).

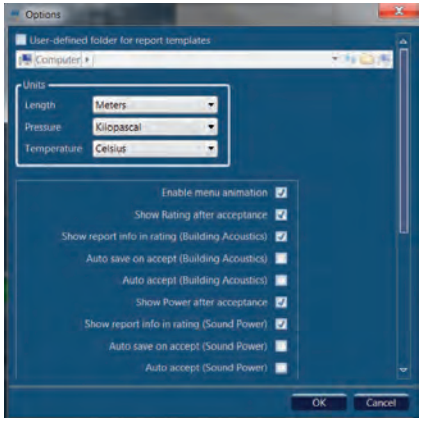


The relationship between them is as follows:

$$LnT,w,50 = \max\{ LnT,w,\ LnT,w+C50-2500\}$$
$$LnT,w,20 = \max\{ LnT,w,\ LnT,w+C20-2500\}$$

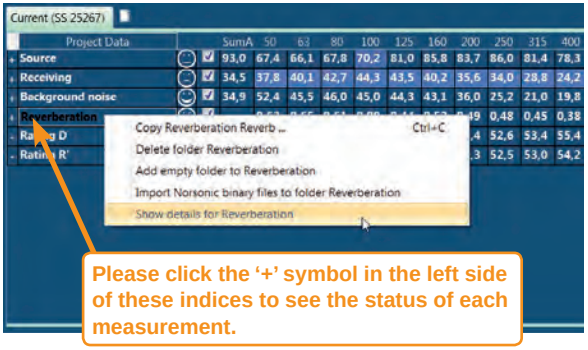


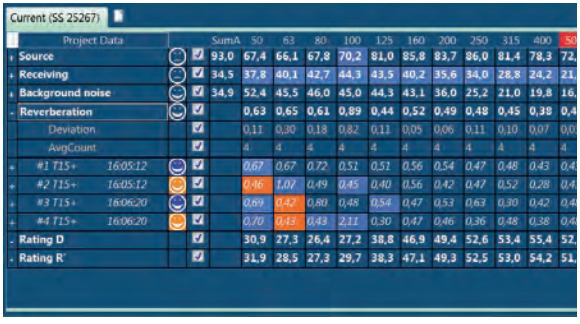
Alternatively, turn on the automatic rating view selector to allow the system to switch automatically to the rating view each time new measurements are accepted. The *Show Rating after acceptance* switch is found in the *Nor850 Options* menu available after clicking the *Norsonic logo* in the upper left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

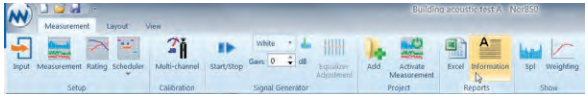
Also you can check the details for these index by click the '+' in the left side of these indices and then right click these index and select *Show* details for these index', you can get the deviation value, average times and also measured resulting values in each 1/3 oct frequency band.





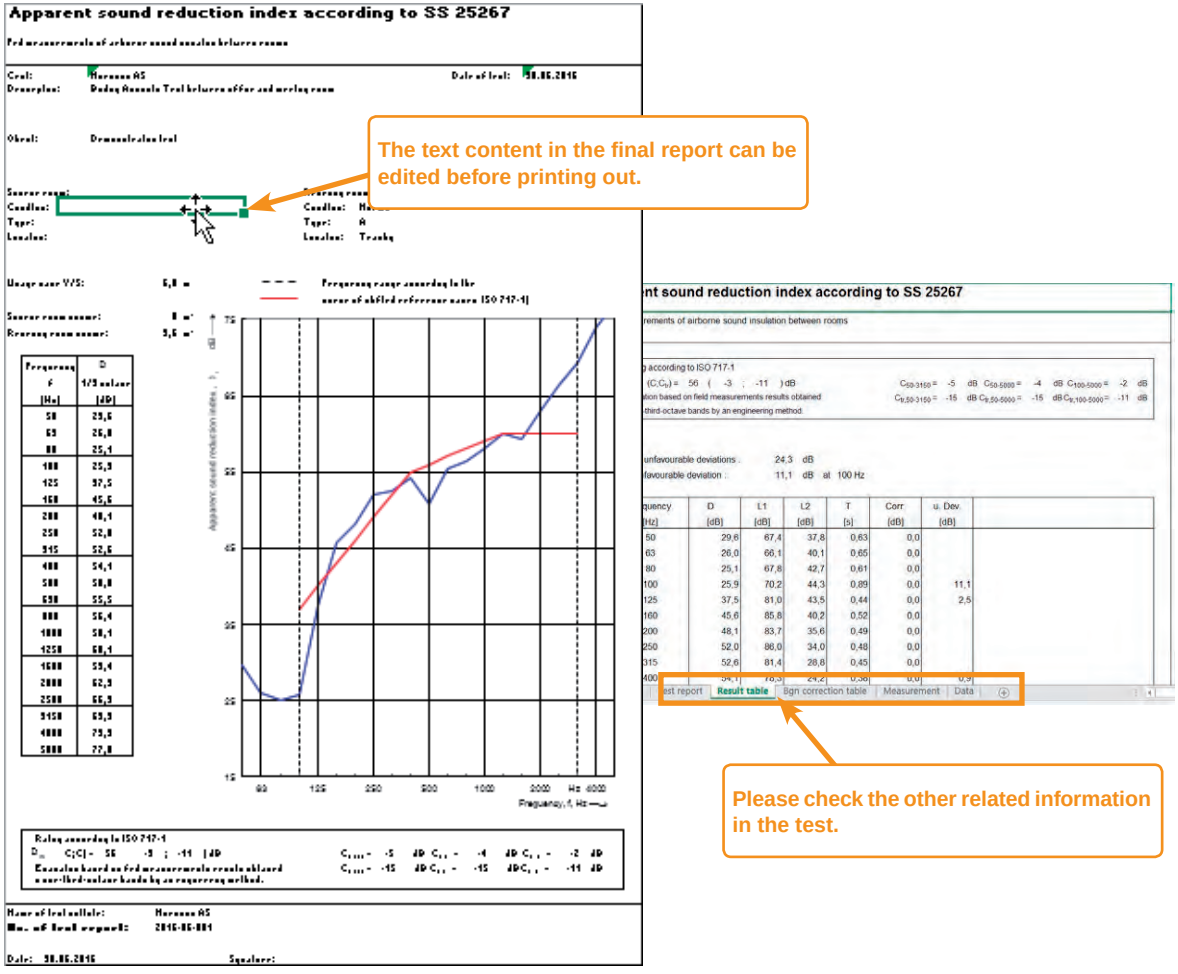
The calculated index may be viewed with or without background noise correction. Simply activate the function by a click in the *Background noise* tick-box in the left part of the upper-section.

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.



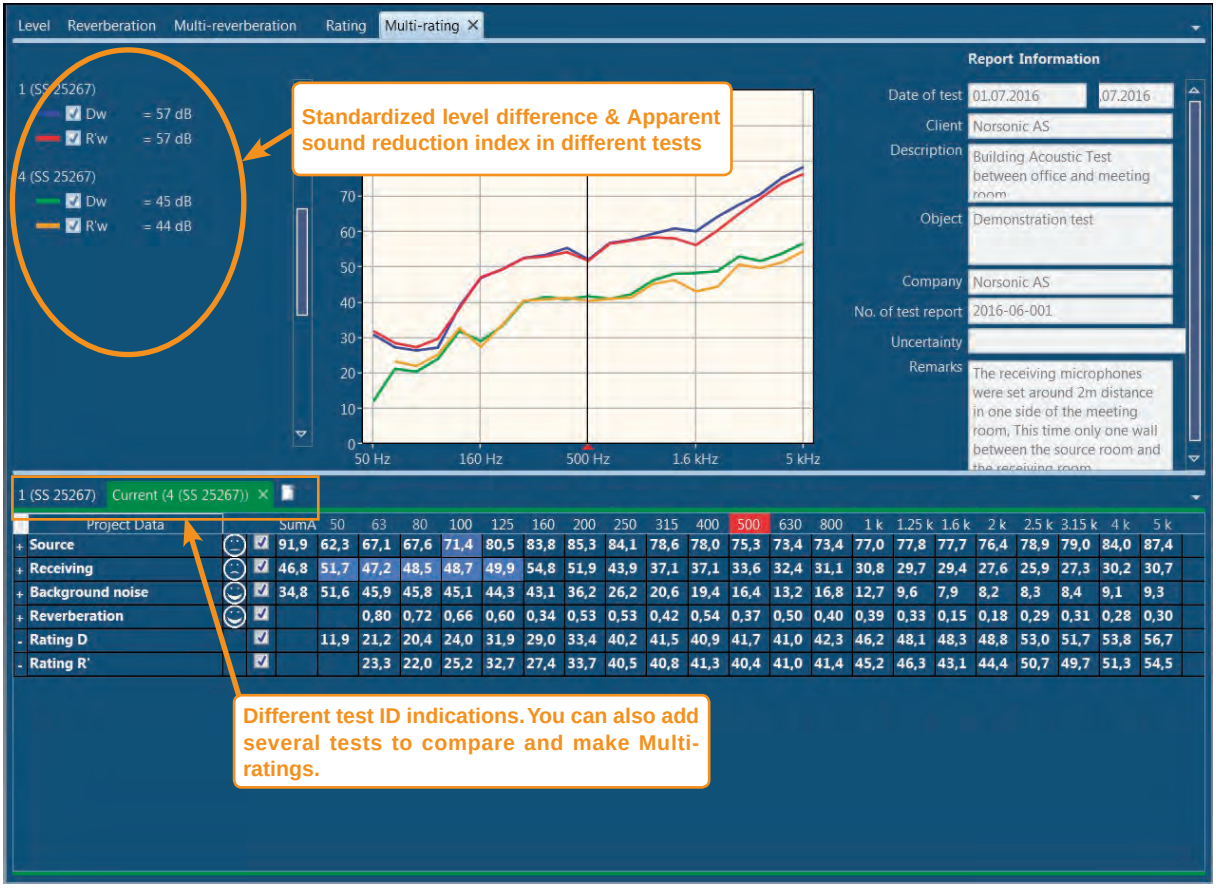
After saving the measurements, you may produce the final excel report of the sound insulation test, select the *Measurement/Excel Reports* feature in the menu bar. In the excel report draft, you can still edit and modify the text of the file.

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

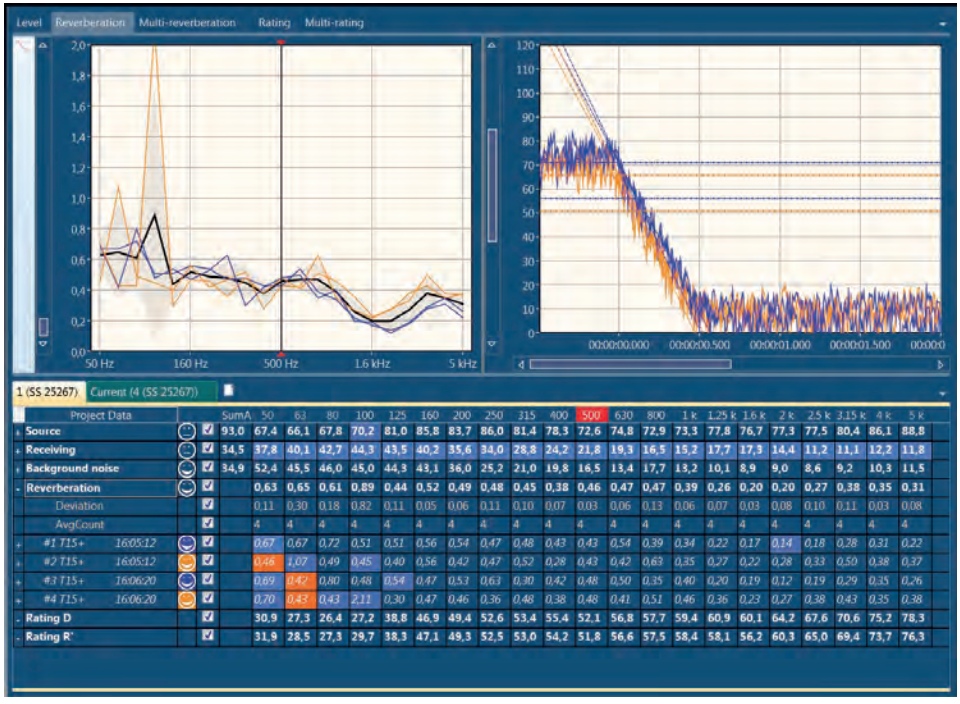
Sometimes it can be useful to compare the results from two or more acoustic tests, this can also be performed by clicking the *Multi-rating* tab in the upper left part of the mid-section.



Detailed analysis of the tabular result display

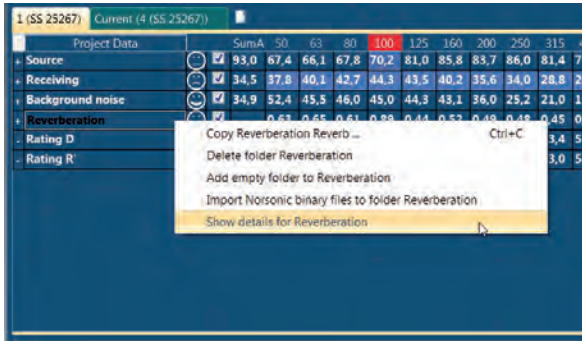
To evaluate the details of the measured data, the tabular view in the lower part of the screen is giving the user many possibilities. The table is organized in accordance with the selected Standard in a kind of folder system where the *Source*, *Receiving*, *Background Noise* and *Reverberation* time 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.



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.

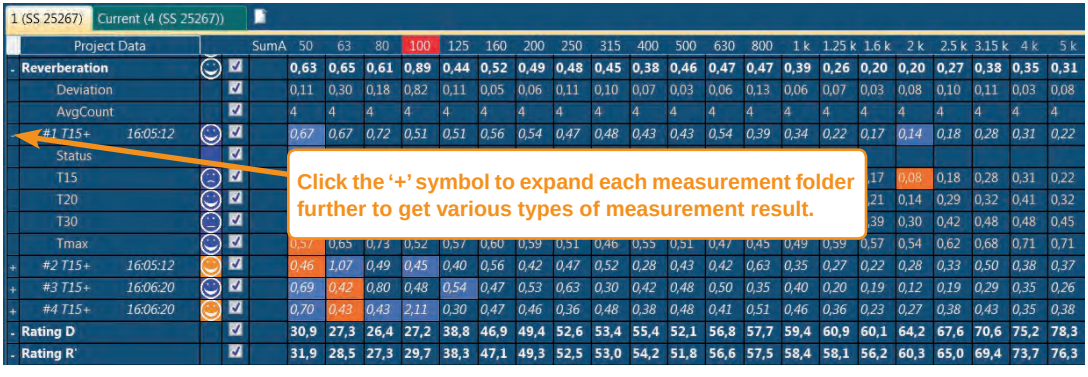
For a best possible evaluation of the average results, a click on the '+' symbol left side of the folder names opens a dialogue box in which the user may activate extra rows showing the details for the folder with the number of averaged positions as well as the calculated standard deviation from this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

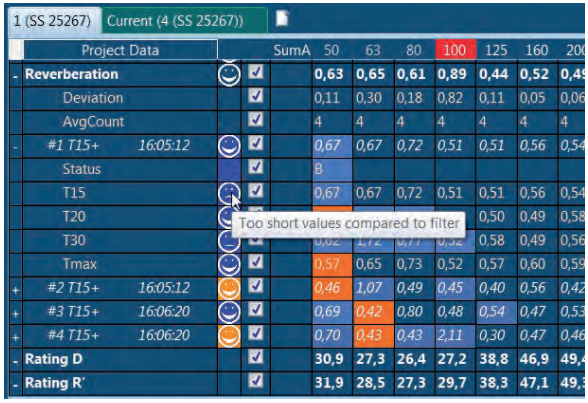


The right-click dialogue boxes additionally give the possibility to delete, copy the measurement positions, add empty folder or import Norsonic binary files to folder.

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 $L_{max} - L_{eq}$ differences.

Along the left hand side of the table view, small smilies indicate 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.

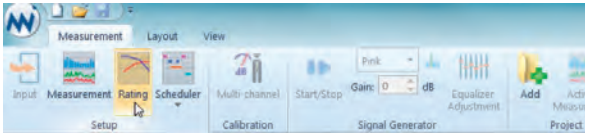
Sound Power Application Mode

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.

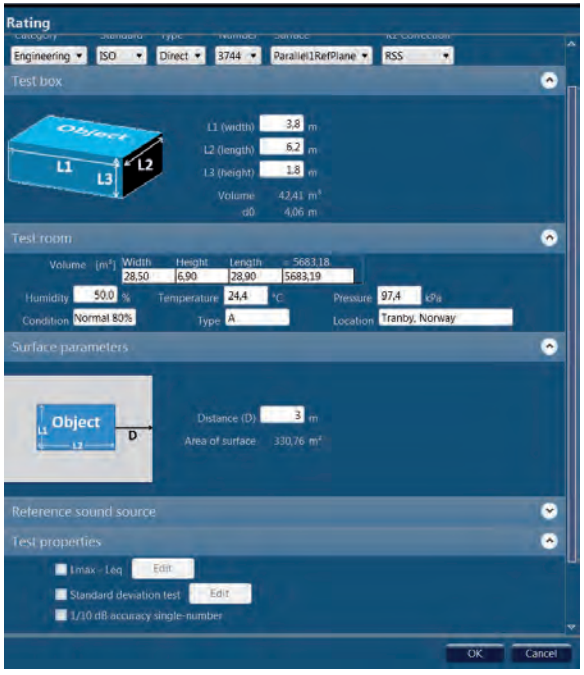
As soon as the application software is loaded, the *Rating* menu containing the settings for the actual sound power measurement is presented.

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 (^/v) 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

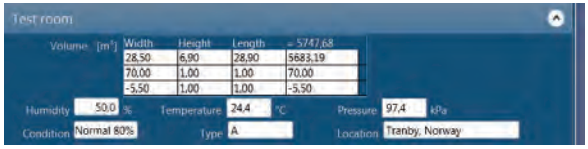
- When using Engineering or Survey grade, the Test Box tab defines the dimensions of the object which is to be measured. Here one simply enters the length, width and height of the object. ‘d0’ is the characteristic source dimension which is the distance from the origin of the co-ordinate system to the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

Test Room

- *Volume* is the actual volume of the measurement room given in m^3. 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.

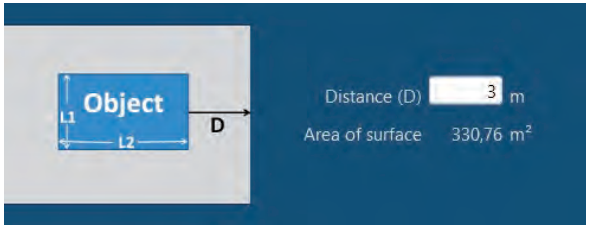
Entering a negative value into one of these lines will make it possible to subtract the volume of construction beams etc. The additional line may be removed again by deleting all values in the line.



- *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 *L_{max}-L_{eq}*', *Standard devitation test* and 1/10 dB accuracy single-number.

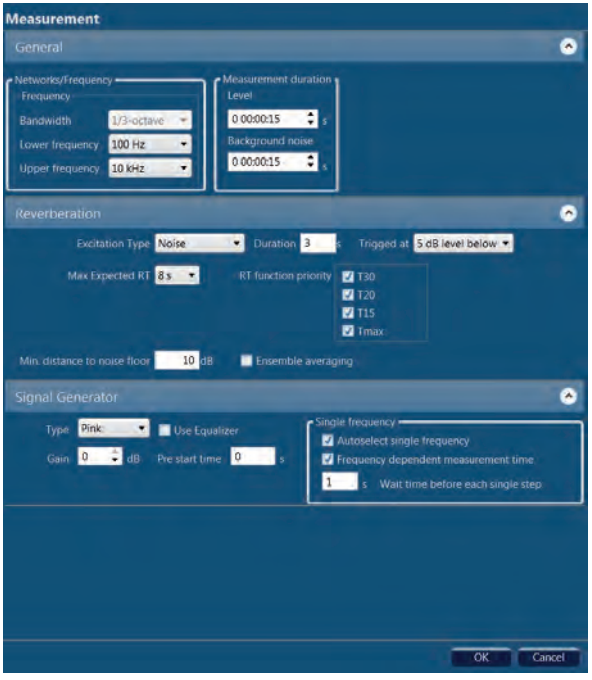
Calculations

- *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 rever-beration 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 T_{30}, T_{20}, T_{15} or T_{max}. 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.

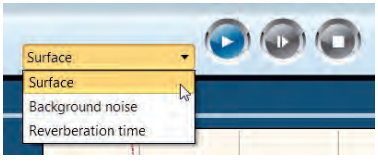
  Reverberation contains the calculated RT spectrum as a function of frequency in the mid-section, and the corresponding level vs time decay for the selected cursor frequency in the corresponding right-sections.

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

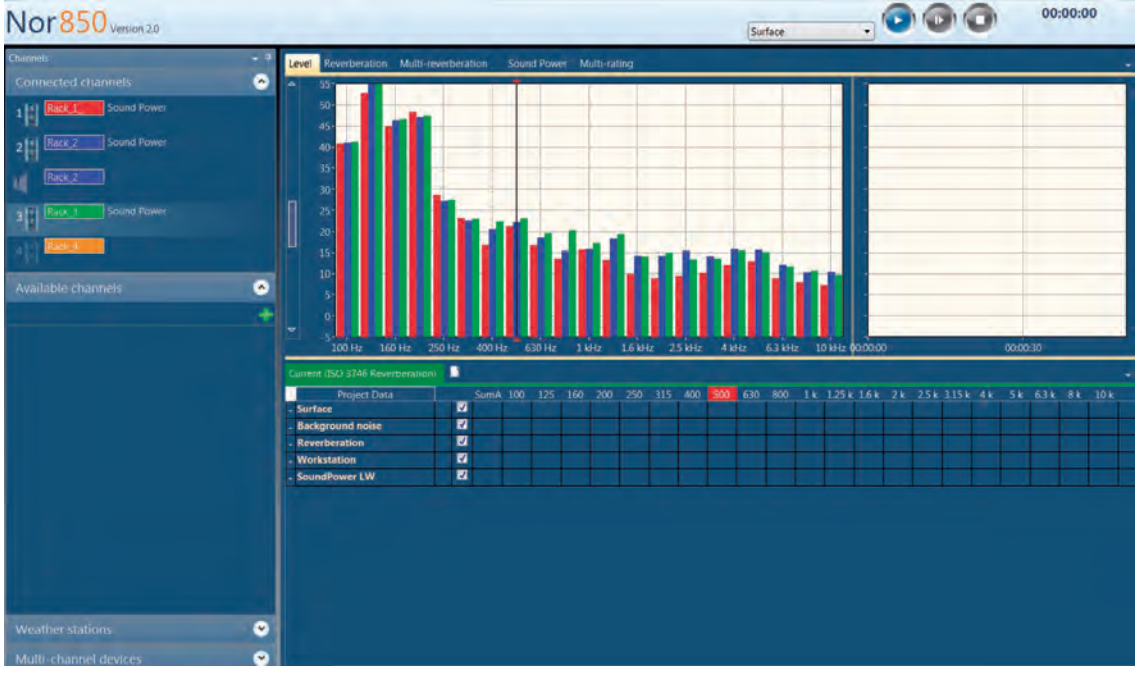
  Sound Power contains the graphical view of the measured sound power spectrum including the calculated total A-weighted sound power level. Here, the user will get a warning if the K1 and/or K2 factor is too high. In this tab it is also possible to enable/disable the background noise correction by toggling 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.

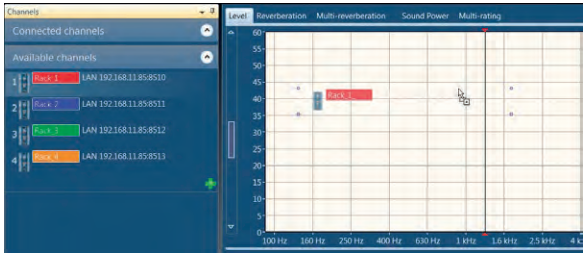


Normal measurement display view

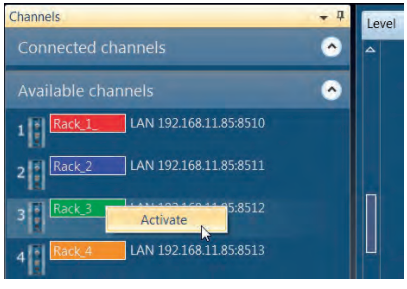


Activating the available measurement channels

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.

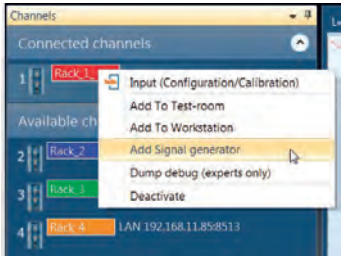


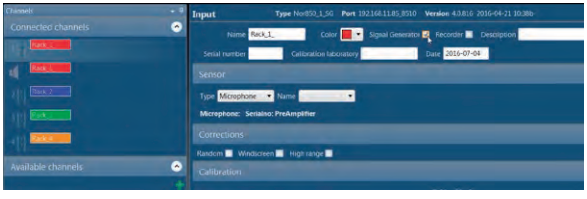
Alternatively, the user may first activate any available channel into the *Connected channels* area, and then place the activated channel into the measurement room by click&drag. The activation of the channels is either done by click&drag, or, by right-click and selecting the *Activate* command in the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

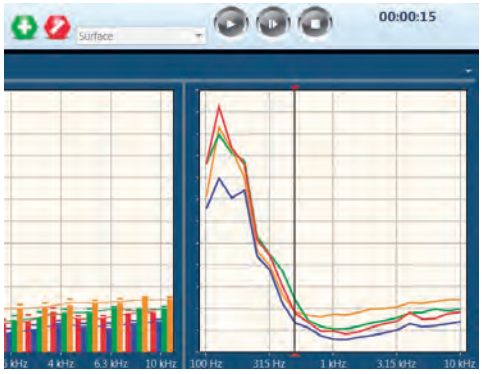




Making the surface level measurements

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.

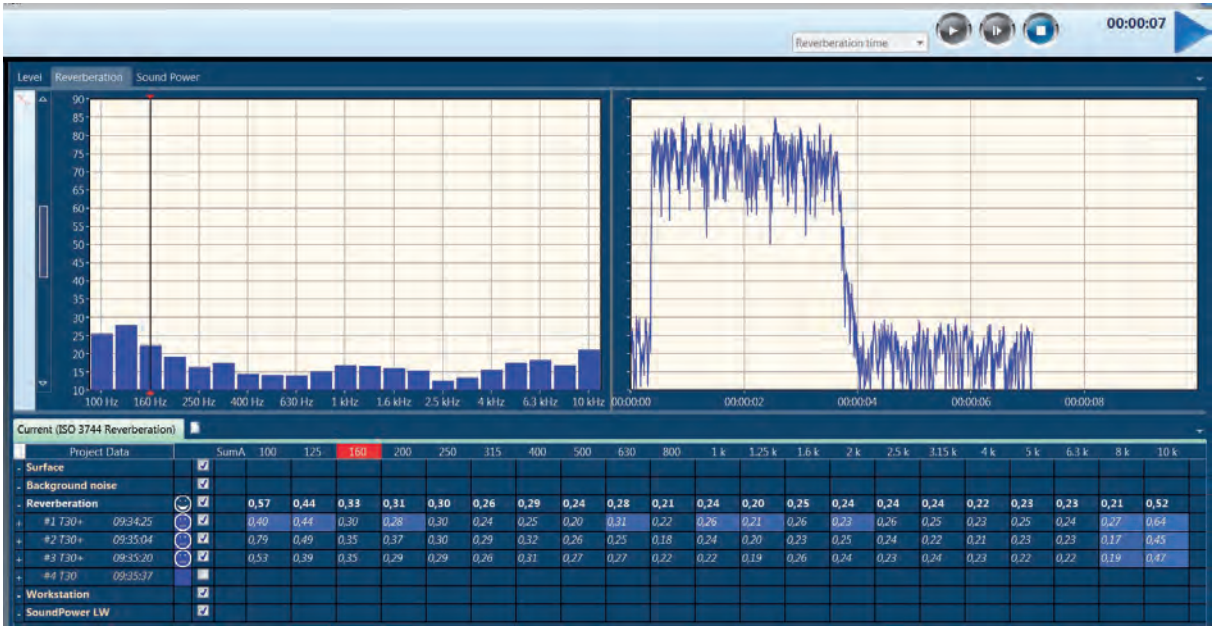
The background noise/RSS measurements must be accepted or cancelled in the same way as the surface measurements. Additional measurement positions may now be measured by a new click on the *Start* key.

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.

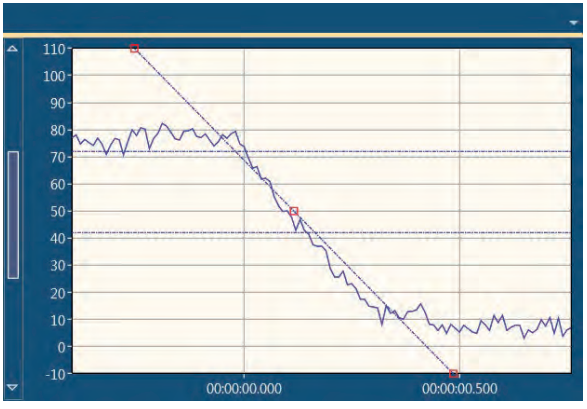
During the measurement, the upper mid-section will show the SPL frequency spectrum, while the upper right-section will show the level vs time of the noise level.

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 T_{30}/ T_{20}/ T_{15}/T_{max} 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 '□' 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 parallelly. The RT value in the table below will change accordingly.

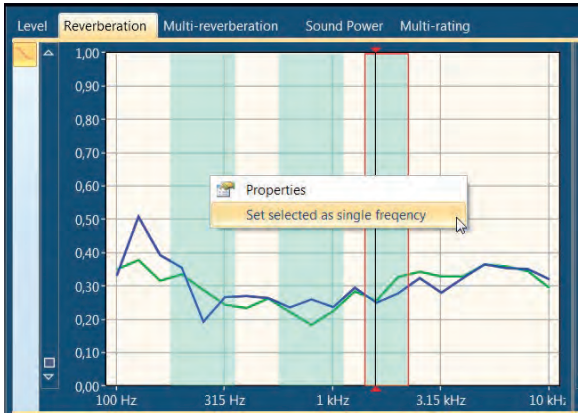
To change the slope of the curve, click & drag the lower or upper red square. The RT value in the table below will change accordingly.



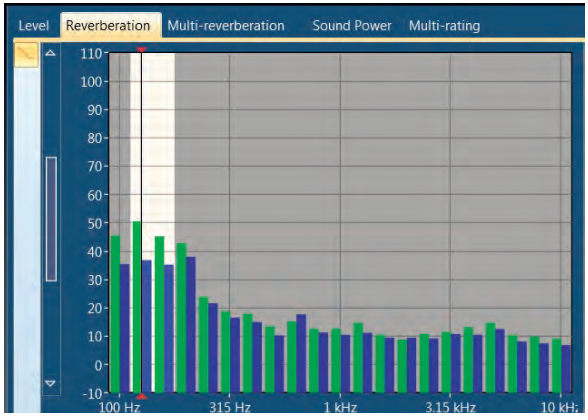
Single frequency measurements

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):



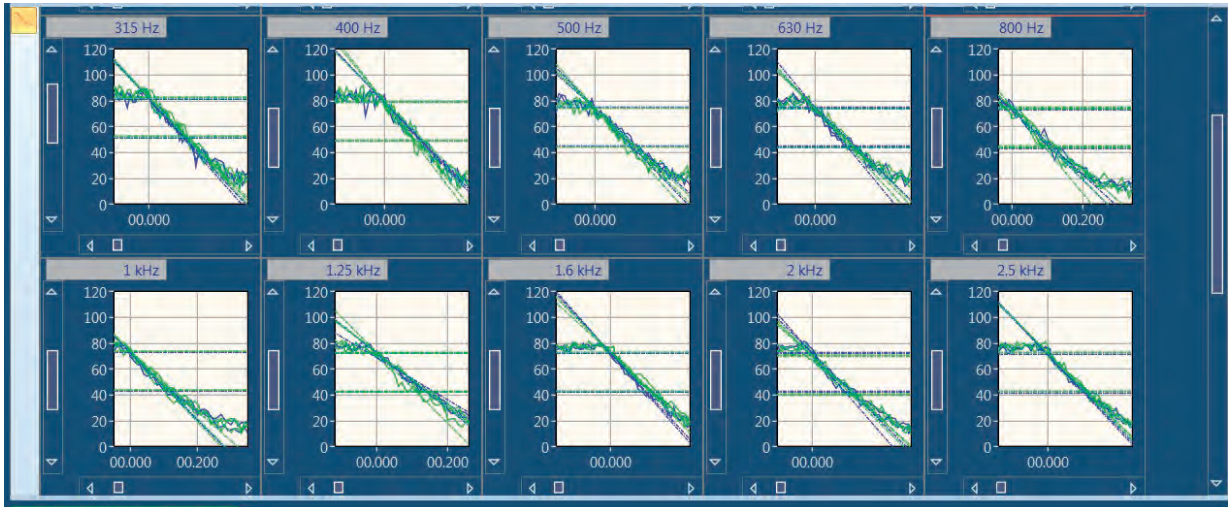
Then, right-click in the spectrum window and select *Set selected as single frequency*, and click the *Accept* button to do the measurements. The Nor850 system will now measure the selected frequency bands automatically, according to the standard. The SPL will be shown for all frequencies while measuring.



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)

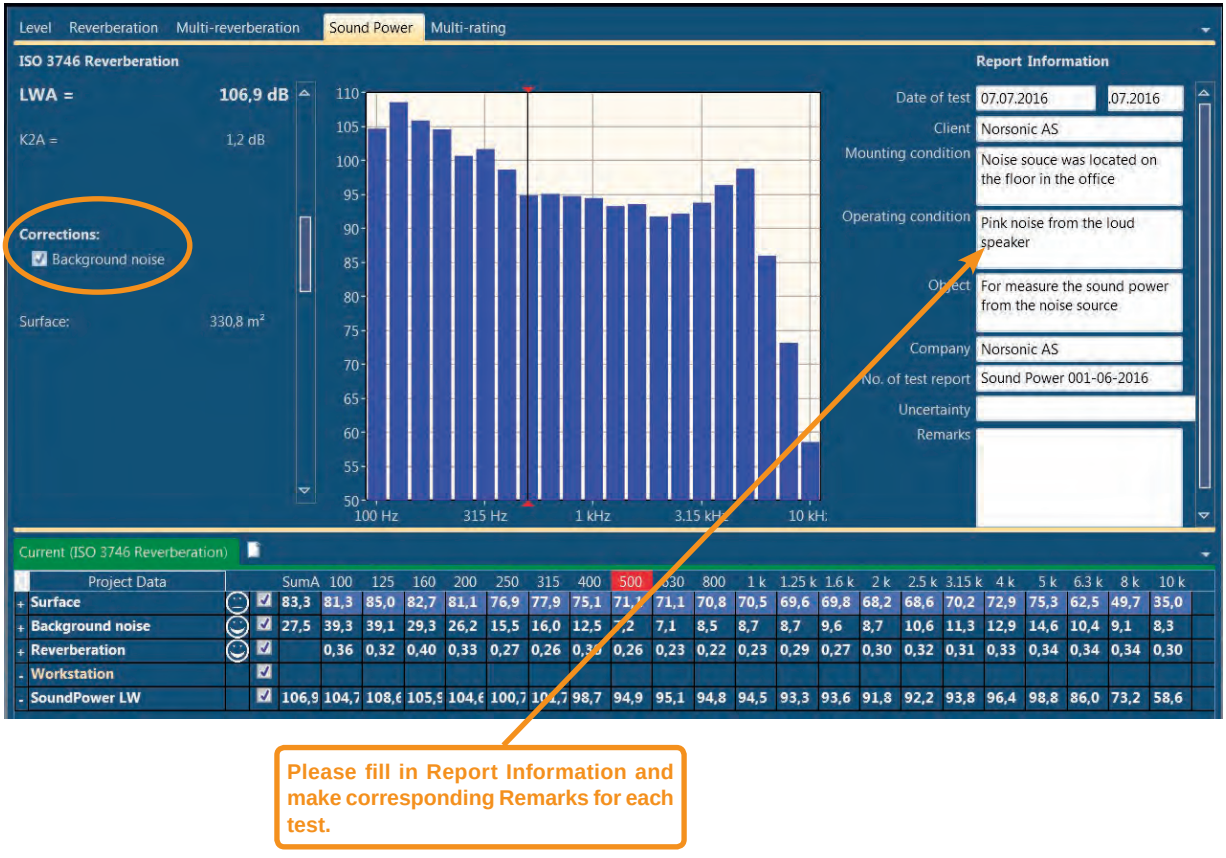
Project Data	SumA	100	125	160	200	250	315	400	500	630	800	1 k	1.25 k	1.6 k	2 k	2.5 k	3.15 k	4 k	5 k	6.3 k	8 k	10 k
+ Surface	28,4	39,3	39,7	31,0	27,3	17,9	18,5	14,7	13,2	10,0	10,3	10,7	12,0	12,3	10,2	12,2	12,5	13,2	14,7	10,5	9,1	8,3
+ Background noise	27,5	39,3	39,1	29,3	26,2	15,5	16,0	12,5	7,2	7,1	8,5	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

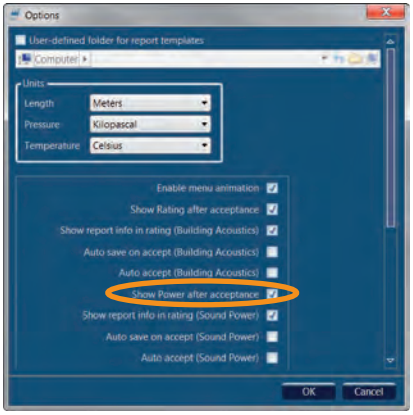
To evaluate the finally calculated rating, select the rating display by clicking the 'SoundPower' tab in the upper left part of the mid-section.

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.



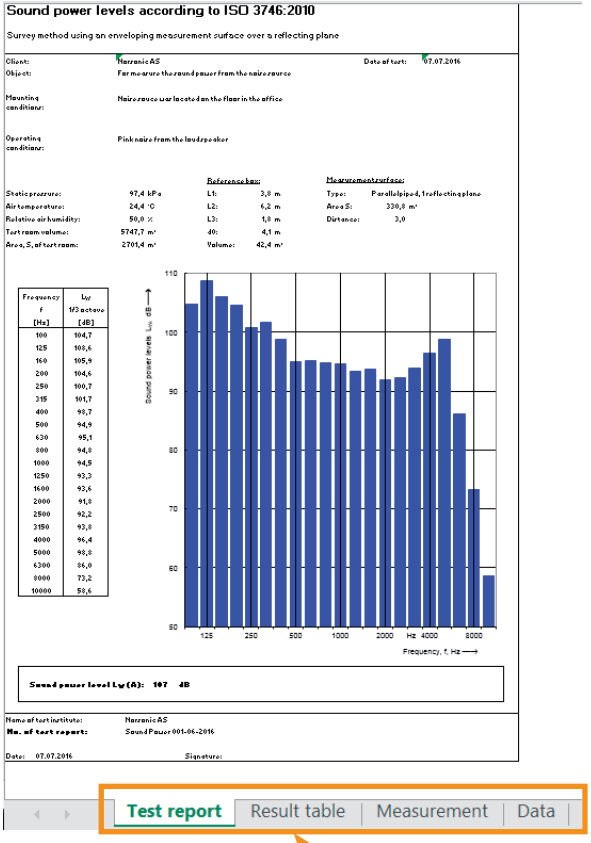
Alternatively, turn on the automatic sound power view selector to allow the system to switch automatically to the rating view each time new measurements are accepted. The *Show Power after acceptance* switch is found in the *Nor850 Options menu* available after clicking the Norsonic logo in the upper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

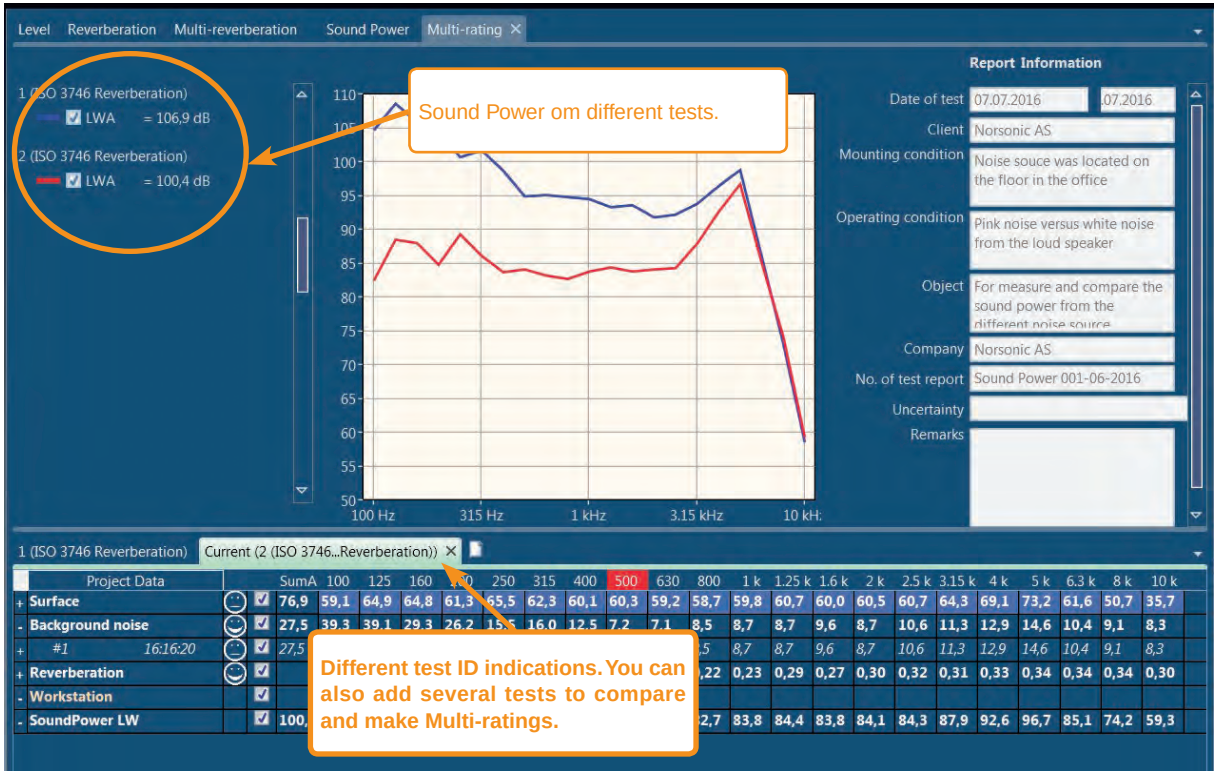
The calculated sound power may be viewed with or without background noise correction. Simply activate the function by a click in the 'Background noise' tick-box in the left part of the upper-section.

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

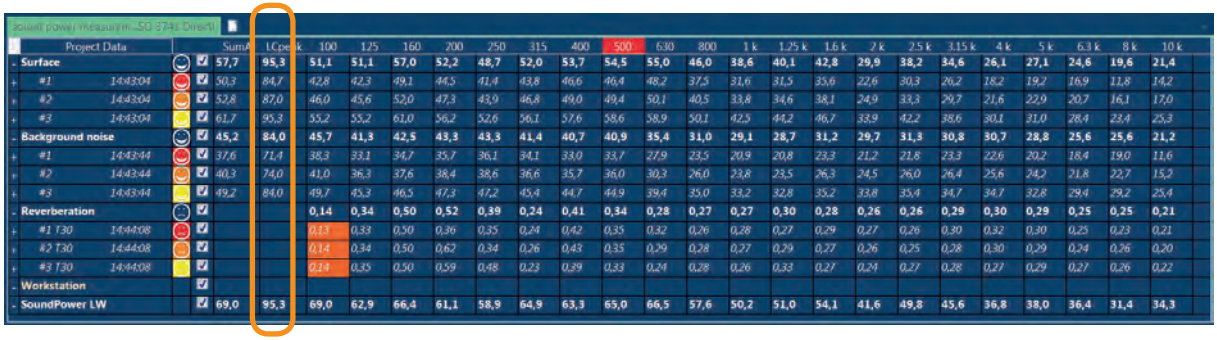
For some clients, they want to compare the results from two or more acoustic tests, this can also be performed by clicking the *Multi-rating* tab in the upper left part of the mid-section.



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*, *ReferenceSound-Source*, *BackgroundNoise* and *ReverberationTime* measurements represent the folders. In addition, the calculated sound power levels are found in the row below the main folders.

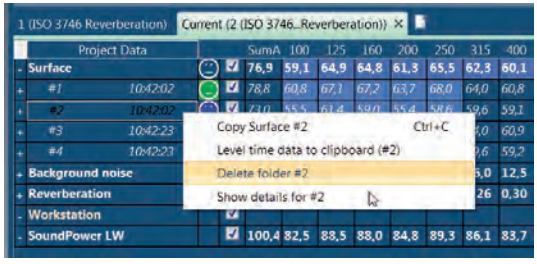
Nor850 provide LCpeak for the Surface, Background Noise, Workstation and Sound Power LW. For some customers, LCpeak is an important reference parameter for necessary hearing protection in working stations.

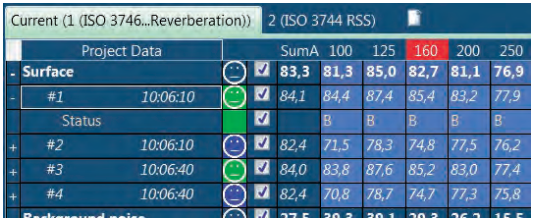


Project Data			SumA	LCpeak	100	125	160	200	250	315	400	500	630	800	1 k	1.25 k	1.6 k	2 k	2.5 k	3.15 k	4 k	5 k	6.3 k	8 k	10 k
Surface			57,7	95,3	51,1	51,1	57,0	52,2	48,7	52,0	53,7	54,5	55,0	46,0	38,6	40,1	42,8	29,9	38,2	34,6	26,1	27,1	24,6	19,6	21,4
#1	14:43:04		50,3	84,7	42,8	42,3	49,1	44,5	41,4	43,8	46,6	46,4	48,2	37,5	31,6	31,5	35,6	22,6	30,3	26,2	18,2	19,2	16,9	11,8	14,2
#2	14:43:04		52,8	87,0	46,0	45,6	52,0	47,3	43,9	46,8	49,0	49,4	50,1	40,5	33,8	34,6	38,1	24,9	33,3	29,7	21,6	22,9	20,7	16,1	17,0
#3	14:43:04		61,7	95,3	55,2	55,2	61,0	56,2	52,6	56,1	57,6	58,6	58,9	50,1	42,5	44,2	46,7	33,9	42,2	38,6	30,1	31,0	28,4	23,4	25,3
Background noise			45,2	84,0	45,7	41,3	42,5	43,3	43,3	41,4	40,7	40,9	35,4	31,0	29,1	28,7	31,2	29,7	31,3	30,8	30,7	28,8	25,6	25,6	21,2
#1	14:43:44		37,6	71,4	38,3	33,1	34,7	35,7	36,1	34,1	33,0	33,7	27,9	23,5	20,9	20,8	23,3	21,2	21,8	23,3	22,6	20,2	18,4	19,0	11,6
#2	14:43:44		40,3	74,0	41,0	36,3	37,6	38,4	38,6	36,6	35,7	36,0	30,3	26,0	23,8	23,5	26,3	24,5	26,0	26,4	25,6	24,2	21,8	22,7	15,2
#3	14:43:44		49,2	84,0	49,7	45,3	46,5	47,3	47,2	45,4	44,7	44,9	39,4	35,0	33,2	32,8	35,2	33,8	35,4	34,7	34,7	32,8	29,4	29,2	25,4
Reverberation					0,14	0,34	0,50	0,52	0,39	0,24	0,41	0,34	0,28	0,27	0,27	0,30	0,28	0,26	0,26	0,29	0,30	0,29	0,25	0,25	0,21
#1 T30	14:44:08				0,13	0,33	0,50	0,36	0,35	0,24	0,42	0,35	0,32	0,26	0,28	0,27	0,29	0,27	0,26	0,30	0,32	0,30	0,25	0,23	0,21
#2 T30	14:44:08				0,14	0,34	0,50	0,62	0,34	0,26	0,43	0,35	0,29	0,28	0,27	0,29	0,27	0,26	0,25	0,28	0,30	0,29	0,24	0,26	0,20
#3 T30	14:44:08				0,14	0,35	0,50	0,59	0,48	0,23	0,39	0,33	0,24	0,28	0,26	0,33	0,27	0,24	0,27	0,28	0,27	0,29	0,27	0,26	0,22
Workstation																									
SoundPower LW			69,0	95,3	69,0	62,9	66,4	61,1	58,9	64,9	63,3	65,0	66,5	57,6	50,2	51,0	54,1	41,6	49,8	45,6	36,8	38,0	36,4	31,4	34,3

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.

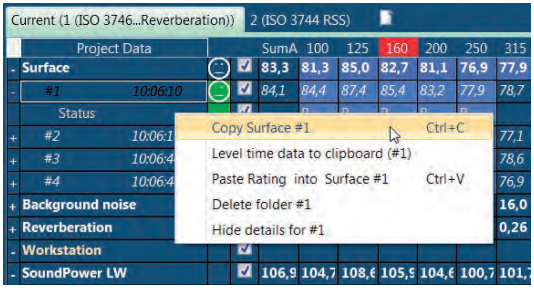
For viewing one single measurement position, a double-click on the required position will present only this single measurement result. It is additionally possible to view the status of each measurement by making a right-click and select the *Show details for Pos X* command.





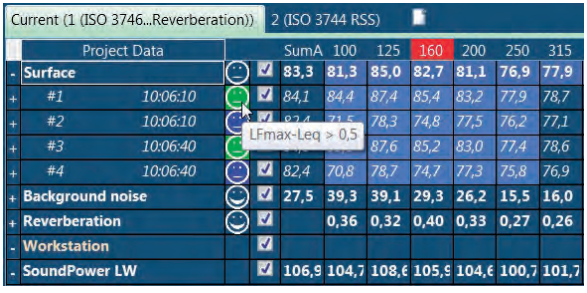
For a best possible evaluation of the average results, a right-click on the folder names opens a dialogue box in which the user may activate extra rows showing the details for the folder with the number of averaged positions as well as the calculated standard deviation from this averaging process.

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.

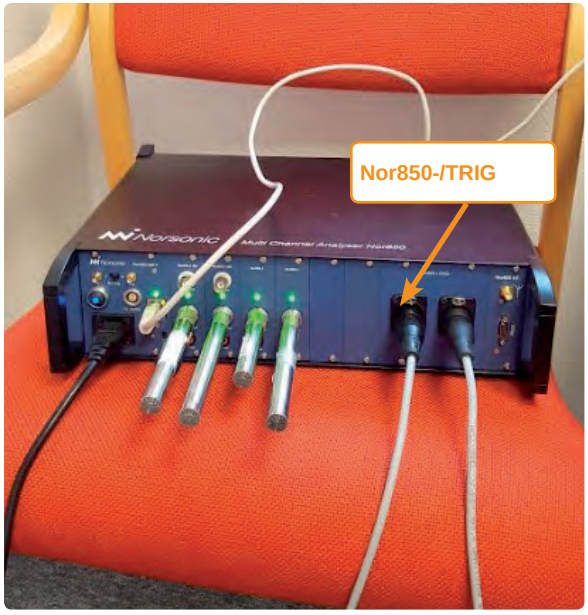
Sound power measurement for earth-moving machinery

The 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 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).

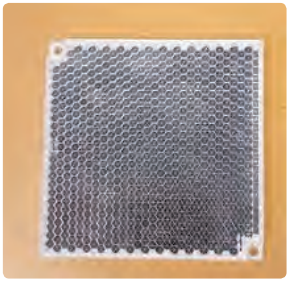
Measurement hardware setup

In order to measure the sound power from earth-moving machinery, the 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.

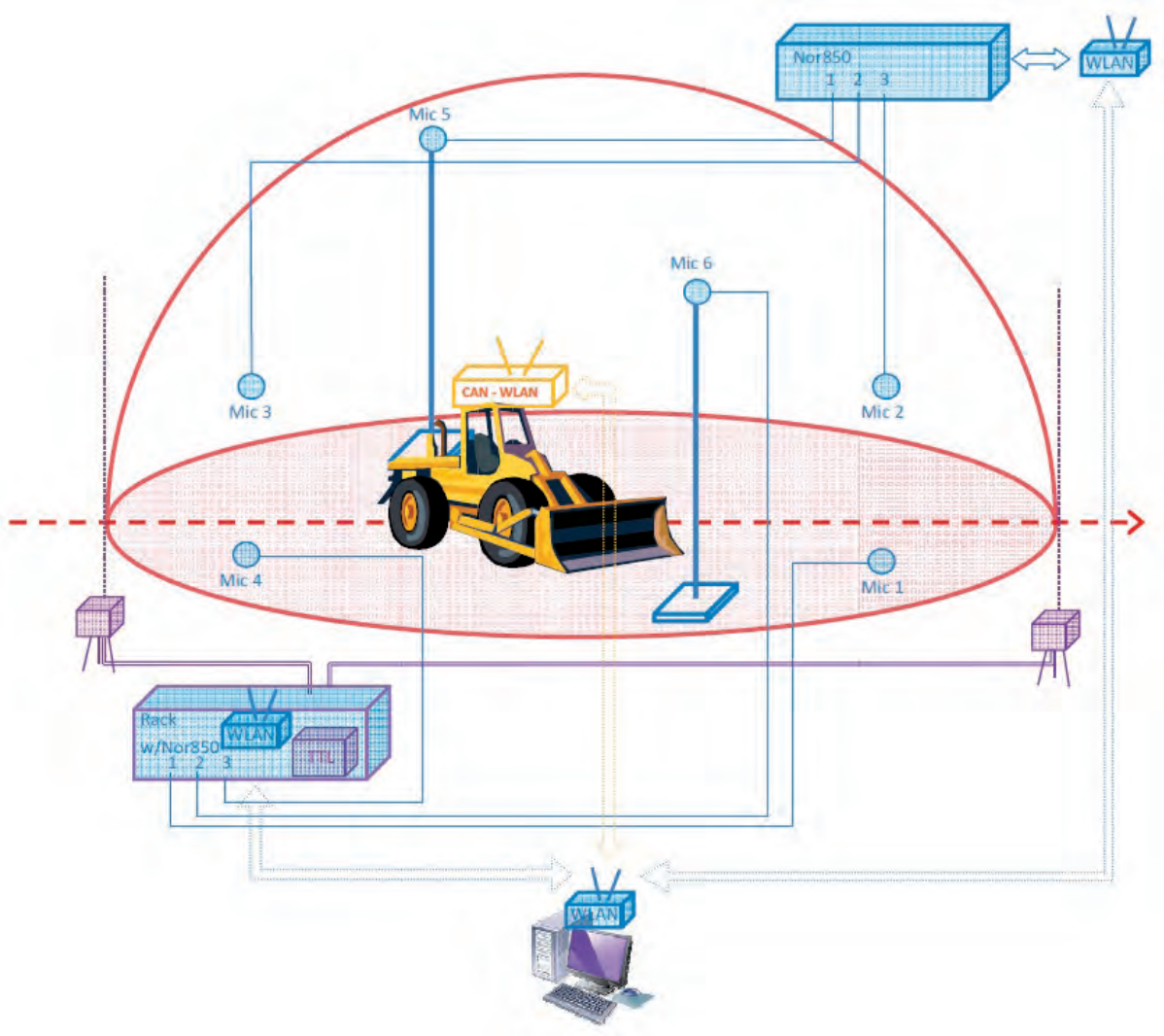


The two trigger cables should be plugged into the socket of the Nor850-1/TRIG of the Nor850-MF1.

Laser Reflective Plate

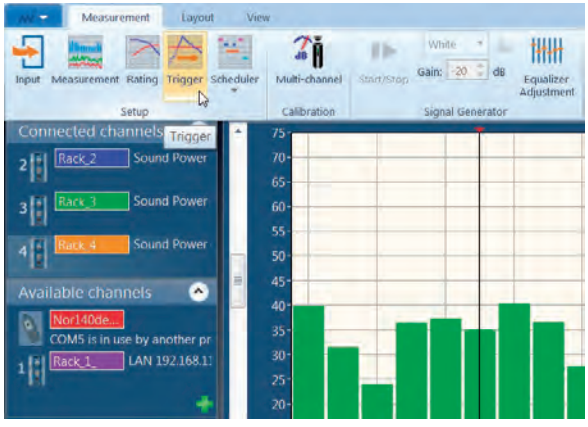


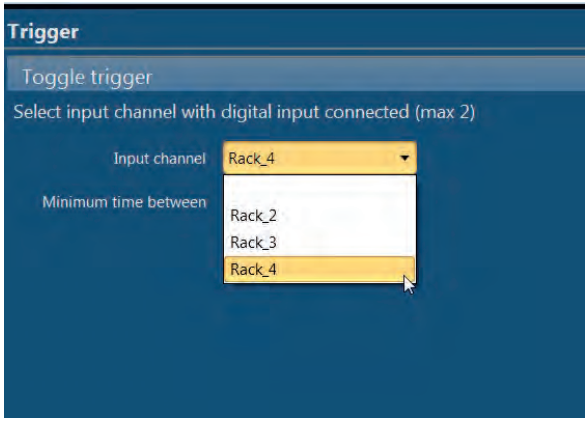
According to the ISO Standard, Earth-moving machinery -Determination of sound power level noise emissions -Dynamic test conditions, six measuring positions shall be used during measurement. The microphone positions along with the measurement hardware setup is illustrated in the following figure. If the 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:

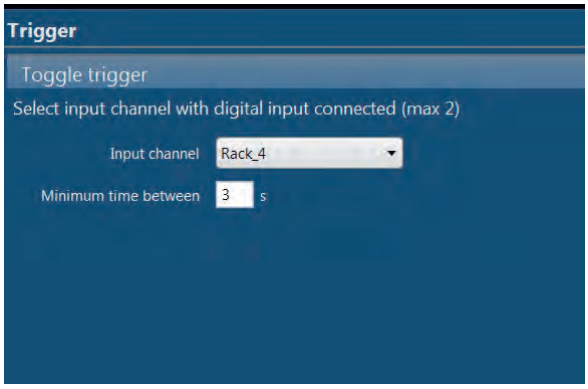

Nor850
1 2 3
WLAN
Mic 5
Mic 6
Mic 3
Mic 2
CAN - WLAN
Mic 4
Mic 1
Rack
w/Nor850
1 2 3
WLAN
WLAN

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.

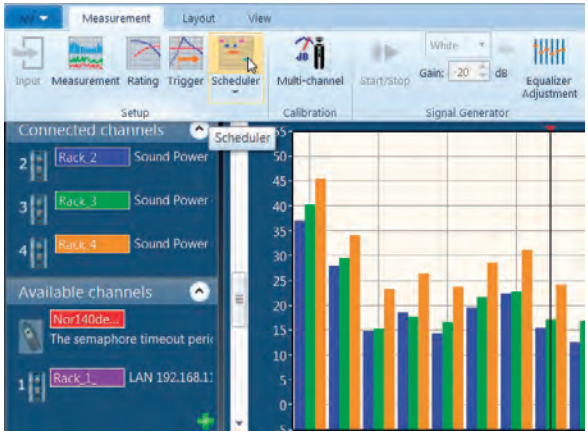


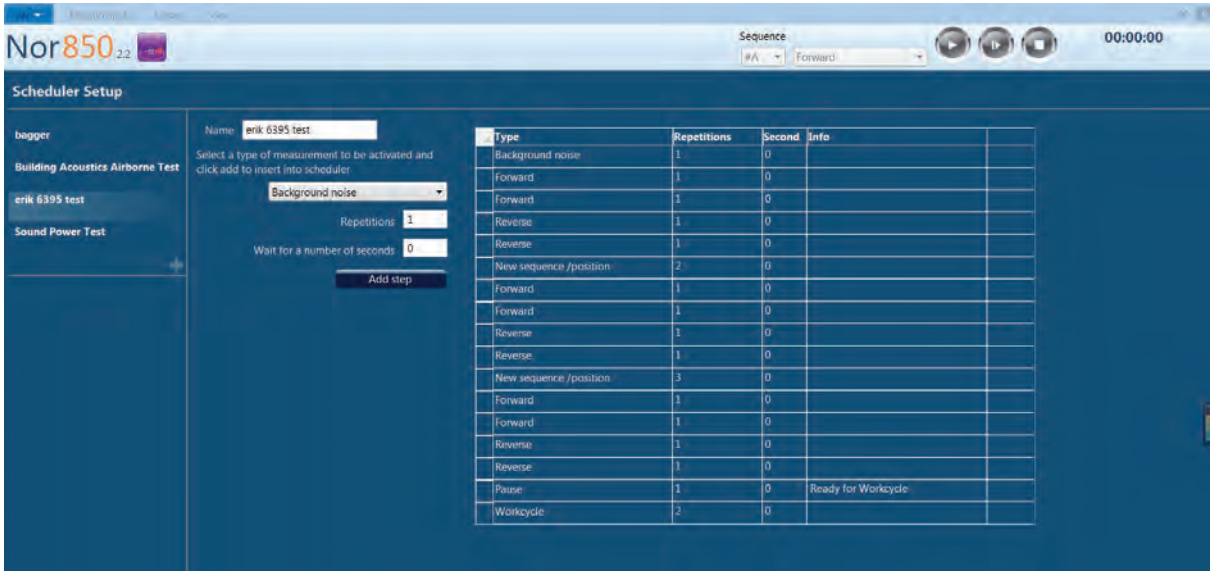




Scheduler setup

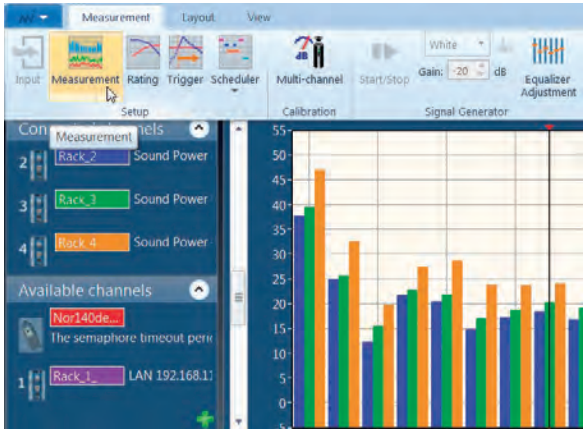
For most of the dynamic test for earth-moving machinery, there should be some certain test schedulers which should be described by the user in advance. For example, if we have installed only 3 microphones on the site, as we mentioned before, the machinery driver should drive the machinery from A to B, 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.

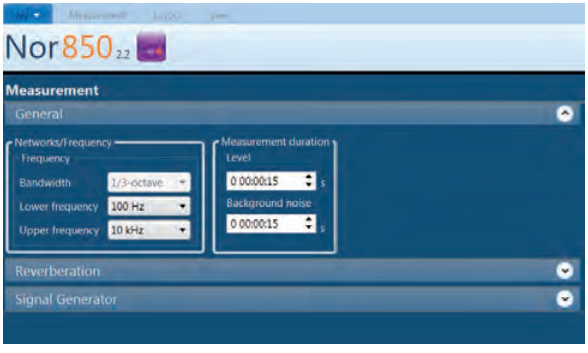

Measurement
Layout
View
Input
Measurement
Rating
Trigger
Scheduler
Multi-channel
Start/Stop
White
Gain: 20 dB
Equalizer Adjustment
Setup
Calibration
Signal Generator
Connected channels
Scheduler
Rack_2 Sound Power
Rack_3 Sound Power
Rack_4 Sound Power
Available channels
Nor140de...
The semaphore timeout peri
Rack_1_ LAN 192.168.1
65
50
45
40
35
30
25
20
15
10
5
0


Nor850 2.2
Sequence
#A
Forward
00:00:00
Scheduler Setup
bagger
Building Acoustics Airborne Test
erik 6395 test
Sound Power Test
Name: erik 6395 test
Select a type of measurement to be activated and click add to insert into scheduler
Background noise
Repetitions 1
Wait for a number of seconds 0
Add step
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

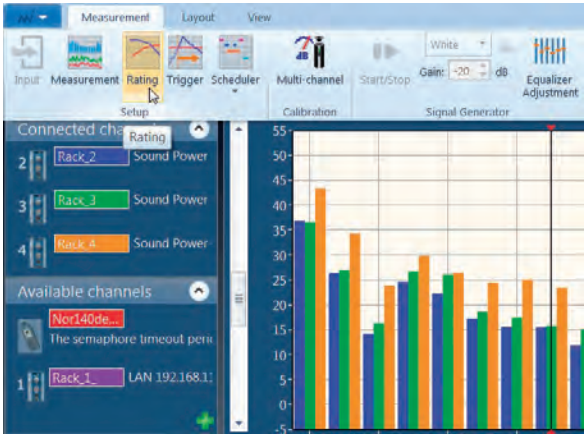
The measurement setup can also be setup from Menu bar as *Measurement/Measurement*. The user only need to fill in the general information as Networks/ Frequency and Measurement duration as follows, the user doesn't need to care about the parameter in the Reverberation and Signal Generator Tab.





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.

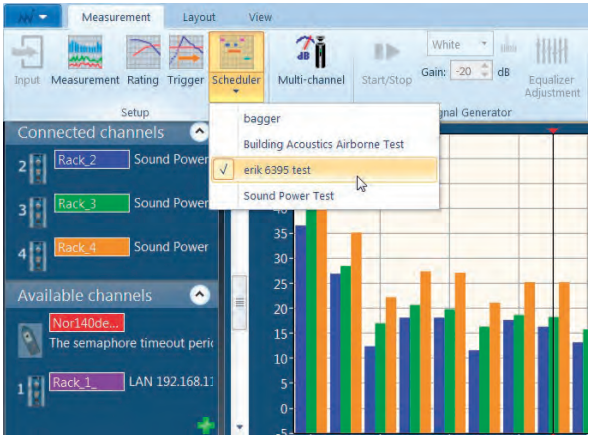


For the Rating setup information, the user does not need to set in the Volume information of the Test room, while the weather condition information is necessary for the sound power measurement. For most of the measurement condition, the earth-moving machinery is being driven on the hard reflecting ground, and 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 tjeu are retained when the user take the Sound Power Mode afterwards.

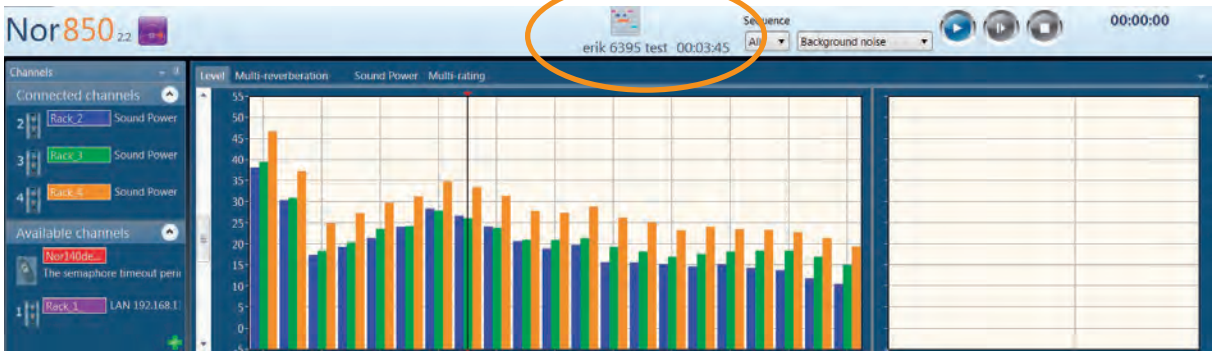
Sound power measurement

Select the prescribed scheduler

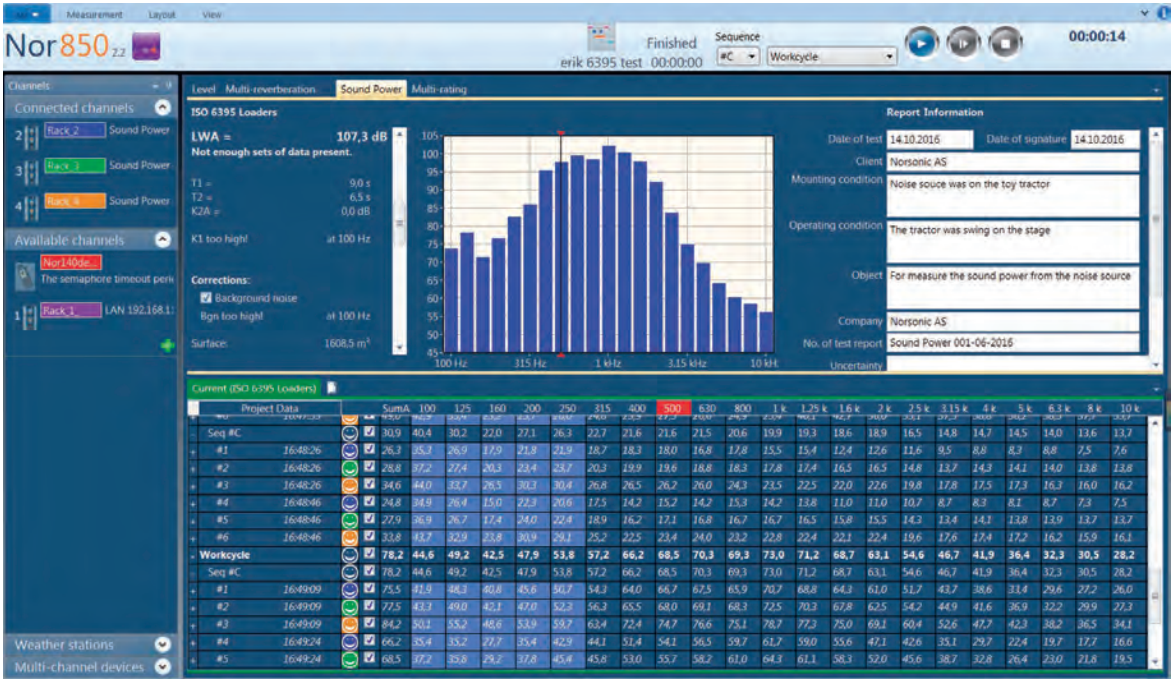
From the Menu bar, select *Measurement/Scheduler,* click on the downward arrow and then double click the desired schedule from the list from previous defined schedulers. The name of that schedule will appear on the upper of the displaying graph.



Then press on the *Start* button to perform the sound power test. As it was prescribed in the scheduler before, the background noise measurement will be perferomed first. When the moving machinery passes the Light Barrier A, it will trigger and start the machinery sound power measurement until it stops measurement as the moving machinery passes the Light Barrier B etc. The Procedures will be performed one by one in the desired scheduler.



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



Sound power measurement versus RPM from rotational machinery

For some rotational machinery, the output power is greatly related with its shaft rotation speed. The varied power output will result in various sound power radiation in measurement results.

In Nor850 there is a feature which can combine the rotational rpm with the measured sound power levels together as a curve. For certain customers, this will be important in evaluating the machineries characteristic for different operation conditions.

We can also adopt other analogue signals such as temperature, pressure, displacement or wind velocity etc. as reference input signal, and compare the measured sound power level versus these analogue signals.

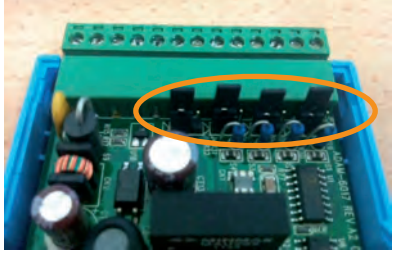
For the moment, we have only developed this feature in Sound Power Mode, we will soon implement this new feature in other measurement modes.

Measurement hardware setup

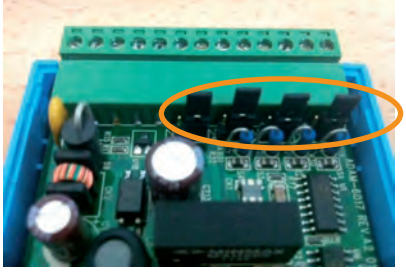
We recommend to use ADAM 6017 as a signal conditioner to compatible to different analogue signals input. However, the customer should read the instruction manual for their sensors in acquiring various analogue signal to certain the sensor's type (output quantity is voltage type or current type) and also the signal output range.

For the tachometer sensor, it will send a voltage signal to ADAM 6017, so it is important to set the jumpers in ADAM 6017 in voltage position. The detailed procedure is as follows.

1. Open the 2 screws on the top panel of the ADAM 3017 device. Remove the holder from the back of the ADAM 6017 device.
2. Open the 2 screws on the bottom panel of the ADAM 6017 device. Carefully open the top panel of the ADAM 6017 device.
3. Change the position of the related jumpers to connect the 2 left pins (Voltage input) instead of the 2 right pins (Current input).



Jumpers was connected in the 2 left pins (Voltage input)



Jumpers was connected in the 2 right pins (Current input)

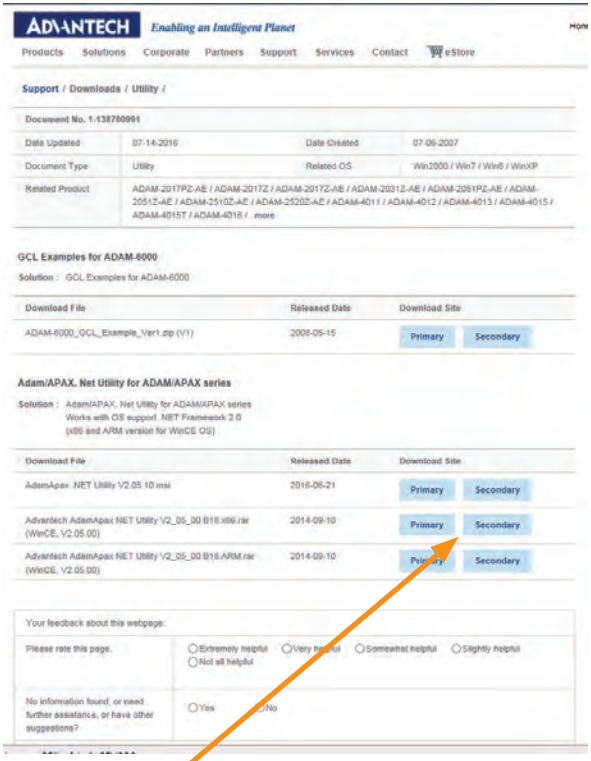
Install “AdamApax .NET Utility” application

(Skip this stage if application is already installed).

Download the “AdamApax .NET Utility” application from:

Open internet explorer with the following address:

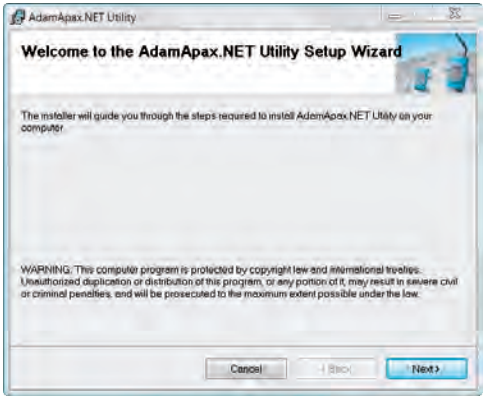
http://support.advantech.com.tw/support/DownloadSRDetail_New.aspx?SR_ID=1-2AKUDB&Doc_Source=Download.



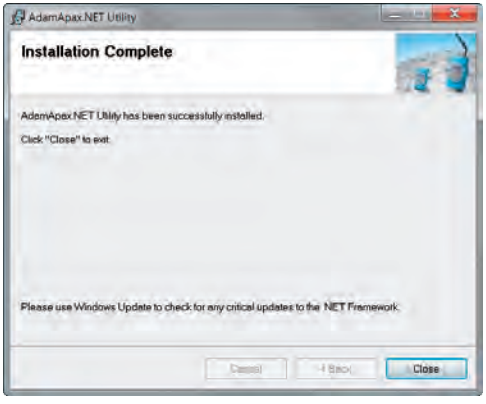
save file “AdamApax .NET Utility Ver 2.05.10.msi “ on your PC.

Enter to that folder contains the application setup and double click the file “ Advantech AdamApax .NET Utility Ver 2.05.10.exe”

This will open the following windows:



Press next to begin installation and wait until finish button will appear:



Click on close, the application is now installed on your PC.

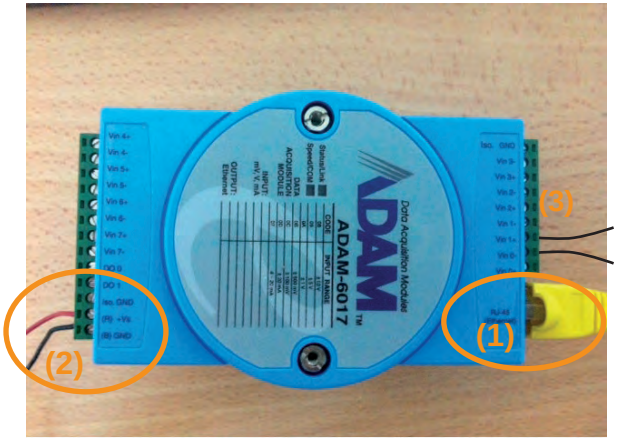
Configure PC IP address to be able to connect to ADAM 6017 device

When your PC is configured IP address, then it is able to connect to ADAM 6017 device by using Ethernet connection (RJ45).

Connecting to an ADAM 6017 device

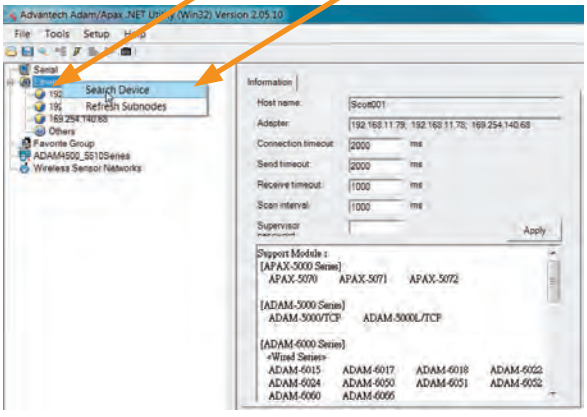
Connect ADAM 6017 device to your PC (1) using regular Ethernet cable (RJ54).

And power on the device (2) using a 24 DC Power supply.

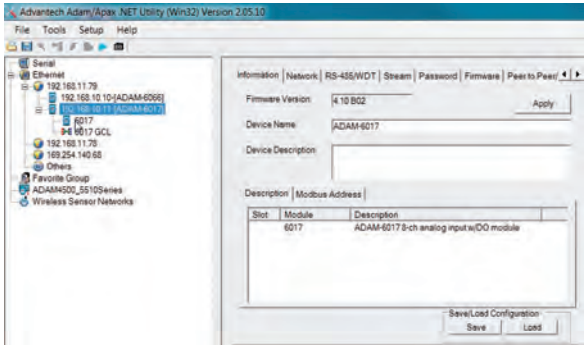


Voltage signal input from tachometer sensor (3).

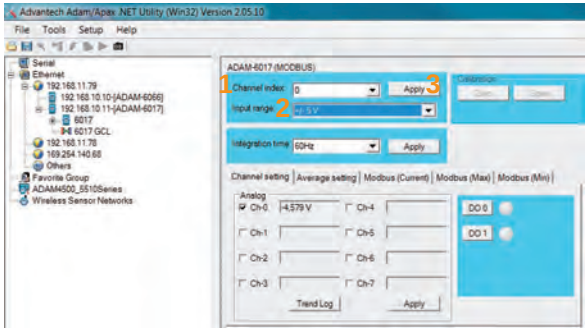
Open *Start*->*All Programs*->*Advantech Automation*->*AdamApax .NET Utility* -> *AdamApax .NET Utility application*, right click on *Ethernet* node and selcet *Search*:



This will search for an ADAM device connected to your PC.



Click *ADAM-6017* and you should be able to connect to the device and change its inner settings. Continue to click *6017* and enter password *00000000* (8 digitals).



1. Select *Channel Index "0"* (If only the 1st channel was used as RPM signal input)
2. Select *Input Range "+/-5V"*
3. Push button *Apply*

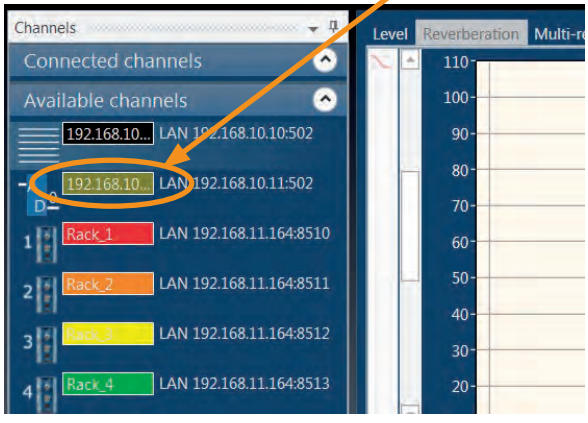
The device is now ready to be used. And now please remember to exit the *Advantech Adam/Apax. Net Utility* in time.

Add NorDC as an available channel in Nor850

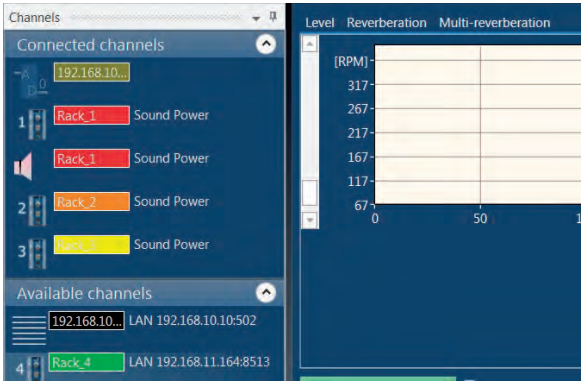
Open Nor850 software, and active the Sound Power Mode. Customer should first add NorDC as an available channel in Nor850.

Select *NorDC* from the Device list and *LAN(Tcp)* as the communication type, IP-address: 192.168.10.11 and Port:502 (Here is only an example, the customer's IP address should be determined by your Network administrator).

When you press *OK*, you will see the *NorDC* icon appears on the Available channels list.

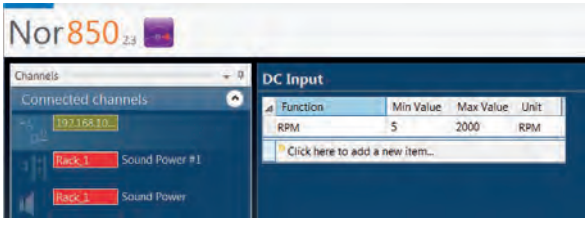


In the following sound power measurement project, we activated three measurement channels along with the NorDC for RPM measurement.

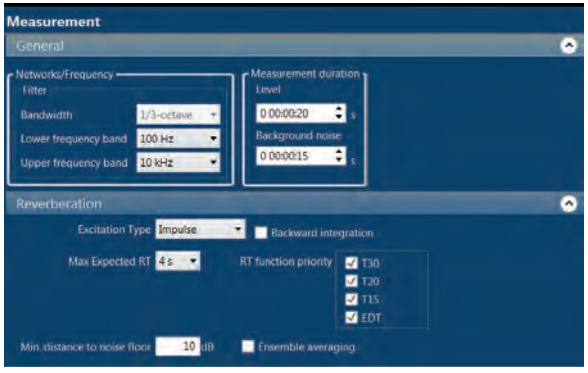


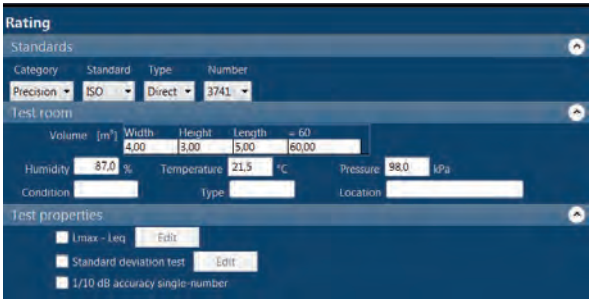
Configure NorDC in Nor850

Right click the activated *NorDC* icon, select *RPM* in Function as your analogue signal input. You should also set in the *Min Value* and Max *Value* for your rotational machinery test. Click *Close* to confirm your RPM configuration parameter.



The customer should also set in measurement parameters, such as *Networks/Frequency Filter* and *Measurement duration level* in Measurement tab; rating parameters in Standards and Test Room in Rating tab.





Make sound power measurement versus RPM on site

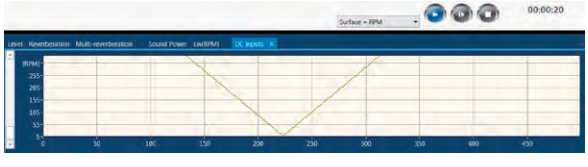
First perform “Background noise” measurement on the measurement site.

Then take *Reverberation time* measurement on the site.

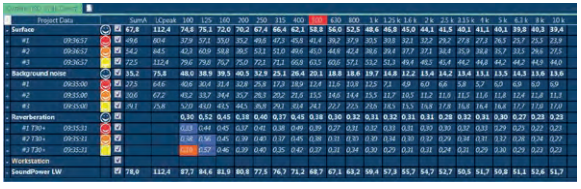
And the last step is to measure *Surface+RPM*. Then you can get the sound power level Lw versus RPM.

Analysis sound power measurement and RPM results from Nor850

From the DC Inputs, you can get the RPM curve versus measurement period

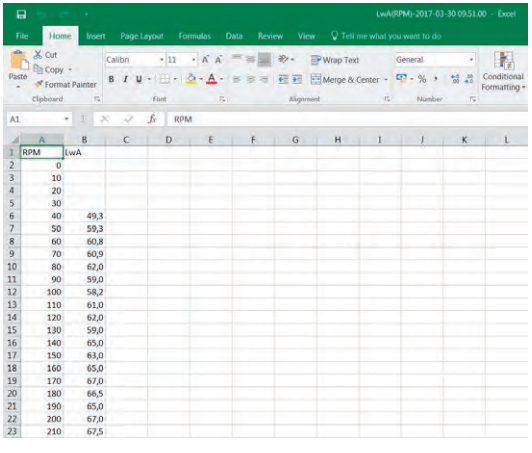


These results will appear while all measurements are completed.



From the Lw(RPM) tab, you will get the averaged sound power level versus RPM.

When the Lw(RPM) window is active, click on the Excel button to get numerical report.



	A	B
1	RPM	LwA
2	0	
3	10	
4	20	
5	30	
6	40	49,3
7	50	59,3
8	60	60,8
9	70	60,9
10	80	62,0
11	90	59,0
12	100	58,2
13	110	61,0
14	120	62,0
15	130	59,0
16	140	65,0
17	150	63,0
18	160	65,0
19	170	67,0
20	180	66,5
21	190	65,0
22	200	67,0
23	210	67,5

About TTL Handling

A universal measurement software or equipment should be adapted to various measurement standards or different measurement hardware. Sometimes we may also need to control the machinery working conditions or control the movement of louder speakers and receiving microphones during measurement process.

TTL Handling function in Nor850 is to help our customers to perform these control over various of machineries, equipment or other hardware.

ADAM-6066 for TTL adoption

The TTL handling is based on ADAM-6066 product for LAN connection.

This unit must be setup for the LAN before use. To do this, download software

Open internet explorer with the following address:

http://support.advantech.com.tw/support/DownloadSRDetail_New.aspx?SR_ID=1-2AKUDB&Doc_Source=Download

and download the “AdamApax .NET Utility” application.

Follow the instructions in the ADAM-6066.pdf.

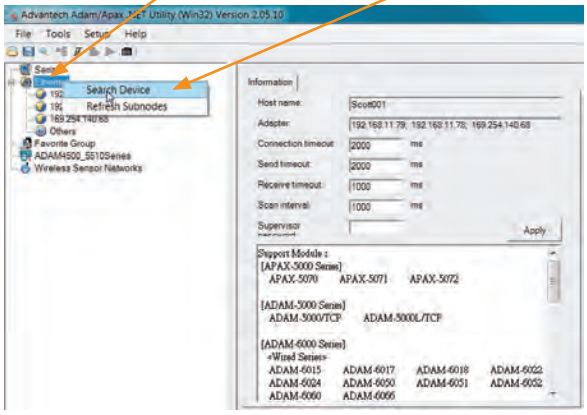
Connecting to an ADAM 6066 Device

ADAM 6066 can be used as a control signal sender using regular Ethernet cable (RJ54) (1).

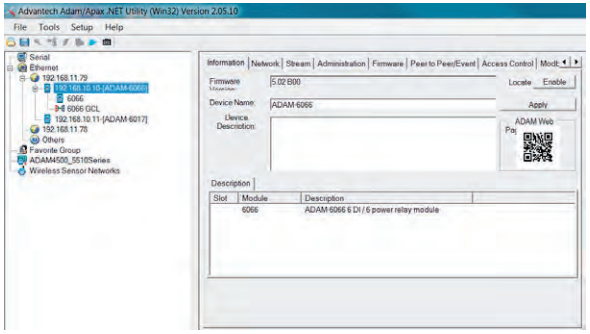
Power on the device using a 24 DC Power supply (2).

Control signal output from the 1st channel (3).

Open *Start*->*All Programs*->*Advantech Automation*->*AdamApax .NET Utility* -> *AdamApax .NET Utility application*, right click on *Ethernet* node and select *Search*:



This can search for an ADAM device connected to your PC and you will find ADAM-6066.

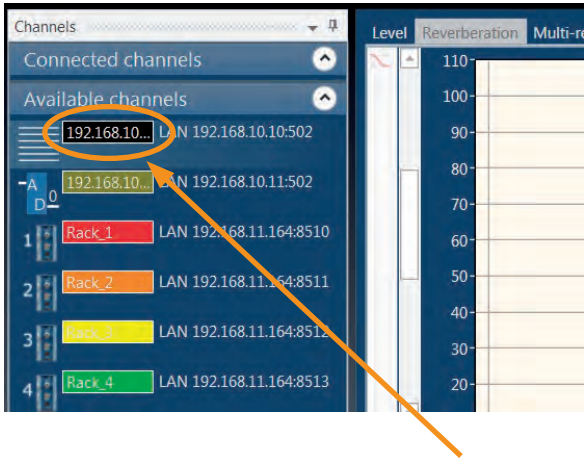


The device is now ready to be used. And now please exit the *Advantech Adam/Apax. Net Utility*.

Add NorTTL as an available channel in Nor850

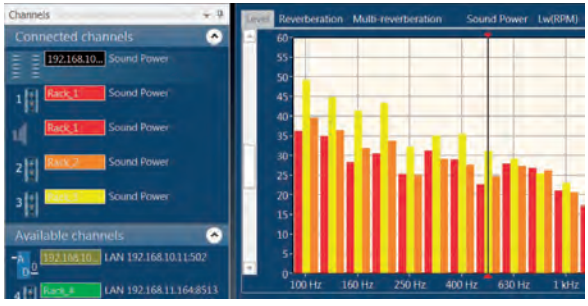
Open Nor850 software, and active one of the measurement mode. Customer should first add *NorTTL* as an available channel in Nor850.

Select *NorTTL* from the Device list and *LAN(Tcp)* as the communication type, IP-address: 192.168.10.10 and Port:502 (Here is only an example, the customer's IP address should be determined by your Network administrator).



When you press *OK*, you will see the *NorTTL* icon appears on the Available channels list.

In the following sound power measurement project, we activated three measurement channels along with the NorTTL for measurement while controlling the operation equipment.



Configure NorTTL in Nor850

In order to illustrate the configuration of NorTTL in Nor850, we have set a project example in laboratory. This is a laboratory test with a moving loudspeaker which can move left/right during noise measurement.

In this project, we should use 4 voltage channels to control the driving motor. The 1st channel is attached to the direction switcher (Left side); the 2nd channel is attached to the direction switcher (Right side); the 3rd channel is attached to the operation switcher (turn on) and the 4th channel is attached to the operation switcher (turn off).

In NorTTL, Relay setup has connection to type of measurement (Level, Background Noise or Reverberation) and to state of measurement (Running/Completing).

Running will be activated when measurement is started and relay connection in test room;

Completing will be activated when measurement is finished and relay connection in test room;

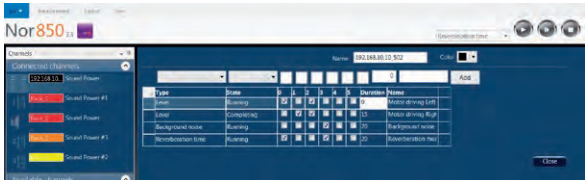
Type: if Type is given, but State is not, the Relay will be activated when measurement type is changed to the selected type.

Default: If neither Type or State is given, the Relay may be activated by using Start and Reset in context menu for channel.

Duration: In state Running, the relay will be reset when measurements is finished, otherwise will stop after given number of seconds or manually stopped.

The setup NorTTL procedure is as follows:

1. Motor driving loudspeaker moving toward left, while microphone is measuring Level;
2. Motor driving loudspeaker moving back right, while microphone is not measuring Level;
3. Driving motor stopped, while microphone is measuring test room Background noise;
4. Driving motor stopped, while microphone is measuring test room Reverberation time;

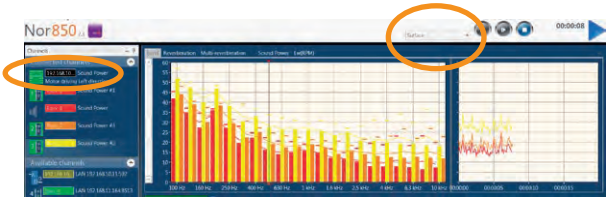


In the first NorTTL procedure, Level/Running, the duration time setup is `0´, which means the control signal format output will be kept until the level measurement is finished.

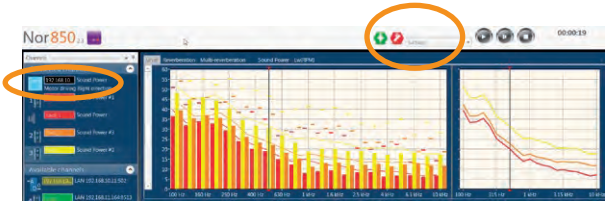
As the same as we described in former chapter " Sound power measurement versus RPM from rotational machinery", customers should also set in right Measurement parameters and Rating parameters in menu bar.

Make measurement along with NorTTL

First perform “Level” measurement on the measurement site. Notice that NorTTL is activated and the first NorTTL procedure name is also indicated under the NorTTL icon, which means the motor is driving loudspeaker moving toward left, while measuring is performing.

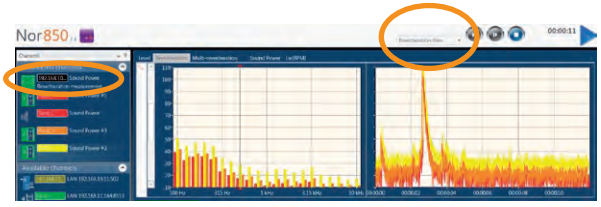


After the level measurement is finished, the second NorTTL procedure name is indicated under the NorTTL icon, which means the motor is driving loudspeaker moving back right, while level measurement is stopped.



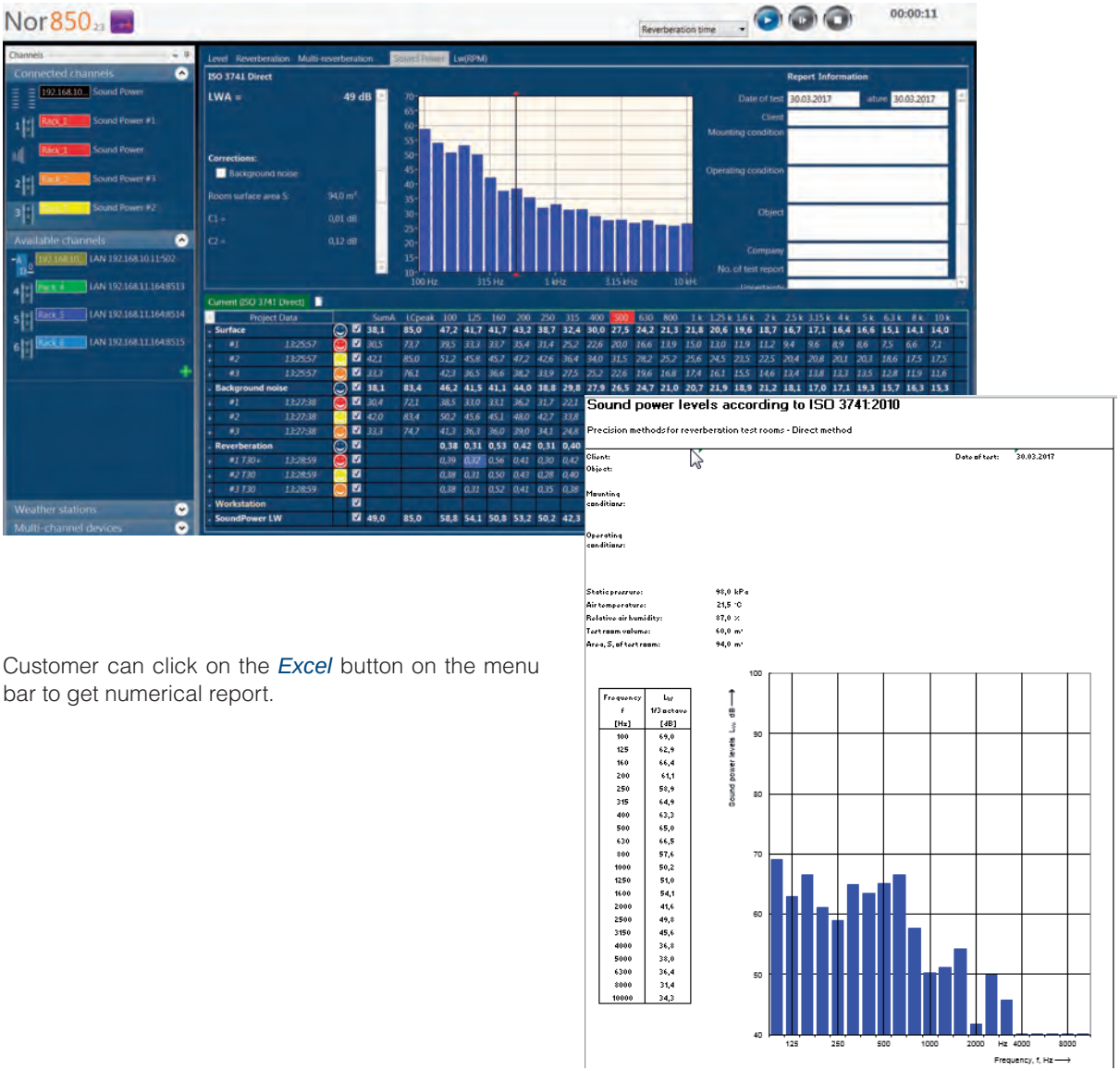
When you select to Background noise measurement, NorTTL indicates the corresponding control command and the driving motor is totally stopped during background noise measurement time.

The last step is Reverberation time measurement, NorTTL also indicates the corresponding control command and the driving motor is totally stopped during Reverberation time measurement time.



Analysis results with NorTTL measurement in Nor850

The results analysis is a common function as described in most of the measurement modes. When all the related measurements are performed, those following results table will appear on the screen.



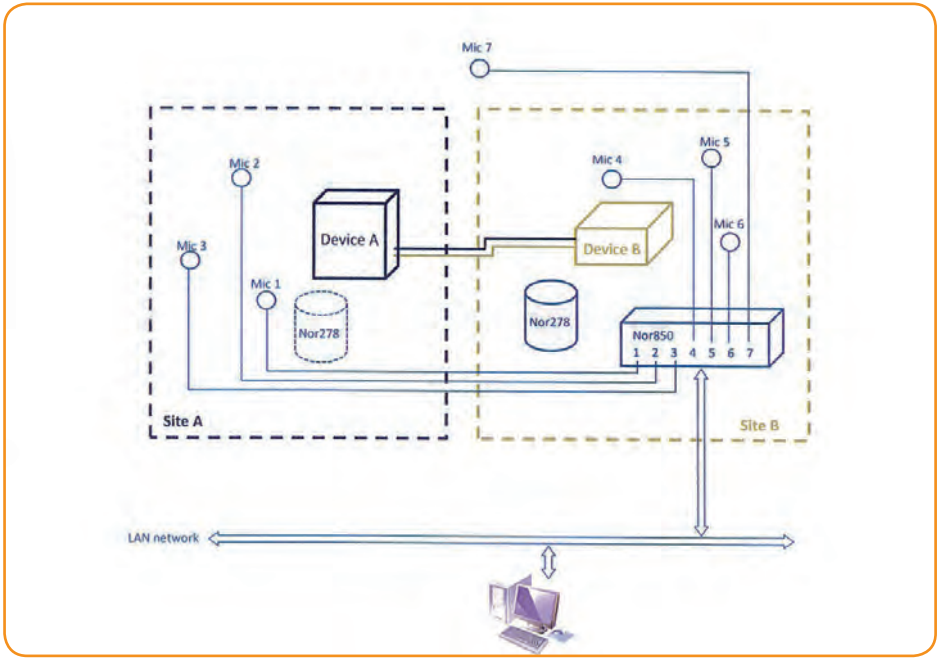
Customer can click on the *Excel* button on the menu bar to get numerical report.

Simultaneously sound power measurement in two adjacent rooms

For some project applications, there are two device components, Device A and Device B, located in two adjacent rooms, and the inside climate condition difference in these two rooms is huge. However, it is always difficult to keep so much inside climate difference for a long time, therefore the test should be performed simultaneously and quickly. The related international standard is applicable to sound power measurement is ISO 3744.

Measurement hardware setup

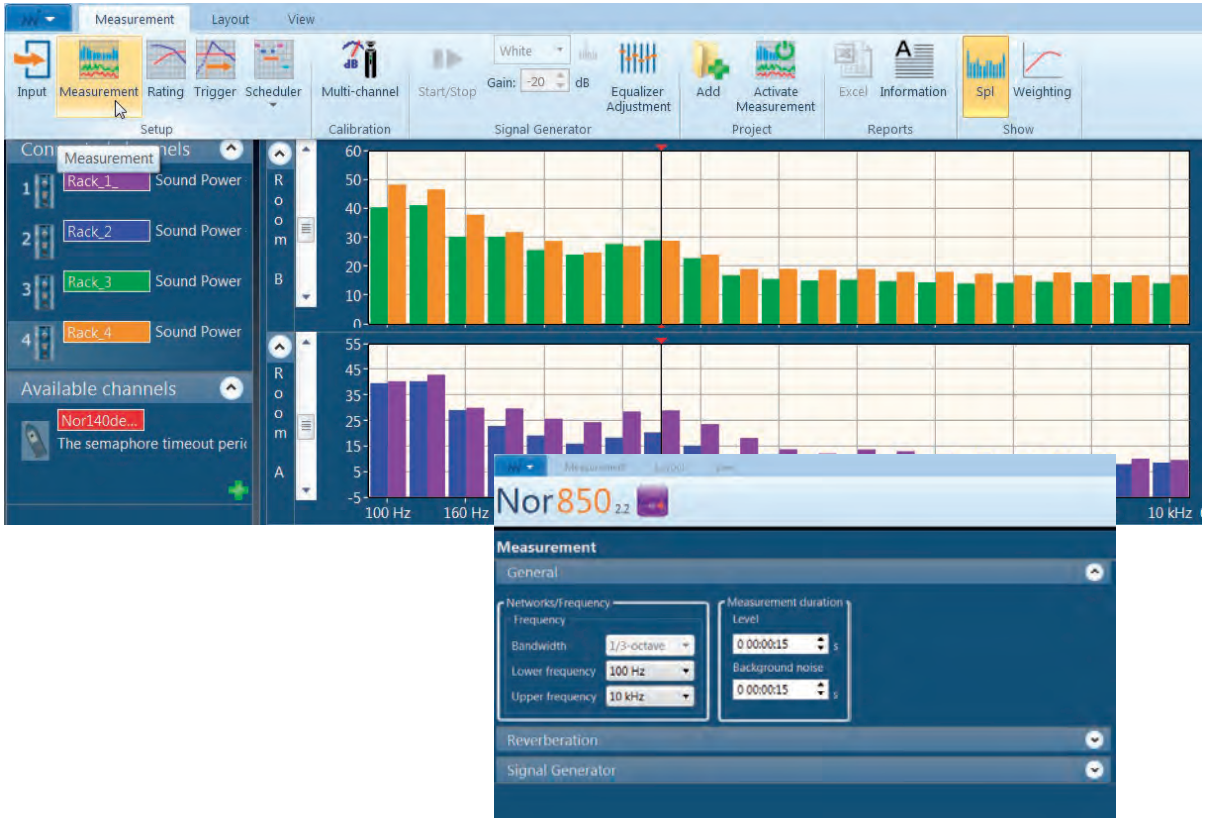
For most of the similar project application, Device A and Device B is running simultaneously and they are located in Room A and Room B respectively. We should arrange measurement hardware in measurement rooms as in the following figure. The detailed setup is set 3 microphones in the Room A (Site A) and 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 be interestd in the noise level in some certain work station, and a reference microphone #7 may be used.



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.



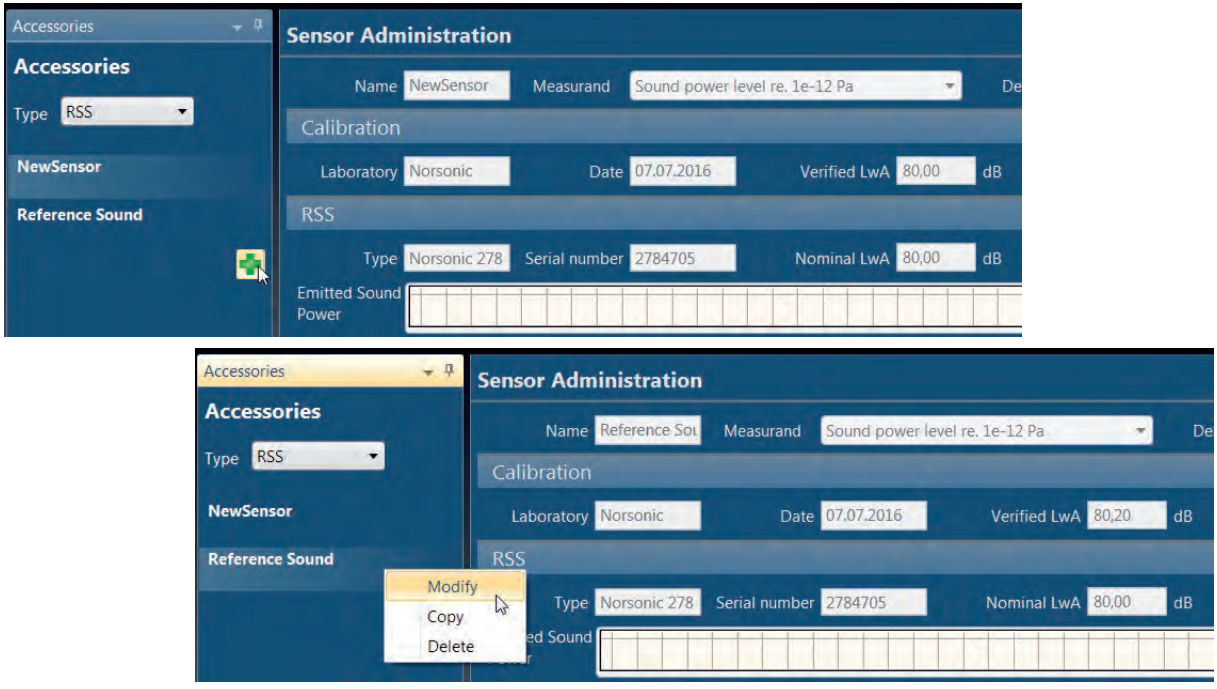
Rating setup

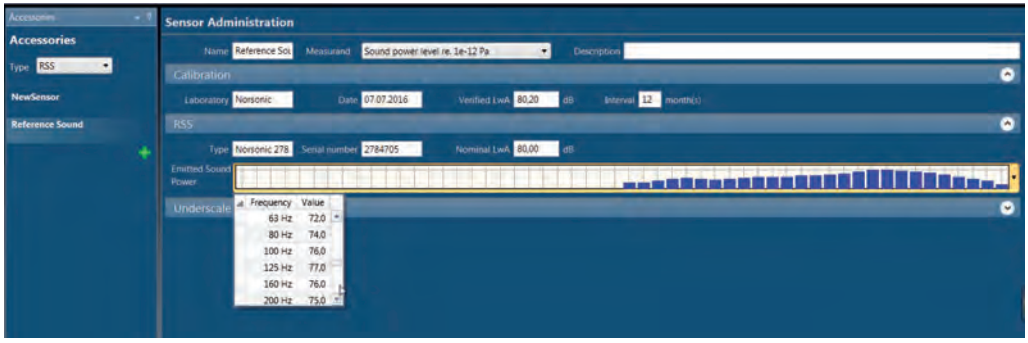
The *Rating setup* described the related sound power measurement standard for two devices in two adjacent room; devices dimensions; test room dimensions; surface parameters and reference sound sources in each room. The *Rating setup* can also be activated from the *Measurement* menu, which is the same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

For the *Rating setup* information, the 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 with the environmental correction factor K2 afterwards.

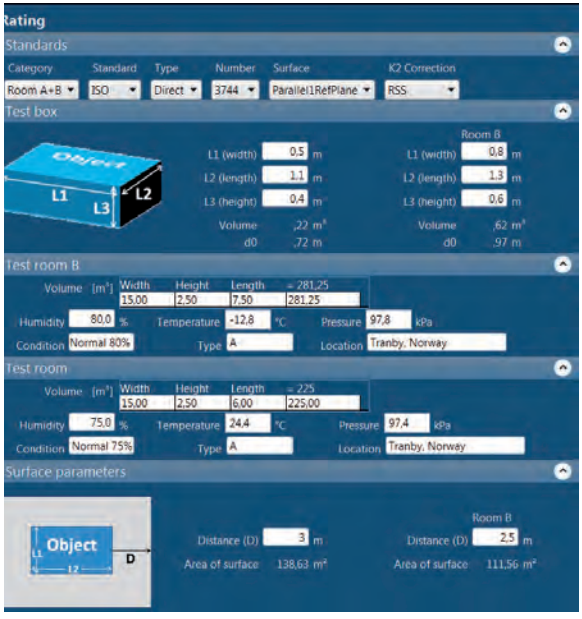
To use the RSS, you must first enter the values from the calibration chart or use the nominal values found in the user manual.

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.



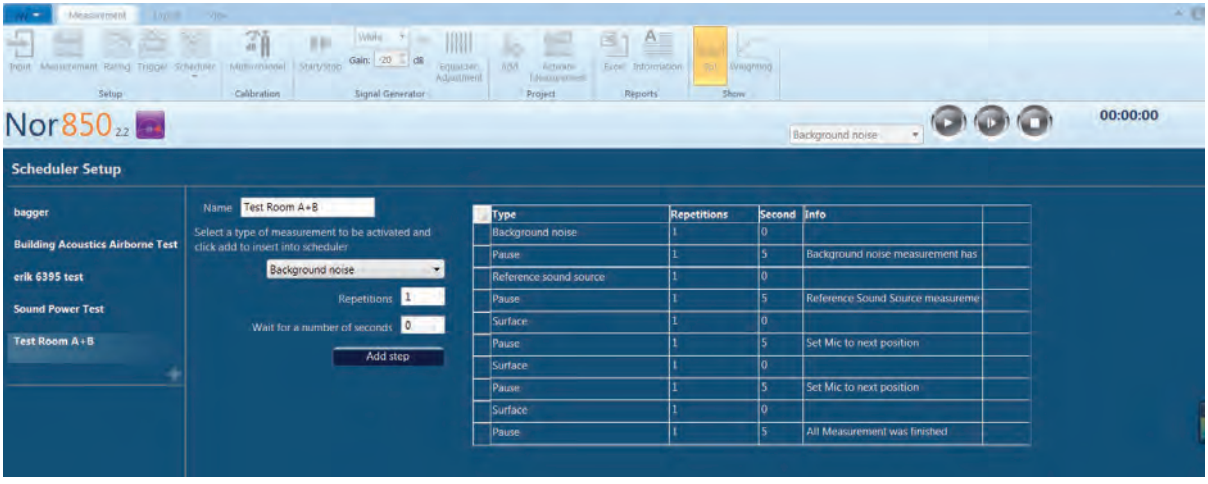


The user should fill in all those measurement parameters for the environment and measurement source one by one, these are necessary input information both for the measurement work itself and the report work afterwards.



Scheduler setup

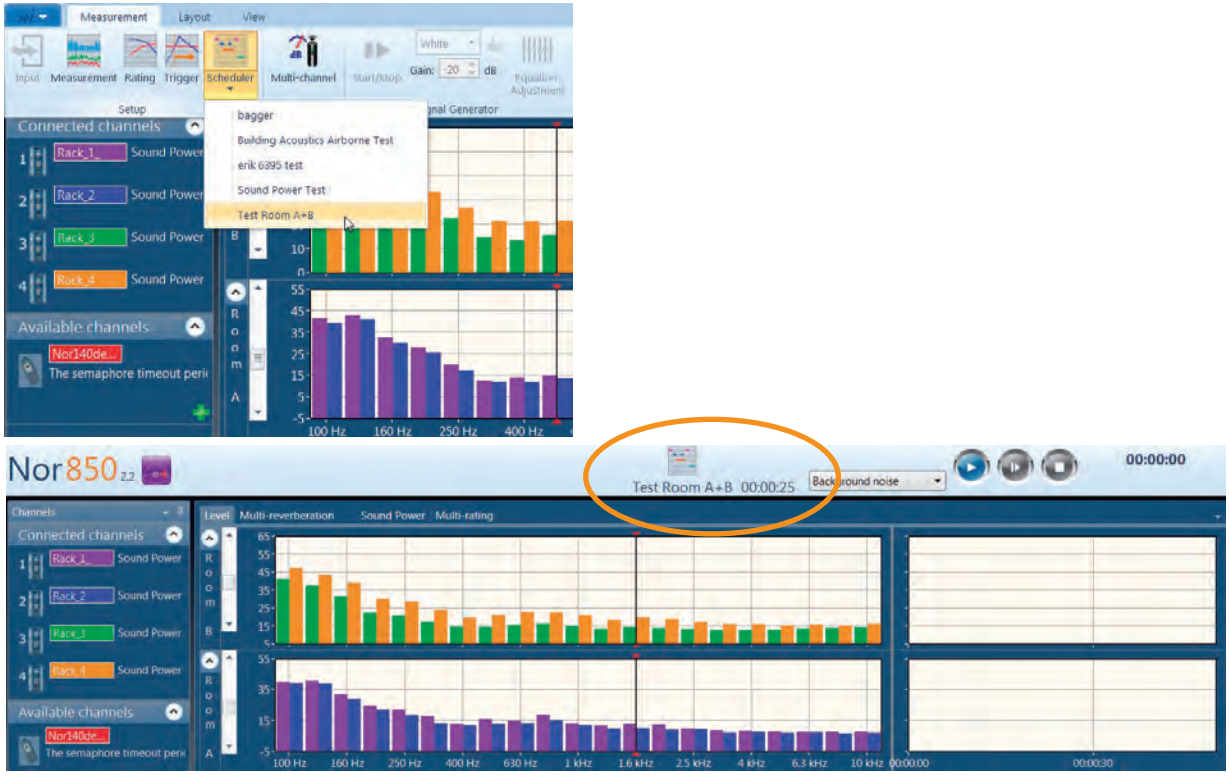
One of the advantages for Nor850 is that the user can describe some certain test schedulers for the measurement in advance, which we have illustrated in the former section. The user should read through the related measurement standard and set up his own measurement system, and arrange his own measurement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



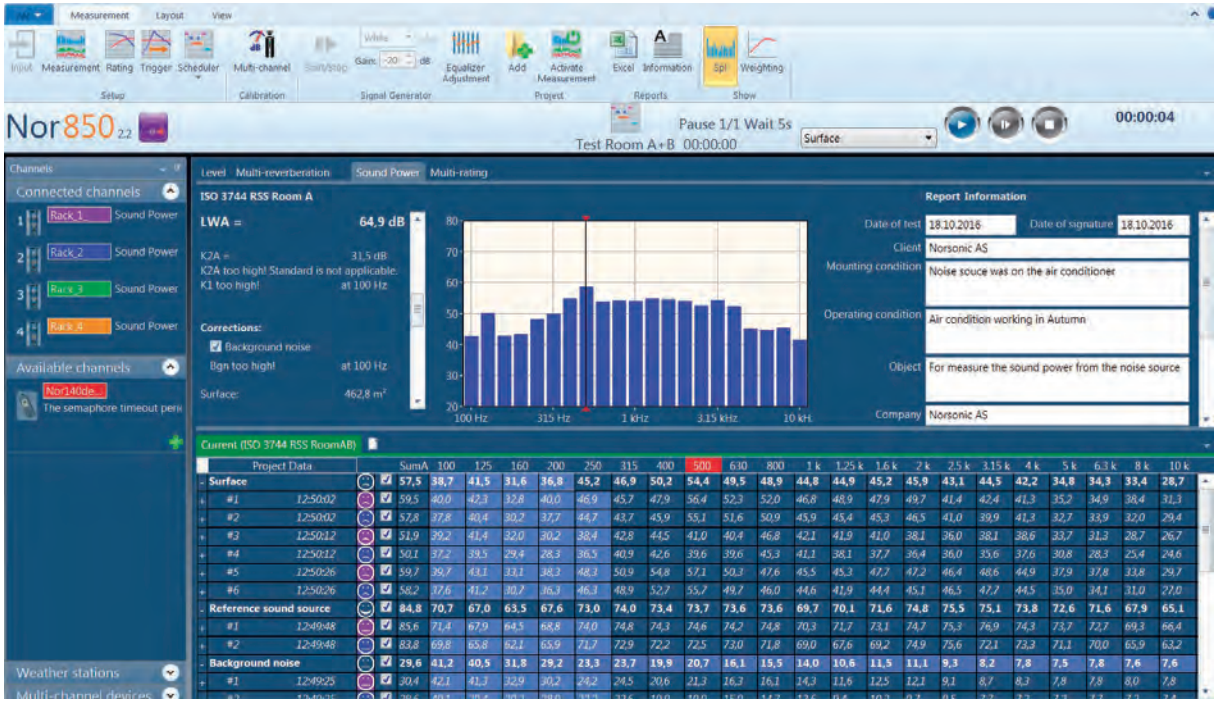
Sound power measurement

Select the pre-defined scheduler

For several pre-defined 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. The name of that schedule will appear on the upper of the displaying graph.



When the test scheduler is finished, the measurement result and the measurement report will appear on the display graph.



Scheduler Setup for repeatable measurement tasks

The measurement scheduler setup is a useful function for complex measurements 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. This ensures a reliable measurement result even if measurements were performed in different places and by different people.

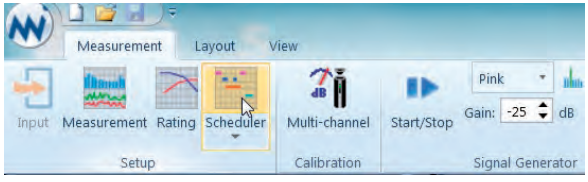
The measurement scheduler also simplifies the task for the operator. What they need to do for these measurement work is only press the start button or running the reference source and operating machinery as the indication in the measurement scheduler.

The measurement scheduler functions can easily be edited, modified or deleted in the Nor850 software.

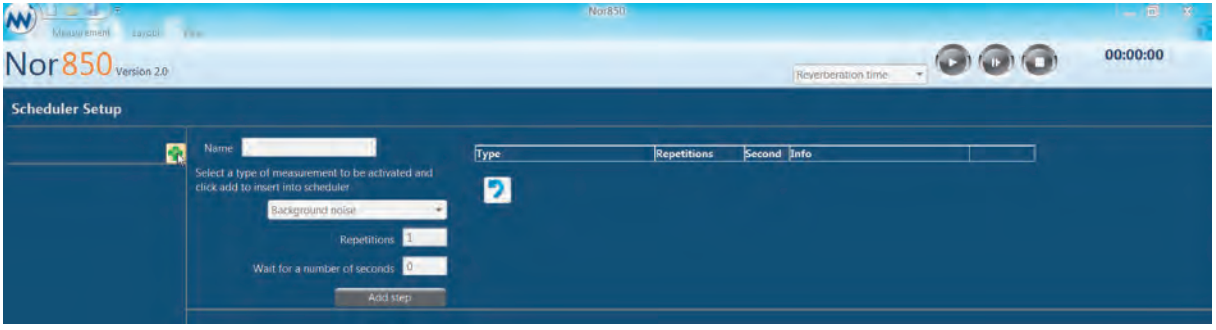
Scheduler menu

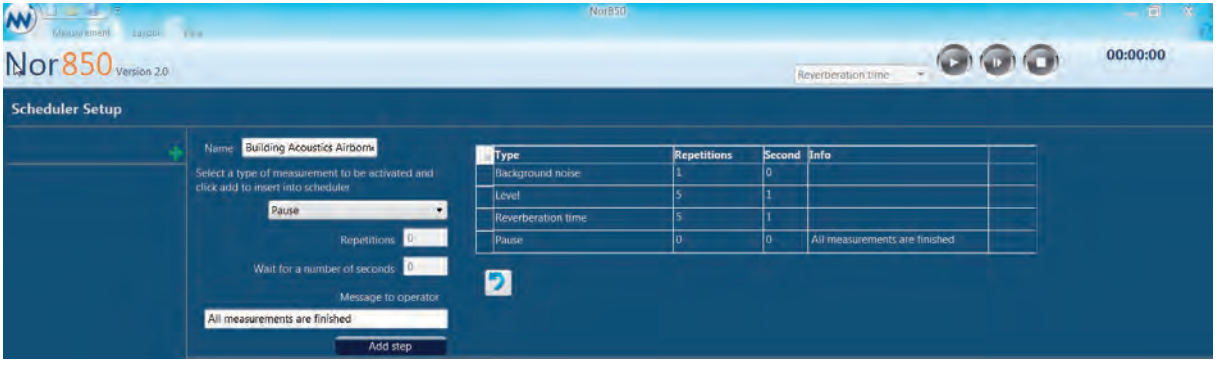
By selecting the Building Acoustic Mode or the Sound Power Mode, you can get the *Scheduler menu*. As soon as the application software is loaded, the *Scheduler* is activated by editing the measurement procedure for the measured tasks.

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.

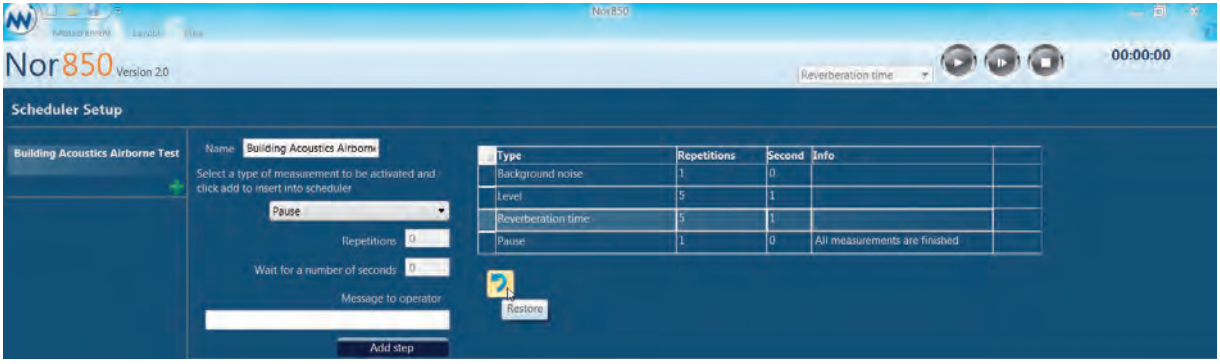


During the edit process of *Scheduler Setup,* one can also press the *Restore* button to restore the *Scheduler Setup*. After finished editing the *Scheduler Setup*, just press O*K* button and then *Close* button in the lower right to quit.





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



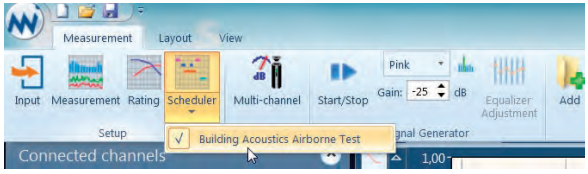
Scheduler functions in Building Acoustics Mode and Sound Power Mode

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

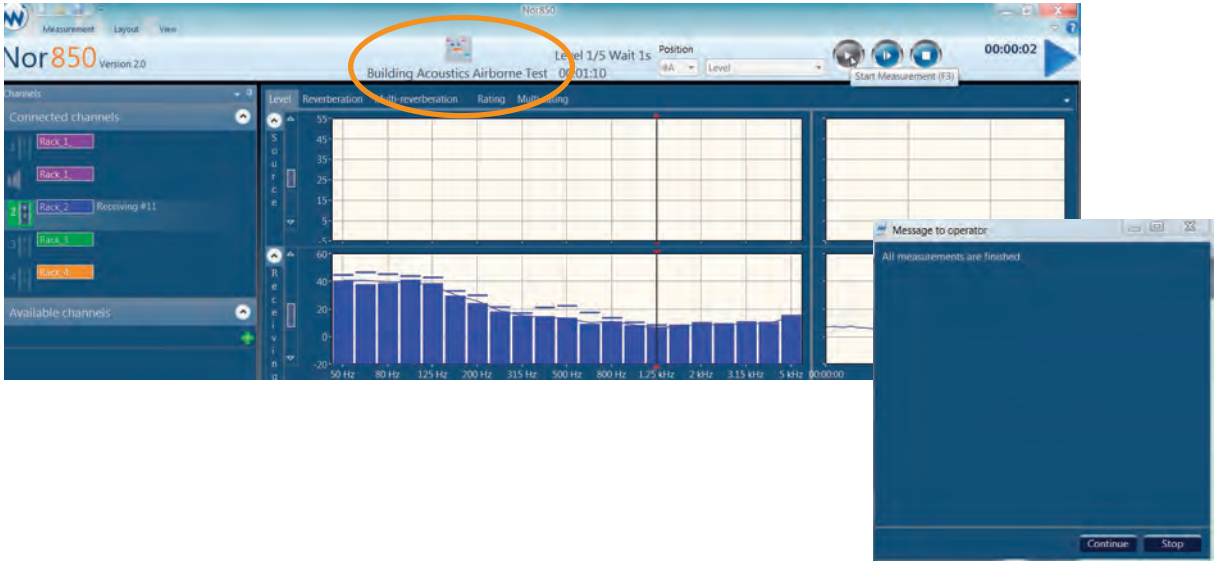
No.	Scheduler Function	Function prescriptions	Remarks
1	Level	Sound level in the source room and/or in the receiving room	Both for Building Acoustics and Sound Power Mode
2	Background Noise	Background noise in the receiving/ machinery room	Both for Building Acoustics and Sound Power Mode
3	Reverberation 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. Tick on the name in the edited scheduler name.



Then press on the *Start* button on the upper right to execute the measurement project. It will perform the measurement step by step until a message to operator that all measurements are finished is given.



Control the Microphone Boom

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

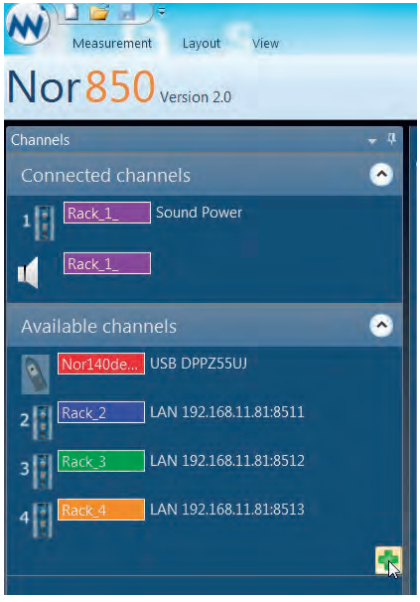
By controlling the microphone boom, one can perform level measurement or reverberation time measurement.

Panel Setting on the Microphone Boom

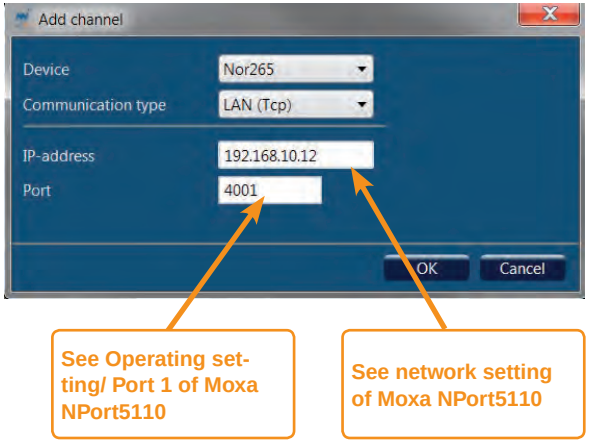
Upon connecting Microphone Boom Nor265 to Nor850, proper setting should be made on the front panel on Nor265. Please turn on the power supply and switch to 'Remote' position.

Active the Microphone Boom

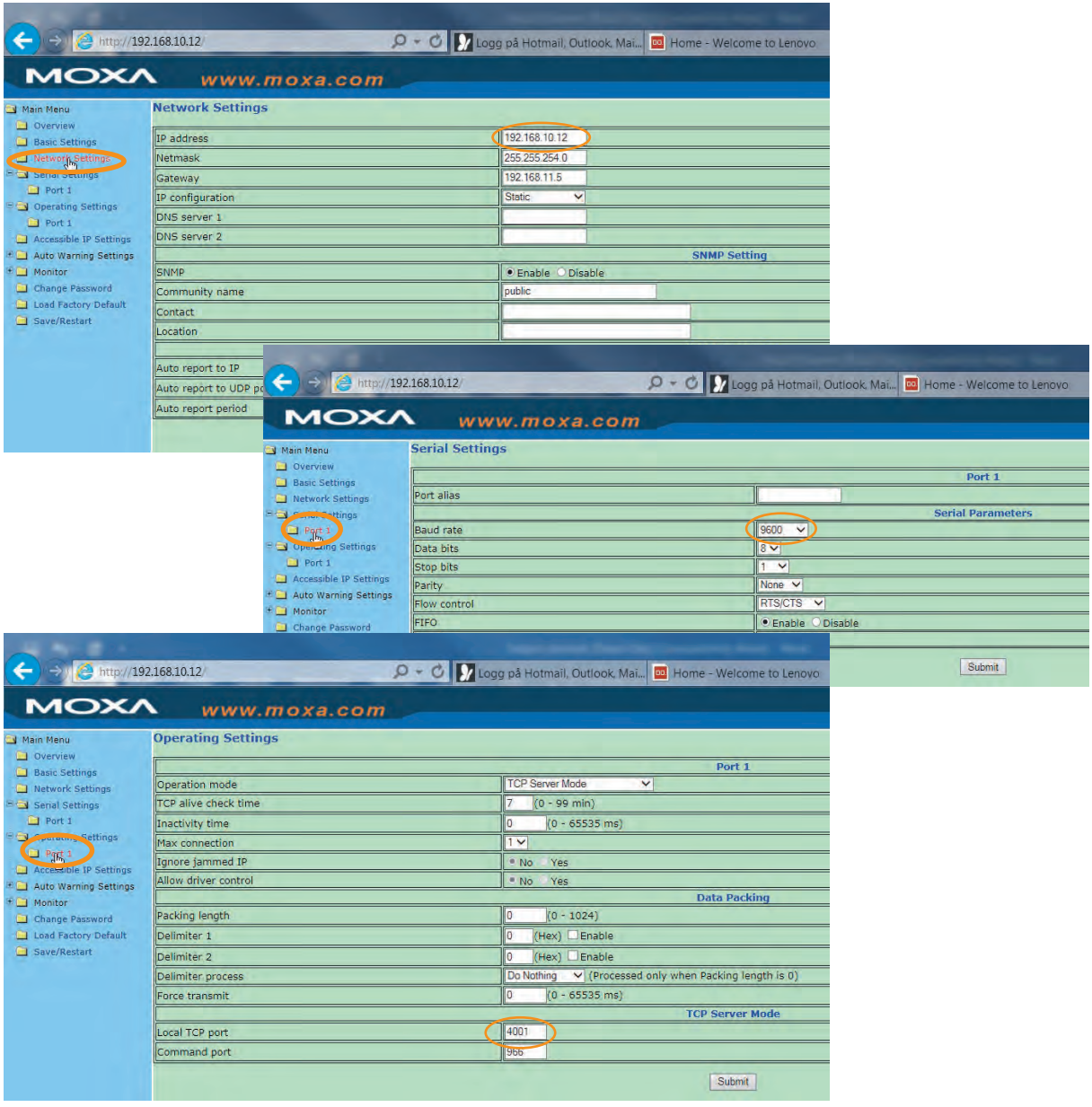
Click on the green '**+**' on the available channels to select the Microphone Boom.

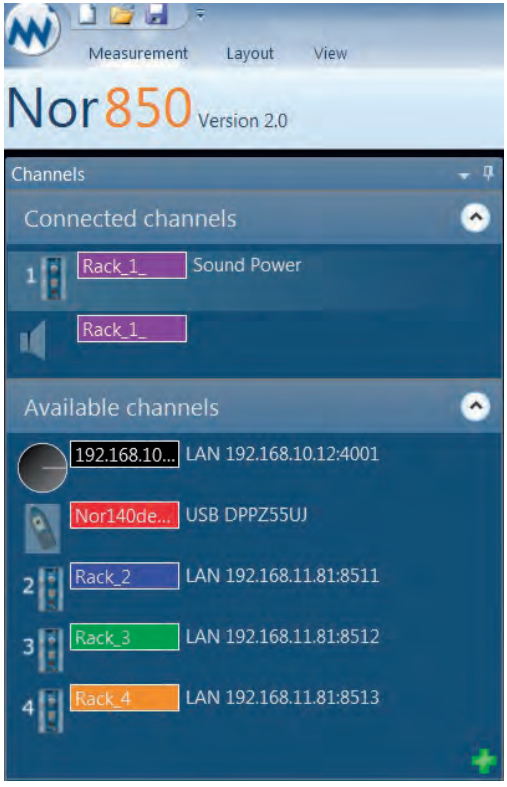


Add channel tab as follows, please set in Device as Nor265, Communication type as LAN(Tcp), IP-address and Port. If you select the Lan Serial unit as Moxa, the default port should be 4001.

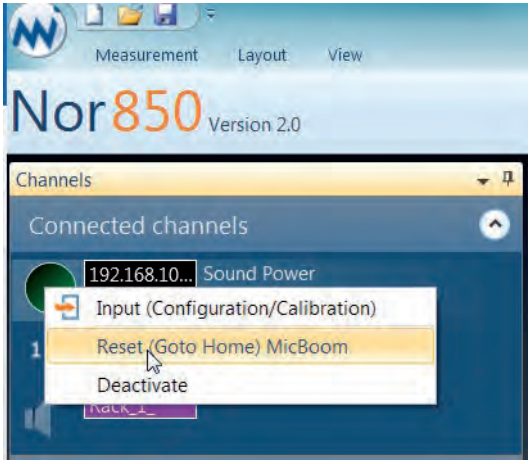


One can get a local IP address from the Network settings of http://192.168.10.12 and port number from Operating settings/ Port 1. One should also check whether the Baud rate of Serial setting is fit for the settings in software of Nor850.


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 MicBoom, you must select “Automatic” from drop-down. Otherwise it will be manually handled.

Type of action is:

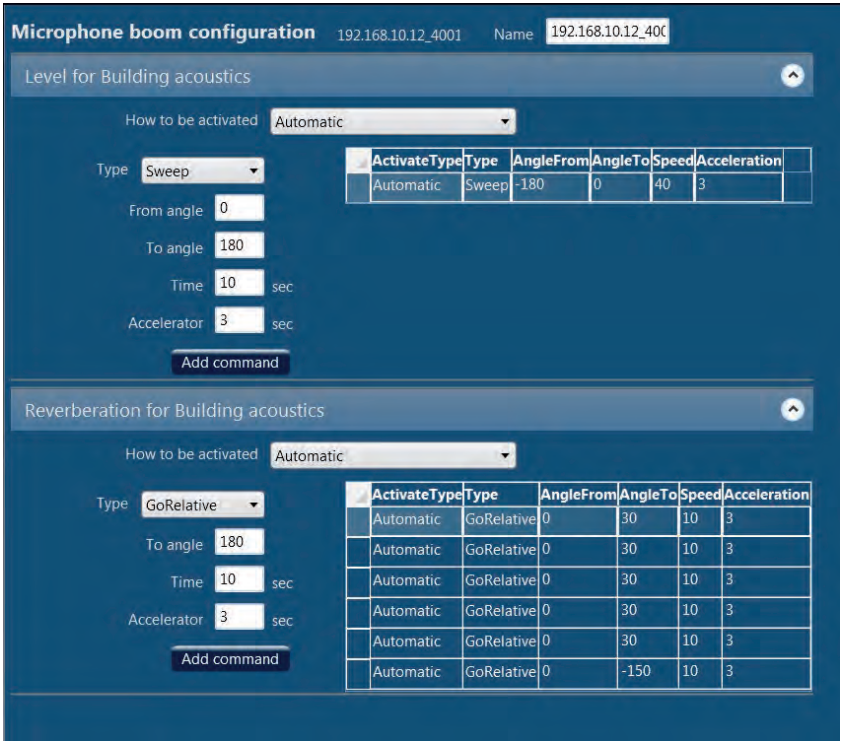
- Sweep - Sweep between two degrees in given time. To avoid twisted cables, the Sweep must be set to a negative position (The MicBoom returns to Home the wrong way). When MicBoom was set in sweep mode, the MicBoom will return back to the original position as soon as possible after the measurement was 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.

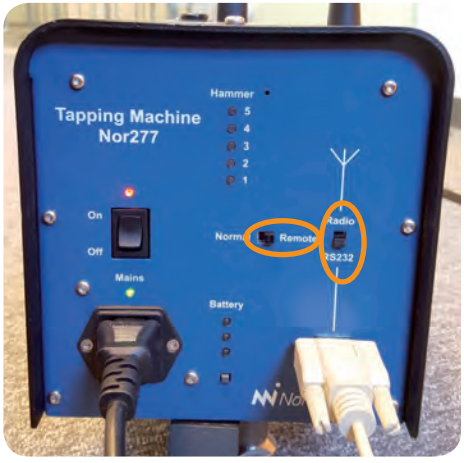


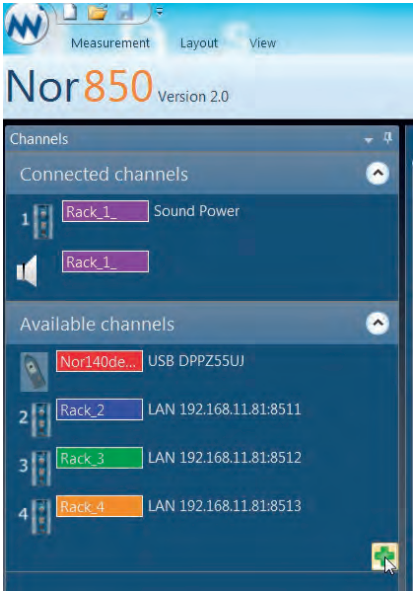
Control the Tapping Machine

The Nor277 Tapping achine 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

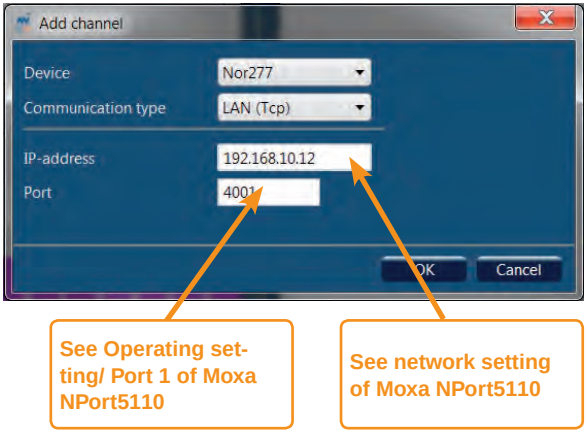
Upon connecting Tapping Machine Nor277 to Nor850, proper setting should be made on the front panel on Nor277. Please turn on the power supply and switch to 'Remote' position together with 'RS232' Position.

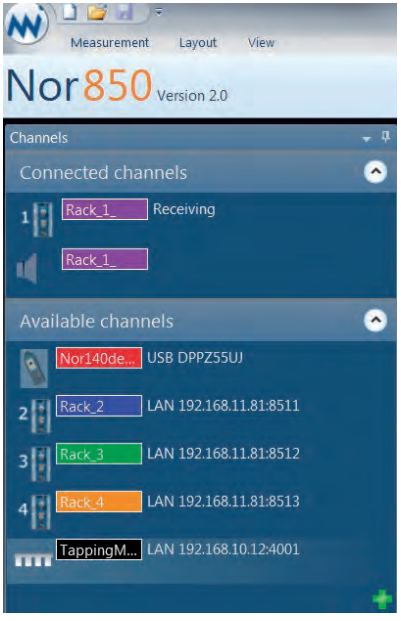




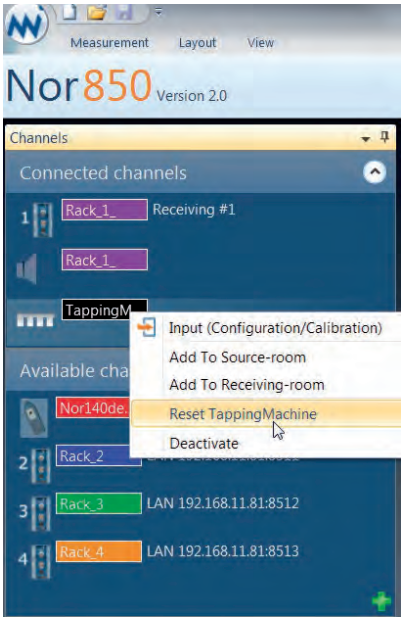
Active the Tapping Machine

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".



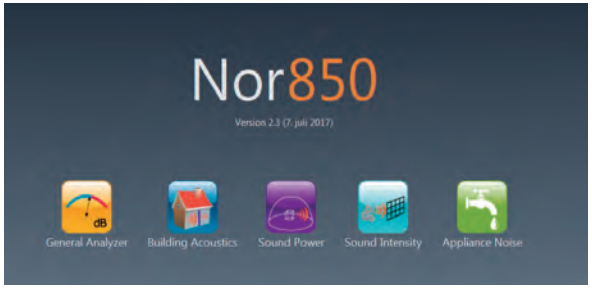
When you activate the Tapping machine (shown as *Connected channels*), Please right click it and re-set the Tapping Machine. No more configuration or calibration for tapping machine is needed for testing.

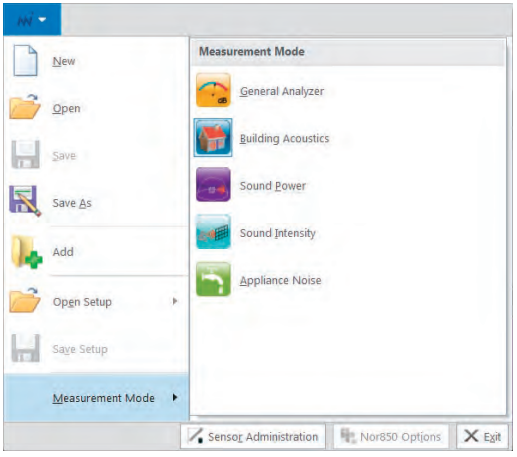
Just select the level from the down list and press on the *Start* button, the tapping machine will begin to start running and get ready to noise measurement.

Sound Intensity Mode

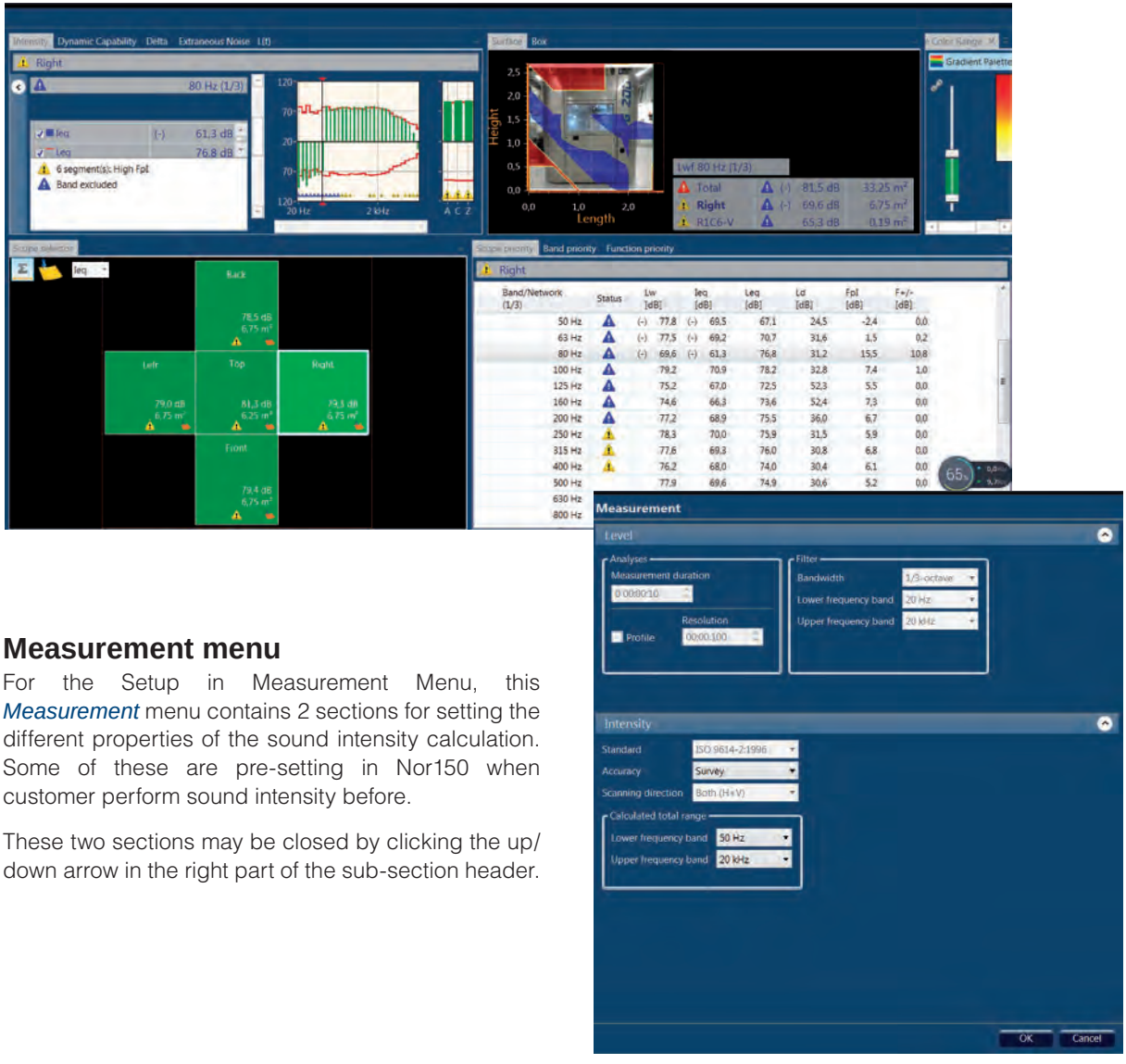
Sound Intensity Mode is used for post process for sound intensity measurement project. Customers can open an executed sound intensity mode files taken by Nor150 before, and use Nor850 software for data processing or color mapping for measured sound intensity on the measurement surface.

The *Sound Intensity mode* is selected either by clicking the *Sound Intensity* 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 and opened a sound intensity file, customer can get the sound intensity interface. This interface was composed of four function zones, Measurement Navigation zone (lower-left corner), Function Figure zone (upper-left corner), Result Mapping zone (upper-right corner) and Result Table zone (lower-right corner).



Measurement menu

For the Setup in Measurement Menu, this *Measurement* menu contains 2 sections for setting the different properties of the sound intensity calculation. Some of these are pre-setting in Nor150 when customer perform sound intensity before.

These two sections may be closed by clicking the up/ down arrow in the right part of the sub-section header.

Level_Analyses

- *Measurement Duration* is used for setting the measurement duration for sound intensity measurements
- *Resolution* is defined when customer need a profile curve

Level_Filter

- enables the user to switch between 1/3- and 1/1-octave measurements. Please note that for all currently supported sound intensity standards in the Nor850 system, only the 1/3-octaves are selectable
- *Lower frequency band* is used for selecting the lowest frequency band to be measured. In the Sound Intensity Mode, the minimum is 20 Hz for 1/3-octaves
- *Upper frequency band i*s used for selecting the highest frequency band to be measured. In the Sound Intensity Mode, the maximum is 20 kHz for 1/3-octaves

All those configuration parameters in Level section were set in Nor150 for sound intensity measurement and then it is impossible to modify it her in 'Measurement' menu.

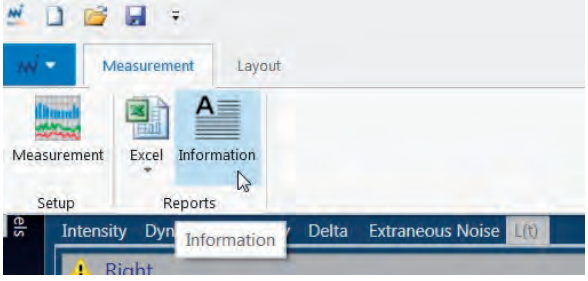
Intensity

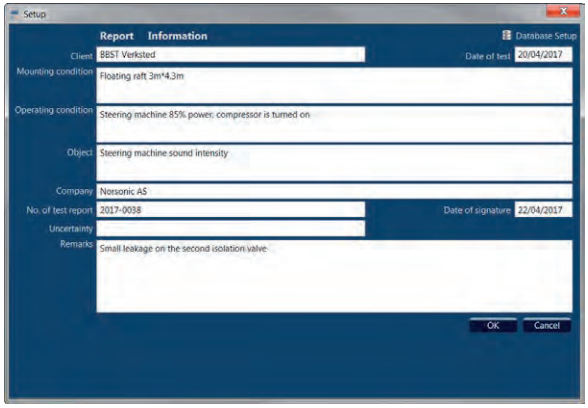
- *Standard* enables customer to select the standard for determining sound power based on sound intensity. The ISO 9614-2 relies on the scanning method.
- *Accuracy* is available for both engineering and survey grade accuracy.
- *Scanning direction* is prescribed the orthogonal scanning directions, customers may choose Horizontal; Vertical or Both(H+V). Horizontal and Vertical is used as annotation for convenience. An H and V will appear on the segments when either of these scanning directions has been used.
- *Calculated total range* is define the *Lower frequency band* and High frequency band, which is used for sound intensity post processing calculation.

As mentioned before, some of these parameters or settings were performed in Nor150, here it is only for monitoring and its configuration function is disabled.

Information Menu

Customers can fill in the related test information about mounting condition, operating condition and test object description etc. These will be very helpful to generate a formal test report later.





Layout Menu

This is the configuration menu for the Sound Intensity post processing mode. Customers can set Function option; Networks; Surface Display Mode and favorite Usert Interface from here.

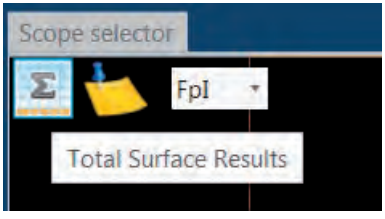
- *Function,* here customer have the option for various Functions in post processing;
- *Network,* customer should define which Weighting Network, A or C, to be adopted in this post process mode;
- *Surface*, this is the configuration for display mode of measurement results. By ticking on the 'Background Image', the imagination of the measurement surface will be appeared on the envelop surface box, which will be very intuitive for expressing measurement result. Ticking on the 'Segment Info' will also display all measurement values or possible warning icons on each measurement segment in every surface;
- *Themes/Languages*, let customers select their favorite Interface Themes and Working Languages.

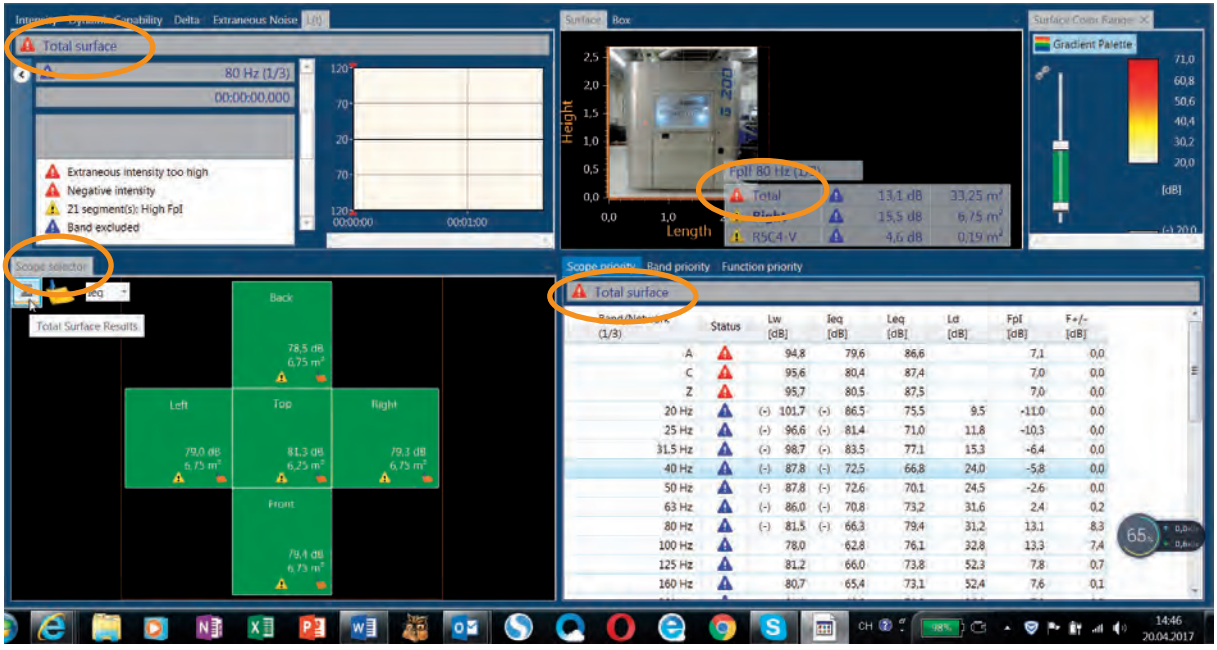
About Measurement Navigation Zone

Navigation zone is also a scope selector, customer can select various measurement surface of sound intensity measurement for further analyzing.

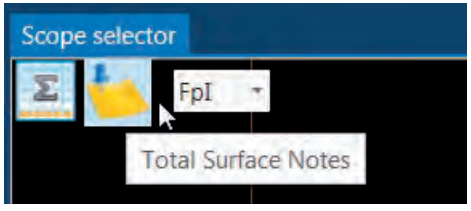
In the upper left corner, there are three icons, which are related with the selection of measurement surfaces, notes and functions.

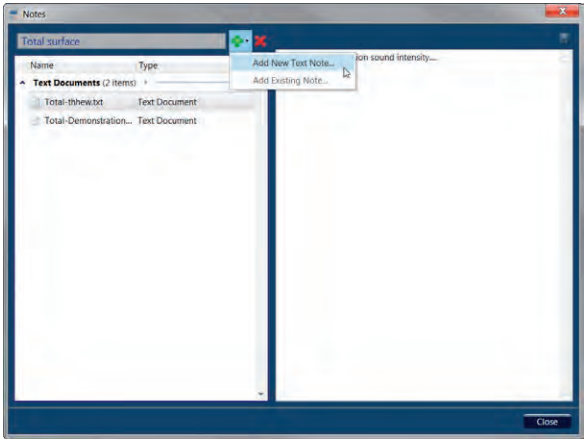
Press the "∑" icon to analyze the Total Surface Results. Then all the function results displayed in other zones are related to the total surfaces.





Press the *Note* icon to open the Note Tab for the total surface notes, then you can Add new text note or Add existing note. These notes can be text word files or JPEG image files, which can add supplementary information for the whole measurement project.





From the function selector, customer can select one of the analysis functions from

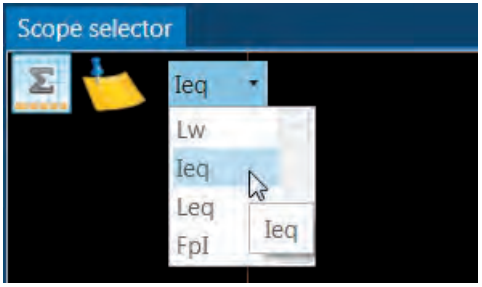
Sound Power Level L_w;

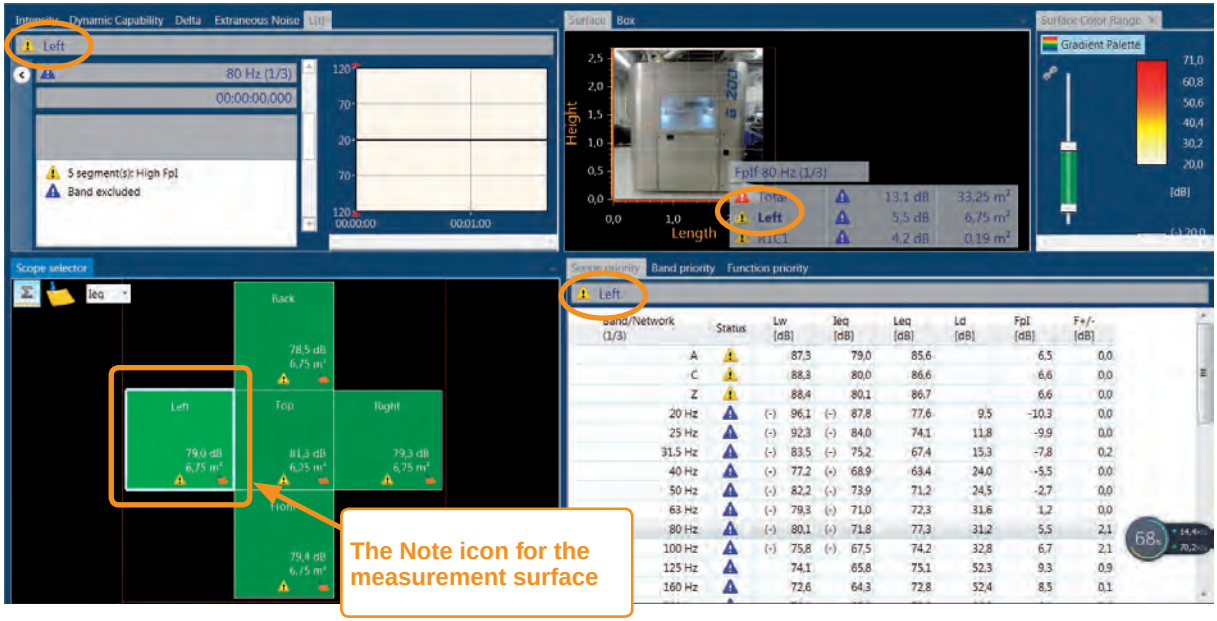
Equivalent Sound Intensity I_{eq};

Equivalent Sound Pressure Level L_{eq};

Difference Between Sound Intensity and Sound Pressure Level F_qI.

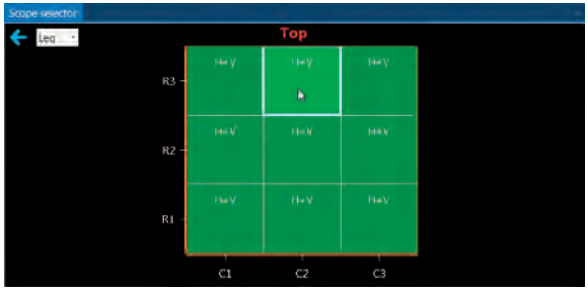
However, when customer click on one of the surface, for instance Left, the related surface will be surrounded with a bold white frame, while the other measurement surface is still surrounded with a thin white frame. The other display zones will appear the function result in that designated measurement surface.





If there is a *Note* icon appear on those surfaces, it indicates that you can check the related test note information by clicking that icon, it may be a picture of that measurement surface or others. If the customer want to add more note information for that surface, just right click the mouse and then select Manage Notes…, the following procedure is just the same as illustrated before.

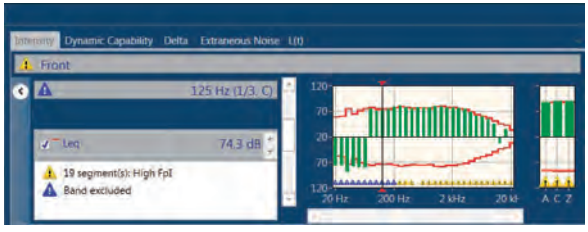
When customer double click the related measurement surface, it will zoom in all detailed measurement segments for that surface. Click one of the segments, it will be highlighted by a bold white frame and the other display zone will show the measurement results for that corresponding segment. For each segment, you can also set in note information as we illustrated in measurement surface.



About Function Figure Zone

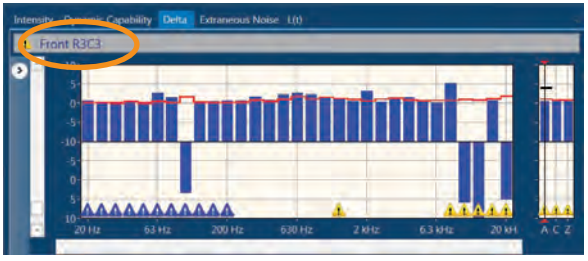
Function Figure Zone is on the upper left of the customer interface, which is composed of several tabs such as Intensity; Dynamic Capability; Delta; Extraneous Noise and L(t).

- *Intensity Tab*, customer can check the result for Ieq, Leq, and Lw in every measurement surface for each 1/3 octave band by ticking on the related measurement functions, it will also display the spectrum of those functions and its overall values in various weighting network, meanwhile, it will indicate the warning icons if there are any measurement warnings in certain frequency bands.



- *Dynamic Tab,* it will indicate the measurement dynamic capability on each frequency band for different surfaces, all those dynamic capability value is referenced by the calibrated dynamic capability for the measurement sound intensity probe. All those measured dynamic capabilities are also provided with overall values in various weighting network in addition.

- *Delta Tab*, if customer double click one of the measurement surfaces, it will zoom in every measurement segment in detail. When customer select one of those measurement segments, the Delta Tab will indicate the arithmetic sound intensity difference calculated for segments scope with the two orthogoncal scanning directions.



- *Extraneous Noise(Intensity) Tab*, for the measurement surface scope, these will be triggered if F+/, negative partial power indicator, calculated for those surface scopes exceeds 3dB.

About Result Mapping Zone

The *Result Mapping Zone* is located on the upper-right corner of the customer interface of this Sound Intensity Application Mode, the main purpose of zone is to illustrate the measurement result by mapping of the measurement surfaces or in a three-dimensional box.

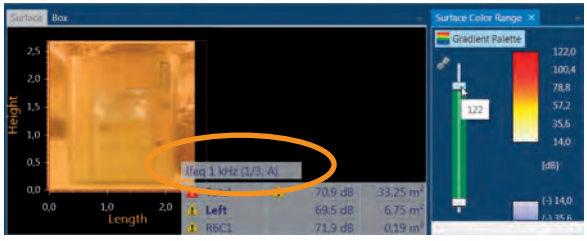
Customer should first select the measurement function for mapping or illustration from the Layout menu and then select the Function tab. As we mentioned before, there are 4 measurement functions, Lw, leq, Leq and FpI for customers to select, all those functions can be mapped in Surface and Box mode. Customer should also select the related Weighting Network for those measurement functions in the Networks tab.

In order to adjust the mapping color on the Result Mapping Zone, the Color Range icon should also be ticked on in the Surface tab in order to open the Gradient Palette.

Surface Tab

There are two different selection tab in the *Result Mapping Zone*, one is *Surface* tab and the other is *Box tab*. For *Surface* tab, it will display the imagination of that measurement surface along with the result colour mapping figure, if the customer has already added that imagination taken from that surface in the Measurement Navigation Zone.

The *Surface* tab will also show a table, which will indicate the total value of that function for all measurement surfaces, along with the function result on that special measurement surface with its imagination. If the customer has already separated the surface into several segments, then you can survey each segment for checking the function result. All those items will be presented with the related area.

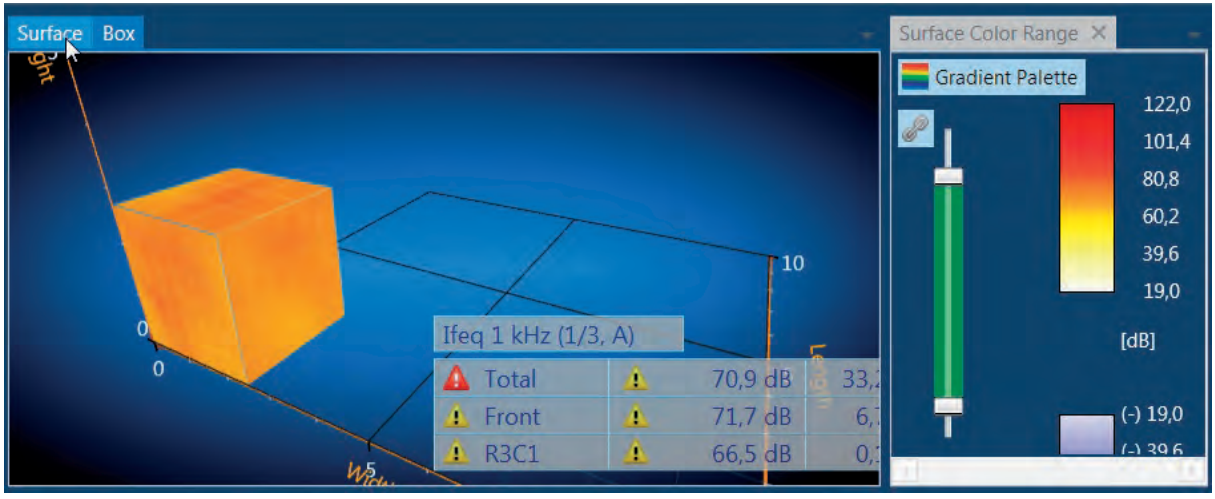


To check the measurement result for different functions in 1/3 octave frequency band, customer can select frequency band in Function Figure Zone. Another tips for customer is that the customer can slide both color bars up and down to optimize the result mapping color. In order to enlarge the result mapping zone, you can close the Gradient Palette afterward.

Box Tab

For other customers, if they want to check the whole mapping results to indicate the maximum sound radiation location of the machinery, then the *Box* tab maybe more efficient for those purposes. The result mapping illustration in *Box t*ab will provide an intuitive evidence for machinery modification.

Customer can click the left button of mouse and hold it, then you can rotate the envelop box for all measurement surfaces; while clicking the right button of mouse and hold it, you can translate move the envelop box. Both these manipulation to the envelop box will optimize the display view of the result.

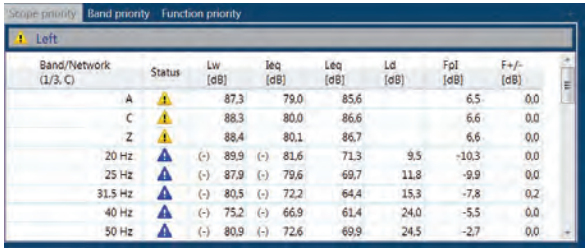


About Result Table Zone

The last *Result Table Zone* is in the down-right side of the customer interface in Sound Intensity Application Mode. There are 3 Section tab, *Scope Priority* tab, *Band Priority* tab; *Function Priority* tab.

Scope Priority

For *Scope Priority* tab, it will express all those measurement functions in frequency band for the measurement surface defined in the Measurement Navigation Zone.



Band/Network (1/3, C)	Status	Lw [dB]		leq [dB]		Leq [dB]	Ld [dB]	Fpl [dB]	F+/- [dB]
A		87,3		79,0		85,6		6,5	0,0
C		88,3		80,0		86,6		6,6	0,0
Z		88,4		80,1		86,7		6,6	0,0
20 Hz		(-)	89,9	(-)	81,6	71,3	9,5	-10,3	0,0
25 Hz		(-)	87,9	(-)	79,6	69,7	11,8	-9,9	0,0
31,5 Hz		(-)	80,5	(-)	72,2	64,4	15,3	-7,8	0,2
40 Hz		(-)	75,2	(-)	66,9	61,4	24,0	-5,5	0,0
50 Hz		(-)	80,9	(-)	72,6	69,9	24,5	-2,7	0,0

Function Priority

This tab will provide the function results in all measurement segments for all measurement surface, these results are total values and will be presented in a table of various measurement bands. Customer also can press the ^/v icon in front of each measurement surface to folded or unfolded the measurement segment result for further analyzing.

Surface	Status	Area [m²]	5 kHz [dB]	1.6 kHz [dB]	2 kHz [dB]	2.5 kHz [dB]	3.15 kHz [dB]	4 kHz [dB]
Total surface		33,25	70,8	69,5	69,7	68,0	66,7	6
Front		6,75	70,6	68,6	68,9	67,2	66,5	6
Top		6,25	73,1	71,3	72,6	70,8	65,8	5
R1C1		0,69	70,6	66,4	66,2	64,4	61,2	5
R1C2		0,69	73,7	71,6	71,9	69,0	63,7	5
R1C3		0,69	71,7	70,9	71,4	69,3	65,6	5

Band Priority

This tab will provide the band results in all measurement segments for all measurement surface, these results will be presented in a table of various functions. Customer can press the ^/v icon in front of each measurement surface, to folded or unfolded the measurement segment result for further analyzing.

Measurement Functions and Indicators

Sound power measurement according to ISO 9614-2 uses the intensity values to generate sound power levels for each individual segment, and summing these for both surfaces and the total measurement surface. The following functions were adopted in the Sound Intensity Application Mode.

Lw – sound power, calculated for all scopes, referenced 1 pW;

leq – time-equivalent sound intensity level, referenced to 1 pW/m2;

Leq – time-equivalent sound pressure level, referenced to 20 µPa;

Ld – dynamic capability, available for all scopes, calculated based on probe verification and grade of accuracy;

FpI – pressure-intensity indicator (Leq – Ieq), calculated for all scopes;

ΔIeq – arithmetic sound intensity difference, calculated for segment scope with two measurements;

ΔLeq – arithmetic sound pressure difference, calculated for segment scope with two measurements;

F+/- – negative partial power indicator, calculated for total scope.

Water Appliance Noise Mode

Water below atmospheric pressure create vapor at lower temperature. Large pressure differences appear across small volumes of turbulent water.

Here bubbles are created, and they collapse then they reach a region of higher pressure. This creates a disturbing amount of acoustic noise distributed thru the tubes.

Standardized measurements are needed to compare the noise emitted from different products.

Norsonic Nor850 multi channels noise analyzer has the following characteristic for water appliance noise measurement.

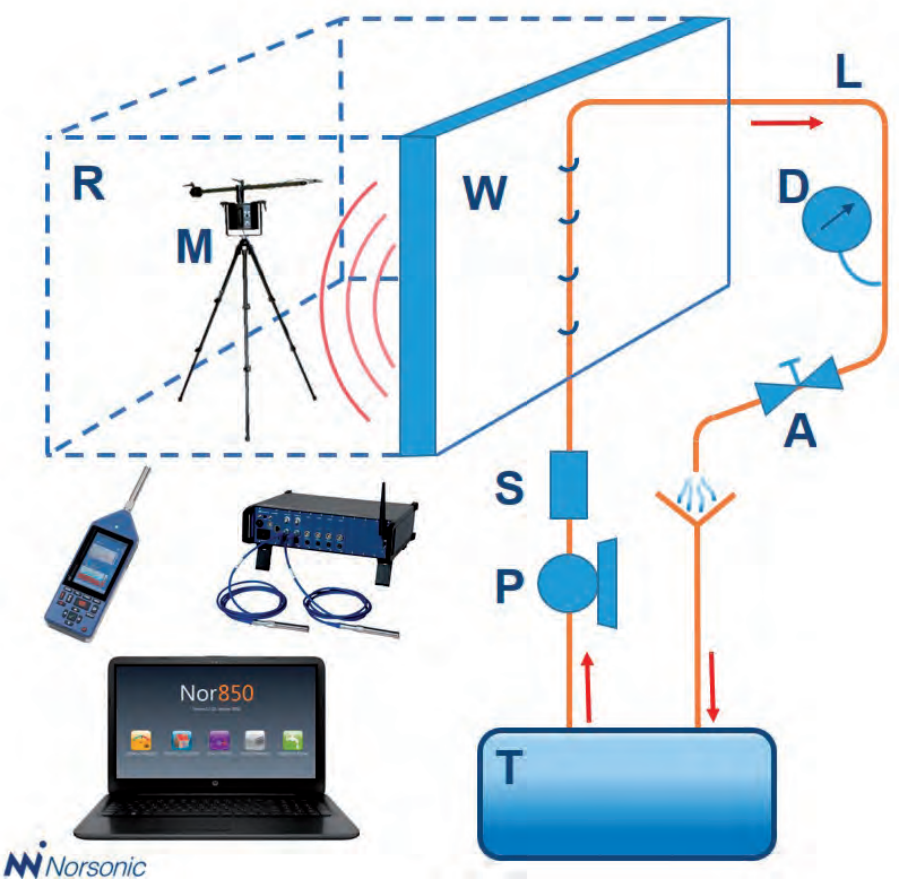
- Highly configurable
- Easy setup
- Intuitive and efficient interface
- Test Scheduler for automated processes
- Customized report generator
- Flexible but still easy use
- For both experts and freshmen

In a way, this is a perfect sound power tool for use both in R&D and on production line.

The Appliance Noise mode is selected either by clicking the *Appliance Noise* button on the opening screen, or by selecting the *Appliance Noise* Measurement Mode menu found by clicking on the Norsonic logo in the upper left corner.

Measurement hardware setup

The measurement hardware setup is simple. You should setup both the measurement system and the water appliance operation system. One of the typical measurement configuration is illustrated as follows:



All those key components in the measurement configuration is

- T – Tank
- L – Tube line, ø22mm
- P – Pump
- S – Silencer
- w – Wall
- D – Pressure and Flow measurement
- A – Appliance under test
- R – Measurement Room
- M – Norsonic Nor150/ Nor850 rack+Nor265 microphone rotating boom

and Nor850sw for data collection and reporting.

Test sequence

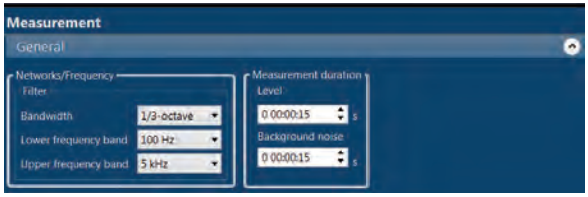
According to the installation noise standard ISO 3822, the related test sequence is

- 1/1 or 1/3 octave analysis (100Hz - 5KHz)
- A standardized calibrated “bend” for base line measurements
- Plural test modes in combination
  - fully opened & most noisy position
  - warm, cold and 50/50 mix
  - water pressure 3 and/or 5 bar
- 3 samples pr. model
- 3 measurements pr. test mode
- Results in an averaged Sound

Pressure Level: Lap

Measurement menu

As soon as the measurement setup is prepared, and you have been familiar with the measurement sequence, customer may choose to adjust different parameters for the measurements by opening the *Measurement* menu. Select *Measurement/ Measurement* in the upper menu bar.



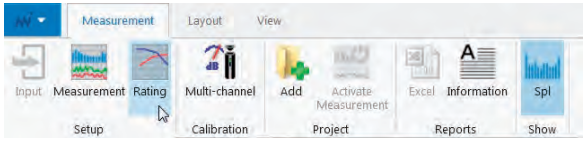
The *Measurement* menu contains the following features and settings for the measurements of levels:

General

- *Bandwidth* enables the user to switch between 1/3- and 1/1-octave measurements.
- *Lower frequency* is used for selecting the lowest frequency band to be measured. In the Appliance Noise mode, the minimum is 20 Hz for 1/3-octaves; 16Hz for 1/1-octaves.
- *Upper frequency* is used for selecting the highest frequency band to be measured. In the Appliance Noise mode, the maximum is 20 kHz for 1/3-octaves; 16kHz for 1/1-octaves.
- *Duration Level* is used for pre-setting the measurement duration for the level measurements.
- *Duration Background noise* is used for presetting the measurement duration for the background noise in the measurement room.

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 appliance noise measurement, and for pre-entering text descriptions for the final test report document. The different sub-sections may be closed/opened by clicking the up/down arrow (^/V) in the right part of the sub-section header.

Standards

- *Category* is used for selection among the predefined Standard categories, Noise emission and Flow rate.
- *Standard* is used for selecting the different Standardization groups. For the moment, only ISO Standards are available.
- *Type* is the selection of measurement object type, as Mixing valve, Shower head or Flower adjuster or as for other normal appliance.
- *Number* is used for the selection of possible multiple Standard numbers within the set Category and Type. Her 3822 is used for the laboratory noise emission test for appliances and equipment used in water supply installations.
- *Subtype* is only fit for General.

Test room

- *Volume* is the actual volume in the test room given in m3
- *Humidity* is the humidity in the test 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 test room
- *Type* may be used for describing the actual type of test room
- *Location* may be used for describing the location of the test room

The related climate parameter can also be gotten from the net connected Vaisala instrument.

Test properties

In order to obtain comparable measurements in different laboratories, the noise produced by the appliance is always compared with the noise produced by an Installation Noise Standard (called: INS).

The INS is mounted at the end of the test pipe instead of the appliance. And since there is usually a twin outlet, hot/cold or left/right, customer can specify on which outlet he mounts the INS. If customer selects Left and Right, the values of the left and the right will be averaged to one value.

Some laboratories have an extra (single) pipe for control purposes. The INS can be mounted for control purposes on this pipe as well. Use the corresponding tick box (Control) if you want to have the INS measured with the control pipe.

Her can customers also perform the other two test properties, they are '1/10 dB accuracy Lap' and 'Number of averages'.

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 level values will be corrected for the measured background noise level when measured. The selected Standard is automatically giving the details for such corrections.
- If customer has the microphone correction factors for each individual 1/3 octave band, it is also possible to active the *Use sensor correction*.
- When customer want to import the related measured *.nbf file before into this Appliance Mode project, it is also possible to edit and active the *Use import correction*, which is also the sensor correction for getting the *.nbf.

When all required and desired properties are entered, and click on the *OK* key initiates the Nor850 system for the desired appliance noise measurements in accordance with the selected Standard.

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 Appliance noise 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 INS, Level or Background noise 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.

Background Noise contains the spectrum of the measured Background noise 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.

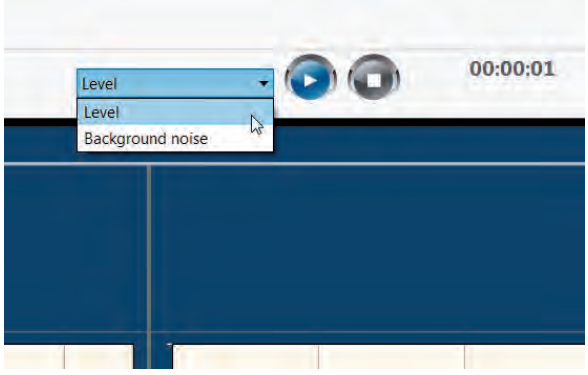
Rating contains the table view of the measured Lap value, which is the maximum Lap value for sample #1, #2 and #3, under 3,0bar and 5,0bar pressure. The 'Rating' tab also contains the table for averaged Lap value in fully open or loudest conditions with cold/ warm/ mixed water under various pressures.

Customers can also enable or disable of the Background noise in 'Rating' tab, thus the user can see how much the background noise is influencing the measurements.

From *Rating* tab, customer should also fill in the related test information, such as test time, test sample, test report and test company etc. Also customers can make remarks for each test in this Appliance Noise mode, all those are useful information for further report work in Excel.

Multi-Rating will permit customers to select the measurement 1/3 octave spectrum for certain test sample under certain test condition and certain test pressure. Customers can tick on/off several curves for further comparison, as the corresponding test sample, condition and pressure is indicated by various color indications.

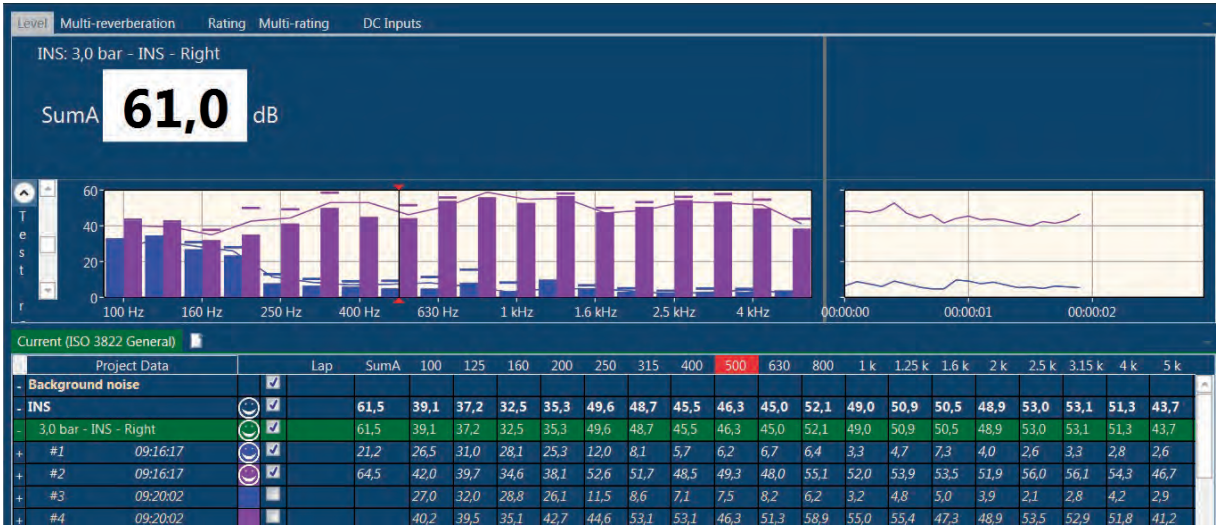
- On the very top section, the operator finds the measurement mode selector, the *Start/ Stop* measurement push buttons as well as the measurement duration indicator. While the measurement mode selector is used to select which kind of measurement to perform when hitting the *Start* button. Normally the selection is Level or Background noise.



Activating the available measurement channels

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

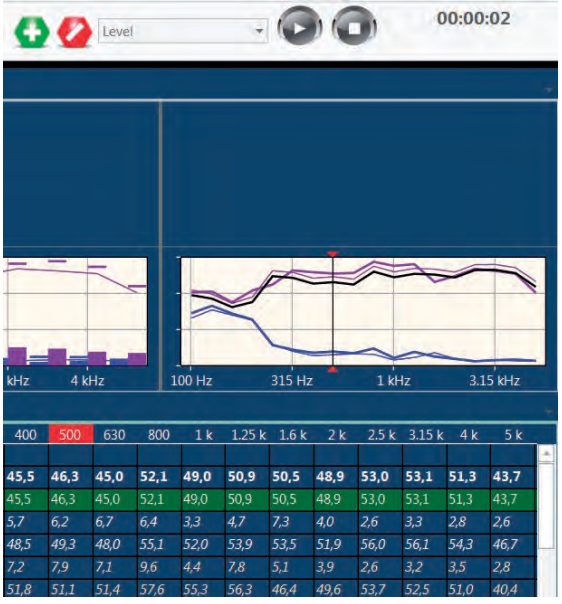
There are other alternative methods to active channels, all these procedures are the same as prescribed in the former chapters. If that channel is well established, it will be found under the *Connected channels* in the upper left part of the display.



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 test 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 Leq values as a line, and the Lmax values as a step-line.

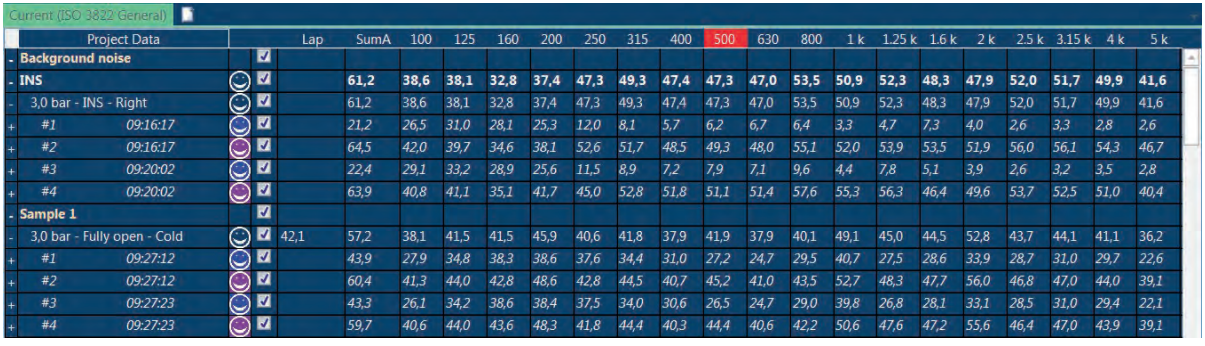
When the pre-set measurement duration is ended, or the *Stop* key is pushed, the upper right-section will change to present the last measured spectrum (thick lines) together with the possible previously measured microphone positions. In addition, a thick black line will indicate the average level of 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.



The first step is to measure the noise level from the Installation Noise Standard(INS). And then measure the noise level of water appliance from different pressure and various operation conditions.

In the tabular section, the measured values are presented in a yellow color. 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 (ISO 3822 General)

Project Data	Lap	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
- **Background noise**																				
- **INS**		**61,2**	**38,6**	**38,1**	**32,8**	**37,4**	**47,3**	**49,3**	**47,4**	**47,3**	**47,0**	**53,5**	**50,9**	**52,3**	**48,3**	**47,9**	**52,0**	**51,7**	**49,9**	**41,6**
- 3,0 bar - INS - Right		61,2	38,6	38,1	32,8	37,4	47,3	49,3	47,4	47,3	47,0	53,5	50,9	52,3	48,3	47,9	52,0	51,7	49,9	41,6
+ *#1 09:16:17*		*21,2*	*26,5*	*31,0*	*28,1*	*25,3*	*12,0*	*8,1*	*5,7*	*6,2*	*6,7*	*6,4*	*3,3*	*4,7*	*7,3*	*4,0*	*2,6*	*3,3*	*2,8*	*2,6*
+ *#2 09:16:17*		*64,5*	*42,0*	*39,7*	*34,6*	*38,1*	*52,6*	*51,7*	*48,5*	*49,3*	*48,0*	*55,1*	*52,0*	*53,9*	*53,5*	*51,9*	*56,0*	*56,1*	*54,3*	*46,7*
+ *#3 09:20:02*		*22,4*	*29,1*	*33,2*	*28,9*	*25,6*	*11,5*	*8,9*	*7,2*	*7,9*	*7,1*	*9,6*	*4,4*	*7,8*	*5,1*	*3,9*	*2,6*	*3,2*	*3,5*	*2,8*
+ *#4 09:20:02*		*63,9*	*40,8*	*41,1*	*35,1*	*41,7*	*45,0*	*52,8*	*51,8*	*51,1*	*51,4*	*57,6*	*55,3*	*56,3*	*46,4*	*49,6*	*53,7*	*52,5*	*51,0*	*40,4*
- **Sample 1**																				
- 3,0 bar - Fully open - Cold	42,1	57,2	38,1	41,5	41,5	45,9	40,6	41,8	37,9	41,9	37,9	40,1	49,1	45,0	44,5	52,8	43,7	44,1	41,1	36,2
+ *#1 09:27:12*		*43,9*	*27,9*	*34,8*	*38,3*	*38,6*	*37,6*	*34,4*	*31,0*	*27,2*	*24,7*	*29,5*	*40,7*	*27,5*	*28,6*	*33,9*	*28,7*	*31,0*	*29,7*	*22,6*
+ *#2 09:27:12*		*60,4*	*41,3*	*44,0*	*42,8*	*48,6*	*42,8*	*44,5*	*40,7*	*45,2*	*41,0*	*43,5*	*52,7*	*48,3*	*47,7*	*56,0*	*46,8*	*47,0*	*44,0*	*39,1*
+ *#3 09:27:23*		*43,3*	*26,1*	*34,2*	*38,6*	*38,4*	*37,5*	*34,0*	*30,6*	*26,5*	*24,7*	*29,0*	*39,8*	*26,8*	*28,1*	*33,1*	*28,5*	*31,0*	*29,4*	*22,1*
+ *#4 09:27:23*		*59,7*	*40,6*	*44,0*	*43,6*	*48,3*	*41,8*	*44,4*	*40,3*	*44,4*	*40,6*	*42,2*	*50,6*	*47,6*	*47,2*	*55,6*	*46,4*	*47,0*	*43,9*	*39,1*

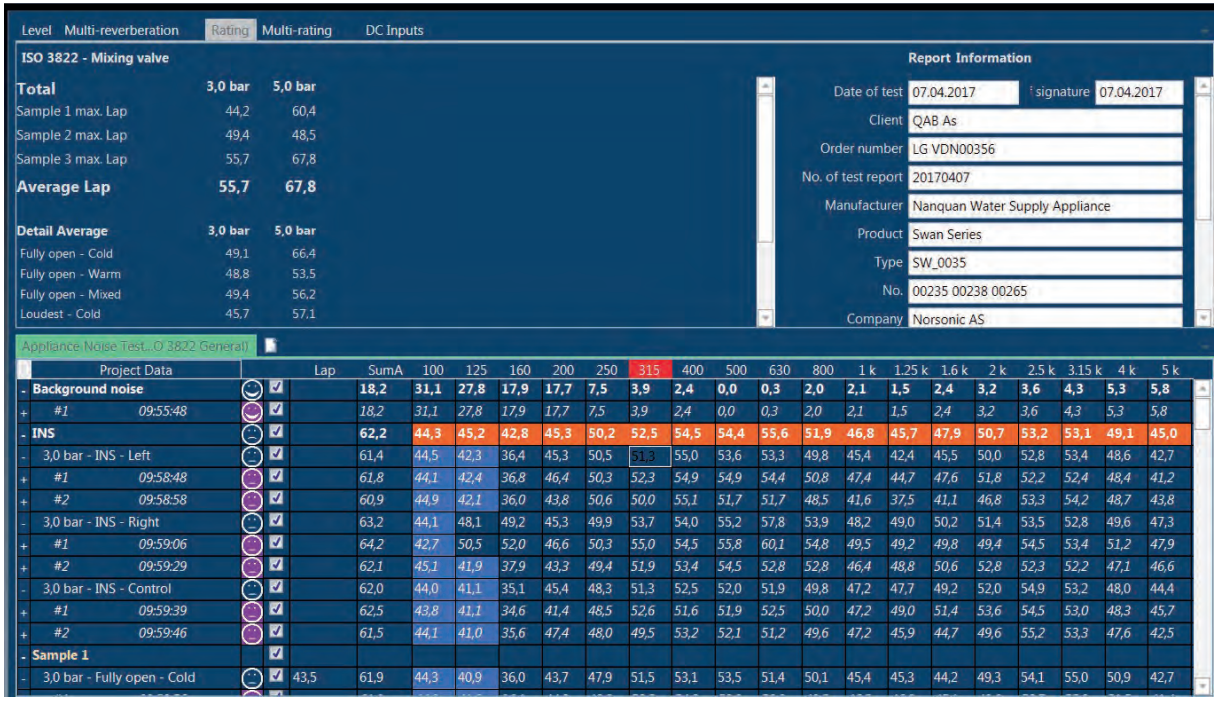
Making the Background Noise Measurements

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 test 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.

Evaluating the final results in the Rating display

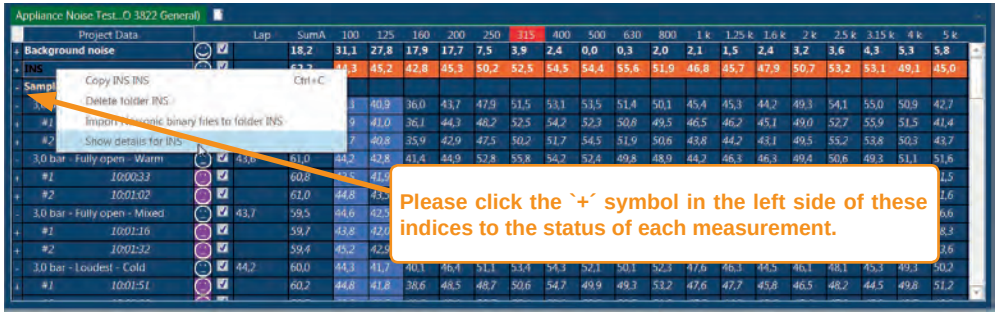
When all the Background noise and Level measurement procedure are finished, you may evaluate the final calculated rating, select the rating display by clicking the *Rating* tab in the upper left part of the mid-section.

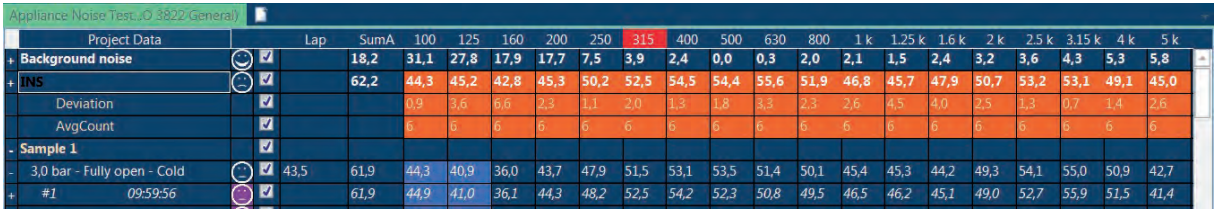
Alternatively, turn on the automatic rating view selector to allow the system to switch automatically to the rating view each time new measurements are accepted. The *Show Rating after acceptance* switch is found in the *Nor850 Options* menu available after clicking the Nor850 Button in the upper left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



The Rating display contains the measured resulting level with/without correction for background noise. The final rating includes averaged levels for each test appliance sample under various pressures, along with averaged levels for each test condition under various pressures. It will also indicate the Rating index for that appliance type under various pressures. 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.

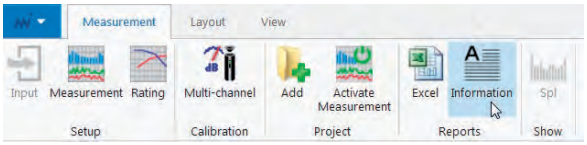




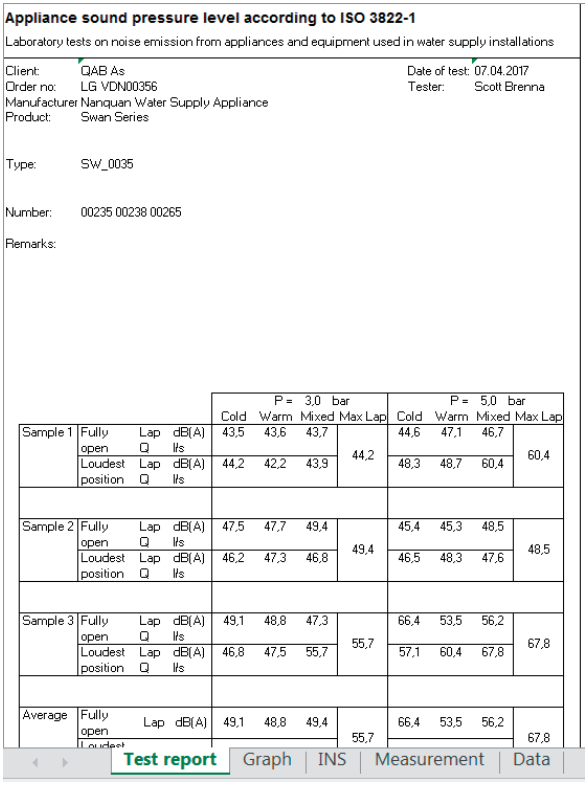
Project Data	Lap	SumA	100	125	160	200	250	315	400	500	630	800	1 k	1.25 k	1.6 k	2 k	2.5 k	3.15 k	4 k	5 k
Background noise		18,2	31,1	27,8	17,9	17,7	7,5	3,9	2,4	0,0	0,3	2,0	2,1	1,5	2,4	3,2	3,6	4,3	5,3	5,8
INS		62,2	44,3	45,2	42,8	45,3	50,2	52,5	54,5	54,4	55,6	51,9	46,8	45,7	47,9	50,7	53,2	53,1	49,1	45,0
Deviation			0,9	3,6	6,6	2,3	1,1	2,0	1,3	1,8	3,3	2,3	2,6	4,5	4,0	2,5	1,3	0,7	1,4	2,6
AvgCount			6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Sample 1																				
3,0 bar - Fully open - Cold	43,5	61,9	44,3	40,9	36,0	43,7	47,9	51,5	53,1	53,5	51,4	50,1	45,4	45,3	44,2	49,3	54,1	55,0	50,9	42,7
#1 09:59:56		61,9	44,9	41,0	36,1	44,3	48,2	52,5	54,2	52,3	50,8	49,5	46,5	46,2	45,1	49,0	52,7	55,9	51,5	41,4

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 appliance noise 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.



Appliance sound pressure level according to ISO 3822-1

Laboratory tests on noise emission from appliances and equipment used in water supply installations

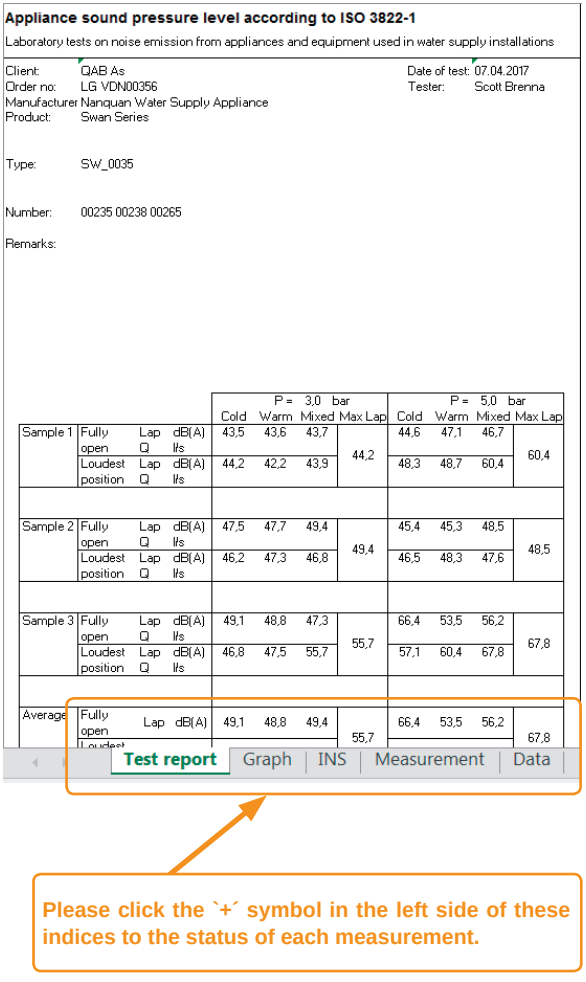
Client: QAB As
Order no: LG VDN00356
Manufacturer: Nanquan Water Supply Appliance
Product: Swan Series
Type: SW_0035
Number: 00235 00238 00265
Remarks:

Date of test: 07.04.2017
Tester: Scott Brenna

			P = 3,0 bar				P = 5,0 bar			
			Cold	Warm	Mixed	Max Lap	Cold	Warm	Mixed	Max Lap
Sample 1	Fully open	Lap dB(A)	43,5	43,6	43,7	44,2	44,6	47,1	46,7	60,4
		Q l/s								
	Loudest position	Lap dB(A)	44,2	42,2	43,9		48,3	48,7	60,4	
		Q l/s								
Sample 2	Fully open	Lap dB(A)	47,5	47,7	49,4	49,4	45,4	45,3	48,5	48,5
		Q l/s								
	Loudest position	Lap dB(A)	46,2	47,3	46,8		46,5	48,3	47,6	
		Q l/s								
Sample 3	Fully open	Lap dB(A)	49,1	48,8	47,3	55,7	66,4	53,5	56,2	67,8
		Q l/s								
	Loudest position	Lap dB(A)	46,8	47,5	55,7		57,1	60,4	67,8	
		Q l/s								
Average	Fully open	Lap dB(A)	49,1	48,8	49,4	55,7	66,4	53,5	56,2	67,8
	Loudest									

Test report | Graph | INS | Measurement | Data

In addition, you can also check the other information of 'Graph', 'INS', 'Measurement' and 'Data'.



Appliance sound pressure level according to ISO 3822-1

Laboratory tests on noise emission from appliances and equipment used in water supply installations

Client: QAB As
Order no: LG VDN00356
Manufacturer: Nanquan Water Supply Appliance
Product: Swan Series
Type: SW_0035
Number: 00235 00238 00265
Remarks:

Date of test: 07.04.2017
Tester: Scott Brenna

			P = 3,0 bar				P = 5,0 bar			
			Cold	Warm	Mixed	Max Lap	Cold	Warm	Mixed	Max Lap
Sample 1	Fully open	Lap dB(A)	43,5	43,6	43,7	44,2	44,6	47,1	46,7	60,4
		Q l/s								
	Loudest position	Lap dB(A)	44,2	42,2	43,9		48,3	48,7	60,4	
		Q l/s								
Sample 2	Fully open	Lap dB(A)	47,5	47,7	49,4	49,4	45,4	45,3	48,5	48,5
		Q l/s								
	Loudest position	Lap dB(A)	46,2	47,3	46,8		46,5	48,3	47,6	
		Q l/s								
Sample 3	Fully open	Lap dB(A)	49,1	48,8	47,3	55,7	66,4	53,5	56,2	67,8
		Q l/s								
	Loudest position	Lap dB(A)	46,8	47,5	55,7		57,1	60,4	67,8	
		Q l/s								
Average	Fully open	Lap dB(A)	49,1	48,8	49,4	55,7	66,4	53,5	56,2	67,8
	Loudest									

Test report | Graph | INS | Measurement | Data

Please click the `+´ symbol in the left side of these indices to the status of each measurement.

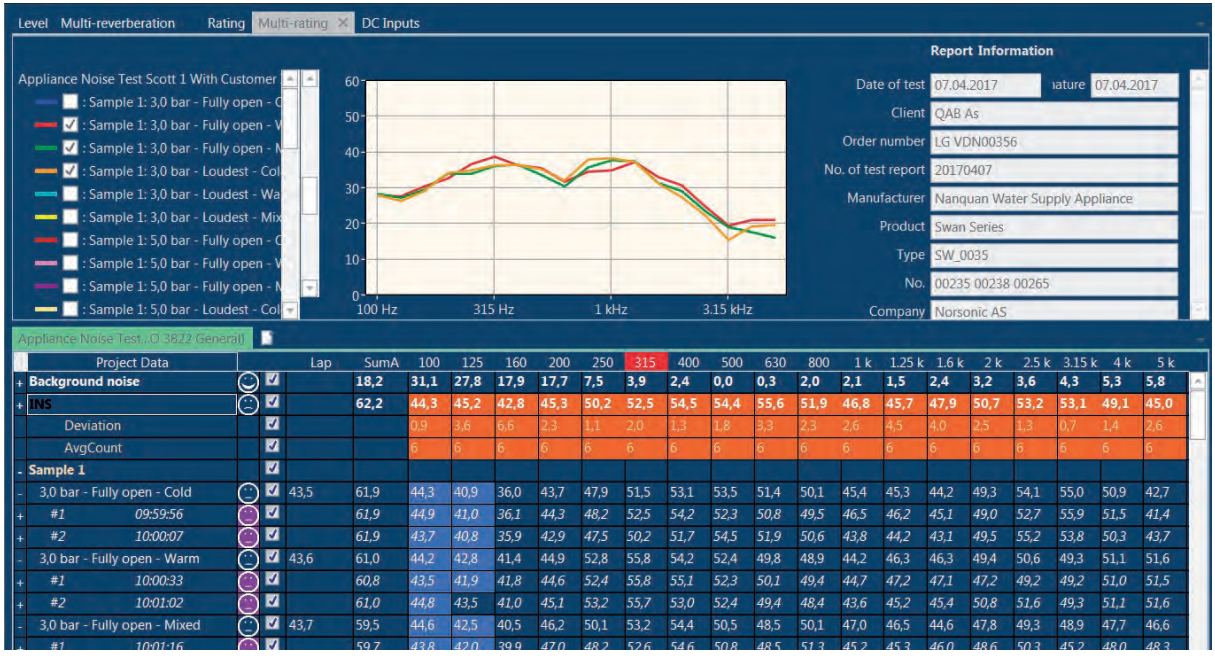
Comparing the different appliance noise tests in the Multi-rating display

If the customer want to further study the measurement result, they can 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

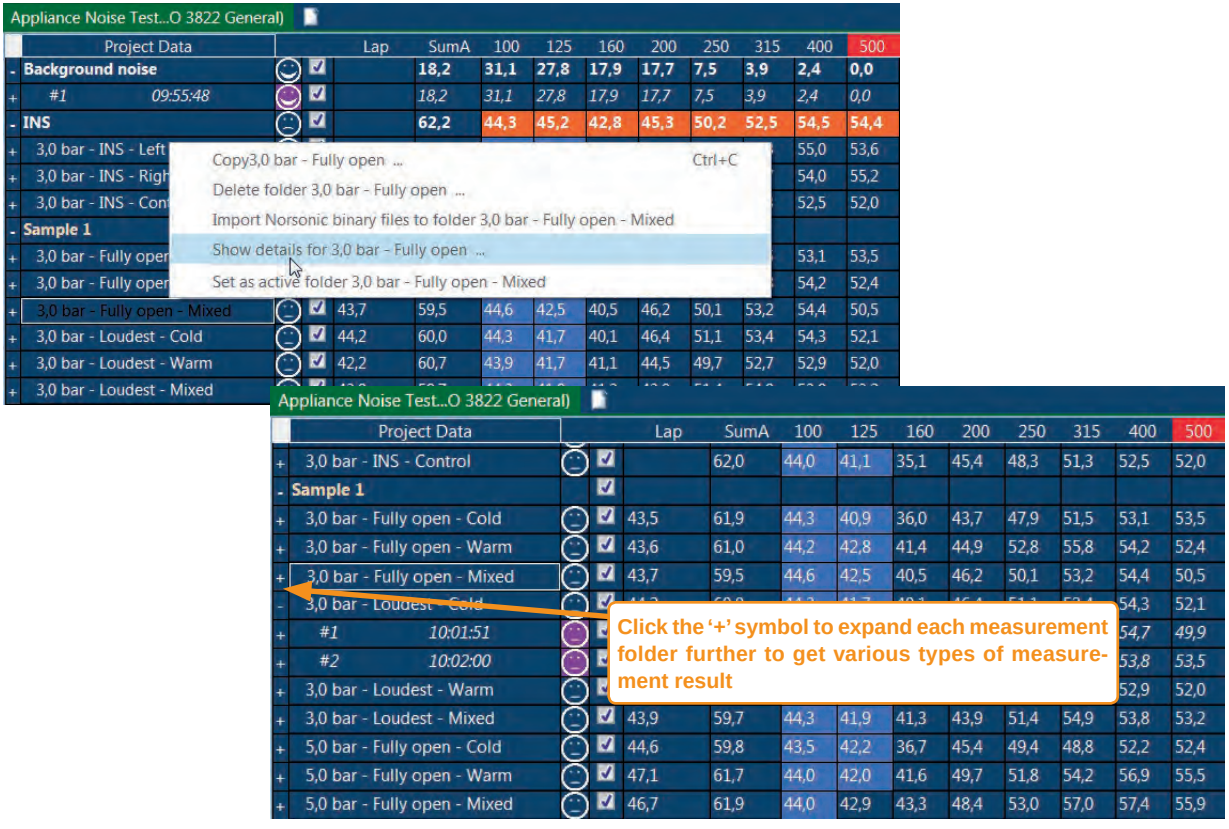
As we discussed in the “Building Acoustic Application Mode” on page 50, to evaluate the details of the measured data, the tabular view in the lower part of the screen is giving the customer many possibilities. The table is organized in accordance with the selected Standard in a kind of folder system where the Background Noise, INS (Installation Noise Standard) and Samples #1, Sample #2, Sample #3 represent the folders. In addition, the calculated Ratings Lap 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 Background and INS will change the upper part to show all the related measurement made in level mode. Double-clicking each measurement condition or pressure under Sample folder will show the measurements in the test 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. It will also show SumA index for INS or Lap index for each measurement condition of test samples.



For viewing one single measurement sample condition, a double- click on the required condition 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 XXX* 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 copy, delete the measurement positions, import Norsonic binary files to folder.

Depending of the quality of the measurements, the table view additionally contains different color background in the various cells. Generally, the grey color represents a warning that the difference measurement level is less than 15dB reference to background level.

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 manually corrected measurement value in the status row.

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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.