INSTRUCTION MANUAL

INSTRUMENT SOFWARE 1.0

Norsonic have always been at the forefront introducing new technology to sound level meters. The Nor150 Sound and Vibration Analyser sets a new standard in user-friendliness. Featuring the largest colour touch screen in a handheld meter on the market today, the Nor150 provides the user-friendliness of a smart phone. Further features include built in web server, camera, GPS, sound recording, voice and text notes, sophisticated marker handling and event triggers in addition to high resolution time profile and multi-frequency spectra bringing the sophistications normally found in laboratory instrumentation out in the field. The instrument is designed to cover a variety of applications besides being a sophisticated sound level meter. This instruction manual is covering software version 1, which with its features mainly address the noise assessment market.

nor150

SOUND & VIBRATION ANALYSER

Norsonic

Nor150 User Guide – October 2014 Edition

lm150_1Ed1R0En

If you wish to communicate with us, please feel welcome.

Our address is:

Norsonic AS, P.O. Box 24, N-3421 Lierskogen, Norway

Find us on the web: www.norsonic.com

Tel: +47 3285 8900,

Fax: +47 3285 2208

E-mail: info@norsonic.no

Finding the information you need

Thank you for choosing Norsonic!
The Nor150 has been designed to give you many years of safe, reliable operation.

Your approach to the Nor150 documentation depends on what you want to do and how much you already know.

This manual is divided into several sections plus an index. Each section provides useful and in depth information about the available features. Depending on your requirements and your familiarity with measurements as such, you may find that you use some parts of this manual quite often and others not at all.

A brief introduction of the user philosophy and use of the instrument is described in chapter 2. We recommend reading this chapter before use, and as a minimum, reading the safety instructions and precautions in chapter 1.

If you do not have this manual at hand, useful help is found in context sensitive help function in the instrument. In most pictures there is a red question mark "?" in the upper right corner of the display. Tap it to access a description of the help function.

Note that the instruction manual describes a fully equipped instrument. Your version of the instrument may not have all the optional extensions available. Software extensions may, however, be installed as retrofit at any time, However, extensions like the dual channel option, camera and GPS cannot be installed as retrofit.

Denotes

Some denotes are used in the manual to ease the use and distinguish a keyboard key, a soft key or a menu

VIEW denotes the View button found on the rubber keyboard.

Stop denotes a soft key mostly found in the lower line of the display.

Instrument denotes a menu point.

Contents

Important information

Safety instructions

- Read these instructions.
- Follow all warnings and safety instructions.
- Do not use this apparatus near water, in rain or moisture.
- Keep the instrument out of corrosive atmosphere and do not use it in a hazardous area.
- Clean the instrument only with dry cloth, except for the display where special wipes are available.
- Do not place this instrument near any heat sources such as radiators, heat registers, stoves, or other apparatus that produce heat.
- Only use the original mains adapter supplied with the instrument .
- The internal battery is a Li-Ion type. Make sure it is recycled properly if it is going to be replaced
- Make sure the instrument and any accessories are not damaged in any way before trying to use them or connect them together.
- Only use attachments/accessories allowed or specified by Norsonic AS.
- Be careful when using the instrument on a tripod or in combination with a rotating boom.
- Unplug this apparatus during lightning storms or when unused for long periods of time.
- Refer all servicing to qualified service personnel. There are NO user-serviceable parts inside. Servicing is required when the apparatus has been damaged in any way, such as power failure, battery failure or any plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

Precautions

You probably already know it but…

… the microphone is a specially fragile device. It is easily broken, so take care.

…. always keep the microphone cartridge mounted on the preamplifier. This is the safest way to avoid damage and access of dirt on the contact pin between the preamplifier and microphone cartridge.

… keep the instrument in its carrying case, don't leave it everywhere.

… even the instrument is a field instrument, prevent it from direct contact with dust and moisture.

… Nor150 is a measurement instrument; protect it from impacts and strong vibration.

… keep the batteries fully charged, then it is ready for use when you need it.

… always calibrate the microphone before and after a measurement.

… send the instrument for verification at an accredited laboratory minimum every 24 months.

Introducing the Nor150

Operating the Nor150

The design and user philosophy that is built into the Nor150 takes the user-friendliness to a new level. Customers will find the same user interface principles as a smart phone, and existing Norsonic customers will also find similarity with other Norsonic instruments.

In the following chapters we discuss the use of the instrument and explain the different functions and menus.

When working with the instrument there are a few important things to pay attention to;

- You must select the measurement functions that you want to measure.
- Based on the measurement functions you have selected, select which of the measurement functions you want to display and how you want to display them; as a level trace (level recorder) as a traditional sound level meter display, as level versus frequency display or as a statistical distribution and probability function.
- How to calibrate.
- How to store and get the data out of the instrument.
- For the more sophisticated use you need to pay attention to marker setting, trigger settings, audio recording settings, storage modes etc.

Due to the flexible configuration and the vast number of functions and sophistications Nor150 offers an easy applications menu where you can load predefined factory settings for the different applications, or you may store your favourite settings.

Simple sound measurements

This chapter describes briefly how you may take a simple measurement. After the proper transducer is connected to the input, you have to go to the instrument **SETUP** button and inspect the settings so they correspond to your measurement intentions. This is discussed in detail later in the manual

A good alternative to go through all the menus is to go to the “Applications Menu” and select one of the Environmental setups that are stored there. This will enable a rich selection of measurement parameters so you can go on and do some measurements. The “Applications Menu” normally appears when you turn the power on. If not go to **SETUP** > *Applications* to gain access to this menu.

There are two keys on the front panel of the Nor150 that controls the measurement sequence. The largest key is the **START/STOP** button. On the right hand side of this one, you will find a key with a graphical symbol ⏯ for **PAUSE /CONTINUE**. Most of the time the start and stop functions are also available as soft buttons at the bottom of the screen.

The measurement time should be set to match the amount of time you intend to measure. If it is set to a longer time, this will make no problem – just press the **START/STOP** key when you want to terminate an ongoing measurement. However, you should consider the settings of the time constant and the spectral weighting (A-, C- or Z-weighting). Once they are set, the instrument will remember these until they are changed to something else.

The Start function does not really start the measurement. It starts a Waiting for Trigger sequence. If the trigger is set to “Manual trig” then the measurement starts immediately.

Please note that when a measurement is finished, you cannot immediately start another measurement. If the performed measurement is saved automatically it is OK, but if not, you have to decide whether the already measured results are going to be saved or wasted. The measurement can be deleted by pushing the **X** button or saved to the current selected save directory by pushing the **MEM** button and then the instrument is free to start a new measurement sequence. Messages will be given on the screen.

Optional extensions

The Nor150 comes with an extensive set of functions available in its basic version. Many other functions are available as optional extensions. The modular software design inside the Nor150 enables functional expansion to take place when you need it and not at the time you purchase the instrument. All installed options remain in the instrument and there is no need for further loading of the options when used. There is no need for external modules.

Software maintenance

Norsonic provide regular firmware updates with new features and bug fixes. By carefully listening to our customers we implement their wishes to improve the handling of the instrument and expand it with new features. New software versions can be uploaded from our website and are free of charge if the version is on the same main software version level. A software upgrade fee is charged if you want to upgrade to the next main version (i.e. from version 1.xx to 2.xx), unless you have signed a maintenance contract. Please contact your local Norsonic dealer to receive more information about our software maintenance program. A new main version consists of several new features. Such features can be adaption to new revisions of measurement standards, new measurement functions or new and easier use of the instrument. In addition to new software versions, new option extensions are developed to expand the use of the instrument.

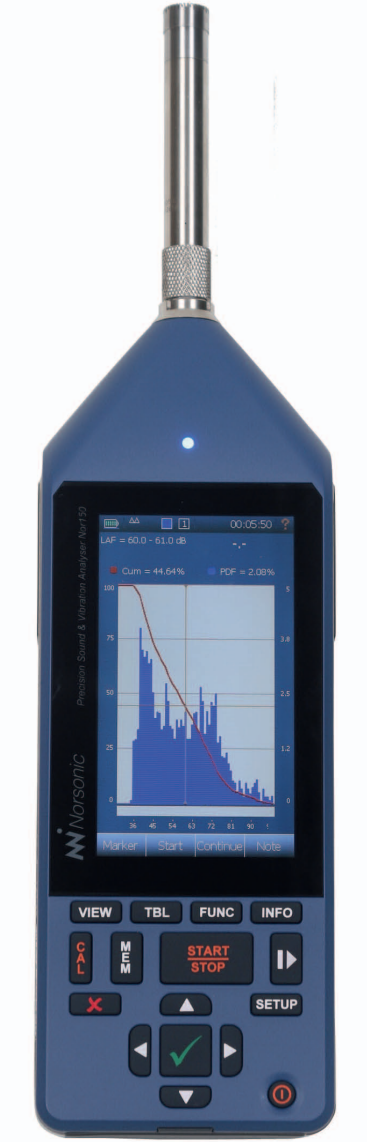
Taking a closer look at the instrument

Be sure to take utmost care when mounting a microphone cartridge onto a preamplifier. To avoid electrical shock from the 200 V polarization voltage always keep the preamplifier disconnected whenever you are mounting a cartridge onto a preamplifier and screw finger tight only!

The picture shows the Nor150 fitted with the standard preamplifier Nor1209 and the microphone Nor1225 mounted in sound channel one.

The instrument is powered from an internal rechargeable Li-Ion battery pack. The battery is fully charged when leaving the factory, but due to self-discharge, you may experience the battery gauge shows a lower value than full. The batteries will be charged once the instrument is connected to mains via the supplied mains adapter Nor345

Always keep the microphone cartridge mounted on the preamplifier. This is the safest way to avoid damage and access of dirt on the contact pin between the preamplifier and microphone cartridge. The preamplifier input has extremely high input impedance (10 Giga ohms) in order not to load the microphone cartridge. Hence, dust, finger prints or other types of contamination may change the sensitivity of the microphone, especially at high humidity.

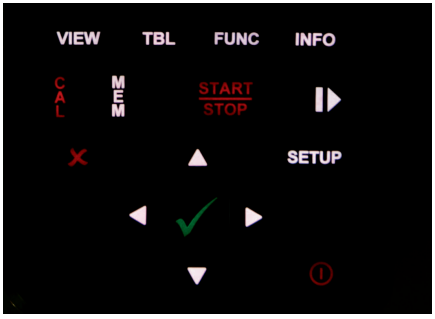


Switching ON/OFF

The instrument is toggled **ON/OFF** by pressing the lower right key . A short push is enough to start the instrument. The instrument is then going through an initial startup procedure before showing a measurement display or the application selection menu

A new push on the button produces a question on the screen, where you confirm that the instrument shall be turned off.

You may force the instrument to turn off by pressing the **ON/OFF** key for more than 5 seconds.



Keyboard

The Nor150 is mainly operated via the touch screen. There is however a dedicated back-lit rubber keyboard uses for operation of the main important functions like instrument **ON/OFF**, **START/STOP, PAUSE** and **CALIBRATION**. The philosophy is that all important functions can be operated via the keyboard as well as using the touch sensitive display.

The backlighted keyboard enables easy operation in dark environment. The backlight is adjusted from the factory so it works well in low light conditions. The backlight brightness may however be adjusted in power setting menu. Additionally there is a time out function that will turn off the keyboard light. Touch the screen or push a button and the light will be turned on again. You may prevent the keyboard light from coming on (in the Instrument menu) and thereby saving battery power. This setting is done in **SETUP** > *Instrument* > *Power Setting*.

It is recommended to use the measurement control buttons in the touch sensitive screen if you are measuring low noise levels. The rubber keyboard may generate acoustical noise that might influence your measurements at levels below 40 dBA.

In this manual the following symbols are used to indicate the keyboard buttons:

VIEW — View button (**VIEW**): Switch between the four available view setups. Each view can have its own result types displayed, and the cursor movements can be linked.

TBL — Table button **(TBL**): Switch between graphical and numerical/table version of the results.

FUNC — Function button (**FUNC**): Rotating between selected measurement functions.

INFO — Information button (**INFO**): The info screen is available and shows important measurement settings even when the measurement is running and the menus therefore are not available.

CAL — Calibration button (**CAL**): Activates the calibration functions.

MEM — Memory button (**MEM**): Gives access to the memory system.

START STOP — Start/Stop button (**START/STOP**): Starts a measurement or Stops an ongoing measurement.

Pause/continue button (**I▶**): Temporarily prevents measured data to go into the global results. The pause is a toggle style function. It includes a graphical back-erase function.

SETUP — Setup button (**SETUP**): Gives access to the menu system. Gives access to all measurement parameters. Display parameters are also available via pop-up menus which are context sensitive.

Cursor buttons (▶ ▲ ▼ ◀): Keys for moving the cursor in graphical and tabular displays. The cursor buttons may have different functionality in the different displays.

On/Off button (**ON/OFF**): Turns the instrument On or Off. When turning off a control question appears on the screen. Holding the button down for more than 5 seconds force the instrument to switch off.

V button (**V**): Exits the current menu and stores your current selections.

X button (**X**): Exits a menu without doing your modifications.

Touch sensitive screen

The large 4.3” capacitive touch display is optimized for use both in dark environment as well as in sunlight. The Nor150 uses the latest technology for touch sensitive displays. The capacitive touch technology eliminates the use of a stylus or calibrating the XY position of the screen.

Manoeuvring in the menus follows the same use as on any smart phone or pad. I.e. in all menus use your finger tapping on the selection fields or dragging on the selection wheels or drag a table up/down.

Placing the finger for a few seconds in a graphical display or numerical table gives access to a context sensitive menu with various selections available for the current display – easy and intuitive.

The backlight brightness is preset from the factory to work in various environments. It is however possible to adjust it in the power setting menu to optimize it for the current light condition. It may be needed to increase the brightness in heavy sunlight, while dark environments may call for a lower setting. Additionally there is a time out function that will turn off the backlight after a preset time. Touch the screen or push a button and the light will be turned on again.

Please note that the use of the backlight makes a significant impact on the power consumption.

Use the measurement control (Start/Stop, Pause/Continue) in the touch sensitive display when you measure low noise levels. The touch sensitive display is completely noiseless compare to a traditional keyboard.

You may experience a loss of fidelity on the touch screen if the Nor150 is connected to the mains adapter. The reason is that the instrument may drift away from your body's electrical potential level. In that case touch the metal frame, or hold the instrument with one hand and use the other hand to operate the touch display.

The Main Status LED

The multi-colour LED above the display indicates several operating states. Red colour indicates some type of error condition (like overload) while green colour is for positive information.

Please see table below.

State	Color	Behavior	PWM	Description
Startup/Booting	Red	Continuous		Startup before instrument is in Idle/ready mode.
Idle/ready	Blue	Continuous		Instrument is ready to start or measurement is finished.
Waiting for trigger	Blue	Blinking	Yes	Start is pressed, but instrument is waiting for trigger condition to be fulfilled.
Running	Green	Continuous		Instrument is measuring, no event.
Event trigger fulfilled(Audio, camera)	Green	Blinking	Yes	Any of the event triggers are fulfilled, recording or camera. The LED lights continuous as long as the recording/ video/picture is on
Overload	Red	Continuous		Instantaneous overload only not latched.
Battery too low at start-up	Red	Blinking	No	Rapid flashing, before shutting down
Battery low when running	Yellow	Blinking	Yes	Instrument is running, the Green running state is turned into Orange.
After shutdown if battery low	Red	short ON long OFF		The LED will report some short red blink if you try to switch on the instrument after a battery shutdown to indicate that the battery has insufficient capacity to power on the instrument.
Charging	Yellow	Blinking	No	1 to 5 blink. 1 blink means 0-20 capacity. 5 blinks means 80 to 100% capacity.

Input and output connectors

Input channel 1 is located at the top of the instrument. This is the “default” channel and is the channels used for most sound measurements.

Input channel 2 is mounted on the left hand side of the instrument. This socket is wired identically to sound channel 1 on the top of the instrument.

Input channel 2 is optional and is not available as retrofit.

On the right hand side of the instrument there are different communication sockets and the power socket. The mains adapter, Nor345, is connected to the large circular socket. See chapter *“Technical specifications”* for detailed description of the 15 pin general I/O socket.

Several sockets are located under the flip on the bottom side of the instrument.

LAN socket

Mini USB socket

Normal USB socket

Micro SD card socket

Headset. This socket is intended for connecting a headset with microphone. The signals directly from the input sound channels or from an audio recording can be available so the operator can listen to it. The microphone input can be used to add audio notes to the measurements.

On the use of the internal battery vs. external DC

The Nor150 comes with an internal Li-Ion battery pack (Nor150/Battery) using the latest available charging technology. The battery pack is a so called smart battery where a build in microprocessor holds all information about the power use and charging. The battery pack sends information to the instruments main processor about available capacity. Thus, the battery may be replaced with a fully charged one without any need for re-calibration of the battery gauge.

Battery lifetime is typically 6–9 hours (depends on measurement mode, use of backlight and interfaces etc.). The battery pack is fitted with a fuel gauge. Push the switch below the row of LED's to verify the status of the battery.

A mains adapter type Nor345 is supplied with the instrument. This mains adapter will recharge the batteries (at least 80%) within 2 hours if the instrument is switched off. Longer time if needed if the mains adaptor shall power both the instrument and provide charging.

The instrument switches uninterrupted between mains adaptor and battery power. Hence, always keep the battery pack installed, even when continuously powering the instrument via the external power socket. This will increase the power redundancy.

An external DC voltage (10 – 28 V) can also be used to power the instrument. A cable for this purpose is available separately from Norsonic or our distributors. Please note that fast charging of the internal battery requires 12 V / 3A.

A backup battery (capacitor) retains vital information (like real time clock) for more than 5 minutes if switching between two battery packages is needed.

Charging the Internal Battery

We recommend that you use the mains adapter Nor345 for charging the battery pack. Connecting an external DC-source (10–28 V) to the instrument may do the same function if it can supply 3A continuously. Icons in the upper line of the display indicate the battery condition and whether the instrument is connected to external power.

If power fails

If the battery voltage drops below 9 V, the battery indicator turns red and after a short while the instrument will start to shut itself off. Any ongoing measurement will be terminated and stored. Memory contents are retained without the use of electrical power (flash memory). Upon inserting a fresh battery pack, or connecting to a proper DC voltage source, the instrument will start-up again, and ask the operator for the confirmation to store the previous measurement in the normal way.

Should the external power fail during a measurement, without any internal batteries installed (or the installed batteries have no power left), the instrument will be turned off immediately without storing the ongoing measurement. However, as the instrument automatically makes a backup storage every 2 minutes, the last file stored will include the correct results except for maximum the 2 last minutes prior to the power failure. Upon return of the external power, the instrument will automatically start to measure as if the **START/STOP** key had been pressed.

The Nor150 has a built in power saving feature that turn down the backlight and eventually switch itself off if left unattended in ready mode (I.e the instrument is not measuring or is in ended mode).

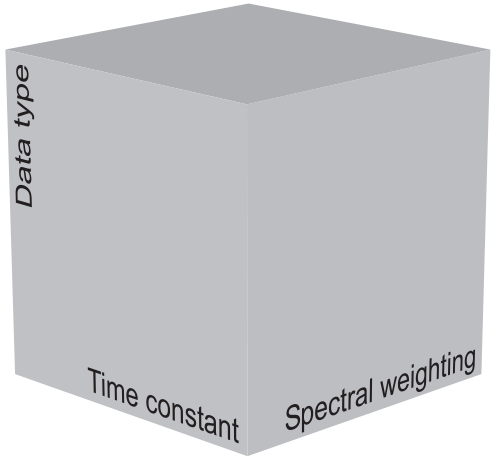
The measurement functions available

What is a Function? In the Nor150 the term is used to denote the combination of RMS (or Peak) detection with certain time constants (when applicable) and certain spectral weighting functions involving measurement duration whenever relevant. Examples of such functions are A-weighted L_{eq}, the A-weighted SPL etc. The functions are based on the following data types:

SPL	The instantaneous Sound Pressure Level
L_{max}	The Maximum Sound Pressure Level time weighted
L_{min}	The Minimum Sound Pressure Level time weighted
L_{eq}	The Integrated Averaged SPL
L_E	The Sound Exposure Level
L_{PEAK}	The Maximum Peak Level
L_n	Statistical functions
T_{MAX5}	"Takt Maximal" – a special parameter measured mainly in Germany

To form a function you combine a data type with a time constant; Fast, Slow or Impulse and a spectral weighting function A, C, Z, octave or third octave band frequency analysis.

A function can be described as a point in the three-dimensional space having data-type, time constant and spectral weighting as its three dimensions



The analyser does either full octave or third-octave analysis – it cannot do both simultaneously.

Filling in the three dimensions with data types, time constant and spectral weighting, we arrive at the Function cube.

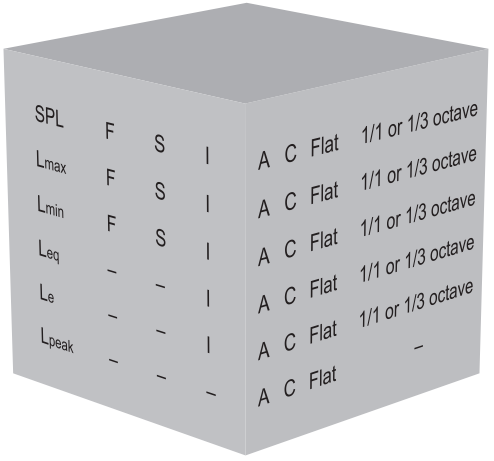
So far we have yet to mention statistics. In the Nor150 statistics is always based on SPL using a user defined time constant. The statistics can be presented in several ways – as statistical and cumulative distribution, but also as percentiles. There are 8 percentiles settings available. This must be set up in advance before a measurement.

The spectral weighting functions A, C and Z is measured simultaneously and in addition to the 1/3 or 1/1 octave filter bands (optional)

All three time constants (exponential averaging), Fast, Slow and Impulse are measured in parallel.

The instrument measures all parameters both as global values and time profile values also in 1/1 octave band or 1/3 octave bands, if applicable. The user may configure which parameter to measure in order to limit the amount of data.

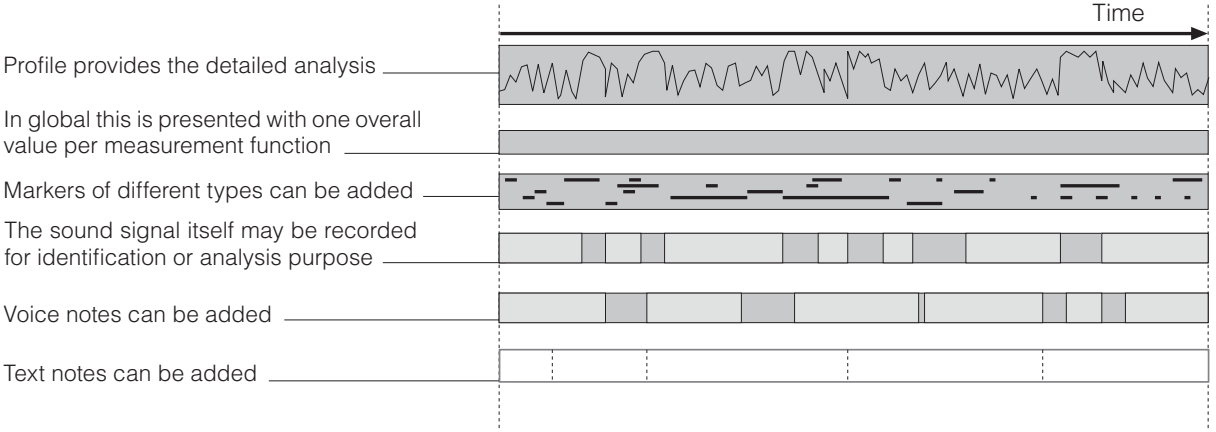
The Function cube expresses a three-dimensional space with the data type (e.g. SPL), the time constant (e.g. F) and the spectral weighting (e.g. A-weighting) as the dimensions. A function will then be a point in this space. Note that not all the points in this space are defined. For example, the (normal) L_{eq} has no time constant and for the Nor150 the peak is not defined in octave and third octave bands.



Global measurement values are a single set of measurement values describing the entire measurement. Such values typically are the L_{eq}, the L_{max}, The L_{min} etc. of the entire measurement as well as an octave or third octave spectrum. These are the same as the values you acquire with a traditional sound level meter

Level vs. time (L(t)), also known as **time profile** or electronic level recorder is a part of the basic functionality. In its basic version one time profile is available in addition to the global measurement values discussed above.

The main features - an overview



The time profile logs the selected measurement values in time intervals defined by the user. The time profile resolution span is from 2 ms to 24 hours. To avoid overloading the Digital Signal Processor –DSP some limitations are set dependent of the selected profile time and the number of selected measurement parameters;

<= 5 ms: One multispectrum function and No Audio recording

>=25 ms: Three multispectrum functions and full audio recording

>=1 sec: No limitation

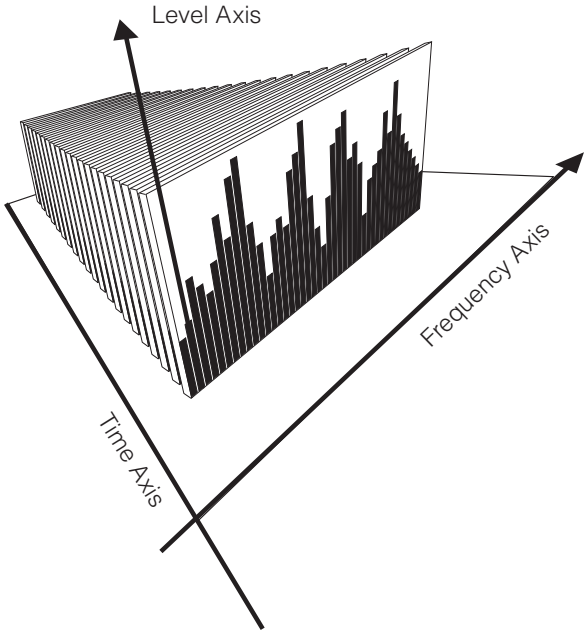
There is no limit to the number weighting network (A, C and Z) functions, only the multispectrum functions.

The term **Multispectrum** is octave or third octave values acquired in the time profile. One spectrum is measured per profile period. This requires a relatively high amount calculation power from the DSP due to the amount of data calculated. The highest work load however is triggered audio recording.

Statistics. There are eight percentiles available. The class width is 0.2 dB over the entire 130 dB range. Each of the eight percentiles can be set to any value between 0,1% to 99,9%.

The statistical distribution calculation applies to the spectral weighting networks (A, Z and C) as well as all the individual filter bands (if applicable). The statistics is also calculated for each period of the time profile, providing the time profile resolution is set to one minute or more.

Multi-spectra is a set of spectra captured at equidistant moments in time corresponds to setting up the analyser to measure the level vs. time involving frequency analysis in octaves or third-octaves.



The graphical back-erase feature, which deletes the most recent seconds (0-20 sec back erase) of acquired global data prior to a pause upon resuming, updates the statistics buffers as well as maintain consistency.

For the statistical sampling the user can select either Fast or Slow time constant, irrespective of what time constant(s) the frequency analysis as such employs.

Setting up the analyser

The organisation of the display

After the Nor150 is turned on, the applications selection screen appears. If you just pass this screen or tap on the “last used” icon, the instrument will show the same types of displays as when you left it last time. If this is the first time you start your instrument, some predefined views will be there for you.

If a specific set up is selected in the applications selection screen, the associated functions and views will also be loaded.

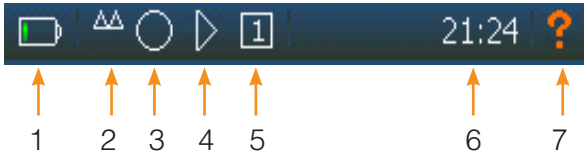
The display is divided in three main sections. On the top is a status bar holding information about the current state and at the bottom is a button row with quick access keys. See *“The status bar”* and *“The soft key bar”* chapter on the next pages for detailed explanation. The middle part is either one full or two half displays that can be customized to your needs. By holding your finger on a graph (the white coloured area) and holding it there for a couple of seconds, a context sensitive menu will be displayed, alternatively pushing the “OK” button located between the arrow keys on the keyboard.

The display settings will be saved in the instrument so you can get them back again next time you want to use the instrument.

The status bar

The status bar at the top of the display provides useful information about the instrument and the ongoing measurement.

The status bar



1 Battery gauge
2 Overload indication
3 Audio recording status
4 Measurement status – Ready, waiting for trigger, running, pause, ended, stored
5 Display View number (1-4)
6 Real time clock in ready mode. In all other modes the measurement time is displayed
7 Help function

The status bar is not displayed in the menus.

The soft key bar

In the bottom of the touch screen or on the left in landscape mode there are four soft keys. In some menus there are soft keys found elsewhere also. Some of the soft keys open up a “scroll down” menu with more functions. The following table shows the symbols that are used on the screen to indicate selectable functions.

Exits the current menu and stores your current selections (✓). Works in parallel with the **V** button on the keyboard.

Exits a menu without doing your modifications (✘). Works in parallel with the **X** button on the keyboard.

Opens the Marker selection menu in the measurement picture.

Starts a measurement, works in parallel with the Start button found on the keyboard.

Stops a measurement, works in parallel with the Stop button found on the keyboard.

Pause an ongoing measurement and remove the paused values from the overall measurement. Time profile is continuing, but a pause marker is inserted in the time profile while paused. This button works in parallel with the Pause/Continue button found on the keyboard

Continue: Continues a paused measurement, works in parallel with the Pause/Continue button found on the keyboard.

Note: Opens up a menu where Recording, Camera, Voice and Text notes can be enabled.

Show/Hide: Hide - Used in the application menu. It toggles between Show and Hide. Push on the Show button to enable the application start up menu. Push on the Hide to disable the application start up menu.

Alpha/Numerical on-screen input keyboard. Switches between the parameter wheel(s) and a traditional numerical keyboard.

Add: Used in the menus to add a new item e.g. a new input device to the transducer selection.

Delete: Removes selected item.
Please note: usually there is no undo of a delete.

+ and -: Used for increasing or decreasing numerical values.

Calibrate: Starts an auto-calibration process in the calibration picture.

The measurement picture

The main part of the display is for the measurement results. The configuration of the measurement picture (named Views) is very flexible supporting a variety of different views dependent on the selected measurement application.

The measurement display can either be a single or dual type frame. The dual type frame is useful if you want to combine for instance Level vs Frequency, L/f and Level vs Time, L/t, data in the same display, while the single type frame gives you a better resolution and workspace if that is preferred. All single type views, except from the Sound level meter view, can be selected as landscape view. I.e. the display is turned 90 degrees to take advantage of a wider horizontal axis for time or frequency.

The following graphical displays are available:

- Sound level meter
- Level vs time – available as port right and landscape
- Level vs frequency – available as port right and landscape
- Combined cumulative and statistical percentage – available as port right and landscape

Each graphical view has an associated numerical table available. Just push the **TBL** button to access it.

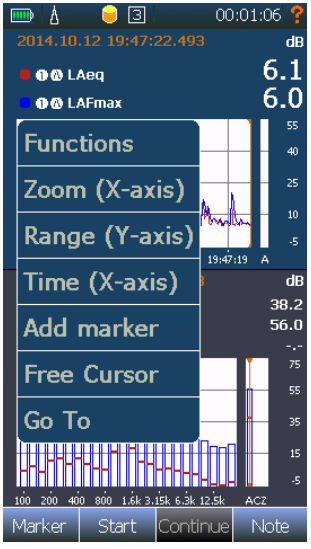
Up to four different views can be configured. Each view can either be a single or dual type. Use the **VIEW** button to switch between each of the four different views. For easy use you may turn off the views so that you at the extreme only have one view to deal with.

Please note that you must configure which measurement functions you want to display in each of the views.

The instrument may measure more parameters than displayed on the screen. Each graphical view can display up to 3 measurement parameters simultaneously. You may however configure up to eight different parameters per view to display. Use the **FUNC** button to scroll through the selected parameters.

On-screen menus

Context sensitive menus are available when needed. They give access to several of the parameters that decide the look and feel of the view you are looking at.



You access the context sensitive menu in two different ways

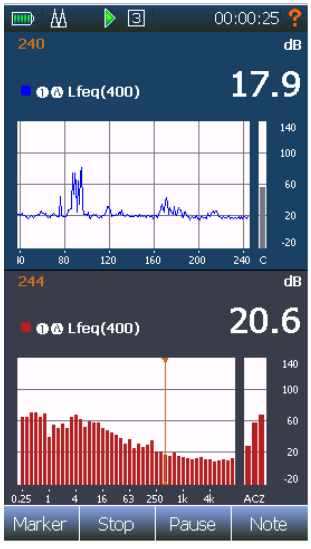
1. Place your finger in one of the graphical (or numerical) displays and hold it there for a couple of seconds, and the menu will appear.
2. Push the **V** button on the keyboard and the menu will appear instantly.

On-screen menus:

Functions	Here you select displayed parameters, networks and functions, and how this shall be displayed
Zoom	Select more or less measurement results to be shown in the display (X-axis zoom).
Range	Modifies the dB scale (Y-axis zoom).
Time unit	Changes from periods to absolute or relative time on the X-axis.
Add marker	This will open a menu were you can set your markers.
Free cursor	Disconnects the cursor in the current view from following the other cursors. Enables the context sensitive menu again and select Link Cursor to set it back. When you Link Cursors again, the cursors in the other displays will jump to the cursor position in the view you are linking the cursors.
Go To	This opens up a submenu where you may key in the cursor position. Very useful when working with large L(t) files.

Different display types may show different contents.

Activate and deactivate the result displays



If the display is split in two halves you can tap on any of the display parts to set it active. The other half then turns inactive (greyish). An inactive display is still live updated.

The purpose of the active/inactive setting is to determine which of the two displays the key buttons shall update.

Tapping an inactive display part will set it back to “normal” state.

While active you can also decide if the current view shall follow the general cursor selections. The function is called “Unlink”. It gives an easy way to look at the measurement at two different frequencies or in two places in time simultaneously.

The statistical distribution (Ln) view cannot be linked or connected in a similar way.

Cursor handling

As discussed in the previous chapter, the cursor will move in all display views if they are “linked”. This is useful if you want to move in the time domain and update the frequency domain accordingly. In the time domain (the level vs time view) you move in time with the horizontal arrow keys (or simply tap on the screen). In the level vs time view you may also move in the frequency domain with the vertical arrow keys. Similar you move in the frequency domain in the level vs frequency view with the horizontal arrow keys (or tap on the screen) and in the time domain with the vertical arrow keys.

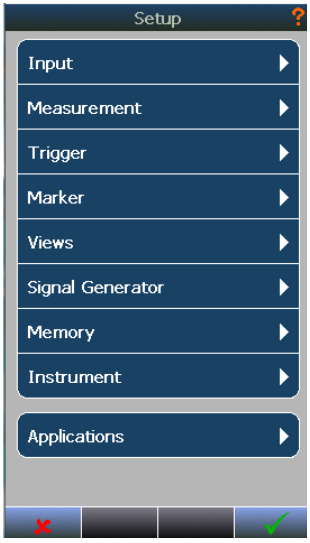
The single level versus time view offers a compressed graph at the top of the graph. You may use this graph to rapidly move to a certain time. The yellow shaded area is the current displayed view in the large graph

The context sensitive menu offers a go to function for the level vs time and level vs frequency view. This is especially useful for large time profile measurements with high resolution.

Another useful function is to jump between markers. This feature is found in the context sensitive menu.

The main menu system - an overview

The main menu appears when pushing the **SETUP** key on the front panel. Manoeuvring in the menus follows the same use as on any smart phone or pad. I.e. in all menus use your finger tapping on the selection fields or dragging on the selection wheels or drag a table up/down. The menu is organized so that you start on the top and manoeuvre downwards when setting up a measurement, if you are not using one of the predefined setups.



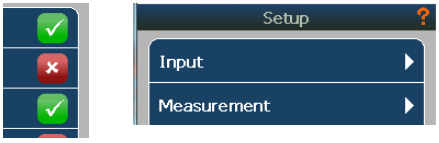
Use the ✓ or ✘ button to leave the main menu and return to the measurement pictures. While the sub menus are on the screen you store and exit the currently shown selections using the ✓ button or leave without any changes using ✘. You may use either the display soft keys or the hard keys on the keyboard

Input	Your transducers, microphones and preamplifiers are specified and connected to the analyser in the Input menu.
Measurement	All basic measurement parameters are set here, like measurement parameters, time profile resolution, overall measurement time, Time constants, Filter frequency response and resolution etc.
Trigger	The trigger menu defines how to start a measurement and how to setup the event triggers.
Marker	Defines what the individual markers represent and how they are displayed in the graphical displays.
Views	Defines the graphical and numerical views consisting of four individual views that may contain almost any combination of display types and measured functions.
Signal Generator	The signal generator (optional) provides test signals that match your measurement needs.
Memory	Setup and configuration of the memory. Define file naming, path etc. Results can be organized in folders and projects.
Instrument	This menu contains instrument specific settings like date and time, language, number formats, power saving setting, interface setting etc.
Applications	Access the factory predefined applications and user defined settings.

On/Off/Available/Disabled indication

In most menus there are indications whether something is selected or not. The green tick means that the function is selected and the red X means that it is not.

A greyish menu indicates that this function is not available. Either due to the state the instrument is in, or that an option is not enabled.



A menu selection containing a submenu is indicated with an ▶.

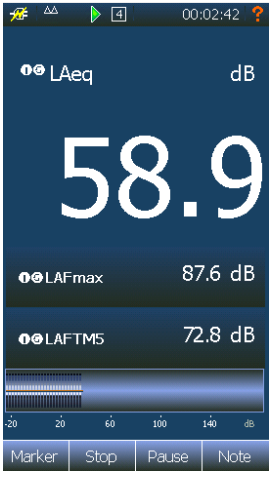
Selecting the different views and the parameters to display

There are four different views that you can customize. An indicator in the status bar is telling which view that is currently on the screen. You can rotate between the active views using the **VIEW** button. If wanted, some (but not all) of the views can be left unused.

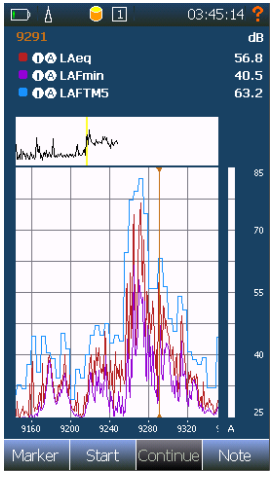
Each view can either be a single or dual type frame except from L(t)(wide), L(f)(wide), Ln(wide) and Ln.

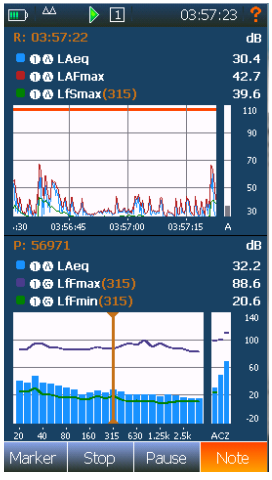
Available views are

SLM - Sound level meter display, only showing global values

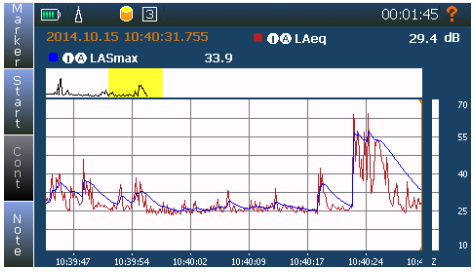


L(t) - Level vs time display is a Profile display showing the selected level function versus time, but no global values. – available as portrait in single and dual frame mode

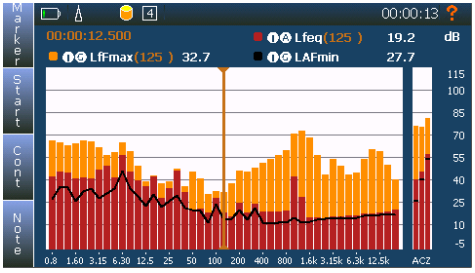




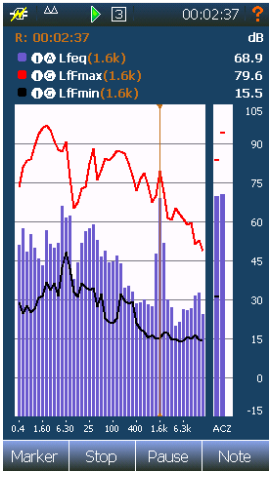
L(t) (Wide) – same as above, but only available as landscape (wide) in single frame mode. I.e. The graphical display is turned 90 degrees.



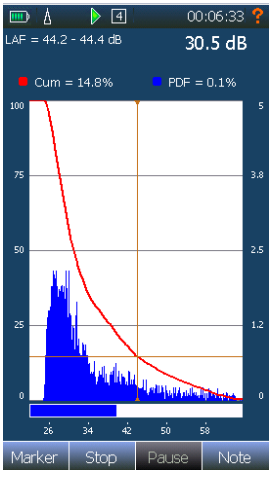
L(f) (Wide) – same as above, but only available as landscape (wide) in single frame mode. I.e. The graphical display is turned 90 degrees.



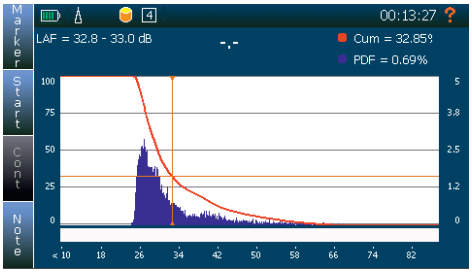
L(f) - Level vs frequency display is a Spectrum display and can show spectra for both the on-going time profile and the global results at the same time. – Available as portrait in single and dual frame mode.



Ln Combined cumulative and statistical percentage display. Only available as single frame display

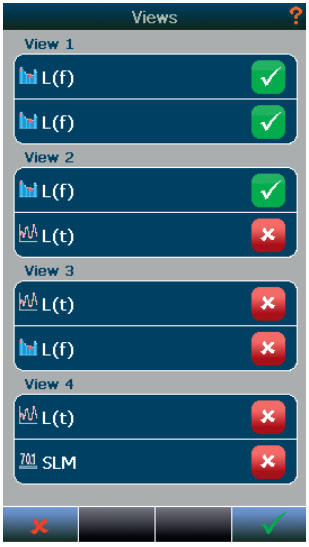


Ln (wide) - same as above, but displayed as landscape (wide). I.e. The graphical display is turned 90 degrees



Use the **VIEW** button to switch between each of the four different views. For easy use you may turn off views so that you at the extreme only have one view to deal with.

Push the **SETUP** key and then the *Views* to gain access to the View setup menu. Each view has two menu points which can be turned on or off. Simply turn on one, two or none to set the current view to a single, dual or off. Access the setup of the menu by touching the menu point. This gives you access to the various choices listed above.



If only one selection in a view is active, as indicated in View 2, this view will use the whole available screen area. Otherwise, the two selected displays will use the upper and lower halves of the screen area respectively.
As can be seen, View 3 and 4 are not active in this example. The View button will therefore only switch between View 1 and 2 when it is pressed.

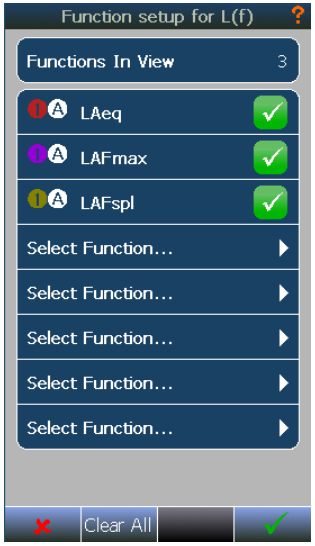
Please note that the *Wide* displays and the *Ln* display are only available as single frame pictures and thus only available in the upper of the two menu point for each of the four views.

Function selection – selecting the measurement parameters

The different views can show different types of results (or the same result in different ways). But you can only show result for functions that are selected for measurement. I.e. the parameters you want to display in any of the views must be measured. Use **SETUP** > *Measurement* > *Functions* menu to select the measurement parameters necessary for your measurement. The parameters you select here will be available to select for configuration of the different views.

Be careful when selecting the measurement parameters. Do not select more functions than what you really need. Too many functions may slow down the performance of the measurement system and make it complicated for you to select the interesting functions to display. In addition, having many functions selected take more space when storing and longer time to save or load.

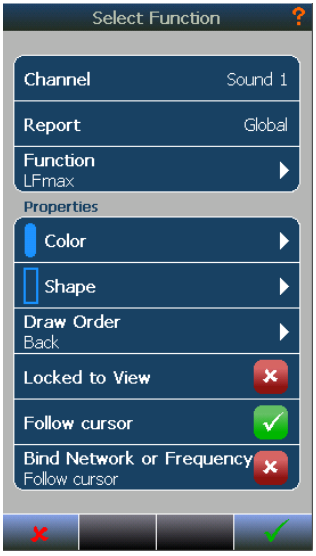
Return to the measurement display and use the context sensitive submenu to customize or filter your display selection for each of the views. Hold your finger on the display for a couple of seconds, and the context sensitive menu appears. Select the Functions in the context sensitive menu. This gives access to a menu where you may select up to eight parameters per View. The View Function setup is a combination of channel information, data or result type information and finally information about how you want this information to be displayed.



In the top of the menu you select how many parameters you like to display simultaneously. Up to three parameters may be displayed simultaneously. The size of the fonts is dynamic, dependent of how many parameters you have selected to be displayed. Select one if you need good readability, two or three if you want more parameters to be displayed simultaneously

Use the FUNC button below the display to rotate between the selected functions if your selections of measurement parameter excess the number of functions to display in the view.

Selecting one parameter will access a submenu where you select measurement parameter type, colour, drawing order and shape to optimize the readability and use of the measurement picture. On next page is a detailed explanation of the possibilities found in this menu.



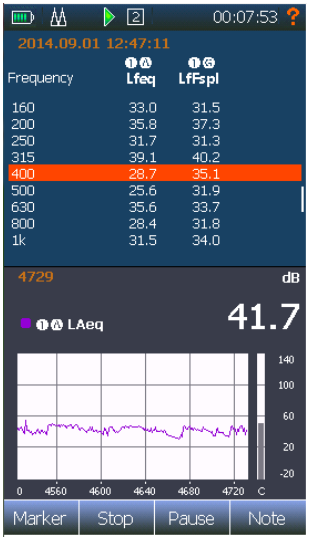
Channel	Only sound channel 1 is supported in the current firmware
Report	Select whether the data shall be acquired from the global or profile report. Due to the nature of the view, some views gives you only the option to select only global or profile data; **SLM** – Global only **L(t)** – Profile only **L(f)** – Profile and Global **Ln** - Not applicable. This menu is fixed and not possible to configure.
Function	Select measurement parameter. The parameter must be available. I.e. it must be set up to be measured in the function list found in **SETUP** > *Measurement* > *Functions* menu. Only parameters selected in the measurement function menu will be available. A list of available measurement functions will be present. Once a function is selected an additional field may be present above the list of available functions. The selection here is either time constant (Fast, Slow or Impulse) if an exponential average function is selected (SPL, Max or Min) or Normal or Impulse if a time averaged function is selected (Leq or LE). **Note!** Some of these choices may not be available since it is dependent on the settings done in the **SETUP** – *Measurement* menu.
Colour	Select which colour to use in the graphical view.
Shape	Select which shape to use. Applies only for the L(f) picture. Available shapes are; • Step Line • Rectangle • Framed rectangle • Line
Draw order	Apply to the L(f) picture only. Define the draw order, whether the bargraph shall be drawn back, middle or front.
Locked to View	If turned on, this parameter will always be displayed when the **FUNC** button is used to scroll through the selected measurement parameters.
Follow cursor	The selected data presented will follow the cursor position.
Bind Network or Frequency	Opposite to follow cursor, and locks the selected data to the selected frequency or network

Numerical tables

Each graphical display has a numerical table as an alternative. Use the **TBL** button to switch between the displays modes.

The same information as shown graphically as a specter or a profile will be shown numerically if possible in the display.

If both display halves are active when the **TBL** button is pressed, then they both will turn into numerical mode. To get a picture like the one shown here, first tap the lower display so it is inactive (grey) then use the **TBL** button to get the upper display numerically. Finally tap the lower display back to active mode again.



Input selection Menu

The *Input* selection menu is where you select which transducer to use for your measurement. You may also add new transducers or modify existing transducers. The Nor150 may be fitted with two sound channels (optional). In the current firmware only channel one is supported.

In the example *Sound Channel 1* is active and a transducer called “1209&1225” is connected to it.

You may also go directly to the calibration menu from this menu. The calibration menu is discussed in details later.

There is also a set of corrections that may be added. These corrections are;

Random incident. When turned on, a frequency correction is added so that the free field response is changed to a Random Incident type (only available if a free-field type microphone is selected.

Windscreen. Turn this correction on if the normal 60 mm windscreen Nor1451 is used. This adds a frequency compensation in order to compensate for the change in frequency response caused by the windscreen

High Level. Only available if an external polarised microphone is selected. For Nor1225 which is a microphone that require 200 V polarization voltage, the sensitivity can be reduced by approximately 10 dB by lowering this polarization voltage. The level range can therefore be extended without changing the microphone cartridge. This feature shall be used in combination with the Nor1225 cartridge only. It will not work with prepolarized microphones such as the Nor1227

When this feature is selected, the polarization voltage is lowered from 200 V to 70 V. Lowering the polarization voltage after the tension in the diaphragm. A correction network is therefore applied automatically to compensate for the change in frequency response of the microphone due to the lower polarization voltage.

Note that the needed correction will depend on the type of microphone, and shall only be applied when using microphone cartridge type Nor1225. Please note that you should calibrate with an acoustical calibrator if you change this setting.

If any of the outdoor microphones Nor1214, Nor1216, Nor1217 or Nor1218 is selected the corrections above will disappear and be replaced by the two following ones;

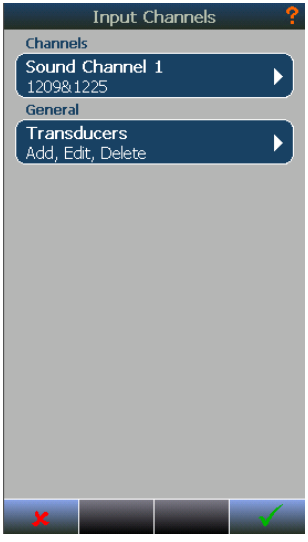
Orientation correction. This adds correction to the outdoor microphones listed above dependent on the sound incidence. Apply Horizontal for normal environmental noise such as traffic noise, construction site noise etc. Apply Vertical only when the noise incidence is consistently coming from above, such as under or close to an airflight path.

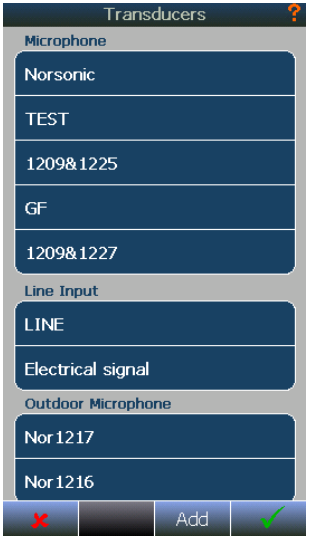
Windscreen Nor4576. Only available if Horizontal correction is selected. This correction should be enabled if the large 200 mm windscreen is added to any of the outdoor microphones listed above.

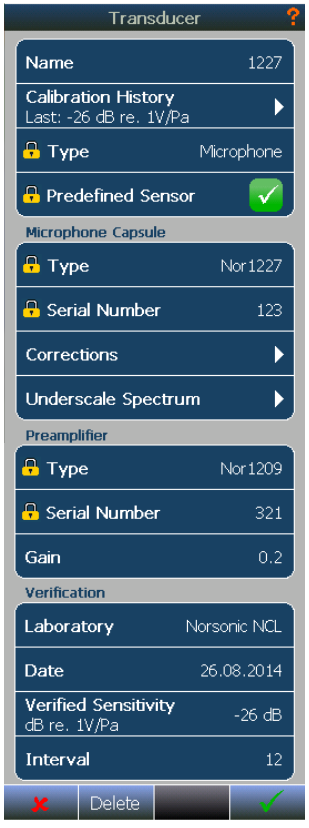
Selecting the menu *Sound Channel 1* access a sub menu for selection of available sensors, a short cut to the calibration menu and a list of available corrections like Random Incident, Windscreen and High Level. The corrections available are dependent on the selected transducer.

The Transducer menu

The selections *Transducer* opens up a menu where you may edit add or delete existing sensors. You may also use this menu to acquire information about the sensors.







In the *Transducers* menu a list of the already added transducers is shown. As a minimum, one Microphone will be available. This is the transducer set from the factory and is normally denoted 1209&1225. The picture above shows a list of several microphones, one line sensor and several outdoor microphones added if the instrument is supplied with a Nor1225 microphone. If it is supplied with the prepolarised version of Nor1225, the Nor1227, the transducer is denoted 1209&1227.

If you tap on one of the fields in this case *1209&1225* a submenu with all the relevant parameters for this transducer will be available. Several are locked and cannot be edited.

The available fields differ from type of sensor, but the most common fields are discussed in table on next page.

Name	The name of the sensor. Give each of your microphone / preamplifier combinations a name so they are easy to recognize. This makes it simple to select the correct one, and the same input hardware set up that was used last time will be loaded. This ensures quick and safe set up of your transducers. This is not a locked field and may be edited.
Calibration history	Opens up a L(t) graph which holds historical data of the calibration. Move cursor to obtain information about previous calibrations. Please note that this is the values obtained each time you perform a calibration in the calibration menu. Must not be mixed with the data obtained at the annual verification normally performed by an external accredited laboratory.
Verification - Laboratory	The name of the calibration laboratory that performed the last verification of the transducer.
Verification -Date	The date of the last verification.
Verification - Verified sensitivity	This is the sensitivity that was obtained when the last verification was performed. A typical sensitivity 50 mV/Pa microphone is -26 dB. This value is given in dB relative to 1V/Pascal. This value is used as a new “reference” line in the calibration history graph. As times goes by, the actual sensitivity may drift a little bit. If it drifts off, this is clearly seen in the calibration history view, and if it changes too much the system will refuse to calibrate correctly. See “Calibration chapter”.
Verification -Interval	This is the interval, in months, between each verification.
Detector - Type	This is the type of detector. For a microphone this is the type microphone cartridge. When adding a new microphone, you may choose from a list of predefined sensors or a non-predefined sensor. Choosing a predefined sensor will preset some of the fields below. This is a locked field and cannot be altered.
Detector - Serial number	The microphone cartridge serial number. This is a locked field and cannot be altered.
Detector - Polarization voltage	Set either to on or off. This is a locked field and cannot be altered.
Detector - Corrections	Here you may add frequency corrections.
Detector - Spectrum underscale	Here you may add information about the self-noise values of your sensor. This is used to indicate underscale condition in the SLM display.

Preamplifier - Type	This is the type of preamplifier. When adding a new preamplifier, you may choose from a list of predefined sensors or a non-predefined sensor. Choosing a predefined sensor will preset some of the fields below. This is a locked field and cannot be altered once the information is stored.
Preamplifier - Serial Number	The preamplifier serial number. This is a locked field and cannot be altered.
Preamplifier - Gain	Here you add preamplifier gain. Normally the preamplifier attenuates the signal from the microphone due to its input capacitance. Hence you should enter a negative number. Negative gain=attenuation.
Preamplifier - IEPE	IEPE on or off. Off, means a traditional powered preamplifier. On means that the IEPE power is added to the signal line on the Lemo connector.

Adding a new sensor

With reference to the previous chapter, start by adding a name and then type. Current available selections are;

- Microphone
- Vibration Sensor
- Line Input
- Outdoor microphone

If a *Predefined sensor* is selected several fields are selected and locked.

Some microphone cartridges require a polarization voltage to work properly while other microphone types are pre-polarized. Pre-polarized microphones are clearly marked with a thin ring on the outside of the cartridge. By selecting the proper microphone type from the list, this polarization voltage will be set correctly.

Select the microphone type e.g. Nor1225.

Key in the serial number of this microphone.

Typical nominal microphone sensitivity values are:

mV/Pa	dB rel. 1V/Pa	Microphone types
50	-26	Nor 1220, 1225, 1227, 1228, 1230
40	-28	Nor 1229
12.5	-38	Nor 1236
4	-48	Nor 1245

Preamplifier selection

Select preamplifier type. Only types that will work with your microphone will be displayed. It is dependent on polarization voltage. If polarization voltage is required then a “traditional” preamplifier with a multi pin (7 pin Lemo) socket is needed. Pre-polarized microphones can also be used on preamplifiers with IEPE type of connection.

Please note that a microphone with IEPE compatible preamplifier is also called an ICP type sensor.

Using other transducers

The Nor150 supports a variety of transducers. A typical use is the low noise microphone GRAS 40HL which may be directly connected to the Nor150. You need to specify this as a Non predefined sensor. This is an external polarised microphone, so the 200 V polarization voltage must be turned on. It has internal gain of 20 dB. Hence the sensitivity is typical -1,4 dB re 1 V/Pa instead of -26 dB re 1 V/Pa for a normal 50 mV/Pa microphone such as the Nor1225.

Calibrating the instrument - field check

Calibration (or field check) is the normal way to ensure that the sound level meter measures the level with sufficient accuracy. To check the level we need a sound calibrator. The use of sound calibrators dates back to the days when it was easier to design a stable sound calibrator than a stable sound level meter. Today, sound measuring instruments are, in general, as stable as sound calibrators. However, measuring microphones are very delicate devices designed to fulfill very rigid specifications. This makes them vulnerable and subject to damage if not taken well care of. Using a sound calibrator is just as much a verification of proper operation as it is a device of adjusting the sensitivity of sound measuring instruments.

The Nor150 is calibrated by clicking the **CAL** button or in the **SETUP** > *Input* > *Channels* > *Calibration* menu.

When to calibrate

Calibration of the Nor150 should preferably take place before a measurement session is commenced, or whenever required by applicable standards.

Carrying out the field check / calibration

You will need a sound calibrator of sufficient accuracy, I.e. a class 1 sound calibrator as defined by the IEC 60942 standard such as the Norsonic sound calibrator Nor1251.

The Nor1251 has a nominal sound pressure of 114.0 dB at 1kHz. In order to compensate for effects due to diffraction around the microphone, we recommend adjusting the sound level meter to indicate 113.8 dB (diffuse field and wind screen corrections off), providing you are calibrating a ½" free field type microphone. Other correction may apply for different types of microphones.

Do as follows:

1 **Mount the calibrator onto the sound level meter**. Mount the sound calibrator onto the microphone. Switch on the sound calibrator and wait until the level has stabilized. Information on how long time this will take should be available from the documentation accompanying your sound calibrator.

Note: Never calibrate the instrument before three minutes after switching the instrument on

2 **Enter calibration mode**. Press the **CAL** key to gain access to the *Calibration* menu. Nor150 offers two different ways to perform an acoustical calibration, *Manual* or *Auto*. The third option *Mic. Check* is an electrical verification of outdoor microphones.

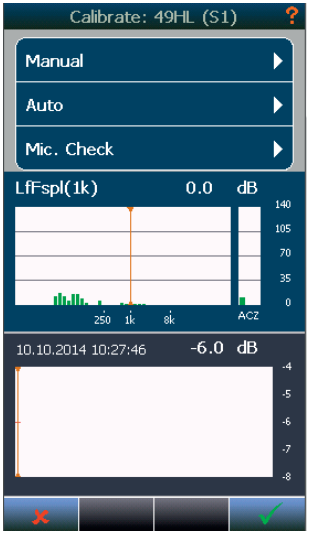
3 **Know the output level of your sound calibrator.** Some sound calibrators have an output level of 94 dB, while others (like the Nor1251 which is used in the example to the right) have an output level of 114 dB. Some have an output of 124 dB (like the Nor1253). Unless you know the output level of your sound calibrator you won't be able to know what level the measuring instrument is supposed to show. The output level is normally printed on the sound calibrator or stated in its accompanying user documentation.

4 **Free-field microphones require lower settings.** Be aware of the fact that instruments using free-field microphones shall be adjusted to a value slightly lower than the output level of the sound calibrator. For a half-inch cartridge this will typically amount to 0.2 dB lower for calibrators producing a 1000 Hz calibration signal (e.g. the sound level meter should then be set to 113.8 dB when using a 114 dB @ 1000 Hz sound calibrator). Other frequencies will require different correction values.

5 **Set the sensitivity.** Select either *Manual* or *Auto*.

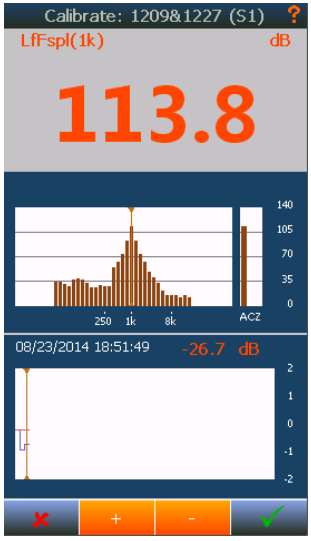
Do not use *Mic. Check*. See separate chapter for description of this feature.

In Manual mode you simply use the **+** and **-** to adjust the sensitivity until you read correct level. New values are set with the ✓. The old value is preserved with the ✘ button.

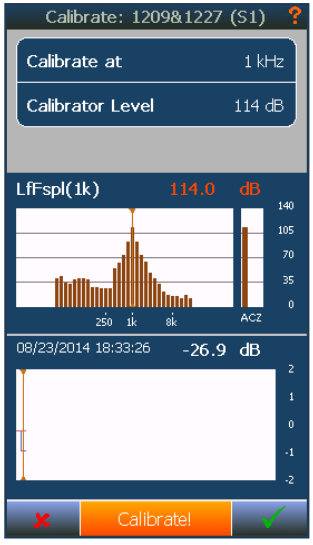


In Auto you select the calibrator level and frequency and push the Calibrate soft key button. The instrument will automatically perform a calibration. The level is displayed in the L(t) trace in the calibration menu. New values are set with the ✓. The old value is preserved with the ✘ button.

Calibrating outdoor microphone Nor1214, Nor1216, Nor1217 or Nor1218! Please note that the frequency correction is turned off, when entering into the calibration menu. Perform calibration and calibrate the microphone as a normal free field microphone. I.e.-0.2 dB if using a 1000 Hz calibrator. When leaving the calibration menu, you will observe that the level measured with the calibrator on, is different from what obtained in the calibration mode. This is correct, and is due to the frequency correction added. If Horizontal position is selected the signal will be about 0.1 dB higher than the calibrated signal, in vertical position the signal will be 0.3 dB lower than the calibrated level.



Manual callibration



Auto callibration

Microphone check

For long term monitoring purposes, it is often handy to be able to check the functionality of the measurement system along the signal line from microphone/ preamplifier until the display of the instrument without the use of an external calibrator. The Nor150 has a build-in Mic. Check feature that allows this (also called SysCheck).

Pin 1 on the microphone input socket is able to supply a known voltage signal to the Norsonic Preamplifier Nor1209. By enabling this constant voltage signal, the entire measurement chain including the microphone is tested, and the display will show the corresponding measured value in dB. Hence, if this value is constant from the previous check, it is highly likely that the overall functionality of the measurement chain is constant.

The procedure for using this Mic. Check feature is as follows:

1. Perform a normal calibration of the entire instrument by use of an external acoustical calibrator (see the previous pages in this chapter for details) before the first time you use the Mic. Check to establish a “reference level”
2. Press the **CAL** > *Mic. Check* to open the *Mic. Check* menu.

   Place the cursor on the 1kHz bar and read the level. The level will be dependent of the actual previous sensitivity calibration as well as the individual preamplifier and microphone in use. Normally, using the Norsonic Preamplifier Nor1209 and Microphone Nor1225, the level will be approx. 90 dB with a 1-2 dB variation from instrument to instrument. The Nor1227 will normally return a value of about 94 dB. The exact level is not so important. What is impor-

tant is that the level you read the following times should not deviate much from your initial level. The Mic. Check level is mainly determined by the microphones cartridge capacitance. Hence, a ¼" microphone will return a much lower signal level than 90 dB. The Mic. Check feature works also with the Norsonic Dehumidifier Nor1284 and Nor1285 mounted.

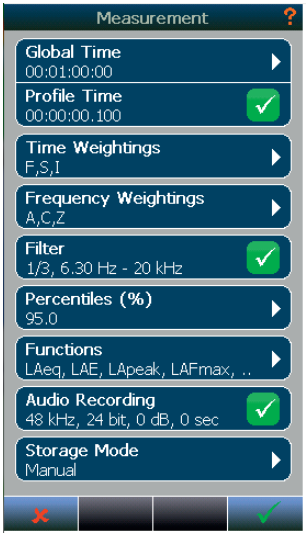
3. It is recommended to not adjust the sensitivity level. Just leave the menu either by the cancel or OK button. If you leave by using the OK button, the date and sensitivity value will be updated.

If an external device should be controlled by the Mic. Check feature, go to the digital I/O menu. **SETUP** > *Instrument* > *Digital I/O* and select *Mic. Check* on the I/O line you have connected your device to. For the Nor1210 using a Nor512 unit, you shall use digital I/O line 3. This will then start the electrostatic actuator in the Nor1210.

NOTE/CAUTION: Always turn off the Mic. Check when calibrating the system with an acoustical calibrator. If not you will add the acoustical and the Mic. Check tone together resulting in a wrong calibration value, often observed as unstable calibration value.

Measurement Setup Menu

There are a large number of parameters that can be selected for a measurement. Use the **SETUP** key and then the *Measurement* selection to configure the various measurement parameters.



Global Time is the overall measurement time for the whole measurement sequence. In Repeat or Synchro mode the global measurement time is repeated until the selected stop condition is fulfilled.

Profile Time is the time period length, also known as the duration of each element (time slice) in the electronic level recorder.

Time Weightings. In this menu you set which time weighting functions you want to use. The instrument is capable of measure all three available time constants, Fast, Slow and Impulse in parallel. You may also define which time constant that shall be used in idle mode (ready mode).

Frequency Weightings. In this menu you set which time frequency weighting filters you want to use. The instrument is capable of measure all three available filters A, C and Z in parallel. You may also define which of the filters that shall be used in idle mode (ready mode).

Filter. In the Filter menu you select the bandwidth, 1/1 or 1/3 octave and the frequency range.

Percentiles (%). The instrument can collect samples from one of the time weightings F or S for statistical calculations of the sound level. The statistical distribution function may be calculated for both Global and Profile and all weighting networks and filter bands, providing that the time resolution is more than 1 minute. Up to eight percentiles values may be measured. Each percentile can be set with a resolution of 0.1 %. The complete statistical data can be shown both graphically and numerically in the View called Ln.

Functions. In the function list you select which measurement parameters you want to measure. The list is dynamic based on the selections done in the Time Weightings, Frequency Weightings, Filter and Percentiles menu. The column denoted G is global values while the column PA is profile values. Please note that the Global value will automatically be turned on if you select the profile value.

Audio Recording. Defines the fidelity of the audio recording, gain and pre-trigger. Please note that the resolution must be set to 16 bit if you want to replay the audio recording on the instrument itself. All formats are however supported in NorReview.

Storage Mode. Here you set the storage mode. Nor150 offers four different storage modes.

- *Manual*, which requires that acquired data are stored manually by the operator before the next measurement is made. A dialogue box will appear to verify that you want to discard the measurement if forget to store it.
- *Automatic,* which causes the acquired data to be stored automatically upon measurement termination, regardless of the reason for termination – irrespective of whether termination took place because the duration expired or because you pressed stop.
- *Synchronized.* In nature equal to repeat, but the instrument synchronizes itself with the next full hour of the time of day. To be active, synchronized requires a minimum measurement time (duration) of 30 seconds per individual measurement.
- *Repeat*, which causes the instrument to store the acquired data and then restart immediately and make another measurement using the same measurement setup and duration. Repeat applies to measurements terminated by themselves only. If you terminate a measurement by pressing stop, the instrument will not restart. There is no time gap between the measurements.

Synchronized – an example

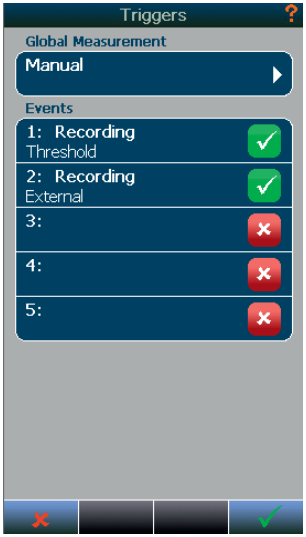
Assume that you set up the instrument to measure in periods of one hour and that you start the measurement at 08:52:40. The first period will last 7 minutes and 20 seconds ending at 09:00:00. The next measurement will be started at 0900, followed by a new measurement each full hour.

We recommend limiting the use of the synchronized-feature for measurement periods which are either a multiple of one hour or one hour divided by a whole number as the feature has been designed with this limitation in mind.

If you want to apply short measurement periods below a few minutes, we generally recommend using the level versus time feature instead (time profile), since this gives you a much more flexible way of displaying and work with the stored data.

Trigger Selection Menu

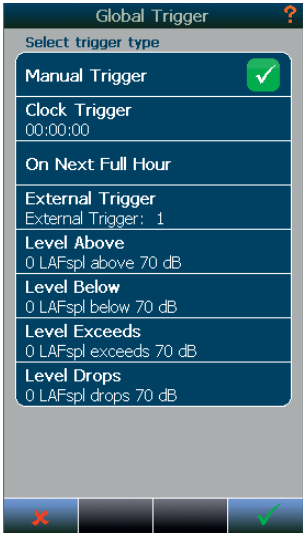
The *Trigger* menu is used for two purposes; to start the overall measurement, the Global measurement and to specify the condition of the event triggers.



Global Trigger

The upper selection, Global Measurement, specifies how to start (trigger) the measurement, while the lower frame, Event, specify the settings of the event trigger. Global Measurement is the overall measurement. The Global measurement time (duration) is specified in the *Global Time* in the *Measurement* menu. For most application the Start button is used to start (trigger) a measurement. It is however, often required to start a measurement based on other criteria's than just push the start button. The Nor150 has a variety of choices found in the *Global Measurement* menu.

Independent on the selections made in the Global Trigger menu, the **START** button must be pressed to activate the setting. The measurement icon in the upper bar in the display will turn into "waiting" indicated by ⧖ icon to show that the instrument is ready to measure once the global trigger condition is fulfilled.

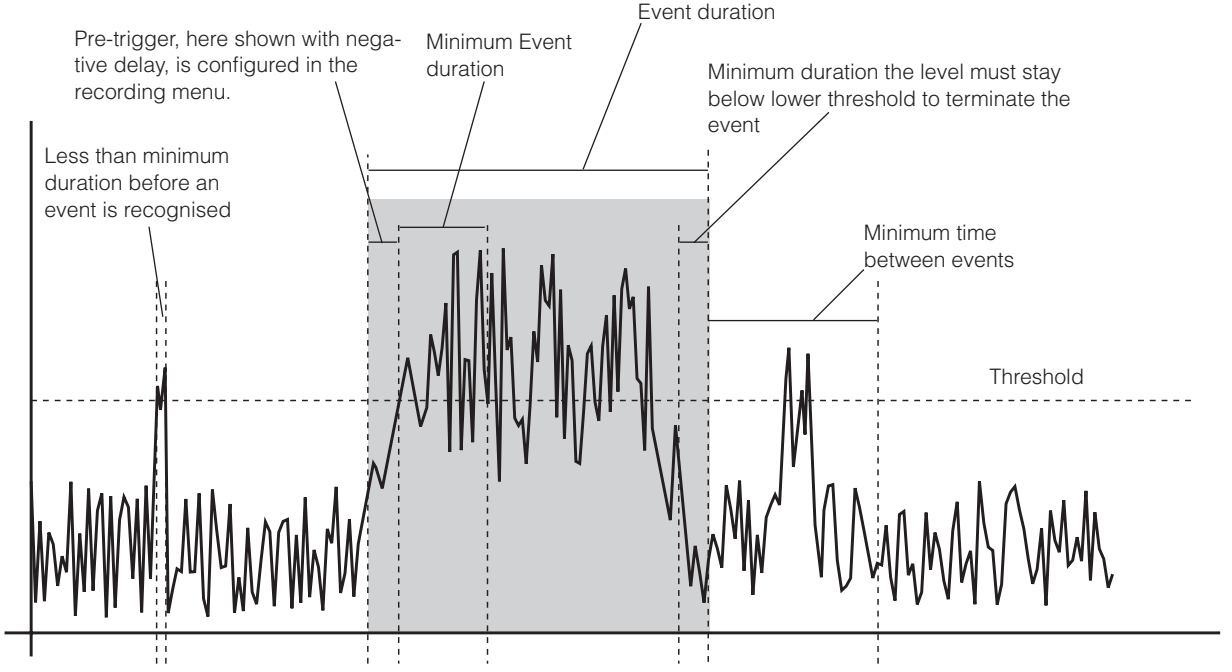


Manual Trigger	The measurement start is controlled by the Start/stop button on the keyboard and the soft buttons in the display.
Clock Trigger	The measurement start is controlled by the real time clock.
On Next Full Hour	The measurement will start once the real time clock in the Nor150 passes the next full hour.
External Trigger	The measurement will start once the external trigger is activated. I.e. a digital signal on the I/O socket pin 1. The hand switch Nor263A or Nor263B is suitable for this use.
Level Above	The measurement will start once the level is above the set trigger level. In addition to the level, the measurement parameter can also be specified.
Level Below	The measurement will start once the level is below the set trigger level. In addition to the level, the measurement parameter can also be specified.
Level Exceeds	The measurement will start once the level exceeds the set trigger level . It derivates from the Level Above in which will trigger once the level is more than the set trigger level, the Level Exceeds must be below, and then exceed the set trigger to fulfill the trigger condition. In addition to the level, the measurement parameter can also be specified.
Level Drops	The measurement will start when the level drops below the set trigger level. It derivates from the Level Below in which will trigger once the level is less than the set trigger level, the Level Drops Below must be above, and then drop below the set trigger to fulfill the trigger condition. In addition to the level, the measurement parameter can also be specified.

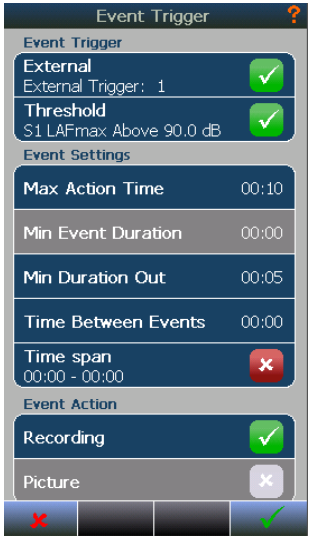
The Event Trigger

An event is a significant change in the sound level for more than a minimum period of time. The amount of level change required is predefined by you by setting a threshold level. Hence, the purpose of the event triggers is to start an action based on the event. A typical action can be to start an audio recording if the noise exceeds a certain level. The event trigger criteria (and On/Off status) is controlled in the second frame in the Event Trigger menu. To picture an overview of the event trigger there is a certain terminology associated with events – see figure below.

Event related terminology



Each of the five event triggers can be configured independently. The main purpose of offering five instead of only one trigger is that each of the five triggers is connected to the real time clock. This means that you may configure one trigger level for a certain period of the day, and another one for the evening and a third one for the night, or simply turn off the event trigger for a certain period of the day.

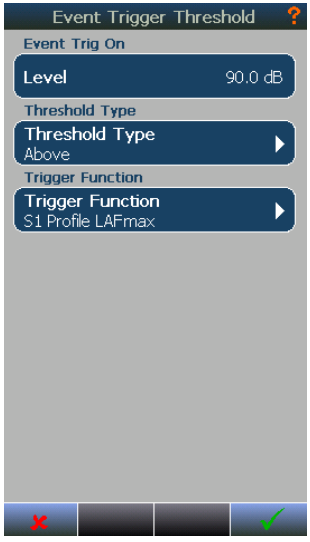


The upper selection frame “Event Trigger” is where you set the type of event trigger.

External; The event will be enabled if the hand switch type 263A or B is used, similar as pin number one on the digital I/O socket is enabled.

Threshold; The threshold trigger is a sophisticated trigger with several possibilities. Pushing the Threshold button opens up a submenu where the threshold trigger is specified.

Both *External* and *Threshold* trigger may be activated simultaneously.



Start Level
This is the start trigger level

Stop Level
This is the stop trigger level

Threshold type

Above: Trigger once the level is above the set trigger level
Below - Trigger once the level is below the set trigger level

Trigger function
Here you set trigger measurement function and Frequency (if applicable)

Max Action Time
This is the maximum time the event shall be active. The event action is terminated when the maximum Action Time is reached

Min Event Duration
This is the minimum time the event must be fulfilled. Events shorter than the minimum time will be rejected. This function is not supported in firmware version 1.0

Min Duration Out
This is the minimum duration the event trigger condition is not fulfilled

Time Between events
This is the minimum time between events. An event will be rejected if it occurs before the minimum time is reached

Time Span
Here you specify which time span of the day the event trigger settings shall be active.

In the lower frame you specify the Event action. The current software version offers only Audio recording. Setting the audio recording quality and pretrigger is done in the **SETUP** > *Measurement* > *Audio Recording* menu. This setting is common for the audio recording regardless of which action that starts it; an event trigger, external hand switch, a marker etc.

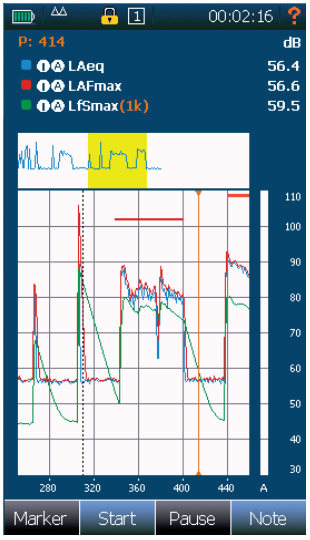
Working with Markers

Setting up Markers - the Marker Setup menu

Have you ever made a measurement where you later found out that you desperately need to identify the cause of the level? Recording the audio may be one answer, but for attended measurement it may be more convenient to add markers to the measurement.

Markers can be inserted into a running measurement. In the marker setup menu there are up to 10 different markers available. Each marker can be set to sound incidents that are interesting to note in a measurement. Markers are connected to a specific period in the profile measurement. There are two types of markers; single markers and toggle markers. A single are mainly used to indicate short duration sound events, while toggle markers typically is for noise events that last longer such as pass by noise of a train or similar types of noise.

In addition to selecting whether the marker is a single or toggle type, the real name and colour is also possible to configure in the sub menu associated with each marker. The marker will be added to the time profile with the selected colour. A single marker appears as a dotted vertical line, while the toggle marker appears as a horizontal line.



Each marker may also start an action. The following actions can be assigned to a marker.

Recording; The marker will start an audio recording. Setting of the audio recording such as pre-trigger, # of bits and sampling is set in the *Audio Recording* menu found in the *Measurement* menu.

Picture; A picture is taken when the marker is activated. (Not supported in v1.0)

Digital Output; A digital output line will be set when the marker is activated. A digital output must be assigned to the marker. This is configured in the "Digital I/O" menu found in the "Instrument" setup menu.

Reference tone; This will add tone signal to the time profile in the similar way as an audio recording. Mainly used for adding a "calibrated" sound level to the start of a measurement. The signal type, level and excitation time is set in the *Reference Tone Setup* found in the *Instrument Setup* Menu.

Instrument specified markers

In addition to the user defined markers described above, other markers may be inserted by the instrument itself.

Pause marker; As discussed in chapter *Pausing and resuming a measurement*, a yellow toggle marker including a blue shaded field indicates the duration of the pause. The values obtained in the pause area are removed from the global measurement, but remain in the profile. The single marker "P" is added to the periods to denote that these periods contain data acquired in pause mode.

Continue; A red single marker labelled "C" for continue is inserted in the time profile if you terminate an ongoing measurement prematurely by pressing the **STOP** key and later resume the measurement by pressing ⏯. The "C" marker will be added to the period within which the ⏯ key was pressed

Recording; An orange recording marker is added to the profile during recording of the signal.

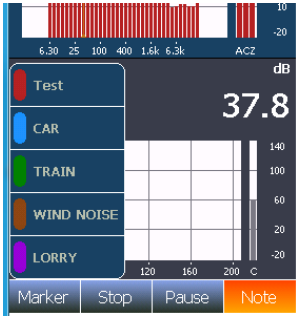
Signal Overload; A red marker is added to the profile if the input circuit is overloaded. I.e the measured signal is higher than the measurement range.

DSP Work Overload; A black marker is added to the profile if some of the specified tasks have been omitted due to work overload for the signal processor.

Adding a marker to an ongoing measurement

An on-screen selection with the available markers appears in the measurement picture when the Marker button is activated. This menu then remains on the screen until it is closed with a new push on the marker selection field. Active markers remain active even when the menu is closed.

Several markers can be active simultaneously. The marker button turns into orange when active.



Working with markers - post processing

Once a measurement is elapsed, or recalled from memory, you may edit, delete, move or jump between markers. Unlike setting a marker which can be done in any view, regardless of type, you can only perform post processing from the L/t view.

The post processing marker management menu is a context sensitive menu. If you place the cursor on a marker and open the context sensitive menu you will find one menu point named marker. Tapping on this menu opens a submenu offering three choices; Move, Delete or Add.

Move: The marker you placed the cursor on is moved to where you place the cursor by tapping on the new position.

Delete: The cursor you placed the cursor on before you entered the menu is deleted

Add: The available markers appear. Select the new marker and tap on the screen where you want the end position to be. Start position is where the cursor was placed before you entered the menu.

Jump between markers: Place the cursor on a marker. Tap on the *Marker* key and use the ◀▶ on the keyboard to jump to the next marker left or right.

Recording the sound - Audio recording and replaying

The Nor150 allows storing the sound signal itself obtained by the microphone if the appropriate option 4 is installed. The most common application is for identification purposes (by listening to the sound signal). Dependent on the selected quality of the recording format, the signal may also be used for further analysis.

The recording quality is available in several flavours serving slightly different purposes. The main disadvantage for using an unnecessary high quality is large files which consumes a large part of the storing medium, increased calculation power and handling time due to the large amount of data.

The Audio setup is found under **SETUP** > *Measurement* > *Audio Recording*.

Formats

Three different Resolutions, 8 – 16 – 24 bit, and two sampling frequencies, 12 kHz and 48 kHz, give in total 6 different formats for the recorded sound. The sampling frequency of 48 kHz in combination with 24 bit resolution reflects closely to the basic accuracy of the instrument and should be used if further processing of the signal is requested. When the sampling frequency is set to 12 kHz, only frequencies up to 5 kHz can be reproduced. However, in most cases this is sufficient for noise source identification. Note that the best format consumes twelve times as much memory as the simplest for storing a recording with a certain duration.

Select 16 bit resolution if you want to replay the audio recording on the Nor150 itself. NorReview as well as most media players accept all formats.

Recording gain

The instrument has a large dynamic range – exceeding 120 dB. This means that if you try to play back the recorded sound after having transferred the files to your PC, you will – in most cases – hear nothing! The reason why is that most soundcard/PC solutions simply can't handle the high dynamic range. To overcome this problem you may introduce a gain applied to the recorded sound only – the rest of the measurement is left unaffected. The drawback is that the dynamic range for the recording is reduced accordingly so a sound recording overload may occur with no overload

being detected by the instrument. All other parts of the measurement are left unaffected by this gain setting. The upper range for the recording will be the upper level for the instrument minus the selected recorder gain. The upper range for the instrument is dependent of the calibration, but is normally 130 dB (140 dB peak). The recording gain may be selected in steps of 6 dB (2x) from 0 dB to 60 dB.

Pre-trigger

The pre-trigger function allows the start of the sound recording to be recorded 5 seconds before the recording was triggered.

Recording duration and Trig level

The duration of a recording and how it shall be started is configured in the Trigger Menu. Please refer to chapter *Trigger Selection Menu* for further details.

Making a recording

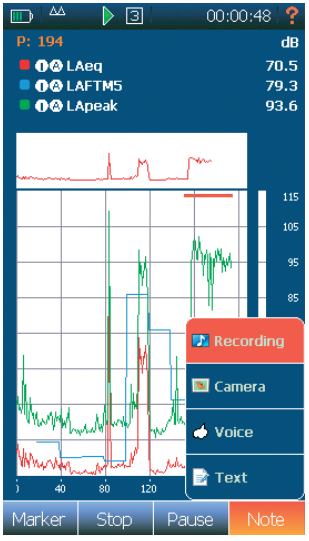
The start of a recording may be done in many ways. Manually by pressing the Note soft key and then *Recording*

Manually by connecting the audio recording action to a Marker.

Manually using the remote hand switch Nor263 connected to the I/O port.

Threshold triggered by connecting the Audio recording to one or several of the event triggers.

For a level triggered recording the recording will start during a measurement if the level in the selected network or filter band fulfils the trigger criterion. The length of the recording is selected as a part of the trigger setup discussed in chapter *Trigger Selection Menu*.



The recording file is automatically assigned to the current measurement. A marker is inserted in the L/t profile. See figure. The figure also shows the Note menu open. The orange (as well as the orange Note button) indicates that there is an ongoing recording in addition to the orange marker.

If you want to make an automatic record lasting for the whole measurement, set a very low threshold (e.g.: -0,0 dB) and select the Max action time to 0 min and 0 sec.

The Span feature offered in the Event menu enables a different setting of the audio recording during a day. Up to five different time span may be configured with associated trigger levels/actions. More details is found in chapter *Trigger Selection Menu.*

Listening - replaying an audio recording

Once a measurement is elapsed, or recalled from memory, you may replay and audio recording if applicable. Place the cursor at the audio recording marker you want to listen to and enable the context sensitive menu and select play. The audio recording is now replayed via the headphone socket. Please note that it is required that the audio recording has a resolution of 16 bit to be able to replay the recording on the instrument itself. Be sure that you have configured the headphone socket to replay the audio recording and not set it to listen to the microphone signal itself. This is set in the **SETUP** > *Instrument* > *Analogue Output* > *Headset* menu. Select Playback. You may also set a replay gain to any value between 0 and + 60 dB.

Push the Marker softkey and then the left or right arrow key to move to the next audio recording. Please note that this function moves the cursor to the next marker regardless of type.

All recordings are made in a standardized WAV-format which allows most media-players to play the recorded file if they are transferred to a PC. We recommend using NorReview to work with the time profile data and listening to the audio recordings.

Insert a reference tone as a recording

When listening to a recording, it may be required to make the playback with the same actual sound level at the listener's ears as the original sound was at the spot of the actual measurement. In such cases a reference tone with a pre-defined level may be recorded during the measurement, and later replayed through the listener's loudspeaker system at the spot of the replay. The reference tone is configured in the **SETUP** > *Instrument* > *Reference Tone* menu. Here you select Level – 0 to -50 dB, Signal type- white, pink or sine, Excitation Time – 1 to 60 seconds, and Frequency if Sine is selected as signal Type.

The Reference Tone is activated by a marker. Cf, chapter *Setting markers – Working with markers* . Only one of the markers can be assigned to activate the reference tone.

Voice and Text notes

You may add voice and text notes prior to, during and after a measurement. There are two types of notes, global note and profile note. A global note applies to the entire measurement, while the profile note will produce a marker and is meant to add additional description related to an event. You may add several profile notes, but only one global. For voice notes you need a proper headset with microphone connected to the headphone socket found on the rear input connector panel. In addition you need to select Playback in the **SETUP** > *Instrument* > *Analog Output* > *Headset* menu.

Adding text and voice notes

Push the Note soft button on the touch screen and select either *Text* or *Voice* note. Text or Voice notes added prior to a measurement assumes that you are in ready mode. I.e. no recalled measurement or ended measurement available on the screen. The note(s) will then be added to the coming measurement. Text or Voice notes added to an elapsed measurement will be assigned to the elapsed measurement. These notes are so called global notes.

Similar, voice and text notes may be added to an ongoing measurement. These notes are called time profile notes. The text note will produce a single marker, while the voice note will produce a toggle marker.

You may also add text to the global note while the measurement is running. To access the global note, press Text Note as usual and then the soft key Global found on the soft key bar in the bottom of the display.

If you add a global note prior to the measurement, and want to add more info after a measurement, you may add the information as additional text, or modify the existing text for the text note, while the voice note only offer the possibility to replace the one you made prior to the measurement.

Retrieving text and voice notes.

You may read the added text notes by placing the cursor on the single marker and push the *Note* and *Text* note button. To read the global note, just press the *Text* note button and then the Global soft key.

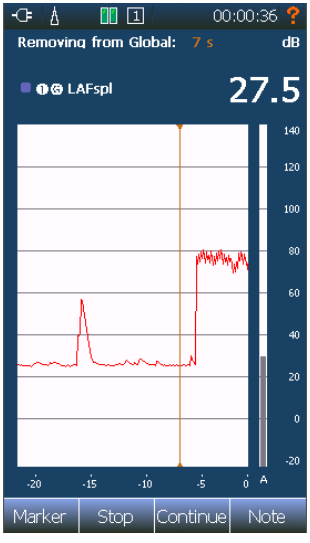
A voice note is replayed in the same way as an audio recording. Simply place the cursor within the marker field and open the context sensitive menu either by placing your finger for some seconds on the cursor/marker or push the **OK** button on the keyboard. Select *Play* to replay the voice comment. To replay a global text note, push the *Voice* button. A dialogue box will appear and ask if you want play it, or replace it with a new one. If there exist no voice note, a new voice note will be added.

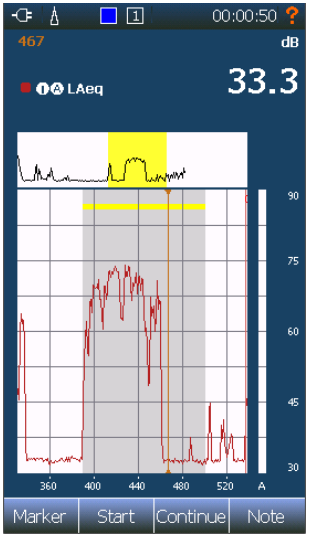
Pausing and resuming a measurement

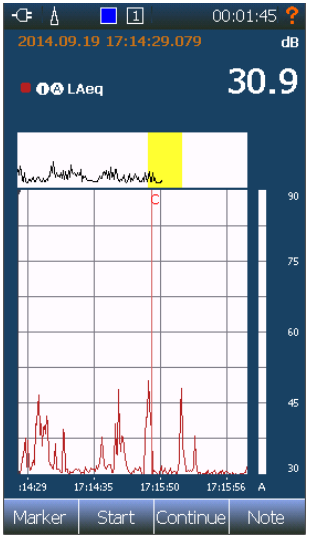
Extensive pause and continue functions are available. When paused, the instrument will produce the time profile for the last 20 seconds of the measurement. The time cursor can then be moved backwards in one seconds step to remove the unwanted noise and resumed. Data acquired to the right of the time cursor in the pause picture will be removed from the global measurement. This applies to the statistical values in global as well.

The data removed in the pause picture is not removed from the time profile. Instead a pause marker is inserted in the time profile for easy identification of the paused area. The markers are also transferred to the post processing and reporting program NorReview

The picture shows a paused area which is indicated by a greyish background followed by a yellow horizontal marker line. The yellow area in the summary graph is not indicating the paused area, but the current view in the summarized graph.







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 C is inserted in the time profile as shown in the picture. Notify the discontinuity in the time axis at the Continue marker.

Storing a measurement - Memory Organising Menu

The memory menu is found under **SETUP** > *Memory*. Here you configure the file name conventions, storage destination, move, rename and delete files or directories. This is also where you store and manage your setups.

Storage Folder: Here you select between Internal Memory and the SD Card, move around in the memory system and create new folders. Measurements containing audio recordings can only be stored on the SD card. Use the ↑ soft key to move up in the folder system. Push on the desired directory or storage media to select or move down in the memory system. NEW creates a new folder. You may copy your files from the internal memory or the SD card onto a USB memory stick. The memory stick is denoted Hard Disk. The memory stick cannot be used to directly store measurements, since the speed of this media is too slow. Hence it can only be used to move files from the SD card or the internal memory when the instrument is not measuring.

The instrument supports SDSC, SDHC and SDXC micro SD cards. The maximum size of the SD card is 64 Gbyte. The card must be class 10 or better.

It is important to know the different storage modes and what features they offer. The configuration of the storage mode is set in the **SETUP** > *Measurement* > *Storage Mode.*

Cf. Chapter ***Measurement Parameter Setup Menu***,

A short description of the storage mode is repeated below;

Manual - Results are not stored. If you want to keep the results then you have to save them manually by pressing the **MEM** button

Auto - Every measurement is automatically stored after it is finished. There are guidelines in the lover 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 - The measurement results are saved and the instrument synchronises new measurements with the clock.

File name

The instrument offers a sophisticated file naming system with a variety of options.

You may either enter the file name manually when you store the file. This is only possible if you have selected manual as storage mode. Default suggestion is date and time.

If *Auto*, *Synchronised* or *Repeat* is chosen as storage mode the default automatic file naming is chosen. This stores a file with the date and time at the time the measurement was stored. A more sophisticated naming is enabled if you turn on “Filename Base” and “Start Index”. The instrument will store the measurements automatically and increase the file index by 1. You may however choose which number to enumerate from (Start Index). In any case the time and date will be added to the filename.

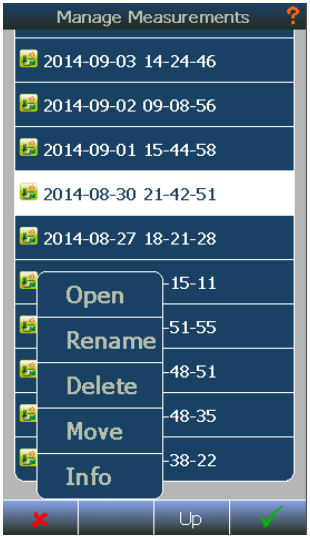
Say you have a project consisting of several locations and several measurements on each location. You may then name your directory with the project name, say “Project Highway” and make subfolders under this directory, say “Route 66”

File Name Base. Here you specify the start name / default name of each location. Say “Sunny beach” Start Index. The index is added to the File Name Base. If you start on one, the first file will be named “Sunny beach 1” plus the time and date.

Rename, Delete, Move

A file or directory may be renamed, deleted or moved. These features are offered in context sensitive menu in the memory menu or pushing the **MEM** button. Touch the desired file or directory for a couple of seconds to gain access to the context sensitive menu. Open a file is also offered if you enter the menu from the **MEM** button.

Info displays vital information about the measurement, such as measurement time, measurement functions and so on.

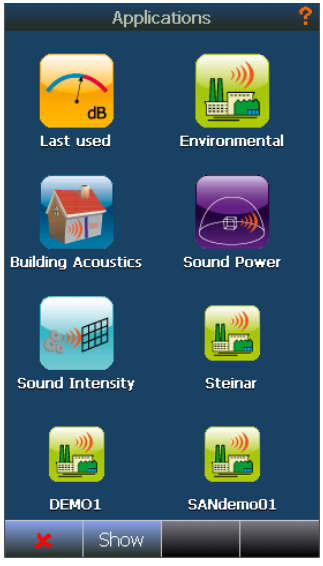


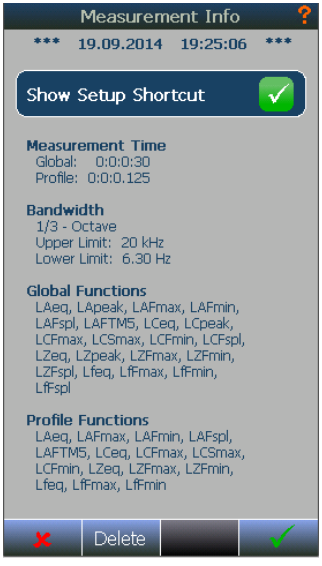
Application Selection Menu - Predefined Setups

The application menu is normally the first menu that appears after the instrument is powered on and the boot sequence is finished. This is the menu where you may select your favourite setup or other setups dependent on your measurement application.

The menu is organized with some large buttons labelled with different applications. In software version 1 only “Last Used” and “Environmental” is enabled. The Menu may also contain a set of smaller buttons with a user defined label. The Icon picture indicates what measurement type the setup is meant for.

If you tap on one of the large icons you get access to all setups that are available for that application. Selecting a setup will open up an info frame showing the most important settings. At the top of the info frame there is a menu point where you can decide if the setup shall be visible as an Icon on the Application menu.





Instrument Specific Setup

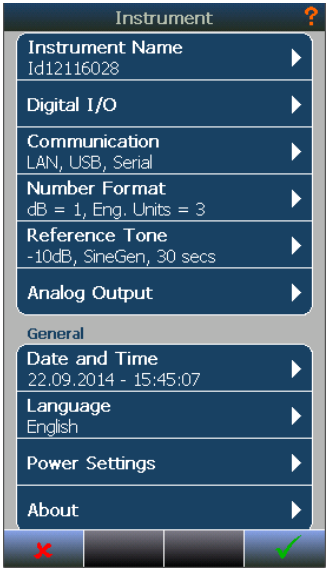
This menu holds all the setup related to the peripherals, power saving settings, language etc.

Instrument name; This is the name that is used as identification tag for transferred measurements, remote control etc

Digital I/O. Here you configure the 4 digital output lines found on the 15 pin I/O socket on the left hand side of the instrument. Each line may be set to the following functions

Running – The line goes active when the instrument is measuring.
Recording S1 – The line goes high when sound recording is performed.
Overload S1 – The line goes high when sound channel 1 is overloaded.
Calibrating – The line goes high when you enter the calibration menu.
Mic. Check – The line goes high when the Mic. Check feature is enabled. Mainly used to start the electrostatic actuator calibration feature in the outdoor microphone 1210A or C. See ***Mic. Checks*** description in the chapter discussing calibration

Remote controlled – The line goes high when the Nor150 is controlled from another device.
High – The line stays permanently high.
Low – The line stays permanently low.
Events/Markers – The line goes high if an event or marker is enabled.
Remote Output – This line may be controlled from remote via a PC.



Communication. In this menu you specify different setting related to the LAN interface, the USB interface and the RS232 interface

LAN. Defines how to communicate via the LAN interface. You may choose between automatic or static IP address. If Static, specify the IP address, Subnet Mask and Default gateway.
USB. Select between Normal, where you use the USB as a IP interface, or Remote Display.
Remote display enables you to display the Nor150 screen on a PC screen.
RS232 is found on the 15 pin I/O socket on the left hand side of the instrument. Use cable Nor1441B to connect the unit to a PC via the RS232 interface.

Number Format. Here you specify the number of digits you want to use.

Reference Tone. Please cf chapter 8 – Recording the Sound for more details

Analog Output. Here you manage the setting of the headphone socket and the analog output found on the 15 pin I/O socket. For the headphone socket you may either listen to the sound channel one, two or to an audio recording. Similar on the I/O socket you may either connect it to sound channel one or two, or set it to off.

Date and Time. Here you set the date and time.

Language. Select the language to be used in the menus and help texts if applicable. Some language may only be supported with English help file text.

Power Settings. Here you may select different time out and brightness levels. Please note that the factory settings are a good compromise between power use and keyboard brightness and keyboard backlight intensity. The automatic restart feature is not supported in v. 1.

About. Here you find information about the software versions and installed options. This is also where you install new options and software.

Installing new software. Norsonic will issue frequently software updates with new features and bug fix. The software is found on www.norsonic.com/release.

When entering the download site you are prompted to leave your Name, e-mail, product type and serial number of the Nor150 to access to the download site. The only reason for asking for your contact data is to enable us to inform you in case of vital bugs are found in the software you have downloaded. Your contact data will not be distributed or used by Norsonic for other purpose than described above.

Copy the software onto a USB memory stick and connect it to the Nor150 USB port while the instrument is turned off. Turn on the instrument. The Instrument will find that a new software version is available and ask you to confirm to update the software. The software update takes a few minutes. If the automatic search for a new software update fails, you may start the software installation from the **SETUP** > *Instrument* > *About* > I*nstall Software* menu. If your memory stick contains more than one version, select the version to update. Use also this menu if you want to downgrade to an earlier version.

Please note that in several countries the software update may be blocked. The reason is that your instrument is type approved with a certain version. Hence, updating to a non-approved version is not legal. In this case contact your local Norsonic sales office.

Set Factory Default. If you need to go back to initial settings, use this menu. This will set back most of the settings, except from calibration values etc.

Service Menu. Is protected by a password and is only for authorized personnel. Wrong settings here may change vital calibration settings in the analog and digital measurement chain.

Signal Generator (Optional)

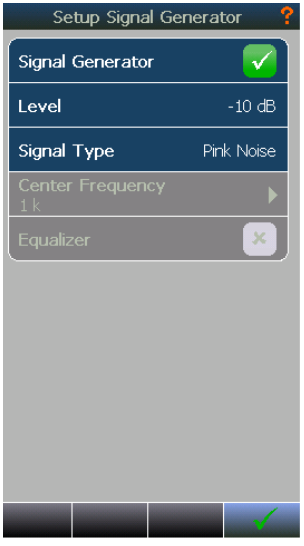
A signal generator is added in the Nor150. This facilitates the use of the instrument for various applications.

White, pink, sine and band-pass filtered noise types are available. The noise excitation can also be synchronized with the measurement sequence.

The frequency of sine and band-pass filtered noise can be set in 1/3 octave bands from 6,3 Hz to 20 kHz.

The signal output from the signal generator is on pin 15. Signal ground is found on pin 14 and the housing. Suitable cables provided are Nor4513B; Cable for simultaneous connection to RS-232 interface and signal generator output and Cable 4514A; Signal generator cable.

The built in signal attenuator is adjustable in 1 dB steps from 0 dB to 50 dB attenuation



Norsonic software

There are mainly four Norsonic software products that support the Nor150.

NorConnect is a web based browser for downloading data from the instrument. Additionally it offers a viewer function that displays the L(t) and L(f) data and a seamless integration to NorReview, NorReport and MS Excel.

NorReview is a sophisticated analyzing tool for calculations, report generation and for replaying of audio recordings and marker management. The use of this program is not covered by this manual.

NorRemote is a web based program for remote control and data download.

NorReport is a program for making your own reports.

Please note that NorXfer does not support the Nor150.

NorConnect - Getting the data out of the instrument

Downloading data from your Nor 150 is done via the program NorConnect (freeware included in the delivery) or via NorRemote, a web based program using the internal web server in the Nor150 for remote control, on line live view of the ongoing measurement and download of data. Description of the use of NorRemote is not covered in this manual.

Installation

NorConnect can be downloaded from:
www.norsonic.com/release.

When entering the download site you are prompted to leave your Name, e-mail, product type and serial number of the Nor150 to access to the download site. The only reason for asking for your contact data is to enable us to inform you in case of vital bugs are found in the software you have downloaded. Your contact data will not be distributed or used by Norsonic for other purpose than described above.

Follow the instruction and install the program on your PC. Answer yes to create shortcut and to view the read-me file.

The program is a desktop application and use a web browser as a user interface and runs on the following version of the listed web browsers. Other browsers might be used, but they are not verified.

Mozilla Firefox version 32 or above

Google Chrome version 37 or above

Microsoft Internet Explorer version 11 or above

Opera version 24 or above

Safari version 8 or above

Once the program is installed, start the program from the shortcut on your desktop. This will start your default browser and NorConnect will run in the web browser environment.

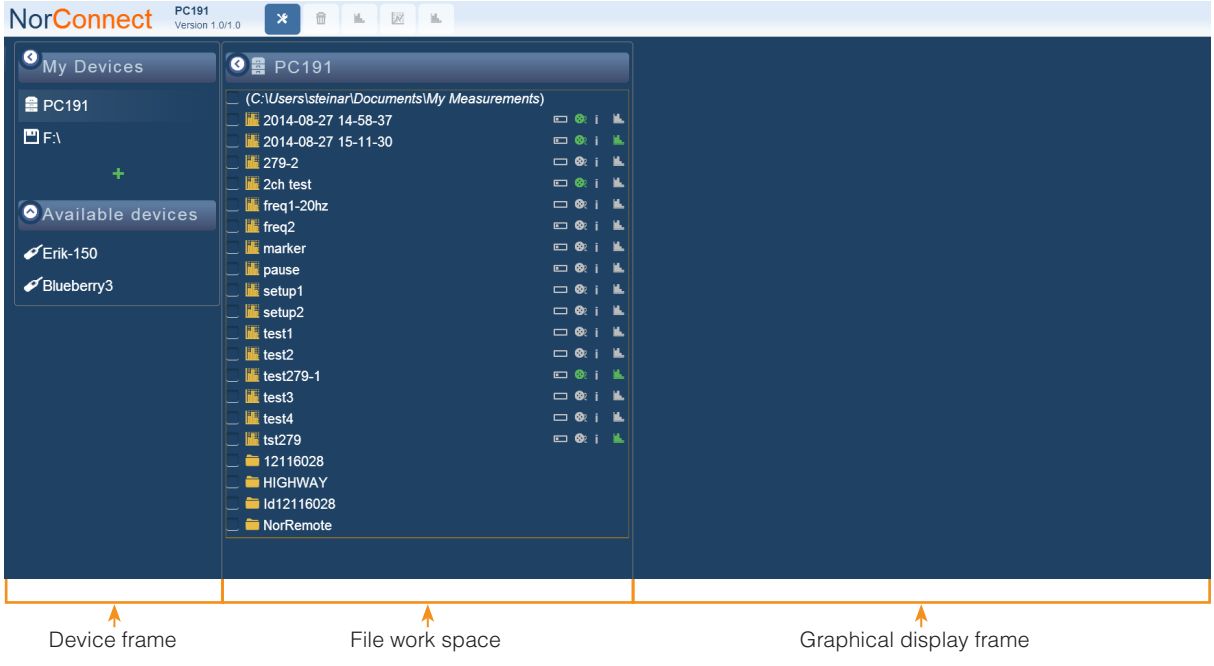
If your program does not start

If NorConnect fails to start and you receive the error message displayed below, it is most likely that another web application is using port 80. Please close the program using this port. Nor850 is one candidate, Skype® is another. Running NorConnect and Nor850 simultaneously has now meaning. Hence, just close the Nor850 application. Skype however is different and is often running in background while you are working with other programs. In this case you must disable the use of port 80 in Skype®. Go to Tool > Option > Advanced > Connection and then tick off “use port 80 and 443 for additional incoming connections”. This setting will enable you to run Skype® and NorConnect simultaneously.

Using the program – Description

The picture below shows the main working environment picture

The left frame is the device frame which is divided in “my devices” and “available devices”.



A device denotes a PC containing already transferred measurements, SD card or USB stick or other type of media containing measurements not transferred to the PC or finally one or more instruments connected to the PC via USB, LAN, WLAN or 3G modem.

The “my devices” is where you have listed the devices you want to transfer files from and to. Or with other words; this is the place you have the devices you want to work with. In the “my devices” list you have always listed your PC or server as default. In addition you may have instruments or as in this case a memory card from a Nor150 which is plugged into the PC and have been assigned as drive F:\

“Available devices” denote available instruments connected to the PC through a communication channel such as USB or LAN, but not yet enabled to be worked with.

In the example above there are two Nor150 available; one named “Erik-150” and “Blueberry 3”. You may connect several Nor150 to the same program. They will pop up in the “available devices” list. If you run the program in a network environment all Nor150 available in the network will be listed in the “available devices” list.

If you want to work with an instrument listed in the “available devices” list, just click on the instrument and it will be moved to the “my device” list.

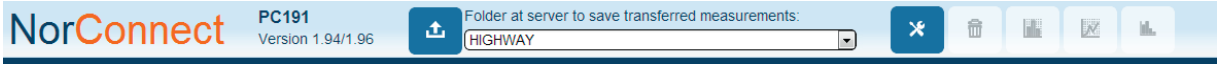
Once an instrument is moved to the “my devices” list it can be worked with. Click on the device you want to work with. Clicking on the PC will show you all files and measurement folders already transferred to the PC. Clicking on an instrument or storage media shows you the content on either the internal memory or SD card in the instrument.

The connected devices under “My devices”, may have green or red color in icon. If it is red, the program have not connection to the device. Be sure the cable/LAN is connected. Click at device to check for communication. If it turns to green, the device is connected.

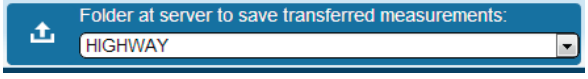
The devices under “My devices” will be loaded and tried connected the next time you startup NorConnect.

Please note that you can either browse content of the internal memory or the SD card on the Nor150. You cannot change between internal or SD card on the instrument from NorConnect. This must be done in the Memory menu in the Nor150.

The toolbar heading and buttons



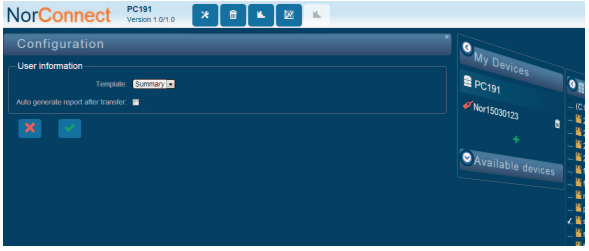
In the toolbar heading there is a set of buttons which are blue or grey dependent on what you have selected in the file work space and in the device frame. A blue button indicates that it is active.



The transfer button becomes active if you select files or directories on an instrument or media. Select destination directory on the PC in the drop down menu to the right of the transfer button. Click on the transfer button when you have defined the destination folder. The files or folders will then be transferred to the PC.

Please note that you must select the files by ticking them on. In the example below is “setup1” selected while “pause” is not selected. When you select a folder, all the measurements below will follow.

Tool button opens up a menu as shown below



Here you may specify what template you want to use for your reports and if you want to auto generate reports after transfer to the PC.

Delete button. Delete files or folders or remove devices from “my devices”. To delete a file or folder you may also right click and use the context sensitive menu.

Generate report. This will generate the report you have defined as template in the Configuration menu. If you want to dump your measurement data into MS Excel select the report called standard. The report icon behind the measurement turns from grey to green once the report is generated. Click on the rightmost icon on the tool bar heading (with the similar icon as the “Generate report icon”) to open Excel with the measurement data.

Analyse in NorReview. This will open NorReview with the selected file(s). One separate L(t) window will be opened in NorReview per file you have ticked on.

Please Note. The “Analyse in NorReview” require that you have purchased a NorReview license and installed it on the PC you are running NorConnect on. You need NorReview V5.2 or above.

Context sensitive menu – mouse right click

If you right click on a measurement or folder, you may rename, move or delete. A folder offers also the option to add a subfolder. In the example below the “Move” command has been enabled on the folder 12116028. A submenu with the possible destinations is listed. If you move a folder, all subfolders and measurements will be moved under destination folder. The selected folder (12116028 in the example) will remain empty and all subfolders/measurements are moved to destination folder. If you move a measurement, the measurement will be moved under destination folder.

Icons used in the file work space

In the file work space there are several icons providing useful information about the measurement. In front of the file name the following icons are used:

Indicates that it is a measurement.

Indicates a folder containing measurements

Indicates the top level of a repeat or synchronous measurement. Click on the icon if you want to access each individual measurement.

After the name there are used icons to provide information about the measurement

Provides information about the measurement size. Empty means a small file, less than 100Kb, one dot, as shown here, indicates a larger file less than 10 Mb. Two dots is less than 100Mb. 3 dots is larger than 100Mb. If you hold cursor over the symbol you will see the file size.

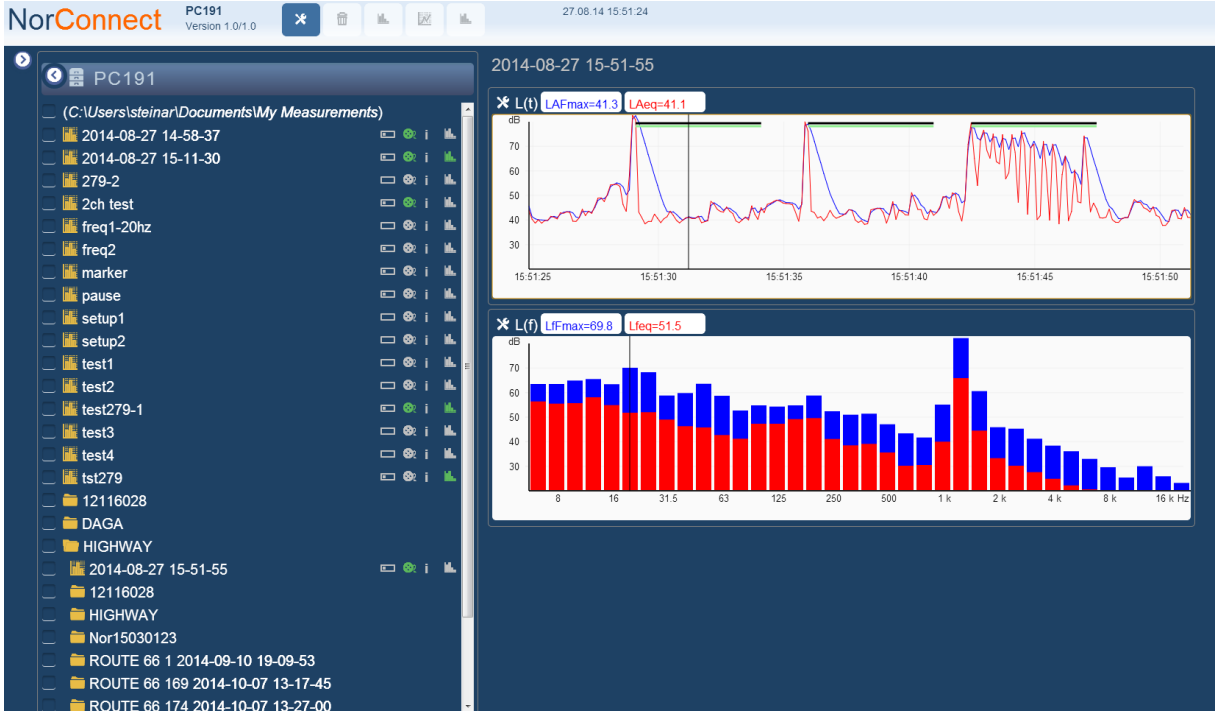
A green symbol indicates that the file contains Audio recording(s). If you hover over the symbol you will see the number of recordings.

A green symbol indicates that the file contains Voice or Text notes. If you hover over the symbol you will see the number of notes.

A green symbol indicates that the it is generated a report of your selected template.

The graphical workspace

The graphical workspace becomes active and displays the L(t) trace including markers and the global L(f) spectra once you highlight a file by clicking on the file name.



Connecting the Nor150 to the PC or a LAN network

The Nor150 offers several communication solutions and ways to get the data from the Nor150 to the PC via NorConnect. We recommend the following methods

1. **USB.** Connect the Nor150 to the PC via USB cable. Verify that the USB is set to "Normal" in the **SETUP** > *Instrument* > *Communication* > *USB* menu. Use the USB cable Nor4525 supplied with the instrument and connect it to the small USB connector on the Nor150 and to the normal USB port on the PC. It may take up to 40 sec before the Nor150 pops up in the available device frame.
2. **SD Card.** Move the SD card from the Nor150 to the PC. The SD card will pop up directly in the "my device" frame. It may take some time before it pops up dependent on the number of files stored on the SD card.
3. **USB memory stick.** Copy the files from the internal memory or the SD card in the Nor150 onto a USB memory stick. Move the memory stick to the PC. The memory stick will pop us as a drive in the "my devices" frame.
4. **WLAN.** Connect the WLAN dongle Nor4614 to the USB port on the Nor150. The Nor150 is automatically configured as an access point named Nor150 followed by the serial number of the Nor150. The PC will prompt you for a password / Security key. The password is 0123456789. The Nor150 will then pop up in the "Available Devices" list.
5. **LAN.** Connect the Nor150 to a LAN network. Verify that the instrument is set up to receive an automatic IP address in the **SETUP** > *Instrument* > *Communication* > *LAN* menu.

   The IP address must be in the same network as your PC. The IP address of your PC is displayed in the address line of your browser. Say this is 192.168.12.72. Then the IP address assigned to the Nor150 must be 192.168.12.xxx. Where xxx is any number between 0 and 254.

Using the Nor150 in a LAN network may require some advanced setting of firewalls etc. The picture on next page explains some details about these settings.

Where are my files stored?

The files are stored on a default folder found on c:\user\My documents\My measurements\.

The measurement is represented as a directory consisting of several files and folders. The excel report is found by opening the directory and then the sub directory called Reports.

Templates - How can I add more templates?

Excel templates are a very powerful way of generating you own customised reports.

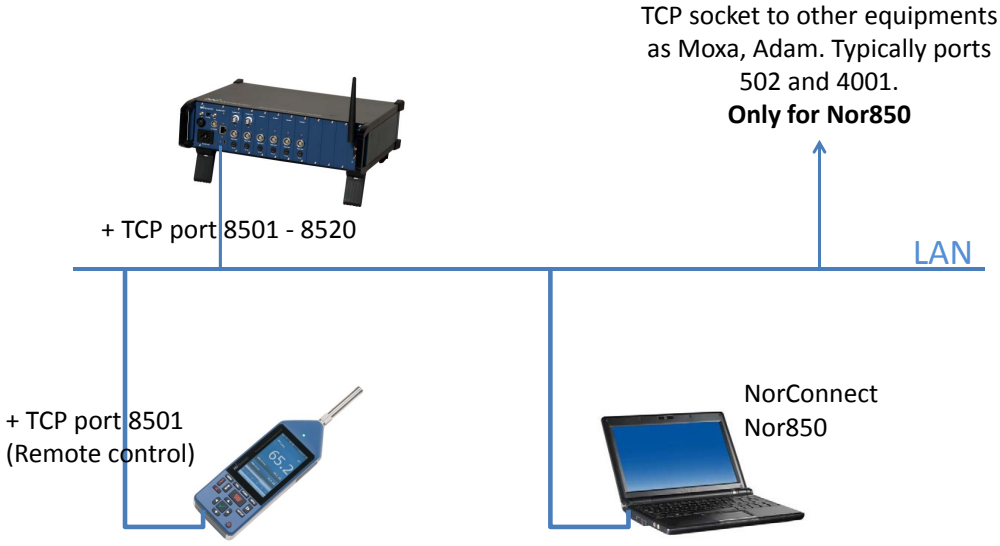
You may make your own templates and use them in NorConnect. Making your own templates is described in a separate document.

The templates are stored in C:\programdata\Norsonic\Templates\GeneralAnalyzer. Once the template is stored here, you may select it in the "Tool" menu in NorConnect.

Norsonic equipment/software at LAN using DHCP

For all Norsonic equipment and software

1. Sending and listening UDP port 8500
2. Sending and receiving TCP port 80 (Web)



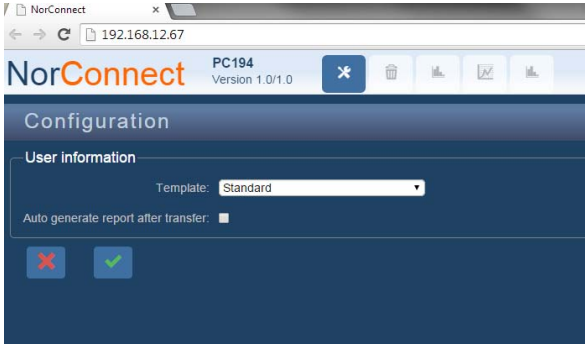
Using Windows explorer

You may also use Windows Explorer to transfer data from your Nor150. Please note that you must download the complete directory and not the single file, since a measurement consist of all the files in a directory. The directory may be dragged directly to NorReview and will be available in NorReview for further processing.

However, we strongly recommend using the NorConnect since this program offers more user flexibility and possibility to view the measurement graphically. Seamless integration with NorReport.

How to use NorConnect to produce the Global and Profile measurement results using the «Standard» Report

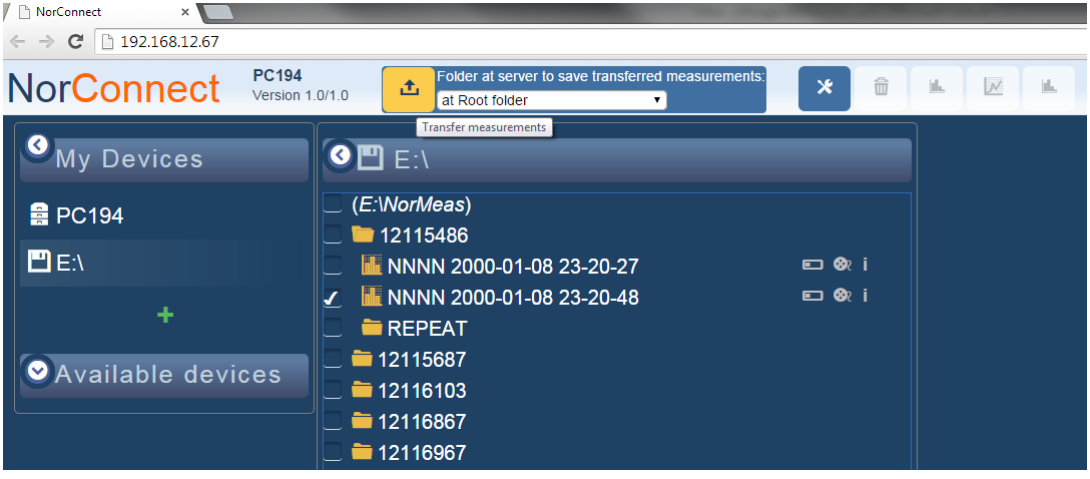
The example below uses the Standard Report template which is part of the NorConnect installation.



Connect instrument or SD card directly.

Select measurement to be transferred and destination directory.

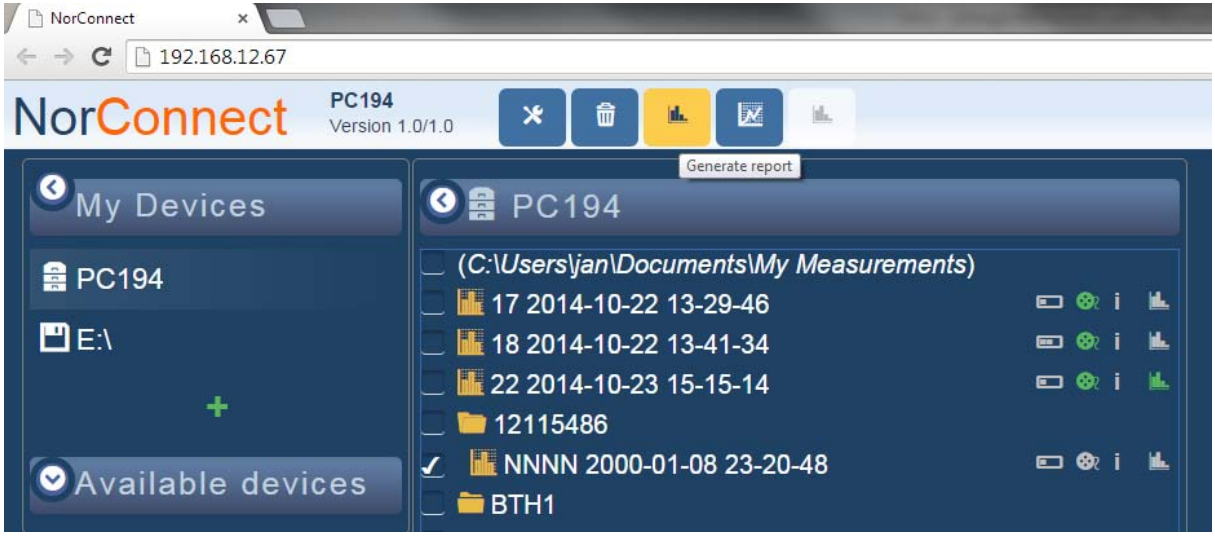
The “Transfer” button on the menu line becomes active. Selecting this will copy the measurement onto the selected directory on your PC



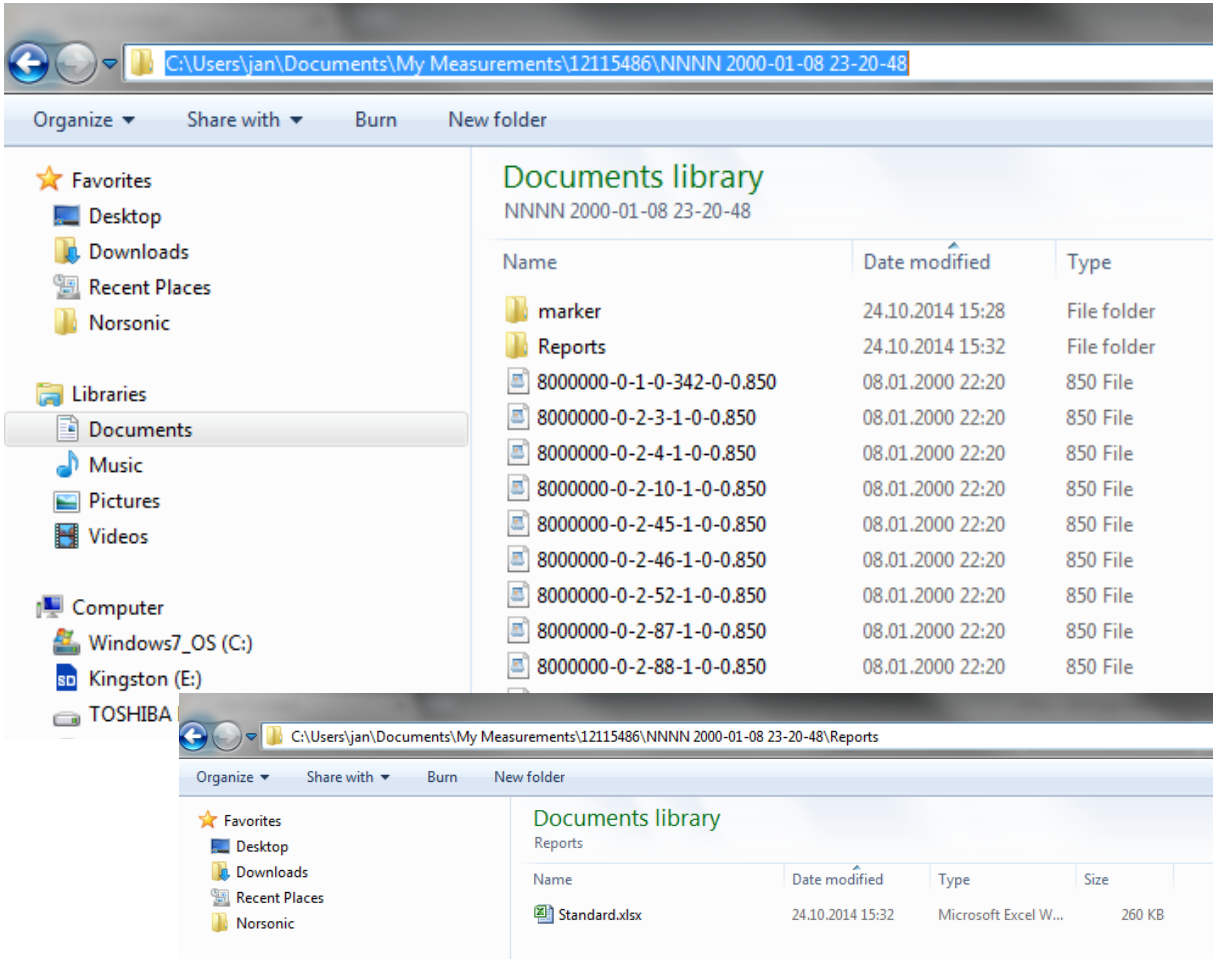
Move to PC and click on the file transferred.

This enables the “Generate Report” button.

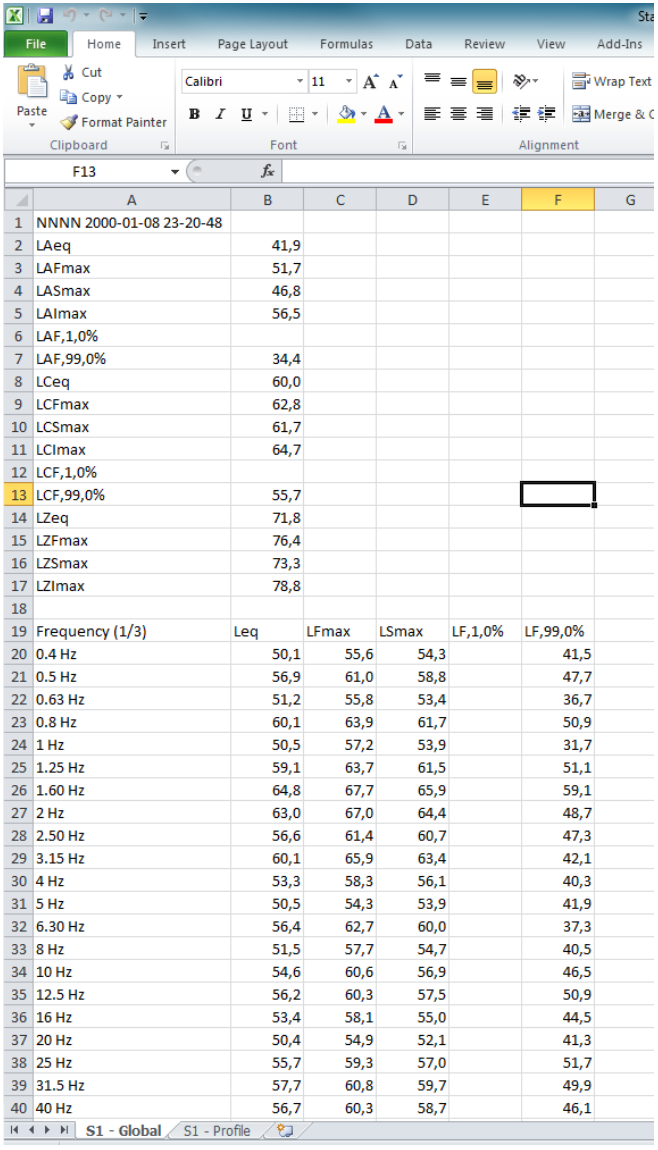
Use this to produce an Excel file based on the chosen template



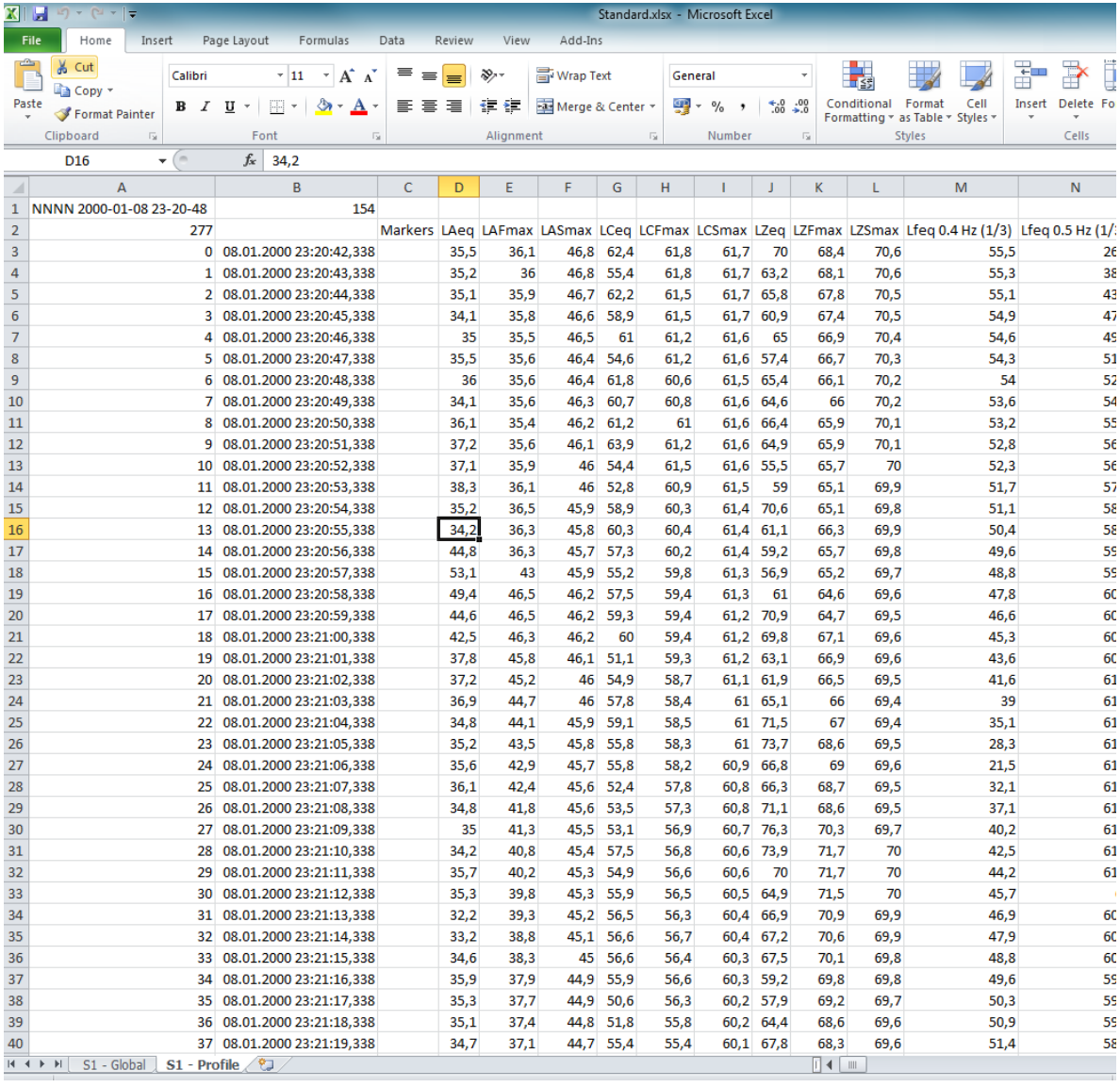
Locate the Excel report using NorExplorer



The “Standard” report produces 2 files, “Global” and “Profile” These contain the parameters as selected on the Nor150



	A	B	C	D	E	F	G
1	NNNN 2000-01-08 23-20-48						
2	LAeq	41,9					
3	LAFmax	51,7					
4	LASmax	46,8					
5	LAImax	56,5					
6	LAF,1,0%						
7	LAF,99,0%	34,4					
8	LCeq	60,0					
9	LCFmax	62,8					
10	LCSmax	61,7					
11	LCImax	64,7					
12	LCF,1,0%						
13	LCF,99,0%	55,7					
14	LZeq	71,8					
15	LZFmax	76,4					
16	LZSmax	73,3					
17	LZImax	78,8					
18							
19	Frequency (1/3)	Leq	LFmax	LSmax	LF,1,0%	LF,99,0%	
20	0.4 Hz	50,1	55,6	54,3		41,5	
21	0.5 Hz	56,9	61,0	58,8		47,7	
22	0.63 Hz	51,2	55,8	53,4		36,7	
23	0.8 Hz	60,1	63,9	61,7		50,9	
24	1 Hz	50,5	57,2	53,9		31,7	
25	1.25 Hz	59,1	63,7	61,5		51,1	
26	1.60 Hz	64,8	67,7	65,9		59,1	
27	2 Hz	63,0	67,0	64,4		48,7	
28	2.50 Hz	56,6	61,4	60,7		47,3	
29	3.15 Hz	60,1	65,9	63,4		42,1	
30	4 Hz	53,3	58,3	56,1		40,3	
31	5 Hz	50,5	54,3	53,9		41,9	
32	6.30 Hz	56,4	62,7	60,0		37,3	
33	8 Hz	51,5	57,7	54,7		40,5	
34	10 Hz	54,6	60,6	56,9		46,5	
35	12.5 Hz	56,2	60,3	57,5		50,9	
36	16 Hz	53,4	58,1	55,0		44,5	
37	20 Hz	50,4	54,9	52,1		41,3	
38	25 Hz	55,7	59,3	57,0		51,7	
39	31.5 Hz	57,7	60,8	59,7		49,9	
40	40 Hz	56,7	60,3	58,7		46,1	



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	NNNN 2000-01-08 23-20-48	154												
2	277		Markers	LAeq	LAFmax	LASmax	LCeq	LCFmax	LCSmax	LZeq	LZFmax	LZSmax	Lfeq 0.4 Hz (1/3)	Lfeq 0.5 Hz (1/
3	0	08.01.2000 23:20:42,338		35,5	36,1	46,8	62,4	61,8	61,7	70	68,4	70,6	55,5	26
4	1	08.01.2000 23:20:43,338		35,2	36	46,8	55,4	61,8	61,7	63,2	68,1	70,6	55,3	38
5	2	08.01.2000 23:20:44,338		35,1	35,9	46,7	62,2	61,5	61,7	65,8	67,8	70,5	55,1	43
6	3	08.01.2000 23:20:45,338		34,1	35,8	46,6	58,9	61,5	61,7	60,9	67,4	70,5	54,9	47
7	4	08.01.2000 23:20:46,338		35	35,5	46,5	61	61,2	61,6	65	66,9	70,4	54,6	49
8	5	08.01.2000 23:20:47,338		35,5	35,6	46,4	54,6	61,2	61,6	57,4	66,7	70,3	54,3	51
9	6	08.01.2000 23:20:48,338		36	35,6	46,4	61,8	60,6	61,5	65,4	66,1	70,2	54	52
10	7	08.01.2000 23:20:49,338		34,1	35,6	46,3	60,7	60,8	61,6	64,6	66	70,2	53,6	54
11	8	08.01.2000 23:20:50,338		36,1	35,4	46,2	61,2	61	61,6	66,4	65,9	70,1	53,2	55
12	9	08.01.2000 23:20:51,338		37,2	35,6	46,1	63,9	61,2	61,6	64,9	65,9	70,1	52,8	56
13	10	08.01.2000 23:20:52,338		37,1	35,9	46	54,4	61,5	61,6	55,5	65,7	70	52,3	56
14	11	08.01.2000 23:20:53,338		38,3	36,1	46	52,8	60,9	61,5	59	65,1	69,9	51,7	57
15	12	08.01.2000 23:20:54,338		35,2	36,5	45,9	58,9	60,3	61,4	70,6	65,1	69,8	51,1	58
16	13	08.01.2000 23:20:55,338		34,2	36,3	45,8	60,3	60,4	61,4	61,1	66,3	69,9	50,4	58
17	14	08.01.2000 23:20:56,338		44,8	36,3	45,7	57,3	60,2	61,4	59,2	65,7	69,8	49,6	59
18	15	08.01.2000 23:20:57,338		53,1	43	45,9	55,2	59,8	61,3	56,9	65,2	69,7	48,8	59
19	16	08.01.2000 23:20:58,338		49,4	46,5	46,2	57,5	59,4	61,3	61	64,6	69,6	47,8	60
20	17	08.01.2000 23:20:59,338		44,6	46,5	46,2	59,3	59,4	61,2	70,9	64,7	69,5	46,6	60
21	18	08.01.2000 23:21:00,338		42,5	46,3	46,2	60	59,4	61,2	69,8	67,1	69,6	45,3	60
22	19	08.01.2000 23:21:01,338		37,8	45,8	46,1	51,1	59,3	61,2	63,1	66,9	69,6	43,6	60
23	20	08.01.2000 23:21:02,338		37,2	45,2	46	54,9	58,7	61,1	61,9	66,5	69,5	41,6	61
24	21	08.01.2000 23:21:03,338		36,9	44,7	46	57,8	58,4	61	65,1	66	69,4	39	61
25	22	08.01.2000 23:21:04,338		34,8	44,1	45,9	59,1	58,5	61	71,5	67	69,4	35,1	61
26	23	08.01.2000 23:21:05,338		35,2	43,5	45,8	55,8	58,3	61	73,7	68,6	69,5	28,3	61
27	24	08.01.2000 23:21:06,338		35,6	42,9	45,7	55,8	58,2	60,9	66,8	69	69,6	21,5	61
28	25	08.01.2000 23:21:07,338		36,1	42,4	45,6	52,4	57,8	60,8	66,3	68,7	69,5	32,1	61
29	26	08.01.2000 23:21:08,338		34,8	41,8	45,6	53,5	57,3	60,8	71,1	68,6	69,5	37,1	61
30	27	08.01.2000 23:21:09,338		35	41,3	45,5	53,1	56,9	60,7	76,3	70,3	69,7	40,2	61
31	28	08.01.2000 23:21:10,338		34,2	40,8	45,4	57,5	56,8	60,6	73,9	71,7	70	42,5	61
32	29	08.01.2000 23:21:11,338		35,7	40,2	45,3	54,9	56,6	60,6	70	71,7	70	44,2	61
33	30	08.01.2000 23:21:12,338		35,3	39,8	45,3	55,9	56,5	60,5	64,9	71,5	70	45,7	
34	31	08.01.2000 23:21:13,338		32,2	39,3	45,2	56,5	56,3	60,4	66,9	70,9	69,9	46,9	60
35	32	08.01.2000 23:21:14,338		33,2	38,8	45,1	56,6	56,7	60,4	67,2	70,6	69,9	47,9	60
36	33	08.01.2000 23:21:15,338		34,6	38,3	45	56,6	56,4	60,3	67,5	70,1	69,8	48,8	60
37	34	08.01.2000 23:21:16,338		35,9	37,9	44,9	55,9	56,6	60,3	59,2	69,8	69,8	49,6	59
38	35	08.01.2000 23:21:17,338		35,3	37,7	44,9	50,6	56,3	60,2	57,9	69,2	69,7	50,3	59
39	36	08.01.2000 23:21:18,338		35,1	37,4	44,8	51,8	55,8	60,2	64,4	68,6	69,6	50,9	59
40	37	08.01.2000 23:21:19,338		34,7	37,1	44,7	55,4	55,4	60,1	67,8	68,3	69,6	51,4	58

Technical Specifications

Unless otherwise stated, the specifications are given for a complete sound level meter Nor150 equipped with microphone type Nor1225 and microphone preamplifier type Nor1209. Values are based on the sensitivity set to the nominal value for the microphone: –26.0 dB, corresponding to 50 mV/Pa.

A windscreen type Nor1451 and preamplifier extension cables of type Nor1408 and Nor1410 may also be used.

The definition of terms is based on:
IEC61672-1 Ed.2.0 (2013): Electroacoustics - Sound level meters - Part 1: Specifications.
IEC 62585 Methods to determine corrections to obtain the free field response of a sound level meter

Firmware version

The specifications in this manual is valid for a Nor150 with software version 1.0. The version number can be found using the **SETUP >** *Instrument* > *About* key sequence.

The Nor150 may also be supplied with the prepolarised version of the Nor1225, the Nor1227. The specifications listed in this chapter are the same for both microphone types except that the Nor1227 does not support the high level option.

Type of instrument

Sound level meter IEC61672-1, class 1, group X measuring exponential time-weighted levels, integrating- averaging levels and sound exposure levels. It complies with IEC 61672-1 Ed.2.0 (2013).

The optional 1/1 octave-band and 1/3 octave-band filters complies with IEC 61260 (2014) class 1.

The instrument also conforms to a number of national standards such as: DIN 45677 (2013-02-06).

Analog inputs

Please note: The current firmware version only supports Sound Channel 1. Channel 2 will be an option.

Number of channels: Two Sound channels. The physical and electrical specifications are identical for both channels.

Channel 1 is located on the top of the instrument and Channel 2, under the flip at the left hand side of the instrument.

Input connector

7 pin LEMO connector for Norsonic microphone systems. (LEMO ECG.1B.307.CLL)

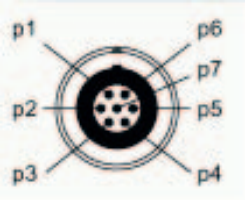
Input impedance direct connection to input socket: More than 100kohm, less than 650pF

Maximum input signal: ±10 V peak

Normal measurement range: 0.3 µV to 7 V (RMS) in one range corresponding to –10 dB to 137 dB with a microphone sensitivity of 50 mV/Pa.

Extended range: With the optional extension permitting high measurement range, peak values up to 150 dB may be measured.

Microphone input socket (outside view)



Pin	Function
1	Microphone system check
2	GND - signal reference
3	Polarization voltage – selectable: 0±1V, 200±1V or adjustable 70 to 74 V short-circuit current <1mA, impedance: 2 MOhm
4	Signal input. Input impedance: min 0,6 MΩ, max. 250 pF. When IEPE is selected in the setup, a constant current of 3 mA is supplied (25 volt source)
5	TEDS interface pin for Lemo style preamplifiers
6	+15±1 V preamplifier supply voltage, max 18 mA
7	-15±1 V preamplifier supply voltage, max 18 mA

High-pass input filter

The microphone input section is equipped with an analog high-pass filter to reduce noise from wind or other sources with frequencies in the lower end of the frequency range.

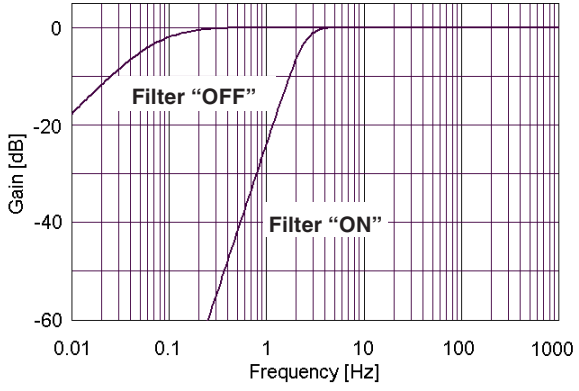
The filter response is -0.5 dB at 4 Hz (or -3 dB at 3 Hz). It should be switched on if the lower frequency of interest is in the normal audio range.

When this filter is “Off” the lower frequency response is -3 dB at 0.08 Hz (or -0.5 dB at 0.25 Hz). The setting of this filter has a great influence especially on the Z network.

Filter type: 3rd order HP filter (-3 dB at 3 Hz, Butterworth response)

The filter is turned on when the 1/1- or 1/3-otave filter is set higher than 6,3 Hz.

Highpass filter frequency response



Microphone

Nor1225 data

Microphone type: Free field microphone
Frequency range (±2 dB): 3.5 Hz to 20 kHz
Dynamic range lower limit: 17 dB(A)
Dynamic range upper limit: 141 dB
Open circuit sensitivity @ 250 Hz (±2 dB):
-26 dB rel 1 V/Pa (50 mV/Pa)
IEC 61094 Compliance: WS2F
Typical cartridge capacity: 18 pF
Microphone venting: Rear
Resonance frequency: 14 kHz
Temperature range, operation: -40 to 85 °C
Temperature coefficient @250 Hz: -0.01 dB/°C
Static pressure coefficient @250 Hz: -0.011 dB/kPa
Humidity range non condensing: 0 to 100 % RH
Humidity coefficient @250 Hz: -0.001 dB/% RH
Influence of axial vibration @1 m/s²:
62 dB re 20 µPa
Weight: 6.5 g

Preamplifier

The standard preamplifier for Nor150 is Nor1209. But different types of preamplifiers can be used. The instrument has the ability to correct for the attenuation in the preamplifier. Typical value of the attenuation is -0.3 dB.

Nor1209 data

The microphone preamplifier Nor1209 has been designed for general use with most ½" condenser microphone of type WS2 or LS2 according to IEC 61094-4: Measurement microphones - Part 4: Specifications for working standard microphones. The microphones may be pre-polarized or use externally supplied polarization voltage up to 200 V. By the use of adaptors, the preamplifier may be used for other microphone sizes. The frequency response covers the range from below 1 Hz to above 200 kHz.

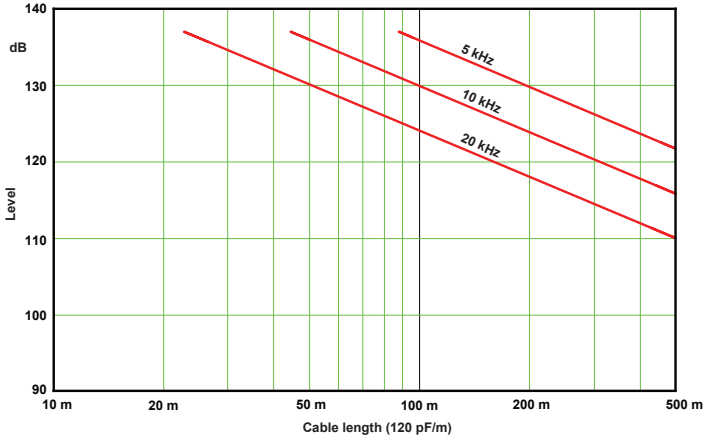
The Nor1209 preamplifier may be mounted directly on the sound level meter, or connected via a suitable cable.

The preamplifier is equipped with a system check facility. By enabling the SysCheck signal in the calibration menu, the capacitance of the microphone as well as the complete signal chain from the microphone cartridge to the sound level meter may be checked.

The voltage gain of the preamplifier is very close to one or correspondingly 0 dB. As the input impedance is 10 GΩ, the attenuation due to loading of the source will mainly be determined by the low input capacitance

Cables and cable length

The Nor1209 preamplifier has excellent driving capability for long cables. The signal output from the microphone preamplifier will be loaded by the capacitance of the cable between the microphone system and the instrument. The capacitance will increase proportionally with the length of the cable. A typical value for microphone cables from Norsonic is 120 pF per metre. Hence, a cable with length 100 m, will load the output with a capacitance of 12 nF. For lower frequencies there are seldom problems with long cables. However, when the signal contains the combination of high amplitude and high frequency, the capacitive loading will lead to high output current. A limited current capacity will set limits for the maximum slew-rate for the signal. The figure below shows the maximum level as function of cable length and frequency. 20 kHz corresponds to the bandwidth of the microphone system with the normal microphone Nor1227.



Nor1209 Technical Specifications

Frequency response (18 pF/small signal):
20 Hz ¬– 20 kHz: ±0,1 dB
Gain: Typically -0,1 dB (-0,2 with 20 pF)
Input impedance: 10 GΩ, 1,4 pF
Output impedance: 50 ohm typical
Noise (20 pF dummy microphone):
A-weighted < 2,2µV (typically 1,8µV)
Noise (20 pF dummy microphone):
Lin (20 Hz – 20 kHz) <6 µV (typ 3,8 µV)
The preamplifier accepts the following voltage i fused via external power supply.
Power supply: ±14 V(1 mA) to ± 60 V (2,8 mA). The Nor150 supply ± 15 V to the preamplifier.
Alternative Power supply:
Single: 28 V (1mA) to 120 V (2,8 mA)
Operating temperature range: -25°C to +70°C
Relative humidity: 0 – 90 %RH
Length: 83 mm
Diameter: 12,7 mm (Ring: 18 mm)
Weight: 36 g

Acoustical data

Acoustical data for Nor1225 and Nor1209 mounted on Nor150

The following tables gives free field frequency response and uncertainty information for the complete sound level meter.

The data are valid in under the following environmental conditions:
Atmospheric pressure: 80 – 105 kPa
Temperature: 20 – 26 °C
Humidity: 25 – 70 % RH

Summary of correction values for verification tests

Typical frequency	Uncertainty	Nominal frequency	Exact frequency	P → FF corrections	Uncertainty P → FF	Case corrections	Uncertainty Case	WS corrections	Uncertainty WS
dB	dB	Hz	Hz	dB	dB	dB	dB	dB	dB
0,00	0,0	63	63,1	0,0	0,1	0,0	0,1	0,0	0,0
0,00	0,0	125	125,9	0,0	0,1	0,0	0,1	0,0	0,0
0,00	0,0	250	251,2	0,0	0,1	0,0	0,1	0,0	0,0
0,03	0,0	500	501,2	0,0	0,1	-0,1	0,1	0,0	0,0
-0,01	0,0	1 k	1000,0	0,1	0,1	0,1	0,1	0,1	0,0
-0,06	0,0	2 k	1995,3	0,3	0,1	-0,3	0,1	0,1	0,0
-0,18	0,1	4 k	3981,1	1,1	0,2	-0,1	0,1	-0,2	0,1
0,12	0,1	8 k	7943,3	3,4	0,2	0,1	0,2	-0,3	0,1
0,58	0,1	12,5 k	12589,3	6,8	0,4	-0,1	0,2	-0,4	0,1
0,90	0,2	16 k	15848,9	8,4	0,3	0,2	0,2	-0,5	0,2

WS = Wind Screen. These data assume that the wind screen correction in the instrument is activated

Detailed table for level corrections according to 62585

Nominal frequency	Exact frequency	Typical free-field response	Pressure to free-field correction	Expanded uncertainty Pressure-FF	Case correction	Expanded uncertainty case corr.	Windscreen correction	Expanded uncertainty windscreen
Hz	Hz	dB	dB	dB	dB	dB	dB	dB
63	63,1	0,00	0,00	0,05	0,00	0,05	0,03	0,03
80	79,4	0,00	0,00	0,05	0,00	0,05	0,03	0,03
100	100,0	0,00	0,00	0,05	0,00	0,05	0,03	0,03
125	125,9	0,00	0,00	0,05	0,00	0,05	0,03	0,03
160	158,5	0,00	0,00	0,05	0,00	0,05	0,03	0,03
200	199,5	0,00	0,00	0,05	-0,01	0,05	0,03	0,03
250	251,2	0,00	0,00	0,05	-0,03	0,05	0,03	0,03
315	316,2	0,01	0,00	0,06	-0,06	0,10	0,03	0,03
400	398,1	0,03	0,01	0,06	-0,10	0,10	0,03	0,03
500	501,2	0,03	0,01	0,07	-0,12	0,10	0,04	0,03
630	631,0	0,02	0,04	0,07	-0,04	0,10	0,05	0,03
800	794,3	-0,01	0,05	0,07	0,08	0,10	0,08	0,04
1 k	1000,0	-0,01	0,07	0,08	0,14	0,10	0,09	0,03
	1059,3	-0,01	0,09	0,09	0,23	0,10	0,09	0,03
	1122,0	-0,01	0,11	0,09	0,35	0,10	0,10	0,04
	1188,5	-0,02	0,13	0,09	0,44	0,10	0,12	0,05
1,25 k	1258,9	-0,03	0,16	0,09	0,41	0,10	0,12	0,06
	1333,5	-0,04	0,16	0,10	0,21	0,10	0,12	0,05
	1412,5	-0,04	0,17	0,10	-0,02	0,10	0,12	0,03
	1496,2	-0,03	0,17	0,10	-0,12	0,10	0,12	0,03
1,6 k	1584,9	-0,03	0,18	0,10	-0,10	0,10	0,12	0,03
	1678,8	-0,03	0,21	0,11	-0,14	0,10	0,12	0,03
	1778,3	-0,04	0,24	0,11	-0,33	0,10	0,13	0,03
	1883,6	-0,05	0,28	0,13	-0,45	0,10	0,13	0,03
2 k	1995,3	-0,06	0,32	0,13	-0,31	0,10	0,12	0,03

Nominal frequency	Exact frequency	Typical free-field response	Pressure to free-field correction	Expanded uncertainty Pressure-FF	Case correction	Expanded uncertainty case corr.	Windscreen correction	Expanded uncertainty windscreen
	2113,5	-0,07	0,34	0,13	-0,01	0,10	0,12	0,03
	2238,7	-0,08	0,36	0,13	0,13	0,10	0,10	0,03
	2371,4	-0,09	0,42	0,14	0,11	0,10	0,08	0,04
2,5 k	2511,9	-0,10	0,48	0,14	0,30	0,10	0,06	0,04
	2660,7	-0,10	0,54	0,15	0,53	0,10	0,02	0,04
	2818,4	-0,12	0,60	0,15	0,15	0,10	-0,02	0,04
	2985,4	-0,12	0,64	0,16	-0,14	0,10	-0,05	0,05
3,15 k	3162,3	-0,13	0,68	0,16	0,00	0,10	-0,10	0,05
	3349,7	-0,14	0,77	0,16	-0,19	0,10	-0,13	0,06
	3548,1	-0,15	0,87	0,16	-0,06	0,10	-0,16	0,07
	3758,4	-0,18	0,96	0,16	0,17	0,10	-0,19	0,08
4 k	3981,1	-0,18	1,05	0,16	-0,11	0,10	-0,22	0,09
	4217,0	-0,18	1,15	0,17	0,15	0,10	-0,23	0,10
	4466,8	-0,17	1,25	0,17	0,02	0,10	-0,23	0,12
	4731,5	-0,17	1,39	0,17	0,34	0,10	-0,21	0,13
5 k	5011,9	-0,17	1,53	0,16	-0,06	0,15	-0,18	0,14
	5308,8	-0,16	1,69	0,17	-0,09	0,15	-0,13	0,14
	5623,4	-0,14	1,85	0,17	-0,15	0,15	-0,07	0,14
	5956,6	-0,12	2,08	0,18	0,10	0,15	-0,01	0,13
6,3 k	6309,6	-0,10	2,31	0,18	0,31	0,15	0,02	0,11
	6683,4	-0,04	2,57	0,22	-0,03	0,15	-0,03	0,14
	7079,5	-0,03	2,84	0,22	-0,16	0,15	-0,04	0,17
	7498,9	0,03	3,11	0,22	0,05	0,15	-0,16	0,16
8 k	7943,3	0,12	3,39	0,22	0,13	0,15	-0,33	0,13
	8414,0	0,21	3,78	0,30	0,08	0,15	-0,46	0,11
	8912,5	0,25	4,17	0,30	-0,07	0,15	-0,62	0,10
	9440,6	0,38	4,59	0,30	-0,13	0,15	-0,69	0,10

Nominal frequency	Exact frequency	Typical free-field response	Pressure to free-field correction	Expanded uncertainty Pressure-FF	Case correction	Expanded uncertainty case corr.	Windscreen correction	Expanded uncertainty windscreen
10 k	10000,0	0,48	5,01	0,30	0,25	0,20	-0,68	0,11
	10592,5	0,54	5,50	0,38	-0,22	0,20	-0,55	0,12
	11220,2	0,55	5,99	0,38	0,06	0,20	-0,41	0,14
	11885,0	0,58	6,38	0,38	-0,01	0,20	-0,32	0,15
12,5 k	12589,3	0,58	6,78	0,38	-0,06	0,20	-0,39	0,15
	13335,2	0,61	7,13	0,38	0,01	0,20	-0,51	0,13
	14125,4	0,78	7,48	0,38	-0,18	0,20	-0,66	0,10
	14962,4	0,87	7,93	0,38	0,03	0,20	-0,65	0,12
16 k	15848,9	0,90	8,39	0,29	0,16	0,20	-0,46	0,20
	16788,0	0,79	8,78	0,34	0,25	0,20	-0,25	0,23
	17782,8	0,58	9,17	0,34	0,07	0,20	-0,21	0,12
	18836,5	0,14	9,59	0,34	0,15	0,20	-0,27	0,16
20 k	19952,6	-0,40	10,01	0,29	-0,10	0,20	-0,18	0,21

Typical free-field response: Typical free-field response of the microphone and preamplifier connected to the sound level meter through a microphone extension cable without windscreen.

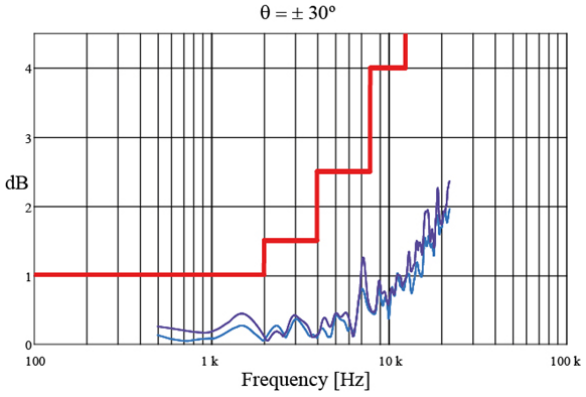
Pressure to free-field correction: Correction to be added to the measured pressure response (electrostatic actuator response) to obtain the free-field response for the microphone system. The corresponding expanded uncertainty (95%) includes the typical variations between different microphones of the same model.

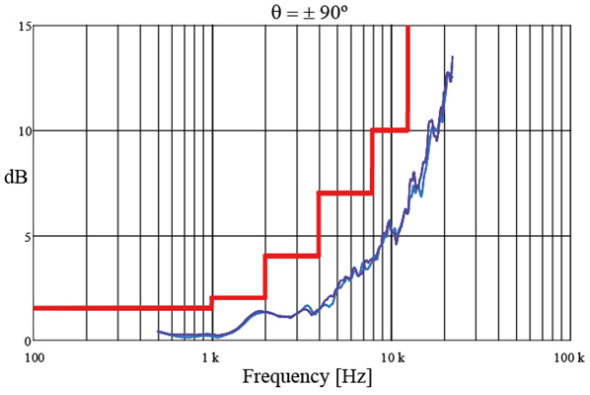
Case correction: Correction to be added to the displayed values for obtaining the free-field sound pressure level when the microphone system is mounted in the front of the instrument (Sound channel 1). The corresponding expanded uncertainty (95%) includes the typical variations between different instruments of the same model measured at reference conditions.

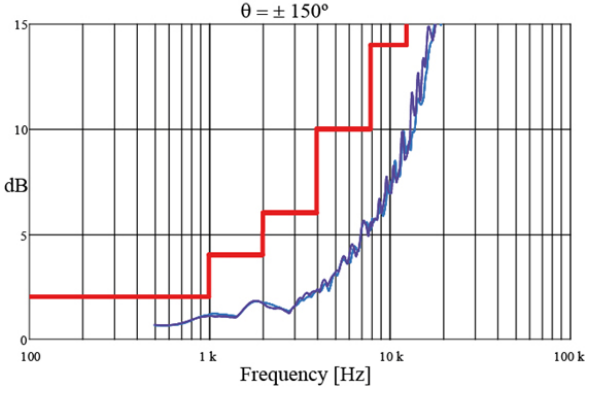
Windscreen correction: Correction to be added to the displayed values for obtaining the free-field sound pressure level when the microphone system is equipped with windscreen type Nor1451 and the windscreen correction in the instrument is switched on. The corresponding expanded uncertainty (95%) includes the typical variations between different windscreens of the same model measured at reference conditions.

Directional response – Horizontal

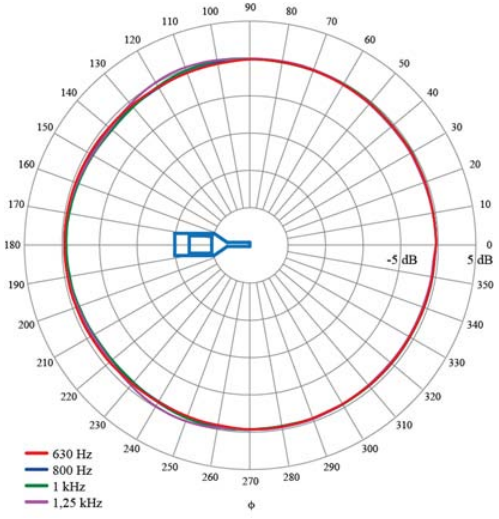
Maximum absolute value of the difference between displayed sound levels at any two sound-incidence angles within ±ɵ degrees from reference direction.

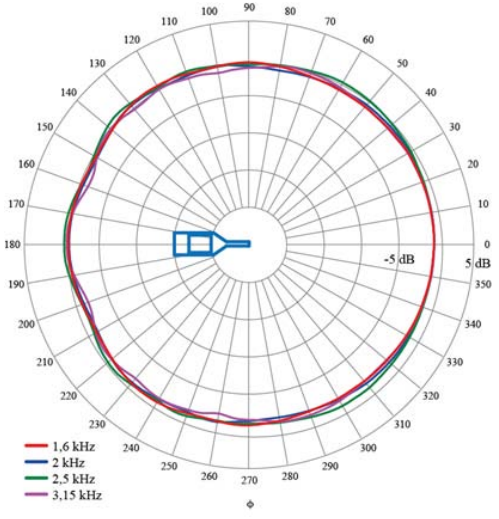


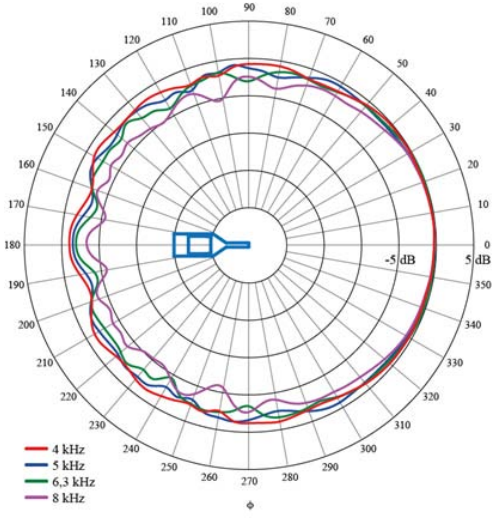


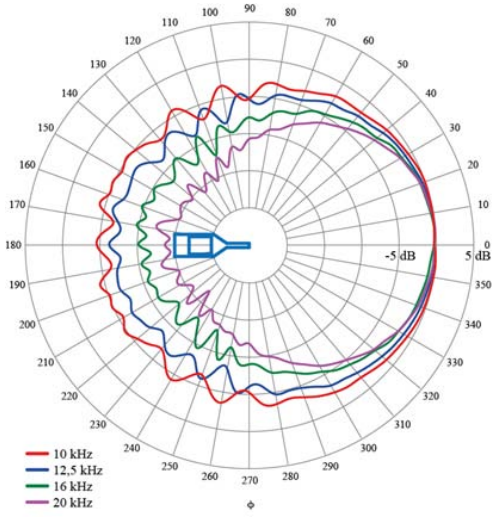


Directional response



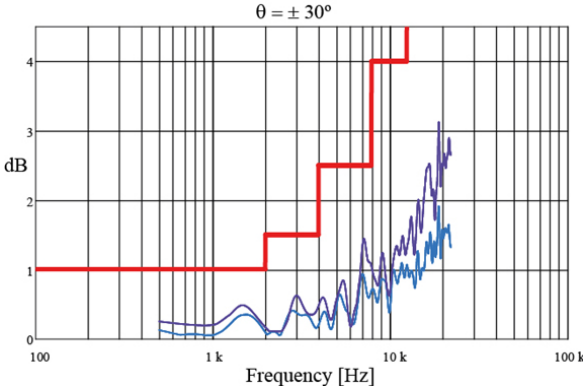


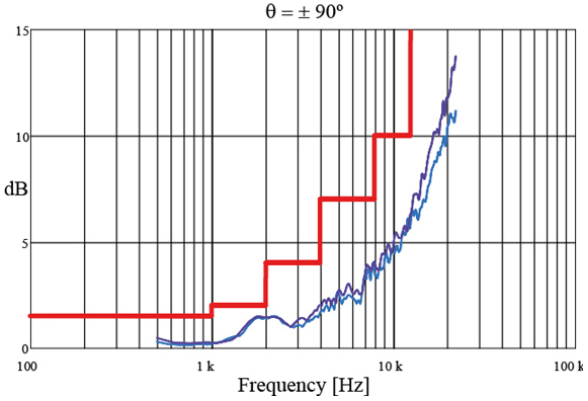


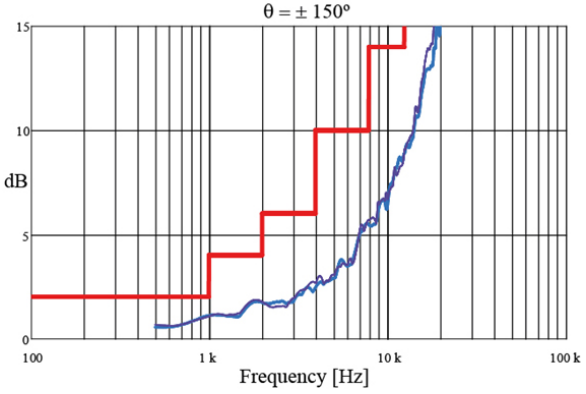


Directional response - Vertical

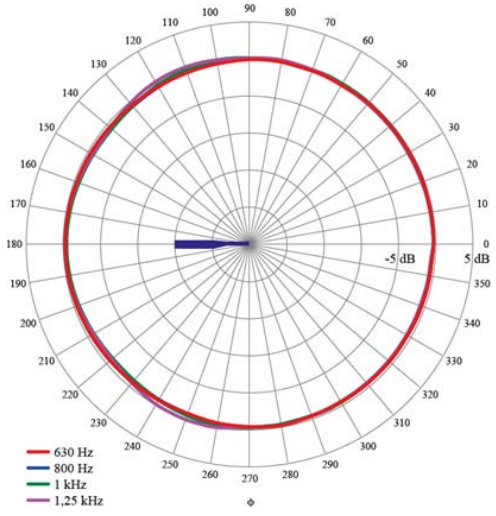
The directional response of the complete instrument is measured in the horizontal direction (sideways, with the display facing upwards). Zero degrees are in the direction of the microphone.

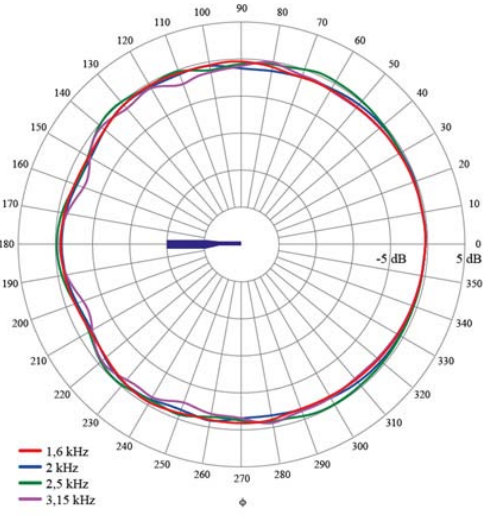


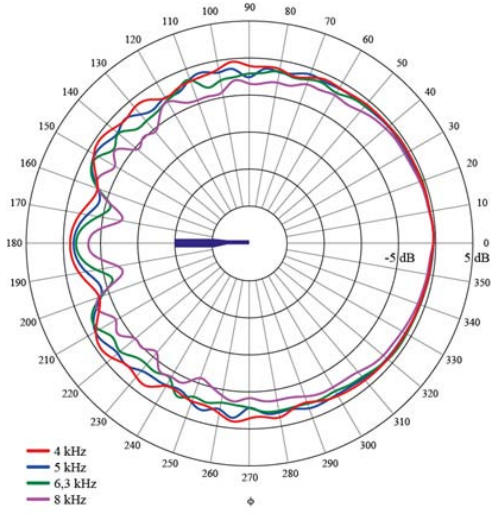


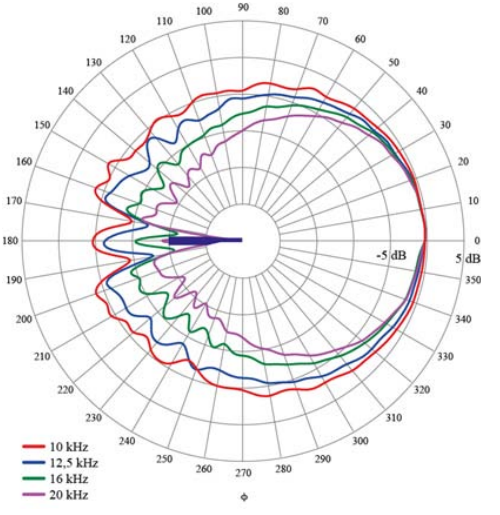


Directional response



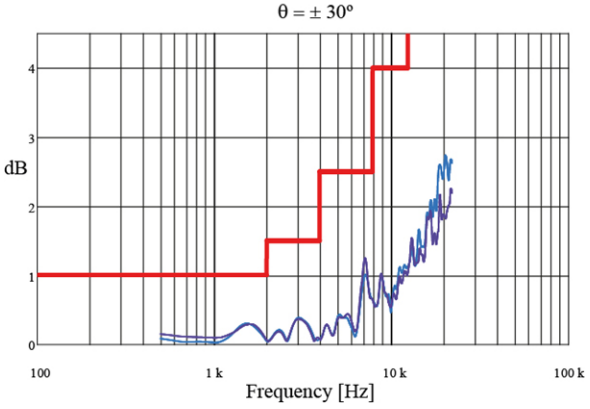


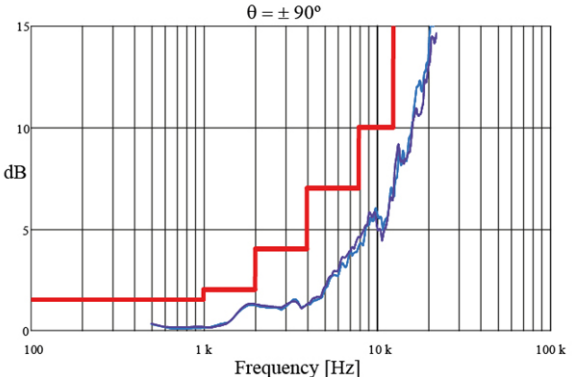


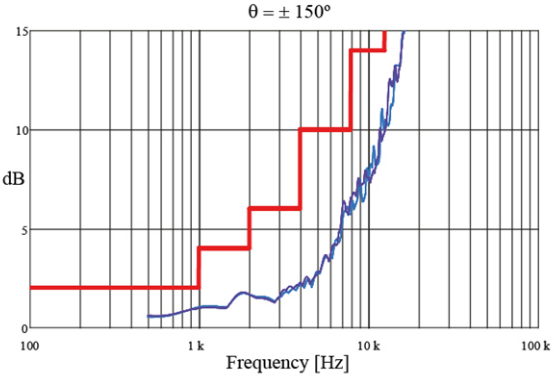


Directional response – Horizontal with Wind Screen

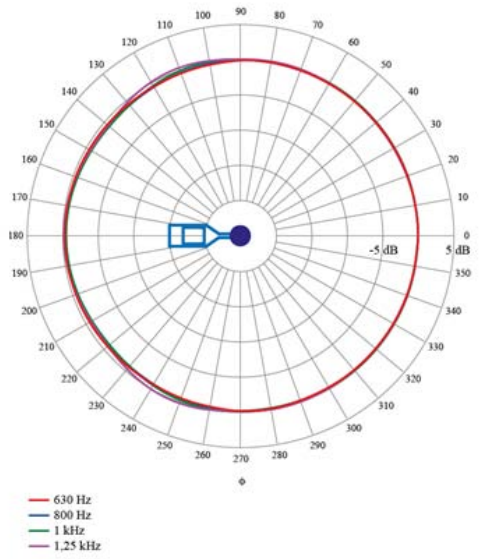
The graphs and plots below show the directional response for the complete sound level meter Nor150 with preamplifier Nor1209, microphone Nor1225 and windscreen Nor1451.



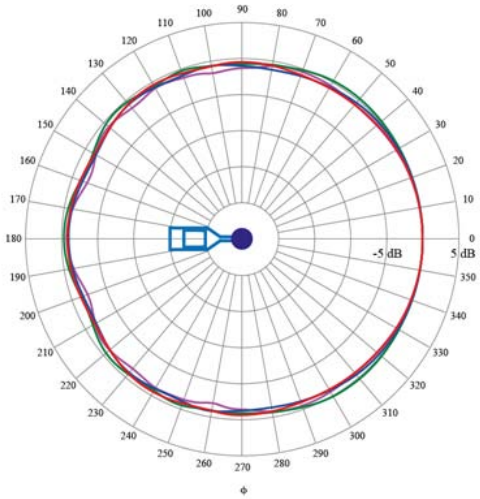




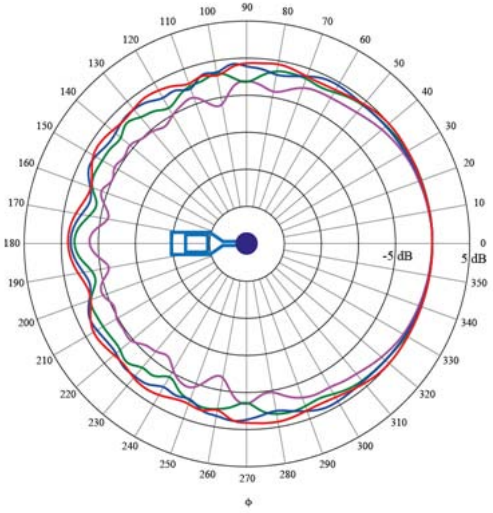
Directional response



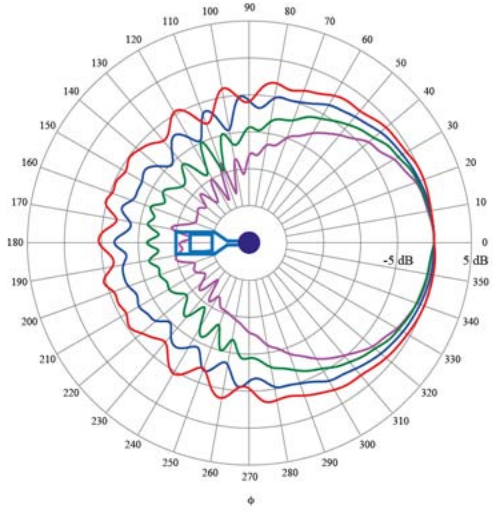
630 Hz
800 Hz
1 kHz
1,25 kHz



1,6 kHz
2 kHz
2,5 kHz
3,15 kHz



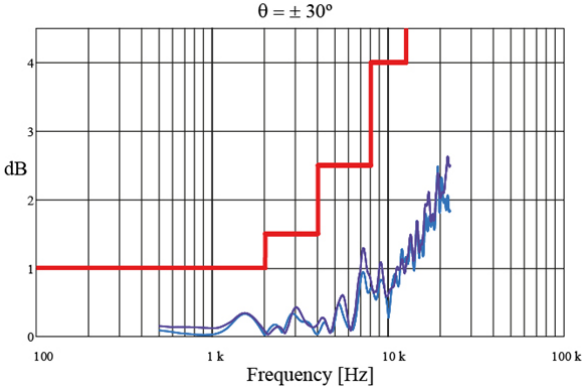
4 kHz
5 kHz
6,3 kHz
8 kHz

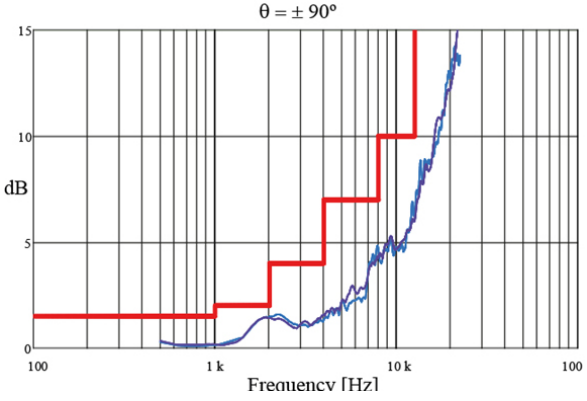


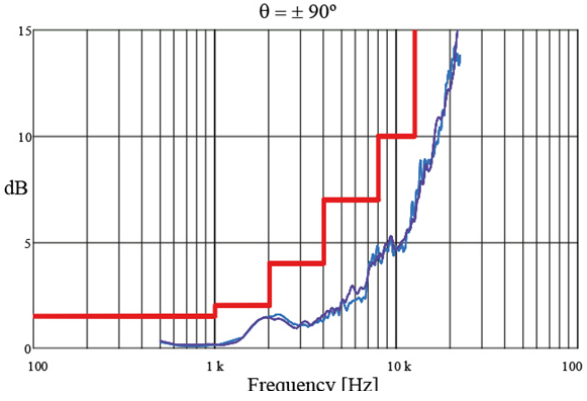
10 kHz
12,5 kHz
16 kHz
20 kHz

Directional response – Vertical with Wind Screen

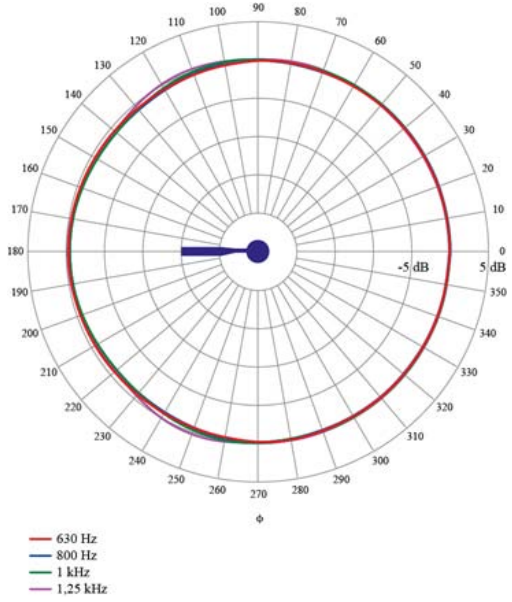
The graphs and plots below show the directional response for the complete sound level meter Nor150 with preamplifier Nor1209, microphone Nor1225 and windscreen Nor1451.



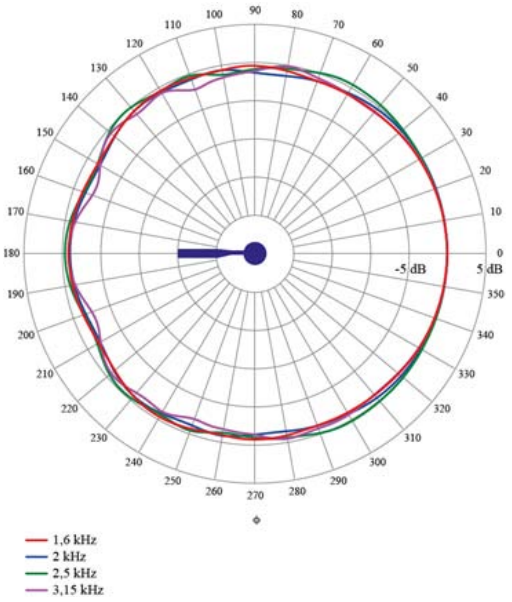




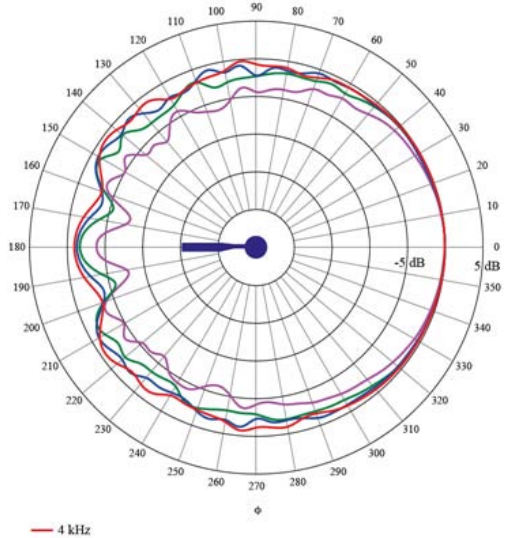
Directional response



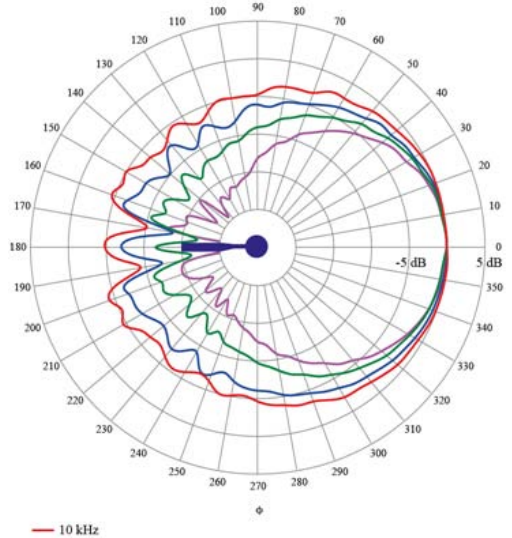
630 Hz
800 Hz
1 kHz
1,25 kHz



1,6 kHz
2 kHz
2,5 kHz
3,15 kHz



4 kHz
5 kHz
6,3 kHz
8 kHz



10 kHz
12,5 kHz
16 kHz
20 kHz

Analog to digital converters

The analog input signals are converted to digital signals by a multi-range sigma-delta converter with an effective sampling frequency of 48 kHz. The anti-aliasing filter is a combination of an analog and a digital filter.

Frequency weightings

Weighting networks:

The Nor150 simultaneously measure the three weighting networks A, C and Z. These networks are designed as described in the IEC 61672-1.
The lower frequency limit of the Z-weighting is only restricted by the high pass filter in the input section, which means that when this filter is off the frequency range is flat down below 0.5 Hz.

Filters

The 1/1 octave band or 1/3 octave band levels may be measured simultaneously with the weighting networks if appropriate options are installed.

1/1 octave filters: 0,5 Hz – 16 kHz
1/3 octave filters: 0,4 Hz – 20 kHz

Filter type

Class 1, digital IIR filters, base 10 system. According to IEC 61260 (2014). The use of filters requires that appropriate options are installed in the instrument.

Level detector

The instrument has only one measurement range.
Reference level (unless otherwise noted) is 114 dB sound pressure level.
Reference range is the same as the only available measurement range.

Detector type

Digital true root-mean-square (RMS) detection and peak detection, displayed resolution 0.1, 0.01 and 0.001 dB selectable in the instrument set up menu. There is only one measurement range.

Crest factor capability

The crest factor is only limited by the capability to measure the peak-value of the signal. The sound input can measure more than 10 V peak.

Overload indication

An Overload condition is indicated in two different ways. Both with a red light in the Status LED above the display and with an overload sign in the status bar in the display. Overload occurs if the input signal is above 10 V peak (either polarity relative to ground).

Under-range indication

In the current version (using Nor1225/1209 combination) the under-range is indicated if the levels are below the measurement range limits for the A-, C- and Z-weighting respectively. Under-range is indicated with a “<” sign in front of the numerical values. The under-range indication is “non-latching”.

Time weightings and measured functions

The time weighting functions F and S have time constants of 125 ms and 1000 mS respectively, and are designed as described in IEC 61672.

The time weighting I has a 35 mS on-time with a peak hold function and a 2.9 dB/S decay rate as described in DIN 45657 (2013).

Simultaneous measurement of the following functions:

- F–time-weighted sound pressure level, instantaneous
- Maximum F–time-weighted sound pressure level
- Minimum F–time-weighted sound pressure level
- S–time-weighted sound pressure level, instantaneous
- Maximum S–time-weighted sound pressure level
- Minimum S–time-weighted sound pressure level
- I–time-weighted sound pressure level, instantaneous
- Maximum I–time-weighted sound pressure level
- Minimum I–time-weighted sound pressure level
- Integrated-averaged sound pressure level
- Sound exposure level
- Peak sound level
- Exceeding level for F–time-weighted sound pressure level (cumulative distribution)
- Integrated-averaged I–time-weighted sound pressure level
- I–time-weighted sound exposure level
- Taktmaximalpegel – DIN45657, F and I time response, 5 seconds “Takt”.

Level distribution

As an optional extension, the instrument may be fitted to calculate the exceeding level (cumulative level distribution) for the F time weighted level. The calculation is done for frequency weightings A, C and Z and for 1/1 octave or 1/3 octave filters.

Minimum integration time for the global measurement (and for the period length of a profile measurement): 100 seconds.
Sampling frequency: 10 samples per second
Display resolution: 0.1 dB based on interpolation
Class width: 0.2 dB
Number of classes: 652
Covered levels: The levels between 10 dB above full scale (140 dB) and 120 dB below full scale (10 dB). The classes for the highest and lowest levels are extended to also include levels above and below, respectively.

Statistics

The Nor150 can be equipped with a statistical level distribution function. Up to eight percentiles can be shown numerically in a table. All of them are freely selectable. The class width is 0.2 dB over the entire 130 dB range. The statistical distribution calculation applies to all the spectral weighting networks (A, C and Z) as well as all the individual filter bands, octaves or third octaves, if they are measured. The selectable Ln values can be set to anything from 0.1% to 99.9%, both extremes included.

The cumulative and probability distribution functions can be shown graphically, and the values read out using the cursor buttons.

The back-erase feature, which deletes up to 20 (selectable 0 - 20) of the most recent seconds of acquired global data prior to a pause upon resuming, updates the statistics buffers as well as to maintain consistency.

For the statistical sampling the instrument makes use of any of the time constants F, S or I. Even Leq based statistics are selectable.

Note that you don't have to define the percentile prior to the measurement. You may redefine the percentile as many times as you like – even after the measurement.

However, once you start another measurement or switch off the instrument, only the selected percentiles will be stored to keep the amount of stored data lower unless you specifically have selected to save the complete probability density function.

Indication on the screen of the Nor150

These indications are in use both on the graphical displays and on the numerical tables.

Time weighted sound levels are indicated on screen as follows based on Time Constant (F, S or I) and Weighting Networks (A, C and Z)

	A-Weighted	C-weighted	Z-weighted
F	LAF	LCS	LZS
S	LAS	LCS	LZS
I	LAI	LCI	LZI
F Max	LAFmax	LCFmax	LZFmax
S Max	LASmax	LCSmax	LZSmax
I Max	LAImax	LCImax	LZImax
F Min	LAFmin	LCFmin	LZFmin
S Min	LASmin	LCSmin	LZSmin
I Min	LAImin	LCImin	LZImin

Time averaged sound levels are indicated on screen as follows based on averaging type

	A-weighted	C-weighted	Z-weighted
Equivalent level	LAeq	LCeq	LZeq
Exposure level	LAE	LCE	LZE

"Takt Maximal" Averaged Levels. Only 5 second "takts" are calculated based on F and I time constant.

	A-Weighted	C-weighted	Z-weighted
F	LAFTM5	LCFTM5	LZFTM5
I	LAITM5	LCITM5	LZITM5

Indication range

The calibration of the instrument allows microphones with sensitivity in the range –84 dB to +15.9 dB relative to 1 volt/Pascal to be applied. The corresponding display range for the indicated sound level is –50 dB to +180 dB.

Self-noise levels

The self-noise is measured with the calibration set to –26.0 dB corresponding to a microphone sensitivity of 50 mV/Pa. For voltage input, the level 0 dB then corresponds to 1µV.

Z-network considerations. The Z-wide network requires several minutes to stabilize at a low level. The preamplifier between the microphone and the sound level meter is a very high impendence device and due to their construction they all have a noise spectrum with increased levels at lover frequencies. There may be relatively large variations in this noise level between the different samples of preamplifiers. It is recommended to have the high pass filter switched on when using the Z-network.

Electric self noise

Noise measured with 18 pF microphone dummy and microphone preamplifier Nor1209, averaged over 30 s of measurement time and the high pass filter switched on.

Spectral weighting functions:
A-weighted: 14 dB
C-weighted: 18 dB
Z-weighted: 28 dB

Third octave filter bands:
0,4 Hz to 2,0 Hz: 48 dB
2,5 Hz to 6,3 Hz: 18 dB (High pass filter Off)
6.3 Hz to 20 kHz: 10 dB (High pass filter Off)
1/3 oct: 6,3 Hz to 20 kHz: 5 dB (High pass filter On)

Acoustic self noise

The acoustic self noise is measured with Nor1225 microphone and preamplifier Nor1209 connected.

The high-pass filter (in the Setup Input menu) shall be turned ON except otherwise noted.

The noise levels are given as equivalent levels averaged over 30 s of measurement time.

Spectral weighting functions:
A-weighted: 19 dB
C-weighted: 22 dB
Z-weighted: 32 dB
Z-weighted: 45 dB (High-pass filter OFF)

Filter bands:
1/3 oct: 0,4 Hz to 5,0 Hz: 45 dB (High-pass filter OFF)
1/3 oct: 6.3 Hz to 250 Hz: 15 dB
1/3 oct: 315 Hz to 20 kHz: 10 dB

Considerations for low noise measurements

If the measured level is within 5 dB of the acoustical self noise given for the actual transducer, special care shall be taken not to underestimate the influence of the self noise of the equipment. The measured value may be over estimated. If you know the correct low level limits for the transducer in use, it is possible to energetically subtract these numbers from your measurement results.

Measurement duration and resolution

Global (Overall) measurement: The total time for a measurement may be set from 1 second up to 7 days 200 hours less 1 second with 1 second resolution.

Timing accuracy: The measurement duration and resolution is locked to the extremely accurate internal clock. Within the temperature range 0°C to +40°C the maximum drift is ±3 ppm corresponding to an accuracy of better than 10 seconds per month. Aging for 10 years may increase the figure with additional 13 seconds per month.

Profile / level recorder measurements: The global period may be subdivided in shorter periods, designated profile time resolution from a few milli seconds up to 24 hours.

Measurement ranges

These ranges are dependent of that the analog high pass filter at the input is turned on.

The “Lower Level” and “Upper Level” given in the tables below are given for the Nor1225/1209 transducer combination. The levels are independent of running on battery/mains adapter, connection to a PC/LAN or use of microphone cables providing the length of the microphone cable is less or equal to what specified in the preamplifier specification.

Total range for measurement of A-weighted levels

The linear operating range is identical to the total range.

Frequency	31.5 Hz	1 kHz	4 kHz	8 kHz	12.5 kHz
Upper level	98	137	138	136	133
Lower level	24	24	24	24	24
Reference level	94	114	114	114	114

The “Reference level” shall be used as the start level when measuring the level linearity. Levels above the “Upper level” will normally indicate Overload. Self noise of the system will typically be more than 5 dB below the “Lower levels”. These levels will normally indicate Under-scale.

The primary indicator range for compliance with IEC 60651 type 1 is 24 dB to 117 dB.

For compliance with IEC60804 type 1, the linearity range is 24 to 137 dB, and the pulse range 24 dB to 140 dB, respectively.

Total range for measurement of C-weighted levels

The linear operating range is identical to the total range.

Frequency	31.5 Hz	1 kHz	4 kHz	8 kHz	12.5 kHz
Upper level	134	137	136	134	131
Lower level	30	30	30	30	30
Reference level	114	114	114	114	114

Levels above the “Upper level” will normally indicate Overload. Self noise of the system will typically be more than 5 dB below the “Lower levels”. These levels will normally indicate Under-scale. If C-weighted levels are used for linearity testing, then the “Reference level” shall be used as the start level of the test.

Total range for measurement of Z-weighted levels

The linear operating range is identical to the total range.

Frequency	31.5 Hz	1 kHz	4 kHz	8 kHz	12.5 kHz
Upper level	137	137	137	137	137
Lower level	40	40	40	40	40
Reference level	114	114	114	114	114

Levels above the “Upper level” will normally indicate Overload. Self noise of the system will typically be more than 5 dB below the “Lower levels”. These levels will normally indicate Under-scale. If Z-weighted levels are used for linearity testing, then the “Reference level” shall be used as the start level of the test.

Measurement range for C-weighted peak levels

Frequency	31.5 Hz	1 kHz	4 kHz	8 kHz	12.5 kHz
Upper level	137	140	139	137	134
Lower level	45	45	45	45	45
Reference level	114	114	114	114	114

Levels above the “Upper level” will normally indicate Overload.

The Nor150 used for electrical measurements

By replacing the microphone with an input adapter (Nor1447) the instrument is well suited for electrical measurements. Alternatively the complete transducer can be removed and replaced with the BNC to Lemo cable type Nor1438.

Please note that when the Nor1438 cable is used it is needed to specify a new transducer with a new name in the sensor set up menu system. Then the instrument can also be configured to feed an IEPE device.

Power supply

After the instrument is turned on, it takes some time to boot up correctly. In addition to this all electronic parts (especially the 200 V polarization voltage) need some time to stabilize properly. It takes two minutes from the power is turned on until the instrument is ready for use.

Internal battery

Battery type: Li-Ion package (simply called Nor150/Battery) with power capacity control circuit. Each battery pack has a “fuel gauge” and its own serial number. The battery and the instrument are designed so the full battery capacity will last for a normal 8 hour work day.

Voltage: 7.4 V

Capacity: 3760 mAh

Charging time using Nor345 mains adapter:
4 hours (80% in 2 hours)

No other battery type than Nor150/Battery from Norsonic can be used in the instrument. Replacement or extra batteries are available from all Norsonic representatives.

The battery must be treated with care. Never store in a hot place or in direct sunlight. Keep free from moisture and dust.

Recycling: These types of batteries are poisonous. Never waste the battery without knowing that it will be handled as required. If you are in doubt, return it to the Norsonic representative.

Power consumption

Typically 3.6 watt dependent on selected modes of operation. External DC source should have source impedance less than 1 ohm and be able to supply at least 500 mA. The mains adaptor Nor345 is recommended for use with the instrument. If the external supply falls below 9V, the instrument will use the internal batteries if available. If the instrument has switched off due to loss of power or insufficient supply voltage, the instrument will automatically switch on and resume normal operation after reapplying the external DC supply.

External DC / Charging input

Socket for external DC: Lemo FFA 0.8 plug, Positive voltage on centre terminal.

The instrument will automatically switch off if the battery or external voltage is too low for operation within the stated specifications. The Nor150 can be used on external voltage without the battery installed.

- Nominal input voltage: 13.2 V
- Low / cutoff voltage: 10 V
- High input voltage: 28 V

The maximum power consumption is below 18 W.

Mains adapter Nor345

The Nor150 is delivered with a mains adapter. This adapter can be fitted with connector for different mains systems.

- Input voltage range: 100 – 240 V AC, 50 – 60 Hz
- Output voltage: 13.2 V
- Max output current: 3 A

Display

Display type: Capacitive touch, trans-reflective color display.

Display resolution: 272 x 480 pixels (W x H)

Backlight: Adjustable in the Setup Instrument menu

Update frequencies: The contents of the display is updated 2 times per second for numerical values, and graphical values are updated 10 times per second.

Keyboard

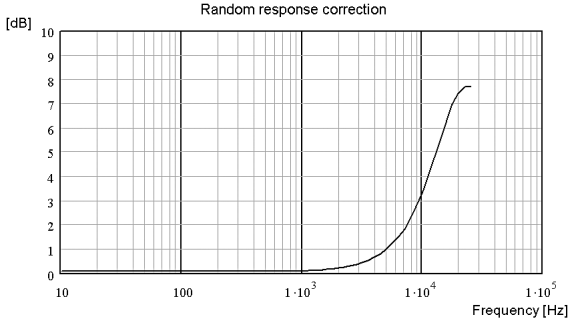
Keyboard type: Silicon-rubber type

Backlight: Adjustable in the Setup Instrument menu

Adjustment of indicated levels

Random response

The instrument is equipped with a microphone with flat free-field response and satisfies the class 1 requirements in IEC 61672-1 to free-field response. By selecting the random response correction network included, the instrument will satisfy the class 1 requirements in IEC 61672-1 to random response as well as ANSI S1.4-1997 type 1. The nominal correction to obtain flat random response is shown in the figure above.

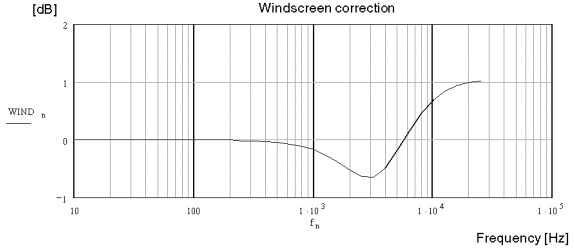


Windscreen

The instrument may be used with windscreen Nor1451. The windscreen correction has to be switched on to obtain the stated specifications when the windscreen is mounted.

When the wind screen is fitted and the correction is turned on the measurements performed will still be within the specifications of a type 1 sound level meter.

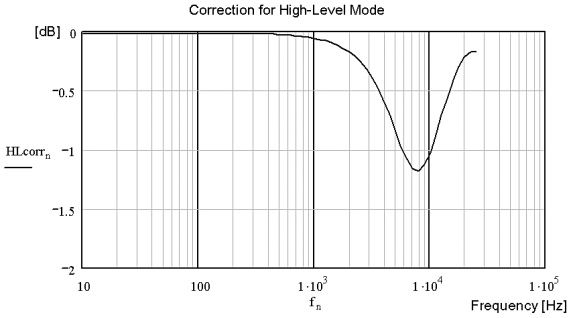
The wind screen correction data and uncertainties are shown in the table in section 6.3.1.



High Levels

For Nor1225 which is a microphone that require 200V polarization voltage, the sensitivity can be reduced by approximately 10 dB by lowering this polarization voltage. The level range can therefore be extended without changing the microphone cartridge. This feature shall be used in combination with the Nor1225 cartridge only.

When this feature is selected, the polarization voltage is lowered from 200 V to 70 V. Lowering the polarization voltage after the tension in the diaphragm. A correction network is therefore applied automatically to compensate for the change in frequency response of the microphone due to the lower polarization voltage. Note that the needed correction will depend on the type of microphone, and shall only be applied when using microphone cartridge type Nor1225.



Diffraction around the instrument casing

The instrument casing and the microphone is designed to have low effects on the sound field in which it is measuring. Nevertheless there is some influence and it is also dependant on the environmental conditions. See the table in section 6.3.1 for details.

The general I/O socket

Pin no.	Signal name	Direction	Remarks
1	DO-1	Out	General digital output control line
2	DO-2	Out	General digital output control line
3	DO-3	Out	Calibration function indication (high = On)
4	RTS	Out	RS232 Request To Send
5	TXD	Out	RS232 Transmit data
6	PWR	Out	3.3V. Max 100 mA
7	RES	In	Instrument reset (0 = Reset)
8	DI-1	In	External trigger input
9	DI-2	In	General digital input control line
10	DI-3	In	General digital input control line
11	AC-out(DO-4)	Out	AC signal output or digital output number 4 dependant on activated menu settings.
12	CTS	In	RS232 Clear To Send
13	RD	In	RS232 Read Data
14	GND		Reference for analog signals
15	SG-out		Noise / signal generator output
Housing	GND		Instrument housing

Signal output – Noise generator

An analog output from the internal signal (noise) generator.
Max output voltage: ±3 volt. Output impedance: < 100 ohm. The output is short circuit proof to GND and output current is in excess of 3 mA
Gain accuracy at 1 kHz: ±0.2 dB.
Frequency response re. 1 kHz: ±0,5dB for 20 Hz < f < 16 kHz.

Signal output – Microphone signal

The signal from one of the AD converters for channel 1 or 2 can be converted back to an analog signal and fed to this output. (Only channel 1 in this version.) The signal can be digitally amplified, but this will reduce the available dynamic range. It will also influence the self noise level. A possibility for overload will increase.

Serial I/O port

RS232 port, 9600 – 115200 baud. The port may be switched off to reduce power consumption, which should be considered if an unused cable is attached to the socket.

Digital inputs

The digital input signals are 3.3V CMOS signals. The voltage levels must be within 0V to +5V to avoid harming the instrument. Voltages in the range 0 to 0.6 V will be accepted as Logical “0” and voltages above 2.5V will be Logical 1.

Input impedance: 10 kΩ connected to the positive supply 3.3 volt. Any open input will therefore be in the high state.

Digital outputs

The digital output signals are 3.3V CMOS signals. Maximum output impedance: 100 Ω. During power-up the output lines will be low or in a high impedance state (100 kΩ to ground).

Digital output control lines

The Nor150 instrument has 4 general digital output lines which all can be used to alarm and control external devices or functions based on the internal status of the instrument. The digital output lines are named DO-1 to DO-4 (see the pin configuration of the general I/O sockets for connection details). The function of each digital output line is controlled / selected by the user through the Digital I/O menu or by remote control of the instrument.

Please note: DO4 is special. It can be used both as a digital output line and as an analog AC signal output line controlled from the Analog output signal menu. If the DO4 is in use as an analog output, it cannot be used for other purposes, so the analog output function has priority.

The following functions are available for each of the output lines:

Running – The line goes active when the instrument is measuring
Recording S1 – The line goes high when sound recording is performed
Overload S1 – he line goes high when sound channel 1 is overloaded
Calibrating – The line goes high when you enter the calibration menu
Mic. Check. – The line goes high when the Mic check feature is enabled. Mainly used to start the electrostatic actuator calibration feature in the outdoor microphone 1210A or C
Remote controlled – The line goes high when the Nor150 is controlled from another device
High – The line stays permanently high
Low – The line stays permanently low
Events/Markers – The line goes high if an event or marker is enabled
Remote Output – This line may be controlled from remote via a PC.

The low signal level is 0 V while the high levels are 3.3 V.

Headset input and output socket

3,5 mm stereo jack. Both channels have identical signals driven by two separate amplifiers. Load impedance shall be 16 ohm or more. Output voltage is generated by the 48 kHz DAC based on data from DSP. Normally a replica of the normalized microphone signal. Full scale on the display bargraph corresponds to 100 mV. Output impedance: Less than 10 ohm, AC-coupled 100 mF. Gain accuracy 1 kHz: ±0,2 dB Frequency response re. 1 kHz: ±0,5 dB for 20 Hz = f = 16 kHz.

LAN interface

This is the preferred way of communication with the instrument. The IP address is found in the **SETUP** > *Instrument* > *Communication* menu and the port number is set to 8501. The easy way is to set the Nor150 to automatically receive its IP address from the network.

USB interface

USB type 2.0 USB socket: B411

Data / Result storage

SD-card

The instrument may use SD-card for storing of setup information, sound recordings and measurement result. Memory size: Up to 64GB cards can be used. Please note that no file in the system may exceed the 4 GB limit given by the operating system. This file size is only possible to achieve with audio recordings, and it corresponds to a recording of approximately 8 hours using 48 kHz sampling 24 bit resolution or 92 hours of 12 kHz 8 bit resolution.

Internal memory

Set up and measured data can also be stored in the internal memory of the sound level meter or on the SD-card. The internal memory is of the “flash” type retaining the information without battery supply. Approximately 375 Mbyte is available for the data storage.

Environmental conditions

Reference conditions. The reference conditions for the instrument are as specified by IEC 61672-1 Temperature: 23°C Humidity: 50% RH Atmospheric pressure: 101.325 kPa

Environmental condition for operation Temperature: –10°C to +50°C Humidity: 5% to 90% RH, dewpoint less than 40°C Atmospheric pressure: 85 kPa to 108 kPa

Environmental condition for storage Temperature: –30°C to +60°C Humidity: 5% to 90% RH, dewpoint less than 40°C Atmospheric pressure: 50 kPa to 108 kPa

Warm-up time

The warm-up time for the main instrument without preamplifier/microphone is very short and the instrument obtains the final accuracy as soon as the self-test is made. Used with a preamplifier and microphone, this time is prolonged due to the charging of the microphone with the polarisation voltage. Normal sensitivity is reached within two minutes. Before a recalibration is attempted, at least three minutes for warm-up is recommended.

Sensitivity for vibration

If the instrument is used under strong vibrating conditions, it is recommended to use an extension cable between the preamplifier and the instrument body. The vibration will mainly affect the microphone, which is most sensitive if the vibration is applied perpendicular to the diaphragm. Typical values are 55 dB to 65 dB for acceleration values of 1 ms-2 perpendicular to the diaphragm.

Sensitivity for magnetic fields

The maximum indication for exposure to magnetic field of 80 A/m and any orientation is typically less than 20 dB.

Sensitivity for radio frequencies

The deviation of the measured sound level due to a normal radio frequency field is less than 1.3dB. The most sensitive direction is when the display faces the source.

Sensitivity for AC power frequency

The sensitivity for a mains power frequency field is small. The worst situation is when a microphone extension cable and an AC power line are positioned parallel to each other – which should be avoided.

Size and weight

Depth: 30 mm
Width: 75 mm
Length, excl. microphone/preamplifier: 210 mm
Length, incl. microphone/preamplifier: 292 mm
Weight incl. batteries: 410 g.

Index

H

I

K

L

M

N

O

P

R

S

T

U

V

W

Norsonic

Declaration of Conformity

We, Norsonic AS, Gunnersbråtan 2, N-3408 Tranby, Norway, declare under our sole responsibility that the product:

Precision Sound & Vibration Analyser Nor150

to which this declaration relates, is in conformity with the following standards or other normative documents:

Performance complying with:

IEC61672-1 Class 1	ANSI S 1.4 1983 type 1
IEC 60651 Type 1	ANSI S 1.43 1997 class 1
IEC 60804 Type 1	ANSI S1.11-2004 class1
IEC 61260 class 1	EN 61010-1: February 2013

This product has been manufactured in compliance with the provisions of the relevant internal Norsonic production standards.

All our products are tested individually before they leave the factory. Calibrated equipment—traceable to national and international standards—has been used to carry out these tests.

During the RF emission test the following was connected: LAN cable (3m), mains adapter Nor345, microphone preamplifier Nor1209 and microphone Nor1225. Setup: Measurement duration 1h, Frequency mode parallel; 1/1 octave, all weighting networks on.
During the RF immunity test the following was connected: LAN cable (3m), microphone preamplifier, Nor1209 and microphone Nor1225. Setup: Frequency mode parallel; 1/1 octave, all weighting networks on. Orientation: Laying face up on the table and the microphone was pointing towards the antenna.
During the AC power frequency field test the following was connected: microphone preamplifier Nor1209 and microphone Nor1225. Setup: Frequency mode parallel; 1/1 octave, all weighting networks on.
The orientation of the instrument in the magnetic field had no influence. During the ESD test the SPL value may show some fluctuations from the ESD pulse. Power supply: Battery voltage 7.2V. External DC voltage 13.2V.

This Declaration of Conformity does not affect our warranty obligations.

Tranby, June 2014

Dagfinn Jahr
Quality Manager

The declaration of conformity is given according to EN 45014 and ISO/IEC Guide 22.

Norsonic AS, P.O. Box 24, N-3421 Lierskogen, Norway

Norsonic

P.O. Box 24
N-3421 Lierskogen
Norway
Tel: +47 3285 8900
Fax: +47 3285 2208
info@norsonic.com
www.norsonic.com

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.