

NoiseWatch

Noise Monitoring Station

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1 Introduction

Congratulations for purchasing the NoiseWatch Monitoring Station. This instrument provides an innovative and cost effective solution for professional grade noise monitoring.

Professional Grade Acoustical Measurements:

- Complies to IEC 61672/ANSI S1.4 Class 1;
- Frequency Range: 20 Hz – 16 kHz;

Simultaneous Measurement and Recording of:

- Leq, Lmax, Lmin, Lpeak, and SEL in A, C, and Z weightings;
- 7 Percentiles (LN%) for selected weighting (A, C or Z);
- 31.5 Hz to 8 kHz Octave Band Spectrum;
- 400 lines FFT Spectrum.

Embedded Power Solution :

- Large battery providing 5+ days run-time;
- Optional solar kit providing unlimited power.

Impressive Data Storage Capacity:

- All parameters recorded (Leq, Lmax, Lmin, Lpeak, SEL, LN%, 1/1 Oct. and FFT);
- Memory buffer holding more than 135 000 records (without FFT, 16 000 records with FFT);
- Auto-store period from 1s to 1h, aligned on clock.

Fully Integrated to Soft dB Web Monitoring Service:

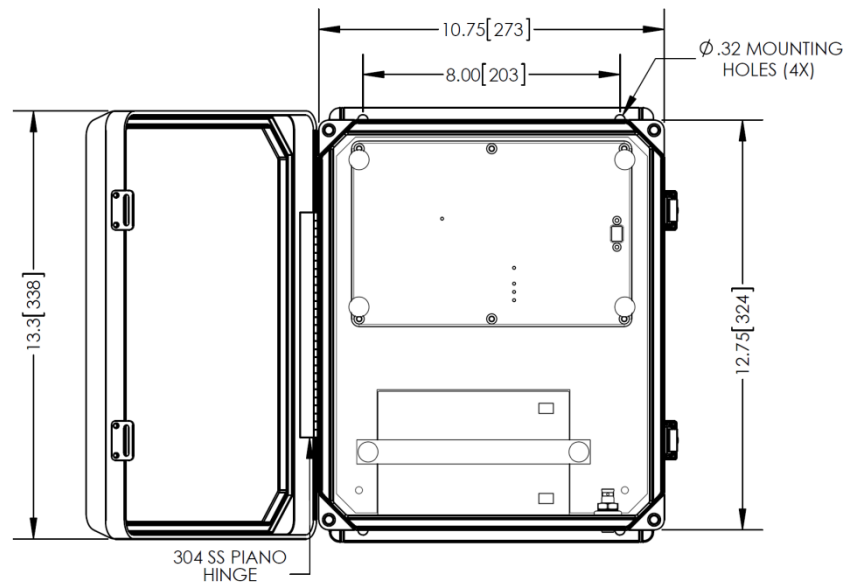
- Embedded 4G LTE module for data transfer, status, mail and SMS alerts,
- Embedded GPS for accurate positioning and time synchronisation,

2 Monitoring Station

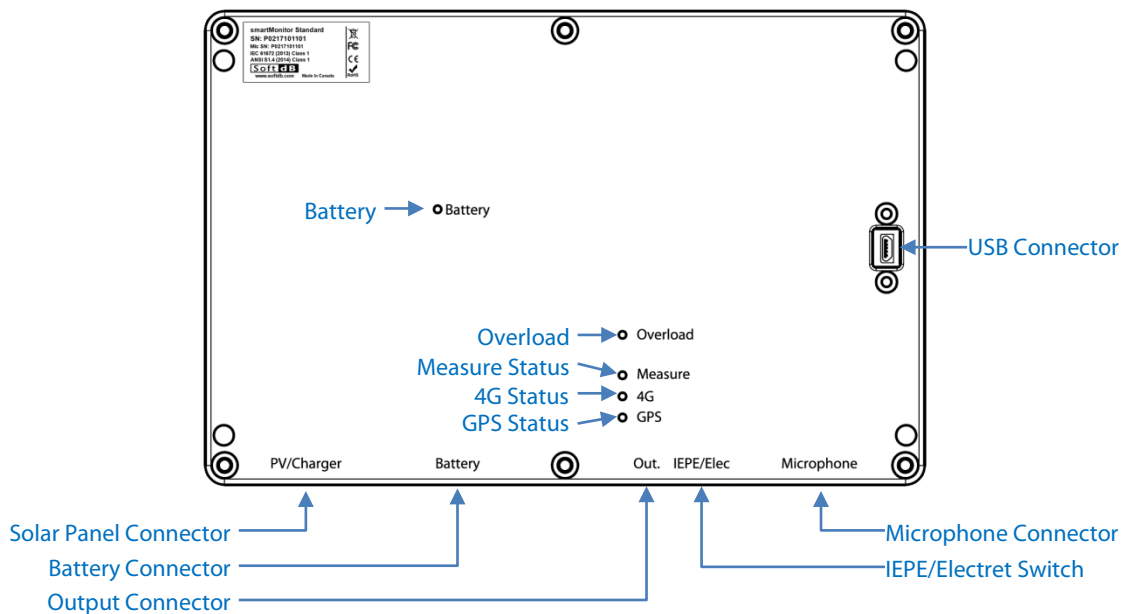
2.1 Components



2.2 Cabinet Dimensions



2.3 Connectors and Indicators



Solar Panel Connector – Connect the solar panel cable from the external cabinet connector. The external cabinet connector is used to connect the external solar panel or the power-pack when charging the battery from an outlet or when using the monitoring station indoors.

Battery Connector – Connect the battery cable from the battery to this connector.

Output Connector – Use this connector to connect an external audio recorder. This output is configured in the instrument setup.

IEPE/Electret Switch – Use this switch to use either IEPE or Electret signal conditioning. (Not available on all models).

Microphone Connector – Use this connector to connect the microphone. A short BNC cable is provided to extend this connection out to the cabinet microphone connector.

USB Connector – Use this connector along with the appropriate USB cable (micro-B) to configure the Monitoring Station with the Utility software.

Battery LED – This LED indicates the battery status.

- Green : >95%
- Yellow: 5%-95%
- Red: <5%
- Continuous: charging
- Flashing: not charging

Overload LED – This LED will blink for 1s when an overload occurs. The overload flag is recorded in the corresponding record. The overload threshold is set 1 dB below the upper limit of the dynamic range.

Measure Status LED – This LED indicates if a measurement is running (Flashing Green) or idle (OFF).

4G Status LED – This LED indicates the status of the 4G connectivity.

- OFF : Idle
- Green : Record Transmit
- Yellow : Status Transmit or Network Binding
- Red : Transmit Error or Module Reset in progress

GPS Status LED – This LED indicates if a GPS fix is found (Flashing Green) or not (OFF).

3 Installation

3.1 Install the Monitoring Station

Install the Monitoring Station cabinet on a pole using the provided pole-mount brackets. The mounting bracket is provided with 2-1/4" U-bolts for small posts but worm gear clamps (not supplied) can be used for larger posts. Use the vertical slits in the bracket to use worm gear clamps.



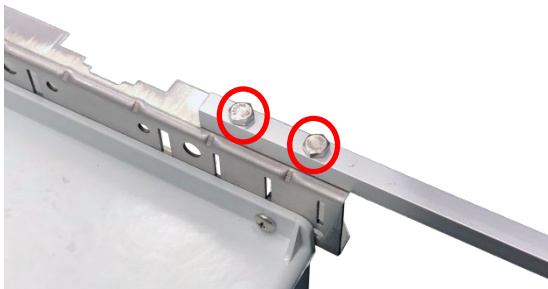
The bracket with 4 vertical holes needs to be mounted on the top of the cabinet. These holes are used to mount the microphone bracket.

3.2 Install the Microphone

Install the environmental protection on the microphone:



Install the microphone bracket on the pole-mount bracket using the provided hardware (1" ¼-20 bolts and nuts). You can install the bracket on the left side or right side. Once the microphone bracket is installed, secure the microphone using the provided screw (¾" ¼-20 bolt).



This bracket is intended to prevent any acoustical reflections that could occur on the post or cabinet surfaces.

Connect the microphone to the microphone connector on the cabinet using the provided BNC cable.



3.3 Install Solar Panel or Power-Supply

The Monitoring Station has a built-in battery that should be sufficient for short-term monitoring campaigns. For longer periods the monitoring station must be powered from the solar panel. Connect the solar panel to the dedicated connector on the cabinet:



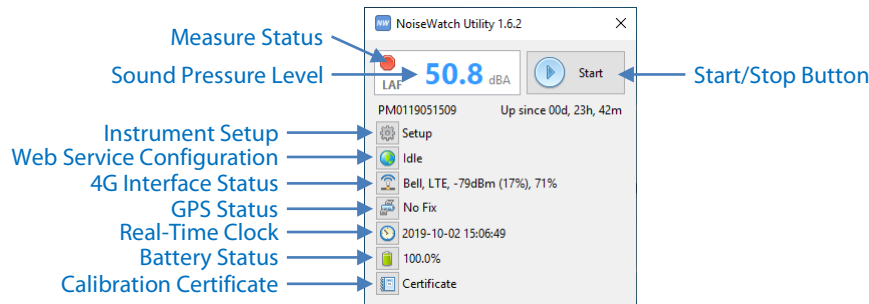
You can connect the provided power-supply in the solar panel connector on the cabinet to either charge the battery or use the monitoring station where 120V power is available. In the latter case, the battery can act as an uninterruptible power-supply should there be a power outage.

Refer to section 8 Power Management, p.20 for more information on power management and solar panel orientation.

4 Configuration

4.1 Utility Software

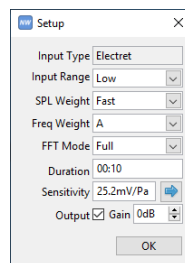
Connect the NoiseWatch Monitoring Station to the computer using the provided USB cable. Once connected, launch the “NoiseWatch Utility” from the Start Menu.




Use the following link To download the software: www.softdb.com/software.php?noisewatch

4.2 Configure Measurement Setup


Click on the  button to configure the measurement.

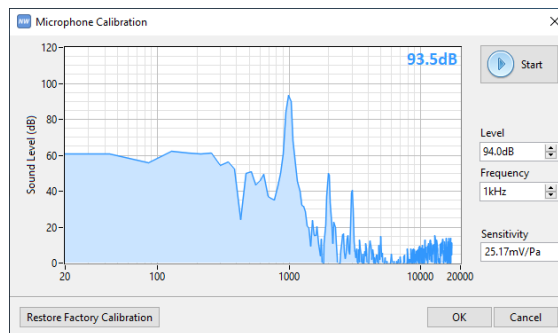


Typical parameters are:


- Low input range (most appropriate for environmental monitoring);
- Fast SPL weight;
- “A” frequency weight (only for percentiles (LN%), A, C and Z weights are recorded for every other metric);
- FULL FFT Mode (bandwidth ranging up to 17kHz with 43Hz resolution)
- 30s record duration (longer periods will be computed online using the short records)
- Microphone Sensitivity: Click on the  button to launch the calibration (See section 4.3).
- Analog output: Click on the checkbox to activate the analog output. A gain can be set from 0 to 30dB for more dynamic if required.

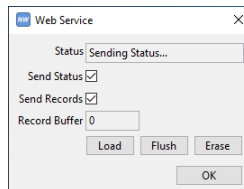
4.3 Calibrate the Microphone

- 1) Click on the  button from the Setup Interface to launch the microphone calibration utility;
- 2) Insert the microphone in the calibration chamber of a microphone calibrator¹;
- 3) Enter the calibrator reference Sound Pressure Level and Frequency;
- 4) Turn the calibrator ON;
- 5) Click on the "Start" button to start the calibration process;
- 6) After 5s the measurement stops and the sensitivity value is updated.
- 7) Click "OK" to accept.



4.4 Configure Web Monitoring

Click on the  button to configure web monitoring:



This interface shows the current status of the web service engine:

- "Idle": Waiting for next operation;
- "Sending Status...": Currently sending Monitoring Station status to the web server;
- "Sending Record...": Currently sending measurement record to the web server;
- "Querying Time...": Currently synchronising on-board clock to the web server time;
- "NAT Info Request": Querying Network Access Technology (Signal quality) from 4G interface.

Check the "Send Status" checkbox for the Monitoring station to send its status to the web server. This check-box should always be enabled except if 4G service is unavailable in this location.

¹ The microphone calibrator should be compliant to IEC 60942.

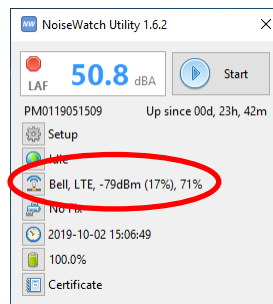
Check the “Send Records” checkbox to send the records to the web server. Uncheck this parameter if performing local storage only.

When sending the records to the web server, it’s recommended to set the record length with a minimal duration of 10s (30s recommended). With a faster record rate the 4G transfer may not be able to send the records in real-time.

The record buffer indicates how many records are to be sent to the web server.

4.5 Verify 4G Connectivity

Verify the 4G connectivity by reading the 4G status:



The 4G status indicates the following information:

- Provider Name: Verizon in the USA, Telus in Canada
- Network Access Technology: 2G, 2.5G, 3G, 4G, LTE
- Signal Strength in dBm and %
- Signal Quality in %

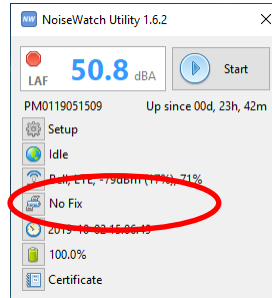
Additionally the 4G status can report the current state of the 4G module if the module is not bound to a network:

- “Not Detected”: 4G interface not present
- “Unknown”: 4G interface currently booting
- “Not Registered, Not Searching”: 4G interface failed to find signal
- “Not Registered, Searching”: 4G interface searches for network
- “Registration Denied”: Invalid network.

You can click on the  button for detailed information on the 4G interface.


4.6 Verify GPS Location and Time

Verify the GPS status by reading the GPS status:



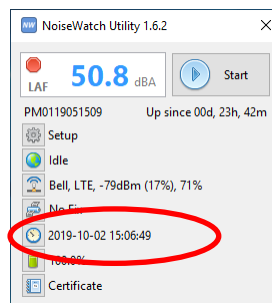
The GPS status can be:


- "No Fix": Insufficient GPS data
- "Time Only": Limited GPS data providing timestamp only
- "2D Fix": Limited GPS data providing timestamp and 2D coordinates
- "3D Fix": Fully resolved coordinates and timestamp


Click on the  button to get the detailed GPS information.

4.7 Verify On-Board Clock

Verify the On-Board clock by reading the timestamp:

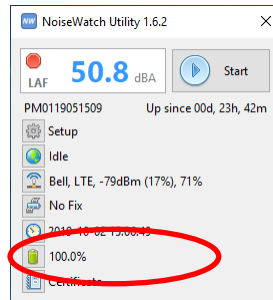



If the clock needs to be synchronised, the clock button will show a warning .

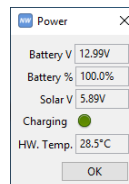
The on-board clock will be automatically synchronised on GPS time or on the web server time. If none of these are available in your location you can click on the  button to synchronise the clock to the computer clock.

4.8 Verify Battery Status

Verify the Battery status on the main interface:





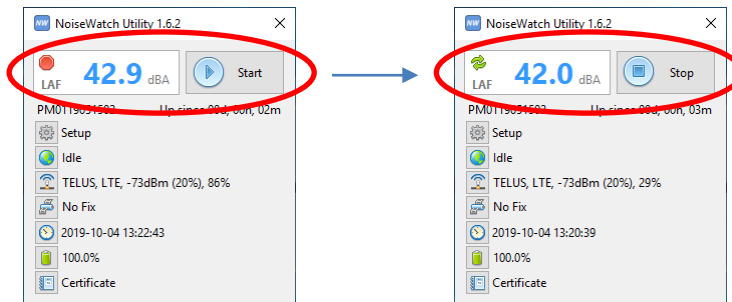
Click on the  button for detailed information on power management:



The battery state of charge in percent is set between 12.5V (100%) and 11.5V (0%). The low-voltage disconnect is set at 11.4V to preserve the battery. For more information refer to section 8 Power Management, p. 20.

5 Run a Measurement

Click on the  button to start the measurement. The measurement status will show the  icon indicating that the measurement has started.



At this point you can disconnect the USB cable.

6 Monitoring Web Service

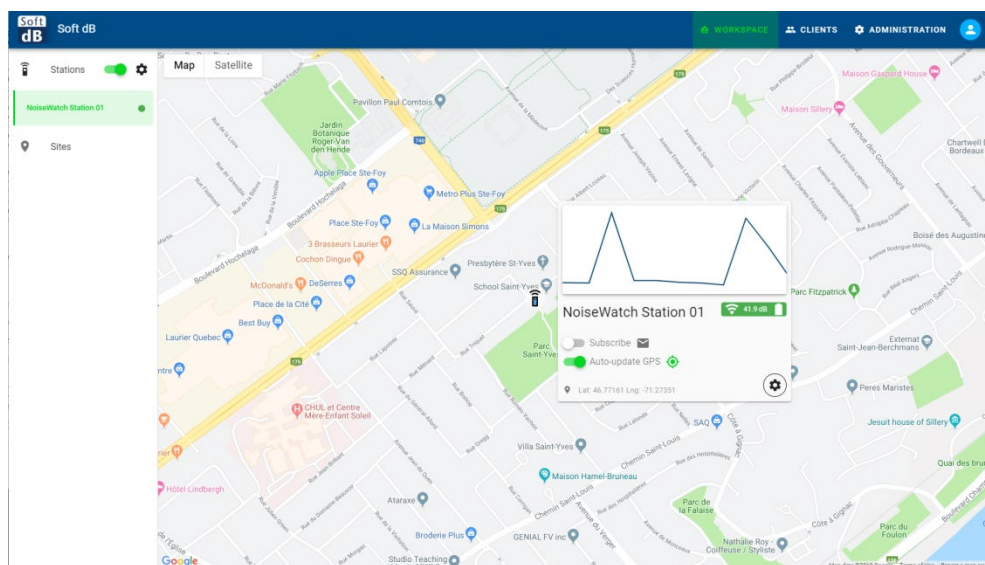
Login to your Soft dB Monitoring account:

<https://monitoring.softdb.com>

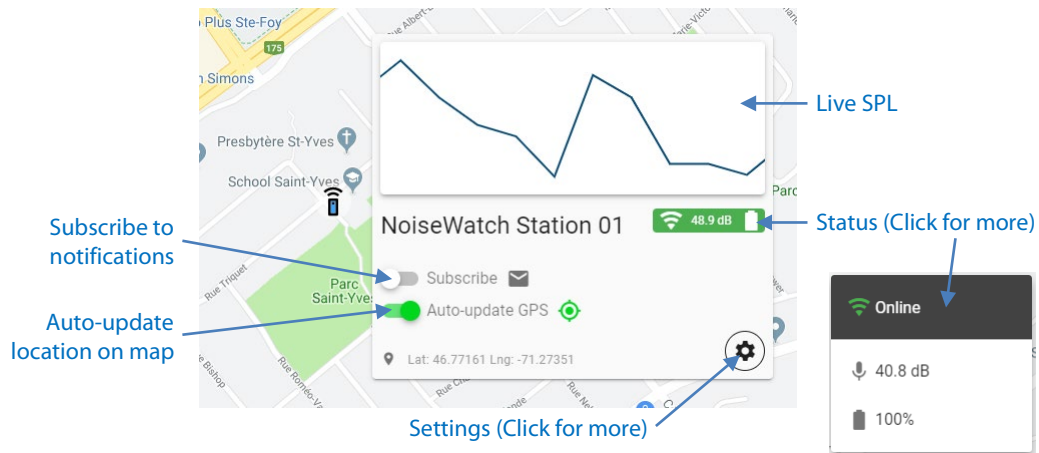


6.1 View Monitoring Station Status

Go to the Workspace tab to view the map and see if your monitoring station is online, measuring and sending data online:



The station context menu provides basic information



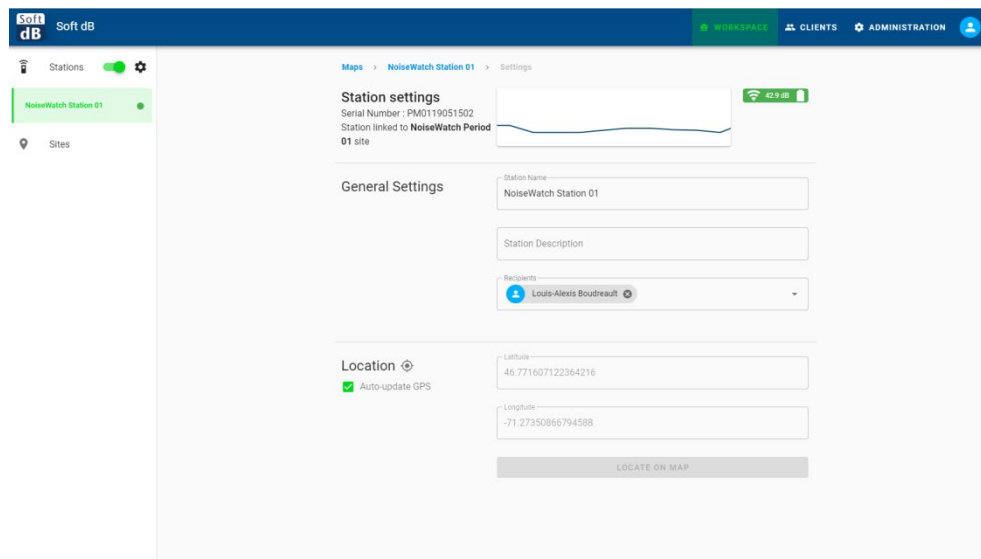
The status icon provides the main status:

- : Online and running a measurement;
- : Online and idle (measurement stopped);
- : Offline (may be powered off or 4G unavailable).

You can subscribe to the monitoring station notifications which will send you an email when:

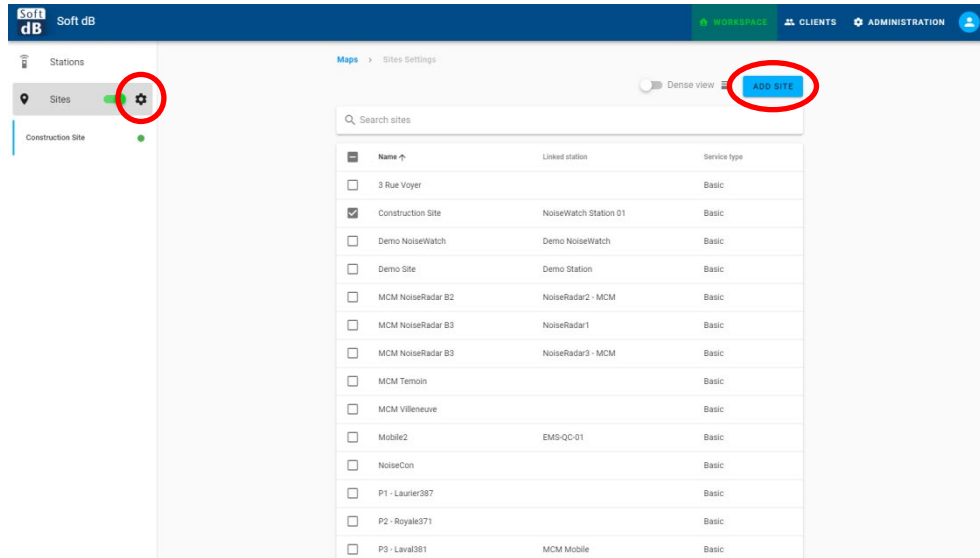
- The monitoring station becomes offline or online;
- The measurement is started or stopped;
- The battery level is below 5%.

Click on advanced settings for more details:

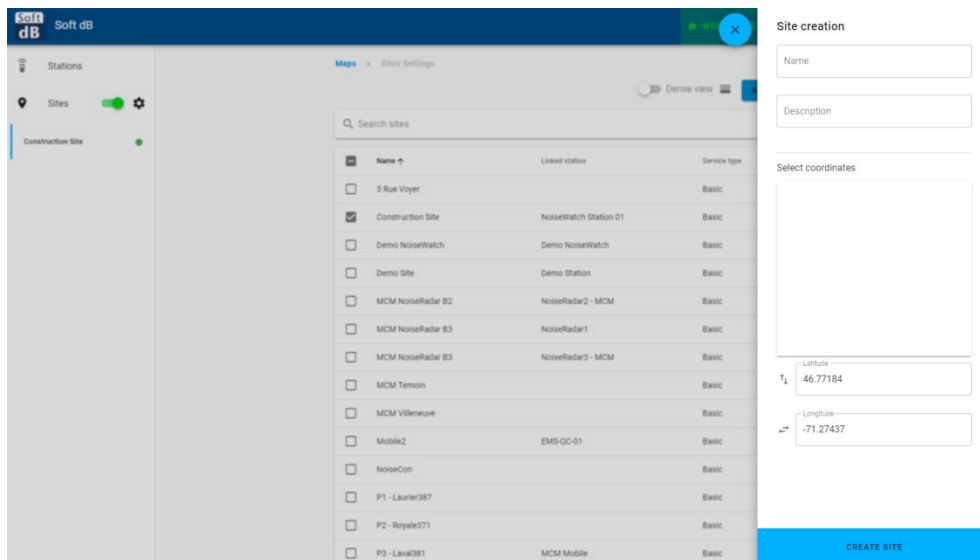


6.2 Create Monitoring Site

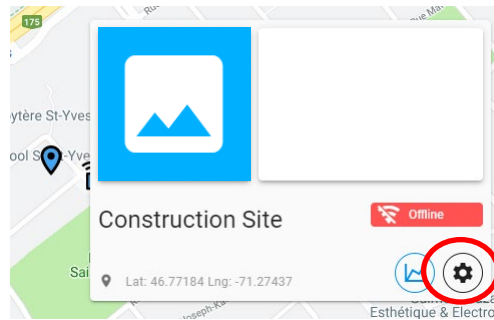
Click on the “gear” icon next to site and click on “Add Site”:



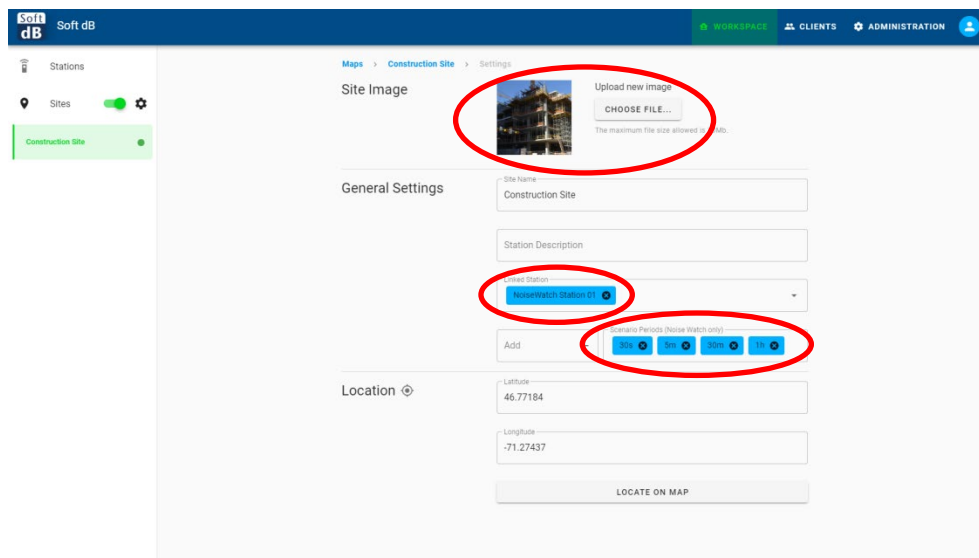
Enter the name and location of the site:



Once the site is created and shown on map, click on the gear button to show the site settings:



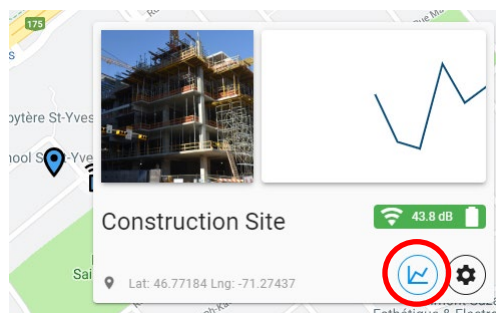
Add an image for the monitoring site, link the monitoring station to the monitoring site and create time history intervals:

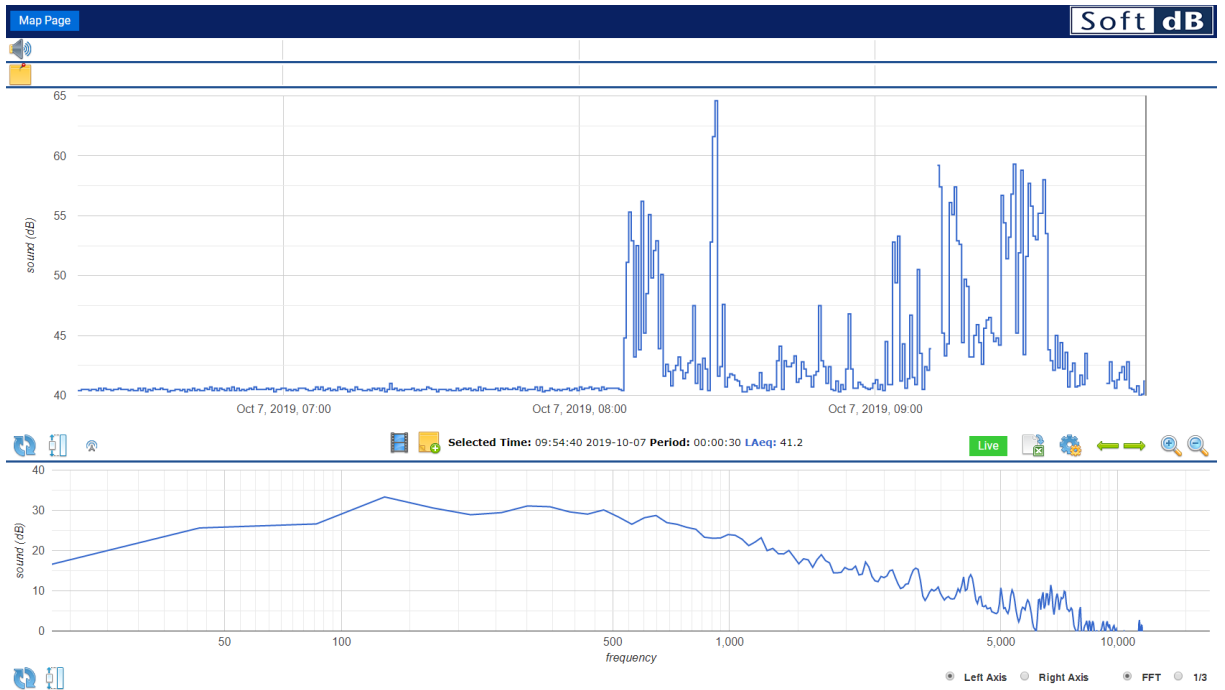


The time history intervals will be used by the server to create longer periods based on the short periods sent by the monitoring station.

6.3 View Monitoring Data

Click on the "Graph" button to access the monitoring data from a monitoring site:





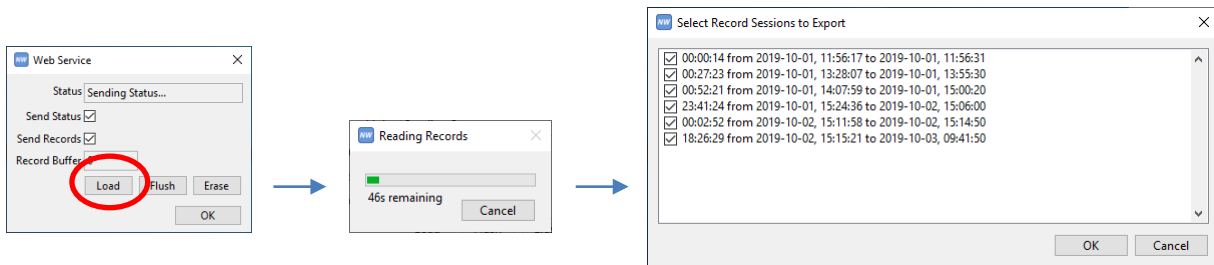
7 Memory Management and Record Download

The NoiseWatch memory holds up-to 134 640 records (without FFT, 16 320 records with FFT). For example, if the records are 30s long, the memory will last 46 days (without FFT, 5 days with FFT).

The memory is arranged in a circular buffer where the old records are overwritten by the new records. It's not necessary to manually erase the memory.

When enabling record transfer to the web server, the monitoring station keeps writing the records in its memory. This serves two purposes: firstly to keep a safety copy of the records locally should anything happen during the transfer and secondly to act as a buffer should 4G connectivity be temporarily down.

When the web transfer is disabled, the records can be downloaded from the monitoring station using the "Load" button from the Web Server configuration utility:



8 Power Management

8.1 Battery

The following table shows the battery life expectancy with respect to temperature and model (NoiseWatch (Electret) vs NoiseWatch XT (IEPE)). The listed durations are for a fully charged battery without solar panel.

Battery Life Expectancy

Temperature	NoiseWatch (Electret, 1.1W)	NoiseWatch XT (IEPE, 1.5W)
30°C (86 F)	132h (5.5 days)	96h (4.0days)
20°C (68°F)	132h (5.5days)	96h (4.0days)
10°C (50°F)	120h (5.0days)	87h (3.7days)
0°C (32°F)	112h (4.7 days)	82h (3.4days)
-10°C (14°F)	94h (3.9days)	68h (2.8days)
-20°C (-4°F)	72h (3.0days)	53h (2.2days)

8.2 Power-supply

You can connect the provided power-supply in the solar panel connector on the cabinet to either charge the battery or use the monitoring station where 120V power is available. In the latter case, the battery can act as an uninterruptible power-supply should there be a power outage.

8.3 Solar Panel (Optional)

The following table shows the specifications of the solar panel:

Solar Panel Specifications

Specification	Value
Power	30W
Efficiency	21%
Solar Cells	Monocrystalline - 36 Cells
Operating Temperature	-40°C to 90°C
Dimensions	340 x 600 x 25mm (13.4 x 23.6 x 1in.)
Weight	2.8kg (6.2lbs)

The solar panel should be sufficient to make the monitoring station self-sufficient in North America (below parallel 51°N). For North America, the solar panel should be oriented south with an angle ranging from 23° to 42° (angle from vertical). The table below shows the recommended angle for various locations in North America.

Recommended Solar Panel Angle

City	Angle from vertical
Calgary, AB	23°
Vancouver, BC	26°
Montreal, QC	29°
Minneapolis, MN	30°
Toronto, ON	31°
Chicago, IL	33°
New York, NY	34°
Denver, CO	35°
San Francisco, CA	37°
Los Angeles, CA	41°
Dallas, TX	42°

9 Technical Specifications

Sound Level Meter	Noise Watch	Noise Watch XT
Standards	IEC 61672-1/ ANSI S1.4-1 (2013) Class 1, ANSI S1.43 (2007) Type 1, IEC 60651 (1979), Amd.1(1993-02), Amd.2(2000-10) Type 1	
Averaging	Exponential and Linear	
Time Weightings	Slow or Fast	
Frequency Weightings	A, C and Z	
Input Ranges	Only 1 range available	Low or High
Sampling Rate	44.1 kHz	
Measured Metrics	Leq, Lmax, Lmin, Lpeak, SEL, LN% (1%, 2%, 5%, 8%, 10%, 50%, 90%, 95%, 99%)	
Peak Maximum Level	106 dBZpk	Low: 101 dBZpk, High: 121 dBZpk
Under-Range Level	26 dBA	Low: 21 dBA, High: 37 dBA
Electrical Noise Level	20 dBA	Low: 15 dBA, High: 31 dBA
Total Noise Level	26 dBA	Low: 21 dBA, High: 31 dBA
Resolution	0.1 dB	
Microphone Nominal Sensitivity	30 mV/Pa	50 mV/Pa
Microphone Technology	Electret Condenser	IEPE Condenser
Spectrum Analyzer		
Standards	IEC 61260-1/ ANSI S1.11-1 (2014) Class 1	
Averaging	Linear (Leq)	
1/1 Octave Spectrum	31.5 Hz to 8 kHz	
FFT Spectrum	400 lines on 6 bandwidths from 17.2 kHz to 539 Hz	
Timing		
Record Duration	1s to 1h	
Record Duration Resolution	1s	
Recording Mode	Continuous auto-store	
Align on Real-Time Clock	Yes	
Recording		
Recording Data	All Global Metrics (A, C and Z), LN% (A, C or Z), 1/1 Octave, FFT (optional)	
Memory Capacity	Without FFT: 134 640 records, With FFT: 16 320 records	
Memory Type	Looping Buffer (older records are overwritten)	
Monitoring		
Cellular	4G LTE with HSPA+ fallback, embedded antennas	
GPS	56 Channels GPS, SBAS, QZSS, On-Board RTC	
Web Service	Soft dB Monitoring Web Service	
Output		
Connector	1/8" Jack Mono	
Dynamic Range	0dB to 30dB Gain – Max ±1.5Vpk	

Environmental		
Operating Temperature	-20°C to 40°C	
Storage Temperature	-30°C to 50°C	
Certified to	NEMA Type 4 – IP66	
Power	Noise Watch	Noise Watch XT
Power	1.1W	1.5W
Battery	168 Wh (12V-14Ah)	
Battery Life (without solar pack)	132h (5days, 12h)	96h (4days)
Physical		
Height	324 mm (12 ¾")	
Width	273 mm (10 ¾")	
Depth	145 mm (6 5/8")	
Weight	8.9kg (19.6lbs)	
Accessories		
Windscreen	All Weather Protection	
BNC Cable	1.2m (4')	
USB Cable	0.9m (3') A to Micro-B	
Charger Pack	24VDC, 2A	
Calibration Certificate	Tested in accordance with procedures from IEC 61672-3 (2013)	
Solar Panel (Optional)	30W solar panel (345 x 605mm / 13.5 x 23.8")	
Pole-Mount Bracket (Optional)	Accepts pipe straps for pole diameter 3cm to 30cm (1 ¼" to 11")	
Utility Software		
Operating System	Windows 7 or more	
Min. CPU	Dual-Core at 1.2 GHz	
Min. Memory	2 GB RAM	
Hard drive	300 MB free hard disk space	
Port	USB 2.0	
Min. Display resolution	800 x 600	

10 Glossary

Time-Weighted Sound Pressure Level (SPL)

Expressed in dB, the SPL represents the sound level of the running time-weighted average of a sound pressure signal observed at a specific time.

$$LW(t) = 10lg \left[\frac{1}{\tau_w} \cdot \frac{\int_{-\infty}^t p^2(t) e^{-t/\tau_w} dt}{p_0^2} \right]$$

- W is the time-weight indication, F for Fast and S for Slow
- τ_w is the time constant for the time-weight 0.125s for Fast and 1s for Slow
- $p(t)$ is the sound pressure signal;
- p_0 is the reference sound pressure (2×10^{-5} Pa.)

Equivalent Continuous Sound Level (Leq)

Expressed in dB, the Leq,T represents the equivalent continuous sound level of a sound pressure signal observed for a specific time interval.

$$Leq,T = 10lg \left[\frac{1}{T} \cdot \frac{\int_{t-T}^t p^2(t) dt}{p_0^2} \right]$$

- T is the averaging time interval;
- $p(t)$ is the sound pressure signal;
- p_0 is the reference sound pressure (2×10^{-5} Pa.)

Peak Sound Level (Lpk)

Expressed in dB, the Lpk represents the sound level of the maximum of a squared sound pressure signal observed for a specific time interval.

$$Lpk = 10lg \left[\frac{\max(p^2(t), T)}{p_0^2} \right]$$

- T is the observation time interval;
- $p(t)$ is the sound pressure signal;
- p_0 is the reference sound pressure (2×10^{-5} Pa.)

Maximum and Minimum Sound Pressure Level (Lmax, Lmin)

Expressed in dB, the Lmax and Lmin represent the maximum and minimum time-weighted sound pressure level observed for a specific time interval.

Percentiles (LN%)

Expressed in dB, the Percentiles represent the time-weighted sound pressure level which is exceeded N% of a specific time interval. Typical percentiles are L1%, L5%, L10%, L50%, L90%, L95% and L99%.

Sound Exposure Level (SEL or LE)

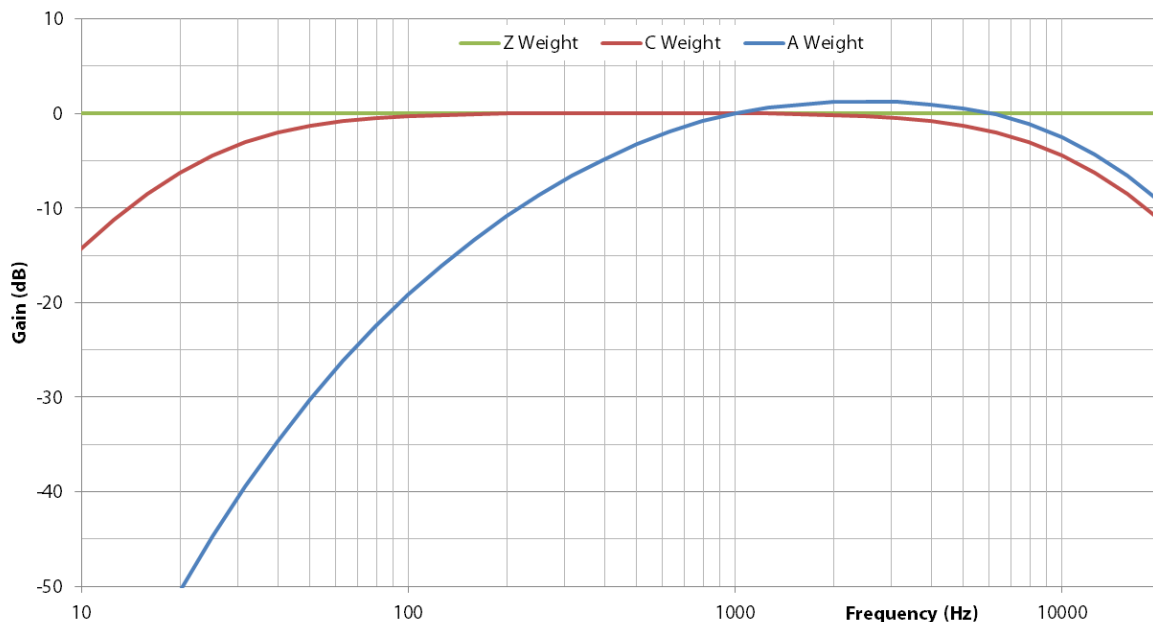
Expressed in dB, the SEL (or LE) represents the total energy level of a sound pressure signal observed for a specific time interval.

$$LE, T = 10 \lg \left[\frac{\int_{t-T}^t p^2(t) dt}{p_0^2} \right]$$

- T is the averaging time interval;
- p(t) is the sound pressure signal;
- p₀ is the reference sound pressure (2x10⁻⁵ Pa.)

Frequency Weighting (A, C, Z)

The A, C and Z frequency weightings refer to signal filters applied to the sound pressure signal. The figure below shows the frequency response of each filter.



Note that all sound level metrics (SPL, Leq, SEL, Lpk, Lmax, Lmin, and LN%) can be expressed with a specific frequency weighting. For example, the LAeq represents the A-weighted Equivalent Continuous Sound Level.

11 Warranty

Soft dB warrants this instrument to be free of defects in parts and workmanship for one year from date of shipment (a six-month limited warranty applies on sensors and cables). Please contact us at info@softdb.com should it become necessary to return the instrument for service during or beyond the warranty period. A return authorization (RMA) must be issued before any product is returned to Soft dB. The sender is responsible for shipping charges, freight, insurance and proper packaging to prevent damage in transit. This warranty does not apply to defects resulting from actions of the user such as misuse, improper wiring, operation outside of specification, improper maintenance or repair, or unauthorized modifications. Soft dB specifically disclaims any implied warranties or merchantability or fitness for a specific purpose and will not be liable for any direct, indirect, incidental or consequential damages. Soft dB's total liability is limited to repair or replacement of the product. The warranty set forth is inclusive and no other warranty, whether written or oral, is expressed or implied.