User Guide

Loadsensing Vibrating Wire Data Loggers

Version 1.9

5-Channel
(LS-G6-VW)

1-Channel Aluminum
Version
(LS-G6-VW-1M)

WORLD SENSING

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Before starting to use Vibrating Wire Data logger

Please read these instructions carefully and ensure that the required conditions specified in this document are met before using the product. Each of our edge devices includes this information inside the packaging

General warnings

- Follow these precautions to avoid a battery explosion or leakage of flammable liquid or gas:
  - Use the correct battery type. Dispose of the batteries according to instructions. Do not dispose of the batteries by throwing them into a fire or a hot oven, or mechanically crush or cut them.
  - Do not leave the batteries in an extremely high-temperature environment.
  - Do not subject the batteries to extremely low air pressure. It may result in an explosion or leakage of flammable liquid or gas.
  - Do not short circuit the batteries. This will blow the protection fuse.
- Batteries and equipment to be connected via the data port must meet IEC 62368-1 ES1 and PS1 requirements.
- Equipment to be installed in restricted access areas.

Symbol	Description
	Caution. Do not proceed until the instructions are clearly understood and all required conditions are met.
	Read the instructions for use carefully before using.
	Caution, hot surface.
	According to the European Union WEEE Directive 2012/19/EU, this product and its batteries should not be discarded as unsorted waste. Please send them to separate collection facilities for recovery and recycling. It is your responsibility to dispose of your waste equipment and batteries properly. The correct disposal of your old equipment and batteries will help prevent potential negative consequences for the environment and human health.

Overview of the Loadsensing Vibrating Wire Devices

This user guide explains the basic procedure for configuring and operating Worldsensing's Loadsensing LS-G6 vibrating wire nodes (LS-G6-VW, LS-G6-VW-1M). You can find further technical details in our data sheets.

The Loadsensing Vibrating Wire data logger is a low-power, long-range wireless edge device. Two models are available: a 5-channel vibrating wire node where up to 5 vibrating wire sensors can be connected at the same time, and a single-channel vibrating wire node for a single sensor.

We offer metallic versions of the single-channel and multichannel nodes.

The Loadsensing Vibrating Wire data logger can also be used as a standalone logger for manual monitoring. It can be configured easily and connected with a USB cable and an Android phone.

Loadsensing Vibrating Wire devices are able to read most of the vibrating wire sensors of the market. These are used for geotechnical applications in civil works, tunnel construction, landslides and mining.

Vibrating Wire Logger Specifications

You can check the vibrating wire datalogger specifications here

Equipment provided

The Loadsensing nodes are shipped with the following accessories:

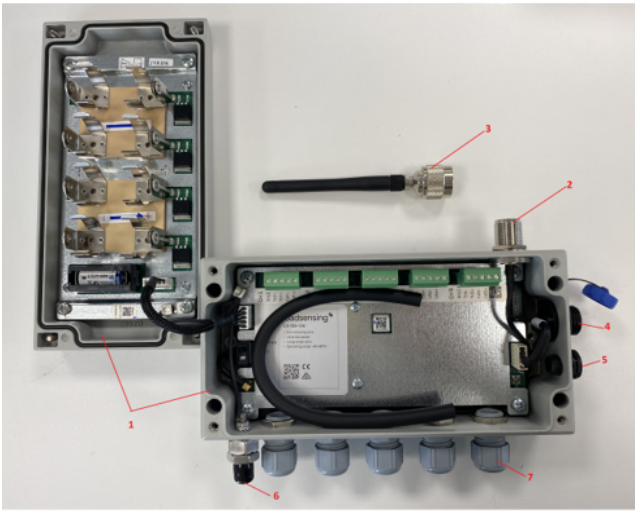
- Vibrating wire data logger.
- Antenna.
- Antenna adapter.

The package does not include:

- A USB-OTG configuration cable.
- Batteries.
- A grounding connector.
- Mounting support .

The vibrating wire logger comprises:

1. Casing.
2. RP N female connector.
3. Male RP N connector to RP - SMA male and aerial with RP - SMA male.
4. External mini USB B female connection
5. Gore valve for protection against condensation.
6. A grounding screw for metallic nodes.
7. Cable gland.



An open Loadsensing LS-G6-VW 5-channel.

Check the labels in the image on the right to determine the position of each component.

Data Logger Mounting

All vibrating wire data loggers can be deployed as follows, depending on the application and the conditions of the site:

- On a wall, using a metallic (LS-MEC-MP-001) or polycarbonate (LS-ACC-MP-P) mounting support.
- On a 35-mm or 50-mm mounting pole, using an aluminum mounting plate (LS-ACC-POLE35-2/LS-ACC-POLE50-2). This includes nuts and U-bolts for a pole diameter of less than 35 mm and 50 mm.
- Inside a manhole, with a plastic or metallic cover. No special accessories are available for this type of mounting. Even though the data loggers are IP67 certified, if they are closed following the instructions in the chapter on *Safely closing the vibrating wire data logger* from this User Guide, we strongly recommend reading the Data Logger Installation in Manholes guide.

You can find drawings for our supports in the Accessories List in our knowledge base.

Sensor connection

Most vibrating wire sensors can be connected to the Loadsensing vibrating wire data loggers. Further information can be found in the vibrating logger specification chapter.

The data logger has a cable gland for each channel, to allow you to adjust different sensor cable diameters. Each terminal block has a group of five connectors and each group has:

- 2 vibrating wire connectors (with no polarity) *VW +/ -*
- 2 thermistor connectors (with no polarity) *TH +/-*
- 1 shield terminal *SHLD*

The terminal blocks accept wires prepared by stripping a short length of insulation from the end.

Wires and their pinouts must be checked with the sensor data sheet from the manufacturer. As a workaround, pairs can be checked with a multimeter.

After you connect each terminal block, we recommend you take some sensor readings to make sure the connections have been made correctly. Also, taking several readings will help you check that the sensor is correctly wired to the logger and the sensor wires.

An alternative can be to compare the sensor reading at installation with a portable readout unit.

Powering the wireless data logger

The Loadsensing vibrating wire nodes are shipped closed, without batteries. To power it up, follow these steps:

1. Open the vibrating wire node using a 2.5 mm Allen key.
2. A small RTC battery was shipped inside the ½ AA size battery holder in our multichannel data loggers in order to keep time regardless of whether C-type batteries are also inserted in the data logger.
   Since serial 52594 and above, the ½ AA size battery holder and its battery have been removed from the battery board to simplify the product installation and maintenance and in line with our thrust to provide more environmentally sustainable products by reducing battery waste.
   Please take note that this update shall have no impact whatsoever on the performance of the edge device, as since Gateway firmware version 1.12.1 the Gateway is able to check if the node is on time. If it's not, a time synchronization message is sent.

3. The data logger always uses UTC time, although data can be visualized in local time in our gateway.

4. Insert **C-type batteries** in the battery holders. The single channel node takes only one battery and the multichannel node has up to four (more batteries will give the logger a longer life for a given configuration). See our LS G6 data logger recommended batteries guide for further information.
   Please note our devices have reverse battery protection but it is not safe to keep batteries reversed in the node for a long time.
   Warning: There is a risk of explosion if you use the wrong batteries. Dispose of batteries according to instructions and refer to the General Warnings from bellow.

5. As well as batteries, the logger can be powered with external power. There is a power mode switch on the node. Turn it to whichever power mode you are using. Please take a look at the External power options document before using this option.

General Warnings

- We advise during usage of the batteries to observe the following precautions:
  - Risk of explosion if the battery is replaced with an incorrect type.
  - Disposal of the battery into fire or a hot oven, or mechanically crushing or cutting of a battery, can result in an explosion.
  - Leaving the battery in an extremely high temperature surrounding environment can result in an explosion or the leakage of flammable liquid or gas.
  - The battery subjected to extremely low air pressure that may result in an explosion or the leakage of flammable liquid or gas.
  - Short-circuiting the battery will result in blowing the protection fuse.
- Batteries and equipment to be connected via the data port must meet the requirements of ES1 and PS1 according to the IEC 62368-1.
- Equipment to be installed in restricted access areas.

Loadsensing Device Configuration

We strongly recommend configuring the Loadsensing device on location so you can conduct an on-site radio coverage test at the same time.

Device configuration has to be carried out using the Worldsensing Android app (WS App), which is compatible with USB On-The-Go (OTG) Android devices. Please refer to the Worldsensing app User Guide for more details. To make sure the app works properly, we recommend purchasing one of the mobile phone models in stock from Worldsensing. Please contact the technical support team for more information.

WS App starts up once the Android device is connected to the Loadsensing node using an USB-OTG cable. It does not need to be started up manually.

The whole configuration process takes no more than five minutes. From then on, the Loadsensing node will start taking readings and sending data to the gateway.

Please take note of the following credentials in the Gateway Information Sheet. These will be necessary to perform the radio coverage test:

Gateway Information Sheet	Mobile app field
Default network ID	Network ID
Default network key	Password
Default network access password	Server password

The process for configuring the vibrating wire node is the same as the other nodes and it is detailed in the Worldsensing App user guide.

There are some configurations and functionalities that are particular for the vibrating wire node, such as configuring the sweep frequency from the sensor and setting a specific magnitude threshold to detect if the sensor has been disconnected.

User will need to add the channels that want to read, with a suitable sweep frequency group from the sensor. There are 4 frequency groups available on the app that cover most of the vibrating wire sensors on the market.

	Frequency range
Sweep A	450-1.125 Hz
Sweep B	800-2.000 Hz
Sweep C	1.400-3.500 Hz
Sweep D	2.300-6.000 Hz

Table 1. Sweep frequencies ranges

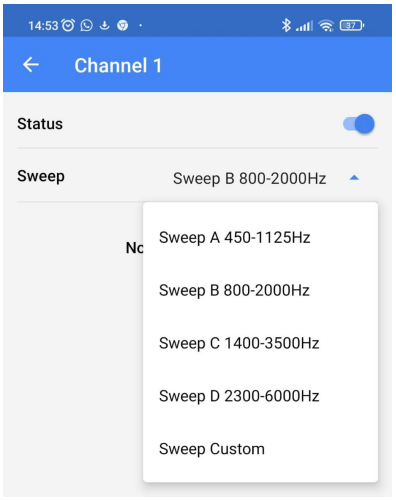


Fig.1 Node sweep frequency configuration.

A sweep custom frequency is also available on the app, where a custom start and end frequency in Hz can be added and also a custom time (in ms) for reading the sensor.

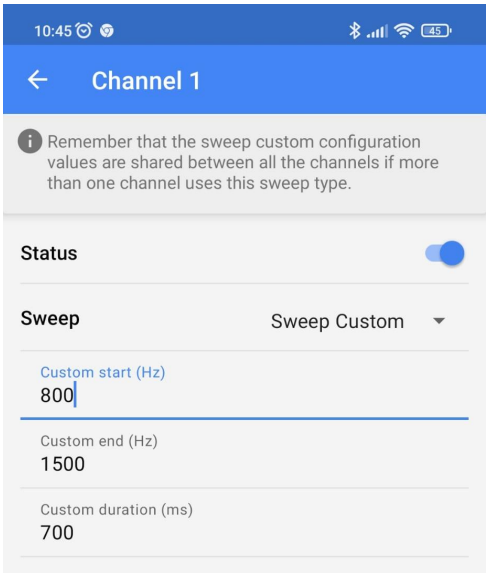


Fig.2 Sweep custom configuration.

We recommend checking this information with the datasheet from the sensor manufacturer.

Algorithm refinement

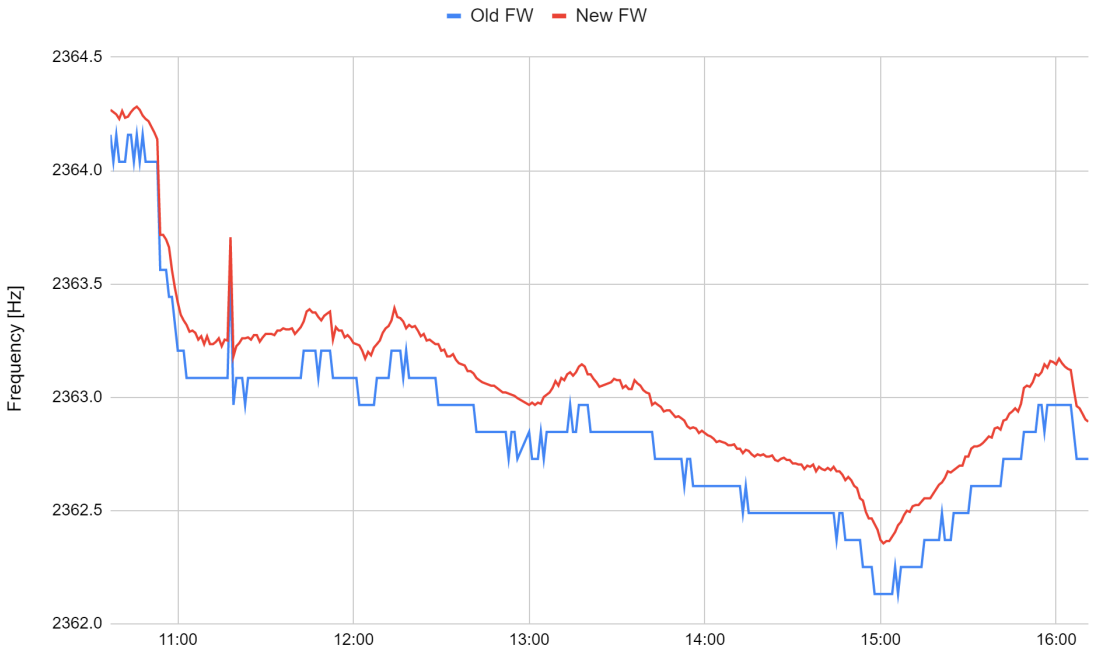
From Vibrating wire Data logger firmware version 2.43, the algorithm we use is able to improve resolution and accuracy using proper sweep configurations.

	Excitation Freqs.	Accuracy - Error %	Resolution Hz
Sweep A	450-1125	0.013	0.002
Sweep B	800-2000	0.008	0.002
Sweep C	1400-3500	0.010	0.004
Sweep D	2300-6000	0.009	0.007

If you configure a custom sweep frequency within a wide range, the resolution will correspond to the group with the lower specs. For this reason, we recommend your sweep frequency fits the sensor range and not much more.

The chart below shows spot-weldable strain gauge readings from our previous firmware compared to version 2.43. As you can see, the resolution with the new firmware is significantly better and allows you to detect smaller changes.

Firmware readings comparison



A comparison of strain gauge readings using the previous firmware and version 2.43

Version 2.43 also includes an advanced configuration option and users can use it to configure a magnitude threshold (see 'Sensor detection functionality' overleaf for more details) to avoid recording noise or induced frequencies on the cable. If the measured magnitude is lower than the configured threshold (for example if the cable gets cut), you will get a 'sensor not detected' error message. See the next page for more details.

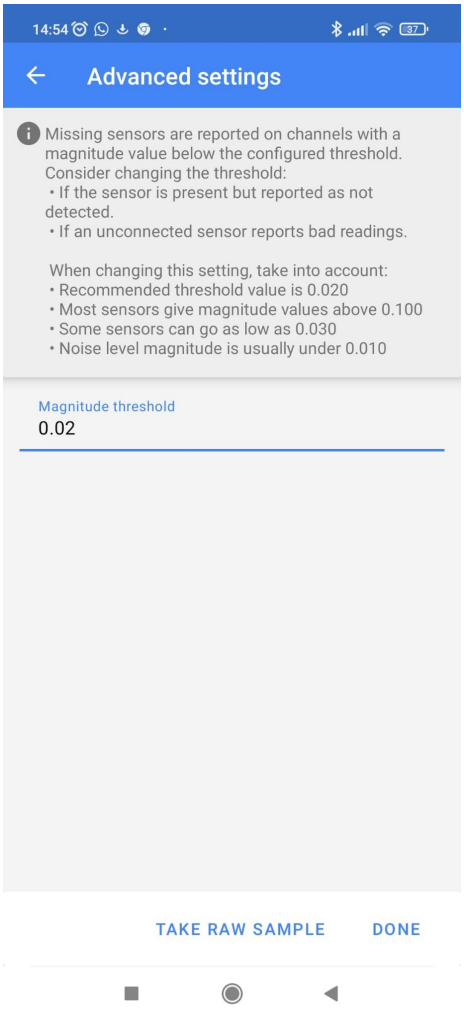


Fig.3 Magnitude threshold configuration.

Sensor Detection Functionality

Vibrating wire sensors may sometimes get disconnected due to a cut cable or other issues. This can lead to data analysis challenges when you are analyzing data remotely, as it could be interpreted as a node or a sensor failure, among other things.

To reduce noise or induced frequencies, we've implemented a configurable threshold. If the magnitude of the reading is above that threshold, the reading is taken as valid. If the magnitude of the reading is at or below the threshold, the reading is discarded and an error code is sent.

When configuring the threshold note that:

- Only one threshold can be configured for all the channels.
- Different sensors give different magnitude responses.
- The excitation sweep influences the magnitude returned, so it is important to choose a sweep frequency group instead configuring a custom sweep frequency within a wider frequency range.
- The default threshold is set at a safe distance from noise, at 0.075 Hz, but there are sensors that work closer to the noise level, at 0.02 and 0.01 Hz.
- Any value beneath the threshold will trigger a 'missing sensor' warning.

You should consider changing the threshold when a sensor is present but reported as not detected, or when the magnitude of noise is higher than the threshold.

When changing this setting, remember that:

- The recommended threshold value is 0.02.
- Most sensors have magnitude values above 0.1.
- Some sensors can go as low as 0.03.

- The noise level magnitude is usually under 0.01.

When dealing with false errors, do the following in order:

1. Make sure the node threshold is the default one.
2. Make sure the sweep you have configured covers the range of the sensor.
3. Try a custom sweep that fits the range of the sensor better.
4. Lower the threshold to fit the magnitude given by the sensor.
5. In extreme cases, set the threshold to 0. This will disable sensor detection.

Once the configuration is finished the app will show the option of taking a sample. Taking a sample will show the parameters measured and allow you to check the consistency of the readings.

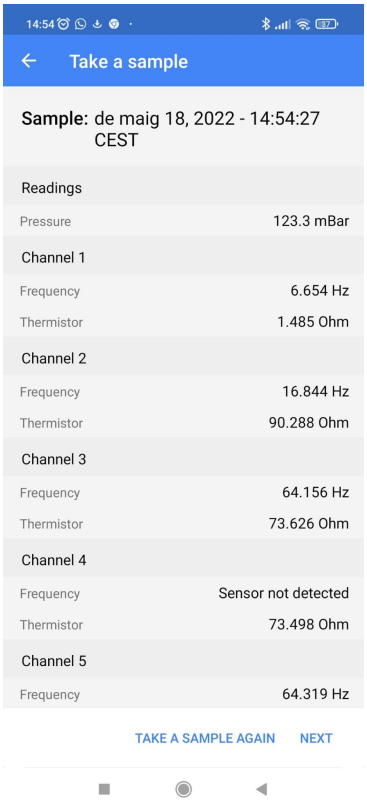


Figure 4: WS app screenshot taking a sample.

Barometric Measurements

As the data logger includes a barometer. It is important to avoid placing the data logger inside any type of container. This would affect the readings the barometer makes through the gore valve.

If the vibrating wire sensor requires barometric pressure compensation (such as for piezometers installed in locations that may be affected by changes in barometric pressure), the current pressure readings from the barometer are usually used directly. Note that the transformation of the data (compensated by the barometric pressure) is done on the gateway in the **Engineering Units** drop-down menu from the particular node.

If you want to use sea level atmospheric pressure (as commonly used in meteorology), you will need to correct the barometric readings using this formula:

$$p_0 = \frac{p}{(1-\frac{altitude}{44330})^{5.255}}$$

Where:

p_0 = pressure at sea level in mbars.

p = current pressure reading.

altitude = altitude in meters above sea level.

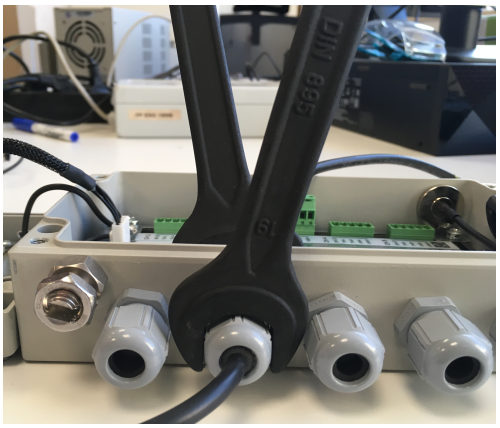
Safely Closing the Vibrating Wire Logger

This is important to ensure water tightness and the durability of the node. Close the cover by cross-screwing the 2.5 Nm/2Nm torque as indicated. Please see the *Watertightness* document for detailed information.

The Loadsensing vibrating wire data loggers have undergone water tightness testing by an external laboratory and are rated at IPX7 (one meter for 30 minutes).

To guarantee water tightness, make sure to do the following:

- Properly adjust the cable glands. Please note that the cable glands are closed and held with a 19 mm open spanner (e.g. a Bahco 19 mm single-ended open spanner, RS Amidata code 717-8992).

Figures 5, 6 Pictures show how to properly close and hold cable glands with the open spanner.

- Seal the unused cable glands with the piece of rubber rod provided in each box.
- Lock the box by tightening screws crosswise on the lid after connecting the sensor. Adjust the screws using a torque wrench. If not, the base faces and cover may not be parallel, screwing may become more difficult and the screw threads or the Helicoil inserts may be damaged. Moreover, the O-ring (seal) may not be

properly sealed and the degree of protection against water intrusion could be compromised.

- You screw the box at 2,5 Nm/2 Nm (depending on the vibrating wire data logger model-the force that needs to be applied is marked on the outside of the device-) using a torque screwdriver (e.g. Ref. 1227107 from WERA).

  Note that box screws shouldn't be torqued more than 2.5 Nm/ 2 Nm, even though they can support a maximum torque of 3.5 Nm. If you exceed the torque, the Helicoil insert may be damaged. We do not recommend using electric drills or electric screwdrivers.

- You mount the antenna or, if not, cover the antenna connector with a cap.
- The sealing ring has not been physically or chemically manipulated.
- The sealing cap USB connector is coiled.

NOTE: there is no need to seal the GORE valve to comply with IPX7. If you seal it, the barometer won't be able to measure the atmospheric pressure and you won't be able to apply pressure compensation.

We can't guarantee the IPX7 rating if any of the above conditions is not met or if one or several components (e.g. GORE valve) are damaged.

Should the node need further sealing, for instance due to placement in an extreme environment or in a floodable manhole, please refer to the Installation on Manhole document.

Node Surge Protection

Following IEC 61000-4-5, vibrating wire data loggers have been equipped with class 2 surge immunity protection against damaging spikes and transients. That means the node is protected up to 1kV.

You need to ground the node (metallic case nodes come with an easy-to-use grounding screw), otherwise the surge protection cannot prevent the node from being damaged by direct or indirect lightning. In any case, nothing can protect a system from a direct lighting strike or one so close that it overloads the capacity of the surge protection. Further information can be found on the Surge protection document.

Dataserver visualization

When connecting the vibrating wire to the Dataserver, the last readings will be shown on *Last readings and Time series graph*.

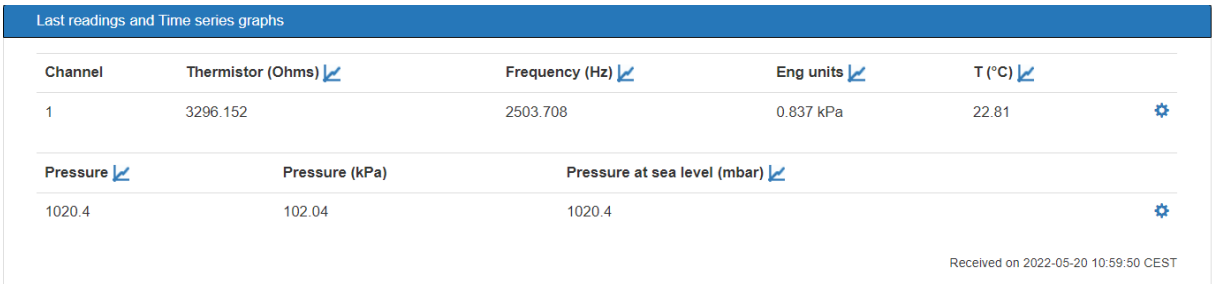


Figure 7: Readings from the vibrating wire shown on the dataserver

Note that by clicking the gear on the right side, the user will be able to access the formulae that can be applied for engineering unit conversion on the CMT.

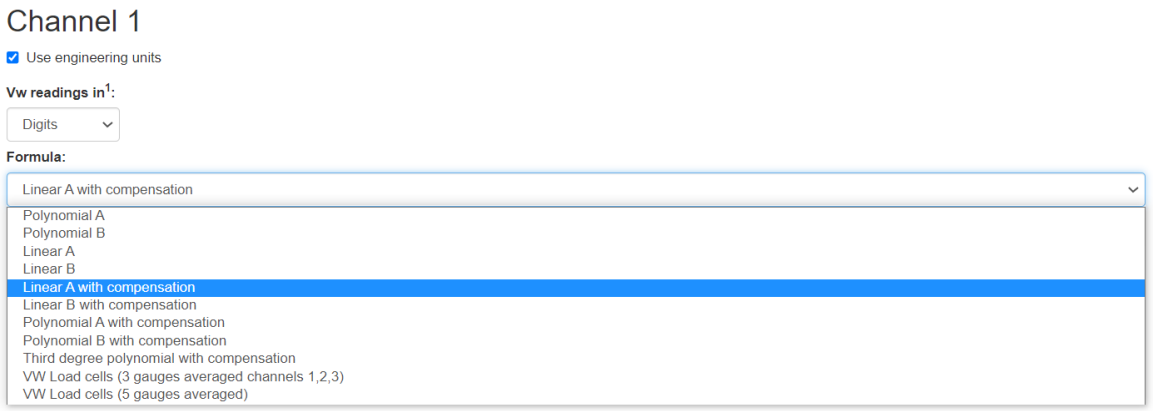


Figure 8: Available formulae for engineering units conversion on Vibrating wire logger.

Please note that vibrating wire readings can be used on the formula in Hz or Digits and must be selected from the "Vw readings" drop-down menu.

Formulae that can be used on the CMT menu are:

- *Polynomial A*

$$P = AR_i^2 + BR_i + C + K(T_i - T_0) + D$$

P: Converted data in units
R_i: Current reading in selected unit[1] during observation
T_i: Temperature during the observation

Where *A, B* and *C* are polynomial gage factors, *K* is thermal factor and *D* is an offset in units

- *Polynomial B*

$$P = C0 + C1R_i + C2T_i + C3R_i^2 + C4R_iT_i + C5T_i^2 + D$$

P: Converted data in units
R_i: Current reading in selected unit[1] during observation
T_i: Temperature during the observation

Where *C*'s are polynomial gage factors and *D* is an offset in units

- *Linear A*

$$P = G(R_0 - R_i) + K(T_i - T_0) + D$$

P: Converted data in units
R_i: Current Reading in selected unit[1] during observation
T_i: Temperature during the observation

Where *G* is the linear factor, *K* is the thermal factor and *D* is an offset in units

- *Linear B*

$$P = G(R_i - R_0) + K(T_i - T_0) + D$$

P: Converted data in units
R_i: Current Reading in selected unit[1] during observation
T_i: Temperature during the observation

Where *G* is the linear factor, *K* is the thermal factor and *D* is an offset in units

- *Linear A with compensation*

$$P = G(R_0 - R_i) + K(T_i - T_0) - F(S_i - S_0) + D$$

P: Converted data in units
R_i: Current Reading in selected unit[1] during observation
T_i: Temperature during the observation
S_i: Current barometric pressure in kPa

Where *G* is the linear factor, *K* is the thermal factor, F is a conversion factor for pressure and *D* is an offset in units

- *Linear B with compensation*

$$P = G(R_i - R_0) + K(T_i - T_0) - F(S_i - S_0) + D$$

P: Converted data in units
R_i: Current reading in selected unit[1] during observation
T_i: Temperature during the observation
S_i: Current barometric pressure in kPa

Where *G* is the linear factor, *K* is the thermal factor, F is a conversion factor for pressure and *D* is an offset in units

- *Polynomial A with compensation*

$$P = AR_i^2 + BR_i + C + K(T_i - T_0) - F(S_i - S_0) + D$$

P: Converted data in units
R_i: Current reading in selected unit[1] during observation
T_i: Temperature during the observation
S_i: Current barometric pressure in kPa

Where *A, B* and *C* are polynomial gage factors, *K* is thermal factor, *F* is a conversion factor for pressure and *D* is an offset in units

- *Polynomial B with compensation*

$$P = C0 + C1R_i + C2T_i + C3R_i^2 + C4R_iT_i + C5T_i^2 - F(S_i - S_0) + D$$

P: Converted data in units
R_i: Current reading in selected unit[1] during observation
T_i: Temperature during the observation
S_i: Current barometric pressure in kPa

Where *C*'s are polynomial gage factors, F is a conversion factor for pressure and *D* is an offset in units

- *Third degree polynomial with compensation*

$$P = AR_i^3 + BR_i^2 + CR_i + D + K(T_i - T_0) + F(S_i - S_0) + E$$

P: Converted data in units
R_i: Current reading in selected unit[1] during observation
T_i: Temperature during the observation
S_i: Current barometric pressure in kPa

Where *A, B, C* and *D* are polynomial gage factors, *K* is the thermal factor, *F* is a conversion factor for pressure and *E* is an offset in units

It is not possible to convert data to more than one engineering unit (i.e piezometer reading can be converted to pressure or to meters, but not both).

Please note that the *D* parameter is used to refer water column to a reference (i.e meters above sea level)

Please check the "how to convert to engineering units" document as an example.

For vibrating wire Load cells with strain gauges, please note that only 3 or 5 average formulae have been implemented on the CMT and thus converting raw data from Load Cells with different amounts of strain gauges sensors to engineering units won't be possible . In those cases we recommend using a third party software.

- *VW load cells (3 gauges averaged channels 1, 2, 3)*

$$Load = (Average_i - Average_0)B + D$$

Load: Converted data in units
$Average_i$: Average of current activated readings in selected unit[1] (ch 1, ch 2 and ch 3)

Where B is a calibration factor and D is an offset in units

- *VW load cells (5 gauges averaged)*

$$Load = (Average_i - Average_0)B + D$$

Load: Converted data in units
$Average_i$: Average of current activated readings in selected unit[1] (ch 1, ch 2, ch 3, ch4 and ch 5)

Where B is a calibration factor and D is an offset in units

On the bottom of the page, formulae for thermistor conversion can be selected. The most common thermistor types have been added (YSI44005 and BR55KA822J), but on the drop-down menu a custom thermistor conversion can be also used.

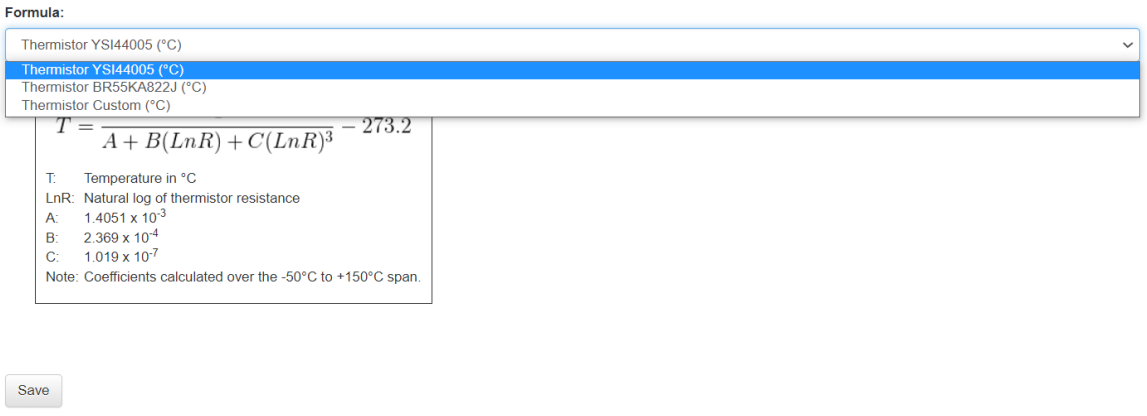


Figure 9: Available formulae for thermistors

On the pressure gear, it is possible to convert measured pressure with the internal barometer from the Vibrating wire datalogger and convert it to pressure at sea level. This pressure will be used for barometric compensation formulae.

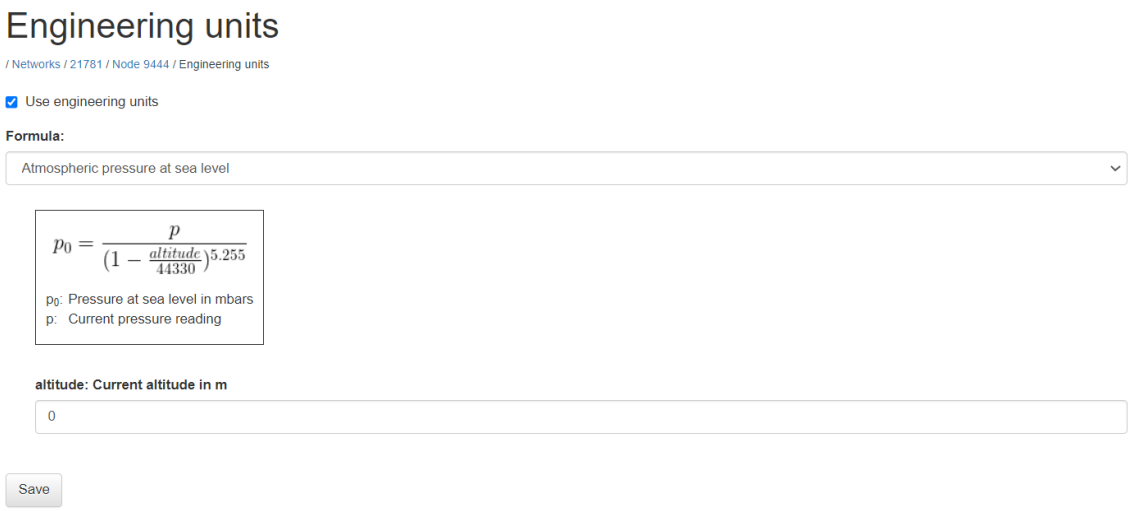


Figure 10: Formula for converting pressure

Errors implemented

When a missing sensor is detected, an error is returned and a timestamp is registered on the reading error CSV file on the CMT , while the reading file will show blank readings corresponding to that timestamp.

Please note that this feature is available for CMT with firmware version 2.4.1 onwards.

Maintenance and troubleshooting

The node is packaged in a rugged aluminum box and should provide many years of trouble-free operation.

Wireless vibrating wire dataloggers require no maintenance other than normal cleaning, battery replacement and inspection of the seals. Apart from this maintenance, the devices are not field serviceable.

It is important to avoid any impact that could distort the mechanics of the device, high vibration levels or Water ingress. The wireless node should never be submerged in water. **WATER DAMAGE TO INTERNAL COMPONENTS VOIDS THE WARRANTY.**

In case of doubt regarding the reliability of the readings, first inspect the wireless node. Having verified that the device has not been affected by the cases described before, the user can open a ticket to support@worldsensing.com in our Help Center to request a Return Material Authorization (RMA).

After receiving the device, Worldsensing will inspect the mechanical parts and the node will go through the quality chain to detect potential failures. If this occurs after expiration of the warranty, Worldsensing will repair the equipment at its factory and may require additional charges for parts and labor charges. Worldsensing will provide a quote for repairs, if feasible, for products returned after warranty expiration.

Worldsensing is not liable for damages or erroneous decisions caused by defective units, since it is only responsible for the warranty of the equipment.

Battery Lifespan

Battery consumption varies depending on the number of sensors, sampling rate and environmental and wireless network conditions. The following tables provide the battery lifespan in years per channel according to different wireless network conditions.

Note: European radios work between SF7 and SF11, and FCC radios work between SF7 and SF9.

Table 2: Battery lifespan in years per vibrating wire node channel assuming intermediate environmental conditions for European and FCC radios

Number of channels	Sampling rate (considering SF 9 14dB)					Sampling rate (considering SF 8 20dB)				
	30 secs	5 min	30 min	1 h	6 h	30 secs	5 min	30 min	1 h	6 h
1	0.1	0.9	2.8	3.5	4.6	0.1	1.1	3.2	3.8	4.7
5	0.3	2.2	6	7.1	8.5	0.4	3	6.6	7.6	8.6

Note: The estimated lifespans are for a 1-channel node using 1 C-size cell and a 5-channel node with 4 C-size cells.

Table 3: Battery lifespan in years per vibrating wire node channel assuming extreme environmental conditions for European radios.

Number of channels	Sampling rate (considering SF 7 14dB)					Sampling rate (considering SF 11 14dB)				
	30 secs	5 min	30 min	1 h	6 h	30 secs	5 min	30 min	1 h	6 h
1	0.2	1.6	3.7	4.2	4.8	0.03	0.3	1.4	2.2	4.1
5	0.6	3.7	7.21	7.95	8.6	0.1	0.87	3.5	5	7.85

Note: The estimated lifespans are for a 1-channel node using 1 C-size cell and a 5-channel node with 4 C-size cells.

Notes: These tables are estimates based on the consumption profile of Saft LSH14 batteries, provided only to assist in project maintenance. Spreading factors have an important effect on battery lifespan. Extreme temperatures could cut capacity by 20 to 40%, Check battery specifications.

Data Storage

The internal node has 4 MB of memory. A 5-channel data logger connected to five sensors stores up to 73,500 readings. A 1-channel data logger stores up to 200,000 readings. Table 3 shows how long data is stored on 1- and 5-channel data loggers. When the memory is full, new readings overwrite the earliest ones. As well as sensor data, the device collects hourly health data on battery voltage, internal temperature and node uptime.

Number of sensors	Sampling rate		
	60 minutes	30 minutes	10 minutes
1	more than 10 years	more than 20 years	3.5 years
5	8 years	4 years	17 months

Table 4: Times of data storage (without overwriting) for LS VW-data logger 1 ch and LS VW- data logger 5 ch

Data is stored in comma-separated value (CSV) files. You can download readings and health files using the WS App.

To do this, connect an Android device to the node Mini USB port with a USB-OTG cable. When WS App loads, download data by clicking on the **Download Data** tab. You need to set a start and end date for the data you want to download. The Android device allows these CSV files to be opened with applications such as e-mail or cloud apps. Files are also stored in the device memory, on the SD card in the WS App folder.

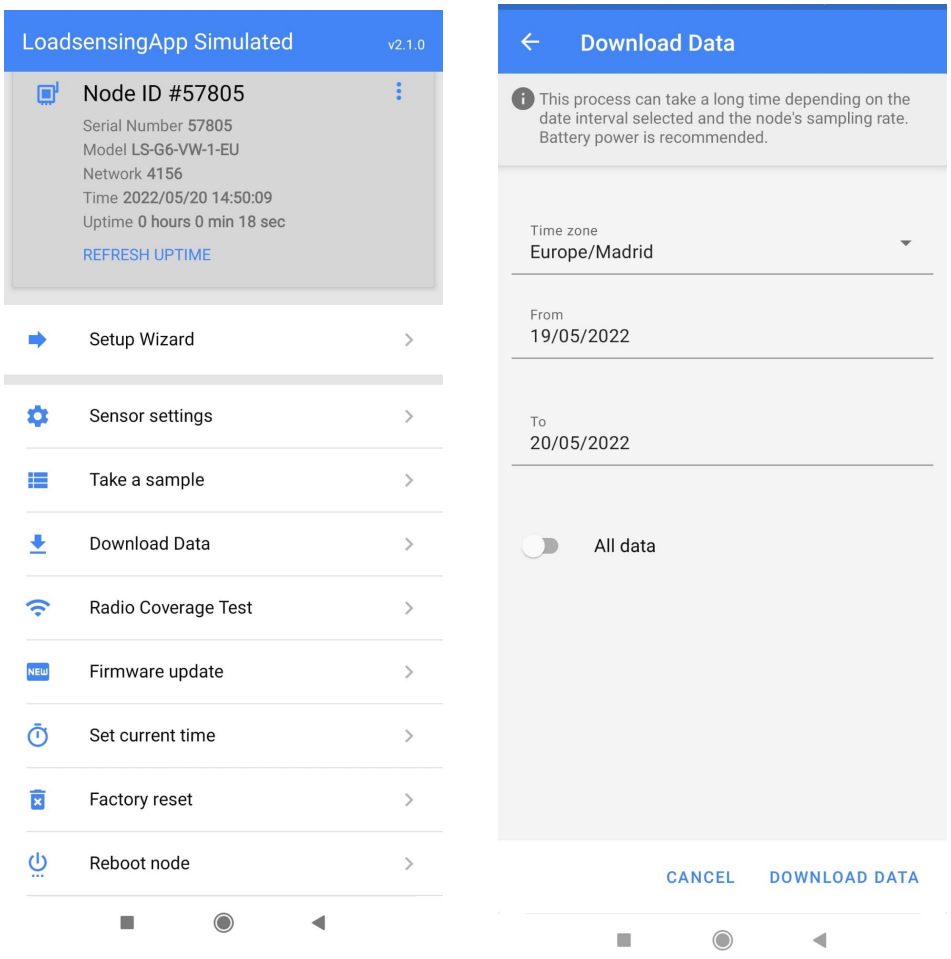


Fig 11. How to download readings from the Android device.

FAQs

How can I improve the resolution of the vibrating wire data logger?

We've improved the resolution and accuracy from data logger firmware version 2.43. and gateway firmware version 2.4.1 onwards. To benefit from this feature, make sure you use a sweep frequency group instead of configuring a custom sweep frequency within a wider frequency range. For further information, please refer to the algorithm refinement chapter.

How can I know if a sensor has been disconnected from the node? Which magnitude threshold should I apply?

You can detect when a wire has been cut with the node firmware version 2.42. and gateway firmware version 2.4.1 onwards. To use this feature, set a threshold above the noise from the sensor. We recommended a threshold value of 0.02, but there are sensors with magnitudes closer to the noise level. For further information, please refer to the sensor detection functionality chapter.

If you have a gateway with a firmware version below 2.4.1, then when a sensor has been disconnected an out-of-range value of 16,777.215 Hz will appear.

I have a big variation on frequency readings. Is this normal?

Usually the frequency variation between readings is very low. If you are experiencing high frequency variation we recommend you:

- Check that the sensor is configured in the correct sweep frequency group, according to the manufacturer's data sheet.
- Check that the pairs are wired to the node according to the manufacturer's data sheet and carry out multimeter tests to check the resistance values.

- Check the wires. You can do this with the sensor wired detection function, although it is important to set the correct threshold on the node.

If the variation is not due to any of these causes, it is possible that the sensor or the data logger has burnt out due to an electrical discharge. Please refer to the surge protection document.

Should I apply surge protection to my logger?

LS-G6 nodes have been equipped with class 2 surge immunity protection against damaging spikes and transients. That means the node is protected up to a voltage of 1kV. You need to ground the node or the surge protection cannot prevent it from being damaged by direct or indirect lightning. We strongly recommend applying surge protection for project sites in isolated environments. But note that nothing can protect a system from a direct lighting strike or one so close that it overloads the capacity of the surge protection. For further information please refer to the surge protection document.

I need to install the node inside a manhole. What do you recommend?

When facing manhole installation there are two main points you need to consider. First, close the device properly according to the water tightness document. You can improve the water tightness of the node by applying sealant or bicomponent gel inside the electric case. Bear in mind that our equipment is IP67 certified and we do not guarantee water damage from conditions above this certification level.

The second point is that metallic manhole lids reduce radio coverage, so we recommend you use plastic lids if possible. If not, you can find some useful recommendations in our Installation in *Manholes document.*

Should I expect the same radio coverage while using the LS-G6-VW-1P?

You can expect lower radio coverage with the polycarbonate case node, as it comes with an internal antenna. As a rule of thumb the internal antenna has 60-70% of the range of the external one.

Some timestamps are missing from the node but there is no 'radio message lost' alert. What's going on?

If your node is not properly closed, humidity might penetrate the device. This happens in humid weather or locations where there is a big temperature difference between night and day. As the gore valve will allow the humidity to escape, if there is no damage to the electronics the node will start taking readings again once it has dried out.

CONTACT WORLDSENSING

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