

Loadsensing LS-G6 Piconode

Configuring and operating the Loadsensing LS-G6 Piconode



Piconode

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Piconode overview

The Worldsensing LS-G6-Piconode comprises a configurable single channel, a thermistor, and a pulse counter node. It can be regarded as a simpler version of LS-G6-VOLT node, in the sense that it is compatible with sensors of different analog signal output, such as full Wheatstone bridge, potentiometer/ratiometric, single-ended voltage and thermistors, but with the novelty of being able to read potential-free (dry contact) pulses. The sensor's voltage excitation required to be compatible with the piconode is 5 VDV up to 70 mA. A distinctive feature of Piconode as compared to LS-G6-VOLT and LS-G6 vibrating wire nodes is that it collects and transmits the internal temperature at each reading, to an accuracy of 2 °C.

Unlike other LS-G6 nodes, the antenna in a piconode is located internally in the casing upper cover. The coverage tests results prove that distances over five kilometres can be achieved in urban areas.

You can check the specifications of the piconode here: <https://www.worldsensing.com/product/loadsensing/>

Equipment

The Worldsensing LS-G6-Piconode is equipped with an internal antenna.

Other additional accessories can be supplied upon request. Here is a partial list, please inquire for other accessories:

- USB-OTG configuration cable
- Batteries
- Sensor surge protection
- Mounting supports

Piconode installation

Supports

The Piconode can be mounted:

- On a wall - polycarbonate wall mounting brackets are available as additional accessories (refer to Figures 1, 2, and 3)

- On a raised horizontal surface - same mounting brackets as above
 - Inside a manhole (with a plastic or metallic cover) - no special accessories are available for this mounting type.
- See [Annex 10 LS-G6 Dataloggers installation on manholes](#) for further detail

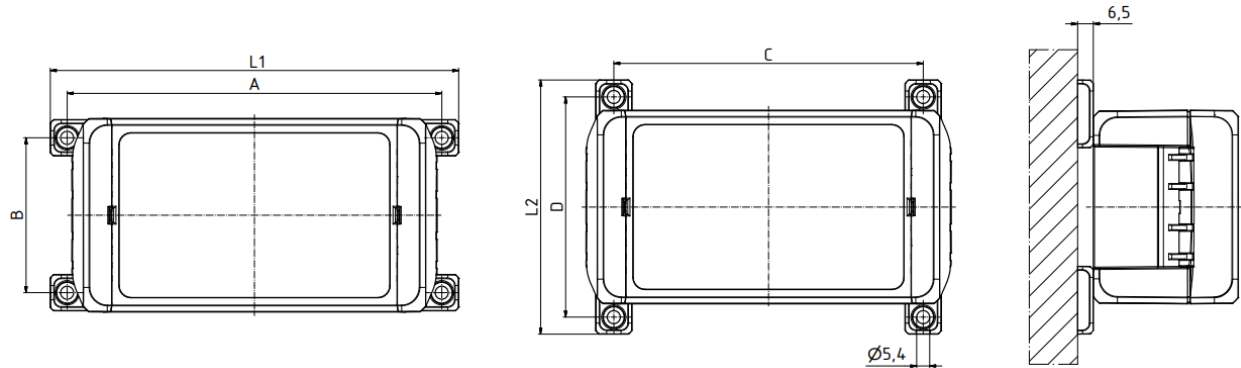


Figure 1: Plan and section views of the mounting brackets (packs of four brackets and four screws)

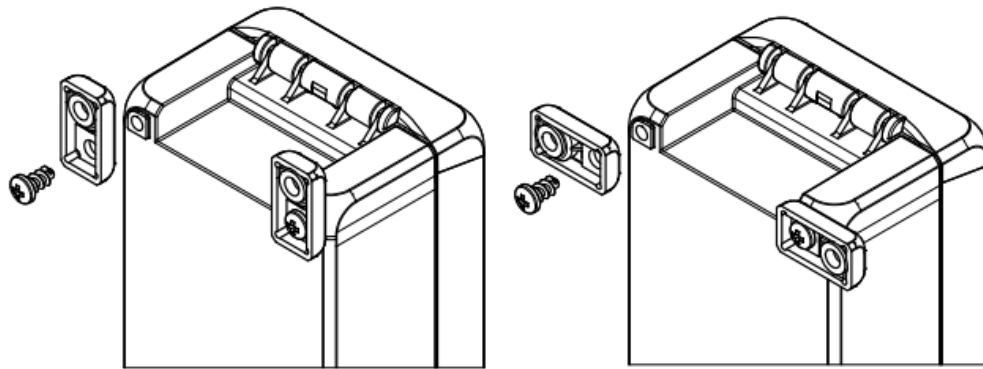


Figure 2: Lateral view of mounting brackets - vertical and horizontal positions

Anschraubmaße / screw mounting dimensions						
Modell / model	A	B	L1	C	D	L2
BOCUBE B 1008..	117	64	131	90	91	105

Figure 3: Screw mounting dimensions

Powering the Piconode

The data logger arrives sealed and without batteries installed; however, it is possible to have it with the batteries inserted upon request, in that case you should remove the non-conductive material that protects the terminals.

In order to initialise the piconode, the user should follow these steps:

1. Open the data logger (using a 2-mm flat-head screwdriver). The batteries should be inserted into the battery holder placed above the logical board (Figure 4). The internal antenna is internally attached to the cover and is connected to the main board through a cable - be careful not to snap the cable while opening the node



Figure 4: The Piconode can be opened making use of a 2-mm screwdriver

2. Insert one or two **C-type batteries** into the battery holders. Polarity is indicated (see Annex 4 for further information on the batteries)

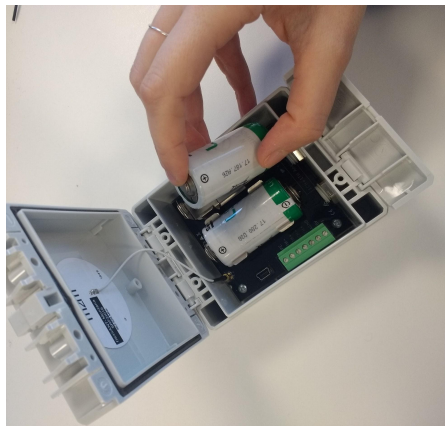


Figure 5: One or two batteries power the Piconode

Note: The device has reverse battery protection but it is not safe to keep batteries reversed in the data logger for a long time.

Warning: Risk of explosion if the incorrect batteries are used. Dispose of batteries according to the instructions. This equipment should be installed in restricted access areas.

3. The node does not have a switch (Figure 6), therefore the only way possible to use the node is with batteries



Figure 6: Unlike other LS-G6 nodes, there is no power switch in the Piconode

Piconode configuration

Ideally, this step of the process should be carried out in the same location in which the node is going to be installed. This way, you can perform an on-site radio coverage test.

The node configuration process is done using the WorldSensing DLog app, which is compatible with any Android device equipped with OTG technology (Lollipop 5.1 sdk or higher is required). WorldSensing has tested Motorola Moto G4 and G5 and guarantees that they are able to configure and test all nodes. Battery usage may be required as Android devices may not be able to power some sensors.

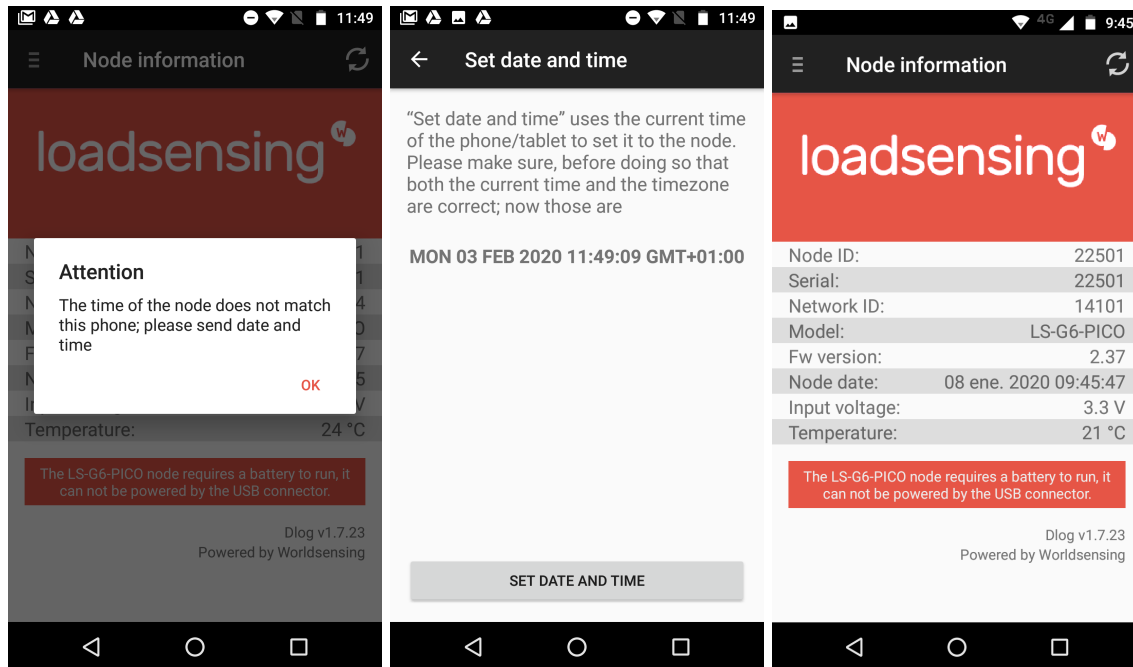
DLog starts up once the device has been connected to the node using the USB-OTG cable. Manual startup is not necessary.

The whole configuration process shouldn't take more than five minutes and, from then, the node will start taking readings and sending data to the gateway (once the gateway is already up and running).

Step 1: Connect DLog Android application

Download the app onto your Android device from the [download website](#).

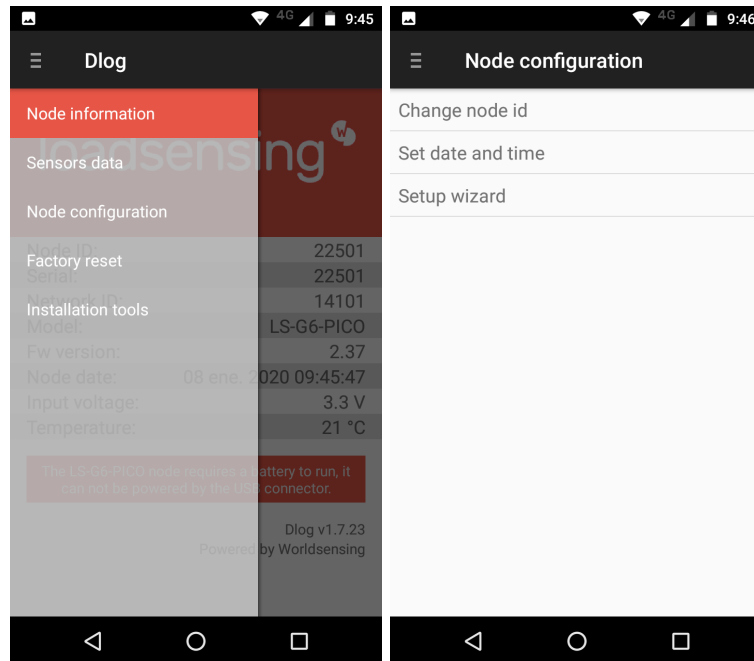
Connect your device to the node using the USB-OTG cable (see the Accessories list). Make sure the battery or batteries are correctly inserted. The app will automatically appear and display a message (Figure 7) requesting that the date and time of the node be set (it will take them from the mobile phone or tablet in use, Figure 8), afterwards, the node's basic information will appear (Figure 9).



Figures 7, 8 and 9: in sequence, showing the first Dlog steps to set up a Piconode through Dlog app.

Step 2: DLog main menu

1. **Node info** - Contains basic information about the node, such as version, ID, or temperature
2. **Sensors data** - Access to real time sensor readings and downloaded data stored in the node
3. **Node Configuration** - Access this menu to configure the node
 - a. Change node ID - this is optional and allows you to change the node ID and use a different number
 - b. Set the date and time - this information will be taken from the mobile phone or the laptop in use
 - c. Setup wizard - sensor and radio configuration
 - d. To access node configuration, on the main menu go to **Node configuration** and then select **Setup Wizard**

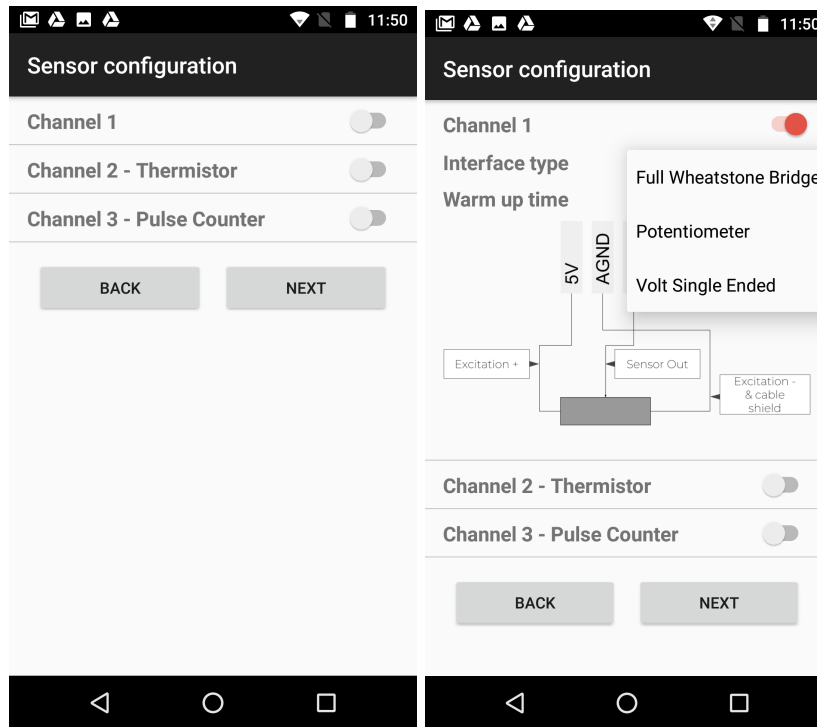


Figures 10 and 11: Main configuration menu and Node configuration setting options, respectively

4. **Factory Reset** - this option resets the configuration parameters and removes all stored data. It is designed to allow the node to be used in different sites. We do not recommend using it for other purposes unless suggested by Worldsensing Technical Support
5. **Installation tools** - this node does not have any installation tool implemented yet

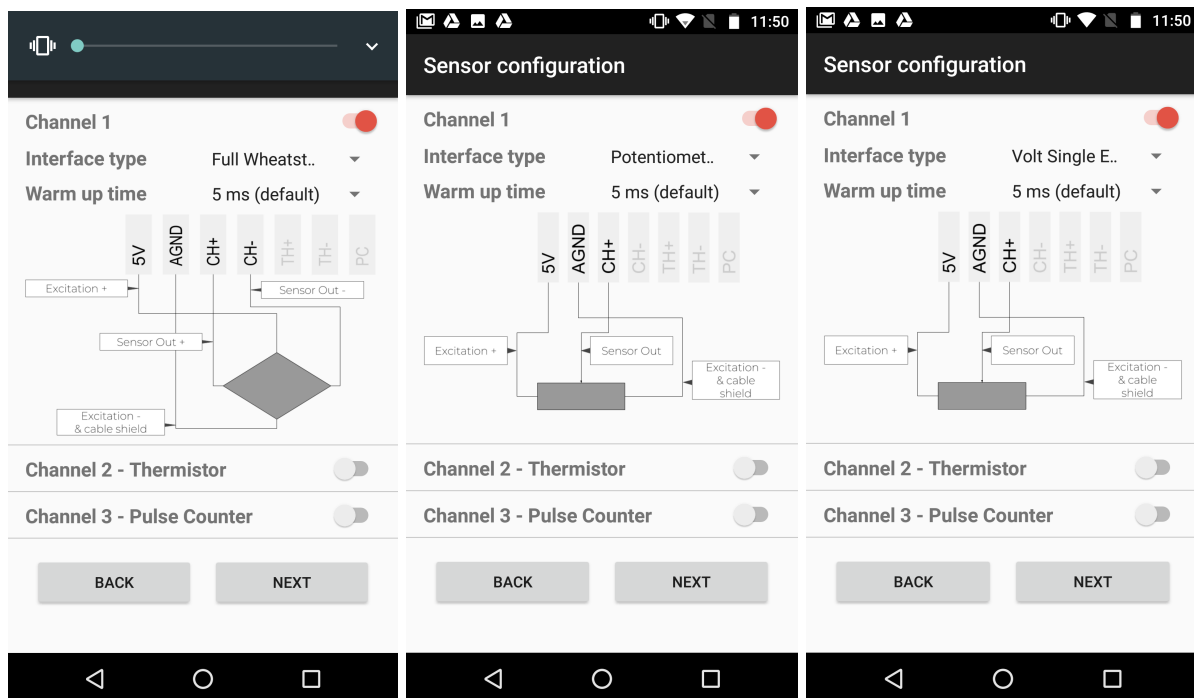
Step 3: Sensor wiring and set up

Wiring can be connected once the **Setup Wizard** in the Android Configuration app has been initialized, which is when the wiring schemes appear. There are three channels from which to choose. A wiring diagram shows up on the phone or tablet used for configuration for each one of the options selected as shown below.



Figures 12 and 13: Three channels of the Piconode and Channel 1 options (sensor types), respectively

Channel 1 for Full Wheatstone Bridge, Potentiometer/Ratiometric and Volt Single Ended



Figures 14, 15 and 16: Full Wheatstone bridge, Potentiometer/Ratiometric and Volt Single Ended sensors wiring diagram, respectively

Full Wheatstone Bridge, Potentiometer/Ratiometric and Volt Single Ended are three types of signal output compatible with Piconodes, along with Thermistors and Pulse Counters, As shown in the above images, all three types of sensors are powered at 5 V dc through the Piconode. This is the maximum voltage the Piconode can supply. This aspect is key to knowing if a sensor is compatible with the Piconode.

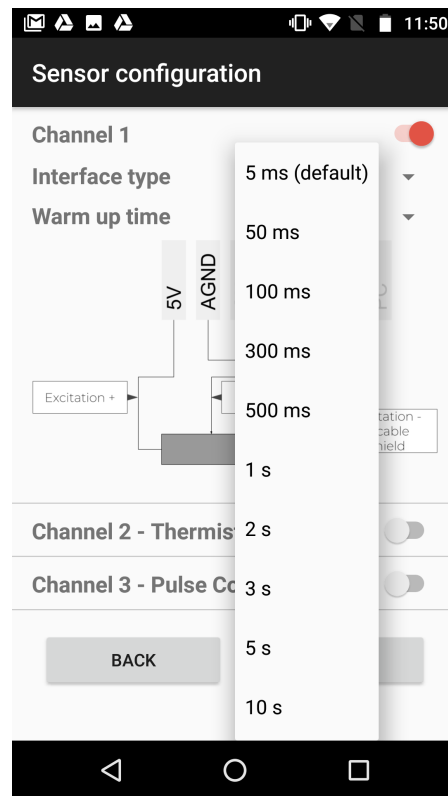
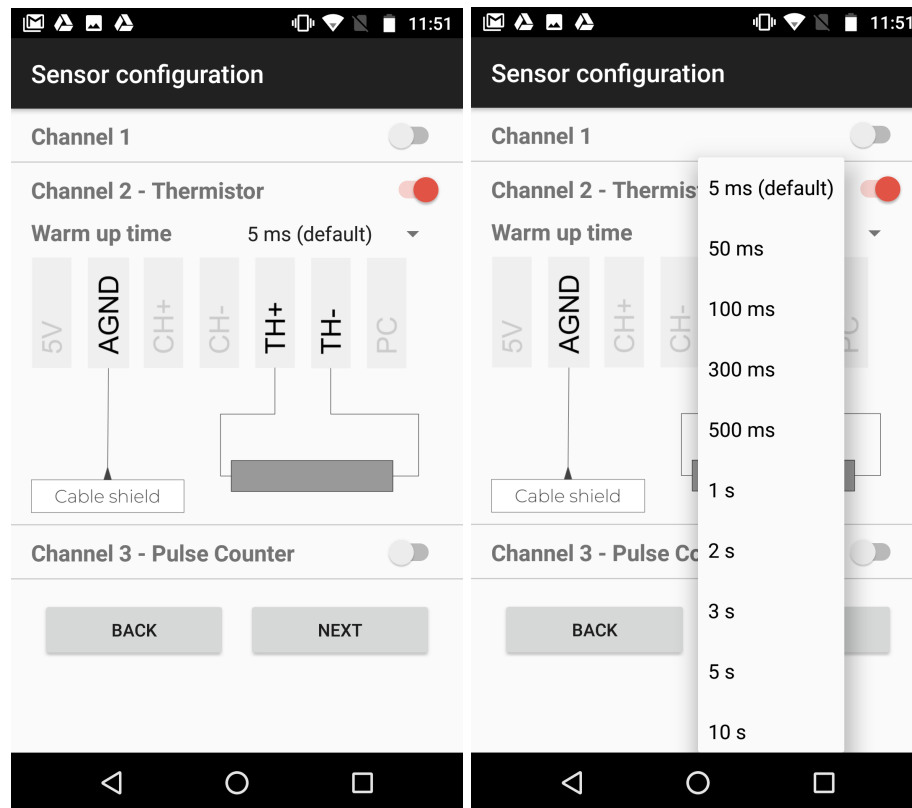


Figure 17: Available warm-up times

For each one of these types of sensors, a warm-up time has to be set. The value set by default, if not changed, is 5 ms. Other allowed values are 50 ms, 100 ms, 300 ms, 500 ms, 1 s, 2 s, 3 s, and 5 s. The user should refer to the sensor's manual to check which value is necessary or else contact the sensor supplier to get that information.

In case of sampling at a high rate, high values of warm-up time are automatically disabled. The user has to consider that the higher the warm-up time, the higher will be the battery consumption. This is important in estimating the battery lifespan.

Channel 2- Thermistor



Figures 18 and 19: Wiring diagram for a thermistor and available warm up times, respectively

When connecting a thermistor, a warm-up time has to be entered (refer to the above explanation on warm-up time for Channel 1).

Channel 3 Pulse counter

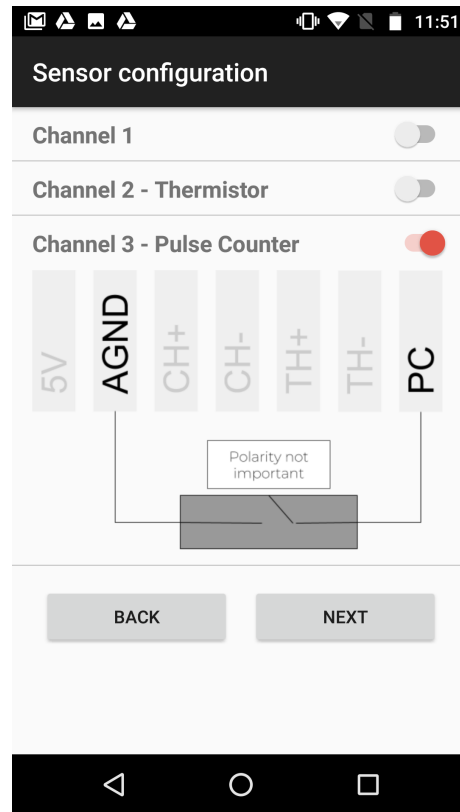


Figure 20: Wiring diagram for a pulse counter

Sensors with potential-free (dry contact) pulses output are usually furnished with two cables, these two cables are interchangeable and have to be connected one to the PC (power connection) terminal and the other one to the AGND (grounding).

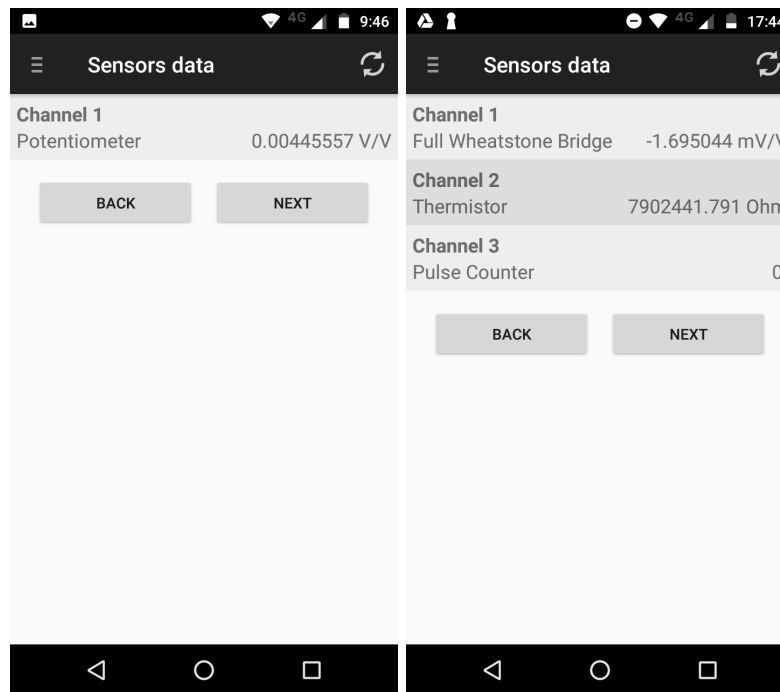
The Piconode can read a pulse rate of up to 50 Hz, its measuring range is 0 to 2 MOhms, and it has a memory capacity of 4.294.967.296 pulses that can be accumulated. Once memory capacity is exceeded, the Piconode will start counting over from zero.

Notes:

1. Since LS-G6-PICO has two battery cells and not much space is left, its socket is removable, thereby facilitating the wiring of the sensor to which to connect
2. In any case, the customer should also refer to the sensor's manual to see the wiring scheme of the sensor
3. All three channels can be used together

Step 4: Sensors data

After enabling the channel or channels to use and selecting the interface type (if applicable), the next screen displays the sensor's data as shown in the images below.



Figures 21 and 22: Potentiometer's data in Channel 1 and Full Wheatstone Bridge, Thermistor, and Pulse counter data in Channel 1, 2 and 3, respectively

Step 5: Radio Network configuration

At this stage, several parameters need to be specified.

Radio Type

There are two types of radio from which to choose, namely, Radio off and LS radio (Figure 23). The former is meant to work in standalone, this is with the Piconode collecting data from the sensor or sensors it has connected but without having deployed a gateway to transfer the data. LS radio (Loadsensing radio) refers to having a node (Piconode in this case) and a gateway.

Radio off

Only the Sampling Rate parameter needs to be indicated (see figure 24).

The message shown specifies that:

- LS Radio - is to be selected for systems working with the original gateway architecture (dataserver embedded in the gateway)

- MultiGW - Multi Gateway is to be selected for systems working with the multi gateway architecture (external dataserver) - currently the Piconode is not developed to work with the MultiGW new architecture

After selecting the desired sampling rate and clicking on the Next button the setup is finished (figure 25).

The image displays two screenshots of a mobile application interface for radio configuration. The left screenshot (Figure 23) shows the 'Radio configuration' screen with a dropdown menu open for 'Radio type', showing 'Radio off' and 'LS Radio' options. The right screenshot (Figure 24) shows the same screen with 'Radio off' selected. Both screens show fields for 'Sampling rate' (30 s), 'Region' (923A), 'Network Size' (1-4 nodes), 'Edit network ID and password' (toggle), 'Network ID' (21344), 'Password', and 'Advanced options' (Max. spreading factor: 11). A 'BACK' and 'NEXT' button are visible at the bottom of the right screenshot.

Figures 23 and 24: Two options under radio type and radio off settings for standalone Piconodes

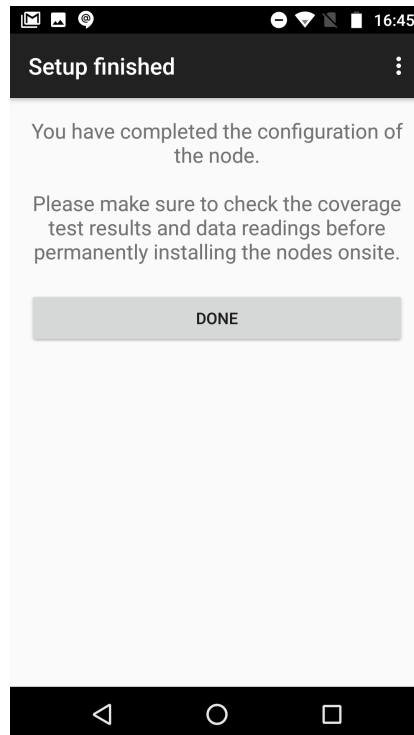


Figure 25: End of the test

LS Radio

This is the radio type to select when the Piconode is meant to send the data to a Gateway: frequency

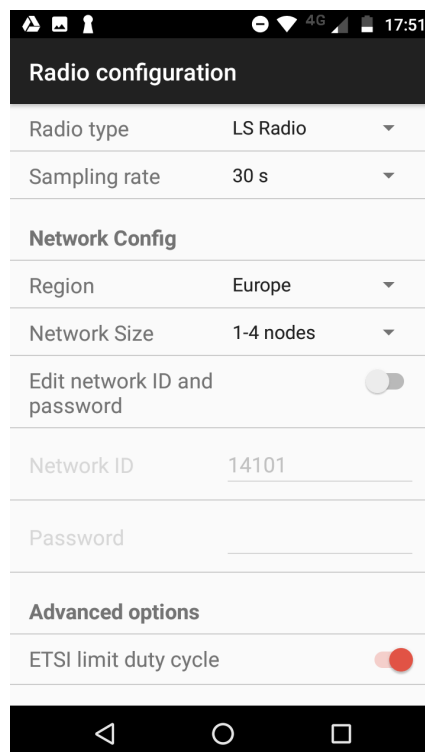


Figure 26: LS Radio type

Sampling Rate

Choose the desired reading frequency from the drop-down menu (see Figure 27). The highest possible sampling rate is limited by the network size, and vice versa. Smaller networks can read up to every 30 seconds and frequency is progressively reduced on bigger networks. DLog will show the available sampling rates according to the network size chosen in the previous step.

For more information regarding network size limitations, see the Tables, Number of nodes, Sampling rate, and Slot time chapters in the [LS-G6 Gateway User Guide](#).

Network Configuration - Region

The Region is another parameter the user has to select according to the country in which the gateway and nodes are deployed (Figure 28). This region has to match the radio configuration set in the gateway to be used for the network (Figure 29).

Radio configuration	
Radio type	30 s
Sampling rate	1 min
Network Config	2 min
Region	5 min
Network Size	10 min
Edit network ID and password	15 min
Network ID	30 min
Password	1 h
Advanced options	2 h
Max. spreading factor	4 h
	6 h

Radio configuration	
Radio type	LS Radio
Sampling rate	30 s
Network Config	Europe
Region	FCC
Network Size	866I
Edit network ID and password	916I
Network ID	922B
Password	922K
Advanced options	922S
Max. spreading factor	923A
	923M

Figures 27 and 28: Sampling rate options respectively and region under Network Configuration

loadsensing
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Networks

Status ▾

Configuration ▾

Radio

/ Radio

Change country and frequency range:

- These parameters must match those configured on all sensors in the network
- You must choose the correct country where this equipment will be used. This device may otherwise fail to comply with local regulations

☐ 866I

☒ Europe

☐ Malaysia-legacy-868

Changes will not be applied until next device reboot.

Change Country and frequency

Change Radio Network ID and password for this gateway:

- These parameters must match those configured on all sensors in the network
- The network ID matches the Gateway ID by default. Do not change unless you know what you're doing
- The network password cannot be retrieved from the gateway, **write it down and keep it in a safe place**, you will need it to configure the nodes, and in case you need to replace this gateway
- The network password is case sensitive

Network ID:

Network Password:

Changes will not be applied until next device reboot.

Change Network ID and password

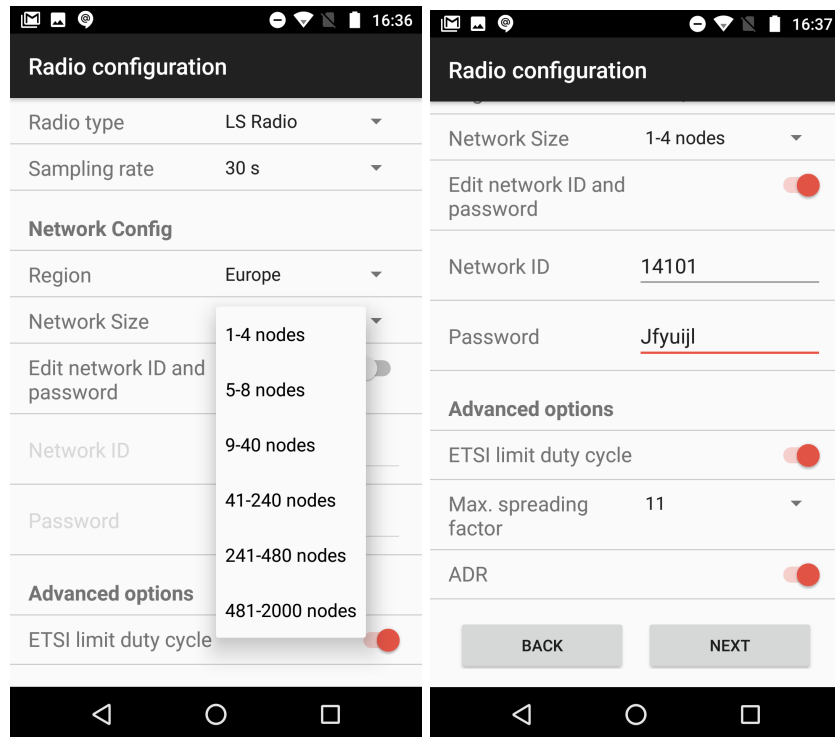
Figure 29: Radio Configuration settings of the gateway

Network Configuration - Network Size

The network size (Figure 30) is the number of nodes (data loggers and Loadsensing wireless sensors). We strongly recommend initially setting it to the final number of nodes that the wireless network will have since this parameter determines the available sampling rates. Large networks do not allow selection of high sampling rates.

For more information, please check the Radio specification chapter in the Gateway User Guide.

Correct configuration of these two parameters (network size and sensor sampling rate) is crucial to prevent data transmission collisions, which translates to data loss on the gateway. For more information, please check the Radio specification chapter in the Gateway User Guide.



Figures 30 and 31: Network size and network ID and password parameters, respectively

Edit network ID and password

This tab (Figure 31) needs to be activated (by swiping the button to the right) to enable radio communication between the nodes and the gateway. The user has to type the corresponding ID of the network and the password.

Advanced options

See the Radio specification chapter of the Gateway User Guide or **Annex 01: LS G6 Gateway Radio Specifications v1.8** for more details on radio models and settings.

Bear in mind that DLog saves and maintains Radio settings to simplify configuration of all the nodes in a network. To modify these settings, Radio must be enabled again.

Step 6: Radio Signal Coverage Test

This is the final step in node configuration. DLog performs a signal coverage test to check the quality of communication with the gateway. The gateway must have been previously connected and configured.

This test will check for correct connectivity between the data logger and the gateway. The data logger will send some test packages. The Android app will then check on the gateway (using the Internet connection) for the reception of these packets. Hence, the test will check for:

- Correct gateway operation and communication

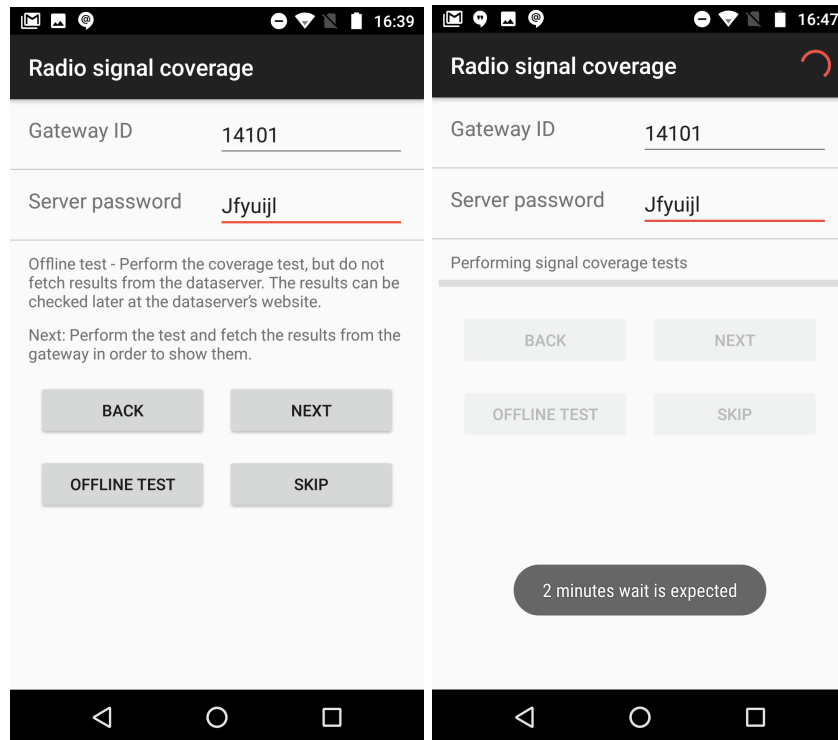
- Correct radio configuration of both the gateway and data logger (including matching region and ID/password configurations)
- Quality of the signal received by the gateway from the data logger

Online Coverage Test

By clicking the Next button, DLog will run an Online Coverage test. For the results of this test to be immediately displayed on the Android device, the gateway and the Android device must also be connected to the Internet.

In order to perform an Online Coverage test, the gateway serial number and remote access password must be provided to the DLog app (Figure 32). The remote access password is used to protect the gateway from access via the local network or the Internet. It is different from the radio network password even though it is set to the same value by default unless it is changed by the user on the gateway interface (credentials at Gateway Information Sheet). It takes about two minutes for the coverage test to be performed (Figure 33).

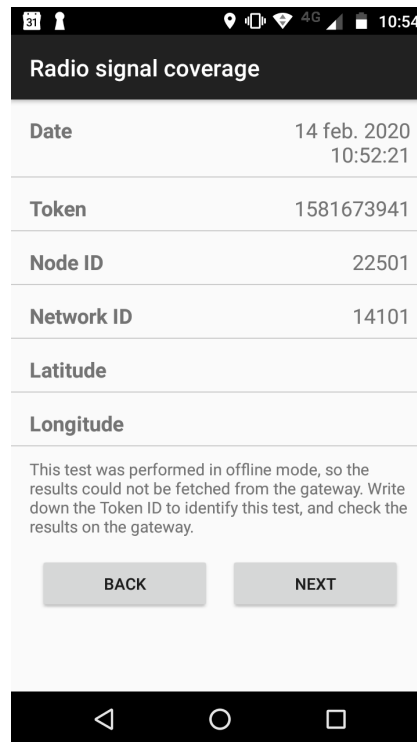
When doing the Radio signal coverage test, the position of the Android device is saved (if you gave the app permission to access the GPS data) and a security token number identifies each test.



Figures 32 and 33: Gateway ID and password are needed to perform a radio coverage test, it takes two minutes to be completed

Offline Coverage Test

If the gateway and/or the Android device are not connected to the Internet during the test, the Online Coverage test will fail and you will need to perform an Offline Coverage test. In this mode, however, the results of the test cannot be displayed on the Android device. The security token number (Figure 34) identifies each test. Write down the token number along with a description of where and under what conditions the test was taken. Check the results of the coverage test on the gateway web interface (under Network → Signal coverage test map → Download all tests of this network in a .csv format).



The screenshot shows an Android application titled "Radio signal coverage". It displays the following information in a form-like layout:

- Date:** 14 feb. 2020 10:52:21
- Token:** 1581673941
- Node ID:** 22501
- Network ID:** 14101
- Latitude:** (field is empty)
- Longitude:** (field is empty)

Below the form, there is a text message: "This test was performed in offline mode, so the results could not be fetched from the gateway. Write down the Token ID to identify this test, and check the results on the gateway." At the bottom of the screen, there are two buttons: "BACK" and "NEXT". The status bar at the top shows the time as 10:54 and various icons including signal strength, battery, and a lock icon.

Figure 34: Token number generated out of an offline radio coverage test

Step 7: Test results interpretation

The results displayed are listed for each Spreading Factor (SF) (Figures 35 and 36). The SF represents a way of modulating data. The lower the SF number is, the shorter the message; thus, more messages can be sent on the network.

Radio signal coverage		Radio signal coverage	
Date	05 Feb 2020 16:39:28	Network ID	14101
Token	1580917168	Latitude	
Node ID	22501	Longitude	
Network ID	14101	SF7	10 / 10
Latitude		SF8	10 / 10
Longitude		SF9	10 / 10
SF7	10 / 10	SF10	5 / 5
SF8	10 / 10	SF11	5 / 5
SF9	10 / 10	SF12	3 / 5
SF10	5 / 5	BACK NEXT	

Figures 35 and 36: Coverage test results (online test) expressed as spreading factor

The SF is proportional to the distance between the data logger and gateway: higher SFs are capable of transmitting data at higher distances, while lower SFs reach lower distances.

During the radio signal coverage test, the data logger sends five or ten data packages at SF7 to SF12. The number of data packages that reach the gateway are captured and give an idea of the quality of the communication.

A coverage test is considered correct if any of the SFs available on the network are able to deliver at least half the packages sent. For more information, please refer to [01. LS G6 Gateway User Guide v1.8](#) and the [Annex 01_ LS G6 Gateway Radio Specifications v1.8](#).

Note: Performing the Radio signal coverage test takes approximately two minutes.

Note: Radio Australia 500MHz works differently. See the wireless radio section in the Gateway User Guide.

Similarly, if an offline radio coverage test is performed, the results can be retrieved from the gateway interface. Under networks, signal coverage test map (Figure 37), the user is able to download the results in a .csv file (Figures 38, 39, and 40).

loadensing

Networks

Status

Configuration

Network: Terrat

/ Networks / 14101

Comments

Gateway ubicada al terrat Viriat 47

Compacted readings CSV files

[compacted-readings-14101-current.dat](#)

+ More

Compacted engineering units CSV files

[compacted-eng-14101-current.dat](#)

+ More

Compacted custom CSV files

Signal coverage test map

Nodes

All

0 nodes selected of 103

	Id	Name	Status	Model	Serial
☐	4099 5m	Vale - piez 1	Ok	LS-G6-VW-1-EU	4099
☐	4444		Ok	LS-G6-VW-1-EU	4444
☐	5051 5m		Ok	LS-G6-INC15	5051

Figure 37: Signal coverage test map from which the test results can be downloaded

loadensing

Networks

Status

Configuration

Signal coverage tests

/ Networks / 14101 / Signal coverage tests

SF 12

SF 11

SF 10

SF 9

SF 8

SF 7

No signal

Low

Best

[Download all tests of this network](#)

Delete tests

Figure 38: Download all tests of this network tool

A	B	C	D	E	F	G	H	I	J
node_id	network_id	token	gateway_id	date	latitude	longitude	received_sf7	expected_sf7	received_sf8
22501	14101	1580917795	14101	2020-02-05T1	0	0	10	10	10
22501	14101	1580917863	14101	2020-02-05T1	0	0	10	10	10

Figure 39: Extract from a coverage test result file, a token number helps to identify the test performed

K	L	M	N	O	P	Q	R	S
expected_sf8	received_sf9	expected_sf9	received_sf10	expected_sf10	received_sf11	expected_sf11	received_sf12	expected_sf12
10	8	10	0	5	0	5	0	5
10	8	10	5	5	5	5	2	5

Figure 40: Coverage test result file extract, test performance expressed in messages received against messages lost for each SF

Safely closing the Piconode

To ensure water tightness and durability of the data logger, the polycarbonate cover has to be fully closed by lifting it up and pressing until you hear a 'click' sound. The cable gland is to be tightened with a 19 mm spanner to ensure watertightness (Figure 41).

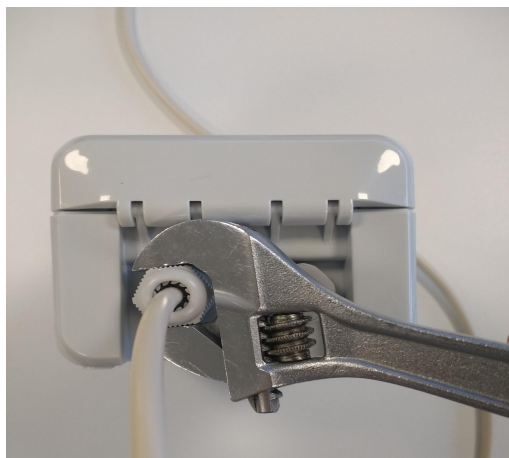


Figure 41: Tightening of the Piconode cable gland

If the above conditions are not met, IP67 rating cannot be guaranteed. Should the data logger need further sealing due to placement in an extreme environment or in a floodable manhole, additional sealants will be required to close the box. See [Annex 10 LS G6 Dataloggers installation on manholes](#).

Maintenance

Piconode Firmware Upgrade Procedure

When a new version of the app is available, DLog will display an automatic message asking the customer to upgrade it. To be able to have the latest Dlog version, the mobile phone or tablet in which the app is installed needs to have Internet, otherwise the customer should contact Loadsensing Technical Support for assistance.

Battery lifespan

This node can run on one or two battery cells and cannot be powered by an USB connector, that is to say, it cannot be powered by using an external power source. No Real Time Clock (RTC) battery is allocated in piconodes. As a result, anytime the battery or batteries are removed, you need to update the node's time and date via Dlog app.

The battery life of the Piconode will depend on the sampling rate selected, on the radio communication quality, i.e. the spreading factor (SF) and the transmission power (Tx Pw) with which the system works and on the temperature profile of the area.

Some estimated figures for a scenario with SF:9 ; Tx Pw 14dB (European radio) and with the temperature profile of Singapore (average temperature: 31°C) are as follows:

Sensor	Sampling rate	One battery	Two batteries
Potentiometer + Thermistor	5 min	1 year	2.5 years
	1 h	5 years	8 years
	6 h	6.5 years	9.5 years

Sensors	Sampling rate	One battery	Two batteries
Gauge + Thermistor	5 min	0.5 years	1.5 years
	1 h	4 years	6.5 years
	6 h	6 years	9 years

Sensors	Sampling rate	One battery	Two batteries
Pulses	5 min	1.5 years	3 years
	1 h	5.5 years	8 years
	6 h	6.5 years	9.5 years

Figure 42. Tables showing the estimated battery duration based on the sensors connected and the sampling rate selected.

Notes:

The above figures are estimated in lab conditions using 2 SAFT LSH 14 batteries with a nominal voltage of 3.6V ([SAFT LSH 14 batteries product sheet](#)).

Type of sensors used for the calculation: 7.5 x 7.5Kohm potentiometer, , 3K thermistor and 300ohm wheatstone bridge strain gauge.

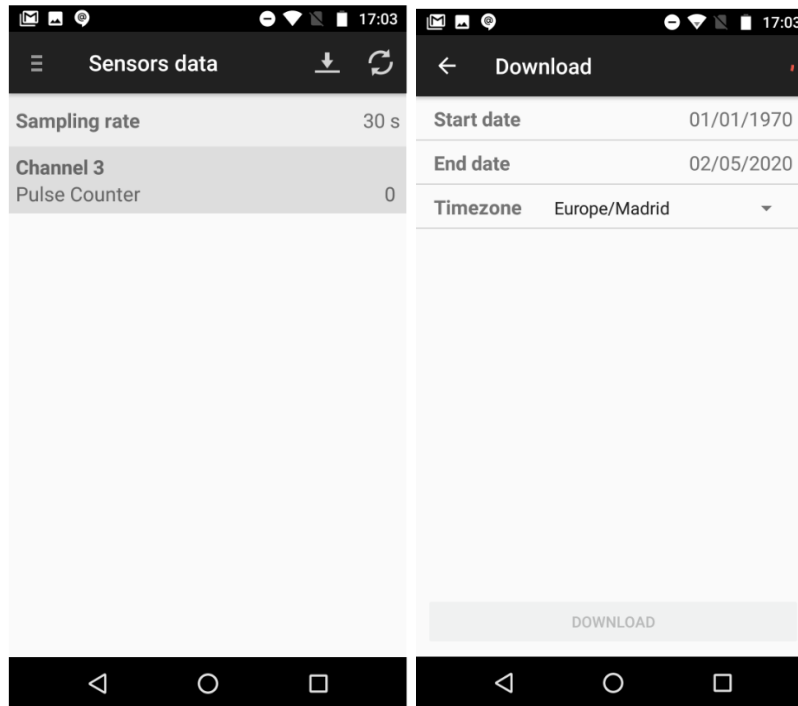
As mentioned, temperature and spreading factor have effects on the the batteries' lifespan as shown in the following table:

Temperature profile:	Singapore (average temp. 31°C)		Barcelona (average temp. 19°C)		Moscow (average temp. 7°C)	
Sampling rate	SF8	SF9	SF8	SF9	SF8	SF9
5min	2	1.9	2.1	2	2.2	2
1h	8	7.8	9.1	9	9.7	9.5
6h	9.8	9.8	11.7	11.7	12.8	12.8

Figure 43. Table showing the estimated battery duration average in years for different SR, SF and T^a profiles. Source: SAFT

Data Acquisition and storage

Data is stored in the laser node in comma-separated variable (.csv) files. These files are available to download using the Android DLog application. Both readings and health files can be downloaded. For this purpose, an Android device must be connected to the node Mini USB port with a USB-OTG cable. When the DLog application loads, data can be downloaded by clicking on the Download arrow-shape icon in the Sensors Data tab as shown in Figure 44. A Start and End date must be set, and data from that period will be downloaded (Figure 45). The Android device allows these .csv files to be opened with applications such as email or cloud apps. Files are also stored on the device memory, on the SD Card, or in the DLog folder.



Figures 44 and 45: Sensors data tool and settings to download data recorded for a certain period of time

Pulse counter particularities - Engineering Units

There are some particularities related to the pulse counter. This type of signal input implies data to be continuously stored, in a way that the value recorded when sampling is added up to the previous one. The Piconode therefore, stores an accumulative value from the moment the node starts taking readings. The maximum number of pulses that can be recorded until the reset-to-zero point is 2^{32} . Consequently, if the user wishes to start over the data counting (from zero value), either the node has to be reset via the Dlog app or the engineering units have to be redefined.

Steps to reset the node configuration via Dlog app

On setup wizard

- Disable channel 3- pulse counter
- Enable Channel 1 or Channel 2, or both if already in use. They will have to be reconfigured by choosing the same settings. The coverage test can be skipped
- Enable Channel 3 - pulse counter
- Proceed with the usual node configuration, the coverage test can be skipped

Steps to reset the node configuration via Gateway configuration

On Networks – Node ID

- Click on the wheel icon located on the right side of the Last readings and Time series graphs panel as shown in the image below (Figure 46)

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Networks Status Configuration

Node 22501

/ Networks / 14101 / Node 22501

Name

Installation date

Comments

Model LS-G6-PICO

Firmware version 2.37

Serial number 22501

Health CSV files [22501-health-current.csv](#)
+ More

LS-G6-PICO CSV files [22501-readings-current.csv](#)
+ More

▼ Last readings and Time series graphs

Channel	Raw reading
1 Full Wheatstone Bridge	-7.782052 mV/V
2 Thermistor	7906515.809 Ohms
3 Pulse Counter	

Received on 2020-02-14T11:19:17Z

► Status

► Metadata

► Last messages

Figure 46: By clicking on the wheel icon it is possible to reset the pulse value to zero

- On formula panel, choose Pulses minus an offset by clicking on the dropdown menu (this formula appears by default if never configured before, Figure 47)

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WORLDSENSING

Networks

Status ▾

Configuration ▾

Engineering units

/ Networks / 14101 / Node 22501 / Engineering units

Channel 3

☒ Use engineering units

Formula:

Pulses minus an offset ▾

$$R = P_i - P_o$$

R: Pulses result
P_i: Current pulse reading

P₀: Pulse offset

Save

Figure 47: Pulses minus an offset formula

This formula will allow the pulses counting to be reset. Enter the value to offset to zero (for example, if 23 pulses recorded, P₀ shall be 23 to start counting over from zero value). Other formulae are captured below in Figures 48 and 49.

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NetworksStatus ▾Configuration ▾

Engineering units

/ Networks / 13319 / Node 18378 / Engineering units

Channel 3

☒ Use engineering units

Formula:

Pulses minus previous pulses ▾

$$PulseCount = CumCounts_i - CumCounts_{i-1}$$

Pulse Count: Pulse Count in the sampling period
CumCounts_i: Current reading of the accumulated counts
CumCounts_{i-1}: Previous reading of the accumulated counts

- Node sampling rate has to be remotely set to apply this formula.
- In the case where one radio packet is lost, the formula will not be applied.
- Readings manually collected with android App will be rejected in the calculation.

Save

Figure 48: Pulse count formula

The pulse count formula will allow you to get a cumulative pulses variation within a specific sampling period (hourly, daily, etc.)

Engineering units

/ Networks / 13319 / Node 18378 / Engineering units

Channel 3

☒ Use engineering units

Formula:

Rainfall ▾

$$Rainfall = (CumCounts_i - CumCounts_{i-1})G$$

Pulse Count: Pulse Count in the sampling period

CumCounts_i: Current reading of the accumulated counts

CumCounts_{i-1}: Previous reading of the accumulated counts

G: Linear Gage Factor in units/pulses

0.1

Units: Magnitude that is measuring the sensor (ie: mm/cm)

mm

- Node sampling rate has to be remotely set to apply this formula.
- In the case where one radio packet is lost, the formula will not be applied.
- Readings manually collected with android App will be rejected in the calculation.

Save

Figure 49: Rainfall formula

The Rainfall formula will allow you to get a cumulative pulses variation within a specific sampling period (hourly, daily, etc.) expressed in specific units, for example in mm which is equivalent to the litres of water poured per square metre of surface.

Regulatory notices

FCC - Regulatory Notices

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Permitted Antenna

This radio transmitter has been approved by the FCC to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Interface and frequency range	Type	Max Gain
Unlicensed bands		
LoRA @900 MHz	Adhesive FPC antenna	1.9 dBi

RF exposure safety

This device complies with the FCC RF exposure limits and has been evaluated in compliance with **mobile** exposure conditions.

The equipment must be installed and operated with minimum distance of **20** cm of the human body.

Class A device notice

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

ISED - Regulatory Notices

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with ISED license-exempt RSS(s).

Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Permitted Antenna

This radio transmitter has been approved by the ISED to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Interface and frequency range	Type	Max Gain
Unlicensed bands		
LoRA @900 MHz	Adhesive FPC antenna	1.9 dBi

RF exposure safety

This device complies with ISED RF exposure limits and has been evaluated in compliance with **mobile** exposure conditions.

The equipment must be installed and operated with minimum distance of XX cm of the human body.

CAN ICES-00x (A)

This Class **A** digital apparatus complies with Canadian ICES-00x.

Avis de Conformité Réglementaire - ISED

Les changements ou modifications non expressément approuvés par la partie responsable de la conformité peuvent annuler le droit de l'utilisateur à utiliser l'équipement.

L'équipement est conforme aux CNR d'ISED applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement

Antennes autorisées

Cet émetteur radio a été approuvé par l'ISDE pour fonctionner avec les types d'antennes listés ci-dessous avec le gain maximum autorisé indiqué. Les types d'antennes non inclus dans cette liste, ayant un gain supérieur au gain maximum indiqué pour ce type, sont strictement interdits pour une utilisation avec cet appareil.

Interface and frequency range	Type	Max Gain
Unlicensed bands		
LoRA @900 MHz	Adhesive FPC antenna	1.9 dBi

Sécurité d'exposition aux RF

Cet appareil est conforme aux limites d'exposition RF d'ISDE et a été évalué conformément aux conditions d'exposition mobile.

L'équipement doit être installé et utilisé à une distance minimale de 20 cm du corps humain.

CAN NMB-00x (A)

Cet appareil numérique de classe A est conforme à la norme canadienne NMB-00x.