pr.Logger – PiezoRobotics Noise & Vibration Logger

The PiezoRobotics' pr.Logger is a geospatial noise level and acceleration data recorder. It is the next generation of portable noise and vibration sensors, enabling plug-and-play measurement in harsh environments anywhere in the world. The pr.Logger measures and records noise level in *dB(A)* and RMS levels of acceleration in *g*, by means of a calibrated microphone and a calibrated triaxial accelerometer. It also records Timestamp and GPS Position and transmits all information via LTE-M to an online dashboard for data visualization. This is useful in applications exposed to risks arising from high noise and vibration levels, thus requiring constant monitoring, such as machinery, transportation vehicles and construction sites.

Key Features

- Integrated and calibrated sensors
- Worldwide GPS and LTE-M connectivity
- Dashboard for data visualization
- Dust protected

Technical Specifications

Specifications	Value	Notes
Power Supply	5 V_{DC}	via USB-C cable
Accelerometer Range	up to ±16 g_{0-p}, triaxial	customizable up to ±100 g
Accelerometer Bandwidth	up to 200 Hz, triaxial	customizable up to 11 kHz
Accelerometer Resolution	0.0008 g	
Sound Level Range	30-130 dB(A)	
Sound Frequency Range	30-8500 Hz	
Connectivity	GPS and LTE-M Band 3 (1800 MHz)	
Dimensions	100 x 70 x 40 mm	
Weight	0.157 kg	
Operating Temperature	-40°C to +85°C	
Ingress Protection	IP 50 (Dust protected)	

Applications

Wireless Monitoring of Machinery, Vibration-Sensitive Assets, Transportation Vehicles, Environmental Noise, Construction and Mining Sites, Work Health and Safety.

Mechanical Mounting

The pr.Logger can be mounted to a vibrating structure by means of four M4x40 mm screws spaced by 87 x 57 mm. A temporary mounting can also be done with a double sided tape (3M 9448A) on the base of the pr.Logger. A cable tie can be additionally secured to the pr.Logger to prevent detaching.

Electrical Connection

First, connect the GPS and LTE antennas to the SMA connectors. To power on the pr.Logger and at the same time start a measurement, connect the USB-C cable to a USB port supplying 5 V_{DC}, such as a power bank.

Operation

For ease of use, the pr.Logger can be triggered simply by connecting the USB-C cable to a power supply. To perform a measurement:

A. Connect the USB-C cable to the pr.Logger:
   1. GPS connection is initialized (LED will turn ON at start and OFF upon successful completion, ~30 sec at open air and clear sky or up to 15 min for cold start);
   2. UTC Timestamp information is obtained from GPS signal;
   3. LTE-M network connection is initialized (LED will turn ON at start and OFF upon successful completion, ~2 min);
   4. Measurement and recording are triggered (LED will blink shortly every 5 seconds when a datapoint is recorded);
B. In the Dashboard Software:
   1. Type the 13-Digit Access Code for your specific device;
   2. Connect to server;
   3. Start data streaming for live visualization of measurements;
   4. Or download recorded data and plot custom file for offline map plot;
C. Disconnect the power supply for shutdown:
   1. Measurement and recording are stopped;
   2. LTE-M and GPS connections are closed.

Embedded Sensors and Electronics

The pr.Logger contains a calibrated sound level meter that outputs data directly in dB(A). A maximum noise level of 130 dB(A) can be measured. The integrated microphone does not record any noise or voice signal.

It also contains a calibrated triaxial accelerometer capable of measuring vibration levels of up to ±16 g_{0-p} (or 156.96 m/s^2). In the default configuration, each axis time signal is sampled at 2 kHz, thus allowing vibration measurements of up to 1 kHz. A low-pass filter with cutoff frequency at 200 Hz is programmed in the firmware. The RMS value is then calculated from the time signal over a period of 2 seconds.

The pr.Logger also features an integrated GPS for logging the precise geographic location where the noise and vibration levels occur, together with the UTC Timestamp. An embedded SIM Card for data transmission via LTE-M is able to connect to a cellular network worldwide in more than 180 countries. The measured data is uploaded to a secure server, which the dashboard software will access for data visualization.

Software

Our dashboard software was developed to securely connect to the server and plot the measured noise and vibration data live, as they are being acquired, in a user-friendly geospatial map.

Figure 1. Dashboard software and example of a geospatial noise level map in Singapore

Quality and Testing

Each pr.Logger is individually tested. The calibration data of the sensors are already included in the firmware for each delivery.
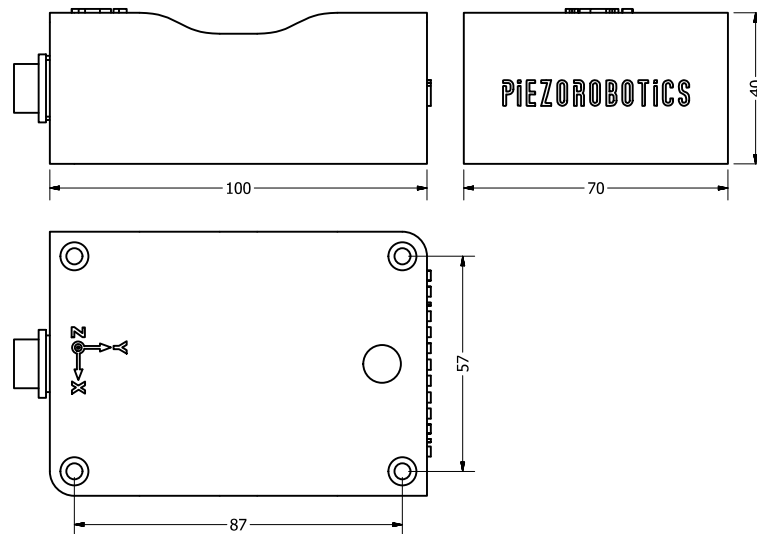
Dimensions

Figure 2. Dimensions of the pr.Logger

Customization

PiezoRobotics has the capability to customize the pr.Logger according to your specific application and requirements. We can include any sensors, customize the dashboard software, include other vibration metrics, modify any electrical specification, dimensions, connectors or other parameters, and integrate it with your own electronics and IoT Network. We also guarantee much lower prices for high volume purchases. Please contact us for further details.

Package Content

1x pr.Logger

1x USB-C Cable

4x Mounting Screws M4x40 mm

4x Mounting Double Sided Tape (3M 9448A)

1-Year Free Worldwide Data Package via LTE-M