

PermaNET SU | LTE-M & NBloT-enabled Correlating Leak Noise Logger

Fixed Network Buried Water Pipe Leak Detection



IOT Communications

Compact unit with small dimensions

Sending data and alarms

Remote water leak detection

Leak noise recording

Automatic leak location

Management Platform Integration

Water leak monitoring and location system

PermaNET SU is an innovative correlating noise logger that contains a leak noise sensor with NBloT (narrow band internet of things) via cellular networks for reliable and low-powered network monitoring.

The PermaNET SU logging devices with integrated leak noise sensors are waterproof & designed to be permanently installed into a buried water pipe network for **24X7 continuous monitoring listening for leaking pipes.**

PermaNET SU is robust and durable & designed specifically for smaller and more challenging installation areas.

The PermaNET SU is also the ideal choice where cellular based telemetry is not feasible, providing the option of "Drive by Data" collections using bluetooth.





PermaNET SU | Fixed Network Buried Water Pipe Leak Detection

The PermaNet SU employs a specialized microphone that **detects sounds** emitted from a **leaking pipe**- the micro controller performs statistics analysis to generate data for a **"noise histogram"**

Depending on the consistency of noise measured the equipment judges for leak / no leak, transmits the sound recording files to allow the operator confirm leak certainty by reviewing the sound file and deploy teams to the area for secondary validation & repairs

Sound and data files stored in the logger can be acquired and accessed in two ways :

1.  **PermaNET web application**, wherein data is **automatically** sent over the internet to the DataGate server
2.  **Drive By Data collection** using the Patroller Wireless Data Transceiver, wherein field teams can access data wirelessly through bluetooth when driving by (or walking near) the site

Length of Sound recording of suspected leak identified by the PermaNet SU is by default for **10 seconds**.

PermaNET SU is fully compatible with PermaNET Web, the online data viewing and analysis platform, combining to provide map-based display, GIS interface and full audio and correlation facilities.

Features:

- **Telemetry:** NBIoT based cellular communication
- **Sensor movement detection:** daily check to confirm no sensor movement: alarm if a movement is detected
- **Single compact unit:** combines leak noise sensor and telemetry technology into a single compact unit
- **Robust and durable:** designed specifically for smaller and more challenging installation areas
- **Quick response:** enables leakage teams to respond quickly to specific locations when a leak is detected
- **Secondary validation :**
 - Aqualog - detailed noise histogram to reduce 'false positives'
 - Audio - remotely listen to the noise
 - Remote correlation to localise leak position
- **Fully waterproof:** the IP68 rating has been tested at 10m depth over a 24 hour period
- **PermaNET Web:** software supports

• select GIS file formats	• Filtering
• Correlation	• Aqualog
• Remote reconfiguration	• Threshold Modelling
• Map view	• Electrical Noise identification
- **Easy to use:** compatible with HWM Deployment app. Select features can be programmed through PermaNET Web
- **External antennas:** support improved signal strength





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How the PermaNET SU is used to create a Leak detection network :

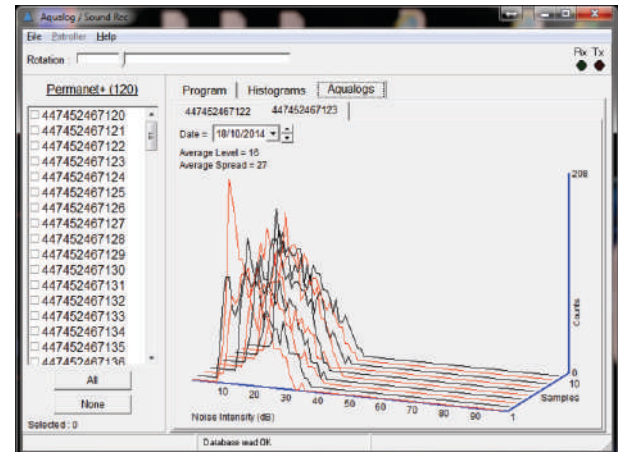
PermaNET SU is a powerful leak detection system that allows the user to **deploy a fleet of data loggers** around a water network that are **permanently installed to listen for leaking pipes**.

Typically ≥ 20 loggers are recommended to be installed within an area keeping distance upto 200 meters between loggers when installed on a metal pipe & upto 50 meters when installed on plastic pipes

The device listening for possible leaks analyses & determines **Leak /No Leak** and **in case of a suspected leak**, based on built in algorithms , **goes into an alarm mode** , alerting the water department team, while **recording the leak noise sound**.

Sound and data files recordings : in the logger are **automatically** sent over the internet to the **DataGate server**, and accessible through the PermaNET web application.

Length of Sound recording of suspected leak identified by the PermaNet SU is by default for **10 seconds** (max: 20 seconds).



Histograms & Aqualog: Additionally, the leak detection team can view daily Histograms of individual loggers, or via detailed Aquascans including 3D views.

Built in Telemetry : Equipped with **NBLoT connectivity** and other options with an external antenna. PermaNET SU operates on low cost cellular data transmission to the DataGate server. NBLoT ensures that the battery consumption of the sensor is minimized, **ensuring longer life**.

GIS Mapping & Remote Monitoring : PermaNET SU is also compatible with **google maps & allows overlay**, allowing leakage teams to monitor each deployed logger's status via **Google Maps compatible software**



The leak noise sensor loggers can be programmed to switch on at a given time in a night or day for noise sampling.

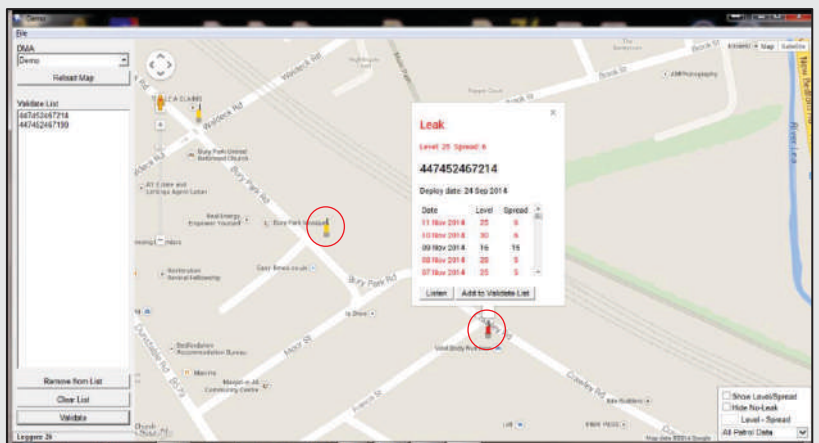
The system can be ordered to make recordings remotely to take an additional recording at a time of choice the next day.



Drive By Data Collection Option :



Patroller 4 is a wireless Bluetooth-compatible transceiver used for downloading the data via radio, permitting drive-by data collection.



Sites coloured Yellow are not detecting a leak, Red sites are where a leak is suspected.

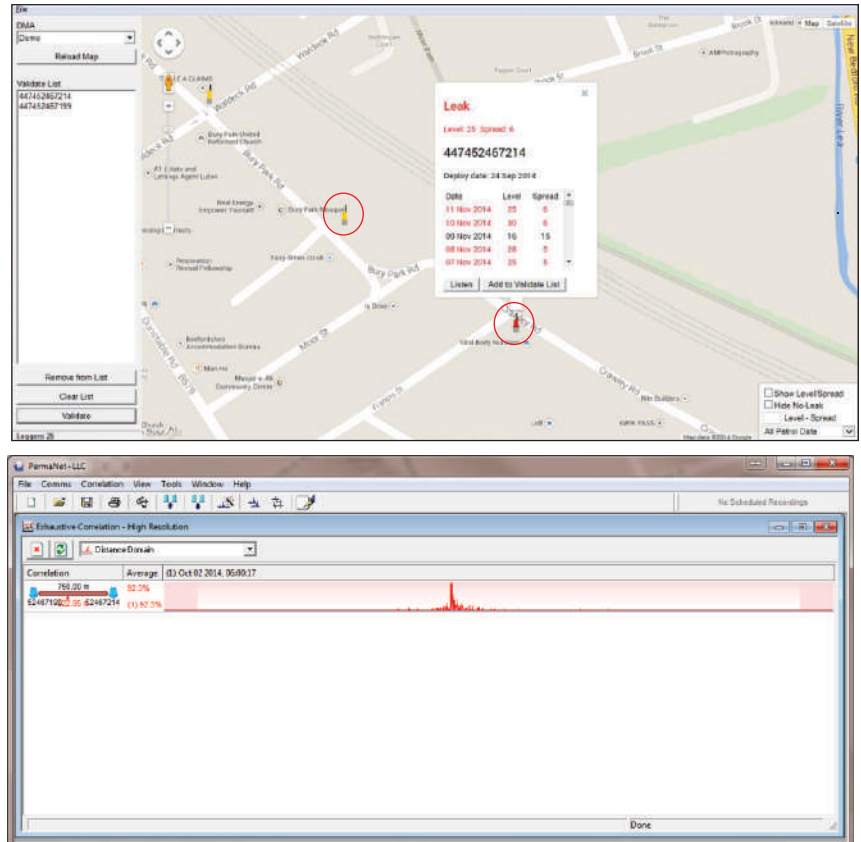
When sound files are available, two buttons appear. To perform secondary confirmation validation click <Add to Validate List> and the <Validate> button to launch the Leak Localisation & Correlation tool.

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Leak Localisation and Correlation Tool

In addition to listening to the sounds recorded, you can use this tool to perform some rudimentary correlations to gain confidence that a leak is present.

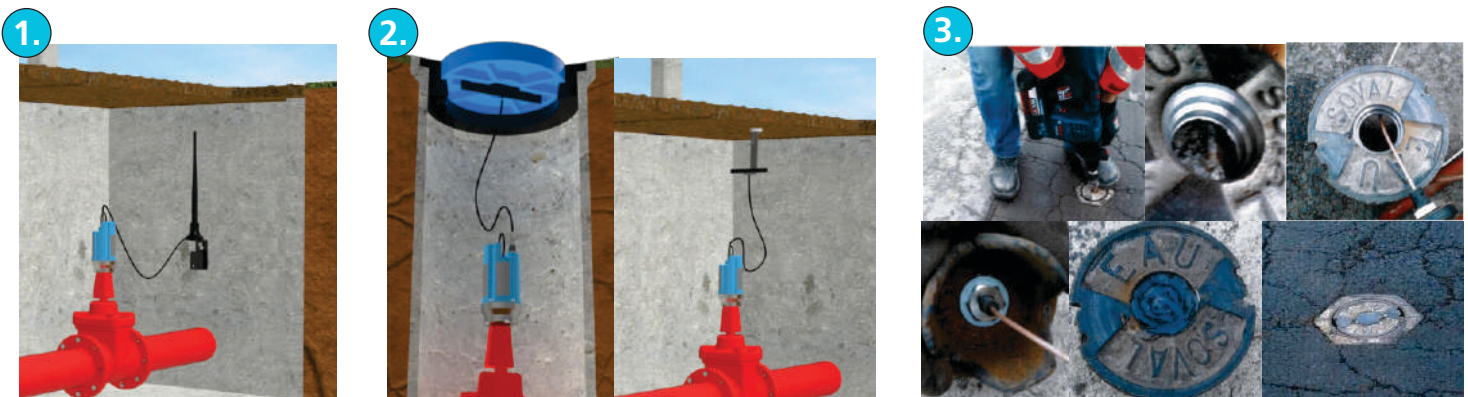
1. Choose 2 loggers to test between. In the example shown, a check is being performed between 2 sites ringed to identify if the Leak suspected can be confirmed.
2. For both loggers, click <<Add to Validate List>>
3. Next click the <<Validate>> button
4. The PermaNET+LLC (Leak, Localisation & Correlation) tool will launch and perform a correlation on the sound files available
5. The Average indicates a confidence level for the correlation a clear peak indicated on the graph confirms that a leak is detected with high confidence between the two loggers selected.



*The department team or designated expert can **validate the leak by hearing the sound** & use secondary measure of acoustic leak detection to confirm leak location.

Antenna options : Network connectivity Antennas are installed as close to surface to allow data transmission. Antenna options include :

1. Monopole (installed close to surface in underground chambers)
2. T-Bar (mounted at top of chambers)
3. Button (drilled into chambers manhole)



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PermaNET Web

Online Data Portal

PermaNET Web is a secure, web-based portal designed to support the PermaNET product range in the remote identification of network leakage. Supporting acoustic correlation, leak detection and logger programming, PermaNET Web delivers connectivity with multiple loggers and provides the user with numerous ways to view collected data.

Two-Way Communication: Enables local and remote parameter settings. Auto Processing: Filters interference and external noise.

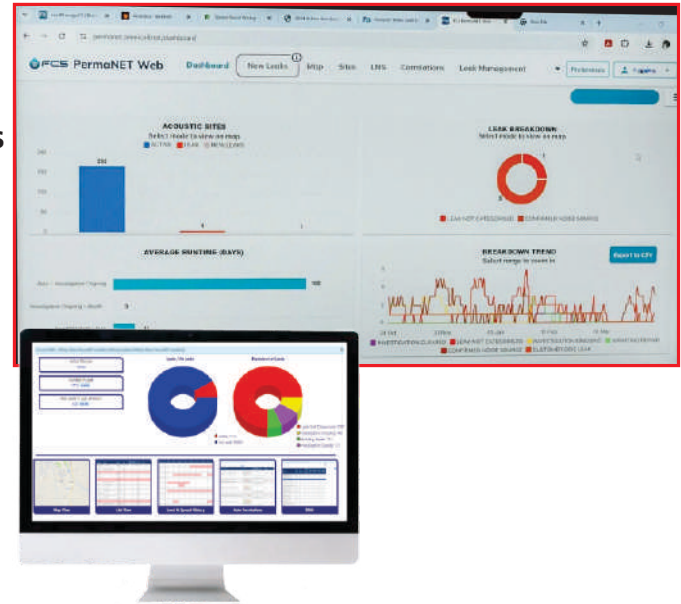
Dynamic DMA Management: Provides full DMA views and threshold adjustments.

GIS Integration: Overlays GIS data with Google Maps for dynamic location info.

AI Noise Identification: Automatically identifies and categorizes electrical noise.

Versatile Functionality: Sets system alarms, monitors signal and battery levels.

Data Security and Storage: Offers robust security features and stores historic data for comparison.



Specifications

Operating Temperature	-20 to 60°C
Battery Life	5 years (depending on settings and signal condition)
Memory	Primary recording: 1 million readings
Dimension	Height = 120mm, Diameter=60mm
Weight	700g
Antenna	Multiple external options
Internal Cellular modderna	NB-IoT (narrow band internet of things) via cellular networks
Alarms	Leak / No Leak Signal Received / Not Received
Environmental	IP68

