

ENIGMA 3 HYBRID DATA LOGGERS



KEY COMPONENTS

- 1 Hydrophones & caps case
- 2 Eight position data transfer case
- 3 Three Data loggers w/ magnet base
- 4 Three Data loggers w/cable connection
- 5 Three Hydrophone and cable kits
- 6 Three SS 2.5" Hydrant Caps
- 7 Data transfer USB cable
- 8 Enigma Classic PC Software
- 9 Enigma web portal

DESCRIPTION

The Enigma 3 Hybrid combines the Enigma 3 Standard and Enigma 3 Hydrophone systems into a single package. The system includes three vibration-sensing loggers for external pipe acoustic measurements and three hydrophone-equipped loggers for direct pressure-wave measurements within the water column.

This configuration allows the operator to select either standard vibration sensing or hydrophone sensing depending on pipe material, diameter, and field conditions. Both logger types are operated and processed using the same host software platform. Standard vibration loggers and hydrophone loggers are not intended to be mixed within the same correlation deployment. A single deployment supports up to three standard correlations when using vibration loggers, or up to three hydrophone correlations when using hydrophone loggers.

MULTI-POINT NETWORK CORRELATION

After retrieval, the recorded leak sound data is transferred to the host software for correlation analysis. The software processes the acoustic data from each logger pair to calculate and display leak locations between all deployed loggers. Pipe sections, logger positions, and calculated leak locations are displayed graphically to provide a visual representation of the survey area and correlation results.

SEPARATING GENUINE WATER USAGE

Each logger records during three sample periods, typically spaced one hour apart. A characteristic of leak noise is that it is always constant and so if the correlation peak is not present during all three samples then it is due to water use and not leakage.

OPTIMUM LEAK SENSING

Overnight use provides ideal conditions for leak detection. This is because background acoustic noise from traffic, water usage and other sources, is lowest and, at the same time, water system pressure can be higher which greatly aids leak sound propagation.

Hydrophone carrying case w/SS hydrant caps and a data transfer case with 8 position loggers space.



SPECIFICATIONS

CORRELATION DATA LOGGERS

Sensors	Data logger
Type	Integral Accelerometer
Frequency range	1 - 2,400 Hz
Sensitivity	10 V/g
Attachment	Integral magnet

Sampling	
Rate	4860 Hz
Resolution	24-bit
Number of epochs	1, 2, or 3
Epoch duration	60 seconds
Max total recording time	180 seconds

Power	
Type	Dual lithium cells
Replaceable	At factory or service center
Operating life	>5 years

Physical	
Dimensions	104mm (high) x 59mm (diameter)
Material	Aluminum
Waterproof rating	Submersible to IP68
Operating temperature	-10°C to +60°C



Hydrophone
Hydrophone connected externally
1- 2400 Hz
-195dB
1" NPT connection + pipe adapters

COMMUNICATIONS CASE

Host Communications	
Type	USB
Rate	2.5 Mbits/sec
Data saved into case	One run (8 correlations)

Memory	
Data Store	32MB static Ram

Communications	
Type	Optical
Rate	2.5 Mbits/sec

Power Supply	
Type	User replaceable alkaline 4 cell pack
Physical	
Dimensions	Holds 8 loggers 410 x 325 x 172 mm
Material	Rugged high impact plastic
Waterproof rating	IP65
Operating temperature	-10°C to +60°C

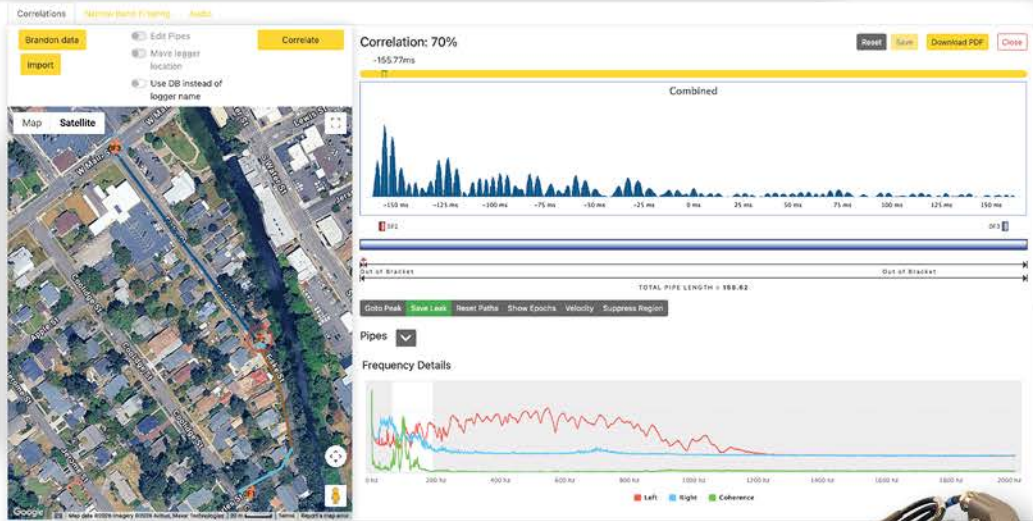
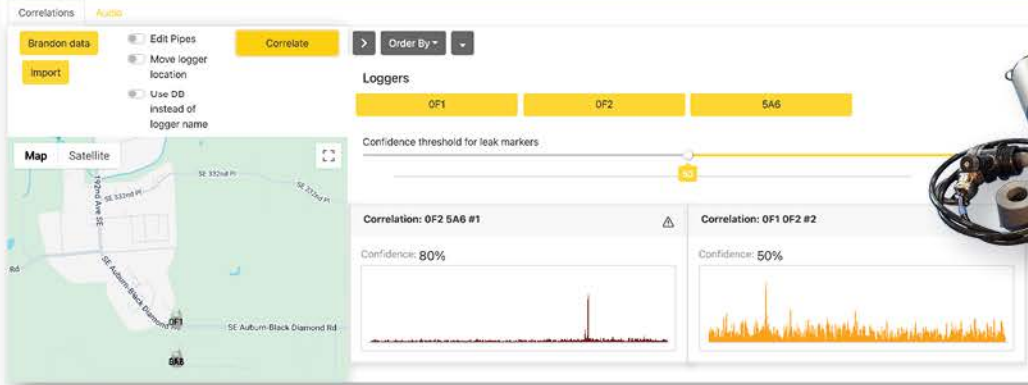


SubSurface Instruments, Inc. | 1230 Flightway Drive, De Pere, WI. 54115
 Toll free: 855.422.6346 | Website: www.ssilocators.com | email: info@ssilocators.com

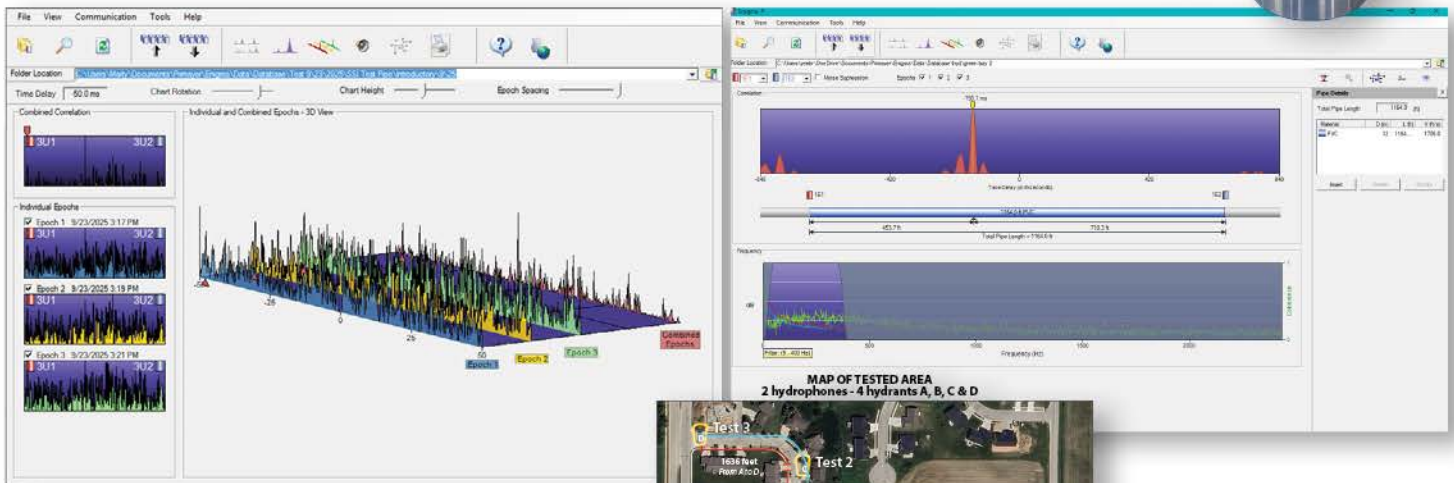


ENIGMA 3 HYBRID DATA LOGGERS

CORRELATION SCREENS - CLOUD VERSION



CORRELATION SCREENS - PC VERSION



	Distance between sensors	Distance to leak - Overall Analysis	Distance to Leak - Laptop Analysis	Test w/Brigade B	Distance
Test 1 (Hydrant A to B)	714'	452'	454'	Inconclusive	
Test 2 (Hydrant A to B)	1154'	451'	454'		
Test 3 (Hydrant A to C)	1636'	451'	454'		

