

About Our Company...

Signal Solutions, LLC specializes in non-invasive solutions for animal research.

The PiezoSleep Behavioral Tracking System integrates piezoelectric sensor, data acquisition hardware and software with custom cages for automated behavior scoring.

Our system uniquely enables noninvasive real-time sleep feedback control to improve experimental models, such as targeted sleep disruption, sleep apnea simulation, and optogenetic applications.

The PiezoSleep system and customized solutions have aided researchers worldwide in areas of gene and disease model phenotyping, drug testing, sleep biology, heart rate and breath monitoring and seizure detection.



PiezoSleep Behavioral Tracking System

SIGNALSOLUTIONS

Sensor Systems, Software, Sleep

Non-invasive Innovation

Signal Solutions LLC - 1-877-SIGSOLN (Toll free)
www.sigsofn.com

About Our System...

Non-invasive

Piezoelectric sensor reduces need for surgery and implants required for EEG recording.

Automated

PiezoSleep data collection software automatically records sleep and wake states. It saves time by eliminating the need for tedious human scoring of EEG/EMG.

Cost & Time Effective

Automated scoring and lower cost of entry make our complete, turn-key systems more attractive for new and experienced sleep researchers.



Giant SquidBox



Calamari



Piezoelectric Sensor



Cage Assembly

NONINVASIVE + AUTOMATED = COST & TIME EFFICIENT

Non-invasive Alternative to EEG/EMG Sleep Scoring

SleepStats analysis software classifies the piezoelectric signal into "Sleep" or "Wake" every 2 seconds. A combination of features, extracted from the piezo signal, are used to classify the data into the two states. System Validation: The classifier was validated by comparing its results against the gold standard method of human sleep scoring of EEG/EMG.

Simultaneous piezoelectric and EEG/EMG data was recorded for twenty-four hours from twenty mice. The EEG/EMG data was independently scored by two trained human scorers and compared against the sleep/wake scores generated by SleepStats. Recall/sensitivity for detection is **91.4%** for sleep and **92.3%** for wake. Specificity of calls is **91.4%** for sleep and **92.3%** of wake.



The PiezoSleep Behavioral Tracking System integrates piezoelectric sensor, data acquisition hardware and software with custom cages for automated sleep/wake scoring.

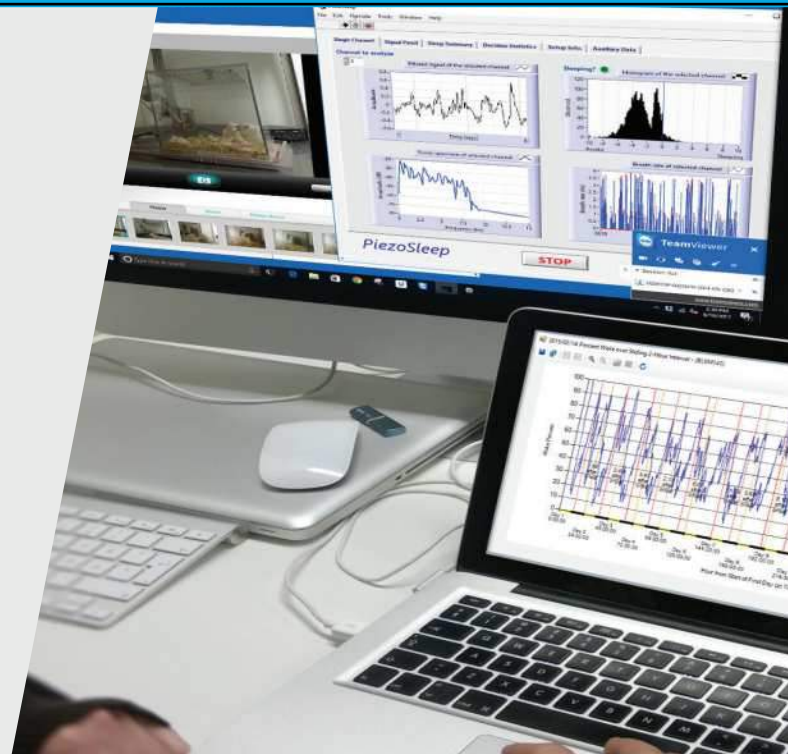
PiezoSleep Behavioral Tracking System Applications

Currently Being Used for

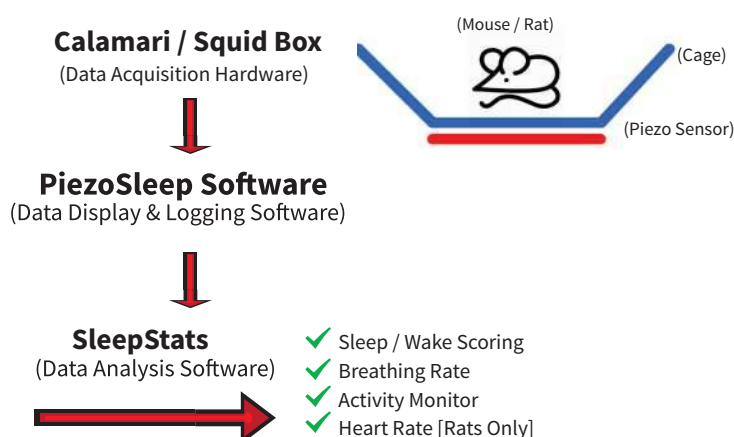
- ✓ Sleep studies:
 - Basic research*
 - Disease models*
 - Preclinical drug testing*
- ✓ Sleep phenotyping
- ✓ Respiratory rate tracking
- ✓ Activity tracking

Potential System Uses and Features

- ✓ Providing real-time feedback control for:
 - *Targeted sleep disruption*
 - *Sleep apnea simulation*
 - *Optogenetics applications*
- ✓ Heart rate tracking
- ✓ Seizure detection



System Basics



What's New



Rat System

Complete Piezo system now available for rats



Mouse System

System modified for use with traditional mouse housing



MouseQwake

Non-invasively detects targeted behavioral states & shakes the cage to disrupt behavior. Adjustable amplitude & frequency.