

# Ponemah™ Analysis Modules



**DSI**™

BetterData. BetterScience.



## Ponemah Analysis Modules

Trusted by researchers worldwide to discover new insights into their research applications.

### *Confidence*

- Obtain accurate, consistent results via validated algorithms developed from scientific and peer-reviewed journals
- Verify analysis accuracy with real-time visual feedback
- Operate with full compliance within GLP environments with the Ponemah Data Security Option (DSO)

### *Speed*

- Efficiently refine results by re-analyzing data segments or manually editing mark placement
- Automatically detect noise and eliminate it from results
- On-demand switching between time-based averages or beat-to-beat data, which automatically export to Microsoft Excel® or Access®

### *Versatility*

- Easily configure modules to analyze various signal types from any species
- Instantly switch between time-based average or beat-to-beat data
- Solutions for all applications, including implantable telemetry, jacketed telemetry and traditional hardwired solutions

# Ponemah High Performance Analysis Modules

## Multi-Lead Electrocardiogram (ECG)

Analyzes ECG signals to provide single and multi-lead calculations.



• *P, Q, S and T Wave Degree of Match using ECG PRO • Heart Rate • R-R Interval • QT Interval • ST Interval • P-R Interval • QR Interval • QRS Width • P Width • R, P and T Wave Heights • T Height Negative • QR Amplitude • Variable ST Elevation • Q Alpha T Negative • Multiple Corrected QT Calculations • QT Dispersion • +dV/dt Max • T Area • P, T, QT and R Count • Bad, Good and Total Waves • T Peak • T Peak Interval • Noise • Timing, Channel and Dispersion Information Across Multiple Leads*

## Blood Pressure (BP)

Analyzes arterial and venous pressures.



• *Systolic • Diastolic • Mean • Pulse Height • Heart Rate • Time to Peak • Ejection Time • +dP/dt • -dP/dt • %Recovery • Non Pulsatile Mean • Q-A Interval • Pulse Transit Time • Pulse Wave Velocity • Inter-Beat Interval • Count*

## Blood Pressure Respiratory (BPR)

Derive respiration values from the cardiac cycle when used in conjunction with the BP module.



• *Respiration Rate • Interval*

## Left Ventricular Pressure (LVP)

Analyzes pressure signals from the left ventricle and is used as a reference signal for other analysis modules, such as Cardiac Volume.



• *Systolic • LVEDP • Minimum Pressure • Time Tension Index • Developed Pressure • Heart Rate • +dP/dt • -dP/dt • Contractility Index • Relaxation Times (1 & 2) • dP/dt at Selected Pressures • Non Pulsatile Mean • Q-A Interval • IVT (Time from Systolic to LVEDP) • TTI-T (Time from LVEDP to -dP/dt) • Tau • Period • Electromechanical Window • Count*

## Heart Rate Variability (HRV)

Analyzes the R-R intervals of ECG signals or Inter-Beat-Intervals of blood pressure signals to convert these time-based calculations to the frequency domain, revealing the frequency components of the signals.



• *Very Low Frequency (VLF) • Low Frequency (LF) • High Frequency (HF) • Normalized LF and HF • LF/HF Ratio • Total Power*

## Cardiac Volume (CVOL)

Analyzes any volume from the circulatory system and can derive values relative to the cardiac cycle.



• *Heart Rate • Minimum Volume • Maximum Volume • Stroke Volume • Volume at LVP Min Slope • Pressure at LVEDP • Volume at LVEDP • Ejection Fraction • Peak Filling Rate • Peak Emptying Rate • Time to Peak Filling Rate • Diastolic Filling Time • Time to Peak Filling (Percentage) • Pressure at Max Elastance • Volume at Max Elastance • Stroke Work • Arterial Elastance*

## Coronary Blood Flow (CBF)

Provides coronary flow and volume information during systolic and diastolic periods in conjunction with the LVP module.



• *Mean • Flow Maximum • Flow Minimum • Cardiac Output • Stroke Volume • +dQ • Systolic Flow • Diastolic Flow • Systolic Volume • Diastolic Volume • -Flow • Total Volume • Non Pulsatile Mean*

## Systemic Blood Flow (SBF)

Analyzes systemic blood flow from the circulatory system and eliminates drift resulting from certain types of flow meters.



• *Mean • Flow Maximum • Flow Minimum • Cardiac Output • Stroke Volume • +dQ • Iso Flow • Total Peripheral Resistance • Non Pulsatile Mean*

## PV Loop

Permits the display and analysis of LVP cycles plotted against cardiac volume cycles.



*Characterization of End Systolic Pressure Volume Relationship, End Diastolic Pressure Volume Relationship and Pre-Recruitable Stroke Work*

## Raw Electrical Mean

Analyzes any type of input signal that has no specific analysis module. This module comes with the Ponemah application.



• *Mean • Maximum • Minimum • Period • Beats per Minute • Area • Total Activity • Non Pulsatile Mean*

## Pulmonary Volume (PVO)

Analyzes pulmonary volume signals to derive respiratory endpoints obtained from respiratory impedance transmitters (D70-PCTR).



• *Peak Inspiratory Flow • Peak Expiratory Flow • Tidal Volume • Minute Volume • Respiration Rate • Inspiratory Time • Expiratory Time • Total Time • Apnea Time • Penh • Relaxation Time • Tidal Volume (Expiration) • Inspiratory/Expiratory Flow 50% • Accumulated Volume • Volume Baseline • Volume Fluctuation • Flow Fluctuation • Median Tidal Volume • Median Tidal Volume Expired • Tidal Volume Throughout • Tidal Volume Expired Throughout • PZr Ratio*

## Pulmonary Air Flow and Airway Resistance (PAF)

Analyzes any pulmonary signal derived from a plethysmography chamber, pneumotach or Jacketed External Telemetry (JET™) Respiratory impedance bands.



• *Peak Inspiratory Flow • Peak Expiratory Flow • Tidal Volume • Minute Volume • Respiration Rate • Inspiratory Time • Expiratory Time • Total Time • Apnea Time • Specific Airway Resistance • Phase Shift • Delay Time • Penh • Relaxation Time • Tidal Volume (Expiration) • Accumulated Volume • Inspiratory/Expiratory Flow 50% • Ratio EF/IF 50% • Apneic Interval*

## Unrestrained Plethysmography (URP)

Analyzes signals obtained from unrestrained whole body plethysmography chambers. Includes the ability to compensate for environmental conditions to calculate adjusted volumes.



• *Peak Inspiratory Flow • Peak Expiratory Flow • Tidal Volume • Minute Volume • Respiration Rate • Inspiratory Time • Expiratory Time • Total Time • Pause • Penh • TVadj • MVadj • Apnea Time • Apnea Count • Inspiratory/Expiratory Flow 50% • Ratio EF/IF 50% • Apneic Interval*

## Pulmonary Compliance & Resistance (PCR/PCRP)

Analyzes pulmonary signals from either a plethysmographic chamber or a pneumotachometer, along with a pressure, in anesthetized or conscious animal models.



• *Peak Inspiratory Flow • Peak Expiratory Flow • Tidal Volume • Minute Volume • Respiration Rate • Inspiratory Time • Expiratory Time • Total Time • Apnea Time • Resistance • Compliance • Conductance • Multiple Resistances at Specified Points • Average Compliance • Average Resistance • Pressures at Start of Inspiration/Expiration • Flow and Pressure at Isovolumetric Points • Penh • Relaxation Time • Work and Power of Breathing Calculations • Tidal Volume (Expiration) • Accumulated Volume • Inspiratory/Expiratory Flow 50%*

## Diaphragmatic EMG (dEMG)

Analyzes diaphragmatic EMG signals to provide respiratory endpoints.



• *Respiration Rate • Tidal Volume\* • Minute Ventilation\* • Inspiration Time • Expiration Time • Total Time*

*\*Tidal Volume and Minute Ventilation are only partial representations as diaphragmatic activity is only a partial representation of the respiratory mechanics.*

## Electromyogram (EMG)

Analyzes the electrical activity of muscle tissue.



• *Integral • Peak*

## Action Potential (MAP)

Analyzes a host of action potentials with focus on key regions such as plateau, recovery time and upstroke velocity.



• *Maximum • EDV • Minimum • Plateau • Amp • Rate • +dV • -dV • Recovery 1 • xR1 • Recovery 2 • xR2 • Recovery 3 • xR3 • %Max • Time • Count • RiseT*

## Electroencephalogram (NeuroScore™)

DSI offers NeuroScore CNS analysis software for sleep and seizure detection. NeuroScore is fully compatible with the Ponemah system and can analyze data collected by implantable telemetry, external telemetry and hardwired amplifiers.



## Cystometry (CYS)

Analyzes pressures resulting from non-voiding bladder contraction cycles or longer time-scale pressure changes resulting from bladder filling/voiding cycles.



• *Peak Pressure • Base Pressure • Rise • Period • Peak Duration • Inter-Contraction Interval • Duty Cycle • Time to Peak • Peak Count • Peak Count Time • Area • Start Time • Peak Time • End Time • Maximum Derivative • Minimum Derivative*

## Pulsatile Tissue and Gut Motility (PT)

Analyzes signals from isotonic or isometric transducers from spontaneously or repetitively beating preparations.



• *Maximum • Minimum • Average • Delta • Rate • Time to Peak • +d\_/dt • -d\_/dt • %Recovery 1 • %Recovery 2 • +d'/dt • -d'/dt • Motility Index • Area*

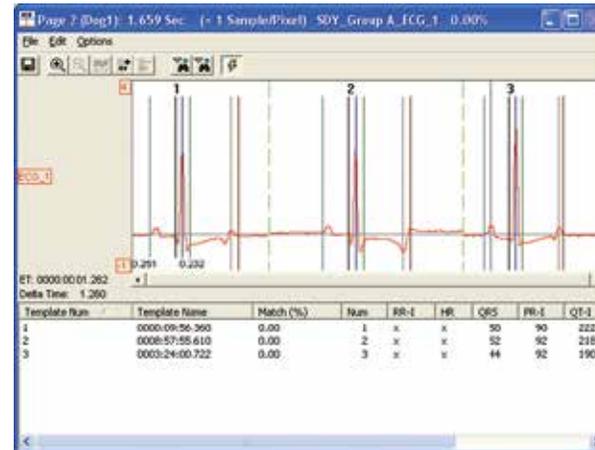
## ECG Pattern Recognition Option (ECG PRO)

Greatly reduce processing time using ECG PRO's template-based analysis as it allows the selection of a template cardiac cycle for precise comparison to other cycles in the dataset.

- Save time by only attempting to match unmatched cycles or within specific regions
- Automatically adjust the ECG waveform's cycle marks based on the template(s)

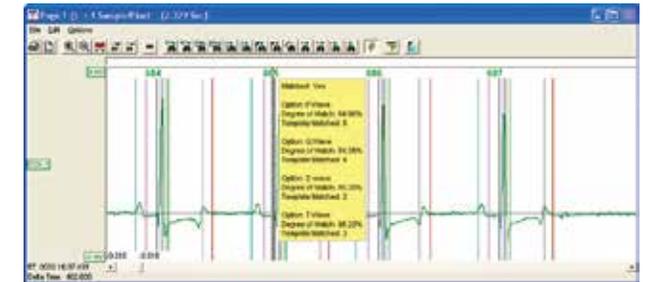


Automated validation marks for Q, R, S, End of T and Beginning of P are shown. The validation marks provide visual, online verification of the accuracy of the system.



ECG PRO template library graph.

- Multiple templates can be used in a dataset and templates can be added to a template library for use in other studies
- Accelerates the process of locating potential arrhythmic beats



Mouse over cycle match. Can get visual information for each cycle (how well it matched and to what template) by mousing over the complex.

## NeuroScore™ CNS Data Analysis Software

NeuroScore is a versatile, streamlined solution that combines easy-to-use tools, efficient data processing and accurate data analysis to reduce time to results. Choose the CNS software modules that best meet your research needs.

### Sleep Scoring Modules

Dramatically reduce analysis time and variability using the Rodent and Large Animal Sleep Scoring modules.

#### Automated Rodent Sleep Scoring

- Scoring based on the frequency content of the EEG and presence of EMG activity and movement.
- Stages include: Paradoxical Sleep, Slow Wave Sleep (SWS-1 and SWS-2), Wake and Active Wake.

#### Automated Large Animal Sleep Scoring

- Based on the American Academy of Sleep Medicine standards for human sleep scoring, this algorithm uses EEG, EMG, EOG and activity data.
- Stages include REM, Non-REM (N1, N2, N3), Wake, and Active Wake.

### Seizure Detection Module

The Spike Train detector scans the waveform for repeating EEG spike activity via user-defined amplitude-based criteria.

Several parameters including spike train duration and number of spikes can be displayed per event or summarized over longer time intervals.

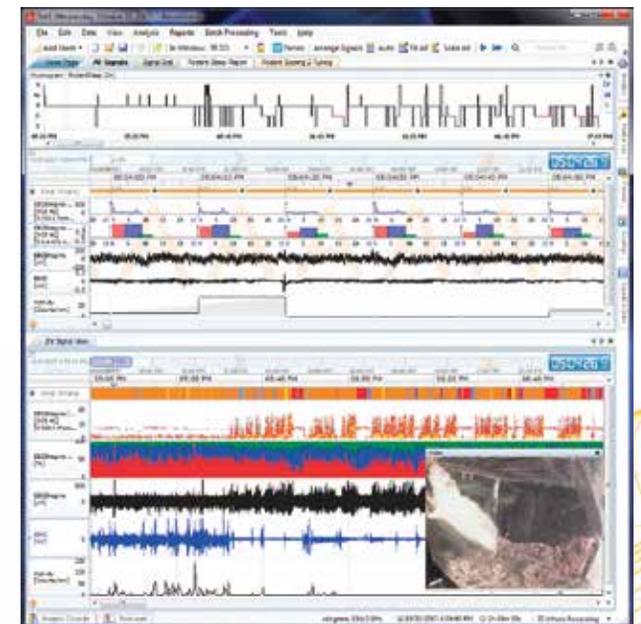
### Video Synchronization Module

Improve confidence in results by synchronizing video data acquired with Dataquest A.R.T. or Ponemah to validate or further classify detected events.

### Batch Processing Module

Increase throughput by automating analysis processes on multiple recordings at once. Customize workflows to:

- Score multiple recordings
- Export signal or parameter data
- Generate and export reports
- Complete these three steps within a single workflow



NeuroScore Workspace view for Sleep Scoring with Video Player.



## Start Studies Quickly with Help from DSI Scientific Services

DSI can help you streamline your studies by providing expertise you can trust. With our services, we can help you meet your software validation GLP requirements, achieve greater implanted telemetry success and summarize data for confidence in your results.

### Data Services

DSI will assist you with creating high quality, useable reports that summarize your experimental data. The reduction in time spent on data analysis and reporting processes will provide you with more time to evaluate the experimental results and plan your next logical experiment.

- Analysis expertise include hemodynamics, seizure detection, sleep scoring and ECG evaluation
- Comprehensive, useable results
- Customized report package

### Validation Services

Our experienced team offers a customized program to help save time and reduce costs associated with software systems validation.

- Customized Validation Solutions Package (VSP) with test scripts
- Industry experienced GLP validation specialists

Contact us today for your free services consultation at [ScientificServices@datasci.com](mailto:ScientificServices@datasci.com)

## About Data Sciences International

DSI is a pioneering biomedical research company focused on preclinical systems physiology and pharmacology. The recognized global leader in physiologic monitoring, DSI offers telemetry, instrumentation, software and services that facilitate accelerated, well-informed drug therapy and development decisions.

DSI serves many industries including: Pharmaceuticals, Academia, Contract Research Organizations, Biological and Chemical defense, the Medical Device Industry, Government and Biotechnology companies. We offer solutions that are tailored specifically to meet the unique research needs of our customers.

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