Cardiovascular
Telemetry & Hardwired Solutions

Arrhythmia • Drug Safety • Heart Failure • Hypertension • Myocardial Infarction • Vascular Diseases

DSI™
a division of
Harvard Bioscience, Inc.
## Solutions You Can Trust for Your Cardiovascular Applications

<table>
<thead>
<tr>
<th>Applications</th>
<th>DSI Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrhythmia</td>
<td>An abnormal heart rhythm is often identified by reviewing ECG traces. Researchers routinely use implantable and external telemetry along with hardwired ECG recording solutions.</td>
</tr>
<tr>
<td>Drug Safety</td>
<td>Telemetry allows scientists to be compliant with ICH guidelines for drug safety evaluation which require data from freely moving, conscious animals. Telemetry provides the flexibility to measure blood pressure, heart rate, ECG and other endpoints simultaneously.</td>
</tr>
<tr>
<td>Heart Failure</td>
<td>Record left ventricular pressure in animals ranging in size from rat to primate. A measure of cardiac contractility can be calculated with sophisticated analysis tools to derive dP/dt.</td>
</tr>
<tr>
<td>Hypertension</td>
<td>Blood pressure monitoring allows researchers to look at the underlying mechanisms of hypertension to assist with clinical translation of treatments. They can also study comorbidities such as coronary artery disease, stroke, heart failure, and more.</td>
</tr>
<tr>
<td>Myocardial Infarction</td>
<td>MI causes cardiac cell death due to a loss of oxygen. When cells die, the electrophysiology of the heart and ECG wave morphology can be altered. Researchers may use implantable telemetry, external telemetry, or hardwired solutions to measure ECG.</td>
</tr>
<tr>
<td>Vascular Diseases</td>
<td>Vascular stiffening, common to vascular diseases, can be quantified by measuring the intravascular pulse wave velocity (PWV). By measuring two intra-vascular pressures at a known distance from one another, PWV may be calculated.</td>
</tr>
</tbody>
</table>

### Multiple Sensing Options with a Single Acquisition System

[Diagram showing external telemetry, implantable telemetry, and Ponemah™ software.]

- **External Telemetry**
- **Implantable Telemetry**
- **Ponemah™ Software**
- **Hardwired**
Implantable Telemetry Devices
PhysioTel™ implants are designed for acquiring data from conscious, freely moving laboratory animals — providing stress-free data collection while reducing risk of infection. PhysioTel implants are offered in various sizes to support a range of research models, including mice, rats, dogs and non-human primates.

External Telemetry
By jacketing subjects, cardiovascular and respiratory endpoints may be collected continuously without requiring surgery. Animals remain freely roaming and unstressed, providing high quality data for your studies. Options include JET™ for large animals and the CA-EXT external telemetry device for rats and similarly sized animals.

Hardwired Acquisition Solutions
Suite of amplifiers, modules, and sensing instrumentation to collect a variety of inputs including: blood pressure, electrocardiogram, left ventricular pressure, blood flow, and pressure-volume loops. Versatile platform allows up to 128 channels to bring in a multitude of signals enabling unique applications, examples include Langendorff and open chested experiments.
Ponemah Analysis

Ponemah is a software platform which integrates validated algorithms to reliably obtain accurate, consistent results and quickly deliver these results to you. Below is a sample of signal types and derived parameters. To learn more visit datasci.com.

<table>
<thead>
<tr>
<th>Signal Type</th>
<th>ECG</th>
<th>BP</th>
<th>LVP</th>
<th>Blood Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Heart Rate</td>
<td>Systolic</td>
<td>Coronary and Systemic Blood Flow</td>
<td></td>
</tr>
<tr>
<td>Sample of Derived Parameters</td>
<td>ECG Interval Quantification</td>
<td>Diastolic</td>
<td>Max and Min Cardiac Output</td>
<td>Max and Min</td>
</tr>
<tr>
<td></td>
<td>Waveform Amplitude</td>
<td>Mean</td>
<td>Systolic and Diastolic</td>
<td>Cardiac Output</td>
</tr>
<tr>
<td></td>
<td>Corrected QT</td>
<td>Pulse Height</td>
<td>Stroke Volume</td>
<td>Systolic and Diastolic</td>
</tr>
<tr>
<td></td>
<td>Pulse Wave Velocity</td>
<td></td>
<td>Stroke Volume</td>
<td></td>
</tr>
</tbody>
</table>

Ponemah software can collect a wide variety of signal types and display them side-by-side to expedite analysis. The figure to the left shows a sampling of endpoints which can be collected in Ponemah including aortic blood pressure, left ventricular pressure (LVP), $dP/dt$ (differential pressure) derived from LVP, pulmonary arterial pressure, pulmonary air flow (PAF), tidal volume derived from PAF, and pulmonary pressure.

Advanced ECG Analysis with ECG Pro and Data Insights

Pattern recognition with ECG Pro and Automated Arrhythmia Detection with Data Insights save you time and money. Let your research goals determine the depth of your investigation.

Find
- Ventricular beats
- Atrial beats
- Junctional beats
- Atroventricular (AV) block
- Sinus pause

Classify
- Runs of complexes
- Couplets
- Triplets
- Bigeminy
- Trigeminy
- Premature beats

Report
- Durations
- Occurrences
- Cycles per occurrence
- Distribution