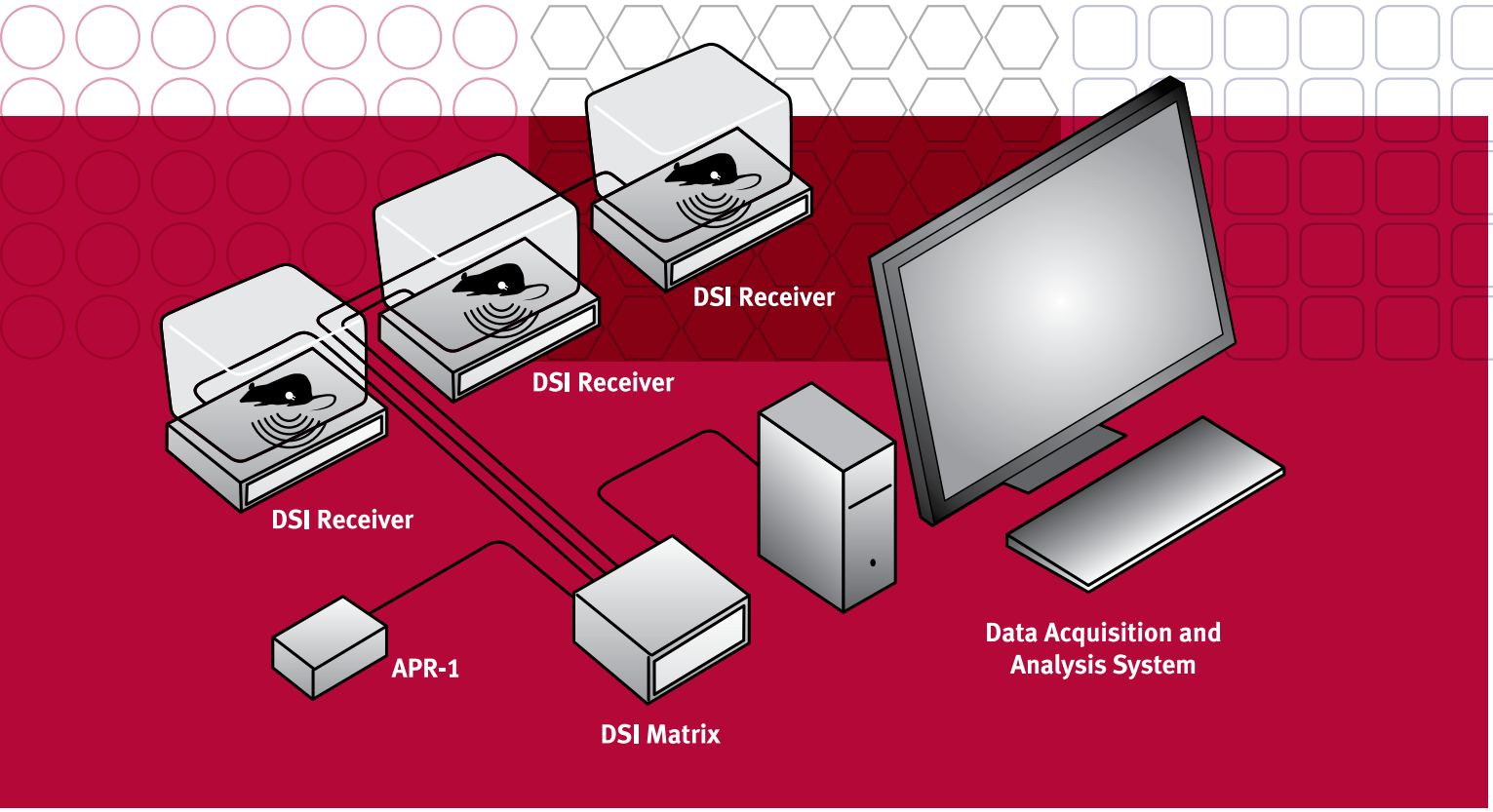
Guide to the DSI System

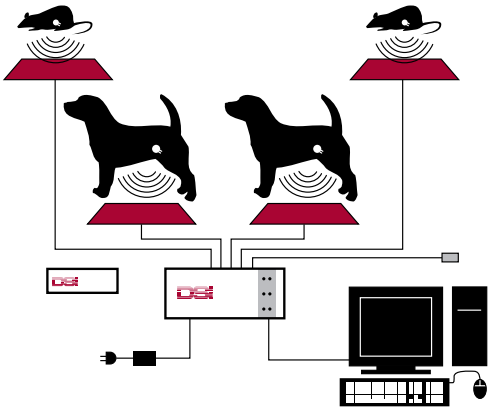
Implantable and External Telemetry Devices | Telemetry Hardware | Data Acquisition and Analysis Systems



DATA SCIENCES INTERNATIONAL

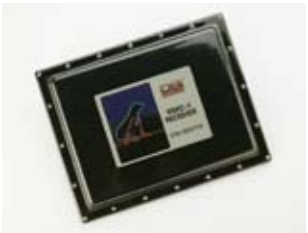
Better Data. Better Science

The DSI System



A pioneer in the field of wireless monitoring since 1984, DSI today is the platform of choice for researchers in the pharmaceutical, biotech and biomedical fields worldwide.

DSI provides a high level of integration and will meet the needs of researchers for full harmonization that allows time synchronous data acquisition and analysis using a broad array of sensors. DSI is part of the continuum that helps researchers advance science, leading to an improved quality of life for millions of people.



Monitor multiple parameters from untethered, conscious, freely moving laboratory animals

Data Sciences International (DSI) provides complete systems for monitoring and collecting data from conscious, freely moving laboratory animals. No wires or tethers are needed. You receive the highest quality data possible.

The DSI telemetry system facilitates the monitoring of animals while they move within their cages. A miniature transmitter implanted in each animal measures one or more parameters (e.g., blood pressure, temperature, heart rate, ECG, EEG, etc.) and transmits the data via radio frequency signals to a nearby receiver. The data may be collected using the Dataquest® or the Ponemah data acquisition system.

Each animal requires a dedicated transmitter (which is shipped to your laboratory, sterile and ready for implantation) and receiver. PhysioTel® transmitters and receivers are available in a variety of models, thus allowing optimal performance for various animal models and cage types.

DSI also offers a surface telemetry system known as JET,™ specifically designed for toxicology and safety pharmacology laboratories running high throughput studies.

PhysioTel receivers

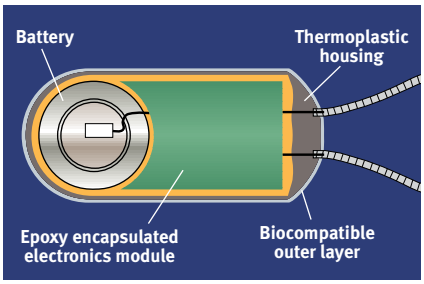
PhysioTel receivers are designed to provide reliable reception of telemetered data from implantable telemetry for a wide variety of species and housing types. Models are available to monitor animals housed in plastic or metal caging in addition to special experimental settings such as running wheels, treadmills, runs, pens, and mazes.

The RPC-1 is most often used for monitoring animals housed in plastic cages placed on top of the receiver, while the RMC-1 is typically used when monitoring animals housed in metal cages. The RMC-1 may also be used to monitor animals housed in plastic basin cages if provisions are made to accommodate the cable exiting the rear of the housing. The RMC-1 is housed in stainless steel and polycarbonate with a gasketed seal and water-resistant connector, making it possible to spray down the cages with the receiver in place. The RPC-1 and RMC-1 each have two receiving antennae oriented at right angles to minimize dropouts due to directionality of the transmission pattern.

These receivers are compatible with both single channel TA Series transmitters and MultiPlus™ TL Series transmitters. Each of these receivers is capable of detecting movements by sensing changes in signal strength as the animal traverses the cage. Digital pulses corresponding to the movements are forwarded to the DSI system for recording.

The DSI acquisition system allows up to 16 receivers to be combined into a single receiving system to extend the range of reception in each individual cage.

DSI also offers a telemetry repeater solution to house large animals such as dogs and primates in cages or pens compliant with the latest animal welfare guidelines for animal housing. Animals can also be grouped housed for improved social interactions, reduced stress and improved animal welfare.



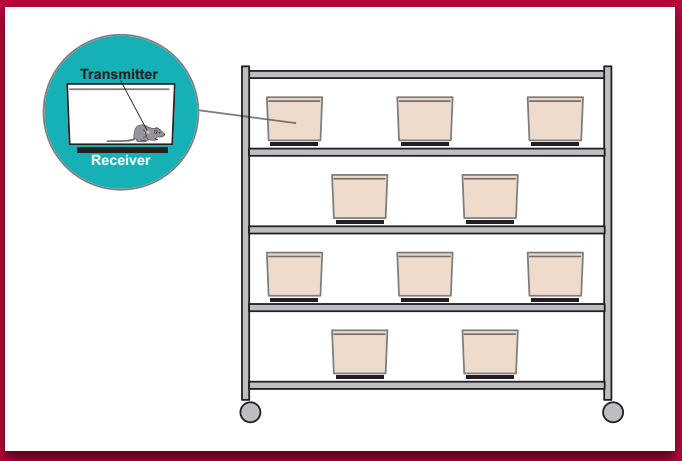
Transmitters contain a battery and a reusable electronics module, enclosed in advanced biocompatible packaging.

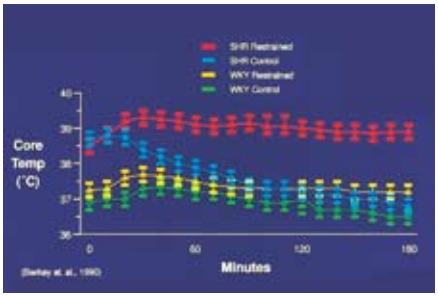
Miniature, fully implantable, and biocompatible telemetry devices

- Flexible, reliable, and easy to use.
- Compatible with most types of caging.
- Simultaneously monitor several parameters in each animal.
- Monitor animals ranging in size from mice to cattle.
- Long-term reliability in vivo due to advanced packaging and catheter design.
- Chronic implantation— small size, contoured shape, and biocompatibility.
- Sterile and ready for implantation.

Proven health benefits make implantable telemetry the first choice for physiological monitoring

- Stress-induced artifact is significantly reduced.
- Measurements are free from the effects of anesthesia.
- Allows animals to be chronically instrumented and used sequentially as their own control or in several studies.
- Animal handling is minimized.
- Telemetry is among the most humane means of monitoring animals.
- Exit site infections are eliminated.
- Data obtained by telemetry contain no cable or commutator artifact common in tether systems.
- Monitor blood pressure, ECG, EEG, temperature, and more.





Implantable telemetry eliminates restraint stress

For many years, the scientific community believed the core temperature of SHR rats was higher than that of its WKY counterpart. In 1990, however, Berkey et al. published the results of a study which employed implantable telemetry to measure the core temperatures of restrained and unrestrained SHR and WKY rats. These data clearly demonstrate that the elevated temperature documented in the SHR was not innate but was the result of stress induced by the methods employed on previous studies.

DSI Implantable Telemetry Devices

A variety of transmitters to improve the quality of your data and simplify your studies

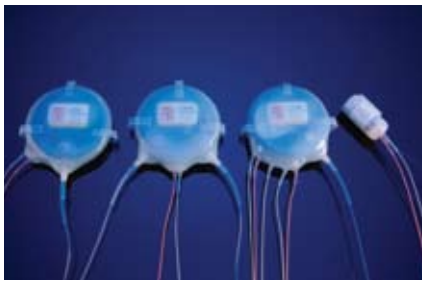
PhysioTel® transmitters

PhysioTel transmitters are provided in a variety of sizes to accommodate various species and cage size requirements. Species monitored include mice, rats, rabbits, dogs, pigs, primates, sheep, horses, cattle, and others. Parameters measured include arterial pressure, intra-pleural pressure, left ventricular pressure, intra-ocular pressure, bladder pressure, ECG, EMG, EEG, EOG, temperature, activity, and other parameters.

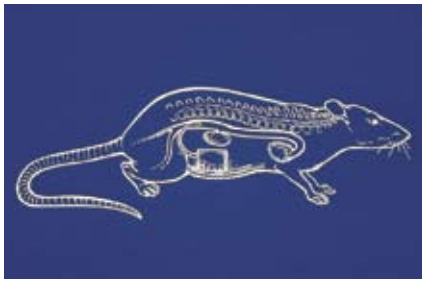
Every transmitter contains one or more sensors, depending on your needs, plus a battery and electronics module. PhysioTel transmitters are biocompatible and each transmitter is provided calibrated and in sterile packaging ready for implantation and immediate use. In some models, the sensor consists of high-quality flexible leads which detect bioelectric events (e.g., ECG, EEG, etc.). Other models have a thermistor or pressure sensor integral to the electronics module.

All models incorporate a magnetically activated on-off switch to conserve battery power in vivo or ex vivo.

Each transmitter is 100% inspected and tested, prior to shipment. Quality is built into the product during every step of the manufacturing process.



Transmitters are provided in packages of various sizes in order to optimize features, battery life, and transmitting range.



The PA-C40 blood pressure transmitter is surgically implanted in the peritoneal cavity with the sensing catheter inserted into the abdominal aorta as shown above.

Extended Warranty
Transmitter Exchange Program

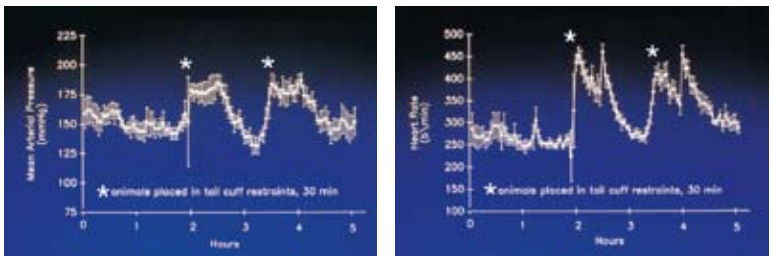
Get the most out of each transmitter

Extend the life of each transmitter. When the battery is depleted, simply return the transmitter to DSI. DSI will completely refurbish the transmitter and extend your warranty for an additional two years *

Transmitter Exchange Program includes:

- electronic module is recovered
- new sensing leads and catheters are attached
- battery is replaced
- transmitter is tested, calibrated, sterilized, and repackaged

*4ET telemetry module, F20-EET and F40-EET transmitters have a warranty of one year.



Restraints affect blood pressure and heart rate

Tail cuff and other restraints have a profound effect on both blood pressure and heart rate, in addition to other physiological measurements. This is clearly demonstrated by the blood pressure (far left) and heart rate data shown here.

At the time points indicated by *, six SHR rats were placed in tail cuff restrainers for 30 minutes. Blood pressure and heart rate were measured and recorded using DSI PA-C40 transmitters and the Dataquest system (from Rodney Lappe, with permission).

External Telemetry Devices

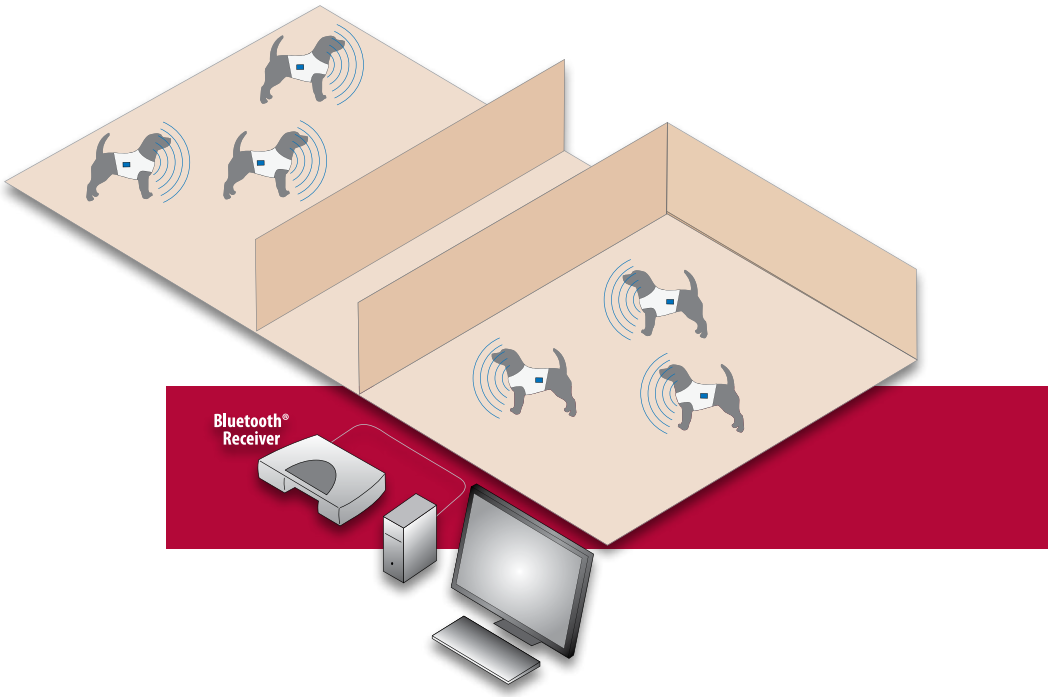
JET ™ accelerates the acquisition of high-quality data in fast track studies

DSI extends its family of telemetry products with the JET™ system of externally worn telemetry. JET is a Bluetooth® enabled device specially designed for toxicology and safety pharmacology laboratories running large animal studies. It can be used to monitor one, seven or 10 leads of ECG, temperature, and activity.

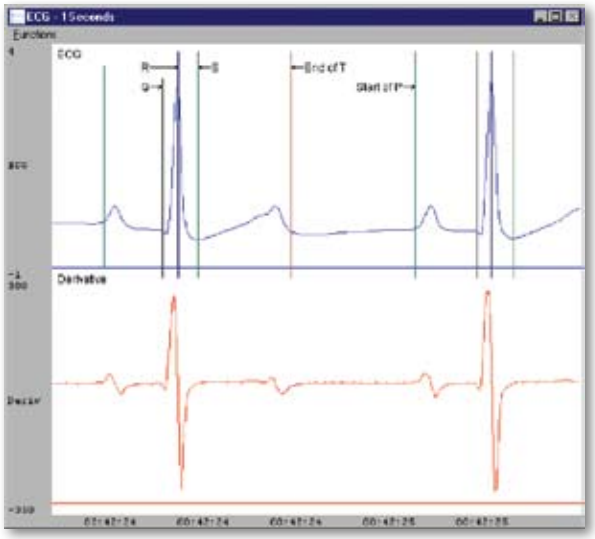
Jacketed External Telemetry

Up to 36 devices can be used in the same room without interference.*

- Easy to set up and use.
- Reliable, low-cost operation.
- Designed for portability.
- Collect accurate data faster.



The JET system functions exclusively with the industry-leading Ponemah software. The Ponemah system provides continuous data storage and experimental analysis either as they occur, or during subsequent review, with the option of performing these actions within GLP guidelines.



Ponemah ECG Analysis has been heavily used and validated over the last 15 years.

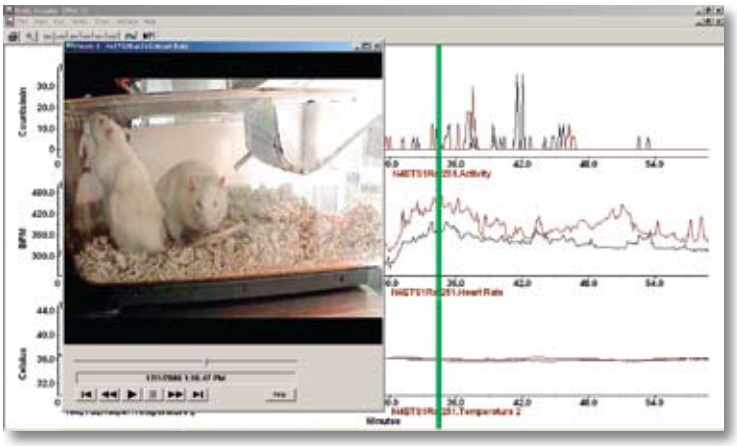
*18 device limit for JET-6ETA model. 36 device limit for JET-EA and JET-3ETA.

Data Acquisition and Analysis Systems

Dataquest A.R.T. — Accuracy, reliability, and ease of use

The Dataquest system maintains digital data from the receiver to the computer to optimize data integrity throughout the system. The Dataquest family of PC-based data acquisition systems is ideal for collection of telemetered data, no matter the number of animals being studied. Sampling rate, calibrations, transmitter type, animals monitored, extracted features, and other protocol settings can be easily selected using a Windows graphical user interface.

Dataquest ART™
Advanced Research Technology



Key features of Dataquest A.R.T.™

- Simple system setup and configuration.
- Continuous data collection from multiple animals simultaneously (up to 16 simultaneous animals).
- Scheduled data collection from large groups of animals.
- Combine continuous and scheduled data collection for maximum system flexibility.
- Standard Windows® user interface and controls.
- Automated hardware detection and verification.
- Common network-type cabling for flexible, low-cost installation.
- Continuous activity monitoring from all configured animals.
- Synchronized video monitoring from up to 4 video sources.
- Simple yet capable analysis program.

Note: The telemetry system may be interfaced to other third-party data acquisition systems through Dataquest OpenART. Consult your sales representative for more information.

Ponemah — High performance acquisition and analysis

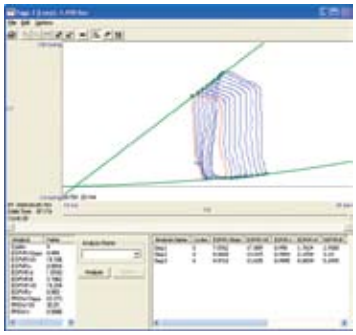
DATA SCIENCES INTERNATIONAL | PONEMAH

The Ponemah System is a complete physiological data acquisition and analysis system ranging from an acquisition interface unit and software to a complete PC-based scientific workstation. The Ponemah System is a multi-application platform, which utilizes state-of-the-art digital technology to automate the data analysis routinely performed in physiology, pharmacology and toxicology laboratories.

The Ponemah System controls the flow of data from the collection of the incoming signal to data summary and final report generation.

Ponemah accelerates the performance of your study

The Ponemah software platform consists of a library of pre-programmed, validated software modules that perform real-time analysis, drawing validation marks on key points of interest on the signal for verification of proper analysis.



Pressure-Volume Loop Analysis

Our Ponemah Performance Analysis Modules

- Offer an integrated solution for all applications, including synchronization of telemetered and non-telemetered signals.
- Provide validated algorithms for accurate, continuous reporting in acquisition or post analysis.
- Can be easily configured for various signal types.
- Include digital filtering in algorithms.
- Feature built-in validation assistance by placing marks on the signal at key points of interest.
- Allow the creation of secondary signals which can be displayed and recorded in certain analysis modules with specific graphical presentations.
- Over 200 derived/calculated values at your fingertips.

Ponemah analysis modules are validated and compliant

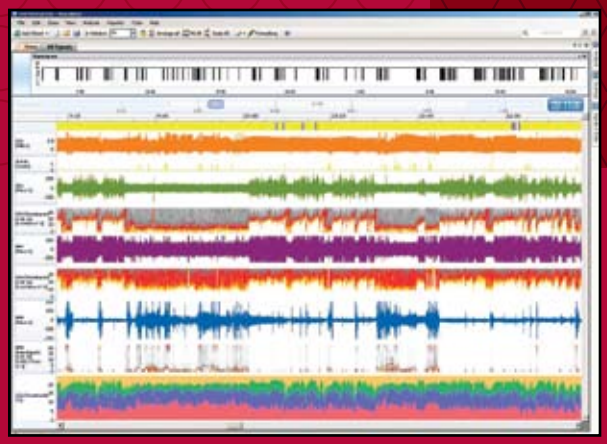
Our engineers use the latest scientific and peer-reviewed journals to develop application algorithms. We continually develop and test new modules to meet the changing requirements of the research community.

As with the core Ponemah platform, the Analysis Modules can operate in a regulatory compliant and GLP environment.

Software Analysis Modules

- Standard Multiple Lead ECG
- ECG PRO (Pattern Recognition Option)
- Systemic Blood Flow
- Blood Pressure
- Segment Length & Wall Thickness
- Left Ventricular Pressure
- Action Potential
- Pulmonary Air Flow & Airway Resistance
- Pulsatile Tissue and Gut Motility
- Electromyogram
- Pulmonary Compliance & Resistance
- Indirect Blood Pressure
- Unrestrained Plethysmography
- Cardiac Volume
- Coronary Blood Flow
- Pressure-Volume Loop Analysis
- Smooth Muscle Tissue
- Cystometry

To learn more, talk to a DSI representative
at 1-800-262-9687 (U.S.A./Canada),
1-651-481-7400 (worldwide),
or visit www.datasci.com



CNS Analysis Software

Neuroscore CNS analysis software offers fully automated sleep scoring based on EEG, EMG and other waveform signals. The software provides advanced frequency analysis tools as a basis to manually score and audit automated results.

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