Pinnacle’s AUTOMATED SLEEP DEPRIVATION SYSTEM is a unique solution for sleep deprivation and sleep fragmentation studies. This “gentle handling” system is capable of sleep depriving mice and rats without direct human intervention while minimizing exercise. The system is sold as either a STAND ALONE SYSTEM or a FEEDBACK SYSTEM in which EEG/EMG activity is used to determine the sleep/wake state.

### SYSTEM FEATURES

<table>
<thead>
<tr>
<th>Feature</th>
<th>STAND ALONE</th>
<th>FEEDBACK</th>
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<tbody>
<tr>
<td>Available for both mice and rats</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Adjustable speed and motor control</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Calendar-based scheduling</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Suitable for short-term, long-term, and chronic studies</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Optional video recording</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Real-time biopotential analysis and feedback</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Rule-based programming</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Yoked control functionality</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Requires Pinnacle’s EEG/EMG system</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Compatible with third-party systems</td>
<td>✔</td>
<td>✔</td>
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### COMMON USES

- Automated deprivation
- Sleep fragmentation
- Simulated shift work
- Jetlag paradigms

### ADVANTAGES

- **Simulates** gentle handling
- **Limits** unnecessary exercise
- **Minimizes** resources compared to manual deprivation
- **Prevents** sleep acclimation and habituation
- **Accommodates** water, food, and bedding
- **Provides** flexible scheduling controls
- **Saves** schedules for future use
- **Integrates** with synchronized video system

### Effectiveness of Sleep Deprivation in Mice

The chart above shows a comparison of baseline sleep (purple bars) with a 24-hour sleep deprivation period (gold bars). Six mice (male, C57BL/6J) were maintained on a 12-hour lights-on/12-hour lights-off schedule. EEG and EMG activity were recorded for 24 hours (baseline). During the following 24 hours, each animal was sleep deprived by programming the system to rotate the bar within ten seconds of the mouse entering a sleep-like state, as determined by active EEG feedback. Vertical bars represent sleep time in 2-hour bins.
HOW IT WORKS

PINNACLE’S SLEEP DEPRIVATION SYSTEM is designed to gently restrict sleep without unnecessary exercise. This is achieved by a rotating bar placed a short distance above the cage floor, lightly nudging the animal from sleep and encouraging low levels of activity until the animal maintains wakefulness on its own. The speed, direction, and duration of bar rotation are fully customizable.

OPTIONAL VIDEO SYSTEM

Integrated video recording provides a platform for synchronizing EEG and EMG changes with observable behavioral states. Captured video is displayed on screen and is synchronized with other recorded data in playback mode.

ROTATING BAR

The bar rotates at speeds between five and fifteen RPM and can be programmed to change directions to reduce acclimatization to the sleep deprivation environment.

A VARIETY OF CAGE SIZES ARE AVAILABLE

MULTIPLE CONTROLS

The system can be controlled by a computer or by the programmable interface on the front panel of the device.

YOKED CONTROL

Add additional units to perform yoked control sleep studies. All units can be programmed to operate simultaneously under one schedule or set of rules. A feedback system is required for yoked control.

OPTIONAL ANALYSIS SOFTWARE

Pinnacle’s Sirenia® Sleep Pro software allows users to reduce scoring and analysis time by automating the process with tools such as cluster scoring, threshold scoring, hypnograms, and spectral plots. The software’s analysis features allow users to quickly compare scores, perform bout and sleep analyses, and customize high-quality charts and graphs.

TWO DEPRIVATION SYSTEMS

OPTION 1: STAND ALONE SYSTEM

When used in stand alone mode, the bar is programmed to rotate at discrete intervals, ranging from a second-by-second basis to hourly, daily, weekly, or monthly intervals. Programming using the LCD controls on the device eliminates the need for a computer connection. The system is compatible with most EEG/EMG hardware and physiological measurement systems.

OPTION 2: FEEDBACK SYSTEM

The feedback system provides the same scheduling functionality as the stand alone system along with the capability of adding real-time EEG/EMG monitoring to ensure the bar rotates only when the animal enters a sleep-like state. Bar rotation starts and stops automatically based on user established rule sets for the animal’s sleep state, and users can easily incorporate delays, shifts in bar rotation, and time restrictions into the experimental setup.

RULE-BASED PROGRAMMING

The true versatility of the feedback system is unlocked in Sirenia® Acquisition with the included license key. Our software uses EEG and EMG data to establish thresholds, or rule sets, for the animal’s sleep patterns. Rule criteria can be easily adjusted by the researcher to target specific sleep behaviors.