

NOT FOR THE MEDICAL USE

## SPECIFICATIONS

### DATA COLLECTION

#### A/D CONVERTING FUNCTION

Channel Numbers	Maximum 32 channels
Sampling Frequency	From 100 To 1,000[Hz] (A certain limitation for the sampling frequency depends on the CPU)
Recording Time	Maximum 1 Week (Depends on the free space of the hard disk)

### DATA ANALYSIS

#### SCORING OF SLEEP STAGES

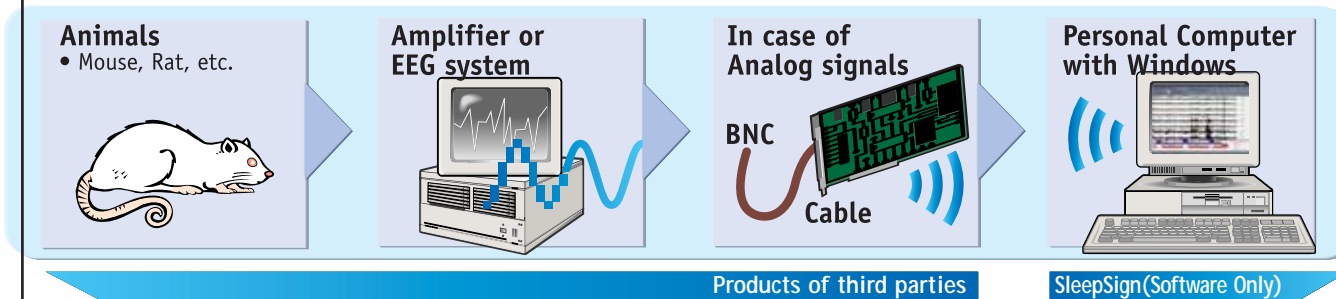
Sleep Stages	SleepSign™ has 3 unassigned stages except for regular preassigned sleep stages (Wake, REM, SWS, etc.).
Epoch length	4, 5, 8, 10, 12, 15, 20, 30, and 60 [second]
Minimum required signals	EEG:1ch, EMG:1ch, (Capabilities to include EOG signals)
Waveform Recognition	Delta-wave, Theta-wave, IEMG(Integrated EMG), (REMs Counts in EOG)
Method of Scoring	This software determines sleep stages by the condition divergence.

### COMPUTER HARDWARE REQUIREMENTS

OS	Windows XP	
CPU	PentiumII 400MHz or higher processor (600MHz or higher is recommended)	
RAM	128MB or higher (256MB or higher is recommended)	
Hard Disk	100MB or higher free space (1GB or higher is recommended)	
Resolution	1024 x 768 or higher	
Other	A/D Converting Board	CONTEC MICROELECTRONICS USA INC. AD16-16U (PCI) EV (16 chanel, 16bit, ±10V, ±5V) AD16-32/2(PCI) F (32 chanel, 16bit, ±10V, ±5V, ±2.5V) AD16-32/2(CB) F (32 chanel, 16bit, ±10V) (for laptop PC)
	<Note> A signal connection cable need to be purchased separately	
	Third party data import	BioPac AcqKnowledge date file DSI Data Quest Art data file EDF (European Data Format) file Text file
	Printer	Any printers work with the OS listed above.
	Expansion Storage Devices	The use of a recording data storage is recommended. DVD-RAM, etc. (There is no limitation if it works with OS listed above.)

### ARCHITECTURE DIAGRAM OF SYSTEM

The whole recording system consists of the software, SleepSign™, and hardwares with an A/D conversion board and peripherals such as an amplifier.



Note: SleepSign™ is software only. (Personal computers and other pieces of hardware are not included.)

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# SLEEP ANALYSIS SOFTWARE

## SleepSign™ for Animal

### REVOLUTION FOR SLEEP ANALYSIS

**COST EFFECTIVE!**  
**LESS TIME CONSUMING!**  
**USER FRIENDLY!**

- SleepSign™ helps you to evaluate the different sleep stages of animals (rat, mouse, dog, etc.).
- SleepSign™ has 3 unassigned vigilance stages in addition to the regular pre-assigned sleep stages (Wake, REM, SWS, etc.). You can assign these vigilance stages as required in your research.
- SleepSign™ automatically evaluates sleep stages based on EEG and EMG signals. You can also easily evaluate sleep stages by visually checking the waveforms on the screen.
- SleepSign™ can display various types of information, such as Hypnograms and Trend Graphs.
- SleepSign™ has various analyzing functions, including Stage Graphs, Vigilance State Parameters Display, FFT analysis, digital filter, and zooming.

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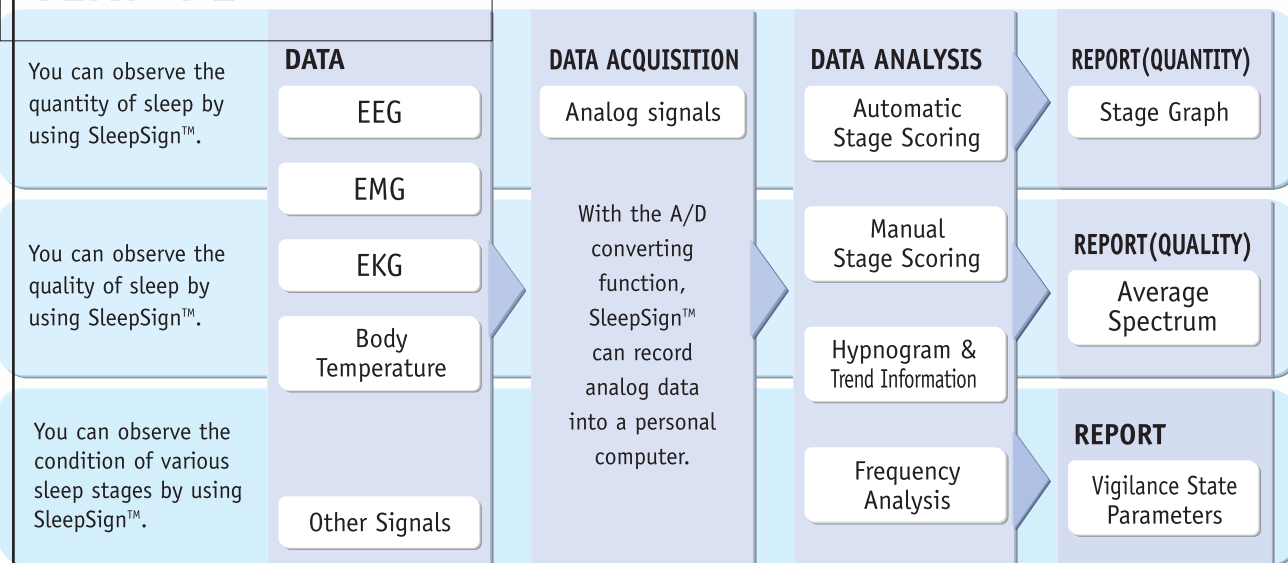
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# SLEEP ANALYSIS SOFTWARE

## SleepSign™ for Animal



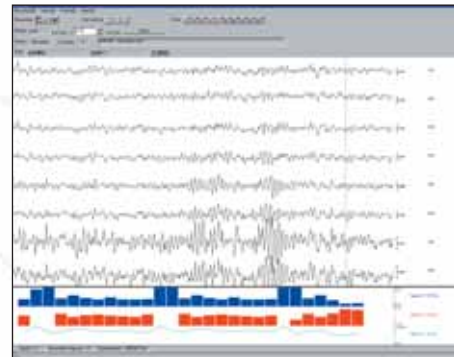
### FEATURES



### DATA ACQUISITION

#### A/D CONVERTING FUNCTION

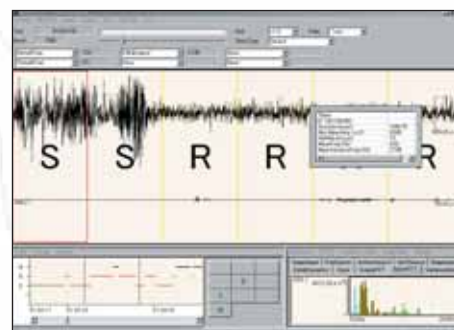
SleepSign™ can continuously record physiological signals up to 32 channels for a long period of time (with certain limitations for sampling frequencies).



#### Recordings

- With the A/D converting function, SleepSign™ can record analog signals to a maximum of one week.
- In addition to EEG and EMG, it can also record analog signals such as EOG, Body temperature and Blood pressure.
- SleepSign™ displays the raw data with the trend-graph (the maximum, minimum, average, and integral graphs calculated from the recording data of any time bin) in real time. You can easily grasp the change of the Integral EMG and body temperature.

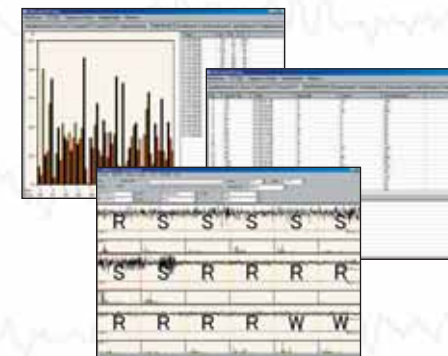
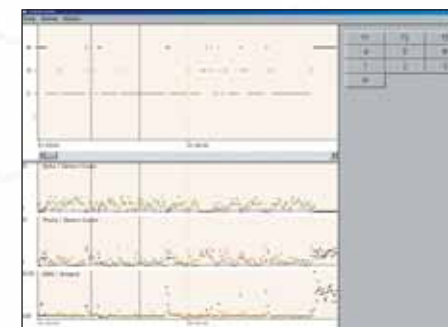
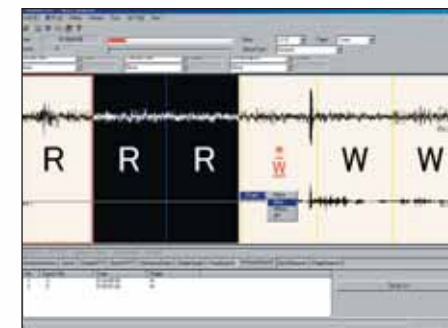
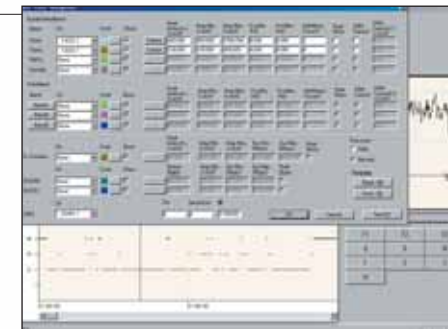
### DATA ANALYSIS



#### WAVEFORM VIEWER

- SleepSign™ can display to the maximum 32 channels of waveforms. It displays the raw data as the numerical value or character, in addition to displaying the line as waveform. This function is convenient to display data of small changes such as body temperature blood pressure etc.
- A waveform window can be divided horizontally into 3 or 5 parts. The waveform of the previous page and the page after can be displayed on one screen with this function. Also, it can display data up to 1 hour on one screen.
- You can always display a spectrum corresponding to EEG data and use it as the index for manual scoring.

### DATA ANALYSIS



### STAGE SCORING

You can score the sleep stages from EEG and EMG signals automatically or manually.

#### Automatic scoring

- The algorithm of the automatic scorings uses the method of simple condition divergence. The results of the automatic scoring can be modified manually.
- The automatic scoring of SleepSign™ has a search function for multiple stages. All of the condition divergences that you set up are computed from the beginning to the end. If there are some stages that meet a condition other than the first applicable stage, SleepSign™ will memorize them as the next candidate, and make a list of these epochs. After the automatic scoring, you can also correct the these epochs visually by checking the list.
- SleepSign™ has the function to detect artifact signals by setting the threshold level. These artifact epochs can be excluded from average spectrum analysis.

#### Manual scoring

- You can carry out scoring easily by using the keyboard or mouse and score continuous epochs with one action of the mouse.
- SleepSign™ can memorize 2 previous the stages that are changed manually, so, the history of the modification of the stages can easily reviewed.

### OTHER SLEEP ANALYSIS

#### Hypnogram & Trend Information

- You can divide hypnogram windows to up to 12 partitions. This is convenient to analyze the sleeping data collected for a long period "Trend Window" (displays hypnograms) and "Workspace Window" (displays spectrums) can be separated from the Waveform Viewer.
- SleepSign™ can display trend graphs on the same scale as the hypnogram. The Trend Window can display other information such as percentage of FFT analysis, amount of Integral EMG, maximum/minimum of the blood pressure, LF/HF of the EKG, etc.

#### Stage Graph

- You can tell the occurrence-rate and total-time of sleep stages for any time bin.

#### Vigilance State Parameters

- With the Vigilance State Parameters function, you can obtain the number and duration of the sleep stages in selected periods.

#### Frequency Analysis

- SleepSign™ has various frequency analytic functions:
  - FFT analysis on each epoch or all epochs either for an epoch or page can be displayed.
  - Average Spectrum for each sleep stage can also obtained.

### OUTPUT

#### Text data outputs

- You can output various analysis results (spectrum, trend information, hypnogram etc.) as numerical values to the clipboard and text files. You can also output the result of the data analysis directly to MS-Excel etc. by text output function.

#### Print

- You can print waveforms, hypnograms, and trend graphs and the result of other analysis can also be out put as files. You can further edit or print the results of data analysis by using other applications (MS-Excel etc.).