



## **PSG Config**

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## **AD060-2**

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# Table of Contents

Foreword	0
<b>Part I Before You Begin</b>	<b>5</b>
<b>Part II Introduction</b>	<b>8</b>
<b>Part III What's New</b>	<b>10</b>
<b>Part IV About Configurations</b>	<b>11</b>
<b>Part V Device Types</b>	<b>13</b>
<b>Part VI Recording Configuration</b>	<b>14</b>
1 Data Types .....	15
Channel Group .....	16
Sampling Rate .....	16
Range .....	17
Hardware Filter .....	17
2 Physical Inputs .....	18
Calibration .....	19
3 Manual Inputs .....	21
4 Study Analysis .....	22
Analysis Settings .....	24
Scoring Mode .....	26
Study Type .....	28
Sleep .....	29
Respiratory .....	33
Arousal .....	39
Manual Classification .....	41
Automatic Classification .....	43
Limb Movements .....	47
Other .....	49
Automatic Analysis .....	52
Sleep Analysis .....	53
Arousal Analysis .....	53
Respiratory Analysis .....	54
Respiratory Parameters .....	55
Apnea/Hypopnea detection parameters .....	56
Minimum Apnea/Hypopnea duration (seconds) .....	57
Max Apnea relative amplitude (%) .....	58
Min Apnea relative duration below threshold .....	59
Max Hypopnea relative amplitude (%) .....	60
Min Hypopnea relative duration below threshold .....	62
Apnea Classification parameters .....	63
Minimum relative amplitude (%) .....	63
Minimum relative duration (%) - Obstructive Apnea and Mixed Apnea .....	64

Desaturation parameters .....	66
Desaturation Artifact .....	66
Respiratory Rate .....	67
Sound .....	67
Limb Analysis .....	69
Limb movement parameters .....	70
PLM .....	72
Other Parameters .....	73
PTT .....	74
EtCO2 .....	77
Heart Rate .....	77
<b>5 Decision Assist .....</b>	<b>78</b>
<b>6 Alerts .....</b>	<b>80</b>
<b>7 Observation Chart .....</b>	<b>83</b>
<b>Part VII View Configuration .....</b>	<b>86</b>
1 Trend .....	87
2 Meters .....	90
3 Trace Display .....	91
Configuring Trace Layout .....	92
Configuring Traces .....	93
Managing Trace Layouts .....	96
Shortcuts .....	96
<b>Part VIII Save Configuration .....</b>	<b>97</b>
<b>Part IX Options .....</b>	<b>98</b>
1 System Settings .....	99
General .....	100
Trace Window .....	102
Scoring .....	103
Timebase Options .....	104
Technician Notes .....	104
Security Options .....	105
Patient Calibration .....	106
2 User Settings .....	106
<b>Part X Reference .....</b>	<b>109</b>
1 Device Calibration .....	109
2 Raw Input Stability .....	110
<b>Part XI Menu Items .....</b>	<b>111</b>
<b>Part XII Product Support .....</b>	<b>113</b>
<b>Index .....</b>	<b>0</b>

# 1 Before You Begin

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## Intended Use

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### User Guide

The **PSG Config User Guide** contains information for you to work with Compumedics Systems. It is one in a set of several user manuals designed to enhance your knowledge of Compumedics Systems.

### Software

**ProFusion Sleep 3** is a series of software applications which provide tools for the recording, review, analysis, summary and reporting of polysomnography (PSG) studies recorded with Compumedics Systems, thus assisting the Physician in making a diagnosis regarding sleep disorders.

The different programs in the Profusion Sleep 3 suite are:

<b>PSG Config</b>	For configuring settings used during study acquisition
<b>NetBeacon*</b>	For selecting PSG hardware to acquire data
<b>PSG Online</b>	For recording sleep studies and performing real time analysis
<b>Profusion PSG 3</b>	For reviewing, analysing and reporting studies
<b>Study Manager*</b>	For managing studies, including archiving

\* Users of the Compumedics neXus software should not use these programs.

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## Safety and Effectiveness Considerations

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Sleep studies should only be carried out under the recommendation of a physician.

This software is intended for use by persons trained in professional health care. The operator must be thoroughly familiar with the information contained in this User Guide before using the software.

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## Indications for Use

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Compumedics Systems are intended for use to aid in the evaluation and diagnosis of sleep disorders. Use this software only under the supervision of a physician, sleep technologist or clinician.

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## Contraindications

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None.

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## Warnings and Cautions

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**Warning**

Do not operate the Compumedics Systems during electrical storms. Information could be lost or equipment could be damaged. Damaged items manufactured by Compumedics must be returned to a Compumedics Authorised Repair Centre.

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## Prescription Device

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**Caution**

US federal law restricts this device to sale by or on the order of a physician.

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## Placement of Equipment

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Place the system components on a sturdy and level surface. Do not place any unit on the carpet or in the bed with the patient.

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## Manufacturer's Recommendations

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For all third party equipment used with the Compumedics Systems, follow all of the manufacturer's recommendations and instructions. Be sure to read, understand and follow the instructions in this User Guide and any others that come with the system and its components.

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## Product Support

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If you have a question regarding the operation of **ProFusion Sleep 3**, first look in this User Guide or consult the Online Help for the solution. To access the Help, press **F1** or select **Contents** from the **Help** menu.

If you are unable to find the answer in your documentation, contact Compumedics Product Support on:

Australia      **1800 244 773**

International    **+61 3 8420 7396**

USA              **1-877-294-1346**

or your authorised representative.

If you call, you should be sitting in front of your computer system with the **ProFusion Sleep 3** software running at the section you have the question on. You should also have this User's Guide at hand. When you call, please provide the following information:

- The version of software and operating system being used
- A description of what happened and what you were doing when the problem occurred
- The exact wording of any messages that appeared on your screen.
- A description of any attempts made to fix the problem

If you need to ship the equipment, pack the equipment and its accessories carefully to prevent shipping damage. All relevant accessories should accompany the equipment.

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[www.compumedics.com](http://www.compumedics.com)

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## 2 Introduction

**PSG Config** is used to configure Compumedics polysomnography devices. The configuration can be performed without a recording device connected to the system. Multiple configurations can be created, and then linked to a PSG device when opening a study through **PSG Online**.

To open PSG Config, select the program through the Windows Start menu, or click the PSG Config icon.



If you want to share configurations between networked computers, you should specify the network path to the folder where the configurations are to be saved in the [Options](#) <sup>1001</sup>.



### Info Definitions:

**Input** – Individual data input channel to be recorded. Input numbers are assigned to specify where the sensor is physically connected to the PSG equipment. The Recording Configuration determines the parameters for recording these inputs.

**Trace** – Displayed data, which may be referenced to other inputs, and manipulated to display an optimal signal without changing the recorded signal. The View Configuration determines the display parameters.

### *To create a new configuration*

To create a new configuration, select **File > New Configuration** or press the New Configuration icon:



Select the Device type to be configured.



## ***To open an existing configuration***

To edit an existing configuration, select **File > Open Configuration** or press the Open Configuration icon:



Select the Device type, and choose the configuration to edit from the list. Only configurations compatible with the device type will be displayed.

### 3 What's New

Profusion PSG 3.1 incorporates a significant number of new features to enhance your recording, analysis, reviewing and reporting process. Click the links below to go to the relevant topic.

#### ***PSG Online (see the PSG Online help file for more links)***

[Security features. User Events are tagged with the user currently logged-in to PSG Online.](#) 

Support for Compumedics Digital Video 3, which allows IP (networked) cameras to be used, and controls Pan-Tilt-Zoom (PTZ) functions directly from the Digital Video window (for compatible cameras only).

Improved workflow:

- Patient name now appears in title bar before recording starts


- Patient details can be edited during acquisition

- Change the input for the Flow-Volume loop on the fly

#### ***Profusion PSG (see the Profusion PSG help file for more links)***

Track user log-in changes from acquisition. Changes to User Events are tagged with the logged-in user.

Bookmark feature. Take screenshots of the trace display for bookmarking. These can be included in reports, or sent to the Windows Clipboard for pasting into other applications.

[Customise Trace Label names](#)  (also available in PSG Online).

The Zoom tool is back, now with interactive features including a caliper to measure exact durations and amplitudes (available in PSG Online via PageBack).

The Statistics window now includes the Sleep Onset time.

Lights out and Lights on times can be set via a dialog, in addition to through the Trend window.

More windows can be printed, including the Observation Chart.

Scoring Comparisons can now be performed for an epoch range (eg: 200 epochs for QA purposes).

Automatic Analysis improvements:

Snore analysis improved to handle different input devices (microphone, piezo sensors, SPL meters)

Ability to perform Respiratory Event detection, Snore analysis and SpO2 desaturation/artifact algorithms separately.

## ***Reporting (see the Profusion PSG help file for links)***

New report fields:

Chronological CPAP statistics.

Include Bookmarks (screenshots).

Include technician comments from the Study Log.

Impressions can be placed anywhere in a report (Impressions is an optional feature).

Recommendations can be placed anywhere in a report (Recommendations is an optional feature).

## ***Other***

Data Card Manager now supports Somté studies, allowing Somté studies to be imported into Compumedics Nexus. See the Data Card Manager online help for details.


NetBeacon now supports Safiro devices (see the PSG Online help file for link).

## **4 About Configurations**

There are four different configuration files that are created and managed by PSG Config:

- [Recording Configuration](#)<sup>[14]</sup>
- [View Configuration](#)<sup>[86]</sup> (Trace Layout)
- [Observation Chart](#)<sup>[83]</sup> Configuration
- [Trend](#)<sup>[87]</sup> Configuration

In order to record a study, a Recording Configuration and a Trace Layout must be defined. Studies can be recorded without Observation Charts and Trends configured or selected, but obviously these features cannot then be used during recording.

 **Info** The Observation Chart is configured in the Recording Configuration pane, and the Trend is configured in the View Configuration pane. However they are saved separately from these configurations.

There are also a variety of [Options](#)<sup>[98]</sup> that should be configured before starting a recording.

Each Recording Configuration can be assigned default Trace Layout, Observation Chart and

Trend configurations. These will be loaded when the study is created in PSG Online 3. The Trace Layout can be changed once recording has started, but the Trend and Observation Chart configurations cannot be changed.

The Study Type determines the sleep stages that will be available for analysis.

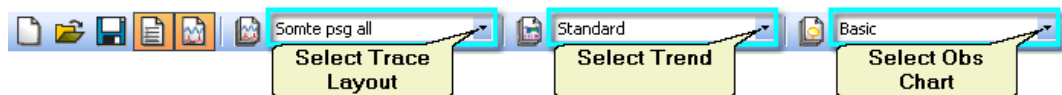
The Scoring Mode determines whether AASM rules or R&K rules are used for manual and automatic analysis.

The Defaults are displayed in the Recording Configuration pane:

The Recording Configuration dialog box contains the following settings:

- Data Types**
- Physical Inputs**
- Manual Inputs**
- Analysis Settings**
- Decision Assist**
- Alerts**
- Observation Chart**
- Defaults**
  - Default Trace Layout: Standard-AASM
  - Trend Layout: Standard
  - Observation Chart: Basic
  - Scoring Mode: AASM (dropdown)
  - Study Type: Adult (dropdown)
  - Epoch Length: 30 seconds

These Default Configuration files match those selected in the toolbar:



Selecting a different Trace Layout, Trend or Observation Chart from the toolbar will automatically update the defaults for the current Recording Configuration.

## 5 Device Types

**PSG Config** is used to set up configurations for Compumedics PSG recording devices.

### E-Series

The E-Series is a 58-channel PSG system where the recording unit sits next to the patient and communicates to the recording computer through network cables.

### Siesta/Safiro

The Siesta is a 52-channel wireless PSG system where the recording unit can be worn by the patient and can either record the study to an inserted Compact Flash card or via radio link to a wireless access point connected to the recording PC.

The Safiro is similar to the Siesta in all respects except that it does not have radio functionality. In this help file, all references to the Siesta apply equally to the Safiro.

### Somté PSG

The Somté PSG is a 23-channel PSG system that can be used in ambulatory mode, or can communicate to PSG Online 3 via a wireless Bluetooth connection. The ambulatory mode does not require any configuration in **PSG Config**.

### Neuvo

The Neuvo is a 68-channel PSG system where the recording unit sits next to the patient and communicates to the recording computer through network cables. Coming soon!

### Synamp2

The Synamp2 is a 40-channel amplifier designed primarily for EEG monitoring.

## Configuration

As each of the PSG devices have different parameters, the study Configuration files are not interchangeable between them. When making a new configuration, the type of device must be selected. When **PSG Config** is started, the last recording device type used is loaded by default. The device type selected is displayed in the title bar.

When a new study Configuration is created, the device type must be selected to match the recording device the Configuration is being made for. If an existing study Configuration is being edited instead of being created from scratch, it will already apply to the correct device type and does not need to have one selected.

## 6 Recording Configuration

The Recording Configuration defines what data is recorded, and how that data is used by the various analysis and monitoring modules within **PSG Online 3**. The default settings for Input Assignments and Automatic Analysis in **Profusion PSG 3** are also defined by the Recording Configuration.

Specifically, the Recording Configuration pane is used to configure:

- [Physical Inputs](#)<sup>18</sup> - All electrodes and other sensors
- [Manual Inputs](#)<sup>21</sup> - Inputs that are not monitored via sensors, but are changed by the monitoring technologist
- [Analysis Settings](#)<sup>22</sup> - Assign which inputs to use for manual and/or automatic analysis, and the parameters for automatic analysis
- [Decision Assist](#)<sup>78</sup> - A tool to assist in making decisions about when to start treatment in split night studies
- [Alerts](#)<sup>80</sup> - Set alerts that trigger when the specified thresholds are reached for calibrated inputs
- [Observation Chart](#)<sup>83</sup> - Can be customised and used to replace paper-based observation charts

If it is not visible, open the Recording Configuration window from the **View > Recording Configuration** menu item, or the Inputs icon:



## 6.1 Data Types

Data types offer a quick and convenient way to apply settings (for example [sample rate](#)<sup>[16]</sup>, [filters](#)<sup>[16]</sup>) to multiple [physical inputs](#)<sup>[16]</sup>, for example EEG, EMG and Effort.

To create a new data type, right click in the Data Type pane and enter a name.

**Info** If you want to create Derived Traces (eg: A1A2), you must create a Data Type named EEG, and assign all channels to be used for Derived Traces to this Data Type. See the Profusion PSG 3 help for details on using Derived Traces.


**Info** Inputs do not have to be associated with a data type. Settings for unique inputs (for example: Body Position) can be configured in the Physical Inputs pane.

Set the following parameters:

- [Channel Group](#)<sup>[16]</sup>
- [Sampling Rate](#)<sup>[16]</sup>
- [Voltage Range](#)<sup>[17]</sup>
- [Hardware Filter](#)<sup>[17]</sup>

### 6.1.1 Channel Group

Select the channel group for the data type. The available channel groups vary depending on the recording device selected.

 **Tip** Look at the recording device for information about which channel groups to assign to particular data types. For example, the E-series headbox is labeled with channel numbers for all inputs, and names for typical EEG channels.

The sampling rates and ranges vary depending on the channel group selected. For the E-Series device, each channel group has a fixed hardware filter. For the Siesta device, some channel groups have a selectable hardware filter.

### 6.1.2 Sampling Rate


The sampling rate is the number of times per second (Hz) that the data is stored. The higher the sampling rate, the higher the accuracy of the signal reproduction, but the larger the study file.

Sampling Rates for Data Types can be selected from the following: 16, 32, 64, 128, 256, 512 hertz (not all sampling rates are available for all channels).

#### ***Recommended Minimum Sample Rates***

Inputs	Rate (Hz)
Thermistor	16
Nasal Cannula: with snoring detection without snoring detection	256 16
Respiratory effort belts	16
ECG, EOG	64
EEG, EMG, Sound, Leg	128

 **Tip** The sampling rate should be at least double the highest frequency you want to be able to view.

 **Tip** There are minimum sampling rates required for data acquisition in order for the Automatic Analysis to operate correctly. [Click here to view these sampling rates.](#)



### 6.1.3 Range

The range defines the maximum signal amplitude (peak-to-peak amplitude) for the data type. 17 different ranges are available, from 500uV – 20.0V (not all ranges are available for all inputs. The available ranges depend on input channel used). Using the lowest suitable range for a data type will maximise the resolution of the data recorded.

Input Type	Data Type Name	Input Signal	Recommended peak to peak Range
AC Electrode	EEG	EEG, EOG	2mV
	EMG	EMG	2mV
	ECG	ECG	4mV
AC Bipolar	Leg	Leg/L, Leg/R	64mV
	Effort	Thor, Abdo	32mV
DC Bipolar	DC	Position	512mV

### 6.1.4 Hardware Filter

The Hardware Filter settings are determined by the input [channel group](#)<sup>16</sup>.

In the E-Series Control Module the hardware filters are fixed for all inputs.

For the Siesta device, the hardware filter is selectable for DC inputs 1-4 (0Hz or 0.15Hz), and AC Alt inputs 28-32 (0.05Hz or 0.15Hz).

## 6.2 Physical Inputs

The Physical Inputs panel defines where individual electrodes or sensors are connected to the PSG monitoring equipment. Inputs are numbered sequentially (different devices have different total amounts of inputs), with corresponding labels on the PSG equipment to assist in plugging the right thing into the right place.


 **Info** The only inputs that are not configured are the Reference and Ground. Both of these inputs must be connected to record signals.

### *Name*

Defines the name of the input channel, which will be displayed in the trace pane.

### *Data Type*

Select available [data types](#)<sup>[15]</sup> from the drop down list. The available data types will vary depending on which channel number you are configuring.

 **Tip** Set the same data type for inputs that you wish to reference to each other. For example, in order to reference EEG electrode C3 to referential electrode A2, both should be assigned to the EEG Data Type.

### *Rate and Range*

The Rate and Range will automatically be configured to the setting defined in Data Types if you select a Data Type. Otherwise, these can be manually configured. A Rate of 0 (zero) will turn the input off and it will not be recorded.

 **Info** Any inputs not required should be turned off to reduce the file size.

### *Hardware Filter*

This is fixed for the E-series. For the Siesta, this will be set by the selected Data Type for each input, or can be manually set for individual inputs (where available).

### *Impedance*

The *Impedance* column displays whether the impedance of the input can be checked online or not. This is hardware-limited and cannot be changed.

## 6.2.1 Calibration

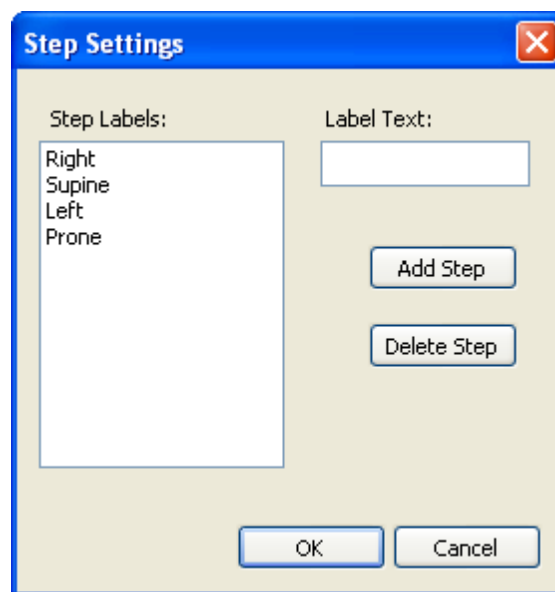
Most inputs can be set for calibration. The calibration settings are configured in PSG Config. The calibration itself is performed while acquiring data from the PSG device in **PSG Online**.

To configure the calibration settings, right click on the input in the Physical Inputs pane and select the calibration type. Two calibration types are available:


### *Step calibration*

Use for signals with discrete steps, for example body position. For each step required:

- Click Add Step
- Enter Label Text for that step. The Step Labels will be displayed
- Steps can also be deleted or edited
- Click OK to save the calibration step settings



In order for the Automatic Analysis to extract the correct position information, the position sensor should be calibrated with steps 1-4 should be in the order shown above (ie: Right, Supine, Left, Prone). Names other than these can be used (eg: "Back" instead of "Supine", but the correct order must be maintained).

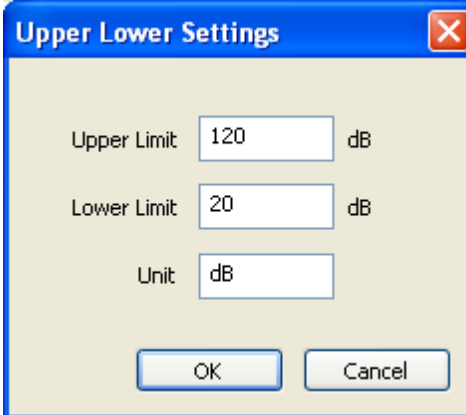
 **Tip** Before configuring the calibration steps for body position, select the Position input in the [Input Assignments](#)<sup>[38]</sup> section of the Analysis Settings. When you enter the calibration settings dialog the correct order of steps will be shown.

## Upper/Lower calibration

Use for signals that display a numeric value, for example sound pressure level (decibels). Upper/Lower calibrations can be linear, 2<sup>nd</sup> Order or 3<sup>rd</sup> Order, allowing for different input characteristics.

To set the calibration range:


- Enter the upper and lower limits to set the default display settings for the calibration
- Enter the unit to be measured
- Click OK to save the calibration upper and lower limit settings

A screenshot of a software dialog box titled "Upper Lower Settings". The dialog has a blue title bar with a red close button in the top right corner. The main area is light beige. It contains three input fields: "Upper Limit" with the value "120", "Lower Limit" with the value "20", and "Unit" with the value "dB". Each input field has its label to the left and the unit "dB" to the right. At the bottom, there are two buttons: "OK" and "Cancel".

These settings are used when you [insert the trace](#)<sup>[99]</sup> into one of the Trace Panes for display.

For information on performing the calibration, see the [Device Calibration](#)<sup>[109]</sup> section.

## 6.3 Manual Inputs

User defined manual inputs can be configured to supply information that cannot be recorded by sensors, or to verify sensor readings. Manual Inputs should be displayed in the [Meter Bar](#) , where they can be viewed and changed. Manual Inputs can also be displayed as traces.

To configure a manual input, right click in the panel to Insert User Input.

- Enter a name for the User Input
- Set the Input Type: Step or Upper/Lower

### **Step Input**

Use for inputs with discrete steps, for example Lights or *Body Position*. In the Property box:

- Select the number of steps required
- Enter the labels for the steps
- Set the initial step value

Recording Configuration															
Data Types															
Physical Inputs															
Manual Inputs															
User Input	Input Type														
Light	Step														
▶ Manual Pos	Step														
<table border="1"> <thead> <tr> <th>Property</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>Total Steps</td> <td>4</td> </tr> <tr> <td>Initial Step</td> <td>Right</td> </tr> <tr> <td>Step 1 Label</td> <td>Right</td> </tr> <tr> <td>Step 2 Label</td> <td>Supine</td> </tr> <tr> <td>Step 3 Label</td> <td>Left</td> </tr> <tr> <td>Step 4 Label</td> <td>Prone</td> </tr> </tbody> </table>		Property	Name	Total Steps	4	Initial Step	Right	Step 1 Label	Right	Step 2 Label	Supine	Step 3 Label	Left	Step 4 Label	Prone
Property	Name														
Total Steps	4														
Initial Step	Right														
Step 1 Label	Right														
Step 2 Label	Supine														
Step 3 Label	Left														
Step 4 Label	Prone														
Automatic Analysis															
Decision Assist															
Alerts															
Observation Chart															
Defaults															

## 6.4 Study Analysis

**PSG Online 3** contains powerful tools for the analysis of sleep studies. These tools are configured in **PSG Config**, and are saved as part of the Recording Configuration.

There are two methods of analysis available, Manual and Automatic. The events detected by the Automatic Analysis can be manually edited, or the study can be completely manually scored. During acquisition, the analysis can be viewed and edited using the Page Back feature.

In order to analyse a study (manual or automatic), it is necessary to configure some settings. These determine which inputs will be analysed as part of the automatic analysis,

and where marked events will be displayed. These settings also define basic criteria for the analysis, such as whether you want to mark central, mixed and obstructive hypopneas, or just have a generic hypopnea classification.

In order to report a study, the **Summary** analysis must be performed (during or after acquisition). The other automatic analysis modules are optional. The Profusion reporting tools allow for templates to be configured that will automatically include the desired information from the study.

There are settings for the following analysis groups:

**Sleep**

- Sleep staging
- Arousals

**Respiratory**

- Events
- Oximetry
- PTT
- EtCO2

**Limb movements**

- Individual movements
- PLM episodes

**Cardiology**

- ECG
- Heart Rate

**pH**

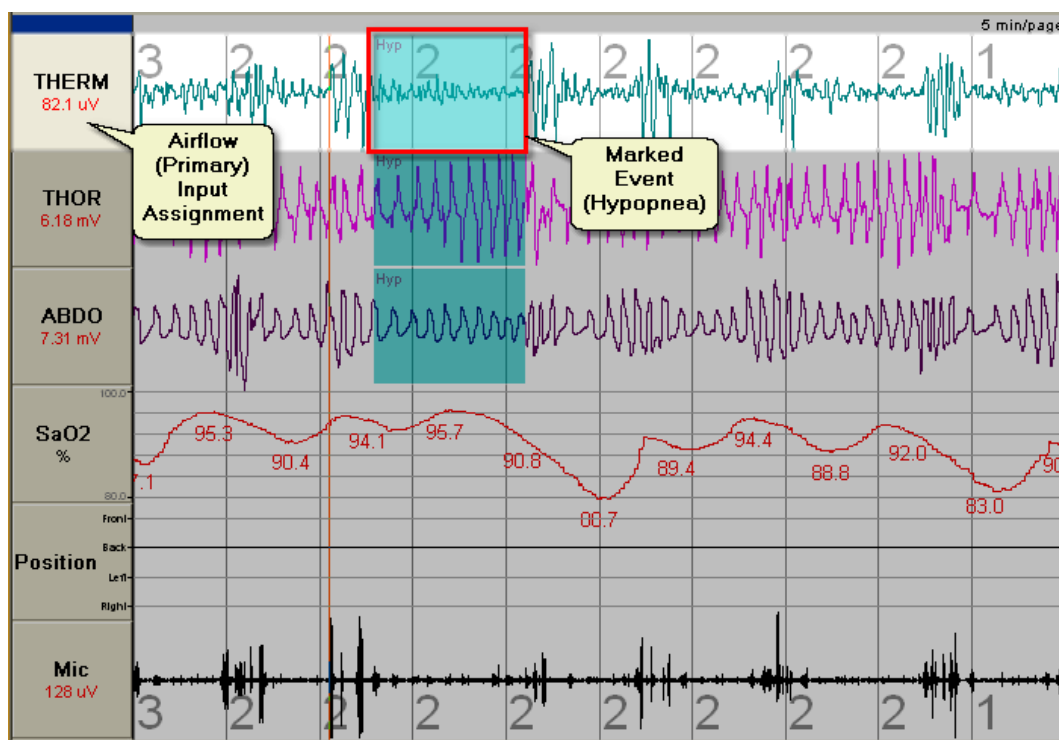
## 6.4.1 Analysis Settings

For each of the analysis groups, there are a variety of settings that need to be configured. The Input Assignments define which inputs are used for analysis and marking of events. The other settings are for general options related to study analysis.

The Input Assignments and other settings apply to manual and automatic analysis. The automatic analysis can be customised to better match your scoring criteria and methods.

### Input Assignments

The Input Assignments define which inputs are used for analysis and marking of events. Some input assignments also determine which inputs will be used for generating report statistics. For example, if the Apnea detection input is set as a thermistor input, the thermistor will be analysed for apneas, and they will be displayed and can be edited on the thermistor trace. In the example below, this trace is named *Therm*.



For each input in the three categories (Sleep, Respiratory and Other), select the Input channel, and where required the Reference channel, High and Low Pass filters, Notch filter and Lag Time.

The assignments in the Arousals category define which arousal types are available for marking and which input they will be marked on, and the pre-defined arousal types to be used if the [Automatic Arousal Association](#)<sup>[103]</sup> is enabled.



Most of the Automatic Analysis algorithms are performed on a single input. However, for some of the Sleep and Respiratory analyses more than one input is used.

Input Assignments need to be configured for the following groups:

- [Sleep](#)<sup>29</sup>
- [Respiratory](#)<sup>33</sup>
- [Arousal](#)<sup>39</sup>
- [Other](#)<sup>49</sup> (includes Limb Movements)

## Other Settings

Settings need to be configured for the following groups:

- [Respiratory](#)<sup>33</sup>
- [Arousal](#)<sup>39</sup>
- [Limb Movements](#)<sup>47</sup>

### 6.4.1.1 Scoring Mode

Profusion PSG 3 now allows you to select the **AASM Mode**, which applies the scoring rules contained in *The AASM Manual for the Scoring of Sleep and Associated Events*. If you wish to use the *Rechtschaffen and Kales* sleep staging rules for manual and automatic analysis, select the **R&K mode**.

To select the Scoring Mode, open the Defaults tab in the Recording Configuration window and select the desired mode.

The differences between the two scoring modes are shown below, along with the relevant AASM recommendations:

AASM Recommendation	AASM Mode	R&K Mode
Alpha detected using occipital EEG derivation	Detected on dedicated input: <i>EEG for Alpha Detection</i>	All EEG features detected on single EEG input
Sleep spindles detected using central derivation	Detected on dedicated input: <i>EEG for Spindle Detection</i>	
K complexes detected using frontal derivation	Detected on dedicated input: <i>EEG for Slow Wave and K complex Detection</i>	
Slow wave activity detected using frontal derivation	Detected on dedicated input: <i>EEG for Slow Wave and K complex Detection</i>	
Sleep stages: W, N1, N2, N3, REM	Automatic sleep analysis marks W, N1, N2, N3, REM	Automatic sleep analysis marks W, NREM1, NREM2, NREM3, NREM4, REM
Stage N2 and Stage R continuation rules – score same as previous stage until change of stage or arousal noted	Stages N2 and R continue to be scored as previous stage until change of stage or arousal noted	Stage reverts to N1 after 3 minutes without K complexes or sleep spindles (for stage N2), or rapid eye movements (for stage REM)

Apneas detected on oronasal thermal sensor	Detected on dedicated input: <i>Apnea Detection</i>	Apneas and hypopneas detected on single <i>Primary</i> respiratory input
Hypopneas detected on nasal air pressure transducer	Detected on dedicated input: <i>Hypopnea Detection</i>	
Limb movements defined by a minimum amplitude above resting EMG	Limb movements detected by amplitude above moving window average of preceding EMG	Limb movements detected by peak-to-peak amplitude

## Sleep staging

Sleep stages available in AASM mode (Adult) are:

- Wake
- N1 (NREM1)
- N2 (NREM2)
- N3 (NREM3)
- R (REM)

In addition the epoch stage markers Unsure and Artifact are maintained.

Input Assignments available for alpha detection, sleep spindle detection, and slow wave and K complex detection (typically occipital, central and frontal derivations respectively)

Automatic Analysis uses the AASM sleep stages.

Sleep stage continuation rules comply with the AASM recommendations.

## Respiratory events

Input Assignments available for Apnea and Hypopnea detection (typically thermal and pressure sensors respectively).

Default Automatic Analysis parameters for respiratory events comply with the AASM recommendations.

For Adult and Child studies, the *Periodic Breathing* marker has been renamed *Cheyne Stokes Breathing*.

## Limb Movements

Automatic Analysis detects signal increases above resting level, rather than a peak-to-peak amplitude.

Default Automatic Analysis parameters for limb movement events comply with the AASM

recommendations.

#### 6.4.1.2 Study Type

The Study Type can be set for Adult, Child or Infant scoring. The selected type determines the sleep stages available for marking, and the types of Automatic Analysis modules available.




To select the Study Type, open the Defaults tab in the Recording Configuration window and select the desired type.

#### ***Sleep Stages Available:***

Adult		Child		Infant
AASM	R&K	AASM	R&K	AASM and R&K
W	Wake	W	Wake	I (Indeterminate)
N1	NREM1	N (NREM)	NREM1	Q (Quiet)
N2	NREM2	N1	NREM2	A (Active)
N3	NREM3	N2	NREM3	Movement
R	NREM4	N3	NREM4	Wake
	REM	R	Stage 1/2	
	Movement		Stage 3/4	
			Movement	

#### ***Automatic Analysis Modules Available:***

Analysis Module	Adult	Child	Infant
Summary	✓	✓	✓
Sleep Staging	✓	✗	✗
Arousal	✓	✗	✗
Respiratory	✓	✓	✓
PLM/Limb Movement	✓	✗	✗
PTT Event Detection	✓	✓	✓
pH Event	✓	✓	✓

Detection			
EtCO2 Peak Detection			

### 6.4.1.3 Sleep

The **EEG**, **EMG** and both **EOG** inputs (as defined by the Input Assignments) are analysed to determine the sleep stage and arousals. The Automatic Analysis parameters for sleep staging and arousals are based on the AASM sleep staging rules, and if required can be changed to use the R&K sleep staging rules by changing the [Scoring Mode](#)<sup>26</sup>. The Automatic Analysis looks at the frequency spectrum of the EEG for each 30 second epoch, and features such as sleep spindles, K-complexes, EMG amplitude and eye movements to determine the sleep stage and arousals. The **Light** input is used to determine which epochs are to be included in reports.

The EEG spectrum can also be used to assist in manual sleep staging.

## Input Assignments



**Info** The Sleep Input Assignments are found in the Analysis Settings pane of the Recording Configuration.

### EEG for Spindle detection (AASM Mode)

#### EEG (R&K Mode)

##### Assignments:

- Input - Select a Central EEG electrode (AASM recommendation is C4).
- Reference - Assign the correct reference electrode for the selected Central EEG input (AASM recommendation is M1).
- Filter Settings - Recommended settings are High pass = 0.3Hz, Low pass = 35Hz, Notch = On. Adjust these to account for any signal artefact (eg: sweat).

##### Analysis:

In AASM Mode, the **Summary** (available in both **PSG Online 3** and **Profusion PSG 3**) analyses the assigned central EEG input to detect sleep spindles, and generates a frequency spectrum to determine EEG frequencies other than alpha, slow waves and K complexes.

In R&K Mode, the **Summary** analyses the assigned EEG input to build up a frequency spectrum, and detect alpha activity, sleep spindles, K complexes and delta activity. The spectrum and features are then used for automatic **sleep staging** and **arousal analysis**.

### EEG for Alpha detection (AASM Mode)

##### Assignments:

- Input - Select an Occipital EEG electrode (AASM recommendation is O2).
- Reference - Assign the correct reference electrode for the selected Occipital EEG input (AASM recommendation is M1).
- Filter Settings - Recommended settings are High pass = 0.3Hz, Low pass = 35Hz, Notch = On. Adjust these to account for any signal artefact (eg: sweat).

**Analysis:**

The **Summary** (available in both **PSG Online 3** and **Profusion PSG 3**) analyses the assigned occipital EEG input to detect alpha frequencies.

## EEG for Slow wave and K complex detection (AASM Mode only)

**Assignments:**

- Input - Select a Frontal EEG electrode (AASM recommendation is F4).
- Reference - Assign the correct reference electrode for the selected Frontal EEG input (AASM recommendation is M1).
- Filter Settings - Recommended settings are High pass = 0.3Hz, Low pass = 35Hz, Notch = On. Adjust these to account for any signal artefact (eg: sweat).

**Analysis:**

The **Summary** (available in both **PSG Online 3** and **Profusion PSG 3**) analyses the assigned frontal EEG input to detect K complexes and slow wave activity.



**Info** In AASM Mode, the Automatic Sleep Staging analysis looks at all three EEG inputs, and uses the EEG features from each to assist in determining the sleep stage.

**Reporting**

Statistics from manual or automatic sleep staging are available as report fields. The hypnogram can be included as a graph.

## EMG

**Assignments:**

- Input - Select one of the chin EMG electrodes.
- Reference - Select a second chin EMG electrode. If you are recording three chin EMG signals, select the most reliable two as the Input and Reference.
- Filter Settings - Recommended settings are High pass = 10Hz, Low pass = 100Hz, Notch = On. Adjust these to account for any signal artefact.

**Analysis:**

The **Summary** analysis calculates an average EMG amplitude per epoch. The assigned EMG input is used by the automatic **sleep staging** and **arousal analysis** for assisting in detection of arousals, sleep onset, and stage REM.


**Event Marking:**

Bruxism can be marked on the chin EMG input.

### Reporting

No report fields are available for the EMG input.

## EOG (Left), EOG (Right)

 **Tip** The analysis of stage REM works best when the EOG is configured such that vertical eye movements are in phase and horizontal eye movements are out of phase. This is most easily achieved by placing both EOG electrodes lateral and inferior to the outer canthus, and referencing both to a common referential electrode at Fpz (which is the recommended placement of the Reference electrode for E-series and Siesta devices).

### Assignments:

- Input - Select the Left and Right EOG inputs.
- Reference - Leave blank to use the common reference described in the tip above, or select a traditional reference (eg: A1, A2).
- Filter Settings - Recommended settings are High pass = 0.3Hz, Low pass = 35Hz, Notch = On. Adjust these to account for any signal artefact (eg: sweat).

### Analysis:

The **Summary** analysis detects eye movements and rapid eye movements. Each EOG is analysed for eye movements. These movements are then compared to the other EOG input to look for in-phase, anti-phase and singular movements. The detected movements are used by the automatic **sleep staging** to assist in detection of REM and Wake.

### Event Marking:

The following features will be marked on the Left and Right EOG inputs:

- Eye movement (Singular) - movements that occur in one EOG without a corresponding movement in the other EOG.
- Eye movement (Anti-phase) - movements that are a positive deflection in one EOG and a negative deflection in the other EOG.
- Eye movement (In-phase) - movements that are positive or negative deflections in both EOG inputs.

 **Tip** The display preferences for these features can be configured through the [Trace Window](#) <sup>102</sup> preferences.

### Reporting

No report fields are available for the EOG inputs.

## Light

### Assignment:

- Input - Select an input to be used to mark whether the lights are On or Off. This can be a [manual input](#) <sup>21</sup>.

### Analysis:

Only epochs with Stage Light set to Off will be included in report statistics.

**Event Marking:**

No events are marked on the Light input.

**Reporting**

Stage Light is available as a graph, and the Light input is used for calculation of the lights out and lights on times.



#### 6.4.1.4 Respiratory

Many different types of respiratory events can be marked in the Page Back feature of **PSG**

**Online 3:**

- Obstructive Apnea\*
- Central Apnea\*
- Mixed Apnea\*
- Hypopnea\* (can choose to mark hypopneas as Central, Mixed and Obstructive if required)
- Unsure Respiratory event\*
- Respiratory Artifact
- Respiratory Paradox
- Periodic Breathing
- RERA

\*These events can be detected and marked by the Automatic Analysis. The parameters can be customised to best match your scoring criteria and marking preferences. See the [Respiratory Analysis](#) <sup>54</sup> section for more details.

In addition, up to four other respiratory event types can be defined.

**SpO<sub>2</sub> events** (desaturation and artifact) can be marked, and associated with respiratory events.

**Snores** can be marked and included in reports.

**TcCO<sub>2</sub>** and **EtCO<sub>2</sub>** can be reported, and automatic EtCO<sub>2</sub> event detection is available.

## Settings

The settings for respiratory analysis can be found by going to the Scoring Options window ( **Tools > Options > Preferences > System Settings > Scoring** ).

### Hypopnea Classification

When this is set to **Yes**, respiratory events can be marked as **Central**, **Mixed** or **Obstructive Hypopneas**, in addition to the other respiratory event types.

When this is set to **No**, only a general **Hypopnea** classification is available, in addition to the other respiratory event types.

### Default Respiratory Length


The Default Respiratory length defines the duration of respiratory events marked by a single

right-click on the assigned input (requires the Standard Event Marking Mode to be selected). The default setting is 10 seconds.

## Default Snore Length

The Default Snore length defines the duration of snores marked by a single right-click on the assigned input (requires the Standard Event Marking Mode to be selected). The default setting is 1 second.

## Input Assignments

 **Info** The Respiratory Input Assignments are found in the Analysis Settings pane of the Recording Configuration.

### Hypopnea Detection (AASM Mode)

#### Assignments:

- Input - Select a pressure sensor recording input. This may be a nasal cannula or pressure monitoring from a CPAP device.
- Filter Settings - Recommended settings are High pass = 0.1Hz, Low pass = 15Hz, Notch = On. Adjust these to account for any signal artifact.


#### Analysis:

The **respiratory analysis** uses the Pressure input to detect decreases in flow indicating hypopneas.

### Apnea Detection (AASM Mode)

#### Assignments:

- Input - Select a thermal sensor recording input. This may be a thermocouple or thermistor.

 **Info** For CPAP studies, or studies without a thermal sensor, assign a pressure input or other appropriate measure of flow. Both the Thermal and Pressure input assignments must be defined for the Automatic Analysis to detect both apneas and hypopneas.

- Filter Settings - Recommended settings are High pass = 0.1Hz, Low pass = 15Hz, Notch = On. Adjust these to account for any signal artifact.

#### Analysis:

The **respiratory analysis** uses the Thermal input to detect decreases in flow indicating apneas. This is then compared to the Effort 1 and Effort 2 inputs to determine the type of event (obstructive, mixed or central).

### Primary (R&K Mode)

#### Assignments:

- Input - Select an airflow recording input. This may be a thermocouple, pressure signal or other appropriate measure of flow.
- Filter Settings - Recommended settings are High pass = 0.1Hz, Low pass = 15Hz, Notch = On. Adjust these to account for any signal artefact.

**Analysis:**

The **respiratory analysis** uses the Primary input to detect decreases in flow indicating apneas and hypopneas. This is then compared to the Effort 1 and Effort 2 inputs to determine the type of event (obstructive, mixed or central).



**Tip** Events marked on the Primary input are also marked on the Effort 1 and Effort 2 inputs.

## Effort 1 & 2

### Assignments:

- Input - Select two respiratory effort inputs. These may be piezo respiratory belts or RIP belts (eg: Summit IP), or other appropriate measure of respiratory effort Typically, set Effort 1 to a thoracic belt and Effort 2 to an abdominal belt.
- Filter Settings - Recommended settings are High pass = 0.1Hz, Low pass = 15Hz, Notch = On. Adjust these to account for any signal artefact.

### Analysis:

The **respiratory analysis** uses the Effort inputs to classify Primary input decreases as obstructive, mixed or central events.

## Event Marking:

In **AASM Mode**, respiratory events can be marked on any of the inputs assigned for Hypopnea detection, Apnea detection, Effort 1 or Effort 2.

In **R&K Mode**, respiratory events can be marked on the Primary, Effort 1 or Effort 2 inputs.

See the Marking Events section of the Profusion PSG 3 help for more details.

Once marked, the event marker will be displayed on all of the respiratory inputs. The following respiratory events can be marked on these inputs:

- Obstructive Apnea\*
- Central Apnea\*
- Mixed Apnea\*
- Hypopnea\* (can choose to mark hypopneas as Central, Mixed and Obstructive if required)
- Unsure Respiratory event\*
- Respiratory Artifact
- Respiratory Paradox
- Cheyne Stokes Breathing (AASM Mode)
- Periodic Breathing (R&K Mode)
- RERA

\*These events can be detected and marked by the Automatic Analysis.



**Tip** The display preferences for these features can be configured through the [Trace Window](#) <sup>102</sup> preferences.

## Reporting

A wide variety of respiratory event statistics and graphs can be included in reports.

## Sound

### Assignments:

- Input - Select a sound sensor input. These can be any valid measure of sound, for example microphone, SPL meter (decibels), the filtered snoring signal from nasal pressure monitoring, or the derived Snore input available from the Somt  PSG.
- Filter Settings - The recommended filter settings depend on the type of input:
 

➤ Microphone	HP = 10Hz, LP = 100Hz, Notch On
➤ SPL	DC input, filters not required
➤ Filtered nasal pressure	HP = 10Hz, LP = 100Hz, Notch On
➤ Snore (Somt� PSG)	Derived input, filters not required

### Analysis:

The **respiratory analysis** uses the sound input to detect deviations from the baseline, indicating snores. The baseline is calculated as a moving window average.

### Event Marking:

Individual snores can be marked on this input.

 **Tip** The display preferences for these features can be configured through the [Trace Window](#) <sup>102</sup> preferences.

### Reporting

Snore statistics and graphs can be included in reports.

## SpO2

### Assignments:

- Input - Select the oximeter input.
- Lag Time - The SpO2 lag time defines the maximum time between the end of a respiratory event and the minimum SpO2 reading. The default setting is 30 seconds, but may need to be changed depending on the characteristics of the oximeter being used, and the recording location.

### Analysis:

The **summary** analysis uses the SpO2 input to detect decreases from the baseline, which is calculated as a moving window average. Parameters can be set to differentiate between desaturations and artifact. Desaturations can be used as part of the respiratory event criteria. The minimum and maximum SpO2 values for each epoch are calculated.

### Event Marking:

SpO2 desaturations and artifact can be marked on this input.

 **Tip** The display preferences for these features can be configured through the [Trace Window](#) <sup>102</sup> preferences.

### Reporting

SpO2 statistics and graphs can be included in reports.

## CPAP

### Assignments:

- Input - Select an input for CPAP. This may be a direct pressure from a CPAP machine or a Manual Input.

**Analysis:**

The **Summary** analysis calculates an average CPAP value for each epoch.

**Event Marking:**

No events are marked on the CPAP input.

**Reporting**

CPAP statistics and graphs can be included in reports, including information about respiratory events at different CPAP levels.

## Position

**Assignments:**

- Input - Select an input for position. This may be a position sensor or a Manual Input.

**Analysis:**

The **Summary** analysis calculates an average position value for each epoch.

**Event Marking:**

No events are marked on the position input.

**Reporting**

Position statistics and graphs can be included in reports.

## TcCO2

**Assignments:**

- Input - Select an input for TcCO2.

**Analysis:**

The **Summary** analysis calculates an average TcCO2 value for each epoch.

**Event Marking:**

No events are marked on the TcCO2 input.

**Reporting**

TcCO2 statistics and graphs can be included in reports.

## EtCO2

**Assignments:**

- Input - Select an input for EtCO2.

**Analysis:**

The **EtCO2 Peak Detection** analysis calculates the peak EtCO2 value of each respiratory cycle.

**Event Marking:**

The peak value is marked for each cycle by the **EtCO2 Peak Detection** analysis.



**Tip** The display preferences for these features can be configured through the [Trace Window](#) <sup>102</sup> preferences.

**Reporting**

EtCO<sub>2</sub> statistics and graphs can be included in reports.

**User Defined 1-4**

There are four optional User-defined event types that can be configured. If you enter input names for these, they will appear in the popup dialog box when a new respiratory event is marked.

**Assignments:**

- Input - Enter a name for each User-defined event type.

**Analysis:**

No analysis is performed on the user-defined event types.

**Event Marking:**

Each User-defined event that has been assigned an input name will be available for marking on the Primary, Effort 1 and Effort 2 inputs.

**Reporting**

User defined event statistics and graphs can be included in reports, available from the Report Script category in the Profusion PSG Report Wizard.

**6.4.1.5 Arousal**

Up to five different arousal types can be defined, and each of these can be marked on a different input. The Input Assignments define where the various arousal types are marked. The inputs used for the Automatic Analysis of arousals are configured in the [Arousal Parameters](#)<sup>[53]</sup> section. Only one EEG input and the EMG input are automatically analysed for arousals.

Arousals can be classified manually.

To speed up the classification process, the Automatic Arousal Association tool can be used. This will classify arousals (both manually marked arousals and those marked by the automatic analysis) based on whether respiratory events and/or limb movements are present before the arousal.

- If you want to classify every arousal yourself, see the [Manual Classification](#)<sup>[41]</sup> section for information on configuring the Arousal settings and Input Assignments.
- If you want to have **PSG Online 3** automatically assign the correct arousal type depending on the presence of respiratory events and/or limb movements, see the [Automatic Arousal Association](#)<sup>[43]</sup> section.

**Settings**

Regardless of whether you choose Manual Classification or Automatic Arousal Association, there are some settings to configure for Arousals. These are found by going to the Scoring Options window (**Tools > Options > Preferences > System Settings > Scoring**).

**Arousal Overlapping**

Set this to *No* to prevent different arousal types from overlapping. In most cases this should

be set to *No*.

### **Default Arousal length**


The Default Arousal length defines the duration of an arousal marked by a single right-click on the assigned input (requires the Standard Event Marking Mode to be selected). The default setting is 3 seconds.



#### 6.4.1.5.1 Manual Classification

For each Arousal Type that is to be classified manually, the Type, Input and a Label need to be assigned.


### **Input Assignments**

 **Info** The Arousal Input Assignments are found in the Analysis Settings pane of the Recording Configuration.

#### **Arousal 1-5**

**Assignments:**

- Type - Select User defined (the other options are used for the Automatic Arousal Association feature).
- Input - Select the input on which each arousal type will be marked and displayed.
- Label - Enter a descriptive label for each arousal type. This label will appear in the event marker.

 **Tip** Although different inputs can be selected for each Arousal Type, it is recommended to assign only one or two inputs. Doing so will make reclassification of events easier.

**Analysis:**

No automatic analysis is performed on these inputs. The Arousal Analysis module has its own options for setting the input to analyse for arousal detection.

Each Arousal Type will be marked on its respective input. Marked arousals can be reclassified to other types only if each arousal type has the same input.

**Reporting**

Arousal statistics and graphs can be included in reports.

## Example

If the Arousal Input Assignments are configured as shown in *Figure 1*, the 5 Arousal Types can be marked as shown in *Figure 2*.

Property	Value
<b>Arousal 1</b>	
Type	User defined
Input	C4
Label	Unknown
<b>Arousal 2</b>	
Type	User defined
Input	C3
Label	Obstructive
<b>Arousal 3</b>	
Type	User defined
Input	C3
Label	Leg
<b>Arousal 4</b>	
Type	User defined
Input	C3
Label	RERA
<b>Arousal 5</b>	
Type	User defined
Input	C4
Label	Other

Figure 1 - Arousal Input Assignments

In this case, Arousal Types 2, 3 and 4 can be marked on the C3 input (even if it is referenced to another input, as shown here), and can be reclassified to the other types with the same input.

Likewise, Arousal Types 1 and 5 can be marked on the C4 input and reclassified to the other type.

However an arousal marked as Type 2, 3 or 4 cannot be reclassified as a Type 1 or 5 arousal, except by deleting the first arousal and marking another on the correct input.

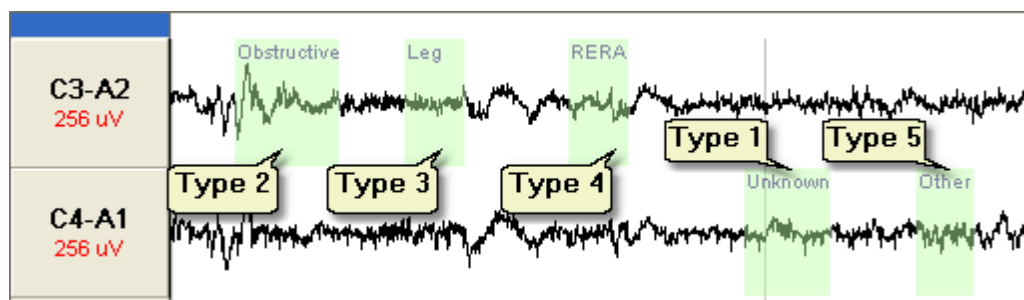


Figure 2 - Marked Arousal events



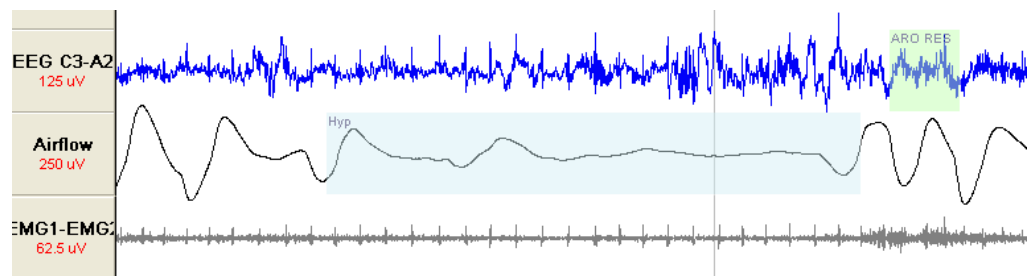
The events marked in the above example are not arousals, but have been shown to demonstrate the input assignment concept.

#### 6.4.1.5.2 Automatic Classification

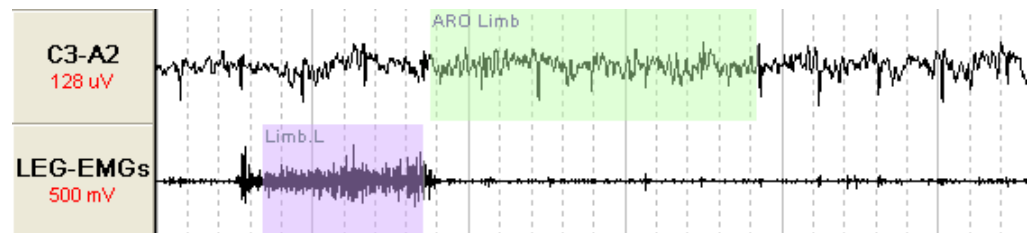
When using the Automatic Arousal Association feature, arousals will be marked as Spontaneous, Respiratory or Limb Movement arousals depending on the presence of events. This feature can be used to aid manual analysis, and can also be used to classify arousals when running the Automatic Analysis.

Arousals marked on the assigned input will be classified as either a Respiratory arousal (ARO RES) or Limb Movement arousal (ARO Limb) when the following criteria are met:

- **Respiratory** – the arousal begins before or after the *end* of the respiratory event, within the specified respiratory event association time.



- **Limb Movement** – the arousal begins after the *start* of the limb movement event, within the specified limb movement association time.



- If both a Respiratory Event and a Limb Movement Event precede the marked arousal within the respective time periods then the arousal will be categorized as a Respiratory Arousal.
- If neither condition is met for a Respiratory or Limb Movement category the arousal will be marked as Spontaneous.

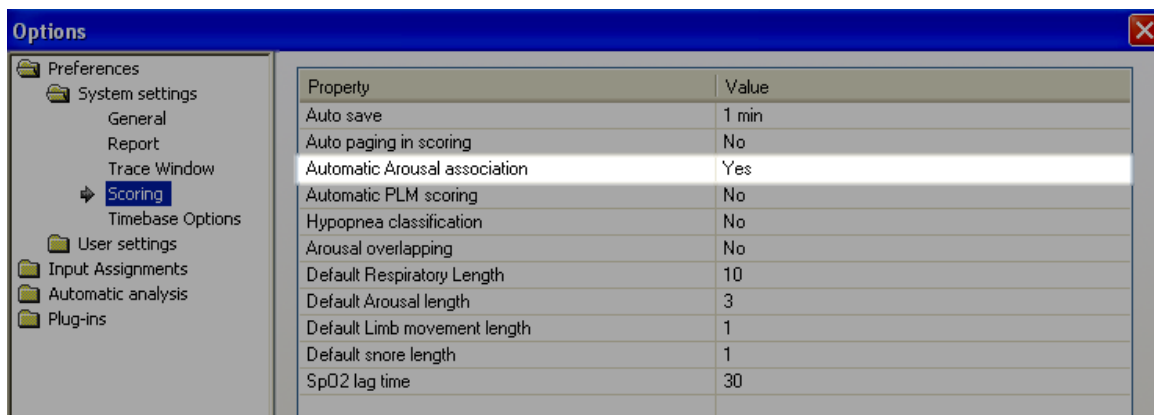
The automatic arousal association will dynamically update whenever new arousals, respiratory events and limb movements are marked, so it doesn't matter whether arousals or respiratory and limb movements are marked first, or whether the arousals are marked manually or by the Arousal detection analysis.



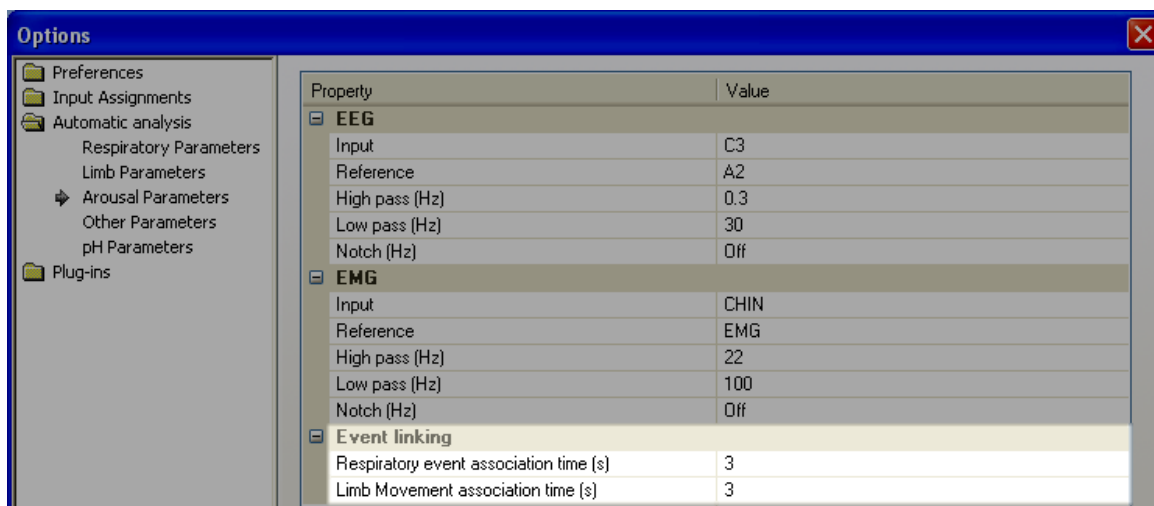
**Tip** Arousals that have been Automatically classified can still be reclassified to other arousal types that have the same input assignment.

## Settings

In order to use the Automatic Arousal Association feature, go to the Scoring Options window (**Tools > Options > Preferences > System Settings > Scoring**) and set *Automatic Arousal Association* to Yes.




To set the Arousal Association times, go to the Arousal parameters section of the Automatic Analysis (**Tools > Options > Automatic Analysis > Arousal Parameters**). Set the Event Linking times for Respiratory and Limb Movement arousals.



**Tip** If you are working with a long timebase (eg: 5 minutes), a 3 second association time requires very precise marking of events. Try a longer association time if you find that the Automatic Arousal Association is not reclassifying arousals when it should.

## Input Assignments

 **Info** The Arousal Input Assignments are found in the Analysis Settings pane of the Recording Configuration.

Each Arousal Type that is to be classified automatically needs to be assigned a Type, Input and Label. There are three Automatic Arousal Types, and there are specific requirements for the configuration of these.

### Analysis:

The Automatic Arousal Association will check each arousal as it is marked to see if it has a preceding respiratory event or limb movement within the association time, and classify the arousal accordingly. If a preceding respiratory event or limb movement is added or deleted, the associated arousal will be reclassified accordingly.

The arousals will be marked on the assigned input. Arousals classified by the Automatic Arousal Association feature can be reclassified to other types.

### Reporting

Arousal statistics and graphs can be included in reports.

## Example

The order of Input Assignments described below is the recommended configuration, however a different order can be used if required.

### Arousal 1

#### Assignments:

- Type - Select Respiratory.
- Input - Select the input on which Respiratory arousals will be marked and displayed. The same input must be used for all of the Automatic Arousal types.
- Label - The label will be blank. When an arousal is automatically associated with a respiratory event, the arousal marker label will be ARO RES.

### Arousal 2

#### Assignments:

- Type - Select Limb Movements.
- Input - Select the same input as Arousal 1. This is the input on which Limb Movement arousals will be marked and displayed. The same input must be used for all of the Automatic Arousal types.
- Label - The label will be blank. When an arousal is automatically associated with a limb movement, the arousal marker label will be ARO Limb.

### Arousal 3

#### Assignments:

- Type - Select Spontaneous.

- Input - Select the input on which Spontaneous arousals will be marked and displayed. The same input must be used for all of the Automatic Arousal types.
- Label - The label will be blank. When an arousal without respiratory events or limb movements within the association times is marked, the arousal marker label will be ARO SPONT.

### **Arousal 4, 5**

If required, Arousal types 4 and 5 can be configured for [Manual Classification](#)<sup>[41]</sup>. This allows other arousal types to be defined, such as RERA or Other.

#### 6.4.1.6 Limb Movements

Limb movements and Periodic Limb Movement (PLM) episodes can be marked manually, and detected automatically by the **PLM / Limb Movement Analysis** module. Manually marked limb movements can also be monitored as they are marked to automatically detect PLM episodes.

The configuration of the settings and input assignments depends on your recording configuration and scoring preferences.

### Recording Considerations

Limb movements can be recorded using a variety of recording methods:

- Piezo limb sensors
- EMG - One electrode per limb (not recommended)
- EMG - Two electrodes per limb

The recording configuration for each method is defined by the Physical Inputs section of **PSG Config**.

The Input Assignments for each recording method are described below.

### Settings

The settings for Limb Movement analysis can be found by going to the Scoring Options window (**Tools > Options > Preferences > System Settings > Scoring**).

#### Automatic PLM scoring

When this is set to *Yes*, the PLM episode detection module will monitor marked limb movements to see if they meet the PLM criteria as defined by the [PLM analysis](#) settings. As limb movements are marked or deleted, the PLM episodes will be dynamically updated to reflect the changes.

When this is set to *No*, PLM episodes must be marked manually.

#### Default Limb Movement Length

The Default Limb Movement length defines the duration of individual limb movement events marked by a single right-click on the assigned input (requires the Standard Event Marking Mode to be selected). The default setting is 1 second.

### Input Assignments



The Limb Input Assignments are found in the Analysis Settings pane of the Recording Configuration.

#### Leg (Left/Right)

**Assignments:**

*Piezo limb sensor:*

- Input - Select the left or right limb sensor respectively.
- Reference - No reference required.
- Filter Settings - Recommended settings are High pass = 1Hz, Low pass = 20Hz, Notch = On. Adjust these to account for any signal artefact.

*One EMG electrode per limb:*

- Input - For the Leg (Left) Input, select the Left EMG electrode.
- Reference - For the Leg (Left) Reference, select the Right EMG electrode.
- Filter Settings - Recommended settings are High pass = 10Hz, Low pass = 100Hz, Notch = On. Adjust these to account for any signal artefact.



**Info** For one EMG electrode per limb, only configure the Input Assignment for one Leg (suggested to use the Leg (Left) assignment). Leave the other assignment blank.

*Two EMG electrodes per limb:*

- Input - For the Leg (Left) and Leg (Right) Inputs, select the first Left or Right limb EMG electrode respectively.
- Reference - For the Leg (Left) and Leg (Right) References, select the second Left or Right limb EMG electrode respectively.
- Filter Settings - Recommended settings are High pass = 10Hz, Low pass = 100Hz, Notch = On. Adjust these to account for any signal artefact.

**Analysis:**

The **PLM / Limb movement analysis** uses both the left and right leg inputs to detect individual limb movements and PLM episodes. If the Input Assignments have been configured for only one leg, only that leg will be looked at for analysis.

**Event Marking:**

Individual limb movements and PLM episodes can be marked on the Left and Right leg inputs. Individual movements will be classified as Limb Movement (Left) or Limb Movement (Right).



**Tip** The display preferences for these features can be configured through the [Trace Window](#)<sup>102</sup> preferences.

**Reporting**

Statistics and graphs for individual limb movements and PLM episodes can be included in reports.




#### 6.4.1.7 Other

A variety of other input assignments can be configured for analysis and event marking.

The following inputs are configured in the Other tab:

- Pleth
- Heart Rate
- ECG
- Leg (Left and Right) - See the [Limb Movements](#)<sup>47</sup> Settings section for details
- pH (Distal and Proximal)
- Blood Pressure
- Body Temperature

### Input Assignments

 **Info** The Other Input Assignments are found in the Analysis Settings pane of the Recording Configuration.

#### Pleth

**Assignments:**

- Input - Select a plethysmography input. For example, channel 58 of the E-Series is dedicated as a Pleth input.

**Analysis:**

The **PTT analysis** uses the Pleth input and ECG to derive a Pulse Transit Time trace (PTT). After acquisition, the PTT trace can be analysed to **Detect PTT Events**.

**Event Marking:**

No events are marked on the Pleth trace, but events can be marked on the derived PTT trace.

 **Tip** The display preferences for these features can be configured through the [Trace Window](#)<sup>102</sup> preferences.

**Reporting**

No report fields are available for the Pleth input, however PTT statistics and graphs can be included in reports.

#### ECG

**Assignments:**

- Input - Select one of the ECG electrodes.

- Reference - If two ECG electrodes are used, select the second ECG electrode.
- Filter Settings - Recommended settings are High pass = 0.3Hz, Low pass = 70Hz, Notch = On. Adjust these to account for any signal artefact.

#### Analysis:

The **Summary analysis** uses the ECG input to derive a heart rate. This is a beat to beat heart rate, rather than an averaged heart rate as obtained from a pulse oximeter. The **PTT analysis** uses the Pleth input and ECG to derive a Pulse Transit Time trace (PTT). After acquisition, the PTT trace can be analysed to **Detect PTT Events**.

#### Event Marking:

Bradycardia and tachycardia events can be marked on the ECG input.

 **Tip** The display preferences for these features can be configured through the [Trace Window](#)<sup>102</sup> preferences.

#### Reporting

Bradycardia and tachycardia events, including their association with respiratory events, can be included in reports.

### Leg (Left and Right)

See the [Limb Movements](#)<sup>47</sup> section for details.

### pH (Distal and Proximal)

#### Assignments:

- Input - Select the distal and/or proximal pH inputs respectively.

#### Analysis:

The **pH Event Detection analysis** uses either the distal or proximal pH inputs to detect pH events.

#### Event Marking:

pH events can be marked on the distal or proximal inputs, and will be classified as Distal or Proximal pH events respectively. The **pH Event Detection analysis** will mark events only on the input assigned for analysis.

 **Tip** The display preferences for these features can be configured through the [Trace Window](#)<sup>102</sup> preferences.

#### Reporting

Statistics and graphs for pH trends and events can be included in reports.

### Blood Pressure

#### Assignments:

- Input - Select a blood pressure input.

#### Analysis:

No analysis is performed on the Blood Pressure input.

#### Event Marking:

Blood pressure artifact can be marked on this input

#### Reporting

No report fields are available for the Blood Pressure input.

## Body Temperature

### Assignments:

- Input - Select a body temperature input.

### Analysis:

No analysis is performed on the Body Temperature input.

### Event Marking:

Body temperature artifact can be marked on this input

### Reporting


No report fields are available for the Body Temperature input.

## 6.4.2 Automatic Analysis

The Automatic Analysis feature can be used to automatically mark sleep stages, arousals, respiratory events (including SpO2 desaturations and snoring), limb movements and PLM episodes. The Automatic Analysis can be performed online during data acquisition, or during study review. All automatically marked features can be edited or deleted.

The aim of the Automatic Analysis is to approximate laboratory scoring, and to assist in manual scoring of studies. Each Automatic Analysis algorithm can be run individually.

The inputs analysed by the various algorithms are configured in [Input Assignments](#)<sup>24</sup>.

 **Tip** There are minimum sampling rates required for data acquisition in order for the Automatic Analysis to operate correctly. Click here to view these sampling rates.

The default Automatic Analysis parameters are configured in PSG Config. These parameters define the analysis performed during data acquisition, and the default parameters for study review in Profusion PSG 3. These parameters can be changed and the Automatic Analysis run again in Profusion PSG 3.

The Automatic Analysis algorithms to be performed during data acquisition are selected in the Online tab of the Analysis Settings pane of PSG Config.

Recording Configuration																	
Data Types																	
Physical Inputs																	
Manual Inputs																	
Analysis Settings																	
<ul style="list-style-type: none"> <li>Input Assignments               <ul style="list-style-type: none"> <li>Sleep</li> <li>Respiratory</li> <li>Arousal</li> <li>Other</li> </ul> </li> <li>Automatic Analysis               <ul style="list-style-type: none"> <li>Respiratory</li> <li>Limb</li> <li>Arousal</li> <li>Other</li> </ul> </li> <li>Online</li> </ul>	<table border="1"> <thead> <tr> <th>Property</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td colspan="2"><b>Online</b></td> </tr> <tr> <td>Respiratory Analysis</td> <td>Off</td> </tr> <tr> <td>PTT</td> <td>Off</td> </tr> <tr> <td>pH Event Detection</td> <td>Off</td> </tr> <tr> <td>Limb Movement</td> <td>Off</td> </tr> <tr> <td>Staging / Arousals</td> <td>Off</td> </tr> <tr> <td>Summary</td> <td>Off</td> </tr> </tbody> </table>	Property	Value	<b>Online</b>		Respiratory Analysis	Off	PTT	Off	pH Event Detection	Off	Limb Movement	Off	Staging / Arousals	Off	Summary	Off
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Defaults																	

#### 6.4.2.1 Sleep Analysis

The analysis parameters for sleep staging are based on either the AASM or the R&K sleep staging rules, depending on the [Scoring Mode](#)<sup>[26]</sup>. The Automatic Analysis looks at the frequency spectrum of each 30 second epoch, and features such as sleep spindles, K-complexes, EMG amplitude and eye movements to determine the sleep stage.

 **Info** Automatic sleep staging is only available for studies with the Study Type set to Adult.


The automatic Sleep Staging and Arousal detection are performed as part of the same analysis module during study acquisition.

To enable this automatic analysis module, go to the Analysis Settings tab of the Recording Configuration. In the Online analysis folder, set the **Staging / Arousals** option to On.

#### 6.4.2.2 Arousal Analysis


The parameters for automatic Arousal Analysis are based on either the AASM or the R&K rules, depending on the [Scoring Mode](#)<sup>[26]</sup>. The analysis looks at the selected EEG and EMG inputs to detect alpha activity in association with chin EMG increases as an arousal marker.

For the EEG, set the input and reference channels. It is recommended to use a central derivation for best results. The recommended filter settings are High pass = 0.3Hz, Low pass = 35Hz, Notch = On. Adjust these to account for any signal artefact (eg: sweat).

 **Tip** The EEG used for Arousal Analysis can be different to the EEG input used for Sleep Staging.

For the EMG, set the input and reference channels. These should be two chin EMG inputs. The recommended filter settings are High pass = 10Hz, Low pass = 100Hz, Notch = On. Adjust these to account for any signal artefact.

The event linking options are used by the [Automatic Arousal Association](#)<sup>[43]</sup> feature.

 **Tip** For the most accurate sleep staging results, run both automatic sleep staging and arousal detection. This is the default setting for online analysis. Staging analysis can be performed in Profusion PSG 3 without including arousals.

The automatic Sleep Staging and Arousal detection are performed as part of the same analysis module during study acquisition.

To enable this automatic analysis module, go to the Analysis Settings tab of the Recording Configuration. In the Online analysis folder, set the **Staging / Arousals** option to On.

### 6.4.2.3 Respiratory Analysis

Automatic respiratory analysis can be used to detect apneas (obstructive, mixed and central), hypopneas and snoring. SpO2 desaturations can be detected, and used as part of the criteria for defining respiratory events. The parameters for respiratory analysis can be altered to provide optimal results.

The following inputs are used for the automatic detection and classification of respiratory events:

- [Hypopnea Detection](#) <sup>56</sup> (AASM Mode, typically pressure sensor)
- [Apnea Detection](#) <sup>56</sup> (AASM Mode, typically thermal sensor)
- [Primary Input](#) <sup>56</sup> (R&K Mode, typically thermal or nasal pressure)
- [Effort Inputs](#) <sup>63</sup> (two inputs, usually thoracic and abdominal respiratory effort)
- [SaO2 Input](#) <sup>66</sup> (used for detecting desaturations)

In addition, desaturation artifact can be detected and excluded from analysis, and the Sound Input can be analysed for snoring.

 **Info** Respiratory events marked by the automatic analysis can be edited or deleted manually using the Page Back feature in PSG Online 3, and new events can be marked manually.

The automatic Respiratory Analysis can be performed during study acquisition.

To enable this automatic analysis module, go to the Analysis Settings tab of the Recording Configuration. In the Online analysis folder, set the **Respiratory Analysis** option to On.

### 6.4.2.3.1 Respiratory Parameters

The Respiratory Parameters define the Automatic Analysis settings for all respiratory-related features, including respiratory events and SpO2 events. These can be adjusted as required.




To view and change the Respiratory parameters, go to the Analysis Settings tab of the Recording Configuration. Click on Analysis Parameters, then Respiratory. The default settings are shown below.

View Configuration																																																					
Data Types																																																					
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<div> <input type="checkbox"/> Input Assignments           <ul style="list-style-type: none"> <li>Sleep</li> <li>Respiratory</li> <li>Arousal</li> <li>Other</li> </ul> </div> <div> <input checked="" type="checkbox"/> Analysis Parameters           <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Respiratory</li> <li>Limb</li> <li>Arousal</li> <li>Other</li> </ul> </div> <div> <input type="checkbox"/> Online           </div>	<table border="1"> <thead> <tr> <th>Property</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td colspan="2"><b>Primary Input</b></td> </tr> <tr> <td>Minimum Apnea/Hypopnea duration (s)</td> <td>10</td> </tr> <tr> <td>Max Apnea relative amplitude (%)</td> <td>20</td> </tr> <tr> <td>Min Apnea relative duration below threshold</td> <td>50</td> </tr> <tr> <td>Max Hyp relative amplitude (%)</td> <td>50</td> </tr> <tr> <td>Min Hyp relative duration below threshold (%)</td> <td>50</td> </tr> <tr> <td colspan="2"><b>Effort Input</b></td> </tr> <tr> <td>Minimum relative amplitude (%)</td> <td>15</td> </tr> <tr> <td>Min relative duration - Ob Apnea</td> <td>66</td> </tr> <tr> <td>Min relative duration - Mixed Apnea</td> <td>33</td> </tr> <tr> <td colspan="2"><b>Desaturation</b></td> </tr> <tr> <td>Min SpO2 reduction (%)</td> <td>2</td> </tr> <tr> <td>Apply desat criteria during event detection</td> <td>Yes</td> </tr> <tr> <td>Min desat - Apnea (%)</td> <td>3</td> </tr> <tr> <td>Min desat - Hypopnea (%)</td> <td>3</td> </tr> <tr> <td colspan="2"><b>Desaturation Artifact</b></td> </tr> <tr> <td>Minimum desaturation (%)</td> <td>50</td> </tr> <tr> <td>Max SpO2 level (%)</td> <td>25</td> </tr> <tr> <td>Min SpO2 reduction slope (%/s)</td> <td>5</td> </tr> <tr> <td colspan="2"><b>Respiratory Rate</b></td> </tr> <tr> <td>Input</td> <td>None</td> </tr> <tr> <td colspan="2"><b>SOUND</b></td> </tr> <tr> <td>Threshold</td> <td>4.000000</td> </tr> <tr> <td>Minimum time between snores (s)</td> <td>0.800000</td> </tr> <tr> <td>Minimum Duration (s)</td> <td>0.400000</td> </tr> </tbody> </table>	Property	Value	<b>Primary Input</b>		Minimum Apnea/Hypopnea duration (s)	10	Max Apnea relative amplitude (%)	20	Min Apnea relative duration below threshold	50	Max Hyp relative amplitude (%)	50	Min Hyp relative duration below threshold (%)	50	<b>Effort Input</b>		Minimum relative amplitude (%)	15	Min relative duration - Ob Apnea	66	Min relative duration - Mixed Apnea	33	<b>Desaturation</b>		Min SpO2 reduction (%)	2	Apply desat criteria during event detection	Yes	Min desat - Apnea (%)	3	Min desat - Hypopnea (%)	3	<b>Desaturation Artifact</b>		Minimum desaturation (%)	50	Max SpO2 level (%)	25	Min SpO2 reduction slope (%/s)	5	<b>Respiratory Rate</b>		Input	None	<b>SOUND</b>		Threshold	4.000000	Minimum time between snores (s)	0.800000	Minimum Duration (s)	0.400000
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#### 6.4.2.3.1.1 *Apnea/Hypopnea detection parameters*

These parameters are used to determine whether signal decreases in the airflow signals, as set in the Input Assignments, are hypopneas or apneas. In the AASM Mode, the apnea parameters are applied to the Apnea Detection input, and the hypopnea parameters to the Hypopnea Detection input. In R&K Mode, the apnea and hypopnea parameters are both applied to the Primary respiratory input.

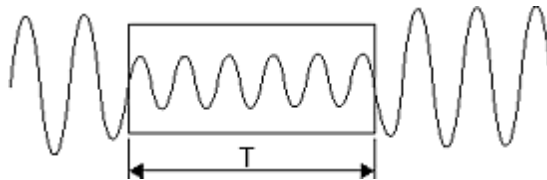
The following parameters can be adjusted for best automatic event detection and classification performance:

- [Minimum event duration](#) 
- [Maximum relative amplitude](#) 
- [Minimum apnea relative duration](#) 



This value sets the minimum duration for an event to be classified as an apnea or hypopnea. The automatic analysis measures the start and end point of events as the waveform crosses the 0 line.

For example, if this value is set at 10 seconds, then any event that the computer finds that is less than 10 seconds will generally not be marked. Occasionally events of less than 10 seconds duration may be marked, due to adjustments by the analysis program for timing differences in the respiratory cycle.



Type: Apnea, Hypopnea

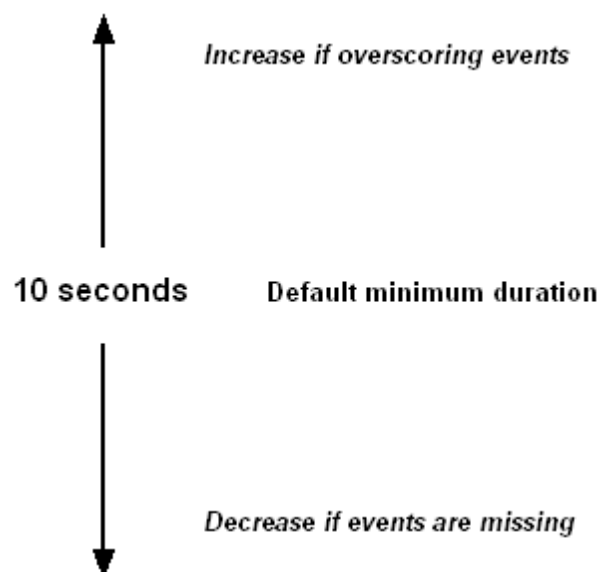
Default Setting: T = 10 seconds

## Adjustments

You may want to change the minimum duration value from the default setting of 10 seconds to reflect your measurement technique.

If you want Automatic Analysis to mark:

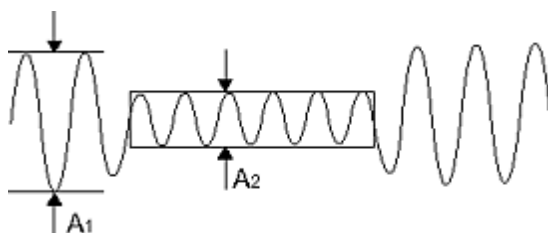
- more events: *decrease* minimum duration
- less events: *increase* minimum duration



Set the amplitude threshold for apneas, relative to the preceding 3-6 breaths. The length of this window depends on breathing stability.

This sets the threshold of the peak-to-peak amplitude of the Apnea Detection (or Primary) flow trace relative to the preceding amplitude for an event to be classified as an apnea.

For example, if this maximum relative amplitude was set at 20%, then every event that is found to have an amplitude of 20% or below of the preceding data will be classified as an apnea.



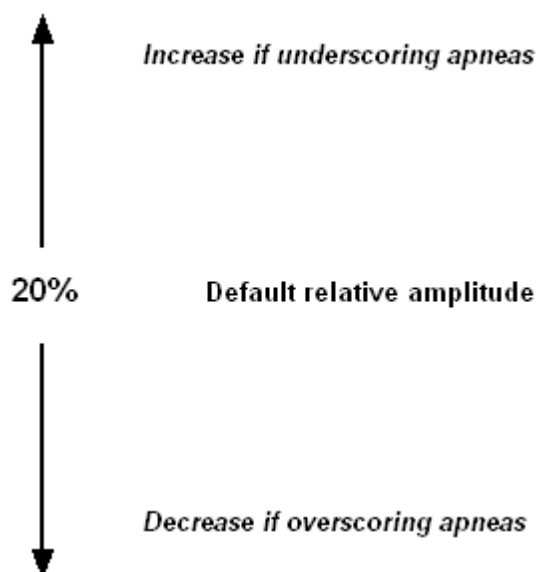
Type: Apnea

Default Setting:  $A2 / A1 \leq 20\%$

## Adjustments

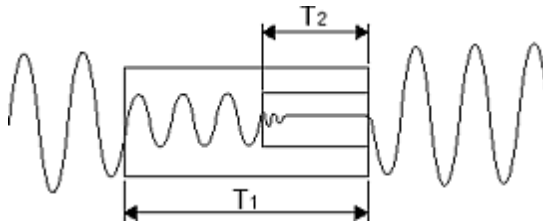
You may want to change the maximum relative amplitude value from the default setting of 20% to reflect your measurement technique.

- Automatic Analysis is marking events as apneas that I would call hypopneas: *decrease* relative amplitude
- Automatic Analysis is marking events as hypopneas that I would call apneas: *increase* relative amplitude



The minimum relative duration is the proportion of the event for which the signal amplitude must be below the threshold level to be classified as an apnea. This parameter is set to allow tolerance for brief amplitude changes during an event.

The minimum relative duration is the proportion of the event for which the signal amplitude must be below the threshold level to be classified as an apnea. This parameter is set to allow tolerance for brief amplitude changes during an event.



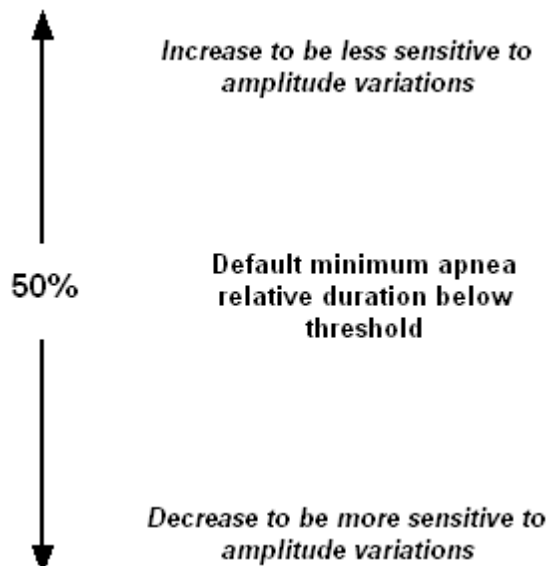
Type: Apnea

Default Setting:  $T2 / T1 \geq 50\%$

## Adjustments

You may want to change the minimum apnea relative duration below threshold value from the default setting of 50% to reflect your measurement technique.

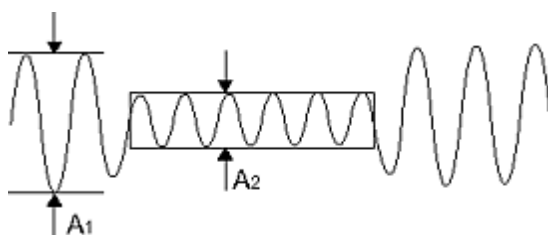
- I want Automatic Analysis to be less sensitive to amplitude variations for apneas: *increase* minimum relative duration below threshold
- I want Automatic Analysis to be more sensitive to amplitude variations for apneas: *decrease* minimum relative duration below threshold



Set the amplitude threshold for hypopneas, relative to the preceding 3-6 breaths. The length of this window depends on breathing stability.

This sets the threshold of the peak-to-peak amplitude of the Hypopnea Detection (or Primary) flow trace relative to the preceding amplitude for an event to be classified as a hypopnea.

For example, if this maximum relative amplitude was set at 50%, then every event that is found to have an amplitude of 50% or below of the preceding data will be classified as a hypopnea.



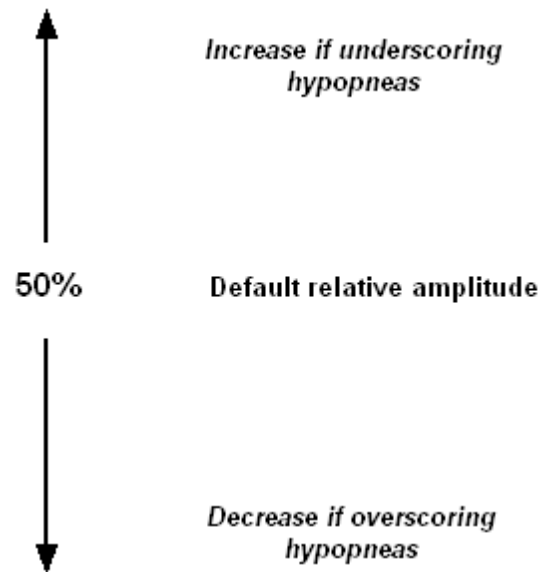
Type: Hypopnea

Default Setting:  $A2 / A1 \leq 50\%$

## Adjustments

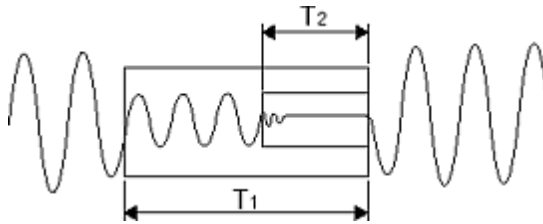
You may want to change the maximum relative amplitude value from the default setting of 50% to reflect your measurement technique.

- Automatic Analysis is marking events as hypopneas that I would not score:  
*decrease* relative amplitude
- Automatic Analysis is not marking events that I would score as hypopneas:  
*increase* relative amplitude



The minimum relative duration is the proportion of the event for which the signal amplitude must be below the threshold level to be classified as a hypopnea. This parameter is set to allow tolerance for brief amplitude changes during an event.

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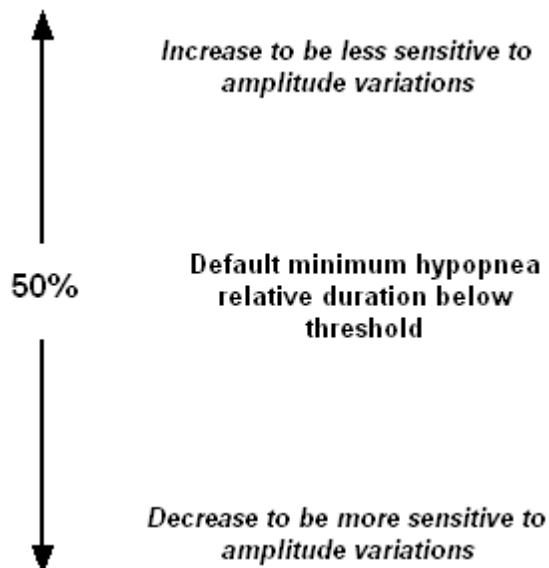
Type: Hypopnea

Default Setting:  $T2 / T1 \geq 50\%$

## Adjustments

You may want to change the minimum hypopnea relative duration below threshold value from the default setting of 50% to reflect your measurement technique.

- I want Automatic Analysis to be less sensitive to amplitude variations for hypopneas: *increase* minimum relative duration below threshold
- I want Automatic Analysis to be more sensitive to amplitude variations for hypopneas: *decrease* minimum relative duration below threshold



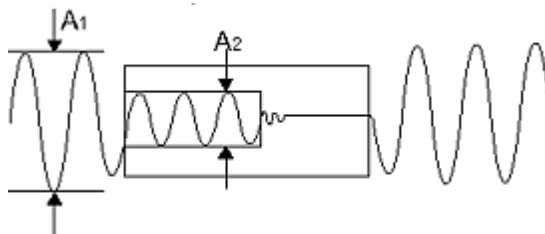
#### 6.4.2.3.1.2 Apnea Classification parameters

These criteria are used to determine the type of apnea (obstructive, central or mixed) and are applied to the **Effort 1** and **Effort 2** traces as defined in Input Assignments. These should be some measure of respiratory effort, typically piezo respiratory belts or RIP bands.

The algorithms look at the effort on either trace, with no priority given to either.

Used to determine the relative amplitude of effort during a respiratory event that is to be classified as no effort. The relative amplitude refers to the amplitude of the trace relative to the amplitude during the previous 3-6 breaths. The length of this window depends on breathing stability.

If, for example, this is set at 15%, then all selected respiratory effort traces need to fall below 15% of the preceding movement in order for an apnea to be classed as a central type.



Type: Central, Mixed, Obstructive Apnea

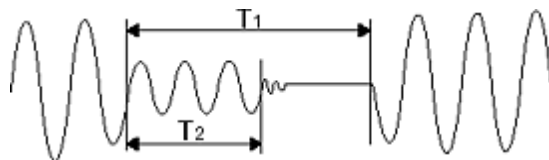
Default Setting:  $A2 / A1 \geq 15\%$

### Adjustments

You may want to change the minimum relative amplitude value from the default setting of 15% to reflect your measurement technique.

- Automatic Analysis is marking events as obstructive apneas that I would call mixed or central apneas: *increase* minimum relative amplitude
- Automatic Analysis is marking events as mixed or central apneas that I would call obstructive apneas: *decrease* minimum relative amplitude

These parameters define what proportion of the event should have respiratory effort present (as set by the effort *minimum relative amplitude*) in order to classify events as Obstructive, Mixed or Central apneas.



Type: Central, Mixed, Obstructive Apnea

Default Settings:

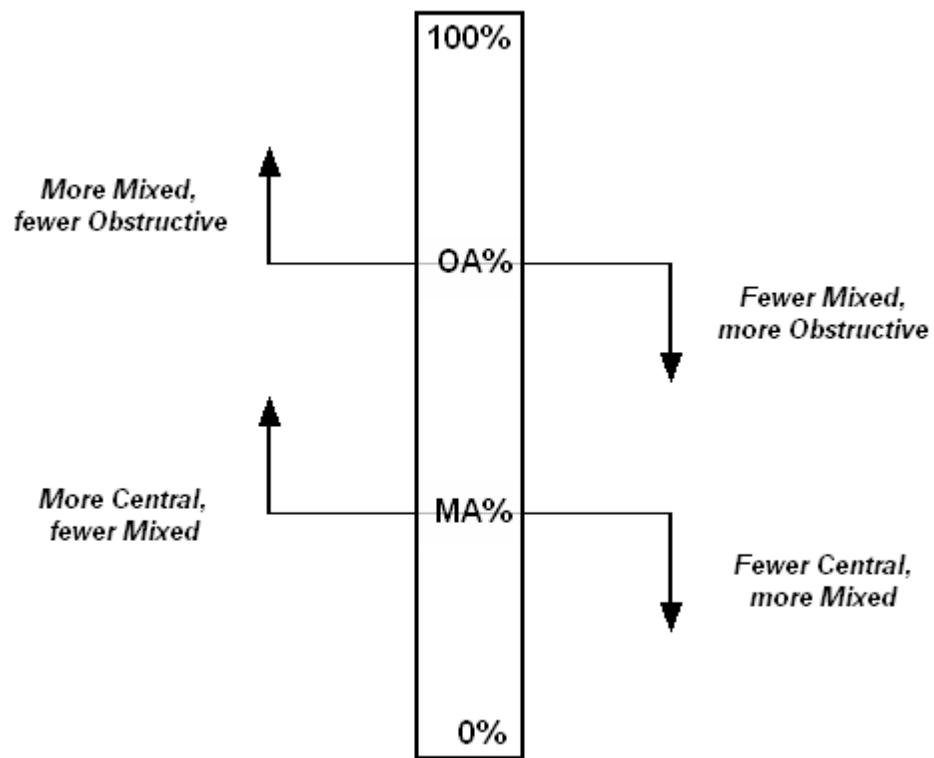
- **Obstructive Apnea (OA):**  $T2/T1 \geq 66\%$
- **Mixed Apnea (MA):**  $66\% > T2/T1 \geq 33\%$
- **Central Apnea (CA):**  $T2/T1 < 33\%$

## Adjustments

You may want to change the minimum relative duration values from the default settings to reflect your measurement techniques.

- I want Automatic Analysis to mark more MAs and fewer CAs: *decrease* MA%
- I want Automatic Analysis to mark more CAs and fewer MAs: *increase* MA%
- I want Automatic Analysis to mark more OAs and fewer MAs: *decrease* OA%
- I want Automatic Analysis to mark more MAs and fewer OAs: *increase* OA%





*Minimum Relative Duration Adjustments*

#### 6.4.2.3.2 Desaturation parameters

These determine the handling of SpO<sub>2</sub> desaturations and whether they are part of the event criteria.

The input analysed is set in the Input Assignments.

##### **Min SpO<sub>2</sub> reduction (%)**


Determines the minimum SpO<sub>2</sub> reduction that will be classified as a desaturation. Desaturation events are marked on the SpO<sub>2</sub> trace.

##### **Apply desaturation criteria during event detection**

Set whether desaturations should be included as part of the criteria for respiratory events. The specific criteria for apneas and hypopneas are set in the subsequent two parameters.

##### **Min desat: Apnea / Hypopnea (%)**

Applies only if the *Apply desaturation criteria during event detection* (described above) is enabled. Set the desaturation criteria for each event type. Only events meeting all the defined [Primary](#)<sup>[56]</sup> and [Effort](#)<sup>[63]</sup> input parameters will be marked.

 **Info** The Min SpO<sub>2</sub> reduction and the Minimum desaturations can be different values. For example, if the Min SpO<sub>2</sub> reduction is set at 2% and the Minimum desaturations are both set at 3%, all SpO<sub>2</sub> reductions of 2% or greater will be marked, but only respiratory events with accompanying reductions of 3% or greater will be marked. Respiratory events meeting all criteria (as defined by the Primary and Effort parameters) except for the desaturation criteria will be marked as Unsure events.

#### 6.4.2.3.3 Desaturation Artifact

These parameters define desaturations that are to be marked as artifact rather than physiological desaturations.

The input analysed is set in the Input Assignments.

##### **Minimum desaturation (%)**

Set the minimum desaturation from baseline required before marking as artifact. Any desaturation greater than this will be marked as artifact.

##### **Max SpO<sub>2</sub> level (%)**

Set the maximum SpO<sub>2</sub> level that is to be considered physiological. Anything below this level will be marked as artifact.

## ***Min SpO<sub>2</sub> reduction slope (%/s)***

Set the rate of desaturation that is to be considered physiological, in percentage points per second. Any desaturation rate faster than this will be marked as artifact.

### ***6.4.2.3.4 Respiratory Rate***

The respiratory rate is automatically calculated from the Apnea detection input in AASM mode, and the Primary Input in R&K mode.

In the value field, enter a name to be used for the respiratory rate. When the Summary Analysis is run (either in PSG Online or Profusion PSG 3), the respiratory rate will be calculated. It can be displayed as a trace.



**Tip** Do not select an input from the drop down list. Once you have entered a name for the Respiratory Rate, it will appear in the drop down list.

### ***6.4.2.3.5 Sound***

Set the parameters for snoring detection from the Sound input assignment.

The sound channel is analysed for deviations from the baseline. The baseline is calculated as a moving window average, and snoring can be analysed from microphones, SPL meters (dB) or a filtered snoring signal from nasal pressure monitoring.

## ***Threshold***

Because of the variety of inputs that can be analysed for snoring, the threshold for detecting snores is set as the number of standard deviations from baseline. The threshold will depend on the input device.

Recommended settings for different input devices:

- Microphone: Threshold = 0.1
- Calibrated dB meter: Threshold = 3.0
- Piezo snore sensor: Threshold = 0.2
- Somté PSG Sound channel (card-converted studies): Threshold = 4.0
- Filtered Nasal Pressure (10-100Hz): Threshold = 0.1

These recommendations are based on sample studies, and may need to be adjusted for your lab.

## ***Minimum time between snores***

Set the minimum time between sounds that meet the sound threshold criteria. If this is too

short, snores with a double peak (sounds on inspiration and expiration) may be marked as two separate snores.

### ***Minimum duration***

Set the minimum duration for snores. If this is too short, isolated spikes in sound may be marked as snores.

#### 6.4.2.4 Limb Analysis

Automatic limb movement analysis can be used to detect individual limb movements, and then mark PLM episodes when the marked limb movements meet the defined criteria.

Both the left and right leg inputs are analysed for limb movements. If only one limb input is being recorded, leave one of the input assignments blank.

Parameters can be adjusted to match your scoring criteria for:

- [Limb movements](#) <sup>70</sup>
- [PLM episodes](#) <sup>72</sup>



**Info** Limb movements and PLM episodes marked by the automatic analysis can be edited or deleted manually, and new movements and PLM episodes can be marked manually.

The automatic Limb Movement Analysis can be performed during study acquisition.

To enable this automatic analysis module, go to the Analysis Settings tab of the Recording Configuration. In the Online analysis folder, set the **Limb Movement Analysis** option to On.

To view and change the Limb Movement parameters, go to the Analysis Settings tab of the Recording Configuration. Click on Analysis Parameters, then Limb. The default settings are shown below.

Data Types																					
Physical Inputs																					
Manual Inputs																					
Automatic Analysis																					
<div> <div>Input Assignments</div> <div> Sleep Respiratory Arousal Other </div> </div> <div> <div>Analysis Parameters</div> <div> Respiratory Limb Arousal Other </div> </div> <div> <div>Online</div> </div>	<table border="1"> <thead> <tr> <th>Property</th> <th>Value</th> </tr> </thead> <tbody> <tr><td><b>Limb Movement</b></td><td></td></tr> <tr><td>Minimum Duration (s)</td><td>0.500000</td></tr> <tr><td>Maximum Duration (s)</td><td>11.000000</td></tr> <tr><td>Apply minimum amplitude threshold</td><td>No</td></tr> <tr><td>Min amplitude threshold (uV)</td><td>1000.000000</td></tr> <tr><td><b>PLM</b></td><td></td></tr> <tr><td>Minimum Duration (s)</td><td>6.000000</td></tr> <tr><td>Maximum Duration (s)</td><td>50.000000</td></tr> <tr><td>Apply criteria of limb movement similarity</td><td>Yes</td></tr> </tbody> </table>	Property	Value	<b>Limb Movement</b>		Minimum Duration (s)	0.500000	Maximum Duration (s)	11.000000	Apply minimum amplitude threshold	No	Min amplitude threshold (uV)	1000.000000	<b>PLM</b>		Minimum Duration (s)	6.000000	Maximum Duration (s)	50.000000	Apply criteria of limb movement similarity	Yes
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Maximum Duration (s)	50.000000																				
Apply criteria of limb movement similarity	Yes																				
Decision Assist																					
Alerts																					
Observation Chart																					
Defaults																					

*Limb Movement Default Settings*

#### 6.4.2.4.1 Limb movement parameters

These parameters determine the criteria used in marking individual limb movements.

##### **Minimum Duration**

Set the minimum duration for limb movements in seconds. If this is too short, phasic limb movements during REM and ECG artifact may be marked as limb movements.

Default Setting: T = 0.5 seconds

##### **Maximum Duration**

Set the maximum duration for limb movements in seconds. If this is too long, sustained muscle contractions or signal artifact may be marked as limb movements.

Default Setting: T = 10 seconds



**Info** The default minimum and maximum duration settings reflect the AASM criteria for PLM episodes.

### ***Apply minimum amplitude increase threshold (AASM Mode)***

Determines whether an amplitude increase criteria is to be used in marking limb movements. Set to "Yes" to use, and define the threshold in the *Minimum amplitude increase threshold* field below.

The Automatic Analysis detects increases above the resting EMG level, which is determined by a moving window average.

### ***Minimum amplitude increase threshold (AASM Mode)***

If the *Apply minimum amplitude increase threshold* setting is "Yes", set the amplitude increase to detect. The AASM recommendation is 8uV. This can be changed in **Profusion PSG 3** to reflect the amplitude as recorded during patient calibrations. The threshold will depend on the recording technique used (piezo sensors or EMG), and may need to be adjusted to best match the individual study.

### ***Apply minimum amplitude threshold (R&K Mode)***

Determines whether an amplitude criteria is to be used in marking limb movements. Set to "Yes" to use, and define the threshold in the *Min amplitude threshold* field below.

The Automatic Analysis detects limb movements that have a peak-to-peak amplitude meeting the minimum amplitude threshold criteria.

### ***Minimum amplitude threshold (R&K Mode)***

If the *Apply min amplitude threshold* setting is "Yes", set the amplitude to be applied. This can be changed in **Profusion PSG 3** to reflect the amplitude as recorded during patient calibrations. The threshold will depend on the recording technique used (piezo sensors or EMG), and may need to be adjusted to best match the individual study.

#### 6.4.2.4.2 PLM

These parameters determine the criteria to be used in marking individual limb movements as PLM episodes. The PLM marking algorithm requires at least 4 consecutive limb movements in a PLM episode.

If two limb inputs are analysed, they will be considered as a single input when being analysed for PLM episodes. This is to account for limb movements occurring on separate limbs with a duration shorter than the minimum duration between them. These two movements are considered as one movement in the PLM analysis.

#### ***Minimum Duration***

Set the minimum duration between individual limb movements to be included in PLM episodes.

Default Setting: T = 5 seconds

#### ***Maximum Duration***

Set the maximum duration between individual limb movements to be included in PLM episodes.

Default Setting: T = 90 seconds



**Info** The duration between limb movements is the duration between the end of one movement marker and the start of the next.

#### ***Apply criteria of limb movement similarity***

Uses additional criteria for PLM episodes

- Similarity of duration
- Similarity of amplitude
- Similarity of periodicity

This option can be used to mark PLM episodes in studies where the limb movements are very regular and have similar amplitudes. However it should not be used for studies with variations in limb regularity and amplitude.



#### 6.4.2.5 Other Parameters

In addition to Sleep, Arousal, Respiratory and Limb Movement analysis, Automatic Analysis during acquisition is available for Pulse Transit Time (PTT), EtCO2 and Heart Rate.

The following Analysis modules can be performed during study acquisition:

- PTT
- pH Event Detection

The Summary analysis generates average TcCO2 values per epoch and the Heart Rate average per epoch.

To enable these automatic analysis modules, go to the Analysis Settings tab of the Recording Configuration. In the Online analysis folder, set the **PTT** and **pH Event Detection** options to On.

To view and change the parameters for these modules, go to the Analysis Settings tab of the Recording Configuration. Click on Analysis Parameters, then Other. The default settings are shown below.

Data Types																			
Physical Inputs																			
Manual Inputs																			
Automatic Analysis																			
<div> <div>Input Assignments</div> <div> Sleep Respiratory Arousal Other </div> </div> <div> <div>Analysis Parameters</div> <div> Respiratory Limb Arousal Other </div> </div> <div> <div>Online</div> </div>	<table border="1"> <thead> <tr> <th>Property</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td><b>PTT</b></td> <td></td> </tr> <tr> <td>Pleth threshold (s)</td> <td>50.000000</td> </tr> <tr> <td>PTT label</td> <td>PTT</td> </tr> <tr> <td><b>EtCO2</b></td> <td></td> </tr> <tr> <td>Lag Time (s)</td> <td>0.000000</td> </tr> <tr> <td>Minimum Threshold</td> <td>0.500000</td> </tr> <tr> <td><b>Heart Rate</b></td> <td></td> </tr> <tr> <td>Input</td> <td>None</td> </tr> </tbody> </table>	Property	Value	<b>PTT</b>		Pleth threshold (s)	50.000000	PTT label	PTT	<b>EtCO2</b>		Lag Time (s)	0.000000	Minimum Threshold	0.500000	<b>Heart Rate</b>		Input	None
Property	Value																		
<b>PTT</b>																			
Pleth threshold (s)	50.000000																		
PTT label	PTT																		
<b>EtCO2</b>																			
Lag Time (s)	0.000000																		
Minimum Threshold	0.500000																		
<b>Heart Rate</b>																			
Input	None																		
Decision Assist																			
Alerts																			
Observation Chart																			
Defaults																			

#### 6.4.2.5.1 PTT

The Pulse Transit Time (PTT) can be used to provide additional information about respiratory events.

Set the Pleth threshold (%) and label for the PTT. The PTT can be displayed as a trace. See below for details on the Pleth threshold value.

In PSG Online, a PTT trace can be displayed, but PTT event detection is only available in Profusion PSG 3.

### ***PTT Analysis Parameters***

Automatic PTT Analysis measures the time interval between the ECG R-point and a designated point on the plethysmographic wave signal from a pulse oximeter capable of producing such a signal. The designated point on the plethysmographic wave is specified as a percentage of the plethysmographic wave variation from the trough (foot) to the peak of the wave. The point is user adjustable with the default value equal to 50%. This value is recommended as the pleth wave is likely to have the largest slope in the middle of its rise from the foot to the peak of the wave and therefore the PTT calculation error is likely to be minimal.



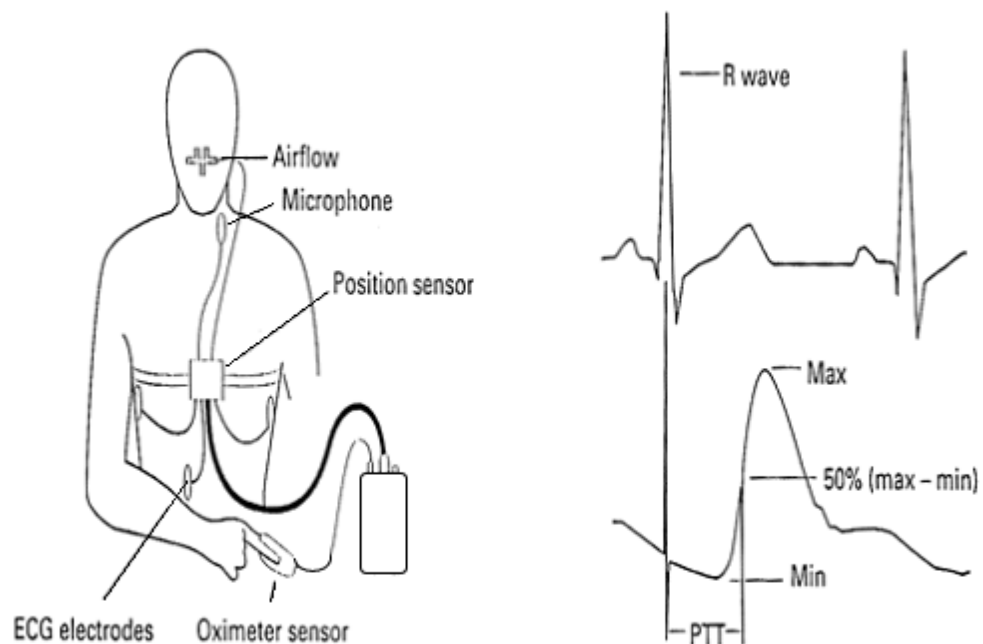
**Tip** The PTT algorithm uses the ECG filter settings from the [Input Assignments](#). Make sure these have been set correctly (default values are 0.3-30Hz) in order to obtain a meaningful PTT signal.

## What is the PTT?

PTT (Pulse Transit Time) is defined as the time interval that it takes for the blood pressure wave to travel from the heart to a specified measurement point on the body. This destination point is typically a finger.

PTT calculation has two steps:

- The ECG signal analysis is performed to find all R-points.
- For every R-point the nearest subsequent pleth wave threshold crossing point is found:



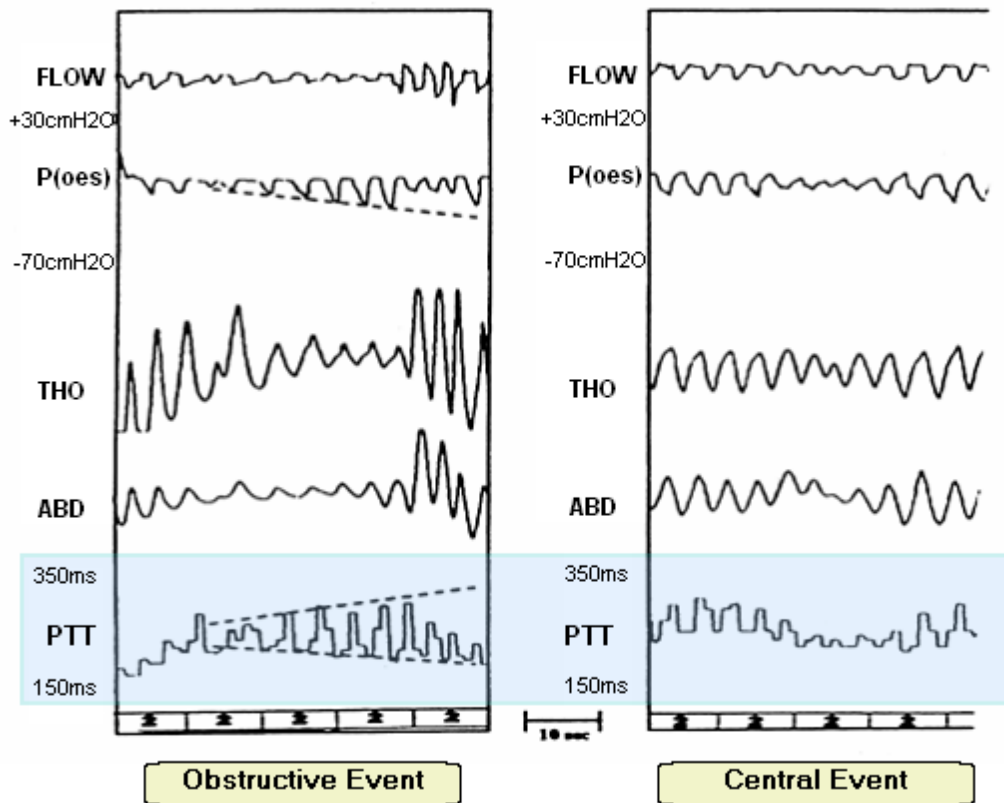
The value of PTT is equal to the interval between the ECG R-point and the pleth wave threshold crossing. The PTT values are presented on screen as discrete traces with the switch points located at respective pleth wave threshold crossings. The typical PTT is 250ms.

The PTT trace can then be analysed to determine significant changes that are usually associated with respiratory events.

## Clinical Application

The clinical application of PTT is twofold:

- PTT (or more specifically its pre-ejection component) is affected by changes in the intra-thoracic pressure and therefore it presents an approximation of the effort signal. By monitoring the profile of the PTT changes in the course of a respiratory event it is possible to discriminate central and obstructive events.



- PTT (or more specifically its vascular component) is affected by blood pressure changes due to autonomic arousals. Episodes of reduction in the PTT value can be used as markers of autonomic arousal activity.

#### 6.4.2.5.2 EtCO2

EtCO2 Peak Analysis detects the peak CO2 value during a respiratory cycle. Analysis is performed on an exhaled CO2 waveform (capnography).

The analysis results are used by the Report Generator to represent EtCO2 Statistics.

Set the lag time (s) and minimum threshold.

To mark the peak of each EtCO2 cycle, go to Tools > Automatic Analysis and check the EtCO2 Peak Detection box.

Click OK to run the analysis.

#### 6.4.2.5.3 Heart Rate

The Heart Rate is calculated by the **Summary Analysis** in beats per minute (BPM) from the ECG input.

In the value field, enter a name to be used for the Heart Rate. When the Summary Analysis is run (either in PSG Online or Profusion PSG 3), the Heart Rate will be calculated. It can be displayed as a trace.

This derived Heart Rate is different from the Heart Rate available from an oximeter. The derived Heart Rate is a beat-to-beat analysis of the ECG, whereas the Heart Rate from an oximeter is a moving window average of a number of seconds (window time depends on the oximeter being used).

## 6.5 Decision Assist


The Decision Assist tool is available during recording when enabled. It has been designed specifically for use during split night studies, assisting you in determining when user-defined criteria have been met and implementation of CPAP is appropriate.

Using results from any manual and/or automatic analysis performed, Decision Assist will keep track of:

- Recording time since lights out. Lights out is determined by
- Total time asleep
- Total time in REM
- Respiratory disturbances (Apnea Criteria, which is treated as a single criteria)
- Time remaining before the end of the study

Decision Assist Alerts can be set to indicate when a definable number of criteria have been met, or the parameters have reached within a definable percentage of the criteria.

The Decision Assist tool is available during acquisition in PSG Online.

 **Tip** If any parameters are not required to be tracked, set the criteria to zero (or a maximum level for Time remaining).

### Decision Assist Default Settings

Recording time since lights out is at least **120** minutes

AND

Time asleep is at least **60** minutes

AND

Time in REM is at least **10** minutes

AND

Number of Apneas and Hypopneas during sleep is at least **40** (Select *Include RERAs* to also include the number of RERAs during sleep as part of the criteria).

OR

AHI during sleep is at least **40** (Select *Use RDI Instead* to use the number of Apneas, Hypopneas and RERAs per hour as the criteria)

<b>OR</b>	AHI during sleep is at least <b>20</b>
	Time with SpO2<=80% is at least <b>10</b> minutes
	# desats >= 10% at least <b>5</b>

AND

Time remaining until the end of the study is at least **180** minutes

Study End Time **6:00:00 AM**

Indicator condition	Colour	Show Alert	Alert Text
All criteria met		No	None
All within <b>10%</b>		No	None
Any <b>4</b> criteria met		No	None
Less than 3 criteria			

## 6.6 Alerts




Alerts provide an obvious visible and/or audible notification to the operator when an input meets defined criteria. Multiple alerts can be set for any calibrated input. An alert is displayed as watermark text behind the scrolling data, and if the input is displayed in the meter bar it is coloured to match. Alert sounds will play once when the alert is triggered.

If there are multiple activated Alerts, each will be displayed in a cycle of 6 seconds. The alert can be acknowledged by double clicking the coloured indicator in the meter bar, which will temporarily disable the notification. When the alert condition is re-triggered, the alert will again appear and any alert sound will be played.

For example, the following alerts could be configured for the SpO<sub>2</sub> input (Upper/Lower Calibration):

SpO <sub>2</sub> range	Alert Text	Alert Colour	Alert Sound
Above 80%	None	None	None
Between 60-79%	Significant Desaturation		None
Between 30-59%	Severe Desaturation		Notify
Below 29%	Check Oximeter		Speech



Alerts					
Input	Colour	Alert Text	Alert Size	Persist Duration	Sound
▶ SpO2		Significant Desat	50	0 s	None
SpO2		Severe Desat	50	0 s	Notify
SpO2		Check Oximeter	50	0 s	Speech

Property	Name
Alert Criteria	Between
Upper Limit	79.00
Lower Limit	60.00

In this example, the alert text will display on the traces in the colour specified, and the meter bar indicator will change to the same colour. A notification sound will play when the SpO2 level is at 30-59%, and the text Check Oximeter will be read aloud when the SpO2 level falls below 29%. Alternatively, the input Ox Status (Step Calibration) could be used to trigger an alert when it is Poor or Off.

## Creating an Alert

- To create an alert, right-click on the Alert pane and select Insert Alert.
- Set the Input to the required calibrated input.
- Assign the parameters Colour, Alert Text, Alert Size, Persist Duration and Sound as required. If the alert text contains the string "%s", then this is replaced with text representing the current input value.
- In the Property section of the pane:
  - Step Calibrations: Choose the step to trigger the Alert. If there are several Steps that need one, an individual Alert must be made for each one.
  - Upper/Lower Calibrations: These can be set to trigger if the input goes above, below or between set boundaries. Choose the Alert type and then the upper and lower limits. The Between condition can be used as an intermediate alert.

## Alert Parameters

**Input:** Select a calibrated input from the drop-down box.

**Colour:** Select an alert colour. The watermark text and the meter (if displayed on the meter bar) will both be this colour.

**Alert Text:** The text in this box will appear as a watermark behind the scrolling traces.

**Alert Size:** This setting represents the font size of the watermark alert. If this is set to 0, the watermark will not be visible.

**Persist Duration:** If the Alert condition is no longer valid, the watermark text will persist for the duration set here. This is useful for alert conditions which may only be present for a very short time.

**Sound:** If a sound is selected, it will play once each time the alert is triggered. The folder for saving sounds is assigned in **Tools > Options > Alert Sounds Path**. If the sound is set to "Speech", the Microsoft Windows Speech-to-Text function will read the alert Text.

## 6.7 Observation Chart

The Observation Chart can be used to replace paper-based observation charts. The Observation Chart can be set to grab information from the recorded inputs at regular intervals, and user comments can be added. Observations can also be added on-demand at any time while recording.

Observation Chart					
Time	POSITION	SpO2	Notes	Confirm	
19/09/2006 04:46:11 PM	Right	96.00 %		Confirmed	
19/09/2006 04:47:11 PM	Right	97.00 %		Confirmed	
19/09/2006 04:48:11 PM	Front	96.00 %		Confirmed	
19/09/2006 04:49:11 PM	Right	96.00 %		Confirmed	
19/09/2006 04:50:11 PM	Front	95.00 %	Loud noises next door	Confirmed	
19/09/2006 04:51:11 PM	Front	96.00 %		Confirmed	
19/09/2006 04:52:11 PM	Right	96.00 %		Confirmed	
19/09/2006 04:53:11 PM	Front	96.00 %		Confirmed	

The Observation Chart is set to appear periodically throughout the night, and the interval is set in the "Frequency (min)" box. Observation Charts can either open automatically in **PSG Online 3** or a popup message from the system tray can be used.



Observation Chart popup message in the system tray

The chart will automatically log the time when an entry is inserted.

**Info** Although the Observation Chart is configured within the Recording Configuration pane, it is actually saved as a separate configuration file. This is so that you can quickly use the same Observation Chart layout for other recording configurations.

## To Add a New Column

- click the Add Column button
- select the Type, which determines which calibrated input it will take a reading from (select *none* to include a column for user comments)
- enter a Name for the column

## To Delete a Column

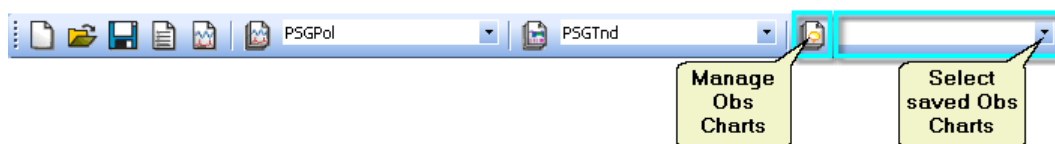
- click the Delete Column button
- click the column(s) to be deleted, or Delete All
- press the > button to move the selected columns to the Deletion Set window
- press OK to delete the columns in the Deletion Set window

## Saving the Observation Chart

Observation charts are saved as a separate configuration file. This means that you can load the same Observation Chart for use in other configurations. When the **File > Save Configuration As** option is selected, the Observation Chart can be given a unique name for saving.

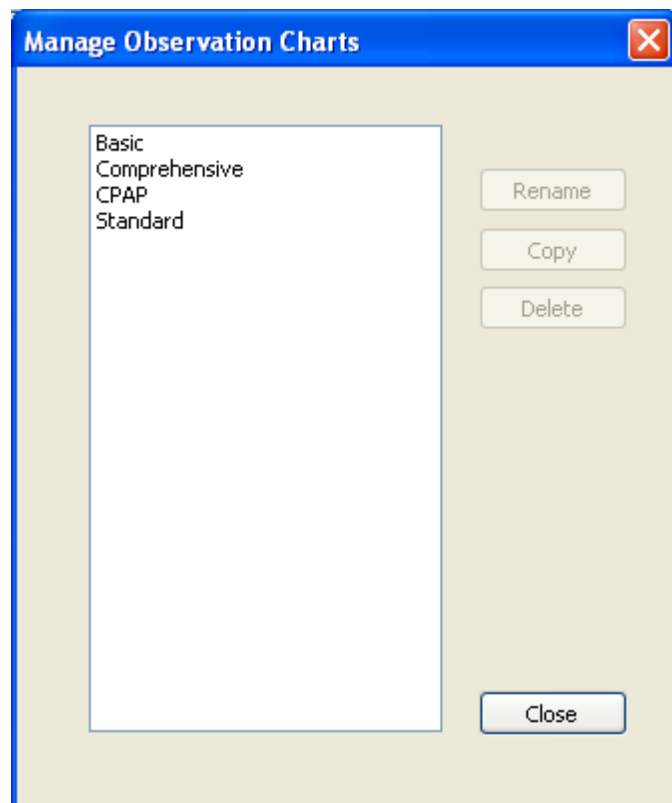
## Managing Observation Charts

The toolbar in PSG Config has options to select previously saved Observation Charts for use with the current Recording Configuration, and an Observation Chart Manager to rename, copy and delete Observation Chart files.



Saved Observation Charts can be selected from the drop-down list in the toolbar. The currently loaded Observation Chart will be shown in the toolbar, and also in the Defaults tab of the Recording Configuration pane.

Click the Manage Observation Charts icon to view the manager:



Select the Observation Chart that you want to manipulate, and choose Rename, Copy or Delete.

- Rename - Enter a new name for the Observation Chart.
- Copy - Create a copy of the selected Observation Chart with a new name. You will be asked to enter a new name.
- Delete - Deletes the selected Observation Chart(s). Multiple Observation Charts can be deleted at the same time.

## 7 View Configuration

The View Configuration defines how the recorded data is displayed within PSG Online 3, and the default display settings for Profusion PSG3.

Specifically, the view configuration pane is used to configure:

- [Trend](#)<sup>[87]</sup> - A graphical epoch-by-epoch summary of the recorded data
- [Meters](#)<sup>[90]</sup> - Tools for viewing the instantaneous values of calibrated signals, editing Manual Inputs, and acknowledging Alerts
- [Trace Layout](#)<sup>[91]</sup> - Defines which inputs are displayed (including referential traces) and in what order, trace properties, timebases and other display properties

If it is not visible, open the View Configuration window from the **View > View Configuration** menu item, or the Trace Layout icon:



## 7.1 Trend

During recording, the Trend window provides a graphical epoch-by-epoch summary of the selected inputs. A wide variety of inputs can be displayed in this trend form, and events marked as part of the online analysis (automatic or manual) can also be displayed as trend graphs. The number of trend graphs available depends on the recording configuration (for example the trend graphs for TcCO<sub>2</sub> will not be available if there is no Input Assignment for TcCO<sub>2</sub>).

The Trend pane configures which charts will be displayed in the Trend window during recording.

View Configuration

Trend

☐ Grid Markers
 Grid Colour:

Cursor Colour:

Background Colour:

Input	Size
Hypnogram	2
▶ Position Summary	2
SpO <sub>2</sub>	2
CPAP Press	2
Pulse	2
Avg EMG	1
Spindle	1
REM	1
EEG Spectrum	4
Limb (Left)	0.5
Limb (Right)	0.5
Obstructive Apnea	0.5
Mixed Apnea	0.5

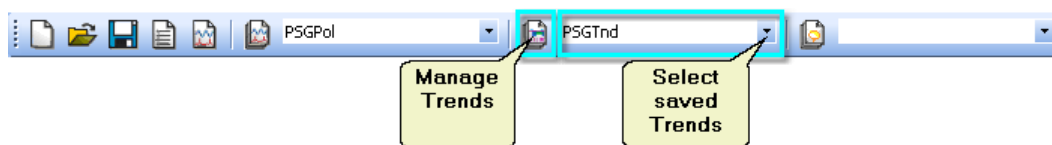
Property	Name
Colour	<span style="background-color: black; color: black;"> </span> 000000
Enable Grids	True

Meters

Pane 1

Pane 2

Saved trends can be opened for viewing or editing from Tools > Trend Layouts > Manage Trend Layouts menu item, or the Trends drop down list.



The background settings of the trend can be set at the top of the Trend window.

To add a new trend graph

- right-click in the Trend pane and select *Insert Trend Graph*.
- select one of the available trend graphs from the drop-down list, and set the Size (relative to the other traces). For some trend graphs, the colour and display of gridlines can be set.

To delete an existing trend graph, right-click on the graph name that you want to delete and select Delete Trend Graph.

**Info** Although the Trend is configured within the View Configuration pane, it is actually saved as a separate configuration file. This is so that you can quickly use the same Trend layout for other recording configurations.

## Saving the Trend

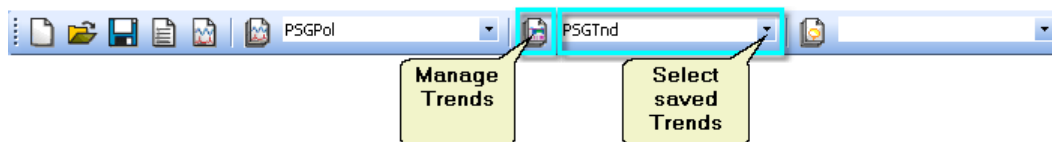
Trend layouts are saved as a separate configuration file. This means that you can load the same Trend Layout for use in other configurations. When the **File > Save Configuration As** option is selected, the Trend can be given a unique name for saving.

Trend configuration files are saved to the directory specified in the [Options](#) <sup>[100]</sup> section.



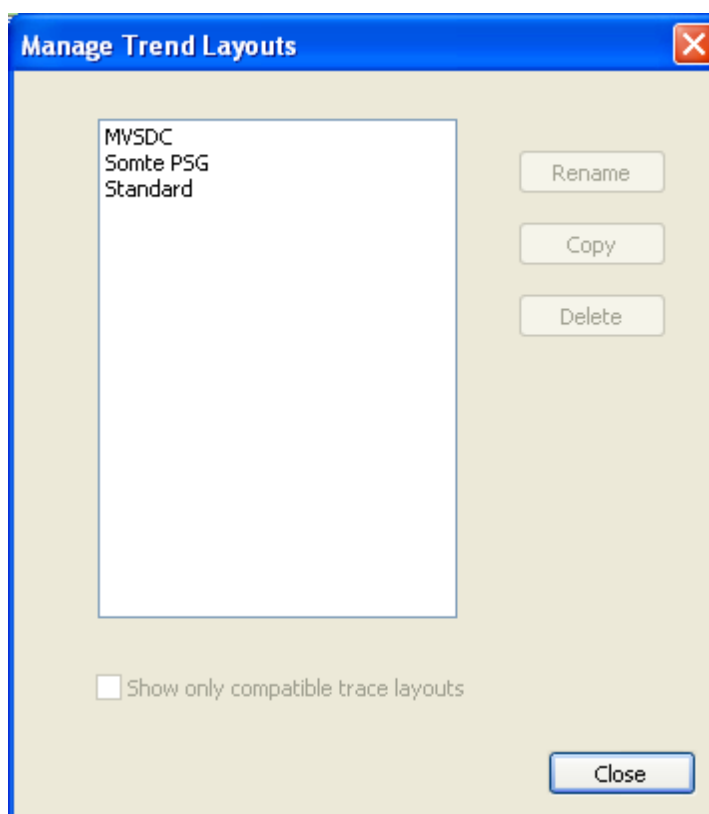
## Managing Trends

The toolbar in PSG Config has options to select previously saved Trend layouts for use with the current Recording Configuration, and a Trend Layout Manager to rename, copy and delete Trend files.



Saved Trend Layouts can be selected from the drop-down list in the toolbar. The currently loaded Trend will be shown in the toolbar, and also in the Defaults tab of the Recording Configuration pane.

Click the Manage Trend Layouts icon to view the manager:

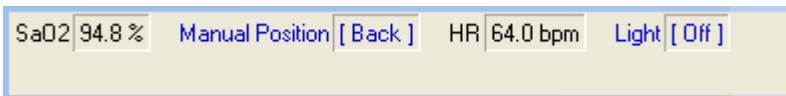


Select the Trend that you want to manipulate, and choose Rename, Copy or Delete.

- Rename - Enter a new name for the Trend.
- Copy - Create a copy of the selected Trend with a new name. You will be asked to enter a new name.
- Delete - Deletes the selected Trend(s). Multiple Trends can be deleted at the same time.

## 7.2 Meters

Meters can be used to display real-time information for any calibrated input. Manual inputs are managed from the Meter Bar, and should also be added for viewing.



The meter bar by default is displayed at the bottom of the trace window, but can be docked on any edge by right-clicking the meter bar and selecting the new position.

### *Configuring the Meter Bar*

#### **To insert a meter:**

- Right-click in the Meter pane, and select *Insert Meter*. Use the drop-down list to select the required input.

#### **To delete a meter:**

- Right-click on the input to be deleted and select *Delete Meter*.

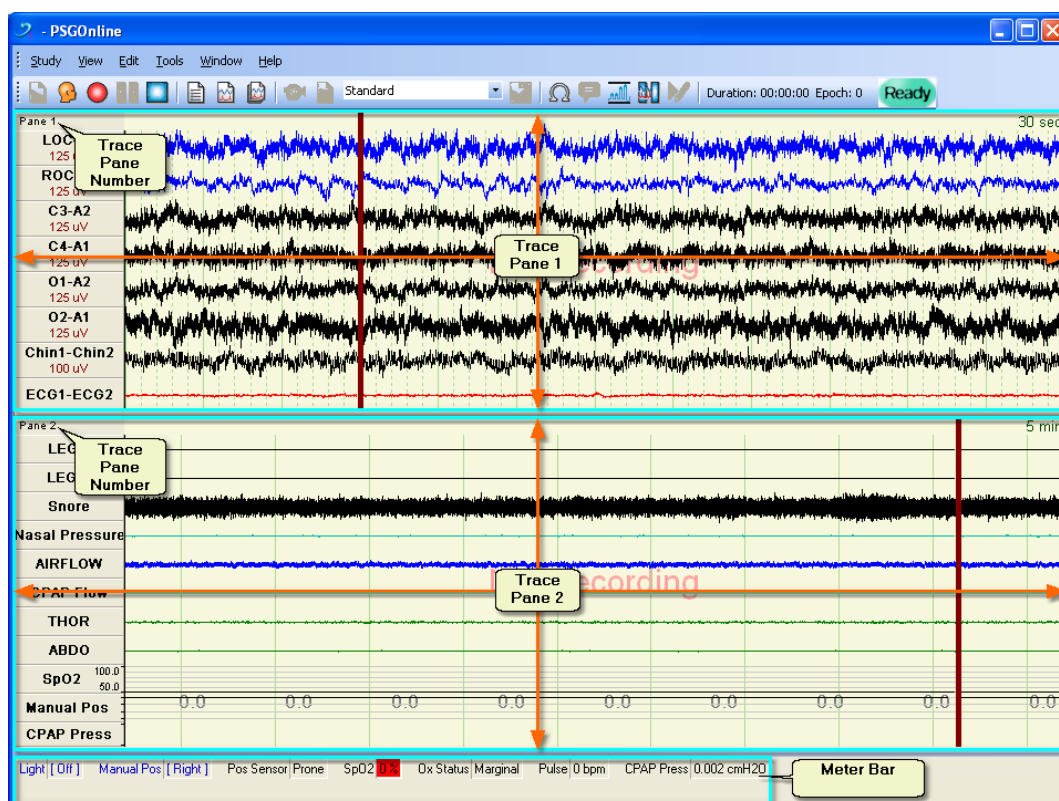
#### **Changing the Meter Bar font:**

- The Meter Bar font can be changed by right clicking in the Meter pane and selecting *Change Meter Font*. Any system font can be selected. It may be useful to change to a smaller font if there are a lot of meters displayed.

## 7.3 Trace Display

The main Trace Display window can be customised to display the recorded data exactly as you need to.

The Trace Layout defines the look of the main Trace Window, including how the recorded data is displayed. The inputs displayed, whether they are referenced to other inputs, the order of traces and trace properties are all configured in the Trace Layout. The Trace Layout can be changed as required, and you can save the most often used layouts for use in any study.



### 7.3.1 Configuring Trace Layout

Open the View Configuration window from the menu (**View > View Configuration**).

Name	Input	±	Ref	Colour	Zoom	Size	Grids	Polarity	Upper	Lower	HP Filter	LP Filter	Notch	Clip	Auto Scale	Numeric
L0C-A2	L0C	-	A2	Blue	8.00	1.0	0.00	Negative	N/A	N/A	0.30 Hz	30 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
R0C-A1	R0C	-	A1	Blue	8.00	1.0	0.00	Negative	N/A	N/A	0.30 Hz	30 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C3-A2	C3	-	A2	Black	8.00	1.0	0.00	Negative	N/A	N/A	0.30 Hz	30 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C4-A1	C4	-	A1	Black	8.00	1.0	0.00	Negative	N/A	N/A	0.30 Hz	30 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D1-A2	D1	-	A2	Black	8.00	1.0	0.00	Negative	N/A	N/A	0.30 Hz	30 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D2-A1	D2	-	A1	Black	8.00	1.0	0.00	Negative	N/A	N/A	0.30 Hz	30 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chin1-Chin2	Chin1	-	Chin2	Black	10.00	1.0	0.00	Negative	N/A	N/A	0.30 Hz	30 Hz	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ECG1-ECG2	ECG1	-	ECG2	Red	4.00	1.0	0.00	Positive	N/A	N/A	0.30 Hz	30 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

To add a new Trace Pane, select **Tools > Trace Layouts > Add Trace Pane**.

To delete a Trace Pane, **Tools > Trace Layouts > Delete Trace Pane**.

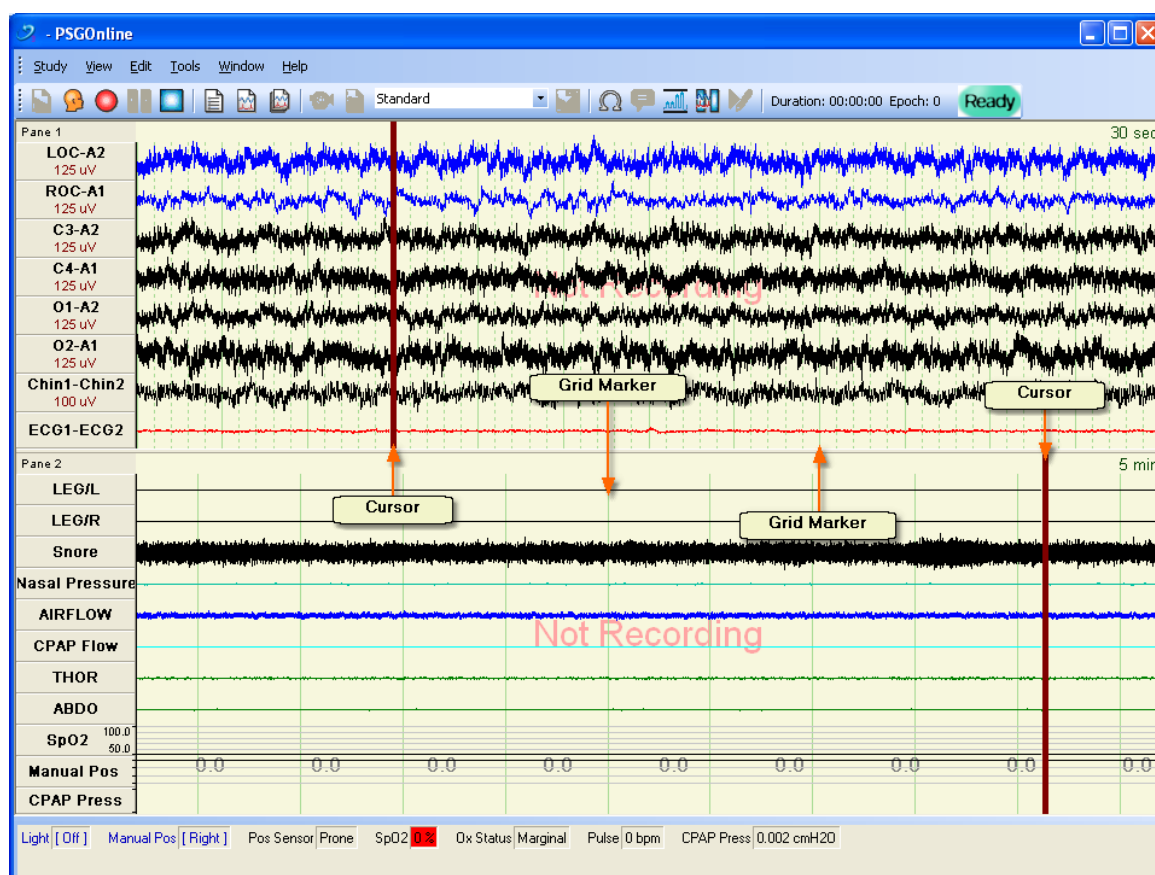
The traditional use for multiple Trace Panes is to group inputs by timebase so that usable data is viewed in each. Rapidly changing signals such as EEG need a fast timebase, and are often set to 30 seconds. Moderately frequently changing signals such as airflow can be set to a 2 minute timebase Trace pane, while slowly changing signals such as oxygen saturation might be assigned to a 5 minute timebase Trace Pane. Assigning inputs to the appropriate Trace Pane enables the optimum balance of viewing the current data for integrity and analysis versus viewing recent data to observe changes.

At the top of each Pane configuration window, there are a variety of options for the overall display configuration of the selected Pane:

- **Timebase** - The timebase sets how many seconds (or minutes) are displayed in the Trace Pane.
- **Grid Markers** - Apply vertical markers across the Trace Pane. These can be configured in **Tools > Options > Timebase Options**
- **Epoch Markers** - In Page Back mode and Profusion PSG 3, epoch markers place a vertical marker and an icon of the sleep stage at the start of each epoch.
- **Apply Changes to Data Type** - Any changes to a trace property will be applied to other

traces that share the same Data Type.

- **Background Colour** - Set the background colour of the Trace Pane.
- **Cursor Colour** - Set the colour of the cursor. In PSG Online the cursor moves along the Trace Pane to indicate data as it arrives. In Page Back mode and Profusion PSG 3, the cursor can be used to find the corresponding point in Trace Panes with different timebases.
- **Grid Colour** - Set the colour of the Grid Markers.
- **Epoch Colour** - Set the colour of the Epoch Markers.



## 7.3.2 Configuring Traces

### Adding Traces



With the View Configuration window open, right click under the Name column and select Insert Trace. A blank trace will be added.


From the drop-down lists, select the Input to display. If required, also select a Reference input and the operator to use (+/- summed or differential). Inputs with the same Sampling Rate and Sensitivity can be referenced to each other. The Trace Name is set automatically


as the Input and Reference are selected, but can be customised (see table below).

Set the Trace Properties:

<b>Name</b>	Enter a custom name for the trace if desired. This feature is particularly useful if the same trace is being displayed more than once but with different filter settings.
<b>Colour</b>	Set the display colour for the trace
<b>Zoom</b>	The Zoom is a simple visual amplification or gain, and is not relative to the other traces in the pane. Doubling the Zoom will double the visual height of the trace
<b>Size</b>	Size refers to the proportional size of the trace compared to the total Size of all the other traces. If the total Size of all traces is 10, then a single trace with a Size of 1 will take up 10% of the vertical height of the Trace Pane, a trace Size of 2 with a total of 10 would take 20% and so on. Size can be entered as a decimal value if required.
<b>Grids</b>	Entering a number $n$ here will place a horizontal grid reference line every $n$ units for that trace. For example, an SpO2 trace with an upper and lower bound of 75 and 100 and a Grids value of 5 will have a horizontal reference line placed at 75, 80, 85, 90, 95 and 100.
<b>Polarity</b>	Each trace defaults to positive up, negative down. To display a trace as negative up, change the polarity to Negative. This is useful in cases such as traditional EEG or EOG display. Nasal Pressure is also often set to negative up so that an upwards deflection of the trace represents an inhalation (reduction of pressure).
<b>Upper / Lower</b>	A calibrated trace can have upper and lower display bounds set to maximise the usefulness of the displayed area. Setting Upper / Lower bounds do not alter the recorded data in any way, only the visual display. Values beyond the Upper / Lower bounds will be displayed as being at the boundary.
<b>HP / LP Filter</b>	Set the high and low pass filters for display. Setting filters here do not alter the recorded data in any way, only the visual display. Filters can be altered during recording in <b>PSG Online</b> as required.
<b>Notch</b>	Apply the notch filter to the trace (the notch filter frequency is set in <b>Tools &gt; Options &gt; General Options</b> ).
<b>Clip</b>	Ticking the Clip box will prevent the trace from moving above or below the top and bottom of the trace label box. This can be useful in preventing occasionally noisy traces such as EMG from obscuring neighboring traces.
<b>Auto Scale</b>	When checked, the trace can have Auto Scaling applied by clicking the Auto Scale icon in PSG Online 3 or Profusion PSG 3

	 <i>Auto Scale</i>  <b>Tip</b> Uncalibrated traces without Auto Scale checked can be Auto Scaled on demand by right-clicking the trace label and selecting Auto Scale
<b>Numeric</b>	When checked, calibrated inputs will have a numeric value displayed below the trace. You can choose to either have a numeric value displayed at set intervals, or to have the numeric values displayed at the peak and trough values. This is set in the User Settings section of the Options..

 **Tip** If the *Apply changes to Data Type* box is checked, any changes made to any trace that is associated with a Data Type will automatically be applied to all other inputs of the same Data Type. This can be useful to use the same settings, for example filters, for all traces of the same Data Type.

 **Info** Remember that the Trace Properties only affect the display of the traces. The parameters for the recorded data are not changed.

## Deleting Traces

Right click the name of the Trace to delete and select *Delete Trace*.

### 7.3.3 Managing Trace Layouts

#### *Saving Trace Layouts*

Once the Trace Layout has been configured correctly, you can save it. From the menu, select **Tools > Trace Layouts > Save Trace Layout**. Enter a name for the Trace Layout and click OK to save.

#### *Managing Trace Layouts*

The Trace Layout Manager allows you to Rename, Copy or Delete existing Trace Layouts. Select **Tools > Trace Layouts > Manage Trace Layouts** to open the manager. Check the **Show only compatible trace layouts** box to see only Trace Layouts that match the selected Recording Configuration.

### 7.3.4 Shortcuts

#### *Drag and Drop Traces*

The order of individual Traces in the Trace Display can be changed by dragging and dropping the trace labels. Combinations of keystrokes and dragging perform the following functions:

Function	Command
Add Trace	Click and drag
Replace trace	Ctrl+click and drag
Reference to existing trace*	Shift+click and drag
Delete trace	Click trace label and drag off screen
Move trace	Click trace label and drag to existing trace
Replace existing trace	Ctrl+click trace label and drag to existing trace

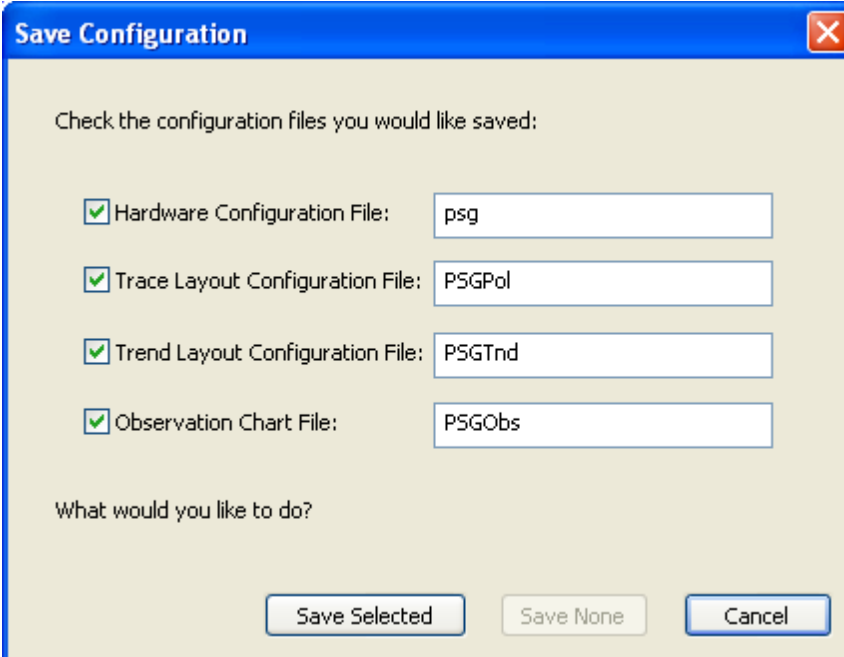


**Tip** The Reference to existing trace drag and drop method only works by dragging input names from the Recording Configuration window. All other drag and drop methods can also be used from this window.



## 8 Save Configuration

When the configuration has been completed, press the Save Configuration icon. The following window will appear:



The image shows a 'Save Configuration' dialog box with a blue title bar and a close button (X) in the top right corner. The main area is light beige. It contains the text 'Check the configuration files you would like saved:' followed by four rows of configuration options. Each row has a checked checkbox, a label, and a text input field. The options are: 'Hardware Configuration File:' with 'psg', 'Trace Layout Configuration File:' with 'PSGPol', 'Trend Layout Configuration File:' with 'PSGTnd', and 'Observation Chart File:' with 'PSGObs'. Below these is the text 'What would you like to do?'. At the bottom are three buttons: 'Save Selected', 'Save None', and 'Cancel'.

Configuration File	Value
Hardware Configuration File	psg
Trace Layout Configuration File	PSGPol
Trend Layout Configuration File	PSGTnd
Observation Chart File	PSGObs

Tick the configuration files that you wish to save. These settings will be the default files loaded when the configuration is selected in PSG Online 3. Only the Trace Layout can be changed after the configuration is loaded for a new study.

All configuration files are saved to the directory specified in the [Options](#) <sup>100</sup> section.

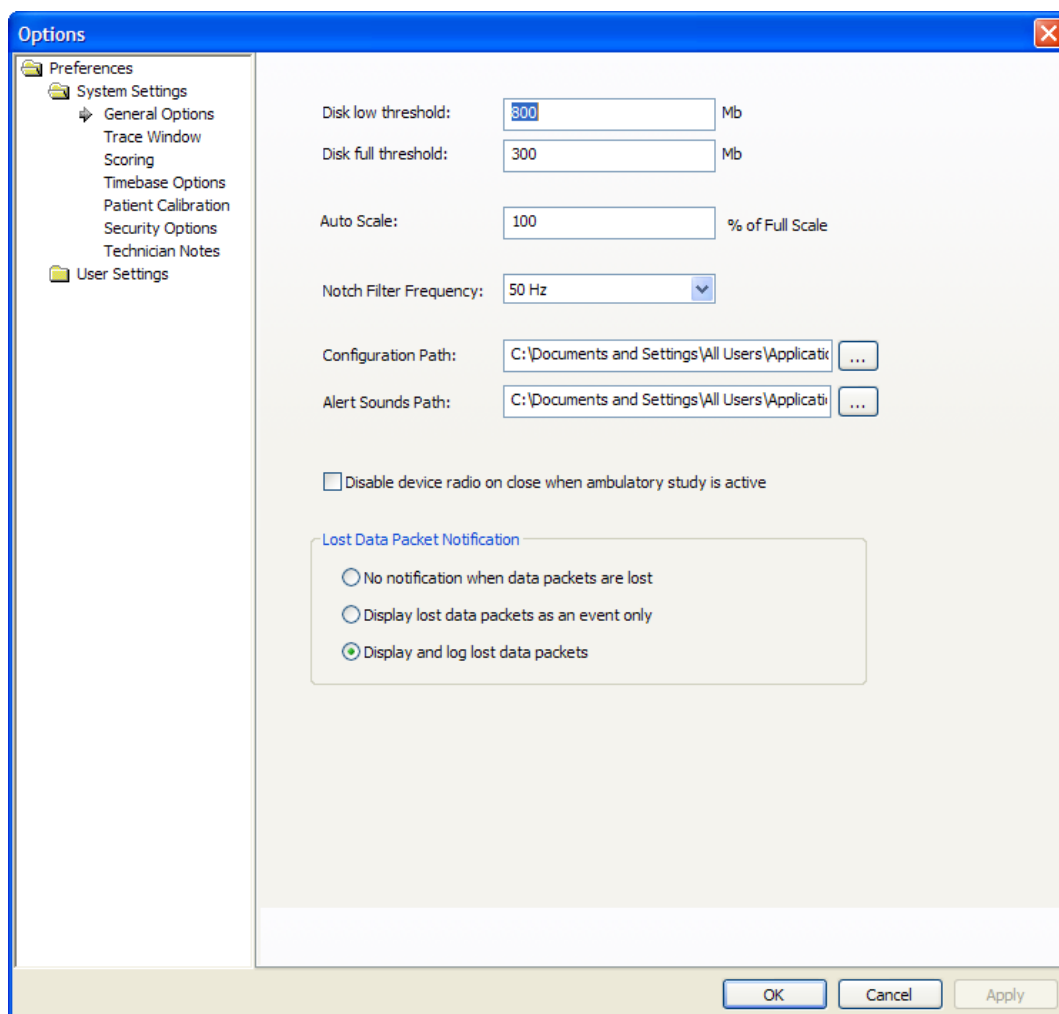
## 9 Options

The Options for PSG Config can be opened by selecting **Tools > Options** from the menu.

The Options window will open. The initial view will be the [General](#)<sup>[100]</sup> Options, with further items for:

- [Trace Window](#)<sup>[102]</sup>
- [Scoring](#)<sup>[103]</sup>
- [Timebase Options](#)<sup>[104]</sup>
- [Patient Calibration](#)<sup>[106]</sup>
- [Security Options](#)<sup>[105]</sup>
- [Technician Notes](#)<sup>[104]</sup>

Click on the required item to open the relevant options.

*Initial Options view*

## 9.1 System Settings

These are settings that apply globally to each computer. The System Settings are separated into the following categories:

**General** - Settings for Disk Capacity alerts, Configuration Folders and basic display options.

**Trace Window** - Settings for event marker display properties

**Scoring** - Advanced scoring options

**Timebase Options** - Display options for gridlines

**Security Settings** - Define requirements for tracking users during acquisition

**Patient Calibration** - Define the tests to be performed when using the Patient Calibration feature

**Technician Notes** - Define the most-commonly technician notes that are to be displayed in the Technician Notes bar

### 9.1.1 General

The General options are global settings for all recordings. They apply to all configurations.

#### Disk Low Threshold

This sets the threshold where a warning is displayed when the data drive is almost full. This allows the recording staff to start taking action to create more free space on that drive for the study, for example by moving older studies to another drive.

#### Disk Full Threshold

This sets when the disk is considered out of space for further study data and effectively halts the current study. If the C: drive is used for recording studies, it is advised to leave some space for the Windows pagefile.

#### Autoscale

Sets the Autoscale percentage. When the Autoscale button is clicked, the appropriate traces are rescaled to make their minimum and maximum values display across this percentage of the Trace label's size. This setting applies to PSG Online (including Page Back) and Profusion PSG 3.

#### Notch Filter Frequency

The Notch Filter Frequency should be set to the mains frequency in the country of recording (50/60Hz). This setting applies to PSG Online (including Page Back) and Profusion PSG 3.

#### Configuration Path

Specify which folder the configurations will be saved to. This can be set to a shared network drive if necessary.

The default directory is *C:\Documents and Settings\All Users\Application Data\Compumedics\ProFusion Sleep\Config\*

#### Alert Sounds Path

Specify which folder the sounds to be used for alerts are located in. Sounds should be in WAV format.

The default directory is *C:\Documents and Settings\All Users\Application Data\Compumedics\ProFusion Sleep\AlertSounds\*

#### Disable device radio on close when ambulatory study is active

For recordings with the Siesta device, the radio can be disabled when an ambulatory recording (ie: recording to the compact flash card only) is initiated with PSG Online, then PSG online is closed after the recording has started. Disabling the radio will extend the

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battery life.

### **Lost Data Packet Notification**

Lost data packets typically occur when there are network disruptions. It is recommended to choose the *Display and log lost data packets* option to assist with tracking data transmission problems.

## 9.1.2 Trace Window

The Trace Window options define how marked events are to be displayed.

### Event Display Properties

The appearance of the listed events (in Pageback mode, and Profusion PSG3) can be defined here. The background colour and text colour can be defined by clicking in the colour bar and selecting a new colour from the drop-down box. Ticking the Outline box changes the appearance of the event from a filled box to a thin outline box in the Trace Window.

### 9.1.3 Scoring

The Scoring Options are settings for both the Pageback mode in PSG Online 3, and for study review in Profusion PSG 3.

#### Auto Save

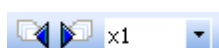
**Profusion PSG 3** can automatically save your work at 1, 2, 5 or 10 minute intervals. Set the Auto Save interval.

The Auto Save feature can also be turned off, but this is not recommended.

#### Auto Paging in Scoring

This option is designed to make manual sleep scoring easier by automatically scoring the current epoch with the last scored sleep stage, and advancing to the next epoch. Selecting a different sleep stage will update the stage to be scored and continue auto-paging. The auto-paging can be stopped by pressing the spacebar. Auto Paging during manual scoring is initiated by pressing a sleep stage key or on of the Auto paging icons.

The Auto Paging icons are found on the navigation toolbar, with the speed of page updates controlled by the drop-down box (available speeds are 0.5, 1, 2, 3 times the recorded speed, or maximum speed):



#### Automatic Arousal Association

Set to **Yes** to turn on Automatic Arousal Association. Click [here](#)<sup>43</sup> for details on how this feature works.

#### Automatic PLM Scoring

The Automatic PLM scoring feature allows manually marked limb movements to be analysed as they are marked or deleted. When the individual limb movements meet the criteria defined by the PLM Episode parameters, a PLM episode marker will automatically be inserted.

#### Hypopnea Classification

When this is set to **No**, the only hypopnea classification available for respiratory events will be a general *Hypopnea*.

When this is set to **Yes**, hypopneas can be classified as *Obstructive*, *Mixed* or *Central Hypopnea*.

#### Arousal Overlapping

Set to **No** to prevent different arousal types from overlapping.

#### Default Respiratory Length

Set a default length (seconds) for respiratory events when single-click event marking is

used. Requires the Standard Event Marking Mode to be selected. The default settings is 10 seconds.

### Default Arousal Length

Set a default length (seconds) for arousals when single-click event marking is used. Requires the Standard Event Marking Mode to be selected. The default settings is 3 seconds.

### Default Limb Movement Length

Set a default length (seconds) for individual limb movements when single-click event marking is used. Requires the Standard Event Marking Mode to be selected. The default settings is 1 second.

### Default Snore Length

Set a default length (seconds) for snores when single-click event marking is used. Requires the Standard Event Marking Mode to be selected. The default settings is 1 second.

## 9.1.4 Timebase Options

Configure the vertical grid markers for each timebase.

### Set the Minor Interval

A dashed vertical marker will display at this interval.

### Set the Number of Minors per Major

A solid vertical marker will be displayed at this rate.

For example, for a 30 second timebase:

- Minor Interval = 1s => dashed marker every second
- No of Minors per Major = 15 => solid marker every 15 seconds.



**Tip** Changes to the timebase options are only visible once data acquisition has been started.

## 9.1.5 Technician Notes

Pre-defined Technician Notes can be entered. These are available to the monitoring techs when they insert a new tech note, and can also be displayed in a window for quick entries. Manual tech notes can still be entered.

To add a new Technician Note, right-click in the panel and select Insert Entry. Type the text and press Enter to apply the new note.

Five Hot Keys (F5-F9) are available for assigning to Tech Notes. Monitoring techs can press the appropriate Hot Key to insert the assigned note instantly.

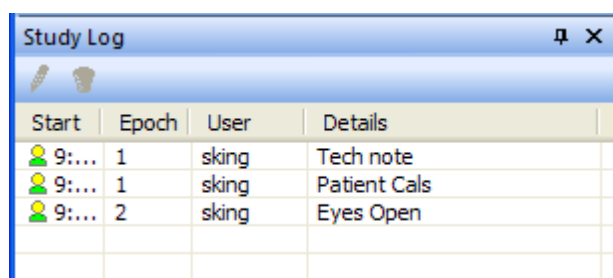


### 9.1.6 Security Options

The Security Options determine how PSG Online and Profusion PSG 3 handle different users. You can require users to login to the PSG Online application, which will record the logged-in user and all user entries they insert. You can also configure PSG Online to automatically log-off after a period of inactivity.

If the security settings are enabled, PSG Online requires logging in to the application. You do not need to log in to Profusion PSG, as it will use the logged-in Windows user.

User entries are tagged with the currently logged-in user name, and this can then be viewed in Profusion PSG:

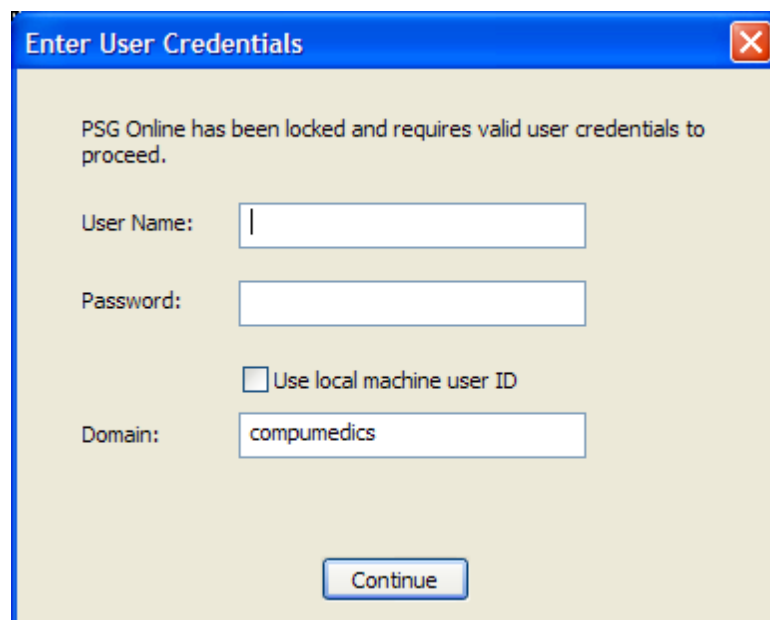


Start	Epoch	User	Details
9:...	1	sking	Tech note
9:...	1	sking	Patient Cals
9:...	2	sking	Eyes Open

## Online Settings

### Force technician to logon before acquisition

Enabling this setting turns on the Security for PSG Online, and requires logging in to the application every time a recording is initiated.



Enter User Credentials

PSG Online has been locked and requires valid user credentials to proceed.

User Name:

Password:

☐ Use local machine user ID

Domain:

Continue

A valid User Name and Password must be entered to continue. Domain logins can be used, or if you check the **Use local machine user ID** box you can use local machine

logins.

### **Auto logoff after x minutes of inactivity**

If required, a time-out period can be specified. Activity within PSG Online is monitored, and when there has been no activity for the specified period, the current user will be logged out and the *Enter User Credentials* dialog will appear. The current recording will still continue, but PSG Online will be locked until valid login details are entered.

### **Don't allow authentication using local users**

Enabling this option will only allow users to login if they have a valid domain user name and password.

## ***Using Security during Acquisition***

See the Security topic in the PSG Online help for details on using the security features during acquisition.

### **9.1.7 Patient Calibration**

The tests to be performed during the Patient Calibrations can be customised.

To edit an entry, click on the test description and enter the new description. Press *Enter* when finished each description.

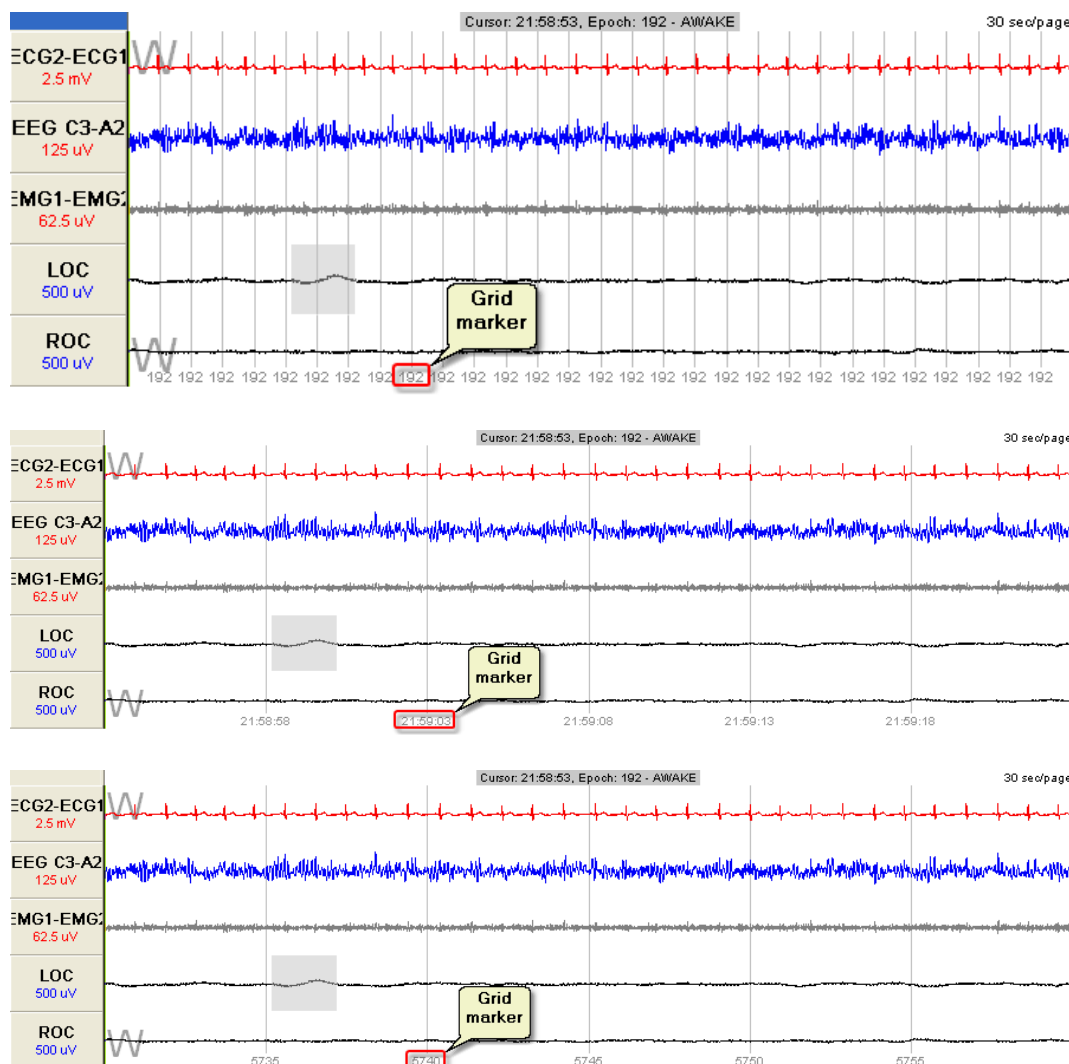
To insert a new test description, right-click in the panel and select *Insert Entry*. Type the text and press *Enter* to apply the new description.

## **9.2 User Settings**

The User Preferences are settings that apply to the current Windows login, allowing different users to set certain personal preferences.

### **Grid Display**

Toggles the type of gridlines displayed in the Trace Window, marked by Epoch number, Time of Day, or number of Seconds From Start of Study. Click the images below to see the different grid markers.



## Peak Point Detection

Calibrated inputs can be displayed with a numeric value (enabled through the properties window or the Trace Layout configuration).

If this option: *Detect peak points when displaying numeric values on Upper/Lower traces*, is enabled, the software will attempt to display numeric values only at the high and low points of that trace.

If this option is not selected, a numeric value will be displayed at a regular interval, determined by the screen resolution and the timebase.

## Event Display Enable/Disable

Ticked boxes allow each type of event to be shown in the Trace Window. The appearance of the events is a [System Setting](#) <sup>102</sup>System Setting.

The following events can be toggled on/off:

- Respiratory Events - can be displayed and edited
- PLM episodes
- Arousals
- Spindles - Sleep spindles can be displayed but not edited
- Delta H waves - High amplitude delta waves ( $>75\mu\text{v}$ ) can be displayed but not edited
- Eye movements - Eye movements can be displayed but not edited
- Gain Changes - for S-Series devices only.
- Impedance tests
- User events
- EtCO<sub>2</sub> Peaks
- pH events
- Lost packets events
- SpO<sub>2</sub> events
- Snores
- Tooltips
- Trace layout changes
- PTT events

## Scoring

Each respiratory input can be assigned a default respiratory event type. When you mark an event on that input, the type defined here will automatically be used (regardless of whether the *Reselect last event type* feature is on).



**Info** In AASM Mode, there are four respiratory inputs: Hypopnea detection, Apnea detection, Effort1 and Effort2.

**In R&K Mode, there are three respiratory inputs: Primary, Effort1 and Effort2.**

Set the respiratory event type to be marked on each of the respiratory inputs (as set in Input Assignments).

When set to *Prompt*, a popup box will appear each time an event is marked, from which the event type is selected (unless *Reselect last event type* is enabled).

## 10 Reference

### 10.1 Device Calibration

Inputs are recorded as a digital value (-32768 to 32677), referred to as the Raw Input when acquiring the calibration points. These digital values need to be converted into a meaningful value in the unit required. This conversion is defined by the Calibration Curve.

The Calibration process involves setting the upper and lower display limits for the input in **PSG Config**, and then acquiring the calibration data points and selecting the type of calibration curve in **PSG Online 3**.

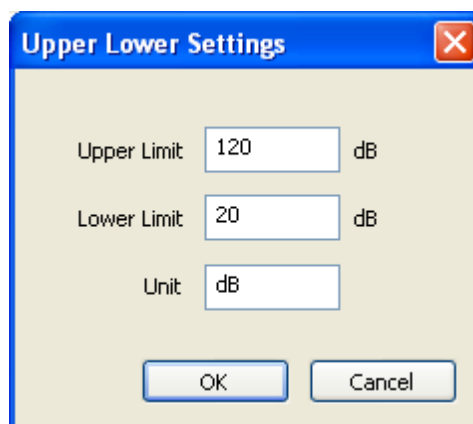
The upper and lower limits define:

- The default display limits for the input. These can be changed later in the View Configuration window in **PSG Config**, or the Trace Properties in **PSG Online 3**.
- The range displayed in the Calibration graph in **PSG Online 3**. The calibration data points are plotted on a graph to show the calibration curve, which defines the conversion of the raw input values to the unit required. Changing the display limits in the Trace Properties does not change the range displayed in the Calibration graph.

 **Tip** Step calibrations are performed in the same manner as described below, except that you acquire a calibration point at each step as specified in **PSG Config**.

Consider for example the calibration of an SPL meter for recording decibels (dB). In the Standard configuration for E-Series that is installed with **Profusion PSG 3**, this input is channel 38 and is called "Snore".

In **PSG Config**, the Upper/Lower Calibration Settings might be set as shown:



When the "Snore" input is added as a trace to the View Configuration, it will use these values as the Upper and Lower limits:

Trend															
Meters															
Pane 1															
Pane 2															
Timebase: 30 sec		Background Colour: <span style="background-color: #d3d3d3; border: 1px solid black; padding: 2px;"> </span>													
<input checked="" type="checkbox"/> Grid Markers		Cursor Colour: <span style="background-color: #800000; border: 1px solid black; padding: 2px;"> </span>													
<input checked="" type="checkbox"/> Epoch Markers		Grid Colour: <span style="background-color: #90ee90; border: 1px solid black; padding: 2px;"> </span>													
<input type="checkbox"/> Apply Changes to Data Type		Epoch Colour: <span style="background-color: #654321; border: 1px solid black; padding: 2px;"> </span>													
Name	Input	±	Ref	Colour	Zoom	Size	Grids	Polarity	Upper	Lower	HP F	Upper/Lower display settings	Clip	Auto Scale	Numeric
LEG/L	LEG/L	-		<span style="background-color: black; color: black;"> </span>	4.00	1.0	0.00	Positive	N/A	N/A	20 Hz		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LEG/R	LEG/R	-		<span style="background-color: black; color: black;"> </span>	4.00	1.0	0.00	Positive	N/A	N/A	20 Hz		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Snore	Snore	-		<span style="background-color: black; color: black;"> </span>	N/A	1.0	0.00	N/A	120.0	20.0	10.0 Hz	100 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nasal Press	Nasal Press	-		<span style="background-color: green; color: black;"> </span>	4.00	1.0	0.00	Negative	N/A	N/A	0.10 Hz	15 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AIRFLOW	AIRFLOW	-		<span style="background-color: blue; color: black;"> </span>	10.00	1.0	0.00	Positive	N/A	N/A	0.10 Hz	15 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CPAP Flow	CPAP Flow	-		<span style="background-color: cyan; color: black;"> </span>	4.00	1.0	0.00	Positive	N/A	N/A	0.10 Hz	15 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
THOR	THOR	-		<span style="background-color: green; color: black;"> </span>	10.00	1.0	0.00	Positive	N/A	N/A	0.10 Hz	15 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ABDO	ABDO	-		<span style="background-color: green; color: black;"> </span>	10.00	1.0	0.00	Positive	N/A	N/A	0.10 Hz	15 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SpO2	SpO2	-		<span style="background-color: black; color: black;"> </span>	N/A	1.0	10.00	N/A	100.0	50.0	Off	Off	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Manual Pos	Manual Pos	-		<span style="background-color: black; color: black;"> </span>	N/A	1.0	0.00	N/A	N/A	N/A	N/A	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CPAP Press	CPAP Press	-		<span style="background-color: black; color: black;"> </span>	N/A	1.0	0.00	N/A	20.0	4.0	Off	Off	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

## 10.2 Raw Input Stability

The Raw Input displays the actual digital value for the selected input. Inputs are sampled at 16-bits, meaning that the number of sampling steps available is  $2^{16}$  (65536 total steps). For calibrated traces, these are distributed evenly around a zero point (using two's-complement arithmetic). The lowest Raw Input value is -32768, and the highest is +32767.

If, for example, an input device is connected to the External Inputs Module, it will automatically have an input range of 2 Volts. When this is sampled, the voltage resolution is the voltage range (2V) divided by the number of steps ( $2^{16} = 65536$ ).

$$\frac{2V}{65536} = 0.0000305$$

which is 30.5µV.

All signals are subject to a certain amount of noise (signal to noise ratio), such that even a stable input will still have a small amount of variability. Looking at the example of a 2V input (-1V to +1V), the exact zero Raw Input value is zero (0). In reality, the Raw Input may fluctuate from, for example, -100 to +100 (the variability will depend on the amount of noise). Using the above calculation, this corresponds to a variability of  $\pm 3.05\text{mV}$ , which is only .305% of the full scale range.

So small fluctuations in the Current Raw Input are expected and normal.

## 11 Menu Items

### *File Menu*

#### **New Configuration**

(Ctrl+N) Select this option to clear all configuration information and start a new configuration. The recording device type must then be selected. Selecting New Configuration allows an entirely new configuration to be built from scratch. If a desired new configuration is similar to an existing one, consider editing the existing one and saving the changes under a different name instead.

#### **Open Configuration...**

Select this option to open an existing Configuration to edit. A list of existing Configurations will appear. Choose the appropriate device type to display a list of available Configurations. Highlight the required configuration and click OK.

#### **Save Configuration...**

(Ctrl+S) Select this option to save all of the current Configurations and Layout configurations at once.

#### **Save Configuration As...**

Select this option to save a current Hardware Configuration, Trace Layout Configuration, Trend Layout configuration or Observation Chart under a different name. A dialogue box will appear, and the configuration components that are ticked will be saved. Enter a new name in the appropriate box to save that component under a different name. Components that have been altered are initially ticked by default.

### *View Menu*

#### **Input Configuration**

Toggles the Inputs configuration window, used for defining what data is recorded.

#### **Trace Layouts Configuration**

Toggles the Trace Layouts configuration window. The Trace Layouts window is used for defining what data is displayed when recording.

#### **Trend**

Toggles the Trend preview window. This window will update to display the Trend layout as described in the Trace Layouts window.

## Meter Bar

Toggles the Meter Bar preview window. This window will update to display the Meters as described in the Trace Layouts window.

## Toolbars

Toggles standard and plug-in toolbars.

**Standard Toolbar:** Displays basic functions to assist in modifying configurations.



## Tools Menu

### Trace Layouts

#### Manage Trace Layouts...

Opens the Manage Trace Layouts box. Highlight a layout and click the appropriate button to copy, rename or delete it. The list can be limited to show only those layouts that are compatible with the current Inputs by ticking the Show only compatible trace layouts box.

#### Save Trace Layouts...

Opens the Save Trace Layouts box. The box will be filled with the name of the last Trace Layout that was loaded. Select a new name from the drop-down arrow on the right side of the box, or type a new name in the field. Click OK to confirm the save.

#### Add Trace Pane

Adds a blank Trace Pane to the bottom of the list in the Trace Layouts window. Note that the Trace Preview window will not display the additional pane until it has been edited.

#### Delete Trace Pane

Deletes the bottom Trace Pane from the Trace Layouts window and updates the Trace Preview window to reflect the change.

### Trend Layouts

#### Manage Trend Layouts...

Opens the Manage Trend Layouts box. Highlight a layout and click the appropriate button to copy, rename or delete it.

#### Save Trend Layouts...

Opens the Save Trend Layouts box. The box will be filled with the name of the last Trend Layout that was loaded. Select a new name from the drop-down arrow on the right side of the box, or type a new name in the field. Click OK to confirm the save.



## Observation Charts

### Manage Observation Charts...

Opens the Manage Observation Chart box, where an Observation Chart can be renamed, copied or deleted.

### Save Observation Chart...

Opens the Save Observation Chart box, where the current Observation Chart can be named and saved.

## Options...

Opens the Options dialogue box.

## Customise...

Opens the Customise dialogue box.

## Help Menu

### Contents...

Opens this help documentation.

### Index...

Opens this help documentation to the keyword Index.

### Search...

Opens this help documentation to the keyword search panel.

### About PSG Config...

Opens an information box which displays the current version and build number of the PSG software.

## 12 Product Support

If you have a question regarding the operation of **ProFusion Sleep 3**, first look in this User Guide or consult the Online Help for the solution. To access the Help, press **F1** or select **Contents** from the **Help** menu.

If you are unable to find the answer in your documentation, contact Compumedics Product Support on:

Australia      **1800 244 773**

International    **+61 3 8420 7396**

USA                **1-877-294-1346**

or your authorised representative.

If you call, you should be sitting in front of your computer system with the **ProFusion Sleep 3** software running at the section you have the question on. You should also have this User's Guide at hand. When you call, please provide the following information:

- The version of software and operating system being used
- A description of what happened and what you were doing when the problem occurred
- The exact wording of any messages that appeared on your screen.
- A description of any attempts made to fix the problem

If you need to ship the equipment, pack the equipment and its accessories carefully to prevent shipping damage. All relevant accessories should accompany the equipment.

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[www.compumedics.com](http://www.compumedics.com)

