



## **PSG Online**

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## **AD061-2**

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# 1 Before You Begin

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## Intended Use

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### User Guide

The **PSG Online 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.

## 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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### Compumedics Home Page

Visit Compumedics on the internet:

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

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## 2 Introduction

The PSG Online software application is used to record polysomnography data for later review in Profusion PSG 3. Summarised data analysis (Trend) can be performed and can be viewed during recording, or used to assist manual scoring. PSG Online software can also record study data and digital video to a Profusion neXus database, the local computer, or a networked drive. PSG Online can also set a Siesta recording device to record to a Compact Flash card.

The PSG Online application initially gives a new study the configuration file used during the most recent study. A different configuration can be indicated when initiating the New Study sequence, after which manual changes to the way traces are displayed may be made if required.

Where multiple computers are monitoring the same study, the first computer to connect to the recording device takes full control of the unit, and subsequent computers are provided with a set of tools limited to viewing the study only.

### 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***

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<sup>37</sup>](#) (for compatible cameras only). See the Digital Video 3 help file for details.

Improved workflow:

Patient name now appears in title bar before recording starts

[Patient details can be edited during acquisition<sup>13</sup>](#)

[Change the input for the Flow-Volume loop on the fly<sup>79</sup>](#)

#### ***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<sup>25</sup>](#) (also available in PSG Online).

The [Zoom tool<sup>76</sup>](#) 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.](#)<sup>[12]</sup>

## **4 Recording Studies**

To record a study:

- [Start a new study](#)<sup>[12]</sup> and view traces as data is being acquired by the unit.
- Check [electrode impedance](#)<sup>[16]</sup>.
- Check [device](#)<sup>[104]</sup> and [patient calibration](#)<sup>[17]</sup>.
- Record [Digital Video](#)<sup>[37]</sup>.
- [Start recording](#)<sup>[18]</sup> to neXus database, hard drive or network drive.
- Add [Technician Notes](#)<sup>[43]</sup> during recording.
- Enter [bilevel pressure settings](#)<sup>[44]</sup>.
- View and analyse recorded data using [Pageback](#)<sup>[45]</sup>.
- View [Trend](#)<sup>[34]</sup> window
- [End the recording](#)<sup>[20]</sup>

## 4.1 Start a new study


If you have Compumedics neXus installed, click [here](#)<sup>14</sup> to see how to start studies.


If you do not have neXus installed, start studies using NetBeacon as described below.

### *Starting Studies through NetBeacon*

To start a new study, open NetBeacon and double-click the appropriate device.




 **Tip** Devices can be renamed, and a background image can be assigned to be displayed in NetBeacon. Right-click anywhere in the NetBeacon window to select the image.

 **Tip** Safiro and Siesta devices can be recorded via their infrared interface. To configure this, right-click the NetBeacon icon in the Windows system tray and select Options. Select or enter the appropriate COM port.

PSG Online 3 will be launched.

Select New Study from the Study menu, or press the New Study icon.



 **Tip** Depending on the Security Settings you may need to login before being able to start a new study. See the [Security](#)<sup>18</sup> topic for more details.

The New Study window will appear:

**New Study**

**Patient Details**

Patient First Name:

Patient Last Name:

Reference Number:

Date of Birth:

**Gender**

☐ Male

☐ Female

Study Path:  

Free Space:

Select Configuration:

Select Trace Layout:

Ambulatory:

Enter the Patient Details as required. The More Patient Details window allows for extensive details to be added.

**Tip** Patient details can be edited during acquisition by selecting *Patient Details* from the View menu in PSG Online. All details except the patient name can be edited. All details can be edited after the study has completed recording using Profusion PSG 3.

Select the Study Path, which specifies where the recording will be saved. The amount of free space on that drive will be displayed.

**Info** The size of each study depends on the study duration, the number of channels recorded and the sampling rates used.

Select the Study Configuration and Trace Layout. These are set up in PSG Config.

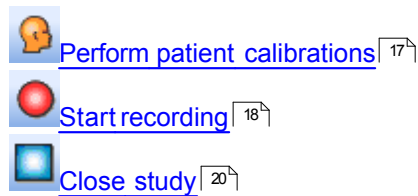
For portable devices, select whether the recording is to be on the local drive, ambulatory (recorded on the device flash memory card) or both.

**Info** To begin recording, PSG Online 3 requires the Patient Last Name, a Study Path and Study Configurations and Trace Layouts to be selected.

Click OK to establish data communication with the recording device. The trace display will have an alert “Not Recording”, and the recording indicator will display a ready signal:



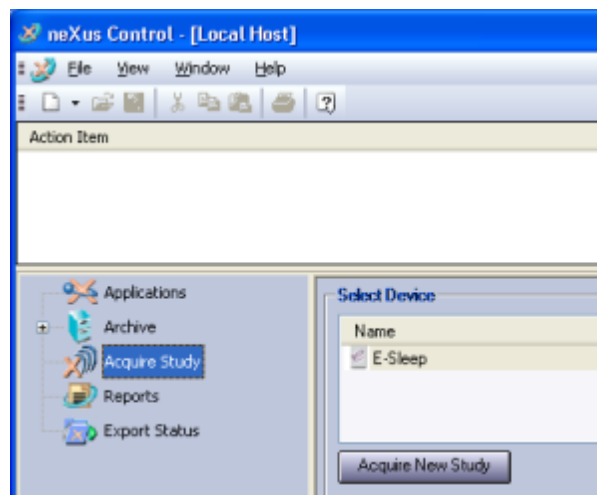
The toolbar will display three recording options:



**Info** Closing the study before starting recording will close PSG Online 3.

## Starting Studies through neXus

If **Profusion neXus** is installed, new studies are initiated through the **Profusion neXus** Control application instead of **NetBeacon**. More detailed information can be found in the **Profusion neXus** documentation.



From within the neXus Control software application, click the Acquire Study option in the sidebar.

- Select the appropriate recording device and click Acquire New Study.
- PSG Online 3 will initialise. Select Study > New Study... or click the New Study icon.

- Select or create a new Patient and select a Service.
- Select the Configuration and Polygraph to use for this patient.
- For a Siesta recording device, choose Ambulatory or Local recording.
- Click OK.

The study will initialise and will be ready to start recording.

Studies that were interrupted prior to ending the recording can now be resumed from within the neXus Control application by selecting an action item. Refer to the neXus Control **Online Help** for further information.

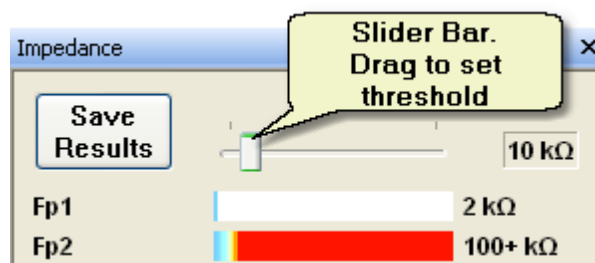
## 4.2 Impedance Checking

Before the recording is started, it is recommended that an impedance check is performed to verify the quality of electrode connection. Impedance checks can be performed before or after a recording is started, and results of impedance checks can be saved if the recording has been started. Saved impedance results can be viewed in Profusion PSG 3 during study review.

Press the Impedance icon to start the impedance check.



The Impedance window will open:



**Info** The traces will not display physiological data during impedance checks. The traces will be restored when the Impedance window is closed or hidden.

Drag the slider bar to set the impedance threshold. The colour bar indicating impedance will display red when the impedance is above the threshold.

The table below shows the recommended action for readings within the ranges listed.

Impedance (kOhm)	Description
<5	Excellent connection. Proceed with recording.
5 - 10	Good connection.
10 - 20	Poor connection. Re-apply electrodes if signal is noisy.
>20	Re-apply electrodes.

The impedance measurement is displayed in real time while the window is open. To deactivate impedance measurement, close the impedance window. If impedance is tested during study acquisition, click the Save Results button to save the displayed results to the study for later review in **Profusion PSG 3**.



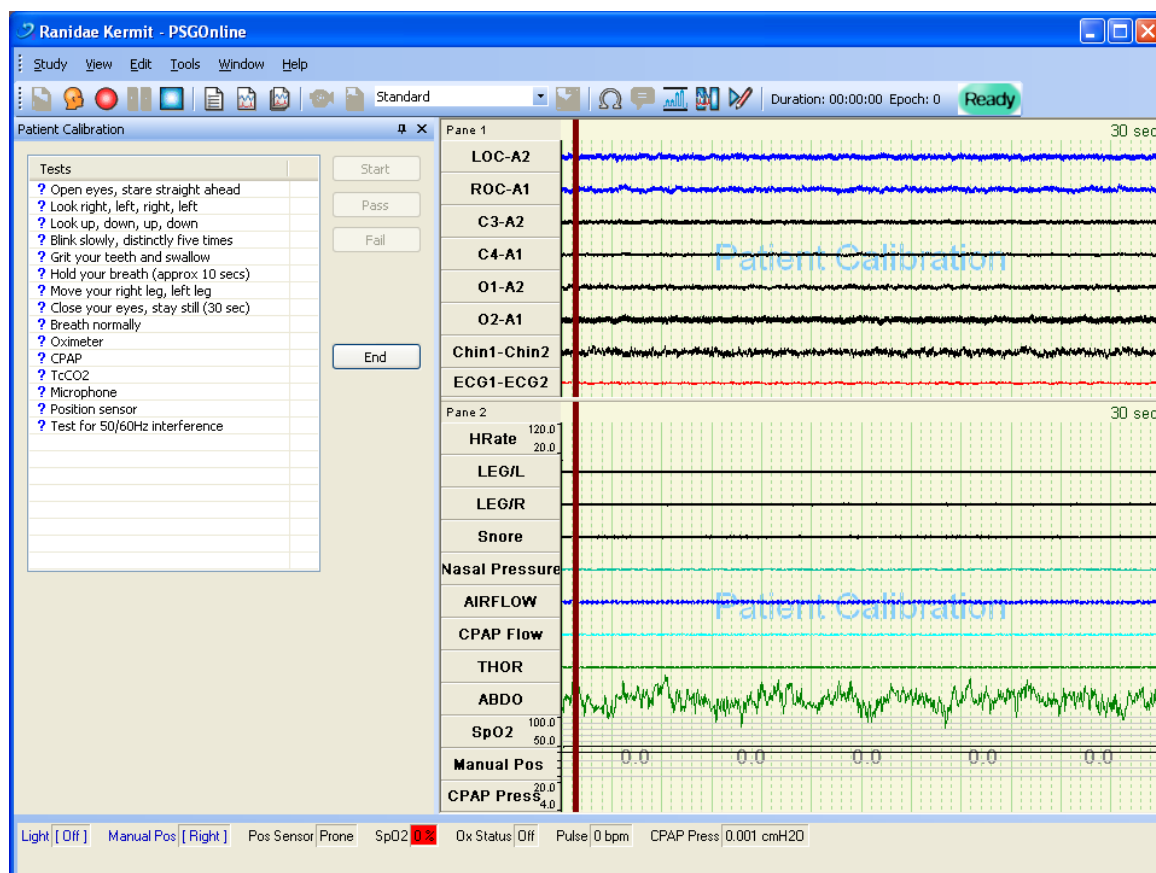
## 4.3 Patient Calibration

A study can be started without performing patient calibrations. If the calibrations are performed, they are recorded and stored with the study file.

Press the Patient Calibration icon:



The calibration window will appear, and the trace display alert will change to “Patient Calibration”:



## 4.4 Electrical Calibration

The Calibration signal is used to verify the sensitivity and time base settings for all AC traces currently being shown on the polygraph window. When it is activated, a 100 $\mu$ V, 2Hz square-wave signal is generated for all inputs.

Activate the Calibration Signal using the menu item View > Calibration Signal. Select the menu item again to turn off the signal.

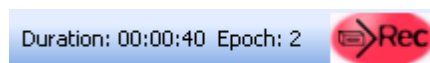
 **Tip** It may be necessary to disable filtering options to enable a true representation of the calibration signal to be displayed.


## 4.5 Start Recording

To start the study recording, press the recording icon.



The default Workspace for the device will be loaded, and the “Not Recording” alert will disappear. The toolbar will display the study duration (from the start of the recording), the current epoch number and the recording indicator.

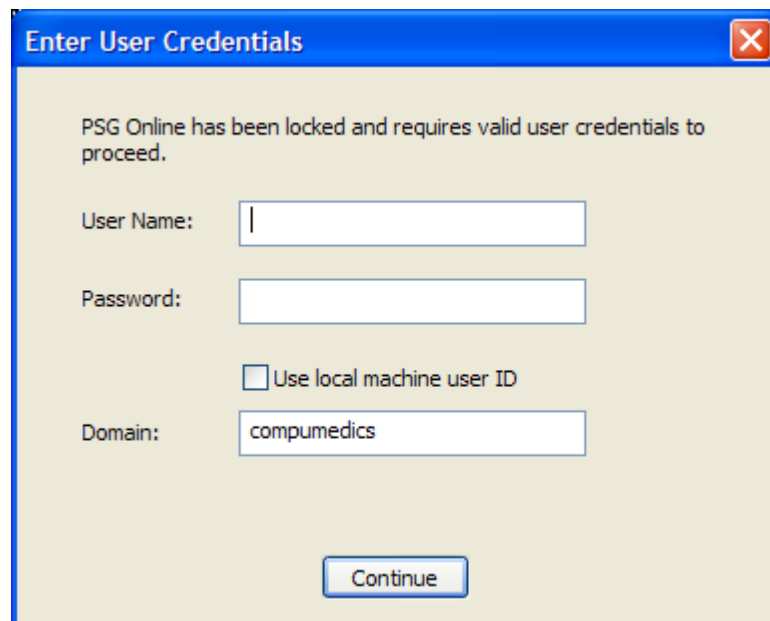


 **Info** One Workspace is definable for each device and workstation. Configure the Workspace as required (see *My Workspace™* section), and save the Workspace as default (Window > Save workspace layout as default).

## 4.6 Security

PSG Online now has a number of options to allow tracking of users for security purposes. The options for these settings can be accessed through the Tools > Options menu.

If selected, you may be required to enter valid user credentials when PSG Online is first started. You will see the following dialog:

A screenshot of a Windows-style dialog box titled "Enter User Credentials". The dialog has a blue title bar with a red close button. The main area is light beige. It contains the text "PSG Online has been locked and requires valid user credentials to proceed." followed by four input fields: "User Name:" (with a cursor), "Password:", "Domain:" (containing "compumedics"), and a checkbox labeled "Use local machine user ID" which is unchecked. A "Continue" button is at the bottom.

In most cases you will enter your normal Windows User Name and Password. The first time this window appears the Domain will need to be entered. This then becomes the default Domain for logging in.

User Names and Passwords for the local machine (ie: not domain logins) can also be used by checking the *Use local machine user ID* box, unless this option has been disabled in the Security options.

## ***During Acquisition***

Any Technician Notes entered will automatically be tagged with the currently logged in user.

During acquisition, you can logoff at any time by selecting Study > Logoff Technician from the menu. This will enter a comment in the Study Log, and the *Enter User Credentials* dialog will be opened for another user to login. Another comment will be inserted in the Study Log when a user logs in.

If a timeout period has been specified in the Security options, activity in PSG Online will be monitored (activity includes keystrokes and mouse movements). When there has been no activity in PSG Online for the specified period the current user will automatically be logged out and the *Enter User Credentials* dialog will be displayed.

## **4.7 MSLT and MWT recordings**

Start a new study and perform patient calibrations as normal. Begin recording at the first nap.

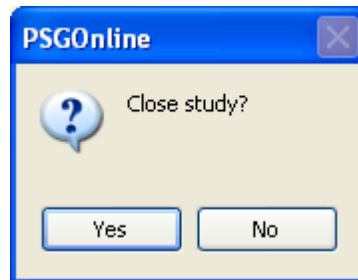
At the end of each nap, pause the recording. Resume at the start of the next nap. This will reduce the file size. This method allows for the MSLT / MWT reporting feature to be used in **Profusion PSG 3**.

## 4.8 End Recording

To end a recording, press the Close Study icon.



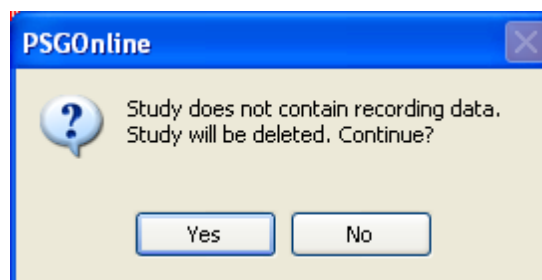
A window will ask you to confirm that you want to end the recording and close the study:



Press **Yes** to confirm, or **No** to continue the recording.

### Closing without Recording

If you press the Close Study icon before starting the recording, you will be asked if you want to close without recording:

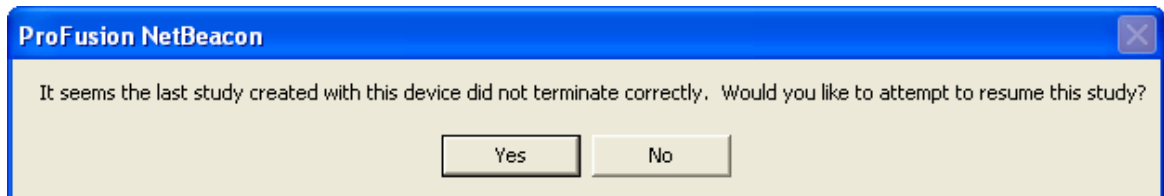


Press **Yes** to close PSG Online 3 and delete any data associated with the prepared study (including any Patient Calibration data).

Press No to return to **PSG Online 3**.

## 4.9 Resuming Studies

If a hardware or software issue causes PSG Online to crash before a study is closed, when that device is opened again through NetBeacon or neXus the following message will appear:




Click Yes to resume the study with the same configuration and patient details as before the crash.

Press Start Recording to resume data recording:



The study segments will be merged, appearing as one study for analysis.

The time between the study segments will be filled with blank data, and in most cases would be scored as artifact.

 **Tip** If a study is voluntarily stopped then restarted, the two study segments can be merged using Study Manager provided the study configuration and patient names are identical.

## 5 During Recording

Once recording has begun, two recording options are available:




Pause recording – Temporarily stops data recording without closing the study. Press again to resume recording. Use between naps in MSLT and MWT studies to reduced the file size.



Close study – Stops recording and closes the study. PSGOnline3 will be closed.

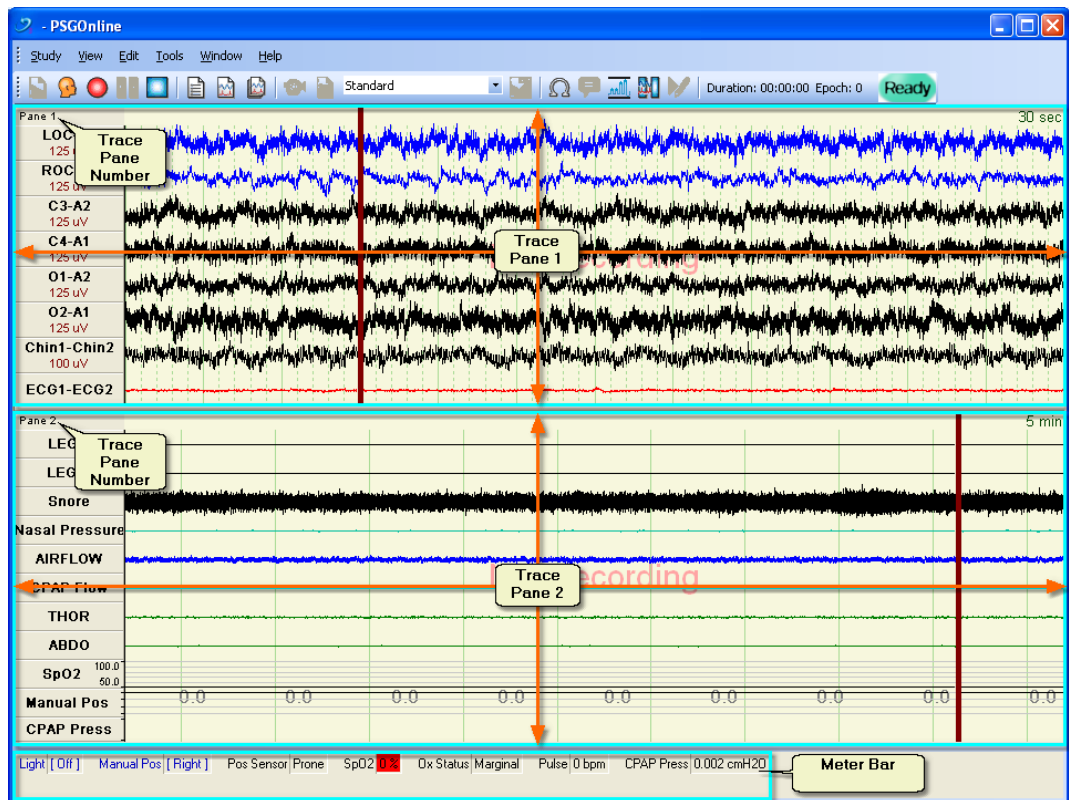


**Info** To stop the traces from scrolling without pausing data recording, press the Freeze Traces icon.  Press again to unfreeze the traces:

## 5.1 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.



### 5.1.1 Configuring Trace Layout

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

View Configuration

Trend

Meters

Pane 1

Timebase: 30 sec

Background Colour: [Yellow]

☒ Grid Markers

Cursor Colour: [Red]

☒ Epoch Markers

Grid Colour: [Green]

☐ Apply Changes to Data Type

Epoch Colour: [White]

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	Negativ	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	Negativ	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	Negativ	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	Negativ	N/A	N/A	0.30 Hz	30 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
O1-A2	O1	-	A2	[Black]	8.00	1.0	0.00	Negativ	N/A	N/A	0.30 Hz	30 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
O2-A1	O2	-	A1	[Black]	8.00	1.0	0.00	Negativ	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	Negativ	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"/>

Pane 2

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.

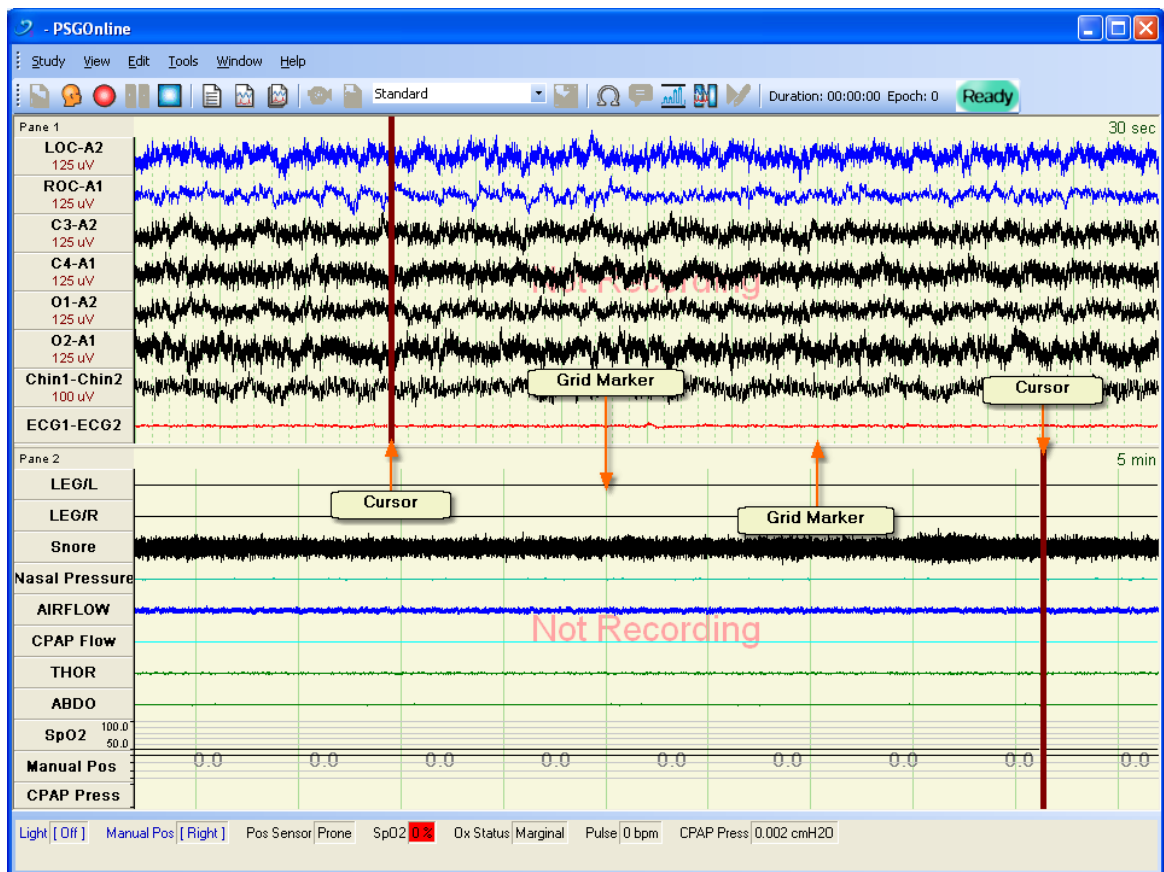
At the top of each Pane configuration window, there are a variety of options for the overall display configuration of the selected Pane:

- **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.



## 5.1.2 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*.

### 5.1.3 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.

#### ***Loading Trace Layouts***

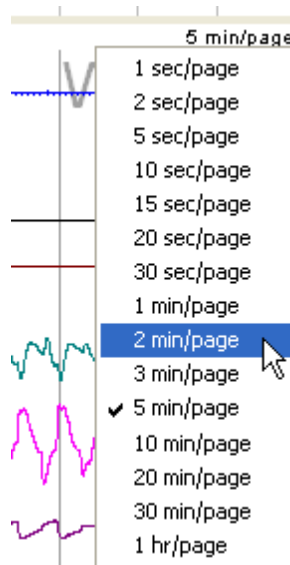
From the Trace Layout quick list, select the Trace Layout that you want to apply to the study.



## 5.1.4 Shortcuts

### ***Changing Timebases***

Quick changes can be made to the timebase for a pane by selecting a new timebase from the drop down list at the top right corner of each pane:



You can also use the Increase and Decrease Timebase options from the View menu to move to the next or previous timebase. For easier access to these options you can [customise keyboard shortcuts](#)<sup>[100]</sup>.

### ***Changing Individual Trace Properties***

- Double-click on the trace label to open the properties window for that trace
- Place the cursor over a trace and press the up or down arrow keys to increase or decrease zoom
- Place cursor over trace label and use mouse scroll wheel to increase or decrease zoom
- Right-click trace label to select Auto Scale on demand, regardless of whether the trace properties has Auto Scale enabled
- Select the Auto Scale icon to auto scale all traces enabled in trace properties

### ***Changing Data Type Trace Properties***

Changes can be made to all traces with the same data type from the View Configuration window. Check the *Apply Changes to Data Type* box.

View Configuration

Trend

Meters

Pane 1

Timebase: 30 sec Background Colour:  

☒ Grid Markers Cursor Colour:  

☒ Epoch Markers Grid Colour:  

☒ Apply Changes to Data Type Epoch Colour:  

Name	Input	±	Ref	Colour	Zoom	Size	Grids	Polarity	Upper	Lower	HP Filter	LP Filter	Notch	Clip	Auto Scale	Numeric
L0C	L0C	-			8.00	1.0	0.00	Negativ	N/A	N/A	0.30 Hz	35 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
R0C	R0C	-			8.00	1.0	0.00	Negativ	N/A	N/A	0.30 Hz	35 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F3-M2	F3	-	M2		8.00	1.0	0.00	Negativ	N/A	N/A	0.30 Hz	35 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F4-M1	F4	-	M1		8.00	1.0	0.00	Negativ	N/A	N/A	0.30 Hz	35 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C3-M2	C3	-	M2		8.00	1.0	0.00	Negativ	N/A	N/A	0.30 Hz	35 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C4-M1	C4	-	M1		8.00	1.0	0.00	Negativ	N/A	N/A	0.30 Hz	35 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
O1-M2	O1	-	M2		8.00	1.0	0.00	Negativ	N/A	N/A	0.30 Hz	35 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
O2-M1	O2	-	M1		8.00	1.0	0.00	Negativ	N/A	N/A	0.30 Hz	35 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chin1-Chin2	Chin1	-	Chin2		10.00	1.0	0.00	Positive	N/A	N/A	10.0 Hz	100 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ECG1-ECG2	ECG1	-	ECG2		4.00	1.0	0.00	Positive	N/A	N/A	0.30 Hz	70 Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>


Pane 2

Select the Data type. Changes made to the Zoom, HP, LP and Notch filters will be applied to all traces in the selected Data type.

## 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.

## ***Adding and Deleting Traces***

From the main Trace Display, right-click any Trace Label to select Append, Insert or Delete Trace.

- Append - Inserts a Trace at the bottom of the selected Trace Pane
- Insert - Adds a Trace above the Trace Label that is clicked on
- Delete - Deletes the selected Trace (or use the drag-and drop method to delete)


When a new Trace is Appended or Inserted, double click the new Trace Label to define the input(s) to be displayed and set the trace properties.


## 5.2 Manual Inputs

If Manual Inputs have been configured, these will be displayed with the Meter Bar in blue.

To change the Manual input:

- Step inputs: select the input from the drop down list
- Upper/Lower inputs: click in the text box and enter a new value

 **Tip** If there are Manual Inputs configured that are not displayed in the Meter Bar, the value of the Manual Inputs can be changed in the Input Configuration window. From the menu, select View > Input Configuration, and click on the Manual Inputs tab. Select or enter the new Current Value.

 **Tip** Manual Inputs can be edited in Profusion PSG 3 after acquisition is complete. See the Profusion PSG 3 help file for details.



## 5.3 Available Workspace Windows

All of the windows listed below are accessed from the **View** menu item (unless otherwise indicated). These windows can be displayed with the Workspace tools. See the Workspace section for details on configuring the display of these windows.


### 5.3.1 Page Back

Allows acquired data to be reviewed. Sleep staging and events marked by automatic analysis are displayed and can be edited. Events can also be manually added using the same procedures as for Profusion PSG 3. Navigation and available tools are the same as for Profusion PSG 3.

To open Page Back, select **View > Page back** from the menu, or press the Page Back icon:



See the [Study Analysis](#) <sup>[45]</sup> section for more details on using Page Back for analysis.

 **Info** When Page back is open, other windows, for example the Konno-Mead and Flow Volume loops, will continue to display information based on the real-time acquisition.

### 5.3.2 Study Log

The Study Log contains details of User Events (technician notes) and hardware events (lost data, impedance checks etc).

To open the Study Log, select View > Study Log from the menu.

See the [Analysis During Recording](#) <sup>[86]</sup> section for more details.

### 5.3.3 Trend

Displays a graphical summary of selected traces and data for the entire study. This is updated for each epoch. The trend view can be zoomed in using the scroll arrows at the top of this window. The trend graphs to be displayed are set in PSG Config.

To open the Trend window, select **View > Trend** from the menu, or press the Trend icon:



See the [Analysis During Recording](#) <sup>78</sup> section for more details.



**Tip** Click on the Trend screen to go to that epoch in the Page Back window.

### 5.3.4 Input Configuration

Displays the Data Types, Physical Inputs and Manual Inputs for the current configuration. The Physical Inputs pane can be used to add traces using the drag-and-drop method.

To open the Input Configuration window, select **View > Input Configuration** from the menu, or press the Inputs icon:



See the [Trace Layout](#) <sup>30</sup> section for more details on the Drag and Drop procedures.



**Tip** If there are Manual Inputs configured that are not displayed in the Meter Bar, the value of the Manual Inputs can be changed in this window.

### 5.3.5 View Configuration

The View Configuration window allows you to view the Trend layout, and configure the Meter Bar and Trace Layout.

To open the View Configuration window, select **View > View Configuration** from the menu, or press the Trace Layout icon:



See the [Trace Layout](#) <sup>24</sup> section for more details.

### 5.3.6 Pageback Trace Configuration

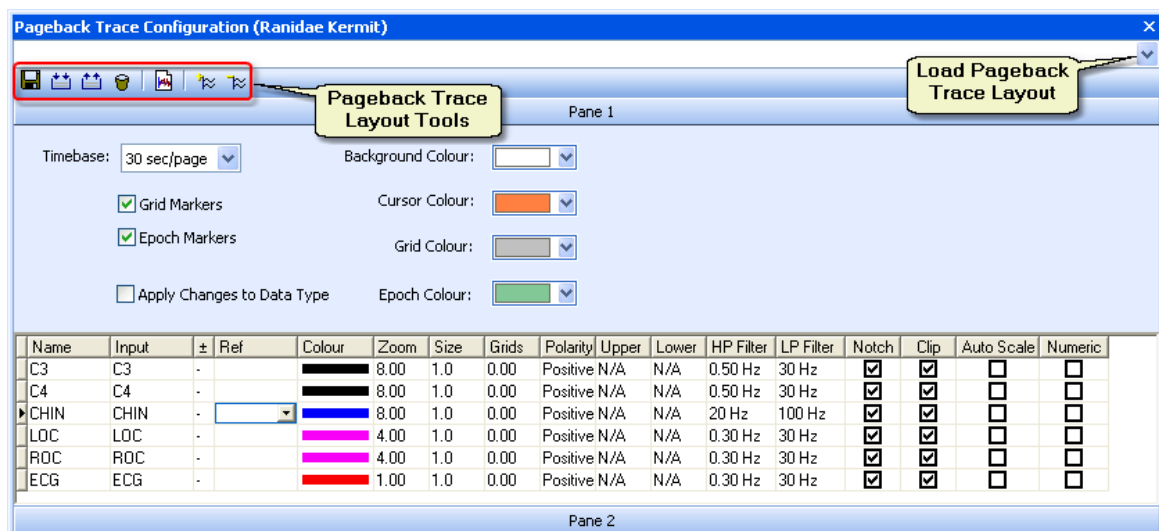
The Pageback Trace Configuration window allows you to configure the Trace Layout for the Page Back window.

To open the Pageback Trace Configuration window, select **View > Pageback Trace Configuration** from the menu, or press the Pageback Trace Configuration icon from the Page Back window:



**Tip** The Pageback Trace Configuration window can be docked to the Pageback window to make access easier. It can be docked to one side, or as a tabbed window. See the [My Workspace](#) section for details on docking and tabbing windows.

Configuration of the Trace Layout for Page Back is exactly the same as for the main trace display. See the [Trace Layout](#) section for more details. However the options available for management of Trace Layouts are accessed through the icons in the Pageback Trace Configuration window.



### Saving Trace Layouts

Once the Trace Layout has been configured correctly, you can save it. Click the Save icon:




. Enter a name for the Trace Layout and click OK to save.

### Loading Trace Layouts


From the Trace Layout quick list, select the Trace Layout that you want to apply to the study.

## ***Saving as Default***

From the Trace Layouts Properties window, click the Save as Default icon: 

This will set the current Trace Layout as the default layout for the open study.

## ***Reload Default***

If you make changes to the Trace Layout, and then need to revert to the default layout, open the Trace Layout Properties window and click the *Reload Default* icon: 

### 5.3.7 Recording Digital Video

 **Info** Digital Video is an optional feature for PSG Online. If it is not currently installed, contact Compumedics or your authorised representative for information on obtaining Digital Video recording capabilities.

To record digital video with each study, Digital Video software must be installed on the computer used to acquire studies, as well as the Digital Video Server (which may be the same computer).

 **Info** Refer to the Compumedics Digital Video documentation for information on configuring a Digital Video Server.

#### Recording a Study with Digital Video

It is first necessary to connect to the correct Video Server by selecting **Tools > Options > Digital Video** and selecting the desired Digital Video Server, entering the server name and profile name if required. Once the Video Server is set for a particular recording device, it will continue to use those settings for future studies or until altered again.

- **Do Not Use Digital Video:** If video is not to be recorded, select this option.
- **Use Local Digital Video Server:** If video is to be acquired from the same computer that is recording the study, select this option. The Profile Name refers to the name of the appropriate video profile in Compumedics Digital Video.
- **Use Remote Digital Video Server:** If video is to be acquired from a different computer to the one recording the study, select this option. Note that the Digital Video computer must be on the same network as the **PSG Online** computer. The *Remote Digital Video Server Name* refers to the network name of the computer acquiring video. The *Profile Name* refers to the name of the appropriate video profile in Compumedics Digital Video on the remote machine.

**PSG Online** attempts to connect to the requested server, and once the connection is established, the video button on the main tool bar becomes available for selection.

The profile name is set in the **Compumedics Digital Video** software and should match the appropriate recording device. If there is more than one recording device using Digital Video connected to a computer, each must be distinguished with individual profile names as these refer to the separate video inputs. A single recording device with Digital Video can use the 'default' profile. Any profile used must be first be set up correctly in Digital Video, including the 'default' profile.

Digital Video profiles are stored against the recording device. Once a recording device is set to refer to a Digital Video profile, it does not need to be altered when changing Configurations in **PSG Online**.

Digital Video will always be recorded with each study when a video server is selected.

To reduce study size for archive purposes, the video files can be edited or completely

deleted when analysing the study in **Profusion PSG 3**.

### Using Pan-Tilt-Zoom controls

Pan-Tilt-Zoom (PTZ) controls are available for the iCanView 250-36s network camera only, and requires Compumedics Digital Video 3 to operate.

If you have this camera installed, you will be able to access the PTZ only when the digital video window is open. To open the PTZ control interface, make sure the video window is open and select *Pan-Tilt-Zoom Control* from the Edit menu of PSG Online.

## 5.3.8 Viewing Digital Video

Select the Digital Video Icon to open the Digital Video Display Window:



### Zooming

The video image can be zoomed by clicking on the image and dragging a box around the image section that is to be zoomed. The selected image will then be drawn in the display window.



The image may also be zoomed by rolling the wheel of a wheel mouse. The placement of the mouse pointer determines the center point for zooming the image.

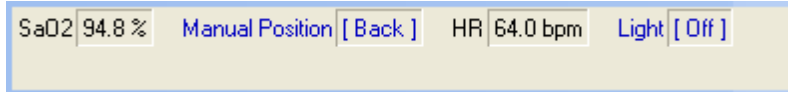
Double-clicking the left mouse button in the video display window will return the image to its original size.

### Panning

Once the video image is zoomed it may be panned by pressing the Ctrl key and the left mouse button. If using a wheel mouse the wheel may be pressed down and used to pan the image.

### 5.3.9 Meter Bar

The Meter Bar will be displayed by default at the bottom of the Workspace, but can be moved by right-clicking the Meter Bar and selecting a new docking position.



Meters are displayed in black, and are updated every second. The Meter font can be changed in PSG Config before the recording is started.

Manual Inputs are displayed in blue..



**Tip** If there are Manual Inputs configured that are not displayed in the Meter Bar, the value of the Manual Inputs can be changed in the Input Configuration window. From the menu, select **View > Input Configuration**, and click on the Manual Inputs tab. Select or enter the new Current Value.

### 5.3.10 Impedance Bar

Allows Impedance testing on all recorded AC inputs.

To open the Impedance window, select **View > Impedance Bar** from the menu, or press the Impedance icon:

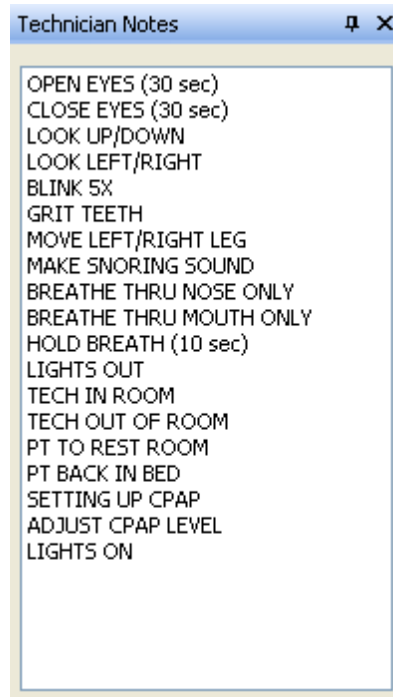


See the [Impedance Checking](#) <sup>16</sup> section for more details.

### 5.3.11 Technician Notes Bar

The Technician Notes Bar window can be made part of the Workspace. This contains a list of all the pre-defined tech notes, and clicking on the appropriate note automatically inserts it.

To open the Technician Notes window, select **View > Technician Notes Bar** from the menu.



**Info** The notes available in the Technician Notes bar can be edited in the [Options](#) menu. Hotkeys can also be assigned to any Technician Note for quick entries.




### 5.3.12 Decision Assist

This window is only available if the Decision Assist feature has been configured and enabled in **PSG Config**. To open the Decision Assist window, select **Tools > Open Decision Assistant**.

Parameter	Threshold	Current Value
▶ Time since lights out	120 minutes	
Time asleep	60 minutes	
Time in REM sleep	10 minutes	
Total Apneas and Hypopneas	40	
AHI	40	
Time with SpO2 ≤ 80	10 minutes	
Number of desats ≥ 10	5	
Study time remaining	180 minutes	


The Decision Assistant updates at the end of each minute, using data from the Automatic Analysis and manually edited staging and events. The scheduled end of study time and lights out can be altered:

- Setting Lights Out to Auto will set the lights out time as the start of recording.
- Setting Lights Out to Manual allows you to manually edit the lights out time to reflect the true lights out time, and will include statistics from all epochs after this time regardless of the Stage Light data.

 **Tip** Changing the Lights Out or Scheduled end of study time will update the Time since lights out and Study time remaining at the end of the current minute.

The *Start Titration* State will display the alert colour set in PSG Config. If Alerts have been configured in PSG Config, these will display as each alert level is reached, and the alert can be canceled by pressing the Acknowledge Alert button.

The Threshold for each parameter is shown, as well as the Current Value of each parameter. If the threshold has not been reached, the current value will be in red text. If the threshold has been reached, the current value will be in green text.

 **Info** The number of apneas and hypopneas, and AHI, is calculated using respiratory events that start in epochs marked as sleep.

### 5.3.13 Observation Chart

If an Observation Chart has been configured in **PSG Config**, it will appear at the specified interval either as a message in the Windows System tray or as a popup window. The columns will automatically be completed with the current values, and user comments can be added in text columns. The Observation Chart must then be confirmed, and the time of the confirmation will be recorded. If the Observation is not confirmed, the observations will bank up with confirmation reminders.

To open the Observation Chart, select **Tools > Open Observation Chart**, or click the Observation Chart icon:



To insert a manual entry, right-click inside the Observation Chart window and select Insert Row. The latest values will be inserted as an observation.

Every time a manual or automatic entry is made into the Observation Chart, it must be confirmed. To confirm an entry, click the Confirm button at the end of each row. The confirmation time is recorded.

## 5.4 Technician Notes

To enter a technician note, press the icon or the keyboard shortcut:



The drop-down list contains pre-defined notes that can be selected. Custom text can be entered in the description. Click OK or Enter to insert the note.

Alternatively, the [Technician Notes Bar](#)<sup>40</sup> can be made part of the Workspace. This contains a list of all the pre-defined tech notes, and clicking on the appropriate note automatically inserts it.

Any technician notes and system events will appear on the traces as a vertical note.

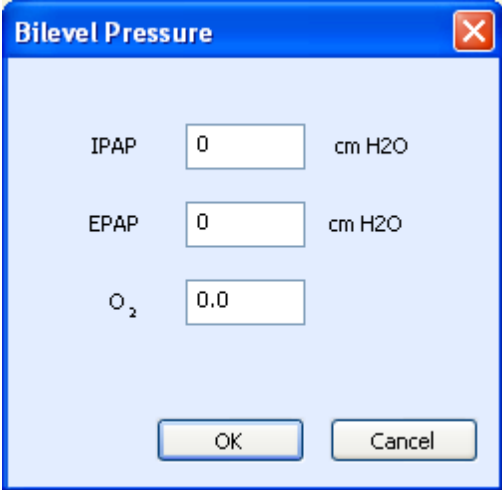
## 5.5 Alerts

Alerts (text and/or sound) will appear if set. To cancel an alert, double-click the appropriate alert in the meter bar. If a meter has not been set for this input the alert cannot be canceled. The alert will re-trigger only if the value for that input goes outside the alert range and then meets the alert criteria again.

## 5.6 Bi-level Pressure entries

Entries can be made for pressure titration studies. Both IPAP and EPAP values can be entered, as well as supplemental O<sub>2</sub> levels. These values can be used for reporting.

To enter a Bi-level pressure setting, select Edit > Bi-level Pressure (this could also be assigned a keyboard shortcut). The Bi-level Pressure window will be displayed:



The screenshot shows a 'Bi-level Pressure' dialog box. It has a blue title bar with the text 'Bi-level Pressure' and a red close button. The main area is light blue and contains three input fields. The first is labeled 'IPAP' and has a value of '0'. The second is labeled 'EPAP' and has a value of '0'. The third is labeled 'O<sub>2</sub>' and has a value of '0.0'. To the right of each input field is the unit 'cm H2O'. At the bottom of the dialog are two buttons: 'OK' and 'Cancel'.

Enter the IPAP, EPAP and O<sub>2</sub> values and click OK.

## 6 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**

## 6.1 Analysis Settings

For each of the analysis groups, there are a variety of settings that need to be configured.

Settings need to be configured for the following groups:

- [Respiratory](#) <sup>52</sup>
- [Arousal](#) <sup>53</sup>
- [Limb Movements](#) <sup>54</sup>

### 6.1.1 Scoring Mode

The Scoring Mode (AASM or R&K) is set by the recording configuration, and cannot be changed in PSG Online. See the PSG Config User Guide for details on setting the Scoring Mode.

### 6.1.2 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.

#### *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			

### 6.1.3 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>[47]</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

### 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 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.

**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.

## 6.1.4 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 Section of the Profusion PSG 3 help 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](#)<sup>[61]</sup> 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](#)<sup>[61]</sup> to be selected). The default setting is 1 second.

### 6.1.5 Arousal

Up to five different arousal types can be defined, and each of these can be marked on a different input. The Input Assignments are configured in PSG Config, and cannot be changed in PSG Online. These define where the various arousal types are marked.

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 section of the PSG Config help 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 section of the PSG Config help.

## 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](#)<sup>[61]</sup> to be selected). The default setting is 3 seconds.

## 6.1.6 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 in PSG Config. 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](#) <sup>61</sup> to be selected). The default setting is 1 second.

## 6.2 Manual Analysis

During recording, the study can be analysed as data is acquired using the Page Back feature:



If any Automatic Analysis modules have been set to run during acquisition, the analysis results will be displayed in Page Back, and can be edited. Sleep staging can be performed, and new events can be added. If the Decision Assist tool has been configured, any manual changes to the analysis will be reflected in the statistics.

Study Editing is divided into the following sections:

- [Sleep Staging](#)<sup>[56]</sup>
- [Arousal marking](#)<sup>[63]</sup>
- [Respiratory Event marking](#)<sup>[64]</sup>
- [Limb Movement \(including PLM\) marking](#)<sup>[65]</sup>

The same basic method is used for marking and editing arousals, respiratory events, limb movements and other events, however there are differences in the options available depending on the event type being marked. See the [Marking Events](#)<sup>[60]</sup> section for details on basic marking methods, and the individual event sections ([Arousals](#)<sup>[63]</sup>, [Respiratory Events](#)<sup>[64]</sup>, [Limb Movements](#)<sup>[65]</sup>) for an explanation of the options available for each type.

There are a variety of [Scoring Tools](#)<sup>[73]</sup> available to assist with analysis.

## 6.2.1 Sleep Staging

Sleep staging can be performed automatically (if configured in PSG Config), or manually. The sleep stages that can be used depend on the Scoring Mode (AASM or R&K) and Study Type (Adult, Child or Infant).

There are four methods for manual sleep staging (or editing of automatic sleep staging).

**Info** There is a fifth method - selecting the sleep stages from the Edit > Sleep Staging menu. However this is a very slow and inefficient method that is not recommended.

### Using the Keyboard

Sleep stages are available for Adult, Child and Infant staging. The Scoring Mode and Study Type are set in PSG Config. Pressing the appropriate key will update the sleep stage for the current epoch, and automatically advance to the next epoch. The hypnogram will also be updated.

Click the Study Type below to see the default keys. These keys can be [customised](#) <sup>100</sup>.

☐ Adult

AASM Mode	R&K Mode	Keyboard	Keypad
Stage W (Wakefulness)	Wake	W or 0	0
Stage N1 (NREM 1)	NREM 1	1	1
Stage N2 (NREM 2)	NREM 2	2	2
Stage N3 (NREM 3)	NREM 3	3	3
	NREM 4	4	4
Stage R (REM)	REM	R or 5	5
	Movement	M or 6	6
Artifact	Artifact	A or 7	7
Unsure	Unsure	?	8
Lights On	Lights On	F8	
Lights Off	Lights Off	F9	



Child

AASM Mode	R&K Mode	Keyboard	Keypad
Stage W (Wakefulness)	Wake	W or 0	0
Stage N1 (NREM 1)	Stage 1	1	1
Stage N2 (NREM 2)	Stage 2	2	2
Stage N3 (NREM 3)	Stage 3	3	3
Stage N (NREM)	Stage 4	4	4
	Stage 1/2	N/A	N/A
	Stage 3/4	N/A	N/A
Stage R (REM)	REM	R or 5	5
	Movement	M or 6	6
Artifact	Artifact	A or 7	7
Unsure	Unsure	?	8
Lights On	Lights On	F8	
Lights Off	Lights Off	F9	

Infant

AASM Mode	R&K Mode	Keyboard	Keypad
Indeterminate	Indeterminate	I	1
Quiet	Quiet	Q	2
Active	Active	A	3
	Movement	M	4
Unsure / Unscorable	Unsure / Unscorable	5	5
Wake	Wake	W or 0	0
Lights On	Lights On	F8	
Lights Off	Lights Off	F9	

The Lights On and Lights Off stages are used to specify which epochs are included in reports. Only epochs marked as Lights Off will be included in report statistics, with the exception of statistics related to the total recording time.

## Using the Toolbar

Pressing the appropriate icon will update the sleep stage for the current epoch, and automatically advance to the next epoch. The hypnogram will also be updated.

The toolbar displayed depends on the Scoring Mode (AASM or R&K) and Study Type (Adult, Child or Infant):

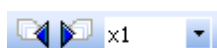
	AASM Mode	R&K Mode
Adult	⋮ N1 N2 N3 R ? W	⋮ 1 2 3 4 R M ? W
Child	⋮ N1 N2 N3 N R ? W	⋮ 1 2 3 4 R M ? — 12 34

Infant	: I Q A ? W	: I Q A M ? —
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## Auto Paging

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 toggled with the **Tools > Options > Preferences > System Settings > Scoring > Auto paging in scoring** check box, and is initiated by pressing a sleep stage key or one 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):



## Using the Trend

Sleep staging can be performed from the Trend window. Epochs can be staged one-by-one, or multiple epochs can be reclassified at once. To select multiple epochs, open the Trend window (**View > Trend**). Right-click and drag across the region of epochs to classify, and press the keyboard shortcut. The entire selected range of epochs will be given the same sleep stage. This can be used for marking Lights On and Lights Off periods too.

## 6.2.2 Marking events

### *Before You Start*

Before marking any events, you must configure the study correctly, particularly the Input Assignments. See the [Analysis Settings](#) <sup>46</sup> section for details.

### *Marking Events*

The same basic method is used for marking and editing arousals, respiratory events, limb movements and other events.

Events are marked on the input defined in the Input Assignments, which are configured in PSG Config and cannot be changed in PSG Online.

Events are linked to the Input Assignments as follows:

Input Assignment	Events
Arousal 1-5	Arousals
Apnea Detection, Hypopnea Detection, Effort 1, Effort 2.  <i>Note: The R&amp;K Mode has a single input, named Primary, for apnea and hypopnea detection.</i>	Obstructive Apnea Central Apnea Mixed Apnea Hypopneas Unsure Respiratory Events Respiratory Artifact Respiratory Paradox Periodic Breathing RERA User defined events
Sound	Snore
SpO2	Desaturation Artifact
ECG	Bradycardia Tachycardia
Leg (Left, Right)	Limb Movement (Left) Limb Movement (Right) PLM episodes
pH (Distal, Proximal)	Distal pH Event Distal pH Artifact Proximal pH Event Proximal pH Artifact
Blood Pressure	Artifact
Body Temperature	Artifact



**Info**

Sleep stages are marked per epoch, and do not require an Input Assignment.

Marking of events requires one of the event marking modes to be selected from the Navigation Toolbar:

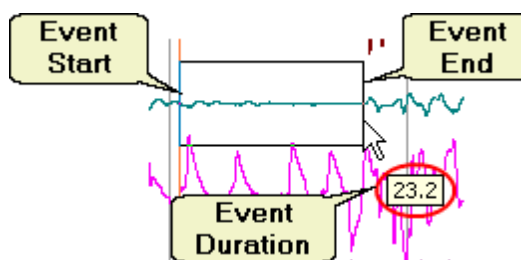


## Standard Event Marking Mode



Right-click on the assigned input and drag the appropriate duration.

The event duration is set by the start and end borders of the event marker. As an event is marked using the Standard Event Marking Mode, the duration will be displayed in a popup box until the mouse button is released.




If the event continues in the following page, the page will scroll when you drag the event marker to the edge of the page.

 **Tip** In this mode, you can right-click once at the start of the event to mark an event using the [Default Event Length](#) .

## Click Event Marking Mode

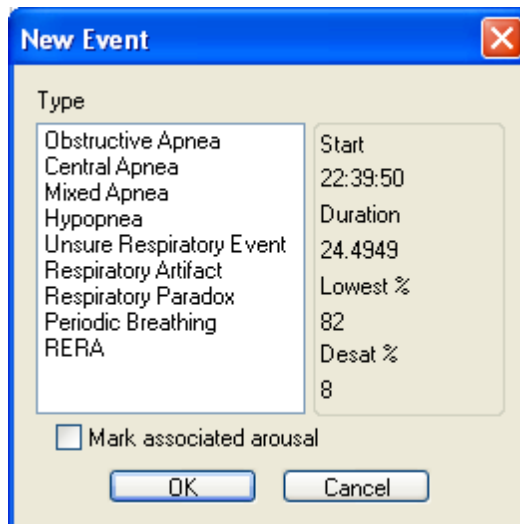


Right-click the start and end of each event on the assigned input.

 **Tip** Use the Click Event Marking mode for events that span multiple pages, for example long periods of SpO2 artifact.

## Selecting the Event Type

If there is more than one event type that can be marked on the input, a dialog box will appear once an event has been marked using one of the above modes. Select the correct event type from the box:



This example is for a respiratory event. The event Start Time, and event Duration will be displayed for all event types. For Respiratory Events, the Lowest SpO<sub>2</sub> and total Desaturation will also be displayed.

The Mark Associated Arousal box only appears for Respiratory Events. Check this box to mark an arousal at the end of the event (the arousal will be marked on the Arousal input). Alternatively, use a right-click to select an event type and the associated arousal will automatically be marked.

## Reselect Last Event Type

With this feature enabled, the New Event selection box will only appear for the first time you mark an event (for all event types except arousals when using the Automatic Arousal Association feature). Each subsequent event type will be the same as this first event until a new event type is selected. To select a new event type, left click an existing event marked and select a new event type from the box.

The default keyboard shortcut for toggling the Reselect Last Event Type mode is F2, or it can be enabled from the Edit menu. The keyboard shortcut can be [customised](#) <sup>(100)</sup> if necessary.

The cursor indicates whether the Reselect Last Event Type mode is enabled:



Normal cursor



Reselect last event type cursor

### 6.2.2.1 Arousals

Up to 5 arousal types can be configured. These can be user-defined or pre-defined types, or a combination of both.

- To manually mark and classify custom arousal types, configure arousals for Manual Classification in PSG Config.
- The Automatic Arousal association feature allows pre-defined arousal types (Spontaneous, Limb Movement and Respiratory) to be manually or automatically marked, and automatically re-classified when respiratory or limb movements precede the arousal. To use the Automatic Arousal Association, configure arousals for Automatic Classification in PSG Config.
- See the Arousal Settings section of the PSG Config help for more arousal marking options.

To manually mark an arousal, choose one of the [event marking modes](#)<sup>61</sup> and mark the arousal as described for that mode.

Any arousal can be reclassified, including those that have been classified by the Automatic Arousal Association feature.

### 6.2.2.2 Respiratory events

The full range of respiratory events can be marked, with a variety of shortcuts available:

<b>Respiratory Event Shortcuts</b>	<b>Marking events</b> With reselect last event type disabled, mark event and press key...	<b>Reclassifying events</b> Place cursor over existing event and press key (can be <a href="#">customised</a> <sup>(100)</sup> )...
Obstructive Apnea	1	Alt+1
Central Apnea	2	Alt+2
Mixed Apnea	3	Alt+3
Hypopnea	4	Alt+4
Central Hypopnea*	5	Alt+5
Mixed Hypopnea*	6	Alt+6
Unsure Respiratory Events	7	Alt+7



**Info** \*Central and Mixed Hypopneas can only be marked by setting Hypopnea classification to Yes. Go to Tools > Options > Preferences > System Settings > Scoring to enable this option.

Events can also be marked for RERA, Respiratory Paradox, Periodic Breathing and Respiratory Artifact. These event types are available in the dialog box shown when a new event is marked (with reselect last event type disabled) or when you left-click on an existing event.

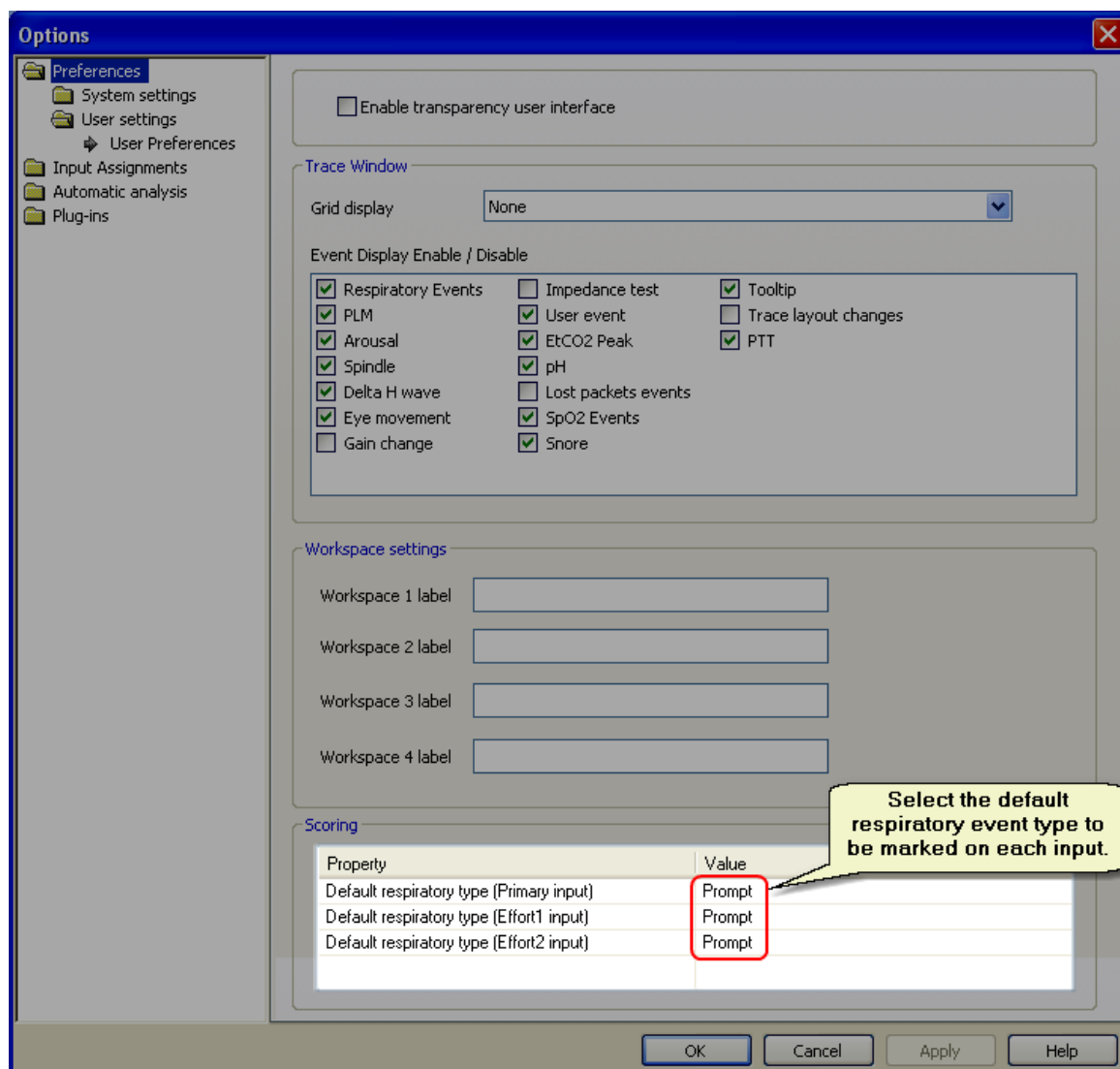
In addition, up to 4 custom respiratory event types can be defined. These are defined in PSG Config, and cannot be changed in PSG Online.

Respiratory events can be marked on the inputs assigned for Hypopnea Detection, Apnea Detection (or the Primary input in R&K Mode), Effort 1 or Effort 2, and the event markers are displayed on all these traces.



## Default Respiratory Event Types

These are configured in **Tools > Options > Preferences > User Settings > User Preferences**.



### 6.2.2.3 Limb Movements and PLM Episodes

Individual limb movements and PLM episodes can be marked. Criteria can be defined for automatic PLM episode detection, including detection of episodes for manually marked movements.

## Marking Individual Limb Movements

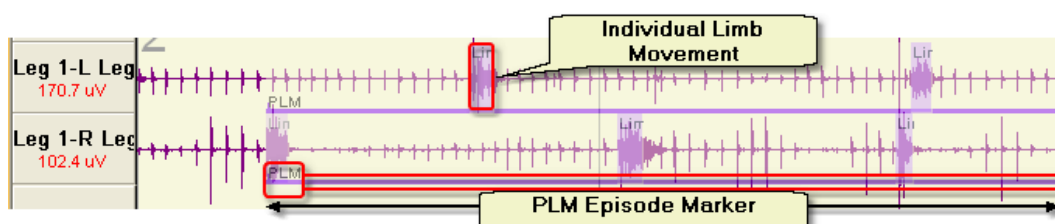
If two limb inputs have been recorded, both left and right limb movements can be marked. This is defined by the Input Assignments, which are configured in PSG Config and cannot be changed in PSG Online. Movements marked on the Left limb input will be classified as

*Limb movement (Left)*, and movements marked on the Right limb input will be classified as *Limb movement (Right)*.

 **Tip** Using the [standard Event Marking Mode](#)<sup>[61]</sup>, single right-click on the left or right limb input to mark a movement with the [Default Limb Movement Length](#)<sup>[54]</sup>.

## Marking PLM episodes

PLM episodes are marked in the same way and on the same input as individual limb movements, except that at least two individual limb movements must be marked before a PLM marker is used.



PLM episodes can be marked manually. However, 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.

## Deleting Limb Movements within PLM episodes

Special care must be taken when deleting individual limb movements within PLM episodes. You need to make sure that the Limb Movement marker is highlighted, and not the PLM marker, before pressing the Delete key. To make sure you delete the Limb Movement and not the PLM marker, either left-click the Limb Movement and then press Delete, ensuring that the Scored Event Info box describes a Limb Movement, or enable [Tooltips](#)<sup>[94]</sup> Tooltips to have a popup box appear when the mouse is over the event.

#### 6.2.2.4 Bruxism

Bruxism events can be marked on the input assigned as the Chin EMG input in the Sleep section of the Input Assignments in PSG Config. These events can be reported, with the report fields contained under the heading Bruxism in the Report Wizard.

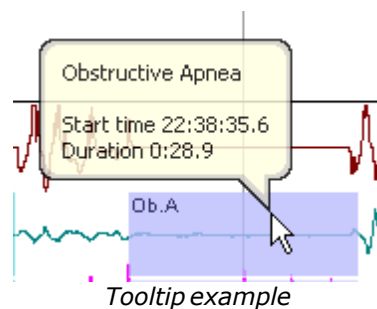
### 6.2.3 Editing Events

Manual analysis can consist of either a complete manual process, or editing of Automatic Analysis. See the [Analysis Settings](#) <sup>[46]</sup> section for details on configuring the study for Manual analysis.

#### 6.2.3.1 Changing Event Duration

Once an event has been marked, the event duration can be changed by left-clicking one of the side borders of the event marker and dragging left or right.

To see the duration of a marked event, left click on the event marker to see information about the event. Alternatively, you can choose to view the Tooltips, which displays a popup information box when you place the cursor over an event marker.



#### 6.2.3.2 Changing Event Types

Once an event has been marked, it can be changed to another event type (if there are multiple event types available for the input).

Left-click the event marker and select the new event type. This will change the event type marked when using the reselect last event type feature

OR

For respiratory events, place the cursor over the marker and use the keyboard shortcuts. This will not change the event type marked when using the reselect last event type feature.

These are the default shortcuts for quick editing of respiratory events. They can be [customised](#) <sup>[100]</sup> if required.

Alt + 1: Obstructive Apnea

Alt + 2: Central Apnea

Alt + 3: Mixed Apnea

Alt + 4: Hypopnea (Obstructive Hypopnea if [Hypopnea Classification](#) <sup>[92]</sup> enabled)

Alt + 5: Central Hypopnea (only if Hypopnea Classification enabled)  
Alt + 6: Mixed Hypopnea (only if Hypopnea Classification enabled)  
Alt + 7: Unsure Respiratory Event  
Alt + 8: RERA

### 6.2.3.3 Deleting Events

Left-click the event marker and select Delete from the dialog box

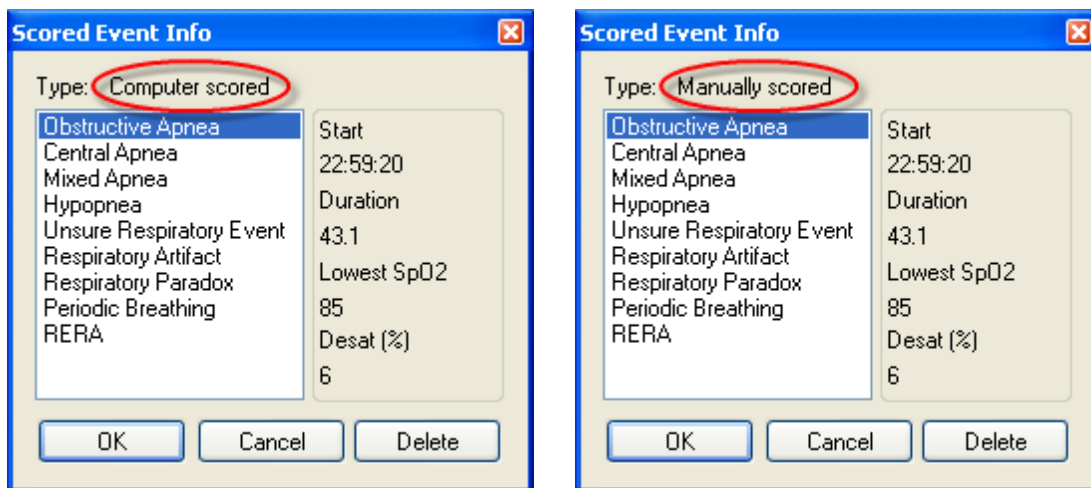
OR

Place the cursor over the marker and press the delete key.

### 6.2.3.4 Verifying Automatic Events

All events are classified as either Computer Scored or Manually Scored. All events marked by the Automatic Analysis will be classified as Computer Scored. When the event is verified, it will be changed to a Manually Scored event.

To change an event from Computer Scored to Manually Scored, simply right-click the event and press OK. The event will be reclassified to Manually Scored.









There are two reasons why you would want to verify Computer Scored events:

1. When using the Delete Scored Events feature, you can choose to delete only Automatic events. This will only delete Computer Scored events.
2. Report fields are available that include all events, Computer and Manually scored, during sleep, and ONLY Manually Scored events during wake. This allows you to include events that occur during epochs that are staged as Wake, which can be particularly useful when dealing with high levels of sleep fragmentation.

## 6.2.4 Managing Scored Events

To see all the events scored, either automatically or manually, open the Scored Events window (**View > Scored Events**). The drop down list allows you to select which events will be displayed in the window. Some events have associated icons.

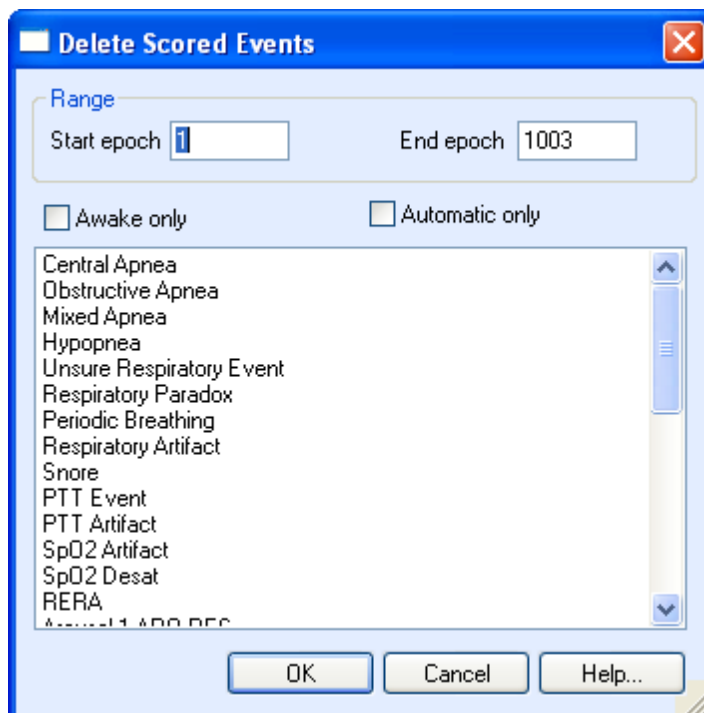
Event Category	Icon	Event Type
<i>Respiratory Events</i>		Apneas
		Hypopneas
		Respiratory Artifact
		Unsure Respiratory Events
		RERAs
		Periodic Breathing
		Respiratory Paradox
<i>Snores</i>		
<i>Arousals</i>		All arousal types
<i>Limb Movements</i>		Individual limb movements
		PLM movements
<i>pH Events</i>		
<i>SpO<sub>2</sub> Events</i>		Desaturations
		SpO <sub>2</sub> Artifact
<i>EtCO<sub>2</sub>/TcCO<sub>2</sub> Artifacts</i>		
<i>ECG Events</i>		Bradycardia
		Tachycardia
		HR Artifact
<i>PTT Events</i>		PTT Event
		PTT Artifact
<i>Sleep related events</i>		Eye movements (in-phase & anti-phase)
		Delta waves
		Spindles

For each event, the start time, start epoch, sleep stage of the epoch and event duration is displayed. For some event types relevant details are also displayed (for example desaturations associated with respiratory events).

Clicking on an event will display the page containing the event in the trace panes.


#### 6.2.4.1 Delete Scored Events

To delete multiple scored events, open the Delete Scored Events window from the **Edit** menu.



Enter the start and end epochs if events are only to be deleted from a specific range of epochs. Otherwise events are deleted from the entire study.

Check the Awake Only box to delete only events that occur during epochs marked as Wake.

Check the Automatic Only box to delete only events classified as [Computer Scored](#) .

Select the event type(s) that you wish to delete. Use the Ctrl key to select multiple event types.

Press OK to delete the selected event types from the specified epoch range.

### 6.2.4.2 Find / Replace

To find events of a particular type, open the Find / Replace Scored Events window from the Edit menu.

Use the Find / Replace feature to search for specific event types, and replace them with another type if necessary. Use the Search Origin and Search Direction to determine the search pattern.

Use the Criteria to search for event types that match your requirements. Search parameters can be set based on Duration, Desaturation or Lowest SpO2. For example, you could find only Obstructive Apneas with desaturations in the range 70-80% using the Between criteria.

If you want to Replace an event with another event type, select the event type to be replaced from the Find What list, choose the event to replace it with from the Replace With list, and set any search criteria required. Click Find Next, and then Replace. When you press Replace, the event will be replaced with the selected type, and the next event matching your search will be found. Click Replace again to continue the process.

**Tip** If you choose to replace an event with an event type that is assigned to a different input (see [event table](#)) the event will be moved to that input.



## 6.3 Scoring Tools



There are a wide variety of scoring tools available for use in analysis. These tools range from those that give information about the instantaneous value of individual inputs, to those that provide a summary of the entire night.

### 6.3.1 Rawdata Tools


The Rawdata Tools are enabled from the Scoring Toolbar in the Page Back window. These tools determine the function of a right mouse click on a trace. The active mode will be highlighted in orange.



Icon	Function	Description
	<a href="#">Event marking mode</a> <sup>61</sup>	Use for right-click and drag event marking.  <b>Tip</b> Dragging past the end of the page will scroll the window.
	<a href="#">Click event marking mode</a> <sup>61</sup>	Right-click start and end of event.
	Zoom mode	Right-click and drag to zoom in on the selected trace. See the <a href="#">Zoom</a> <sup>76</sup> topic for more information.
	Ruler mode	Right-click on any trace to place a calibrated ruler, indicating 75uV amplitude and 1 or 10 second time (depending on pane timebase).  <b>Tip</b> Use to check amplitude of slow frequency waveforms in EEG signals to determine presence of NREM 3&4.
	Caliper mode. This works in harmony with the Caliper Duration Counter:  	Right-click and drag between two points to see relative amplitude and time between points. The duration is also displayed in the Caliper Duration Counter in the toolbar. This counter accumulates the selected durations, allowing you to track the total amount of a particular feature (for example the total amount of SWS in an epoch).  <b>Tip</b> Use to check amplitude of respiratory traces before and during events to assist in classifying event type.

	Meter mode	<p>Right-click over any trace to see signal value at that point.</p> <div> <b>Tip</b> Use to check peak snore level when using a dB meter.</div>
-----------------------------------------------------------------------------------	------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

### 6.3.2 Zoom

Use the Zoom tool to look at traces in more detail. The Zoom tool is available in the Pageback window. To enable the Zoom mode, select the Zoom icon from the Pageback toolbar. 

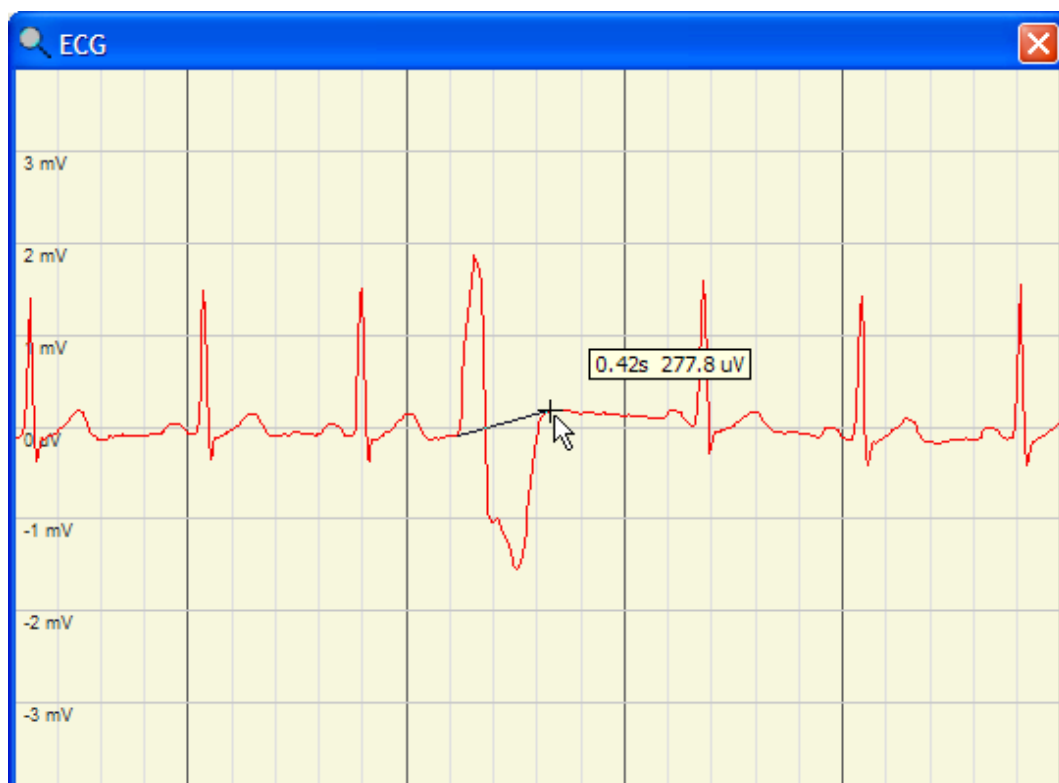
To zoom in on an input, right-click and drag across the input (as if you were marking an event). The zoom window will open, and a marker is displayed on the selected trace to indicate the zoomed section. You can click and drag the edge of this marker to fine-tune the displayed zoom section.

 **Info** The zoom window will use the current filter settings for the selected trace.

To move the zoomed section, left-click and drag within the zoom window. You can move the zoomed section to the limits of the displayed page.

To increase or decrease the amplitude of the zoomed section, use the mouse scroll wheel with the cursor. A scale on the right-hand side of the zoom window indicates the displayed amplitude range.

To measure a specific feature, right-click and drag to access the caliper. The amplitude and time between the start and end of the caliper is displayed.



While the zoom window is open, you can right-click and drag on a different trace to swap the zoom window to that trace.

Paging up or down will automatically close the zoom window.

### 6.3.3 Properties

Displays the properties of the active window or trace. Click on a trace or window to make it active. The properties that can be viewed and edited depend on the window or trace. Once the Properties pane is open, click on another trace or window to see its properties.



**Tip** To view or change the properties of a window or trace, double click the title bar or trace label.

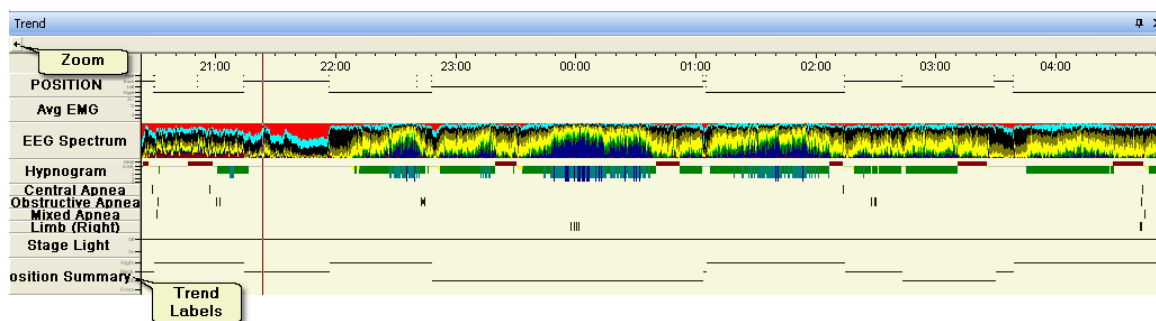
### 6.3.4 Hypnogram

The hypnogram graphically represents the progression of sleep stages across the night. It is displayed at the top of the Page Back window, and can be displayed as part of the [Trend](#) <sup>78</sup>. To open the Hypnogram, select **View > Hypnogram**.

### 6.3.5 Trend

The Trend window displays a graphical summary of various inputs. Correct trend data will be displayed only if the correct Input Assignments have been set, and many of the graphs available require the Summary analysis to be run.

To view the Trend window, select View > Trend. The Trend layout is configured in PSG Config.

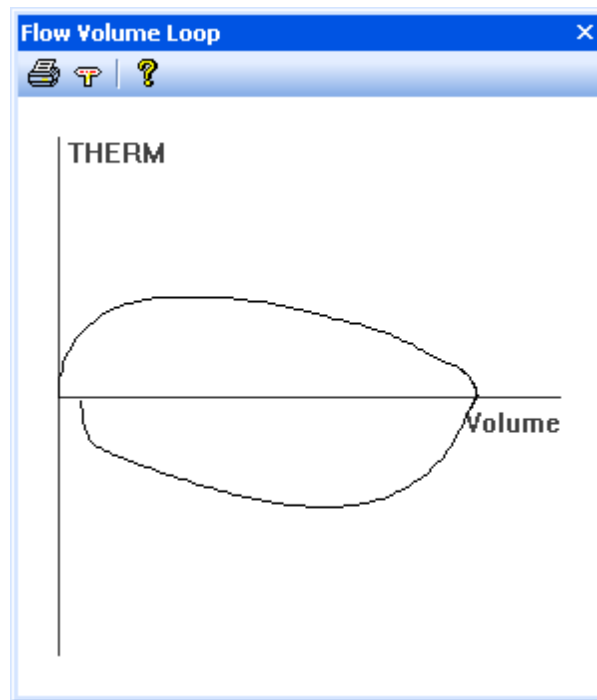


The Zoom arrows can be used to look at sections of the Trend in more detail. Click on one of the zoom arrows and drag towards the centre of the window to zoom in. You can then click and drag the zoom scrollbar to move through the Trend.

### 6.3.6 Flow Volume loops

Flow Volume loops plot the flow (the Apnea detection input in AASM mode, or the Primary input in R&K mode, as set in Input Assignments, which are configured in PSG Config and cannot be changed in PSG Online against the integral of the flow (area under the curve). The resultant loop can be a useful tool in determining the level of respiratory obstruction.

To view the Flow Volume loop, select **View > Flow Volume Loop**




*Typical Flow Volume loop*


#### 6.3.6.1 Properties


To open the Flow Volume Loop Properties, click the window title bar and select **View > Properties**.

- **No of Breaths:** The loop is displayed for the number of breaths set (number of seconds in PSG Online)
- **Zoom Y:** Set the vertical zoom

 **Tip** The Flow Volume loop can be zoomed by placing the cursor over the window and using the mouse scroll wheel to zoom.

- **Show Ref Breath:** Set whether a reference breath is displayed.

 **Tip** To set the reference breath, navigate to a period of stable respiration (for example during patient calibrations), and press the reference breath icon

 **Tip** Set the Reference Breath Colour to one that can easily be distinguished from the Background and Graph colours.

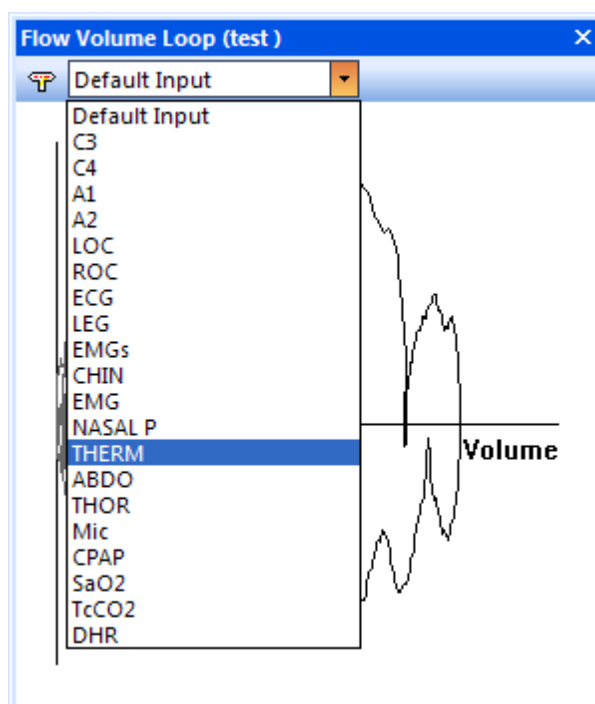
- **Apply Fading:** When set to Yes, the Flow Volume loop will fade previous loops when updating

**Info** The shape of the Flow Volume loop will depend on the type of sensor used for the flow input signal.

### Changing the Flow Volume Loop Input

During acquisition, you can change the input used for the Flow Volume Loop on-the-fly. This is particularly useful when performing split night studies which require a change from, for example, a thermocouple to the nasal pressure input.

To change the displayed input, open the Flow Volume loop and select a new input from the drop-down list at the top of the Flow Volume loop window.



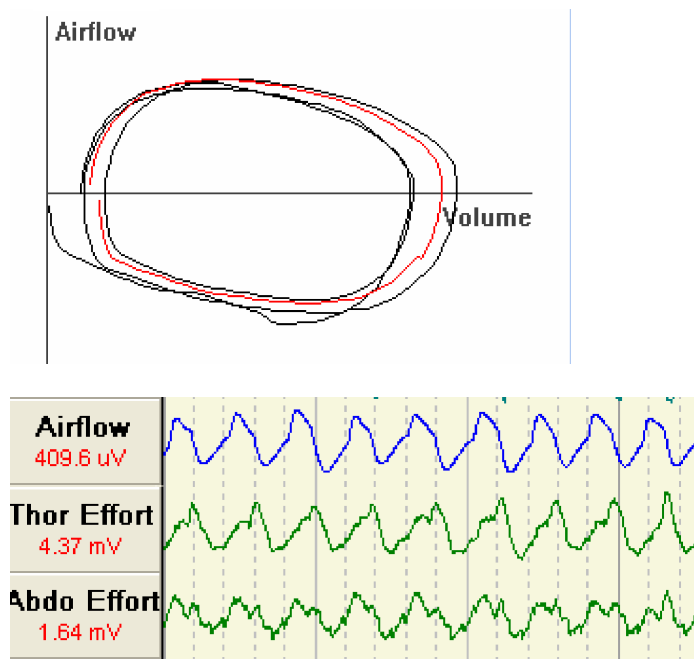
To change back to the original input, select *Default Input* from the drop-down list.

**Info** Changing the displayed input does not change the Input Assignment being used for automatic respiratory analysis.

#### 6.3.6.2 Normal Breathing

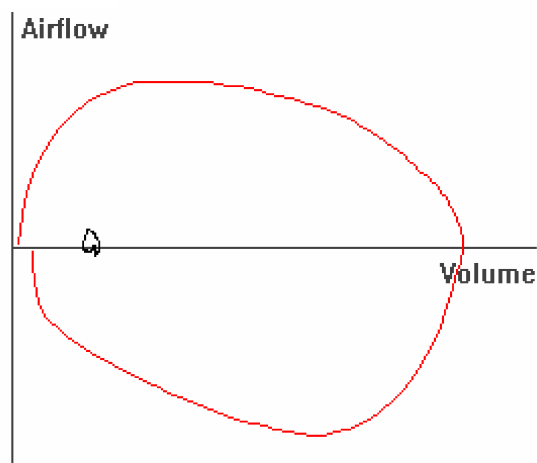
Flow Volume loops for normal respiration show a consistent loop starting and ending at or near the zero point of the x-axis. The reference loop is the red loop:

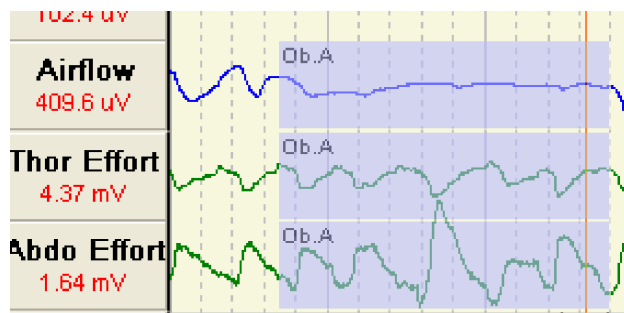




#### 6.3.6.3 Obstructed Breathing

Flow Volume loops for obstructed breathing show a reduced or deformed loop. In this example there is almost no flow or volume despite respiratory effort (the reference loop is the red loop):



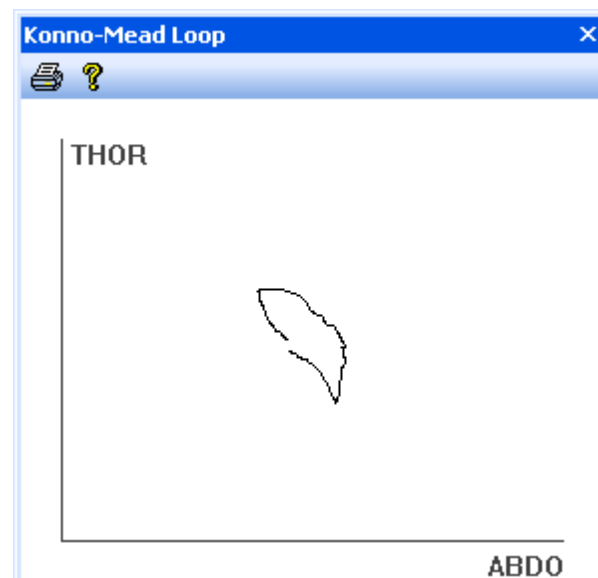


### 6.3.7 Konno Mead loops

Konno Mead loops plot the Effort1 input against the Effort2 input (as configured in Input Assignments, which are configured in PSG Config and cannot be changed in PSG Online).

The resultant loop can be a useful tool in determining changes in respiratory effort.

To view the Konno Mead loop, select **View > Konno Mead Loop**



*Typical Konno Mead loop  
(showing slight phase shift)*

Konno Mead loops will be an almost flat loop at a positive 45° angle for [normal respiratory effort](#)<sup>[84]</sup>.

An open loop is displayed when there is a phase shift between abdominal and thoracic effort, usually indicating some airway resistance.

A shift to a negative angle indicates [paradox respiratory effort](#)<sup>[84]</sup>.

### 6.3.7.1 Properties

To open the Konno Mead Loop Properties, click the window title bar and select View > Properties.

- **Zoom X:** Set the horizontal zoom
- **Zoom Y:** Set the vertical zoom

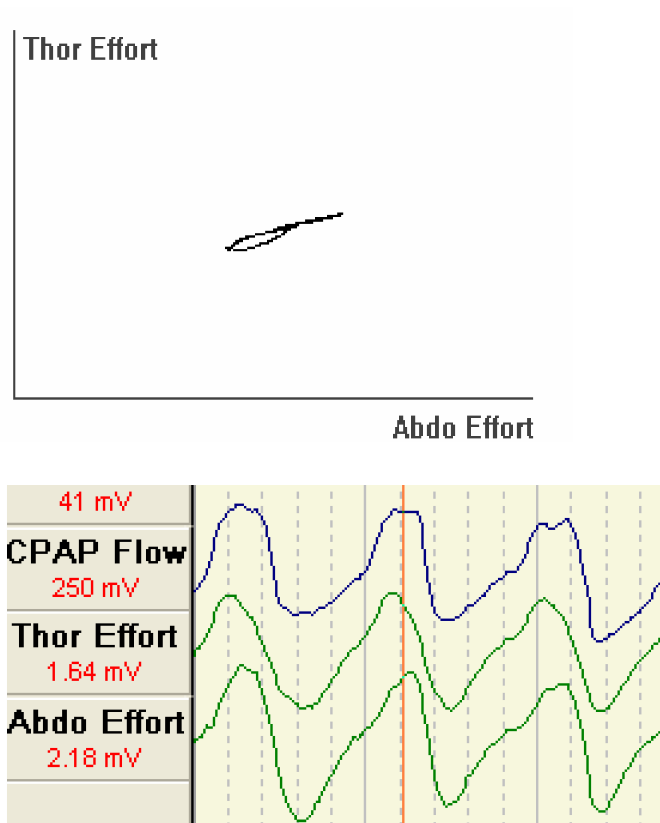


**Tip** The Flow Volume loop can be zoomed by placing the cursor over the window and using the mouse scroll wheel to zoom. This zooms the X & Y axes at the same time.

- **Window Size:** Set the size of the window in seconds. The curve is plotted for the window size, previous to the current point.

### 6.3.7.2 Normal Breathing

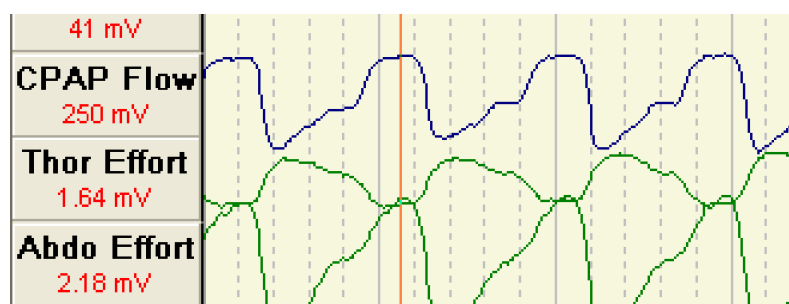
Konno Mead loops for normal respiration show a flat curve at a 45° angle:



### 6.3.7.3 Obstructed Breathing

Konno Mead loops for obstructed breathing show an open loop, and for respiratory paradox effort the loop will be at a negative angle:

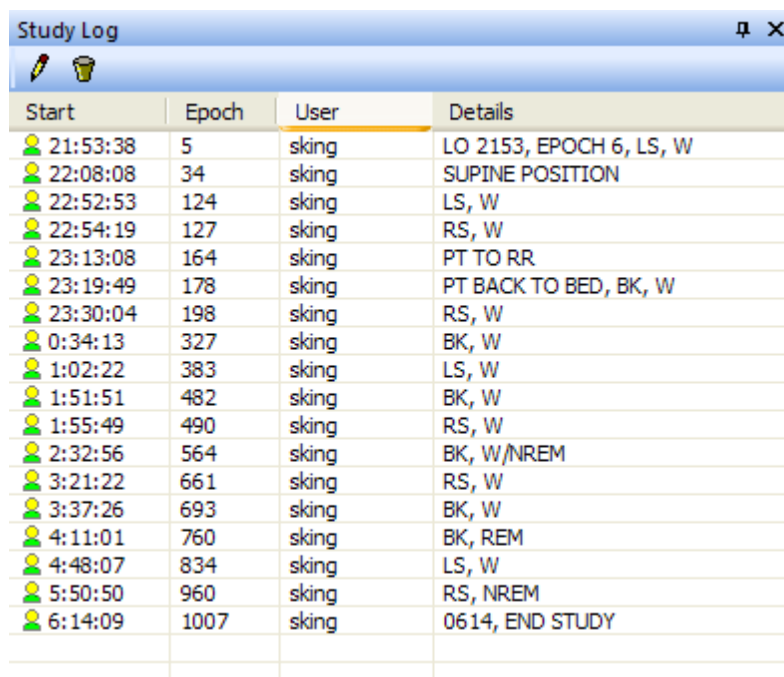




### 6.3.8 Study Log

The study log contains details of User Events (technician notes) and hardware events (lost data, impedance checks etc).

To view the Study Log, select **View > Study Log**.



Start	Epoch	User	Details
21:53:38	5	sking	LO 2153, EPOCH 6, LS, W
22:08:08	34	sking	SUPINE POSITION
22:52:53	124	sking	LS, W
22:54:19	127	sking	RS, W
23:13:08	164	sking	PT TO RR
23:19:49	178	sking	PT BACK TO BED, BK, W
23:30:04	198	sking	RS, W
0:34:13	327	sking	BK, W
1:02:22	383	sking	LS, W
1:51:51	482	sking	BK, W
1:55:49	490	sking	RS, W
2:32:56	564	sking	BK, W/NREM
3:21:22	661	sking	RS, W
3:37:26	693	sking	BK, W
4:11:01	760	sking	BK, REM
4:48:07	834	sking	LS, W
5:50:50	960	sking	RS, NREM
6:14:09	1007	sking	0614, END STUDY

Each entry contains the time that the entry was made (Start time), the Epoch number, the logged-in user (if Security settings are enabled) and the Details. For Technician comments, the Details are the entered text. Other logged event types (for example impedance checks) will have the value or other description in the Details column.

Clicking on a log entry will display the page containing the event in the trace pane display.

Use the icons at the top of the window to manage User Events (tech notes):



Edit the highlighted log entry. If Security settings are enabled, editing an entry will change the User column to the currently logged-in user.



Delete the highlighted log entry (Ctrl + click to select multiple entries).

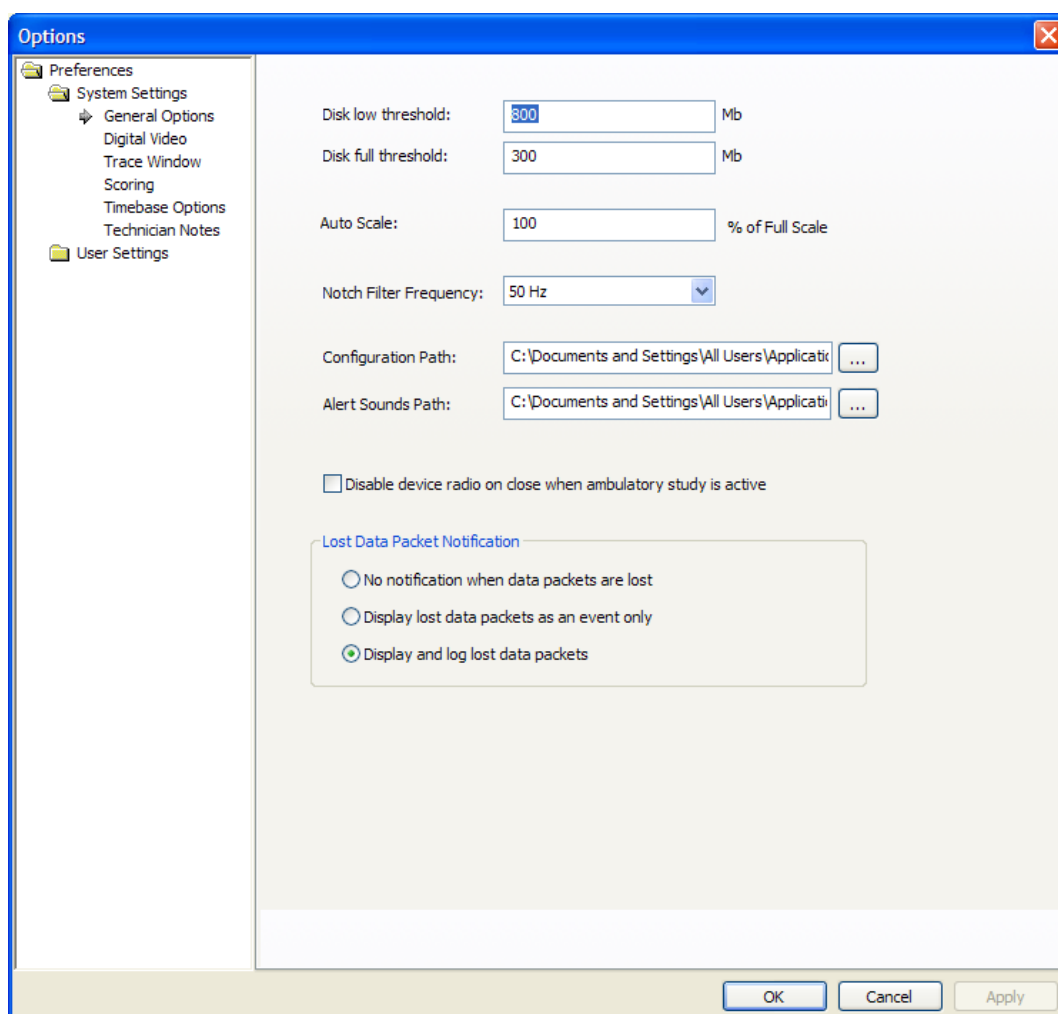
## 7 Options

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

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

- [Digital Video](#)
- [Trace Window](#)
- [Scoring](#)
- [Timebase Options](#)
- [Technician Notes](#)

Click on the required item to open the relevant options.



*Initial Options view*

## 7.1 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.

**Digital Video** - Settings for Digital Video recording (if installed)

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

**Scoring** - Advanced scoring options

**Timebase Options** - Display options for gridlines

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

### 7.1.1 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 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.

### 7.1.2 Digital Video

In order to use Digital Video in recording, an appropriately licensed dongle should be connected to the video acquisition computer and the video should be correctly set using Compumedics Digital Video. This Options page simply indicates from where the recording study should acquire video.

#### **Do Not Use Digital Video**

If video is not to be recorded, select this option.

#### **Use Local Digital Video Server**

If video is to be acquired from the same computer that is recording the study, select this option. The Profile Name refers to the name of the appropriate video profile in Compumedics Digital Video.

#### **Use Remote Digital Video Server**

If video is to be acquired from a different computer to the one recording the study, select this option. Note that the Digital Video computer must be on the same network as the PSG3 Online computer. The Remote Digital Video Server Name refers to the network name of the computer acquiring video. The Profile Name refers to the name of the appropriate video profile in Compumedics Digital Video on the remote machine.

### 7.1.3 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.

### 7.1.4 Scoring

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

#### Auto Save

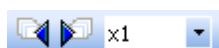
**Profusion PSG 3** can automatically save your work at 1, 2, 5 or 10 minute intervals. Set the Auto Save interval.

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. See the PSG Config help 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](#)<sup>[61]</sup> 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](#)<sup>[61]</sup> 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](#)<sup>[61]</sup> 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](#)<sup>[61]</sup> to be selected. The default settings is 1 second.

## 7.1.5 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.

## 7.1.6 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.

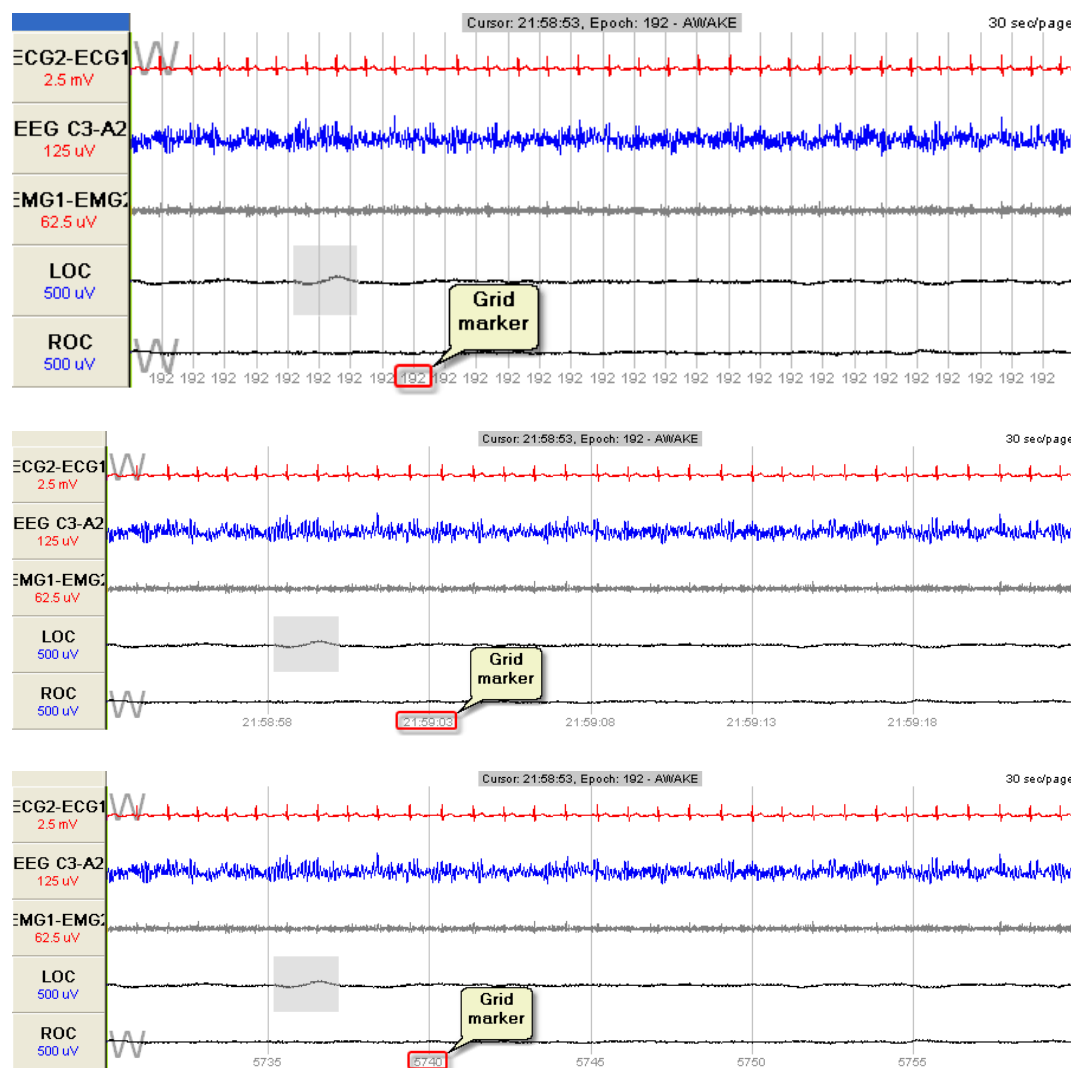
Five Hot Keys (F5-F9) are available for assigning to Tech Notes. Monitoring techs can press the appropriate Hot Key to insert the assigned note instantly.

## 7.2 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>91</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).

## 8 My Workspace

The latest Compumedics software suite introduces the concept of My Workspace™, which allows you to customise the layout and configuration of the display for **PSG Online 3** and **Profusion PSG 3**. These Workspaces can be saved and recalled at any time. The trace layout is also saved as part of the Workspace, so for example you can define different Workspaces for Diagnostic and CPAP studies, and the traces will be displayed as desired without having to open the trace layout manager. A Workspace can extend over dual monitors.

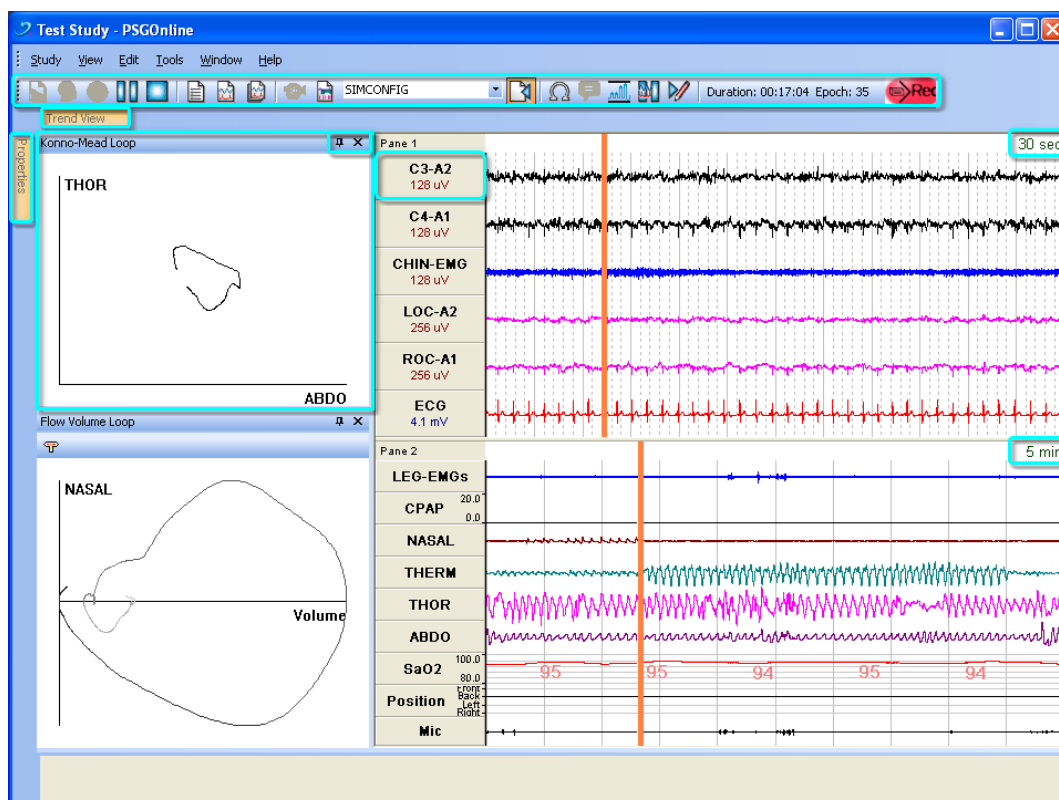
**PSG Online 3** allows one Workspace to be saved per device (E-series, Siesta, and SomtéPSG).

**Profusion PSG 3** allows up to four Workspaces to be saved. These Workspaces can either be shared by all users, or set up as individual Workspaces which are automatically loaded when you login to Windows. This can be configured in **Tools > Options > General**.

 **Info** If you choose to share Workspaces, you must enter a shared workspace folder. This can either be on the local workstation, or a network path. To prevent changes being made to shared Workspaces, open the specified folder from My Computer and set the Workspace files to read-only format.

Below is a diagram with the various elements that can be used in a Workspace highlighted. See the Online Help for more details.





## 8.1 Configuring My Workspace

A Workspace comprises several elements, or windows, which can be selected from the **View** menu. Using the Trace window as the core window, all other windows can be moved around by the drag and drop method. A variety of display options for individual windows are available:

### *Floating Windows*

Windows can be placed anywhere in the Workspace and resized. The window must be pinned open first.

- Click the drawing pin icon to pin open.
- Click and drag the title bar to move the window. To restore a floating window to its previous position, double click the title bar.



**Tip** For dual monitor setups, floating windows can be placed on either monitor.

### *Docked Windows*



Windows can be fixed to the top, bottom or either side of the main Workspace or other window, and either pinned open or set to Auto Hide.

- Click and drag the title bar and move the cursor over one of the positioning icons. As the cursor moves over different windows, these icons will change position to indicate where the window can be docked. A blue overlay shows where the window will dock.

### *Auto Hide*

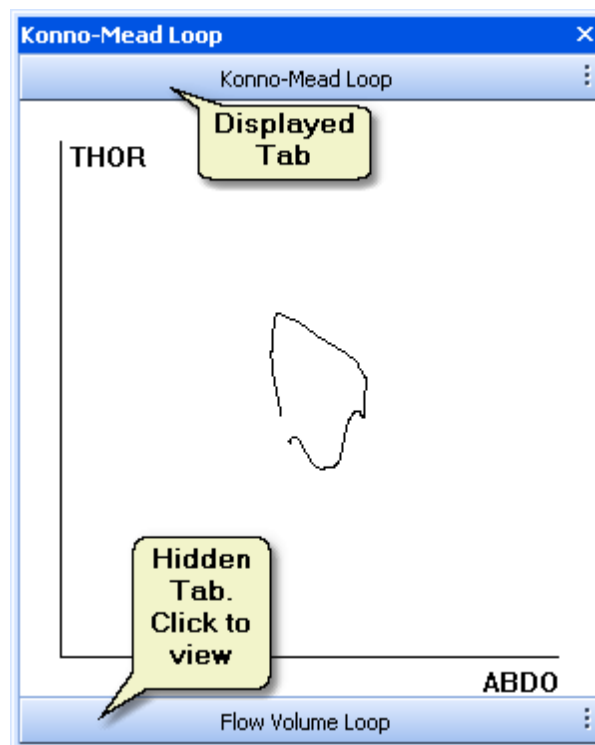
Docked windows (and the Epoch Summary window while floating) can be set to automatically hide when not in use, but still be readily accessible. When hidden, docked windows will display a small text box on the edge of the Workspace close to where you have docked the window. Floating windows will display just the title bar in its usual location.

- To unhide a window, simply place the cursor over either the docked text box or the title bar, and the window will open. Moving the cursor away from the window will auto hide it again.
- To keep the window open, click inside the window. This will keep the window open until you click in another window.
- To set a window to auto hide, click the drawing pin icon in the title bar. Click again to pin the window open.

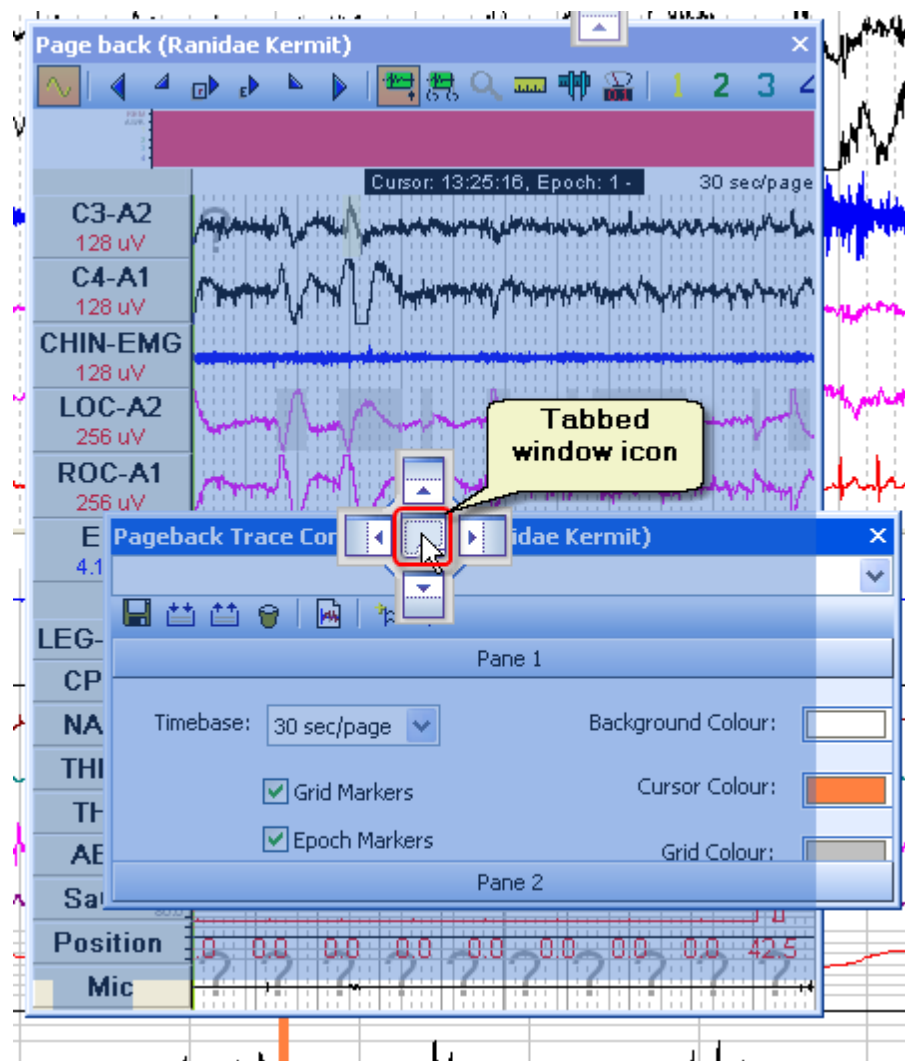
Auto hide	
Pinned open	

## Tabbed Windows

Some windows can be docked to other windows in a tabbed format.



To create tabbed windows, use the central positioning icon when docking one window to another.



To remove a window from a tabbed format, click the tab and drag it away from the other window. It can then be positioned using any of the other Workspace options.

## 8.2 Keyboard Customisation

All keyboard commands for PSG Config, PSG Online 3 and Profusion PSG 3 can be customised to your preferences. These keyboard commands are saved as part of My Workspace™, so different shortcuts can be configured for each Workspace.


### *To customise a keyboard shortcut*

1. Select **Tools > Customise**

2. Click the **Keyboard** tab
3. Select the command Category
4. Select the Command
5. Set the Accelerator for Profusion PSG 3. Any current key assignment for that command will be displayed
6. Click in the *Press New Shortcut Key* box, and press the desired shortcut key
7. Press *Assign* to set the customised key

### ***To remove a keyboard shortcut***

- 1-5. Follow steps 1-5 above to select the correct shortcut
1. Select the **Current Key**
2. Click *Remove* to remove the shortcut

 **Info** To restore the default keyboard shortcuts, open Tools > Customise, and select the Keyboard tab. Press Reset All. A dialog will ask you to confirm that you want to reset the keyboard shortcuts.

Current keyboard shortcuts can be viewed and printed for reference: **Help > Show keyboard shortcuts**

Select the Category, or All Commands



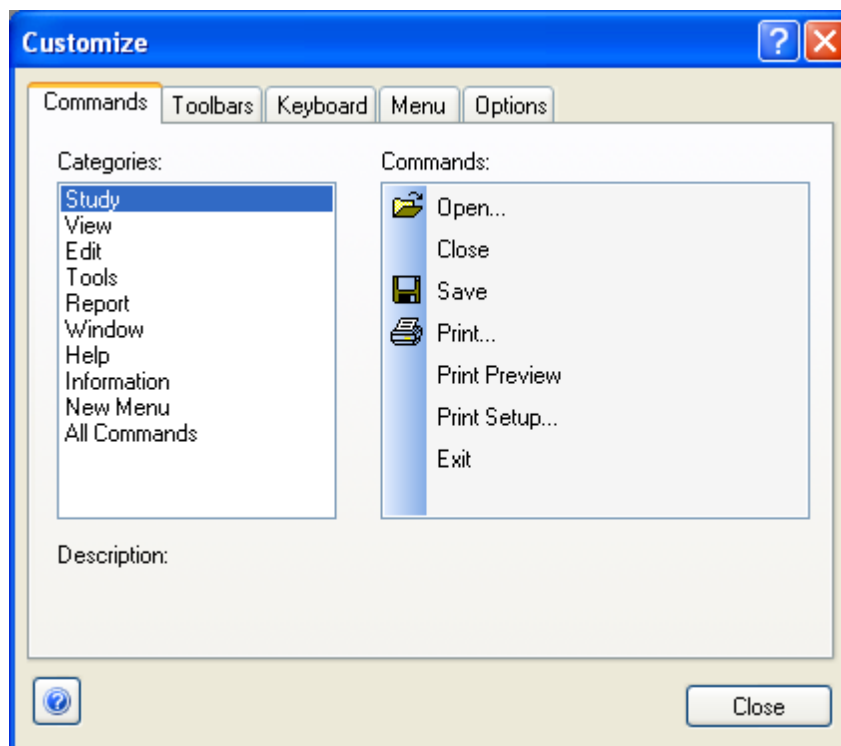
Print the keyboard shortcuts



Copy the keyboard shortcuts to the clipboard.

## 8.3 Other Customisation

Select **Tools > Customise** to open the Customise options dialogue box. The tabs in the Customise box contain settings to enable the user to alter the interface as desired.



### Commands

With this tab open, the Toolbar can be customised by dragging icons about. The Toolbar is 'unlocked' and the icons already on it may be dragged to a different location, or removed from the toolbar by dragging the icon off it. To add a function to the Toolbar, find that function in the menus in the Commands tab and drag it to the Toolbar.

### Toolbars

Text labels can be added to the buttons on the Toolbar by ticking the Show Text Labels checkbox. The box can also be used to create an entirely new Toolbar, however this functionality is reserved for future expansion.

### Keyboard

A shortcut key can be defined for commonly used functions. Find the command for the keyboard shortcut in the left column. Click on the Press New Shortcut Key text box to focus the cursor in it, then press the key desired for the shortcut. Click the Assign button. Keyboard moderators (Ctrl, Alt, Shift) can be combined with regular keys for shortcuts. See the [Keyboard Customisation](#)<sup>[100]</sup> section for more details.

## Menu

The Menu Shadows and Menu Animations box allows the user to alter the appearance of the menus. The other functions on this tab are reserved for future expansion.

## Options

Ticking Show Screentips on Toolbars makes a descriptive text label to appear when the mouse hovers over a button on the Toolbar. Large Icons increases the scale of the icons on the Toolbars, enhancing their visibility.

## 8.4 Saving My Workspace

Once you have setup your Workspace it can be saved for future use.

### *Save as Default Workspace*

You can save the configured Workspace as a default layout. One default Workspace can be saved per recording device, and once a default Workspace is saved it will be loaded every time a recording is started with that device.

To save the current Workspace, select **Window > Save workspace layout as default** from the menu.

## 9 Reference

### 9.1 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.

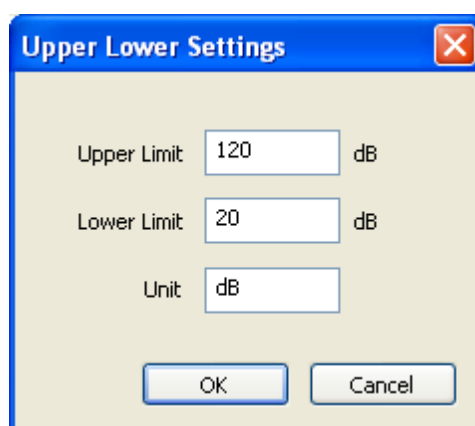


**Tip** Step calibrations are performed in the same manner as described below, except that you acquire a calibration point at each step as specified in **PSG Config**.

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".

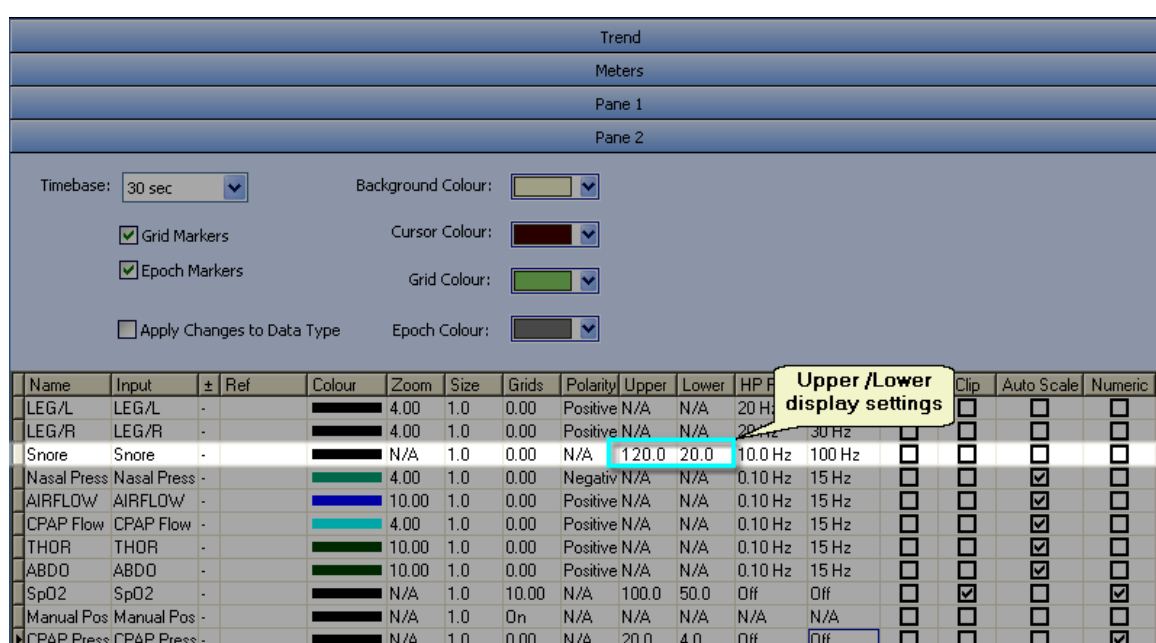
In **PSG Config**, the Upper/Lower Calibration Settings might be set as shown:





The 'Upper Lower Settings' dialog box is shown. It has a title bar with a close button. Inside, there are three input fields: 'Upper Limit' with the value '120', 'Lower Limit' with the value '20', and 'Unit' with the value 'dB'. At the bottom, there are 'OK' and 'Cancel' buttons.

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



The 'View Configuration' dialog box is shown. It has a title bar with 'Trend', 'Meters', 'Pane 1', and 'Pane 2' tabs. Below the tabs, there are settings for 'Timebase' (30 sec), 'Background Colour' (blue), 'Grid Markers' (checked), 'Epoch Markers' (checked), 'Cursor Colour' (red), 'Grid Colour' (green), 'Apply Changes to Data Type' (unchecked), and 'Epoch Colour' (black). Below these settings is a table of inputs and their display settings. A yellow callout box points to the 'Upper' and 'Lower' columns for the 'Snore' input, which are 120.0 and 20.0 respectively.

Name	Input	±	Ref	Colour	Zoom	Size	Grids	Polarity	Upper	Lower	HP F	Clip	Auto Scale	Numeric
LEG/L	LEG/L	-			4.00	1.0	0.00	Positive	N/A	N/A	20 Hz			
LEG/R	LEG/R	-			4.00	1.0	0.00	Positive	N/A	N/A	20 Hz			
Snore	Snore	-			N/A	1.0	0.00	N/A	120.0	20.0	10.0 Hz			
Nasal Press	Nasal Press	-			4.00	1.0	0.00	Negative	N/A	N/A	0.10 Hz			
AIRFLOW	AIRFLOW	-			10.00	1.0	0.00	Positive	N/A	N/A	0.10 Hz			
CPAP Flow	CPAP Flow	-			4.00	1.0	0.00	Positive	N/A	N/A	0.10 Hz			
THOR	THOR	-			10.00	1.0	0.00	Positive	N/A	N/A	0.10 Hz			
ABDO	ABDO	-			10.00	1.0	0.00	Positive	N/A	N/A	0.10 Hz			
SpO2	SpO2	-			N/A	1.0	10.00	N/A	100.0	50.0	Off			
Manual Pos	Manual Pos	-			N/A	1.0	0.00	N/A	N/A	N/A	N/A			
CPAP Press	CPAP Press	-			N/A	1.0	0.00	N/A	20.0	4.0	Off			

## 9.2 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  $30.5\mu\text{V}$ .

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.

## 10 Menu Items

### *Study Menu*

#### **New Study**

If no previous study has been initiated, this will open the New Study dialogue box. To initiate a new study, at minimum it needs a Patient Last Name, a Study Path, a Configuration and a Trace Layout.

#### **Start Recording**

Starts recording the study data to disc. Certain functions are only available after recording has started, such as Tech Notes and Trend analysis

#### **Start Patient Calibration**

Opens the Patient Calibration window. The Patient Calibration is stored as a separately viewable file with the study.

#### **Pause**

Temporarily stops the recording of data to disc. This is useful when the patient is awake or disconnected for extended periods, for example when using the toilet.

#### **Close Study**

Opens the Close Study dialogue box which is used to stop recording the study. Ticking the checkbox in this box will also close the PSG3 Online application.

#### **Exit**

Closes the application if no study has been initiated. If a study has been initiated, the Close Study option should be used.

### *View Menu*

#### **Pageback**

Opens the pageback viewer, allowing the user to view earlier parts of the study. Only available after recording has started.

#### **Trend**

Toggles the Trend window. Only available after recording has started.

## Input Configuration

Toggles the Physical Inputs window. This window displays what data is recorded to disk, and is also used for calibration of certain Physical Inputs.

## Trace Layout Configuration

Toggles the Trace Layouts window. This window is identical in function to the same Trace Layout window in PSG3 Config. Note that any changes made in PSG3 Online will only affect the current study. To make display changes to all future studies, changes must be made in PSG3 Config.

## Video

Toggles the Digital Video view pane.

## Meter Bar

Toggles the display of the Meter Bar

## Impedance Bar

Toggles the Impedance window.

## Technician Notes Bar

Toggles the Technician Notes window. Click a note to insert it in the Trace Window.

## Flow Volume Loop Bar

Toggles the Flow Volume Loop window which displays respiratory volume versus airflow.

## Konno-Mead Loop Bar

Toggles the Konno-Mead Loop window which displays thoracic effort versus abdominal effort.

## Properties

Toggles the Properties window. With the Properties window open, click on a trace to view or alter its settings.

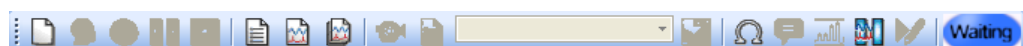
## Calibration Signal

Toggles the electrical calibration signal

## Toolbars

Toggles standard and plugin toolbars.

**Standard Toolbar:** Toggles the Standard Toolbar, which contains the buttons for basic **PSG Online** functions.



## ***Insert Menu***

### **Technician Note**

Opens the Technician Note dialog box. A freeform technician note can be entered or a predefined one selected.

## ***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.

### **Freeze Traces**

Pauses the display of the traces. The study will continue recording data while the traces are frozen. To pause recording, click the Pause button on the toolbar.

### **Configure Technician Notes**

Opens the Technician Notes setup box. Tech Notes can be predefined here, and five notes can be assigned the hotkeys F5-F9.

### **Open Observation Chart**

Opens the Observation Chart window. If this menu option is not available, check that a default Observation Chart is set in PSG Config for this particular configuration file.

### **Open Decision Assistant**

Opens the Decision Assist window. This window is used to assist the recording staff in

identifying when to start the CPAP section of a Split Night study.

### **Options...**

Opens the Options dialogue box.

### **Customise...**

Opens the Customise dialogue box.

## ***Window Menu***

### **Save Workspace Layout As Default**

Selecting this option will record the current window settings (such as physical size and position) and use these settings the next time a recording is started. The Workspace is unique for each individual recording device.

## ***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.

## 11 Troubleshooting

Symptom	Possible Cause	Possible Solution
Do not see the PSG device in NetBeacon	<ol style="list-style-type: none"> <li>1. Power to device is off</li> <li>2. Network connection failed</li> </ol>	<ol style="list-style-type: none"> <li>1. Check power to the PSG device is connected and turned on</li> <li>2. Check network cables are plugged in and that other network devices are operating correctly</li> </ol>
Do not see any traces when <b>PSG Online</b> is launched	<ol style="list-style-type: none"> <li>1. Headbox unplugged (E-Series)</li> <li>2. Headbox cable unplugged from Control Box. (E-Series)</li> <li>3. New study not initiated</li> <li>4. Firewall is active</li> </ol>	<ol style="list-style-type: none"> <li>1. Plug in head box</li> <li>2. Plug Headbox cable into Control Module</li> <li>3. Select New Study button and select a Study Configuration</li> <li>4. Turn off Windows native firewall (XP Service Pack 2 or later). Turn off antivirus / internet security firewall components</li> </ol>
Do not see desired traces in Study Configuration	<ol style="list-style-type: none"> <li>1. Correct Study Configuration not selected</li> <li>2. Correct Layout not selected</li> </ol>	<ol style="list-style-type: none"> <li>1. Start New Study using correct Study Configuration</li> <li>2. Select appropriate layout under Layout button</li> </ol>
High impedance in all traces	<ol style="list-style-type: none"> <li>1. High impedance or bad ground electrode</li> </ol>	<ol style="list-style-type: none"> <li>1. Reapply or replace Ground (GND) electrode; swap with known good electrode</li> </ol>
Flat lines on ALL traces	<ol style="list-style-type: none"> <li>1. Electrical Calibration signal left on at end of last study</li> <li>2. Static discharge when plugging in Headbox which saturates amplifiers</li> </ol>	<ol style="list-style-type: none"> <li>1. Initiate Electrical Calibration signal and stop it again</li> <li>2. Power down Control Module for 10 seconds. Restart Control Module</li> </ol>
Flat lines on all EEG, EMG and ECG signals	<ol style="list-style-type: none"> <li>1. Bad Common Reference electrode</li> </ol>	<ol style="list-style-type: none"> <li>1. Reapply or replace Reference (REF) electrode</li> </ol>
Noise on all EEG, EMG and ECG signals	<ol style="list-style-type: none"> <li>1. Bad ground electrode</li> <li>2. Bad Common Reference electrode</li> </ol>	<ol style="list-style-type: none"> <li>1. Reapply or replace Ground (GND) electrode</li> <li>2. Reapply or replace</li> </ol>

		Reference (REF) electrode
Single trace is flat	<ol style="list-style-type: none"> <li>1. Zoom factor too low</li> <li>2. Sensor off or improperly applied</li> <li>3. Sensor not plugged in proper input</li> <li>4. Improper filter settings</li> <li>5. Improper clipping setting</li> <li>6. Sensor defective</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase zoom factor</li> <li>2. Re-prepare site and re-apply sensor</li> <li>3. Check sensor assignment in Physical Inputs</li> <li>4. Check filter settings</li> <li>5. Turn clipping off for trace</li> <li>6. Replace sensor</li> </ol>
Single trace is low amplitude	<ol style="list-style-type: none"> <li>1. Zoom factor too low</li> <li>2. Input range is too high</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase Zoom factor</li> <li>2. Reduce Input range in study configuration</li> </ol>
Position Sensor not working	<ol style="list-style-type: none"> <li>1. Incorrect input in Headbox (E-Series)</li> <li>2. Sensor not properly applied to patient</li> <li>3. Not calibrated</li> <li>4. Defective sensor</li> </ol>	<ol style="list-style-type: none"> <li>1. Place in position 41 with black plug in black (neg) connector and red plug in purple (pos) connector (E-Series)</li> <li>2. Check location of position sensor (center over sternum). Tape directly on to patient</li> <li>3. Re-calibrate, then replace if still not functioning</li> <li>4. Check function of Position Sensor by holding in all four positions and checking reading. Replace Sensor if defective</li> </ol>
Oximeter reading zero or too low	<ol style="list-style-type: none"> <li>1. Not properly applied to patient</li> <li>2. Poor connection between cable and probe</li> <li>3. Heavy acrylic nail polish, including clear polish</li> <li>4. Bad sensor</li> </ol>	<ol style="list-style-type: none"> <li>1. Be sure red light is located on the nail bed and aligned with sensor end of probe</li> <li>2. Be sure connection between cable and probe is secure</li> <li>3. Remove nail polish</li> <li>4. Replace sensor</li> </ol>
CPAP Pressure reading is inaccurate	<ol style="list-style-type: none"> <li>1. Excessive leak from CPAP mask</li> <li>2. Incorrect calibration</li> <li>3. Bad connection between</li> </ol>	<ol style="list-style-type: none"> <li>1. Check mask placement</li> <li>2. Re-calibrate CPAP Pressure (ensure Headbox is plugged in)</li> </ol>



	<p>CPAP control unit and DC Input box</p> <p>4. Connected to wrong DC input</p>	<p>3. Check connections form CPAP control to DC inputs</p> <p>4. Check Input number in Physical Inputs</p>
Poor quality nasal pressure	<p>1. Poor or improper connection to control box (E-Series) or pressure module (Siesta)</p> <p>2. Not properly applied to patient or moisture in cannula</p> <p>3. Improper trace settings</p>	<p>1. Use Luer lock connector and connect to Airflow port on the control box (E-Series) or pressure module (Siesta)</p> <p>2. Remove moisture from cannula and reapply to patient</p> <p>3. Check zoom factor and filter settings</p>
Poor quality of limb movement sensor	<p>1. Using wrong kind of sensor</p> <p>2. Incorrect sensor application</p> <p>3. Incorrect Physical Input and Data Type settings for type of sensor used</p>	<p>1. Use piezo sensors only in positions 33 – 40 (E-Series) or 29-32 (Siesta)</p> <p>2. Locate sensor directly over tibialis muscle</p> <p>3. Check Physical Input, zoom and filter settings</p>
Changes to Configuration not available on next study	<p>1. Input assignments inappropriately set</p> <p>2. Filters inappropriately set/ not matched to Trace display</p> <p>3. Analysis parameters not optimal</p>	<p>1. Check correct input assignments are configured in <b>PSG Config</b></p> <p>2. Check filters in <b>PSG Config</b> , confirm/match filters on Trace display. Match filters to view artifact as seen by Automatic Analysis</p> <p>3. Check analysis parameters and re-run the automatic analysis</p>
Automatic Analysis providing poor results	<p>1. Input assignments inappropriately set</p> <p>2. Filters inappropriately set/ not matched to Trace display</p> <p>3. Analysis parameters not optimal</p>	<p>1. Check correct input assignments are configured in <b>PSG Config</b></p> <p>2. Check filters in <b>PSG Config</b> , confirm/match filters on Trace display. Match filters to view artifact as seen by Automatic Analysis</p> <p>3. Check analysis parameters and re-run the automatic analysis</p>
Observation Chart not	<p>1. Observation Chart</p>	<p>1. Check Observation Chart</p>

appearing during recording	parameters not correctly set in PSG3 Config 2. Incorrect Observation chart selected	settings for study configuration in <b>PSG Config</b> , save configuration 2. Set default Observation Chart correctly and save Configuration
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## 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)

