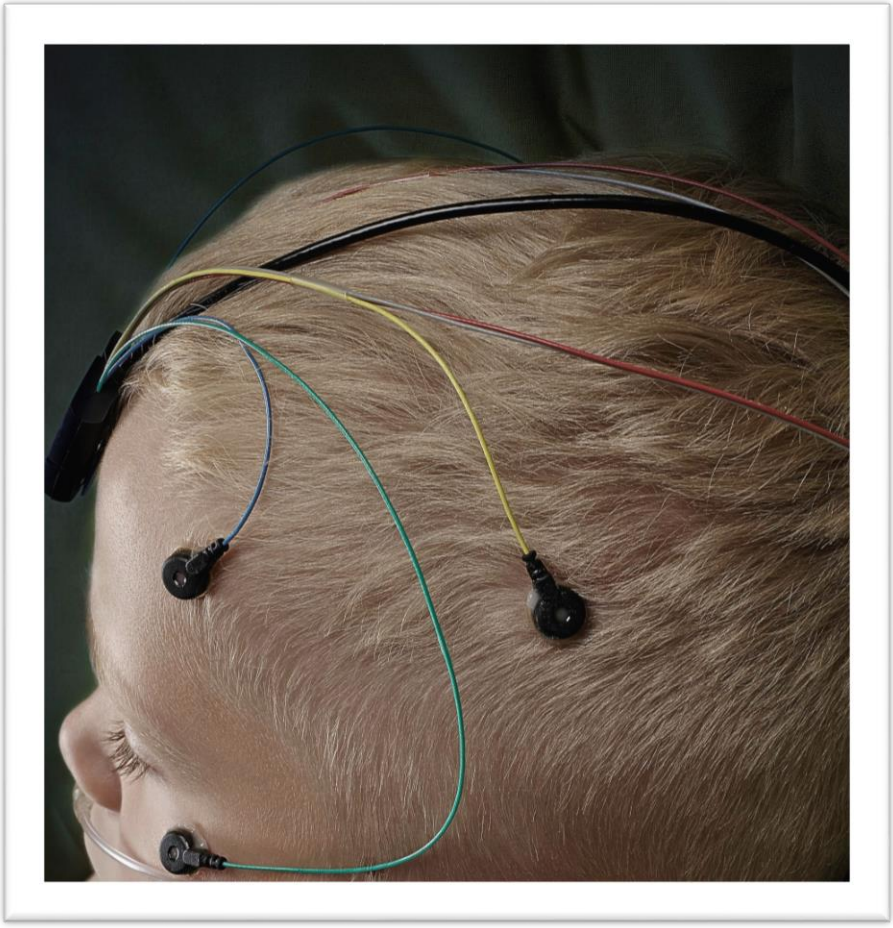
MANUAL

NOXTURNAL



Noxturnal Manual

Version 2.7

Latest Revision: May 2015

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Introduction

Congratulations on choosing the new Noxturnal® application software. The Noxturnal software is a modern sleep diagnostics software platform designed for ease of use and operation efficiency. Its main function is to work with recordings recorded with recording devices from Nox Medical (see Supported Recording Devices chapter) and takes the user through the workflow of configuring recordings, downloading data, analyzing and reporting.

Intended Use

The Noxturnal software is intended for configuring the Nox recording devices for a sleep study as well as downloading and archiving studies from the devices.

The Noxturnal software is intended for review and analyzing of physiological signals and presenting the analysis result in reports.

The intended environments are hospitals, institutions, sleep centers, sleep clinics, or other test environments.

Contraindications

The Noxturnal software is **NOT** intended for any patient monitoring or automatic diagnosis.

Scope

This manual covers the Noxturnal software. It does not cover the Nox recording devices and their accessories that are needed for the recording of physiological signals.

Warnings and Cautions for Use

- The Nox recording systems are **NOT CERTIFIED TO BE USED FOR CONTINUOUS MONITORING** where failure to operate can cause injuries or death of the patient. The term CONTINUOUS MONITORING is specified in the standard IEC 60601-1.
- The Nox recording systems are intended only as an adjunct in patient assessment. They must be used in conjunction with other methods of assessing clinical signs and symptoms.
- Caution: U.S. Federal law restricts this device to sale by, or on the order of, a physician.
- The Nox recording devices and their accessories should be removed from the patient before download of data.
- The Nox recorders shall under no circumstances be connected to the USB port while applied to the patient. This could result in serious harm to the patient.

- Please read this manual carefully before use, especially sections marked with an exclamation mark.

Software Description

The Noxturnal software interacts with the Nox recording devices. It allows the configuration of the devices as well as: navigating, analyzing, reporting and archiving recordings from the device. This section describes the main features of the application and installation instructions.

Supported Recording Devices

Noxturnal supports the following recording devices and their linked devices and accessories:

- Nox A1 PSG recorder
- Nox T3 Sleep recorder

Installing Noxturnal

Before installing the Noxturnal software review the system requirements for running the application.

Noxturnal System Requirements

The following table shows the minimum hardware requirements needed to install and operate the software effectively.

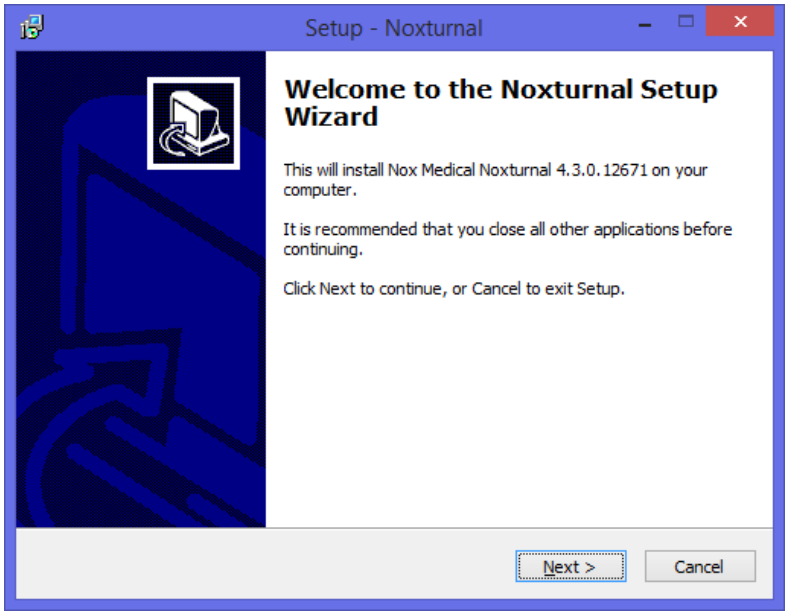
- The computer used must comply with the international standard IEC 60950-1 for the safety of information technology equipment.

Minimum System Requirements

Hardware Type	Minimum Requirements
Operating System	Windows® Vista
Processor	X86 based Intel or AMD
Processor Clock Speed	1.7 GHz or faster
Memory	1 GB or more
Free Hard Drive Space	500 MB or more
Graphics Resolution	1024x768 or higher
USB Port	Yes

Installation Instructions

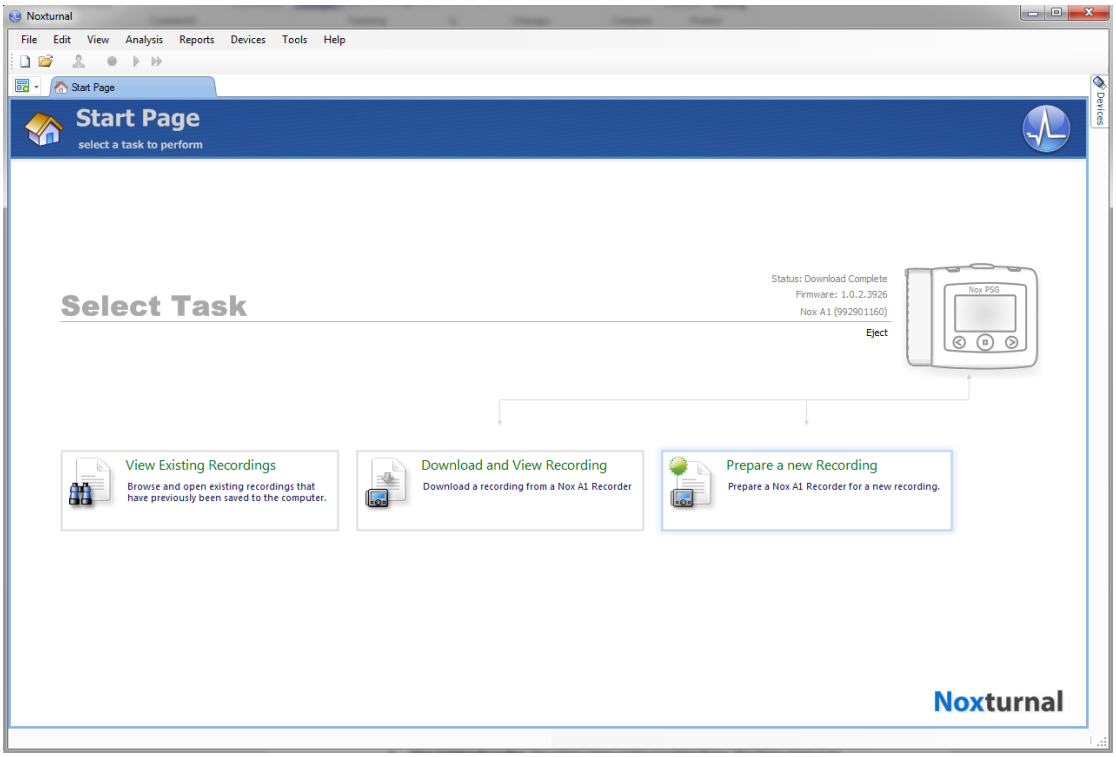
- Make sure to be logged onto the system with administrator privileges.
- Browse for a file on the installation CD called **Setup.exe** and run it.
- A wizard opens up that guides the user through the installation. Follow the instructions to install the application.



Running Noxturnal

To run the Noxturnal application, double-click on the desktop icon or click on the application icon in the Windows start menu. To close the application either click on the **X** in the top right corner, or on the **File** menu choose **Exit.**

When Noxturnal starts up the workspace environment is displayed; see the picture below. If you have a device connected, you will see that in the picture, otherwise no device will be displayed. For the purposes of this document we have a Nox A1 recorder connected as can be seen on the picture.



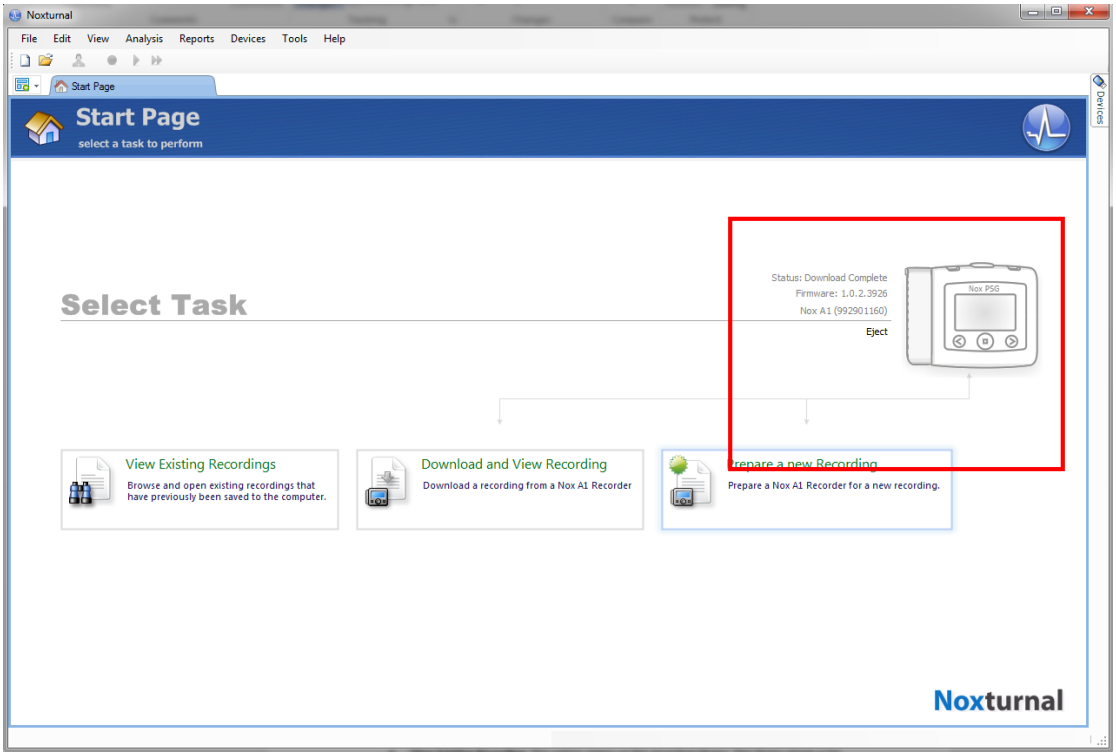
The **Start Page** sheet is where the user works with Nox devices and the recorded data. This sheet also guides the user through the most common tasks it is possible to perform in the application which are:

- **View Existing Recording**: This option opens up the recording library. The library stores a list of all recordings that have been either downloaded or manually added to the recording library. For more information refer to the section *The Recording Library*.
- **Start a New Recording**: To start a new recording, select this option. A configuration wizard will guide the user through the configuration process. For more information refer to the section *Starting a New Recording*.
- **Download and View Recording**: If a recording device is connected and it contains a recording, the user may download and review the recording. For more information refer to the section *Downloading a Recording from a Nox Recording* Device.

Connecting a Nox Recording Device to Noxturnal

Noxturnal is used to configure and download recorded data from Nox recording devices. To work with a recording device, start by connecting it with a USB cable to the computer. Noxturnal automatically detects the device and shows information about the device in the top right corner of the **Start Page**. Detection can take 2-4 seconds. If the device is not detected, click the **Scan for Devices** link.

When Noxturnal detects the connected device the following information about the device is displayed: **recording status, firmware version** and **device name**. In this picture we have a Nox A1 recorder connected, however, any supported Nox recorder will be displayed there, depending on the type of the recorder.



The tasks performed on the recording device depend on the device status which can be the following:

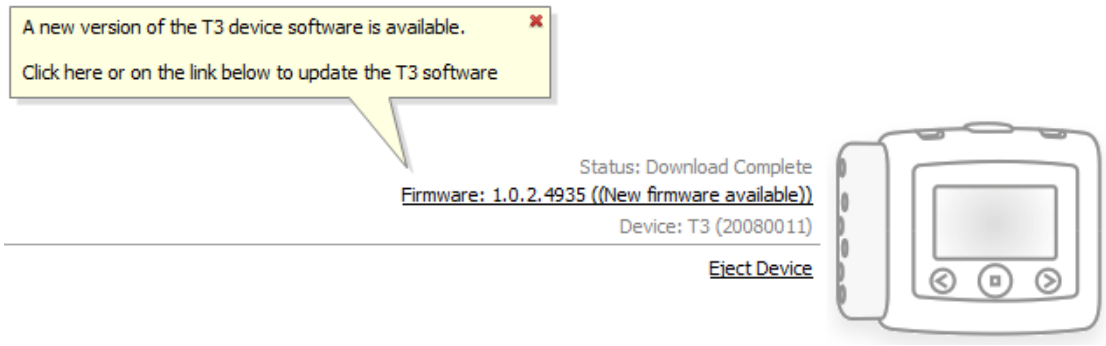
- **Empty** – The device has not been configured and does not contain any recordings. Click **Start a New Recording** to configure the device for a new recording. Please note that configuring the device will remove any existing recordings from the device.
- **Ready to Record** – The device has been configured but does not contain any recordings. At this point the user can disconnect the device and initiate the recording process.
- **Ready to Download** – The device contains a recording that has not been downloaded to the computer. Click on the **Download and View Recording** button to download the recording to the computer.
- **Download Complete** – The device contains a recording that has already been downloaded and has been added to the recording library. At this point the user can either click on **Start a New Recording** to configure the device for another recording or click on **Download and View Recording** to download the recording again.

When you are done working with the device click on the **Eject Device** link and unplug the device from the computer.

- Please note that although it is recommended to eject the recording device before unplugging it from the computer the device can be disconnected without ejecting.
- If a device is connected but does not show up on the start page, click the **Scan for Devices** link. If that does not work, then refer to the *Troubleshooting* section for more information.

Upgrading the Recording Device Software

If a new version of the device software is available for the connected device, Noxturnal will notify the user by displaying a balloon tooltip next to the device. This behavior is device independent and you will see the type of device in this window, depending on which device you have connected. In this picture we have a Nox T3 recorder connected.



Either choose to ignore this message and continue working or to upgrade the device software, which is always recommended. To upgrade click on the balloon and then follow the instructions presented.

- After clicking the balloon for the upgrade you must disconnect the recording device from the computer and reconnect it again for a firmware upgrade to take place.

Starting a New Recording

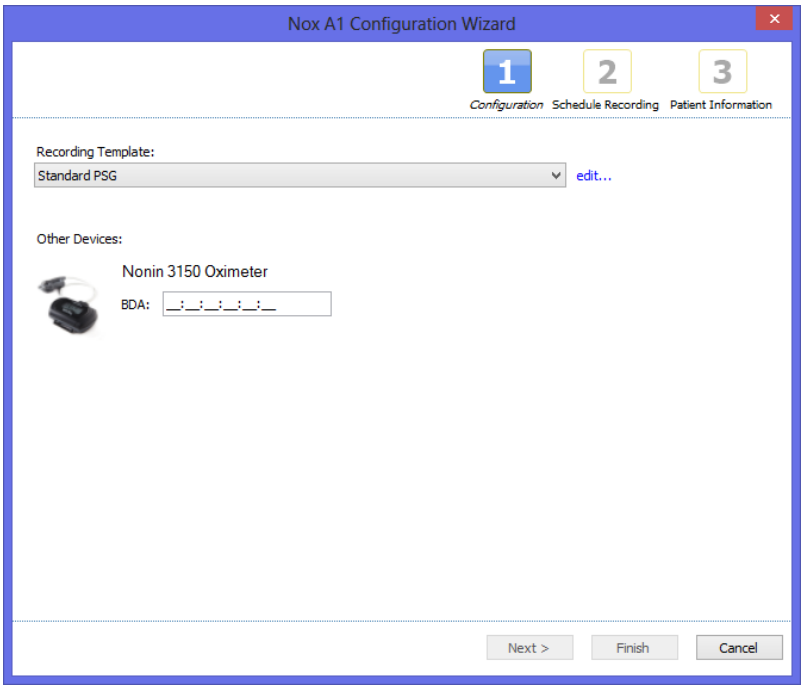
To prepare a recording device for a new recording, start the Noxturnal application and connect the device to the computer using a USB cable. Noxturnal automatically detects the device and shows information about it on the **Start Page**. Click on the **Start a New Recording** button on the **Start Page** and a wizard opens up which guides the user through configuring the device.

The Configuration Wizard is device dependent. This means that each supported recording device will have its own configuration wizard with some variance in graphics and available options. However the key steps are always the same:

1.) **Configuration** of the device. Where you select recording templates, channels to be recorded, study types, and auxiliary devices that may be connected.
2.) **Schedule Recording** where you can select the time and date for a recording to start or to have a patient start the recording themselves.
3.) **Patient Information** where you add the necessary patient information to the recording.

This manual shows the configuration wizard for the Nox A1 recorder.

On the first wizard page specify which Recording Template to use for the recording.



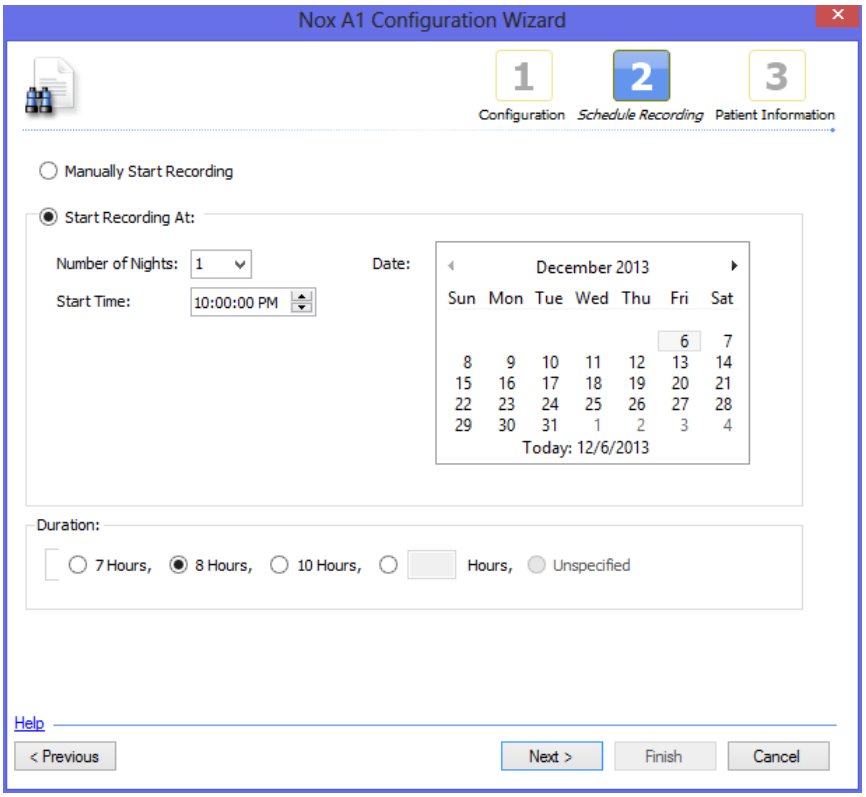
The Recording Templates have descriptive names to exhibit the recording type they are used for. You can edit recording templates by pressing the **edit…** link.

See the Recording Templates section for more information on creating and editing recording templates.

If your recording template is set up to record data from a Bluetooth® device, e.g. pulse oximeter you will see that in the Configuration Wizard. To be able to use a Bluetooth device it needs to be paired to

the recording device as explained in the Recording Templates section. Enter the appropriate oximeter BDA number in the correct field.

Click the **Next** button to move to the next page and schedule the recording time of the recording device.

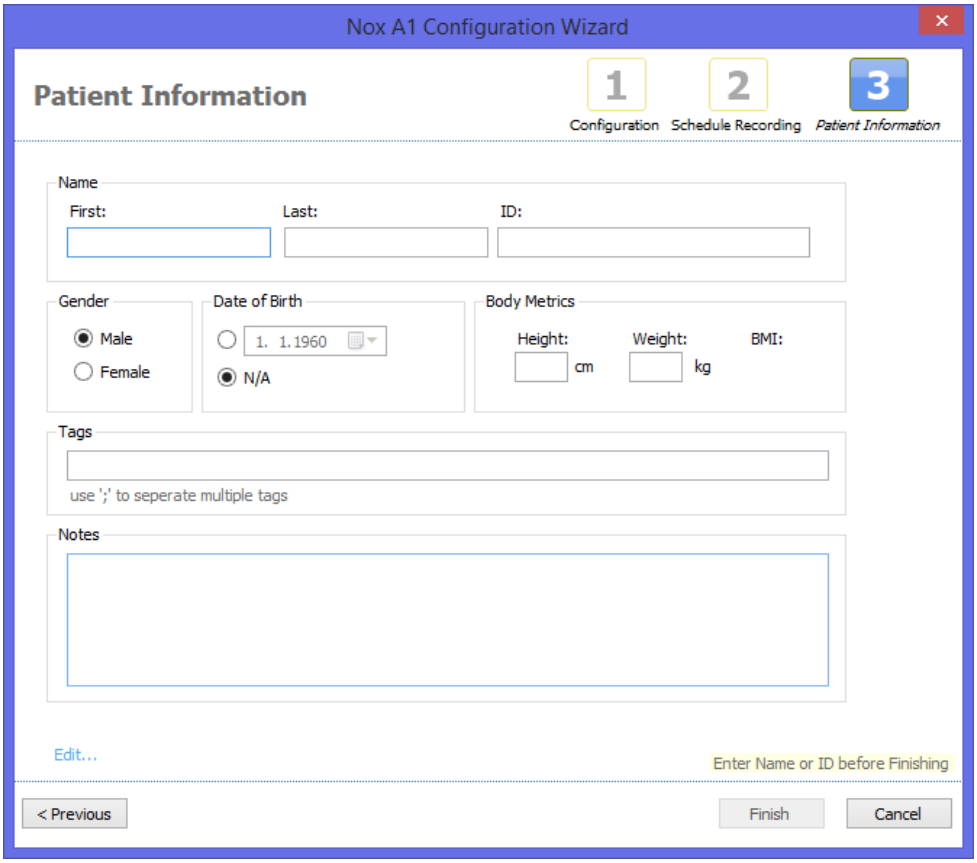


- If the **Manually Start Recording** option is checked, the user is responsible for starting/stopping the recording from the recording device. This is done by pressing and holding the **Middle** button on the device until the device display indicates that the recording has started.

- Check the **Start Recording At:** option to schedule a specific recording time. The device will turn itself on and automatically start recording at the specified time. If the user chooses to record for more than one night, each recording will start at the same time each night.

- To stop recording after a specific duration, specify the **Duration** to be either: **7 Hours**, **8 Hours**, **10 Hours** or enter a customized duration. If **Unspecified** is chosen, then the user is responsible for stopping the recording. This is done by pressing and holding the **Middle** button on the device until the device display indicates that the recording has stopped.

Click the **Next** button to continue to the patient information page where it is possible to enter detailed information about the patient. The only required field is the patient name or the patient ID.

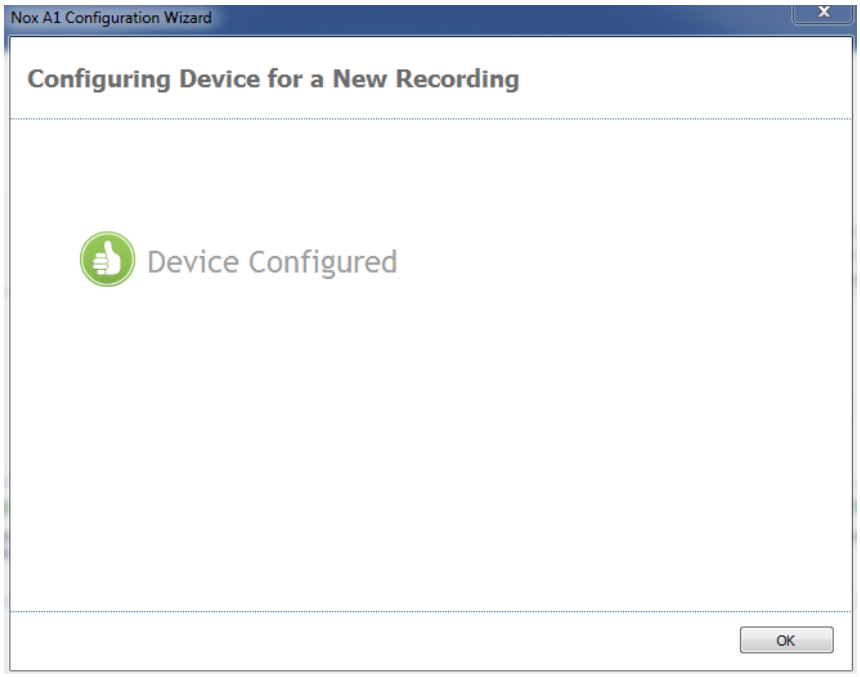


You may also add files or documents to the patient information or even perform detailed editing on the information by pressing the relevant buttons.

After having entered the information click the **Finish** button to write the configuration to the device.

After pressing the **Finish** button the device is configured. If there are any recordings on the device, the user will be asked if he wants to erase those recordings.

Finally a confirmation page appears confirming the device has been configured. For some recorders (such as the Nox T3) hookup instructions can be printed by clicking the **Print Hookup Instructions** button. A PDF document containing the hookup diagram is launched which can be printed. If no Hookup Instructions are available, this option is not displayed.

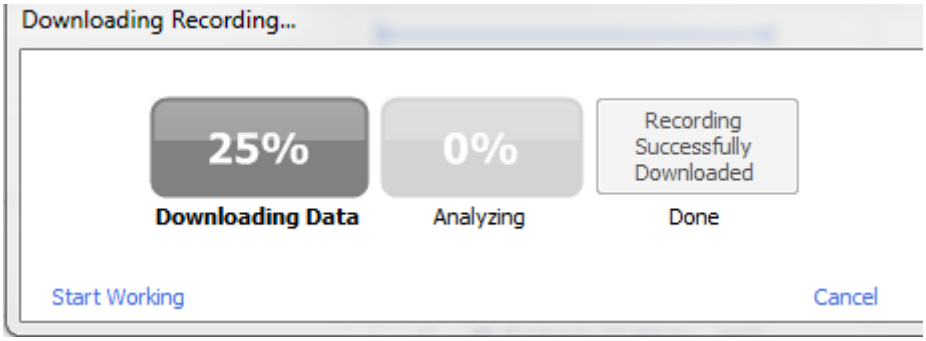


Downloading a Recording from a Nox Recording Device

To download recorded data from a recording device to the computer, ensure that Noxturnal is running and then connect a device to a USB port on the computer.

Noxturnal automatically detects the device and shows information about it on the **Start Page**. Detection can take 2-4 seconds. If the device is not detected, click the **Scan for Devices** link.

Click on the **Download and View Recording** button on the **Start Page** and Noxturnal will start downloading the recording from the device to the computer. A download progress dialog will appear that displays the steps involved while downloading. The data is first downloaded then the default analysis protocol is run and, if the device was configured to record audio, the audio download starts. It is possible to start working with the data at any time while it is being downloaded by clicking on the **Start Working** link.



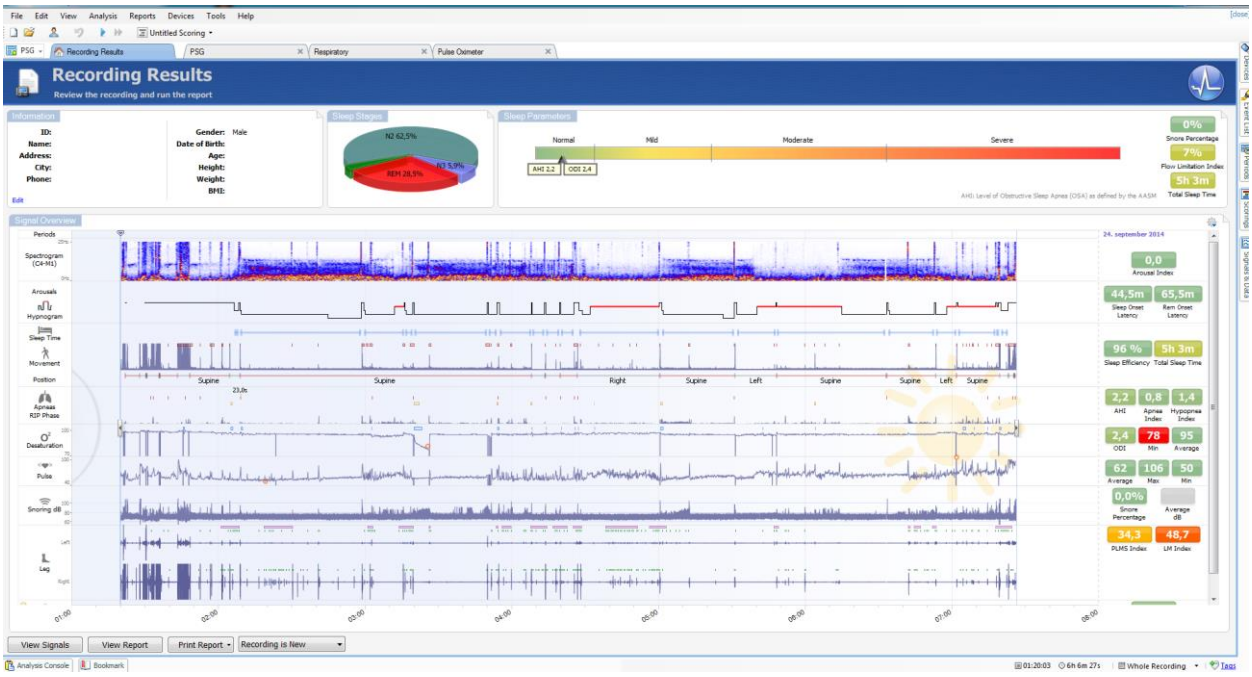
After the download is completed the user is notified and can start working with the whole recording.

Recordings are always downloaded to the default data storage location. It is possible to change the default data storage location on the automation tab in the tools options dialog (**Tools** → **Settings…** → **Automation**). Downloaded recordings are automatically added to the recording library and can be reviewed any time by going to the recording library and opening it. For more information, refer to section *The Recording Library*.

- If a download partially fails for any reason, it can lead to inconclusive recording results. The user will be warned when this happens and needs to decide whether the recorded data is complete or not. It is possible to download the data from the device again. If the problem persists, refer to the *Troubleshooting* section.
- The downloaded recording is not deleted from the device until the device is configured for another recording.

Recording Results Page

After downloading from a recording device or opening an existing recording in Noxturnal the **Recording Results** page is shown. This page contains an overview of the most common analysis parameters and the recorded signals. The result page is automatically updated when changes are made to the existing scoring or if the automatic analysis is run. When sleep stages are available, such as for recordings done with the Nox A1 device, you will see graphs and information with that information. For the Nox T3 device, you will only see parameters available with that device.



Result Page Commands

The results page has buttons for the following actions:

- **Close Recording**: This option closes the active recording and returns to the Start Page.
- **Recording Status**: This option allows to set the status on recordings. Downloaded recordings always have the status *New*. If a recording has failed for any reason, the status can be set to *Invalid*. If the recording has been diagnosed, the status can be set to *Scored*. If the recording and the scoring have been reviewed, the status can be set to *Reviewed*. If a recording has been diagnosed and accepted, the status can be set to *Done*.
- **Play Audio**: If the recording contains audio, the play audio button allows to play the audio. Audio playback can also be played or paused by pressing the space bar key.
- **View Signals**: This option selects the first available signal sheet, allowing to browse through the recorded signals, view automatically scored events and manually edit scored events.
- **Print Results Page**: This option prints the Recording Results Page.

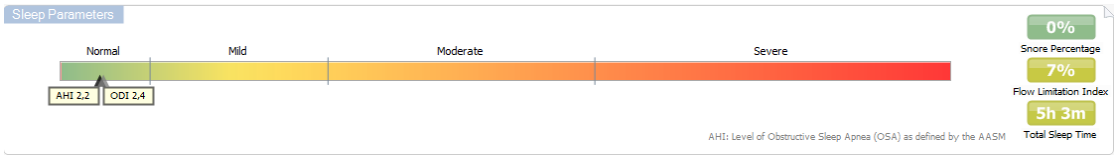
Patient Information

The **Information** panel shows information about the recorded patient. Edit the recording properties and patient information by selecting the **Edit** link or by pressing the **Ctrl+I** shortcut key.

Select **File** → **Recording Properties…** from the application main menu to edit different aspects of the recording properties.

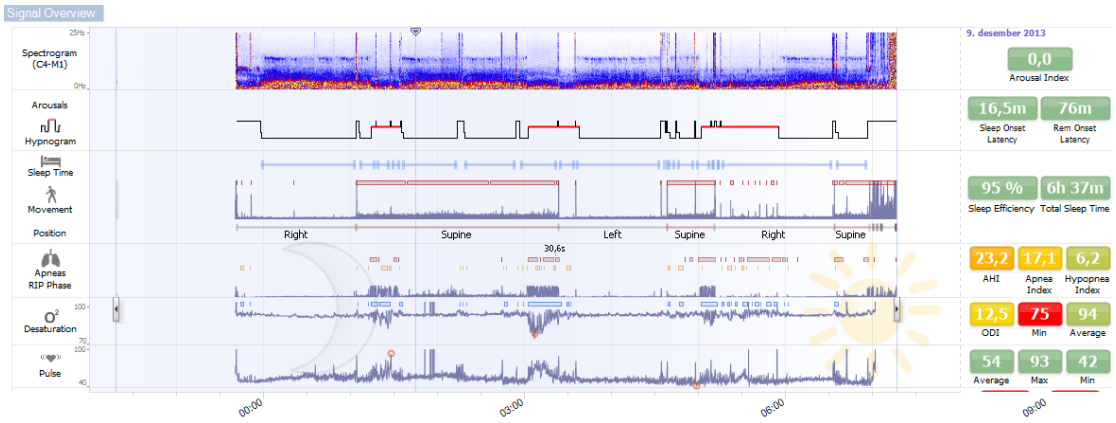
Sleep Parameters

The **Sleep Parameters** panel shows the main analysis parameters and their relation to severity. AHI, the Apnea Hypopnea Index, is the number of apneas and hypopneas per hour of sleep and ODI is the number of scored oxygen saturation drops per hour of sleep (default automatic analysis scores all desaturations of 3% or higher but this can be customized by the user. The severity goes from *Normal* → *Mild* → *Moderate* → *Severe* and complies with the levels set forth by the AASM. If more than one night has been recorded, then these parameters will show the average values for all nights. Refer to the section *Analysis Protocols* for more information.



Signal Overview and Parameters

The **Signal Overview** panel is a top down reviewing tool where recording results can efficiently be reviewed and edited. The overview panel is split up into analysis parameters on the right and signal overview on the left.



The analysis parameters show a summary of the most common analysis parameters, such as **Hypnogram** or **Total Sleep Time**, **AHI**, etc., for a single night. If more than one night has been recorded, then each night is represented within its own panel. Each parameter is color coded based on its severity ranging from green to red (*Normal → Mild → Moderate → Severe*).

- **Arousal Index** is the number of arousals per hour during sleep time.
- **Sleep Onset Latency** is the duration in minutes from Lights out (Analysis Start Time) until the first epoch of scored sleep
- **REM Onset Latency** is the duration in minutes from the first occurrence of sleep until the first occurrence of REM.
- **Sleep Efficiency** ranges from 0-100% where 0% means that the patient was awake the entire night and 100% means that he slept throughout the night. When sleep scoring is not available the software uses movement periods to estimate this parameter.
- **Total Sleep Time** is the time the patient spent asleep.
- When **Total Sleep Time** is not available **Est. Total Sleep Time** is the parameter used. That is the time the patient is lying down during the recording. The green color code (normal) is shown when the patient is lying down for more than 6 hours.
- Respiration is represented by indices. Indices are a method to represent analysis parameters in a standardized way.
    - Apnea Hypopnea Index (**AHI**)
    - **Apnea Index** (AI)
    - **Hypopnea Index** (HI)
    - Oxygen Desaturation Index (ODI) represents a number of oxygen desaturation events per hour of **Total Sleep Time** or alternatively est. **Total Sleep Time**.

  - **Snore Percentage** is the proportion of sleep time spent in snore episodes (marked as **Snore Trains**)

- Overall **Signal Quality** is determined from the monitoring of signal quality of the following signals: oximeter, airflow, abdominal or thoracic respiratory effort signal. The lowest signal quality of those signals is displayed for the overall **Signal Quality** on the Recording Results Page and is represented from 0-100%.

Signals and Events

The signals and events plot in the signal overview panel give an overview of a whole night.

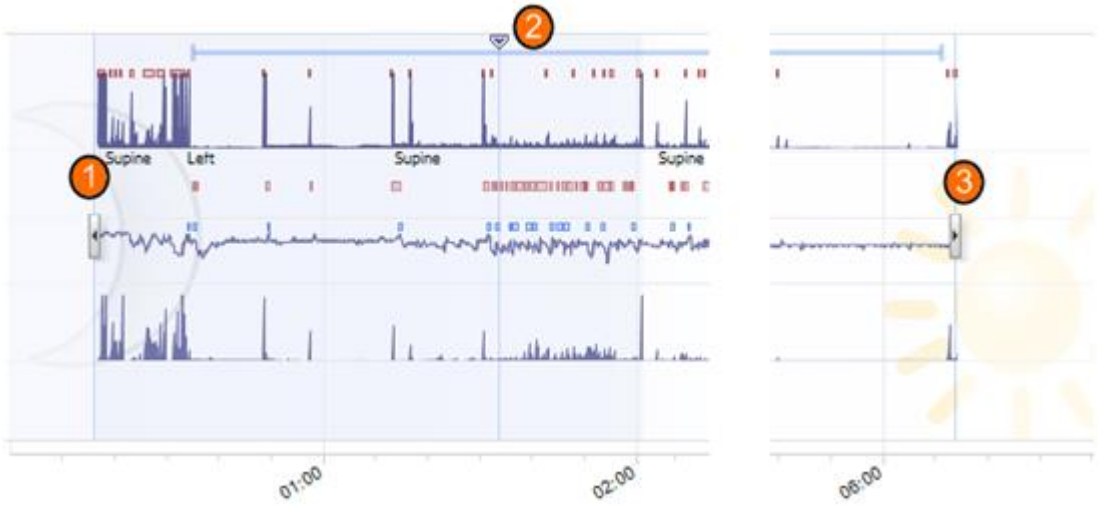
- Signals in the overview can include:
  - **Spectrogram** for the channel displayed on the screen
  - **Arousals/Hypnogram** shows the arousals and sleep stages throughout the night
  - **Sleep Time**
  - **Movement**
  - **Position**
  - **Apneas/RIP Phase** (phase between abdomen and thoracic respiratory effort signals)
  - **Oxygen Desaturation** (SpO_2)
  - **Pulse**
  - Audio Volume (**Snoring dB**)
  - **Leg** Movements (optional)

- Events shown in the overview include apneas and hypopneas, oxygen saturation drops, snoring episodes and artifacts.

Moving the mouse cursor over the **Arousals/Hypnogram**, **Sleep time/Movement/Position**, **Apneas/RIP Phase** and **O_2 Desaturation** and **Pulse** icons will show more details for the related signal or events.

Changing the Analysis Periods

If a recording starts before all sensors have been attached or if the patient removes the sensors before the recording ends, it is possible to adjust the interval being analyzed by moving the analysis start 1 and analysis stop markers 3 to the appropriate location within the recording. All the analysis parameters are updated accordingly when these adjustments are made.



To navigate into the recording use the synchronization marker 2. All signal sheets such as the **Respiration** and **Pulse Oximeter** sheets are synchronized accordingly. If an interesting event is located in the overview, drag the synchronization marker over that area and press the **View Signals** button to view the raw signals. To exclude invalid data from the recording locate areas in the signal sheets, select the areas and insert an 'Invalid Data' event. To exclude data where the patient is awake insert an 'Awake' event. Both the 'Awake' events and 'Invalid Data' events will be excluded from the report calculations.

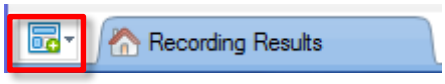
Setting Units

To change units select **Tools** → **Settings…** from the main application menu. On the **General** property page locate the **System Units** drop-down list and select the applicable field to be edited.

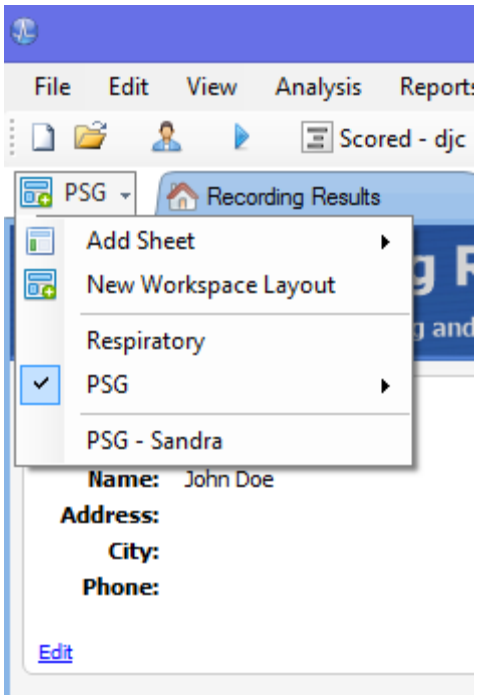
Viewing Signals

Workspace Menu Button

The **Workspace Menu Button** allows you to add one or more sheets into a sheet layout. It is located in the upper left corner of Noxturnal.



You can use this button to **Add Sheets** based on your **Signal Sheet Layouts, Data Sheets,** or **Reports**. This is an excellent way to manage the way that you want to see your recordings, including sheets and reports.



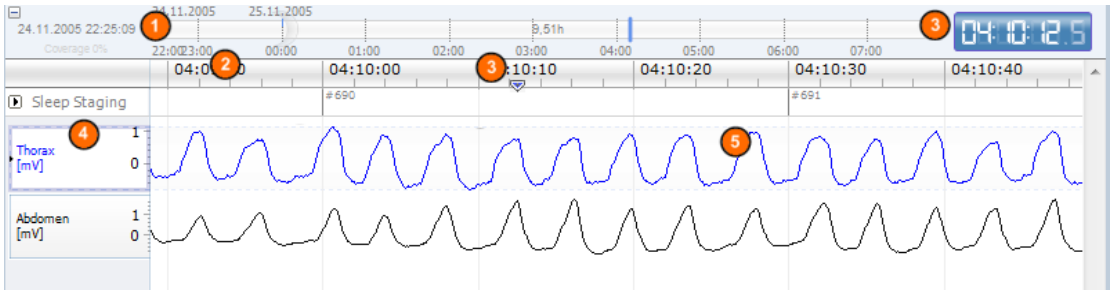
On the Workspace Layout Button you can save all changes to your workspace layout for future use. This means that you can change settings on traces, open up the reports you normally use and setup your work environment as you see fit. Using the button you can **Save Current Layout, Create a New Layout**, using a default layout to base it from or even **Reset Layouts** after making many changes. This is a good way for creating different views on the same data – depending on the user.

Signal Sheets

A signal sheet shows one or more signals in a tab window in the workspace. Noxturnal comes with predefined signal sheets such as the **Respiratory** sheet, **PSG** sheet, and the **Pulse Oximeter** sheet.

To add or remove signals in a signal sheet navigate the mouse to the **Signals and Data** task window located to the right of the workspace. When the mouse cursor is over this tab the **Signals and Data** task window will slide out. A list of all signals available is listed in this task window. A checkbox next to the signal determines if the signal is displayed in the sheet or not. Check/Uncheck the box to add or remove the signal from the sheet.

Working with Signals



1. The navigation bar allows to quickly navigate to any time in the recording. The blue line indicates where the user is located in the recording. Click on any location in the bar to jump to that time. Note there is a moon indicating when it is night time and a sun indicating when it is day time.

2. Time axis displays the recording time and the time period in the window. Right-click on the time axis to change the interval in the window. Stretch/compress the time axis with the mouse to change time interval in the window.

3. The synchronization marker located on the time axis is used to synchronize with other signal sheets and views. The clock on the right side of the navigation bar shows the time of the marker position. The synchronization marker can be dragged and moved in time.

4. Signal value axis shows the name of the corresponding plotted signal and the value axis scale. The axis can be stretched/compressed with the mouse. To change the properties of the value axis double-click on the axis and a dialog will appear where the properties can be changed.

5. Signal plot in a pane. Signals can be adjusted in many ways. Resize the signal pane or move the signal pane around by using the mouse. To change the properties of the signal double-click on the signal and a dialog will appear where the signal properties can be changed.

Keyboard Navigation

Navigate and manipulate the signal sheet by pressing the following shortcut keys:

Navigation:

- Right key = By default - Half page flip forward, user configurable
- Left key = By default - Half page flip backward, user configurable

- Ctrl + Right key = By default - Full page flip forward, user configurable
- Ctrl + Left key = By default - Full page flip backward, user configurable
- Page Down key = Page flip forward
- Page Up key = Page flip backward
- Home key = Start of recording
- End key = End of recording
- Shift + Right key = Increases time span in window
- Shift + Left key = Decreases Time span in window
- Shift + Ctrl + Left key = Jump to previous data session
- Shift + Ctrl + Right key = Jump to next data session
- - key = Zoom out of selection
- + key = Zoom into selection
- Mouse wheel = Scroll forward/backward
- Mouse wheel + Ctrl key = Scroll up and down

Active Signal:

- Shift + Up = Increase signal scaling
- Shift + Down = Decrease signal scaling
- Ctrl + Up = Shift signal up
- Ctrl + Down = Shift signal down
- Shift + Return = Show active signal in new sheet
- Shift + Delete = Remove active signal from sheet
- Up key = Select signal above
- Down key = Select signal below
- Ctrl + F = Find events
- F9 = Auto scale signal

Signal Sheet:

- Space = Play/Pause recording playback
- Ctrl + W = Auto scale signals
- Ctrl + A = Arrange signals

Events:

- Tab = Next event, if searching then next search result
- Shift + Tab = Previous event, if searching then previous search result
- Delete = Delete selected events, or delete events overlapping selection
- Return = Deselect all events
- Esc = Clear all selections

Working with Events

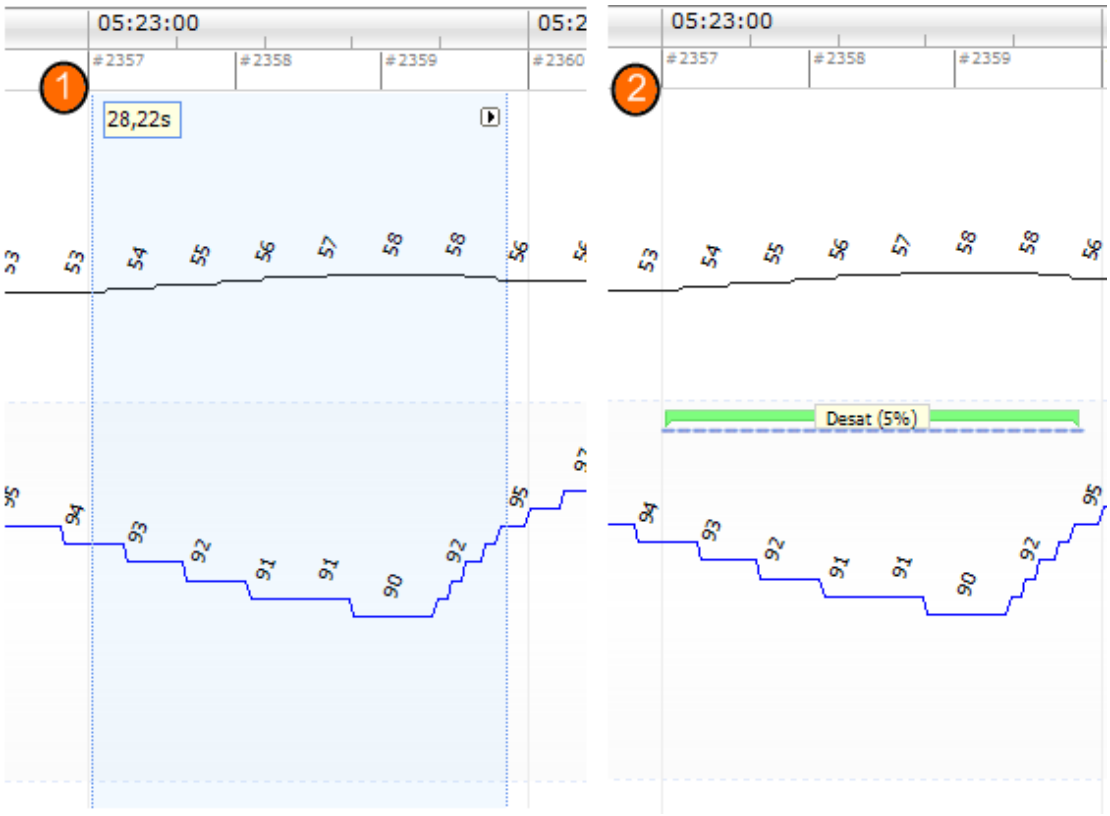
Events are used to identify areas of interest in a signal. An event has a start and stop time and a type used to classify it. Events can either be manually added to a signal or scored by the automatic analysis to flag areas of interest. Events can be modified or removed.

Scoring an Event

To score an event go to a sheet containing signals; locate an area on a signal of interest.

1 With the left mouse button, highlight an area to score the event on.

2 Press the shortcut key for that event. For a list of scoring shortcut keys go to **Edit** → **Configuration** → **Scoring Shortcut Keys**…



An alternative method for scoring an event is to highlight an area with the left mouse button, as before, but then right-click on the area and select an event from the list.

Deleting an Event

There are several ways to delete existing events:

- Select an event by left-clicking it and then press the **Delete** key.
- Right-click on an event and select **Remove Event**.
- Select an area with the mouse that intersects with the events to delete and press the **Delete** key.

Moving an Event

To move an event to a different location select the event by holding down the left mouse button and then drag the event to the desired location. Events can be dragged between signals as well as to a different time period.

Resizing an Event

To resize an event, move the mouse cursor over the left or right boundary of an event. The mouse cursor should change to an icon of an arrow pointing right and left. Once the icon has changed to an arrow, left-click and drag the event to the desired duration.

Navigating Events

There are several ways to navigate the scored events in the recording:

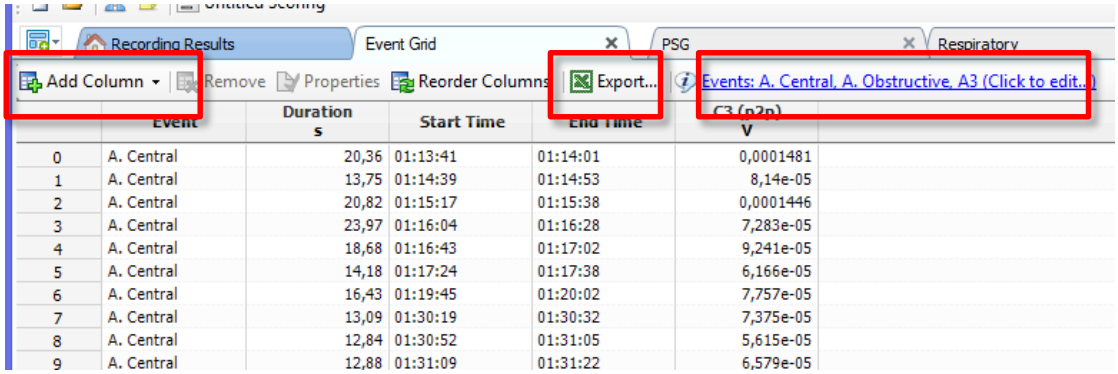
- Jump between the events that have been scored on a signal by clicking on the signal and pressing the **Tab** key which jumps to the next event in time. To jump to the previous event in time press the **Shift + Tab** key.
- In the top right corner of the workspace there is a search text box which allows to search for any events that have been scored. Clicking on the textbox shows a dropdown list of all event types that have been scored. To search for events of some type click on the event type in the list. This shows the next event in time with that type. Click on the navigation buttons in the drop-down list to navigate the events.
- Select **View –> Event Overview** to bring up an overview window that shows all the events in a plot that have been scored in the recording. To navigate to a specific event click on it in the overview plot.

Data Sheets

Data Sheets allow you to view events, signals, scorings, and even create formulas in a tabular format for easy export and analysis.

To create a new **Data Sheet** use the **Workspace Menu Button** and select **Add Sheet** and from the drop down list select either an **Empty Event Grid** or an **Empty Signal Grid**. This is dependent on whether you have more interest in the events, or the actual signal values.

You will see a new sheet being added to the layout. You can now start adding the items of interest into this sheet by using the **Add Column** button and **Event Selection** link. You can pull most event types and signals into these views and use the **Export…** button to save in tabular formats for further analysis.



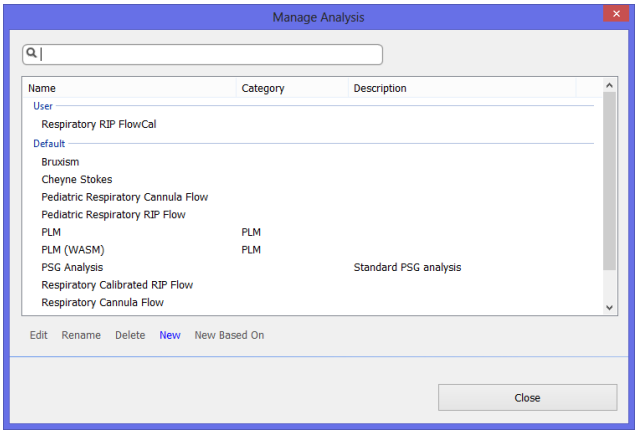
	Event	Duration s	Start Time	End Time	C3 (p2p) V
0	A. Central	20,36	01:13:41	01:14:01	0,0001481
1	A. Central	13,75	01:14:39	01:14:53	8,14e-05
2	A. Central	20,82	01:15:17	01:15:38	0,0001446
3	A. Central	23,97	01:16:04	01:16:28	7,283e-05
4	A. Central	18,68	01:16:43	01:17:02	9,241e-05
5	A. Central	14,18	01:17:24	01:17:38	6,166e-05
6	A. Central	16,43	01:19:45	01:20:02	7,757e-05
7	A. Central	13,09	01:30:19	01:30:32	7,375e-05
8	A. Central	12,84	01:30:52	01:31:05	5,615e-05
9	A. Central	12,88	01:31:09	01:31:22	6,579e-05

Analysis Protocols

An **Analysis Protocol** is a set of detectors that can be run on the recording to detect and mark various events within the recorded signals. The available analysis protocols, including the default protocols, are listed under the **Analysis** menu. To run an analysis protocol on the recording select it from the **Analysis** menu and click on it.

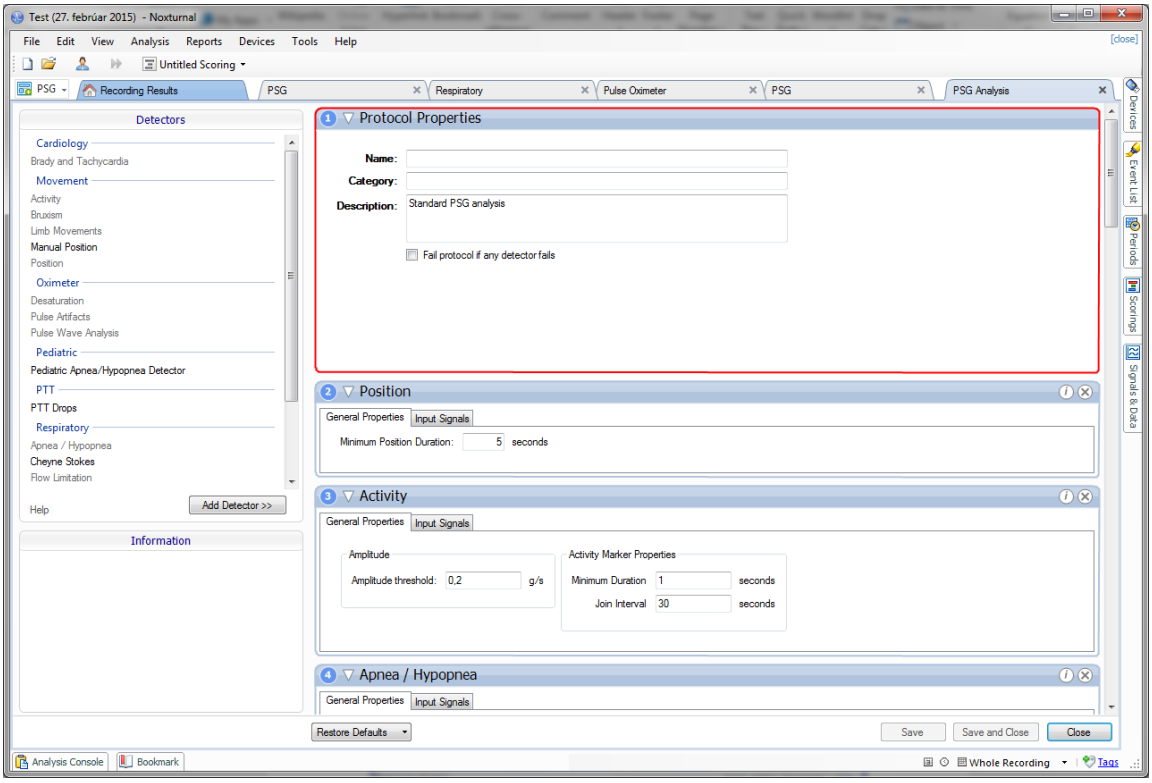
Create a new analysis protocol which uses personalized settings and/or detectors by selecting from the main menu bar **Analysis** → **Manage Protocols**

You can **edit** and **rename** an existing protocol, or create a **new based on** an existing protocol.



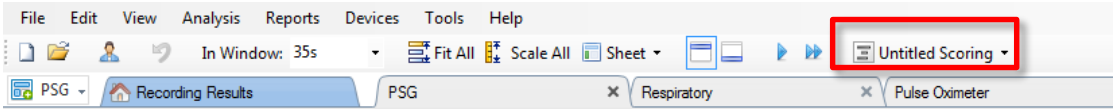
A new sheet will open up where the new/edited protocol can be defined. A new **Analysis Protocol** sheet will open up where the new protocol can be defined. A protocol is a collection of detectors and the function of a detector is to locate areas of interest within a signal and score the areas with events.

To add a detector to the protocol choose detector from list of **Detectors** and select **Add Detector**. **General Properties** and the **Input Signal** can be edited.



Working with Scorings

A scoring is a collection of events that are scored on signals in the recording. The actions for working with scorings are located in the **Scorings** button in the toolbar. The actions taken while working with scorings are listed in the sections below.



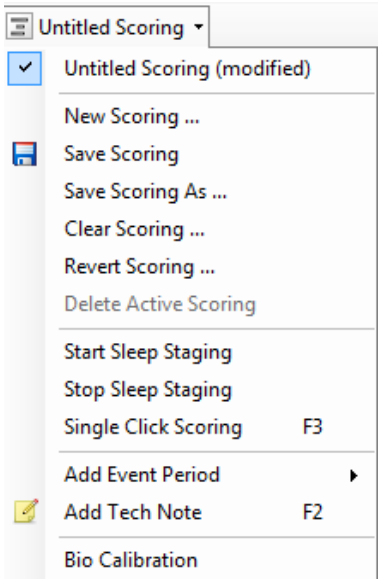
Usually when downloading from a recording device, Noxturnal automatically uses the default analysis protocol to analyze the recording. This creates a new scoring called **Untitled Scoring.** In the Scoring Button (redlined above) you always see the **Selected Scoring** which is used for the reporting and recording overview features. You may easily create new scorings by using the features of the **Scoring Button**, for example if you make modifications to the automatic scoring, you can easily save that as a new scoring called **"Manual Scoring".**

From the **Scoring Button** you can also add Periods or text Notes to the recording.

New Scoring

When using devices that record EEG, you can use the sleep staging features of Noxturnal. Noxturnal offers an automatic sleep stager with the system but manual sleep staging is possible as well.

The way that manual sleep staging is performed is that you use the **Scoring Button** to select a **New Scoring**.



After that, to start sleep staging you can select the “Start Sleep Staging” item from the menu in the **Scoring Button**. The number pad on your keyboard is used for the default sleep staging hotkeys. You can change the scoring hotkeys as explained below.

This is also where you can start your Bio Calibration.

Select a Scoring

Multiple scorings can be associated with a single recording. All available scorings are listed in the scorings panel. Select the active scoring by clicking on it.

Save Scoring

Save the active scoring by clicking on the **Save Scoring** link. The user will be prompted for a name for the saved scoring. The saved scoring will be added to the list of scorings.

Clear Scoring

If a scoring is active, this action will clear it. If the active scoring has local modifications, the user will be prompted on whether he wants to save his local modifications.

Revert Scoring

If a scoring has local, unsaved modifications, these modifications can be reverted. This means that the scoring will be returned to the state it was in when it was loaded.

Delete Selected Scoring

A saved scoring can be deleted by selecting it from the scoring list and clicking on the **Delete Selected Scoring** link. A prompt will come up, asking whether it is OK to delete the scoring.

Scoring Keyboard Shortcuts

A shortcut key is used to score events quickly. For a list of existing keyboard scoring shortcut keys or to change shortcut keys go to **Edit** → **Configuration** → **Scoring Shortcut Keys**…

As a general rule events should only have a single keyboard character as a shortcut, but a combination of **Ctrl**, **Shift** and **Alt** plus a keyboard character is supported.

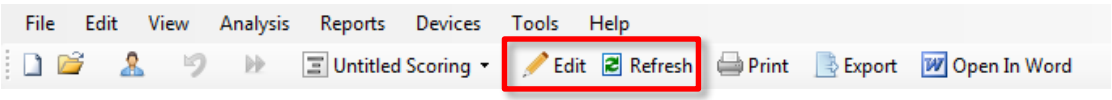
Generating Reports

Reports are used to summarize the analyzed data. To generate reports choose a report from the list of available reports by clicking on the **Reports** menu.

Reports are shown in a new sheet that is added to the workspace.

- Reports results are fixed and are not updated when the analysis of the recording changes.
- If changes are made to the analysis another report can be generated.

When you have generated a report, you can easily modify the report by using the **Edit** button which is visible in the toolbar when viewing reports.



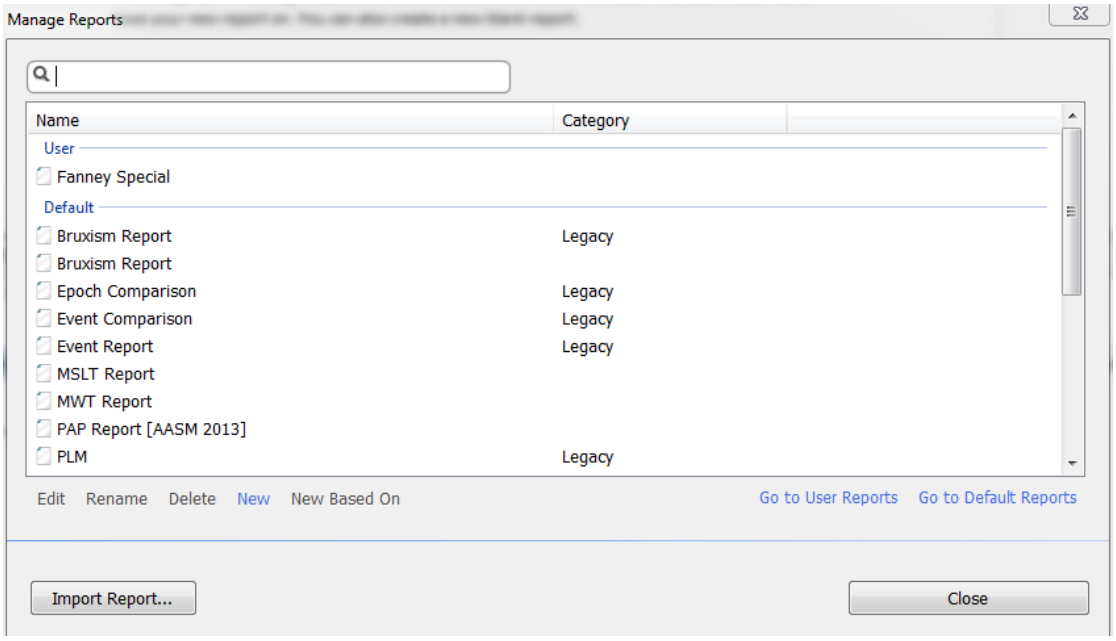
This action launches the **Edit Mode** which allows you to edit the report in the same way as you would use Microsoft Word®. All changes that you make are immediately visible to you. You can also add new indices and even pre-defined report parts when interpreting a study. To stop **Edit Mode**, press the **Edit** button again.

It is possible to add as many reports to the workspace as necessary.

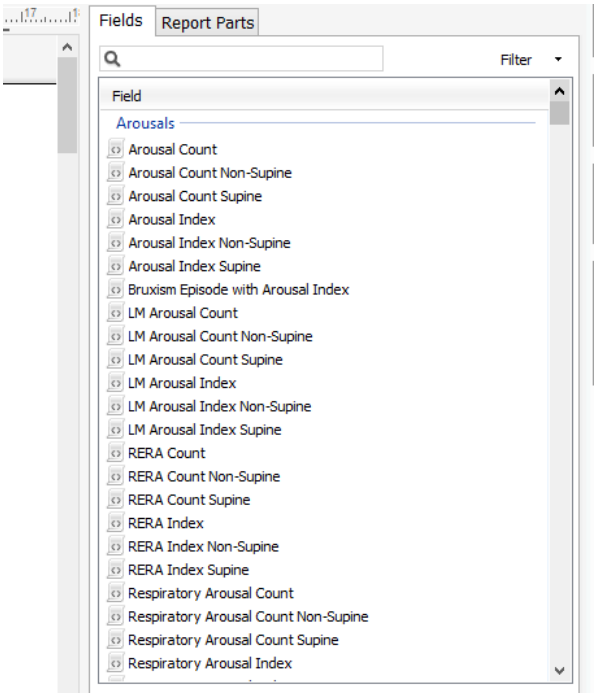
Customizing Reports

Reports in Noxturnal can be customized. To create a custom report select the **Reports** menu and then select **Manage Reports…**

This brings up the Manage Reports window where you can select the report that you would like to base your new report on. You can also create a new blank report.



When you select the **New** link you will be asked to enter a name for the report, a category and a template to build it from. The next step is to build your report by adding content and structure as needed. This adds a new report template to your collection for future use.



In the report editor you can add new fields to the report from the vast collection of pre-defined fields in Noxturnal. You can easily search for fields that you intend to use in your report. Most fields include a short description of what they contain for easy reference.

In this window you may also create new fields of interest, using the **Field Editor**. This powerful feature is a natural language field editor, allowing you to combine and calculate different fields for flexible analysis results.

Exporting Reports

To export a report, select the appropriate report tab in the workspace window. Click **File** → **Export Sheet...** This will open a new window to specify the file format and the file name. Click the **Save** button when done and the report will be saved to the disk in the specified file format. The available formats are:

- PDF (default)
- HTML
- Rich text

Standard Reports

Noxturnal has several stock reports that are installed with the software. These can easily be modified to fit different requirements from users.

Printing Reports

After a report has been generated the user can print the report. To print a report select the report to print in the workspace tabs. Click on the **Print** button on the report toolbar to print out the report. A window will open where the printing options can be changed. Click the **Print** button when the settings have been adjusted.

The Recording Library

The recording library shows and manages all the recordings that have been downloaded from the recording devices. When recordings are opened or downloaded in Noxturnal they are automatically added to the recording library.

To open a recording, select it from the recording library list and either double-click on the list item or click the **Open Recording** button in the recording information panel.

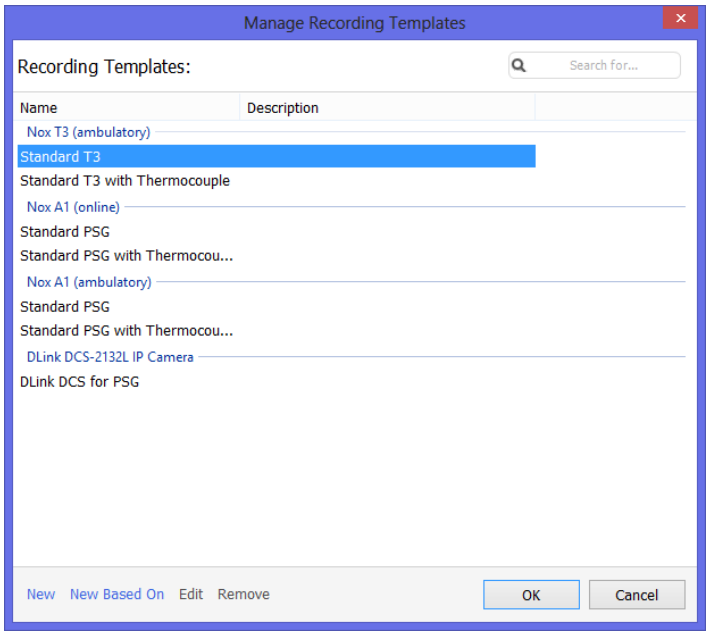
Archiving Recordings

Recordings in the recording library can be archived to a different location or to a permanent storage. To archive a recording select one or more recordings in the library and click on the **Archive Recording…** button on the recording information panel. A dialog will appear guiding the user through the archiving process.

Recording Templates

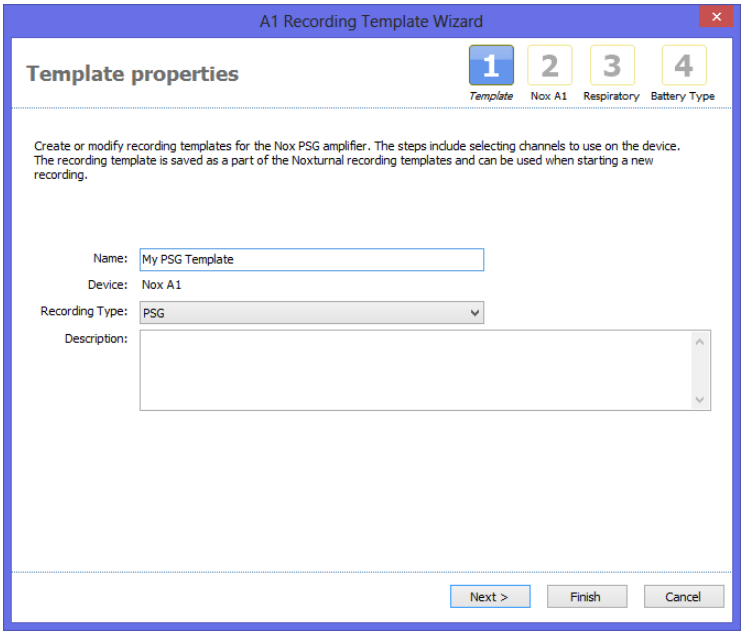
The Recording Templates are created for all standard recordings that you might perform with Nox recorders. They allow for simple setup during the device setup process and save time.

To edit and create Recording Templates you can go to **Devices** → **Recording Templates**. In that window you will see all available recording templates for the Nox recorders.



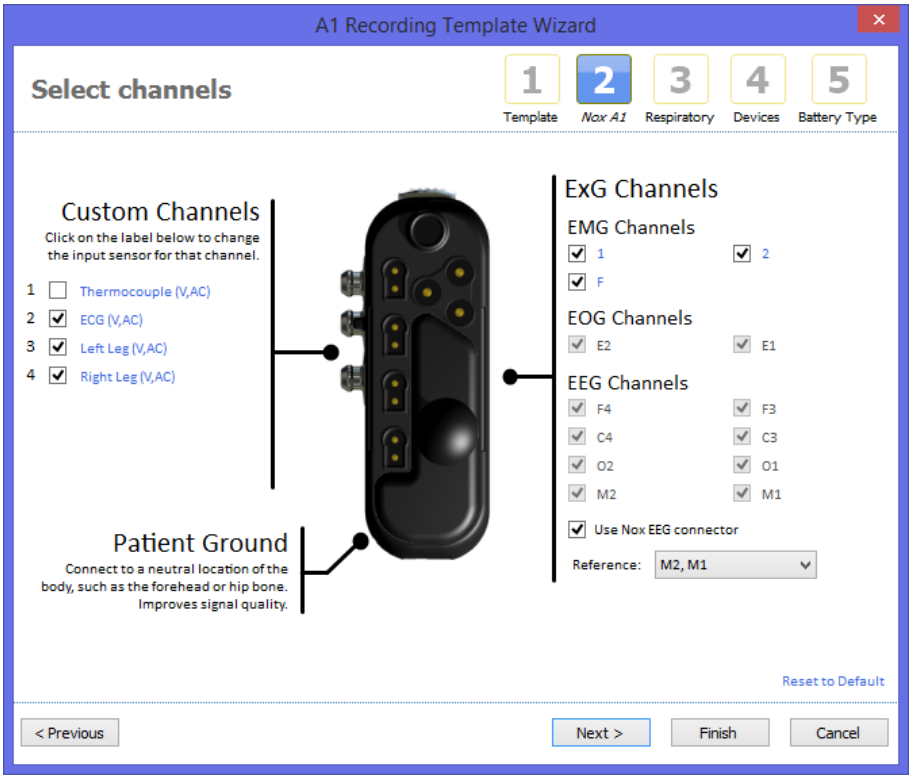
To add your own select **New** or **New Based On** on any of the recording templates you might see there. The system's default templates may not be edited but you can easily create your own templates based on the default ones. Those you can freely edit.

To add a new recording template select the **New** button. You will then need to select for which recording device the template is for and from which of the current recording templates you wish to base your new template on.



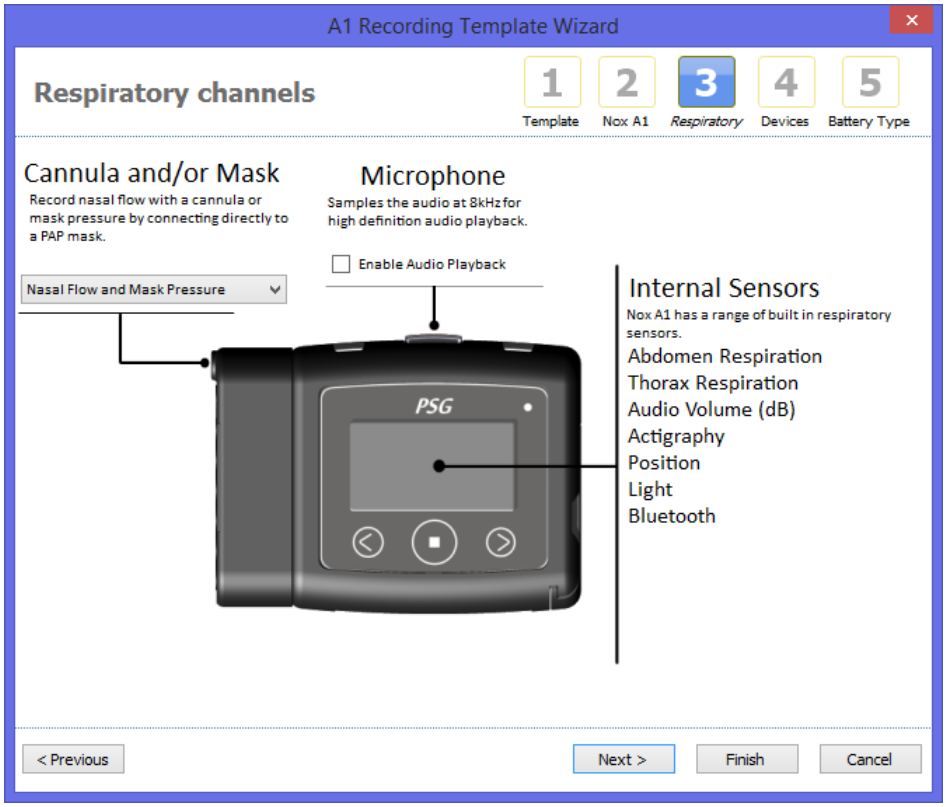
In this wizard you set up your recording templates. You must create a name for the recording template. You must also select the study type and preferably give a short description. Press **Next** to proceed to the next window.

In the next window you can select the channels that you want to be a part of your recording. You can even change the channel type of the **Custom Channels** on the left. To do that, press the name of the channel you wish to change and you will be presented with a range of options.



Press **Next** to proceed to the next window.

In the Respiratory channels window you can modify how the recorder records flow. For example if you wish to connect the pressure input to a PAP device instead of recording nasal flow. This is also the place to decide whether your recording template should record True Audio instead of the audio envelope.



Finally you can select the **Battery Type** and hit **Finish**. Now you will have created your recording template which you can use when setting up a Nox recording device.

- The Recording Templates wizard varies between supported recording devices.

Troubleshooting

This section provides information on troubleshooting of the software. If the system does not operate correctly after following these steps and the problems persist, please contact technical support.

Problems Installing Noxturnal

- When installing the Noxturnal application you need to be logged into the computer with administrator privileges. This is required as some files are copied to shared locations. If you do not have access to an administrator account, contact the administrator of the computer for assistance.
- If installing the Noxturnal application fails, uninstall the previous version and reinstall the application.

Problems Communicating with a Recording Device

If you have problems connecting and communicating with a recording device, please check the following issues:

- USB cable connections: Make sure the USB cable is firmly connected to the Nox device and make sure the USB cable is firmly connected to the USB port of the computer.
- USB port not providing sufficient power: Try connecting the USB cable to another port on the computer, preferably an externally powered USB hub.
- USB cable malfunction: Try connecting with a different USB cable.
- USB driver problem on the computer: The device works as a standard USB mass storage device when connected to the computer. Check if other USB devices are working on the computer. If not, then this is an operating system problem and you should consult the operating system manual for help on troubleshooting USB devices.

If the above checks do not fix the issue, the file system on the device could have become corrupt. This can happen for example if the device is not properly ejected from the computer. Symptoms of this might include:

- Noxturnal fails to recognize the device.
- Operating system errors occur when connecting the device.
- Problems occur while configuring the device.
- Problems occur when downloading recordings from the device.

If there are any recordings on the device, you should try the following to fix this issue:

1. Connect the device to the computer.
2. When a device is connected to the computer it appears as a standard storage disk to the operating system. Locate the disk in the operating system and run the operating system command scan and fix errors. Refer to the operating system help on how to perform this task (Search for “chkdsk” in the windows help).

If the method above doesn't work, try to reset the device to factory settings:

1. Connect the device to a computer.
2. Click the forward button on the recording device. You should see the following on the device display:

3. To format and reset the device to factory settings hold down the **Middle** button on the device for a few seconds and follow the instructions displayed on the device display.

► Resetting the device to factory settings will erase all recordings that are on the device. If those recordings have not yet been downloaded, then they will be lost.

Problems Viewing Recording Results

- A report might come up empty if no printer is setup on the computer. To fix this install any printer driver and make it your default printer. The report uses the page size from the default printer to render reports.
- If recording parameters are always shown as zero (AHI, Snore Percentage, ODI, etc.), this normally indicates that the automatic analysis has not been executed successfully. To fix this try the following:
    - Select **Analysis** → **Manage Protocols** and remove the **Respiratory RIP Flow** and **Respiratory Cannula Flow**. Restart the application. This will reset the analysis protocols to the installation defaults. Run either of these protocols to determine if the problem is solved.
    - Select **Edit** → **Configuration** → **Signal Types & Groups**… From the dialog that appears remove all the signal groups. Close Noxturnal and open it again. This will reset all signal groups to the installation defaults. Run either of the default protocols to determine if the problem is solved.