Lifelines iEEG Client

EEG Review & Patient Management

User Manual

Revision 5.00

Software Version 2.2

Regulatory Compliance

K143487: FDA 510(k) Clearance for class ll medical device. Product: Lifelines iEEG

The Lifelines iEEG software and systems bear a CE mark issued by BSI (CE0086).

The Lifelines Trackit Mk3 and Lifelines R40 amplifiers as well as the Lifelines Photic stimulator bear a CE mark issued by AMTAC (CE0473).

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Intro

Intended Use

Lifelines iEEG is an EEG system that allows acquisition, display, archive, storage and analysis of physiological signals. The intended user of this product is a qualified medical practitioner trained in electroencephalography who will exercise professional judgment in using the information.

The Lifelines iEEG system also includes the display of quantitative EEG plots, power spectrum, which is intended to help the user to monitor and analyze the EEG.

This device does not provide any diagnostic conclusion about the patient's condition to the user.

Caution: Federal (USA) law restricts this device to sale by or on the order of a physician licensed by the law of the State in which he practices to use or order the use of the device.

Indication for Use

Lifelines iEEG is used an aid in the diagnosis of neurophysiological disorders such as epilepsy.

Disclaimers and Warranties

The information in this section is subject to change without notice.

Except as stated below, Kvikna ehf (Kvikna) makes no warranty of any kind with regard to this equipment, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Kvikna shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance or use of this equipment.

Misuse, accident, modification, improper operating environment, improper maintenance or damage caused by a product for which Kvikna is not responsible will void the warranty.

Kvikna does not warrant uninterrupted or error-free operation of its products.

Kvikna or its authorized agents will repair or replace any products which prove to be defective during the warranty period, provided that these products are used as prescribed in the operating instructions in the user's and service manuals.

No other party is authorized to make any warranty to assume liability for Kvikna's products. Kvikna will not recognize any other warranty, either implied or in writing. In addition, services performed by someone other than Kvikna or its authorized agents or any technical modification or changes of products without Kvikna's prior written consent may be cause for invalidating this warranty.

Kvikna manufactures hardware and software to be used on or with standard PC-compatible computers and operating software. Kvikna, however, assumes no responsibility for the use or

reliability of its software or hardware with equipment that is not furnished by third-party manufacturers accepted by Kvikna at the date of purchase.

All warranties for third-party products used within the Lifelines iEEG system are the responsibility of the relevant manufacturer. Please refer to the relevant documentation on each product for further details.

Compliance

Lifelines iEEG is designed to comply with the following medical safety standards.

International standards:

IEC 62304:2006	Medical device software – Software life cycle processes.
IEC 62366:2007	Medical devices -- Application of usability engineering to medical devices

Acquisition Systems:

IEC 60601-1:2006	Medical electrical equipment – Part 1: General requirements for safety.
IEC 60601-1-2:2007	Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral Standard: Electromagnetic disturbances - Requirements and tests
IEC 60601-2-26:2003	Medical electrical equipment – Part 2-26: Particular requirements for the safety of electroencephalographs.
ÍST EN 60601-1-11:2010	Part 1-11: General requirements for basic safety and essential performance - Collateral standard: Requirements for medical electrical equipment and medical electrical systems used in the home healthcare environment.

European standards:

EN ISO 14971:2012	Medical devices – Application of risk management to medical devices.

US standards:

US Code of Federal Regulations Title 21, Chapter 1, Subchapter H – Medical Devices

Safety and Warning Notices

Warnings are directions which, if they are not followed, can cause fatal or serious injuries to a user, engineer, patient or any other person or can lead to a mistreatment.

WARNING: Safety of the Lifelines iEEG service cannot be ensured unless it is provided by Kvikna ehf or an authorized agent. Lifelines iEEG is a medical device compliant with medical safety standards and it is forbidden to tamper with or modify the software.

WARNING: Lifelines iEEG is intended to be installed, used and operated only in accordance with the procedures given within this manual and accompanying documentation for the purpose for which it was designed. Nothing stated in this manual reduces the user's professional responsibilities for sound judgment and best practice.

WARNING: Users shall only install, use and operate Lifelines iEEG in such ways that do not conflict with applicable laws or regulations which have the force of law.

WARNING: Use of Lifelines iEEG for purposes other than those intended and expressly stated by the manufacturer, as well as incorrect use or operation, may relieve the manufacturer or his agent from all or some of the responsibility for resultant non-compliance, damage or injury.

WARNING: Lifelines iEEG is intended to be used by a healthcare professional.

WARNING: Lifelines iEEG is intended only as an adjunct device in patient assessment; it must be used in conjunction with other methods of patient diagnosis. This equipment is not to be used for the determination of brain death.

WARNING: Lifelines iEEG is not intended to be used as a vital signs monitor.

Useful Lifetime

The useful lifetime of the iEEG software is 5 years.

Third-party Devices

Refer to all third-party device documentation and heed all warnings, cautions and safety markings associated with the installation and use of those devices before using this system.

Reporting Incidents

In the event of a malfunction or change in performance of the device that may affect safety, send a report to ieeg@kvikna.com

Warning Symbols

Additional warnings are indicated by this symbol elsewhere in this document.

Device Description

Lifelines iEEG is a software system used to manage and review EEG examinations. It works on data acquired by the Lifelines iEEG acquisition software as well as data from some third party EEG equipment that is imported into the system. The EEG is presented in a conventional way and conventional signal processing is applied such as re-montaging and band pass filtering. The system is also capable of presenting digital video synchronized to the EEG if this is available. Some advanced analysis methods are provided as an aid: FFT analysis and Artifact Removal.

The software is designed using service oriented architecture enabling the possibility of reviewing data over WAN without the use of additional remote desktop software solutions.

Lifelines iEEG comprises two main software components:

The iEEG Centrum client is the main patient and user administration area. It is used to manage patient demographics, keep track of exams and manage user access to clinical data. The system can be configured to allow access from the internet using encrypted communication.

The iEEG Review client is used for review and analysis of EEG data by clinical experts. The user can navigate within the EEG that can be many hours long, filter and re-montage as desired. Furthermore, the artifact removal feature can be used to automatically filter artifacts from the EEG. If video data is available, it can be shown synchronized to the EEG traces. Sections of relevance are manually marked by the user and the relevant sections are archived for long-term storage.

Essential Performance

The medical device is intended to be used as a tool to aid diagnosis of neurological diseases such as epilepsy. It does not provide life-support functions or monitoring of vital physiological signs. The symptoms to be diagnosed and treated are not acute in the sense that delay in the measurement will not result in harm to the patient. However incorrect output from the device could lead to an inappropriate treatment that would present an unacceptable risk to the patient.

Therefore, the Essential Performance of the device is to deliver accurate data in the following ways.

- Correct analog processing, analog to digital conversion, digital processing and host communication.
- Correctly interface to the EEG amplifier and write the data to file.
- Correctly read the data from the previously written file.

- Correctly process the data according to the specification given by the operator.
- Correctly display the data according to the specification given by the operator.
- Associate the data with the correct patient.

Minimum System Requirements

Centrum and Review

The Centrum and Review client software is designed to run on a standard PC (desktop or notebook) with the Windows operating system. For faster processing and added ease, PC equipment such as a printer, video cards etc. can be added, however, only equipment approved by Lifelines ltd or Kvikna ehf may be connected to or fitted into the PC. This also applies to notebooks.

The client system requirements are as follows:

- Computer running Windows 8 or above.
- .NET 4.5 Framework (Full Version).
- Visual Studio 2010 & 2012 (x86) C++ Runtime Libraries.
- 1 GHz processor without video or 2Ghz with video.
- At minimum 20 GB free Disk Space.
- Broadband network connection (Upload: 5 Mbps, Download: 20 Mbps)
- 4 GB RAM
- Display with 1366x768 pixel resolution.
- Optional: Word 2013+ (Recommended for Reporting).

Compatible File Formats

Lifelines iEEG is compatible with the following file formats:

1. European Data Format .edf
2. NicoletOne (trademark Natus) .e and .eeg files.
3. ieeg and ieegz formats

Accompanying Documentation

Refer to these guides for installation of the software and server:

- Lifelines iEEG Admin Guide

- Lifelines iEEG Server Installation Guide
- Lifelines iEEG Client Installation Guide

Refer to these guides regarding these hardware components:

- Trackit Mk3 User Manual
- Lifelines Photic User Manual
- Lifelines R40 User Manual
- JNS Quick Guide
- Lifelines iEEG Clinical Assembly Guide

This Manual

This manual accompanies the system for easy reference. The system described in this manual describes the most extensive configuration and every option may not be configured on your system.

Concepts

Before delving into the details of each feature of Lifelines iEEG, here is a short description of some of the concepts and terms we will be referring to. Some of these are user interface items you will see as you begin using the software.

Visits

Patient Visits are managed automatically by the system. Users cannot specifically add, update or delete visits.

When a patient is admitted into the system, a new Visit is created and a new exam is initiated. Subsequent exams are added to the current visit if the user creating or importing them has full access to the visit. Otherwise a new visit is created. A visit is considered completed once all the exams contained in the visit have been archived. If the patient is readmitted after the visit has been closed, a new visit is created.

In short, each patient in the database can be associated with more than one visit, and each visit can contain several exams.

Patient Database

The Patient Database includes all available patients in the system, past and present plus their demographics. Patients are identified by a distinct Patient ID. The Patient Database is automatically searched when admitting a patient to the system, when importing an exam, and when reassigning an exam to another patient.

Exams

All information and collected data associated with a clinical test make one exam, including reports, external files and workflow state. Each exam is identified by a distinct Exam ID.

Workflow

Each exam type is associated with a customizable Workflow, which includes several stages beginning with Initiate and ending with Archive. The Workflow State refers to the step in the workflow that is in progress or most recently completed.

Permissions

Permissions are granted to patient visits by user group. Individual users can belong to more than one group. When a user admits a new patient or creates a new exam where a new visit is created, the current user's default group is given full access to the new visit. Users are only aware of groups they are members of, while administrators have access to all groups.

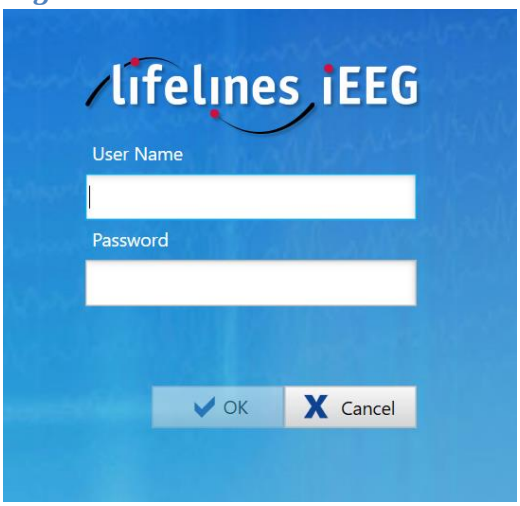
Centrum

Login

If more than one database is available, select a database then enter user name and password. Click OK.

Database Button

Login



After successfully logging in, your user name is stored and displayed in the user name field next time you log in.

> Note: If the server you attempt to connect to is a newer version than your client (but within the same major version), you will be prompted to upgrade. Click yes to download and install the new version.

Multiple Databases

> Note: Non-acquisition systems only

To add a new database, click the Manage Connections icon then click the Add button on the Connection List. Under Connection Properties, give the database a name, select the host type from the dropdown list and enter the host path. Enter the port number in the Port field. Click Save to add the database to the Connection List.

Add New Connection

You can also import a database. Click the Import button, browse for the database and click Open.

To delete a connection from the list, select it and press the Delete button.

Go back to the Login via the Login button on the top-left corner of the screen.

Back to Login

The User Interface

The main navigation of Lifelines iEEG Centrum is a row of tabs across the top of the screen. The tabbed pages are divided into panes by vertical dividers. The size of the panes can be adjusted, if necessary, by dragging the dividers to the right or left.

Update Available

If this button appears to the right of the main tabs, it means an update is available to the Centrum and Review software. Press the button to download and install the software.

Patient List

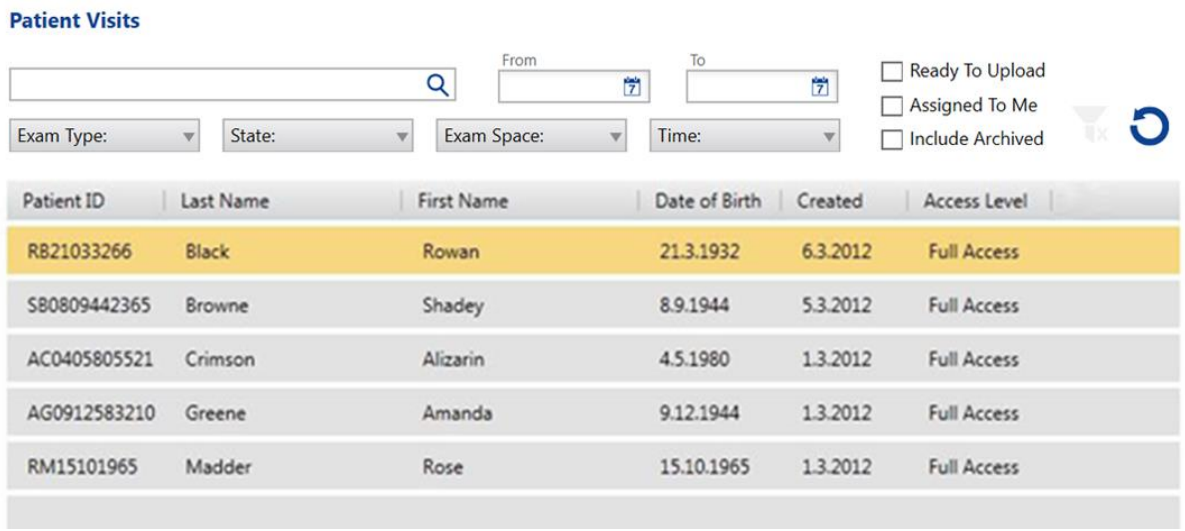
The Patient List tab is the main work area of iEEG Centrum and the first thing you see after logging in. Here you can search for patient visits, view and edit the corresponding patient and exam properties, and schedule new exams within a current visit. You can follow a workflow path associated with each exam, including launching external modality applications. You can also create and view reports or add imported documents to the patient visit. Read on for a detailed description of each section of the Patient List screen.

Patient Visits

The Patient Visit list shows a list of patient visits currently in progress. Click on a patient in the Patient Visit list to activate the Visit Properties on the right side of the screen. The Exam List

will pop out below the selected patient visit. The items on the Patient Visit list can be sorted by clicking on each list header, for example, sort by Patient ID or Last Name.

Patient Visit list sorted by last name



If the list is very large, it will be displayed in pages. Click the arrows or page numbers at the bottom of the list to scroll through the pages. If you want to change the number of exams that are displayed on each page, type a new number in the Items per page box.

Search

Begin typing a name or search phrase to narrow down the choices displayed on the Patient Visit list. It is possible to search by the following criteria: Patient ID, Social Security Number, Name (Last, First or Middle), Street Address, City, Zip Code, Patient Notes and Exam Notes.

Filters

You can also narrow down the search by selecting filter options. The filters can be used to display only patient visits containing exams of a specific exam type, in a particular workflow state, exam space, or within a certain time frame. Select specific dates by typing in the "from/to" fields or clicking on the calendars. Use the Assigned to Me, Include Archived, or Ready to Upload check boxes to further filter the Patient Visit list.

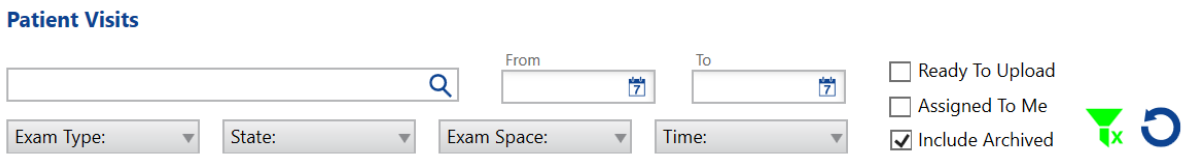
> Note: The system remembers the last used filters and keeps those settings until they are changed or cleared.

Refresh

Click the refresh button to make sure the list is always showing the most recent entries or changes.

Clear Filters

If you have filtered the search, the filter indicator will light up green, as shown below. Click the green indicator to clear all filters.

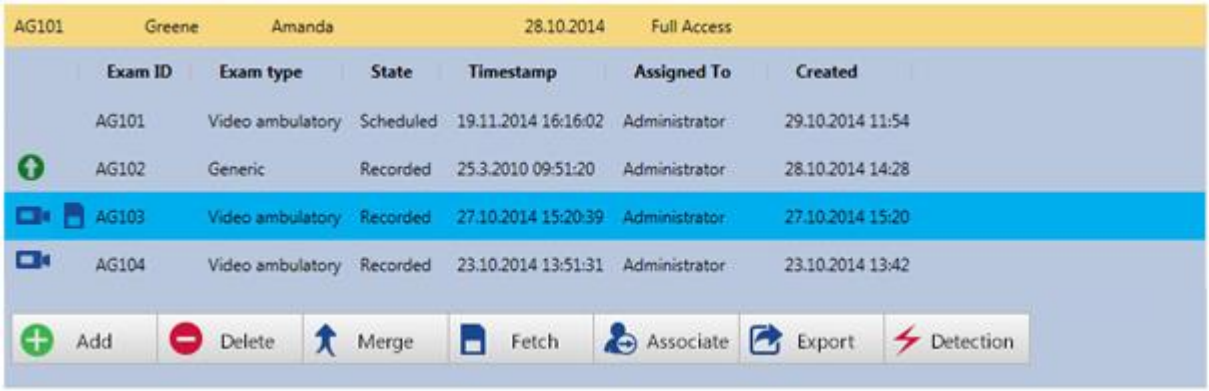


Exam List

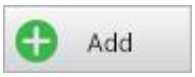
To display the Exam list, click a visit on the Patient Visit list to select it. The Exam list pops down under the patient visit. Select an exam from the list to reveal the exam properties and workflow associated with that exam, and also to activate the buttons described below.

Note: The buttons that appear will vary depending on the exam that is selected.

Exam List & Buttons



Add



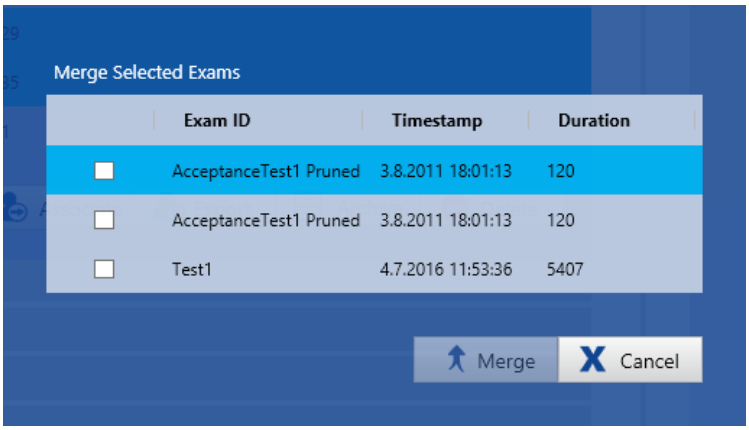
Initiate a new exam associated with the selected patient visit.

Delete

Delete the selected exam on the exam list.

Merge

Open a popup to select two or more exams to merge into one.



Fetch

The Fetch button is available when the exam has been recorded using the amplifier. Use it to fetch the EEG from the amplifier storage to the local iEEG database.

If the exam was recorded using dual storage mode (PC + Amplifier), then a new exam will be created on the exam list. Montage changes, events and video sync points are recalculated for the new exam.

Once the exam has been fetched, you can then upload it to the server (see next button, Upload).

Note: See the Acquire chapter, Setup section for more information about recording storage modes.

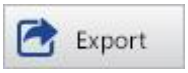
Upload

The Upload button is available when the exam is ready to be uploaded to the server.

Associate

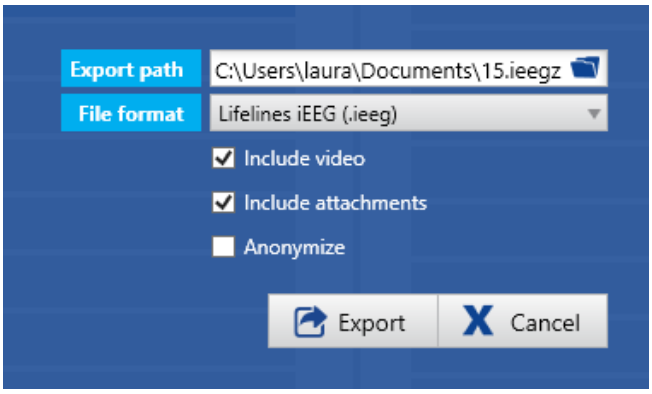
Associate the selected exam to another patient.

Export



The export button opens a dialog that allows you to choose the location of the exported file and the file format you want the exported file in (.ieeg or .edf).

If ieeg is selected, you can check whether you want to include video or attachments, unless you choose Anonymize. Then the video and attachments options are disabled. If edf format is selected, the exported file will be anonymous with no video or attachments so those options are disabled.



Archive

Archive the selected exam.

Seizure Detection

Perform spike and seizure detection on the selected exam.

Exam List Indicators

To the left of each exam on the exam list, you may see small icons indicating the following about the exam:

Exam is ready to be uploaded to server from this computer.

Exam is ready to be uploaded to server from another computer.

Upload is in progress.

Data is ready to be fetched from amplifier or CF card.

Data is ready to be fetched from amplifier or CF card of a dual-storage recording. A new exam will be created on the exam list.

Warning to archive exam.

Exam archive is overdue.

The exam has been pruned.

The exam includes spike and seizure.

The exam includes video.

Visit & Exam Properties

When a patient is selected from the Patient Visit list, the visit properties appear in the right-hand section of the screen, with the name of the selected patient appearing at the top. The visit properties consist of tabbed pages with information related to the currently selected patient visit. When an exam is selected on the drop-down exam list, additional tabs appear with information about that specific exam. These tabs are all described in detail below.

Patient Properties

The Patient Properties tab shows the patient demographics of the selected patient and the fields (besides ID) are editable. Upload a photo by clicking on the Upload Image rectangle and browsing for a photo. Be sure to click Save after editing.

Patient Properties

Patient Properties | Permissions | Reports | Exam Properties | Patient State | Exam History

Patient ID: QuickPatient_144
SSN
Salutation
Last Name
First Name
Middle Names
Date of Birth
Gender: Male Female Unknown
Hand Dominance: Left Right Unknown
Height cm
Weight kg
Gestational age 0 Weeks (at birth)
Street Address
City
Zip Code
Telephone
Mobile Phone
Email
Patient Notes
Clinical History

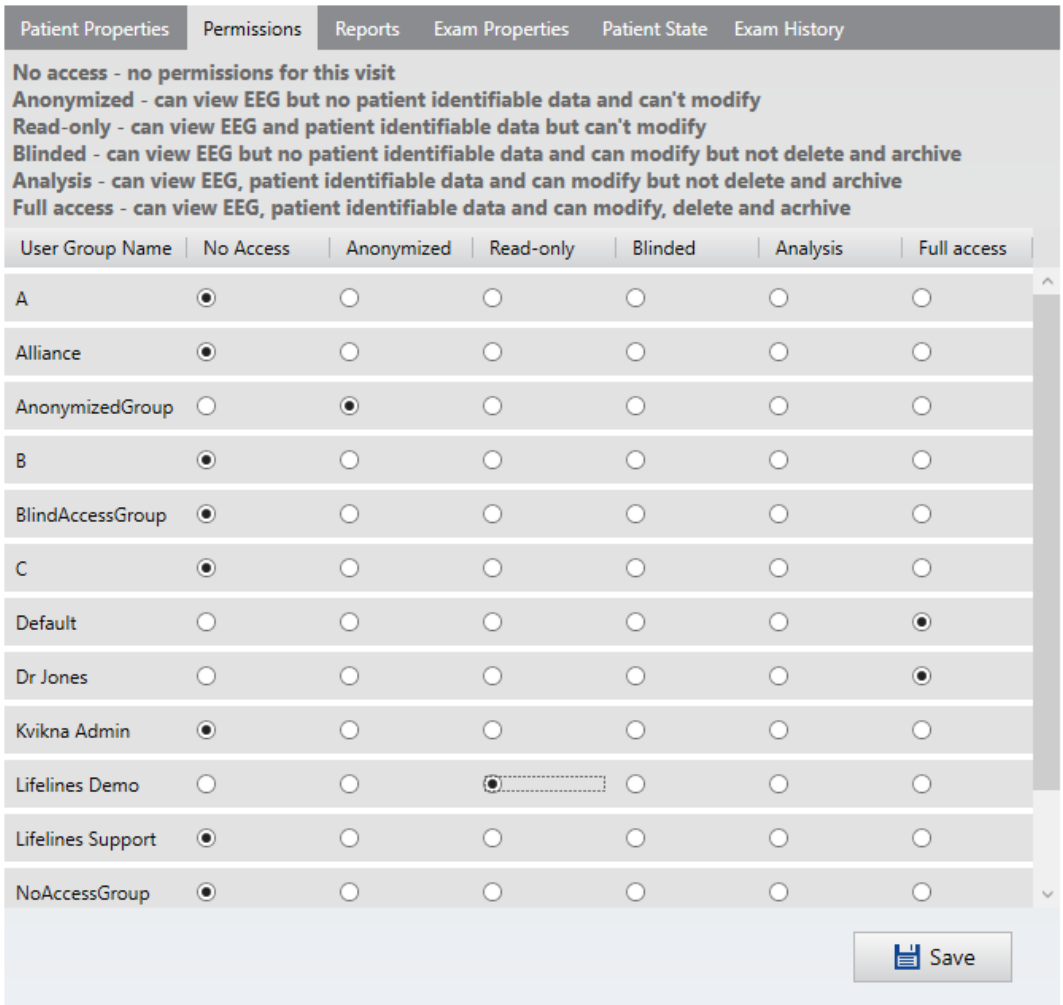
Upload Image

Save

Permissions

Use the Permissions tab to assign access rights to the selected patient visit. Access rights are assigned to user groups. When a user initiates a visit, the user's default group automatically gets full access to the visit.

Users with full access to a visit can give other user groups access to the visit. Be sure to click Save after changing or assigning permissions.



The permissions options are as follows:

Full Access: user can see and edit all patient and exam information, delete and archive.

Example: Technologists, technicians

Analysis: user can see and edit all patient and exam information, but not delete or archive.

Example: Doctors

Blinded: user can view EEG but no patient identifiable data. Can edit but not delete or archive.

Example: Research, pharmaceutical trials

Read Only: user can see all patient and exam information, reports and video, but not edit.

Example: Review for reference.

Anonymized: user can view EEG but no patient identifiable data and cannot edit.

Example: Educational, second opinions

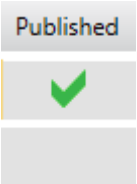
No Access: users with no access cannot see the visit.

See the Admin View > User Administration for information on creating user groups, assigning users to groups and selecting the default user group for each user.

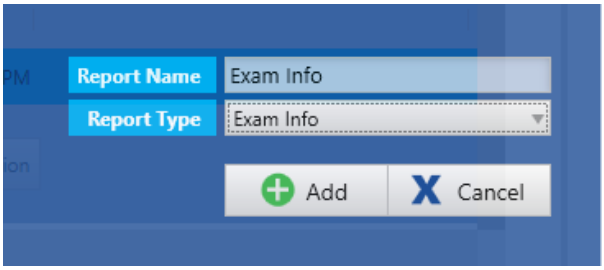
Reports

On this tab is a list of all reports and documents created or uploaded during every exam of the visit. Select a report from the list to open, publish or delete the report.

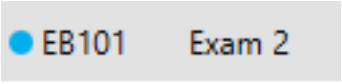
When an report is published, and new report is created and a checkmark appears under the Published column.



To create a new report, you must first select an exam from the Exam List. The report will be associated with that exam. Give the report a name, select the Report Type and click Add.



You can see at a glance which reports are associated with an exam by selecting the exam on the Exam List. All reports associated with the selected exam will be indicated with a blue dot next to the exam ID.



Exam Properties

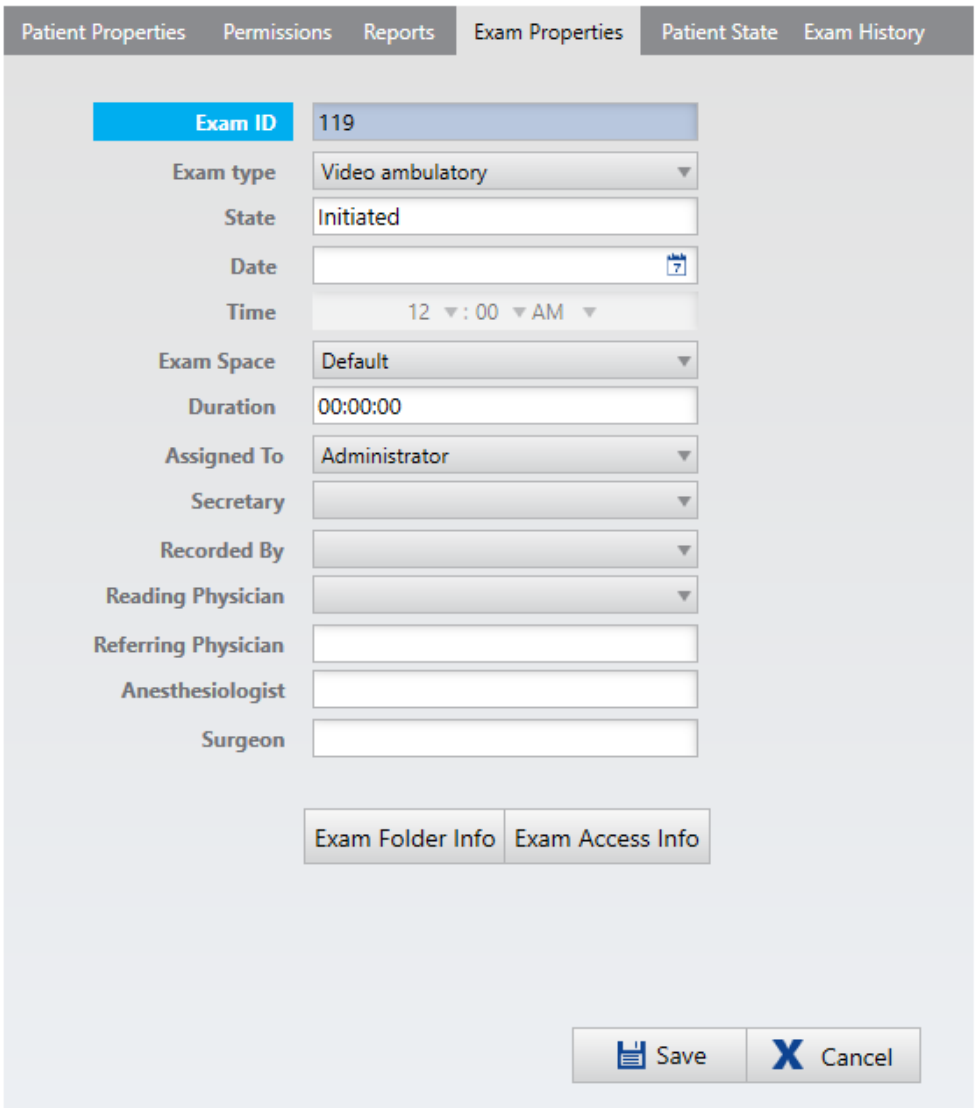
To display the Exam Properties you must first select an exam on the Exam List. The Exam Properties, Patient State and Exam History tabs are then displayed.

The Exam Properties tab shows information about the exam, such as exam type and workflow state (see image below). To edit the info, simply type in new information or make selections from the drop-down lists and then click Save.

Note: Not all fields are editable at all times.

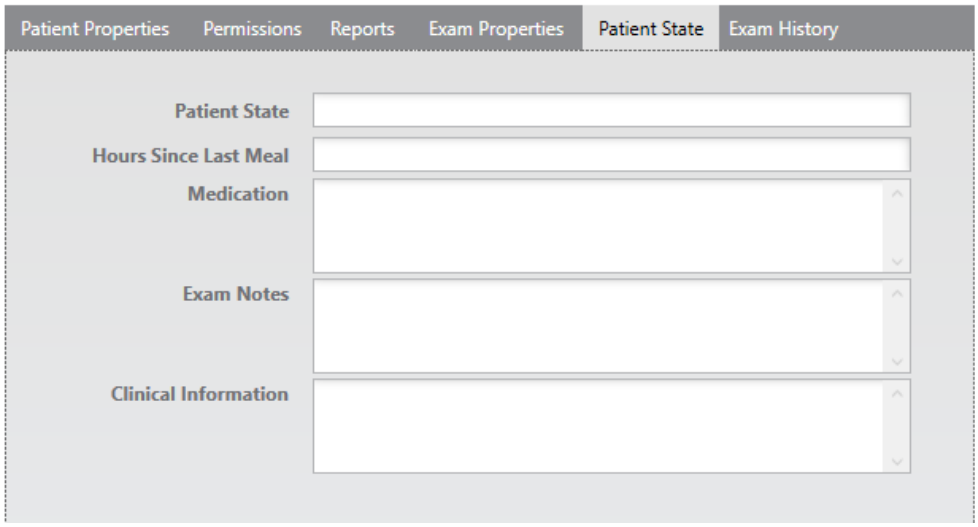
Note: The date and time may change between the scheduled and recorded states to reflect the actual time the recording was started.

Exam Properties



Patient State

On this tab you can enter information about the patient's state during the exam, hours since last meal, medication, notes, or clinical information. Press Save to save any changes.



Exam History

View the workflow history of the selected exam. This infomation is automatically generated and not editable.

Workflow

When an exam is selected on the Exam list, the workflow for that exam appears along the bottom part of the screen. The highlighted (yellow) button indicates the current state of the exam in the workflow. The next button in the row (blue) is an active button than can be pressed to perform the next stage of the workflow, although sometimes the system moves the exam automatically to the next state by an action performed elsewhere.

Moving Back a State

Sometimes it is possible to move an exam back to the previous workflow state, in this case, the previous state will become an active (blue) button. A popup window appears to allow you to confirm that you intend to move the exam to the previous state.

Below is a description of the default workflow states.

> Note: Custom workflow states can also be added to the workflow. See the Definitions>Modalities section under The Admin View in this manual.
>
> Also note that while Prune is available as a default state, it is optional.

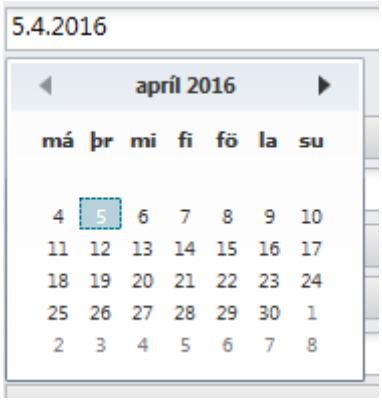
Workflow Buttons

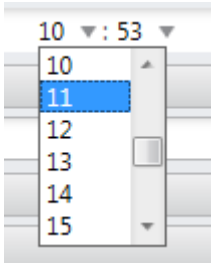
Initiated

When a new patient is admitted or a new exam is created, it is in the initiated state and the Initiated button will be highlighted in yellow. The Scheduled button then becomes active.

Scheduled

Press the Scheduled button to schedule the exam. The system automatically schedules the exam to the current date and time. The Date and Time fields of the exam properties become editable if you want to schedule the exam to a later date and time.





Recording

When the exam has been scheduled, you can click the Recording button to launch the modality application associated with the Exam Type selected when the exam was created. The associated modality is defined under Admin>Definitions>Exam Type.

The workflow state is now “Recording” and is highlighted yellow.

You can also start the recording in Acquire, and the exam will be moved automatically to the Recording state.

Note: It is not possible to start another acquisition until the current one has completed.

Recorded

After the exam has finished recording, it is automatically moved to the Recorded state.

Uploaded

If your recording modality has been set to automatic upload, the exam moves to the Uploaded state after it has been uploaded to the server. If you have selected to manually upload the exam after recording, the you will manually upload either by pressing the Uploaded workflow button, or by pressing the Upload button on the Exam List.

You can set the Server Upload Mode to Online or Manual on the Setup tab of Acquire. This must be done before starting the recording.

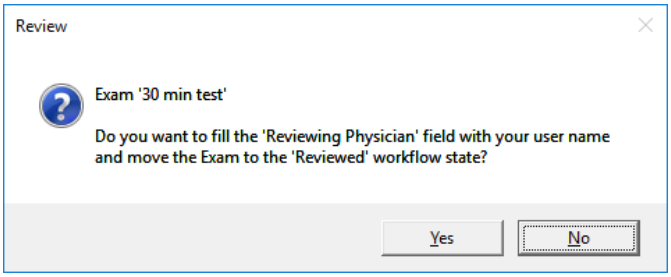
Pruned

After the exam has been pruned, press Pruned to move it to the Pruned workflow state.

Note: This workflow state is optional

Reviewed

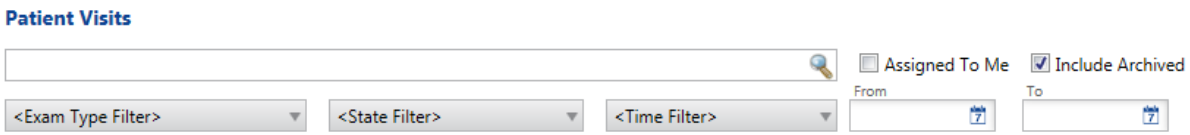
Press the Reviewed button to review the exam and mark it as Reviewed. When you close the exam after reviewing, a popup appears so you can confirm that you want to move the exam to the Reviewed workflow state and fill the Reviewing Physician field with your user name.



Archived

For an exam to be archived, it must be moved to the Archived workflow state, either by pressing the workflow button, or the Archive button on the exam list (see Exam List, above). Doing so finishes the workflow for the exam.

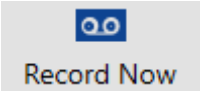
The exam data is then moved to the archive path and the exam is no longer visible on the Exam List unless the 'Include Archived' box is checked.



Note: Archiving can take up to a couple of hours and you can review the progress on the Processing tab.

Record Now Button

Record Now Button



The Record Now button is located to the right of the workflow and allows quick launch of the recording if necessary even before the exam has been scheduled. This method of starting the exam also moves the workflow state to Recording.

Review Button

Review Button

Once the exam has reached the Recorded state, the Review button replaces the Record Now button to the right of the workflow bar. If you are recording locally, you can begin Reviewing the exam while recording.

> Note: Using this button to review the exam will not move the exam to the Reviewed state. To move the exam to the next state, you must open the exam using the Reviewed button on the Workflow Bar.

Remote Review

For non-local recordings, if Online Server Upload Mode has been selected in Acquire setup, you can begin to review the exam in near real-time while it is being recorded. Otherwise, you can begin review after the exam is recorded and transferred to the server.

> Note: Remote review requires the optional Online Networking license.

Reviewing an Archived Exam

You can review an archived exam, but it will be a read-only version of the exam and changes will not be saved. After reviewing, the local copy is deleted but the archived copy is untouched and can be retrieved again at a later time.

Restore Archived Exam

To restore an archived exam back to its unarchived state, press the previous workflow button on the workflow bar. A popup dialog appears asking you to confirm that you want to go back to the previous workflow state.

Changes can now be saved to the exam, but the archived copy is now invalid and the exam must be archived again.

Note: It is recommended to use the Restore option only if the exam was archived by accident before the final review was completed.

Control Button

Remote Control

Press the Control button to open an in-progress remote recording. The exam is opened in Acquire Pro with all of the features of a locally recorded exam, with the exception of photic control. See the Acquire Pro chapter for details on using Acquire Pro.

Note: Remote control requires the optional Online Networking license.

Patient Admission

Use the Patient Admission tab to enter a new patient into the database, and also to start a new patient visit or initiate a new exam with an existing patient.

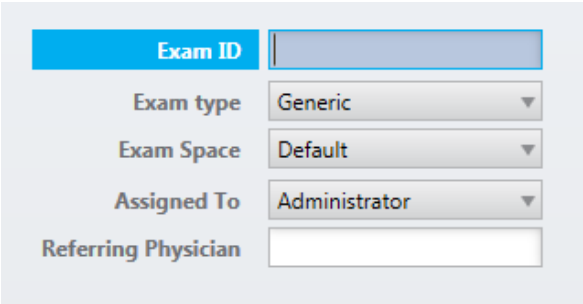
Begin by typing a name or Patient ID into the spaces provided under Patient Properties and the system searches the Patient Database for matches. The Patient Database is shown next to the Patient Properties form.

New Patient

If no match is found, continue entering information and click Save to add the patient to the database. You can now enter an Exam ID under the New Exam area of the screen and click Initiate to initiate a new exam. A new patient visit is added to the Patient Visit list on the Patient List tab.

Note: Both the Patient ID and Exam ID are required fields.

New Exam



Existing Patient

If a match is shown on the list in the Patient Database, click the entry to select it and the rest of the Patient Properties will be filled in. Enter an Exam ID under the New Exam section and click Initiate to initiate a new exam. If the patient already has a visit in progress, the exam will be added to that visit which appears on the Patient Visit list on the Patient List tab. If the previous patient visit has already been archived, a new patient visit is created when you initiate the new exam.

WARNING: It is important to enter the correct ID associated with the patient so exams can be interpreted correctly.

Import

Import makes it possible to import exams recorded on another device into the system. They are then converted into the native format so they can be edited, pruned, etc.

Go to the Import tab to select a file for import. Click the file folder icon to browse for the file.

> Note: Pressing the Import workflow button will also take you to the Import tab for exams initiated on the iEEG system.

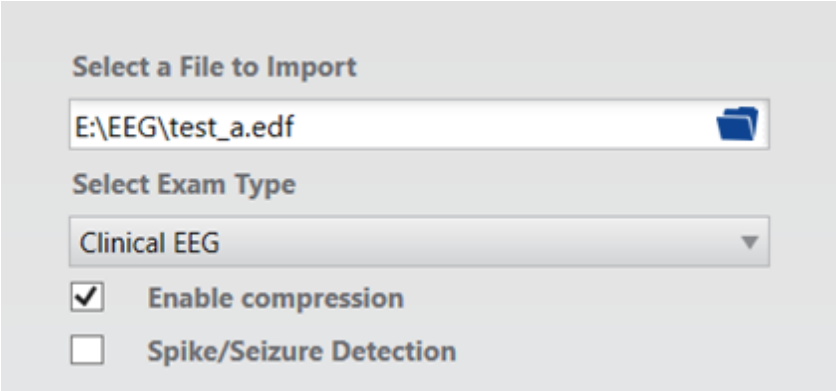
Select the exam type if it is not already selected.

Check “Enable compression” if you are on a slower connection. This will compress the EEG and video files before transferring to the server.

If Spike & Seizure Detection (Persyst) integration is installed on the iEEG Server, check “Spike/Seizure Detection” to run the seizure detection algorithm as a part of the import process. System detected events will be inserted at the top of the channel chart where the system has detected seizure and will also appear on the Event List.

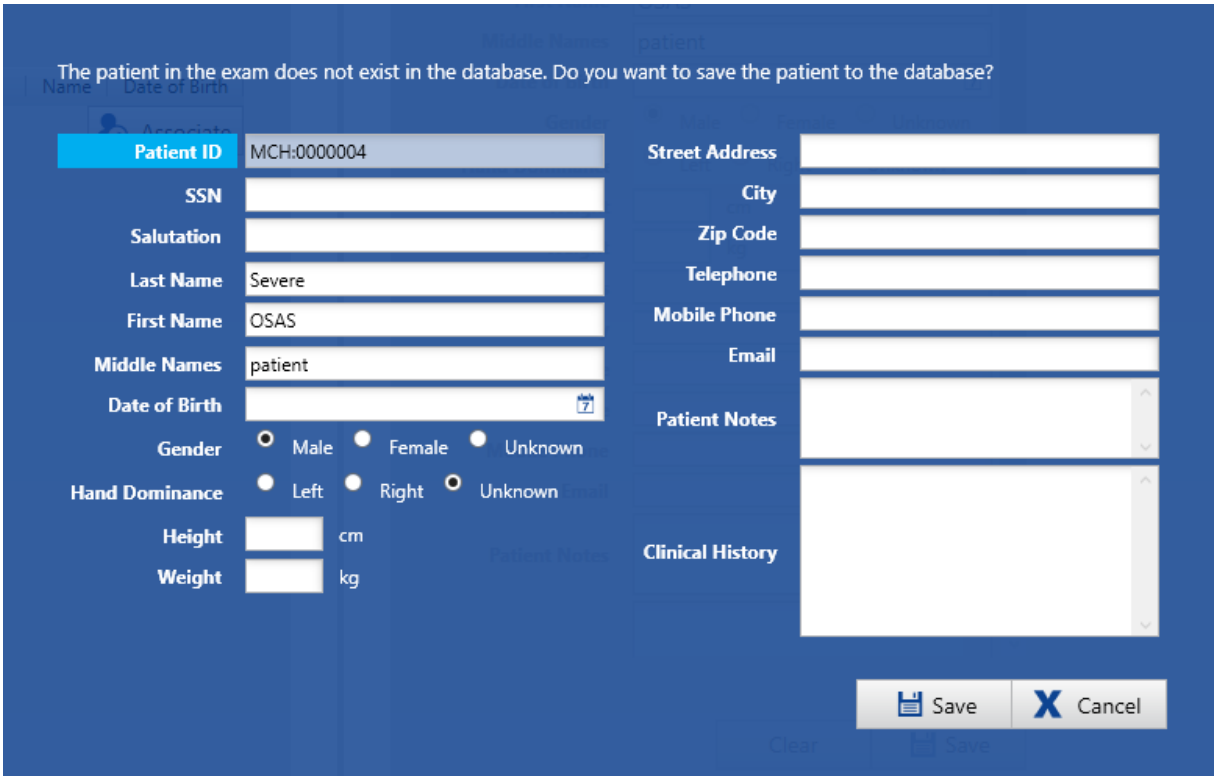
WARNING: The Persyst User Manual must be read before using the Spike & Seizure Detection feature.

Browse to import an exam on the Import tab



If the patient information associated with the file is not already in the database, the following popup dialog appears asking if you want to save the information to the database. Fill in the appropriate information and click Save.

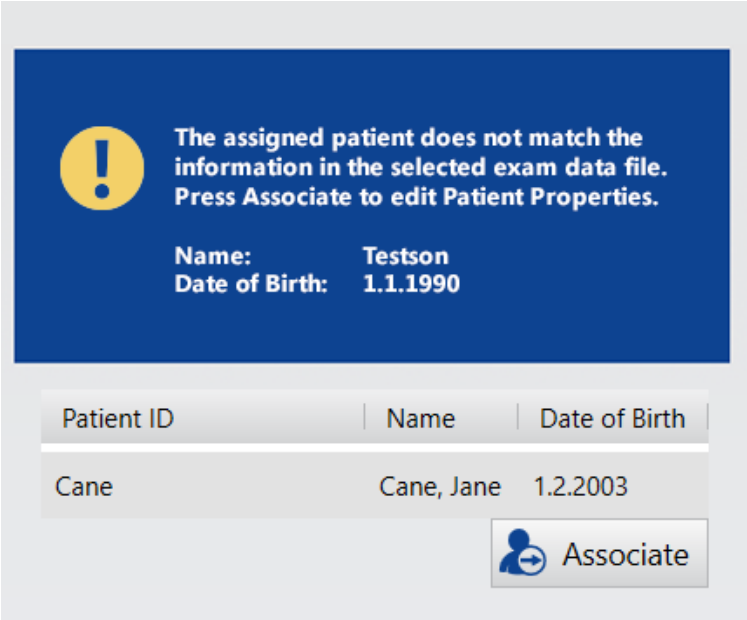
Save to Patient Database Dialog



Associate

If there is no patient information included in the file, or if you need to reassign the exam to another patient, click the Associate button.

Associate Warning



Enter the patient information under Patient Properties. If matches are found, suggestions will populate the Patient Database list shown below the patient information. Select a patient from this list and the rest of the info will be filled for you. Click Save.

WARNING: It is important to enter the correct ID associated with the patient so exams can be interpreted correctly.

Permissions on Import

If you want to override the default permissions, you can assign permissions to the selected exam before importing. Click the Permissions button to open a popup window to select the permission level for each user group.

Import Button Bar

See a description of the permissions levels under Patient List>Visit Properties.

Preview

Click the Preview button to open the data file in a simple viewer if you want to view the EEG before importing.

Prune before Import

While previewing the exam, it is possible to use the prune events to import a pruned version of the exam. Insert prune events at the desired locations and click Import in the top left corner. This will close the preview and prompt you to import either the pruned or full exam.

Caution should be taken when initiating a prune operation to ensure that the correct and accurate data is transferred and/or stored on the server.

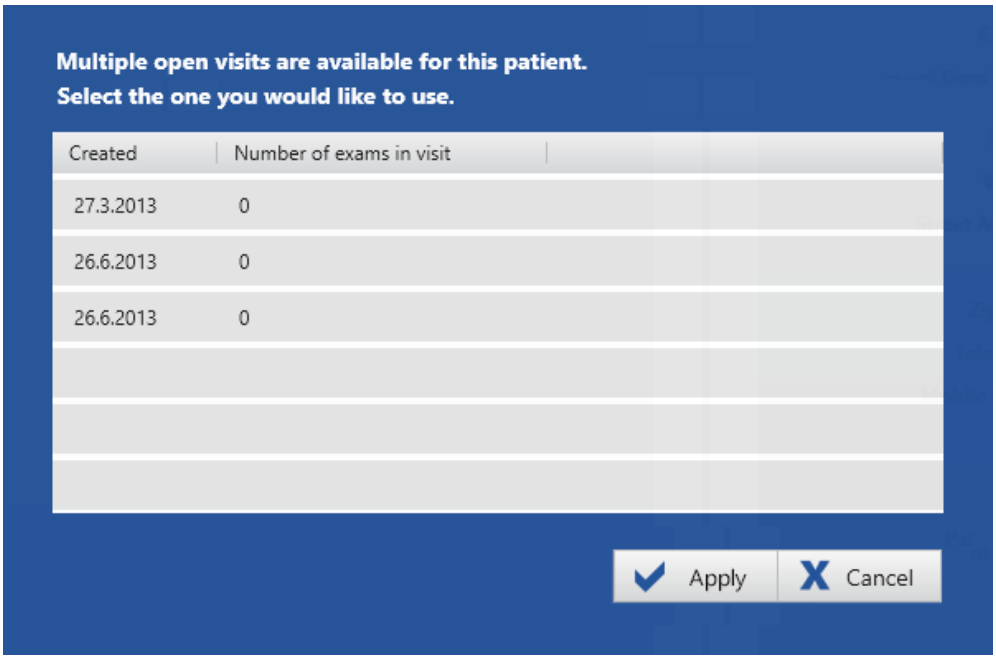
Exam Properties

When importing from the Import tab, it is possible to change or add to the current exam properties by typing in new information before clicking Import.

Patient Visit

If a current visit exists for the patient that is not read only and that the current user has full access to, then the exam is associated with that visit. Otherwise, a new visit is created.

If more than one open visit exists for the patient, the following window will pop up prompting you to select the visit you want to associate with the exam.

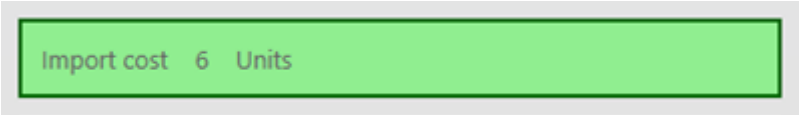


See the section Intro>Concepts>Visits near the beginning of this manual for more information about the meaning of Patient Visits.

Import Cost

The import cost appears above the row of buttons before importing.

> Note: this does not include the cost of running spike and seizure detection even though this option is selected.



Progress

The importation can take some time depending on the size and complexity of the file. You can monitor the progress on the Processing tab.

Processing

On the Processing tab, you can monitor the progress and results of processes such as file importation, video encoding or archiving, to name a few.

The left side of the screen shows the progress of each action with a progress bar, and the right side of the screen shows the results of the process. The progress bars on the right side of the screen are color coded to match the results, which are also printed in text above each bar along with the process type, file name, and time and date stamp.

Green = the process completed successfully.

Yellow = the process completed with warnings.

Red = the process failed.

Blue = the process was cancelled.

Completed processes

Buttons

Click the x box of any progress bar while processing to cancel the process.

Click the circular arrow icon to retry a failed process.

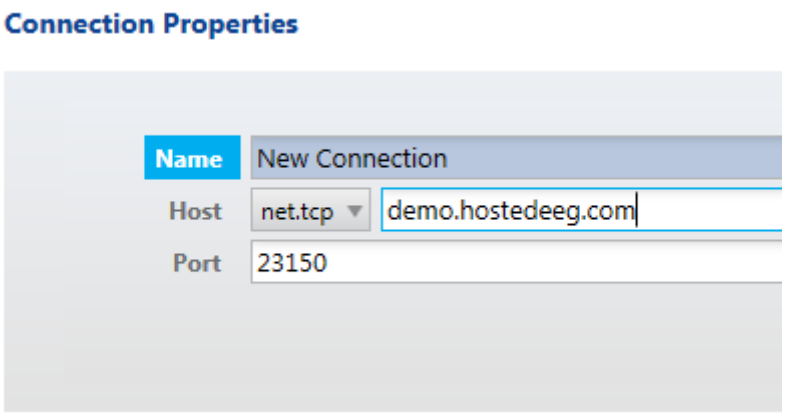
Click the i icon for additional info (if available) about the process.

My Settings

Connection List

Here you can add or import new database connections. Click the Add or Import button and type in a name and path for the database under Connection Properties. (If importing, the path will be filled in already). Select between net.tcp and https from the combobox.

Connection Properties



Click Save and the database will be added to the Connection list and will then be available when logging on to the system.

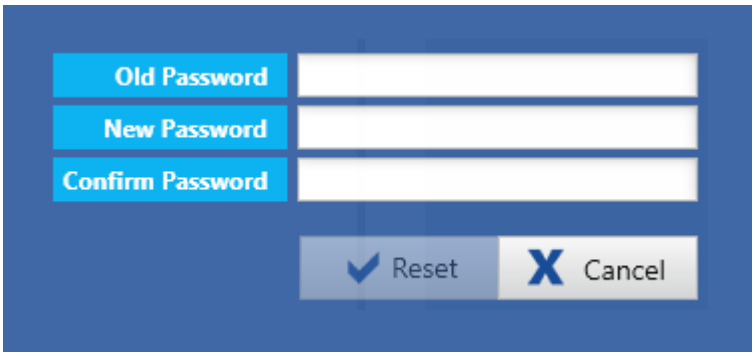
Select a database from the Connection list and click Delete to remove the database from the list.

Note: Multiple databases is only supported on non-acquisition systems.

Settings

Change

Change password



Click Change Password to change your password. You will be asked to type in your old password, a new password and your new password again to confirm. Click Reset to complete the process.

Language

Choose your default language from the drop-down list.

System Font

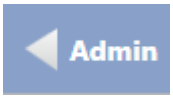
The ability to choose a system font becomes available if your default language requires a special font.

The Admin View

If you have administrator access rights, you will see the Admin button on the top-left corner of the screen, next to the tabs. Click this to display the admin tabs. When you are in admin view, the button on the top-left changes to Patients, to take you back to patient view.

The following sections describe the various features available on the Admin tabs and how they work.

Admin Button



Admin Tabs & Patients Button

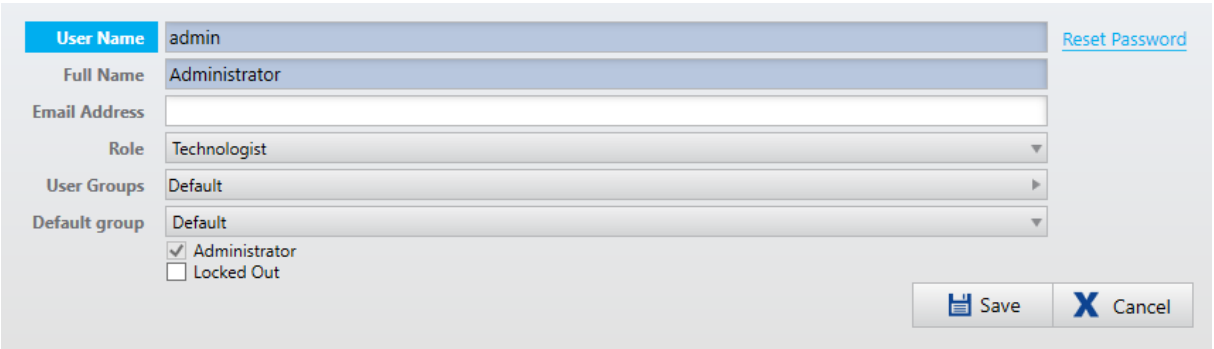
User Administration

Access to the Lifelines iEEG system is password protected. Only defined Users have access to the system. Users that have administrative privileges can manage user accounts.

Add Users

Before adding users to the system, you first need to add some User Groups and Roles to associate with the new users. See the User Group and Roles sections below if you have not already added user groups and roles.

To add a new user, click the Add button under the Users section of the Users tab, then fill in the information in the form that appears below. The email field is optional, but the rest of the fields are mandatory. Note that users can belong to more than one user group. Users (besides administrators) are only aware of user groups they belong to.



If a user belongs to more than one user group, you can select the user's Default Group. That is the group that gets full access to new exams the user creates.

If you want the user to be an administrator, check the Administrator box. Administrators have access to the Admin tabs and can edit everything in there, and they also have full access to all visits and user groups. Administrators are marked with a green A on the Admin column of the Users list.

To lock a user out of the system, check the Locked Out box. Locked out users are indicated by a lock icon in the Locked Out column of the Users list.

When all mandatory fields have been filled in, the Save button becomes available. Clicking it opens a password dialog box. Enter and confirm the password and click Reset.

The new user is now ready. You can add as many users as you want and it is possible to modify their properties afterwards, except for the User Name.

Search and Filter

Use the Search box to filter the Users list by text string. Select an option from the 'Filter by user group' drop-down list to filter by a specific group or show users from all groups.

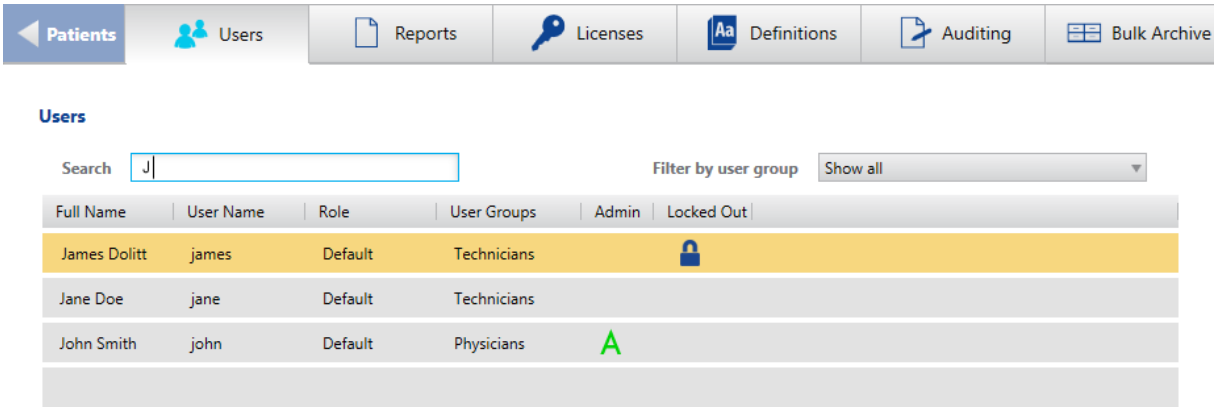


Image shows the Users list filtered by the letter J.

User Groups

Permissions are granted to patient visits by User Groups. To create a user group, click Add on the User Group tab under Settings on the Users tab. Type in a name for the user group and click Save. You can add as many user groups as you want and you can change their names afterwards.

Roles

To add a new role, click Add on the Roles tab under Settings on the User Administration tab. Type in a name for the role and click Save. You can add as many roles as you want and you can change their names afterwards.

Password Policy

On the Password Policy tab, you can set requirements for passwords such as minimum number of characters, or whether a certain number of special character, numbers or capital letters are required. Click Save to save the changes.

Reports

Lifelines iEEG offers the ability to create custom Word report templates to allow different reports for different exam types. The custom report templates are then available for selection when adding a new report to an exam.

Associate Workflow State

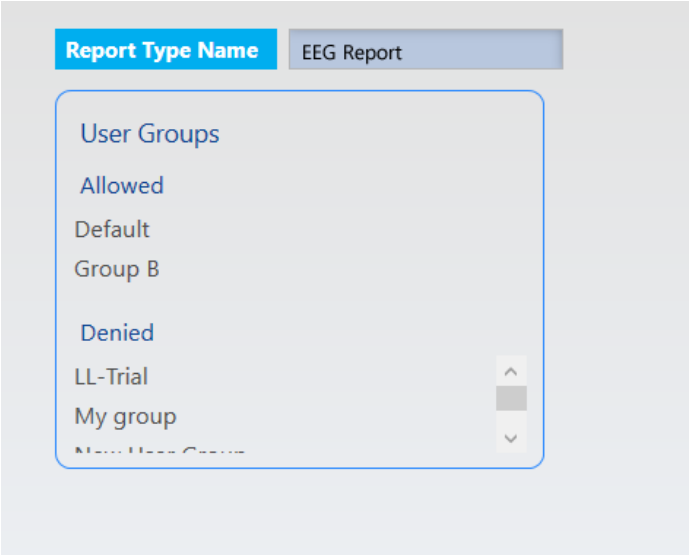
It is also possible to associate a report template with a specific workflow state of an exam type. Then the associated report template pops up automatically when the exam reaches the specified workflow state. (See Definitions > Exam Types to do this.)

Associate User Group

In addition, you can choose to associate user groups with a report type. Then, only members of allowed user groups (as well as administrators) will see and have access to those report types. To do so, select the report from the Report Template list to show the allowed and denied user groups below. Double-click a group from the denied list to add it to the allowed list. Double-click a group from the allowed list to remove it.

Report Templates

Name
EEG Report
Exam Info
Blank
Ambulatory

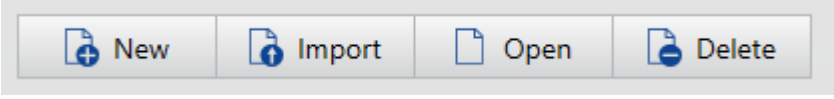


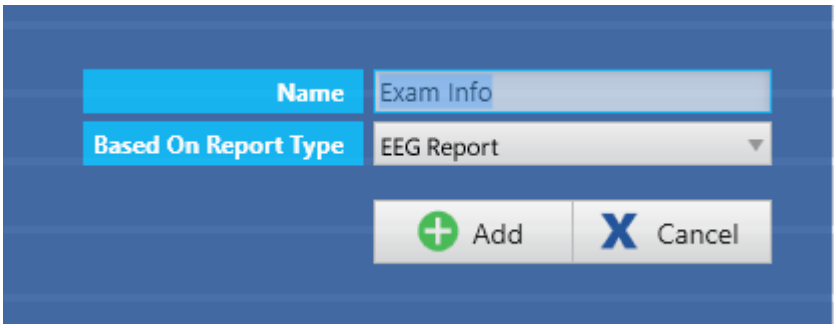
Create a Word Report

In the iEEG installation wizard, there is an option to set up the iEEG Report tab in Microsoft Word. This option is checked by default, but if for some reason you cannot install this add-on, you can still create Word reports using the second method described below.

Method One - With the iEEG Report Tab add-on installed

Click the New button to open the new template popup. Give the new template a name and select whether you want to base the template on another template, or start from a blank document. Click Add and the report template is added onto the Report Template list and Word is launched.

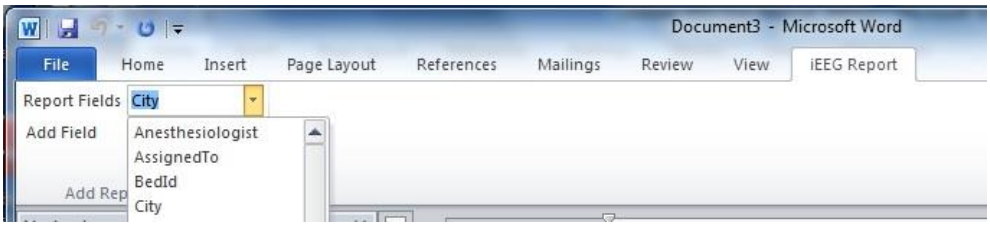




Edit the document just as you would any other Word document by inserting and formatting text, pictures, tables, checkboxes, etc.

You can even include macros in your report template. This could be used, for example, to populate a field based on previously provided information.

To generate the required fields from the iEEG system, insert fields from the iEEG Report tab. Select the field you want from the Report Fields list and click Add Field. These are the fields that will be filled in automatically by the iEEG system when you add the report to an exam.

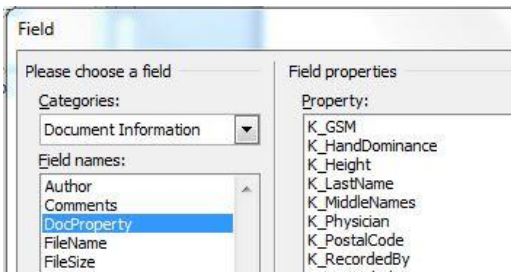


Save the document and your template is now available for selection when adding a new report to an exam. (See the section Patient List > Reports and Documents).

Method Two – Without the iEEG Report Tab add-on installed

If you did not set up the iEEG Report Tab in Word during the iEEG installation process, you can still insert the required fields by following these steps:

1. Click New to create a new template either based on the default template or a blank one.
2. Edit as desired.
3. To insert the required fields, choose Quick Parts > Field on the Insert tab.
4. Then select the category Document Information and the field name DocProperty in the Field popup.
5. You now have a list of field properties that you can insert into the template. The fields beginning with K_ are the field properties from the iEEG system. These were copied temporarily into Word when you opened Word from the iEEG system.
6. Save and close the template.



Edit an existing Template

Select a template on the Report Templates list and click Open. Make the changes you desire then save and close the document.

Import

You can also open a Word document independently of the iEEG system, save it locally and close it. You must then import the document into the system. To do so, click the Import button, browse for the template you created and click Open.

Licenses

On the License tab, Administrators can check the number of cost units for each service, as well as Order History and Usage.

Click an item on the Order History list to display an order summary report which can be printed by clicking the Print button. Click the arrow on the right of the Order Overview bar to close the report.

The Usage list can be filtered by dates using the interactive calendars.

Usage

Show usage from 2/1/2016 To 2/29/2016

Description	Exam ID	Patient ID	Name	Units	Date	User
Import exam (22 ch, 0 hours)	98-002	MP40267	Patterson, Marion	6	20.9.2013 10:21	Administrator
Import exam with video (25 ch, 0,41 hours)	1234-12	AG55123	Greene, Amanda	9	19.9.2013 16:55	Administrator
Import exam with video (25 ch, 0,41 hours)	1234-12	JB46554	Browne, Jackson	9	18.9.2013 17:10	Administrator

Definitions

Exam Types

You can define your own Exam Types and assign a custom workflow to each. To do so, click the Exam Types tab under the Definitions header on the Definitions tab.

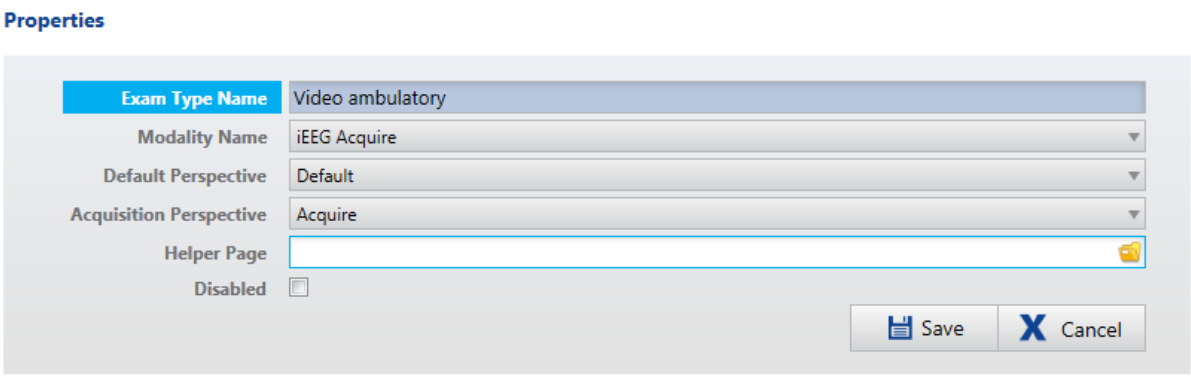
Click the Add button.

Enter the exam type name in the Exam Type Name field. Select the modality from the Modality Name list and the Default Perspective you want associated with that Exam Type.

Helper Page

The Helper Page option is for Acquire users to be able to create and upload their own custom help page to be displayed on the Acquire Help tab with each exam type.

The helper page needs to be in .xps format. This can be easily created in Word by choosing Save As and selecting XPS Document as the type. Browse for the file using the browse button on the Helper Page text box.



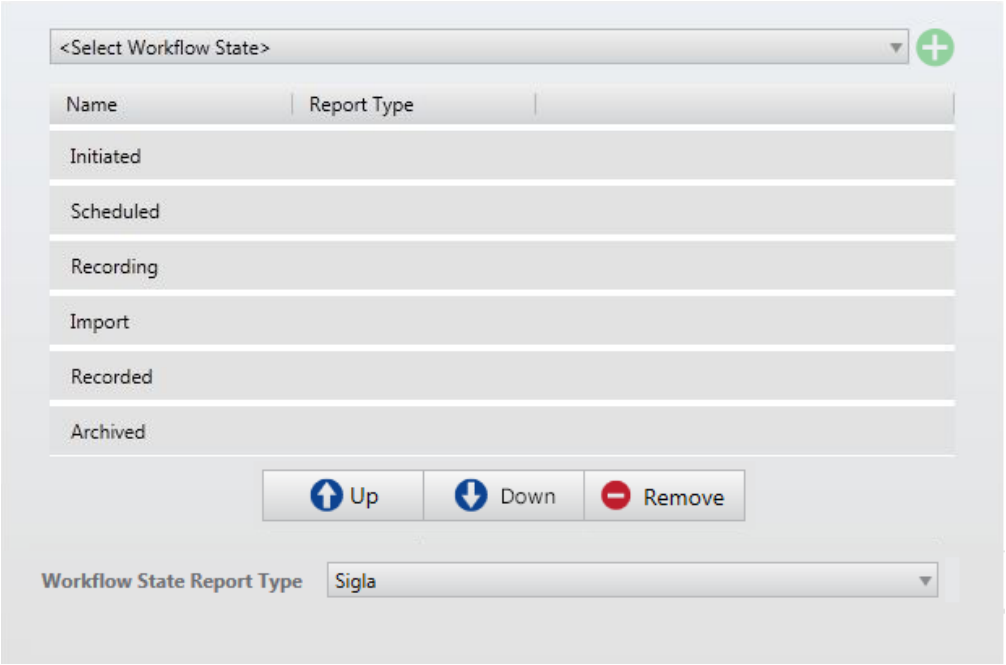
Disable Exam Type

If the Disabled box is checked, the exam type will not be available for selection when adding a new exam.

Click Save to create the new Exam Type, which will now appear on the Exam Types list.

Edit Workflow States

With the exam type selected on the Exam Types list (on the left), you can now edit the workflow states (on the right).



The predefined workflow states are included and they cannot be modified or removed. It is however possible to add user-defined workflow states to the exam type. Select the desired workflow state from the Select Workflow State list and click the Plus button.

The workflow state is added to the list of workflow states and it can be moved up, down or removed using the controls.

Note that some of the predefined workflow states are fixed so user-defined workflow states cannot be added before, after or between them.

A workflow state report type can be added to a workflow state. Select the workflow state then select a report type from the drop-down list. The associated report template pops up automatically when the exam reaches the specified workflow state.

You can add as many exam types as you want and their properties can be changed afterwards.

Exam Types	Modalities	Exam Space	Workflow States
Exam Type Name	Modality Name	Default Perspective	Disabled
Generic	Lifelines Trackit	Default	
NicOne	NicoletOne	Default	
Video ambulatory	iEEG Acquire	Default	

Modalities

Before you can initiate a recording of data from the system you must set the modality application used to acquire the data.

Go to the Modalities tab under Definitions and select one of the applications from the list on the left.

On the right side of the screen, click the browse button for the Recording Application.

Modality Properties

Properties

Modality Name	iEEG Acquire Pro
Recording Application	C:\Program Files (x86)\Kvikna ehf\Lifelines iEEG Acquire 2.x\ie
NicOne Recorder	☐ Check here if the selected recording application is NicOne recorder
Trackit Plus Recorder	☐ Check here if the selected recording application is Trackit Plus recorder
RecArea Registry Key	
RecArea Registry Value	
Exam Data File Extension	
IRecorderCommunicator Assembly Name	
IRecorderCommunicator Class Name	

Check the correct recording device. Click Save. The modality is now set.

Exam Space

Hospitals are equipped with many devices. The ability to track which device was used when recording an exam can be simplified by defining exam spaces. Exam spaces can be room numbers, bed numbers, device numbers, etc.

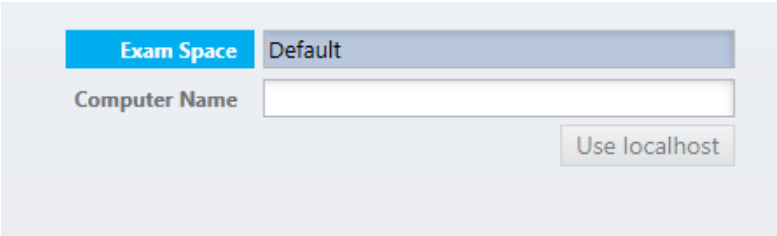
On the Exam Space tab under Definitions, click Add.

Enter a name for the new Exam Space (or bed).

Default Exam Space

It is possible to specify a computer name for a selected exam space. Then when a new exam is created, the default exam space (or bed) is the exam space that is associated with the computer creating the exam.

The computer's short name is sufficient. It is also possible to click the Use Localhost button which then generates the fully qualified name of the current computer.



Click Save.

You can add as many exam spaces as you want and their properties can be changed afterwards.

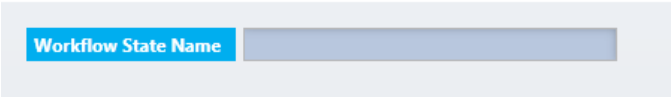
Workflow States

You can create custom workflow states which can then be selected when associating a workflow to an Exam Type (explained above).

Click Add on the Workflow States tab under Definitions.

Enter a name for the workflow state under Properties.

Click Save.



You can add as many workflow states as you want and their names can be changed afterwards.

Auditing

All user actions that deal with patient data are logged to an audit trail. Administrators can view the audit trail via the Auditing tab.

Under the Search section, you can narrow down the search results by User, Date, Category and Action. Click the Search button to perform the search. The results appear on the right part of the screen. Click Copy to Clipboard if you want to paste the results into an Excel or Word document.

Bulk Archive

The bulk archive feature makes it possible to archive multiple exams at once. Select a date on the calendar to show exams that should be archived by that date. Click Select All or Select None at the bottom of the list, or use the Shift or Control keys to select multiple exams. Then press the Archive Selected button.

Acquire Pro

Acquire Pro allows the acquisition of up to 40 channels of EEG, as well as synchronized digital video from one or two cameras. It is optimized for clinical use on desktop or laptop systems for all your routine and bedside recording needs. It includes a protected bedside mode feature so the device can be taken to another location and left unattended for longer recordings.

Launching iEEG Acquire Pro

After logging in, you are presented with the Acquire Pro interface, which is navigated by a series of buttons at the top of the screen.

Exams

The first screen is the Exams screen.

> Note: If you have launched Acquire Pro from Centrum, you will skip this step and go directly to Setup.

Exam List Tab

Select an exam from the exam list. If the amplifier has already been connected, you can begin recording immediately by clicking the Record Now button. Otherwise, proceed to the Setup page by clicking the Setup button at the top of the screen.

If you begin recording without selecting an exam, a 'Quick Patient' exam is started. You will be prompted to associate the exam with a patient when you stop the recording.

Check the 'Assigned to Me' or 'Only This Exam Space' checkboxes if you want to filter the list.

Patient Admission Tab

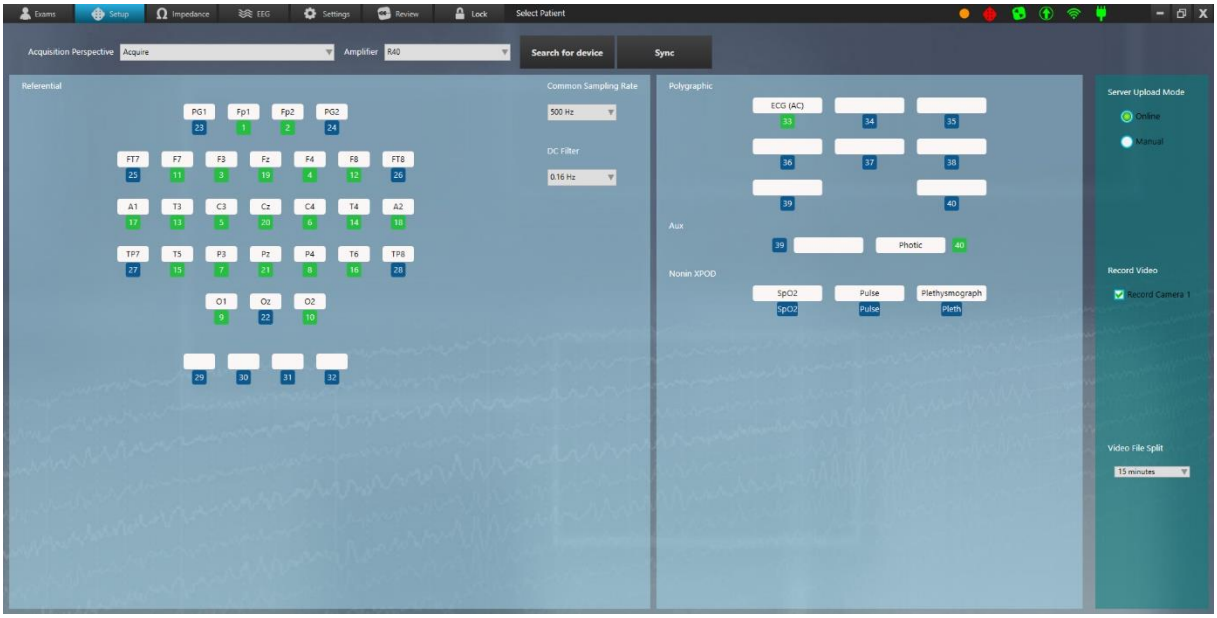
On this tab, you can enter a new patient and/or initiate a new exam, just as you would in Centrum. If the patient is already in the database, begin filling out the Patient Properties form and a list of possible matches will appear in the Patient Database section. When you see the patient you want, click on it to select it. If the patient is a new Patient, click Save to save the patient into the database.

You can then initiate an exam by entering an Exam ID in the New Exam section. Confirm Exam Type, Exam Space, Assigned to, Referring Physician (optional) and click Initiate. The exam will now appear on the Exam List tab.

Properties Tab

Access the patient and exam properties of the selected patient on this tab. You can also edit the information here or add patient and exam notes.

Setup

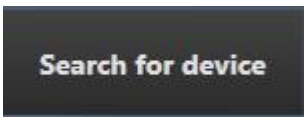


Select Perspective

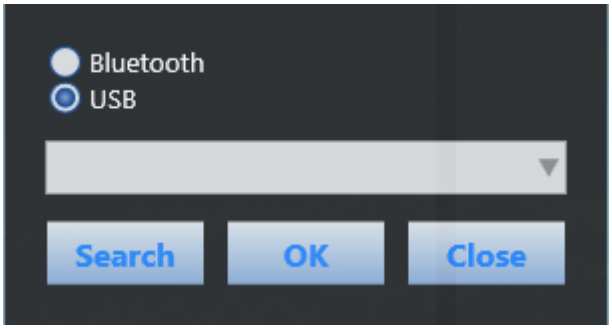
Select the Acquisition Perspective from the drop-down list. The amplifier associated with that perspective will automatically be selected on the Amplifier list, but you can change this if you need to.

Search for Device

Press Search for Device to open the Search popup.



Select Bluetooth or USB (make sure the USB cable is connected if you choose that option).



Press Search to populate the list with available devices and select the one you want. Press OK.

Sync Perspectives

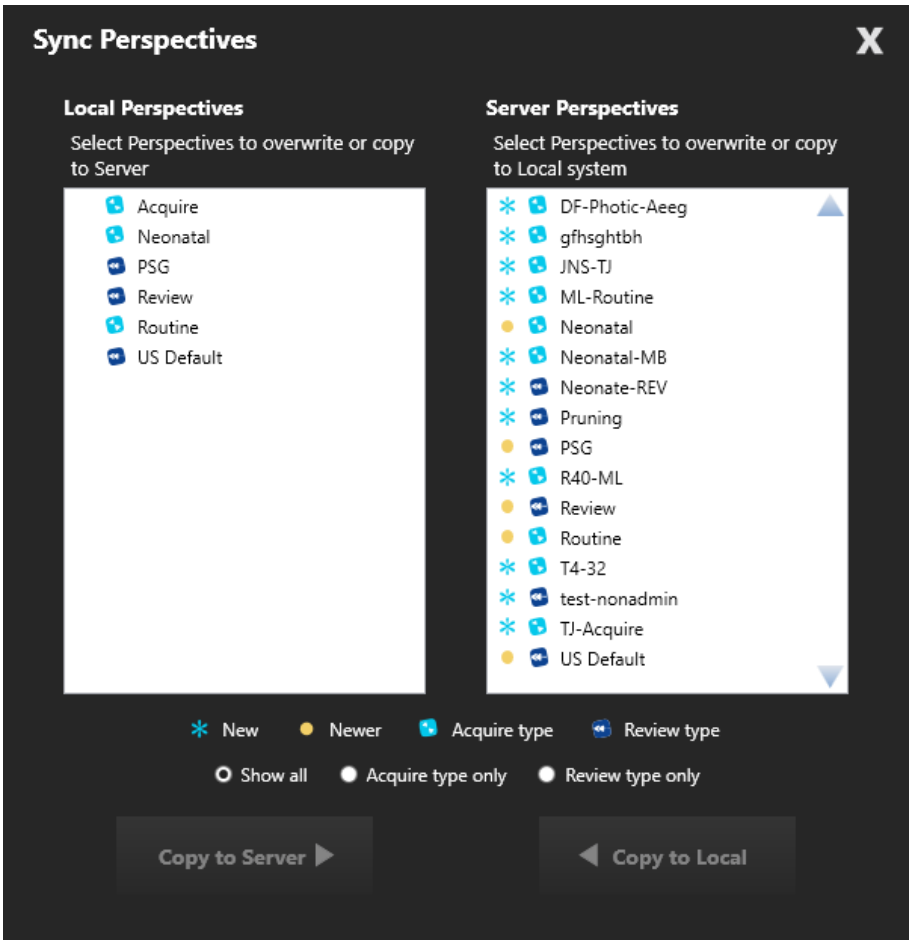
Select perspectives from the Local column that you want to sync to the server. Then press Copy to Server. If a perspective with the same name already exists on the server, you will overwrite it with the one you are copying.

Select from the Server column to sync to the local perspective. Press Copy to Local. You will overwrite local perspectives with the same name. If a perspective with the same name already exists on the locally, you will overwrite it with the one you are copying.

A blue star (asterisk) appears in front of a new perspective that only exists in that location.

A yellow dot indicates that the perspective is newer than the one with the same name in the other location.

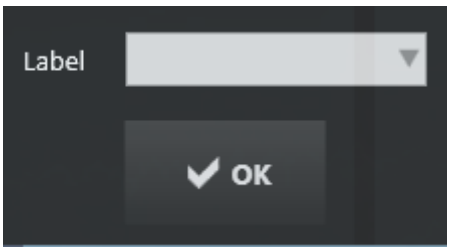
The perspective type is indicated by a small Acquire or Review icon.



Channels

Press the input number to toggle a channel on or off – green indicates on, blue indicates off.

Toggling a blank channel (or pressing the white label) will display the input settings popup. Choose the desired label and press OK.



Common Sampling Rate

Select the sampling rate to be used for all channels.

DC Filter

Choose on or off.

Server Upload Mode

Choose Online to have the data uploaded automatically during recording, or Manual to upload after the recording is finished.

Record Video

Select the cameras you want to record from. Unchecking both disables the Video buttons on the sidebar of the EEG screen.

Video File Length

Select the duration of each video file upload to the server.

Save, Apply, Discard

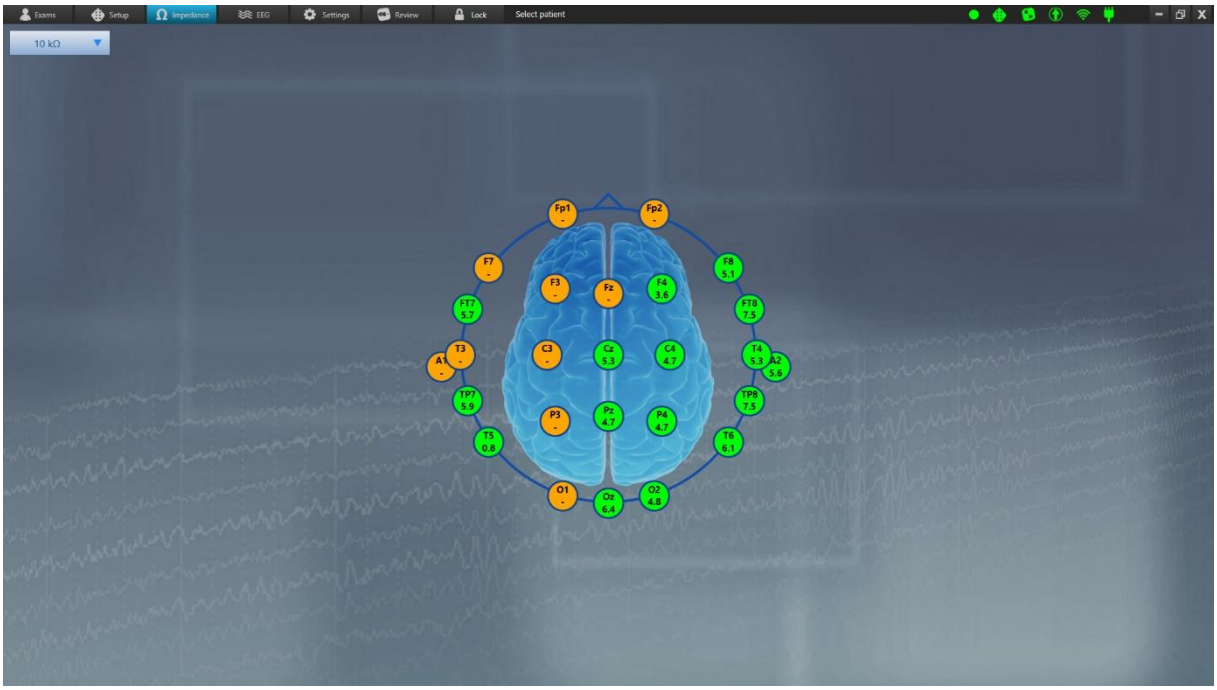
Press Save to save any changes to the perspective.

Press Apply to apply the changes prior to starting the recording.

Press Discard to cancel any changes.

Note: These actions cannot be carried out during a recording session.

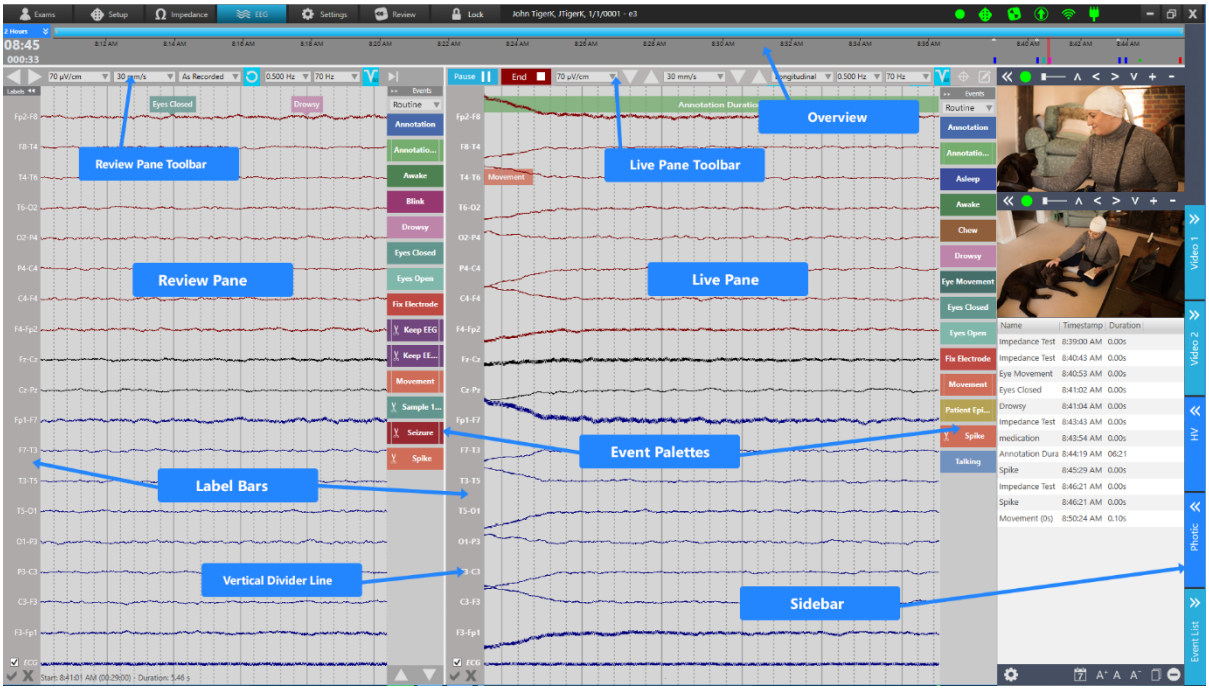
Impedance



Check the impedance on this screen. Select the threshold level from the dropdown list. The green color indicates that impedance is within the selected threshold. The color changes to orange when the impedance is above the selected threshold.

Note: The Impedance button is disabled if the amplifier is not connected and turned on.

EEG



The EEG screen is the main screen of Acquire Pro. It is here that you can follow the recording and live video, add events, change filters and parameters, and perform hyperventilation and photic tests. The following sections describe the various parts of the interface and their functions.

Live and Review Panes

The screen is divided into the live pane on the right and the review pane on the left. To adjust the size of the panes, grab the white vertical divider line and drag it in either direction. On the review pane, you can scroll back and forth through the parts of the exam that have already been recorded. Each pane has its own toolbar for changing parameters and an event palette for adding events. They also each have a label bar where individual channels can be selected for changing parameters.

Live Pane Toolbar

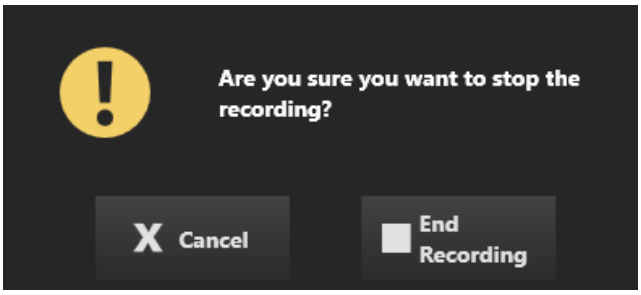
The live pane toolbar contains buttons for starting and stopping the recording, as well as tools for changing parameters and adding note during the recording. Below is a description of these buttons and tools.

Start/Pause Recording

To start the recording, press the Record button. It changes to a Pause button in case you need to pause the recording.

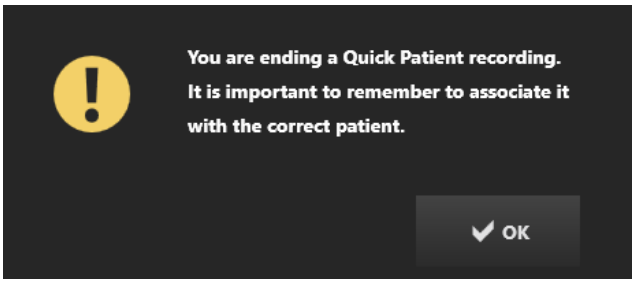
End Recording

The End button ends the recording completely, without closing the Acquire application.



Quick Patient Prompt

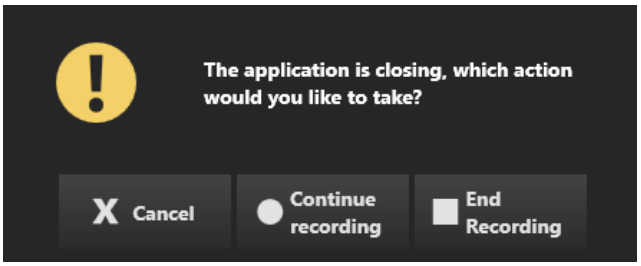
If the recording was a Quick Patient recording, you will also be prompted with a reminder to associate the exam with the correct patient.

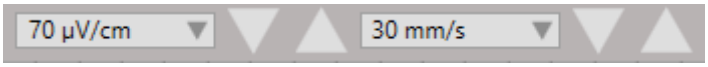


Close Application

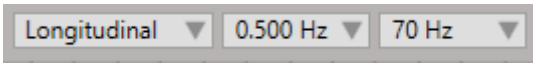
Closing the application is performed by using the Close X in the upper right corner.

You are given the choice to end the recording, continue recording or cancel.





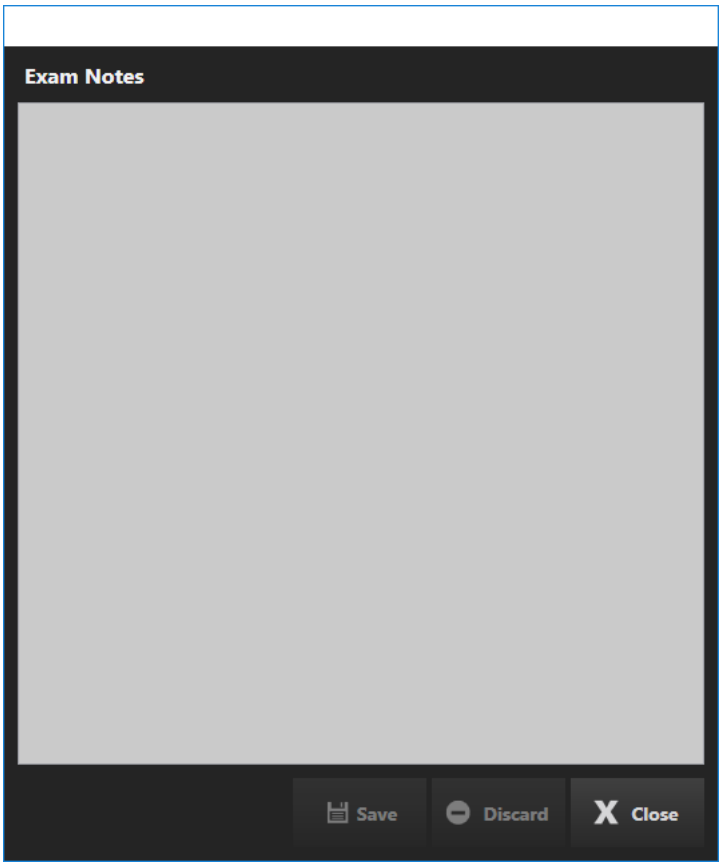
The next two controls on the live pane toolbar are to change the sensitivity and paper speed. You can do this by using the drop-down lists or by pressing the down/up arrows to the right of each control to change the values a step at a time.



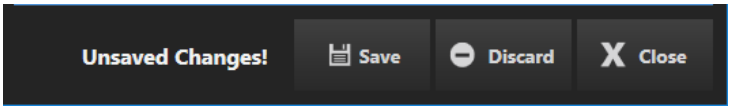
Next come controls to select the montage, low-cut filter and high-cut filter.

After that are the notch filter and calibration buttons, which can be toggled on or off. (The Notch filter is shown toggled ON in this image).

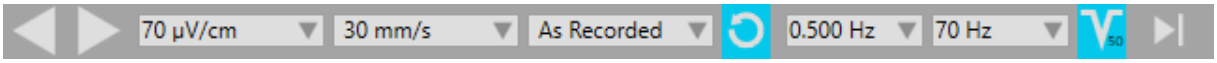
The last button is the Notes button. Press this to open the notes window. Enter notes and press Save to save the notes to the exam properties.



A warning will appear when you have unsaved changes:



Review Pane Toolbar



The toolbar controlling the review EEG pane is similar to the live pane toolbar, with a few variations. From left to right the controls are: paging buttons, forward and back, sensitivity, paper speed, montage selection, reset to the "As Recorded" montage, high-cut filter, low-cut filter, notch filter and the "go to end" button which will take you immediately to the current page of the recording.

> Note: The Go to end button also snaps the Zoom bar to the right of the Overview, which locks it into displaying the most recent duration. See the Overview>Zoom Bar section of this chapter for more information.

Event Palettes

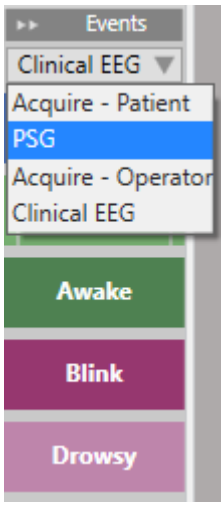
There is an event palette located to the right of both the live and recorded EEG panes.

Hide/Show

You can hide or show either palette by clicking the arrow at the top of the palette.

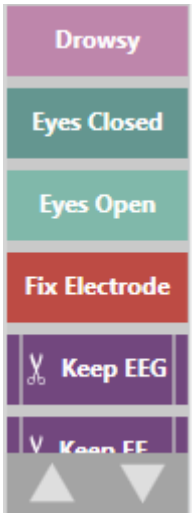
Switch Palettes

Use the drop-down list to quickly switch to another palette set.



Scrolling

Use the up and down arrows at the bottom of the event palette to scroll palettes which contain too many events to fit on the screen.



Placing Events

To place an event in the **live pane**, simply click the event in the live palette and it is automatically inserted at the current position.

To place an event into the **recorded pane**, you click on the event in the recorded event palette once to select it (it will be highlighted with a yellow outline), and then click on the recorded pane at the place you want to insert the event.

To place duration events in the **live pane**, click once on the event at the time of insertion, and again at the time the event ends. For the **recorded** pane, click once to select the event, then click on the recorded pane where you want the event to begin and again on the recorded pane where the event should end.

More Information

Please see the Event Palette section in the Review chapter for more detailed information about types of events: duration, annotation, contect, numerical and prune.

Creating Events and Palettes

For information on creating and customizing events and event palettes, see the Settings chapter.

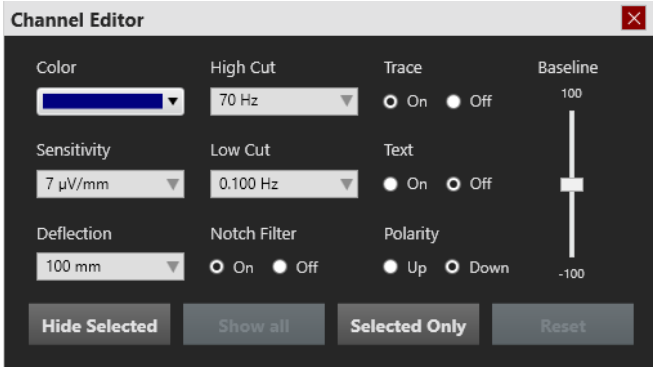
Label Bar

There is a trace label bar located to the left of both the live and recorded panes. You can select one or more channels by clicking on the label and then change a number of display settings or filters on those channels.

To easily select or deselect all channels, use the checkmark and X buttons located at the bottom of each label bar.

Hide/show the label bars by clicking the double arrow button on the label bar header.

Special Channels



Right-click on one of the selected channels to open the Special Channel popup. You can then change the color of the trace, sensitivity, deflection, filters, display type, polarity and baseline position by using the corresponding controls. You can also choose to hide the selected label(s) or display only the selected labels(s). Click Show All to show labels that you have previously hidden. Click Reset to remove the special channel settings from the selected labels.

A checkbox appears in front of the label on special channels. Unchecking the box resets the settings for that channel only.

> Note: These settings are applied but not saved unless you save them on the Montage tab in the Settings.

Sidebar

A vertical toolbar located on the right edge of the screen has interface items and tools that you can hide or show by clicking on them.

The Video and the the Event List will appear docked in a palette to the left of the toolbar. You can also choose to pop those tools out into resizable, floating windows which can be dragged to any position on the screen. To do so, click the left chevron icon at the top of the Video or Event List. Click the close X to redock the window to the palette.

Video

When video is recording, the green indicator will be on. To pause the video recording, click the indicator to turn it off, as shown below:

Click again to toggle video recording back on.

Use the slider bar to adjust the speed of the pan-tilt-zoom controls. The arrow buttons are used to pan and tilt the camera, and the plus and minus buttons will zoom the image in and out.

Note: The video tabs are unavailable if you don't have the video license.

Photic

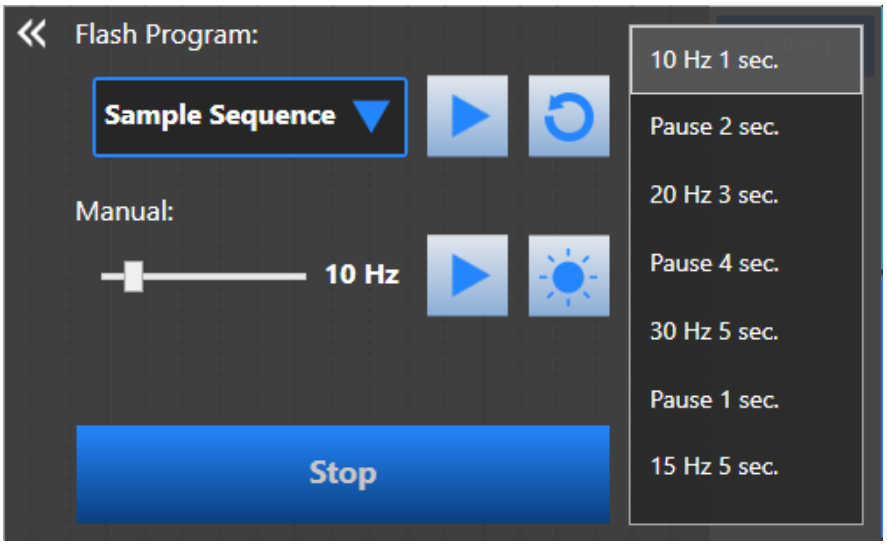
Before using the photic tool, be sure to change your recording montage from the default to Input.

Select a pre-configured Flash Program from the drop-down list. Press the arrow button to start the sequence. The button changes to a Pause button so you can pause or resume the sequence at any time. Click the reset button to reset the sequence at the beginning. The list on the right shows the progress of the sequence as it runs.

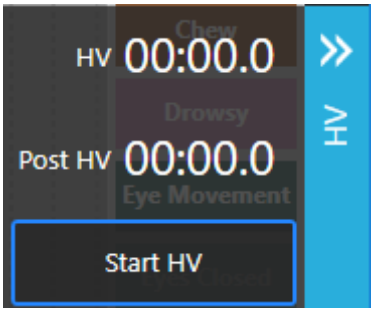
To start the photic manually, choose a frequency on the slider bar and press the arrow button to the right of it. Press the large blue button to stop.

To produce a single flash, press the button with the sun icon.

The large Stop button stops the photic immediately, regardless of whether you are using manual or program mode.



Hyperventilation



Press Start HV to start the hyperventilation timer. The button changes to Post HV, which you can press when you want to start the post hyperventilation timer. The button then changes to Stop HV which stops the timer. Finally, it changes to Reset so you can reset the times to zero.

Event List

The Event List displays a list all of the events in the exam by name, timestamp, and duration. Click on any event in the list to go to that event on the Review Pane.

Sort the list by name, timestamp or duration by clicking on the headers.

Change the font size of the list by clicking the font size buttons at the bottom of the list.

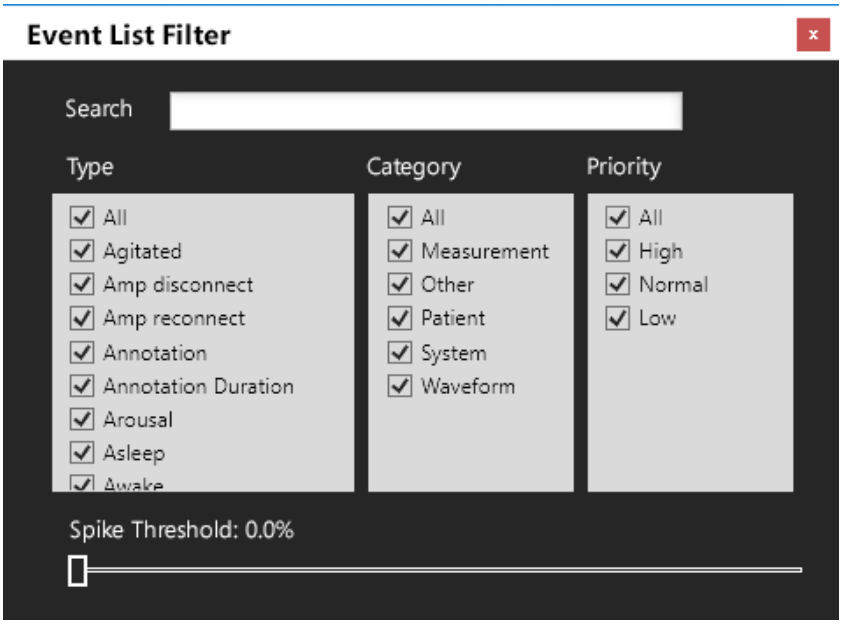
Click the Copy Events to Clipboard button and you can then paste the list, including all columns, to an Excel or Word document.

Click the Delete button to delete selected events, both from the list and the Review Pane.

To select multiple events, select an event, then hold down the control key while selecting additional events. To select consecutive events, select the first event, then hold down the shift key while selecting the last event in the row. All of the events in between will also be selected.

Name	Timestamp	Duration
Impedance Test	8:39:00 AM	0.00s
Impedance Test	8:40:43 AM	0.00s
Eye Movement	8:40:53 AM	0.00s
Eyes Closed	8:41:02 AM	0.00s
Drowsy	8:41:04 AM	0.00s
Impedance Test	8:43:43 AM	0.00s
medication	8:43:54 AM	0.00s
Annotation Dura	8:44:19 AM	06:21
Spike	8:45:29 AM	0.00s
Impedance Test	8:46:21 AM	0.00s
Spike	8:46:21 AM	0.00s
Movement (0s)	8:50:24 AM	0.10s

Event List Settings



Click the gear icon on the bottom of the Event List to open the Event List Settings. Check all the events you want to appear on the list. Use the search field to search for an event type.

If the Persyst seizure detection is enabled, you can filter spike events by confidence threshold using the slider.

The filtered results are reflected on the Overview and Review Pane as well as on the Event List.

The events are arranged in columns by type, category and priority. Check or uncheck the “All” checkbox to select or deselect all events in the column.

Overview

The Overview is located above the Channel Chart and provides a visual representation of the duration of the exam.

Timeline

Tic marks on the timeline show evenly spaced intervals. The actual interval depends on the length of the exam. You can click anywhere on the timeline and the Channel Chart will display that page on the Review pane.

Current Page Marker

A red, translucent marker indicates where the currently displayed page of the Review Pane is located on the timeline. Hover over the red marker to see a tooltip with the current page’s start time and date.

Segment Breaks

Segment breaks in a recording are indicated on the timeline with small white triangles.

Event Overview

Events are indicated on overview as small, vertical bars in a brighter shade of the color of the event marker, except for Duration Events, which appear as horizontal bars for the length of the duration. Click on any event on the overview to go to that event on the Review pane.

Video Overview

If video is present in the exam, a dark red bar appears in the overview. A second video appears in dark blue. A continuous bar indicates that video is present during the entire recording. Breaks in the bar indicate breaks in the video.

Zoom Bar

The Zoom Bar is located at the top of the overview. Its purpose is to be able to zoom into a long timeline so you can see the overview more clearly. To zoom in, drag either the left or right end of the zoom bar to shorten it. The zoom bar then works a bit like a scrollbar. You can move the zoom bar to the right or left to show later or earlier parts of the timeline.

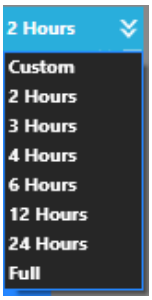
Paging on the Review Pane while you are zoomed into the timeline will cause the zoom bar to move so that the red current page marker is always visible.

When the zoom bar is moved all the way to the right, it "snaps" in place and will continue to display the most recent duration of the recording until you unlock it by dragging it to the left.

> Note: Paging back on the Review pane can also unlock the zoom bar if you page back to a point preceding the current duration.

Zoom Duration

Use the drop-down menu to select a set duration of the overview.



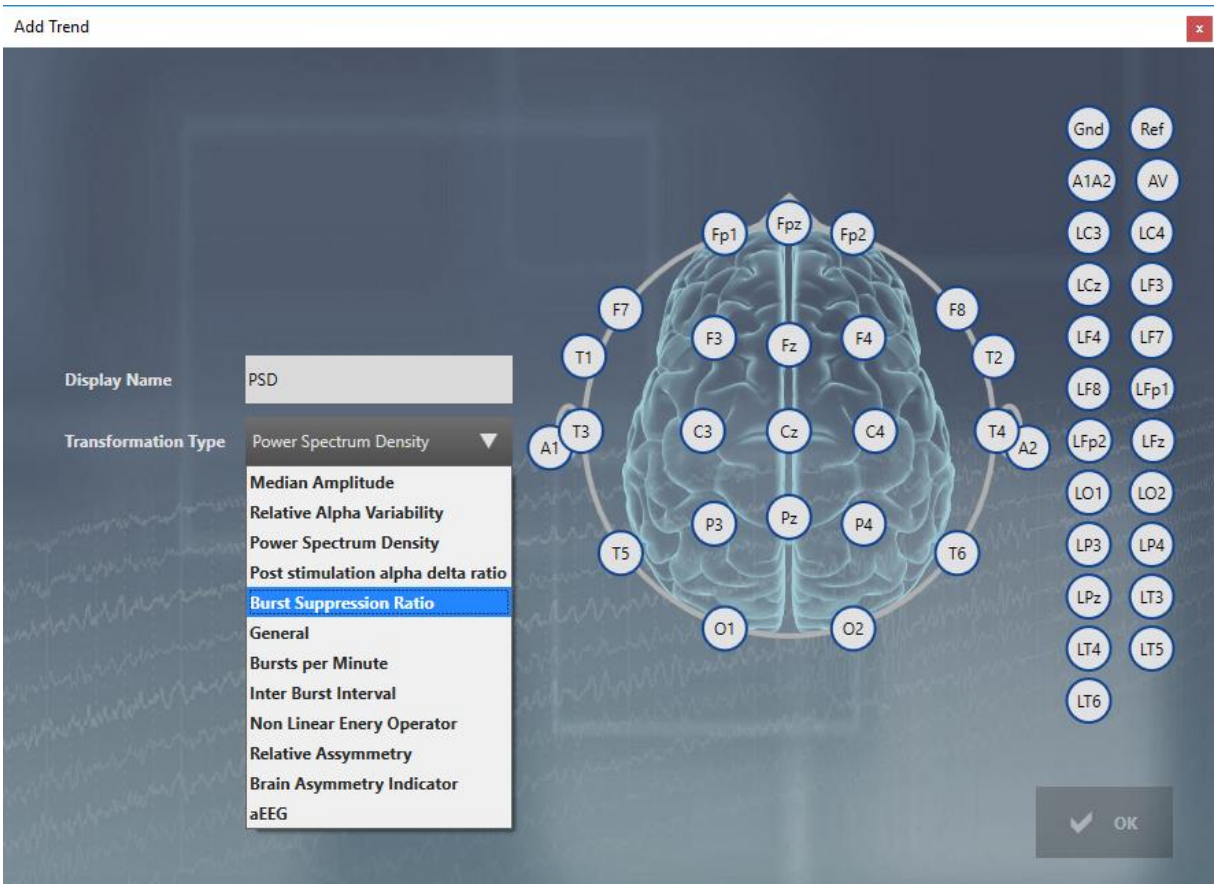
> Note: If you zoom in using the Zoom Bar, the Zoom Duration will automatically change to Custom.

Trends

Add a trend to the overview by clicking the Add Trend button on the right sidebar.

> Note: Trends is an optional feature that is not available without a license.

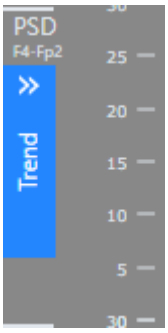
Select a Transformation Type from the drop-down list and give the trend a display name.



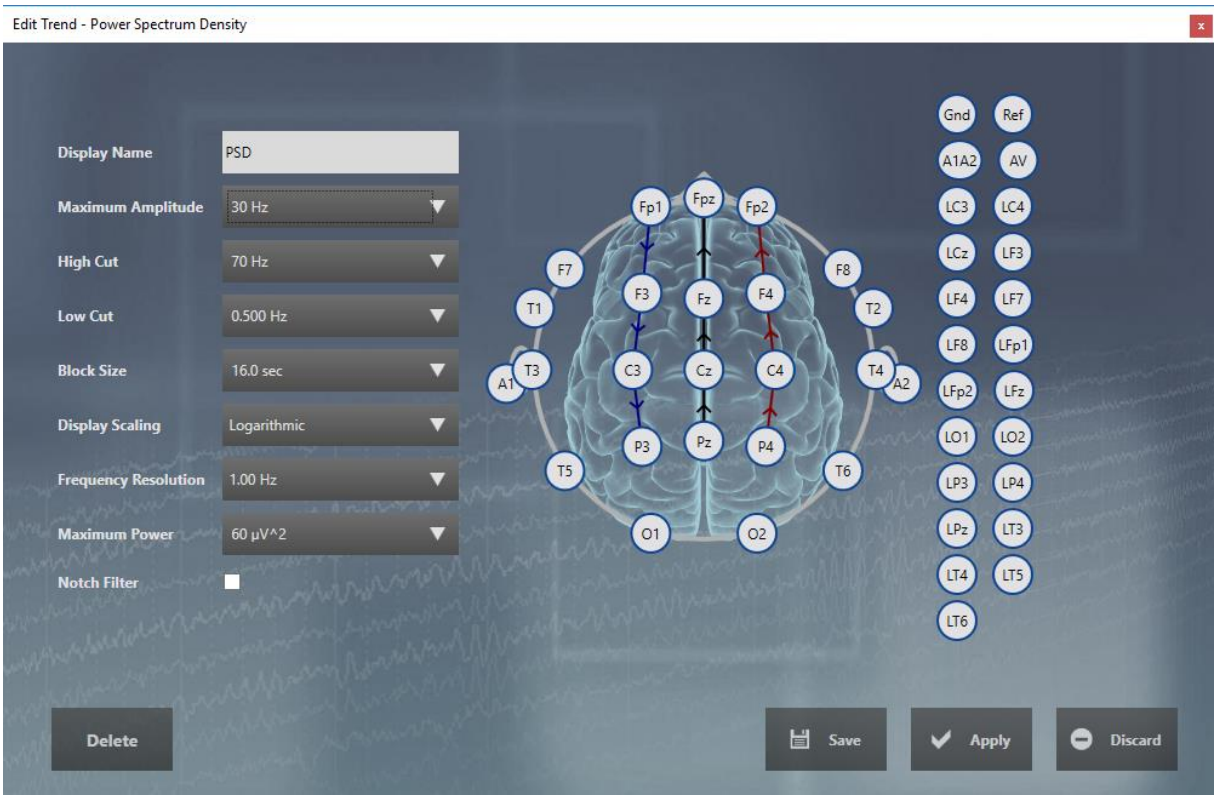
On the montage head, click on the electrode you want as the active electrode, then click on the one you want as the reference. Repeat for the electrode pairs you want to be displayed in the trend, then click ok.

Alternatively, you can select the electrode pairs on the label bar on the trace display BEFORE you click the Add Trend button. Then the electrode pairs are already drawn on the head diagram.

To edit a trend, click the blue arrow button to the left of the trend to open the Edit Trend popup. From this popup, you can also save the trend to the perspective, or delete the trend.



Note: Alternatively, you can right-click the trend overview to open the Edit Trend popup.



Click Save to save the trend to the current perspective. Future exams using this perspective will display the saved trend.

Click Apply to apply the changes to the current recording session only.

Click Discard to discard the changes you made before closing the popup.

Click Delete to remove the trend.

Indicators

A series of indicators in the upper right of the screen light up green when things are running smoothly. Otherwise, they will change to red or orange and the appropriate action should be taken. The Recording indicator will also blink when recording is interrupted and the words "Not Recording" appear on the screen.

The indicators are, from left to right:

Recording Status: Green indicates an ongoing recording. Blinking red/orange indicates that the exam is in a "not recording state". This means that the recording has not been started, has been paused or is in Impedance check mode.

Amplifier Connection: If green – amplifier is connected. If red – amplifier is not connected. Furthermore a message appears in a yellow bar at the top of the screen

indicating the amplifier is not connected. If this happens, take these steps:

Check the amplifier itself. Check if you can see a green light close to the cable connection.

If yes, the amplifier is connected. Try to unplug the cable and re-connect. If message on screen does not disappear, contact Lifelines iEEG support.

If no, check cable connections both at the amplifier side and at the computer side (back of screen). If connections are ok, the cable may be broken. Contact Lifelines iEEG support.

Remote Control Status: If green – remote control is available.

If orange – remote control is unavailable. Check Network Connections (see below).

Upload Status: If green – online upload is available and you can proceed as intended.

If orange – online upload is unavailable. Check Network Connections (see below). If network connections is not the problem, contact Lifelines iEEG support.

If gray – manual upload was selected in Setup.

Network Connection: If green – network connection is good.

If orange – network connection is limited. Check Ethernet cable connections. When cable connections are ok, open a web-browser on the computer and see if the PC connects to the internet. Contact hospital IT for further support.

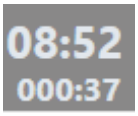
If red – no network connection. Check Ethernet cable connections. When cable connections are ok, open a web-browser on the computer and see if the PC connects to the internet. Contact hospital IT for further support.

Battery Life (Amplifier): If green – battery life is good. If orange – battery life is low. If red – battery life is depleted.

Connection to Electricity: If green – system is plugged into a wall outlet. If red – system has become unplugged from outlet. If using a laptop, it is recommended to plug the system in to avoid depleting the laptop battery.

Hours Remaining: If disk space becomes low, you will see an estimate of remaining time in hours.

Clock



A clock to the left of the overview shows the current time, with the elapsed time of the recording underneath.

Settings

Lifelines iEEG is highly customizable in the way your data is displayed. With the settings editor, you can create your own montages and event palettes, then save them to a group of settings called Perspectives. See the Settings chapter later in this manual for a complete description of how to customize your settings.

Review

Click the Review button to launch the iEEG Review client for live review of the in-progress exam. See the Lifelines iEEG Review chapter for a complete description of iEEG Review.

Lock

Press this button to change the screen to a simplified, locked version of Acquire. In this view, the user can still enter events, view EEG and trends, view the help screen, but all other controls are hidden. To unlock the screen, press the unlock button and enter your login credentials.

Review

Lifelines iEEG Review allows advanced review of EEG exams of up to 128 channels and 2 synchronized video captures. Other features include event placement and annotations, customizable montages and filters, pruning and optional spike and seizure detection.

Launch iEEG Review

The iEEG Review client can be launched by selecting an exam in the Centrum client and pressing the Review button, or you can launch the Review client directly.

WARNING: To ensure accuracy, before reviewing an exam for the first time on a new screen, or when adding a second screen, the screen must be calibrated under Settings > My Settings > Screen.

Exam Mode

If you have selected an exam in Centrum and pressed the Review button, the exam will be opened in review mode, where you can begin review of the exam immediately.

If you have launched Review without first selecting an exam, the client opens on the Exams tab in exam mode. You will also see tabs for Upload, Processing and Settings.

You can switch between exam and review modes via the left arrow button located on the top left of the screen.

Note: Review mode is only available after at least one exam is selected and opened for review.

Exam mode tabs

Review mode tabs showing 2 exams open

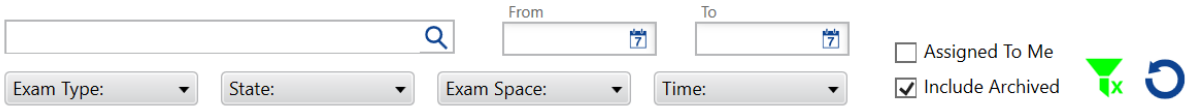
Exams Tab

On the Exams tab you will find a sortable list of current exams ready to be reviewed. Click the headers (Patient ID, Last Name, etc.) to sort the list by that header.

Search and Filter

Search for exams by using the search field. You can narrow down the search results by using any of the filter options shown below. The filter indicator lights up green when filters have

been applied. Click the green indicator to clear all filters. Click the refresh button to make sure the list is always showing the most recent entries or changes.



Note: The system remembers the last used filters and keeps those settings until they are changed or cleared.

Pages

If the Exam List is very large, it will be displayed in pages. Click the arrows or page numbers at the bottom of the list to scroll through the pages. If you want to change the number of exams that are displayed on each page, type a new number in the Items per page box.

Indicator Icons

Indicator icons appear to the left of each exam when applicable to that exam. The indicators are as follows, from left to right:

 Ready to upload – local

 Ready to upload – not local

 Upload in progress

 Ready to fetch

 Dual recording

 Archive warning

 Overdue archive warning

 Pruned

 Spike & Seizure

 Video

Function Buttons

Select an exam on the list and press one of the following buttons at the bottom of the screen to perform the following functions:

Review

Review in the bottom-right corner to open the exam for review.

Control

If the exam is in progress, click Control to gain remote control of the recording in Acquire.

Review and Control buttons

Clinical History

Click the Clinical History button to show the history for that exam.

Exam History

Click the Exam History button to display the dates of each workflow state for the exam.

Reports

Click the Reports button to view, import or create reports to associate with the exam.

Clinical History, Exam History and Reports buttons

Workflow Bar

The workflow bar indicates the workflow state, the same as in Centrum. See the Workflow section of the Centrum chapter for a detailed description of the workflow states and the function of these buttons.

Upload Tab

The Upload tab in iEEG Review works the same as in iEEG Centrum. Refer to the Centrum chapter for more information.

Processing Tab

The Processing tab in iEEG Review works the same as in iEEG Centrum. Refer to the Centrum chapter for more information.

Settings Tab

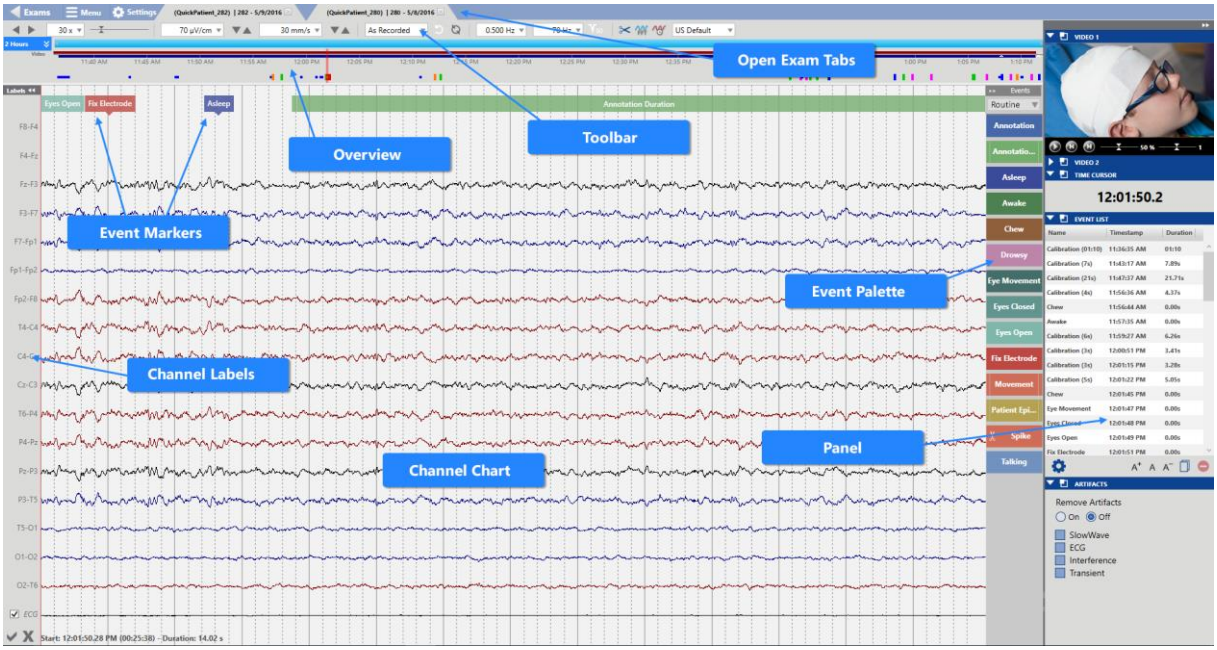
Lifelines iEEG Review is highly customizable to the way you review data. You can create your own montages and event palettes, then save them to a group of settings called Perspectives. This allows you to quickly switch between the settings that are available during review.

See the Settings chapter for a full description of the settings features.

Review Screen

The review screen is where the review of exam data takes places. The following diagram shows the review screen with the main components labeled. These components are described in the following sections.

The iEEG Review Screen



Channel Chart

The Channel Chart is where the exam data, such as EEG channels and events, are presented. The display of the chart is highly customizable, for example by user-defined montage, timebase, filters, sampling rates and display of individual channels.

This section describes the navigation of the Channel Chart and the modifications that can be made quickly during review.

Detailed descriptions of how you can further customize your Channel Chart are found in the Settings chapter.

Overview

The Overview is located above the Channel Chart and provides a visual representation of the duration of the exam.

Timeline

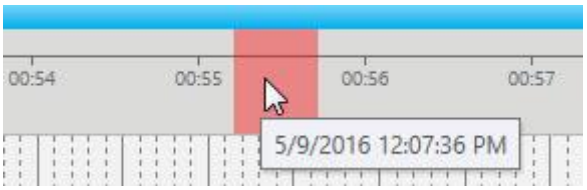
Tic marks on the timeline show evenly spaced intervals. The actual interval depends on the length of the exam. You can click anywhere on the timeline and the Channel Chart will display that page.

> Note: it is also possible to display the timeline below the channel chart. This is done in Settings>My Settings.

Current Page Marker

A red, translucent marker indicates where the currently displayed page is located on the timeline. Hover over the red marker to see a tooltip with the current page's start time and date.

Timeline with red current page marker



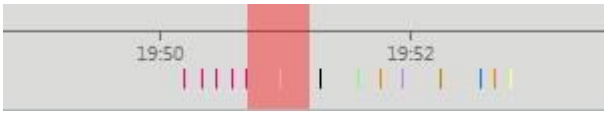
Segment Breaks

Segment breaks in a recording are indicated on the timeline with small white triangles.

Event Overview

Events are indicated on the Event Overview just below the timeline. They appear as small, vertical bars in a brighter shade of the color of the event marker, except for Duration Events, which appear as horizontal bars for the length of the duration. Click on any event on the overview to go to that event in the Channel Chart.

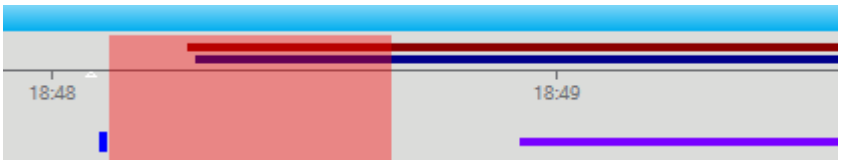
Timeline showing current page marker and event overview



Video Overview

If video is present in the exam, a dark red bar appears in the overview just above the timeline. A second video appears in dark blue. A continuous bar indicates that video is present during the entire recording. Breaks in the bar indicate breaks in the video.

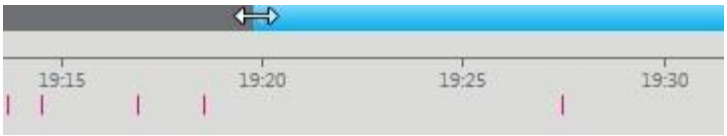
Timeline showing 2 video recordings



Zoom Bar

The Zoom Bar is located at the top of the overview. Its purpose is to be able to zoom into a long timeline so you can see the overview more clearly. To zoom in, drag either the left or right end of the zoom bar to shorten it. The zoom bar then works a bit like a scrollbar. You can move the zoom bar to the right or left to show later or earlier parts of the timeline.

Resize the Zoom Bar by dragging to zoom in or out

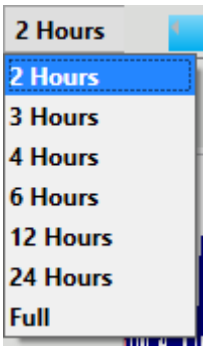


Paging while you are zoomed into the timeline will cause the zoom bar to move so that the red current page marker is always visible.

If you drag the zoom bar all the way to the right, it “snaps” into place and will display the most recent duration of the recording while paging. Drag the zoom bar to the left to unlock. Paging back will also unlock the zoom bar when you reach the point preceding the current duration.

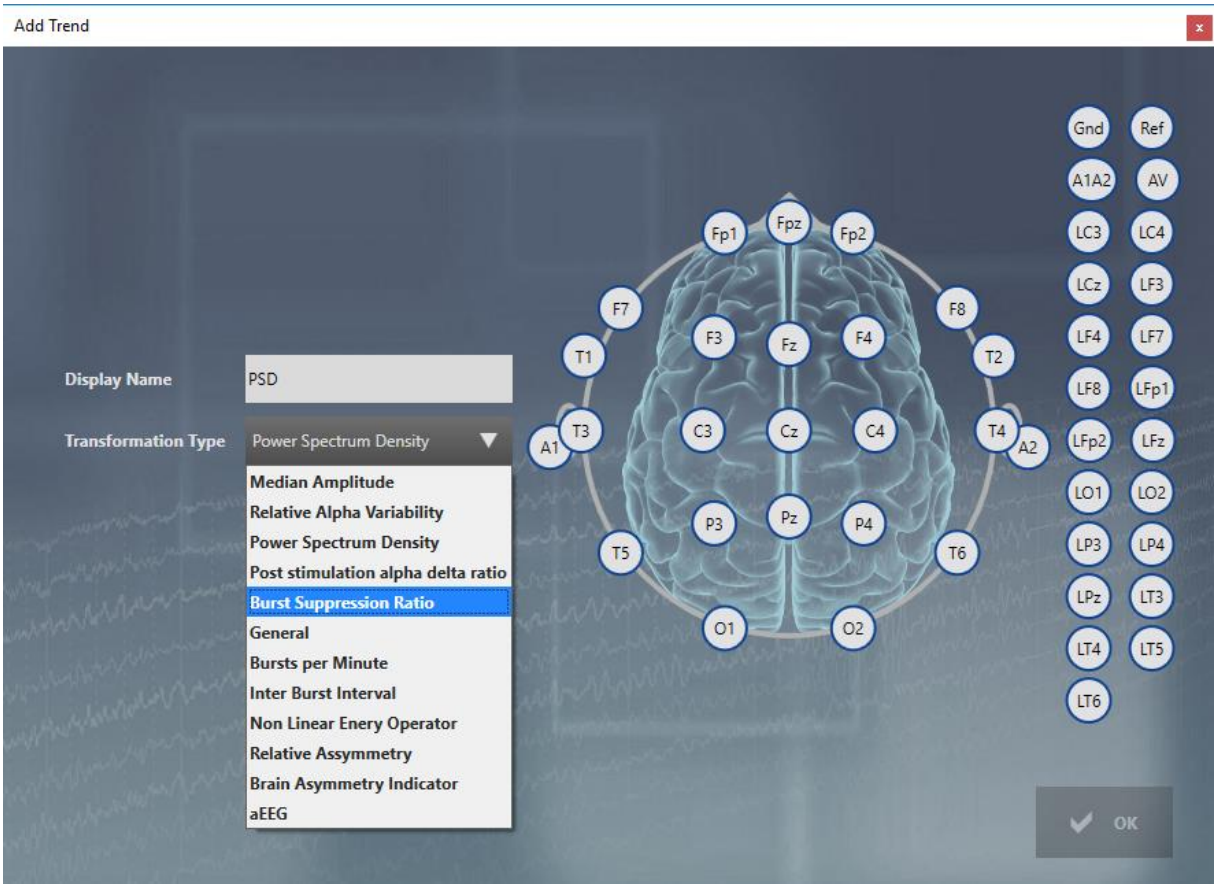
Zoom Duration

Use the drop-down menu to select a set duration of the overview.



Trends

Add a trend to the overview by clicking the Add Trend button on the toolbar.

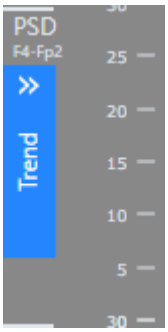


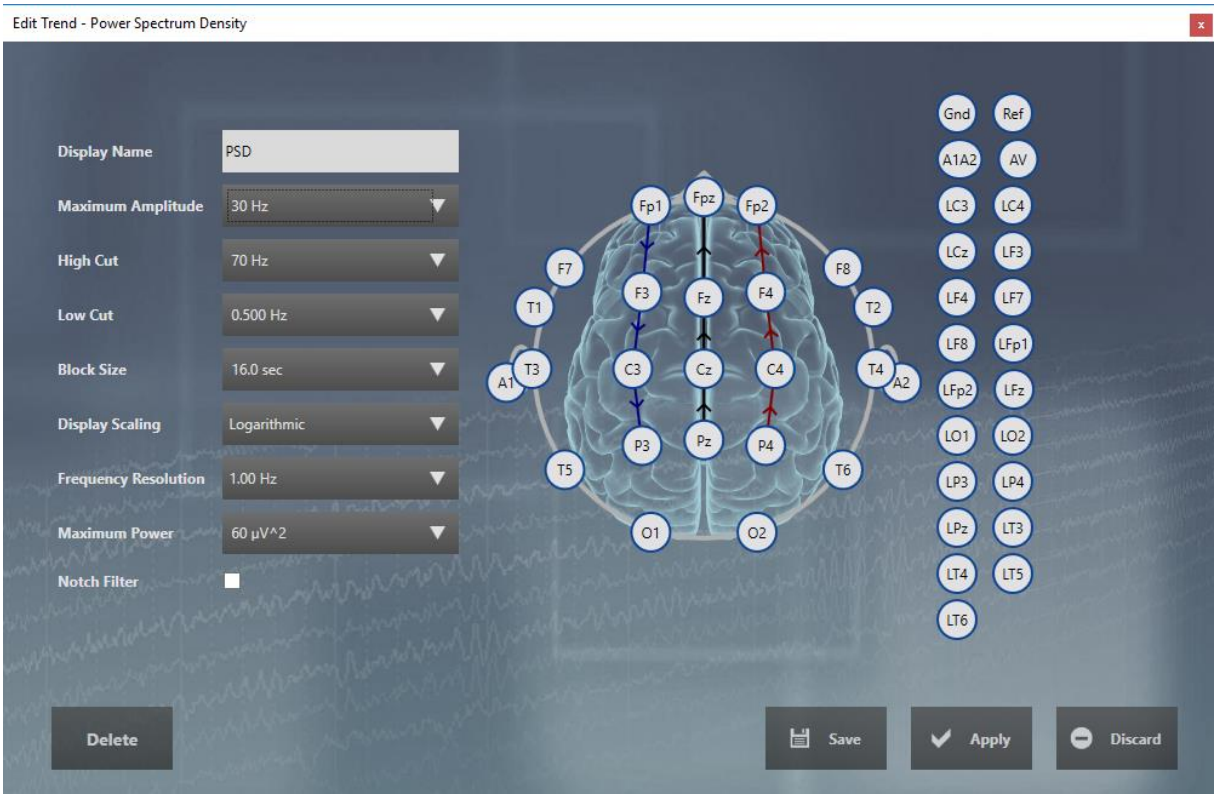
Select a Transformation Type from the drop-down list and give the trend a display name.

On the montage head, click on the electrode you want as the active electrode, then click on the one you want as the reference. Repeat for the electrode pairs you want to be displayed in the trend, then click ok.

Alternatively, you can select the electrode pairs on the label bar on the trace display BEFORE you click the Add Trend button. Then the electrode pairs are already drawn on the head diagram.

To edit a trend, click the blue arrow button to the left of the trend to open the Edit Trend popup. From this popup, you can also save the trend to the perspective, or delete the trend.





Click Save to save the trend to the current perspective. Future exams using this perspective will display the saved trend.

Click Apply to apply the changes to the current recording session only.

Click Discard to discard the changes you made before closing the popup.

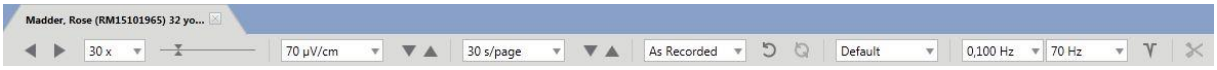
Click Delete to remove the trend.

> Note: Trends is an optional feature. You can only add trends if the exam was recorded with the trend license or if your server has been specially configured to add trends. Be aware that if you add trends to an exam that was recorded without the trend license, a charge will incur.

Toolbar Controls

Located near the top of the screen just below the tabs area is a toolbar with controls affecting the navigation and display of the Channel Chart. Here you will find controls for paging, sensitivity, time base, montage, filters, perspective, and other tools - all described in the sections below.

Toolbar showing channel chart controls



Paging

The left and right arrows are the Auto Paging Buttons. Press once to begin paging forward or back, again to stop. The paging speed can be set using the drop-down list, or use the slider bar to raise or lower the paging speed. The drop-down list is editable: type in a new value and press the Enter key to save. Note: paging may slow down due to heavy data or high network activity.

Toolbar paging buttons, paging speed dropdown and slider

There are some alternative ways to navigate the Channel Chart, described below.

Space Bar: Press the space bar to page forward and again to stop.

Arrow Keys: Step forward or back one second using the right and left arrow keys. Press and hold the arrow keys to page continuously at a high speed.

Page Up, Page Down Keys: Use these keys to page forward or back one whole page. Clicking on the right or left half of the Channel Chart does the same thing.

Sensitivity

Use the Sensitivity drop-down menu to select another value, or use the up/down arrows on the toolbar to change the value one step at a time. The drop-down list is editable: type in a new value and press the Enter key to save.

Use the up/down keys on the keyboard to increase/decrease sensitivity by a factor of 2.

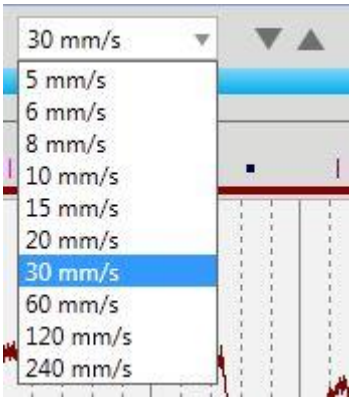
Sensitivity menu

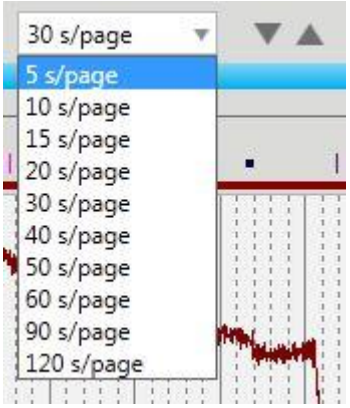
Timebase

You can control how much data is displayed on the channel chart (time-wise) by setting its timebase. According to which default timebase mode has been set (see the

Settings>Perspectives to change the timebase mode), you will see either the Paper Speed or Page Duration drop-down menu on iEEG Review toolbar, where you can quickly change the timebase while reviewing. Alternatively, you can use the up/down arrows next to the drop down list to increase or decrease by one step. The drop-down list is editable: type in a new value and press the Enter key to save.

Change timebase controls – paper speed and page duration





Montage Selector

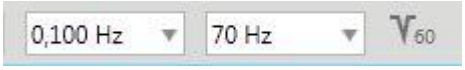
Quickly change to another montage using the Montage Selector. Select As Recorded to view the montage used during recording minus any applied filters. To view the As Recorded montage plus the filters applied during recording, use the back arrow button. Use the double arrow button to go back to the previously selected montage.

Montage Selector

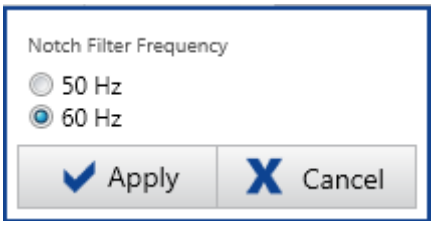
Filters

The next three controls on the toolbar are the filter controls – Low Cut, High Cut and Notch. Select a value for low or high cut. The drop-down lists are editable: type in a new value and press the Enter key to save.

Filter Controls – Low Cut, High Cut and Notch



Click the Notch icon to toggle the notch filter on or off. Click and hold the button to get a popup window where you can change the frequency between 60 and 50. You can also change this under Settings > My Settings.



Prune Preview

Pruning is used to selectively throw away unwanted parts of an exam. The Prune Preview button is used to view the effects of the prune settings before actually throwing out any data. The button is a toggle button so you can view the effects of pruning and then go back to the previous view.

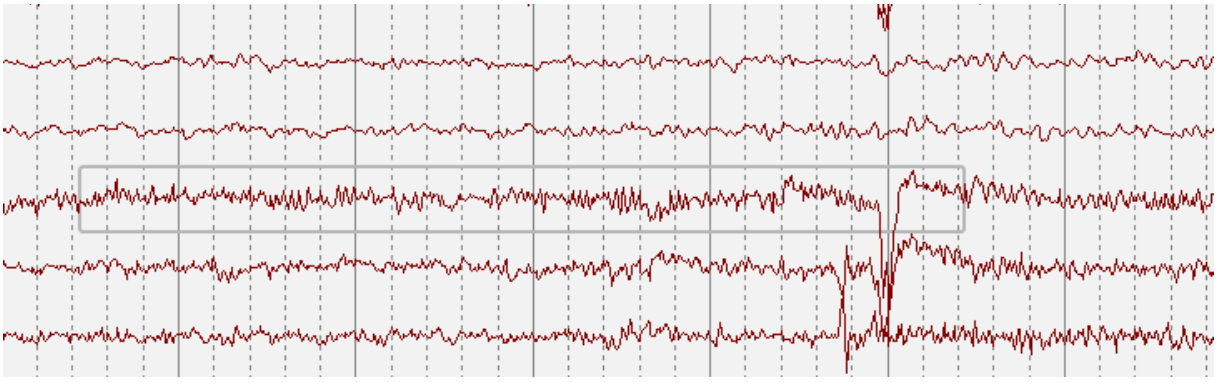
The Prune Preview toggle button

The Prune Preview button becomes active when you have marked certain events as Prune Events. To learn how this is done, see the Events section of the Settings chapter of this manual.

To make the prune effects permanent, select the Prune option on the Menu.

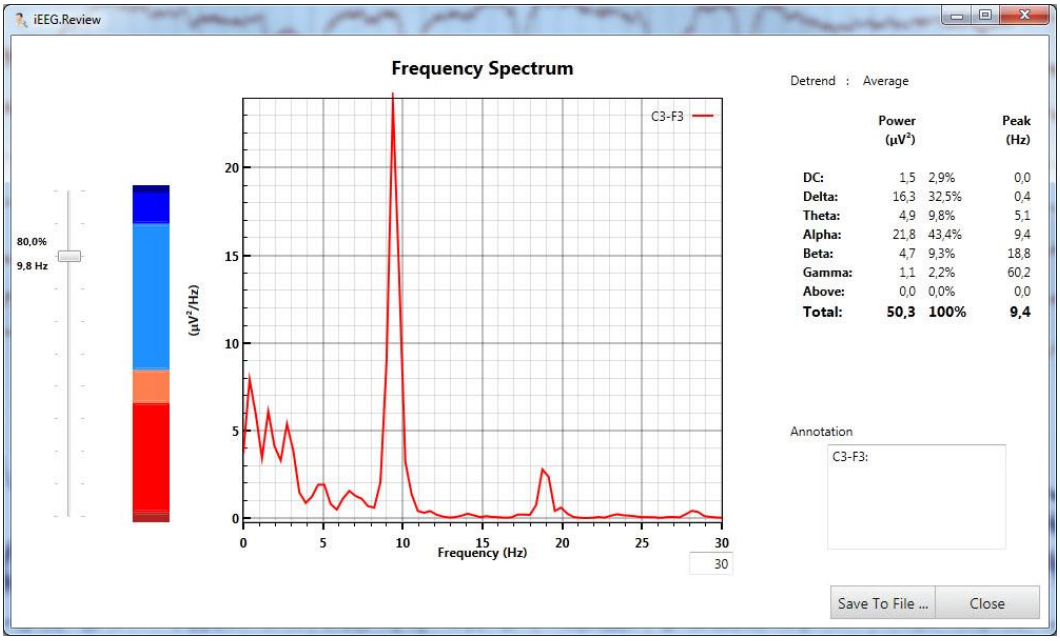
Frequency Analysis

It is possible to perform frequency spectrum analysis on any of the traces as they are displayed in the review screen. To do so, click the FFT button in the Measurement Tools panel, then select a portion of a trace by either clicking on the start point of the channel and then again at the end point, or by dragging from the start point to the end point. A box is drawn around the selected portion of EEG on the channel chart as shown:



A popup window opens with the calculations as shown:

Frequency Spectrum Window



The results for the selected EEG shown in the frequency spectrum window are calculated with the Welch's method:

1. The signal selected by the user and as displayed, i.e with same filtering settings, is divided into 2-second blocks, overlapping by 50%.
2. If the sampling rate is not in power, each block is zero padded until next the power of two samples
3. If the last block is not a full 2 seconds, it is zero padded until it is 2 full seconds.
4. The mean is subtracted from each block (**Detrend: Average** as shown in the results window)
5. Each block is windowed by a Hamming window function.
6. The periodogram is calculated of each block using a standard FFT algorithm with 0.5 Hz
   frequency resolution.
7. All the periodograms are averaged into the resulting frequency spectrum.

The power in the following frequency bands is calculated by summing the power in the frequency bins within the frequency bands:

- **DC**: 0 – 0.5 Hz
- **Delta**: 0.5 – 4 Hz
- **Theta**: 4 – 8 Hz
- **Alpha**: 8 – 13 Hz
- **Beta**: 13 – 30 Hz
- **Gamma**: 30 – 100 Hz
- **Above**: 100 – Nyquist frequency

The power values for each band is always shown in μV^2 in the first column and the relative percent power in the second column, i.e. power in the band divided by total power in all bands times 100, where total power is the sum of the power in all bands.

The spectral edge shown on the left in the Frequency Spectrum window is calculated as the frequency where the power below the frequency is x% of the total power, where x is 80% by default but can be changed by using the slider.

Click the Save to file button to save the results to disk.

Time Domain

The Time Domain tool is used to measure amplitude and duration of a selected section of a waveform. Click the Time Domain button and then select a section of a waveform on the channel chart either by clicking and dragging, or by clicking first on the start point and again on the end point.

A window opens showing an enlarged view of the selected waveform. Click on the waveform where you want the measurement to begin and again where you want the measurement to end. The amplitude and duration are displayed.

Amplitude is measured in µV and duration in milliseconds. The accuracy of the measurement is dictated by the accuracy of the bio potential amplifier used to acquire the data.

Perspective Selector

Use the Perspective Selector to quickly change the view from one perspective to another. A perspective is a group of settings that you can create and name yourself. (See the Settings chapter for more information).

Channel Labels

To the left of the Channel Chart you will see the Channel Labels.

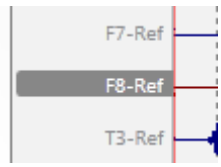
You can hide the Channel Label bar by clicking the hide/show arrow button at the top of the labels. This display option is stored on the computer between sessions for each user.

Hide/Show Labels

Special Channels

You can select one or more channels by clicking on the label and then change a number of display settings or filters on those channels.

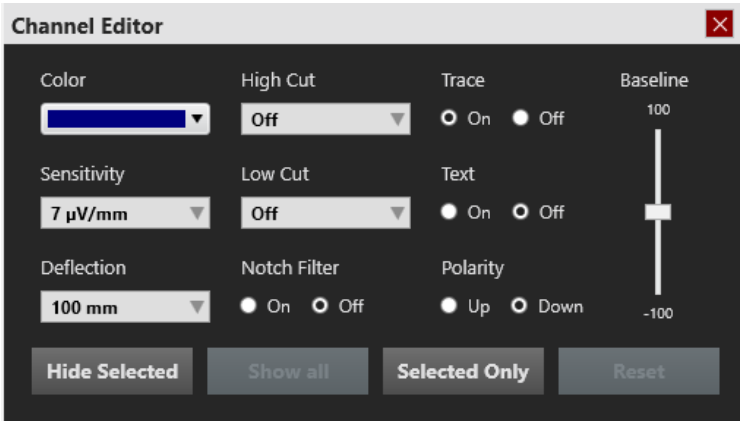
Selected Channel Label



Right-click one of the selected channels to open the Special Channel popup. You can then change the color, sensitivity, deflection, filters, display type, polarity and baseline position by using the corresponding controls. You can also choose to hide the selected label(s) or display only the selected labels(s). Click Reset to remove the special channel settings from the selected labels.

A checkbox appears in front of the label on special channels. Unchecking the box resets the settings for that channel only.

Special Channel Popup



Note: These settings are applied but not saved unless you save them on the Montage tab in the Settings.

At the bottom of the label area are two buttons. The X clears all selections and the checkmark selects all labels.

Select or deselect all labels

Event Palette

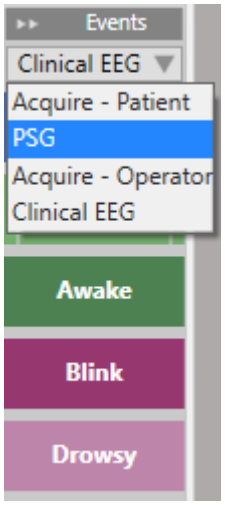
Located to the right of the Channel Chart is the Event Palette. The Event Palette contains a customizable set of event markers that can be placed either directly onto a channel, or at the top of the Channel Chart at the time of the event. The event changes are automatically saved to the central data storage.

Hide/Show

You can hide/show the Event Palette by clicking the hide/show arrow button at the top of the palette. This display option is stored on the computer between sessions for each user.

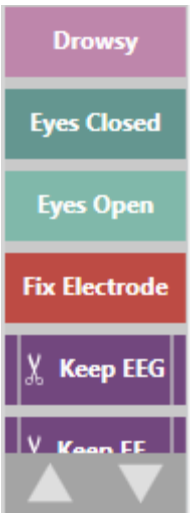
Switching Palettes

Use the drop-down list to quickly switch between different palette sets.



Scrolling

Use the up and down arrows at the bottom of the event palette to scroll palettes which contain too many events to fit on the screen.



Place an Event

To place an event, click the event on the event palette (it will become highlighted with a yellow outline), and then click on the channel chart where you want the event marker to appear. A vertical positioning line and crosshairs appear to help you with the positioning.

Selected Event Marker

To place multiple instances of the same event, double-click the event marker first, and then you can insert an event marker onto the channel chart with each subsequent click, without having to go back to the event palette. Right-click on the channel chart to stop this action.

> Note: if the montage is changed such that the channel where the event was placed no longer appears, the event marker will be displayed at the point where the active electrode appears again, or at the top of the channel chart in the case that the active electrode does not appear.

Event Shortcut Keys

Instead of clicking on the event markers, you can also use the F-keys F1-F10, which correspond to the first 10 event markers on the event palette. Press the F-key then click the channel chart to place the event.

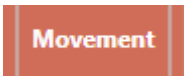
Place Event at Video Marker

During video playback or online video review, simply click an event or its shortcut key to automatically place the event at the point of the video marker. The event marker appears at the top of the channel chart.

See additional event placing information under Duration Events and Annotation Events.

Duration Events

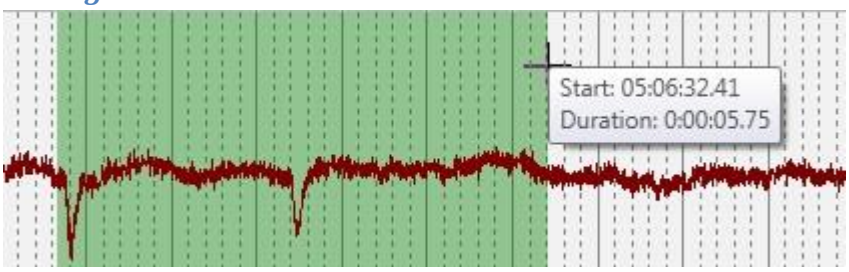
Duration Events are events that happen over a period of time. These event markers can be recognized as they are marked with a vertical bar at each end.



Place Duration Event

To place these events, click on the event on the event palette, and then click on the channel chart where you want the event to begin. Before releasing the mouse button, drag to the point where you want the event to end. In addition to the crosshairs, a translucent background color appears to indicate the horizontal area that will be covered by the event.

Placing a duration event

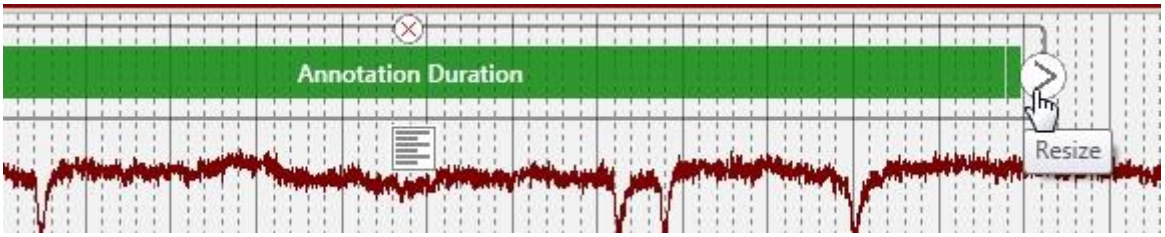


After placing the event, you can adjust the duration by dragging either end of the event marker to extend or contract the area being covered.

Paging during duration event placement

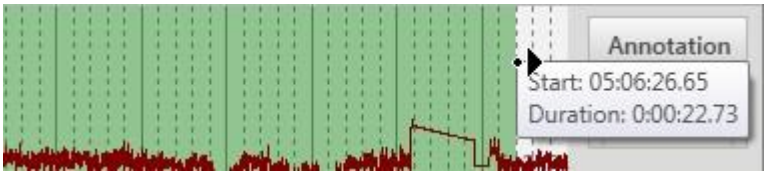
If the duration of the event extends for more than one page, place the event, then hover over the event marker and click the resize arrow that appears to the right of the event. You are now able to extend the length of the duration without holding down the mouse button. You can also click the Resize button and select a place on the timeline. Then click on the original channel again to end the duration event.

Click the Resize button to adjust the length of the duration



When you need to page forward, move the cursor just above or below the channel you are on and it changes to an arrow so you can click to page forward. Click again in the original channel to end the duration event.

Cursor changes to allow paging when hovering above or below the channel



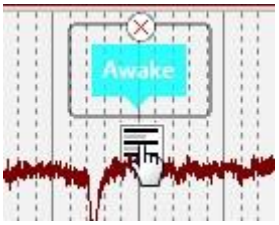
Place Duration Event at Video Marker

To place a duration event while playing video, click the event marker or press its shortcut key to place the beginning of the event at the current location of the video marker, then click the marker or press the key a second time to end the event.

Event Caption

Hover over the event marker on the channel chart and click the small text box icon that appears below the event. You can then type in your own caption for the event which will appear after the event name on the event marker.

Adding a caption to an event



Annotation Events

Annotation events allow you to type in a note which becomes the caption on the event marker.

Place Annotation Event

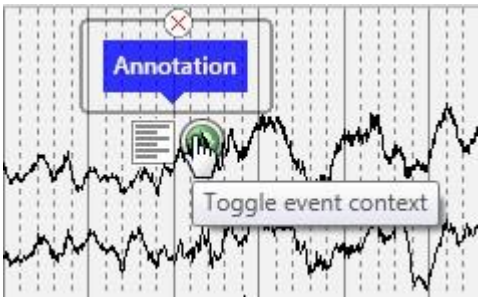
To place an Annotation Event, simply start typing the annotation. A text box appears automatically for you to type in your annotation. The marker appears at the top middle of the channel chart, or at the video marker if video is playing.

Context Events

Context Events store information about the channel chart settings at the time of placement. Later, you can revert back to these settings by clicking the Context toggle button that becomes visible when you hover over the event marker.

Context events store montage, general channel settings and timebase information.

Context Event toggle button

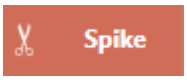


Numerical Events

Numerical events store numerical information associated with the event. Hover over the placed event on the Channel Chart to select a new numerical value from a drop-down list.

Prune Events

Prune events are used to mark areas of the Channel Chart that you want to keep after pruning the exam. Using the Settings, you can set the number of seconds before or after the event to keep. You can also choose whether the event keeps the EEG and video, or only the EEG. You can recognize prune events by the scissors icon:



For more info about pruning, see also Prune Preview under Toolbar Controls and Prune under Menu.

Move an Event

Drag an event to a new position on the channel chart. This will change the timestamp of the event.

Delete an Event

To remove an event once it has been placed, hover over the event and click the x that appears over the event.

Deleting an event

You can also delete an event by selecting it on the Event List and clicking the delete button.

Creating Events and Palettes

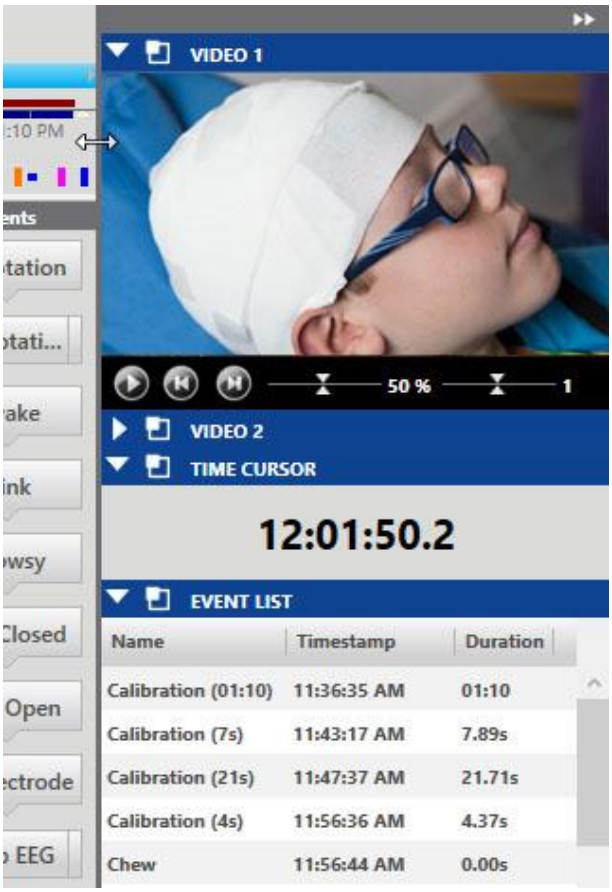
For information on creating and customizing events and event palettes, see the Settings chapter.

Panel

Intro

The Panel is located on the right side of the screen and contains additional tools for navigating and analyzing the exam. The individual items on the panel can be expanded or collapsed by clicking the panel headers, and the entire panel can be hidden by clicking the hide/show arrow button on the gray bar at the top of the panel. The hide/show display option is stored on the computer between sessions for each user.

You can adjust the width of the panel by dragging the left edge of the panel to the right or left.



Click the small “popout” icon in the header to open the panel item in a separate window. The window can be resized and dragged to any position. Click the close X to put the panel item back on the panel.

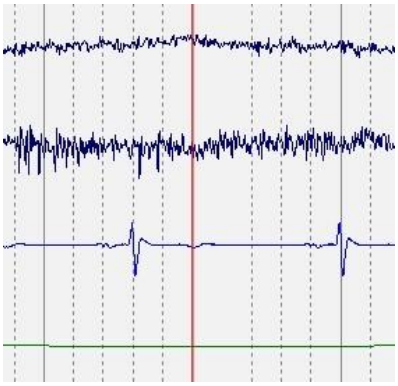
Video 1 panel shown popped out

Video

If video is included in the exam data, it is displayed in the panel and can be played in synchronization with the exam data.

Click the play button to start video playback. A red video marker moves across the Channel Chart to show the position of the video in the EEG data. The Channel Chart pages automatically at the rate of video playback. You can also drag the video marker to a point in the EEG to start the video at that point.

Red video cursor

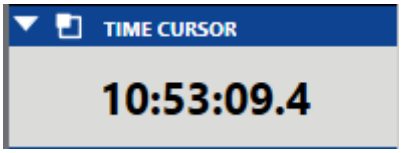


The play button changes to a pause button while the video is playing, so you can press again to pause the video. The other buttons on the video panel are for stepping back and forward one step at a time, adjusting the volume, and adjusting the playback speed.

Zoom

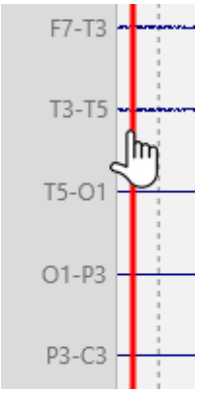
Select an area of the video display to zoom into that area. After zooming in one or more times you can reset the video to the originally displayed size by a right-click with the mouse.

Time Cursor



The Time Cursor panel shows the time of the time cursor on the currently displayed page of the exam. The time cursor is a red vertical line found on the left side of the screen near the trace labels (shown below).

You can fine tune the time cursor by increments of a tenth of a second (0.1 seconds) by dragging the red line to the correct spot on the screen.



Event List

The Event List displays a list all of the events in the exam by name, timestamp, and duration. Click on any event in the list to go to that event on the Channel Chart.

Sort the list by name, timestamp or duration by clicking on the headers.

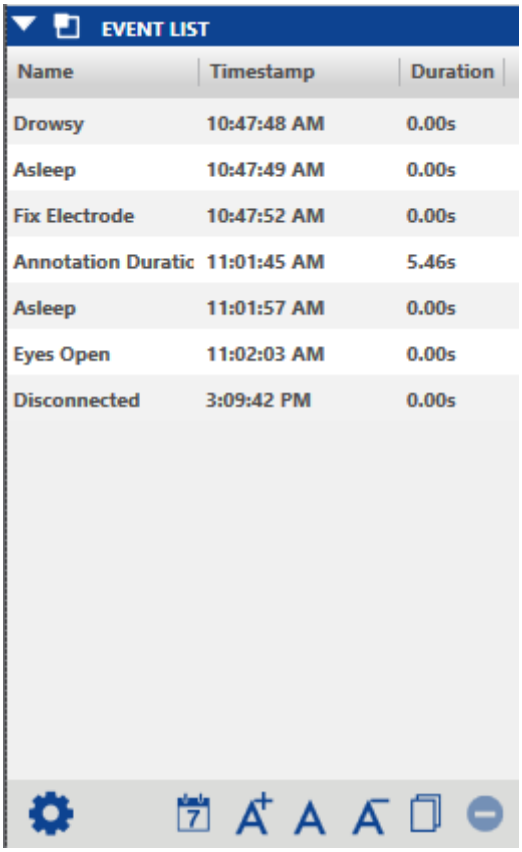
Change the font size of the list by clicking the font size buttons at the bottom of the list.

Click the Copy Events to Clipboard button and you can then paste the list, including all columns, to an Excel or Word document.

Click the Delete button to deleted selected events, both from the list and the Channel Chart.

To select multiple events, select an event, then hold down the control key while selecting additional events. To select consecutive events, select the first event, then hold down the shift key while selecting the last event in the row. All of the events in between will also be selected.

Click the Calendar icon to hide/show the dates on the Timestamp column.



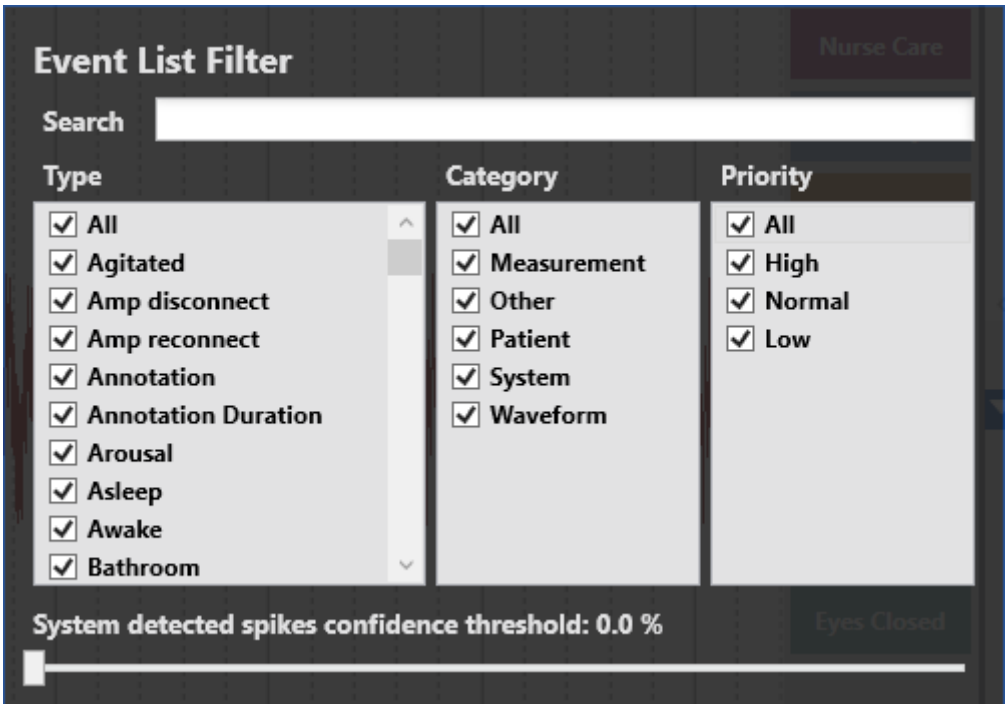
Event List Settings

Click the settings icon to open the Event List Settings popup. On the Event List Filter tab, you can select which events you want shown or hidden in the Event List. You can also filter by free text by typing into the Search field.

If the Persyst seizure detection is enabled, you can filter spike events by confidence threshold using the slider.

The filtered results are reflected on the Overview and Channel Chart as well as on the Event List.

The events are arranged in columns by type, category and priority. Check or uncheck the "All" checkbox to select or deselect all events in the column.

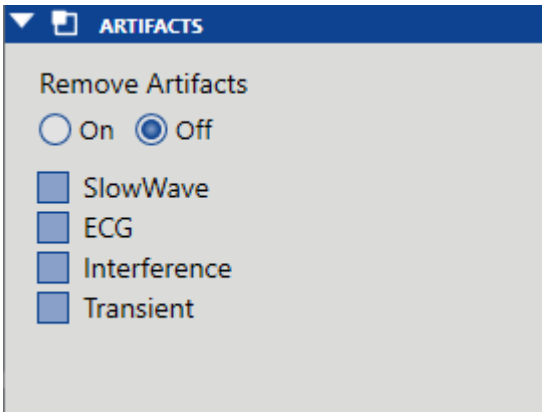


Artifacts

The artifact removal feature uses advanced signal processing methods to remove artifacts from the EEG while leaving the original EEG unaffected.

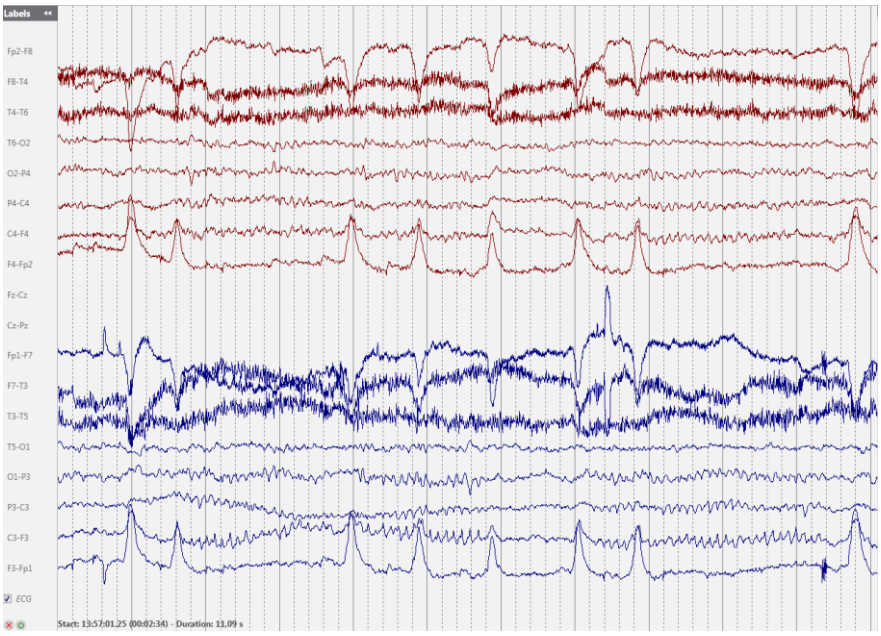
Check the types of artifact removal you want to activate, then click On or Off to show or hide the effects of the artifact removal.

> Note: While artifact removal is On, the system will slow down considerably for actions such as paging.

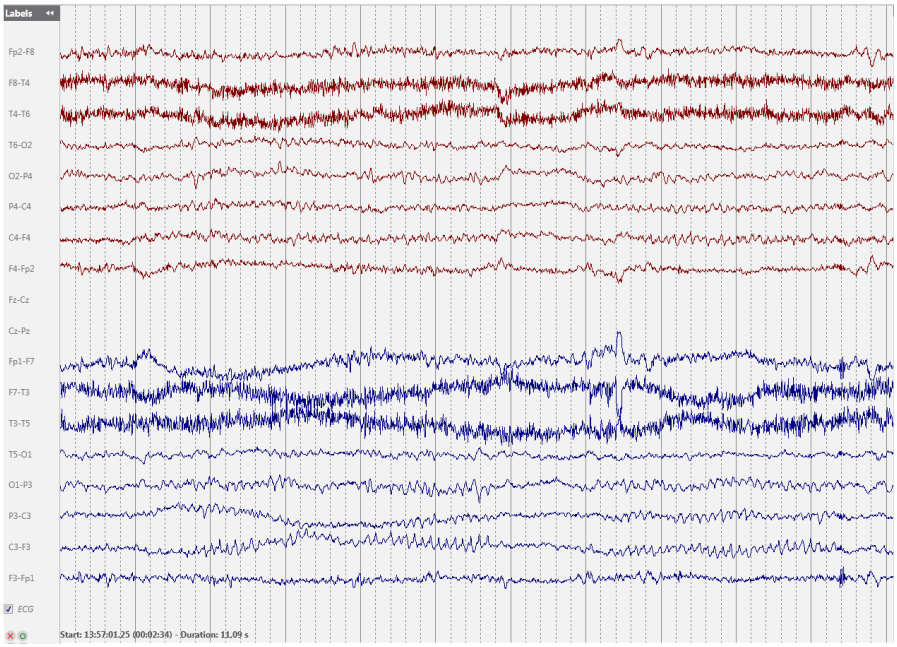


The artifact removal feature is provided as a supplement to conventional EEG processing such as band pass filtering. Artifacts are removed from one page at a time by user request.

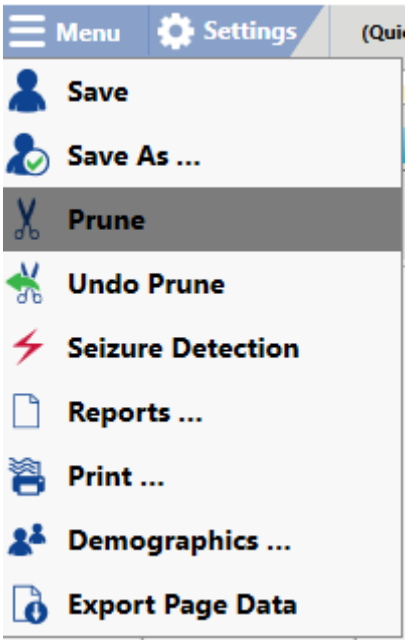
The following image shows a page of EEG with eye blink artifact present. The artifact can be clearly seen on channels Fp2-F8, F4-Fp2, Fp1-F7 and F3-Fp1 but it is present on other channels as well to a lesser extent.



The next image shows the same page of EEG with the eye blink artifact removed.



Menu



The Menu button located at the top of the screen holds functions which are typically located on the File menu in common applications, such as Save and Print.

In addition, there are the following functions:

Save As

Save a copy of the exam with a new ID. The copy can also be saved pruned.

Prune

Select Prune to trim the exam data down to the sections marked by prune events. You can preview the effects of pruning first – see the Prune Preview section under Toolbar Controls. The system keeps a hidden copy of the original data until the exam is archived such that it is possible to undo the prune.

Undo Prune

By selecting Undo prune, the original exam is restored. Once the exam has been archived it is not possible to undo the prune.

Seizure Detection

If the Persyst Spike and Seizure Detection option is installed on the iEEG Server, selecting this option on the menu will run the seizure detection algorithm. System detected events will be inserted at the top of the channel chart where the system has detected seizure and will also appear on the Event List.

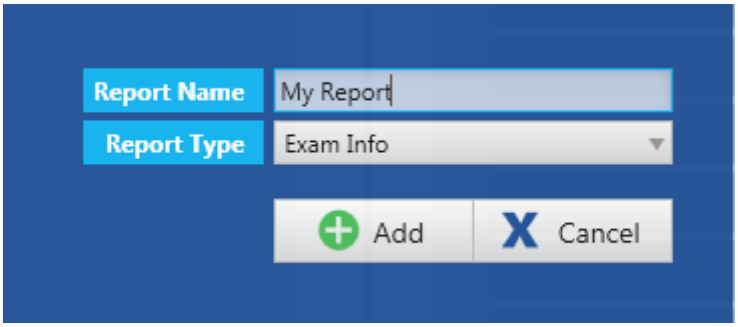
You can also run the Spike and Seizure detection automatically on upload by selecting the Spike/Seizure checkbox on the Upload tab.

Note: the Spike & Seizure process can take up to a few hours. Progress can be monitored on the Processing tab.

WARNING: The Persyst User Manual must be read before using the Spike & Seizure Detection feature.

Reports

This takes you to the Reports and Documents tab for the exam and allows you to create a new report. Enter a name for the report in the popup window , select the report type from the drop down list, then click Add.



New report types can be created in Centrum. Refer to that chapter for more information.

Print

This command opens the print dialog. Select Current Page to print the currently showing page of EEG, or select Custom to choose the pages you want to print. Use the slider to adjust the trace thickness and the checkbox to include patient information.

You can also adjust your printer settings, as you would with a standard Windows print dialog.

Demographics

Select this option to open the patient and exam properties of the open exam. The patient and exam properties can be edited in the same way as on the Patient List tab in iEEG Centrum. Refer to the Centrum chapter for more information.

Export Page Data

Export a text document with the current page in numerical values (ascii).

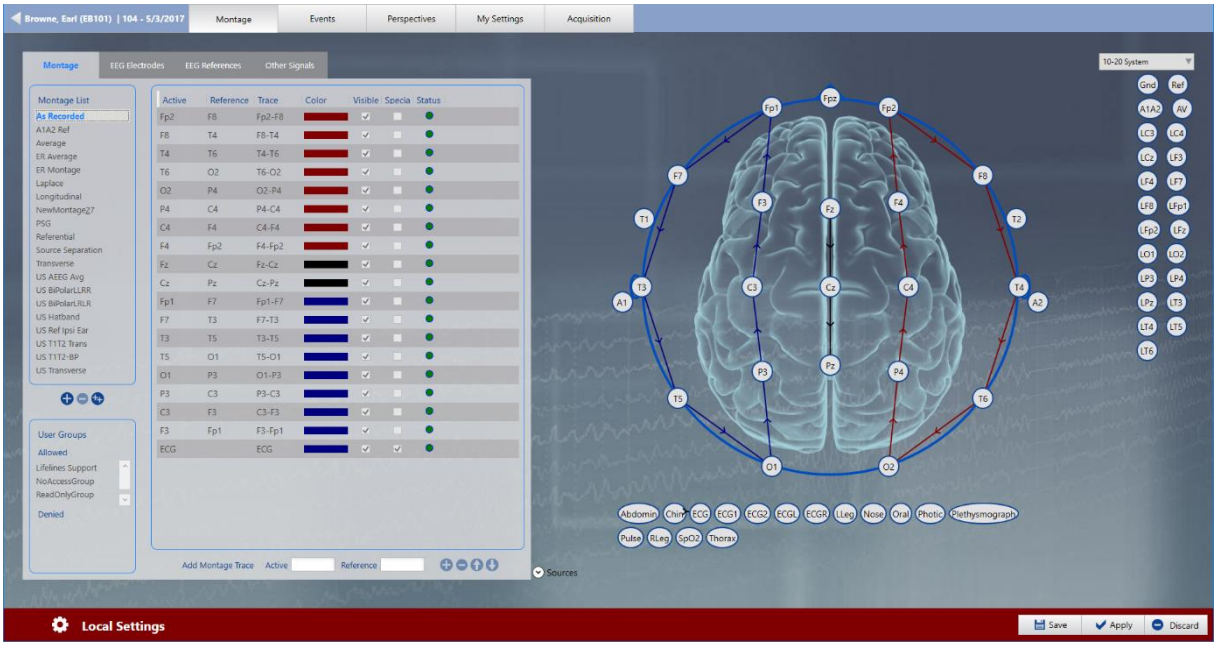
Settings

Lifelines iEEG is highly customizable to the way you record and review data. You can create your own montages and event palettes, then save them to settings groups called Perspectives. This allows you to quickly switch between the settings that are available during recording or review.

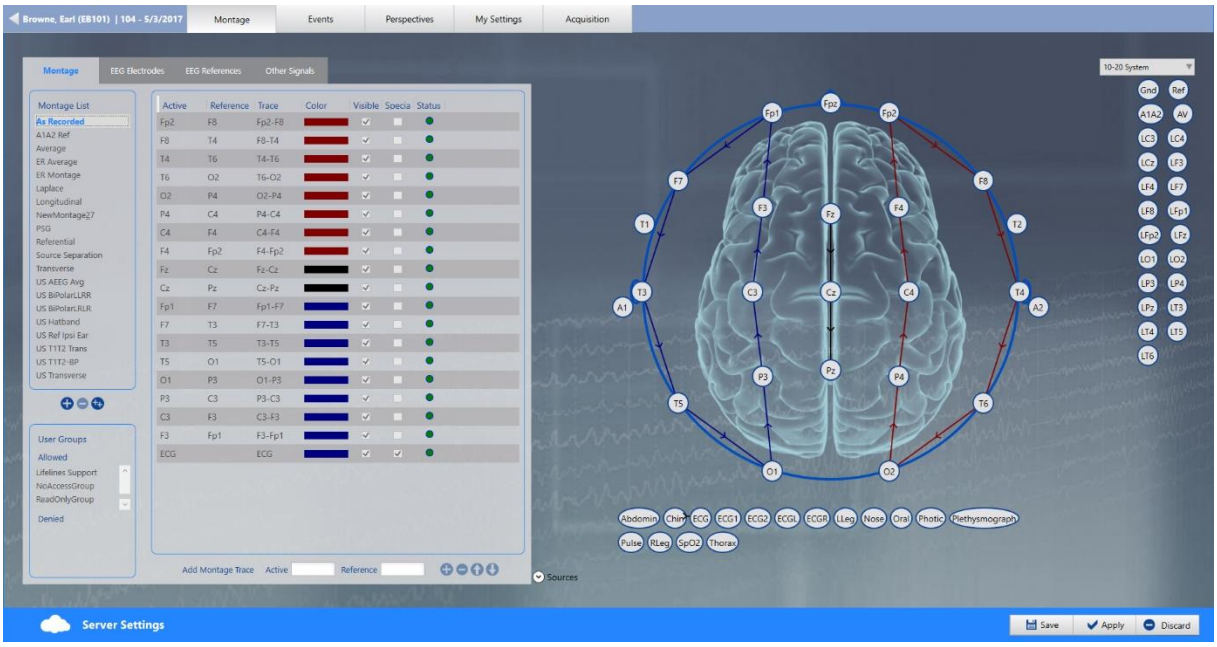
Local and Server Settings

Settings are accessible via the Settings tab in both Acquire Pro and Review. You can also access settings from within an exam you are reviewing in Review. In this case, you may be editing settings either locally or on the server depending on the exam. A colored banner (shown below) appears at the bottom of the Settings screen to indicate whether you are editing locally or on the server.

Local Settings are indicated with a red banner and gear icon:



Server settings are indicated with a blue banner and cloud icon:



Following are descriptions of the various tabs you'll find under Settings.

Montage

The montage is a way to organize how the information from an EEG exam is visualized. On the Montage tab you can create montages, as well as define EEG labels, reference and other labels.

After a new montage is created, add it to a Perspective to make it available on the Review screen. (See Perspectives, later in the Settings section).

There are four tabs under the Montage tab, described below.

Montage

Adding Montages

On the Montage tab, click the Add button at the bottom of the Montage list.

Buttons on the Montage list – Add item, delete selected item, duplicate item

A new montage is added to the list. Double click on the montage name to edit it, then press enter.

> Note: Montages will be sorted with Input and As Recorded at the top, and the rest in alphabetical order.

Duplicating Montages

Select a montage from the list of montages.

Click the Duplicate button at the bottom of the Montage list.

Double click on the montage name to edit it.

Deleting Montages

Select a montage from the list of montages.

Click the Delete button at the bottom of the Montage list.

Note that the As Recorded montage cannot be deleted.

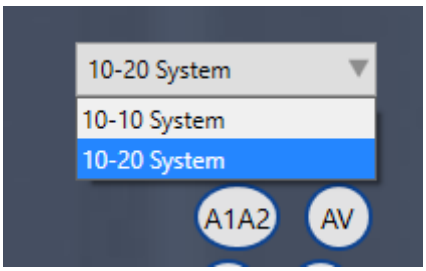
Associate User Groups to Montage

Select the montage from the Montage list, then move the user groups you want to have access to the Allowed user groups box using the arrow buttons and click Save. Only members of allowed user groups (as well as administrators) will see and have access to the montage.

Adding Montage Channels

There are two ways to add channels to a montage – drawing the channels on the Montage Head, or entering the active and reference electrodes in their respective fields.

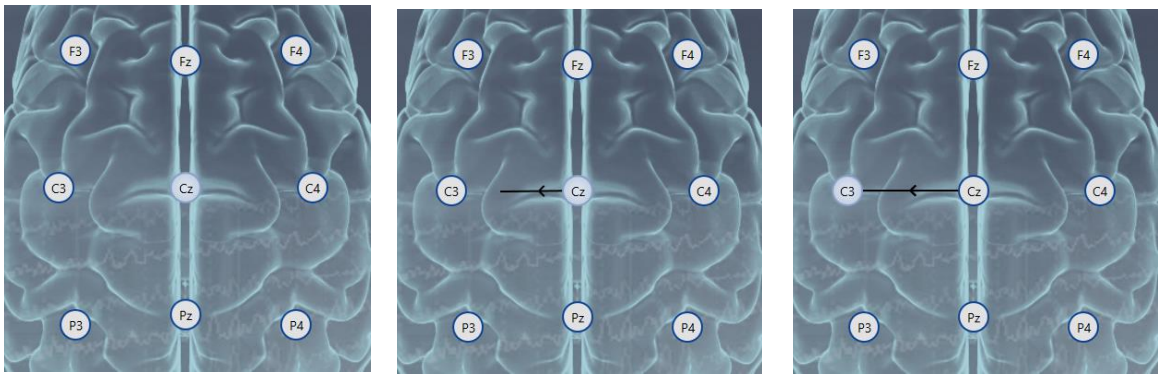
Montages can be made by using any of the available label systems (upper right corner).



You can use still use any of the electrodes in the system, even though the selected label system does not include them.

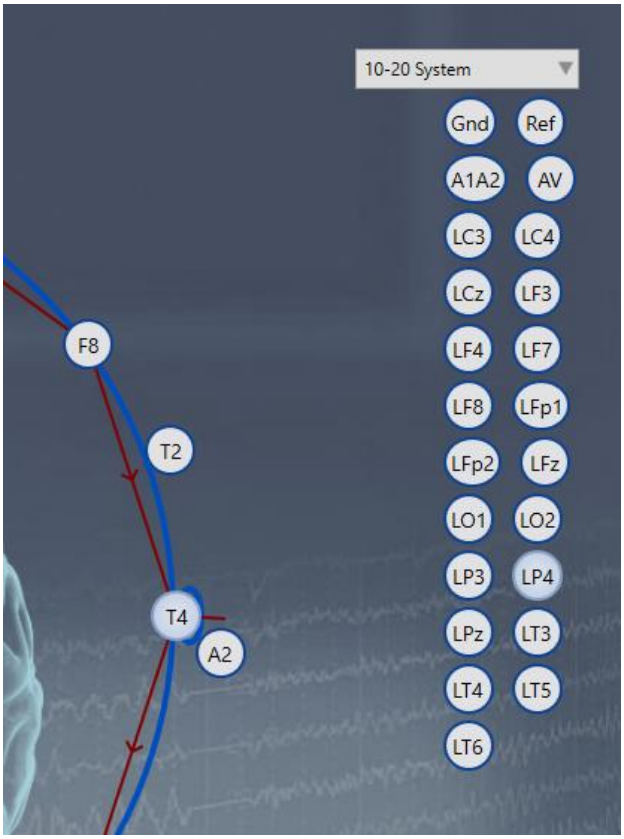
Drawing channels on the Montage Head

Click on the electrode you want as the active electrode, then click on the one you want as the reference.



The channel has now been added to the montage, both to the montage head and to the channel list.

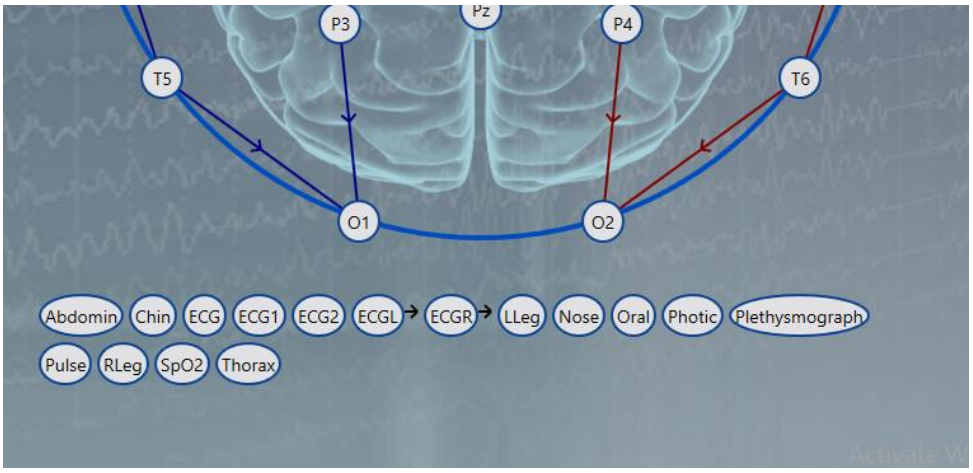
It is also possible to select an active electrode from the head and a reference from the list of References (to the right of the head).



Clicking on a reference activates it so that many electrodes can be selected from the head. Each one then becomes the active electrode against the selected reference in a montage channel.

To deselect a reference, either click on the selected reference again, or select another reference from the list.

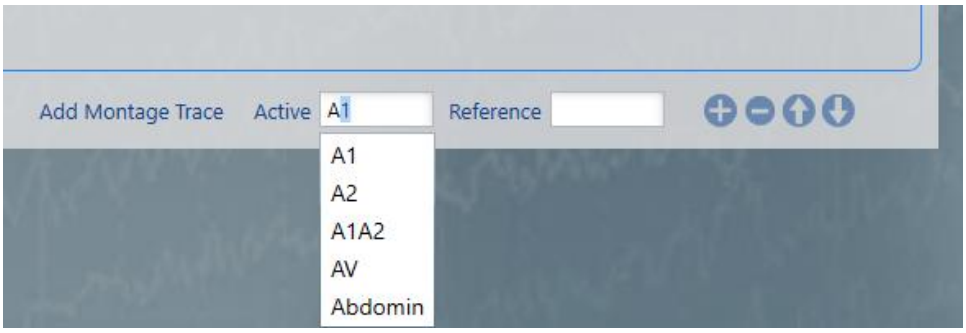
It is possible to add Non-EEG signals to the montage (located below the head) by clicking on the electrode. The non-EEG signals do not need to have references.



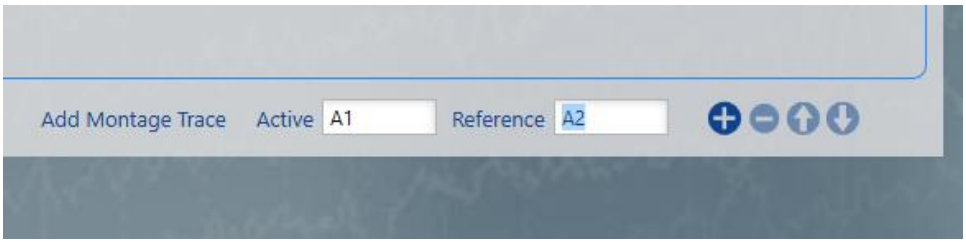
It is possible to add Sources to the montage (located below the Non-EEG signals) by clicking on the electrode. The sources do not need to have references.

Entering active and reference labels

Start entering the name of the active electrode in the Active field. The system displays all available electrodes matching that name. Select the electrode you want. Do the same for the Reference field.



Once valid electrodes have been entered, the Add button becomes available.

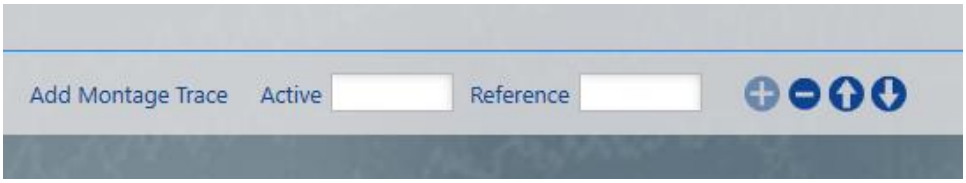


Clicking the Add button adds the channel to the montage, both to the channel list and to the montage head.

Sources and Non-EEG signals can be added this way as well.

Deleting Montage Channels

It is possible to select channels (one or more) from the Channel list and delete them by clicking the Delete button.



Rearranging Montage Channels

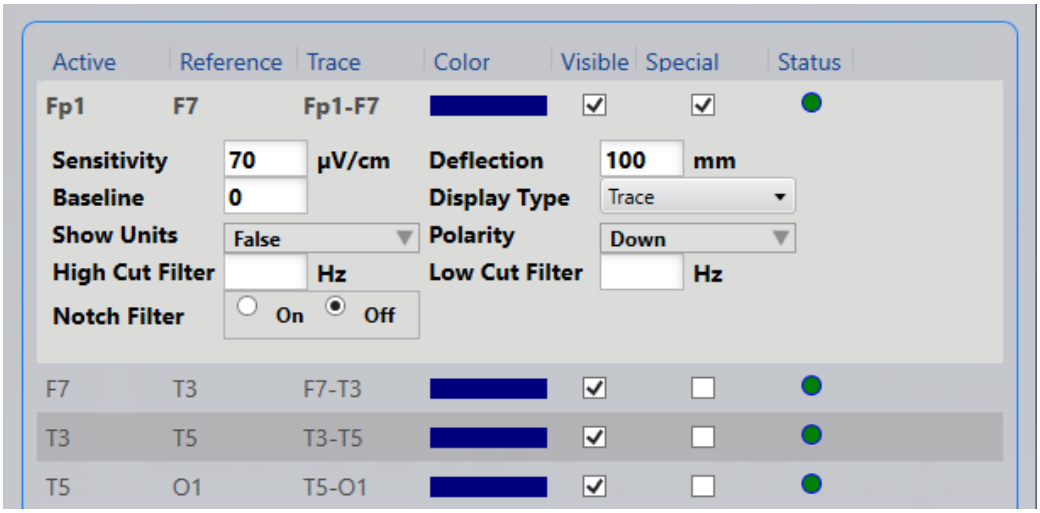
It is possible to move selected channels in a montage up or down by clicking the Up or Down arrow buttons.

Making Channels Special

Special channels do not conform to the general channel settings, but have their own special settings.

It is possible to make a channel special by checking the Special box when you add the channel. The channel can also be made special afterwards by checking that channel's Special box.

Special settings can be applied to a single channel by clicking the Special box



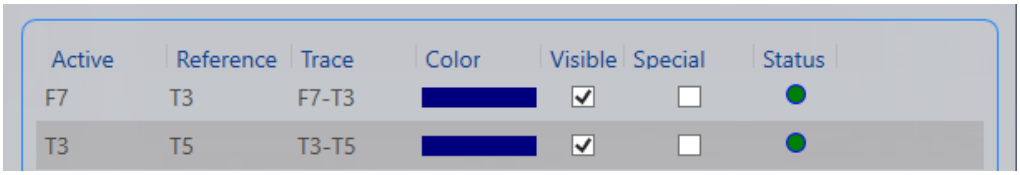
The settings that can be made special are the following:

- Sensitivity (µV/cm) or (µV/mm) depending on the system's default setting
- Deflection (mm)
- Baseline
- Display type (Trace/Text/Trace&Text/Off)
- Show Units (True/False)
- Polarity (Up/Down)
- High Cut Filter (Hz)
- Low Cut Filter (Hz)
- Notch Filter (On/Off)

It is possible to remove the Special settings by unchecking the Special box. After that the channel will conform to the general channel settings again.

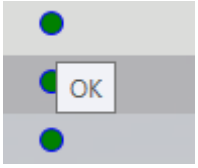
Visibility of Channels

Channels are visible on the EEG by default but it is possible to make a channel invisible on the EEG by unchecking that channel's Visible box.



Channel Status

The channels show their status with a colored dot, and a tool tip explains the status more thoroughly.



The dark green dot shows if the channel is OK.

The light green dot shows if the channel electrodes have different polarity or different sensor types.

The orange dot shows if the channel electrodes compare AC to DC, compare digital to analog, or match unipolar with bipolar.

The red dot shows if the channel electrodes compare different units.

Channel Color

The color of a channel can be changed by selecting it from the Color drop-down list.

Editing the color of a channel does not make it a Special channel.

Editing Channels

It is possible to edit the electrodes of a channel afterwards. This can be done either in the channel list itself or on the montage head.

On the Channel List

By clicking on an electrode (active or reference) in the Channel list, the name of the electrode becomes editable. Start entering the name of the new electrode in the field and the system displays all available electrodes matching that name. Select the electrode you want and the channel in the list as well as the channel on the head will be changed.

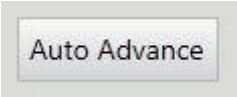
On the Montage Head

When editing channel electrodes on the head, you start by selecting a channel from the Channel list.

If the Auto Advance is off, you can select different electrodes on the head, but you are only editing the active electrode of the channel you selected. To edit other electrodes they must be selected specifically.

If the Auto Advance is on, the system will automatically move to the next electrode in the list for each electrode you select on the head. The move is from the active electrode in the selected line to the reference electrode in the selected line, then to the active electrode in the next line to the reference electrode in the same line, and so on.

Auto Advance toggle button



EEG Electrodes

This tab under Montage is for adding electrodes and creating electrode label systems. All of the electrodes added to the system are available for creating montages whether or not they are grouped into an electrode system.

Adding Electrode Systems

Click the Add Item button at the bottom of the Electrode System list.

Add Item, Delete Selected Item, Duplicate Selected Item buttons

Double click on the system's name to edit it.

Duplicating Electrode Systems

Select an electrode system from the list of electrode systems.

Click the Duplicate button at the bottom of the Electrode System list.

Double click on the electrode system's name to edit it.

Deleting Electrode Systems

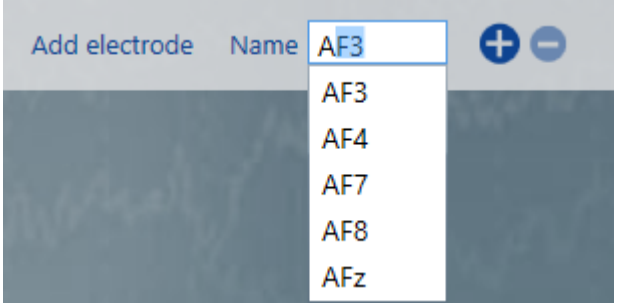
Select an electrode system from the list of electrode systems.

Click the Delete button at the bottom of the Electrode System list.

Note that the predefined 10-10 and 10-20 systems cannot be deleted.

Adding Electrodes to an Electrode System

Select an electrode system from the Electrode System list. Start entering the name of the electrode in the Name field. The system will display all available electrodes matching that name. Select the electrode you want and click the Add button.



The electrode has now been added to the electrode system, both to the electrode list and the head.

Deleting Electrodes from an Electrode System

It is possible to select an electrode from the electrode list or from the head and delete it by clicking the Delete button.

Azimuth and Longitude

Edit the azimuth and longitude of an electrode by clicking to activate the field and typing in a value (between -359 and +359).

Color

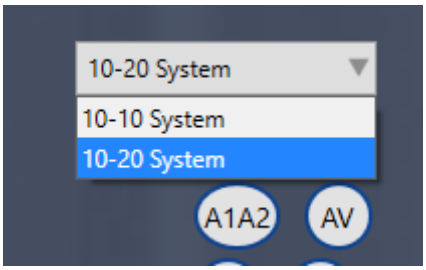
Click the color bar to select a new default “active” color for the electrode. This determines the default color of the trace where the electrode is the active one.

EEG References

This tab under Montage is used to add EEG reference electrodes which are then available when creating montages.

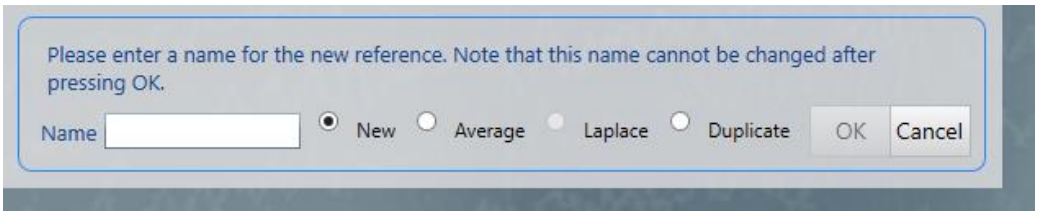
Adding References

Before you add a reference, make sure you have the correct electrode system selected (upper right corner). The reference you make will only be added to the chosen electrode system.



Click the Add Item button at the bottom of the reference list.

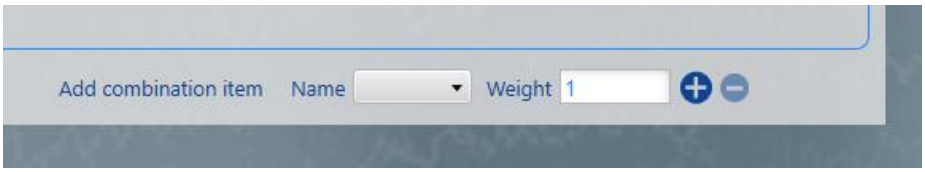
The system will prompt you with a message to enter a name for the reference. Note that the name cannot be changed afterwards.



Enter a name and select a type for the new reference and click OK.

The available reference types are: New, Average and Duplicate.

- Selecting the New reference will create an empty reference. Add combination items to the reference by selecting an available electrode from the Name list. Edit the electrode weight and click the Add button.



- Selecting the Average reference will create a reference with every electrode in the selected electrode system, each with the weight 1.
- Selecting the Duplicate reference is only possible when duplicating references (see the Duplicating References section below). Click OK to duplicate the selected reference.

Duplicating References

Select a reference from the list of references (except for the predefined Ref).

Click the Duplicate button at the bottom of the reference list.

Enter a name for the reference, make sure the Duplicate type is selected and click OK.

Deleting References

Select a reference from the list of references.

Click the Delete button at the bottom of the reference list.

Note that the predefined Ref reference cannot be deleted.

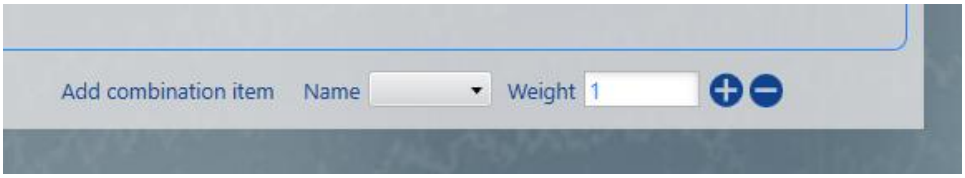
Adding a Combination Item to a Reference

Select a reference from the list of references. Select an electrode from the Name list and enter its weight. Click the Add button.

Note that combination items cannot be added to the predefined Ref and Gnd references.

Deleting a Combination Item from a Reference

Select a reference from the list of references. Select a combination item from the list of combination items. Click the Delete button.



Other Signals

It is possible to add signals from other sources to a montage, for example EKG, respiratory and other signal types. Use this tab under Montage to define these sensors so that they are available to add to montages.

Adding Non-EEG Signals

First make sure you have the correct electrode system selected (upper right corner). Type a name for the new sensor in the Name field. Note that the name cannot be changed afterwards. Select a sensor type from the Type list. Click the Add button.

If the new sensor has a unit other than µV, the Units/µV and Offset can be edited.

- Each signal is measured in µV. If however the signal being measured has a unit that is not µV, the units/µV indicates how many of the signal's unit one µV represents.
- The measured signal may be biased in such a way that the zero point in the measured signal's unit does not coincide with zero µV measured. The offset (in signal units) represents at what point in the unit's scale the zero µV is set.

Changing the Non-EEG Signal Type

Select a sensor from the Non-EEG Signal list, then change the sensor type by selecting another one from the Type drop-down list.

Non-EEG Signal Color

The color of non-EEG signals can be changed by selecting a new color from the Color list.

Deleting Non-EEG signals

Select sensors (one or more) from the Non-EEG Signal list. Click the Delete button.

Events

Events are used to mark the EEG. The most basic events mark a noteworthy incident with a text. More complex events can be used for marking parts of the EEG for pruning, holding annotations and numerical values, and some events even store the current montage at the time of event insertion.

Use the Events tab in Settings to create event types and group them into palettes. You can then assign palettes to different Perspectives to be able to switch between them quickly during review.

Adding Event Palettes

Click the Add Item button at the bottom of the Palette list.

Double click on the palette name to edit it.

Duplicating Event Palettes

Select a palette from the list of palettes.

Click the Duplicate Selected Item button at the bottom of the Palette list.

Double click on the palette name to edit it.

Deleting Event Palettes

Select a palette from the list of palettes.

Click the Delete Selected Item button at the bottom of the Palette list.

Note that predefined palettes cannot be deleted.

Adding Event Types

Click the Add button at the bottom of the available event types list.

Editing Event Types

It is possible to edit events at all times.

Event Settings

The Name and Description fields of the event type can be edited.

A color can be selected for the event type.

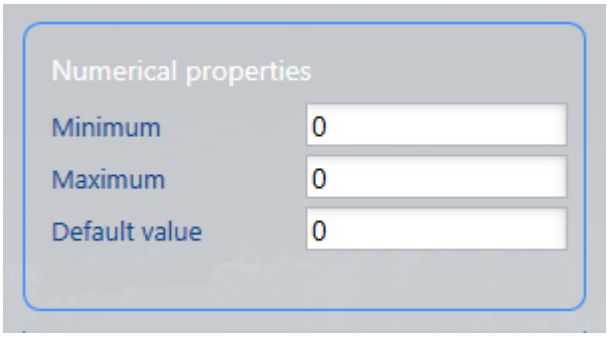
The event type category can be selected from a drop-down list.

The event type priority can be selected from a drop-down list for display purposes.

Numerical Events

To set an event type as Numerical, select one of the options from the drop-down list.

Set the Minimum, Maximum and Default values.

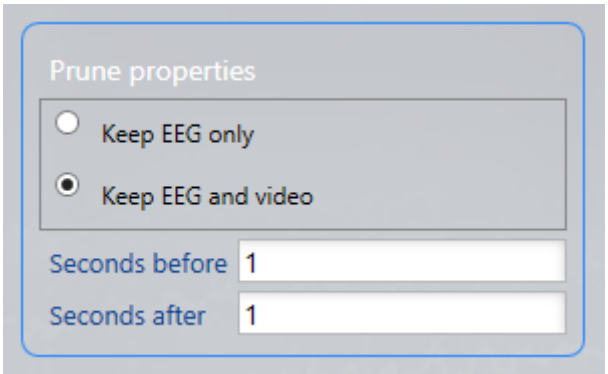


Annotation Events

If the Annotation Event checkbox if checked, the event will be an annotation event, and display the event's annotation as its caption.

Prune Events

If the Prune event checkbox is checked, the event will be a prune event. It is possible to prune (or prune preview) exams, cutting out unwanted data and only leaving the segments marked with prune events. The Prune Properties that can be edited are whether the event should Keep EEG only or Keep EEG and video when pruning.



Also, seconds before and after can be edited. These are seconds right before and after the prune event that the system will keep when the exam is pruned.

Context Events

If the Context event checkbox is checked, the event will be a context event. The system then saves the montage, general channel settings and time base of the exam at the point of insertion. After a context event has been added to an exam, it is possible to toggle its context button and the system will display the event's settings.

Duration Events

If the Duration event checkbox is checked, the event will be a duration event. The Default Duration of the event type can be set.

Duplicating Event Types

Select an event type from the list of available event types.

Click the Duplicate button at the bottom of the available event types list.

Deleting Event types

Select an event type from the list of available event types.

Click the Delete button at the bottom of the available event types list.

Note that predefined event types cannot be deleted.

Adding Event Types to Palettes

Select the palette you want to edit from Palettes list. In the Available Event Types list, double click on the event type you want to add to the palette. It will move to the Event Types in Palette list.

Removing Event types from Palettes

Select the palette you want to edit from Palettes list. In the Event Types in Palette list, double click on the event type you want to remove from the palette. It will move back to the Available Event Types list.

Ordering Events in a Palette

To arrange the events in a palette in a particular order, simply drag and drop the events in the Event Types in Palette list to the position where you want them.

Perspectives

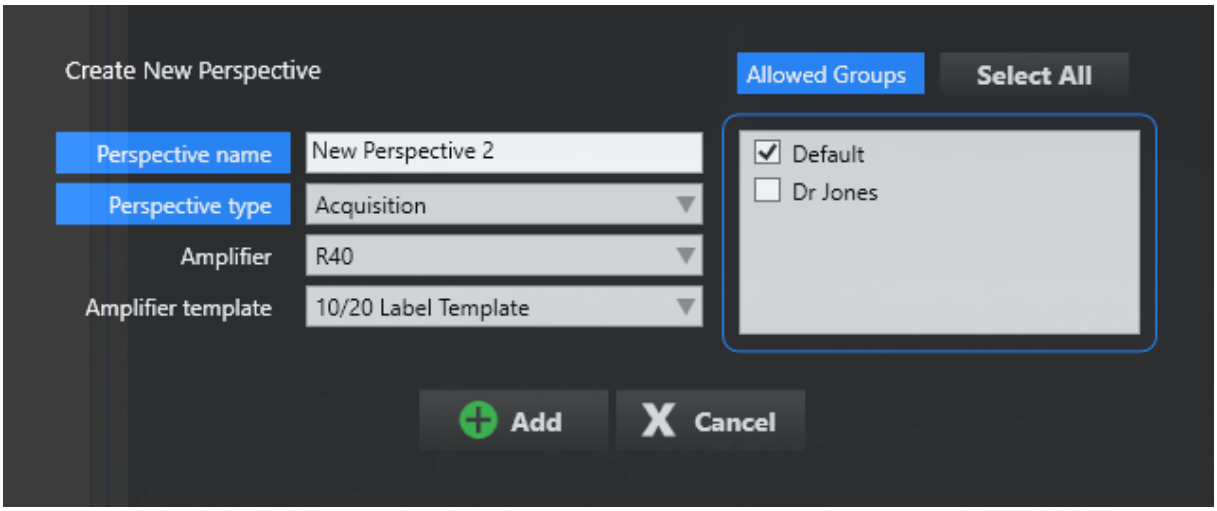
Sometimes you need to re-use the same combination of event palette, montages, general channel settings and more. You can store these combinations into a settings group called Perspectives. It is then possible to easily switch between perspectives during review, resulting in increased efficiency if you need to change the EEG environment frequently. Perspectives can be easily added and modified.

If no Perspective is created, the Default perspective is used, and its settings can be modified on this tab.

Adding Perspectives

Click the Add button at the bottom of the perspectives list to create a new perspective.

The following popup appears. Give the perspective a name and select the perspective type (either Acquisition or Review). If Acquisition, then select the amplifier and amplifier template. You can then select the permissions for this perspective. At least one user group must be selected. Click Add when you are finished.



Customize your perspective further by modifying the parameters in the section below, Editing Perspectives.

Editing Perspectives

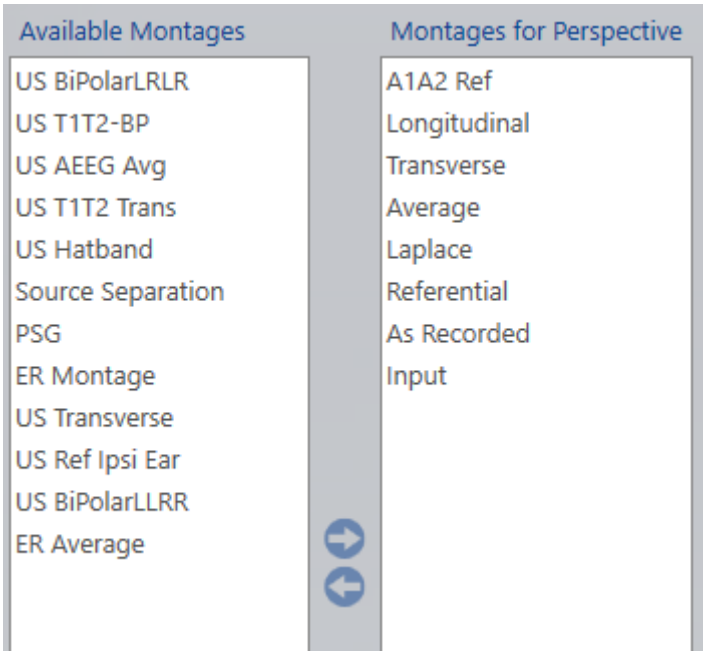
It is possible to edit perspectives at all times. To edit, select the Perspective you want to edit from the list. Then modify the following settings.

Montage for Perspective

Select a montage from the Available Montages list and click the right arrow button to move the montage to the perspective. Montages can be removed from a perspective by selecting the montage from Montages for Perspective and clicking left arrow button.

Note that the As Recorded montage cannot be removed from any perspective.

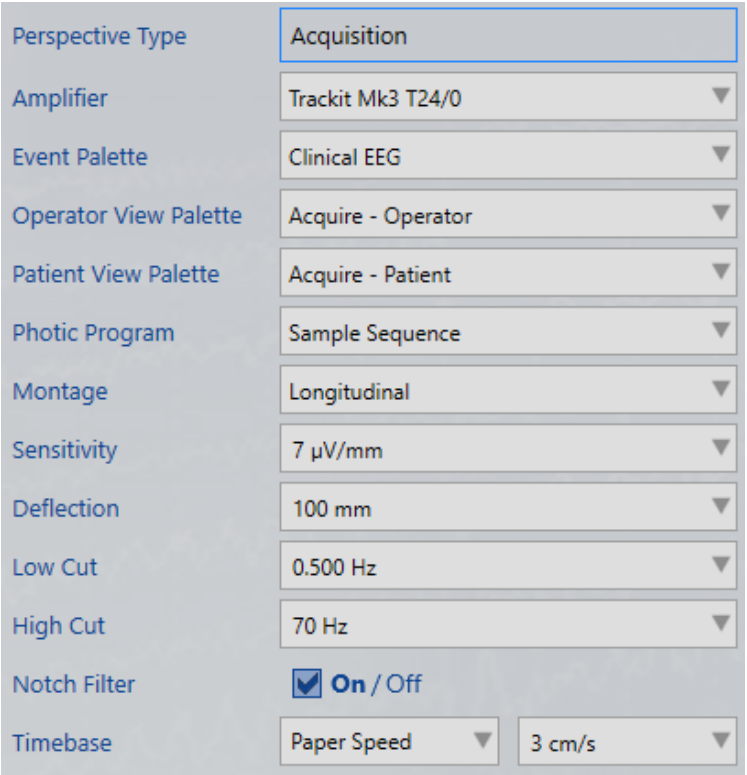
Montages will appear on the Montage Selector in Acquire and Review with As Recorded and Input at the top, and the rest of the montages in alphabetical order.



Defaults

Following are a number of other options (shown below) where you can set the default values for your selected perspective. (The options vary depending on whether your perspective type is Acquisition or Review.)

You can change from the defaults during acquisition or review, but these will be the settings you will start with when your perspective is selected.



Timebase

You can control how much data is displayed on the channel chart (time-wise) by setting its timebase. Choose between two modes: paper speed (represents the length of the page used to display each second of the data) and page duration (represents the number of seconds per page).

Set the default timebase mode by choosing either Paper speed or Page Duration under Timebase. Then select the default paper speed or page duration from the second drop-down list. The list can be edited by typing in a new value (between the upper and lower limits) and pressing Enter.

Edit Name

Double click on the perspective name to edit it. Press Enter after changing the name.

Duplicating Perspectives

Select a perspective from the list of perspectives.

Click the Duplicate Selected Item button at the bottom of the perspectives list.

Double click on the perspective name to edit it.

Note: When duplicating a perspective, it is not possible to change the perspective type.

Deleting Perspectives

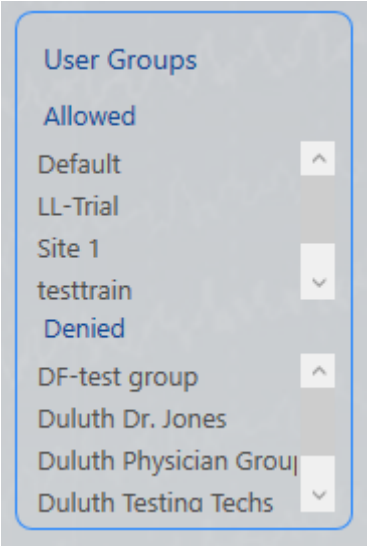
Select a Perspective from the list of perspectives.

Click the Delete button at the bottom of the perspectives list.

Note that the predefined perspectives Default and PSG cannot be deleted.

Associate User Groups to Perspective

Select the perspective from the Perspective list, then move the user groups you want to have access to the Allowed user groups box using the arrow buttons and click Save. Only members of allowed user groups (as well as administrators) will see and have access to the perspective.

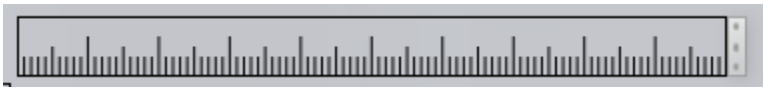


My Settings

Screen

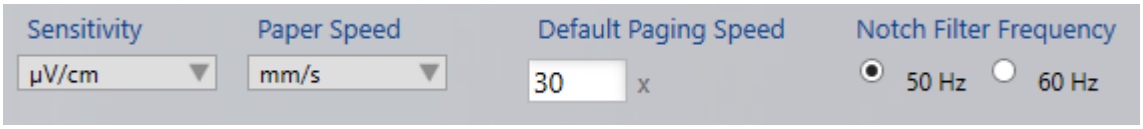
Here you can calibrate the screen for accurate representation of the onscreen channel chart. When calibrated, 1 cm displayed on the channel chart will actually measure 1 cm. The screen calibration must be performed for every new computer screen.

Using a real ruler, drag the handles on both system rulers, vertical and horizontal, so they match exactly 10 cm.



WARNING: It is important to calibrate the screen so exams can be interpreted correctly. The screen calibration must be performed for every new computer screen.

Settings



Sensitivity

The unit for sensitivity can be either µV/cm or µV/mm.

Paper Speed

The unit for paper speed can be either cm/s or mm/s.

Default Paging Speed

Type in a default paging speed in the box provided.

Notch Filter Frequency

The notch filter frequency can be set to either 50 Hz or 60 Hz.

Timeline Position

The position of the timeline on the screen can be set to either Top or Bottom.

Gridlines

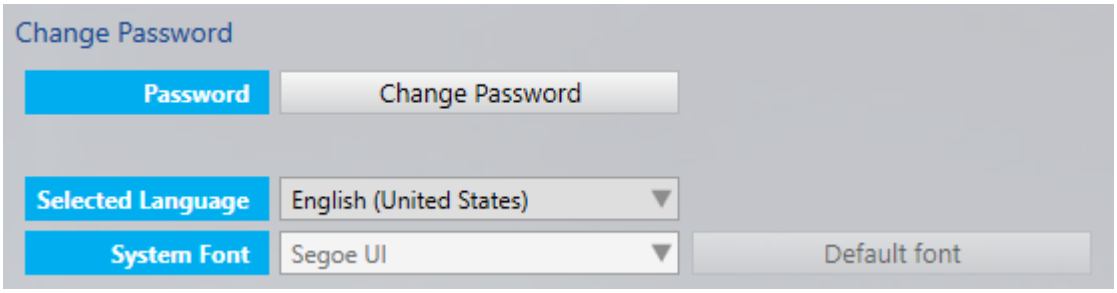
Show or hide major and minor gridlines.

Change Password

Click here to change your password.

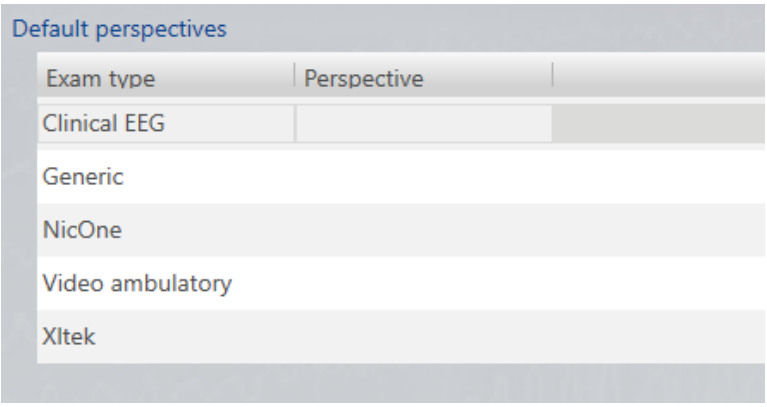
Language and System Font

Select your default language. If your default language requires it, it is possible to change the system font.



Default Perspectives

For each exam type, you can select which perspective you want to be used as the default.



Acquisition

On the Acquisition tab, there are two tabs, one for modifying the amplifier setup associated with a perspective, and another for creating your own photic programs.

Note: The acquisition tab is only available on acquisition systems.

Amplifier Setup

Select the perspective and amplifier type you want to modify.

Your current amplifier setup will appear and can then be edted. Save your changes.

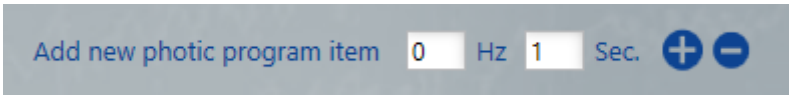
Note: The amplifier setup changes only apply to the selected perspective and do not change the amplifier setup template.

Photic Program

Create a photic program which is then selectable in the photic tool in Acquire.

To create a new photic program, click the Add button at the bottom of the Photic Programs list. Type in a name for the new program and press enter.

To create your sequence of flashes and pauses, enter a flash frequency in Hz. A value of zero will create a pause instead of a flash. Then enter the number of seconds you want the flash or pause to last. Press the Add button to add this item to the flash program. To delete a flash item or pause, select it on the list and press the Delete button.



Click Save to save your changes.