EEProbe™
User Manual
'Getting Started'

Using EEProbe and the EEProbe Databrowser

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DISCLAIMER

We have attempted to write this manual as accurately as possible. However, mistakes are bound to occur, and we reserve the right to make changes to EEProbe or the EEProbe Databrowser, which may render parts of this manual invalid. We assume no liability as a result of the use or application of this product.

No part of this manual may be copied or reproduced without the express permission of the authors.

NOTICE

EEProbe, the EEProbe Databrowser, the incorporated EEP modules and any auxiliary scripts are research software. It is not to be used as the sole or partial basis for clinical diagnosis or treatment.

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ABOUT EEPROBE

'EEP' was developed at the Max-Planck Institute for Cognitive Neuroscience (MPI-CNS), Leipzig, Germany. The 'ERP Evaluation Package' consists of a number of modules (programs) for advanced ERP processing and analysis. This package is available exclusively through ANT Software b.v., Enschede, The Netherlands, under the name *EEProbe*. Further improvements to the package are developed at both MPI-CNS and ANT.

In this manual, we will use the terms

EEProbe programs, to refer to the set of (command line) programs, and

EEProbe Databrowser, to refer to the windowing program that puts a graphical user interface (GUI) around some of the *EEProbe programs*.

1. *EEPROBE* DATABROWSER

Overview

- Introducing the EEProbe Databrowser

- Installation procedure

1.1. Introducing the EEProbe Databrowser

The *EEProbe Databrowser* is a program that provides a graphical user interface (GUI) to a sub-set of the *EEProbe programs* for ERP research.

The Databrowser

- acts like a 'shell' around the implemented *EEProbe programs*,

- facilitates 'browsing' of your data in a well structured directory tree,

- lets you work on selected data of multiple subjects/experiments, and

- eases the learning and handling of the EEP configuration files

The *Databrowser* adds a graphical window layer around the *EEProbe programs*. The program interfaces those EEProbe programs that are mostly used for the processing of ERP data. The incorporated functionality is designed after the EEProbe programs, and still uses the concept of configuration files (see Chapters 2 and 3).

The Databrowser introduces you to EEProbe's philosophy for file handling, using configuration files to store the settings of your data processing, and keeping your data well organized. EEProbe's strength in quickly reviewing and processing a large number of files is very easy with the Databrowser.

The EEProbe Databrowser cannot replace advanced scripting possibilities such as a 'Makefile'. However, it is quite easy to incorporate a shell-script in the graphical interface that allows you to repeat quickly a set of common procedures to your data.

1.1.1. How to use this manual

Section 1.2 of this chapter describes the *installation* procedures.

If you want to learn about the *general concepts* of the Databrowser, read chapter 2.

Use chapters 3 and 4 for *reference* about all implemented EEProbe functionality and the user interface dialogs as provided in the Databrowser.

Chapter 5 demonstrates some *typical ERP analysis procedures*, based on an example data file. Use this to quickly familiarize yourself with the basic usage of the Databrowser.

Read chapter 6 and further for some more 'advanced' topics.

The appendices to this manual are for reference of the keyboard and mouse shortcuts as implemented in the Databrowser (Appendix A: page 96), a summary of the usage of regular expressions (Appendix B: page 100), and Appendix C: (page 101) contains some (technical) notes, advanced usage of the `eeprobe` startup script and copyright information.

In this manual we will sometimes refer to the *EEProbe Reference manual*. This manual is available on-line in the Databrowser via the Help menu. Ready-to-print version of the manuals are available as `.pdf` files on the EEProbe installation CD. Contact ANT for additional information on printed materials.

1.1.2. Further development

The development team at ANT Software is ready to learn from your usage of the Databrowser; do not hesitate to contact us for feedback or ideas. Please take a moment to phrase your thoughts in an e-mail; mail to 'eeprobe@ant-software.nl'.

1.2. Installation procedure

1.2.1. Software requirements

EEProbe and the EEProbe Databrowser run on a variety of Linux systems. For a selection of Linux distributions we have created custom installation files.

The EEProbe software makes use of several 'shared' system libraries:

```
blas
lapack
openmotif        (or lesstif)
tkinter          (or python-tk)
```

These libraries will be used in their 'native' version (specific/optimized per Linux distribution). The dependencies will typically be resolved automatically during the installation procedure.

Python/tkinter

It is not strictly required to install the python/tkinter software in your Linux system before running the EEProbe installation. You can also install these modules afterwards, please read section C.1.5 in Appendix C: of this manual.

If your Linux distribution does not include the required installation files, please go to the /root or /tmp directory and run the following commands as 'root':

```
tar xvzf <mountpoint-of-your-cd>/Python/Python-2.2.2.tgz

cd Python-2.2.2

./configure

make install
```

(this requires that you have a proper Linux development environment, e.g., the packages gcc , tcl-devel)

EEProbe installation files

On the installation CD, EEProbe and the EEProbe Databrowser are present as **rpm** or **deb** files, which can be found on the installation media in sub-directories named e.g., Redhat9.0, Mandrake9.1. You can find the installation files in a subdirectory Install. The distribution-specific files are located in a sub-directory Extra on the EEProbe installation CD.

Alternatively, you may have downloaded the file from the ANT web-site; you should select the appropriate files for your Linux distribution.

Unpack the main installation file as user 'root':

```
tar xvzf eeprobe-3.2.tgz
```

This will create the Install directory as mentioned below. The 'extra' shared libraries will be installed automatically if you have downloaded the file eeprobe-3.2-extra.tgz to the same directory (no need to unpack this file).

Install as 'root' from the Install directory:

```
cd Install
```

Check the rest of the procedure in the next paragraph.

1.2.2. Installation on Redhat, Mandrake or SuSE[1]

Please locate the correct sub-directory for your Linux distribution on the EEProbe installation CD, go to the `Install` sub-directory and open a terminal (console) program.

As user 'root', type the command:

```
./install-rpm.sh
```

This will install EEProbe, and will ask you several questions related some optional installation steps:

```
Do you use an EEProbe dongle (key-lock) on this computer? [y]
The package "usbutils" must be removed for USB dongles, OK ? [y]
```

You must answer these question with 'y' (or just <Enter>) if you are using an EEProbe USB dongle.

```
Copy the shell environment settings to /etc/profile.d ? [y]
Copy the default app-defaults X settings to /usr/lib/X11/app-defaults ? [y]
```

Answer these questions with 'y' to obtain the correct environment settings. Otherwise, the installation script will describe how to do this manually.

```
Install the EEProbe Databrowser (requires Python2 and Tkinter2) (y/n)? [y]
```

Type 'y' to install the EEProbe Databrowser (GUI):

```
/opt/eep/bin/eeprobe
```
(the startup script)

```
/opt/eep/eeprobe_gui
```
(contains the python scripts, default settings)

Installation notes (rpm only)

The `install-rpm.sh` script supports two arguments:

```
./install-rpm.sh check
```

Use this to check if EEProbe has some dependency problem in your Linux environment.

```
./install-rpm.sh uninstall
```

Use this command to uninstall EEProbe.

1.2.3. Startup and licensing the software

After the installation, **restart your ~~bash~~ environment** (typically a restart of the terminal is sufficient).

As a normal user, type

```
eeprobe
```

This will start the EEProbe Databrowser.

---

[1] not tested on other distributions that use RPM

EEPROBE LICENSE

In the EEProbe Databrowser, under the Help menu, you can start the 'EEProbe License' dialog. This dialog allows you to save the information that we need to provide you with a License.

You will be asked to indicate if the (optional) EEProbe dongle should be checked for its license information. Answer 'Yes' when you have your dongle connected.

Please save the text to a file 'license.info'.
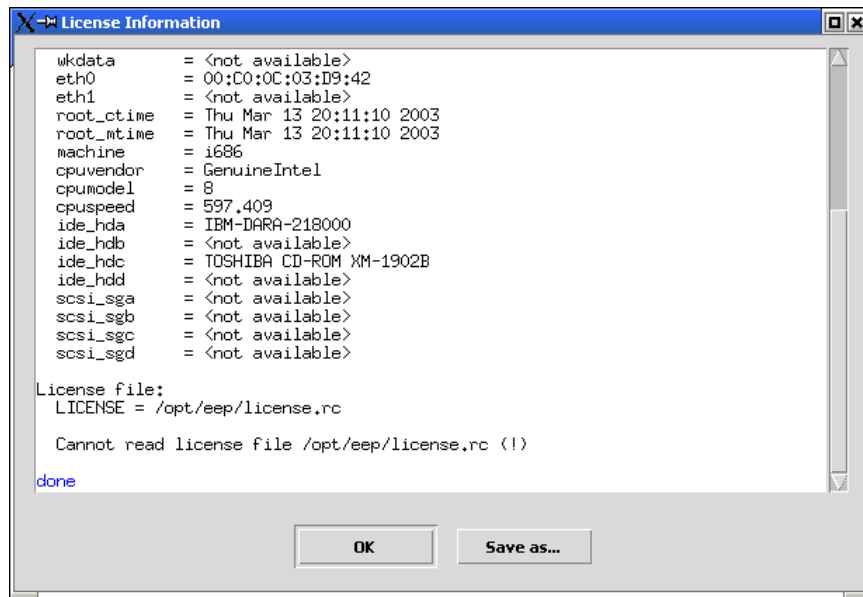
Figure 1-1   **Save the EEProbe license information to a file.**

Alternatively, to license the software on your machine(s), run the command

```
licinf > license.info
```

E-mail the resulting file 'license.info' to ANT Software at the e-mail address info@ant-software.nl (mailto:info@ant-software.nl)

You will receive the license file in the reply mail.

Copy this file (as user 'root') to /opt/eep/license.rc

The current procedure for licensing the software typically includes an automatic license renewal procedure every year (via e-mail).

1.2.4. Per-user settings

After installing the first start of the EEProbe Databrowser, you should be able to start it by typing the command "`eeprobe`" as a normal user.

A special "`settings`" file is used that contains all user configurable settings. The Databrowser program automatically installs this file in `$HOME/.eep` directory at the first startup. Most of the settings are available through the 'Tools' menu, 'Settings'. The settings file contains the default project directory, the layout of a new project and the default configuration files, the channel layout and other items. This will be explained on page 55 and further.

After a new installation (or update) the startup script "`eeprobe`" can be used also to update your "`settings`" file, or for run-time optimization of the python scripts.

Type

```
eeprobe --help
```

for all available options.

Customization of the display configurations

The X-configuration files in `/opt/eep/app-defaults` are usually copied to `/usr/lib/X11/app-defaults` at installation time. This gives you proper default values for the display 'look' of EEProbe's graphical programs. However, you can make a copy of the files in `/opt/eep/app-defaults` to your home directory to customize the display of

- the continuous data viewer `xcnt`

    `~/Xcnt`

- the average viewer `xavr`

    `~/Xavr`

- the filter design program `xfir`

    `~/Xfir`

- the EOG classification program `xeog`

    `~/Xeog`

- the display configuration of the Databrowser[2] - after the first start - is in

    `~/.Xdefaults`

The environment settings for the Bourne Again Shell (`bash`) in

`/opt/eep/scripts/setEnv.sh`

The environment settings for the C Shell (`csh`) in

`/opt/eep/scripts/setEnv.csh`

(These files are copied to `/etc/profile.d/eep.sh` and `/etc/profile.d/eep.csh` at install time; however, if your Linux system does not have a `/etc/profile.d` directory, or simply because you prefer this, you can also include this in your own resource file (e.g. `~/.bashrc` for the bash environment).

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[2] The icon for the Databrowser - e.g., to put a shortcut on your X desktop - is available in the file `/opt/eep/eeprobe_gui/eeprobe-icon.xpm`

The environment setting LICENSE is by default set to

```
/opt/eep/license.rc
```

However, the license file can be placed anywhere on the file system. Just update the LICENSE variable accordingly (alternatively, you can also use EEP_LICENSE as the environment variable).

2. USING THE *EEPROBE DATABROWSER*

Usage summary

- General description, files and directories, concepts

2.1. General description

Startup …

After installation, start the EEProbe Databrowser: *from a terminal (console) window, type* '`eeprobe`', and the program window presents itself:
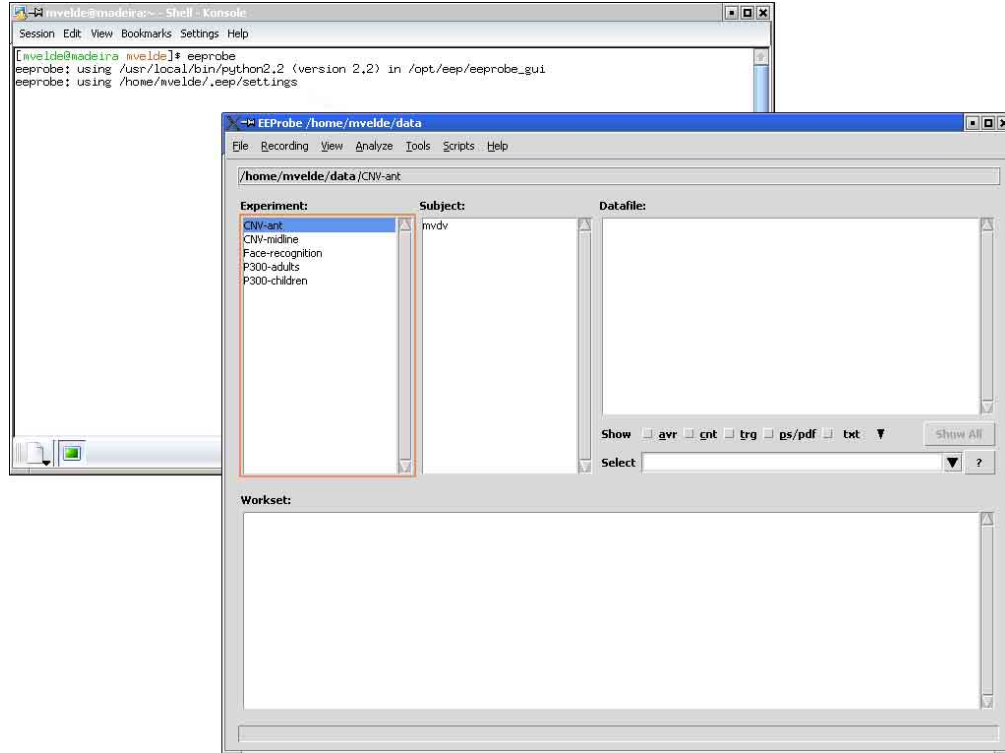
Figure 2-1   EEProbe Databrowser startup screen.

> Your startup screen will probably be empty, because your directory structure may not contain a `~/data` directory. In chapter 5 is explained how to create a new project, load some example data from the CD, and how to perform basic ERP analysis.

2.1.1. Usage summary

The 'caption' – the top line of the window – lists 'EEProbe: /home/mvelde/data'. The indicated directory is the current project location, and can be a standard directory anywhere in the filesystem where you have read / write access.

Menus. Immediately below the caption, you see the menus: File, Recording, View, Analyze, Tools, Scripts, and Help. The contents of the menus will be explained in the next paragraphs.

Data browsing. The three window panes under 'Experiment', 'Subject', and 'Datafile' are the space where you 'browse' your data. Use the mouse to click on an experiment and open the corresponding subject list. 'Experiments' and 'subjects' are standard directories. The third pane lists the datafile(s) of the selected subject. Click on a subject to open the corresponding datafile listing.

Workset. The large pane on the bottom of the Databrowser window is used to list the 'Workset', a list of files on which you want to perform a particular processing step. Open an experiment (click), open a subject (click), select a datafile and add it to the Workset (double-click, or <Enter>).

Most 'View' and 'Analyze' commands in the menus are only available after making a file selection in the Workset. Some default view commands are quickly accessed just by double-clicking on a file in the Workset, or by pressing <Enter>.

2.1.2. Directory structure

The EEProbe Databrowser uses a standard directory structure like this:

```
project
   |___ experiment1
   |      |
   |      |_____ subject1
   |      |             |___ datafiles
   |      |_____ subject2
   |      |             |___ datafiles
   |      |_____ subject3
   |                    |___ datafiles
   |___ experiment2
   |      |
   |      |_____ subject1
   |      |             |___ datafiles
   |      |_____ subject2
   |      |
   |      |___ cfg
   |
   |___ experiment3
   |
   |___ cfg
   |     |___ *.cfg, *.dat
   |___ fir
   |     |___ *.fir
   |___ scripts
         |___ *.sh, *.awk, *.tmpl, (etc)
```
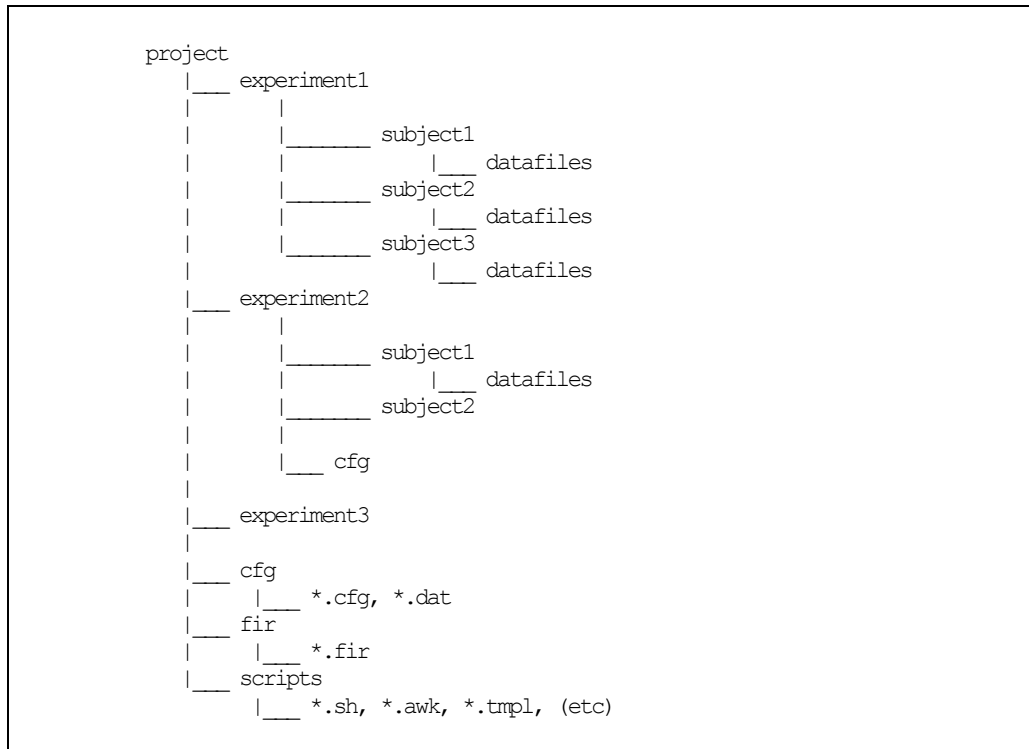
Figure 2-2   EEProbe directory structure.

The experiments that are part of one project all share one configuration directory, 'cfg', one directory 'fir' for filter files and one directory 'scripts' for custom scripts. These are not displayed in the 'Experiment' listbox of the Databrowser.

Although the EEProbe Databrowser does not restrict you from having completely different experiments in one project, the best working practice is to include in one project only experiments that use 'similar' settings for data processing. For example, a P300 study may contain different conditioning with tones or pictures, but similar filtering and averaging settings.

Note: It is highly recommended that subject directories be named with 4 characters, e.g., vp01, vp02, m101, n217. See also the general usage guidelines in the *EEProbe Reference manual* , Chapter 2 'Usage'.

In each project, the cfg directory will contain some default configuration files. For example, the EEProbe Databrowser will use the settings in cntaverage.cfg for the Dialog window for the cntaverage program (see page 39). The default configuration files will be written upon creation of a new project.

For the sub-directories representing 'experiments', also a 'cfg' directory may be present, which can be created through the Databrowser.

2.1.3. Browsing your data
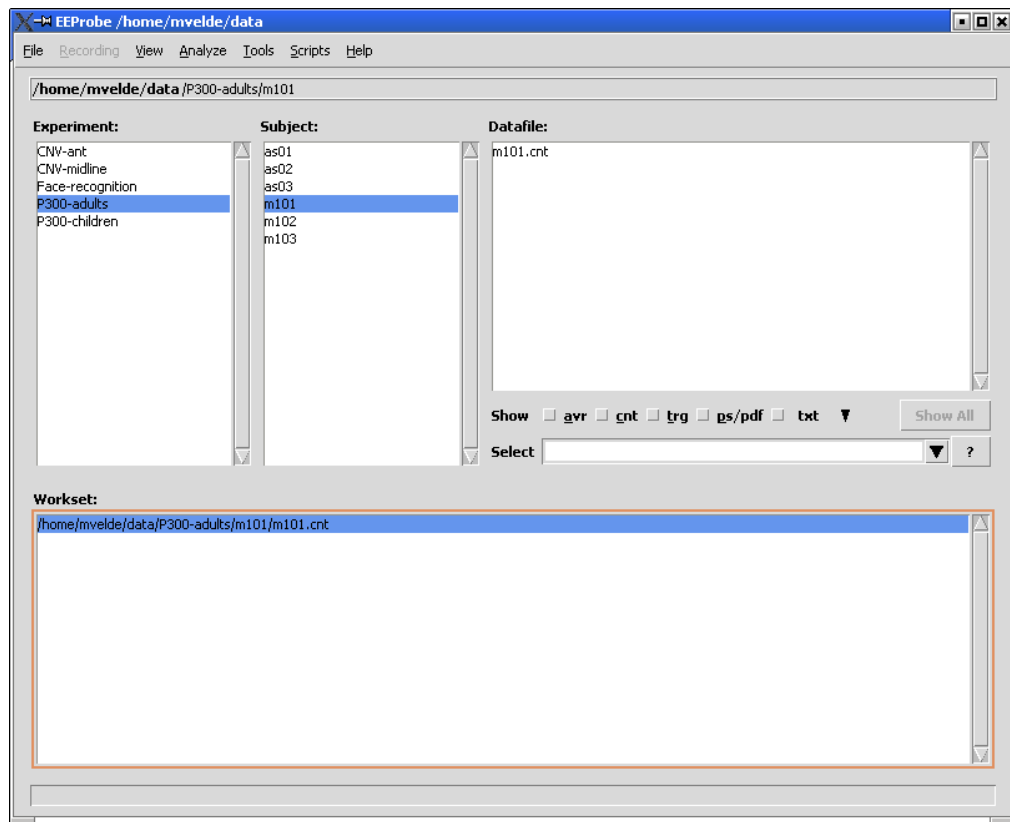
Main screen

Figure 2-3   **The main screen of the Databrowser: browse through Experiments, Subjects, Datafiles, and process one or more files in the Workset.**

The window as shown in the picture above, is the main screen in which you will work with your files, where you will see the result files of your analyses. The upper three window panes show the project's data, structured as Experiments, containing Subjects, containing Datafiles.

Directory structure. As explained in the previous paragraph, the project structure reflects the directory/file structure on disk. Three special directories are not listed under Experiment: the `cfg` , `fir` and `script` directories. Furthermore, the Experiment and Subject windows only list directories, so any files located in an Experiment subdirectory are not shown in the Databrowser.

Datafile listing of selected files. During the processing of data, the number of files for a particular subject can increase dramatically. Therefore, the listing of the subject's datafiles can be filtered using the checkboxes 'avr', 'cnt', 'trg', 'txt', 'ps/pdf', and also using regular expressions. For example, you can also type 'vp' in the Select field to list only the files containing 'vp' in their name. Appendix B: on page 99 explains more about regular expressions, and summarizes the use of some special *regexp* characters.

- click on an Experiment name to view the Subject list belonging to the experiment.
- click on a Subject to open the Datafile listing.

- Double-click on a Datafile to add it to the Workset.

  o Or, press the <Enter> key to add the file selection to the Workset. Or, *right-click* with the mouse on the file selection, and choose 'Add to Workset' from the context menu.

Tip

You can add more files to the Workset at once using the mouse:
you can use the Shift or Ctrl keys together with the mouse: hold
the Shift key to extend the selection to the next file you click on,
or hold the Ctrl key to add single files to the selection.

After each processing step, you will often have some new output (result) file added to the Subject's directory. Sometimes you have to 'refresh' the Datafile listing using the right-click mouse menu.

As most data processing is performed on continuous and average data, these are the file types that you typically have to 'Add to the Workset' from the Datafile listing. The EEProbe commands in the View and Analyze menus are only available when a file with an appropriate file extension is selected in the Workset. For example, the 'View, Continuous' is only available when only `cnt` files are selected. Also some commands in the Tools menu are only available when you have selected `cnt` or `trg` files.

Edit Selected Files (text). You can use the Databrowser also to open *text* files, of a type/extension known to the Databrowser (i.e., as defined within the EEProbe file formats). For instance, you can open a trigger file (e.g., `m101.trg`) or rejection file (e.g., `m101.rej`) by using the menu entry 'Edit Selected Files' in the 'View' menu. First add the file to the Workset, and select the file; now the menu entry is enabled.

View Postscript files. You can open through the View menu also the output postscript files as created from the xavr program (average viewer).

Working with the 'View' and 'Analyze' menus

The 'Analyze' menu is indicated below:
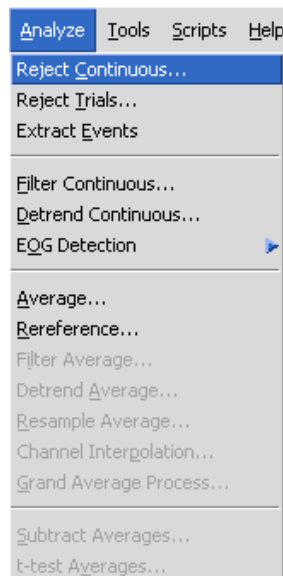
Figure 2-4 The Analyze menu. Menu entries for continuous data files enabled.

The 'black' entries in the 'Analyze' menu are the commands for continuous (`cnt`) files. The 'grayed' items in this picture are only available when average files (`avr`) are selected in the Workset.

Below, you see the 'View' menu, again with only the options for `cnt` files enabled:

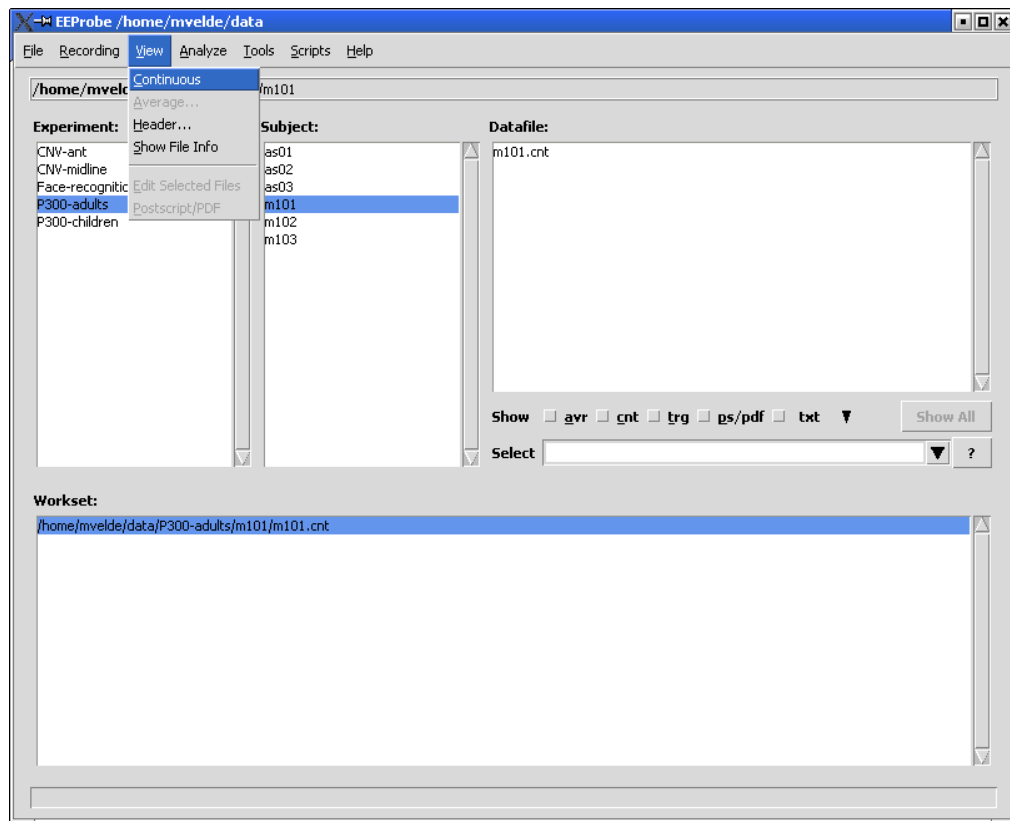**Figure 2-5   The View menu. Menu entries for continuous data files enabled.**
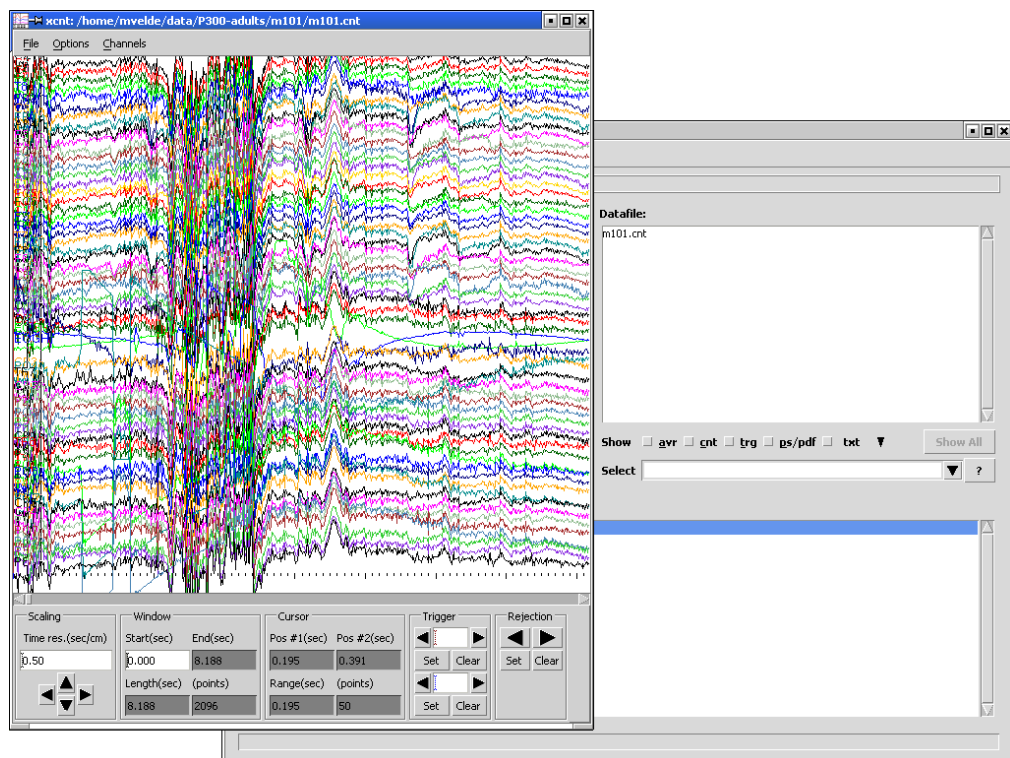

Figure 2-6   Start the xcnt viewer for continuous data from the Databrowser.

To start the viewer for continuous data files, follow the actions as presented in Figure 2-5 and Figure 2-6: select 'Continuous' from the 'View' menu, and the xcnt viewer will be started as shown.

Process multiple files
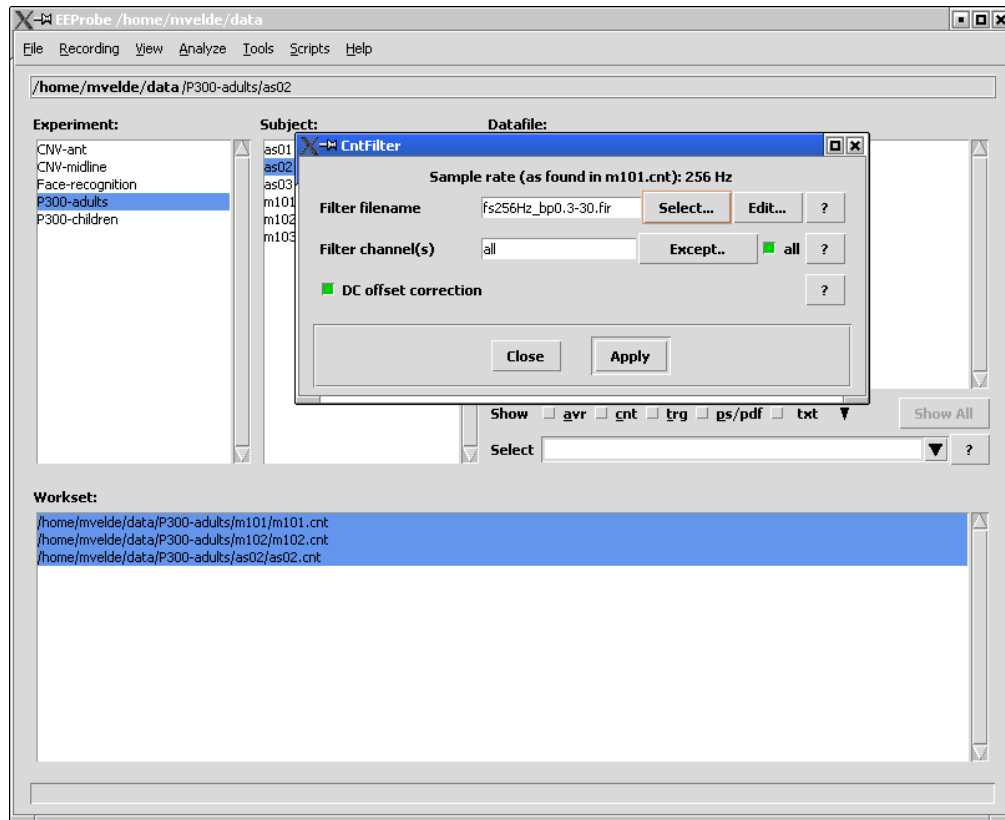
Figure 2-7   Select multiple files for processing, e.g. to filter 3 files in one pass.

Figure 2-7 shows you how you can use the EEProbe Databrowser for processing of more than one file. Select the files in the Workset window pane, and then choose 'Filter Continuous' from the 'Analyze' menu.

In this example, the cntfilter program will process all three files as selected, and will show the process in a 'Command Output' window.

File entries

Almost all *file entry* fields in the Databrowser will show only the basename of filenames. You can see the complete path of the entry by moving the mouse over the filename; a 'tooltip' will be shown:
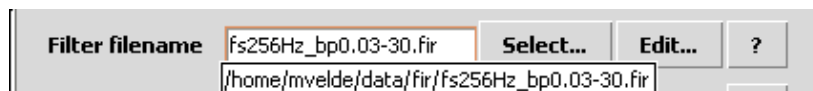
Figure 2-8   The complete location of file entries will be shown in a tooltip.

Some of these entries have a default path associated, and if you just type a name in the entry field, this default path will be appended automagically. See for instance the example in Figure 3-32 on page 53, where the default path is based on the first selected cnt file in the Workset.

Dialogs and configuration files

Most of the entries/commands in the 'Analyze' menu start an additional dialog window that presents you with the available processing parameters for that particular command. In fact, the Databrowser looks for a default configuration file. If this default configuration file is found, the Databrowser scans the file and sets the parameters in the dialog accordingly (also see C.1.2 on page 102 about *comments* in the configuration file).

Configuration files

On-line help

The layout and parameters in the configuration files used in the EEProbe Databrowser are (almost) identical to the configuration files for the individual EEProbe programs. Therefore, you are advised to use the *EEProbe Reference manual* (on-line from the 'Help' menu: 'Index') together with the brief info given via the small buttons showing a question mark '?'. Alternatively, use the <F1> key.
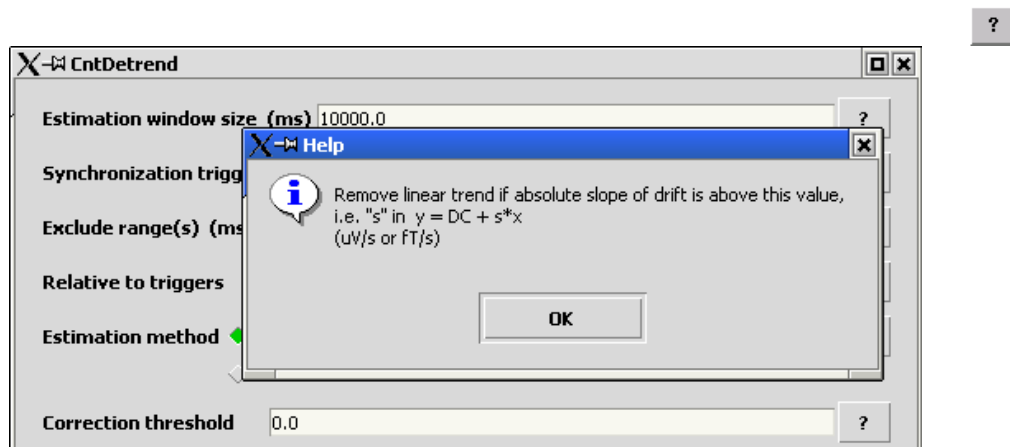
Figure 2-9   On-line help is provided throughout the Databrowser, here shown for the 'Correction threshold' parameter in the detrending procedure.

Default parameters

At the startup of the dialog window for a particular analysis command, the Databrowser searches in the projects `cfg` directory for a default configuration file. The name of the default configuration file is identical to the name of the related EEProbe program. So, for the `cntdetrend` program, the default configuration is `cntdetrend.cfg` (Figure 2-9); for the `cntaverage` program, the default configuration file is `cntaverage.cfg` in the `cfg` directory (see Figure 2-10). For programs that do not use a configuration file, no default parameters can be used in the Databrowser.

One command from the 'Analyze' menu is available to both `cnt` and `avr` files: Rereferencing. The configuration file is identical, and therefore the default configuration file is named `reref.cfg`.

Figure 2-10   The caption of the analysis dialogs reveal the name of the EEProbe program that will be started using the Apply button. This caption label is also the name of the configuration file that is parsed for default parameters.

Apart from using the default parameters, and/or editing the parameters in each dialog according to your processing needs, you can also save your own configuration files, and load this configuration again when you arrive to the same analysis step.

This is supported through the buttons 'Read Configuration' and 'Save Configuration as…' as seen in Figure 2-11. These buttons are present for all EEProbe programs that make use of a configuration file.
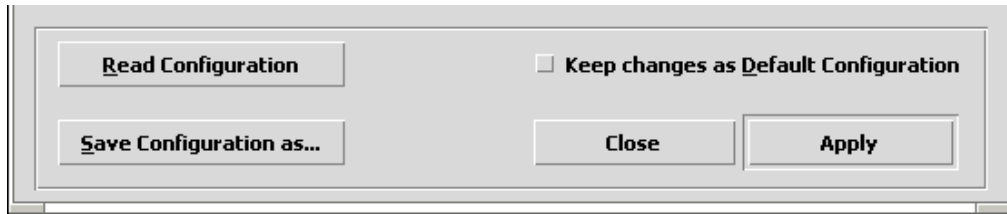
Figure 2-11   Buttons for reading and saving configuration files.

Pressing the 'Read Configuration' button will bring up an 'Open' dialog, which lists the files in the project's cfg directory. To load a particular configuration, click on its file name, and use the 'Open' button. The parameters in the dialog window will be updated according to the contents of the file just opened.
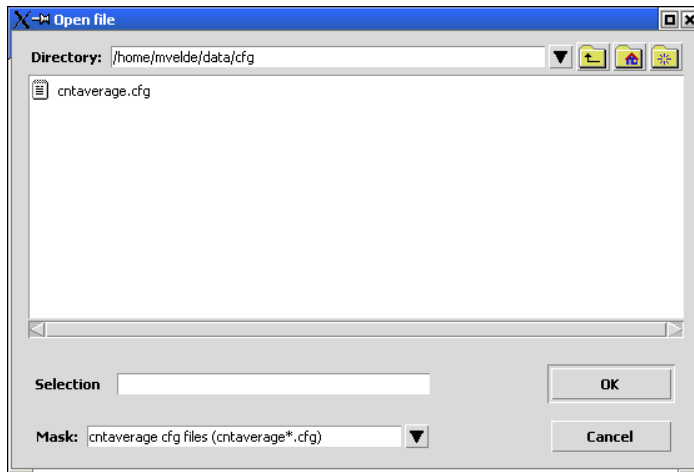
Figure 2-12   The dialog window for opening of a configuration file.

In order to prevent confusion in the naming of configuration files, you are advised to use a meaningful name.
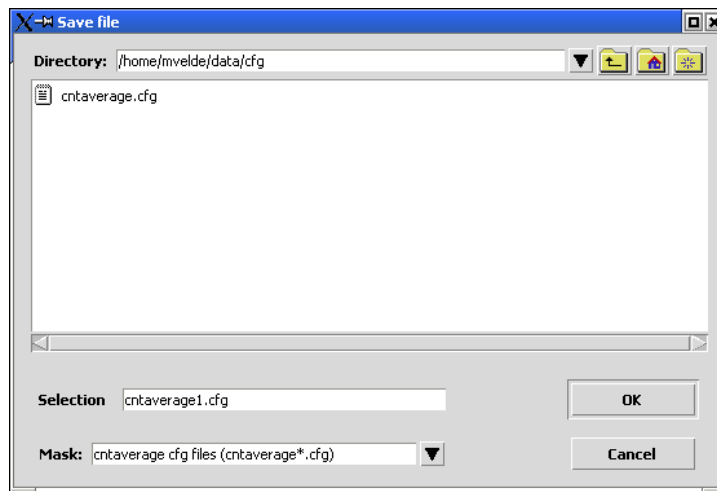
Figure 2-13   **The dialog window for saving your configuration to a file.**

The Databrowser helps to identify the configuration files related to each EEProbe program: when saving an edited configuration, supply the (new) name of the configuration file in the entry field right to the 'Selection' label as depicted in Figure 2-13. Supply a correct name, using no spaces, or other illegal characters. The Databrowser automatically inserts a non-existing name, with a sequence number and with the extension '`.cfg`'. Also, in the example above, if you would just type '`test`', the Databrowser will save the file as '`cntaveragetest.cfg`'. Of course, you can also overwrite an existing file.

Without using the 'Save as' button, you can simply overwrite the default configuration file. Just click on the 'Keep changes as Default Configuration' before 'Close', or 'Apply' (Figure 2-11). The next time when you start 'Average' from the 'Analyze' menu you will load the parameters from this file automatically.

Tip: safeguard your configurations

If you use a lot of different settings, e.g., per subject fine-tuning of rejection thresholds, save the configurations using the name of each subject. Do not *overuse* the default file.

Save the configuration files for later reference/use (e.g., when you write the 'methods' section of your publication), or reproduce your results easily from the original data.

Channel selections

In various places in the EEProbe Databrowser, you will encounter the possibility make (sub-) selections for channels: indicate which channels you want to include/exclude from e.g. filtering, averaging, referencing. This selection process is facilitated through the following dialog:
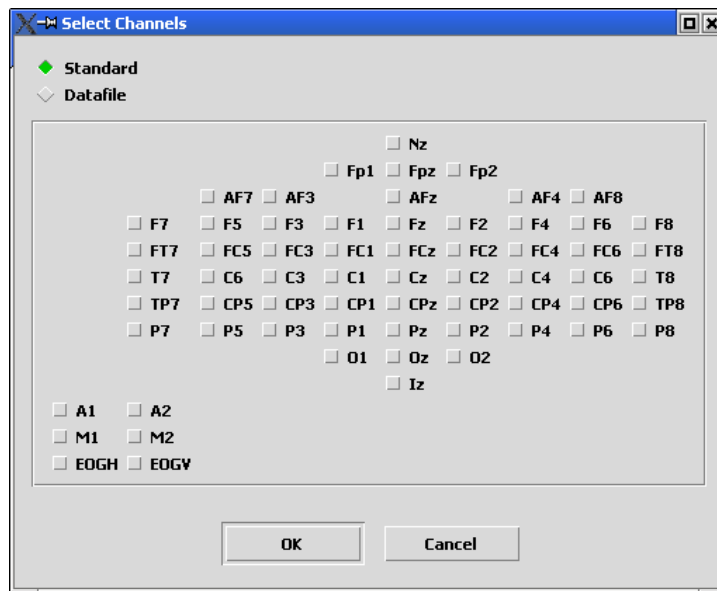
Figure 2-14   The 'Standard' channel selection dialog.

However, the channels as displayed here may not match with the channels as present in your data files. The layout as displayed above **can** be changed in the settings file to represent your own ('customized standard') electrode layout: for more information, see paragraph 4.2.1 on page 62.

For a correct listing of available channels, enable the 'Datafile' representation:
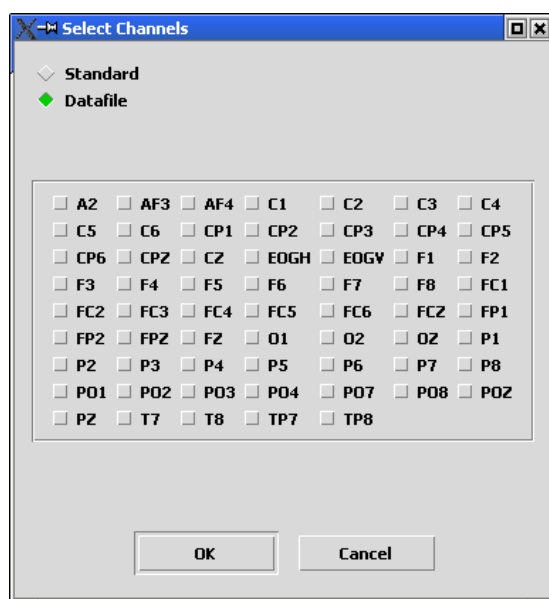
Figure 2-15   The channel selection dialog for channels in the datafile.

3. DATABROWSER REFERENCE

Description of the user interface

- Functionality: user menus, implemented EEProbe programs

3.1.   Implemented EEProbe programs

A summary of the incorporated functionality in the Databrowser is given below. The first paragraph lists the menu structure; in parenthesis you'll find what EEProbe tool(s) corresponds to the menu command. The next paragraph presents the graphical interface to each tool.

| *Menu*	*entry/command*	*related program/file*
File		
	- Open Project	
	- Create Project	
	- New Experiment	
	- New Subject	
	- Import Data	(data converters)
	- Export Data	(data converters)
	- Exit	
View		
	- Continuous	(xcnt)
	- Average	(xavr)
	- Header	(cntview, avrview)
	- Edit Selected Files	(default kate, kedit)
	- Show File Info	(ls -lph)
	- View PS/PDF files	(e.g. postscript output from xavr)
Analyze		
	- Reject Continuous	(cntreject)
	- Reject Trials	(cntreject_t)
	- Events	(cntevents)
	- Filter Continuous	(cntfilter)
	- Detrend Continuous	(cntdetrend)
	- EOG detection	(xeog)
	- Average	(cntaverage)
	- Rereference	(cntreref, avrreref)
	- Filter Average	(avrfilter)
	- Detrend Average	(avrdetrend)
	- Channel Interpolation	(avrinterpol)
	- Resample Average	(avrdown)
	- Grand Average	(avraverage)
	- Subtract Averages	(avrdiff)
	- t-test Averages	(avrstats)

Tools
- Filter Design   (`xfir`)
- Open Terminal   (as defined in 'Settings')
- Show Session Logfile
- Show Disk Usage   (`df`)
- Condition/Trigger tools
    Trigger count / ISI inspection (`trgcount`, `trgisi`)
    Trigger recoding
    Trigger/response time validation
- Continuous data tools
    Cut Epochs   (`cntepoch`)
    Concatenate files   (`cntcat`)
    Resample Continuous   (`cntdown`)
- Settings   (specification of default project,
                                    importers, exporters, and
                                    special viewers)

Help
- Reference Manual   (`/opt/eep/index.html`)
- Command Index   (`/opt/eep/doc/eepindex.html`)
- EEProbe license   (`licinf`)
- About the Databrowser

Not implemented, but available on the command line:

Automatic amplitude - peak - detection	`avrretrieve`
Sophisticated grand averaging (allows to grand average multiple conditions, multiple subjects in one pass)	`avraverage`
Remove or rename channels in `avr` files	`avrchannels`
Merge `avr`'s with different channel sets to one file	`avrmerge`
Manipulate channel attributes, rename, remove, calculate bipolar channels, etc	`cntsetup`

These programs will be included in a future release of the Databrowser.

Other EEProbe programs (shell scripts, or scripts in perl, awk, ...) may be included through the Scripts menu in the Databrowser.

3.2. The File menu

File: Projects

Open a project

The 'Open Project' command expects this location to exist as a directory on your file system. For proper functioning of the Databrowser, two special subdirectories should be present, the `cfg` and `fir` directories.

Create a (new) project

The 'Create Project' command can be used to create a new directory, and writes the subdirectories `cfg` , `fir` and `scripts` according to the 'skeleton' as defined in the settings file (see paragraph 4.2 on page 61). You should have write permission in the directory were you want to create the new project.

This command can also be used to update/revert an existing project directory with the default 'skeleton' files. For any existing files, this command will prompt you for confirmation to overwrite or skip the (re-) installation of the skeleton configuration file. Also see paragraph 5.1.1 on page 65.

File: Import Data

The import of continuous data is facilitated with this menu command. It can be used to copy files ('No Conversion'), or to convert files from a different format than EEProbe's `cnt` format.
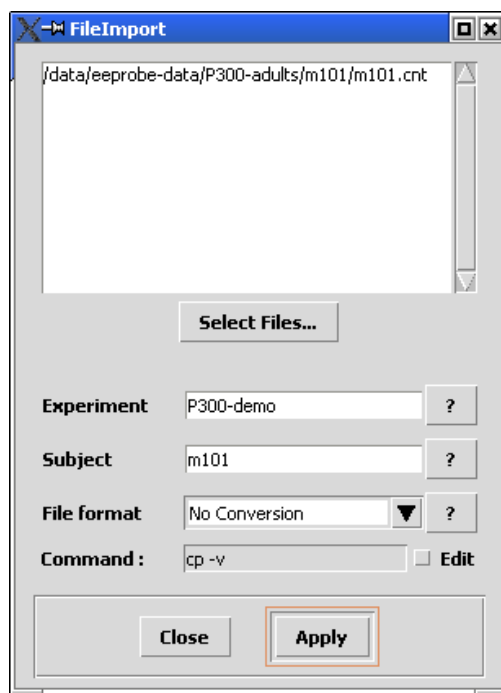

Figure 3-1   The File Import dialog.

- Use the 'Select Files' button to select a file and add it to the list box at the top of the FileImport dialog. To remove a file already included in the list box, select the file in question and press <Delete>, or right-click with the mouse: a popup menu will appear that allows you to remove file(s).

- 'Experiment': also allows you to type a new experiment name.

- 'Subject': supply a new or existing subject name.

- 'File Format': select the desired conversion. If 'No Conversion' is selected, the file will simply be copied.

- If you want to change the command that is used by the Databrowser, click on 'Edit' to add or remove some options in the 'Command' field (the command will be inserted before each file).

If you have selected already in the Databrowser the Experiment and Subject, these will be used as default when you select the 'Import Data' command.

In the Settings dialog, you can indicate a default directory where you want the File Import facility to start. For instance, if the location of the raw data from your recording station is always mounted under `/mnt/pc_rec/rawdata`, you can have the 'Select Files…' dialog start in that directory.
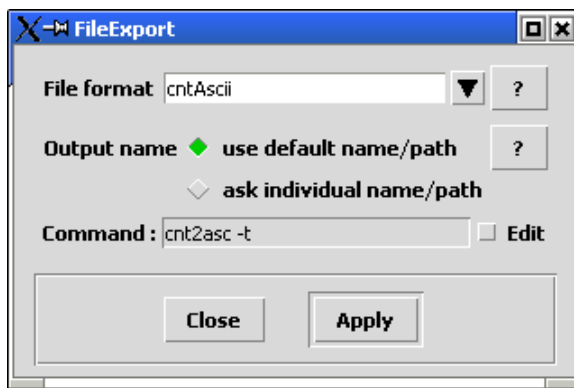
File: Export Data

Figure 3-2   **The File Export facility.**

By default available as file exports are the cnt2asc, cnt2edf, avr2asc, avr2asa converters.

Add the desired set of `cnt` or `avr` file to the Workset, and select 'Export' from the 'File' menu.

Select the desired output format, and if you want to write to a default output file (in the subject directory). Output extensions are 'txt' and 'msr', 'msm' for ASCII and ASA respectively (ASA export for averages only)[3].

The ASA export results in two files, where the `msr` file contains the general header, the `msm` file the data matrix.

You have two options for the location of the output files:

- 'use default name/path' will place the result files in the subject directory

- 'ask individual name/path' presents you with a 'Save' dialog for every output file.

---

[3] The ASA export is only needed for ASA versions 2.x; ASA version 3 and later can automatically read the `avr` and `cnt` file formats.

3.3. The View menu

View: Continuous

EEProbe program: `xcnt`

This command starts the `xcnt` viewer for continuous data files (`cnt`). If more than one `cnt` file is selected in the Workset, multiple instances of the `xcnt` viewer are started. The viewer is started in the subject directory, which is easy when you want to save changes in the trigger- and/or rejections-files (after manual changes in the viewer).

The `xcnt` viewer uses a default file (`channels.cfg`) – if present – in the project's `cfg` directory for user-definable sub selections of the data channels. See the *EEProbe Reference manual* for more information on the `channels.cfg` file.

The viewer also starts with the `xcnt.cfg` file from the subject directory, or, if not present, the default `xcnt.cfg` from the project's `cfg` directory. This file can be used to define custom channel colors in the Channel Legend (see chapter 5, Figure 5-6), scaling, and other options; after your display adjustments in the `xcnt` viewer, just save the file via the File menu, Save configuration file.

View: Average

EEProbe program: `xavr`

This command starts the `xavr` viewer for average data files (`avr`). All files selected in the Workset are loaded in the viewer.

The average viewer `xavr` loads a default configuration file, `xavr.cfg`, when present in the project's `cfg` directory. If not present, the Databrowser will prompt you for a start-up configuration file. The basename (e.g., 'xavr') of the default configuration file is used to load all related configurations (e.g., 'xavr*.cfg'). Also a related electrode positions file is loaded (following the example: 'xavr.dat') for possible 2D mapping objects in the configuration file(s).

The different (display) configurations can be accessed from the 'Window' menu in the `xavr` viewer (e.g. see the tutorial, chapter 5.7 'Visualize the results' on page 74).

The Databrowser scans all `*.pk` (components) files and writes these data to a standard file 'xavr.components.pk' in the project directory. This file is loaded to visualize any peak scoring as performed in `xavr`. After the viewer exits, these data will be distributed again (by the Databrowser) to individual `*.pk` files corresponding to each `*.avr` file.

View: Header

EEProbe programs: `cntview, avrview` (correct program is automatically selected)

For the file(s) selected in the Workset (`cnt` and `avr` files) you can view the header information, using the 'Header' menu entry in the 'View' menu.

Review file info

Use this command to review the recording settings, and also to review a file's processing history.

Additional information is displayed about the length of the recording, the number of channels, the file history (previous processing steps) and the list of channel names contained in the file. For average files (`avr`) you can also review if the file(s) contain valid *variance* information.
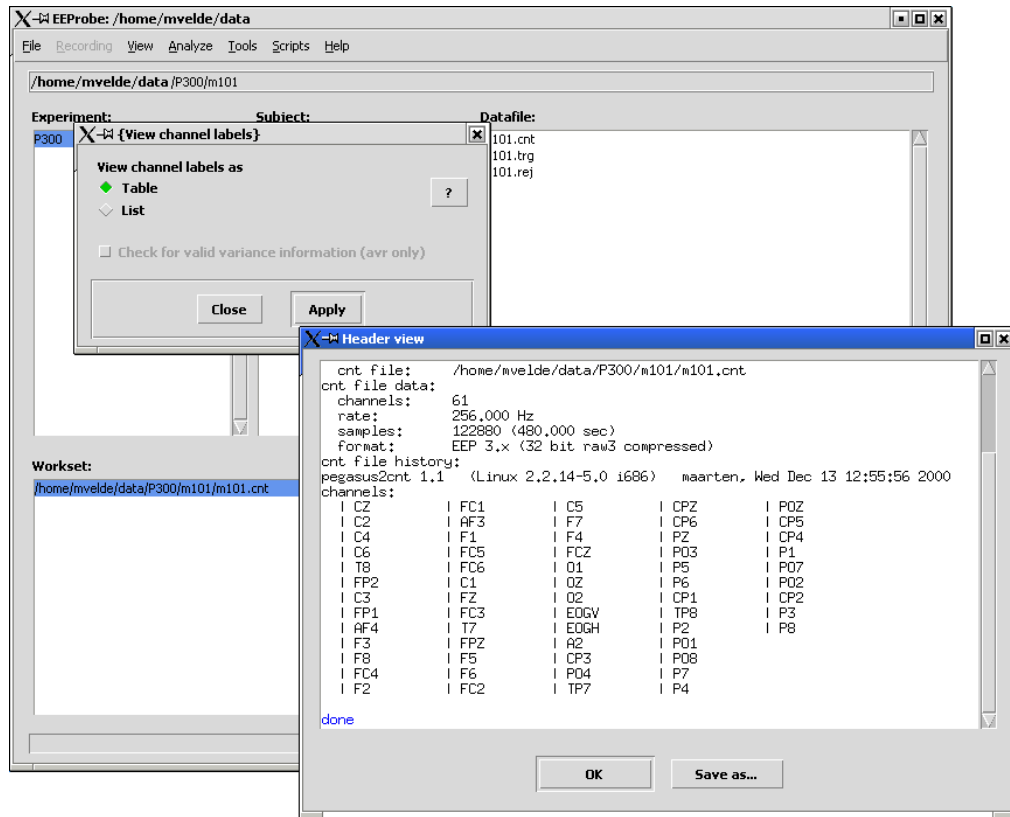
Figure 3-3   **Review the recording settings (example output of cntview shown).**

View: Edit Selected Files

You can use the Databrowser also to edit for example the trigger files and rejection files (both standard ASCII). First add the file(s) to the Workset, and select the file(s); now the menu entry is enabled and you can start the editor (as configured in the settings dialog – see page 58).

View: Show File Info

Default system command: `ls -lph`

This command in the 'View' menu shows you the output of the system command (default '`ls -lph`'). Use this to see the file properties: file size, permissions, file date. This command can be modified in the Settings dialog (see page 56)

View PS/PDF files

Default system command: kghostview

This command can be used to view any `*.ps`, `*.eps`, `*.pdf` file. From the average viewer `xavr`, you can create a postscript file, e.g., to include later in a document. A `*.pdf` file may be created using the standard Unix command `ps2pdf`.

Since release 1.1.2.4 this command is also enabled for gif/jp(e)g/png/bmp graphics files. This is useful for instance when you have a general purpose graphics viewer on your system (e.g., konqueror).

This command (the program that is started) can be modified in the Settings dialog (see page 58).

3.4. The Analyze menu

3.4.1. Continuous data analysis

Analyze: Reject Continuous

EEProbe program: cntreject
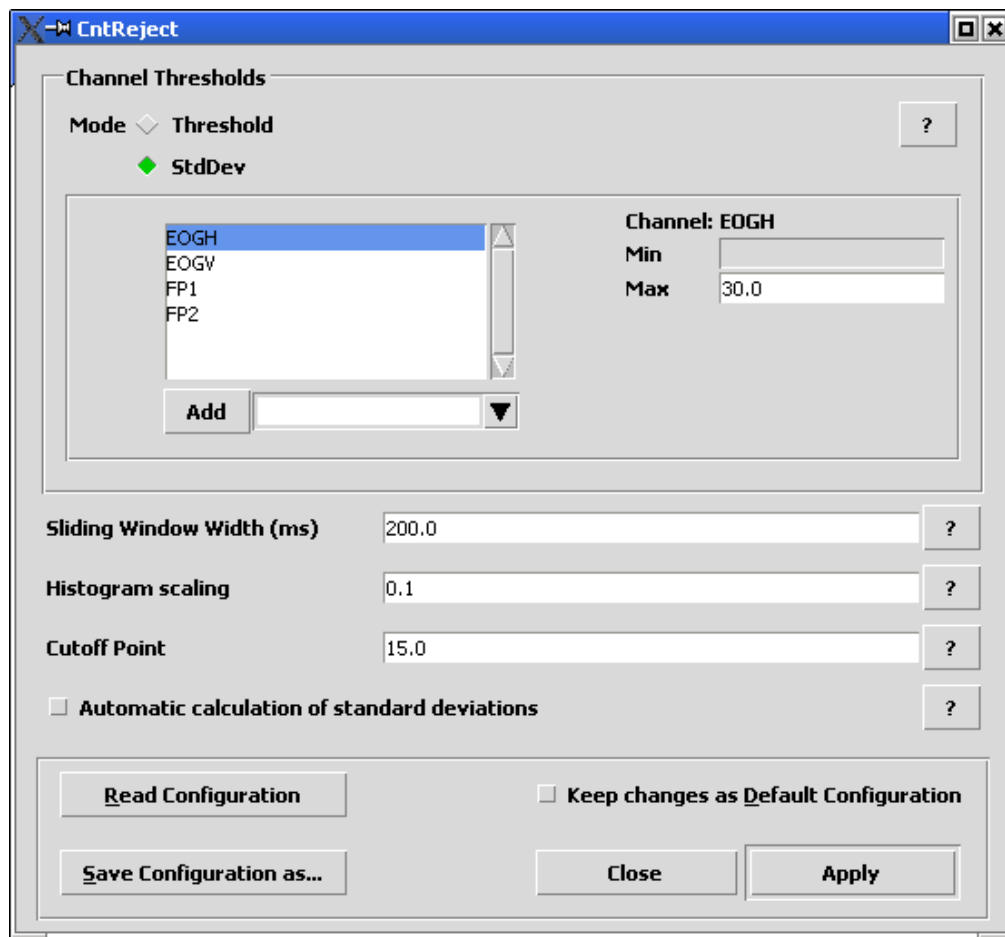
Result file: foo.cnt -> foo.rej

Figure 3-4   **Rejection of continuous files: channel thresholds and other settings.**

This dialog presents the parameters as available for the automatic rejection procedure. This procedure is similar to the 'Reject Trials' command. The interface aspects related to the selection/adding/removing of channels are explained in the next paragraph.

However, the implementation of the rejection analysis here is different in the following way:

- You can select only one of 'Threshold' or 'StdDev'; this setting applies to all channels.

- For 'Threshold' mode, enter two values: use both the 'Min' and 'Max' entry fields (uV).

- For 'StdDev' mode, enter only the 'Max' amplitude value (uV).

In Figure 3-4, the other parameters 'Sliding Window Width', 'Histogram scaling' and 'Cutoff Point', are presented with good default values.

For further explanation about the parameters, see the *EEProbe Reference manual*.

Analyze: Reject Trials

EEProbe program: cntreject_t

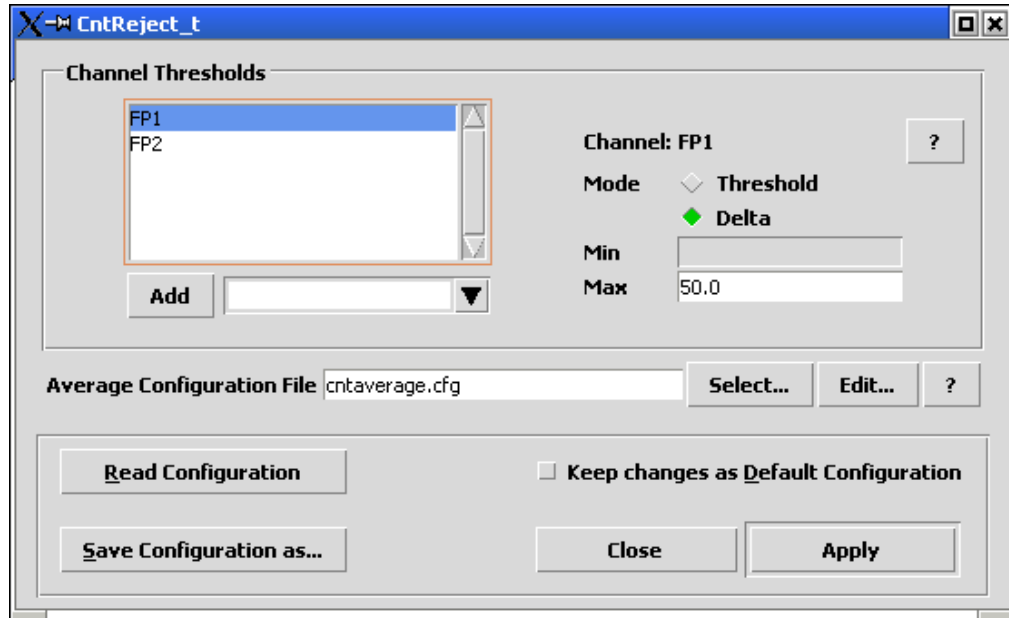*Result file*: foo.cnt -> foo.rej

Figure 3-5 **Rejection dialog: click to select a channel and review/update the corresponding properties.**

The implementation of the rejection analysis based on trials is allows you to:

- Select 'Threshold' or 'Delta' mode for every channel individually.
- For 'Threshold' mode, enter two values: use both the 'Min' and 'Max' entry fields (uV).
- For 'Delta' mode, enter only the 'Max' amplitude value (uV).

In the 'Channel Thresholds' box (Figure 3-4 and Figure 3-5), you have to 'click' on the channel name (in the list top-left) to display its properties (in the upper right part of the dialog).

Channel manipulations

Adding a new channel is performed using the entry field just under the list box. Here, you can type the new channel name/label, or select a channel from the list (see Figure 3-6). The list supplies all channel names as found in the *first* cnt file, as selected in the Workset. Using the 'Add' button to the left, or typing <Enter> will add the channel to the list, after which you can manipulate its settings. The default values for the new channel(s) will be set to the values last used in this dialog.

You can also enter (a group of) channels using regular expressions, e.g.,

```
CZ=-50,50
```

This adds all channels with Cz in their label, using 'Min/Max Thresholds' -50/50.

```
[FC]Z=30
```

This adds the channels Fz, Cz, FCz (and FCCz if available) with a 'Max StdDev' 30.

You can add all channels by selecting 'all' from the list, or when you enter one of the expressions (all resulting in identical behaviour):

 .=30

 all=30

 *=30

Removal of a channel can be achieved using the <Delete> key, or with the right button of your mouse, and remove channels by selecting the 'Remove' or 'Remove All' options.

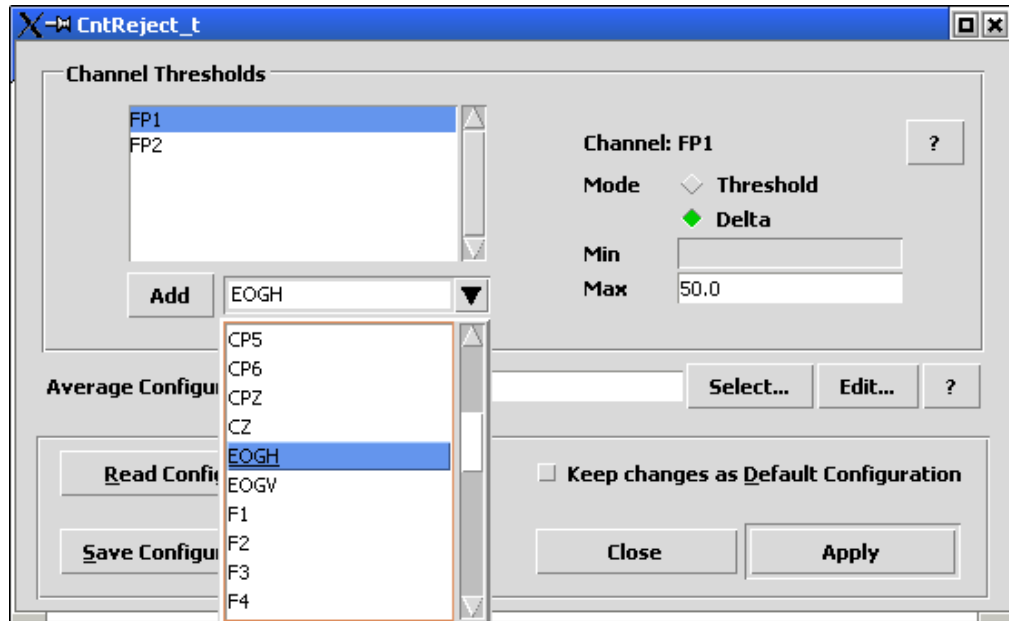Some more examples are given in chapter 5, on page 68.

Figure 3-6   **Rejection dialog: add a new channel from the list, or by typing its name, and click the 'Add' button to update the channel list.**

The 'trial based rejection' work correctly only if you supply a `cntaverage` configuration file that reflects the 'trial parameters'. The Databrowser automatically supplies the default 'cntaverage.cfg' file. You may select another configuration. Click on the 'Edit' button to review the settings, as shown below.

The normal **CntAverage** command dialog is explained on page 39.

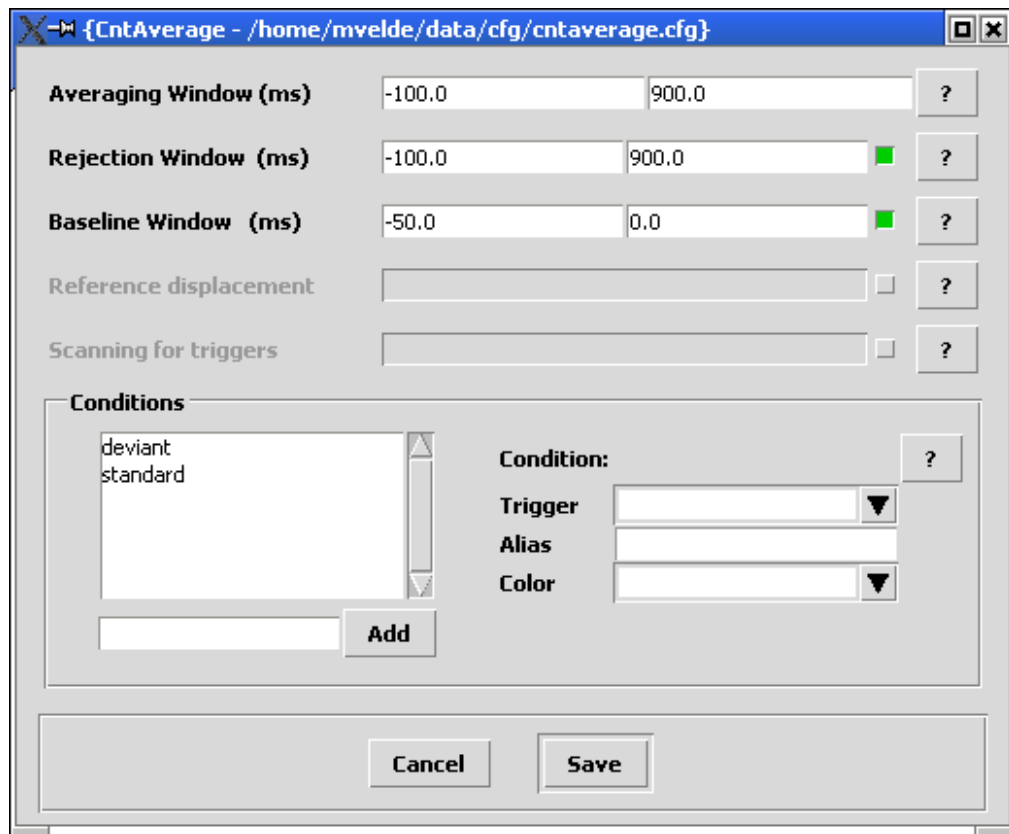**Figure 3-7**   **Configuration window for** `cntaverage.cfg`**, as part of the trial rejection process.**

Analyze: Events

EEProbe program: cntevents

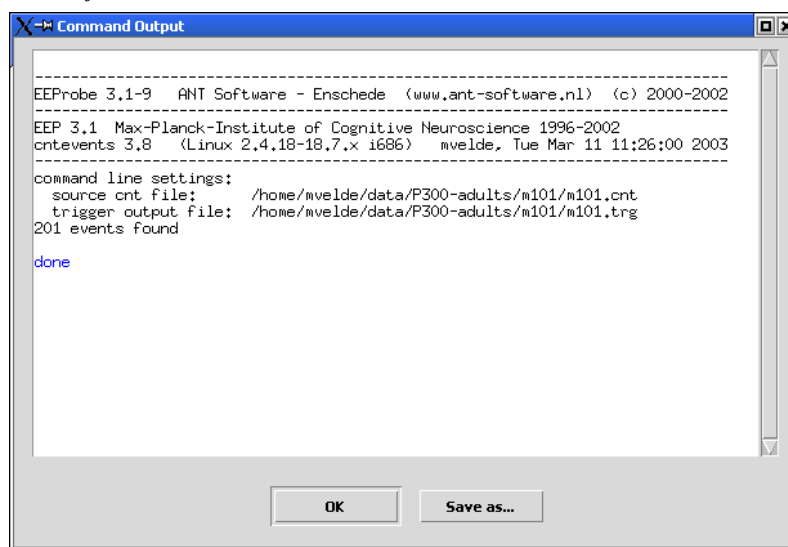*Result file*: foo.cnt -> foo.trg

Figure 3-8   **The command output of the cntevents program.**

Each `cnt` file stores triggers as reference points in the time axis. Usually, they are recorded during the EEG session. The EEProbe programs do not use the *internal* triggers, they use an *external* ASCII file `*.trg`. This is an ASCII listing of all the events in the continuous data file. The 'Events' command extracts the triggers/events contained in the `cnt` file to a trigger file.

If such a trigger file is not already available as the result of some previous conversion/import action, the Databrowser will automatically create this file when needed for a specific command (e.g., View menu: Continuous).

Since the original triggers are stored in the cnt file, this also provides a 'backup-procedure' to revert, if any changes to the trigger file have been made (you can edit the trg file by adding it to the Workset, and selecting View|Edit).

Please note that this command has no additional options. In the *EEProbe Reference manual* , you will find that the `cntevents` program supports some command line switches, e.g., to merge the internal triggers with an already existing trigger file. For example, if you have made a "classified" trigger file using the `xeog` program, the 'Events' command in the Databrowser will (prompt you to) simply overwrite the existing file and the classification will be lost.

Analyze: EOG detection

EEProbe program: `xeog`

Result files: `foo.cnt -> foo.pfc, foo.cls,` updated `foo.trg`
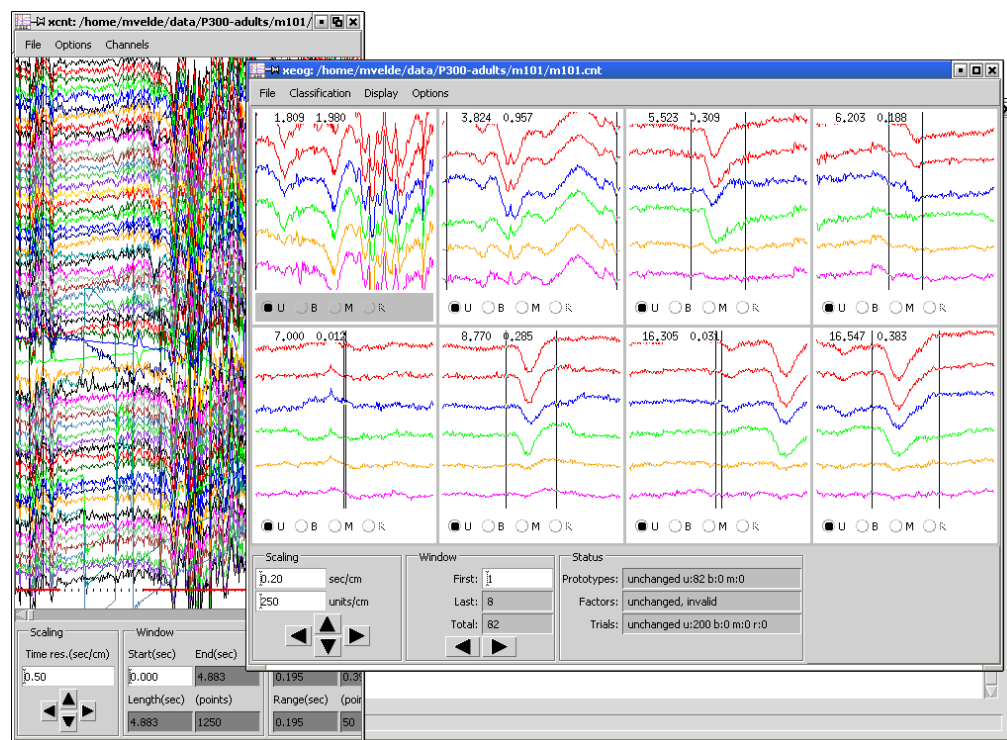

Figure 3-9   **The screen layout of the interactive EOG detection (xeog).**

This menu command will start the `xeog` program.

The program requires the existence of a rejection file '`filename.rej`' to present the rejected periods. This program is typically used to perform the EOG *prototype classification* and *trial classification*.

When starting this program from the EEProbe Databrowser, the *trial classification* can only be performed correctly when the **default configuration file** `cntaverage.cfg` in the project's `cfg` directory matches the desired average configuration (trigger codes, time windows). The new output files '`.pfc`' and '`.cls`' of the EOG detection program should be written in the subject directory, having the same name as the data file on which the `cntaverage` program should perform the EOG *correction*.

Also update the trigger file '`.trg`' to supply the trial classification for the averaging procedure ('blinks', 'move', 'reject', 'unclassified' are saved in the '`.trg`' file).

The *xeog.cfg* configuration file

> Because the naming convention for EOG channels may differ between laboratories, the default configuration as supplied with the Databrowser program does not include the EOG channels, but some frontal, temporal channels.

Please take a moment to review also the settings in the EOG configuration file (available in the submenu). Here you define the sub-selection of displayed channels, the number of rows and columns in the display layout.

Analyze: Filter Continuous

EEProbe program: `cntfilter`

Result file: `foo.cnt -> foof.cnt`

For continuous data files, this command opens the following dialog window:
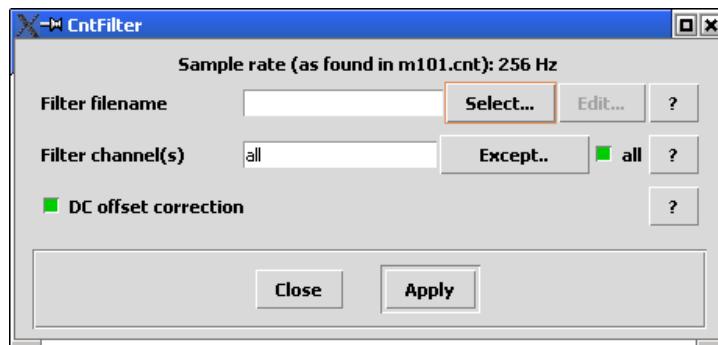

Figure 3-10   The dialog for filtering of continuous data files.

Use the 'Select…' button to enter a file name for a filter file in the first entry field (see Figure 3-11). You have to make sure that the filter parameters are suited to the data file(s); check that the sample frequency for the filter is the same as in the `cnt` file(s). The dialog informs you of the sample frequency that it has found automatically (in the first `*.cnt` file). Also see the 'View, Header' command above.

You can selectively filter only a subset of the channels in the original file. For this you can use the 'Select…' button next to the 'Filter channel(s)' field. You can also simply type the channel names in this field. *Please note that the output file will only contain the selected channels!*

The 'DC offset correction' is on by default. This indicates that the filter process will first calculate the DC signal from a small period at the beginning of the recording[4], which will be subtracted in each channel before filtering.

---

[4] The DC value is recalculated at each 'discontinuity' event (segment boundary).

New filter files can be designed using the `xfir` program, which is available through the 'Edit' button, or from the 'Tools' menu.

Figure 3-11   Filter file selection.
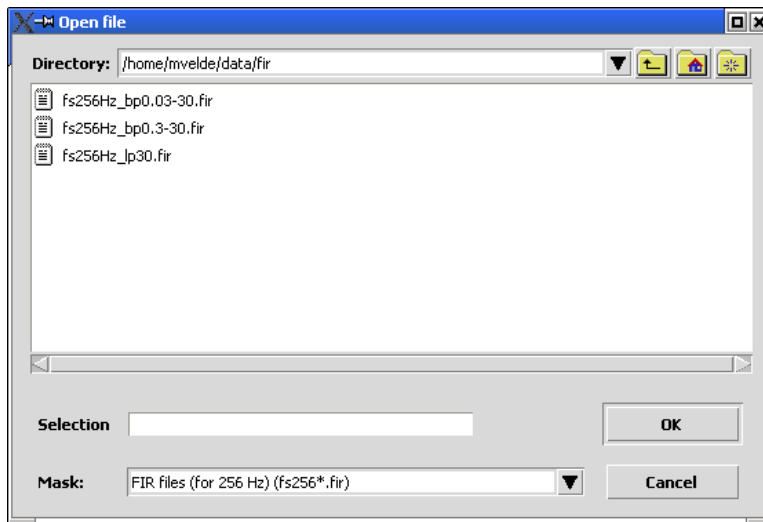
Analyze: Detrend Continuous

EEProbe program: `cntdetrend`

Result files: `foo.cnt -> food.cnt, food.lin`

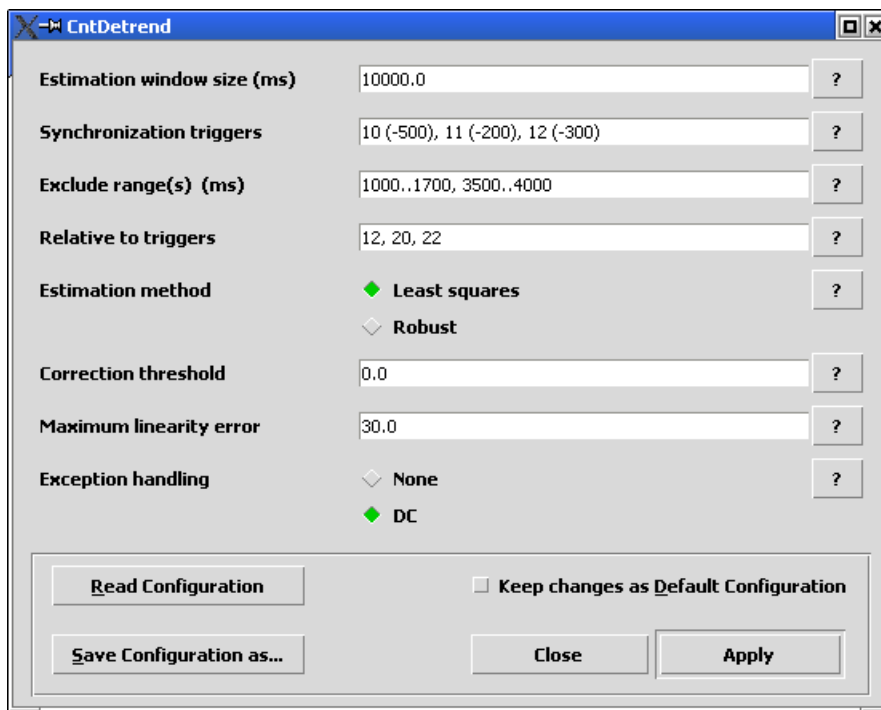Detrending of continuous data requires a lot of configuration parameters, as presented in the following dialog window:

Figure 3-12   The entry fields in the dialog for cntdetrend. The entries are identical to the contents of the cntdetrend configuration file.

The estimation uses a regression (least error squares) robust estimation (least error absolutes) algorithm. For further information about this command, please read the corresponding section in the *EEProbe Reference manual* .

Analyze: Average

EEProbe program: cntaverage

Result file: foo.cnt -> foo<c1>.avr, foo<c2>.avr, foo<c3>.avr ...
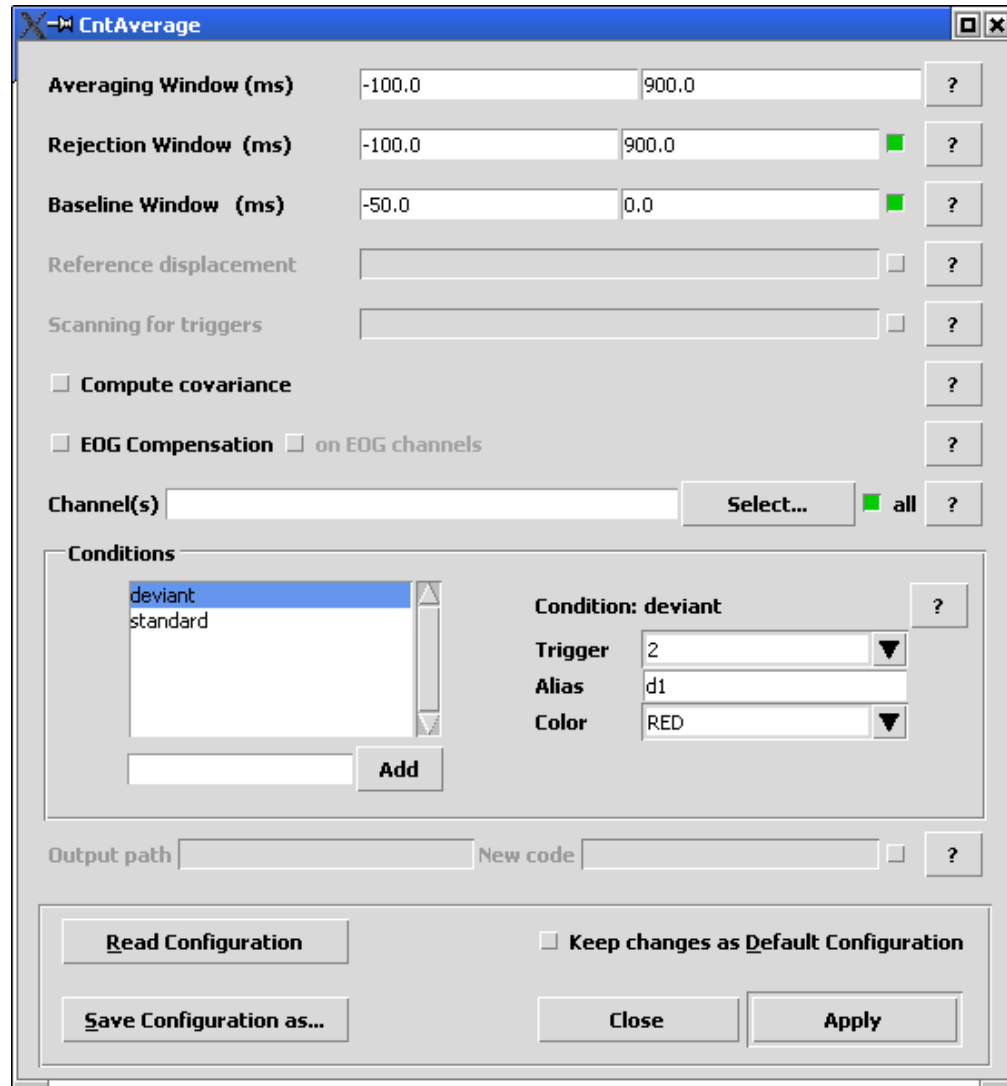
Figure 3-13   **The dialog of the averaging configuration.**

For the averaging process, several time-related parameters can be set:

- The 'Window' is the time window relative the each trigger point that is included in the actual average waveform

- The 'Rejection' window indicates the time where the rejection marks should be checked to decide if the trial should be included or excluded from the averaging process.

- The 'Baseline' window indicates the interval from which the mean value is taken as the zero amplitude.
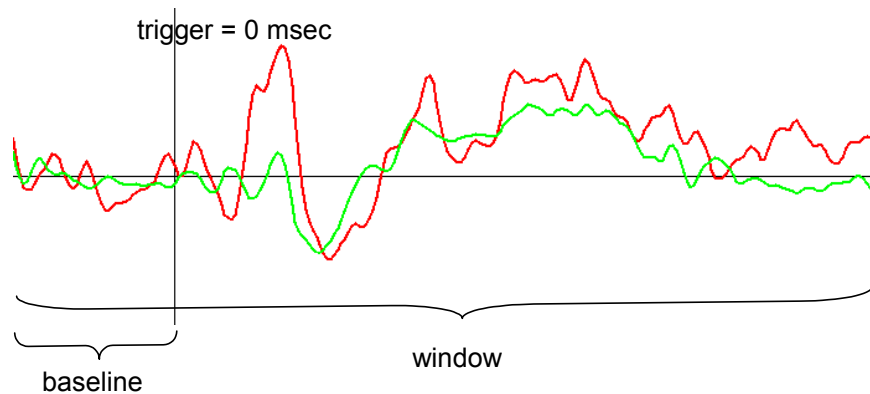
Figure 3-14   The time-related parameters are specified relative to the trigger point.

Enable the 'Compute covariance' option by clicking on the little square just to the left of the label. This results in an extra output file being written, containing the covariance matrices.

Enabling the 'EOG Compensation' requires the existence of a "classified" trigger file (`.trg`) and a "propagation factors file" (`.pfc`) *having the same basename as the* `cnt` *file* on which the averaging is performed.

The 'Conditions' box in the middle of the **CntAverage** dialog window works in a similar way as the 'Channel Thresholds' box in the rejection procedures (page 33):

- 'click' on the condition to display its properties.

- Remove a condition by selecting it with the mouse: then click with the right button of your mouse, and select the 'Remove' option.

- Add a condition using the entry field just under the list box. Type the new condition name. Press the 'Add' button immediately to the right to add the condition to the list; next, edit its settings.

The 'Trigger' is usually a number (the actual trigger value) that can be selected from the list (press on the ▼). The triggers are automatically extracted from the first `cnt` file in the 'Workset' selection. Specify multiple triggers by typing in the 'Trigger' field, and separate the triggers with comma's.

Specify an 'Alias', which will be used in the naming of the resulting average files. Although the alias is optional for conditions relating to single triggers, you must specify an alias when you want to include multiple triggers in one condition (i.e., one average). You are actually advised to use an alias always, and always use for instance a combination of 2 characters.

The 'Color', associated with the condition, can be selected from the list and is also stored in the output average files.

In the bottom of the dialog you can specify an alternative output path for the averages (created as sub-directories in the subject directory – by default maximum 2 levels deep - as well as a 'New code'. Normally, the cntaverage program creates `*.avr` files having the same basename as the input `cnt` file. The optional 'New code' can be used to substitute the default basename of the `cnt` file).

For the more advanced options 'Reference displacement' and 'Scanning for triggers', please refer to the *EEProbe Reference manual* .

Analyze: Rereference

EEProbe programs `cntreref, avrreref`

*Result file*: `foo.cnt -> foor.cnt,` or `foo.avr -> foor.avr`

Rereferencing computes a virtual reference channel from other channels and subtracts this signal from the specified channels before writing the output file.
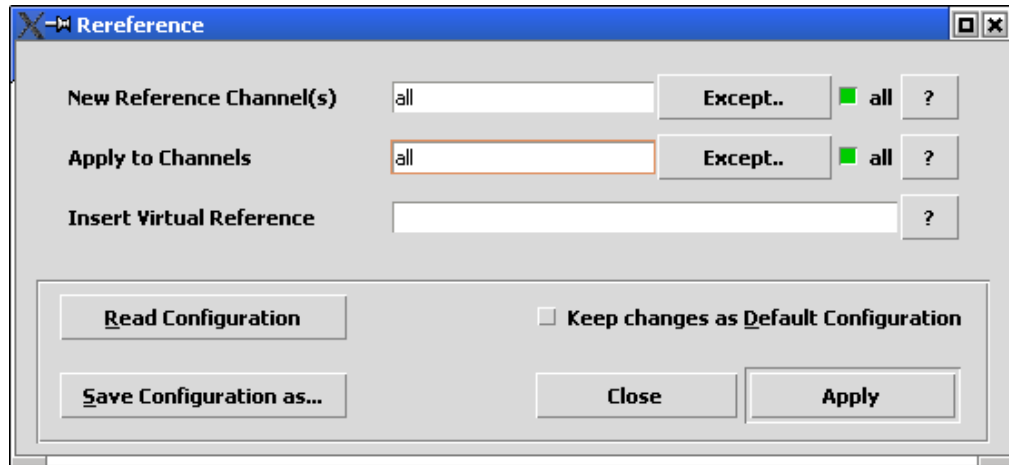

Figure 3-15   Rereferencing of all channels based on common rereference.

In the example indicated this figure, a common reference is calculated from all channels, and this common reference is subtracted from all channels for the new data file.

You may specify a *new* channel name for a 'Virtual Reference' in the third entry field, when you want to insert the calculated reference as a channel in the output file.

Special note:

Unlike all other configuration files, the default configuration file
for the 'Rereferencing' analysis is called `reref.cfg`

You can specify some operators in the entry field 'New Reference Channel(s)', e.g., `A2*0.5` when you want to reference relative to `A2/2`.

3.4.2. Average data analysis

Analyze: Reference Average

This analysis command is identical for both average and continuous files. In fact, you can perform the rereference procedure on both `avr` and `cnt` files in one pass. See the previous page for a screenshot of the dialog window and its description.

Analyze: Detrend Average

EEProbe program: avrdetrend

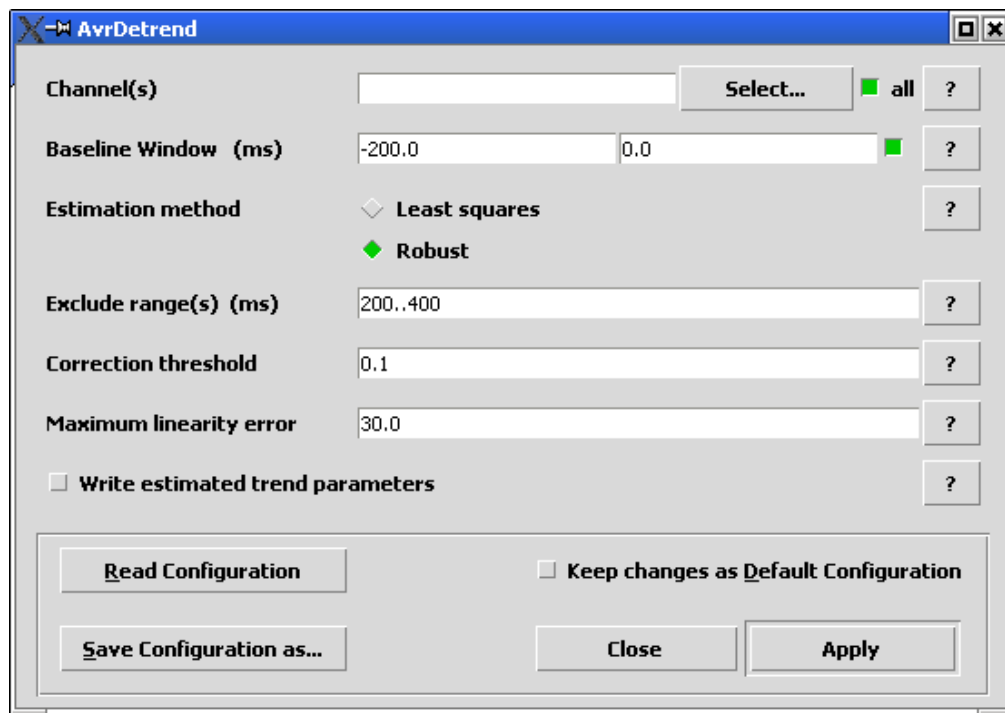*Result file*: foo.avr -> food.avr, food.lin

Figure 3-16   Detrending options for average files.

The EEProbe command `avrdetrend` removes a linear trend from average files. This can be performed using a 'Least squares', or a robust estimation (least error absolutes) algorithm.

The baseline correction is gone after detrending, unless you specify a (new) baseline window.

You can exclude parts of the ERP waveform from trend estimations in the field 'Exclude range(s)'. Specify more than one range by separating the exclusion intervals with a comma (',').

The trend is only removed from the average file(s) if its amplitude deviation is more than the specified 'Correction threshold', provided that the specified 'Maximum linearity error' was not exceeded.

Analyze: Filter Average

EEProbe program: `avrfilter`

Result file: `foo.avr -> foof.avr`

Figure 3-17   Filter average file(s): select the desired filter file.

For the filtering of average files, this command in the EEProbe Databrowser asks you to specify the filter file that you want to use. As with the continuous data files, the dialog informs you of the sample frequency that it has found automatically (in the first `*.avr` file); you can also use the 'View', 'Header' command to check the sample frequency of average(s). The sampling rate should correspond to the sampling rate that was specified in the `xfir` program during the design of the FIR filter.

> Although this command allows you to filter the averages after (almost all?) your ERP processing was done, a better routine is to perform the filtering on the continuous data file.

Analyze: Resample Average

EEProbe program: `avrdown`

Result file: `foo.avr -> foos.avr`
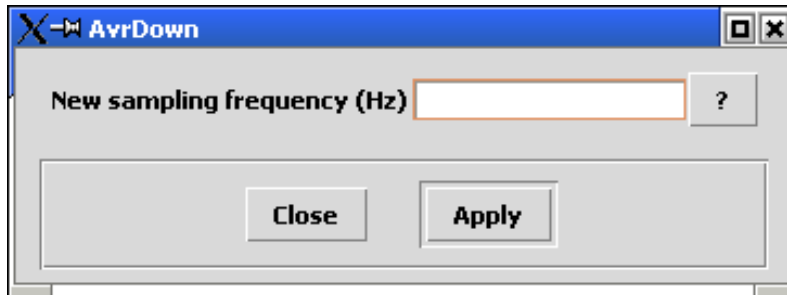

Figure 3-18   Averages can be downsampled to a new sample frequency.

As with the continuous data files, you can down-sample an already calculated average file to a new sampling frequency.

Analyze: Channel interpolation

EEProbe program: `avrinterpol`

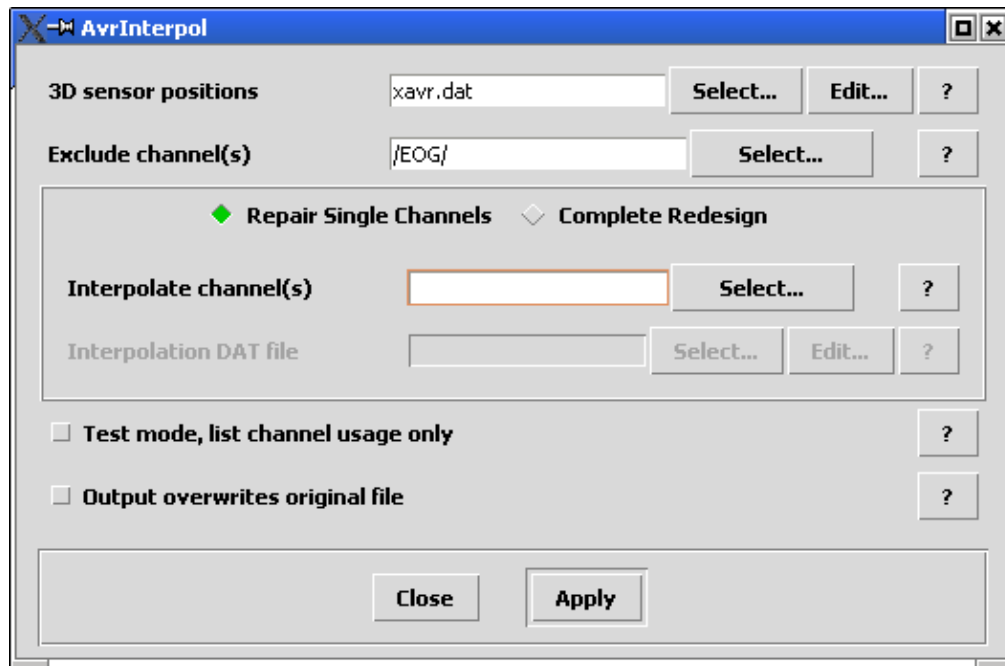*Result file*: `foo.avr -> fooi.avr`

Figure 3-19   **Use the Channel interpolation to repair bad channels in the averages.**

The Channel interpolation command computes "virtual" ERP signal data at requested positions at a unit sphere surface as given by the '3D sensor positions' file.

Basically, a model of the amplitude topography at the unit sphere surface is generated from "good channel" signal data in an `avr` file. Using this model an interpolated value at any point of the sphere surface can be computed.

Specify the (bad) channels that should be recomputed in the 'Interpolate channel(s)' field.

Optionally, you can use the 'Test mode' to review how the `avrinterpol` program will perform the calculation.

The program will create a `*i.avr` file. You can however use the 'Output overwrites original file' option (this is performed by the **Databrowser**, not by `avrinterpol`).

Analyze: Grand Average Process

EEProbe program: `avrprocess`
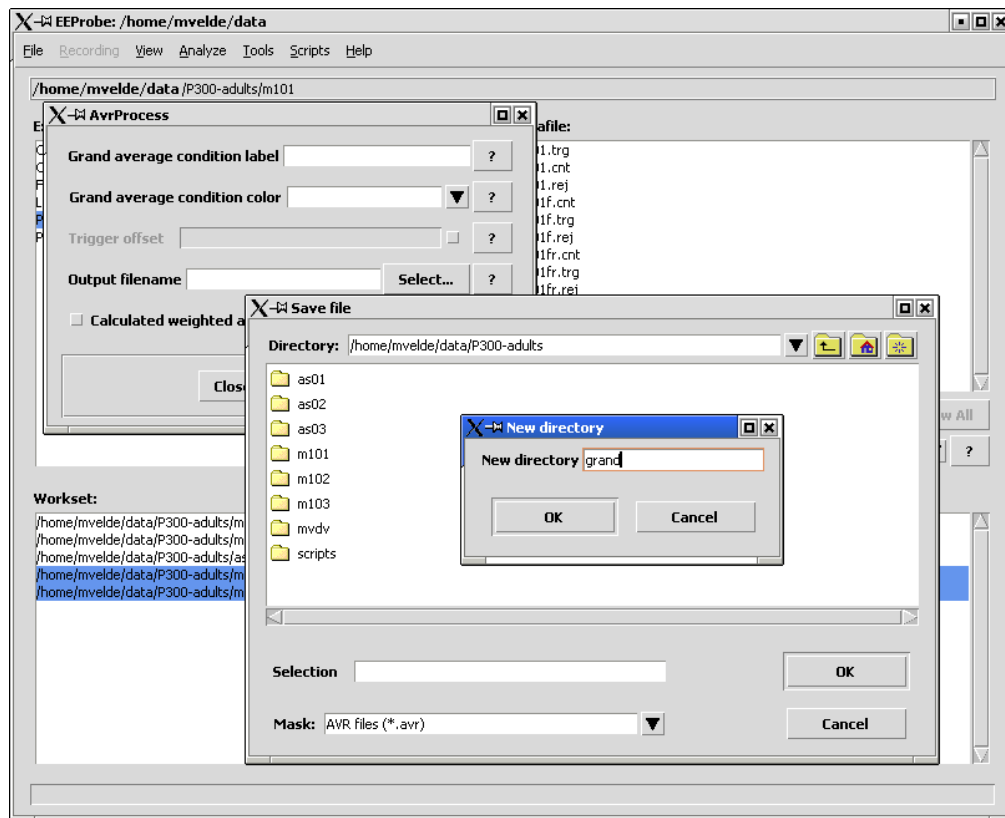

Figure 3-20   Calculate a grand average from a selected set of averages.

The 'Grand Average' command actually implements the `avrprocess` EEProbe program, which does not require a configuration file, like the `avraverage` program. This command provides a little more flexible way of grand averaging as needed for averaging of any set of files that you can select in the Workset pane.

For this command you also need to specify the 'Output filename' for the grand average waveform. Only one output `avr` file will be generated. You are advised to create a new directory in the 'Save file' dialog as depicted in the figure: the button on the top-right of the dialog 🔲 allows you to create for instance a 'grand' directory at the same level as the subject-directories.

Also specify a new 'Grand Average' condition label, and associate a 'color' with the new condition.

Analyze: Subtract Averages

EEProbe program: `avrdiff`
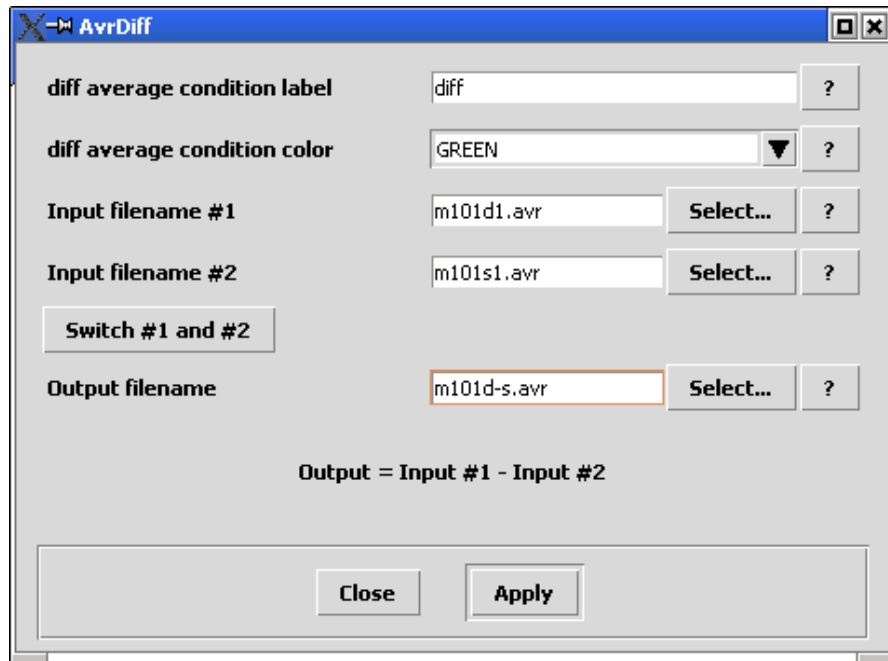
Figure 3-21   Calculate the difference of two averages to a new average file.

Unlike most of the other EEProbe programs that are implemented in the Databrowser, the dialog for the `avrdiff` program requires you to give the output name of the result file.

Use the 'Switch #1 and #2' button to change the order of the files as used in the subtraction. This changes the actual entries in the 'Input' fields.

When this dialog window starts (with two average files selected in the Workset), the order is like in the Workset window.

Optionally you can specify a new condition label, and associate a 'color' with the new condition.

Analyze: t-test Averages

EEProbe program: `avrstats`
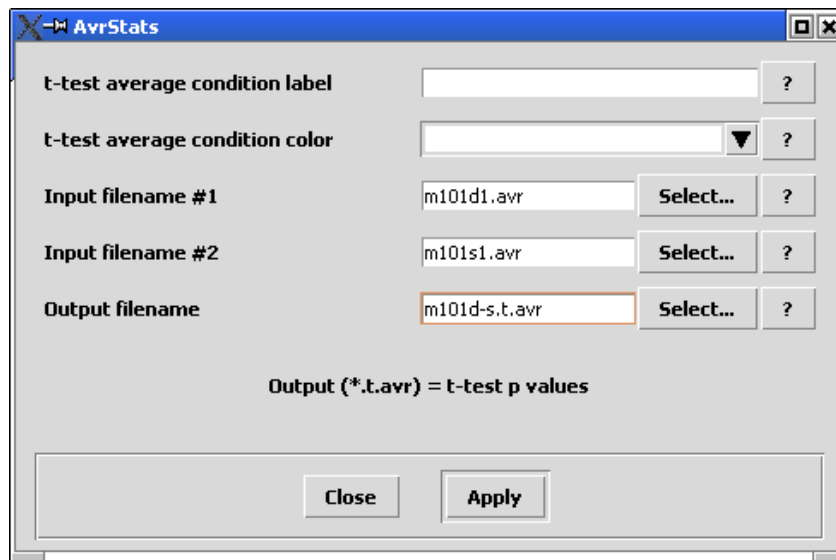
Figure 3-22   Create an average file containing the 'running t-test' values.

This command can be used to create a `*.t.avr` file that contains the result of the running t-test. This calculation is performed exactly identical as is available 'on-line' in the `xavr` viewer ('show significance').

The result file of this procedure allows you to view the significance information also in mapping view to display a t-map or significance-map.

For a proper view, use as 'palette' the 'tmap01' or 'tmap05' in the xavr configuration. An example configuration is provided when you have created a new project: `xavr.t-map.cfg`.

Figure 3-23   t-test information shown as a time series of significance maps.

3.5. The Tools menu

3.5.1. General tools

Tools: Filter design

EEProbe program: `xfir`

The xfir tool is started in the `fir` directory, which is located directly under the project directory.
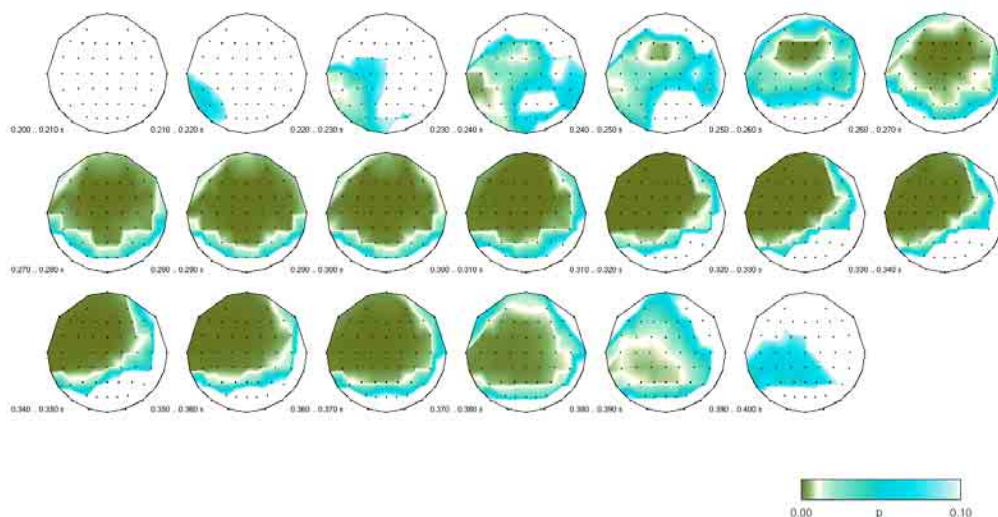
See the *EEProbe Reference manual* for further explanation and some general guidelines how to design filter files.

Tools: Open Terminal

This menu entry will open a terminal window in the 'current' directory (i.e., currently selected subject).

The terminal program that is started by the Databrowser can be changed in the Settings dialog, see page 58.

Tools: Show Session Log

Session Output Log
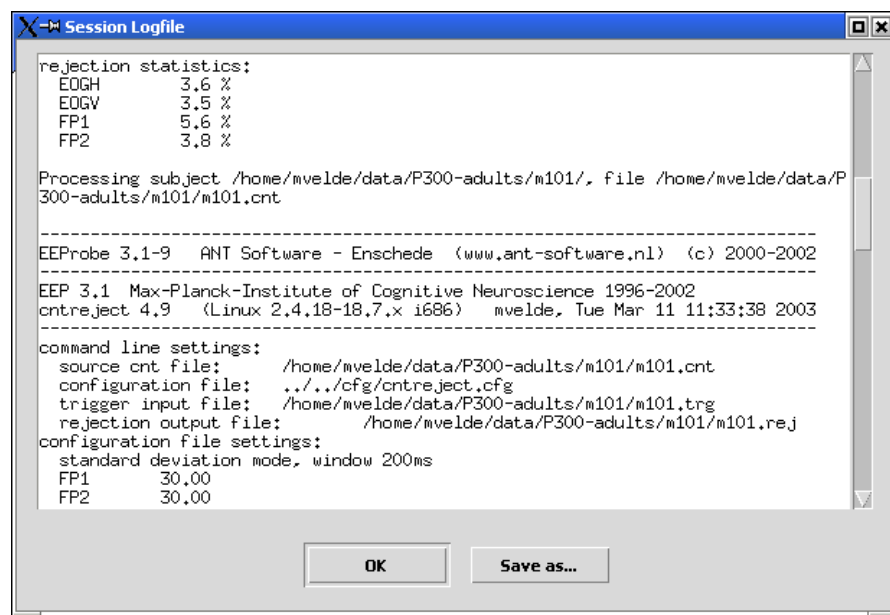
Figure 3-24   Open the Session Output Logfile to review the processing.

You can access the command output of all processing that you have performed in your current 'session' with the EEProbe Databrowser from the Tools menu.

Info: the Session Output Logfile is automatically saved when you exit the EEProbe Databrowser

When you exit the Databrowser, the session logfile is stored automatically with a date stamp and session sequence number in the project directory. So, you can always review the settings used. However, these files are not listed in the Databrowser. You may want to clean up the project directory from time to time.

Session Command Logfile
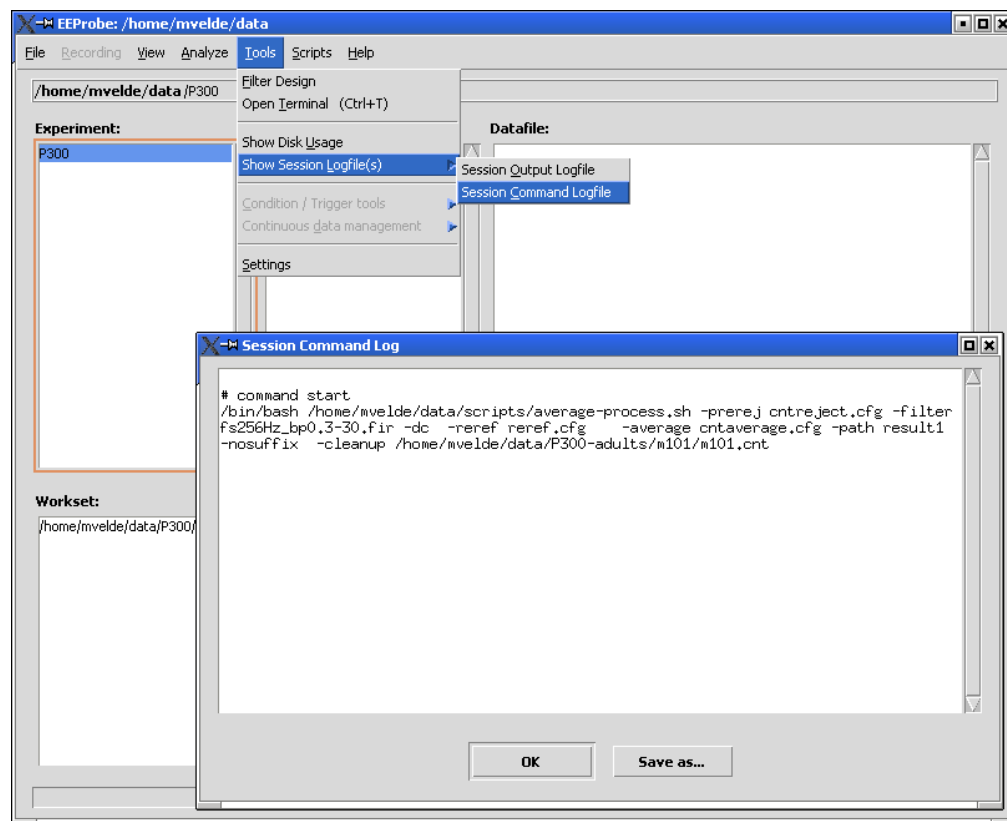
Figure 3-25   **Review the Command Logfile to start creating your own scripts.**

You can use the log of the commands issued by the EEProbe Databrowser to redo a complete analysis process. You would have to save the 'Session Command Log' as available in this menu, and give the file 'executable' rights in order to run the logfile as a script.

Unlike the session's Output Log, by default the Command Log is not automatically written at the exit of the Databrowser. However, you can enable this in the general settings dialog (see page 56).

Tools: Show Disk Usage

System command: `df -h`

This 'tool' shows the output of the 'df' (disk free) command; it informs you about the available disk space on the computer where the EEProbe Databrowser is running. This lists the information for all mounted file systems, as shown in the figure below:

Figure 3-26   **Information dialog showing disk usage.**

3.5.2. Trigger manipulation tools

In EEProbe you can easily manipulate the processing of continuous data files by changing the corresponding trigger files. This is useful for instance for conditional averaging.
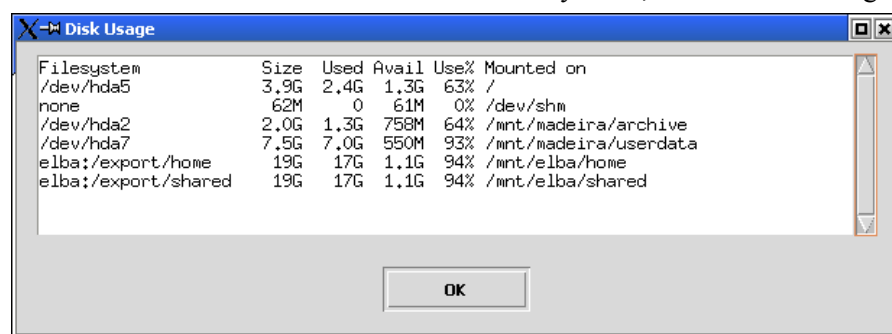
Tools: Trigger count / ISI inspection

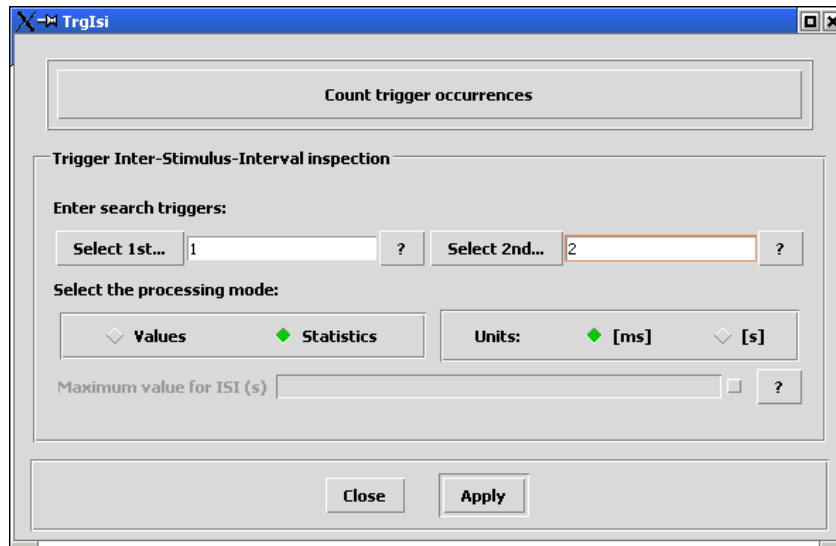*EEProbe command*: `trgcount, trgisi`

Figure 3-27   Inspect the number of triggers in a trigger file and review the statistics of the time intervals between selected triggers.

Use the large button on the top of this dialog to start the `trgcount` script for all selected trigger files and show a count of all trigger occurrences (totals per `trg` file).

The 'Trigger Inter-Stimulus-Interval inspection' allow you to select different triggers and review the mean, minimum, maximum and standard deviation of the ISI times. Select 'Values' to obtain the ISI times of all trigger pairs on which the statistics are based.

The 'Maximum value for ISI' is given in seconds (regardless of the selected 'Units'). This parameter is used to exclude long intervals from the statistics calculation. For instance, you may be interested in the mean reaction time of a subject, but excluding too long reaction times. In this case, select the 'stimulus' trigger and the 'reaction' trigger in the dialog, and use the 'Maximum ISI' to specify the maximum reaction time (e.g., 0.8 sec = 800 msec). This parameter also prevents the search algorithm to look to far ahead and erroneously include triggers; its default value is 2 seconds.

The default behavior of *closing* the dialog after processing is *not* implemented for the TrgIsi tool, because you often want to run the tool several times, using different triggers / parameter settings.

Tools: Trigger recoding
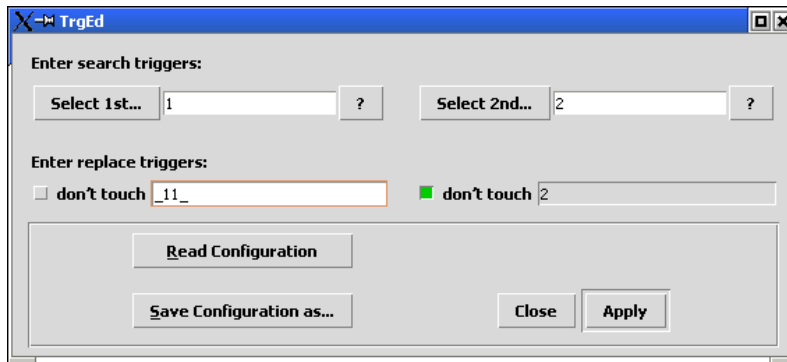
EEProbe program: `trged`

Figure 3-28   Conditional averaging 1: trigger (sequence) recoding.

This is a search-and-replace tool for trigger code sequences in trigger files. Its main purpose is the **recoding of false responses** (i.e., resulting in an invalid trigger sequence) that were recorded from the stimulation program.

Enter the first code of the trigger pair by typing or via the 'Select 1st...' button. Supply the second code in a similar way.

Below, click on the check-buttons 'don't touch' to leave a code unchanged, or enter a replacement code (in the example shown in Figure 3-28: trigger '1', when followed by the - invalid – response code '2', is replaced by '_11_'; thus the trials containing an invalid response '2' are excluded when averaging based on trigger '1').

Tools: Trigger / response time validation

EEProbe command: `trgvalid`
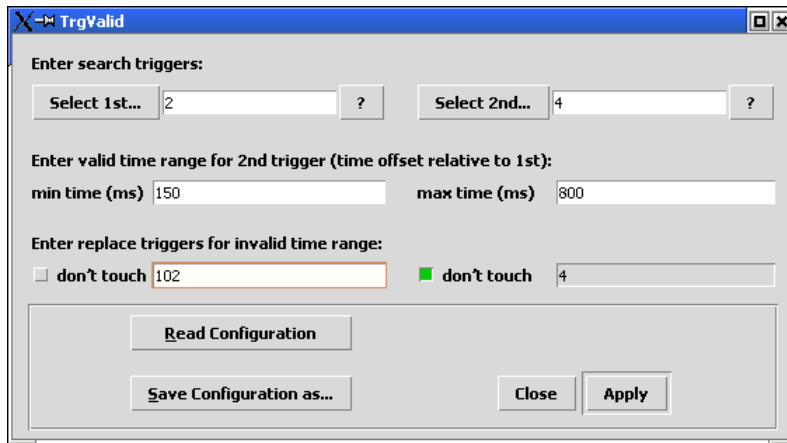
Figure 3-29   Conditional averaging 2: recode triggers with invalid (long) intervals.

Typically, the trigger recoding for the `trgvalid` command is also used in experiments where a subject had to react to stimuli by pressing response buttons. In this kind of experiments, you may only want to average trials in which the subject responded within a certain time window ('min time', 'max time' fields in Figure 3-29 – enter the values in milliseconds).

The `trgvalid` command can be used to **recode triggers for which the time interval is invalid**, i.e., where the response was made too quickly, or too slow.

3.5.3. Continuous data tools

Tools: Cut Epochs

EEProbe program: `cntepoch`

Result file: `foo.cnt -> fooe.cnt`

This command can be used to make a sub-selection from a recording, e.g., when it contains some distorted periods that you want to remove. For this you can best use the continuous data viewer `xcnt`:
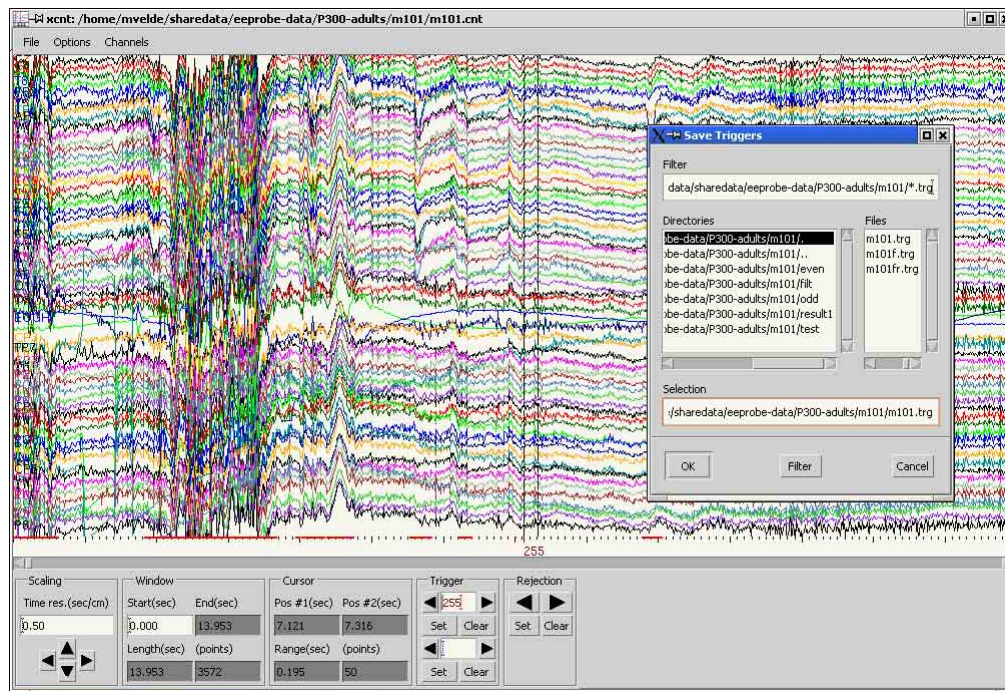
Figure 3-30   **Manually add triggers at the desired time-points.**

At the beginning of the period that you want to *include* in your new file, put a trigger '255': enter this code in one of the 'Trigger' fields at the bottom of the `xcnt` window, and click on 'Set'.

Similarly, at the end of the period that you want to include, put a trigger '254'.

You can define more periods in this interactive way, all inside the `xcnt` viewer.

When you want to quit the viewer, first select the 'Save Triggers' option from `xcnt`'s File menu (see Figure 3-30).

Next, you open 'Cut Epochs' in the Databrowser:
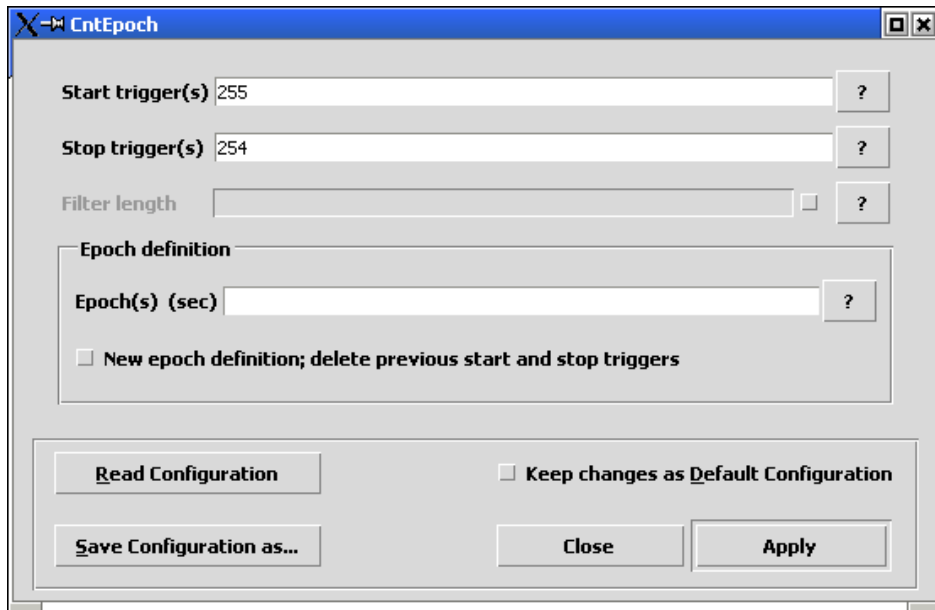
Figure 3-31   **Selected periods in a continuous data file can be written to a new file using the cntepoch program.**

Here, you will normally find the triggers '255' and '254', corresponding to the start and stop of each period that you have marked in the continuous data viewer.

These trigger points will be used to create the output file.

Alternatively, in this dialog you can also specify some periods that you want to use in the output file.

Example. For instance, by entering '10-20' as 'Epoch definition', the **Databrowser** will insert triggers '255' and '254' at 10 sec and 20 sec in the trigger file, before the cntepoch program is started. By specifying that this is a 'New epoch definition' (see the dialog), any previous triggers '255' and '254' (or other values that you entered) will be deleted before inserting the triggers at 10 sec. and 20 sec.

Tools: Concatenate files

EEProbe program: cntcat

Figure 3-32   **Concatenate continuous data files.**

Using this program, you can append data files to one-another. After you have made your file selection in the Workset, you can still reorder the sequence in which the `cnt` files will be concatenated: just 'click&drag' a file up or down in the listbox. You must specify an output file: if you just type a name in the 'Output filename' field, it will be written automa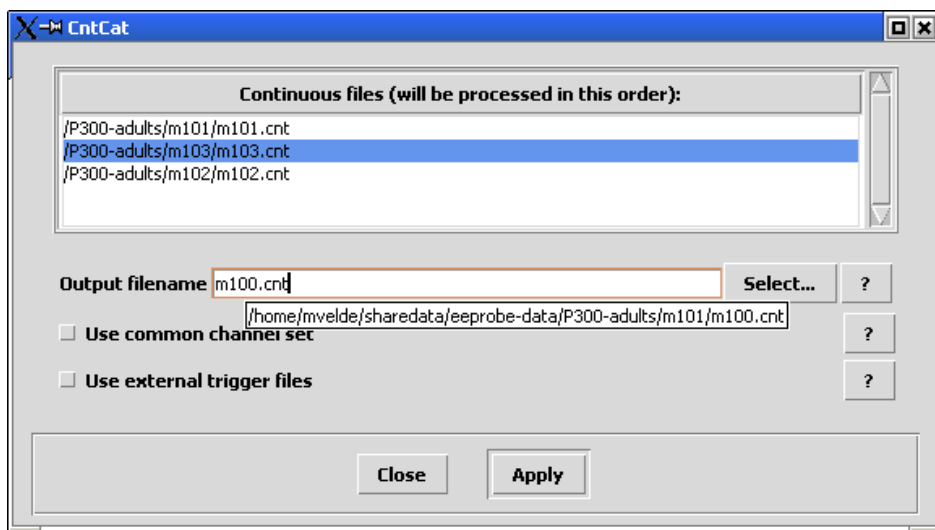tically to the directory of the first file as selected in the Workset (as shown by the tooltip in the figure above – the popup shows automatically when you move your mouse over the entry field).

The 'Common channel set' option is useful to add files that have a different channel naming; channels that do not appear in all `cnt` files, will not be written to the output file.

'Use external trigger files' is a way to create an output `cnt` file where the *internal* events table (triggers) is based on the triggers files. This requires that for every input `cnt` file there is a corresponding `trg` file.

Tools: Continuous data tools: Resample Continuous

EEProbe program: `cntdown`

Result file: `foo.cnt -> foos.cnt`

This command allows you to resample the continuous data file(s) to a new (lower or higher) sample frequency. This may be useful to compare data that was originally sampled at different sample frequencies.
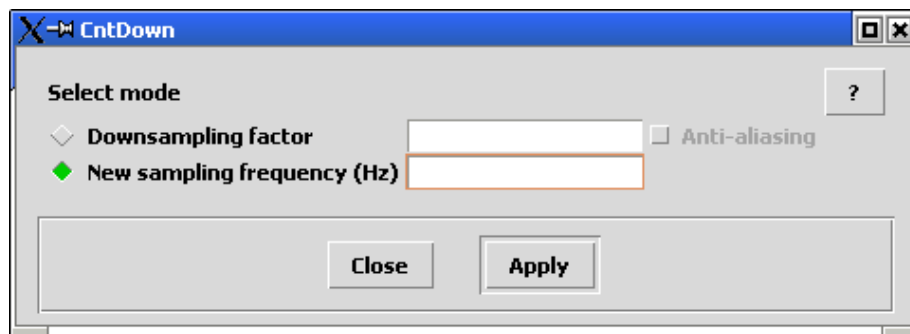
Figure 3-33   Downsampling of continuous data.

For the mode, two options are available (also see the Reference manual):

- 'Downsampling factor' corresponds to the `-s <skip>` command line option. The factor results in skipping every <skip>th source sample and writing this to the destination file.
  The 'Anti-aliasing' option makes sure that the output sample is a mean value of the <skip> samples.

- 'New sampling frequency' can be specified. The samples in the output file will be calculated via a linear interpolation method.

4. *EEPROBE* DATABROWSER SETTINGS

User and environment settings

4.1.   The Settings dialogs

Most of the settings in your $HOME/.eep/settings file can be change interactively via the Tools menu, Settings. Below, the different dialogs are presented:

4.1.1.   General
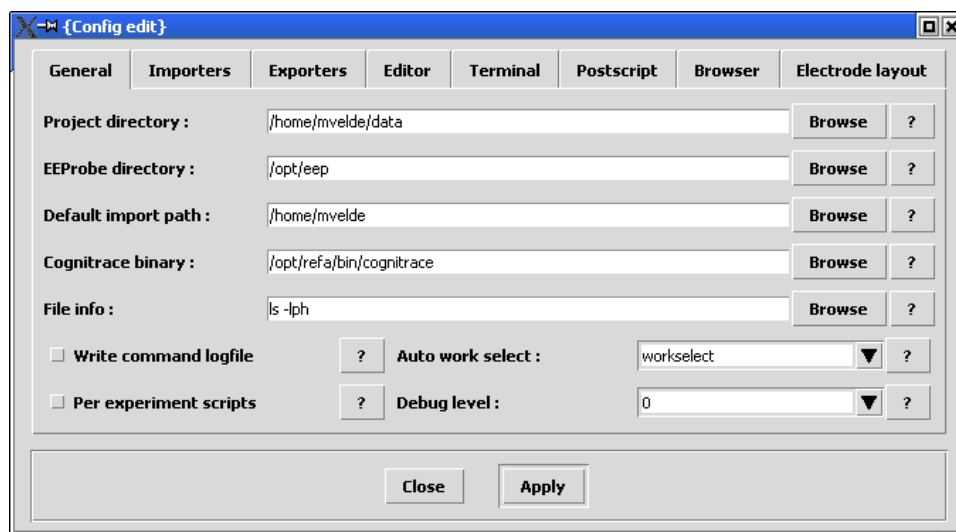
Figure 4-1   General settings.

All options are explained through the on-line help (the '?' buttons, or with the <F1> key). Below, only some of the entries are described.

Project directory

Here you can indicate your default project directory that is opened when you start eeprobe . You can overrule this with the command line option '-p project_dir', or by using an environment variable PROJDIR.

Cognitrace binary

Indicate the location of the recording program 'Cognitrace' (typically /opt/refa/bin/cognitrace). Only when this field contains a valid entry, the 'Recording' menu will be enabled.

Write command logfile

Enabling this option will write the 'Session Command Logfile' automatically when you exit the Databrowser. These files will be placed in the project directory, with a date and sequence number, corresponding to the 'Session Output Logfile'. See paragraph 3.5.1 on page 49 for more explanation on its usage.

Auto work select

Choose the desired selection mechanism in the 'Workset':

workselect (default setting)	automatic selection of datafiles for the next processing step
viewselect	as above, and start of xavr/xcnt viewers (xcnt viewing only for single file processing)
workselect+ and viewselect+	functionality as the counterparts above, *and* also automatically restrict the Datafile listing to show files of the appropriate type (e.g. 'f.cnt' after filtering)

4.1.2. Importers and Exporters
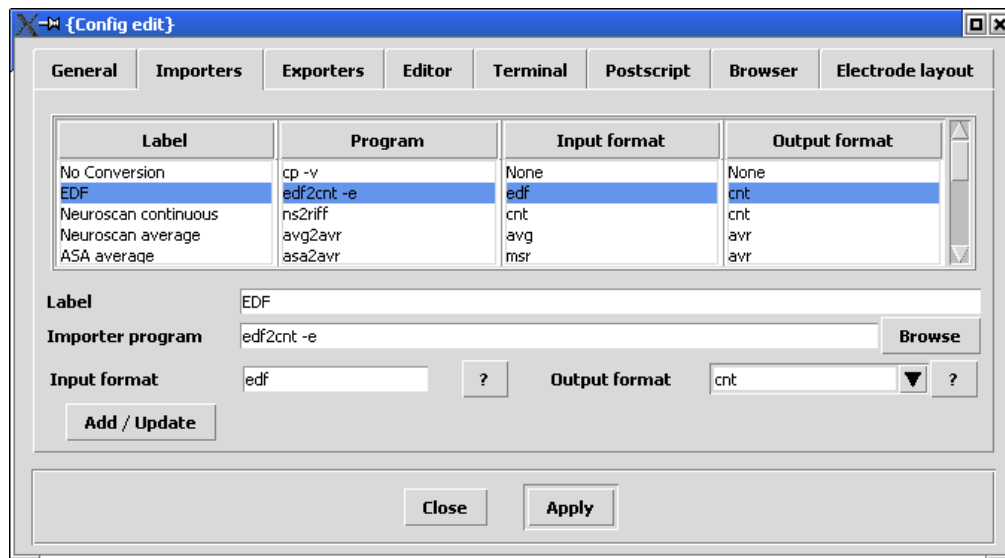
Figure 4-2   Settings: Importers.
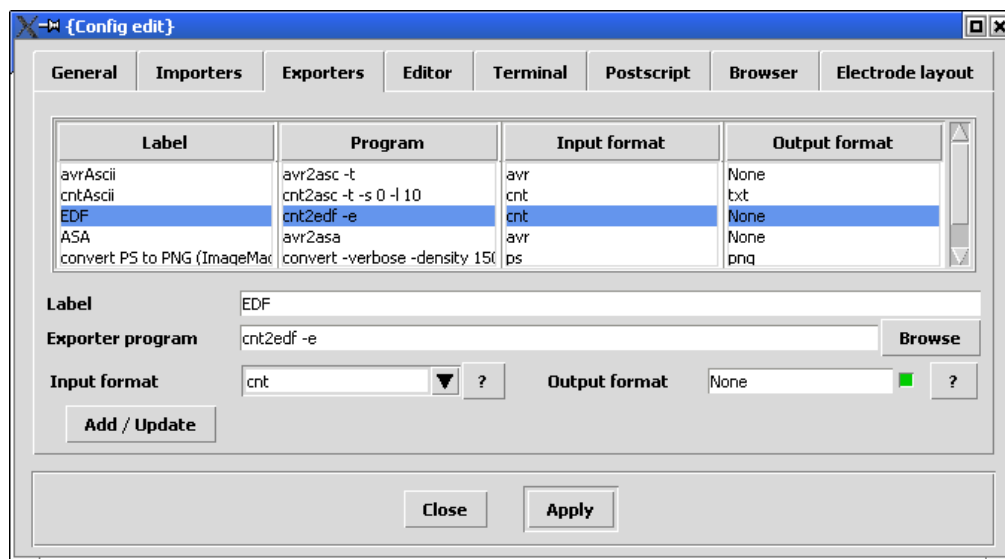
Figure 4-3   Settings: Exporters.

In the 'Importers' and 'Exporters' tabs you can define your own selection of converter programs that will be available in the File menu: Import, Export.

Double-click on an entry in order to edit the label, program, and format fields. Click on the 'Add/Update' button to include the (new) program in the listing. Using the mouse, you can also change the order of the listing: e.g., 'drag' an entry to the top of the listing to make it the default converter.

The converter programs are uniquely identified with their 'Label'.

4.1.3. Helper programs
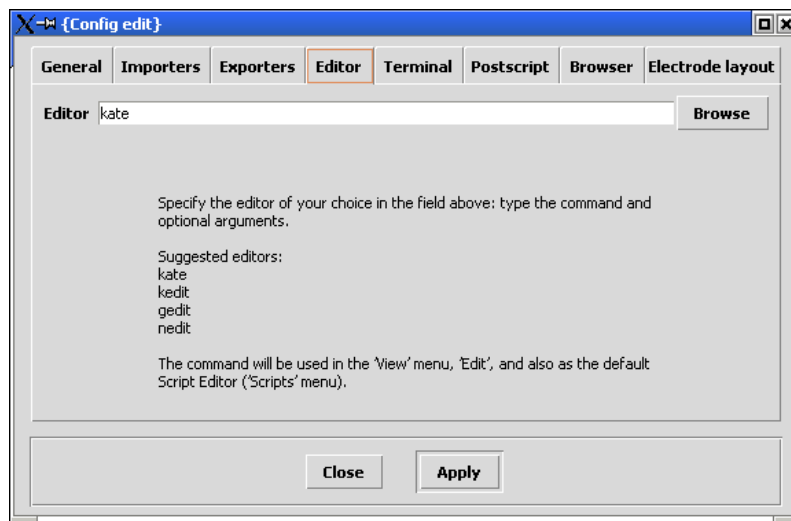
Figure 4-4   Settings: Editor program.

The editor program as specified here will be used in the View menu: Edit. This is also used as 'Script editor' via the scripts menu.
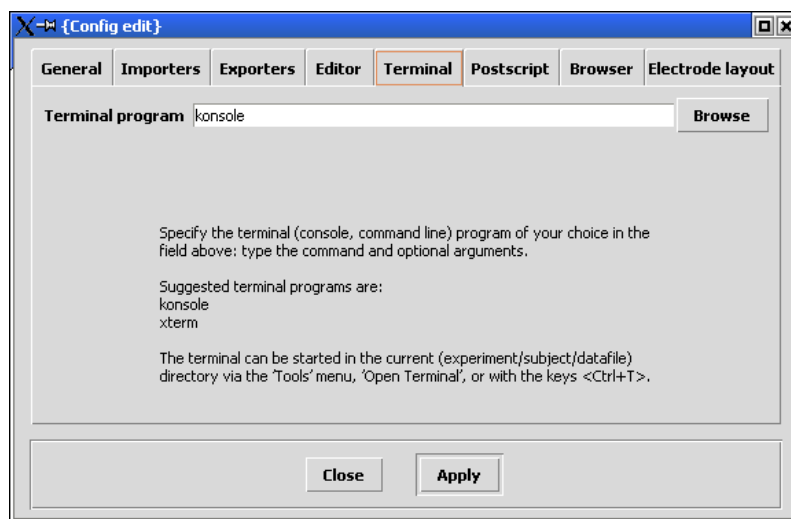
Figure 4-5   Settings: Terminal program.

The terminal can be started via the Tools menu, or with the keys <Ctrl+T>.

It will be started in the current subject directory, or in the current experiment directory if no subject was selected.
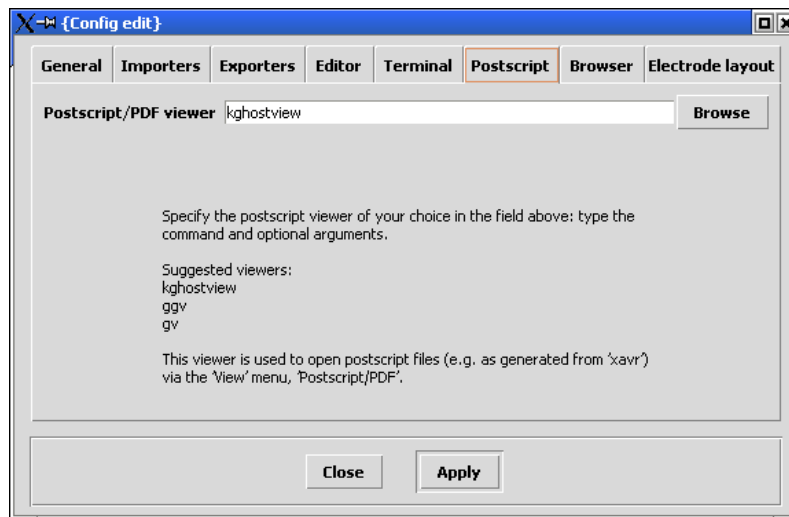
Figure 4-6   Settings: Postscript viewer.

This viewer is used to open postscript files via the View menu.
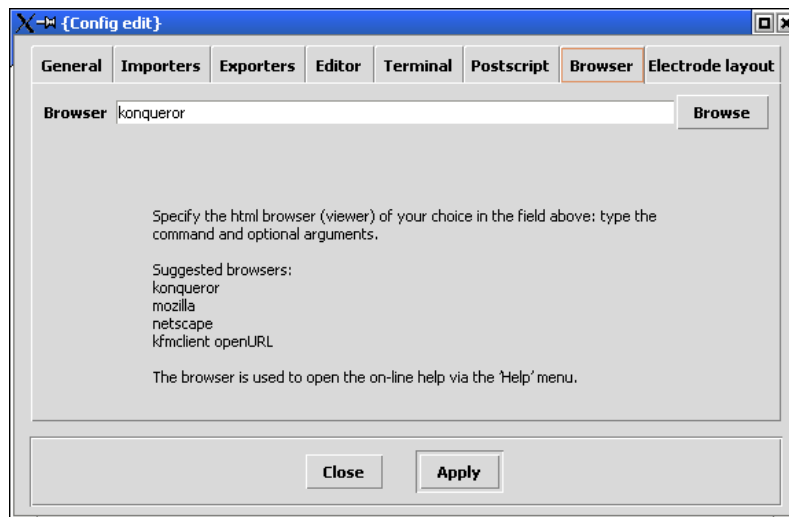
Figure 4-7   Settings: Browser program.

The browser is used to open the on-line help via the Help menu.

4.1.4. Electrode layout

In the Databrowser at various locations in the Analysis procedures, you can make use of a 'Channel Selection' dialog. The actual electrode positions may not match exactly with your electrode layout, a default table of positions is provided. Of course, you can switch to the list of channels as available in the datafile, but using a topographic layout is sometimes more appropriate. Using the 'Electrode layout' tab in the Settings dialog you can select from three standards: electrode_1020, electrode_1010, and electrode_1005:
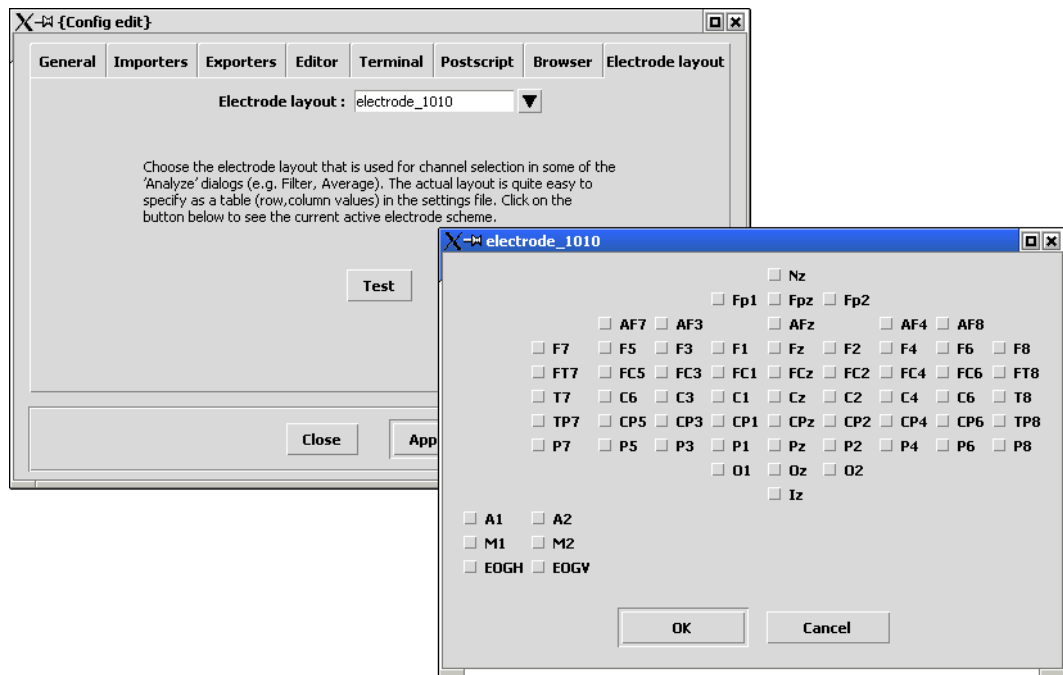
Figure 4-8   Settings: Electrode layout.

The actual layout is quite easy to specify as a table (row, column values) in the settings file (see the next section).

4.2. The $HOME/.eep/settings file

In the settings file itself, you will find all entries as available through the Settings dialogs. General settings contained in the settings file are startup project location, the location where the file import utility should start its 'Select Files…' dialog, and the location of the EEProbe programs. Some extra parameters may be specified here.
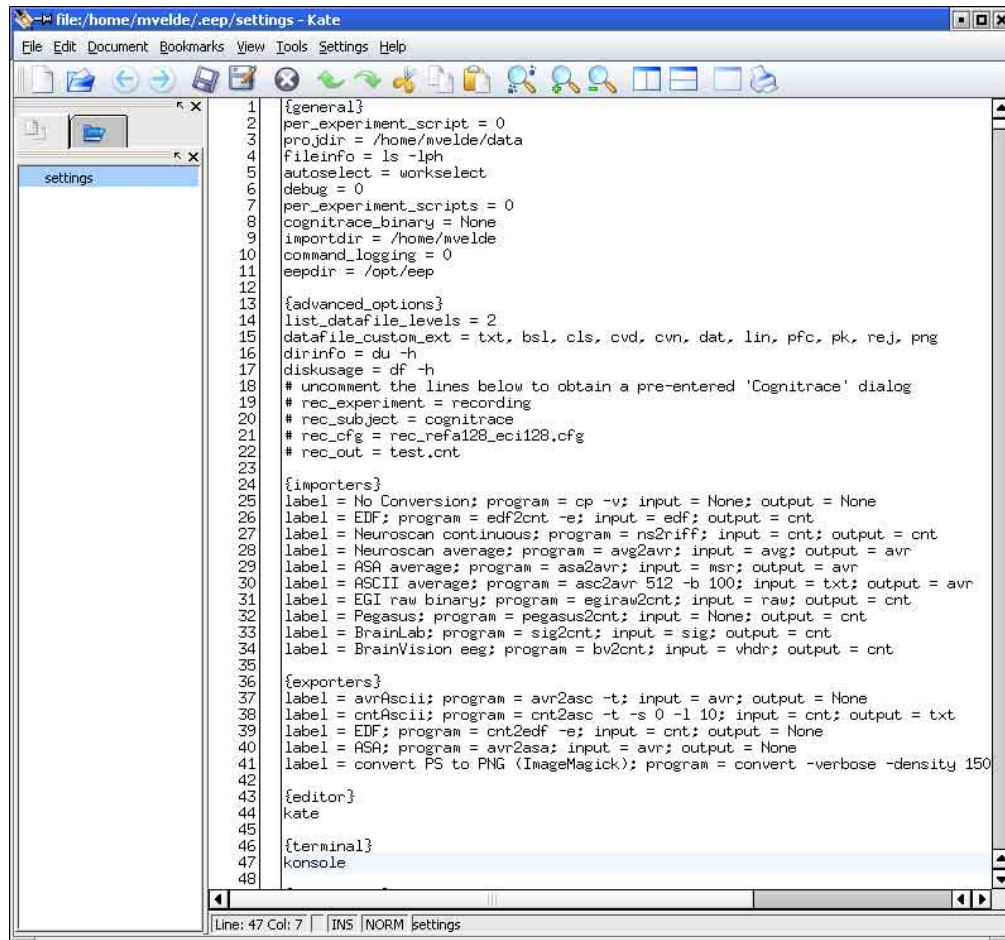
Figure 4-9   **The contents of the settings file.**

Some advanced options can only be changed in the settings file. These special options are written under a section heading {advanced_options}, and pertain to:

- The number of sub-directory levels that can be shown in the Datafile listbox (please be careful when changing this, searching 'deeper' can take considerably more time);
  parameter specification: list_datafile_levels = 2

- A list of file types (extensions) that are available in the 'Select' feature under the 'Datafile' listbox;
  parameter specification: datafile_custom_ext = ext1, ext2, ext3, …

- The extra command that is used to show the sub-directory sizes when requesting 'Info' in the context menu of of the Experiment listbox;
  parameter specification: dirinfo = du –h

- The command that is used under the Tools menu, Disk usage;
  parameter specification: diskusage = df -h

And, only applicable if you have the recording program 'Cognitrace' installed:

- Some special parameters are available to obtain a pre-filled 'Cognitrace' dialog (Recording menu);
  parameters: rec_experiment, rec_subject, rec_cfg, rec_out
  (see Figure 4-9 or in the settings file)

4.2.1. Channel layout settings

Further down in the settings file you will find one or more lists of channel names and associated 'x' and 'y' values. These values are used in the 'Select Channels' dialog window for display of the 'standard' channel selection, as found in several dialogs for entries in the 'Analyze' menu. If you want to edit this list, only use integer values, and find the correct layout using 'x' and 'y'. You do have to restart the EEProbe Databrowser before any changes to the channel layout can be used.

You can keep different lists for different channel layouts in one settings file; the list that is actually used is indicated by the {electrode_layout} parameter (see Figure 4-10).
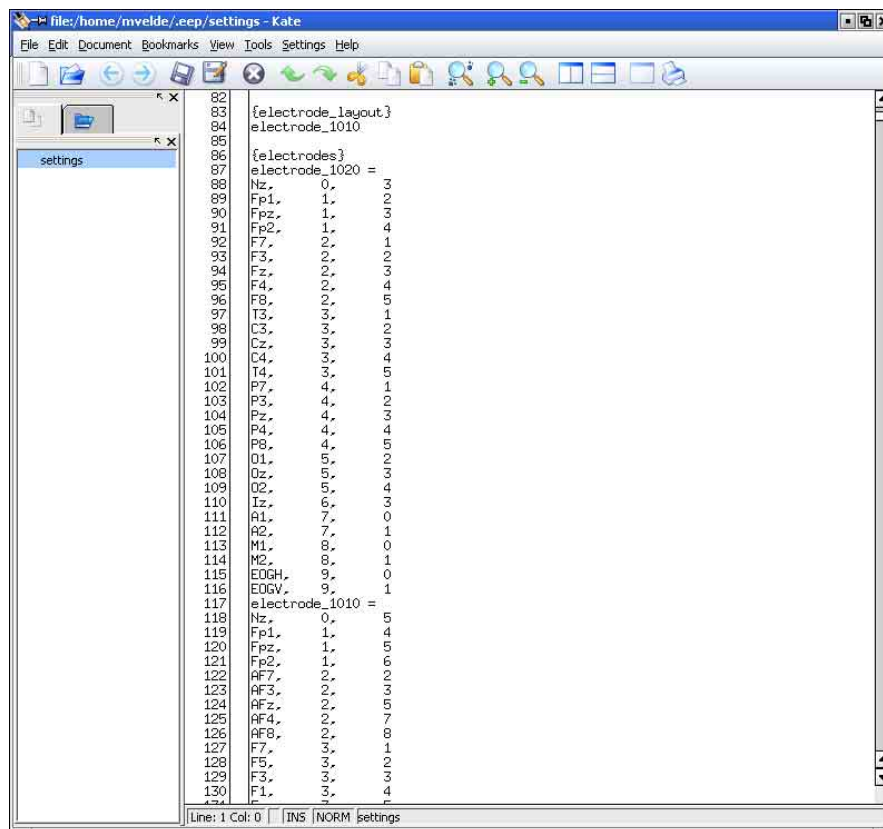
Figure 4-10   **The settings file: the channel list and electrode_layout parameter.**

See Figure 4-8 for an example dialog with channel labels according to the 'electrode_1010' specifications as indicated in the settings file.

4.2.2. Configuration files for new projects

Edit the sections {newproj_dir} and {newproj_file} carefully. This set of files will be created in a new project directory, under the special 'cfg' and 'fir' and 'scripts' directories.

For advanced users: in the installation directory of the EEProbe Databrowser (/opt/eep/eeprobe_gui) you will find a script 'projskel.sh' that will help you in the creation of your own set of files to be included in the settings file.

5. BASIC ERP PROCEDURES

Step-by-step data analysis

5.1. Installation of the example data

The example data file used in this chapter can be installed from a tar file, available on the CD, or from the download-site where you obtained the EEProbe Databrowser files.

You should have installed the EEProbe Databrowser.

The default project directory that the Databrowser will open after the first start, is $HOME/data

5.1.1. Create project

After the first start of the Databrowser the default project directory $HOME/data may not exist; in this case, you will be prompted to create a project. If you already have this directory, you can choose to create a project there anyway, or create a *new* project at another location.

For any *existing* files in a (project) directory, you will be prompted:
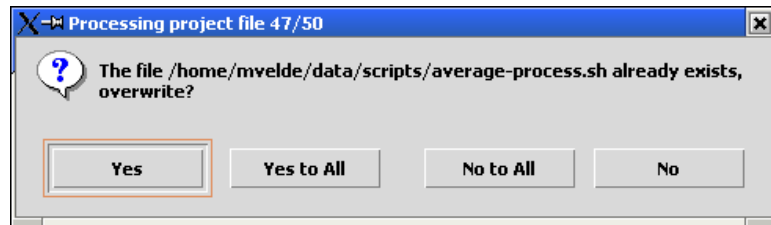
Figure 5-1   Interactive project (re-)creation

Tip: use the <Enter> key for 'Yes', and <Escape> for 'No'.
If you *click* on 'No to All', only *non-existing* files will be created.
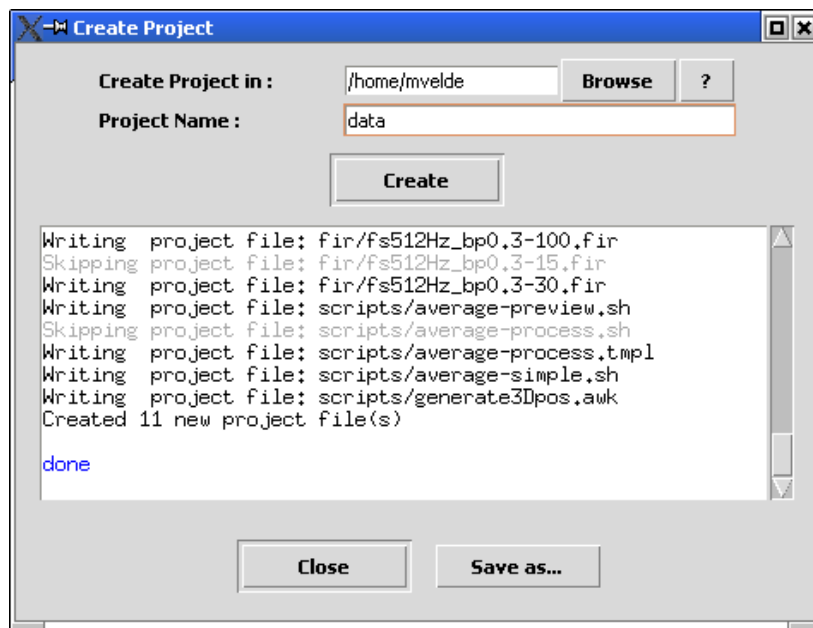
Figure 5-2   Review the newly created project files in the log window.

Note

The file listing of new project files is not included in the overall
'Session Output Logfile'; if you want to save the list, do it in the
above dialog window.

5.1.2. Open the project

You can also specify the location of a project on the command line:

```
eeprobe -p ~/data
```

or you can open it from the EEProbe Databrowser: File | Open project, and specify
/home/james/data, if that is where you installed this project.
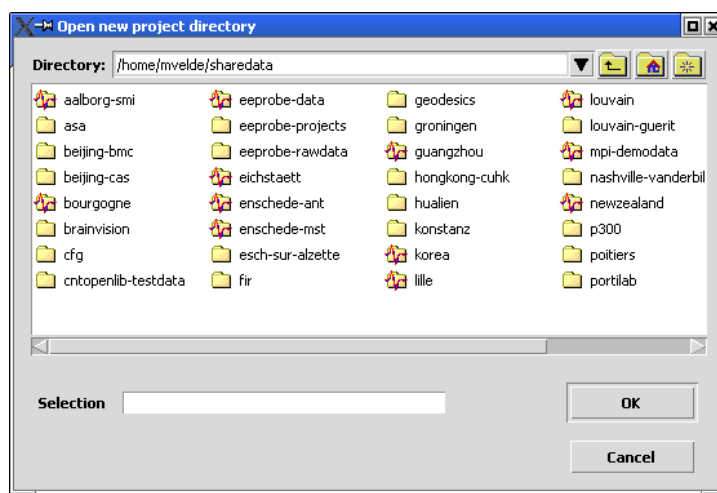
**Figure 5-3   Open project directory: the icons containing 'waveforms' are EEProbe
project directories containing a `cfg` and `fir` sub-directory.**

After you have successfully opened your
project, use the File import facility from the
File menu, and select the data file m101.cnt
on   the   EEProbe   CD   from   the
Examples/P300 subdirectory:

Figure 5-4   Import the example data.

As Experiment, type 'P300'

As Subject, type 'm101'

Use the 'No conversion' option, and click
on apply to copy the file to your hard disk.

On this file, you will perform a typical P300
analysis.
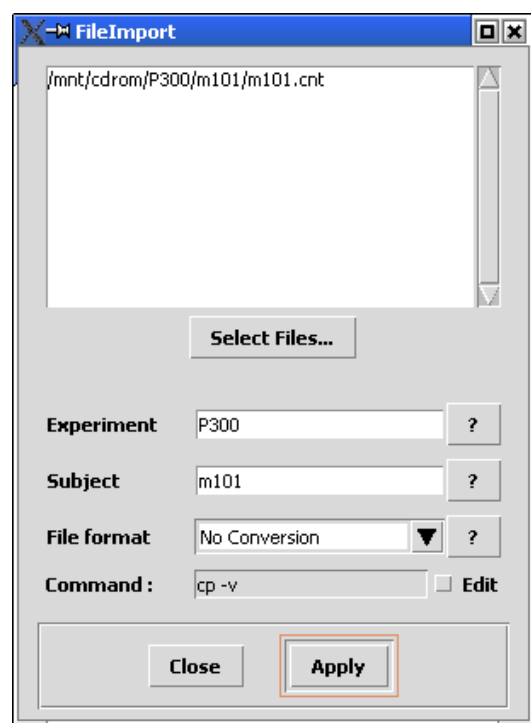
5.2. View the data

Add the continuous data file to the Workset and select it as explained in paragraph 2.1.3 on page 17. Double-click on the file, or press <Enter> to start the viewer.
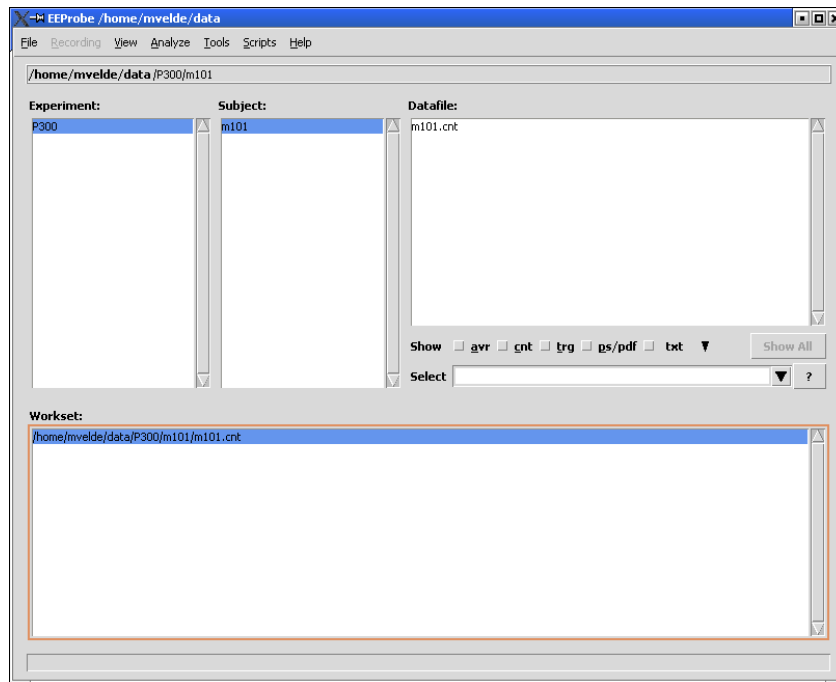
Figure 5-5   **Add the m101.cnt data file to the Workset for processing.**
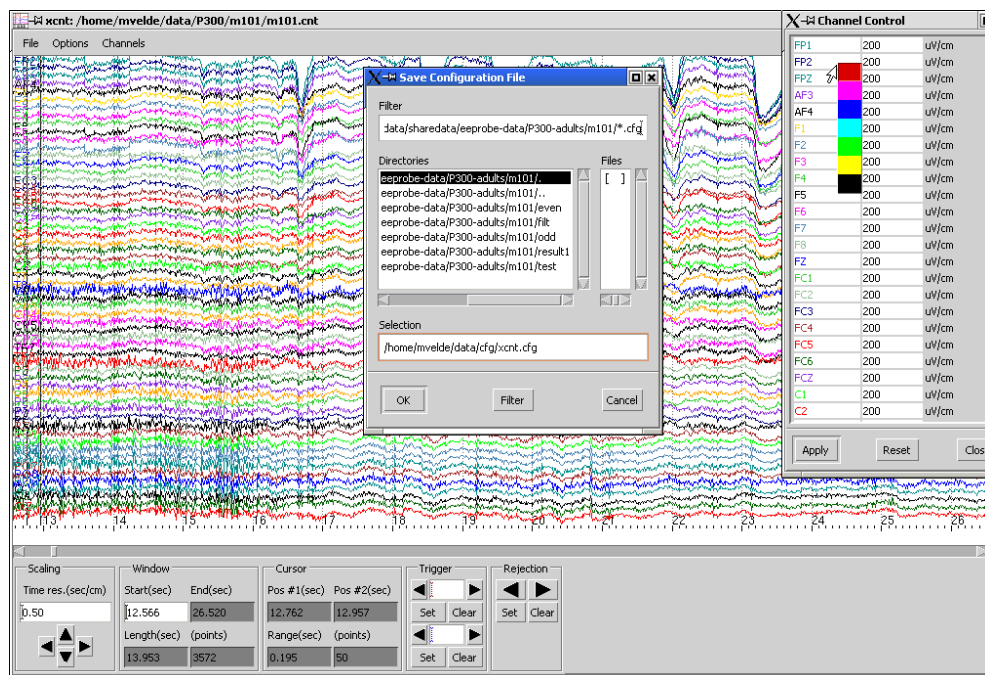
Figure 5-6   **View the example data set.**

In the `xcnt` viewer you can browse your data. You can change the colors of each trace in the Channel Legend and save this as default color scheme. To save the color scheme for the current subject only, just type 'xcnt.cfg' as 'Selection' in the 'Save Configuration file' dialog. You can also edit triggers and/or rejection marks, inspect amplitudes; please see the *EEProbe Reference manual* for detailed usage.

5.3.   Artefact rejection

5.3.1.   Menu command: Analyze, Reject Continuous

Open the CntReject dialog window through the 'Analyze' menu, select the 'Reject Continuous' command.

Check the following settings for identical processing as in this tutorial:

'StdDev' mode for all channels:

EOGV   'Max' = 30

EOGH   'Max' = 30

FZ   'Max' = 20

'Sliding Window' of 200 (msec)

'Histogram scaling' 0.1

'Cutoff Point' 15

The pictures below explain how to quickly set the channel parameters if they are not yet correct.
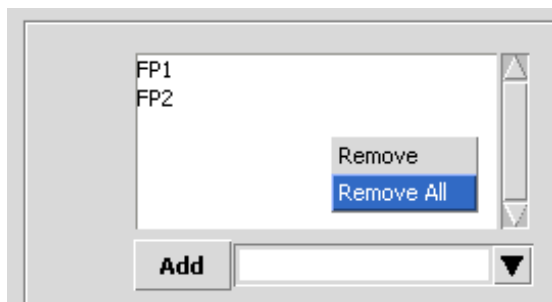
Figure 5-7   Remove unwanted channels with the right-click (mouse) menu.
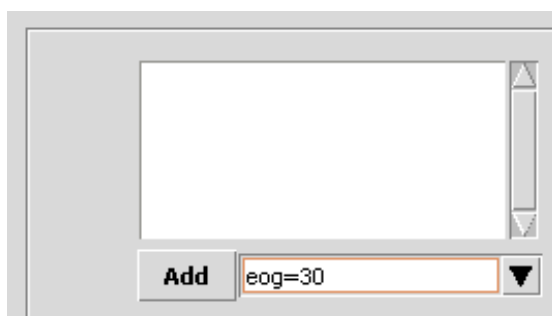
Figure 5-8   Quickly add the EOG channels using a simple formula, click 'Add' or press <Return>.
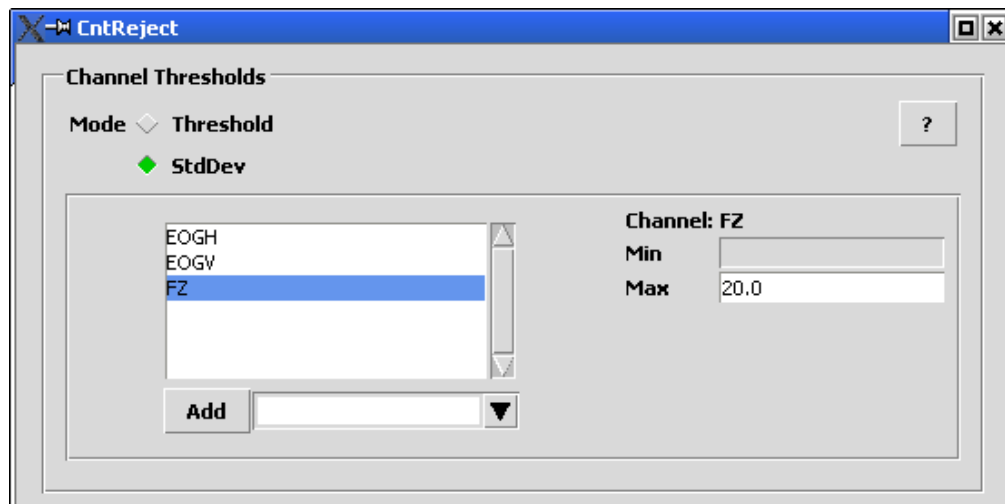
Figure 5-9   Add 'fz=20' to include the StdDev parameter for the Fz channel; click on a channel label to review its setting.

Click on the 'Apply' button to start the rejection process:
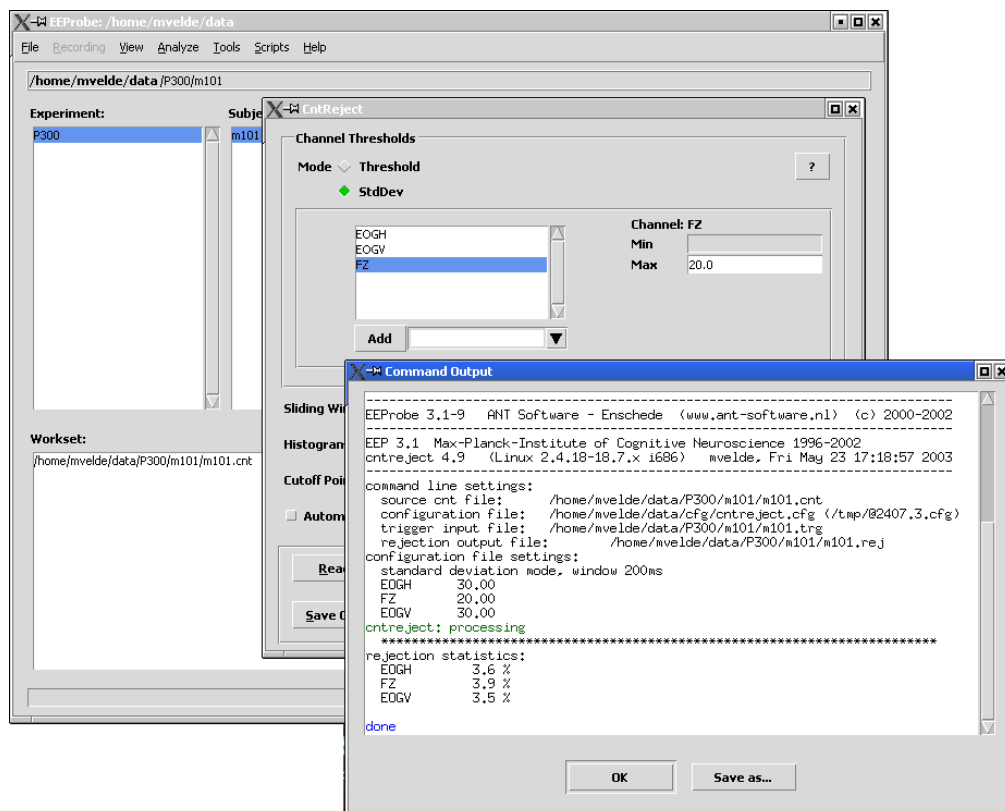
Figure 5-10   The rejection analyis: a rejection output file is created (m101.rej).

When the processing is finished, the 'Command Output' will end with 'done' in *blue*, and the two buttons in the bottom of the 'Command Output' dialog are enabled (grayed/disabled during processing). You can save the output text as shown to a text file using the 'Save as…' button, but it will be appended to the overall Session Log file anyway. So, typically you close the dialog with the 'OK' button.

If some errors occurred, these will typically be displayed as *red* text[5].

After the rejection processing, open the `m101.cnt` file in the continuous data viewer xcnt via the View menu.
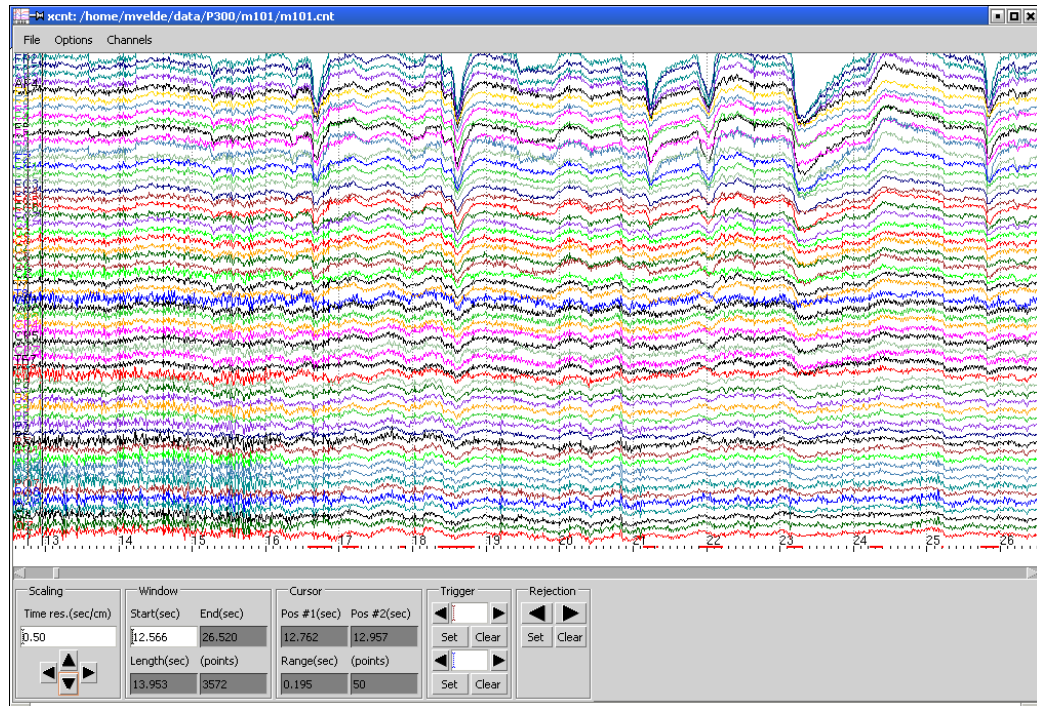
Figure 5-11   Open the data file in the 'continuous data viewer' (xcnt) to review the EEG data together with the triggers and rejection marks (red markings).

---

[5] The context colors green, blue and red are not displayed in the overall 'Session Output Log'.

5.4. Filtering

5.4.1. Menu command: Analyze, Filter Continuous
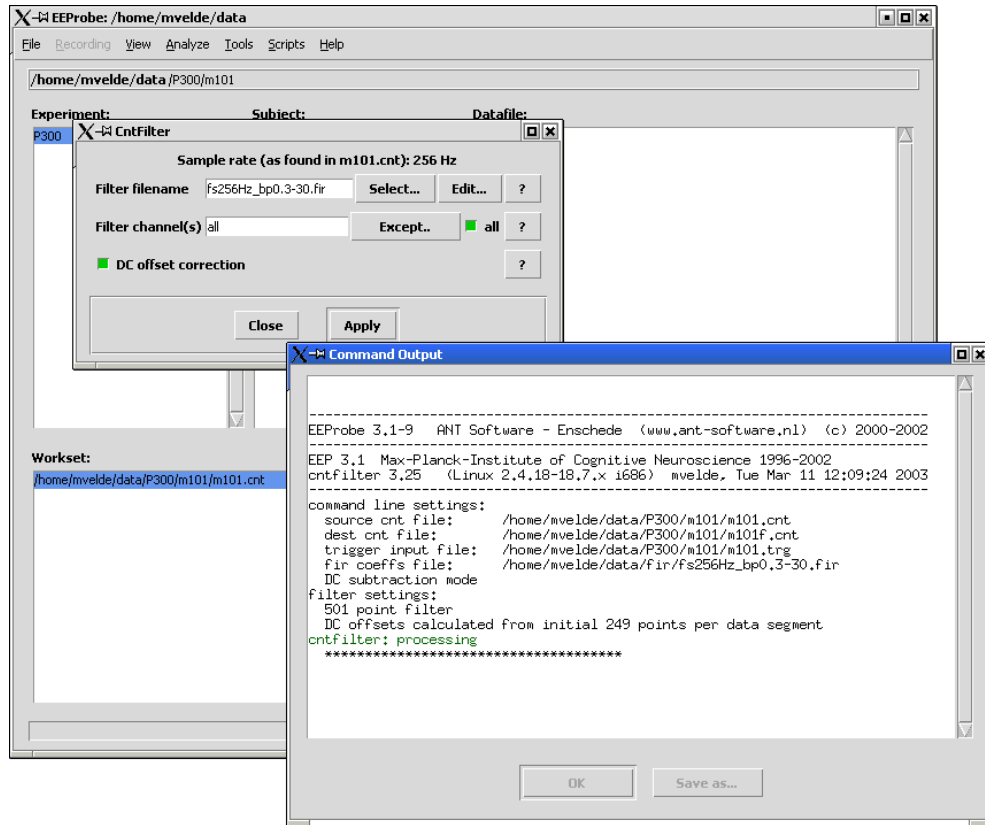
Figure 5-12   **The filtering process.**

In the entry field for the 'Filter filename', we enter the name of a band-pass filter from 0.3Hz to 30Hz, that was designed for the sampling frequency of 256 Hz. Select the file using the 'Select…' button.

By default, you process all channels in the filtering process (see Figure 5-12).

When the `cntfilter` program is finished, the buttons 'OK' and 'Save as…' at the bottom of the 'Command Output' window are enabled: during the processing these buttons are non-functional, after processing they turn from *gray* to *black*.

Click 'OK' to close the 'Command Output' window.

5.4.2. Notes

You can design your own filters using the `xfir` program (see the *EEProbe Reference manual*). This program is available from the 'Tools' menu: 'Filter Design'.

The example above uses a filter file with the name

    `fs256Hz_bp0.3-30.fir`

which is a sensible way of naming your filter files:

    `fs256Hz` = sampling frequency of 256 Hz

    `bp0.3-30` = band-pass filter from 1-30Hz

Use '`lp`' for low-pass filters, '`hp`' for high-pass filters, or '`n`' for notch filters.

5.5. Rereferencing

5.5.1. Menu command: Analyze, Rereference

Select the `m101f.cnt` filtered file to add it to the Workset (this is done automatically by the Databrowser, when using the default 'workselect' mode in the Settings dialog, see page 56).
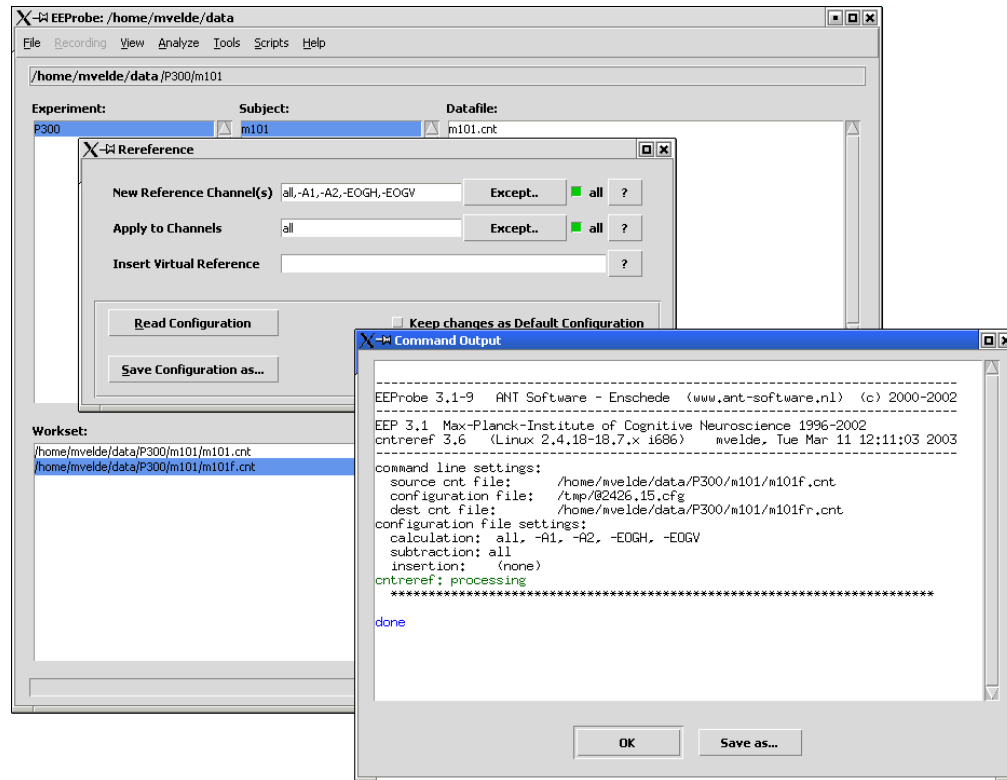
Figure 5-13   **Rereference the data: common reference except ear and EOG channels.**

For the rereferencing process, use the settings as displayed in the figure above: we do not include the EOG channels, nor the right/left ear channels for the calculation of the new reference:

- Click on the 'all' check-button (top-right)
- Select the A1, A2, EOGH, EOGV channels in the Channel selection dialog that opens via the 'Except' button[6]

Press the 'Apply' button and the referencing process is started.

Its output file will be named `m101fr.cnt`, because we have used the filtered file `m101f.cnt` as input. The `cntreref` program adds an 'r' to the basename of the file.

---

[6] The data were recorded using A1 as a reference. To obtain a 'linked-ear' reference, deselect 'all', and type 'A2*0.5' as new reference channel.

5.6.   Averaging

5.6.1.   trigger, rejection filename convention

In the next step, we will perform the averaging process on the the `m101fr.cnt` file. This process expects that the trigger file (for the different conditions) and the rejection file (to reject any contaminated trials) have the same base name as the continuous data file. Therefore, after each step, the EEProbe Databrowser has copied the original trigger and rejection files automatically to the new basename.

5.6.2.   Menu command: Analyze, Average

For the selected `m101fr.cnt` file, start the 'Average' command dialog from the 'Analyze' menu, and review that the settings match the following configuration:
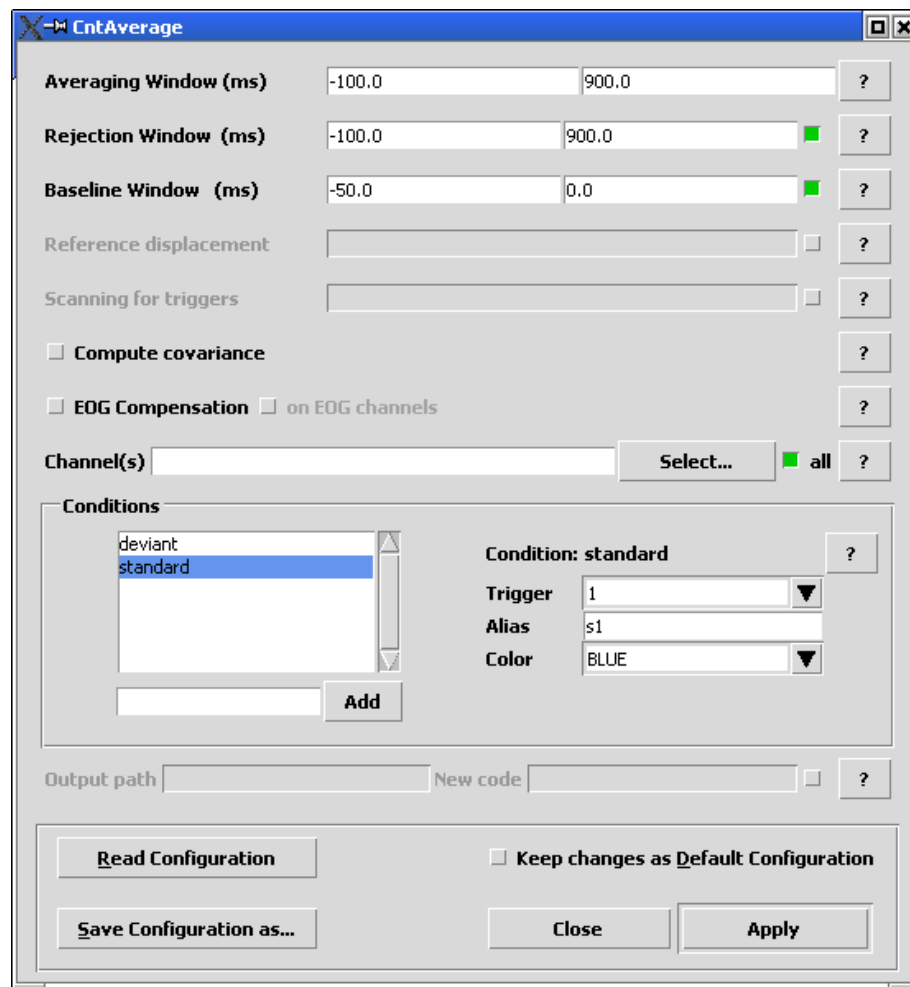
Figure 5-14   **The configuration parameters for the P300 averaging process.**

For the condition 'standard', use the Alias 's1', for the 'deviant' triggers, use an Alias 'd1'. If the default project was installed properly, this is already configured as such.

5.7.   Visualize the results

5.7.1.   Menu command: View, Average

Now that we have the final result `avr` files, we can review these ERP waveforms in the `xavr` viewer.

The avr result files are automatically added to the Workset listing, the averages are automatically selected, and we can immediately choose 'Average' from the 'View' menu. Or, press <Enter> in the Workset.
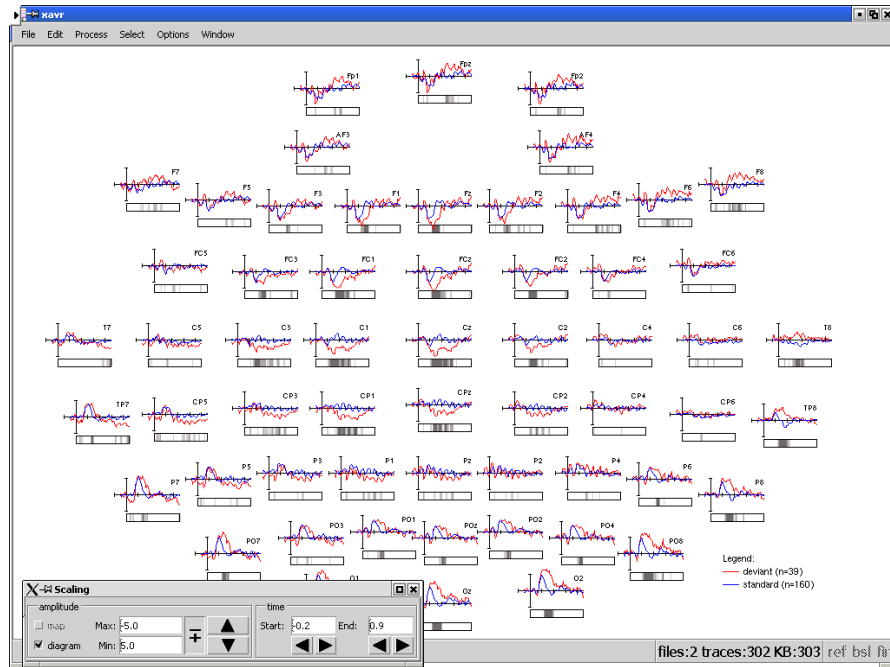
Figure 5-15   **Review the averages together in the viewer.**
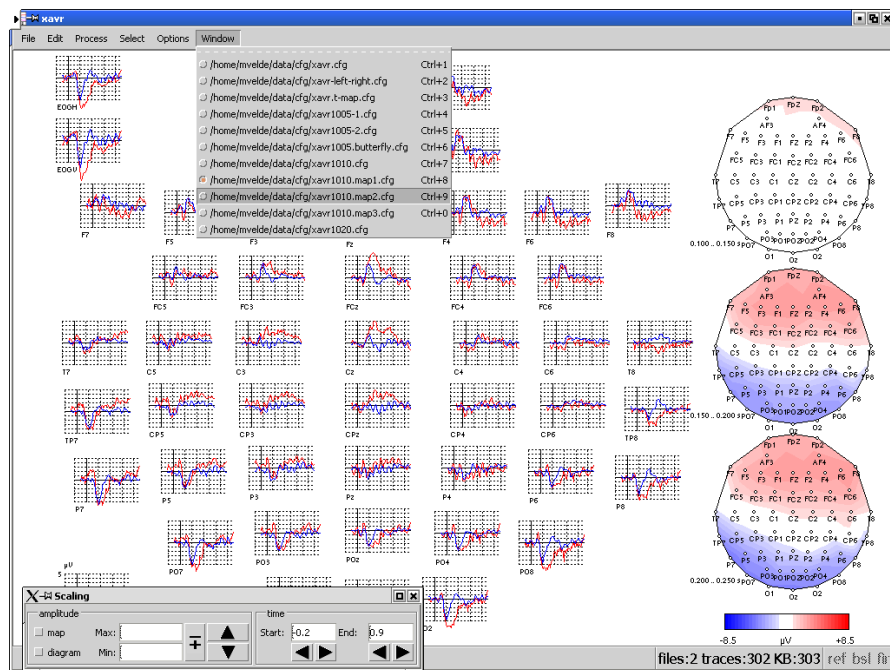
Figure 5-16   **Use the Window menu to open different configurations (display pages).**

5.7.2. Notes on 2D mapping view

The default 3D position file

The startup of the `xavr` viewer via the Databrowser, automatically loads a default `xavr.dat` 3D electrode position file. The 3D positions are used for a spherical spline interpolation to create a spherical surface map, which is unwrapped into a plane to display 2D plots with acceptable distortions.

Since the electrode layout as used in different experiments may be different than in the example data as shown in this chapter, the 2D mapping view may not be optimal, or can even show a distorted picture.

If this is the case for your data, you can try to reload the default sensor positions through the **File** menu, **Load Sensor Positions**. Change the default setting for the number of 'Mesh Control Points' *n* to 1, and reload the `xavr.dat` file:
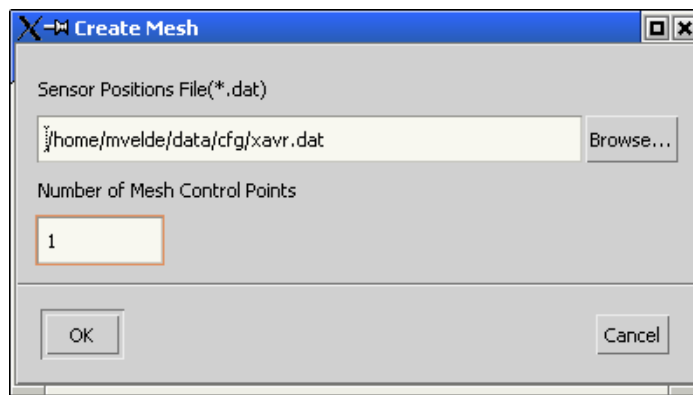
Figure 5-17   **Recreate the 'mesh' as used for the mapping display.**

The number of points controls the map interpolation as follows (*n* is the number you enter and n_{dat} is the number of valid sensor positions in the `.dat` file):

n = 0

   no interpolation at all, a value of -1e30 is assigned if no ERP channel is available for an sensor in the `.dat` file(this is the default)

0 < n <= n_{dat}

   no additional control points, interpolation for sensor positions with missed ERP channels

n_{dat} < n

   insert additional control points, need interpolation always

Create your own 3D position file

For EEG data, a helper-script '`generate3Dpos.awk`' is installed as part of the default files when creating a new project. This script can be used to create a `.dat` file based on the channel layout of your data. Select a `cnt` or `avr` file in the Workset, and from the Scripts menu, run the script:
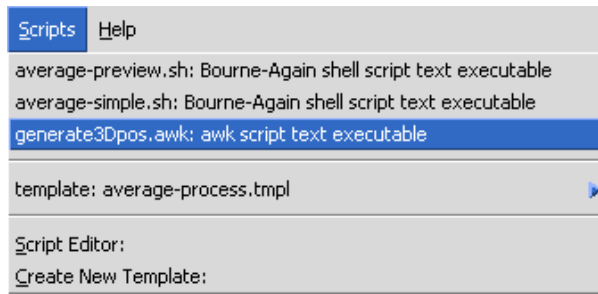
Figure 5-18   **Create a custom 3D position file.**

For the example data, its output will tell you:

```
Found 59 positions out of 346 standard positions (sphere_1005)
Creating 3D position file '/home/mvelde/data/P300/m101/xavr59.dat'
Unmatched channels:
  EOGH
  EOGV
```

After starting the xavr viewer, you can load the result file 'xavr59.dat' through the File menu, Load Sensor Positions.

You can easily edit this file to remove any unwanted channels (e.g., ear, or mastoid channels): in the Databrowser, add the file to the Workset, and select 'Edit Selected Files' in the View menu.

In most editors (the figure below shows the default editor 'kate' as available in the KDE 3 desktop environment) you can save a copy of this file to 'xavr.dat' in the cfg directory of the project. Choose 'Save as...' in the File menu, and navigate to the cfg directory (two levels up). Click on the xavr.dat file and click 'Save'. Thus it becomes the default sensor position file for the next startup of the xavr viewer:
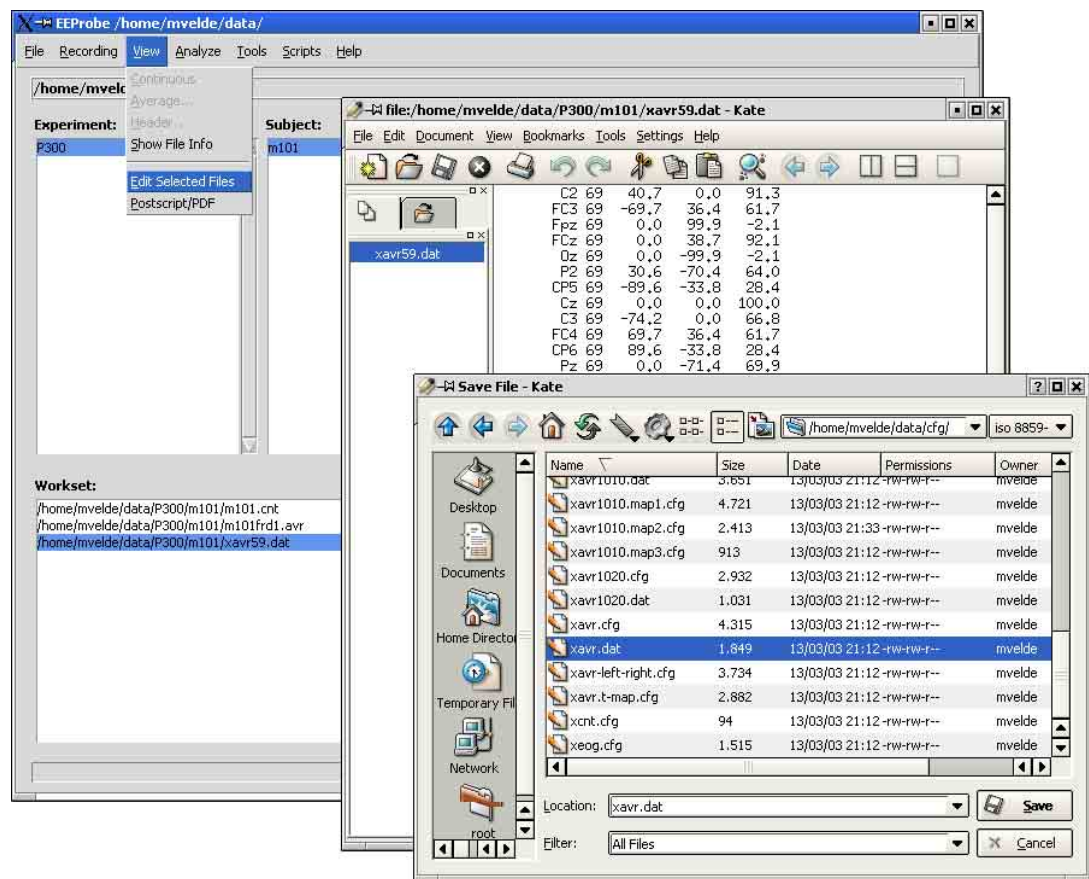
Figure 5-19   **Edit and save a Sensor positions file to the default 'xavr.dat'.**

This concludes this chapter about basic ERP procedures. In the next chapters you will find some additional explanations about specific procedures in EEProbe, and how these are facilitated using the Databrowser.

In the chapter following this one, you can actually find a description of how to perform the same set of analyses as described in the previous pages with just a few mouse clicks! See section 6.2 about 'Templates' on page 80.

6. SCRIPTS AND TEMPLATES

Incorporating external commands

6.1. Scripts

Any scripts that are placed in the 'scripts' sub-directory of a project will automatically (and immediately) be available via the 'Scripts' menu in the EEProbe Databrowser[7].

> *Scripts are started with all file(s) selected in the Workset as argument(s) appended after the script name. The resulting command-line is started in the currently selected experiment/subject directory.*

In the Scripts menu, you can choose to start the 'Script Editor'. The editor will start in the scripts directory of the current project to facilitate opening of an existing script, or save a new script in the correct directory.

6.1.1. Installed scripts in a default project

The default scripts that are installed when you create a new project in the Databrowser, are:

```
average-preview.sh
average-simple.sh
generate3Dpos.awk
average-process.sh
```

(The last script will not show up in the Scripts menu, because it is accompanied by a template file that has the same basename:

```
average-process.tmpl
```

The description of this template/script and how to create new templates will be described in the next paragraph)

The average-preview.sh and average-simple.sh scripts are provided as learner scripts (bash environment) to create your own custom scripts, if needed. The first script can be used to perform a standard averaging process for any trigger present in the recording, do a standard rejection, filtering, rereference (to common) and averaging, and start the average viewer.

The 'generate3Dpos.awk' script works on both cnt and avr files, and will create a 3D electrode position file[8] containing 346 standard electrode positions (EEG only) following the 10/5 system[9]. A sub-selection of the available electrodes will be written to an EEProbe *.dat file (also see paragraph 5.7.2).

---

[7] You may want to check the 'executable' permissions of your scripts; in case you select in the Databrowser a script that 'not executable', it will search for the interpreter on the first line of the script (requires the 'magic' string: #!), and launch the script via the interpreter.

[8] Adapted from a standard electrode file based on original by Robert Oostenveld.

[9] Oostenveld, R. and Praamstra, P. *The five percent electrode system for high-resolution EEG and ERP measurements*, Clinical Neurophysiology 112 (2001) 713-719.

6.2. Templates

6.2.1. The 'average-process' script/template

One standard template is installed by creating a new project, which allows you to quickly redo the analysis as performed in all of chapter 5 "Basic ERP procedures".

Select the file `m101.cnt` in the Workset, go to the Scripts menu and choose 'Edit' from the little sub-menu right to the 'template: average-process.tmpl' entry:
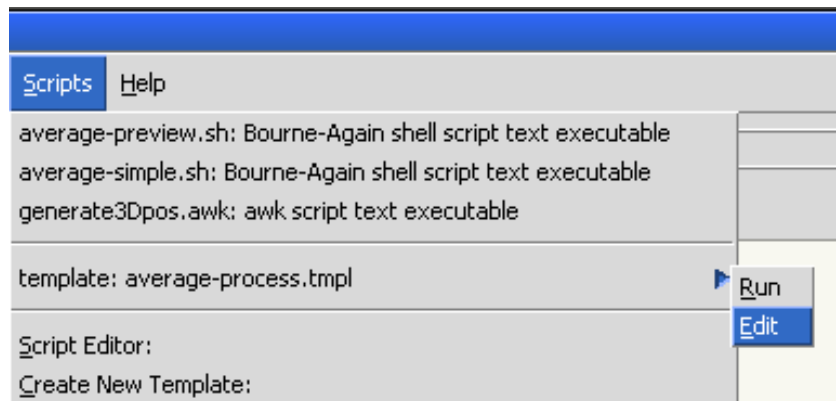
Figure 6-1   **Select and 'Edit' the average-process template.**

Now the following dialog will show:
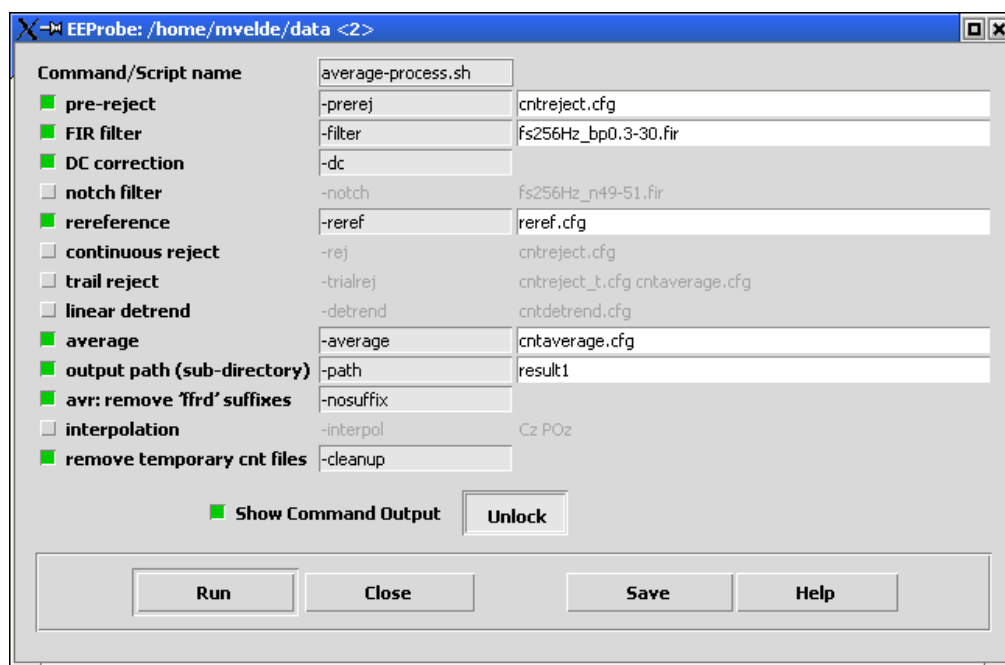
Figure 6-2   **The average-process template facilitates a set of standard processing steps.**

The figure shows you the available options as programmed in the script that is shown at the top line. This script '`average-process.sh`' implements a lot of processing steps

for you to choose from. Just click on one or more of the check-buttons to the left of the dialog to switch on or off a processing step. The second column shows the implemented 'switches' (e.g., -filter, -reref) that will be passed to the `average-process.sh` script after you press 'Run'. The configuration files in the third column will be placed just after each 'switch', and the `average-process.sh` script will automatically find the configuration/filter file in the correct directory.

Templates provide a generic way of designing a interface to a command line program, or a script. Typically, on the command line you specify the options, which manipulate the functionality of the program/script. In this interactive Template Builder, you can specify 'short' and 'long' options, which can be looked upon as 'modifiers' and 'valued options' respectively.

The command/script is started with all enabled options inserted between the command and files selected in the Workset. The command is started in the current experiment/subject directory.

For 'long options' where no '=' (equal) sign is specified, a space is inserted between option and value.

When you click 'Run', all the 'checked' process options will be performed. The resulting average files now arrive in a sub-directory 'result1'; select the files, and right-click with your mouse to 'Add to Workset' these files, as shown in the Datafile listing below:
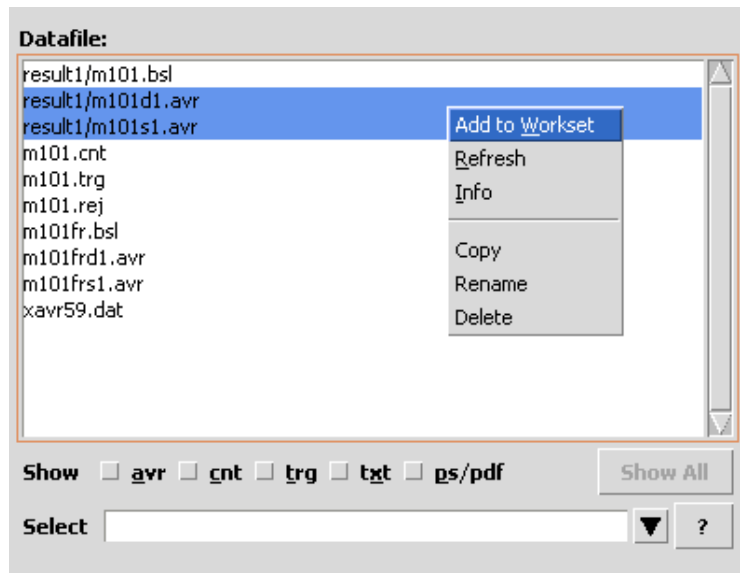
Figure 6-3   Select the resulting avr files to add them to the Workset.

Next, press <Enter> to start the average viewer.

The 'average-process' template is installed in a 'locked' state (as shown in Figure 6-2). You can see how the `average-process.sh` performs its job by clicking on 'Unlock' and then on the 'Edit' button next to the command.

6.2.2.   Creating a new template

We will implement here an interface dialog for the 'ls' command (also see 'man ls'), for example using short options '-a' '-l', and long option '--sort=WORD'.
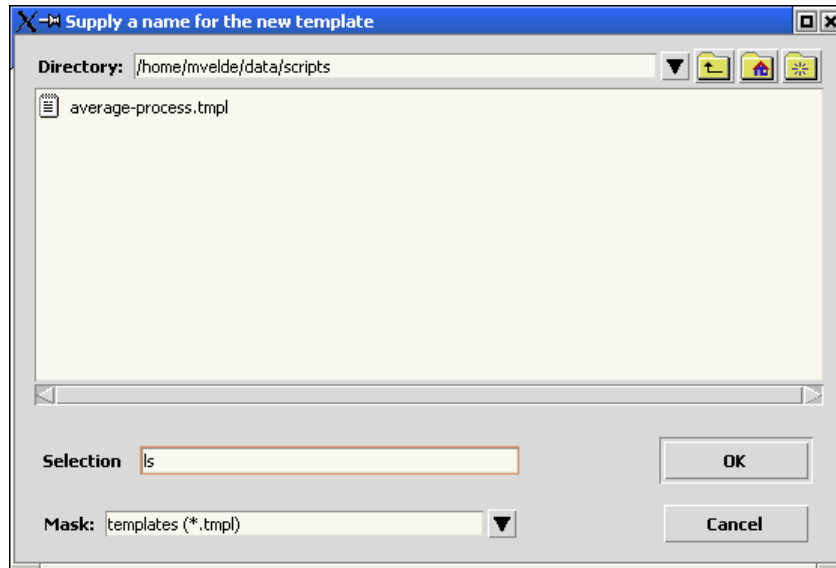
Figure 6-4   Choose a name for the new template.

In the Scripts menu, choose 'Create New Template' and type 'ls' in the 'Selection' field. Click on the OK button.
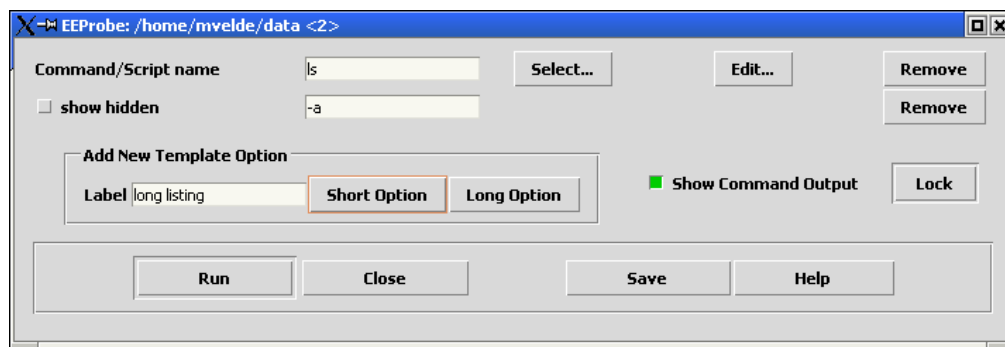
Figure 6-5   Create a new template for a selected command/script.

Supply 'ls' as the Command/Script name.

Type 'show hidden' in the 'Label' field, and click on the 'Short Option' button.

The Template dialog will resize and show a new row (as in Figure 6-5): now type '-a' in the entry field on the newly inserted row.

Type 'long listing' in the 'Label' field, and click on the 'Short Option' button (as shown in the figure above). Type '-l' in the entry field on the new row.

Next, type 'sort' in the 'Label' field, and click on 'Long Option'. Supply '--sort=' in its first entry field.

Click on the 'Lock' button to arrive at a dialog that looks like this:
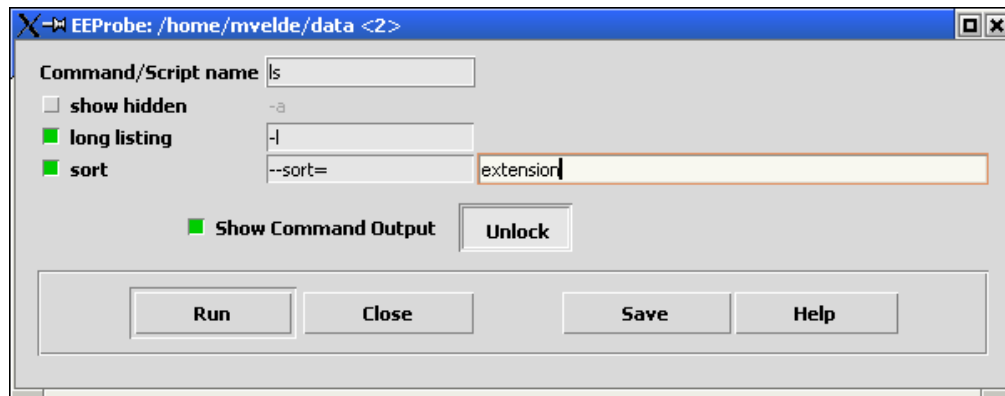
Figure 6-6   **Use the 'ls' template to show a sorted file listing.**

In the entry field next to the sort option, you can use for instance 'extension', 'size', or 'time' to change the way of sorting the file listing.

Click on the 'Save' button to save the current state of the Template.

Click on the 'Run' button to run the 'ls' command with the options chosen.

Even when you do not select any files in the Workset, running this command from the Scripts menu will show the files in the current selected (subject) directory, because that is where the command is started.

6.2.3. Remarks

For some commands/scripts you may want to disable the 'Show Command Output'.

For example, you can easily create a template for one or more (alternative) editors, or a template to start another viewer program. Then you may not be interested in its `stdout/stderr` ('command-line') messages.

Some commands that you may want to use are actually 'normal' binary program files (like the 'ls' command). Using the 'Edit' button (in 'unlocked' state of the template) you *may* be able to open the editor[10] and see its (binary) contents. In the current version of the Databrowser we have not implemented any warning for this.

However, for most programs it is unlikely anyway that you are able to distort anything, simply because you will not have the permission to write to the (system) program file.

---

[10] Some editors may actually prevent you to open a binary file.

7. PEAK (COMPONENTS) SCORING

Manual amplitude / latency extraction

7.1. Peak scoring in xavr

Open the average viewer, and open the signal inspector by a *right-click* on a waveform diagram in the main display: e.g. select 'Inspect' for channel FCz as above.
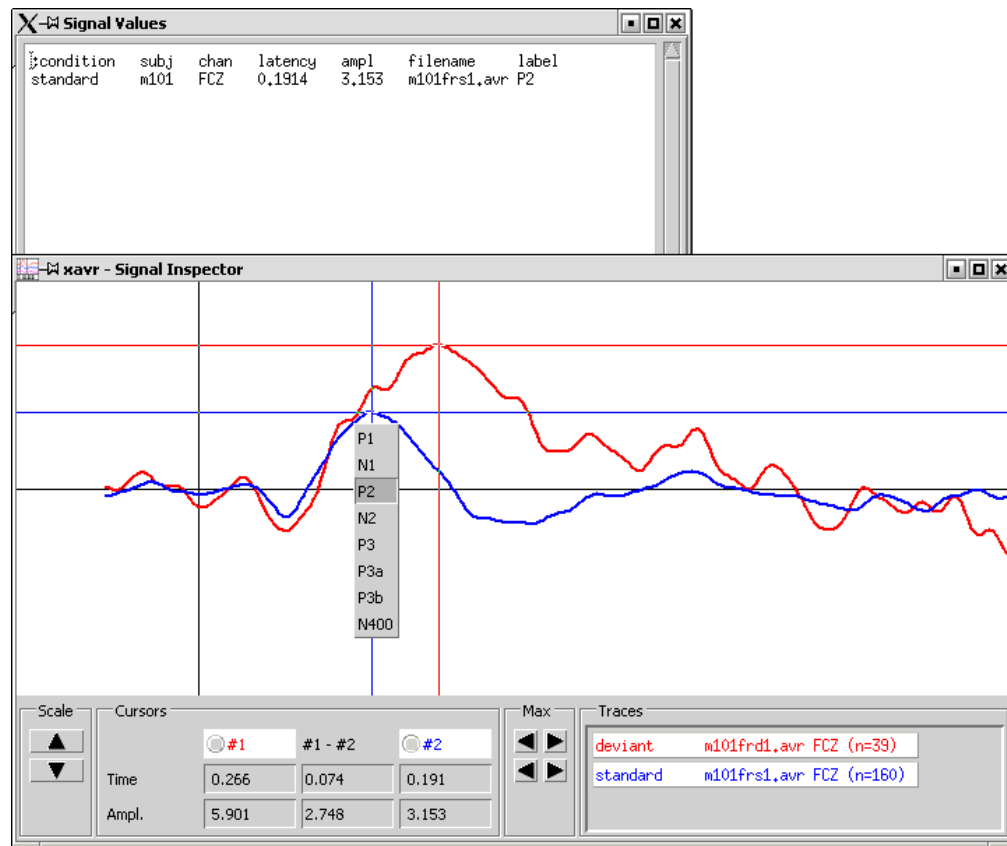
Figure 7-1   Use the signal inspector to perform some peak scoring

Next, use the *left* mouse button to position one of the cursors on a peak, and use the *right* mouse button to open a peak menu (see the figure). In this menu, select a label, and subsequently the 'Signal Values' window will open.

The process can be repeated for different peaks, in different conditions/channels. You can also just assemble the amplitude data at a certain latency by pressing the space bar <Space>.

The list of peaks that can be 'scored' is the combined list of labels as found in all configuration files that are loaded in the xavr viewer. The peaks can be shown in the main window of the average viewer - provided that its 'component' definition is available in the *current* display page (configuration file); see the *EEProbe Reference manual* for more details.
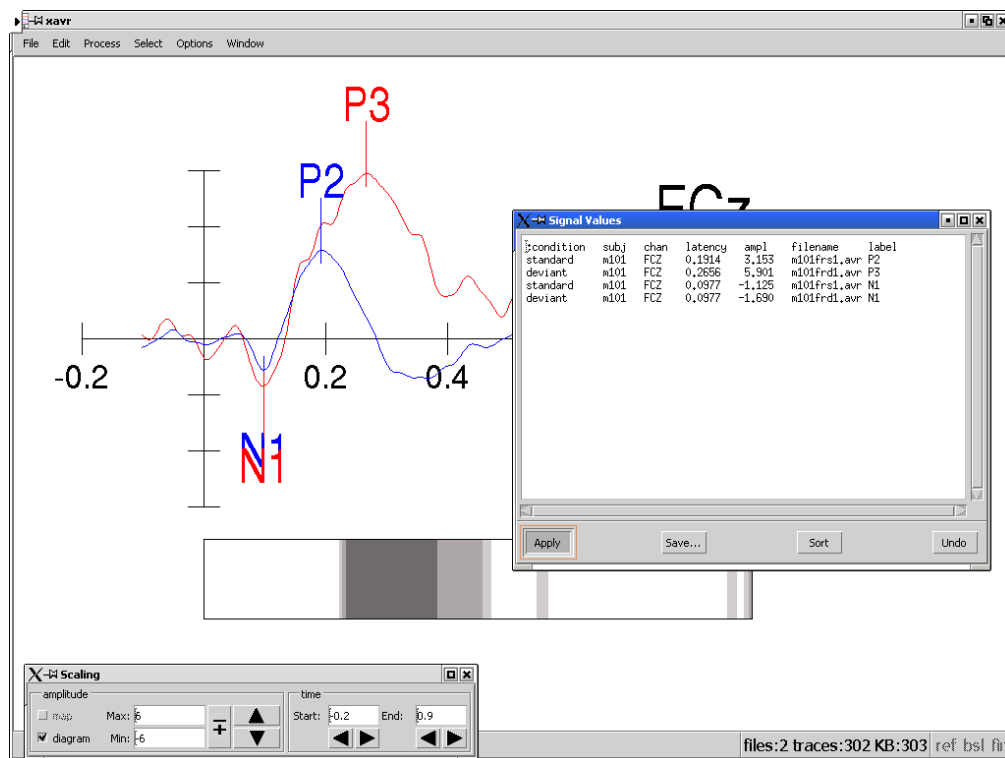
Figure 7-2   Visualize the peak scoring

You can visualize the peak scoring by pressing 'Apply' in the Signal Values window. This requires the presence of a 'components' section is in the configuration file; see the *EEProbe Reference manual* for more details.

Save the amplitude / latency data

Before you exit, do not forget to save the scoring: click 'Save…'
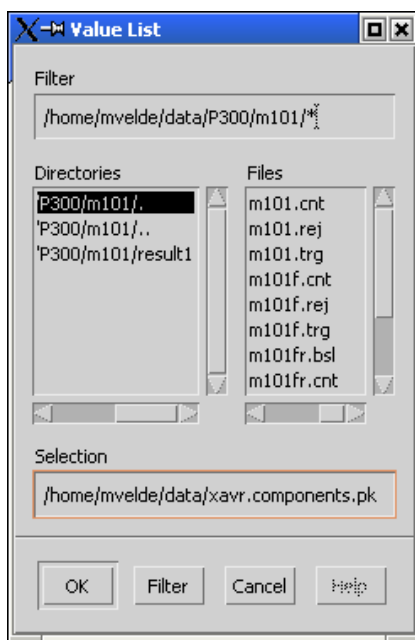
Figure 7-3   The default components file for xavr

Just click 'OK' in the dialog as shown here: do not change the default filename.

At the startup of xavr, the **Databrowser** scans all `*.pk` (components) files and writes these data to the standard file 'xavr.components.pk' in the project directory.

After the xavr viewer exits, the data found in the default file will be distributed again (by the Databrowser) to individual `*.pk` files corresponding to each `*.avr` file.
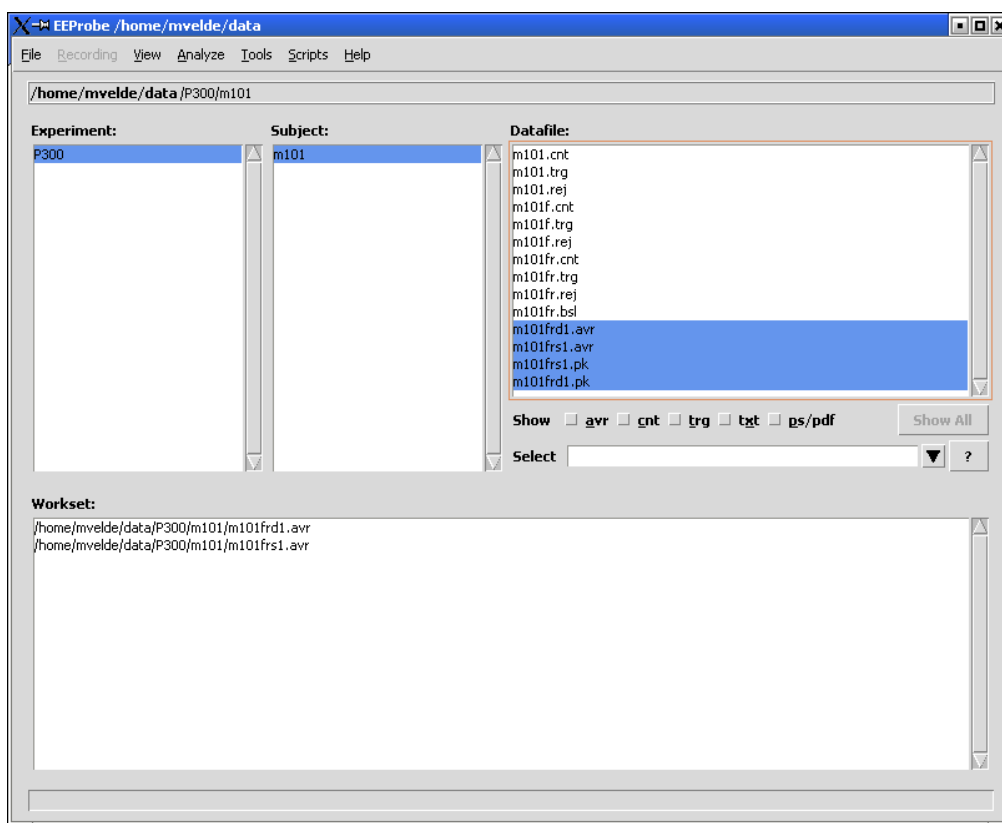
Figure 7-4   After the peak scoring, *.pk files result for each 'scored' average file.

7.2. Interaction between the Databrowser and xavr

7.2.1. Display configurations

The average viewer `xavr` loads a default configuration file, `xavr.cfg`, when present in the project's `cfg` directory. If not present, the Databrowser will prompt you for a start-up configuration file: you can then select one of the available configuration files in the 'cfg' directory.

For example, you have deleted the default `xavr.cfg` file, and in the dialog select `xavr1010.cfg`. The basename (e.g., 'xavr1010') of this default configuration file is used to load all related configurations (e.g., 'xavr1010*.cfg'). Also a related electrode positions file is loaded (following the example: 'xavr1010.dat') for possible 2D mapping objects in the configuration file(s).

No more than 25 configurations will be passed to the `xavr` command line.

The different (display) configurations can be accessed from the 'Window' menu in the `xavr` viewer.

7.2.2. Components file

Also at startup, the **Databrowser** scans all `*.pk` (components) files for the `avr` files as selected in the Workset. These data are all written to a standard file 'xavr.components.pk' in the project directory. This 'component' file is then loaded to visualize any peak scoring as performed earlier in `xavr`.

Any new amplitude / latency data will be appended to the listing in the Components window ('Signal Values'). The peaks are not shown in Signal Inspector, but will be shown in the main display after pressing 'Apply' in the 'Signal Window'. In order to facilitate the review of a lot of data in this window, you can 'Sort' the data (may also be used to delete invalid entries).

After the viewer exits, the data in the 'xavr.components.pk' file will be distributed again (by the **Databrowser**) to individual *.pk files corresponding to each *.avr file (as selected earlier in the Workset).

Within the xavr viewer you can also load average files from the File menu. If you perform some peak scoring on these, the Databrowser will not be able to distribute the data to the correct path. Instead, it will create files 'xavr.<filename>.pk' for each file for which it cannot find the full path. You must **make sure that you use unique names for avr files** of different experiments/subjects (this is common practice anyway).

Also, the 'xavr.components.pk' file will not be deleted; so, it will always contain the data of the last startup of the average viewer, as performed through the Databrowser. This is actually a nice way to quickly assemble 'peak' data to one file for subsequent statistical analysis.

7.2.3. Using multiple instances of the average viewer

As with the continuous data viewer, you can start multiple instances of the average viewer (when selecting multiple cnt files in the Workset, the Databrowser will simply start the xcnt viewer for every file, as separate processes).

Start the average viewer more than once by switching back to the Databrowser window (e.g., by using <Alt+Tab>, or via the *taskbar* – if present in your window environment). Make a selection of avr files in the Workset, and start another instance of xavr.

Configuration files

The viewer will be started with the same set of configuration files, so be careful when making changes (xavr menu: Edit, Configuration).

Components file

However, this second startup from the Databrowser will detect that a '.xavr.components.pk' (hidden file) is present, and will use a different name for the overall components file: 'xavr.components-1.pk' that is passed to xavr on the command-line. The sequence number '1' is updated for every subsequent start of xavr through the Databrowser (based on the presence of the hidden file '.xavr.components-1.pk', etc.).

The file permissions of the overall components file(s) are set to read/write access (mode '0666') for everybody (e.g., on the network). The hidden files will be deleted automatically after you exit the xavr viewer.

If at one time you experience that you have difficulty saving a components file, this may be due to sharing a project with another user on a drive where you cannot change the file permissions. In that case please check with your system administrator, or ask the other users to delete or move their 'xavr.components.pk' files and any hidden files, if present.

8. THE 'SELECT' FEATURE

Usage tips for file browsing and grand averaging

8.1.   Working with 'Select' on datafiles

8.1.1.   File selection

The check-buttons and the 'Select' field provide a flexible way of 'filtering' the list of files as shown in the Datafile listbox:

Figure 8-1   The 'Select' feature is available in the Databrowser's main window.

The check-buttons 'avr', 'cnt', 'trg', 'ps/pdf', 'txt' will result in the display of only those file types corresponding to the 'checked' buttons. This can be used to quickly find the appropriate files for a certain processing/review step.

For the last file type 'txt' you can actually choose from a list, which includes all of the file types as used in EEProbe. You can also type a custom file extension here.

You can click on a check-button with the mouse to turn it 'on' or 'off'.

When you are 'in' the Datafile listbox (as indicated with a special colored square), you can also turn on/off this file selection mechanism by pressing the keys that corresponds to the underlined characters (see Figure 8-1).

The 'Select' entry field / list allows you to enter a regular expression to make a sub-selection of files in the Datafile listing. You can learn this behavior best by doing: start by typing the characters of a filename that you see in the Datafile listbox. During the typing of characters, the listing will update and show fewer and fewer files. Only those matching your typing will remain.

So, you see that you can find quickly a sub-set of files, just by typing some 'normal' characters, without bothering about regular expressions.

The regular expression feature is actually a powerful search mechanism; when you enter for instance '[fr].cnt', you can find the files:

```
m101f.cnt

m101fr.cnt

m101r.cnt
```

The '.cnt' in the entry here is actually optional, you can achieve a similar (sometimes *not* completely identical!) listing by typing only '[fr]' and 'checking' the 'cnt' button.

You can learn more details about regular expressions in Appendix B: "Regular expressions", page 99.

The entries that you type in the 'Select' field are automatically kept in a list, which is available through the ▼ button). However, the list is not stored between sessions of the Databrowser (and is also cleared when you open/create a project).

Quickly clear the entry field by clicking on the 'Show All' button (or by pressing <Escape>). If the 'Select' field is empty, the 'Show All' button will turn off all check-buttons.

Next to the 'Show' label, only a selected number of check-buttons for some 'standard' types of files are available. However, there are more types used in EEProbe, identified by their file extension; these are available in the 'lookup-list' associated with the last checkbutton.

To find 'result' files associated with your `avr` files, you can make use of regular expression, as illustrated in the two figures below:
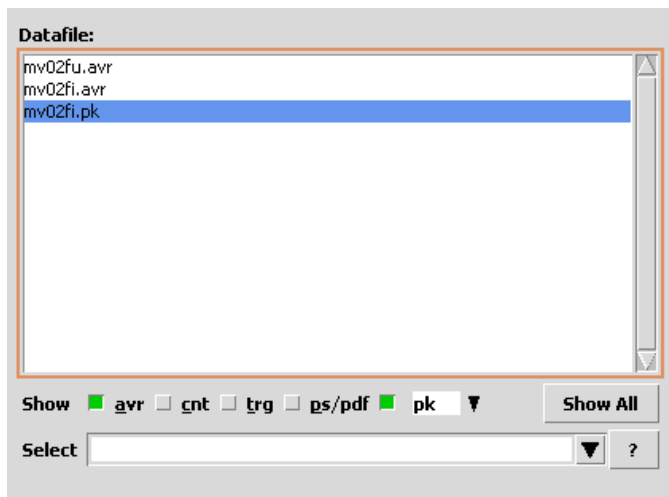
Figure 8-2   Find 'peak' (components) files associated with your averages.

Figure 8-3   Find 'baseline' files associated with your averages, using a regular expression.

As shown in Figure 8-3 the extensions for the two file types can be separated with a comma. The average file extension was entered as 'avr$', which indicates that the string 'avr' should be at the end of the filename (regular expression syntax). The '$' was added in the above examples, because the directories also contained some files 'xavr.ps', which would otherwise show up in the listing. You can make use of expressions like this, to quickly find files in all sub-directories for experiments (read on).

Find files

The 'Select' entry can also be used to find specific files (e.g., filtered files, or files relating to a certain condition) *in the complete directory structure* of an Experiment (including all subject sub-directories). Just enter your search string (e.g., 'f.cnt') and use the context menu (right-click) of the Experiment (or Subject) listboxes. Here, the 'find' functions use the 'Select' entry to search in all sub-directories of the selected Experiment (or Subject).

These 'find' functions do not *take into account any of the check-buttons for the standard file types next to the 'Show' label.*

The use of the 'find' function will be illustrated in the next section 8.2.

8.1.2. Organize your average files

Often, you will want to find a set of average files in the Datafile listing. You can probably achieve this using the 'Select' feature as described in the previous paragraph. However, it becomes more difficult if you have a lot of conditions or want to compare the average results when using different parameters in different processing steps.

To overcome this, you use different output paths during the averaging step. In the bottom of the 'Analyze: Average' dialog (cntaverage) you can specify the sub-directory (directories) for the averages (also see page 39):

Output path nofilter/rej   **New code**   ■   ?

Figure 8-4   Use the 'Output path' during averaging.

For instance, to see the difference of the effect of filtering and rejection, you could write the result files to a set of sub-directories:

        filter/norej

        filter/rej

        nofilter/norej

        nofilter/rej

Result files in sub-directories will be displayed first in the Datafile listing (see for instance Figure 8-3).

8.2.   Support for grand averaging

The 'Select' entry field also has a lookup list attached that automatically stores your 'selection' entries.

When you have 'checked' the 'avr' file type, the listbox will automatically show the conditions as found in the projects `cntaverage` configuration files (file mask: `*cntaverage*.cfg`) (this requires that you have selected a subject):
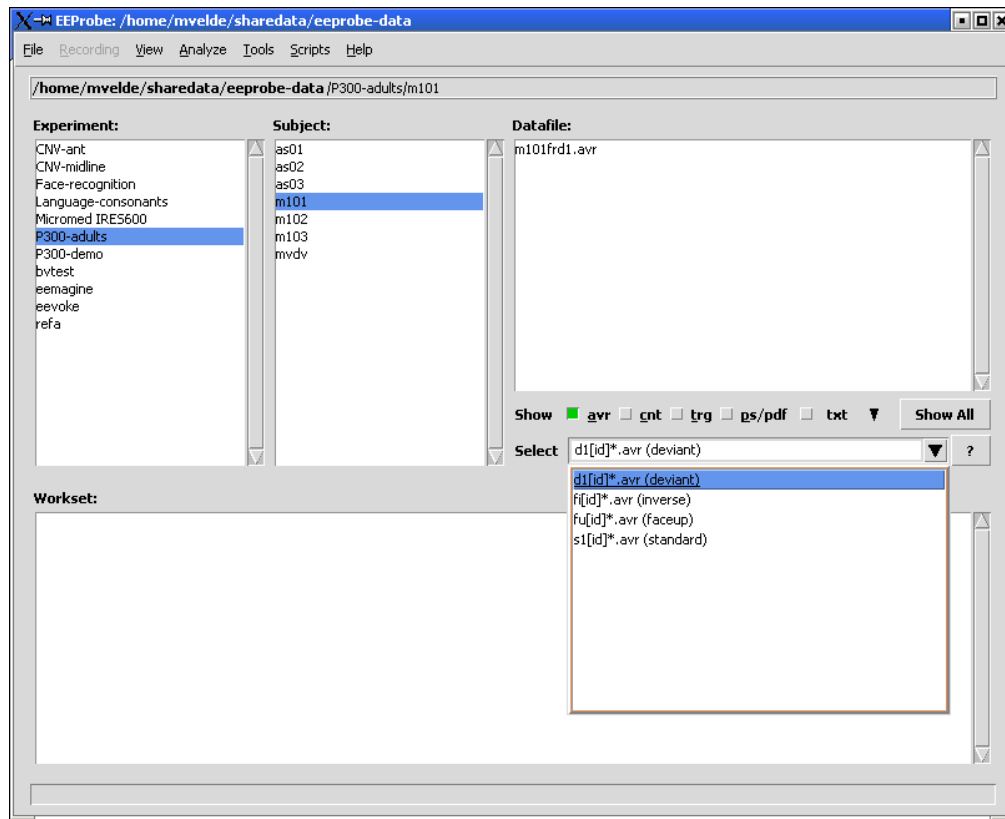
Figure 8-5   **Create a 'filter' for sub-selection of average files.**

Each entry in the 'Select' list will show a regular expression (*regex*) that corresponds to the average file name of a certain condition. For example, in chapter 5, we have performed some averaging, using the alias 'd1' for the P300 deviant tones (page 73).This condition will be available in the list as *regex* 'd1[id]*.avr'.

Each condition can be identified by its name[11], as shown in Figure 8-5.

The regular expressions allow the display of average files that may have been included in further processing:

- When you have performed 'Channel interpolation', the `avr` file name will have been appended with 'i'.

- When you have performed 'Detrending', the `avr` file name will have been appended with 'd'.

You can easily adapt the regex's for filtered averages ('f'), rereferenced ('r') or downsampled ('s') averages.

---

[11] Any text placed between parentheses will not be included in the regular expression.

After selection of the proper condition we can use the context menu (right-click) of the Experiment, and automatically find all average files that match the *regex* of the condition (see Figure 8-6).

All 'find' functions in the context menu for Experiments and
Subjects use the 'Select' entry to search the directory structure.

After the files have been listed in the Workset, you make a selection, and go to the 'Grand Average Process' function in the Analyze menu (see paragraph 3.4.2, page 45).

However, this is still a lot of work when you have to perform this procedure for a great number of conditions, or need to calculate a grand average often within your analyses. A more powerful solution for grand averaging of multiple conditions, multiple files is available using the EEProbe program `avraverage`, which is described in the *EEProbe Reference manual*.
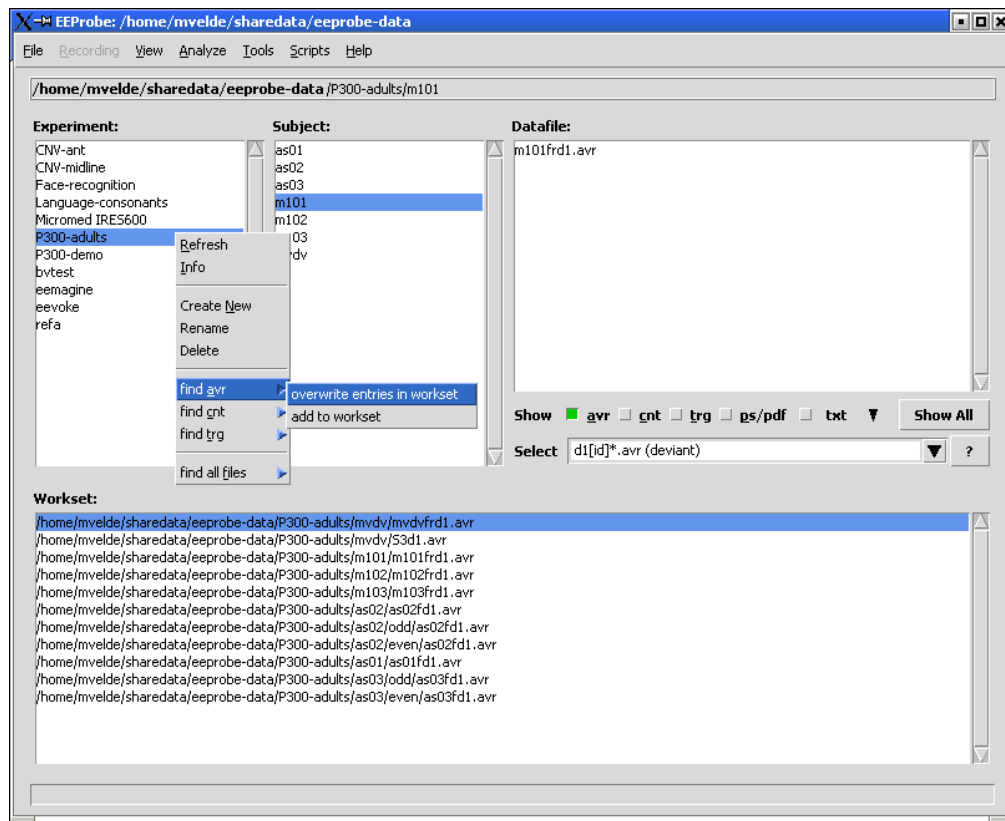
Figure 8-6   **Find all files matching the selected condition.**

Please note that:

'Select' entries for different conditions may not be unique, and a
'find' action may include `avr` files of more than one condition.

In the averaging procedure, you are actually advised to use an alias always, and always use (unique within an Experiment) a combination of 2 characters (see page 39, "Analyze: Average").

Appendix A: SHORTCUTS

Keyboard and mouse shortcuts

A.1 Keyboard and mouse shortcuts

Below, "Button 1" refers to the left mouse button, "Button 3" to the right one. The proper function of these buttons (and also the mouse wheel - scroll button) may depend on your mouse configuration. The "Return" key is often indicated as "Enter" or using the symbol ↵ The Left, Right, Up, Down buttons are the ←→↑↓ keys.

Main window

Key	Action
F1	Help Contents (the on-line *EEProbe Reference manual*)
Alt+F	Open the File menu
Alt+R	Open the Recording menu (if enabled)
Alt+V	Open the View menu
Alt+A	Open the Analyze menu
Alt+T	Open the Tools menu
Alt+S	Open the Scripts menu
Alt+H	Open the Help menu
In the menus, the accelerator keys are underlined. You can also use the arrow keys to maneuver; press the 'Return' key to activate (run) a menu entry.	
Ctrl+T	Open the terminal program
Ctrl+O	Open a new project
Ctrl+N	Create a (new) project
Ctrl+I	File Import
Ctrl+E	File Export
Ctrl+Q	Quit the Databrowser
Left, Right[12]	Move the 'focus' to the left/right on the Experiment, Subject, Datafile and Workset listboxes
Tab	Move the 'focus' between Experiment/Subject/Datafile/ Workset and the 'Select' field (below the Datafile listbox)
General listbox behavior:	
Up/Down	Move the cursor up, down in a listbox
Home/End, PageUp/PageDown	Move the cursor to start, end, page up/down

Experiment listbox

Key	Action
Button-1	Select experiment
Button-3, F11, Ctrl+F (for 'find')	Context menu
Delete	Delete experiment (with confirmation)
I	Directory, file info, show subject dir size
R	Refresh the directory listing
N	Create a new experiment
Ctrl+R	Rename the current selected experiment

---

[12] For 'vi'-adepts we have also implemented the following keys: h, j, k, l, Ctrl+d, Ctrl+u, (Shift+)G. Except for 'G', the Shift key (e.g., Shift+J, Shift+K) is implemented to 'extend' a selection (Datafile and Workset). However, these keys only work in the main window.

Subject listbox

Key	Action
Button-1	Select subject
Button-3, F11, Ctrl+F (for 'find')	Context menu
Delete	Delete subject (with confirmation)
I	Directory, file info
R	Refresh the directory listing
N	Create a new subject
Ctrl+R	Rename the current selected subject

Datafile listbox

Key	Action
Double-click Button-1	Add the file under the mouse to the Workset
Return	Add the current file selection to the Workset
Button-1	Select datafile
Shift+Button-1	Extend the file selection
Ctrl+Button-1	Add/remove the file under the mouse to/from the selection
Drag Button-1	Extend file selection
Shift+ Up/Down, Home/End, PageUp/PageDown	Extend the file selection in the direction of the key
Ctrl+A	Select **all** files in the current listing
Button-3, F11	Context menu
Delete, Ctrl+X	Delete file (with confirmation)
I	File info
R	Refresh the file listing
Ctrl+R	Rename the current selected file
Ctrl+C	Copy the current selected file
A	Turn on/off the 'avr' check-button
C	Turn on/off the 'cnt' check-button
T	Turn on/off the 'trg' check-button
X	Turn on/off the 'txt' check-button
P	Turn on/off the 'ps/pdf' check-button
Escape	1st) Delete any 'Select' entry, 2nd) turn off all check-buttons (works identical to the 'Show All' button)

The 'Select' field

Key	Action
F1	Show the help for the check-buttons and Select entry
Tab, Return	Move the 'focus' to the previously active listbox
Up, Down	Select the previous, next entry available in the list
Shift+Up, Shift+Down	Open the list (identical to a click on the ▼ button)
Escape	1st) Delete the Select entry, 2nd) move 'focus' to previous listbox

Workset

Key	Action
Double-click Button-1	Default action on file under the mouse (**view** for cnt, avr, ps/pdf files, **edit** for known text types, **file info** otherwise)
Return	Perform default action on current file selection
Button-1	Select file
Shift+Button-1	Extend the file selection
Ctrl+Button-1	Add/remove the file under the mouse to/from the selection
Drag Button-1	Extend file selection
Shift+ Up/Down, Home/End, PageUp/PageDown	Extend the file selection in the direction of the key
Ctrl+A	Select **all** files in the current listing
Button-3, F11	Context menu
Delete, Ctrl+X	Clear the current selection (the files will be removed from Workset listing, this is not a file delete)
I	File info
Escape	Deselect all

Analysis / Tools dialogs windows

Key	Action
F1 (on an item in the dialog)	Show the context help (same as the '?' keys)
Return	Validate the item's contents (invisible action, unless you have a 'debug' level > 0)
Ctrl+R	Read configuration file
Ctrl+S	Save configuration file
Ctrl+D	Turn on/off 'Keep as Default Configuration' (this option works with the 'Apply' button, **and** by **clicking** on 'Close')
Ctrl+Return	Same as the 'Apply' button: run the current command
Escape	Close the dialog (if the 'Keep as default...' button was on, this is cleared first: press 'Escape' again to close the dialog)

Create new project dialog

Key	Action
Ctrl+Return	Same as 'Create' button
Return, Escape	Same as 'Close' button
The 'Overwrite' question dialog (recreate files in an existing project):	
Return	Same as 'Yes' button
Escape	Same as 'No' button

Other dialog windows

This applies to Error, Warning, Notice, Question and File dialogs.

Key	Action
Return	Same as 'OK/Close/Open' button
Escape	Same as 'Cancel/Close' button

Appendix B: REGULAR EXPRESSIONS

REGEXP quick reference

The text in this appendix was adapted from the "Python Library Reference".

A brief and somewhat simplified explanation of the format of regular expressions is given. For further information consult the Regular Expression HOWTO, accessible on the Internet, at http://www.python.org/doc/howto/.

B.1 Regular expressions summary

A regular expression (short: *regexp* or *RE*) specifies a set of strings that matches it. In the EEProbe programs, this lets you check if a particular string matches a given regular expression, to select a subset of channels, or files.

Regular expressions can contain both special and ordinary characters. Most ordinary characters, like "A", "a", or "0", are the simplest regular expressions; they simply match themselves. You can concatenate characters, so `last` matches the string "last".

Some characters, like "|" or "(", are special. Special characters either stand for classes of ordinary characters, or affect how the *RE* around them are interpreted.

The special characters are:

"."

(Dot.) In the default mode, this matches any character.

"^"

(Caret.) Matches the start of the string.

"$"

Matches the end of the string. For example, `foo` matches both 'foo' and 'foobar', while the regular expression `foo$` matches only 'foo'.

"*"

Causes the resulting RE to match 0 or more repetitions of the preceding RE, as many repetitions as are possible. `ab*` will match 'a', 'ab', or 'a' followed by any number of 'b's.

"+"

Causes the resulting RE to match 1 or more repetitions of the preceding RE. `ab+` will match 'a' followed by any non-zero number of 'b's; it will not match just 'a'.

"?"

Causes the resulting RE to match 0 or 1 repetitions of the preceding RE. `ab?` will match either 'a' or 'ab'.

"\"

Either escapes special characters (permitting you to match characters like "*", "?", and so forth). Use '\\' to include the literal backslash character '\'.

[]

Used to indicate a set of characters. Characters can be listed individually, or a range of characters can be indicated by giving two characters and separating them by a "-". Special characters are not active inside sets. For example, `[akm$]` will match any of the characters "a", "k", "m", or "$"; `[a-z]` will match any lowercase letter, and `[a-zA-Z0-9]` matches any letter or digit. If you want to include a "]" or a "-" inside a set, precede it with a backslash, or place it as the first character. The pattern `[]]` will match ']', for example.
You can match the characters not within a range by *complementing* the set. This is indicated by including a "^" as the first character of the set; "^" elsewhere will simply match the "^" character. For example, `[^5]` will match any character except "5".

"|"

`A|B`, where `A` and `B` can be arbitrary REs, creates a regular expression that will match either `A` or `B`. To match a literal "|", use `\|`, or enclose it inside a character class, as in `[|]`.
In the Databrowser, you can actually use a comma for this: e.g., list peak files and average files in the 'Datafiles' pane: type "pk,avr" in the 'Select' field.

Appendix C: NOTES

Notes relating to the current version

- Known issues, usage tips

- Reporting bugs

C.1 Known issues, usage tips

C.1.1 Known issues

Output file overwrite

The EEProbe programs overwrite output files without prompting. This is the default behavior of the programs, e.g., using the `cntfilter` program on `m101.cnt`, its output will be written to `m101f.cnt`. For some users this is an undesired feature; for now, we decided not to implement any warning on top of this standard behavior.

Startup failure of commands

Some EEProbe programs may seem not to start under certain conditions. For instance, when the EEProbe license has expired, the output error message related to this is displayed only in the console window from which `eeprobe` was started.

You are therefore advised always to run the EEProbe Databrowser from a console/terminal window. Even when starting the 'eeprobe' command via an icon on your desktop, most X window managers allow you to specify 'startup via terminal application'.

C.1.2 Usage tips

Configuration files

The names of the default configuration files are lower case. The EEProbe Databrowser uses lower case for all default configuration files. On Linux systems, the files `xavr.cfg` and `XAVR.CFG` are different files!

Comments in configuration files. Configuration files with comments (lines that start with a semi-colon ';') can be read, but will be **saved** from within the Databrowser **without comments**.

File naming

Although the EEProbe Databrowser adheres to the standard Linux support for the use of 'spaces' in file names, you are advised **not** to use this. The current implementation for building and starting the command lines of the EEProbe programs does not always support the use of spaces in filenames.

Links

You may experience problems when using 'links' created with the `ln` command. In general, the EEProbe Databrowser does have complete support (symbolic) links for files within a project (directory structure). However, the behavior of links can vary between machines and Linux installations.

However, you may use links for the top-level project directory.

You may also successfully use links for the experiment, and subject directories. However, you may experience difficulties trying to rename or copy files/directories from within the Databrowser (right-click menus).

C.1.3 Installation support

Supported platforms:

- PC i386

Currently supported Linux distributions:

- Redhat 6.2, 7.x, 8
- Debian 2.2, 3.0
- SuSE 7.x, 8.x

The EEProbe Databrowser requires the correct installation of Python2 and Tkinter2. For details about Python, visit the Python web-site; http://www.python.org

Most Linux distributions contain standard installation files for **Python2** and **Tkinter2**; unfortunately, these are often not installed in a default system setup.

I you experience any difficulties or need help on a specific distribution: please contact ANT for support.

C.1.4 Dependencies

The EEProbe script library and EEProbe Databrowser itself make extensive use of some 'standard' system commands. Therefore it is required that the following system commands are available:

```
awk          (/usr/bin/awk)
basename
bash         (/bin/bash)
cat
chmod
df
du
file         (/usr/bin/file)
find
grep, egrep
perl         (/usr/bin/perl)
pwd
sed
su
```

C.1.5 The startup script 'eeprobe'

The EEProbe Databrowser program is started with the command

```
eeprobe
```

You can display a short explanation of its advanced usage by adding the '–h' switch:

```
-----------------------------------------------------------------------
ANT Software b.v. (c) 2003 - EEProbe Databrowser startup script (rev 1.47)
eeprobe - mvelde - Tue May  6 10:35:06 CEST 2003
-----------------------------------------------------------------------
eeprobe - startup/install facility for the EEProbe Databrowser

typical usage:
  eeprobe
  eeprobe -p project_dir
or:
  eeprobe [ --update | --default | --help | -h ]

for experts only:
  eeprobe --compile
  eeprobe <module>.py

  optional arguments:
    --update [section] :  this updates the per-user settings file with new sections;
                          specify a specific section, or when omitted the sections
                          newproj_dir and newproj_file are updated
                          (useful after installing an update)
    --default          :  this forces a fresh copy of the settings file
                          (reset any changes made in the Settings dialog)
    --help (or -h)     :  this help text

  expert arguments:
    --compile          :  creates the compiled python files *.pyc for all modules
                          for run-time optimization (requires the root password)
    <module>.py        :  runs only the specified module (dialog testing)
```

Below, some more help is given on the usages and different arguments of this script.

When you start by typing only:

    eeprobe

you will open the *default* project as indicated in the `~/.eep/settings` file. This setting can be adjusted easily in the Settings dialog. When you have specified a PROJDIR environment variable, this will override the default project.

When you start as:

    eeprobe -p /data/eeprobe-project/erp

you will open the project directory `/data/eeprobe-project/erp` as specified. If this is not a valid path, the program will warn you after the main window of the Databrowser has started. This command line setting will override a PROJDIR environment variable, and overrides the default project.

When you issue the following command:

    eeprobe --update

you will update your `$HOME/.eep/settings` file with a list of files that make up a new project for EEProbe. This is useful after installing an update of the Databrowser program, when files may have changed or added.

To add new files to an existing project: select 'Create Project' from the 'File' menu, click on the 'Create' button. The Databrowser will prompt you to overwrite files that are already present.

> Tip: use the <Enter> key for 'Yes', and <Escape> for 'No'.
> If you *click* on 'No to All', only *non-existing* files will be created.

You may use the `--update` command also for example to update only specific section(s) in the settings file:

```
eeprobe --update importers exporters
```

This is for instance needed when certain sections have a new implementation (e.g., the indicated sections for the 'import' and 'export' facility where updated in release 1.1.2.0).

When you issue the following command:

```
eeprobe --default
```

you will simply copy the default file `/opt/eep/eeprobe_gui/settings` to your `$HOME/.eep/settings` file.

When you have installed the required Python2 version *after* installation of the Databrowser, you can still use all of the above functions. However, you may experience that the Databrowser can run somewhat faster after the following command:

```
eeprobe --compile
```

This will optimize the run-time interpretation by the python interpreter of the scripts that constitute the EEProbe Databrowser. If you are not 'root', you will still need to type the 'root' password, because this procedure needs to write the compiled python files `*.pyc` to the `/opt/eep/eeprobe_gui` directory.

The last option is best illustrated by doing; type:

```
eeprobe cntaverage.py
```

to show the Databrowser's dialog of the `cntaverage` program. The dialog will have a different 'look' than in a normal startup, because it will not use the display settings as defined in your `$HOME/.Xdefaults` file.

This is not useful for processing, but python developers use this for testing.

C.1.6 Bug reporting

When submitting a bug, please answer any relevant questions as suggested below, and supply the any additional information that you deem relevant:

- The Linux distribution, kernel version?
- Is it a bug in the Databrowser? or

  If in the Databrowser, which dialog window
  (look at the caption bar for its title)?
- Is it a bug in one of the EEProbe programs?
- If yes, which EEProbe program, e.g., `avraverage`, `cntfilter`, `xavr`?
- What configuration file(s) did you use?
- Is the error easily reproduced, and can we have access to the data file(s) that you used?

C.2 Copyright information

EEProbe GUI version 1.1

Copyright (c) 2000-2003 ANT Software

For more information visit http://www.ant-software.nl

Parts of this application are:

Copyright (c) 1995-2001 Corporation for National Research Initiatives

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