OpenBrowser User Guide

Data Export

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OpenBrowser User Guide

OpenBrowser is a data export client application for data stored in the DataTank format. Data from one or more data tanks can be selected, previewed, and exported to a standard ASCII file format or to formats compatible with *NeuroExplorer* or *Plexon's Offline Sorter*.

Before You Begin

Installation

OpenBrowser is included with Synapse and TTankMin.

About OpenBrowser

When working in OpenBrowser there are three steps in the data export process: data selection, data browsing, and finally, data export.

Data Selection
Before data can be exported or viewed it must be selected. The desired tank, block, event, and associated values are selected using a spreadsheet-like interface and pop-up lists.

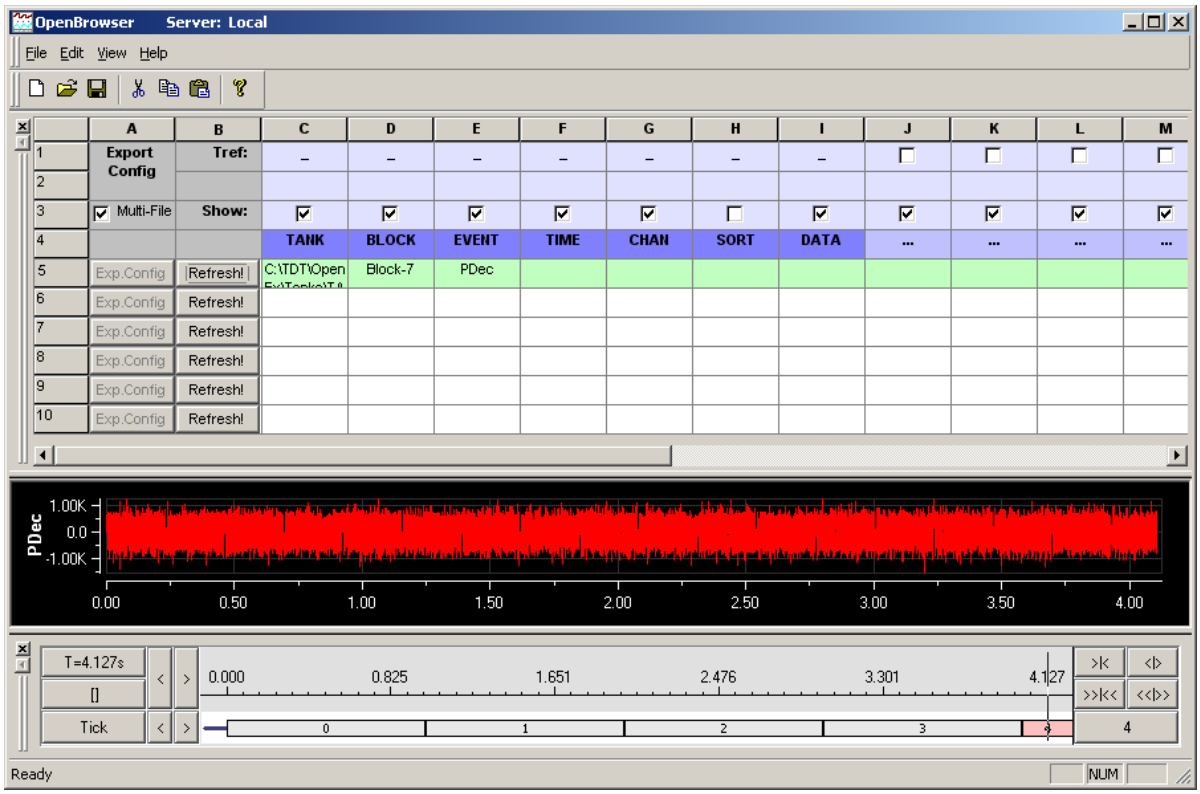
Data Browsing
Data can be previewed in a table or as a scroll plot. A time control window allows users to quickly navigate data in the scroll plot view. Data can be viewed along with epoch data allowing the researcher to modify data selections and create subsets of data on the fly.

Data Export
OpenBrowser provides for flexible data export. Several file formats are supported and users can choose to export all data to a single file or to export subsets of data to separate files.

Workspace Basics

About the OpenBrowser Workspace

OpenBrowser includes a data viewing area and two collapsible sub-windows. A menu bar and toolbar are provided for easy access to commands.



The Data Selection Table window is at the top, the Data View area in the middle, and the Time Line window at the bottom.

Data Selection Table Window

The Data Selection Table window allows users to select events from a data tank. Data is selected and arranged in rows based on the tank, block, event, and other associated variables. The Data Selection Table window also allows users to design a custom configuration file that contains all the export variables and information for a data row.

Data View Area

The data view area displays data selected in the Data Selection Table window. Data can be displayed in either a scroll plot or table view. The scroll plot view displays the waveform data and event times for time reference epochs and can be expanded and contracted using the Time Line window. The table view displays data in a row and column format. In this view, data and time stamp information can be copied and pasted into other applications such as Microsoft Excel. A shortcut menu with Cut, Copy, and Paste commands is also available in this view.

Time Line Window

The Time Line window displays the block's timeline and allows users to move through the selected data using the timeline.

Menus

OpenBrowser File Menu

Tank Server	Opens the Select Server window.
New	Opens a new OpenBrowser file.
Open	Opens the Open dialog box so that an existing OpenBrowser file can be opened.
Save	Saves the current OpenBrowser file with the current name. If the file has not previously been saved, the Save As dialog box opens so that the file can be named.
Save As	Opens the Save As dialog box so that the OpenBrowser file can be saved with a new name.
Export Current Row	Exports the currently selected row.
Export Selected Rows	Exports multiple selected rows. Several adjacent rows can be selected by holding down the SHIFT key and clicking the row numbers. Non-adjacent rows can be selected by holding down the CTRL key and clicking the row numbers.
Export All Rows	Exports all rows containing data.
Recently Used Files	The fourth section of the File menu lists recently used files. Clicking a file name opens the file.
Exit	Closes the OpenBrowser application.

OpenBrowser Edit Menu

Undo	Reverses the last action taken in the Data Selection Table window.
Cut	Cuts the selected row(s) in the Data Selection Table or cuts selected data from the Data Table view.
Copy	Copies the selected row(s) in the Data Selection Table or copies selected data in the Data Table view.
Paste	Pastes the most recently cut or copied row(s) in the Data Selection Table or pastes data in the Data Table view.
Delete Rows	Deletes the selected row(s) in the Data Selection Table. If no row is selected the last row is deleted.
Insert Rows	Inserts a row above the currently selected row in the Data Selection Table. If no row is selected the row is added to the bottom of the table.

OpenBrowser View Menu

Toolbar	Toggles the toolbar between displayed and hidden.
Status Bar	Toggles the status bar between displayed and hidden.
Data View Table	Toggles the Data View window between Table view and Scroll Plot view.
Data Selection Table	Toggles the Data Selection Table window between displayed and hidden.
Time Line	Toggles the Time Line window between displayed and hidden.

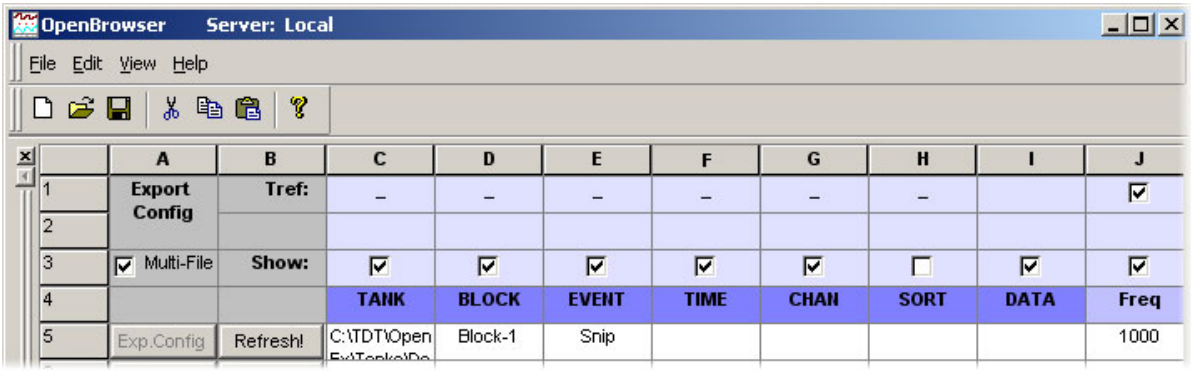
OpenBrowser Help Menu

About OpenBrowser	Displays version and copyright information for OpenBrowser.

Data Selection

About the Data Selection Table Window

The Data Selection Table arranges information in rows and columns. The first three rows define the configuration properties for exporting the data and are separated from the data selection rows by a header row. The data selection rows determine what data is available for export and display. Each row can export data from a single tank, block, and event. To export data from multiple tanks, blocks, or events, a new row of data must be added.



Tref: Check Boxes (Row 1)

This row allows users to select an epoch to be used as a time reference. When the check box in this row is selected for an epoch, the time stamp of the event is based on its position relative to the last epoch as opposed to the start of the block. This is particularly useful if the data is to be exported to *NeuroExplorer* or *Plexon's Offline Sorter*.

Show: Check Boxes (Row 3)

Selecting a check box in this row includes the associated column information, such as the TANK, BLOCK, CHAN, SORT name and the associated TIME (time stamp), when the data is exported or viewed in the Table view.

Multi-File: Check Box (Cell A3)

If the Multi-File check box is selected when data is exported then the data in each row will be saved to a separate file.

Header Cells (Row 4)

This row displays the header names associated with a data tank. The first seven header names (columns C - I) are standard for all tanks and cannot be changed. The cells under each column header are used to access the associated variable type. Cells in columns J and greater can be used to select epoch header names.

Column Header	Function
TANK	Select the tank for data access.
BLOCK	Select the block number.
EVENT	Select the associated Store.
TIME	Select time stamp values.
CHAN	Enter a channel number or range of channels. Leaving this column blank includes all channels.
SORT	Enter a sort code, or range of sort codes, associated with a snippet event.
DATA	Not implemented at this time.
...	Allows the user to select epoch variables to use as time stamp reference markers. A row must be selected before an epoch can be selected. Right-click an empty header cell to add an epoch.

Data Selection Cells (Rows 5 and Greater)
Users can fill multiple rows with data export information. For example, an experiment might consist of a single block of data with multiple events. An OpenBrowser export file would consist of a series of export rows each with different events and possible channels within an event. This allows a user to configure an OpenBrowser file to organize how the data is exported.

Exp. Config Buttons (Column A)
Clicking the Exp. Config button for a row displays a dialog box that allows users to select how the data in that row is exported.

Refresh! Buttons (Column B)
Clicking the Refresh! button for a row refreshes the View area with data for the selected row.

Using the Data Selection Table Window

The Data Selection Table can be used to select data and to prepare data for export.

Selecting Data
To use the Data Selection Table window, select the tank, block number, then event information for the data to be viewed or exported. These three pieces of information must be selected in order, that is, the tank must be selected before the block can be selected and the block must be selected before the event can be selected. Each piece of information can be added by right-clicking the cell under the appropriate column heading and then double-clicking the desired tank, block, or event from the list in the selection window.

When selecting a tank, right-click in the cell under the Tank heading to bring up the Select Tank dialog. To select a tank, single-click a tank in the list or click the Open Existing Tank icon to browse to the desired tank folder.

> **Note**
>
> Clicking OK out of this dialog selects the tank and also closes the Select Tank dialog.

Epochs can be added to the table in the empty header cells (indicated by ellipses) and a single epoch can be used as a time reference by selecting the Tref check box for the epoch column. See Using Epochs as a Time Reference.

Once the first data selection row has been configured in the Data Selection Table, additional rows with the same configuration can be added by copying and pasting the row to a blank row.

After the row has been copied, change the block or event name as needed. To change a cell value, first delete the cell's current value, then right-click the cell to open a list of possible blocks or events. Shorthand characters can also be used to simplify setting up multiple rows. See Using Shorthand Characters for Data Selection for more information.

> **Tip**
>
> When using copy and paste to add multiple rows of data, configure the first row for export first. When it is copied and pasted the export configuration will also be included. Be sure to check one or more of the **Append File Name By** check boxes to ensure that multiple rows saved to multiple files will have unique names. See Data Export for more information on configuring data for export.

Adding Rows

To add a row click the **Edit** menu, and click **Insert Rows**.

Deleting Rows

To delete selected rows, click the **Edit** menu and click **Delete Rows**. To select a row click the row number. Use the SHIFT or CTRL keys to select multiple rows.

Controlling the Data View Area

After a tank, block number, and event have been associated with the row the user can click on Refresh! to view the data in the View area.

Configuring Data for Export

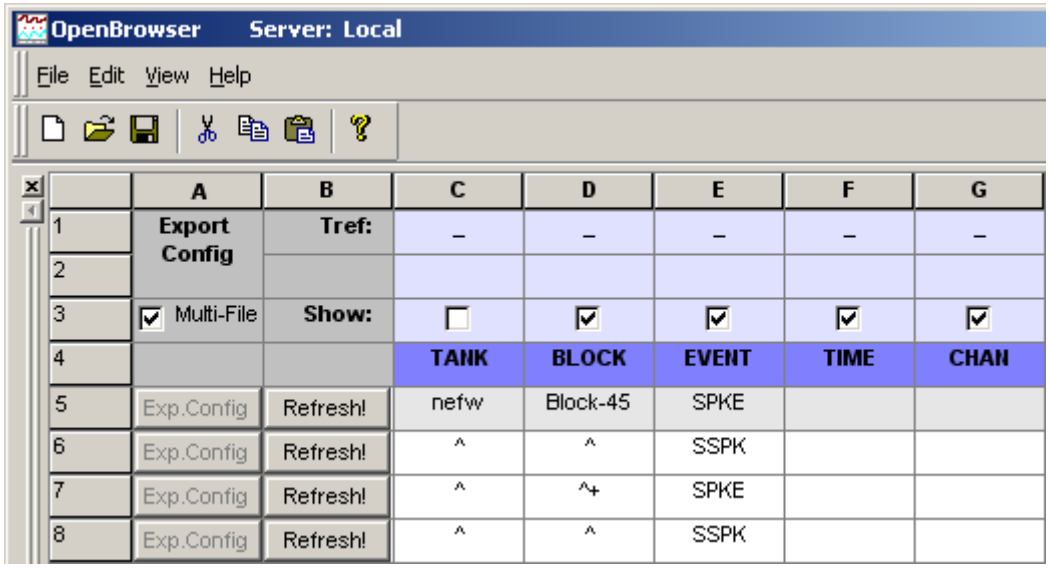
The Exp. Config buttons for each row provide easy access to the Data Export Format Configuration dialog box. After a row has been configured for export, the text on the Exp. Config button changes from gray to blue. When exporting more than one row, use the Multi-File check box to determine if each row of data will be exported to a separate file or if all data will be exported to one single file.

Using Shorthand Characters for Data Selection

A series of shorthand characters can be used to speed up data selection in the Data Selection Table.

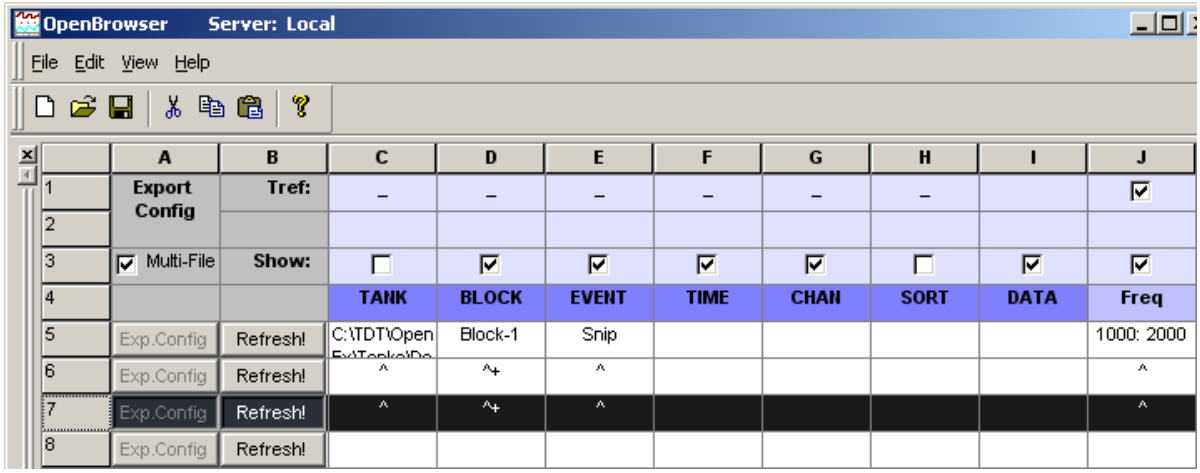
^	Indicates that the value in the cell above will be used for this cell. For example, placing a caret in a cell in the TANK column will cause the row to acquire data from the tank named in the row above.
^+	Used with BLOCK, CHAN, and SORT cells. It will increment the BLOCK, CHAN, or SORT number by one, relative to the cell above it.
>	Used with TIME, CHAN, SORT, and epoch cells. Values that are greater than the cell value are viewed and exported. For example, >3 selects channel or sort values greater than 3.
<	Used with TIME, CHAN, SORT, and epoch cells. Values that are less than the cell value are viewed and exported.
:	Used with TIME, CHAN, SORT, and epoch cells. Values in the named range are viewed and exported. For example, if a cell in the CHAN column contained the statement 3:10 then channels 3 through 10 would be viewed and exported.

In the example below, data would be exported from tank **nefw**, blocks **45** and **46**, and all **SPKE** and **SSPK** events (including all channels). Note that **^+** is only used once for the BLOCK cell for SPKE in row 7. If the BLOCK cell for the SSPK event in row 8 used a ^+, the data would have come from block 47.



Using Epochs as a Time Reference

The Data Selection Table allows users to select an epoch to be used as a time reference. Using a time reference epoch starts the time value at zero for each epoch and allows the time code information to be used to generate PSTH and other graphs in *NeuroExplorer* and other analysis applications.



To add a time reference:

- Select the Tref check box (in Row 1) for an empty epoch column. The header for an empty epoch column contains an ellipsis.
- Select a row containing data selection information for the tank, block, and event. To select a row click the row number.
- In the Header row, right-click the cell (containing an ellipsis "...") for that column. This will open an event selection dialog box. The available epoch events are listed (that is, available in the tank named in the TANK column for the currently selected row).
- To select the epoch to be used as a time reference, double-click the epoch in the list. Additional epochs can be added to subsequent columns; however, only one time reference epoch can be active at a time.

> **Note**
>
> A specific value or range of values can be selected using the epoch cell for a row. For example, entering ">1000" in an epoch cell will limit the epoch values used to those greater than 1000. A single value may be selected by entering a number without a modifier, such as "1000". See Using Shorthand Characters for Data Selection for more information.

The active time reference determines the zero time for the time stamps. When the Show check box is selected for an epoch column the epoch will be included in the view area for any row that is refreshed. It will be displayed above the data in the scroll plot view or shown as a separate column in the data table view.

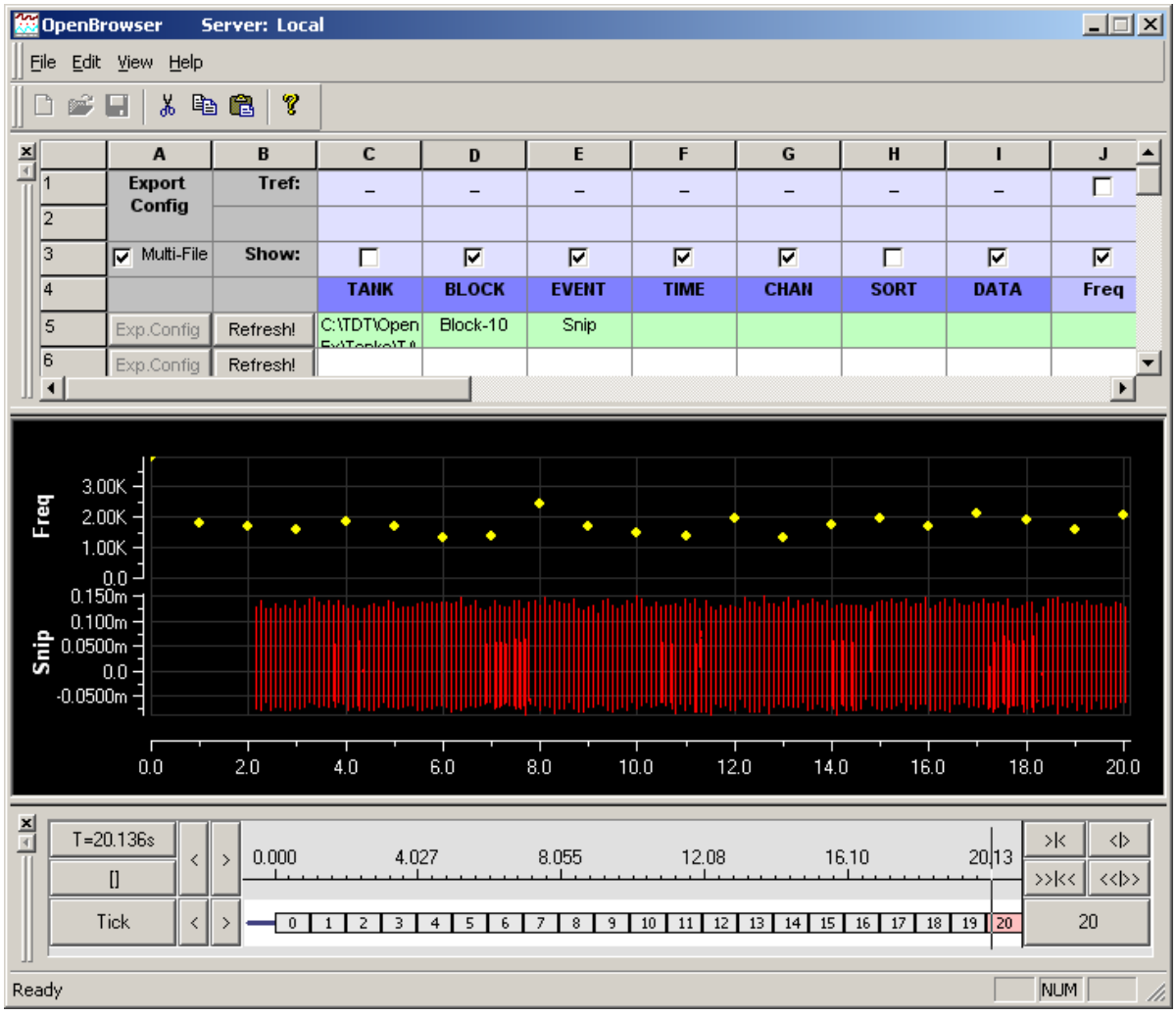
Data Browsing

About the Data View Area

The Data View area allows table or graphic visualization of tank data from a selected row. To switch between table and scroll plot views, select or clear the Data View Table option on the View menu.

Scroll Plot View

The scroll plot displays waveform or scalar data from an event as well as the associated scalar information from epochs. Epochs are displayed above the event data. In the scroll plot below, an epoch (Freq) associated with the time line is shown above the event (Snip) line.



To modify which epochs are displayed, choose the Show check box for the event column in the Data Selection Table window.

To move about the Scroll plot, select the marker in the Time Line window and move it to the time stamp or event of interest. The time range can be expanded or contracted to give additional detail about the waveforms using the Time Line window.

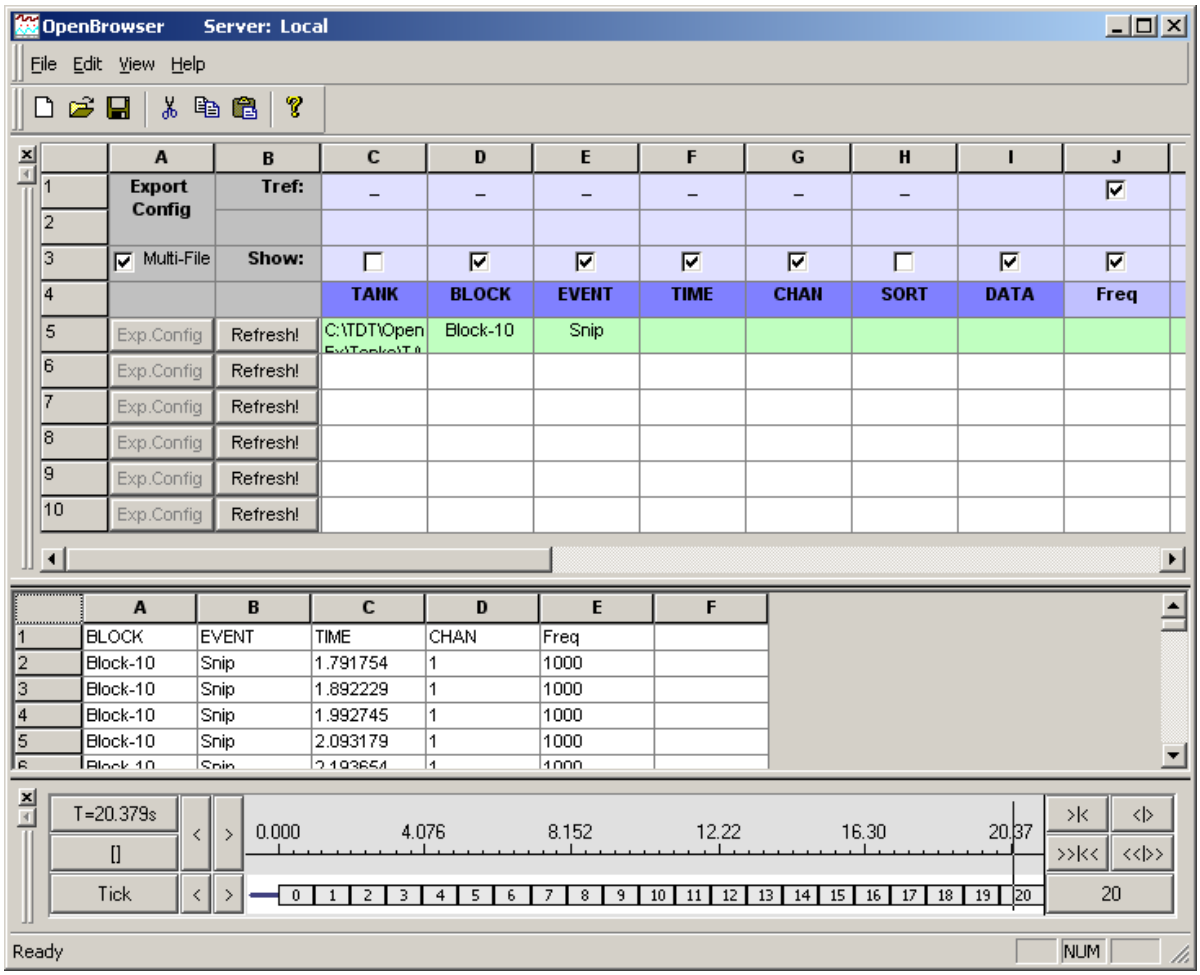
Table View

In table view the variables selected in the Show row of the Data Selection Table window are displayed. The time stamp associated with the event and any associated epochs are displayed. If Tref is selected in the Data Selection Table window the time stamps displayed will be relative to the start of the epoch.

To determine which variables such as block number, tank name, time stamp, and epochs are displayed, choose the corresponding Show check boxes in the Data Selection Table window.

All data can be copied and pasted from the table to a Microsoft Word document or Excel spreadsheet. To copy the data, select the range of cells, right-click the selected cells, and click the Copy command on the shortcut menu. To paste the data into another application, go to that application and press CTRL+V.

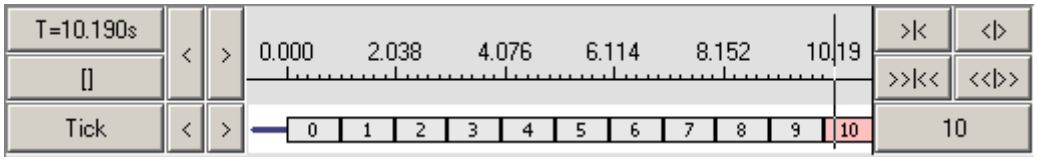
In the example below the event, time stamp (in this case the spike times), channel number, and epochs are displayed.



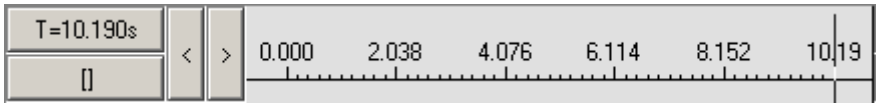
Using the Time Line Window

The Time Line window provides a timeline and vertical line indicator that moves as data is animated in the Scroll Plot view of the Data View area. The Time Line window can also be used to move to a particular time or event in the Data View area. Epoch events that are included in the selected data

area are also added to the window. The Time Line window gives a precise description of when data was collected.



Timeline by Time Stamps

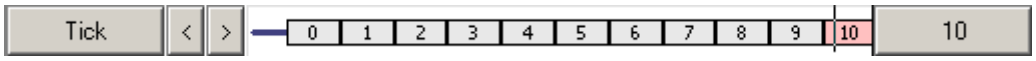


T=10.190s	The current time stamp
<	Moves the indicator back by time stamps
>	Moves the indicator forward by time stamps

Scale Controls

>|	Expands scale in small steps
<|>	Shrinks scale in small steps
>>|<<	Expands scale in large steps
<<|>>	Shrinks scale in large steps

Timeline by Events



Tick	The name of the event displayed on the corresponding line
<	Moves the indicator back by events
>	Moves the indicator forward by events
10	The current event value

Data Export

Exporting Tank Data

The primary function of OpenBrowser is to export data from the tank to other data formats. OpenBrowser can export to several common file formats: ASCII, NEX, PLX, DDT and EDF. The standard ASCII format allows users to export data in a format readable by most statistical and graphic packages as well as Microsoft Excel spreadsheets. OpenBrowser can also export directly to the NEX format for import to *NeuroExplorer*, the PLX and DDT (v101) formats for use with *Plexon's Offline Sorter*, or EDF (European Data Format).

> **Note**
>
> The NEV export function is no longer supported.

Export From the File Menu
The File menu provides the following three choices for exporting data:

- **Export Current Row:** Exports the currently selected row.
- **Export Selected Rows:** Exports multiple selected rows.
- **Export All Rows:** Exports all rows containing data.

Before data can be exported using these commands it must be selected and configured for export. Data is selected using the Data Selection Table window. When multiple rows of data have been selected the user can choose to export multiple rows to a single file or to export each row to a separate file. Single or Multi-File export is determined using the Multi-File check box in the Data Selection Table window. If exporting to multiple files, each row must be configured before the export process begins. Individual rows of data can be configured for export at any time using the Exp. Config buttons. If exporting to a single file, the export configuration can be defined during the export process. If the export configuration has not been completed prior to export, the Data Export Format Configuration dialog box will be displayed during the export process.

Exporting From the Data Table View
The data in the data table can be copied and pasted directly to a Microsoft Excel spreadsheet. This will save all the information about blocks, events, time stamps, channel, sort, and epoch information displayed in the table view. It does not export the waveform data.

Exporting to ASCII

Exporting to the standard ASCII format allows users to access data in a format readable by most statistical and graphic packages as well as Microsoft Excel spreadsheets. When data is exported in the ASCII format, the first six columns always denote the block name, event, time stamp, channel, sampling frequency, and number of points in each record. Subsequent columns contain actual data. Additional columns may be added before data columns to store information such as subsections

and epoch events. The first row contains header information (describing the data stored in each column, such as BLOCK, EVENT, TIME, and so forth) for each column.

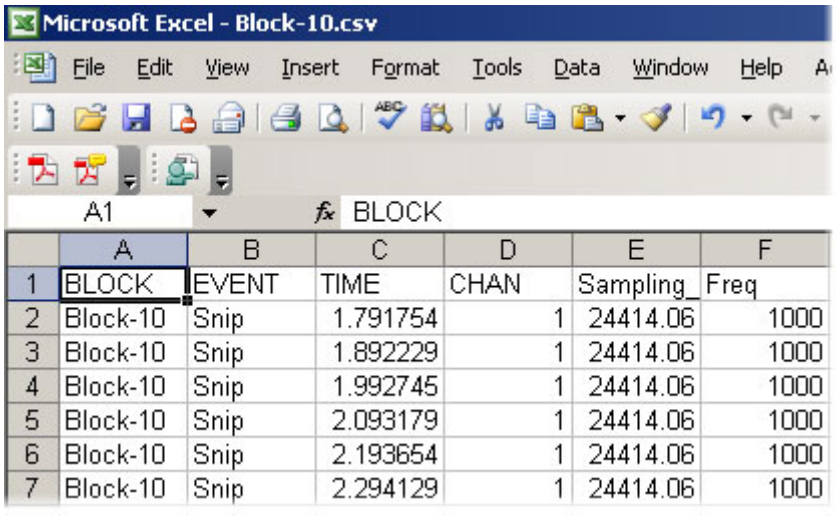
Export to Multiple Files

1. When exporting to multiple files, ensure that the **Multi-File** check box in **cell A3** of the Data Selection Table window is checked.
2. Configure each row for export. To configure a row for export:
    a. Click the **Exp. Config** button for the desired row.
    b. In the **Data Export Format Configuration** dialog box, ensure that **ASCII** is selected in the File Type box.
    c. Name the export file. Click the ... **Browse** button to the right of the Output File Name box. The Open dialog box is displayed.
    d. Browse to the desired file location.
    e. In the **File Name** box, type a file name and click **Open**. You can type individual names for each row/file or use the same base file name for all rows/files. If you use a base name be sure to use the Append File Name By check boxes. If two or more rows attempt to write to exactly the same file, data will be overwritten.
    f. If desired, select one or more of the **Append File Name By** check boxes to include block, channel, event, or row information in the file name.
    g. Modify any other settings as desired.
    h. Click **Save**.
3. Repeat for each row to be exported. To save time, complete the export configuration during the data selection process. That way if you use copy and paste to add rows the export configuration will also be copied. Be sure to use one or more of the Append File Name By check boxes to ensure that each row will have a unique file name.
4. If exporting only selected rows, select the rows to export and click **Export Selected Rows** on the **File** menu.
5. If exporting all rows, on the **File** menu, click **Export All Rows**.
6. Review the messages in the **Export Status** dialog box and click **OK**.

Export to a Single File

1. When exporting to a single file, ensure that the **Multi-File** check box in **cell A3** of the Data Selection Table window is not checked.
2. If exporting a single row, select the row then, on the **File** menu, click **Export Current Row**.
3. If exporting only selected rows, select the rows to export then, on the **File** menu, click **Export Selected Rows**.
4. If exporting all rows, on the **File** menu, click **Export All Rows**.

5. In the Data Export Format Configuration dialog box, ensure that **ASCII** is selected in the File Type box.
6. In the **Output File Name** box, click the ... **Browse** button. The Open dialog box is displayed.
7. Browse to the desired location for the data file.
8. In the **File Name** box, type a file name and click **Open**.
9. Modify any other settings as desired.
10. Click **Export**.
11. Review the messages in the Export Status dialog box and click **OK**.



	A	B	C	D	E	F
1	BLOCK	EVENT	TIME	CHAN	Sampling_	Freq
2	Block-10	Snip	1.791754	1	24414.06	1000
3	Block-10	Snip	1.892229	1	24414.06	1000
4	Block-10	Snip	1.992745	1	24414.06	1000
5	Block-10	Snip	2.093179	1	24414.06	1000
6	Block-10	Snip	2.193654	1	24414.06	1000
7	Block-10	Snip	2.294129	1	24414.06	1000

Exported Data Viewed in Microsoft Excel

Exporting to PLX

OpenBrowser can export directly to the PLX format for use with *Plexon's Offline Sorter* and *Wave Tracker*. Data exported in PLX format can also be viewed with *NeuroExplorer*. For researchers who use several different analysis packages, exporting to the PLX format eliminates the need to export data in several different formats. The PLX export has been streamlined to provide the user with both flexibility and ease of use.

> **Note**
>
> Use *Offline Sorter* version 2.5 or greater, if possible. Earlier versions of *Offline Sorter* might be unable to import OpenEx Stream data.

When tank data is exported to PLX format it must be scaled to match the requirements of the new format. This is done using two parameters: a scaling factor that scales the signal to the correct range and a gain factor that sets the units (mV, µV). Because *Offline Sorter* and *Wave Tracker* handle streamed data and spike data differently, users must set separate scaling factors and gain settings for each type of data. Once these values have been set, OpenBrowser automatically ensures that streamed data and spike data are exported correctly.

Before beginning the export process users should:

1. Ensure that block size for each waveform is less than 256.

   Data that will be exported for use with *Offline Sorter* or *Wave Tracker* should have a block size (in the OpenEx Header) of less than 256 samples.

2. Determine if the PLX data will be used in *NeuroExplorer*.

   The PLX export configuration settings include an **Export epoch events as plx strobe events** check box. If the data will be viewed in *NeuroExplorer*, this check box must be selected. If *NeuroExplorer* will not be used, the check box may be left cleared.

3. Determine the highest absolute value in the data set.

   The highest value is used to calculate the scaling factor for export. It is an absolute number and can be approximated. An approximate value for the highest number can be determined at a glance when viewing the data set in the OpenBrowser preview plot. Simply refresh the data then view the scale values. Because the plot scales automatically, the maximum scale value is a good approximation of the maximum value in the data set.

4. Select a **Gain** setting.

   Gain is expressed as an integer from 1 to 32. The gain is used to display data in *Offline Sorter* or *Wave Tracker* using the correct units, such as µVs. When unit information is not important, the gain can be safely set to 1 to simplify the formula for determining the scaling factor.

5. Calculate **Scale Factor** for Stream and/or Snippet data.

   The scaling factor can be determined using the following formula, where G = gain, SF = scaling factor, and H# = the highest absolute value in the data set. Note that when processing spike data, setting the gain to 1 and the scale factor to 1e6 is usually acceptable.

   For streamed data: SF x G = 5e6 / H#

   For spike data: SF x G = 3e6 / H#

To better understand how the SF x G formulas are derived, begin by considering these facts:

- Data collected in OpenEx are stored as floating point values while *Offline Sorter* expects data stored as 12-bit signed integers. A 12-bit signed integer yields a maximum value of 2047.
- In *Offline Sorter*, the maximum voltage for streamed data is 5 Volts and the maximum voltage for spike data is 3 Volts.
- OpenEx data is typically viewed in the microvolt range (1e-6).
- OpenBrowser uses a user-specified scaling factor (SF) and gain (G) when exporting tank data to a PLX format.

For the highest value (H#) in the tank data, the specified SF and G must yield a value that can be expressed within *Offline Sorter's* dynamic range.

For streamed data this can be expressed as: H# * SF * 1e-6 * 2048 * G / 5 < 2048

For spike data this can be expressed as: H# * SF * 1e-6 * 2048 * G / 3 < 2048

Export to Multiple Files

1. When exporting to multiple files, ensure that the **Multi-File** check box in **cell A3** of the Data Selection Table window is checked.
2. Configure each row for export. To configure a row for export:
   a. Click the **Exp. Config** button for the desired row.
   b. In the Data Export Format Configuration dialog box, in the **File Type** box, ensure that **PLX** is selected.
   c. Enter the appropriate **gain** and **scaling factor** for the data type being exported in the current row.
   d. Name the export file. In the **Output File Name** box, click the ... **Browse** button. The Open dialog box is displayed.
   e. Browse to the desired file location.
   f. In the **File Name** box, type a file name, then click **Open**.

      You can type individual names for each row/file or use the same base file name for all rows/files. If you use a base name be sure to use the Append File Name by check boxes. If two or more rows attempt to write to exactly the same file, data will be overwritten.
   g. If desired, select one or more of the **Append File Name by** check boxes to include block, channel, event, or row information in the file name.
   h. Modify any other settings as desired.
   i. Click **Save**.
3. Repeat for each row to be exported.

   To save time, complete the export configuration during the data selection process. That way if you use copy and paste to add rows the export configuration will also be copied. Be sure to use one or more of the Append File Name by check boxes to ensure that each row will have a unique file name.
4. If exporting only selected rows, select the rows to export and, on the **File** menu, click **Export Selected Rows**.
5. If exporting all rows, on the **File** menu, click **Export All Rows**.
6. Review the messages in the Export Status dialog box and click **OK**.

Export to a Single File

> **Note**
>
> If exporting multiple channels to a single PLX file for use in Offline Sorter's Tetrode Mode, use a single row, not different rows for each channel.

1. When exporting to a single file, ensure that the **Multi-File** check box in **cell A3** of the Data Selection Table window is not checked.
2. If exporting a single row, select the row and, on the **File** menu, click **Export Current Row**.
3. If exporting only selected rows, select the rows to export and, on the **File** menu, click **Export Selected Rows**.
4. If exporting all rows, on the **File** menu, click **Export All Rows**.
5. In the Data Export Format Configuration dialog box, in the **File Type** box, ensure that **PLX** is selected.
6. Enter the **gain** and **scaling factor** for each type of data to be exported.

   If both streamed and snippet data are being exported to the same file, values can be specified for each type of data in a single export configuration dialog box. If only one type of data is being exported, only the gain and scaling factor for that data type will be used and the others will be ignored.

   However, keep in mind that all rows of a particular data type will be exported using the same gain and scaling factor. If two rows of the same data type are dissimilar they might need to be exported separately.
7. In the **Output File Name** box, click the ... **Browse** button. The Open dialog box is displayed.
8. Browse to the desired location for the data file.
9. In the **File Name** box, type a file name, then click **Open**.
10. Modify any other settings as desired.
11. Click **Export**.
12. Review the messages in the Export Status dialog box and click **OK**.

Troubleshooting the PLX Export Process

The following table will help users identify common errors that might occur during the export process.

Symptom	Problem
OpenBrowser crashes during export	This usually indicates that an error was made in calculating the scaling factor
Data seems too small or too large in *Offline Sorter/Wave Tracker*	An error was made in calculating the scaling factor
Data is displayed with the wrong units in *Offline Sorter/Wave Tracker*	An error was made in selecting a Gain setting
Offline Sorter/Wave Tracker displays a message that states that the user needs OfflineSorterLong.exe	This usually indicates that the block size for exported data was greater than 256 samples
Epoch events are not recognized as strobe events in *NeuroExplorer*	The Export epoch events as plx strobe events check box was not selected during export
Events are named incorrectly in *NeuroExplorer*	The Export epoch events as plx strobe events check box was not selected during export

Exporting to DDT

OpenBrowser can export directly to DDT format version 101. A DDT data file is used to import streaming waveforms into Plexon's *Offline Sorter*.

When tank data is exported to DDT format it must be scaled to match the requirements of the new format. This is done using a scaling factor. Once this value has been set, OpenBrowser automatically ensures that streamed data are exported correctly.

Before beginning the export process users should calculate the Scale Factor. To understand how the Scale Factor is used, begin by considering these facts:

- Data collected in OpenEx are stored as floating point values while Offline Sorter expects data stored as 16-bit signed integers. A 16-bit signed integer yields a maximum value of 32767.
- In Offline Sorter, the maximum voltage for streamed data is 5 Volts, so each bit represents ~153 uV.
- OpenEx data is typically viewed in the microvolt range (1e-6).
- OpenBrowser uses a user-specified scaling factor (SF) when exporting tank data to DDT format.

To get full resolution, where the max value of the TDT data is mapped to 5V in Offline Sorter, set Scale Factor to 32767/H# where H# is the largest absolute value in the tank data.

Note that a scale factor of 1e6 is usually acceptable, where each bit represents 1 uV.

Before data can be exported it must be selected and configured for export using the Data Selection Table window.

Export to Multiple Files

1. When exporting to multiple files, ensure that the **Multi-File** check box in **cell A3** of the Data Selection Table window is checked.
2. Configure each row for export. To configure a row for export:
   a. Click the **Exp. Config** button for the desired row.
   b. In the Data Export Format Configuration dialog box, in the **File Type** box, ensure that **DDT** is selected.
   c. Name the export file. In the **Output File Name** box, click the ... **Browse** button. The Open dialog box is displayed.
   d. Browse to the desired file location.
   e. In the **File Name** box, type a file name then click **Open**.

      You must type individual names for each row/file. If two or more rows attempt to write to exactly the same file, data will be overwritten.

   f. Modify any other settings as desired.
   g. Click **Save**.
3. Repeat for each row to be exported.
4. If exporting only selected rows, select the rows to export and, on the **File** menu, click **Export Selected Rows**.
5. If exporting all rows, on the **File** menu, click **Export All Rows**.
6. Review the messages in the Export Status dialog box and click **OK**.

Export to a Single File

1. When exporting to a single file, ensure that the **Multi-File** check box in **cell A3** of the Data Selection Table window is not checked.
2. If exporting a single row, select the row and, on the **File** menu, click **Export Current Row**.
3. If exporting only selected rows, select the rows to export and, on the **File** menu, click **Export Selected Rows**.
4. If exporting all rows, on the **File** menu, click **Export All Rows**.
5. In the Data Export Format Configuration dialog box, in the **File Type** box, ensure that **DDT** is selected.
6. In the **Output File Name** box, click the ... **Browse** button. The Open dialog box is displayed.
7. Browse to the desired location for the data file.
8. In the **File Name** box, type a file name, then click **Open**.
9. Modify any other settings as desired.
10. Click **Export**.

11. Review the messages in the Export Status dialog box and click **OK**.

Troubleshooting the DDT Export Process

The following table will help users identify common errors that might occur during the export process.

Symptom	Problem
Data seems too small or too large in *Offline Sorter*	An error was made in selecting the scaling factor
Data is displayed with the wrong units in *Offline Sorter*	An error was made in selecting the scale factor
Offline Sorter crashes or hangs when opening DDT file made by OpenBrowser	The sampling rate of the waveforms exported to DDT must be higher than 1 kHz for some versions of *Offline Sorter*

Exporting to NEX

OpenBrowser can export directly to the *NeuroExplorer* NEX format.

Export to Multiple Files

1. When exporting to multiple files, ensure that the **Multi-File** check box in **cell A3** of the Data Selection Table window is checked.
2. Configure each row for export. To configure a row for export:
   a. Click the **Exp. Config** button for the desired row.
   b. In the Data Export Format Configuration dialog box, in the **File Type** box, ensure that **NEX** is selected.
   c. Name the export file. In the **Output File Name** box, click the ... **Browse** button. The Open dialog box is displayed.
   d. Browse to the desired file location.
   e. In the **File Name** box, type a file name, then click **Open**.

      You can type individual names for each row/file or use the same base file name for all rows/files. If you use a base name be sure to use the Append File Name by check boxes. If two or more rows attempt to write to exactly the same file, data will be overwritten.

   f. If desired, select one or more of the **Append File Name by** check boxes to include block, channel, event, or row information in the file name.
   g. Modify any other settings as desired.
   h. Click **Save**.
3. Repeat for each row to be exported. To save time, complete the export configuration during the data selection process. That way if you use copy and paste to add rows the export configuration will also be copied. Be sure to use one or more of the Append File Name by check boxes to ensure that each row will have a unique file name.

4. If exporting only selected rows, select the rows to export and, on the **File** menu, click **Export Selected Rows**.
5. If exporting all rows, on the **File** menu, click **Export All Rows**.
6. Review the messages in the Export Status dialog box and click **OK**.

Export to a Single File

1. When exporting to a single file, ensure that the **Multi-File** check box in **cell A3** of the Data Selection Table window is not checked.
2. If exporting a single row, select the row and, on the **File** menu, click **Export Current Row**.
3. If exporting only selected rows, select the rows to export and, on the **File** menu, click **Export Selected Rows**.
4. If exporting all rows, on the **File** menu, click **Export All Rows**.
5. In the Data Export Format Configuration dialog box, in the File Type box, ensure that **NEX** is selected.
6. In the **Output File Name** box, click the ... **Browse** button. The Open dialog box is displayed.
7. Browse to the desired location for the data file.
8. In the **File Name** box, type a file name, then click **Open**.
9. Modify any other settings as desired.
10. Click **Export**.
11. Review the messages in the Export Status dialog box and click **OK**.

Exporting to EDF

OpenBrowser can export directly to EDF format. An EDF data file consists of a header record followed by binary data records. More details about the EDF standard can be found online at http://www.edfplus.info/specs/edf.html.

> **Note**
>
> OpenBrowser does not support the EDF+ format.

> **Important**
>
> The OpenBridge software provides similar functionality to the OpenBrowser EDF export. TDT recommends using OpenBridge.

Before data can be exported it must be selected and configured for export using the Data Selection Table window.

Export to Multiple Files

1. When exporting to multiple files, ensure that the **Multi-File** check box in **cell A3** of the Data Selection Table window is checked.
2. Configure each row for export. To configure a row for export:
   a. Click the **Exp. Config** button for the desired row.
   b. In the Data Export Format Configuration dialog box, in the **File Type** box, ensure that **EDF** is selected.
   c. Name the export file. In the **Output File Name** box, click the ... **Browse** button. The Open dialog box is displayed.
   d. Browse to the desired file location.
   e. In the **File Name** box, type a file name, then click **Open**.

      You must type individual names for each row/file. If two or more rows attempt to write to exactly the same file, data will be overwritten.

   f. Modify any other settings as desired.
   g. Click **Save**.
3. Repeat for each row to be exported.
4. If exporting only selected rows, select the rows to export and, on the **File** menu, click **Export Selected Rows**.
5. If exporting all rows, on the **File** menu, click **Export All Rows**.
6. Review the messages in the Export Status dialog box and click **OK**.

Export to a Single File

1. When exporting to a single file, ensure that the **Multi-File** check box in **cell A3** of the Data Selection Table window is not checked.
2. If exporting a single row, select the row and, on the **File** menu, click **Export Current Row**.
3. If exporting only selected rows, select the rows to export and, on the **File** menu, click **Export Selected Rows**.
4. If exporting all rows, on the **File** menu, click **Export All Rows**.
5. In the Data Export Format Configuration dialog box, in the **File Type** box, ensure that **EDF** is selected.
6. In the **Output File Name** box, click the ... **Browse** button. The Open dialog box is displayed.
7. Browse to the desired location for the data file.
8. In the **File Name** box, type a file name, then click **Open**.
9. Modify any other settings as desired.
10. Click **Export**.

11. Review the messages in the Export Status dialog box and click **OK**.

Single vs. Multi-File Export

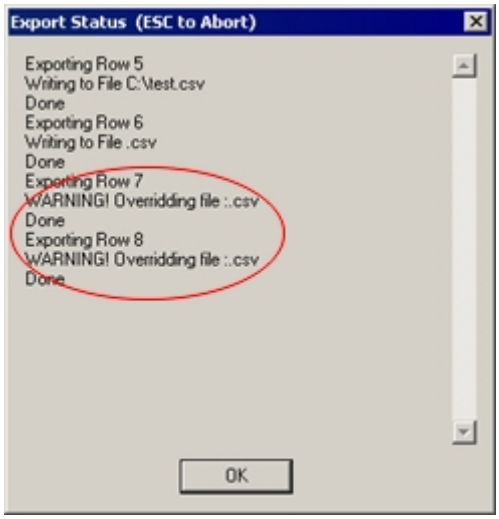
The user can determine if data will be exported to multiple files or a single file using the Multi-File check box in the Data Selection Table window.

Single File Export
If the Multi-File check box is not checked (cell A3) all data is exported to a single file. To use this export function the rows do not have to have been configured before the export process begins. The Data Export Format Configuration dialog box will be displayed during export, giving the user an opportunity to complete configuration. If a single row is selected and has been configured, the dialog box will show the output format for that row. If multiple (or all) rows have been selected the dialog box will display the output format for the first row.

> **Note**
>
> Error messages will occur if a row has no data in it.

Multi-File Export
If the Multi-File check box has been selected each row of data will be saved to a separate file. Each row can have a unique file format. Rows must be configured for export using the Data Export Format Configuration dialog box prior to the export process.

When the export process begins the selected rows are immediately stored to files based on the export configuration format specified. If rows are not configured for export a warning message is displayed in the Export Status dialog, starting with the first row that could not be exported.



Understanding the EDF Export

OpenBrowser's method for exporting to EDF format is designed to maximize resolution by using all 16 bits available in this format. Taking a closer look at the method used should help users understand how the scaling factor is applied and how to interpret the 16-bit values stored in the EDF.

1. OpenBrowser multiplies the tank data by the scaling factor.
2. OpenBrowser scans the entire data set to find the max/min values and then stores them in the EDF file as the **Physical Maximum** and **Physical Minimum** values for each channel (or signal). See http://www.edfplus.info/specs/edf.html for more information on the EDF format.
3. The **Units** parameter is stored as the **Physical Dimension** for all channels in the EDF file.
4. The **Digital Maximum** and **Digital Minimum** in the EDF file are always set to "32767" and "-32768", the maximum resolution of the EDF data format (16-bit integers).
5. The exporter then normalizes the data set onto the full -32768 to 32767 range, converts it to integers, and stores it in the EDF file.

   The basic equation is:

   ```
   EDF = -32768 + 65535 * (OriginalData*SF - PhysicalMin) / (PhysicalMax-PhysicalMin)
   ```

   So, if you are reading the 16-bit integer values from the EDF file, you must also read the physical max/min values and perform the reverse operation manually. For example:

   ```
   OriginalData = (EDF + 32768)*(PhysicalMax-PhysicalMin)/65535 + PhysicalMin
   ```

Using the physical max/min values stored in the EDF header is essential to properly interpret the 16-bit samples.

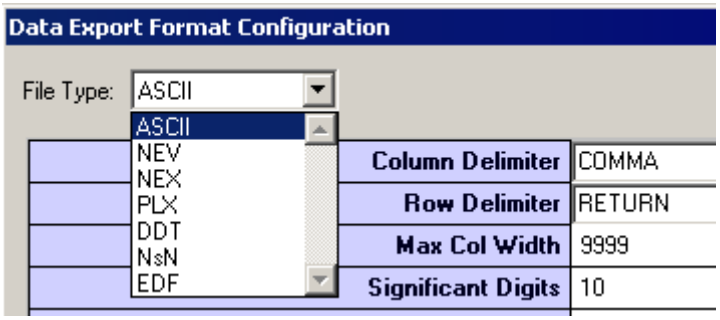
Export Settings

Using the Data Export Format Configuration Dialog Box

The Data Export Format Configuration dialog box is used to configure data for export before or during the export process.

To open the Data Export Format Configuration dialog box, click the Exp. Config button for a row. The settings available depend on the export format selected in the File Type box in the upper left corner of the dialog box.

After the export settings are configured, clicking the Save button stores the export information for future use and the color of the Exp. Config button text changes to blue.



File Type Drop Down Menu

ASCII Export Settings

Column Delimiter: data is exported with the specified separators between columns.

- **COMMA:** each value is separated by a comma. This is the default Excel importing format.
- **TAB:** each value is separated by a tab.
- **RETURN:** each value is separated by a return character.

Row Delimiter: data is exported with the specified separators between rows.

- **RETURN:** each row is separated by a return character (most common).
- **TAB:** each row is separated by a tab.
- **COMMA:** each row is separated by a comma.

Max Col Width: maximum number of columns in a row. When the maximum number is reached, a row delimiter is generated. To ensure the integrity of exported data when viewed in the target application, set the Max Col Width for that application before export.

In applications, like Excel, that have a maximum number of columns, exceeding the application's maximum number of columns might cause problems when the exported data is opened in the target application. Problems might include truncated data display, automatically generated and undesirable row delimiters, and so forth. For example, if the user attempts to open an export file with more than

248 data samples in Microsoft Excel (which is limited to 256 cells in a row), the excess samples will be discarded and Excel will generate a "File not loaded completely" message. Note that the reason the maximum number is 248 is that at least six columns out of the 256 are used for other information such as block, event, time stamps, and so forth. If more than six columns are used before the data columns, then there will be fewer columns available for data. See also **Number of data subsections**, below, for more information.

Significant Digits: number of digits saved for each value starting with the first non-zero digit. This parameter is applied to time stamps as well as data.

Hide Title: hides the first row with the column descriptions.

Raw Data Only: saves only the signal data and discards all of the other details like tank name, block name, event, time, sampling frequency, and number of points.

Output File Name: allows the user to browse to and set the location and name for the output file(s).

Append File Name By ...: appends the block, event, channel number, and/or row number of the exported data to the output file name. This is very useful when the Multi-File option is selected.

Number of data subsections: used to divide the data samples into subsections. By default, each data set is stored in a single row with the tank name, block name, and so forth at the beginning of the row. Specifying subsections allows the data to be stored using several rows. Each row (or subsection) includes the header information such as tank name, block name, followed by a subset of data samples.

This option is useful when loading a data file with a large number of samples. For example, if the user intends to work with exported data in Excel then each row must be limited to no more than 256 cells. A file with 300 points in each record can be exported specifying 2 subsections to create two rows dedicated to each record, each with 150 sample points. This would ensure that the maximum number of cells per row is not exceeded and creates a file with a consistent set of row headers at the beginning of each row. See also **Max Col Width**, above, for more information.

Transpose output (data in columns): transposes columns to rows so that each column is a data set (by default, OpenEx data is saved in rows). This option can be used when exporting a data file containing a large number of samples for use with Microsoft Excel. By saving data in columns the user avoids limitations in the maximum number of cells possible in a row.

PLX Export Specific Settings

Export epoch events as plx strobe events: used to display epoch events as strobe events in *NeuroExplorer*. Not used when exporting for use with *Plexon's Offline Sorter*.

Gain (for spike waveform, in K): used with Scaling Factor to scale spike data for viewing in Offline Sorter. Recommended value is 1. Values can be from 1 to 32.

Spike Scaling Factor (Floating Point to µV): used with Gain to scale spike data for viewing in Offline Sorter.

Gain (for continuous waveform): used with Scaling Factor to scale continuous data for viewing in Offline Sorter. Recommended value is 1. Values can be from 1 to 32.

Stream Scaling Factor (Floating Point to µV): used with Gain to scale continuous data for viewing in Offline Sorter.

Comment: 256 character comment line.

Output File Name: allows the user to browse to a network or local folder and saves the file with a set name.

Append File Name By ...: allows the user to select to automatically add the block, event, channel number, and/or row number of the exported data to the saved file name. This is very useful when the Multi-File option is selected.

> **Note**
>
> See Exporting to PLX for detailed information on using PLX export specific settings.

DDT Export Settings

Output File Name: allows the user to browse to and set the location and name for the output file(s).

Description: optional text field that is included in DDT header.

Scale Factor: used to scale streaming data before converting to integer values for viewing in Offline Sorter.

Append File Name By ...: appends the block, event, channel number, and/or row number of the exported data to the output file name. This is very useful when the Multi-File option is selected.

NEX Export Specific Settings

Quant Factor (mV per LSB): sets the millivolt range for the Least Significant Bit of the NEX format. The default value has been set to ensure that the data is exported correctly. Changing the default settings can cause data to be read incorrectly by *NeuroExplorer*.

Scaling Factor (to convert Tank Data to µV): not used.

Comment: 256 character comment line.

Append Event Name by Channel #: allows the user to select to automatically add the channel number to the event name.

Output File Name: allows the user to browse to a network or local folder and saves the file with a set name.

Append File Name By ...: allows the user to select to automatically add the block, event, channel number, and/or row number of the exported data to the saved file name. This is very useful when the Multi-File option is selected.

> **Note**
>
> The NEV export function is no longer supported.

NsN Export Specific Settings

For more information regarding the NeuroShare Native (NsN) file format, refer to the NeuroShare website at http://neuroshare.sourceforge.net/index.shtml.

Output File Name: specifies the path and filename for the exported *.nsn file.

File Type Descriptor: specifies the file extension for the exported data file. This should be set to .nsn.

Time Stamp Resolution: minimum timestamp resolution in seconds.

Digitization Scaling Factor (in nV): not used.

Scaling Factor (to Convert Tank Data to µV): scale factor used for buffer (type 2), snippet (type 4), or continuous (type 5) data. Recommended value is 1.

Scaling Factor (to Convert Event Tank Data): scale factor used for scalar (type 1) or list (type 3) data. Recommended value is 1.

File Comment: 256 character comment line.

Min Input Signal: minimum possible value of the input signal in Volts.

Max Input Signal: maximum possible value of the input signal in Volts.

Units: enter a text value to specify the recording units of measurement.

Input Signal Resolution: minimum input step size that can be resolved. To obtain the signal resolution divide the voltage range by the number of bit values. For example, for a ± 1 Volt 16-bit ADC this value is $2/2^{16}$ or 0.0000305.

X Location: optional text information about the X coordinate of source in meters.

Y Location: optional text information about the Y coordinate of source in meters.

Z Location: optional text information about the Z coordinate of source in meters.

High Freq Cutoff: high frequency cutoff in Hz of the source signal filtering.

High Freq Order: order of the filter used for high frequency cutoff.

High Freq Filter Type: optional text information to describe the type of filter used for high frequency cutoff.

Low Freq Cutoff: low frequency cutoff in Hz of the source signal filtering.

Low Freq Order: order of the filter used for low frequency cutoff.

Low Freq Filter Type: optional text information that describes the type of filter used for low frequency cutoff.

Probe Info: optional text information about the signal source.

EDF Export Settings

Output File Name: specifies the path and filename for the exported *.edf file.

Description: optional text used to describe the data. This is included in the EDF header.

Scale Factor: used to scale streaming data before converting to 16-bit integer values for EDF format. If the TDT data is stored as floating point, a scaling factor of 1e6 converts everything into round units of uV. If the TDT data is stored as 16-bit integers, leave the Scale Factor at 1.

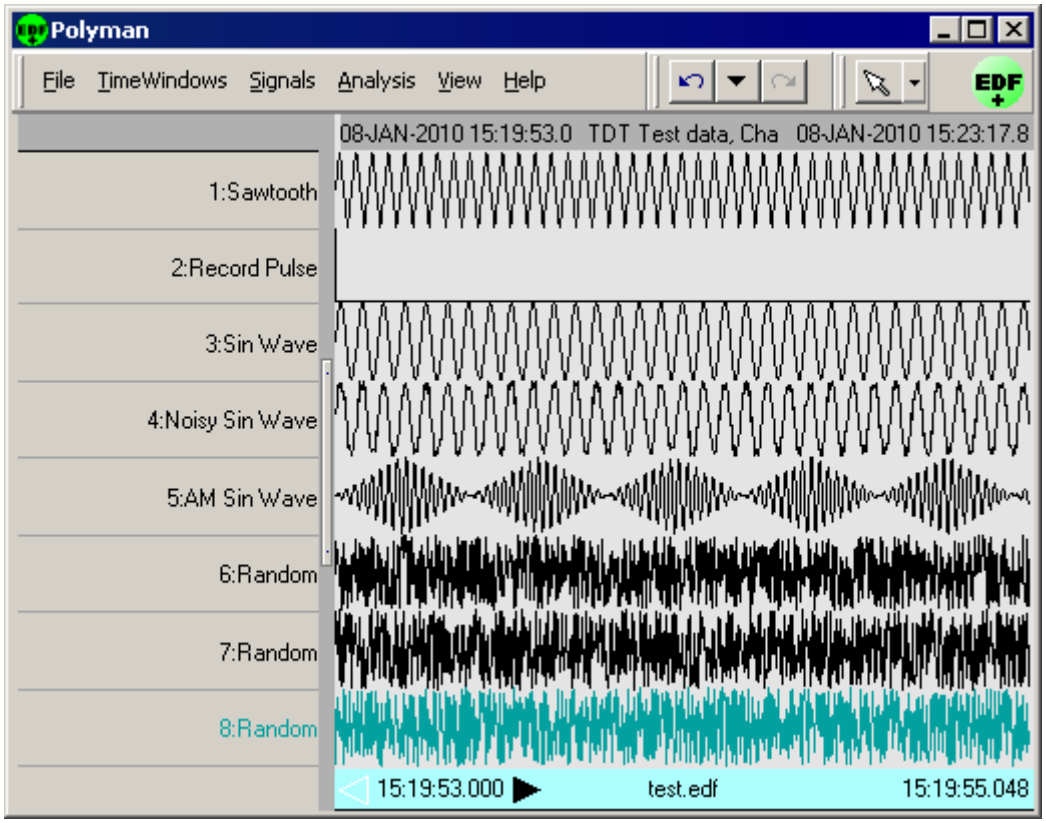
Units: enter a text value to specify the recording units of measurement after scaling.

Clip Min: force the EDF converter to use this value instead of the minimum value in the data for the conversion to integer. Useful for improving signal resolution if some channels have artifact.

Clip Max: force the EDF converter to use this value instead of the maximum value in the data for the conversion to integer. Useful for improving signal resolution if some channels have artifact.

Generate Test Data: optional checkbox. When selected, the output will contain eight channels of recognizable test data signals (sine wave, sawtooth, pulse, noise, etc.) that can be viewed in an EDF viewer to validate the export.

Append File Name By ...: appends the block, event, channel number, and/or row number of the exported data to the output file name. This is very useful when the Multi-File option is selected.



Exported Test Data Viewed in Polyman

An example of the generated test data can be found in the image above. The Polyman EDF viewer software was used to load the data and capture this image.