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# *Dex User's Guide*

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## Table of Contents

|   |    |
|---|----|
| Introduction 4                                  |    |
| Tutorial 5                                      |    |
| Selecting Classes . . . . .                     | 5  |
| Aligning Data . . . . .                         | 6  |
| Loading Rex Data . . . . .                      | 6  |
| Creating and Marking Signals. . . . .           | 8  |
| Creating a Signal . . . . .                     | 9  |
| Marking a Signal. . . . .                       | 9  |
| Types of Marks. . . . .                         | 10 |
| Building Data Rasters. . . . .                  | 11 |
| Graphs . . . . .                                | 11 |
| Labels. . . . .                                 | 12 |
| Paper . . . . .                                 | 13 |
| Page Layout . . . . .                           | 13 |
| Plot Contents . . . . .                         | 13 |
| Viewing Data. . . . .                           | 16 |
| Viewing Rasters . . . . .                       | 16 |
| Viewing Trials. . . . .                         | 17 |
| Viewing Channels. . . . .                       | 20 |
| Summary Reports. . . . .                        | 22 |
| Reports. . . . .                                | 22 |
| Measures . . . . .                              | 23 |
| Viewing Measurements . . . . .                  | 25 |
| Saving and Loading Configuration Files. . . . . | 26 |
| Settings . . . . .                              | 26 |
| Quitting Dex . . . . .                          | 27 |
| Command Line Arguments. . . . .                 | 27 |
| Batch Mode. . . . .                             | 27 |

# Introduction

Dex is an application designed to extract and display data collected with the Rex real-time data acquisition and experimental control program. It runs on Silicon Graphics and Sun Sparc workstations and Intel workstations running Linux. Dex is distributed with two plug-ins, xtig and ptig, with a number of finite impulse response (FIR) filter files, and with eye movement marking templates.

To install Dex, you should copy the executable files (dex, ptig, and xtig) to **/usr/local/bin** and you should create the directory **/usr/local/lib/dex** to receive the FIR filter files and the eye movement marking templates. To run Dex you must have the openlook X11 library package installed on

your workstation. These files are usually found in **/usr/openwin/lib** and include the files libolgx.so and libxview.so. You must set or create a **LD\_LIBRARY\_PATH** variable in your environment to point to the openlook libraries (e.g. **setenv LD\_LIBRARY\_PATH /usr/openwin/lib**). If the openlook libraries are not in **/usr/openwin/lib**, you must set your **LD\_LIBRARY\_PATH** variable accordingly.

This manual is divided into two sections. The first section is a quick tutorial of Dex's interactive mode. The second section is a more detailed explanation of the various options available in Dex and batch mode processing.

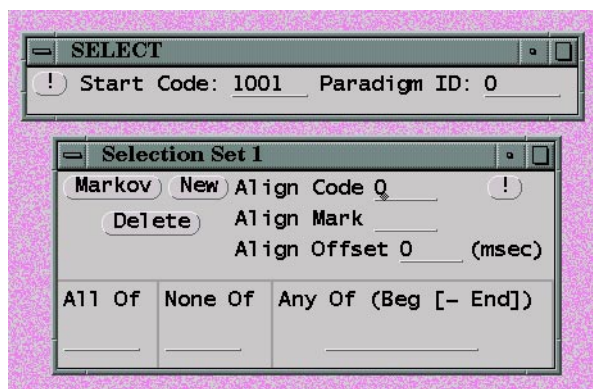
# Tutorial

The first time you run Dex you must run in interactive mode to setup the necessary configuration files. To start Dex, simply type `dex<return>`. This will bring up the Dex toolbar as shown here.



## Selecting Classes

The first thing you need to do is to tell Dex how to organize your data. To do this, click on the **CLASSES** button in the toolbar with the left mouse button. This will bring up the two windows as shown here. The first



window contains two text items and a button with an exclamation mark. The "!" button is the close button. The first text item is for the trial start code. The default value for this is 1001. You don't need to change this unless you use a different trial start code. The second item is for the paradigm ID code. This is the value following the label id in your spot file. It is perfectly OK to leave the paradigm ID value 0. This causes Dex to extract data from the beginning of your data files. If you put in the paradigm ID value, Dex will scan your file until it finds the first trial containing the paradigm ID value and then begin extracting data.

There are three panels in the second window labeled **All Of**, **None Of**, and **Any Of (Beg [-End])**. The **All Of** column is for listing the ecodes that each trial must contain to be

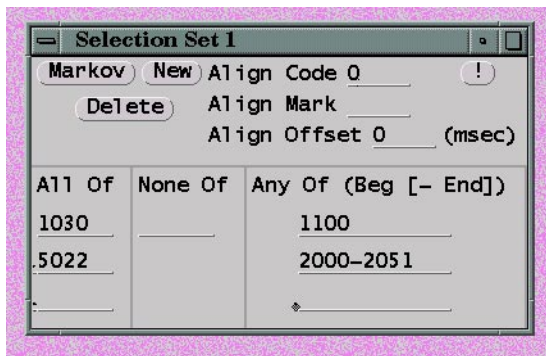
accepted for analysis. Enter the first of these "correct" ecodes, then press `<return>` and a new line will open below the first as shown. You can enter as many ecodes as you want. Remember to end each entry with a carriage return. If you want to delete an entry, you must remember to use a `<return>` after deleting the entry. You will know that the entry was deleted because the line it was on will disappear and the total number of lines will decrease by one.

An alternative to making a list of ecodes that each trial must contain is to make a list of ecodes that each trial must not contain to be accepted for analysis. You list these "error" ecodes in the **None Of** column. As with the **All Of** column pressing `<return>` after each code opens a new line.

It is not necessary to use both the **All of** and the **None Of** lists. In fact it is not necessary to use either the **All Of** or the **None Of** columns. If you leave both of these columns blank, Dex will process all of the trials in your data file looking for **Any Of** ecodes.

The **Any Of** ecodes tell Dex how to organize the trials in your data. Think of these ecodes as identifying the experimental conditions in your data file. Each line in the **Any Of** list can contain a single code or a range of ecodes. You specify code ranges by listing the first and last ecodes of the range on the line separated by a dash. Dex searches each trial that passes the **All Of** or **None Of** tests the ecodes in the **Any Of** list. Dex will group all trials that contain the same **Any Of** code will together. If a trial contains several **Any Of** ecodes, Dex will place it into multiple

groups. In the following example, Dex will



check all trials containing the ecodes 1030 and 5022 to see if they contain the ecode 1100 or one of the 50 ecodes ranging from 2001 to 2051. All of the trials containing the ecode 1100 will be assigned to the 1100 group. All of the trials containing the ecode 2001 will be assigned to the 2001 group. All of the trials containing the ecode 2002 will be assigned to the 2002 group, etc. If a trial contains both an 1100 ecode and a 2001 ecode then it will be assigned to both the 1100 and 2001 ecodes.

## Aligning Data

To compare data from different trials, you must align the data on events in the trials. Dex can use four methods to align data. The default method is to align the data using the time of the **Any Of** ecodes in the trials. If you want to align data on an ecode that is not in the **Any Of** list, enter the ecode



on the **Align Code** line in the top panel of the ecode selection window as shown. In this example, Dex will group the data according to the **Any Of** list, but will align the data on the time of the 1100 ecode.

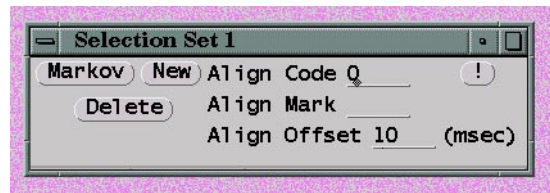
If you want to align the data on an analog record mark, enter the mark symbol on the **Align Mark** line. Dex will align the data on the time of the first mark after the alignment ecode. If you want to align the data on the first mark before the alignment code, put a minus sign in front of the mark symbol.

The alignment ecode will be the **Any Of** ecode if you don't specify an **Align Code**. In this example, Dex will align the data in the first



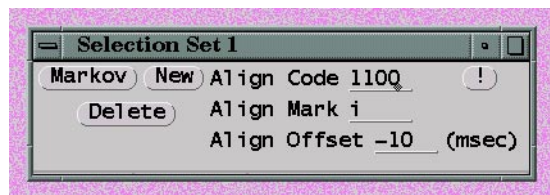
"i" mark following the **Any Of** ecode in each trial. If the requested analog record mark is not in the trial, Dex will keep the alignment at the time of the **Any Of** code.

If you want to align the data at a given time before or after an alignment ecode or analog record mark, enter the time in milliseconds on the **Align Offset** line. If you enter a negative number, Dex will align the data the specified number of milliseconds before the alignment mark. If you enter a positive number, Dex will align the data the specified number of milliseconds after the alignment mark. In this example, Dex will



align the data 10 milliseconds after the Any Of ecode in the trial.

The effects of the alignment options are cumulative. In this example, Dex will align the data 10 milliseconds before the first "i" mark following the 1100 ecode in each trial.

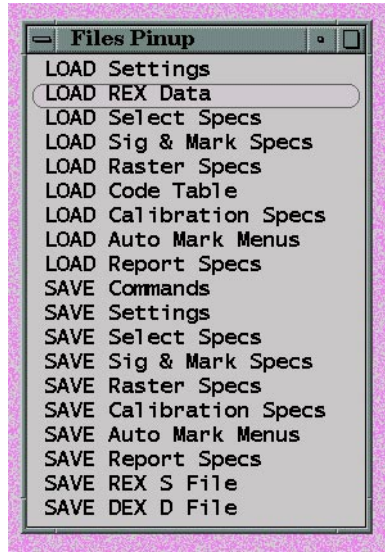


After you have defined your selection criteria, you can save them for future use. (See **"Saving and Loading Configuration Files"** on page 29.)

## Loading Rex Data

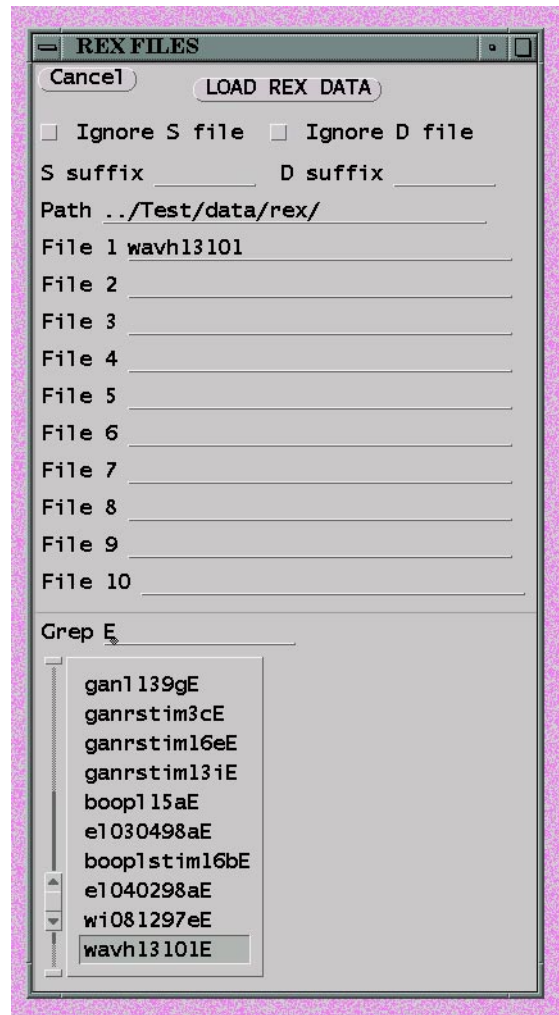
After you have described your ecode selection criteria, you are ready to load data. To do this click on the **FILES** button in the

toolbar with the right mouse button and scroll down to the **LOAD REX Data** item.



This will bring up the **REX FILES** window. Enter the path to the directory where you keep your data and Dex will attach a file browser to the bottom of the window showing the contents of the directory. Click on the file you want to load and Dex will copy the name to the **File 1** line. You can "glue together" up to ten Rex files. Just click on the file and Dex will copy the name to the next **File** line. When you have selected the data files you want to load, click on the **LOAD REX DATA** button to load the data. As the data are being loaded, a progress message will appear in the title frame of the toolbar. After Dex loads each file, it will create an S file of the form **datafileS**. This file contains the grouping and alignment times for each trial that Dex

loaded. After you have loaded data, you are ready to use the other functions that Dex provides.





## Creating and Marking Signals

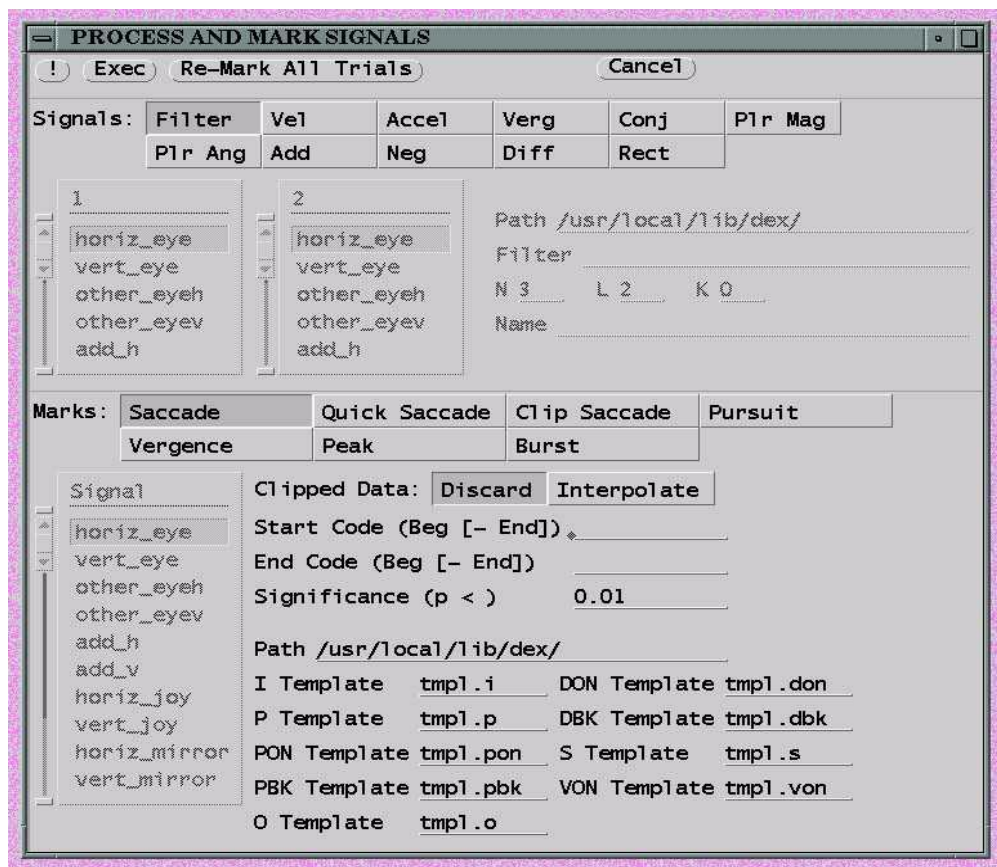
Dex allows you to create new analog signals and to mark eye movements in analog signals and bursts of activity in unit signals. Because the marking of eye movements requires creating velocity and acceleration signals, both functions are available in the



same tool. To create new analog signals or to mark eye movements, click on the **SIG & MRK** button in the toolbar with the right mouse button and scroll to the **Bld & Mrk Sgnls** item in the pulldown menu. This will bring up the **PROCESS AND MARK SIGNALS** window as shown below. Tools to create new

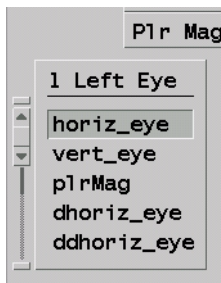
analog signals are in the top panel of the window and tools to mark signals are in the bottom panel. You should specify all of the signals you want to create and all of the types of eye movements you want to mark at one time, then click on the **Exec** button to create and mark the signals. If you run the **PROCESS AND MARK SIGNALS** tool several times, Dex will wind up creating a number of extra signals. This will use a lot of memory unnecessarily.

When you click on the **Exec** button, Dex creates all of the signals and marks all of the events you specified, and creates a file named "filenameD" in the data directory. This file contains instructions for creating signals and a list of all of the marks in each trial in your data set. After you have Exec'd the signals and marks, the tool remains on the screen, but the **Exec** button is inactive and the **Re-mark** button is active. This is to allow you to re-mark data after adjusting marking parameters without recreating the signals. The automatic marking of analog signals and unit data is governed by a number of



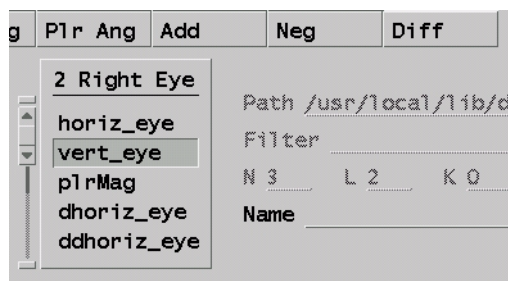
parameters. Dex provides default values for all of the parameters for each type of eye movement. The default parameters work well, but you may have to tweak them for your data set. To adjust eye movement marking parameters click on the appropriate “**Auto**” item in **SIG & MRK** pulldown menu. This will bring up a window with the adjustable parameters for that type of mark and their current values. You can adjust the auto-marking parameters and re-mark the eye movements as many times as you like. To save the parameters, click on the **FILES** button with the right mouse button and select the **SAVE Auto Mark Menus** item.

## Creating a Signal



To create a new signal, say a horizontal, conjugate, eye signal; click on the **Conj** button in the top panel. This will cause the left signal scrolling list to become active and will change the titles of the scrolling lists to **Left Eye** and **Right Eye**. Now scroll

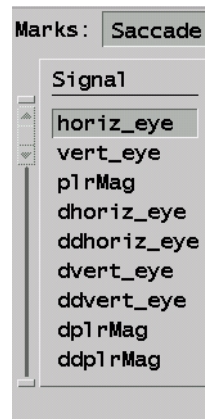
to the horizontal eye signal in the **Left Eye** list and click on it. This will cause the **Right Eye** list to become active. Scroll to the horizontal signal in the **Right Eye** list and



click on it. This will cause the **Name** line to become active. Enter the name of the conjugate eye signal on the **Name** line and hit **<return>**. Dex will record the signal to create, but won't execute the operation until you hit click on the **Exec** button.

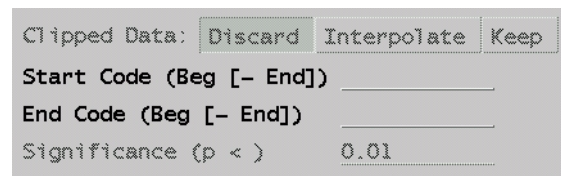
## Marking a Signal

Dex is can automatically mark many types of events of interest in both analog and unit data.(See “**Types of Marks**” on page 10.)



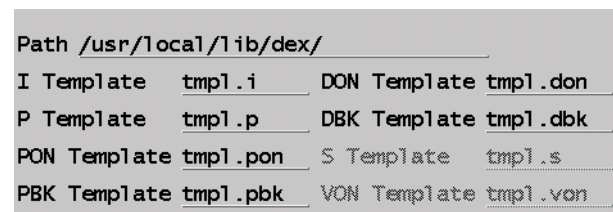
To mark an eye movement, say a saccade; click on the **Saccade** button in the bottom panel. This will cause the **Signal** scrolling list to become active. Scroll to the signal you want to mark and click on it. This will cause a number of lines to become active. If you don't want Dex to mark saccades in the whole trial, you can enter a **Start Code** or an **End**

**Code**. If you enter both start and end codes, Dex will only mark saccades that fall between the two ecodes. If you enter only a start code, Dex will mark saccades beginning with that



ecode to the end of the trial. If you enter only an end code, Dex will mark saccades from the beginning of the trial to that ecode. You can specify either a single ecode or a range of ecodes on each line.

Dex relies on a number of templates to determine the precise times of the significant parts of the saccade. The default template files are in the directory **/usr/local/lib/dex**.



The default templates work well, but if you want, you can create your own template files. If you use your own templates, enter the name of the your template directory on the **Path** line, and the names of the template files on the appropriate **Template** lines. You must enter a template file for each of the active lines.

Dex needs the velocity and the acceleration of the eye to mark saccades. If you want, you can create velocity and acceleration signals using the tools in the top



## Types of Marks

The following tables list all of the marks that Dex uses.

**Table 1: Saccades**

| Mark | Saccade feature                     | Signal       |
|------|-------------------------------------|--------------|
| i    | Beginning of saccade                | Eye position |
| p    | End of pulse-driven part of saccade | Eye position |
| V    | Peak saccade velocity               | Eye velocity |
| o    | End of dynamic overshoot            | Eye position |
| d    | Start of post-saccadic drift        | Eye position |
| s    | End of post-saccadic drift          | Eye position |
| f    | Final eye position                  | Eye position |
| C    | Beginning of clipped epoch          | Eye velocity |
| L    | End of clipped epoch                | Eye velocity |

**Table 2: Pursuit**

| Mark | Pursuit feature               | Signal       |
|------|-------------------------------|--------------|
| B    | Beginning of baseline         | Eye position |
| E    | End of baseline               | Eye position |
| R    | Beginning of regression epoch | Eye position |
| N    | End of regression epoch       | Eye position |
| b    | Beginning of pursuit          | Eye position |
| f    | End of pursuit                | Eye position |
| V    | Peak pursuit velocity         | Eye velocity |

**Table 3: Vergence**

| Mark | Vergence feature       | Signal       |
|------|------------------------|--------------|
| b    | Beginning of vergence  | Eye position |
| f    | Final eye position     | Eye position |
| V    | Peak vergence velocity | Eye velocity |

**Table 4: Unit Activity**

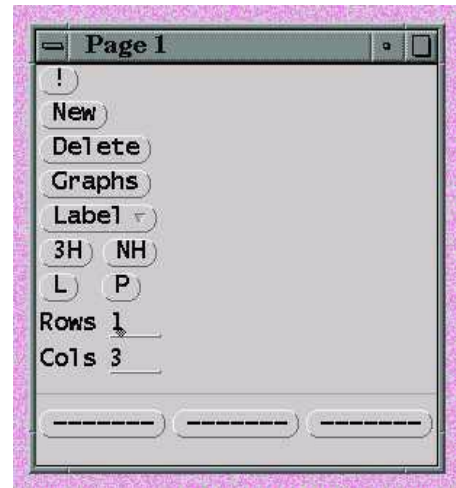
| Mark | Unit activity feature | Signal      |
|------|-----------------------|-------------|
| b    | Beginning of burst    | Raster line |
| t    | End of burst          | Raster line |

panel, but this is not necessary. If you just specify the type of marking you want, Dex will create all necessary signals. The most involved case is creating and marking saccades on polar magnitude and angle signals. To create polar signals, Dex needs to mark the saccades on the horizontal and vertical components of the signal. This, in turn requires velocity and acceleration signals for the horizontal and vertical components. Then Dex needs the velocity and acceleration signals for the polar magnitude. You can specify all of this by hand if you want. Alternatively, you can just click on the **Plr Mag** button in the signal panel, select the horizontal and vertical components, and enter the name of the polar magnitude signal on the name line. Then click the **Saccade** button in mark panel and select the polar magnitude signal from the signal list. Dex will automatically create the velocity and acceleration signals for the horizontal and vertical components; mark the saccades in those components; create the velocity and acceleration signals for the polar magnitude signal; and mark the saccades in the polar signals.

You can save the signal and mark operations by clicking on the **FILES** button in the toolbar and scrolling down to the **SAVE Sig and Mark Specs** item to bring up a save window. You can use previously defined signal and mark operations by scrolling down to the **LOAD Sig and Mark Specs** item to bring up a load window.

## Building Data Rasters

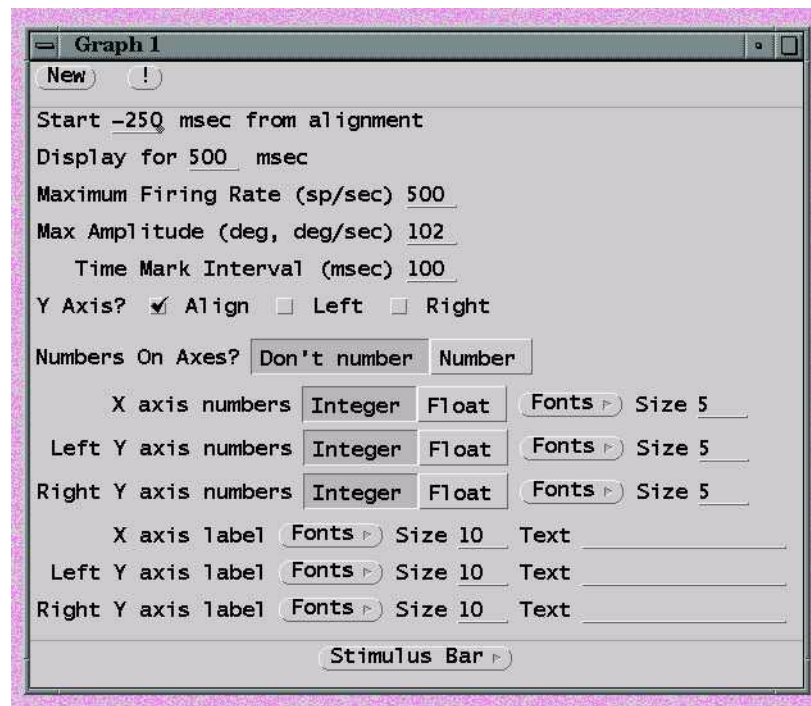
Dex allows you to compare the data from different classes of trials by drawing multiple plots on a single page. You can put up to 64 plots on one page. To specify the comparative data display, click on the **RASTERS** button in the Dex toolbar with the left mouse button. This will bring up a page layout window. The label in the layout window's frame shows that this is **Page 1**.



## Graphs

The first step is to decide the specifications of the graphs you want to use. To do this, click on the **Graphs** button in the top panel of the layout window. This will bring up the **Graphs** window shown below.

The label in the **Graphs** window's frame

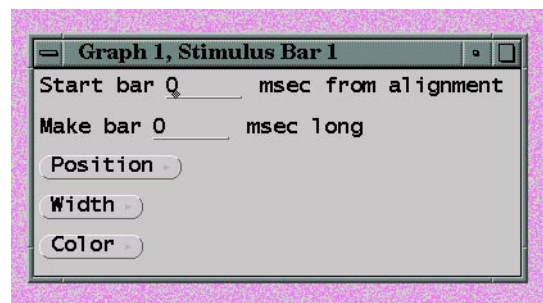


shows that this is Graph 1. As you can see, by default, Dex graphs 500 milliseconds of data beginning 250 milliseconds before the alignment time, and puts tick marks on the X-axis every 100 milliseconds. Dex assumes a maximum neuron firing rate of 500 spikes per seconds and a maximum analog amplitude of 102 deg or deg/sec. You can change any of these values by deleting the displayed value, entering the new value and pressing <return>. In particular, you will want to specify the **Maximum Firing Rate** and **Maximum Amplitude** values so that your data will fill the plot.

Dex gives you several Y-axis options. By default, Dex will put a vertical bar at time 0 as indicated by the check box to the left of the **Align** label. You can also have Y-axes on the left or right side of the plot by checking the appropriate box. Left and right Y-axes will have 5 tick marks on them. By default, Dex does not number the tick marks on the axes. If you want to number the axes, select the **Number** choice. This will cause Dex to number the tick marks on the all of the axes. You can specify the format of the numbering in each axis by checking selecting the **Integer** or **Float** choice. You select the font of the numbers from the **Fonts** menus and enter the size of the numbers used in the **Size**

fields. If you want to label the axes, enter the label in the **Text** field of each axis. Select the label font from the appropriate **Font** menu and specify the label size in the **Size** field.

You can put up to five stimulus bars under the graph to indicate events in your trials. To do this, click on the **Stimulus Bar** button in the bottom panel of the **Graphs** window with the right mouse button. You will see a menu of 5 items with only the first item active. Select the first item to bring up the **Stimulus Bar** window. Enter the starting



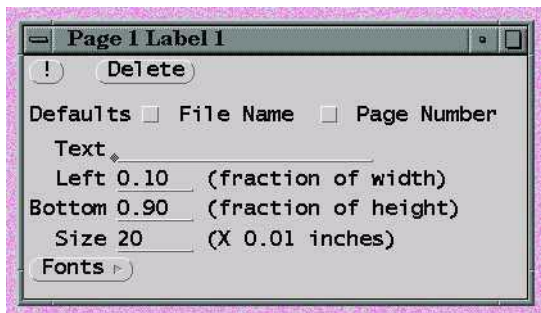
point of the stimulus bar (relative to the alignment time) and its length on the appropriate lines. Follow each entry with a <return>. You can put the bar in one of five positions under the X-axis. Position 1 is closest to the X-axis and position 5 is the farthest below the X-axis. Click on the

**Position** button with the right mouse button and select the position you want. You can set the width and color of the stimulus bar by clicking on the **Width** and **Color** buttons and selecting the values you want. If you want another stimulus bar, click on the **Stimulus Bar** button in the **Graphs** window again with the right mouse button. You will see that now two items are active. Select the second item to bring up a new **Stimulus Bar** window and define the parameters for the new bar.

If you want more than one graph, click the **New** button in the top panel of the **Graphs** window. The **Graph 1** window will disappear and a new **Graphs** window labeled **Graph 2** will come up. You can define as many graphs as you want, but you must define all of your graphs before defining the contents of the plots on the page. (See **"Plot Contents"** on page 14.) If you want to change a graph you defined previously, click on the **Graphs** button in the **Page** window and **Graph** windows will come up for each graph you have defined.

## Labels

By default, Dex does not put any labels on a page. To create page labels, click on the **Label** button in the top panel of the page window with the right mouse button. This will bring up a menu with 1 item. Select the item to bring up the **Page Label** window. Dex



can provide two types of default label, the name of the data file and the raster page number. To use these either of these defaults, check the box to the left of the **File Name** or **Page Number** labels. You can include additional text by entering it in the **Text** field. You position the label by specifying the location of the bottom left corner of the text

in fractions of the page size. The default position of **Left** 0.10, **Bottom** 0.90 is in the upper left corner of the page. The **Size** line determines the height of the characters in hundredths of an inch. The default size is one tenth of an inch high. Dex can print the label in one of three fonts. Select the font you want by clicking on the **Fonts** button with the right mouse button to bring up the font menu. Changing the font will not change the label that is displayed on the **Text** line but it will affect the page as it is viewed or printed. You can have as many labels on a page as you want. For each new label, click on the **Label** button in the **Page** window with the right mouse button. After each label, you will notice that the label menu is one item longer. If you want to change a label you defined previously, click on the **Label** button in the **Page** window with the right mouse button and select the label number from the menu. This will bring up a **Label** window for that label.

## Paper

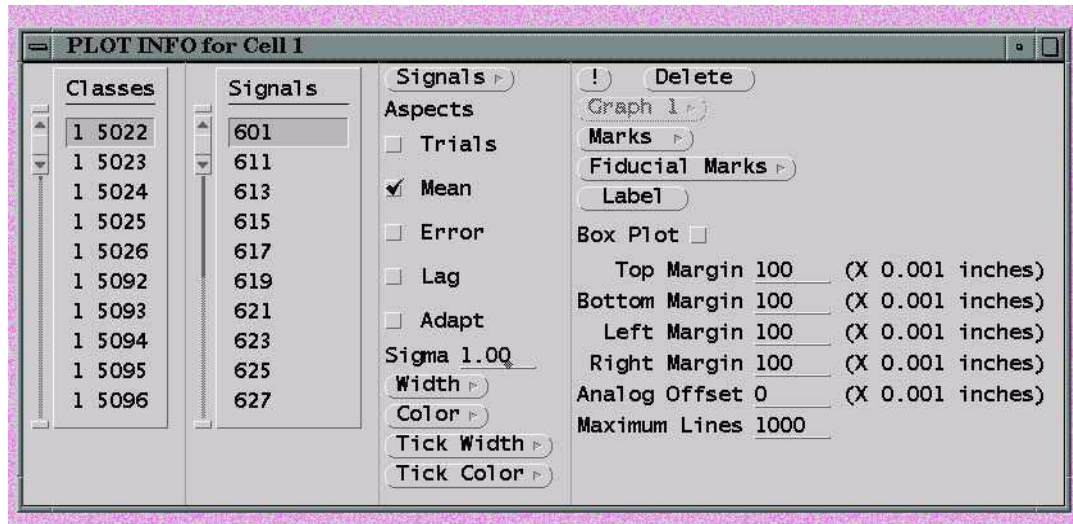
You use the four buttons below the **Graphs** and **Label** buttons in the top panel of the **Page** window to specify properties of the paper. Click the **3H** button with the left mouse button if you want to use 3-hole paper. This is the default. Click the **NH** button if you want to use paper without holes. Click the **L** button if you want the data plotted in landscape mode. This is the default. Click the **P** button if you want the data plotted in portrait mode.

## Page Layout

When you first bring up the **Page** window, the **Rows** and **Cols** entries in the top panel show that there are one row and three columns of plots, and there are three oblong buttons with dashes in the bottom panel of the window. These buttons represent spaces for the three data plots. To specify how many plots you want to put on a page, you enter the number of rows and columns in the **Rows** and **Cols** entries and type <return>. The window will change to display the number of rows and columns of buttons you selected.

## Plot Contents

To specify what to draw in a plot, click on one of the plot buttons. Dex will convert the dashes in this button to question marks to show that this is the active button and will bring up the **PLOT INFO** window. The window title shows that this **PLOT INFO for Cell 1**.



The first step is to select the class of data to plot. Go to the **Classes** list, scroll down to the class of data you want, and click on it with the left mouse button. Dex will change the question marks in the plot button to show the class of data that will be plotted.

Next, go to the **Signals** list, scroll down to the signals you want to plot in this cell and click on them. Clicking on any unselected signal will cause it to be selected. Clicking on any selected signal will cause it to be deselected. You can plot as many signals as you want in any cell. The default signal for any cell is the first unit type in your data set. In this example, unit 601. If you don't want that unit you must deselect it.

Now you need to specify how you want each signal plotted. The tools for this are in the third panel of the **PLOT INFO** window. For each signal, you can plot the individual trials, the mean of the trials, and the standard error of the mean by clicking the appropriate box. For unit signals, you can specify lag compensation and adaptive spike density kernels. You can select as many of these **Aspects** as you want for each signal. The **Sigma** line allows you to specify the starting width of the spike density kernel for unit signals. To specify the line width and color for the signal, click on the **Width** and **Color** buttons with the right mouse buttons to bring up the width and color menus.

Similarly, to specify the width and color of the tick marks in unit rasters, click on the **Tick Width** and **Tick Color** buttons with the right mouse button to bring up width and color menus. If you want to plot more than one signal in a plot, click on the **Signals** button to bring up a menu showing all of the signals you selected from the **Signals** scroll list. Select each signal from the menu, and then click on the **Aspects** you want for that signal. If you want to use the same aspects for each of the signals in this plot, it will be quicker if you select the first signal from the **Signals** scroll list in the second panel, set its aspects from the choices in panel three, then go back to panel two and select the remaining signals from the **Signals** scroll list. Dex will copy the aspects you selected for the first signal to the remaining signals.

After specifying the signals for the plot, you need to specify which graph you want to use for this plot. If you defined only one graph, then Dex will label the **Graph** button in the fourth panel of the **PLOT INFO** window "**Graph 1**" and make this button inactive. If you defined several graphs, Dex will label the button "**Graphs**" and attach a menu of your graphs to the button. Click on the **Graphs** button with the right mouse button to bring up the menu and select which graph you want to use for this plot.

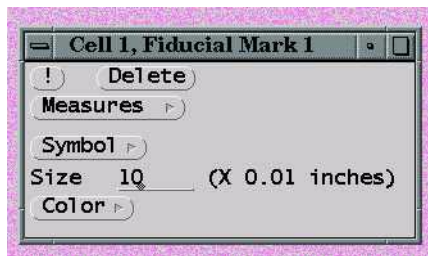


Dex allows you to plot the location of other ecodes or analog marks in a plot. Click on the **Marks** button with the right mouse button to bring up a menu of marks. At first, the menu will have only one entry labeled **NEW**. Select the menu item to bring up the



mark window. Enter the ecode or analog mark you want to plot on the **Mark** line. Enter the symbol you want to use in plotting the mark on the **Symbol** line. The symbol can be any single ASCII-numeric character or one of the key words “**hourglass**”, “**triangle**”, “**diamond**”, “**circle**”, or “**square**”. Enter the height of the symbol in hundredths of an inch on the **Size** line. If you enter a value of 0 on the **Size** line, Dex will automatically set the size of the symbols to be approximately the height of the tick marks it would use to plot individual spikes on raster lines. Select the color of the mark by clicking on the **Color** button with the right mouse button to bring up a menu of colors.

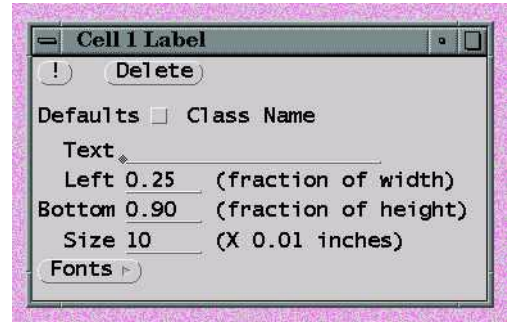
Dex also allows you to indicate on a plot the mean value of any latency measurements you make using the **REPORTS** tool (see below). You have to make the measurements before specifying any fiducial marks. Click on the button labeled **Fiducial Marks** with the right mouse button to bring up the fiducial mark window. Click on the **Measures** button



with the right mouse button to bring up a menu of any latency measures that you configured. Click on the **Symbol** button with the right mouse button to bring up a menu of symbols you can use to plot the measure. The choices are dashed line, up arrow, and down

arrow. Enter the size of the fiducial mark in the **Size** field, and select the color of the fiducial mark from the **Color** menu.

By default, Dex does not put a label on a plot. If you want to label the plot, click on the **Label** button in the fourth panel of the **PLOT INFO** window. This will bring up a label window like the one for page labels. If you



choose to label a plot, Dex can provide a default label consisting of the selection set number and ecode number. If you wish to use this default, check the box to the left of the **Class Name** item. Add any additional text you want in the **Text** field. You position the plot label by specifying the location of the lower left corner of the text in fractions of the cell size. If the **Left** value is negative, Dex will place the label to the left of the plot, and if the **Left** value is greater than 1.0, Dex will place the label to the right of the plot. Similarly, if the **Bottom** value is negative, Dex will place the label beneath the plot, and if the **Bottom** value is greater than 1.0, Dex will place the label above the plot. Enter the height of the label in hundredths of an inch on the **Size** line, and select the font for the label from the **Fonts** pull-right menu. You can put only one label on a plot.

If you want a box around the plot, click the **Box Plot** box. The default is no box.

Dex divides each page into cells, based on the number of rows and columns of plots you want. By default, Dex draws a plot inside its cell with margins of one tenth of an inch. Dex measures the top and bottom margins from the ends of the Y-axis, and the left and right margins from the ends of the X-axis. You can change any of the four margins by entering the size you want on the appropriate **Margin** line in the fourth panel of the **PLOT INFO** window. The values are in thousandths of an inch. For example, you may want to

increase the size of the bottom margin to make room for stimulus bars.

If you are plotting individual trials of analog data, you can offset the traces by entering a value on the **Analog Offset** line. The value is in thousandths of an inch.

If you selected the **Trials** aspect and want to limit the number of lines of trial data in the plot, enter the value on the **Maximum Lines** line. Dex will plot the first n trials. This will not affect the number of trials used in computing the means of signals, only the number of individual trials that are plotted.

Once you have completed the specifications for the first plot proceed to the next by clicking on another **Dashed** button in the **Layout** panel of the **Page** window. The **PLOT INFO** window will remain on the screen, but the title bar will change to **PLOT INFO for Cell 2**.

Filling out the first plot is the most laborious, because you will probably want to specify all of the values. For each successive plot, you have to specify the class of data from the **Ecodes** list, even if it is the same as the last plot. However, Dex will copy all of the

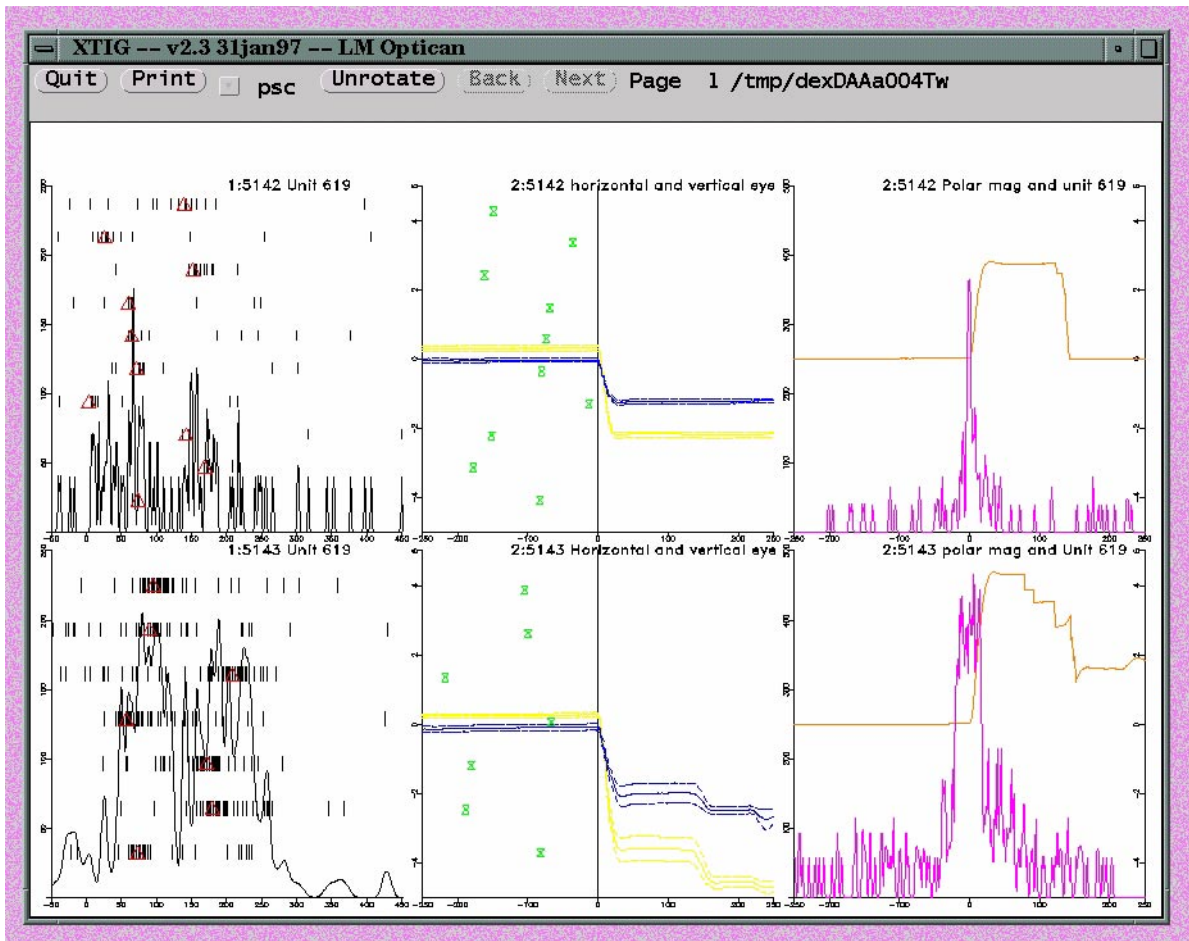
rest of the information from the previous plot to the current plot. Therefore, you won't have to re-specify the signals, aspects, graphs, marks, margins, etc. Dex does not copy the label from the previous plot, but does copy the location, font, and size of the label. If you don't click the **Label** button, Dex will not label the new plot, but if you do, the default properties of the new label will be the same as the previous label.

You can build as many pages of plots as you like. To build a new page, click the **New** button in the top panel of the Pages window. Dex will display a new **Page** window with the same number of rows and columns of cells as the previous page. Dex will copy the **Graphs** and paper properties you defined for the previous page, but not the labels.

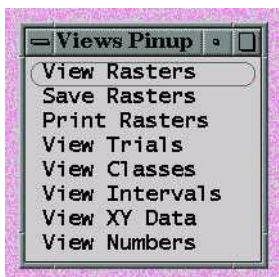
After defining the rasters, you will want to save them for future use. Click on the **FILES** button in the toolbar with the right mouse button and scroll down to the **SAVE Raster Specs** item to bring up a save window. You can use previously defined rasters by scrolling down to the **LOAD Raster Specs** item to bring up a load window.

## Viewing Data

Dex provides several ways to view your data. The options are available from the **VIEWES** menu in the toolbar. The **View Rasters** option displays the rasters you defined using the data rasters tool. The **View Trials** and **View Classes** options display data from individual trials or from classes of trials, respectively. The **View Intervals** and **View Numbers** options work with the report tool and will be described later. (See “**Summary Reports**” on page 25.)



## Viewing Rasters



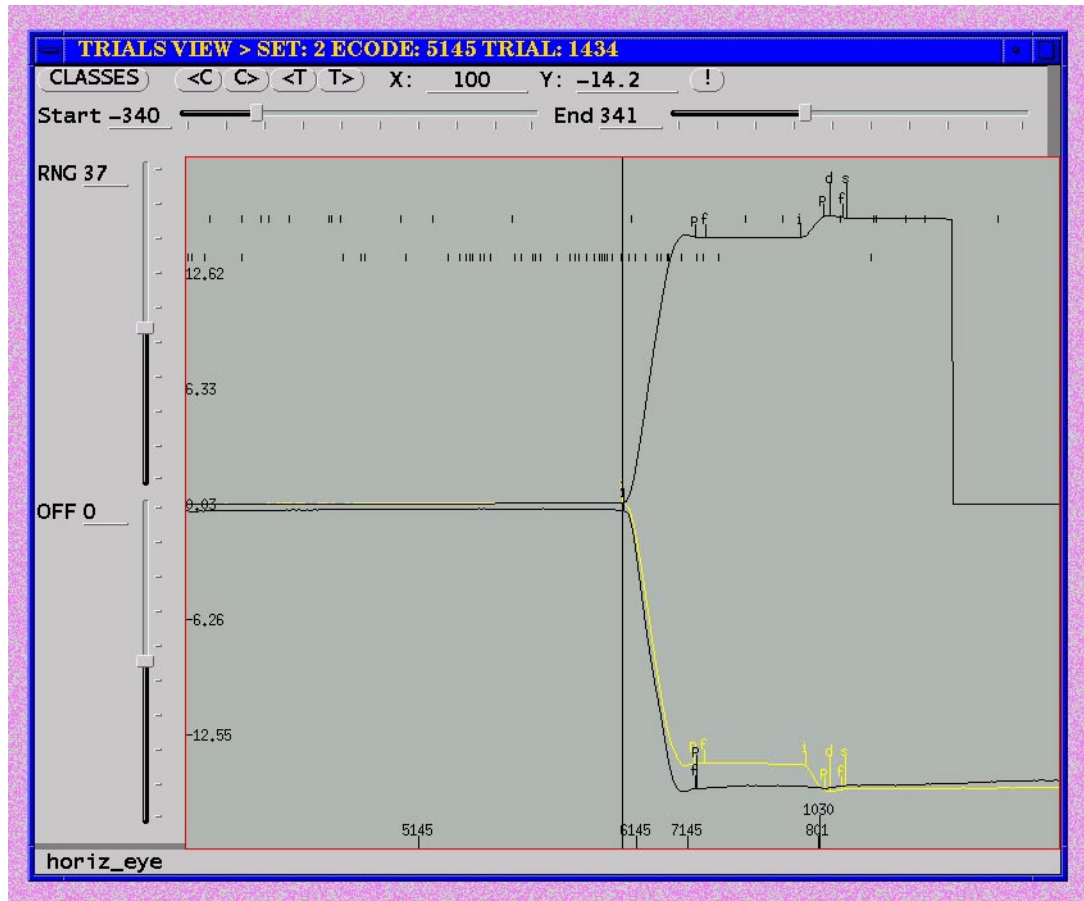
xtig as shown above. This example shows six plots of data exemplifying some of the various combinations of trials and means, unit and

If you want to view the pages of rasters you defined with the raster tool, click on the **VIEWES** button in the toolbar with the right mouse button and scroll down to the **View Rasters** item. This launches

analog data, and graphing options available with **Dex**. After viewing the rasters, you may want to change the display parameters. You can make any changes that you want to the raster display using the tools described above, but to see the changes, you will have to re-select the **View Rasters** item from the **VIEWES** menu. In addition to viewing the rasters with xtig, you can save them in either tig or postscript format by selecting the **Save Rasters** item from the **VIEWES** menu, or you can print them by selecting the **Print Rasters** item from the **VIEWES** menu.

## Viewing Trials

To view all of the data in a single trial, select the **View Trials** item from the **VIEWS** menu. This will bring up the **TRIALS VIEW** window as shown above. The window has top and side panels to hold viewing controls and a canvas for displaying the data.



Several of the display control functions described below affect only the selected signal. The selected signal is always drawn in yellow, and its name is shown in the footer at the bottom of the view. To select an analog signal, click on it with the left mouse button. This works best if you click on a nearly horizontal part of the signal. To select a unit signal, click on the line on which that unit's tick marks are drawn. When your data has many different units, it may be difficult to select an analog signal because the units and analog signals share much of the same space. In this case, you will need to use the **Show Signals** tool to turn off most of the units. In addition, if analog signals overlap considerably, you may have to turn off some to select the one you want.

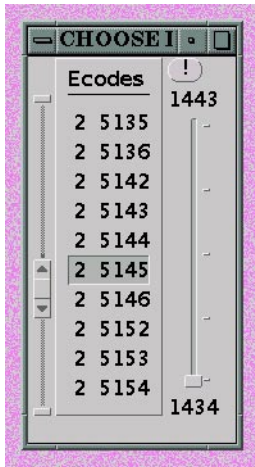
In the canvas, the vertical bar marks the alignment time for this trial. The rows of tic

marks represent unit spikes. Each row of spikes represents a different neuron. The traces are plots of analog data; in this case, the horizontal and vertical eye positions and polar magnitude. The letters above each analog signal are marks placed by the automatic marking routines. The horizontal eye position is the selected signal.

The numbers at the left side of the canvas area of the window show the scale of the window in terms of the selected signal. The numbers across the bottom of the canvas are the ecodes in the displayed portion of the trial.

The blue arrow in the canvas is a cursor. The **X:** line in the top panel of the window shows the time of the cursor relative to the alignment time. The **Y:** line in the top panel shows the value of the selected signal at the cursor.





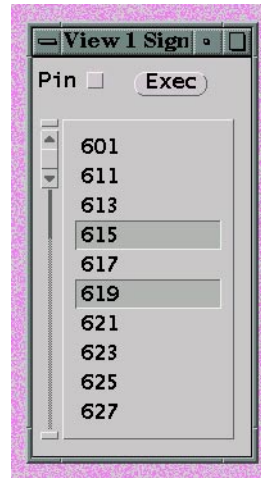
The buttons in the top panel of the window set which class of ecodes to display and which trial in that class to display. If you click on the **CLASSES** button Dex will bring up a window with a list of all of classes of ecodes in your data and a trial slider. To view the data from a particular class of ecodes, scroll to that ecode in the list and click on it with the left

mouse button. Move the slider to display the data from a particular trial. To view the next class of ecodes, click on the **C>** button. To view the previous class of ecodes, click on the **<C** button. To view the next trial in a class of ecodes, click on the **T>** button. To view the previous trial in a class of ecodes, click on the **<T** button.

By default, Dex displays that part of the trial with analog data in the **TRIALS VIEW** window. To change the display epoch, you can type in specific start and end times in the **Start** and **End** entries or you can scroll through the trial using the **Start** and **End** sliders. The **End** slider controls the magnification factor and the **Start** slider controls the starting time of the display.

By default, Dex scales all analog signals to fit the height of the drawing canvas. You can change the scale and offset of the selected signal with the **RNG** and **OFF** sliders in the left panel of the view window.

A number of other controls are available from a popup menu (not shown). Click in the canvas with the right mouse button to bring up this menu. The menu items followed by the > sign have pull-right menus attached to them. To select a pull-right menu, select the item while holding the right mouse button down and slide the mouse to the right.



By default, Dex draws all of the signals in a trial. This can be quite confusing when there are many signals. To choose the signals you want Dex to draw, select the **Show Signals** item from the popup menu. This will bring up a scrolling list of signals. Select the ones you want and click on the **Exec** button. The scrolling list will disappear and

Dex will draw only those signals you want. If you want to keep the scrolling list on the screen, click the **Pin** button. Dex will add or delete a signal as soon as you select or de-select it. To remove the scrolling list, just click the **Pin** button again.



The **Scaling** pull right menu controls the coarse scaling of the data. The **Full Scale** item sets the vertical scale of the drawing canvas to 102 degrees for all analog signals. The **Auto Scale** item adjusts the vertical scale of each signal so that it will fit on

the canvas. The **No Offset** item draws analog signals without a vertical offset. The **Mean Offset** item shifts the vertical offset of each signal by its mean. The **Events** item causes Dex to display the entire trial. The **Analog** item displays only the analog part of the trial. The **1:1** item sets the horizontal scaling to one video pixel per millisecond. The **Lock/Unlock Zoom** item disables the **Start** slider and locks the alignment bar to the center of the canvas. **Auto Scale**, **No Offset**, and **Analog** are the default modes.

The **Colors** pull-right menu displays a palette of colors Dex can use to draw signals. To set the color of a signal, select the signal, then bring up the **Colors** menu and choose the color you want. When a signal is selected,



it is always drawn in yellow, but when you choose a color, the signal will be drawn in that color when it is not selected.

The **Background** pull-right menu displays a palette of gray levels Dex can use for the canvas background.

The **Thickness** pull-right item allows you to choose the thickness of the line Dex uses to draw a signal. To set the thickness of the line used to draw a signal, select the signal, then bring up the thickness menu and select the thickness you want.



The **Cursor** pull-right menu controls whether or not the cursor is tied to the selected signal, and whether the cursor is set to select signals or to move marks. The **Oops** item undoes the last manipulation of a mark (see below). By default, the cursor is in **Track** and **Select**

modes.

The **Del/Undel Trial** item in the canvas menu is used to delete or undelete the current trial. If a trial is deleted, all of the signals are drawn in red.



It may be necessary on some trials to add, delete, or move marks on analog data. The **Add Mark** item in the canvas menu is used to add marks to analog signals. To add a mark, select the signal, set the cursor to **Track** and **Select** modes, move the cursor to the position you want the mark, and select the **Add Mark** item from the canvas menu. Enter the mark you want to add on the text line of the frame that comes up and hit <return>. The frame will disappear and the mark will be added to the signal.

To move a mark, select the signal with the mark, set the cursor to **Track** and **Mark** modes, and pick the mark up by moving the

cursor across it. When you have picked up the mark, it will turn red. It may be necessary to zoom in to **1:1** scale to pick up a mark. Now move the cursor to where you want the mark and put it down. To put down the mark, set the cursor to **Select** mode and click in the canvas with the left mouse button. When the mark is put down, it will turn yellow.

To delete a mark, pick it up as described above and select **Delete Mark** from the canvas menu. Dex will delete the mark and automatically pick up the next mark. If you want to keep this mark, put it down as described above.

If you want to clip saccades from pursuit data, and you added, moved, or deleted the saccade clipping marks **C** or **L**, you will need to re-flag your data. To do this, select the **Reflag Data** item from the canvas menu.

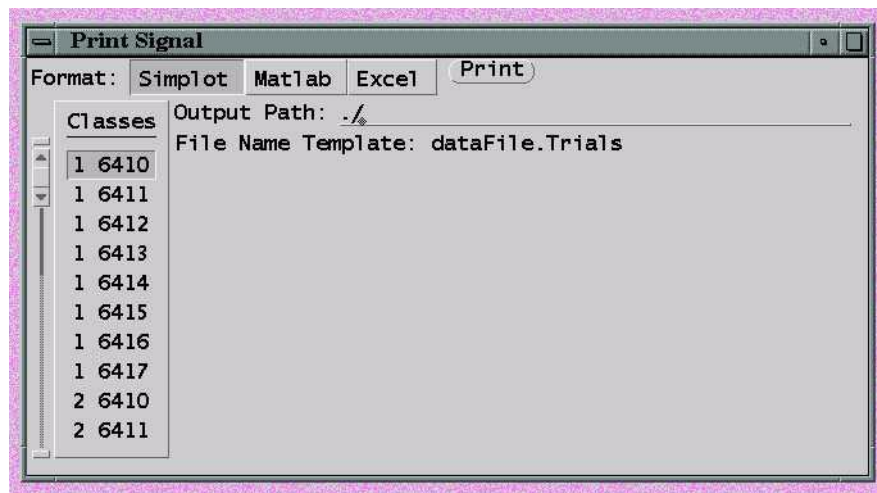


To save mark editing, click on the **FILES** button in the toolbar with the right mouse button and select the **SAVE DEX D File**

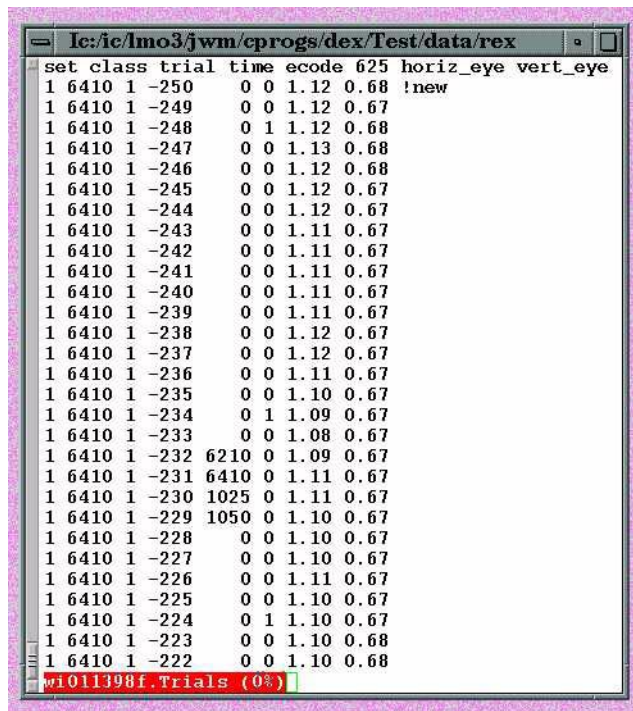
item. This will bring up a window that allows you to append a suffix to the D file. If you want to save the file with a suffix, enter the suffix and hit <return>. Otherwise, just hit <return>.

You can print out the data in the **TRIALS VIEW** in an ascii table that can be imported to Simplot, Excel or Matlab. When you print out trials data, what you see in the view governs what will be printed. Set the **Start** and **End** sliders to display just the epoch of data you want to export. If you don't adjust the epoch of the view, the output file can become hideously long. Use the **Show Signals** scrolling list to display the signals you want to export. Now select **Print Signal** from the canvas popup menu to bring up the

signals print dialog proc as shown By default,



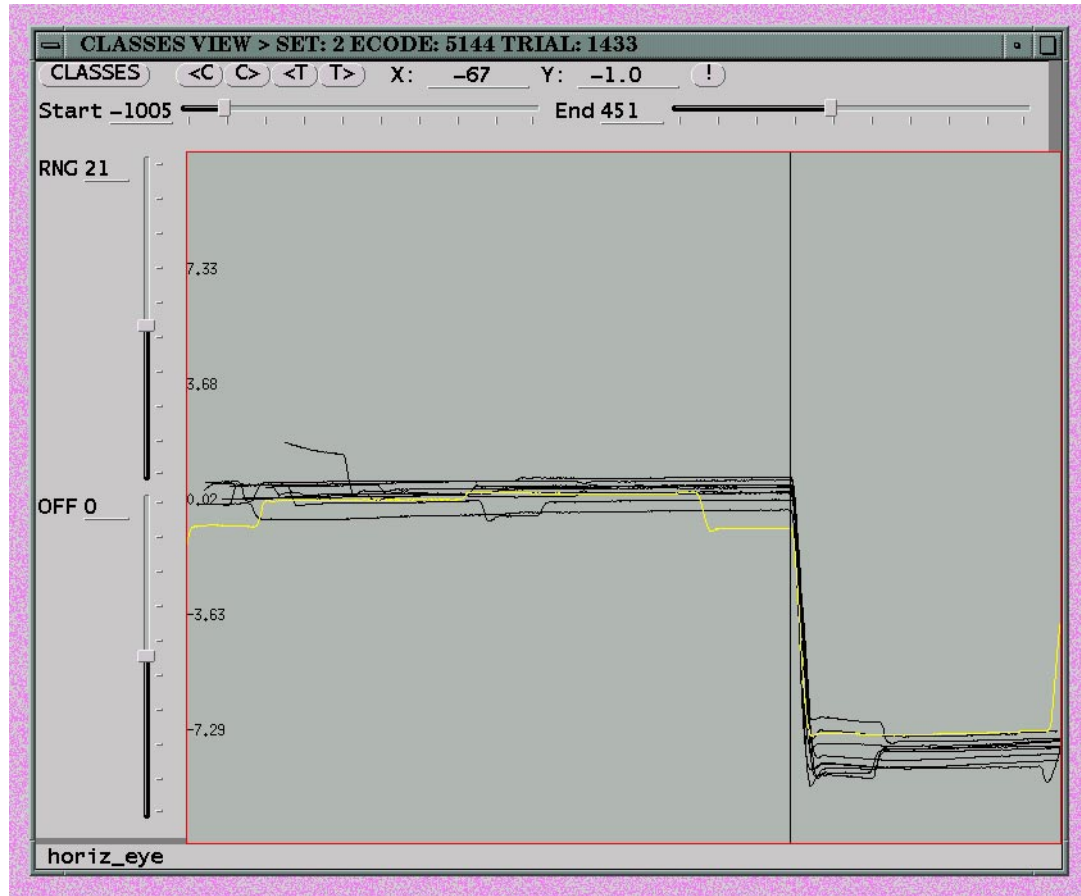
Dex exports only the trials in the class of data presently being displayed. You can select additional classes from the scrolling list in this window. For each class, Dex will print out the signals showing in the view over the epoch showing in the view. Dex will put all of the data in a single file, named “data.Trials” where “data” is the root name of your data file. In this file, each variable is printed in a separate column as shown below.



The first four columns are the selection set, data class, trial number, and time (relative to the alignment time), respectively. If the you show ecodes in the view, there will be a column with the each ecode printed at the time it occurred and zeros printed at times where no ecodes occurred. For each unit displayed in the view, there will be a column with ones printed at each time a spike occurred and zeros printed at times where there were no units. For each analog signal there will be a column with the value of the analog signal printed at each time. If you choose **Simplot** format, Dex will print a header describing each column and will print the string “!new” to the right of the beginning of each new trial. If you choose **Matlab** or **Excel** format, Dex will not print a header, nor will it mark the beginning of each new trial with the string “!new”.

## Classes View

To view one signal across all of the trials in a class of ecodes, select the **View Channels** item from the **VIEWS** menu. This will bring up the **CHANNELS VIEW** window. By default, Dex displays the analog portion of the trials, and scales the data to fit in the drawing canvas. The controls in the top and side panels serve the same functions as in the **Trials View** window. The vertical bar marks the alignment time, and the trace plotted in yellow is the current trial.

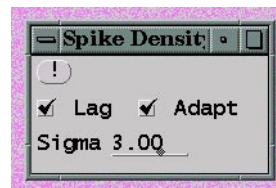


As in the trials view, additional controls are available in a popup menu. Click in the canvas with the right mouse button to bring up this menu.

There are several items in the channels popup menu that are different from the trials popup menu. Because the **Classes View** shows only one type of signal at a time, the **Show Signal** item brings up a menu of signals rather than a scrolling list.

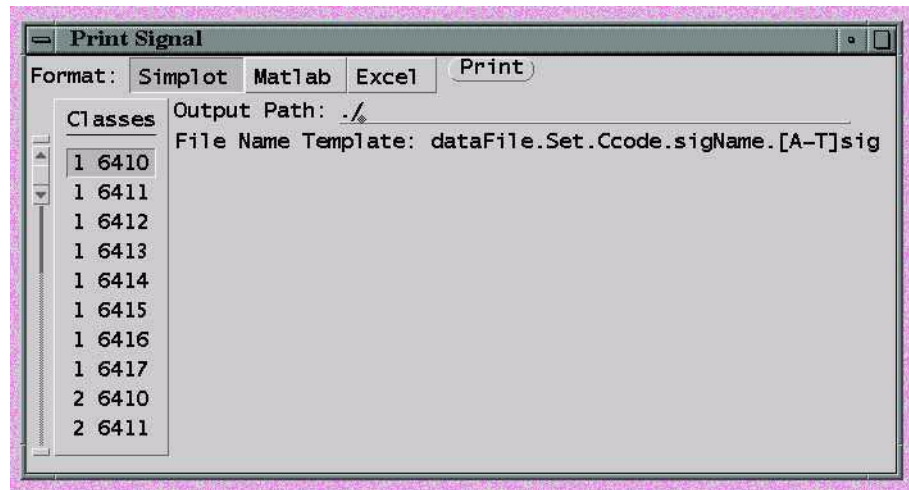
Dex displays unit data in the **Classes View** using spike density functions rather than rasters. When you display unit data in the **Classes View**, the **Spike Density** item in the canvas menu brings up a panel that allows you to control the parameters used to calculate the spike density functions. Check the **Lag** box for lag compensation and the

**Adapt** box for adaptive kernels. Enter the starting kernel width on the **Sigma** line. Changes take effect when you close the window by clicking the “!” button.



The **Mean/Trials** item determines whether Dex displays individual trials or the mean and standard error of the data.

Dex can print the contents of the channels view window in simplot, matlab or excel format. Dex prints the data as it is shown on the canvas. For example, if you had selected the **Print Signal** item from the



canvas popup menu of the channels view shown above, Dex would have printed the individual trials of the **horiz\_eye** signal from 1005 milliseconds before the alignment time to 451 milliseconds after the alignment time.

To print a signal, choose, the signal you want from the **Show Signal** menu, use the **Start** and **End** sliders to display the portion of the signal you are interested in, and set the display to means or trials. Then select the **Print Signal** item from the popup menu. This brings up a window with a format choice tool, an output path line and a scrolling list of data classes. By default, Dex prints the selected signal only for the class of data displayed in the **Classes View**, but you can have Dex print the selected signal for as many classes as you like by selecting them from the scrolling list. Dex will save each class of data in a separate file. Dex provides a default file name made up of the root data file name, the selection set number, the ecode, the signal name, and the tag letters **Asig** or **Tsig** depending on whether you want to print the mean of the trials or the individual trials.

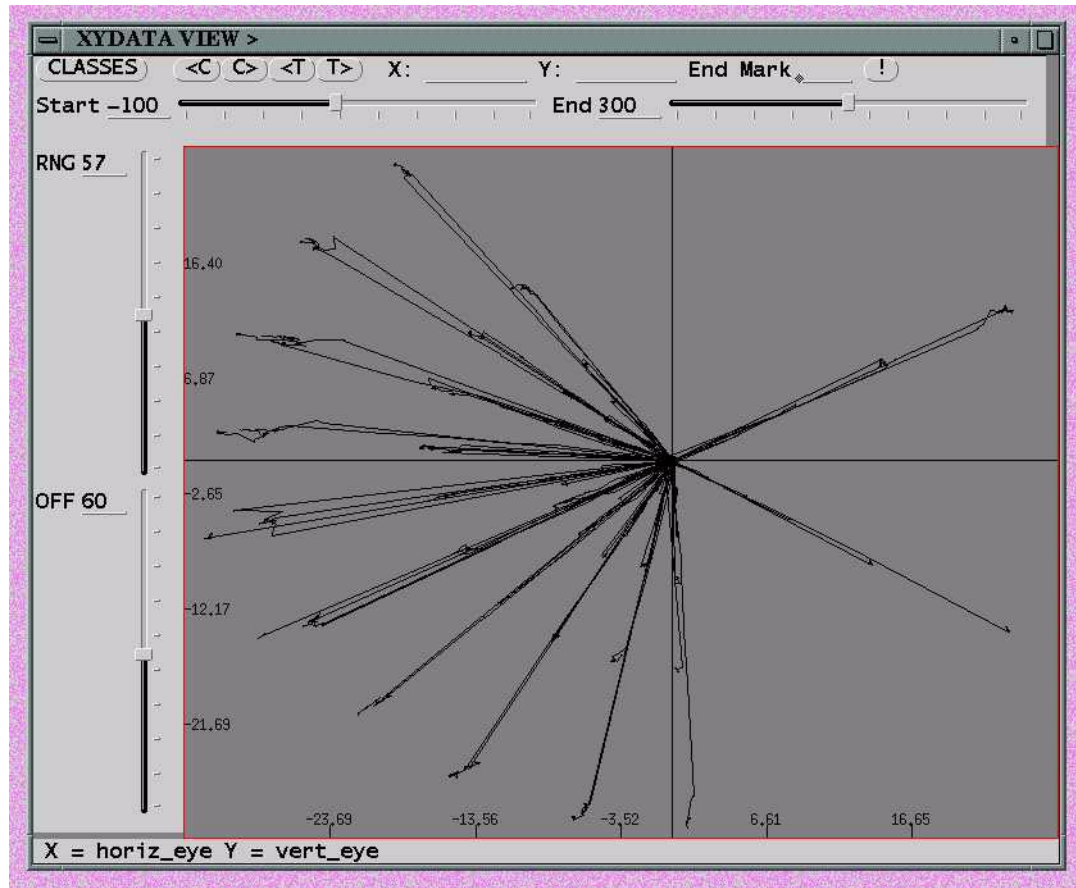
It is not possible for Rex to catch all possible errors that a subject might make in doing an experiment. In the **Classes View**

example on the previous page, the monkey made a small saccade before the alignment time on one trial. If you want to delete these trials from further analysis, select the trial by clicking on it with the left mouse button. Make sure the trial you want turns yellow. Then select **Del/Undel** from the canvas popup menu. Dex will mark the trial as deleted and draw it in red. If you switch to displaying means, you should see that the mean and error bars changed. All other signals from this trial will also be drawn in red. If you have the **Trials** view open, Dex will switch to the offending trial as soon as you select it from the **Classes** view, and will display all of the trial's data in red. To save this editing, click on the **FILES** button in the toolbar with the right mouse button and select the **SAVE REX S File** item. As with the **D** files, you can save the **S** file with or without a suffix. If you use both the trials and the channels views and want to scale the data the same way in both views, select the **Bind/Unbind Views** item from either view's popup menu. Then, changing the display controls in one view will affect the other view as well.



## Viewing Data in XY Format

Most of the data that Dex provides are Y-T plots. That is a variable plotted against time. In the **XYDATA VIEW**, one variable is plotted against another. To view one signal plotted against another, select **View XY Data** from the **VIEWS** menu. This will bring the **XYDATA VIEW**.



In this example The horizontal eye position is plotted on the X axis and the vertical eye position is plotted on the Y axis. However, you are not limited to plotting one analog signal against another. You can use the **XYDATA VIEW** to plot a spike density function against an analog signal or one spike density function against another. To set the signal to be plotted on the X axis, click in the canvas with the right mouse button to bring up the canvas menu then select the signal from the **X Signal** pull right menu. Choose the Y signal in the same manner.

The **Start** and **End** sliders determine what epoch of the signals will be used in the plot. If you find it difficult to get a good looking plot by manipulating the start and end times in the **XYDATA VIEW**, you can use the **CLASSES VIEW** to determine the epoch

and then apply that time to the **XYDATA VIEW**.

In this view, the **RNG** slider on the left side of the canvas controls the gain in the Y dimension and the **OFF** slider controls the gain in the X dimension.

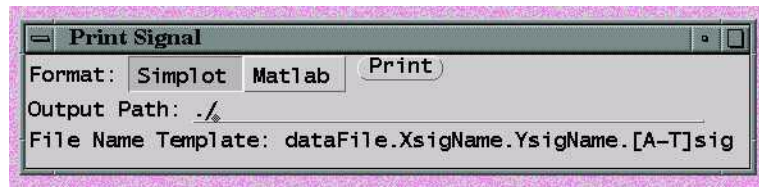
Unlike the trials and classes views, the xydata view can plot multiple classes of data at once. Click on the **CLASSES** button with the left mouse button to bring up the scrolling list of classes. Now just click on each class of data you want to display in this view.

By default, Dex displays the means of the signals because drawing multiple classes of data can be time consuming. Once you have set up the view to display the data the way you want it, click in the canvas with the right mouse button and select the **Means/Trials** toggle item.



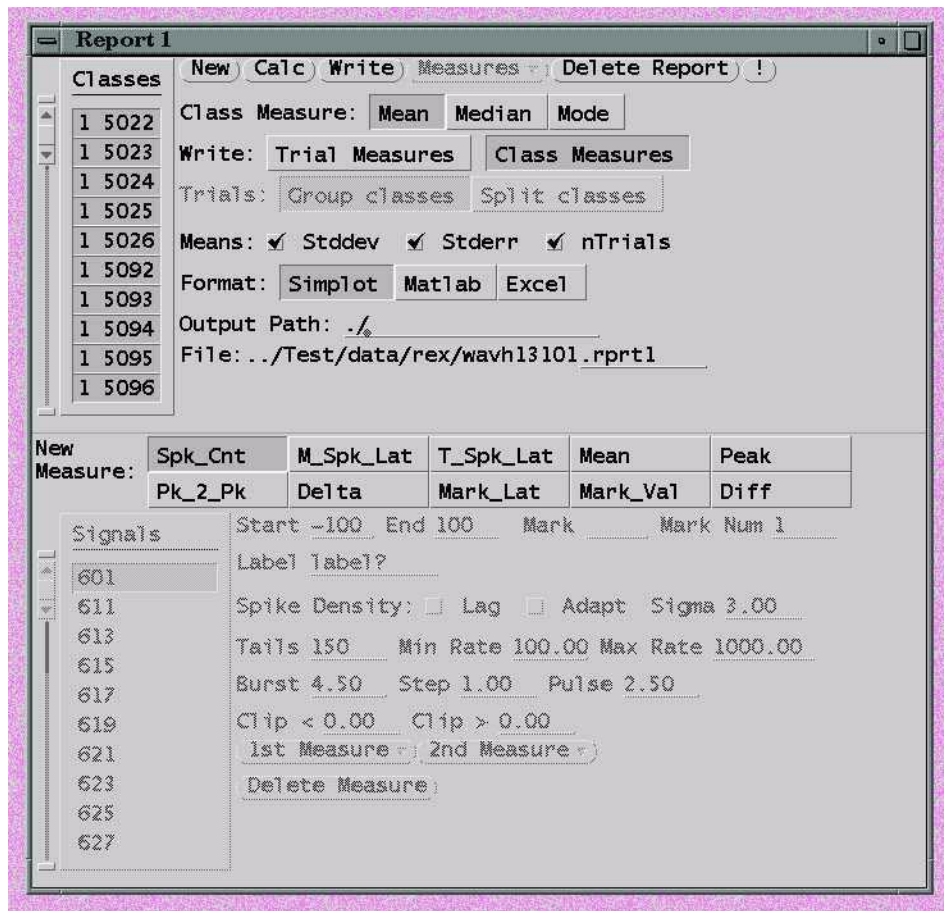
Dex can print out the signals in the **XYDATA VIEW** so you can import them into other programs such as simplot, or matlab. Click in the canvas with the right mouse

button and select the **Print Signals** item to bring up the print dialog. Dex will print out the data as it is shown in the view.



## Summary Reports

Dex can provide a number of measurements of your data. Any number measurements can be grouped together into one file called a report. You can specify as many reports as you wish. The reports are printed in ASCII in simplot format. There are two basic types of reports, those that print the value of the measure for each trial, and those that print the average of the measures for each class of trials.



To generate reports click on the **REPORTS** button in the toolbar with the left mouse button the report tool shown above. The top half of the report tool contains items

to allow you configure the report. The bottom half of the tool contains items to allow you to specify the measurements that will be included in the report.

## Configuring a Report

Dex makes each measure on all classes of data by default. To limit the classes, use the **Classes** scrolling list to deselect the classes of data you **don't** want in the report.

Dex can provide three measures of central tendency; the mean, the median or the mode. The default measure of central tendency is the mean. If you want the median or mode instead, click the appropriate choice.

If you want the individual trial measurements included in the report, select **Trial Measures** from the **Write:** choices. If you want the mean measurements, select the **Class Measures** choice. You can choose both if you want.

If you choose **Trial Measures**, the **Trials:** choice item will become active. This item lets you choose whether you want Dex to write the trial measures for all classes to one

file (**Group classes** choice) or to separate files, one for each class of data (**Split classes** choice).

When you select the **Class Measures** choice, Dex, by default, writes the mean, standard deviation, standard error of the mean, and the number of trials. If you don't want all of these values, uncheck the corresponding box in the **Means:** check box item.

The format of the report can be in simplot, matlab or excel format. Choose the format you want from the **Format** choices.

The path item allows you to specify the directory in which you want Dex to write the report.

Dex builds the report file name from the root data file name, a user definable suffix, and a fixed suffix, Tmsr for trials reports and Amsr for means reports.

## Configuring a Measurement

The first step in specifying a measurement is to select which measure you want from the **New Measure:** choice item. Even though the **Spk\_Cnt** item is shown as selected, there are no default measures, so you must click on one of the 8 choices. Next select the signal you want to measure from the **Signals** scrolling list. If you have the **Intervals View** open (See "Viewing Data" on page 17.) Dex will display that signal with the measurement interval indicated by vertical dashed lines as shown below. This allows you to see the data that will be measured. The coarse dashed line indicates the start of the measurement interval, and the fine dashed line indicates the end of the interval. Functionally, the **Intervals View** is the same as the **Classes View** described earlier, except that the **Intervals View** has a **Recalculate** item in the canvas popup menu instead of a **Print Signal** item.

Dex can make 10 different types of measurements. The **Spk\_Cnt** choice counts the number of spikes in the measurement interval for unit data. It has no meaning for analog data.

The **M\_Spk\_Lat** choice measures the latency of a unit response from the alignment time using the mean spike density function.

The **T\_Spk\_Lat** choice measures the latency of a unit response from the alignment time using the individual trial spike density functions.

The **Mean** choice measures the mean value of the signal over the measurement interval. For unit data this is the average firing rate in spikes/second.

The **Peak** choice measures the most extreme value of the signal in the measurement interval. For unit data this is the peak firing rate in spike/second. For analog data, the **Peak** measure is signed. That is, if the most extreme value is a valley, the measure will be negative.

The **Pk\_2\_Pk** choice measures the difference between the largest and smallest values of the signal in the measurement interval. This measure is also signed. That is, if the absolute value of the most negative point in the signal is larger than the absolute value of the most positive point in the signal, the value will be negative.

The **Delta** choice measures the difference between the first data point in the measurement interval and the last data point in the measurement interval.

The **Mark\_Lat** choice measures the latency of a mark or an ecode falling in the

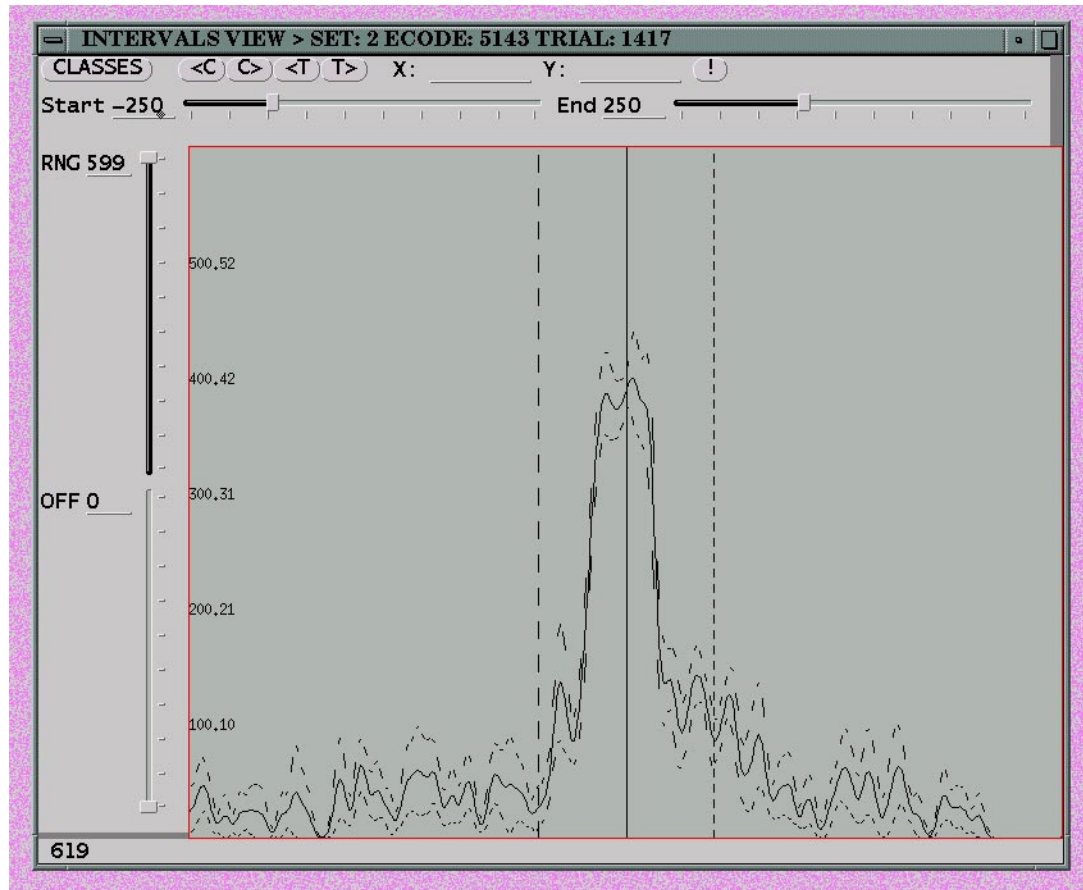
measurement interval from the trial's alignment time.

The **Mark\_Val** choice measures the value of an analog signal at the first specified mark that falls within the measurement interval.

The **Diff** choice measures the difference between two previously defined measures. When you select **Diff**, the two buttons labeled **1st Measure** and **2nd Measure** become active. These buttons display menus of all of the measures in this report. Dex subtracts

the value of the measure you choose from the **2nd Measure** menu from the value you choose from the **1st Measure** menu.

The default measurement interval starts at 100 milliseconds before the alignment time and runs until 100 milliseconds after the alignment time. You can change this interval by entering the start and end times that you want in the report tool or by moving the dashed lines in the **Intervals View**.



You move the interval lines much as you move marks in the **Trials View**. Use the right mouse button to bring up the canvas popup menu and choose **Cursor > Mark**. Click in the canvas with the left mouse button to display the canvas cursor. The canvas cursor should be red. Hold the left mouse button down and slide the cursor across the interval line you want to move to pick it up, then release the mouse button. If you succeeded in picking up the interval line it will turn red. Now click in the canvas with the left mouse button at the location you want to place the interval line. The new time will be shown in

the report tool and in the **X:** line in the top panel of the **Intervals View**. After moving the interval line you must put it down by choosing **Cursor > Select** from the canvas popup menu, then clicking with the left mouse button anywhere in the canvas. The interval line will return to its original color after it has been put down. Dex will automatically recalculate the measurement associated with the interval after either the start or end lines have been moved and put down.

The **Mark** item in the **Measures** panel serves a dual purpose. For the **Mark\_Lat** and

**Mark\_Val** measures, you enter the mark or ecode for the measurement in the **Mark** item. For all other measures, the event entered in the **Mark** item serves as an alternate interval ending point. That is, Dex will make the measurement from the time entered in the **Start** item to the time entered in the **End** item or to the time of the event entered in the **Mark** item, whichever comes first.

Each measure in a report must have a label. The default is **lable?**, but you can enter anything you like as long as there are no embedded spaces.

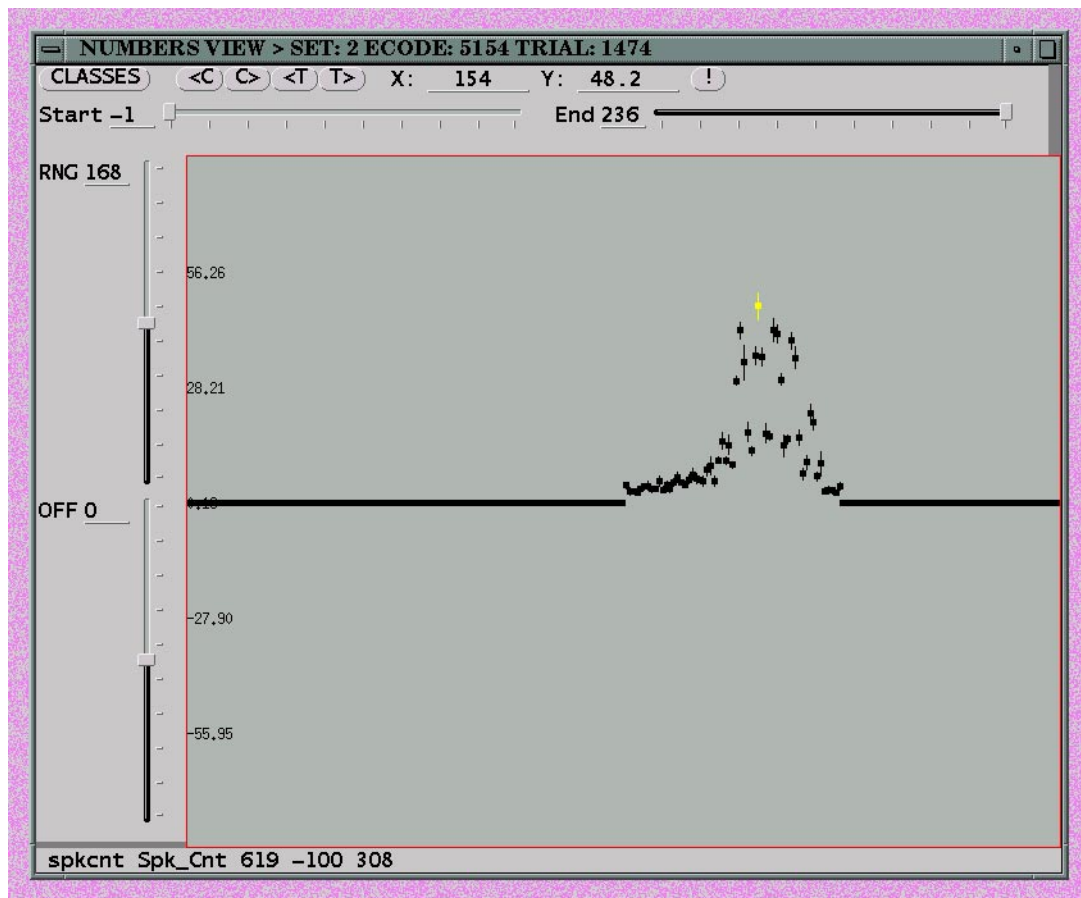
The **Lag**, **Adapt**, and **Sigma** items allow you to configure the computation of the spike

density functions when you want **M\_Spk\_Lat**, **T\_Spk\_lat**, **Peak** or **Pk\_2\_Pk** measures on unit data.

The **Clip** items allow you enter clipping values to automatically delete trials from you analysis. Dex will automatically delete any trial that has a measurement value less than the value you enter in the **Clip <** item, or greater than the value you enter in the **Clip >** item. The default value of 0.0 indicates no clipping, so if you want to clip trials that have a measurment value of 0.0, you must actually enter some very small value such as 0.01.

## Viewing Measurements

After you have defined the measures in each of your reports, you can click the **Write** button or the **Calc** button in the top panel of one of the report frames. Clicking on the **Write** button causes Dex to compute the measures and write the reports. If you click on the **Calc** button, Dex will compute the measures, but won't write the reports. This is useful if you want to edit your data based on the values of the measures that you obtain.



To view the measures, select the **View Numbers** item from the **VIEWS** button in the

toolbar. This brings up the **Numbers View** as shown above. The **Numbers View** is similar

to the **Classes View** with the following exceptions: The X axis displays class or trial number rather than time. The canvas popup menu has a **Write Reports** item, but does not have a **Print Signal**, a **Spike Density**, or a **Bind/Unbind Views** item. The **Show Signal** item in the canvas popup menu brings up a menu of all of the measurements you made across all reports. The name of the current measure is shown in the footer at the bottom of the frame.

By default, the **Numbers View** window displays the means of the measurements. Each square is the mean of the measure for one class of trials. The vertical bars show the standard error of the mean. The square for the current class is drawn in yellow. Classes with no measures are given a value of 0.0.

You can select a particular class of trials by clicking the <C or C> buttons, by using the scrolling list from the **CLASSES** button, or by clicking on a square. When you click on a square, it will turn yellow and the set and numbr of the class will be shown in the title bar of the frame. If you have the **Classes View** or **Trials View** open, they will display the class of data you selected.

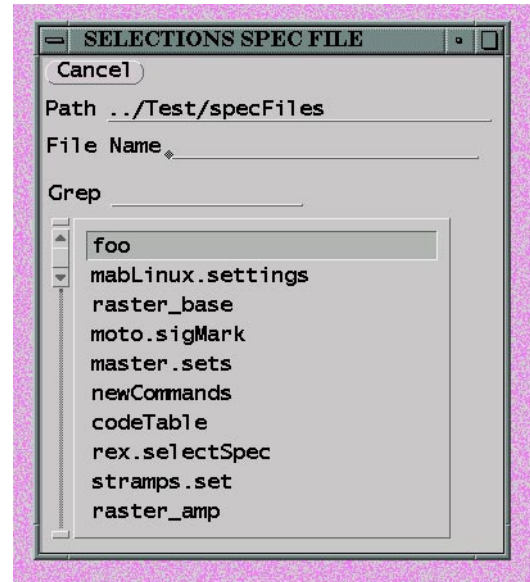
To display the individual trial measurements for the current class, select **Mean/Trials** from the canvas popup menu. Each square is the measure for one trial. The square for the current trial is drawn in yellow. The squares for deleted trials are drawn in red. To select a trial, click on its square with the left mouse button. If you have the **Trials View** open, it will display the data from that trial. If you delete or undelete a trial, Dex automatically recomputes all measures. You can see the result by switching back to the means.

After you are satisfied with the measurements you can write them by clicking on the **Write** button in one of the report frames, or you can select the **Write Reports** item from the **Numbers View** canvas popup menu.

## Saving and Loading Configuration Files

After you set up your configuration files, you can save them for future use. To do this, click on the **FILES** button in the Dex toolbar

with the right mouse button. This will pull down the **FILES** menu. Scroll down to the list of **SAVE** items in the menu and release the mouse button on the type of configuration file you wan to save. This will bring up a save window with **Path** and **File Name** entries.



Enter the name of the directory where you keep your specification files on the **Path** line and hit <return>. Dex will attach a browser panel to the bottom of the window that shows you the contents of the directory. Click on one of the file names in the directory or enter a new file name on the **File Name** line followed by a <return>. Alternately, you can enter the full path and file name of the configuration file on the **File Name** line and hit <return>. The window will disappear and Dex will save your trial selection criteria.

The browser panel has a line labeled **Grep**. If you enter a string of characters on the **Grep** line, the browser will show only those files that contain that string in their names.

To use the same trial selection criteria the next time you use Dex, load them by clicking on the **FILES** button in the Dex toolbar with the right mouse button, and scrolling down to the **LOAD** items. Dex brings up a load window. Enter the name of the directory where you keep specification files on the **Path** line and hit <return>. Dex will give you the file browser. When you click on the file you want to load in the browser, the window will disappear and Dex will load your configuration criteria.



As you can see from the **FILES** pulldown menu, Dex has a number of specification files. Dex allows you to save and reuse all of the specification files needed. To make loading multiple specification files easier; you can save all of the file names using the Settings entry.

## Settings

Dex allows you to save the specifications of your analysis in ASCII files so that you can reload them rapidly. Dex also has a meta-specification file called the **Settings** file. This file contains the names of all of the individual specification files, the path name of the directory where you keep the specification files, the path name of the directory where you keep your data, and the path name of the directory where output is written. This file also contains the location of the tool bar. If you opened the **Trials**, **Channels**, **Interval** or **Numbers** views, Dex will record the specifications for these views in the settings file.

Click on the **FILES** button in the toolbar with the right mouse button and choose the **SAVE Settings** item. Dex will bring up a specification file save panel as shown above. Enter a file name on the **File Name** line or click on a file in the browser. If you have unsaved specification files or auto marking menus, Dex will bring up a panel that allows you to enter names for each unsaved file as



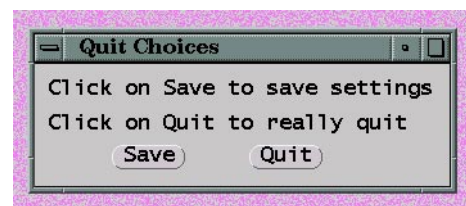
shown here. On each specification file line, enter only the name of the file, not the full path. If you haven't entered a directory for your specification files, Dex will put a line in this panel for a directory. If you don't want to save a particular specification, don't enter a name on its line. Click on the **Save** button. Dex will save the settings and any specification files you entered. Now, to duplicate a work session, choose **LOAD Settings** from the **FILES** pulldown menu and

enter your settings file name. Then choose **LOAD REX Data** from the **FILES** pulldown menu to load data and start your session.

Dex determines which specification files need to be saved by checking to see if you set up specifications, but did not enter a file name. Therefore, if you loaded a set of specifications, then modified them, Dex will not automatically save them.

## Quitting Dex

To quit an interactive Dex session, click on the **QUIT** button in the toolbar. Dex will bring up a **Quit Choices** window as shown. If



you click on the **Save** button, Dex will bring up specification file window that allows you to save the settings as described above. Dex will save the settings but will not quit. To really quit, you will need to click on the **QUIT** button in the toolbar again and chose the **Quit** option from the **Quit Choices** window.

## Command Line Arguments

Dex has several command line arguments that allow faster startup and batch processing. To see the command line arguments, type `dex -h` for the following help message. In this example, the command line

### Command line arguments:

- s settingsFile
- d dataFile
- c commandsFile
- r rasterFile
- v verbose output
- Se S file extension
- De D file extension

### Example:

```
dex -s settingsFile -d dataFile1 \
-d dataFile2 -c commands
```

example is wrapped to the next line. If you need to continue the command line arguments to another line, be sure to type a

backslash (\) at the end of each line. If the Settings file contains the path of your data directory, you should enter only the root name of the data file after the -d flag. If the Settings file doesn't contain the path of your data directory, then you must enter the entire data path and name.

## Batch Mode

After you have developed the necessary configuration files, you can run Dex in batch mode. To run in batch mode you need to build a list of commands that you want Dex to execute. To build the list of commands, start Dex and choose the **SAVE Commands** item from the **FILES** pulldown menu. This will bring up a path and file name window. Enter the path and the name of the

commands file and type <return>. Dex will take down the window. Now just execute the commands in interactive mode. Dex will record each command that it can run in batch mode in the commands file as you execute it. When you quit, Dex will save and close the commands file. To run in batch mode, enter the commands file and a data file on the command line when you start Dex, i.e. **dex -c ../specFiles/commands -d data**.

Dex can execute the following commands in batch mode; all of the **LOAD** commands from the **FILES** pulldown menu the **Print Signal** command from the channels view popup menu, the **View**, **Save**, and **Print Rasters** commands from the **VIEWS** pulldown menu, and the **Write** command from the reports tool