

## **Section II**

### **The Chronobiology Kit Analysis for Windows XP/2000 (Vers. 1.06)**

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The Windows program KitAnalyze is used to analyze the circadian data collected by The Chronobiology Kit.

#### **Setup**

To install the software from the installation CD, copy the program KitAnalyze.exe to any directory that you wish. If you use this program frequently, you may want copy it to the Desktop for easy access.

#### **Property Configuration Files**

When the program is started, it will look in the "Start in" directory for a configuration file named DEFAULT.CFG. If found, the program will be initialized with that file's settings. If no DEFAULT.CFG file is found, the program will initialize with the programmed default settings. The "Start in" directory can be changed by changing the icon's shortcut setting Properties after right-clicking on the icon.

Therefore, if there are standard settings that everyone using the program wishes to use, invoke Settings/Save Properties As to save a file named DEFAULT.CFG . Alternatively, you may rename a previously saved configuration file to have the name DEFAULT.CFG.

If individual users have setting preferences that they want automatically initialized, they may make a separate shortcut icon with a different "Start in" directory and have their own DEFAULT.CFG configuration file in that directory.

#### **Using KitAnalyze**

To perform any of the analyses, data must first be read from a disk and loaded into the computer's memory by selecting File/Open. This scheme is used to minimize the time it takes to do an analysis by circumventing the need to reread the data for additional analyses or when rerunning analyses after changing some settings. After a data set is loaded, its actogram will be displayed.

No matter how much memory your computer has, the absolute maximum number of days of data that can be loaded per data set is 4000.

The desired analysis can be selected from the list box or edit control below the toolbar.

To perform an analysis, press F11 or the GO button in the toolbar after loading the data you wish to use. The analysis will be computed and the program will plot the results in the program window. When you have the plot the way you want it, invoke Print from the File menu to send the plotting instructions to an output device.

## **Periodograms**

The KitAnalyze program makes available to you five different ways of computing periodograms. Three of the periodograms use statistical calculations (Poisson, Chi-Square and Deviation). The Schuster periodogram uses sines and cosines fitted to the data. See Appendix B for the mathematics involved and published references.

The user can set the range of periods that will be evaluated in Periodogram Settings. The minimum period that can be evaluated is 2 hours and the maximum is 2000 hours. The plots are normalized to the maximum point, which will have its corresponding period printed above it. The Fourier Periodogram does not have the resolution to accurately calculate a data segment's period but it is a very good way to show whether a periodic behavior does or does not exist in the data. Therefore, the period printed above the Fourier's maximum should be used for relative comparison only.

After computing a periodogram, pressing the A Tau button will set the Actogram tau setting to the period corresponding to the maximum value. Similarly, pressing the P Tau button will set the data set's tau to the peak value's period. This data set tau is used for calculation of the Rhythm Profile.

The maximum number of data points that all but the Fourier analysis can handle is limited only by the available computer memory. Alter the Step Size to change the resolution of the resulting plots, the noise level of the results or the computation time.

The Fourier Periodogram uses the Fourier Transform to translate data from the time domain into the frequency domain. The maximum number of data points that the Fourier analysis can handle is 32,768. The results are plotted with low frequencies (long periods) to the left and higher frequencies to the right. The leftmost point plotted is the amplitude of that part of the data with a frequency of one, which makes its period equal to the length of the data being analyzed. The next point is for a frequency of two, the next point for a frequency of three and so on. The rightmost point will correspond approximately to the low period setting. There is no high period setting for the Fourier Periodogram. The point corresponding most closely to a 24 hour period is marked on the axis.

The method to calculate periodograms in this version of the analysis differs from previous versions in that data combined together for computation by the step size setting have been normalized to a per minute value. For example, if the step size is 5 minutes, the five values summed together are then divided by 5 before computing the periodogram. Previously, just the sum was used. This change makes no difference in the resulting

shape of the periodogram curve. But it may change the value associated with the periodogram peak in some of the analyses, such as the Schuster Periodogram.

### **Time Series**

This analysis plots a series of points representing the average of data within windows of length equal to Step Size. The maximum number of points that can be plotted is 6,000. Counts are normalized to per minute values.

The result shows the linear time course for the data set. For example, if Step Size is set to the animal's period, you can see the overall change in daily activity. Or you can set Step Size to one fourth of the period to demonstrate the gross circadian fluctuation.

### **Rhythm Profile**

This analysis computes and plots the average period profile for an animal's data. The results are plotted as a number of bins representing the 360 degrees of the animal's subjective day. The maximum number of bins allowed is 1,500. Line plots end at the same level as they begin because the plot is essentially circular. Degree 360 is the same as degree 0.

Given the animal's specific period, the program averages an animal's data into the bin corresponding to that portion of its "day". Results show the average amplitude of an animal's data for different times within its "day". It can also be thought of as the probable level for the animal at different times of "day". Values are normalized to per minute values.

### **Actogram**

Actograms are a series of lines representing blocks of data organized as days. For each "day", actograms show at what time activity or other measurement is concentrated within the day so that a person can see trends more easily. It is an excellent method for seeing an overview of an animal's behavior.

To make the actograms less noisy, that is, to remove extraneous lines or gaps, the user can raise the threshold or increase the block size. The user must remember that since a number of different actograms can be produced from the same data just by changing the settings, it is possible to misinterpret an actogram's data by interpreting its format. For example, if the block size is increased to an hour and the threshold set very high, the animal's rhythm will appear discrete and consolidated.

The number of days of data that can be plotted on one page is limited by the length of your paper and the raster height limits how many lines of data will physically fit on a page.

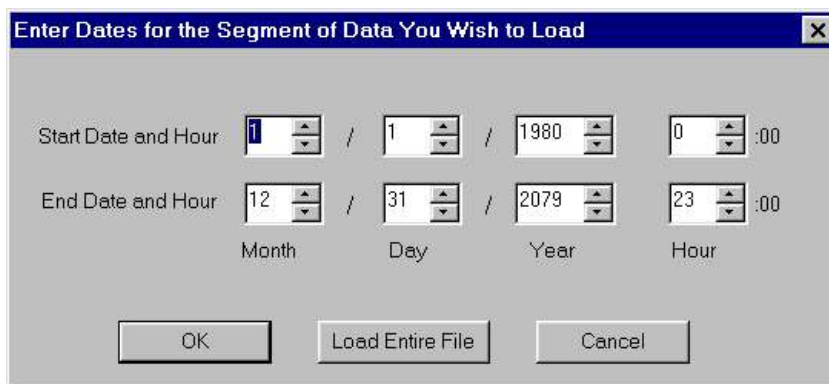
## Labels

All the labels printed on the plots can be changed by the user. To change a label, bring up the appropriate analysis property dialog and type in the text that you desire. The Windows extended character set can be used by holding down the ALT key and typing numeric keypad numbers.

## File

### Open

Use this function to specify which segment of data you wish to load for analysis. If "Ask for Begin and End Times when Opening Files" in Properties/General is set, after selecting the file that contains the appropriate data, the program will display a dialog to specify the segment of data within the file to load.



The screenshot shows a dialog box titled "Enter Dates for the Segment of Data You Wish to Load". It contains two rows of date and time input fields. The first row is for the "Start Date and Hour" and the second row is for the "End Date and Hour". Each row has four input fields: Month, Day, Year, and Hour. The Start Date is set to 1/1/1980 and the Start Hour is 0. The End Date is set to 12/31/2079 and the End Hour is 23. Below the input fields are three buttons: "OK", "Load Entire File", and "Cancel".

Field	Start Value	End Value
Month	1	12
Day	1	31
Year	1980	2079
Hour	0	23

### Specifying the Data Segment

Enter the beginning date (as MM/DD/YYYY) and beginning hour and the ending date and hour for the data that you wish to use.

When attempting to read data, the program will jump to the first record in the file matching or after the start date and hour. Data will be read until reaching a record at or after the end date and hour, the end of the file, if reached, or computer memory is exhausted. An actogram will then be drawn to verify what data was loaded. If there are no records in the file within the time range, the user will be notified and the file ignored. Pressing the Load Entire File button will close the dialog and the program will attempt to load the file from beginning to end.

### Auto Compute/Print Data

To analyze and print multiple data files without user intervention, select this menu item. An Open file dialog will be presented where the user can choose more than one file. Groups of files can be chosen by holding down the shift key when clicking on the end of the block of files. Alternatively, individual, non-adjacent files can be selected by holding down the Ctrl key when clicking on the filenames.

When "Ask for Begin and End Times when Opening Files" has been selected under General in Properties, before the Print dialog is presented, the program will query the user for the range of dates of the segments to load.

### **Next File/Go F10**

Pressing the F10 key, clicking on the Next button or selecting this menu item will load the next data file in the default directory and then perform the current analysis using this data. When "Ask for Begin and End Times when Opening Files" has been selected under General in Properties, each time a file is opened the program will query the user for the range of dates of the segment to load. Until the user uses the standard open file procedure, the default directory is the directory where the KitAnalyze program is located.

### **Print**

Select this menu item to print the currently displayed plot.

### **Print Preview**

Print Preview will show you on screen how the analysis will appear when printed.

### **Print Setup**

Allows the user to set Windows printing properties.

### **Copy**

The Copy function copies the displayed plot to the Windows clipboard, which allows the plot to be pasted into other programs.

### **Save Plot to File**

Writes the displayed plot to a user specified file in the Windows Meta File format.

### **Save Analyzed Data to File**

When selecting this menu item, the actual values computed for a displayed Rhythm Profile or Time Series plot will be written to a user specified file. The program will ask you for the name of the file to be created before it stores the numbers. This file can then

be used by other statistical programs.

### **About KitAnalyze**

This menu item will display a window showing the program version and an E-mail address for contacting Stanford Software Systems.

### **Exit**

Choose this function to exit the program.

### **Settings**

#### **Properties**

Displays the properties dialogs explained below.

#### **Load Properties**

This function is used to specify a configuration file to use for setting the current program properties to previously chosen settings. The program will display a file selection dialog.

#### **Save Properties**

Most of the analysis program's properties can be saved in a file so that the settings may be quickly changed to reflect the present user's preferences. After the user changes the settings from their initial settings, invoke this function. Properties will be saved to the properties configuration file last loaded. If no properties configuration file had been previously loaded, the user will be prompted for a file name.

#### **Save Properties As**

This function will prompt for a file name to save the current properties.

#### **Reset Properties**

Resets all properties to default program settings.

#### **Select Font**

Select this menu item to display the dialog to choose a font for plot labels or to change font properties.

## View

### **Toolbar**

This menu item will toggle whether the Toolbar is displayed in the program window.

### **Status Bar**

This menu item will toggle whether the Status Bar is displayed at the bottom of the program window.

### **Data Select Window**

Select this menu item to display the Data Set Selection Window:



Use this dialog to select one of the sets of data to perform an individual analysis upon. When a new set of data is loaded, it is made the current data set until another set is loaded or the user selects another data set. Data sets are listed on the left and an arrow points to the currently selected data set.

### **Set Taus/Offsets**

To specify the Rhythm Profile analysis Tau for any data set, left click on the current value. Then enter the desired value and press Enter. Also, the Rhythm Profile analysis may need an offset value to position the animal's activity onset to the position desired by the user. Again, left click on the current Offset value and enter a new value. Every point in the Rhythm Profile plot will be shifted by the number of degrees entered for the offset. For example, if 90 is entered, the line will shifted to the right one quarter of the plot width and the rightmost quarter of the line will be moved to the beginning on the left.

Alternatively, after computing a periodogram, a data set's tau can be quickly set to the period corresponding the periodogram's maximum value by clicking on the P Tau button.

## Clear

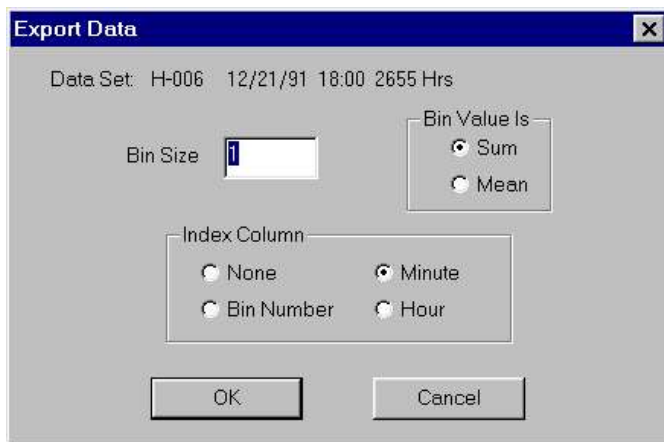
This button is used to clear the current data set from memory so that you may load other data in its place or exclude it from group analyses.

## Clear All

Pressing the Clear All button will remove all data from memory after user confirmation.

## Export Data

Click on the Export Data button to export the current data set to an ASCII text file. The following properties dialog will then appear:

The image shows a Windows-style dialog box titled "Export Data" with a close button (X) in the top right corner. The dialog has a light gray background. At the top, it displays "Data Set: H-006 12/21/91 18:00 2655 Hrs". Below this, there are three main sections. The first section is labeled "Bin Size" and contains a text input field with the number "1". The second section is labeled "Bin Value Is" and contains two radio buttons: "Sum" (which is selected) and "Mean". The third section is labeled "Index Column" and contains four radio buttons: "None", "Bin Number", "Minute" (which is selected), and "Hour". At the bottom of the dialog are two buttons: "OK" and "Cancel".

### Bin Size

Use Bin Size to select how many minutes of data will be combined for each record of data written.

### Bin Value Is

If this property is Sum, each bin value will be a sum of all the data it represents. If Mean is selected, bin values are the bin's sum divided by the number of minutes represented by the value.

### Index Column

If None is selected for Index Column, there will just be one column of numbers (the data) written to the file. Otherwise, the first of two columns will represent an ordinal count of records (Bin Number), or the Minute or Hour associated with the following value.



## Set Actogram Mark Dialog

Select this menu item to display the Set Actogram Mark Dialog:



The user can specify places on the actogram where marks should be drawn (for example, to indicate when an injection was made). Actogram marks can be placed on an actogram only when the Set Actogram Marks dialog is showing. To position a mark, after displaying an actogram on the screen, just point to the spot with the mouse and press the left mouse button. The time and date of the block marked will be displayed in the dialog. Marks can be set in place by right clicking or pressing the Set Mark button in the dialog. The mark will change color to show that it has been made permanent. When printing, marks will appear even if the Set Actogram Marks dialog is not showing.

### Clear

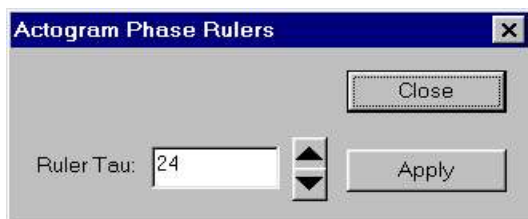
Use this button to clear the current mark.

### Clear All

Use this button to clear all marks for the current data set.

## Actogram Phase Ruler Dialog

Select this menu item to display the Actogram Phase Ruler Dialog:



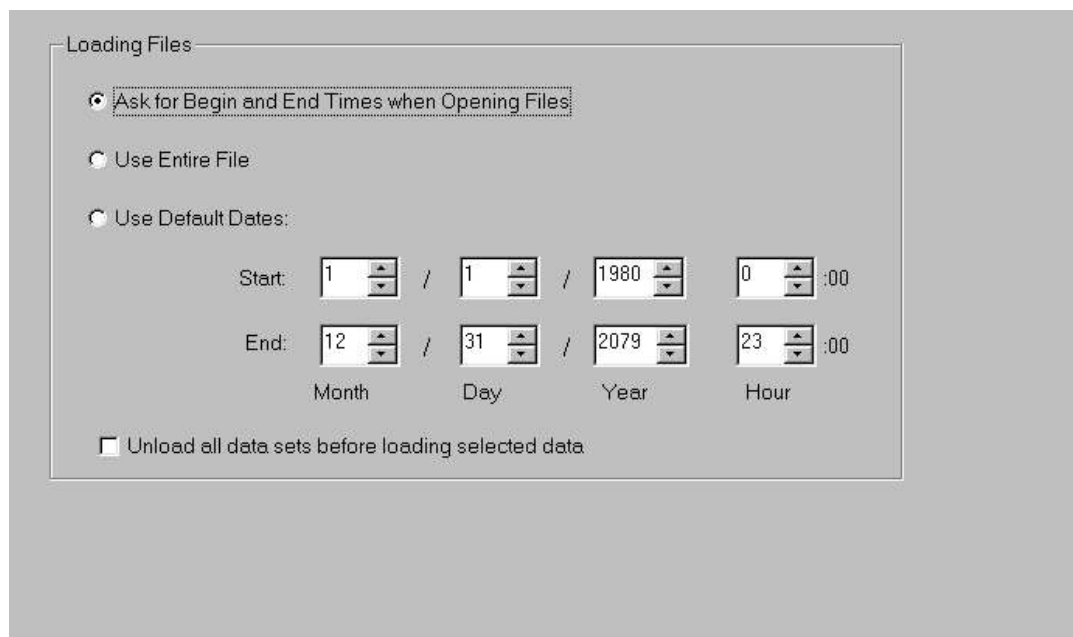
When an actogram and the Actogram Phase Rulers dialog are showing, two lines are displayed on the screen that the user can move. Move a line by left clicking on the top grab box and dragging it to its new location. The length of a line is extended by left clicking on its lower grab box and moving the end to its desired length. The Phase Difference shown is calculated from the RED line to the GREEN line.

When eye fitting lines, we believe that you can get the most accuracy if the program window fills the full screen and the actogram is single plotted.

When printing the actogram, the phase rulers will only be displayed on the plot if the Actogram Phase Rulers dialog is showing on the screen.

## Ruler Tau

The angle of the line is set by entering the Ruler Tau in the Phase Ruler dialog. Both lines need to be the same tau since "a phase shift is only unambiguously defined if the circadian period is identical". If the Ruler Tau is entered from the keyboard, press the Apply button to have the rulers reflect the entered value.



The image shows a 'Loading Files' dialog box with three radio button options: 'Ask for Begin and End Times when Opening Files' (selected), 'Use Entire File', and 'Use Default Dates:'. Below the 'Use Default Dates:' option, there are four sets of spin boxes for 'Start' and 'End' times. The 'Start' row shows 1 / 1 / 1980 / 0 :00. The 'End' row shows 12 / 31 / 2079 / 23 :00. Below these are labels for 'Month', 'Day', 'Year', and 'Hour'. At the bottom, there is a checkbox labeled 'Unload all data sets before loading selected data'.

Field	Value
Start Month	1
Start Day	1
Start Year	1980
Start Hour	0
End Month	12
End Day	31
End Year	2079
End Hour	23

## Properties

### General

#### Loading Files

After the user specifies a data file to open, the program uses these properties to determine which part of the data file to load.

When "Ask for Begin and End Times when Opening Files" has been selected, each time a file is opened the program will query the user for the range of dates of the segment to use. If Use Entire File is set, the program will attempt to read the whole file. When Use Default Dates is selected, the program will use the given dates for all subsequent segments loaded.

Checking "Unload all data sets before loading selected data" will clear all data sets whenever a new data set is opened. Use this setting if you are interested in analyzing only one data set at a time and do not wish to specifically clear previously loaded data.

Low Period

High Period

Fourier Low Period

☐ Auto Correlate

Step Size (Mins)

Labels	
Poisson Periodogram	Poisson Periodogram
Schuster Periodogram	Schuster Periodogram
Deviation Periodogram	Deviation Periodogram
Chi-Square Periodogram	Chi-Square Periodogram
Fourier Periodogram	Fourier Periodogram

Step Size	Step Size:
Minute	Minute
Minutes	Minutes
Auto Correlated	Auto Correlated
Amplitude	Amplitude
Period	Period

## Periodogram

### Low Period

The Low Period is the lower limit for the range of period estimates to compute.

### High Period

The High Period is the upper limit for the range of period estimates to compute.

**Fourier Low Period**

Unlike the other periodicity analyses, the Fourier Analysis only uses a lower limit for periods to display, Fourier Low Period, which will be the approximate period of the point at the right side of the plot. The left side of the plot represents one cycle within the data and, therefore, is the period equivalent to the length of the data segment.

**Auto Correlate**

If Auto Correlate is set, a normalized auto correlation will be performed on the data before the periodogram is computed (see the Appendix for details).

**Step Size**

Step Size is the sample size for the periodogram. The smaller the step size, the better the resolution of your periodicity estimate.

Note: The smaller the Step Size or the larger the range, the longer the computation time.

The screenshot displays the configuration window for the Rhythm Profile plot. It includes several input fields and checkboxes for customizing the plot's appearance and data handling.

**Bin Count:** A text box containing the value 360, with up and down arrow buttons to its right.

**Min Y:** A checkbox labeled "Use:" followed by a text box containing the value 0.

**Max Y:** A checkbox labeled "Use:" followed by a text box containing the value 0.

**Tic Count:** A text box containing the value 3, with up and down arrow buttons to its right.

**Label Frequency:** A text box containing the value 1, with up and down arrow buttons to its right.

**Line Type:** A group box containing four radio button options:
 

- ☒ Line (Interpolated)
- ☐ Line (Gaps for Missing Data)
- ☐ Bar Chart
- ☐ Landscape

**Standard Error Mean:** A group box containing three radio button options:
 

- ☒ None
- ☐ Solid SEM
- ☐ Dotted SEM

**Labels:** A group box containing several text boxes for labeling the plot:
 

- Rhythm Profile: Rhythm Profile
- Phase Angle: Phase Angle
- Mean Counts: Mean Counts
- Cycles: Cycles:
- Bin Count: Bin Count:
- Tau: Tau:
- Hrs: Hrs
- n: n=

**Plot Options:** Two checkboxes at the bottom right:
 

- ☐ Plot All Data Sets
- ☐ Plot Group Mean

## Rhythm Profile

### Bin Count

Here is where you may set how many points you want computed for the Rhythm Profile plot. The maximum points allowed is 1,500.

### Min Y

If the Use box is checked, this setting indicates the minimum of the vertical axis for the Rhythm Profile plot. If a point to be plotted is less than the user's Min Y, this setting will be ignored and the lowest value used instead.

### Max Y

If the Use box is checked, this setting specifies the maximum of the vertical axis for the Rhythm Profile plot. If a point to be plotted is greater than the user's Max Y, this setting will be ignored and the peak value used instead.

### Tic Count

Tic Count is the number of ticks you want equally spaced along the Y axis.

### Label Frequency

Label Frequency is how often you want the actual value associated with the tic mark

printed next to the mark.

### **Line Type**

This selection allows the user to specify the line type for the plot. There are three basic choices: Line, Bar Chart and Landscape. Bar Chart produces histogram type plots. Landscape is like bar but there is no space between the bars, just one continuous line. Line (Interpolated) specifies that lines will be drawn between points that have missing data between them. Otherwise, selecting Line (Gaps for Missing Data) will display non-continuous lines for missing data segments.

### **Standard Error Mean**

If Solid SEM or Dotted SEM is selected, when Plot Group Mean is selected, the Standard Error of the Mean will be calculated and displayed. Solid SEM will plot a solid line and Dotted SEM will plot a dotted line for the SEM.

### **Plot All Data Sets**

Toggle this selection on to see multiple individual data sets on the same plot.

### **Plot Group Mean**

Toggle this selection on to plot the mean of a group of data sets.

Step Size: 60

Length: 0

Tic Increment: 360

X0: 0

X Axis Label Frequency: 4

Min Y: 0 Use: ☐

Max Y: 0 Use: ☐

Y Axis Tic Count: 5

Y Label Frequency: 5

Line Type

- ☒ Line (Interpolated)
- ☐ Line (Gaps for Missing Data)
- ☐ Bar Chart
- ☐ Landscape

Standard Error Mean

- ☒ None
- ☐ Solid SEM
- ☐ Dotted SEM

Labels

Time Series: Time Series

Time (Mins): Time (Mins)

Time (Hours): Time (Hours)

Time (Days): Time (Days)

Intensity: Intensity

Step Size: Step Size:

Mins: Mins

n: n=

☐ Plot All Data Sets

☐ Plot Group Mean

## Time Series

### Step Size

The Step Size is the window or bin size used for collecting individual data samples into plotted points.

### Length

Length is the number of minutes of data that you wish to be plotted. If Length is less than the amount of data loaded, the displayed data will be truncated. If Length is more than the amount of data loaded, the plot will be extended with the equivalent of missing data. If Length is 0, the entire data set will be plotted. The length of data to be plotted will always be truncated if greater than 6000 points. To plot more data, increase the step size appropriately.

### Tic Increment

Tic Increment is the distance, in minutes, between tic marks. If Tic Increment is less than 60 minutes, then the X axis will be in units of minutes. If greater than 1440 (1 day) and a multiple of 1440, the units will be days. Otherwise, if a multiple of 60, the units will be in hours.

### X0

X0 specifies the tic mark relative to the first tic mark to be labeled as the time 0.

### **X Axis Label Frequency**

X Axis Label Frequency sets how often you wish the actual time to be printed below the tic marks.

### **Min Y**

If the Use box is checked, this setting indicates the minimum of the vertical axis for the Time Series plot. If a point to be plotted is less than the user's Min Y, this setting will be ignored and the lowest value used instead.

### **Max Y**

If the Use box is checked, this setting specifies the maximum of the vertical axis for the Time Series plot. If a point to be plotted is greater than the user's Max Y, this setting will be ignored and a value just above the peak value used instead.

### **Y Axis Tic Count**

Y Axis Tic Count is the number of ticks you want equally spaced along the Y axis.

### **Y Label Frequency**

Y Label Frequency is how often you want the actual value associated with the tic mark printed next to the mark on the Y axis.

### **Line Type**

This selection allows the user to specify the line type for the plot. There are three basic choices: Line, Bar Chart and Landscape. Bar Chart produces histogram type plots. Landscape is like bar but there is no space between the bars, just one continuous line. Line (Interpolated) specifies that lines will be drawn between points that have missing data between them. Otherwise, selecting Line (Gaps for Missing Data) will display non-continuous lines for missing data segments.

### **Standard Error Mean**

If Solid SEM or Dotted SEM is selected, when Plot Group Mean is selected, the Standard Error of the Mean will be calculated and displayed. Solid SEM will plot a solid line and Dotted SEM will plot a dotted line for the SEM.



## Plot All Data Sets

Toggle this selection on to see multiple individual data sets on the same plot.

## Plot Group Mean

Toggle this selection on to plot the mean of a group of data sets.

	Hours On	Hours Off	# of Cycles
1:	12	12	1
2:	0	0	0
3:	0	0	0
4:	0	0	0
5:	0	0	0
6:	0	0	0
7:	0	0	0

## Light-Dark Bar

### Display Light-Dark Bar

If the user wishes a Light-Dark Bar, they can check this setting.

### Display Vertical Lines in Plot

If Display Vertical Lines in Plot is set, dashed lines will be drawn vertically through the plot below the Light/Dark transitions.

### Bar Height

Bar Height is used to set the height of the bar.

### Offset

Offset specifies the distance above the plot to place the bar.

## Fill Type

Fill Type refers to the dark phases of the bar. Setting Solid will make them completely filled in and Hash will fill the bars with a crosshatch pattern.

## Hours On/HoursOff/#of Cycles

These seven lines are for setting up to seven sets of cycle changes in the LD Bar. For one 12:12 cycle that begins at the beginning of the plot, on the first line you would enter 12 in the Hours On, 12 in Hours Off, 1 for # of Cycles and zeroes on all other lines. Hours On and Off may be entered with decimal points and fractions. See Appendix E (Light-Dark Bar Examples) for examples of cycle settings and the resulting bars.

The bar is produced by summing the total times of all the cycles, then assigning fractions of the bar to light or dark in the order that they were defined (see the example plots in Appendix F).

If an actogram is double plotted, its LD bar will automatically be double plotted.

The screenshot shows a configuration window for an LD Bar. It includes several sections:

- Tau:** A text box containing the value 24.
- Zero Hour:** A text box containing the value 8.
- Raster Height:** A text box containing the value 100.
- Block Size (Mins):** A group box containing eight radio buttons for 5 Mins, 6 Mins, 10 Mins, 12 Mins, 15 Mins, 20 Mins, 30 Mins, and 1 Hour. The 5 Mins option is selected.
- Actogram Type:** A group box containing a checked checkbox for "Double Plot" and five radio buttons for "Threshold (Use Mean)", "Threshold:", "Percentile Distribution", "Even Distribution", and "Even Distribution Range:". The "Threshold:" option is selected, with a text box containing the value 0.
- Labels:** A group box containing a table of labels and their corresponding text boxes.
- Dates on Y Axis:** A checked checkbox.
- Label Frequency:** A text box containing the value 5.
- Show Missing Blocks:** A checked checkbox.
- Mark Size:** A text box containing the value 100.

Label	Text Box
DATE	DATE
DAY	DAY
TIME OF DAY	TIME OF D
Threshold	Threshold =
Phase Difference	Phase Differ
Mean	Mean =
/ Min	/ Min
(cont)	(cont)
Hrs.	Hrs.
Tau	Tau:

## Actogram

### Tau

This setting is used to specify the tau for computation of subsequent lines or days on the

actogram,. The minimum tau that can be used is 2 hours and the maximum is 600 hours. The tau may have a decimal part, for example, 24.13.

Each line of the actogram will display tau worth of data, rounded up to complete the last block on the line. But the beginning of each subsequent line will be as close as possible to tau time later than the beginning of the previous line.

After computing a periodogram, the actogram tau can be set without displaying the properties sheet by pressing the A Tau button. The Actogram tau will be set to the period corresponding to the periodogram's peak value.

### **Zero Hour**

This is the hour that is used for the left side of the actogram (just for the first line of the first page for a non-24 hour actogram).

### **Raster Height**

The Raster Height is the vertical distance allocated to each line or "day" of the actogram. Decreasing the Raster Height will allow more days to fit on each page.

### **Double Plot**

Actograms may be single or double plotted. If Double Plot is checked, actograms will be plotted with adjacent days next to each other as well as above or below.

### **Actogram Type**

You may select one of five available actogram types.

Threshold (Use Mean) uses the mean of the data on the current page to determine which blocks to mark and which to leave blank.

Threshold uses the user entered value as the limit. The value is the per minute average of the block that must be exceeded for the block to be marked on the plot. Therefore, a threshold of 0 will show every block that has any activity whatsoever.

The three distribution options, Percentile Distribution, Even Distribution and Even Distribution Range, each separate the data amplitude distribution into five ranges. The average per minute level for each block on the current actogram page is computed and five ranges are computed, excluding blocks with no activity. The Percentile Distribution divides the data into ranges of approximately 20 percentile each. This version of the software differs from previous version in that previous versions used rounded whole values in determining the distribution. This version uses the actual value, possibly with a fractional part, to determine the distribution more accurately.

The Even Distribution takes the value for the block with the most activity and divides it by five to compute ranges of five equal levels. Even Distribution Range divides the user entered range between the upper and lower values by 5 to compute the levels.

The four numbers printed in the upper-right corner of the actogram are the lower values of the ranges 2, 3, 4 and 5. The lower value of range 1 is always 0 counts per minute, and the upper value of range 5 is essentially infinity.

### **Block Size (Mins)**

Select here the size of the block to use for computing and plotting the actogram. Possible choices are 5, 6, 10, 12, 15, 20 and 30 minutes and 1 hour. Larger blocks will make less noisy actograms.

### **Dates on Y Axis**

If the Tau is 24 hours, the user has the choice between dates or the day count on the vertical axis. Toggle this setting on to have dates printed along the left side of the actogram. For actograms with non-24 hour Taus, day counts will always be printed.

### **Label Frequency**

The frequency of the day count or date labels on the vertical axis can be changed with this setting.

### **Show Missing Blocks**

If this is set, blocks where no data was collected will be shown as dotted lines on the actogram. You may wish to turn this selection off if your raster height is very small and the dotted lines interfere with your actogram.

### **Mark Size**

This setting is used to set the height of displayed marks. It is in the same units as the raster height.