

XLR8R version 2.0

Help Documentation

September 28, 2009



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1 General Description

The XLR8R application is a quick and easy tool for graphically presenting data collected from a GCDC data logging device. The program is written using Java, which provides cross platform compatibility to Operating Systems running Java 6.0 or later. XLR8R implements some basic analysis tools but GCDC recommends using a commercial or open source mathematics package, such as MathCAD, Microsoft Excel, OpenOffice Calc, Octave, R, S, etc.

XLR8R allows the user to open and display multiple files created from a single device. A calendar highlights relevant dates, a gant chart graphically shows the time frame of each file, and a time series plot presents the collected data. The data is sub-sampled to accelerate the presentation of large data sets. As the user zooms into the data, the data set is sampled to greater detail.

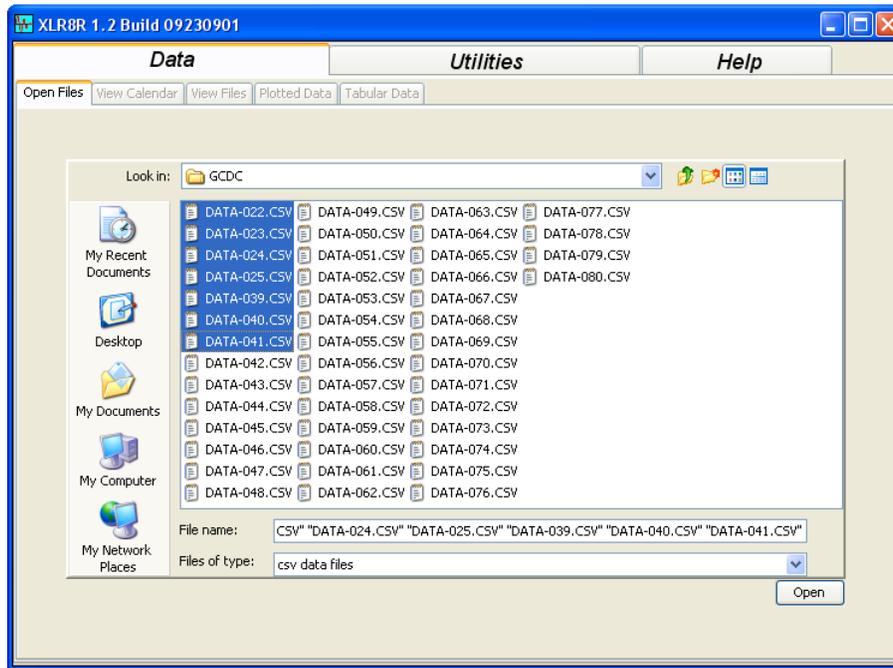
XLR8R provides a simple frequency analysis feature using an FFT algorithm and the ability to scan the data for limit bound violations. Copy-and-paste operations allow easy transport of converted data or re-sampled data into other software applications.

Device configuration files are easily managed using the configuration options editor. XLR8R will write properly formatted time initialization files to a device or directly initialize the real time clock (requires installing the GCDC device driver).

2 Data Tab

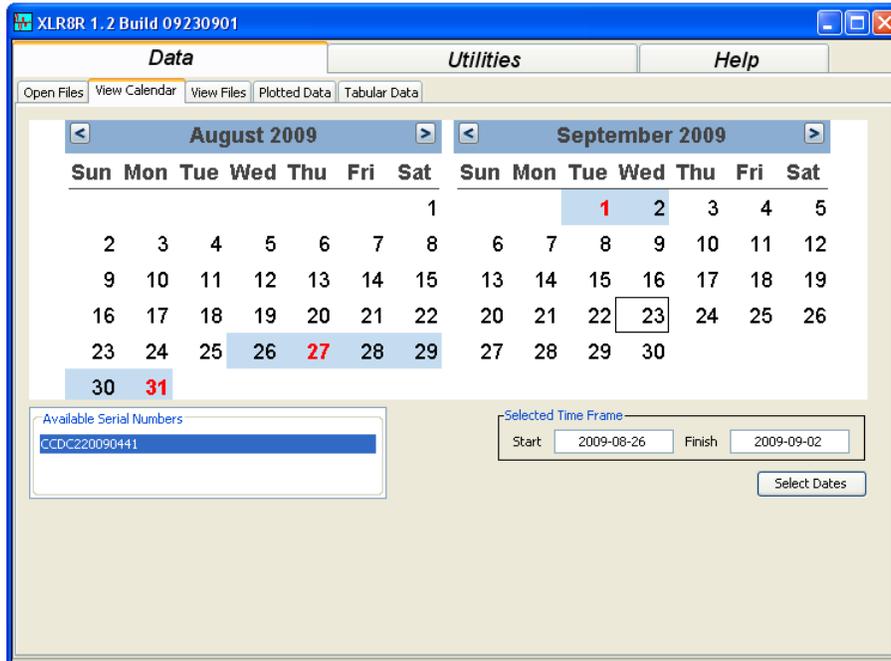
2.1 Opening Files and Directories

The **Open Files** tab is presented after the splash screen disappears. XLR8R will open a single data file, multiple data files, or a directory containing data files. Select the desired files or directory and click *Open* to begin reading the data files.



2.2 Calendar View

First, XLR8R will read the header information of each file to determine the data acquisition settings, start time, and calculate the finish time. The **View Calendar** tab highlights dates that contain data. The user may select a date or several contiguous dates containing data and click *Select Dates* to begin data plotting. If multiple devices are present in the directory or selected files, the device serial numbers are listed in the lower left list box. The user may select a serial number to cull the available data. The calendar tab is automatically presented only when a directory was selected for opening.

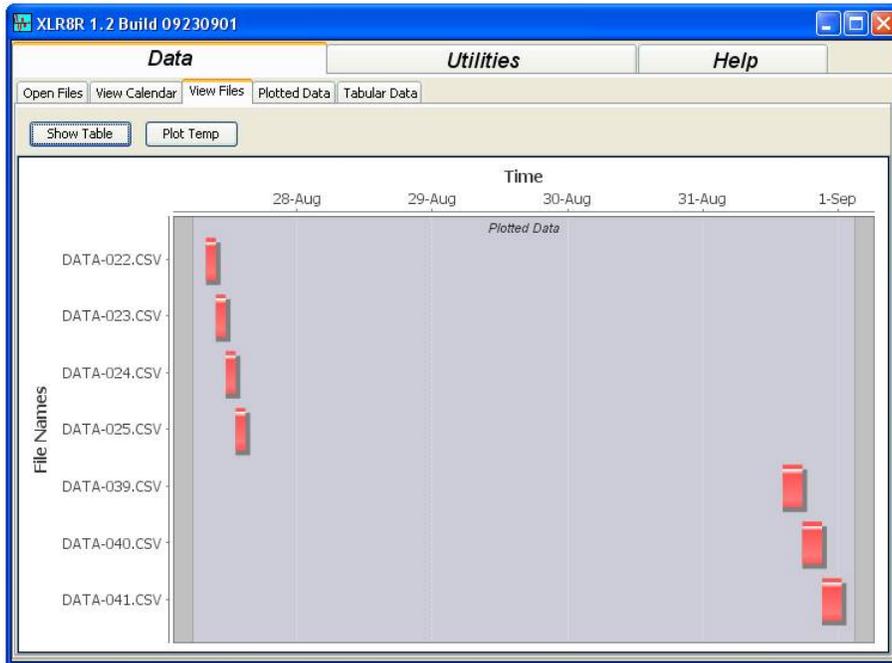


2.3 Viewing File Information

The selected files are presented as a Gant chart in the **View Files** tab, which graphically shows the time frame of each file. Data plotted on the following tab is highlighted on the Gant chart with a blue box labeled “plotted data”. The user may select data to plot using the Gant chart by shift+left-click and dragging a new blue plotted data box. The data plot is then automatically updated with the new time frame.

Clicking *Show Table* button will present a table representation of the selected data files. The table lists particular header tag values of each file. The chart view is easier to read when large number of files are opened.

The *Plot Temp* button will open a new window showing a temperature-vs-time plot based on the temperature values recorded in the header of each file.



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Data Utilities Help

Open Files View Calendar View Files Plotted Data Tabular Data

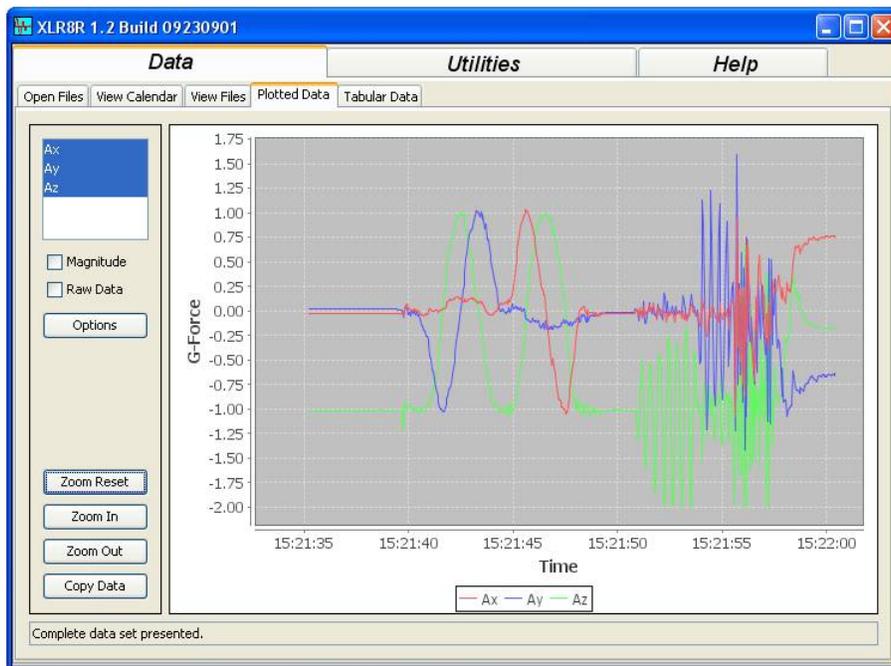
Show Gant Plot Temp

File Name	Start Time	Stop Time	Sample Rate	Dead...	DBTi...	Gain	Re...	HPF
DATA-022.CSV	2009-08-27 07:47:57.003	2009-08-27 09:32:54.732	80	0	30	high	16-bit	0	2...	
DATA-023.CSV	2009-08-27 09:32:54.743	2009-08-27 11:17:51.116	80	0	30	high	16-bit	0	2...	
DATA-024.CSV	2009-08-27 11:17:51.128	2009-08-27 13:02:49.193	80	0	30	high	16-bit	0	2...	
DATA-025.CSV	2009-08-27 13:02:49.205	2009-08-27 14:47:46.844	80	0	30	high	16-bit	0	2...	
DATA-039.CSV	2009-08-31 14:09:57.005	2009-08-31 17:39:27.495	40	0	30	high	12-bit	0	2...	
DATA-040.CSV	2009-08-31 17:39:28.509	2009-08-31 21:08:57.475	40	0	30	high	12-bit	0	2...	
DATA-041.CSV	2009-08-31 21:08:57.488	2009-09-01 00:38:28.836	40	0	30	high	12-bit	0	2...	

2.4 Plotted Data

The **Plotted Data** tab presents the available data in the opened files on a time series plot. To speed the presentation of data, the data is subsampled to reduce the read time from the device. This means that data is actually skipped and not presented in the plot. As the user zooms into a particular region, the data is scanned again at greater resolution. A note at the bottom of the plot declares when the data is subsampled or when the complete data set is represented in the plot.

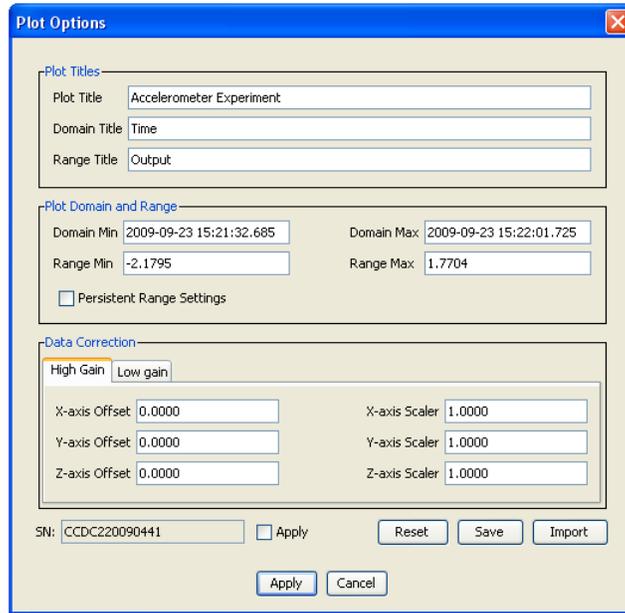
The available data series are listed in the list box located in the upper left and the user may select one or multiple series. Selecting the *Magnitude* check box will add a new series to the plot representing the magnitude of the selected series. Selecting the *Raw Data* check box presents the data as recorded in the data files and without any unit conversion or calibration.



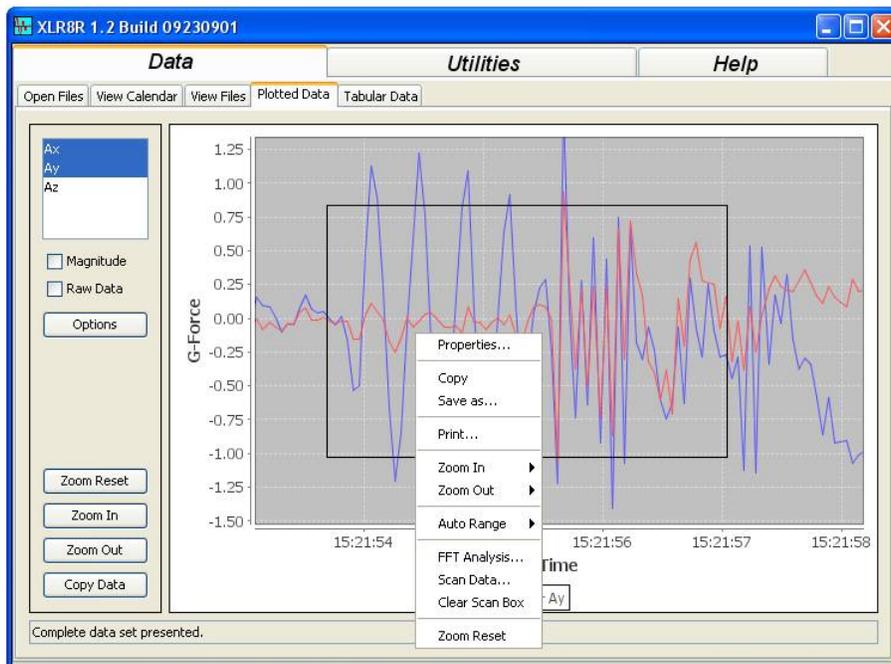
The *Options* button opens a dialog of plot options. Here, the plot title and axes titles may be added or changed. The domain and range can be defined. The *Persistent* check box will force the plot to keep the range values during zoom operations. Scale and offset values can be applied to high and low gain data of accelerometers. These values can be saved to a text file or loaded from a text file using the *Save* and *Import* buttons. The equation for the corrected data is as follows: $\text{corrected_value} = (\text{data} - \text{offset}) * \text{scale}$ where "data" is the raw numbers recorded in the files.

The user may zoom into the data plot by left-click and dragging a box around the region to zoom. *Zoom Reset* changes the plot domain to the time frame presented in the **View Files** tab. *Zoom In/ZoomOut* changes the domain a set percentage with each click.

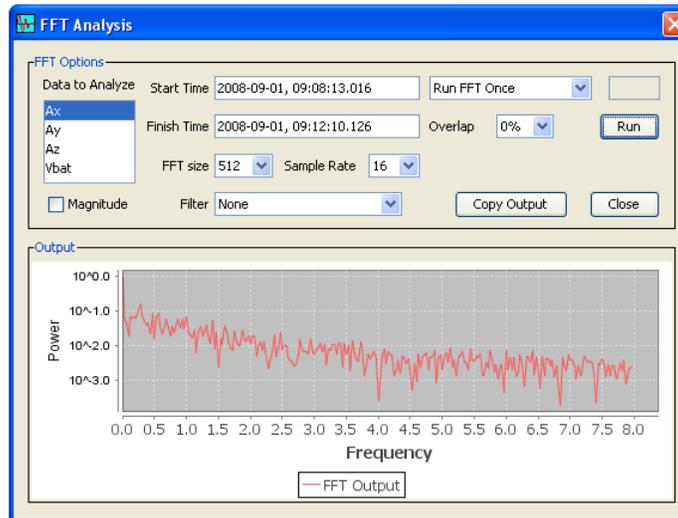
Right-click over the plot will show a pop-up menu listing several more plot features. The pop-up menu contains features for changing the plot colors, auto-range, zoom in/out, and saving the plot as a png picture file.



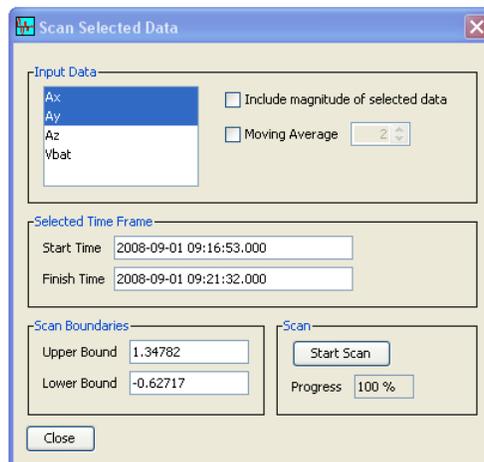
Shift+left-click and dragging a box around a region creates a “scan box”. The scan box defines a time frame and upper/lower bound limits for analysis. Right-click over the plot will present a pop-up menu with *FFT Analysis...* and *Scan Data...* features.



The *FFT Analysis* command shows a dialog with settings for the FFT algorithm. The Scan Box defines the time frame for the analysis. The user may select a data series or multiple series if the magnitude check box is selected. Click *Run* to start the analysis. Run *FFT Once* will plot the results of a single run of data starting at the start time. Accumulate Multiple FFTs will continually add the output of each run for the entire time frame into one data plot. The *Copy Output* button places the plotted data onto the system clipboard for importing into other software applications.



The Scan Data feature will determine when a data series exceeds the scan box limits. Select a series or multiple series to scan and click *Start Scan*. A new window will present the results and allow exporting the results into a text file.



The screenshot shows a software window with a blue title bar and standard Windows window controls. At the top, there are two text boxes for 'Start Time' (2008-09-01, 09:16:53.798) and 'Stop Time' (2008-09-01, 09:21:32.159), with 'Save' and 'Close' buttons to the right. Below this is a summary section with a list box containing 'Ax' and 'Ay'. For 'Ax', the 'Time Outside Boundaries' is 54.001s (19.400 percent) and 'Time Within Boundaries' is 3m 44.360s (80.600 percent). For 'Ay', the 'Number of Events' is 166. At the bottom is a table with 21 rows of event data.

Event	Input	Start	Stop	Type	Duration
1	Ax	2008-09-01,...	2008-09-01,...	Upper	0.249s
2	Ax	2008-09-01,...	2008-09-01,...	Upper	0.683s
3	Ax	2008-09-01,...	2008-09-01,...	Upper	0.186s
4	Ax	2008-09-01,...	2008-09-01,...	Upper	0.559s
5	Ax	2008-09-01,...	2008-09-01,...	Upper	0.186s
6	Ax	2008-09-01,...	2008-09-01,...	Upper	0.621s
7	Ax	2008-09-01,...	2008-09-01,...	Upper	0.310s
8	Ax	2008-09-01,...	2008-09-01,...	Upper	0.063s
9	Ax	2008-09-01,...	2008-09-01,...	Upper	0.124s
10	Ax	2008-09-01,...	2008-09-01,...	Upper	0.185s
11	Ax	2008-09-01,...	2008-09-01,...	Upper	0.187s
12	Ax	2008-09-01,...	2008-09-01,...	Upper	0.124s
13	Ax	2008-09-01,...	2008-09-01,...	Upper	0.124s
14	Ax	2008-09-01,...	2008-09-01,...	Upper	0.310s
15	Ax	2008-09-01,...	2008-09-01,...	Upper	0.558s
16	Ax	2008-09-01,...	2008-09-01,...	Upper	0.434s
17	Ax	2008-09-01,...	2008-09-01,...	Upper	0.310s
18	Ax	2008-09-01,...	2008-09-01,...	Upper	0.063s
19	Ax	2008-09-01,...	2008-09-01,...	Upper	0.062s
20	Ax	2008-09-01,...	2008-09-01,...	Upper	0.434s
21	Ax	2008-09-01,...	2008-09-01,...	Upper	0.063s

2.5 Tabular Data

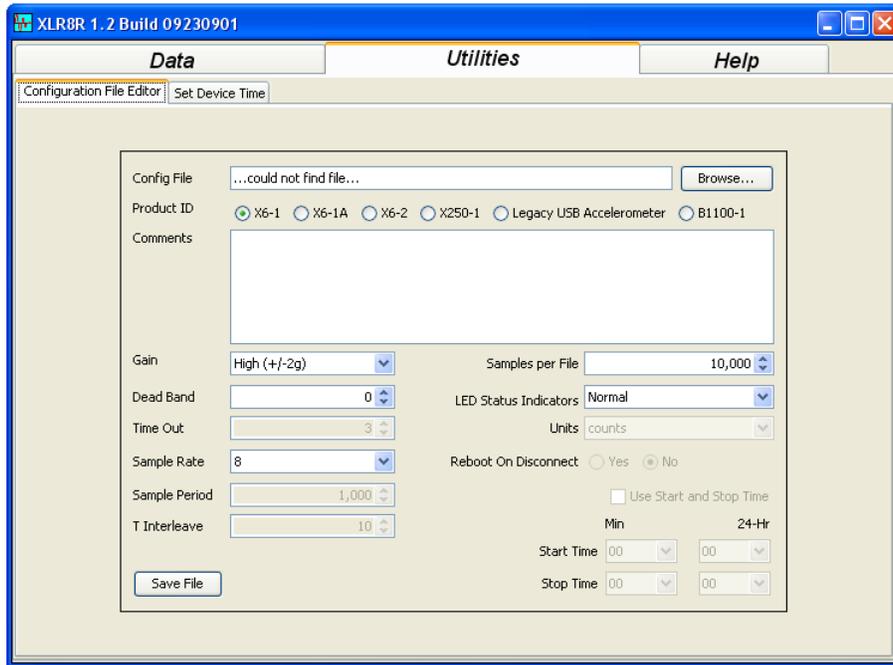
The Tabular Data tab lists the data points presented in the time series plot. A note at the bottom of the table indicates if the listed data is a subsample of the actual recorded data.

3 Utilities

The **Utilities** tab contains two tabs with features for editing configuration files and initializing the device real time clock.

3.1 Configuration File Editor

XLR8R will try to automatically load the config.txt file. Otherwise, the user may click *Browse* to find a configuration file to read or save to. Clicking the device type radio buttons will automatically enable the available features for the particular device type. Refer to the device specification for detailed description of the available features.



The following describes the basic features of most devices:

- **Gain** defines the scale the device records on. “high” sets the system to record at $\pm 6g$. “low” sets the system to record at $\pm 2g$.
- When the **dead band** is set to “0”, data is written at the specified sample rate. When the dead band is greater than “0”, the data is written only if any one of the three axes results in a data point greater than the previous data point by the amount defined by the dead band. The dead band value is expressed in “counts” units. The dead band allows for easy filtering of low-level noise or minuscule movements. Furthermore, a dead band reduces the number of writes to the memory card and increases the battery life.
- **Time Out** defines the period in seconds when a sample is recorded by the device regardless of the deadband setting. This feature ensures periodic data is recorded during very long periods of inactivity
- **Sample Rate** defines the interval in Hertz that a data sample is recorded. For example, a sample period of 320 means data is recorded 320 times a second. Sample rate is used in accelerometers.
- **Sample Period** defines the interval in milliseconds that a data sample is recorded. For example, a sample period of 500 means data is recorded at 2 Hertz and a sample period of 3600000 means data is recorded once per hour. Sample period is used in barometers.
- **T Interleave** defines the number of pressure readings between each temperature reading.
- **Samples per File** defines the number of lines each data file can have before a new file is created. This tag controls the size of the data files into easily manageable lengths for later processing.
- The two **LED status indicators** located on the USB Accelerometer can be activated with normal brightness (Normal), activated with high brightness (High), or completely deactivated (Off). A steady blinking blue LED once a second indicates the unit is operating. A rapidly blinking blue LED means the battery is depleted and data collection has stopped. The red LED

- blinks when data is written to memory, which depends on movement and dead band settings.
- **Reboot on Disconnect** causes the device to automatically start collecting data once removed from a host USB port.
- GCDC devices start and stop data recording based on the times defined using **Start Time** and **Stop Time**. The times must be in “MM HH” 24-hr format. Entries marked with “*” are ignored, or operate as a wild card. Example timing configurations:

Example 1: Start recording at 12:30pm and stop recording at 6:00pm.

Start Time = 30 12

Stop Time = 00 18

Example 2: Start recording at the beginning of every hour and stop recording at the 45 minutes later.

Start Time = 00 *

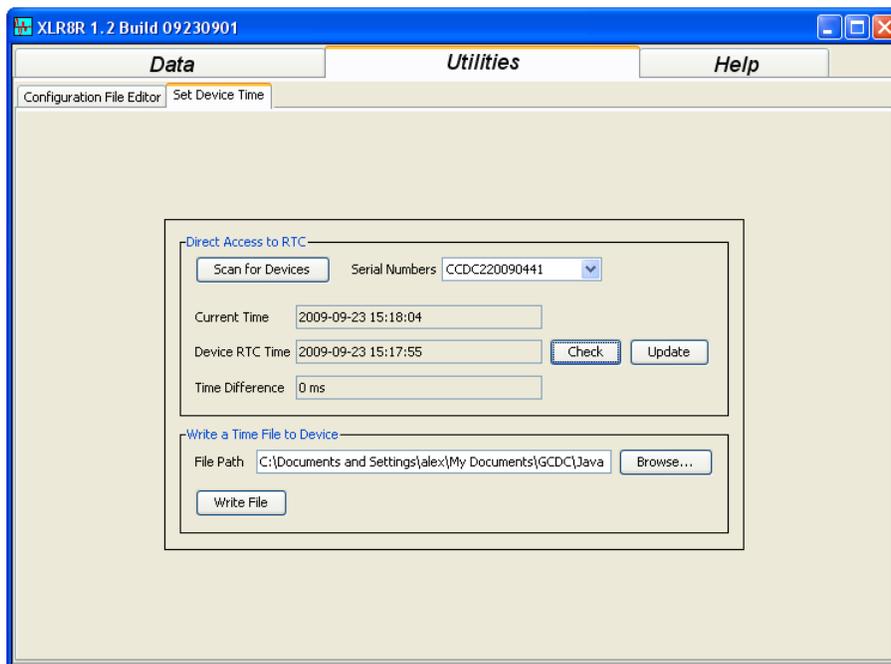
Stop Time = 45 *

3.2 Setting Device Time

The **Set Device Time** tab provides two methods for initializing the real time clock – using the time.txt method or direct access to the RTC.

When writing a time.txt file, the file must be written to the root directory of the device. Click *Browse* to find the proper directory. Clicking *Write File* creates the time.txt file containing the current system time. The next time the device reboots, the time saved in the file will be written to the RTC.

Direct access to the RTC requires the use of a GCDC device driver. Please visit the GCDC website or contact technical support for the device driver. Clicking *Scan for Devices* searches the USB ports for GCDC devices and presents the serial numbers in the drop down box. Select a serial number and click *Check* to read the current device time. The difference between the device time and the host time is shown. Click *Update* to write the current host time to the device RTC.



4 Help

The Help tab contains a information about XLR8R and the sensor orientation of the accelerometer series of GCDC products. Clicking *Open Help File* opens this help document.

