

11. View Graph.

When viewing the data as a graph, it is possible to set statistical lines of Minimum, Maximum, Mean, Standard Deviation and Regression. Also, zooming in and out of the graph allows you to view all of the data at once, or just the sequences or individual reads you wish to view.

12. Save, print, export.



Spreadsheet data can be exported as comma separated text for importing into other spreadsheet programs, or as xml based for exporting onto the web. It is important to note that saving (exporting) the data into any format other than the ".dld" format in the TRAC software program will allow you to change the raw data. Changing is not possible within the TRAC software program. Graph data can also be exported as an image file.

3.0 Feature Summary

Data Acquisition

- Stand-alone operation – uses internal memory to store data
- Interval Recording
- Trigger-based (Event) Recording and Repetitive Triggering
- Status Indication: Sampling, Trigger-Mode, Memory Full, Low Battery
- Low-Power, Battery Operation
- 10-year battery backup and software interlock to protect data

Software Framework

- The TRAC Configuration and Analysis software framework is compatible with all current level Tinker & Razor DL-1 data acquisition systems.
- One-button operations to setup the logger, receive data and generate graphs.
- Configurations, data and graphs are treated as documents, much like a word processing program treats documents. All information is carried forward to the next level 'document', which means that you don't have to save configurations, data and graphs together as a set – a configuration can be created from an existing data file or graph file; a data file can be created from a graph file. Once a graph is created from data collected by the logging unit, the configuration and data files can be discarded, if desired, for the purpose of storing and organizing data files more efficiently.
- The 'configuration' button on the status window allows you to create a configuration 'document' from the logging unit that is currently connected to the PC.

Data View & Analysis

- View all data or view only the data acquired from individual recording ‘sequences’.
- Export/Copy data in table or graphical format to file or directly to any other program.
- Print data in table or graphical format.
- Print or copy configuration and status window information. This is useful for documenting collected information.
- Statistics may be viewed in table and graph views.

****NOTE:** The DL-1 system is Year 2000 (Y2K) compliant.

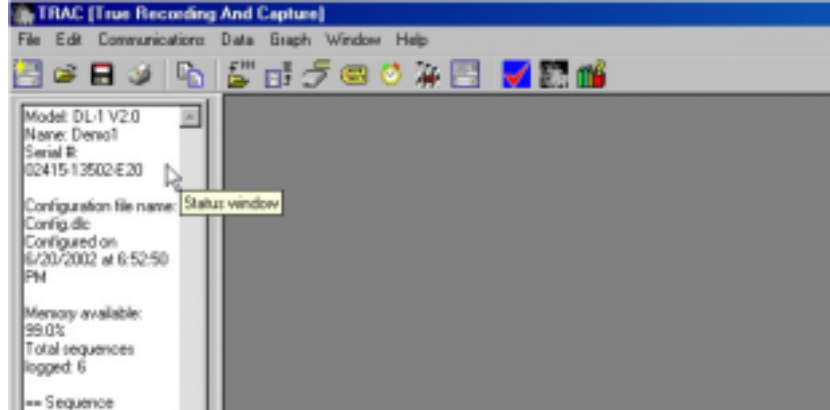
3.1 OPERATION OVERVIEW

This overview covers the five (5) basic steps involved in collecting and reviewing data. **Section 4.0 Feature Details**, covers more advanced features, in addition to instructions for reviewing, formatting and exporting in the spreadsheet and graph windows.

- Step 1: Create a Configuration Document **3.2**
- Step 2: Communication - Send a configuration **3.3**
- Step 3: Recording Data - Hardware **3.4**
- Step 4: Spreadsheet Data View - Receive data **3.5**
- Step 5: Graph Data View - Generate a graph **3.6**

Status Window

The status window (shown on next page) displays the status and specification of the Tinker and Razor DL-1.



Inputs

- Analog – Four independent channels simultaneously recording AC or DC voltages.
- Range selectable: 300 VAC RMS Range or +/- 5 VDC to +/- 100V DC (bipolar).
- Range selectable: 1A, 10A and 100 Amps.
- Input resolution +/- .01% of selected range.

Channel Configurations:

- Channel 1 & 2 – Bipolar DC analog input with automatic AC rejection for data collection and recording traditionally preformed with a Digital Volt Meter. +/- 5V DC range. Software is configurable for DC current readings with the appropriate shunt. (see SHUNT Details in table below.)

Channel 3 – 300V AC RMS range.

Channel 4 – Bipolar DC analog input with TrueView. Software configurable for AC current readings with optional amp clamp.

SOFTWARE CONFIGURABLE SHUNTS	CHANNELS AVAILABLE
.001 Ohm	1 & 2
.01 Ohm	1 & 2
.1 Ohm	1 & 2
1.0 Ohm	1 & 2
AC Amp Clamp, 0 – 100 Amps	4

Data Storage

Data Storage – 500,000 samples.

Recording Duration: 0.002 seconds to years.

Sampling Frequency: Fast as 500 Hz, Slow as 99 min. (all channels).

Data Memory Battery Life: 10 years.

Operating

Power Supply: 9V battery or adapter. Recorded data retained in memory in the event of 9V-battery failure.

Battery Life: Up to 2 months 9V alkaline, Up to 4 months, lithium.

Temperature Operating: -10 to 60 degrees C.

Temperature Storage: -20 to 70 degrees C.

Status – Led Indication of Logger off/on, Data collection start, Logging stopped/complete, Low battery and Memory full.

Communication

RS-232 Interface

Baud Rate – 9600 BPS to 115.2k BPS

Software

Configuration and Data Retrieval from Microsoft® Windows® 95, Windows® 98 or Windows NT® 4.0 or later, Palm™ handhelds or Palm Powered™ handhelds, such as Handspring™ Visor™, running Palm OS® 3.4 or later.

View Graph – Displays graphs for analysis or presentation. With Copy, Paste, Print and Export functions.

Spreadsheet for display of channel voltage, current and/or event data. Each logged event has a date and time stamp.

Data collection can be started and stopped by a programmed time/date or manually.

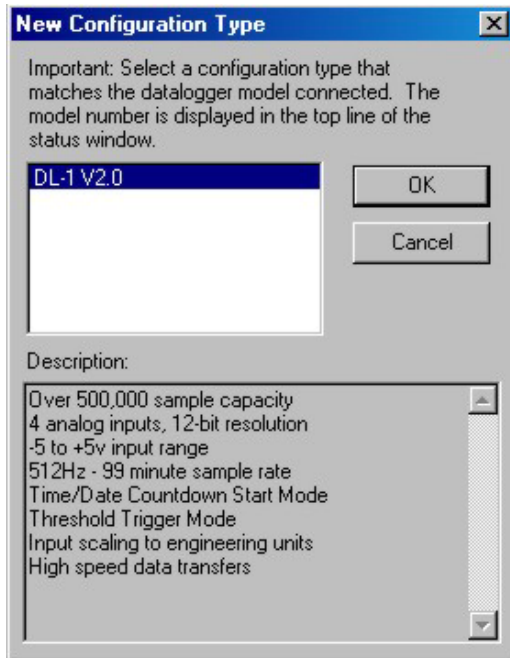
The Status window shows the configuration of a logging unit that is connected to the PC – it is your “window” to the data acquisition hardware. (Status window shown at top of previous page) If a logging unit is connected when the **TRAC** Configuration and Analysis program is started, its status will be displayed automatically. Other messages relating to the most recent communication with the logging unit will also be displayed here.



The display can be updated at any time by selecting the refresh button on the main program toolbar.

For more information on the Status Window, please go to Section 4.1: Status Window.

3.2 Create A Configuration Document



Before recording information with the logging unit, you must first configure it. This is done by creating a configuration ‘document’ and then sending it to the logging unit. Configuration documents can be created once and saved to disk for reuse in future data collection tasks.

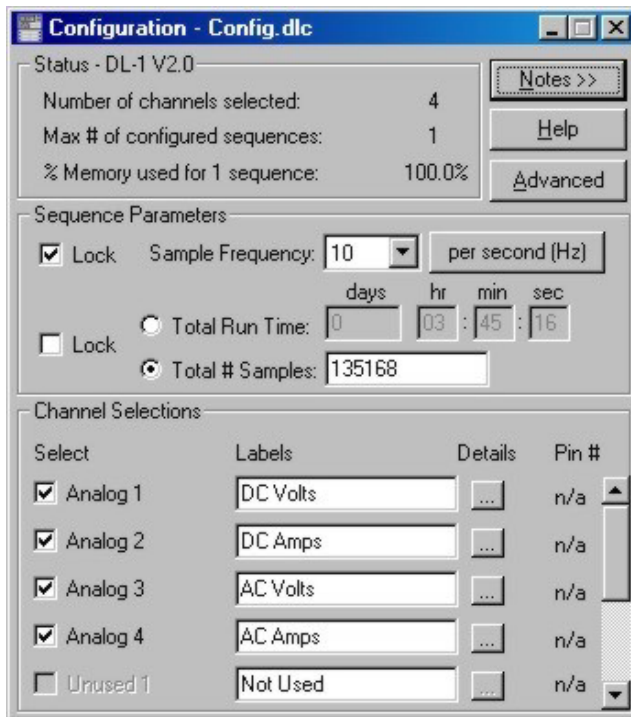
The first step in creating a configuration is to open a New Configuration template by selecting File| New Configuration from the main menu. Be sure to select the configuration template that matches the target logging unit model. The model number of a logging unit that is connected to the PC’s communication port can be found at the top of the Status window.

File | New Configuration

Previously saved (to disk) configurations are opened by selecting File | Open.

****NOTE:** A configuration document may also be created from a connected logging unit by clicking the configuration button on the main program toolbar. Configurations can be generated directly from data (.dld) and graph (.dlg) files by clicking on the configuration icon on the spreadsheet and graph window toolbars.

3.2.1 Setting Up the Configuration



Recording parameters (sample interval, run time, channel selections, etc.) are established in the configuration. A new configuration is already initialized with everything necessary to begin recording – it can be sent to the logging unit and used, as is. However, you will want to customize the configuration for each task.

The configuration window is a “smart form” that automatically calculates sequence parameters and displays: 1) the fastest Sample Frequency possible, and 2) the Total Run Time that is based on using 100% of the data storage memory available in the target logging unit.

These calculations are updated when you make changes. For example, if you add 3 channels to the default configuration (1 to 4), the Total # of Samples and Total Run Time will be reduced by a factor of 4. However, you can “lock in” a Total Run Time by clicking the Lock checkbox next to the Total Run Time field. Similarly, you can “lock in” a Sample Interval/Frequency by clicking the Lock checkbox next to that field.

3.2.2 Recommended Procedure

To appreciate the benefits of the “smart form” feature, specify recording parameters in the following order:

Select each channel to be sampled and enter meaningful channel names.

Set the “Total Run Time” if the test is to be terminated after a specified period of time (though a logging sequence may be interrupted at any time by pressing the “Start/Stop” button on the panel).

Or

Set the “Total # of Samples” if the test is to be terminated automatically after a specified number of samples have been acquired.

Set the “Sample Interval/Frequency” – the time base may be changed by selecting the time base button to the right of the “Sample Interval/Frequency” entry field.

3.2.3 Channel Selections

Record

The Tinker & Razor Model DL-1 has 4 analog channels available. Click the checkbox to select the channels that will be logged during the recording. Use the scroll bar on the right to bring other channels into view.

Label

After selecting a channel, the cursor will move to the channel name field. You may enter a meaningful name for each channel, up to 15 characters.

Details



Click on the detail button to access more advanced options for the input channels, such as scaling and triggering parameters. For more information regarding scaling and triggering, please see **Section 4.3.1: Channel Details – Scaling & Triggering**.

3.2.4 Sequence Parameters

Sample Interval (Frequency)

The default sample rate for a New Configuration is 500 Hz (500 samples per second). The sample rate is auto-calculated following entry of other configuration parameters to display the shortest sample interval available.

To set the Sample Interval for a logging sequence, first set the time base by clicking on the Time-Base Button. Next, type in the desired Sample Interval or Frequency.

per second [Hz]


The Sample Interval field will automatically “lock” when you modify it, disabling automatic calculation of the Sample Interval/Frequency.

****NOTE:** You may wish to select recording channels and define labels before specifying sequence parameters. This will enable you to see the automatic calculations for total run time and total number of samples.

Total Run Time

The Total Run Time parameter allows you to set the duration of a single logging sequence. To automatically terminate logging after a specified period of time, enter the desired number of days, hours, minutes and seconds in the respective fields

Auto-calculation displays the Total Run Time that will result when recording from the selected input channels, at the specified Sample Interval and using all 500,000 data storage locations. When configuration parameters are changed this field is recalculated, unless it is locked. Total Run Time will automatically “lock” if you enter a value in this field, or by clicking in the Lock checkbox. The field may be “unlocked” by deselecting the Lock check box.

If the option button to  the left of the “lock” check box is not selected, the Total Run Time parameter is not enabled. In this case, the Total # of Samples determines the Total Run Time of the sequence, in combination with the Sample Interval.

Total Number of Samples

The Total # of Samples parameter allows you to define a logging sequence by the number of samples to be recorded. A sample is defined as a one record of all selected channels. To terminate logging after a specified number of samples have been logged, enter the desired number of samples in this entry field. Manual entry into this field “locks” the Total # of Samples parameter, disabling the auto-calculation feature. The field may be “unlocked” by deselecting the Lock check box.

If the option button to the left of the “lock” check box is not selected, the Total # of Samples parameter is not enabled. In this case, the Total Run Time determines the number of samples in the configured sequence, in combination with the Sample Interval.

3.2.5 Status Section, Configuration Window

This section indicates the total number of input channels selected for recording. It also displays the percentage of memory required for the configured logging sequence, and the number of sequences of this particular configuration that can be recorded with the available data storage memory.

For more information on memory use, please go to the **Section 4.2: Configuration Options – Memory Use.**

3.2.6 Notes & Advanced Options

Notes

Notes >>

Select the Notes button to display the “Notes” section of the configuration window. The notes section is convenient for documenting test setup, special equipment, general explanation of intended uses for the configuration and test results information to be kept on file for later use. These notes are saved with the configuration so that whenever the configuration is reloaded from the disk, the test notes will also be available. To view, click the Notes button.

****Tip:** This is an extremely valuable feature, when utilized: notes, along with ALL configuration settings are stored in data and graph files that are saved to disk. In the same way, all raw data that is retrieved from the logging unit is stored in a graph file when saved to disk. The TRAC software allows you to recreate a configuration or a complete raw data file, along with scale settings, from a graph file. This capability makes it easy to organize data and assures that you can always duplicate a setup, effortlessly.

Advanced

Advanced

(Please see **Section 4.2: Configuration Options – Advanced Configuration Options**)

3.3 COMMUNICATION

The DL-1 Logging unit must be in “Off” mode in order to communicate with the TRAC Configuration and Analysis software through a PC serial communications port. Communication codes sent by the PC will “wake up” the logging unit each time communication is initiated. A transfer of information takes place between the PC and logging unit for the following functions:

- Configuration of logging sequence parameters
- Transfer of data to the PC
- Transfer of logging unit status to the PC
- Setting the logging unit’s internal clock
- Personalization of the logging unit with a meaningful name

The first of these functions, configuration and data transfer, are initiated by clicking icons on the main program toolbar, or by selecting the appropriate sub-menu item under Communications on the menu bar, which are described below. The remaining communications functions may also be accessed from the main menu and toolbar, and are described in **Section 4.1: Status Window**.

3.3.1 Send Configuration

****NOTE:** If data has been logged but not yet received into a data window, this should be done before re-configuring the logging unit (see **Section 3.3.2: Receive Data**).

To send a configuration to the logging unit, be sure the unit is not recording (stopped) and is connected to a serial (COM) port on the PC with the supplied communications cable. Also make sure that the Configuration window is the active “window”.

From the Communications menu, select Send Configuration. It takes approximately 10 seconds to send the configuration and to program the logging unit (use the Communications | Setup menu option to change ports if necessary – see **Section 1.3: Communication Setup**). Select “OK” at the warning prompt to proceed. The warning prompt helps avoid accidental loss of data, as this process overwrites the previous configuration and access to recorded data is lost.

If you have any problems, check to make sure that the Configuration window type (DL-1) matches the logging unit. The logging unit model number appears at the top of the Status window. If you still have problems, recheck the cable connection and verify that your COM port is set up properly.

3.3.2 Receive Data

To receive the recorded data, make sure the logging unit is connected to a serial port on the PC with the supplied communications cable or to a PDA using Palm OS with optional cable. From the Communications menu, select Receive Data. While data is being transferred, the progress level is displayed on a meter.

If errors occur while attempting to receive data, make sure that the correct COM port is selected (see **Section 1.3: Communication Setup**). Also, make sure the cable is securely connected at both ends.

Once the data is received, a variable-size spreadsheet is created, based on channels configured and the number of samples recorded. This is the spreadsheet window, which is specially formatted with the channel names that were specified in the configuration.

3.4 Recording Data – Hardware

This section gives only a brief overview of the DL-1 logging unit and its use for recording data. For more detailed information, please see **Section 5.0: The DL-1 Data Logging Unit Operation, or Appendix A: Technical Information**.

3.4.1 Connecting the Sampling Interface Cable

Connect the 4-channel cable (included in the shipping package) to the connector on the end of the datalogger. The labeled clips will connect to the equipment being tested. All leads are color-coded and labeled.

3.4.2 Datalogger Panel

The panel of the logging unit includes a color legend for the two LED displays. This legend describes the operating mode associated with each color displayed by each LED and the corresponding text in the same color. A flashing display is differentiated from a solid color.



*Trigger Mode: The green and orange display flash alternately to indicate the logging unit is waiting for the trigger condition to occur.

3.4.3 Power Supply



The DL-1 logging unit is powered by one (1) 9V battery, and an internal Lithium battery for data backup. The 9V battery is replaceable. Remove end cap marked, BATTERY ACCESS, by removing three screws. Insert battery, observing polarity. The sticker on the inside of the battery compartment (shown above) shows where the positive terminal of the battery should be inserted. The battery terminals face INTO the unit when the battery is inserted. Do not over-tighten

screws when replacing BATTERY ACCESS panel. For information on battery life, please see **Appendix A: Technical Information – Battery Life vs. Configuration.**

3.4.4 Start/Stop

Press the Start/Stop button to begin logging. A configured logging sequence will be terminated automatically upon completion, but may be stopped and restarted manually by pressing the Start/Stop button. The logging unit must be in the “off” mode for configuration for communications.

Record	Interval	DC Volts	DC Amps	AC Volts	AC Amps	Date	Time
1	0.000	0.3529	-0.0133	2.2513	-0.1231	6/20/2002	18:54:44.000
2	0.100	0.1258	-0.0133	2.2513	-0.1231	6/20/2002	18:54:44.100
3	0.200	0.1184	-0.0133	2.2513	-0.1231	6/20/2002	18:54:44.200
4	0.300	0.1331	-0.0133	2.2513	-0.1231	6/20/2002	18:54:44.300
5	0.400	0.1395	-0.0133	2.1386	-0.1231	6/20/2002	18:54:44.400
6	0.500	0.1380	-0.0133	2.2513	-0.1231	6/20/2002	18:54:44.500
7	0.600	0.1429	-0.0133	2.2513	-0.1231	6/20/2002	18:54:44.600
8	0.700	0.1429	-0.0133	2.2513	-0.1231	6/20/2002	18:54:44.700
9	0.800	0.1258	-0.0400	2.2513	-0.1231	6/20/2002	18:54:44.800
10	0.900	0.7690	0.0666	2.5895	-1.8463	6/20/2002	18:54:44.900
11	1.000	1.0049	-0.0133	2.2513	-0.1231	6/20/2002	18:54:45.000
12	1.100	1.0049	0.0133	2.2513	-0.1231	6/20/2002	18:54:45.100
13	1.200	1.0024	-0.0133	2.2513	-0.1231	6/20/2002	18:54:45.200
14	1.300	1.0049	-0.0133	2.2513	-0.3693	6/20/2002	18:54:45.300
15	1.400	1.0049	-0.0133	2.2513	-0.1231	6/20/2002	18:54:45.400
16	1.500	0.9927	-0.0133	2.2513	-0.1231	6/20/2002	18:54:45.500
17	1.600	1.0073	0.0133	2.1386	-0.1231	6/20/2002	18:54:45.600
18	1.700	1.0024	-0.0133	2.2513	-0.1231	6/20/2002	18:54:45.700
19	1.800	1.0024	-0.0133	2.2513	-0.1231	6/20/2002	18:54:45.800
20	1.900	1.0049	-0.0133	2.2513	-0.1231	6/20/2002	18:54:45.900
21	2.000	1.0049	-0.0400	2.2513	0.1231	6/20/2002	18:54:46.000
22	2.100	1.0049	-0.0400	2.2513	0.1231	6/20/2002	18:54:46.100
23	2.200	1.0049	-0.0133	2.2513	-0.1231	6/20/2002	18:54:46.200
24	2.300	1.0073	-0.0133	2.2513	-0.3693	6/20/2002	18:54:46.300
25	2.400	1.0024	-0.0133	2.1386	-0.1231	6/20/2002	18:54:46.400

3.5 Spreadsheet Data View

This spreadsheet has the same look and feel as popular spreadsheet programs and data is compatible for exporting to most Windows platform spreadsheet or analysis program. For information on scaling, statistics, printing, exporting, and saving spreadsheet files, please see **Section 4.5: Spreadsheet View Features.**

All options are available on the right mouse menu and also on the main menu bar under Options | Data. Position the mouse over the spreadsheet, click the right mouse button and the menu will appear.

All functions necessary for viewing or exporting are available. To select a range of cells, select a corner and drag the mouse to the opposite corner. A column or row of cells may be selected by clicking on the column/row

header cell. Click the right mouse button to bring up a menu of choices.

Top and Bottom Rows

Click these buttons to move to the top or bottom rows of the spreadsheet.

“Previous” Sequence and “Next” Sequence

Click these buttons to move the cell cursor to the first row of the next or previous data sequence. These buttons will have no effect if you are viewing data file that was recorded in a single sequence.

Column | Auto-Size

Use this button to automatically size the selected column(s) to the labels and data in view at a given time. This is normally not necessary but should be used when viewing the cells in the statistics summary – since the information in these cells is so much wider than is typically in data and label cells, it is sometimes partially hidden to optimize the spreadsheet view.

Create Graph

A new graph window is generated each time this button is selected. The new graph is a stand-alone “database” that includes all raw data and configuration information. Refer to the **Section 4.6 - Graph View Features** for more information about graphs generated from the Spreadsheet Data View.

Create Configuration (Spreadsheet)

Clicking this button will cause a configuration “document” to be generated from the Spreadsheet Data View “database”. The spreadsheet has all of the necessary information to construct a duplicate of the original configuration that was used to record the data.

Data Organization

Data is organized as one row per sample record. Records that represent the time at which recording sequences were started are color-coded green. The last sample record in a sequence is red. All other records are displayed with black text. Each sample record consists of three specific column types: Interval, Sample Data and Time Stamps.

Interval

This column displays the actual time of each sample, starting at 0.0 for each recording sequence and increased by the sample interval value. This column is provided for convenience in creating X-Y charts, as it can be used for “X-range” data.

Sample Data

These columns display sample data read from the specified input channels – one column per selected channel. The user-defined channel label is the column name and the ‘engineering units’ are displayed in the first row. Analog data is displayed as scaled values; by default, 0 to 5 volts.

Time Stamps

The data and time for each data sample are displayed in this column. Data recorded from multiple logging sequences is displayed sequentially. That is, the first data record in a logging sequence is displayed immediately following the last record of the previous sequence. The start of a new sequence is easily distinguished by the green-colored text, in addition to the 0.0 value in the Interval column.

3.6 Graph Data View

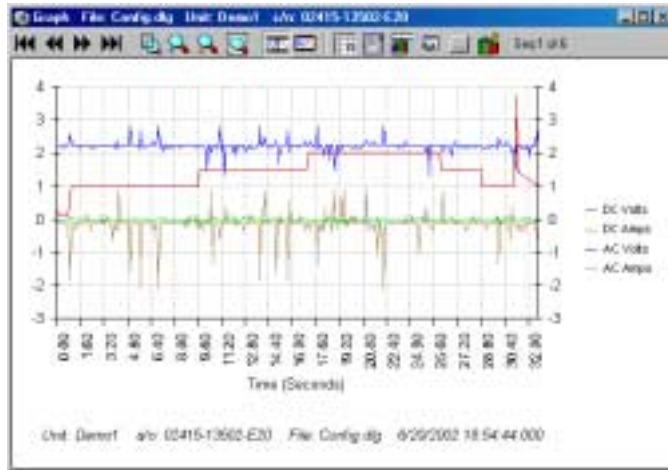
****NOTE:** Various formatting options are available on the right mouse menu. Access this menu by placing the mouse over the graph window and clicking the right mouse button.

“All: Sequences Method”



Click this toggle button ‘on’ to view all recorded sequences as they were on continuous of paper. Each sequence starts right after one another, end-to-end. The x-axis values will reset and count up for each sequence. When viewing the graph this way, the next and previous sequence buttons have no effect. The Graph Start button moves to the beginning of the 1st sequence. The Graph End button moves to the end of the last sequence.

“Individual” Sequence Method



Click this toggle button ‘on’ to view each sequence individually in the graph window. The scroll bar at the bottom will scroll from the beginning of the current sequence to the end of the current sequence. If you want to view other sequences, click the next and previous buttons. This current sequence is displayed on the tool bar.

Graph “Beginning” and “End”



Click these buttons to move the graph view to the beginning of the 1st sequence, or the end of the last sequence regardless of the current graph method. If

you are viewing multiple sequences and want to move to the beginning of a particular sequence, use the scroll bar.

Graph “Next” and “Previous” Sequence



Click these buttons to move between sequences.

Zoom “In” and “Out”



Click this button to zoom in on the data by a factor of 2. The center of the graph window is the zoom point.

Open Data View (Spreadsheet)



Click this button to show the spreadsheet data view.

Create Configuration (Graph)



Use this option to open the configuration form with the parameters used to generate this data. This allows you to quickly configure a logging unit from a previous test file because all options are duplicated from the original configuration.

4.0 Feature Details

This section will discuss in detail some of the advanced features of the TRAC Configuration and Analysis software program.

4.1 Status Window

For general information about the Status Window and its function, please refer to the **Section 3.1: Operation Overview – Status Window**.