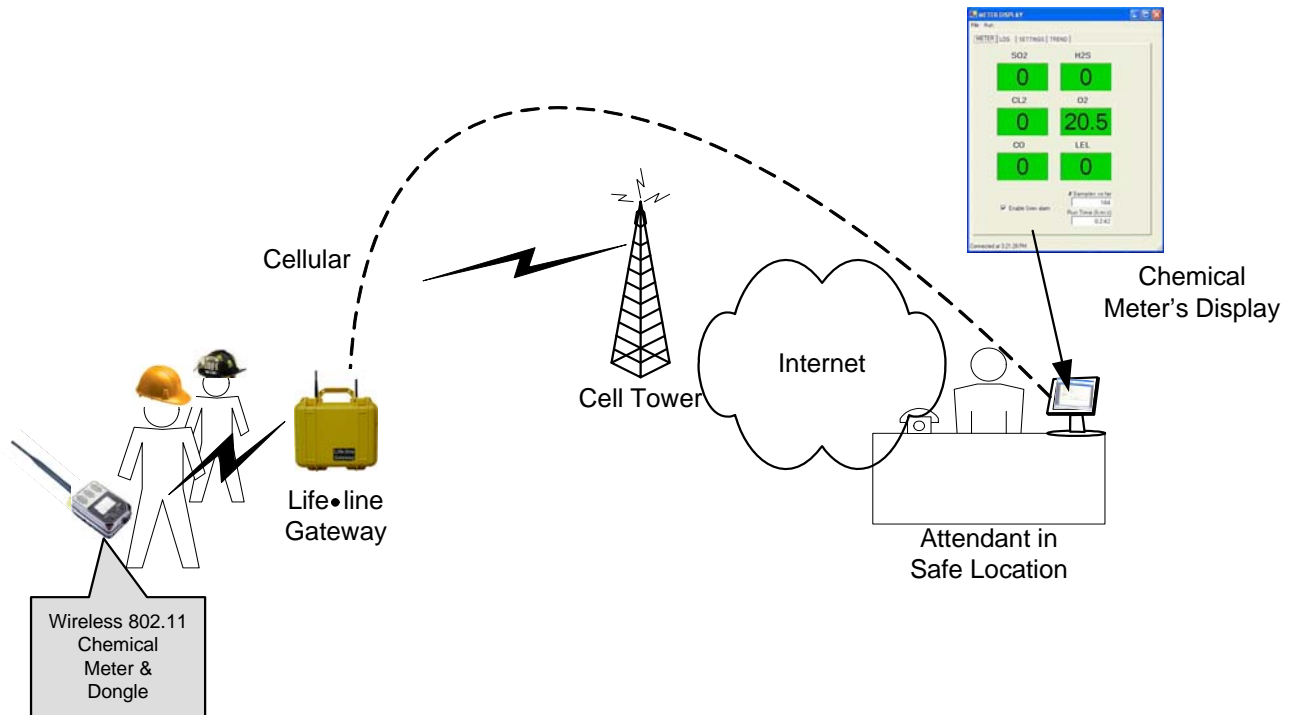




Life•line System System Manual

AT32670200



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1.0 Overview:

Management of hazards such as the release of chemical, radiological or biological agents requires timely information from sensors and detectors. Viewing meter readings while wearing Level A protection suits and gloves can be extremely cumbersome. The practice of transmitting readings by voice to incident command centers can be subject to security risks. Automatic wireless transmission of meter readings to incident command centers is a widely sought solution to these problems.

The solutions offered by Safe Environment Engineering provide a one stop total systems integration package for incident response agencies seeking the capability to communicate sensor data gathered on-site to an individual in an incident command center or anywhere in the world having an internet connection.

The Safe Environment Instrumentation Solution includes the following elements:

- Wireless data transmitters that can be physically attached to a variety of existing chemical, physiological or radiological sensors.
- Custom wired or infrared interconnections between the sensors and data transmitters that allow the capture of readings that appear on meter displays in a digital format.
- A wireless delivery system that can route data to any Internet connected computer.
- A software suite that remotely receives wireless data and includes real-time meter displays, settings for visible and audible alarms and charting components for visualizing trends.
- A variety of data sharing, alerting, visualization and messaging tools for data distribution among applications capable of using the Common Alerting Protocol (CAP).

The wireless software suite is built on a common operational platform (Microsoft .NET) that can be readily customized to provide archival data storage, data aggregation and data re-transmission. Sensor measurements can also be joined with GPS positional information and posted on map displays.

2.0 Installation:

The Lifeline Wireless Monitoring System application comes pre-installed on system computers, the Lifeline Interoperable Network Communicator (LINC) and Gateway. This configuration was designed to allow quick utilization of the system's capabilities.

2.1 Lifeline Gateway:

The Lifeline Gateway bridges the data acquired from a meter's medium distance Wi-Fi radio (LINC) through cellular to any computer having Internet access. The

Lifeline Gateway is sealed and operates on fully charged batteries for at least 8 hours.

The Lifeline Gateway is also a local “Hot Spot” for wireless Wi-Fi equipped computers to gain access to the Internet for research or other library information.



Lifeline Gateway

Lifeline Gateway Controls



To turn on the Lifeline Gateway rotate antennas and toggle the power switch. An indicator on the power switch will glow green when the unit is on. The cellular and Wi-Fi indicators will turn on as soon as both networks are verified and operational.

Battery Charger



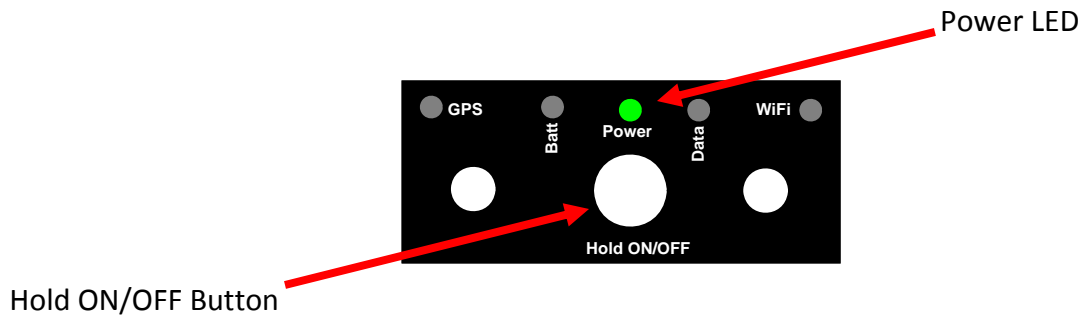
2.2 LINC Battery Installation:

Remove the 4 screws that hold on the LINC cover and insert a fully charge battery.



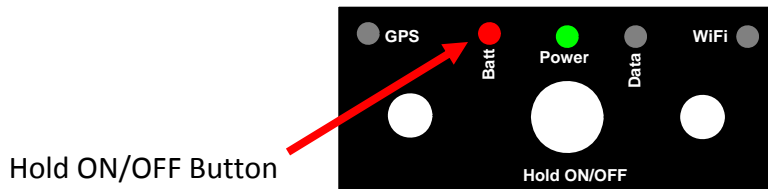
3.0 Turning On/Off the LINC:

Press and hold the Hold ON/OFF Button for 2 seconds until the Power LED illuminates green. Press and hold the Hold ON/OFF Button for 3 seconds to power off the LINC.



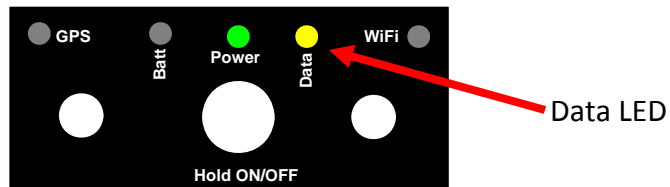
3.1 Low Battery Indicator:

A red Batt light indicates a low battery condition. The battery should be recharged or replaced.



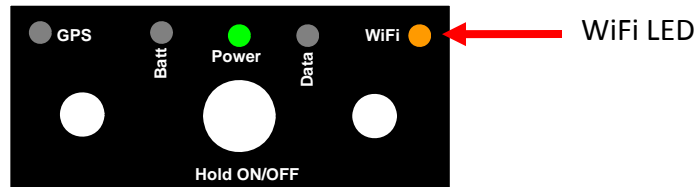
3.2 Data Indicator:

The yellow Data LED indicator lets the LINC user know that meter data is successfully getting back to the monitoring application.



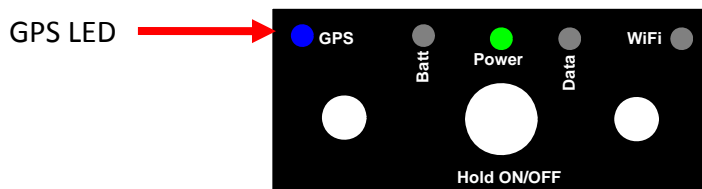
3.3 WiFi Indicator:

The Orange WiFi LED indicator shows the status of the LINC's connection to a Lifeline Gateway or wireless local area network. If the LED is solid it indicated a connected condition if it is flashing it is not connected.



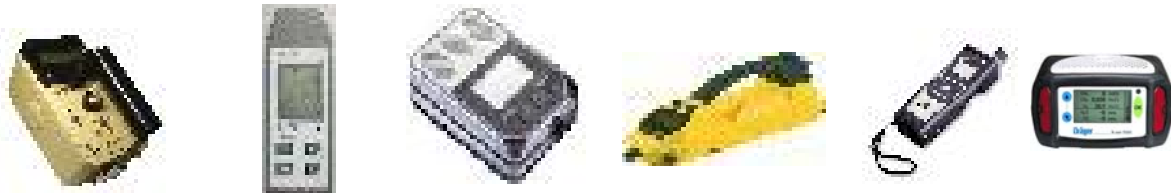
3.4 GPS Indicator:

The Blue GPS LED indicator provides confirmation of valid GPS acquisition.



4.0 Starting the Monitoring Software:

On the desktop double click the Icon for the meter you wish to view.



4.1 Sample Monitoring Application Opening Screen (Drager meter shown)



The screenshot shows the 'SafeEnvMonitor' application window. The main display area contains a table of gas concentrations. A green vertical bar highlights the first two rows (CH4 and IBUT). The table data is as follows:

Chemical Name	Chemical Concentration	Units of Measure
CH4	0.00	%LEL
IBUT	0.00	ppm
O2	20.90	vol%
H2S	0.00	ppm
NH3	0.00	ppm

Below the table, the 'STATUS' is set to 'Exercise' and the mode is 'IF TESTING SET TEST'. The interface includes several status indicators and fields:

- Incident Identification Field:** A field for entering an incident ID.
- User Identification Field:** A field for the user's ID.
- Source Meter:** A field for the source meter ID.
- Signal Strength:** Indicated by a bar graph and '-19 dBm'.
- Connection Indication:** A small globe icon.
- Communications Processing Indicator:** A small globe icon.
- Total Time Sampling:** Displayed as '00:17:55'.
- Total Number of Samples:** Displayed as '# Samples: 89'.
- % Usable Battery:** Displayed as '91%'.
- Current Battery Voltage:** Displayed as '4.4V'.
- Status Bar:** Contains 'Reading Post Success: 889' and '192.168.9.114:8023'.




- **Chemical Name** – Chemical abbreviation of the monitored substance.
- **Chemical Concentration** – The strength of the substance being monitored.
- **CAP Message Status Field** – Allows quick setting of the alert status for CAP messages. **This status will be transmitted to all configured alerting services.** Possible values are Actual, Exercise, System, Test or Draft.
 - “Actual” - Actionable by all targeted recipients
 - “Exercise” - Actionable only by designated exercise participants; exercise identifier SHOULD appear in <note>
 - “System” - For messages that support alert network internal functions
 - “Test” - Technical testing only, all recipients disregard
 - “Draft” – A preliminary template or draft, not actionable in its current form



- **% Usable Battery** – The percentage of remaining battery capacity to power the Dongle.
 -  Battery voltage in operational range
 -  Low Battery Alarm

- **Current Battery Voltage** – The current voltage of the battery (operational range is 4.6 – 2.8 Volts)

- **Status Bar** – Text indicating different tasks the application is performing. Common messages Include:
 - Communications link has connected
 - Connecting to 192.168.x.x on Port 8023
 - Disconnected at HH:MM:SS AM/PM
 - Failed to connect to the meter: Timeout
 - Battery info updated

- **Total Number of Samples** – The total samples taken from the meter since the start of the current wireless link. If link is lost and re-established this number will reset.

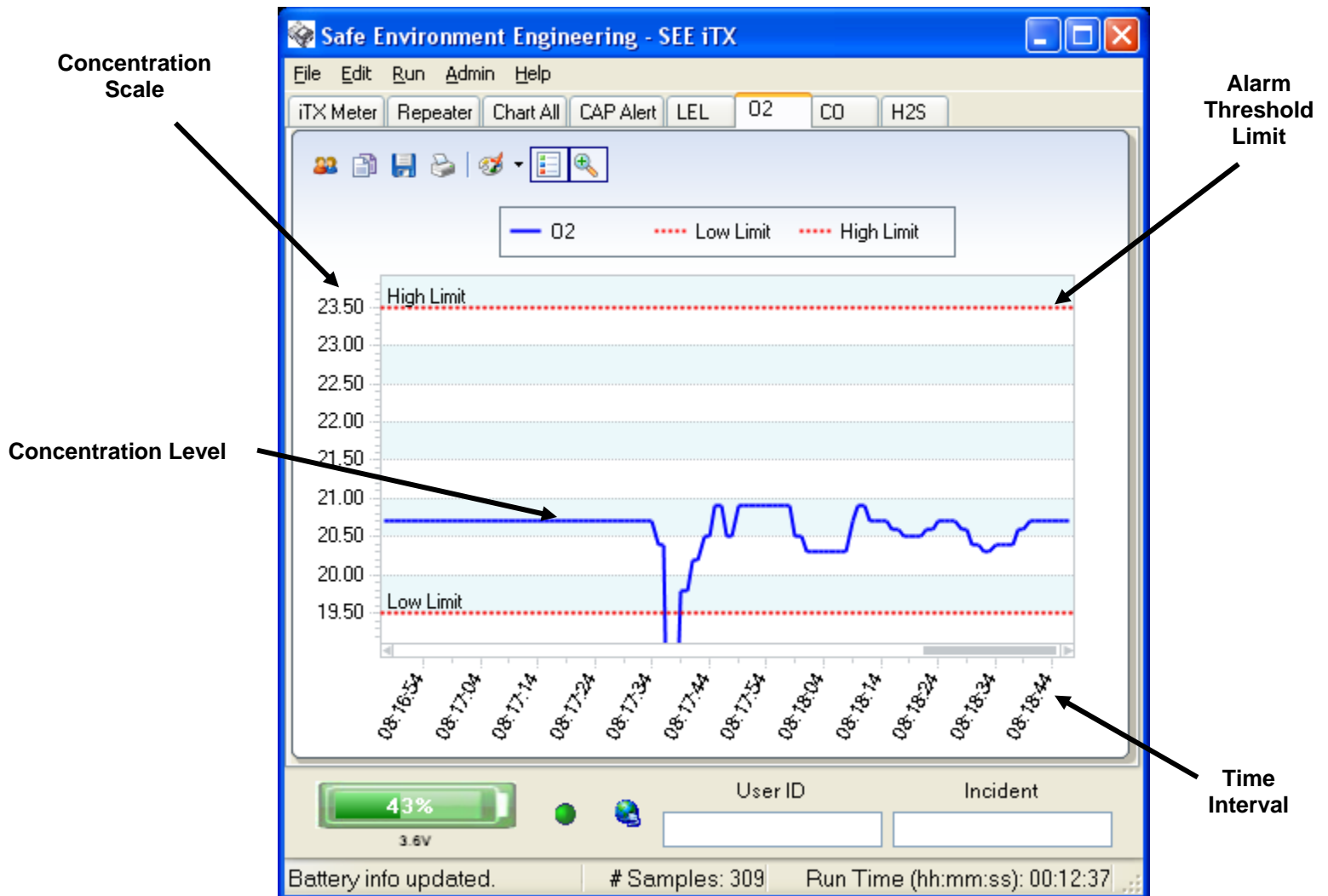
- **Signal Strength** – Current signal strength to the instrument Dongle.
- **Communications Processing Indicator** – This indicator has 3 states:
 -  Grey – The application is idle
 -  Green – The application is processing data from the meter
 -  Red – The wireless link is disconnected and data is not processing

- **Connection Indication** – The communications globe has 2 states:
 -  A wireless link has been established with the meter.
 -  The wireless link with the meter is broken and the application is attempting to re-establish.
- **Total Time Sampling** – How long active samples have been accumulated
- **Source Meter** – Identifier for the currently connected meter.
- **User Identification Field** – Field to type a user's name and/or ID.
- **Incident Identification Field** – Field to type Incident name and/or ID.
- **Alarm Notification** – If high or low threshold limits are exceeded the display box for that chemical turns red.



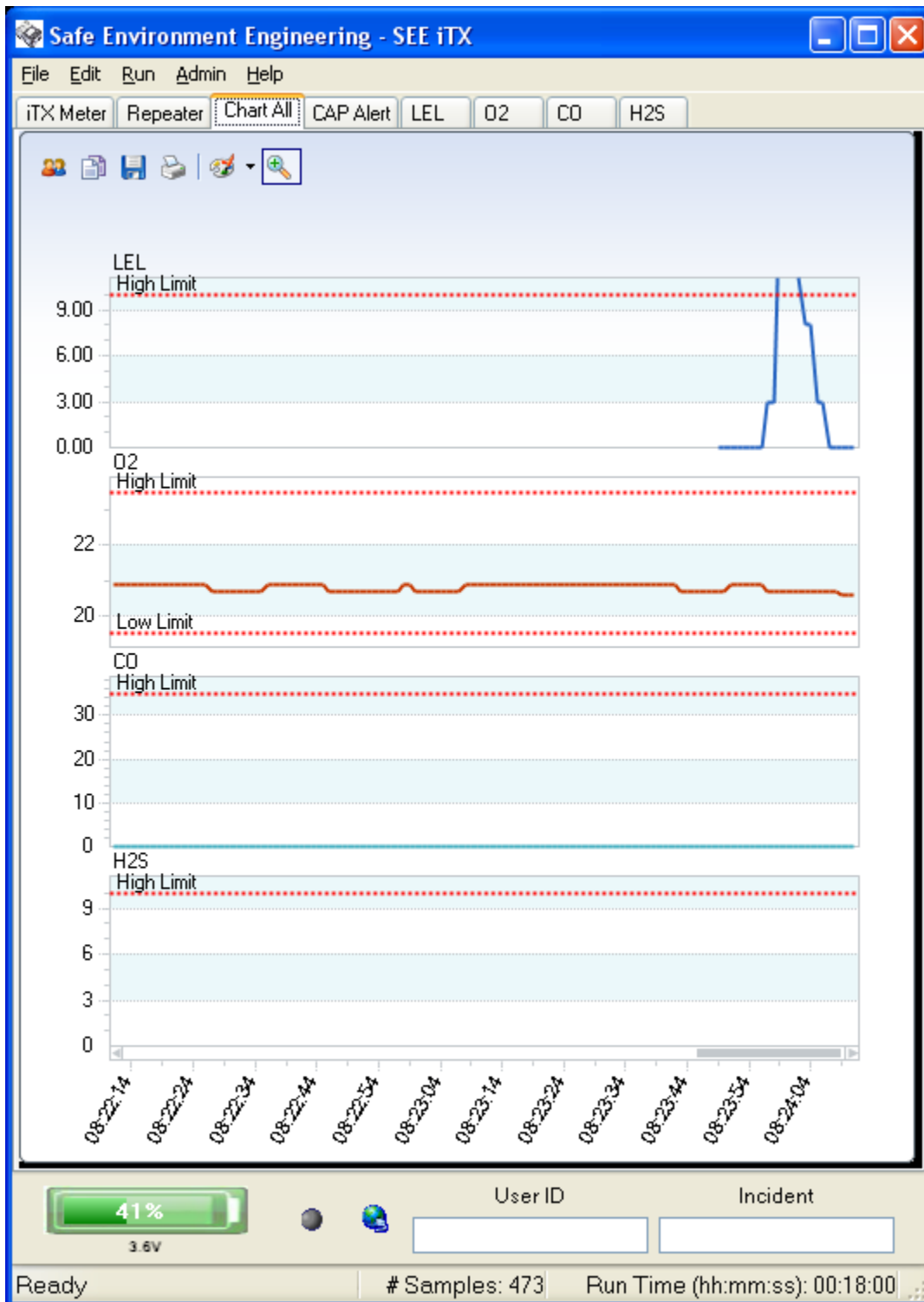
- If the monitor application is hidden by another display it is immediately displayed on top of any other application.
- **Units of Measure** – Units of measure used for each reading

4.1.1 Sample Strip Chart (iTX meter shown)



- **Concentration Scale** – The maximum resolution set between zero and the High Limit alert limit (see Appendix A).
- **Concentration Level** – The averaged concentration level measured in $\mu\text{g}/\text{m}^3$ for the given Interval Resolution.
- **Alarm Threshold Limit** – The alarm threshold limits for High and Low are the levels that the alarm will automatically be set off.
- **Time Interval** – How many minutes of sample viewing is displayed on the chart. This interval window can be set from 1 to 10 minutes.

4.1.2 iTX Strip Chart – Chart All

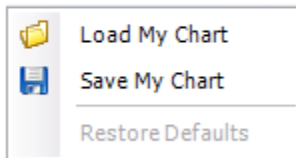


The Chart All Tab allows all the strip charts to be viewed simultaneously. Depending on the number of substances being monitoring resizing the display is advised for easy viewing.

4.1.3 iTX Strip Chart – Settings

The following choice boxes appear in each meters monitor application chart screen:

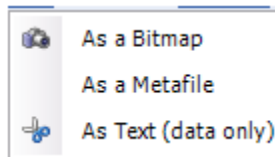
Chart Settings



Load My Chart loads a saved chart
Save My Chart saves the current Chart
Restore Defaults returns to the default settings

Copy - Drop down selection menu.

Each selection will copy the chart area into the clipboard.
The “As Text” choice copies the data points into the clipboard as text in a tabulated format and can be pasted into a wordpad document and printed.



Prints the selected chart area.



Palette selection choose one of the colors from a drop down menu to set the color scheme for the chart.



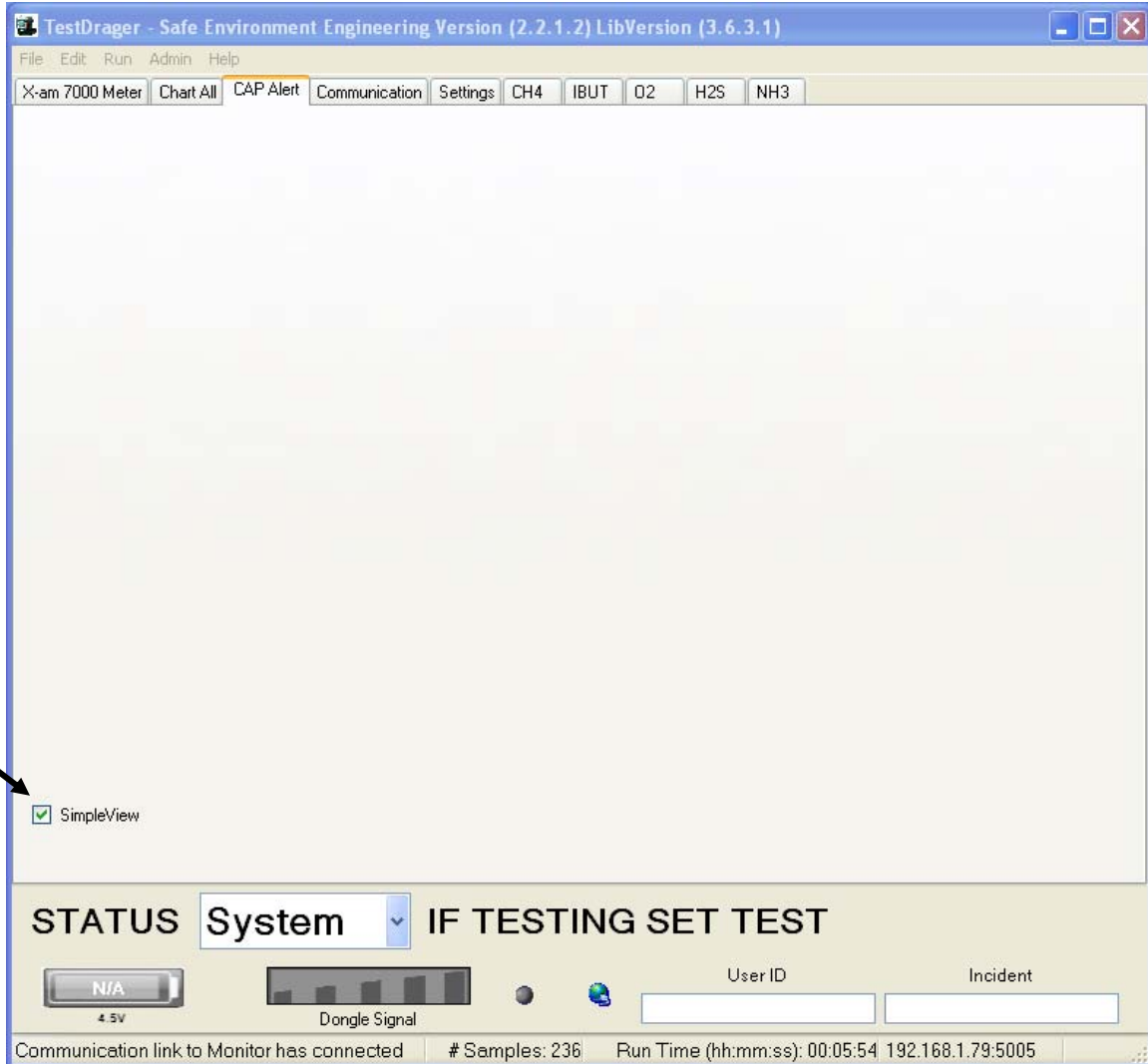
Zoom – Press this to set a manual zoom area. Drag the mouse outwards from the click to center the data around the selection frame. Press again to turn off the zoom.



Legend Box – Select to show or hide the legend.

4.2.0 CAP Alert Tab

By default, the CAP settings are hidden.



Uncheck
SimpleView to
show

Unchecking the SimpleView box will display the full CAP message interface.

CAP Alert Message Information

CAP Alert E-mail Setup

GPS Coordinates and Description

Check to replace data feed with manual Head Line

CAP Send Button

- **CAP Alert E-mail Setup** – CAP Alerts can be sent to E-mail recipients. Similar to other E-mail programs the Outgoing Server, password and Port number is needed to send an E-mail. Multiple E-mails can be sent by inserting a comma between addresses. Setup information is retained.
- **GPS Coordinates and Description** – Coordinates obtained from the associated GPS are displayed in this section as aWGS-84 coordinate pair with a zero radius area indicating a point. Users can type in an Area description for further information detail.
- **CAP Send Button** – Depressing the CAP Send Button will send on-demand CAP information to E-mail recipients and/or other WEB Services selected on this page.
- **CAP Alert Message Information** – CAP Alerts must contain basic additional information to insure the message transferred to other sources have sufficient information to produce actionable results.
 - **Identifier** – A unique message identification string that is generated each time new CAP information become available.

- **Sender** – Identifies the originator of the alert. This must be an Internet domain name.
- **Date Sent** – Represents the date and time an alert message is sent
- **Status** – Denotes the handling of the Alert. Mandatory values are Actual, Exercise, System , Test or Draft.
- **Message Type** – Denotes the nature of the Alert. Mandatory values are Alert, Update, Cancel, Ack or Error.
- **Source** – Provides necessary information on what and where the Alert comes from. Four elements complete the Source field, the meter/sensor manufacturer and model number, the unique open file for the meter/sensor being monitored, the MAC address of the Dongle being communicated with and the IP address of the computer hosting the application.
- **Scope** – Denotes the intended distribution of the Alert. Mandatory fields are Public, Restricted or Private.
- **Category** – Denotes the category of the event comprising the Alert. Mandatory values are Geo, Met, Safety, Security, Rescue, Fire, Health, Env, Transport, Infra or CBRNE.
- **Event** – Lifeline is a meter/sensor monitoring applications, therefore, the Event is hardcoded as a Reading.
- **Urgency** – Denotes the urgency of the Alert. Mandatory values are Immediate, Expected, Future, Past or Unknown.
- **Severity** – Denotes the severity of the Alert. Mandatory values are Extreme, Severe, Moderate, Minor or Unknown.
- **Certainty** – Denotes the certainty of the Alert. Mandatory values are Observed, Likely, Possible, Unlikely or Unknown.
- **Date Expires** – It may be desired to have the CAP data sent to other systems retained on those systems for evaluation, analysis or other analytical work. The Date Expires tell other systems how long to store the data. Minimum expires value is one day.
- **Headline** – Meter/sensor data is populated in this field. Four designators are included for each substance being monitored, substance name (periodic name), substance concentration, units and a green, yellow (where appropriate) or red indicator reflecting a “good”, “warning” or “alarm” state (as defined in the setting windows).
- **Info Description** – Used for meter/sensor probe type.
- **Instruction** – Used for indication of the number of sensors/substances being monitor and indication of remaining usable battery voltage of the Dongle.

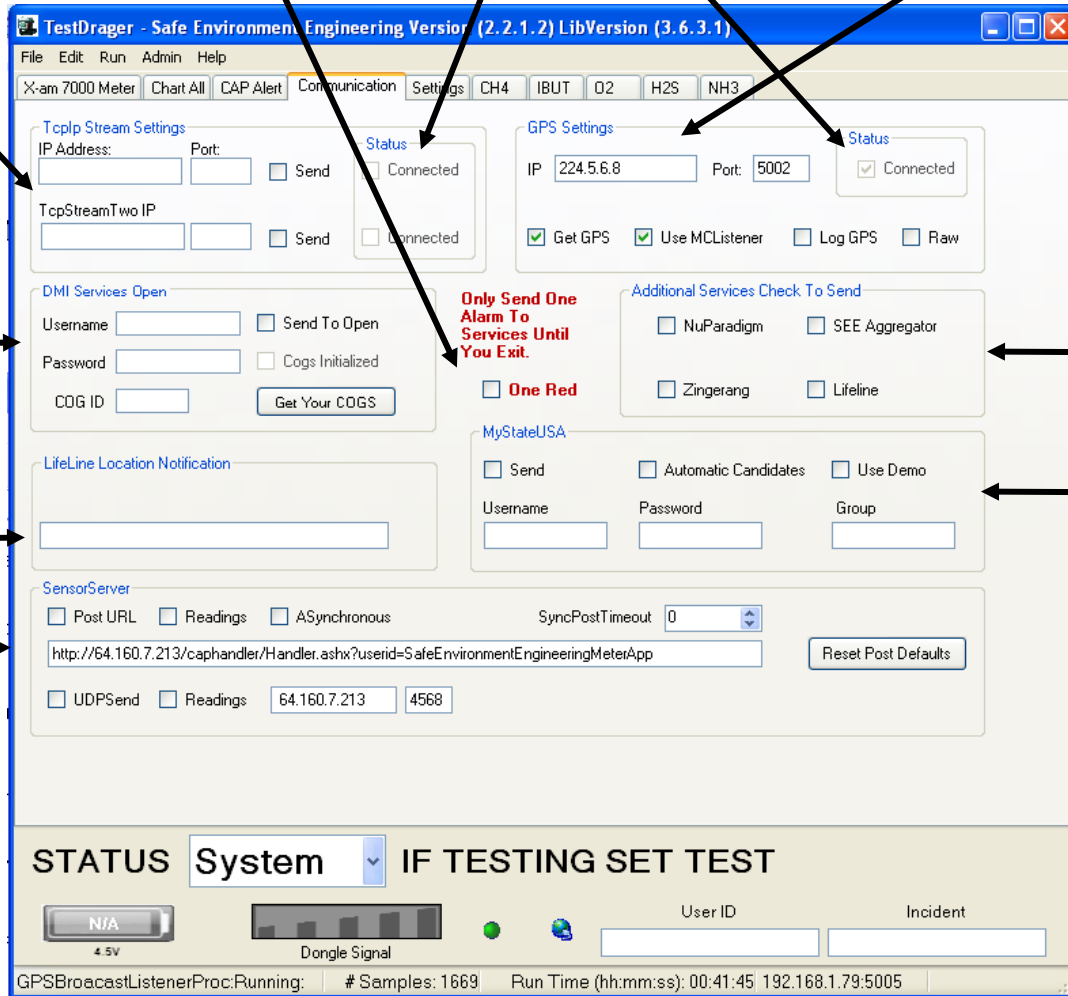
4.3.0 Communication Tab (password protected)

Restricts Red Alerts to the selected services to one per application run.

Connect Status

GPS Dongle Association

Live CAP Feed to IP Address



OPEN Server Interface

Additional Alerting Services

MyStateUSA Server Interface

Send alerts to Lifeline system

Sensor Server Interface (supports multi-meter viewer)

- **Restricts Red Alerts** – Prevents multiple alert notifications from the same incident
- **Live CAP Feed to IP Address** – Streaming CAP sent to a TCP/IP address with a given port number. Selecting the Send check box will turn on this feature.
- **GPS Dongle Association** – GPS location information can be associated with the sensor feeds. A GPS Dongle can be attached to the instrument or to the Lifeline Gateway. To associate a GPS insert the GPS IP address in this section. Select the Get GPS to acquire location data. Select Use MC Listener when using the GPS Gateway program to associate the same GPS data to more than one sensor.
- **OPEN Server Interface** – OPEN provides Federal customers a server bridge to share information between preplanned organizations. OPEN is a agency and vendor neutral federally sponsored server for sharing data provided its rules area used. To use this

service registration must be obtained and a Collaborative Operating Group (COG) setup. Please contact <https://interop.cmiservices.org> or Safe Environment Engineering.

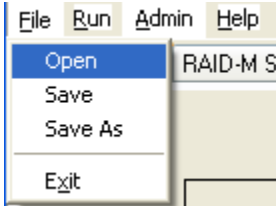
- **Sensor Server Interface** – Enables posting data to a central server for data sharing, storage, and real-time multi-party data display. Either web posting OR UDP sends are supported. Selecting either Post URL or UDPSend will transmit Candidate alerts, and selecting Readings will stream sensor readings as well. Asynchronous and SyncPostTimeout settings are additional settings that may be needed for poor communication conditions.
- **MyStateUSA** – MyStateUSA is an interoperability service that provides both rules based information routing and notification services. This WEB service receives Lifeline CAP data and routes, reports and and/or alerts subscribed recipients using many different reporting tools such as cell phones, E-mails or through other partner programs to Emergency Alerting Systems (such as Amber Alerts).
- **Additional Alerting Services** – Nuparadigm and Zingerang are WEB middleware services providing database services to acquired Lifeline CAP data. Large database manipulation provides statistical and analytical utilization of the data to provide many metrics to users wishing to view trends or looking for specific queries of data sets. Rules can also provide data routing to multiple additional services.
- **Connect Status** – Grey check marks will populate these boxes when the connection is active.

5.0 Getting Connected With The Dongle:

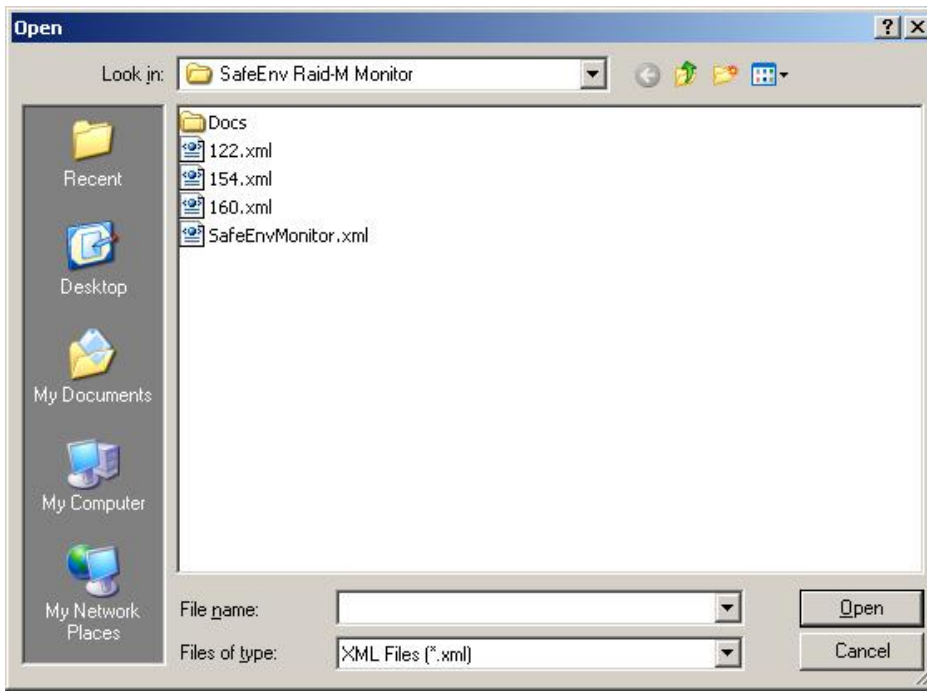
Locate the Number on the bottom of the Dongle:



Select Open from the File menu:



Highlight the xml file with the same Serial Number as the Dongle and click open:



Select Start from the Run menu:

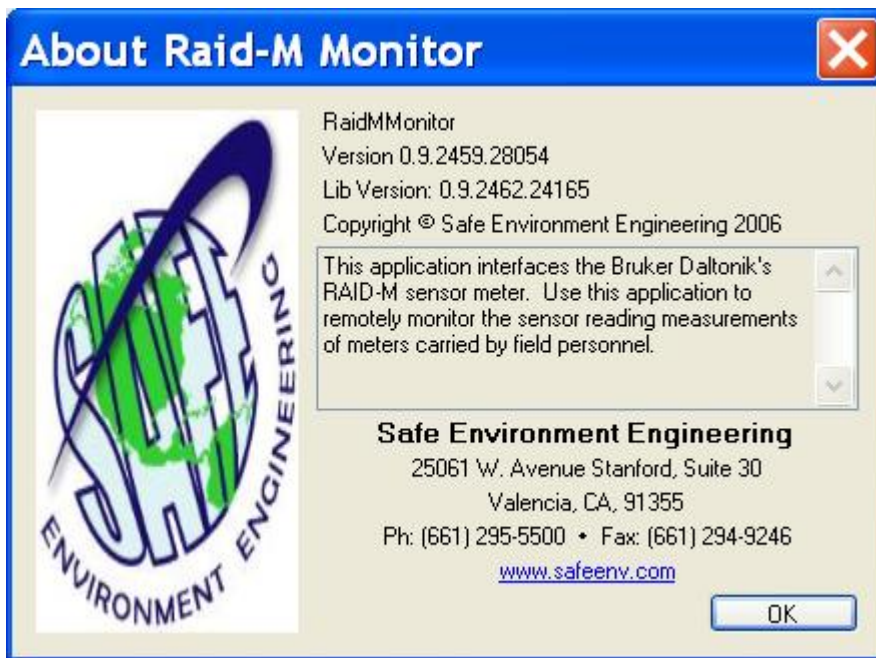


To Stop Select Stop from the Run menu:



6.0 Help:

Application and contact information:



Appendix A

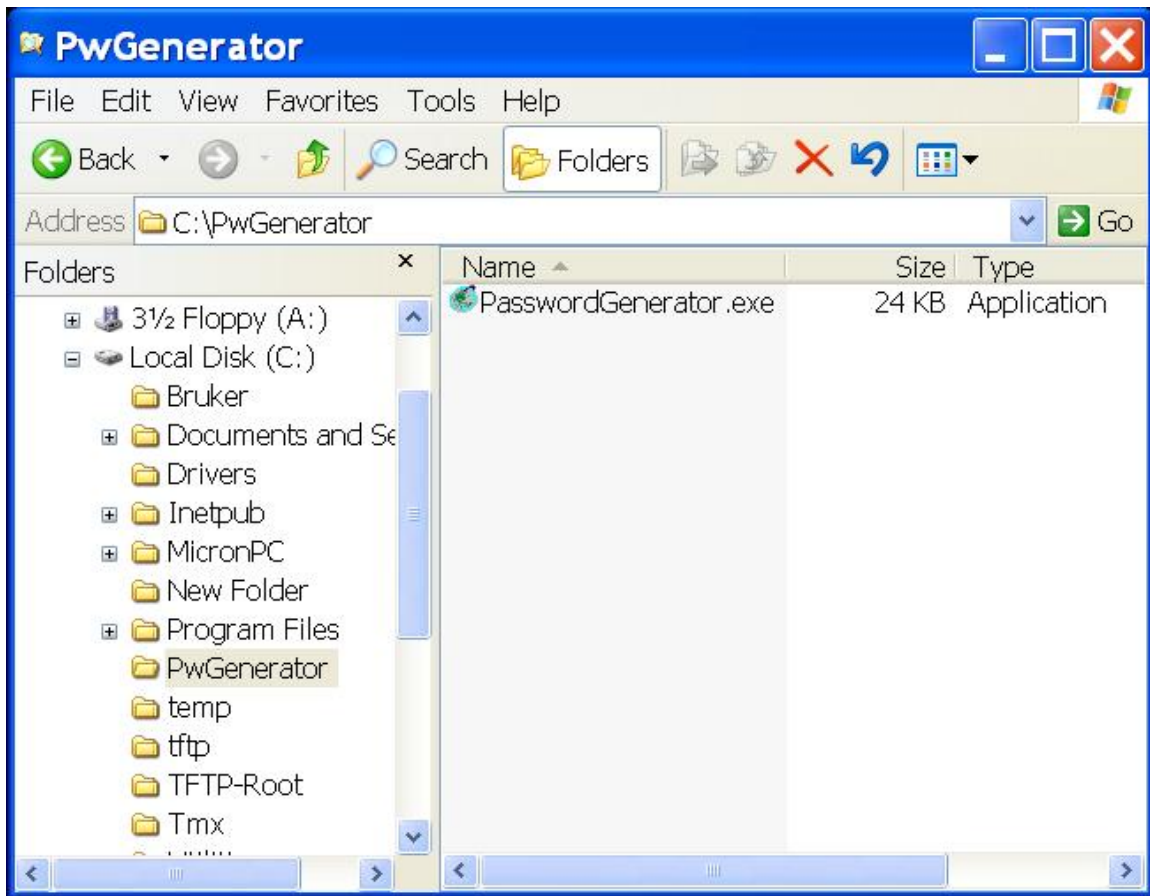
Administration Setting and Logging

Administration settings, Communication settings, and Logging functionality are hidden behind 3 password protected Tabs. The Settings Tab provides meter binding information and alarm threshold configuration. The Communication tab controls connections to specific meters and other services. Since these values typically do not need changing they have been password protected to eliminate inadvertent change. Logging is also provided to view statistical data and count information.

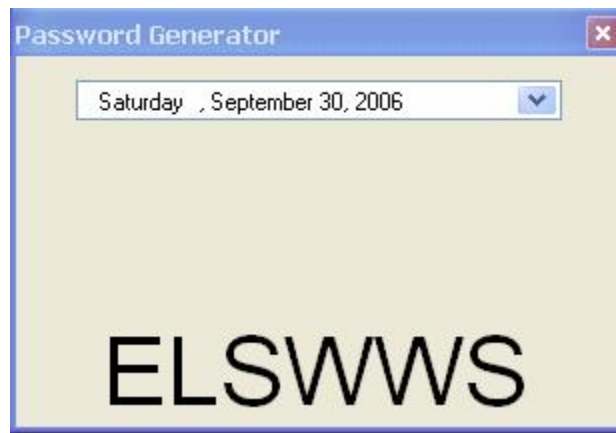
1.0 Password Generator:

The Password Generator is a date driven tool that will change daily to insure a relatively high level of security and to eliminate the need for memorized lists.

The Password Generator application can be found in the c:\Program Files\PwGenerator folder or on the Desktop of some computers:

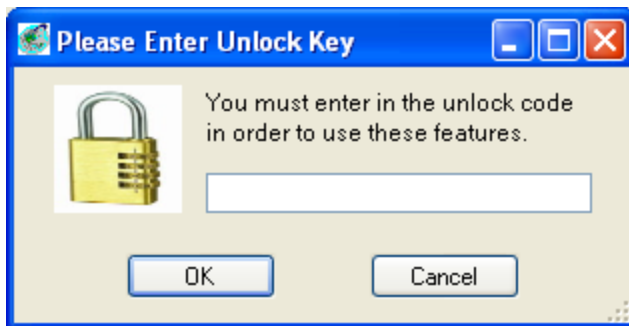


Double clicking on the PasswordGenerator icon will generate the password of the day.



Please make note of the Password. In our example the password is ELSWWS (the password is not case sensitive). The password will be necessary to unlock the Administrative privileges of the application.

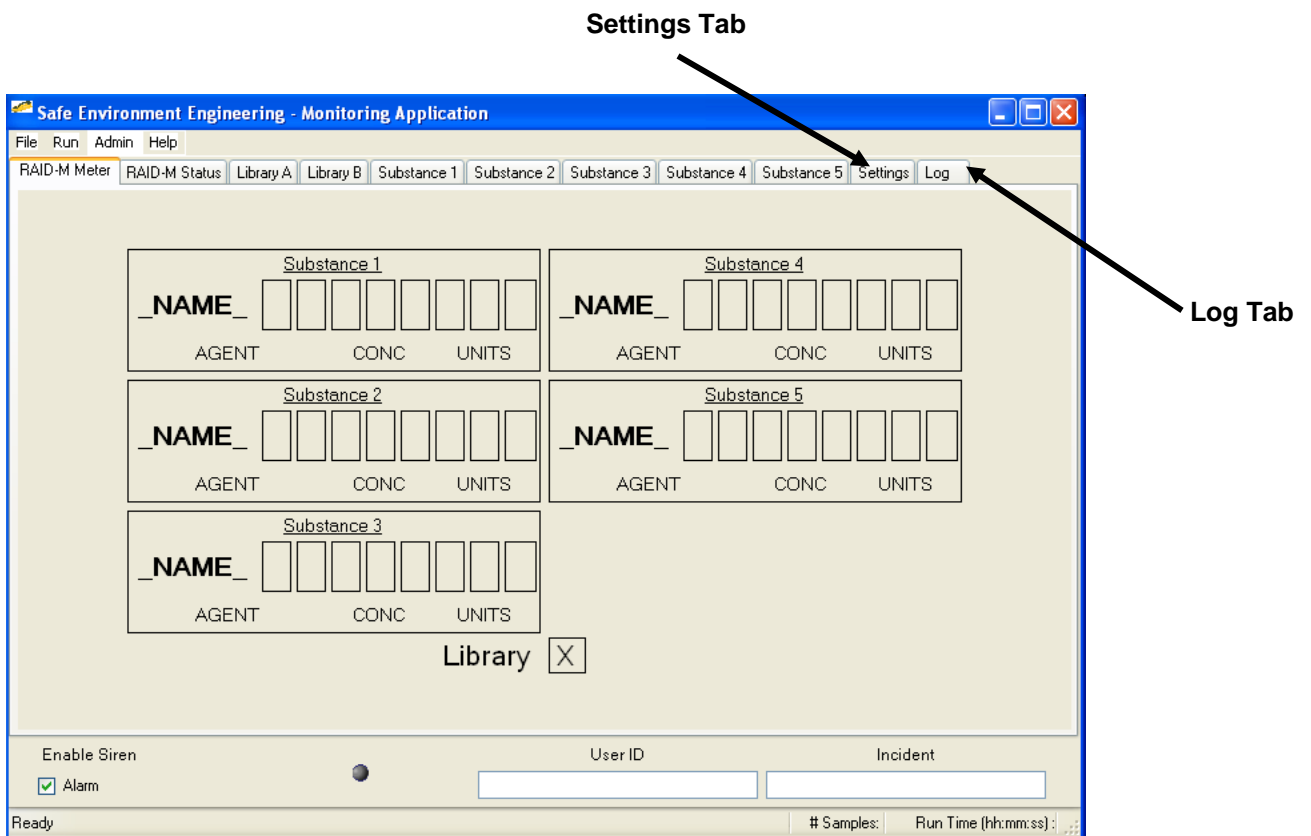
Enter the password into the Unlock Key and select OK:



The Admin window will activate 2 additional options - Setting Tab and Log Tab:



Selecting the Setting and/or Log Tabs will create 2 new Tabs under the main window:



Appendix B Settings

The Setting window provides general network and alarm information for the Dongle and connected meter:

Dongle URL or IP Address

Network Communications Port

Meter Display Picture Button

Dongle IP Address (used on meters with embedded Dongles)

Alarm Threshold Values

Test Alarms Not Operational

Activate Changes

Save Settings

TestDrager - Safe Environment Engineering Version (2.2.1.2) Lib Version (3.6.3.1)

File Run Admin Help

X-am 7000 Meter Chart All CAP Alert Communication Settings CH4 IBUT O2 H2S NH3

Network Setting

Meter's IP Address: 192.168.1.79 Port: 5005 Timeout (s): 30 Scale GPS Sec: 60

Read Batt Voltage TSecs: 30 Battery Port: 23 DongleIP: GPS Retry: 10

Tail: Unicode Browse Wait (ms): 0

Sensors & Alarms Note: Leave box blank to omit test

	Sensor	Units	Low Limit	High Limit
Channel 0	CH4	%LEL		
Channel 1	IBUT	ppm		
Channel 2	O2	vol%		
Channel 3	H2S	ppm		
Channel 4	NH3	ppm		

Enable Siren Alarm Test Alarms Configure Polling Rate (ms): 1500 SourceLineSettingsFile

Save Settings

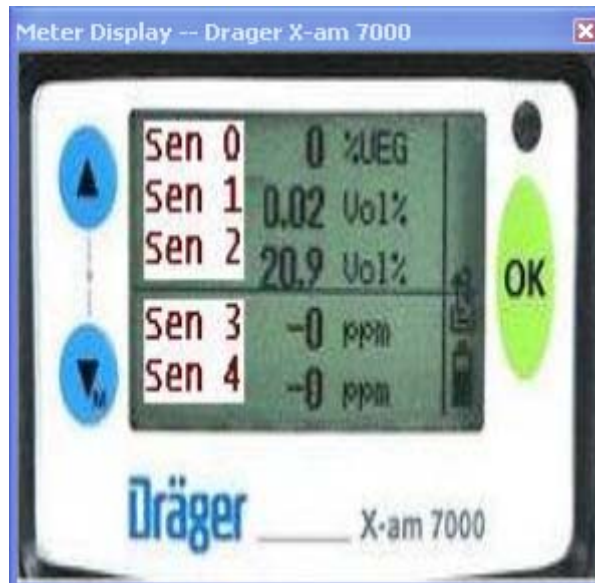
STATUS System IF TESTING SET TEST

N/A 4.5V Dongle Signal User ID Incident

GPSBroadcastListenerProc:Running: # Samples: 29 Run Time (hh:mm:ss): 00:00:43 192.168.1.79:5005

- **Dongle URL or IP Address** – The Identification or Address on the Dongle case. This is also the network address of the wireless radio in the device.
- **Network Communications Port** – A network port that allows data to be exchanged with the wireless device
- **Dongle IP Address** – This feature is used for meters that have been modified to have embedded wireless Dongles as well as Ethernet connections.
- **Alarm Threshold Values** – High and Low limits to trigger system alarms. Most substances will only have a high limit. Low Limits are provided for concentrations of substances below a desired level. For example Oxygen has a Low Limit of 19.5 and a High Limit of 23.5.
- **Test Alarms Not Operational** – This feature is not in operation.
- **Save Settings** – All display data is saved to the current open xml file.
- **Configure** – Activates all changed settings.

- **Meter Display Button** – Picture representing the face of the meter allowing the system administrator greater ease of setting up what Substance alarm threshold goes in what location



Appendix C Logging

Logging provides some statistical information to the viewer of the raw data acquired by the application along with information on timing intervals of the data messaging.

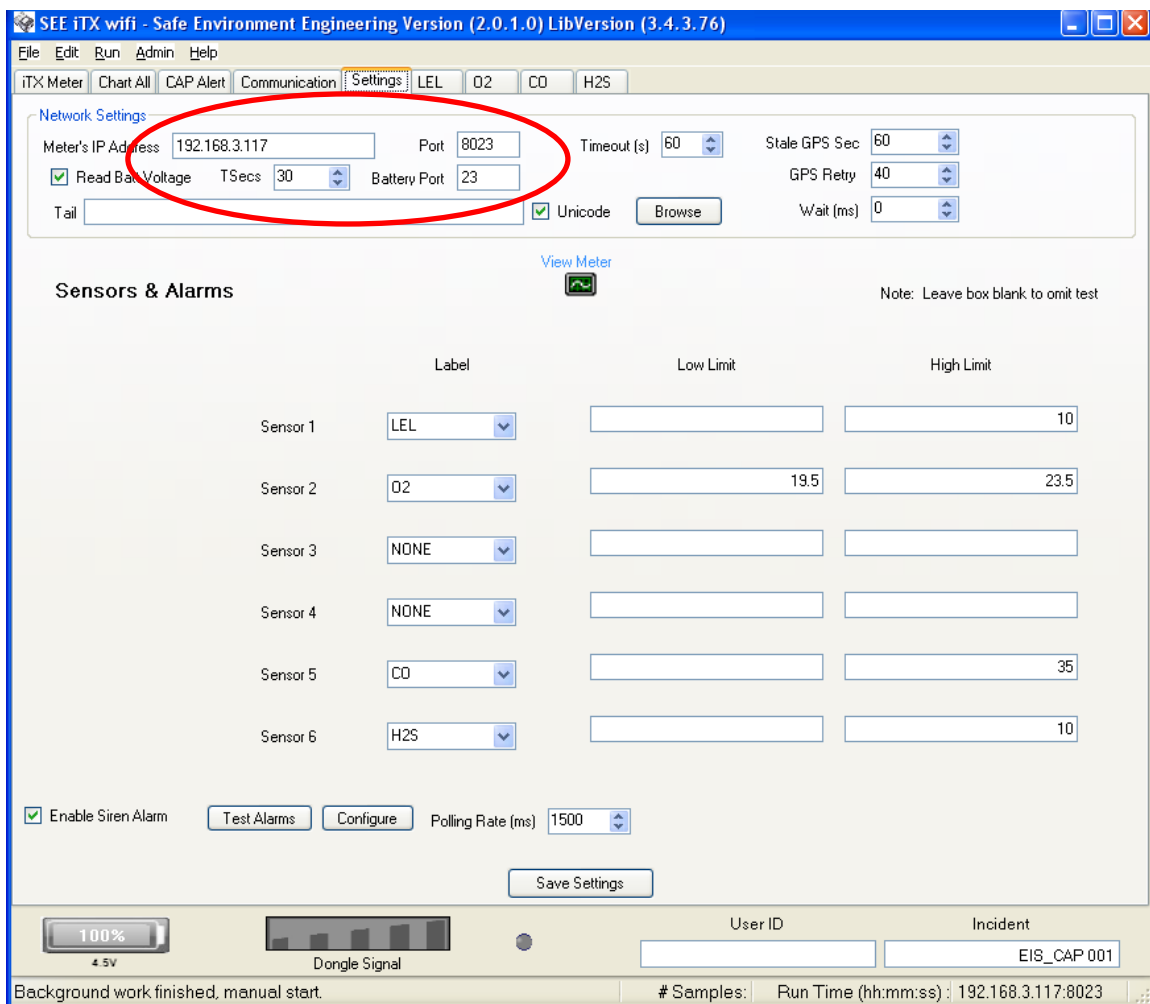
The screenshot displays the 'Safe Environment Engineering - Monitoring Application' window. The top menu bar includes 'File', 'Run', 'Admin', and 'Help'. Below the menu is a toolbar with buttons for 'RAID-M Meter', 'RAID-M Status', 'Library A', 'Library B', 'Settings', 'Substance 1', 'Substance 2', 'Substance 3', 'Substance 4', 'Substance 5', and 'Log'. The main area is divided into two sections. The upper section shows a list of raw data samples, each represented by a long hexadecimal string. The lower section contains a statistical summary with the following fields: 'Count' (20), 'Min Interval' (0), 'Avg Interval' (999), 'Max Interval' (1492), 'std. dev.' (168), and 'Errors' (empty). At the bottom of the window, there are checkboxes for 'Update Meters' and 'Alarm', and input fields for 'User ID' and 'Incident'. The status bar at the very bottom shows 'Communication link was connected', '# Samples: 20', and 'Run Time (hh:mm:ss): 00:00'. Several arrows point from text labels to specific elements in the interface: 'Total Number of Samples' points to the 'Count' field; 'Minimum Data Exchange Interval' points to the 'Min Interval' field; 'Average Data Exchange Interval' points to the 'Avg Interval' field; 'Maximum Data Exchange Interval' points to the 'Max Interval' field; 'Raw Data' points to the list of hexadecimal strings; 'Standard Deviation' points to the 'std. dev.' field; and 'Error Count' points to the 'Errors' field.

- **Total Number of Samples** - The total samples taken from the meter since the start of the current wireless link. If link is lost and re-established this number will reset.
- **Min Interval** – Minimum data exchange interval in milliseconds.
- **Avg Interval** – Average data exchange interval in milliseconds.
- **Max Interval** – Maximum data exchange interval in milliseconds.
- **Errors** – Error count number.
- **Std. dev.** – Standard deviation.
- **Raw Data** – The raw data received by the application.

Appendix D Creating a New Meter File From an Existing Meter

This step involves opening an existing file, making the changes necessary then saving it as a different name.

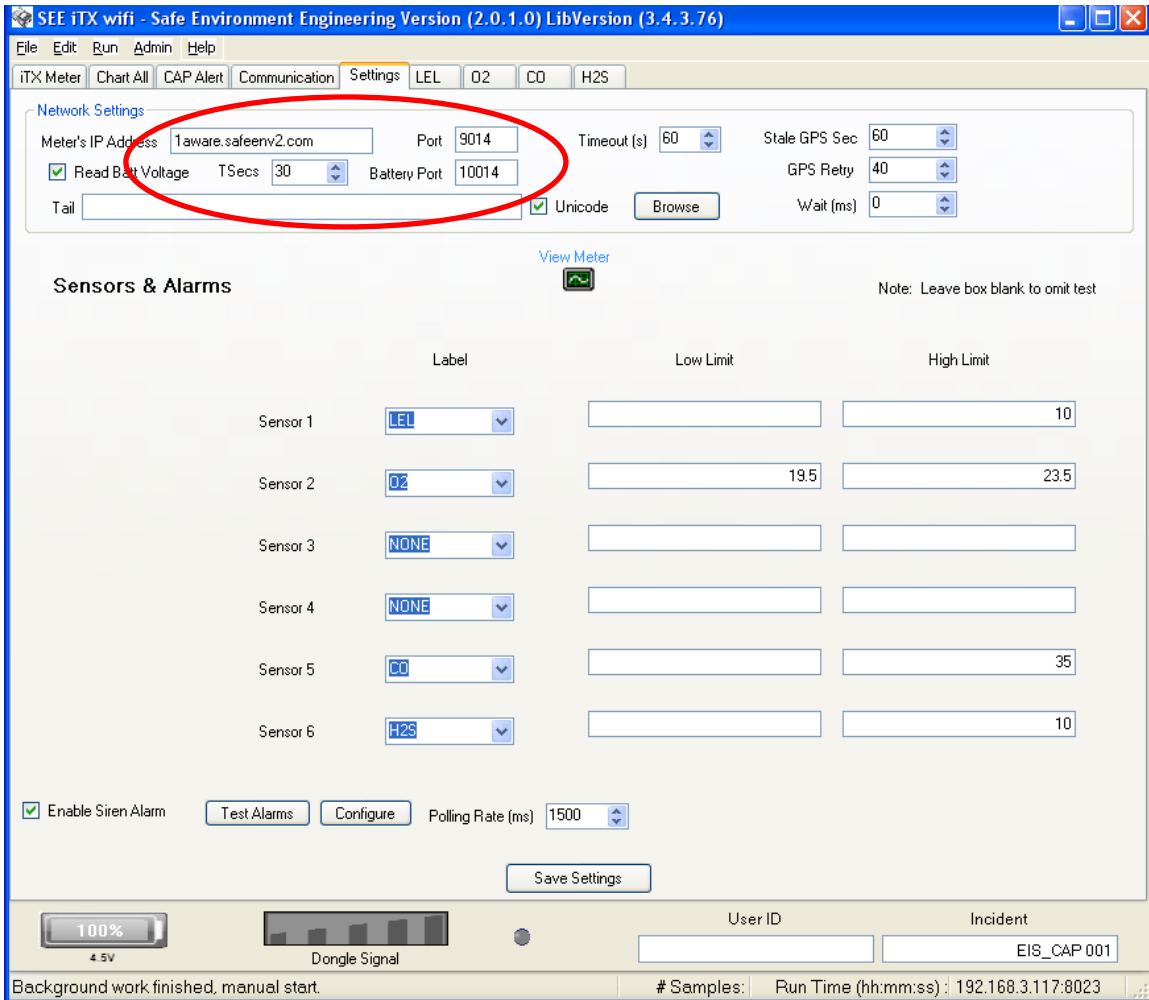
- 1) Double Click the icon of the instrument you want to modify. If you are using the short cuts data is already preloaded otherwise select File and Open to select a template you will use to modify.
- 2) Open the Setting Tab as described in Appendix A and B.



- 3) Make the necessary changes.

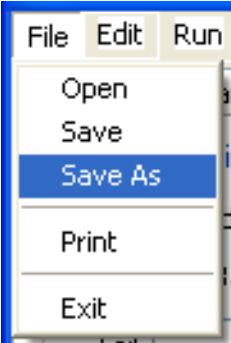
For this example we will change the setting for a Dongle using local WiFi to a connection using Ethernet or a cell card.

- 1) Change the Meters IP Address to the appropriate address provided to you by your Lifeline Agent.
- 2) Change Port Number
- 3) Change the Battery Port Number

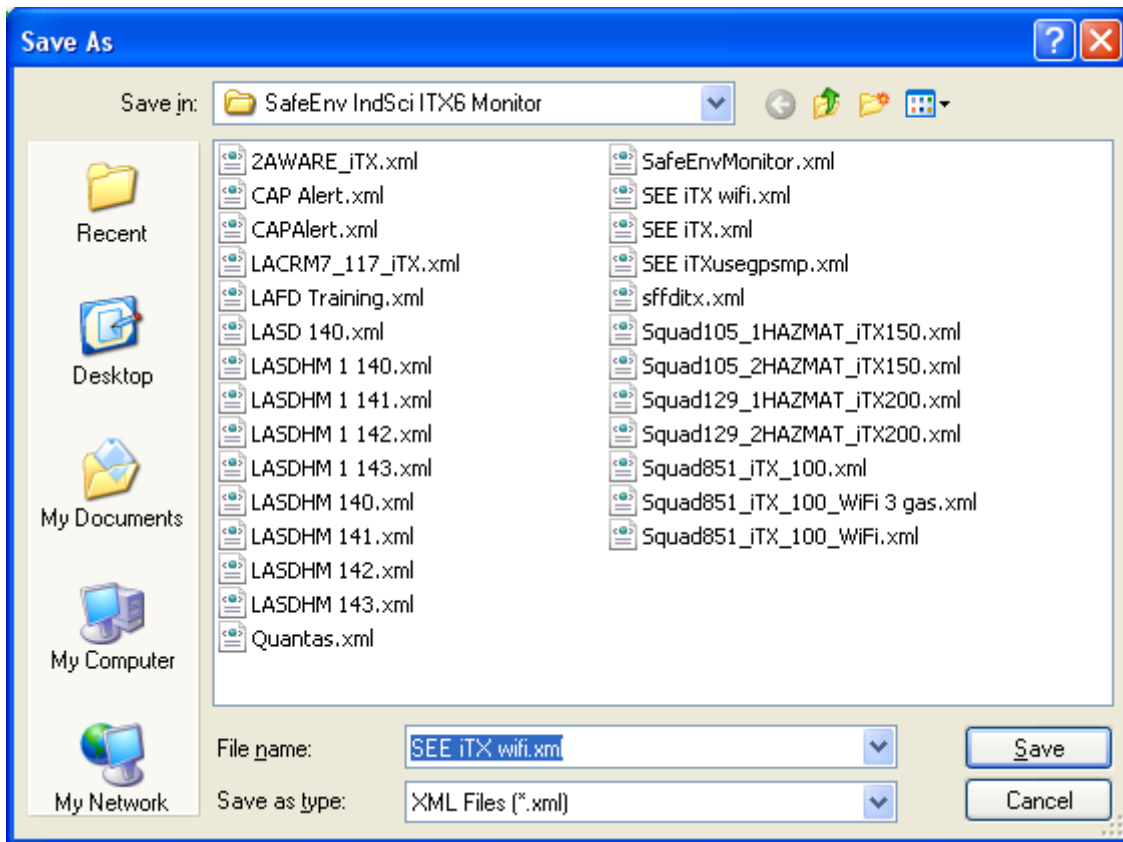


Note the changes made in the Network Settings section

4) Select File then Save As



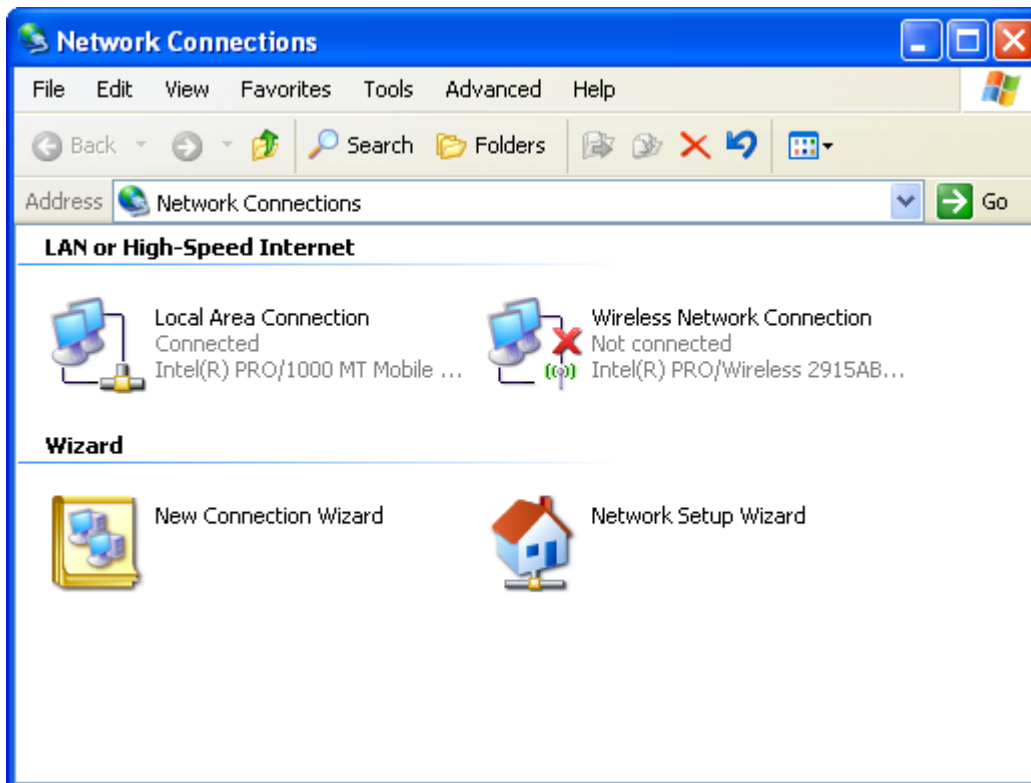
5) Create a new File name and then Save



Appendix E Using a Single Meter Without a Gateway

With specially programmed Dongles it is possible to connect to a Lifeline system Dongle (and thus a single meter) without using a Gateway by reconfiguring the wireless radio in a laptop. This is done by setting your wireless connection to ad hoc mode on the appropriate settings. The exact procedure will vary depending on the wireless network hardware and client software on your laptop, but it should be similar to the following steps shown using the built-in Windows Zero Configuration utility.

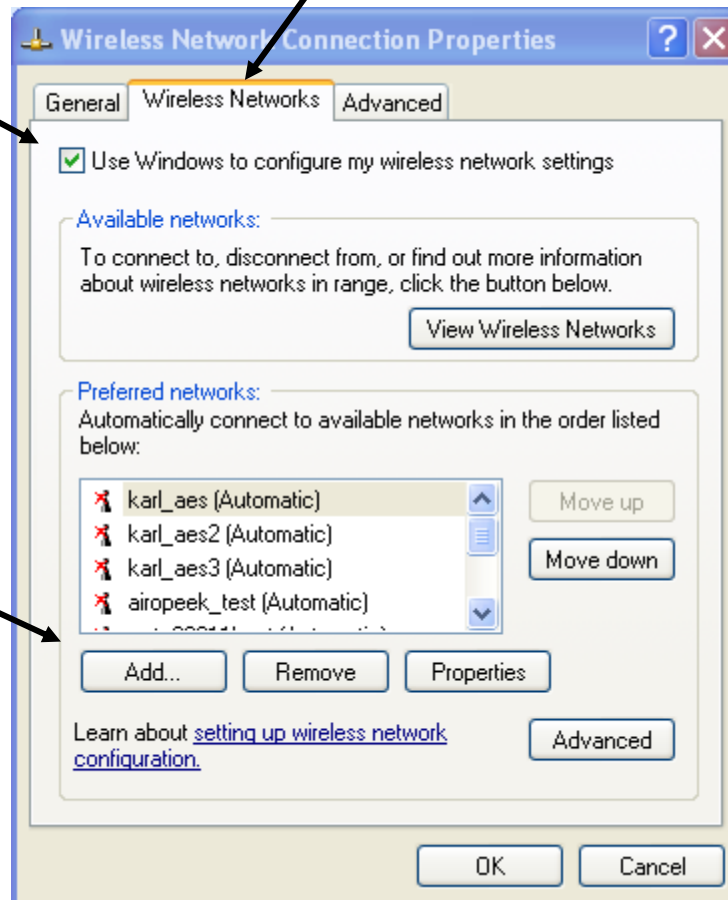
- 1) Go to the Control Panel and open Network Connections. Then right click on Wireless Network Connections and select Properties.



- 2) Click on the Wireless Networks tab at the top of the screen. Be sure that the “Use Windows to configure my wireless network settings” box is checked.

Box should be checked

Click to add a new network



- 3) Click on Add under the list of Preferred Networks and configure as shown.

Set the correct
SSID for your
Dongle

Check
these boxes

Wireless network properties

Association Authentication Connection

Network name (SSID): NYCDHMH

Connect even if this network is not broadcasting

Wireless network key

This network requires a key for the following:

Network Authentication: Open

Data encryption: Disabled

Network key:

Confirm network key:

Key index (advanced): 1

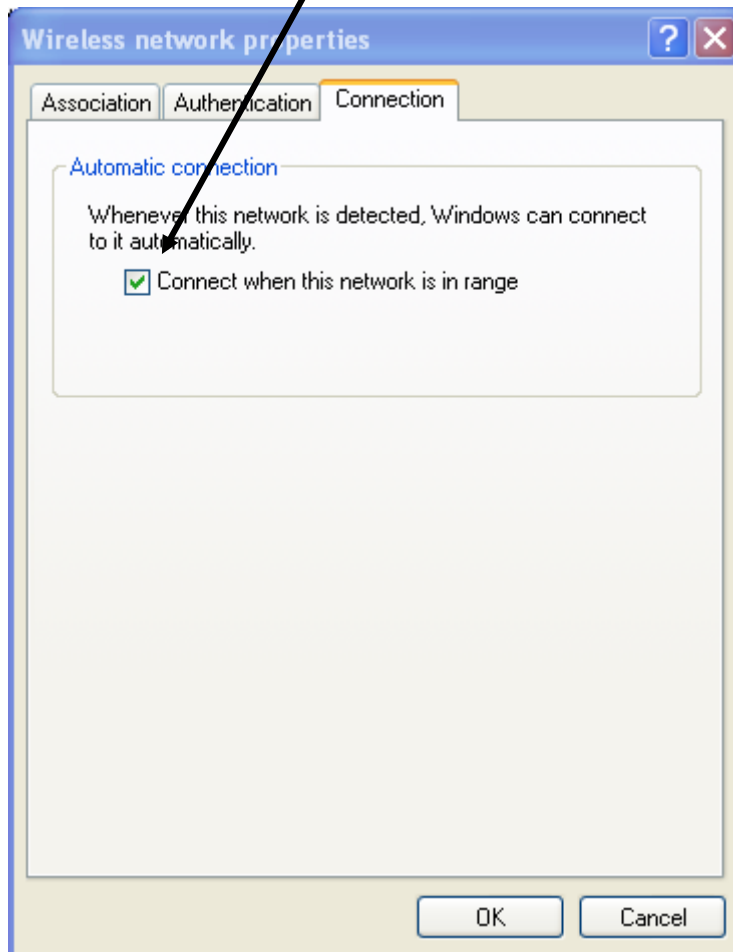
The key is provided for me automatically

This is a computer-to-computer (ad hoc) network; wireless access points are not used

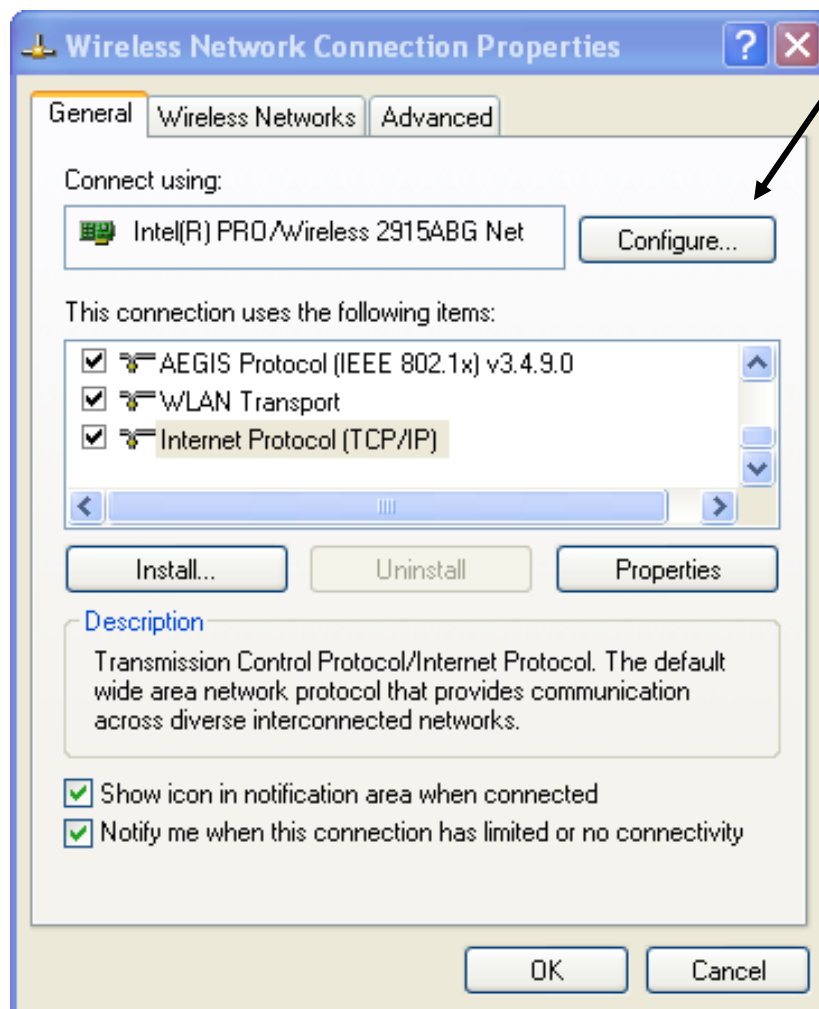
OK Cancel

Set as
shown

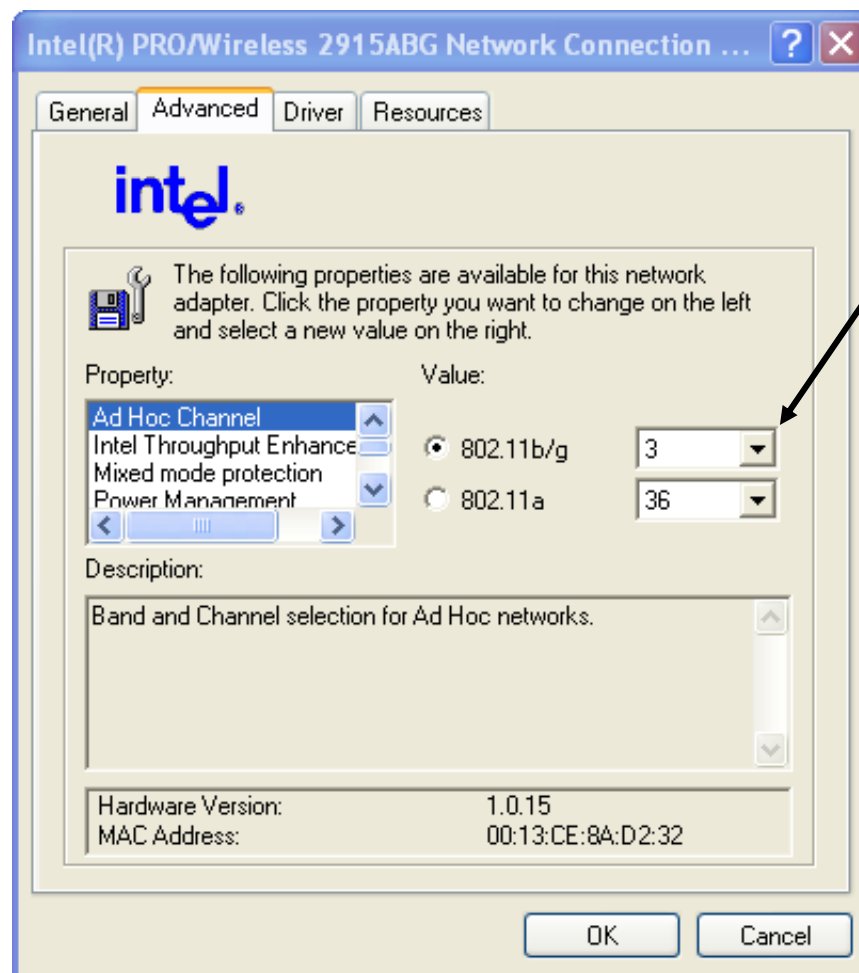
- 4) Under the Connection tab be sure that the “Connect when this network is in range” box is checked. Now click on the OK button. If you get a warning about using an unsecured network click “Continue Anyway”.



- 5) Now, return to the Wireless Network Connection Properties box and select the General tab. For ad hoc connections the wireless radio generally needs to be manually set to a specific channel matching the device or computer to which you are connecting. Here we will configure the radio to channel 3 under the B/G settings (the settings programmed on your specific Dongle may be different). Click on the configure button next to your wireless card.

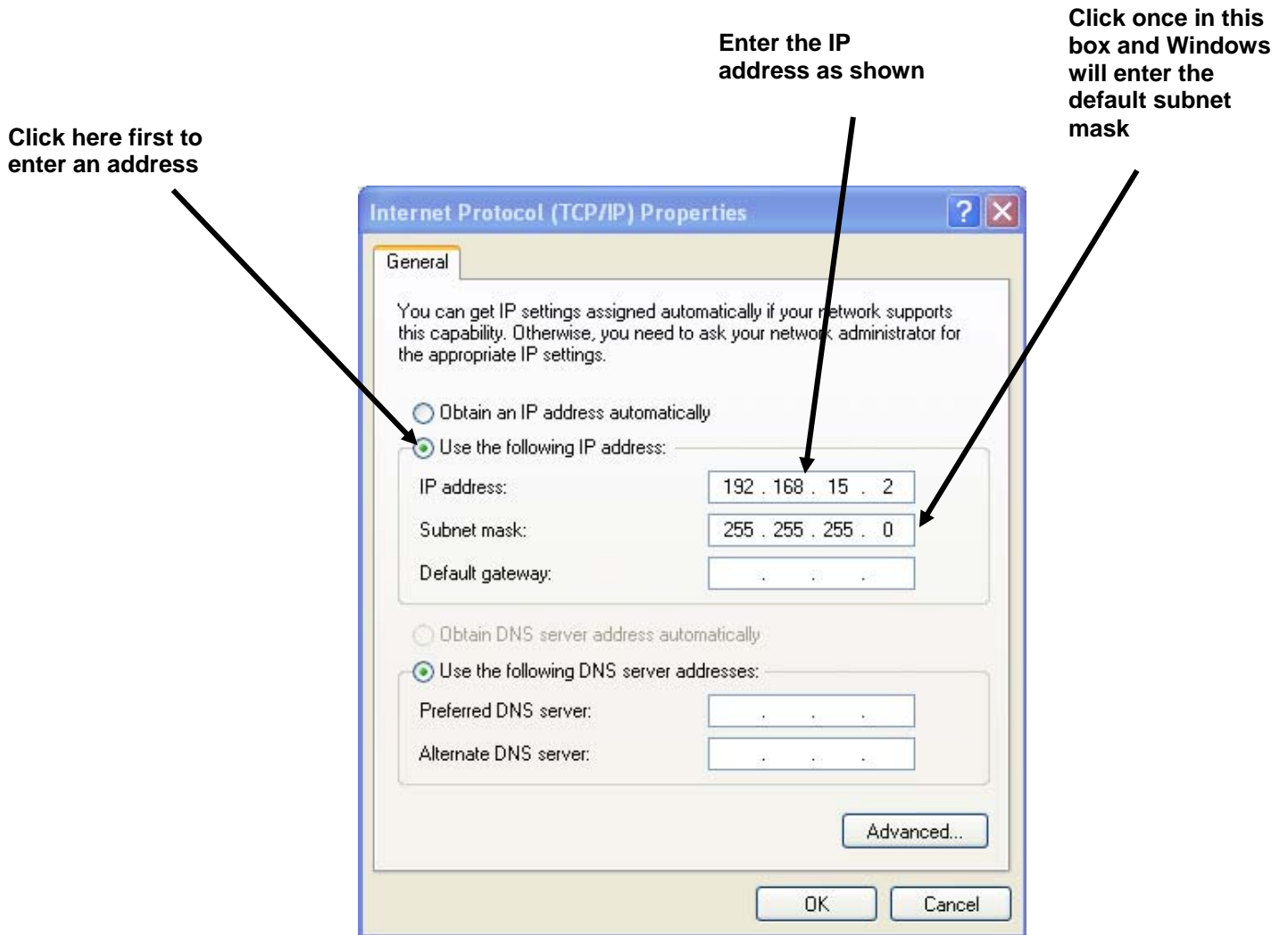


- 6) Set the ad hoc or general radio settings to be B/G channel 3 and click the OK button. You may not have separate settings for your ad hoc connections on your wireless adapter so you might have to manually set the radio to the correct band and channel.

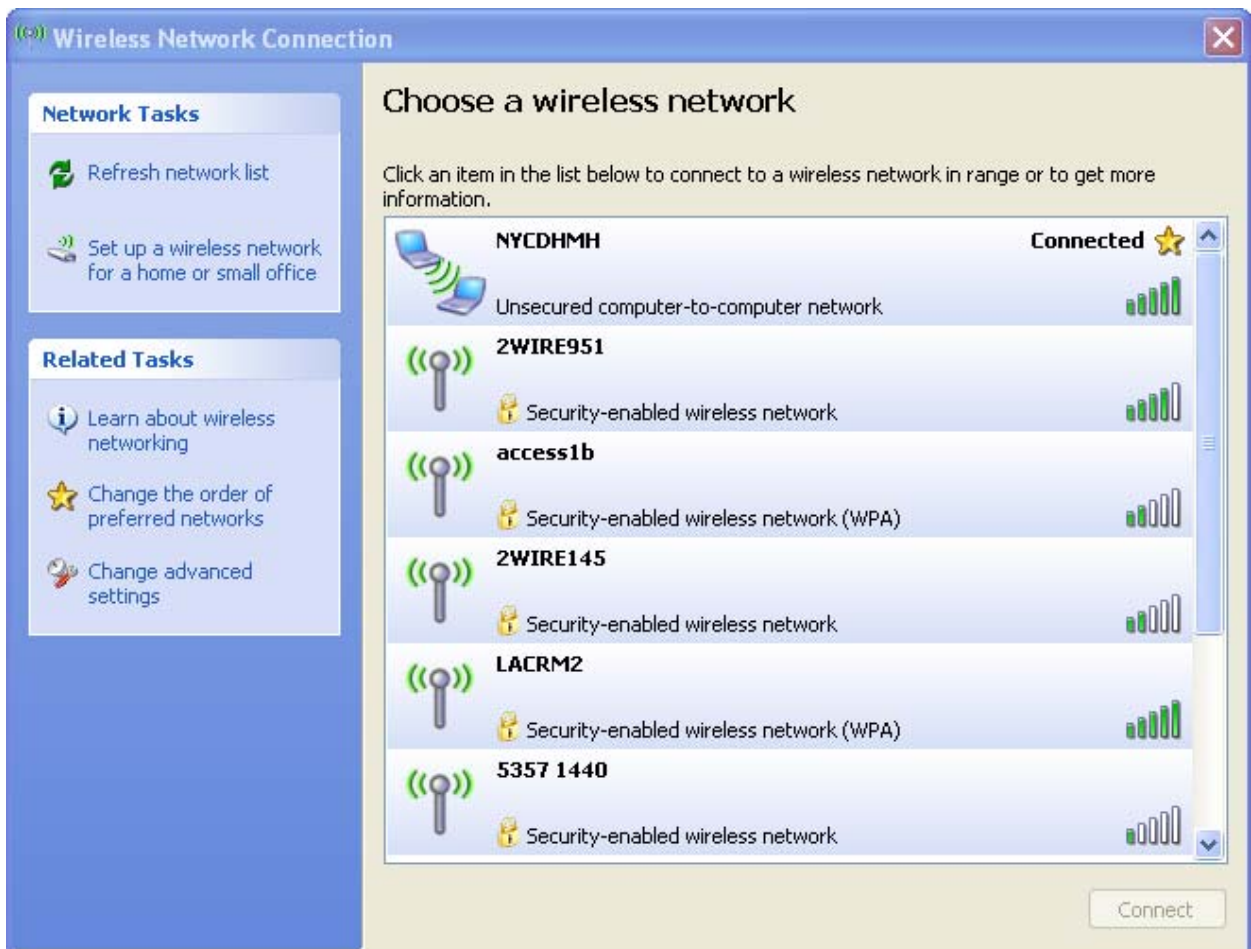


- 7) Because we are not connecting to an access point, we will also need to set the network connection to a static IP address in the same network domain as the Dongle. In this example we will be using 192.168.15.2 for the laptop address.

Again on the General tab of the Wireless Network Connection Properties box find the line in the center window for Internet Protocol (TCP/IP), double click it and configure it as shown, then click OK.



- 8) Finally, return to the Network Connections window we started with in step 1, right click again on the wireless connection, but this time select “View available wireless networks”. Ensure that your meter Dongle is turned on. The Wireless Network Connection display will open. The connection you have just made should display as Connected, or if not double click on the correct connection.



Appendix F USB Serial Connection

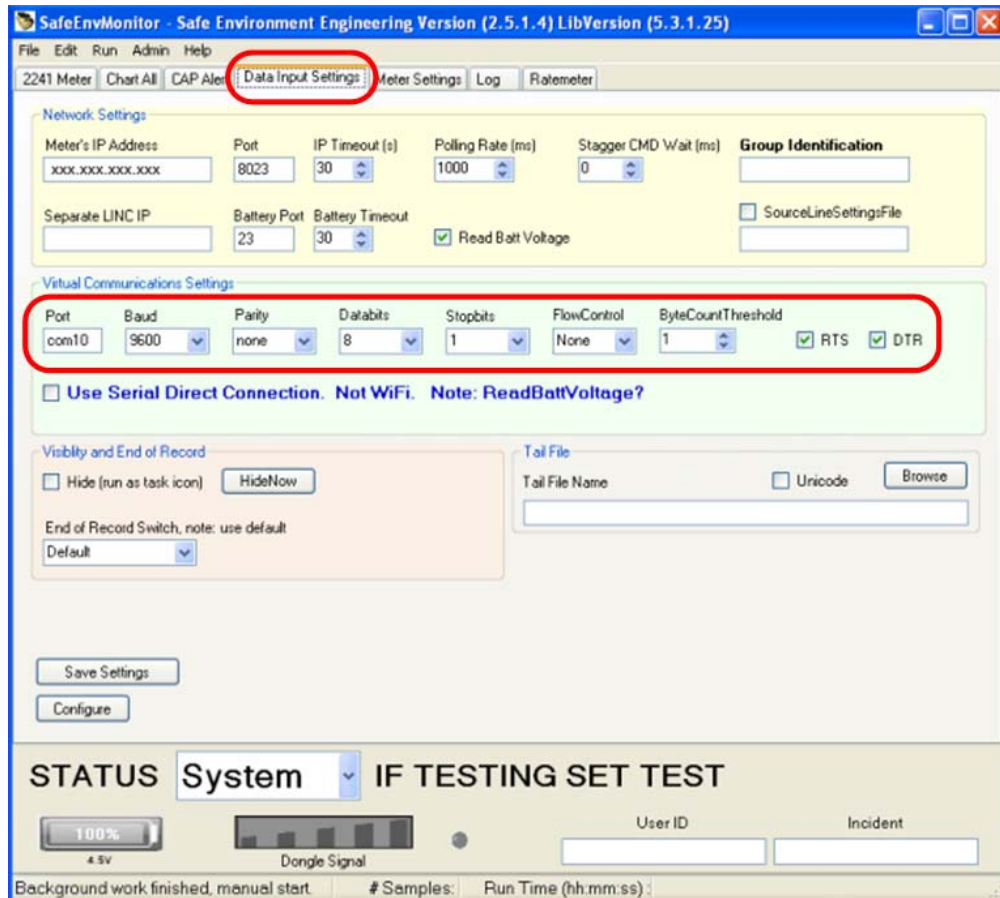
Installation of USB Drivers for Meter Applications

To access data from a Meter via a LINC USB interface, an FTDI USB driver must be installed on the PC that is to run the Meter Application. The driver components are located in the zip file named “CDM20802 WHQL Certified.zip”

For detailed installation instructions, please reference the section of this appendix at Page 43 entitled “FTDI Drivers Installation guide for Windows XP” (Document Reference No. FT_000093 - Version 1.0 - Issue Date: 2008-09-23) incorporated by this reference.

Operation of the USB/Serial connection:

Current meter applications now have a Meter and Connection Settings selection that can be applied to LINC operation. Checking this selection will bring up 2 tabs one is the Settings tab which is the same threshold setting section as prior version with the TCP/IP section removed. These setting can now be found in the Data Input Settings tab.



The Data Input Setting tab has both the TCP/IP settings and serial settings along with a check mark to toggle between serial or WiFi. For the serial connection you will have to know what the virtual com port is (covered in the attached document). These setting should only need to be set once per instrument. It is suggested that 2 configurations are saved one as WiFi and the other as serial. The user can select the one needed.

Serial Settings:

Make	Model	Baud	Parity	Bits	Stop	Flow Control
Ludlum	2241	9600	N	8	1	N
Ludlum	2360	2400	N	8	1	N

Please note that the battery and signal strength data is not available though the USB connection because the application is directly connected to the instrument and not to the LINC.