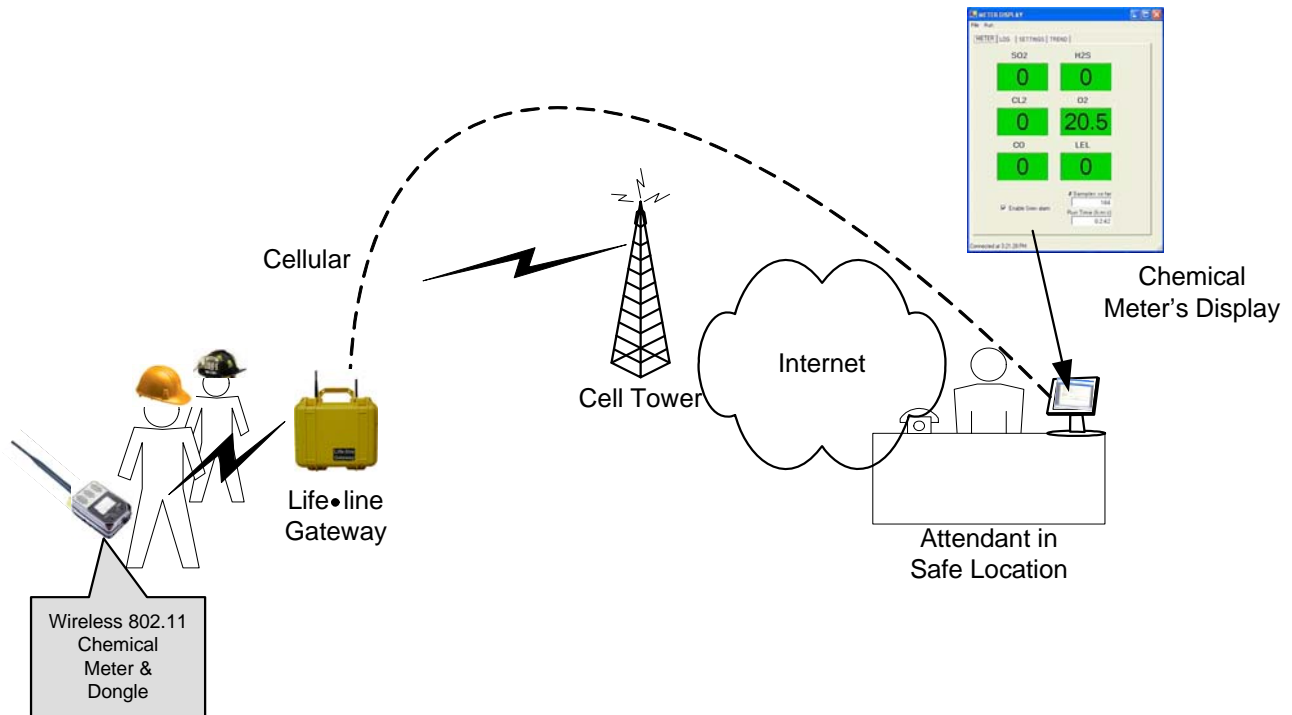




Life•line System System Manual

AT32670200



Safe Environment Engineering
28474 Westinghouse Place
Valencia, CA 91355
(661) 295-5500 • (661) 294-9246 Fax
www.safeenv.com • info@safeenv.com

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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.



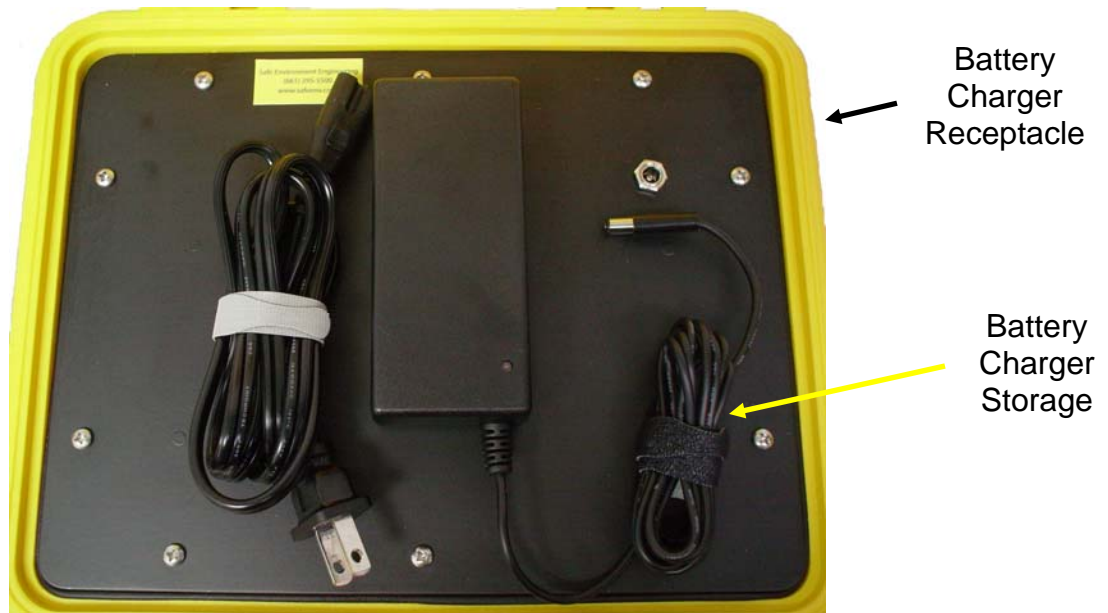
Lifeline Gateway

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:

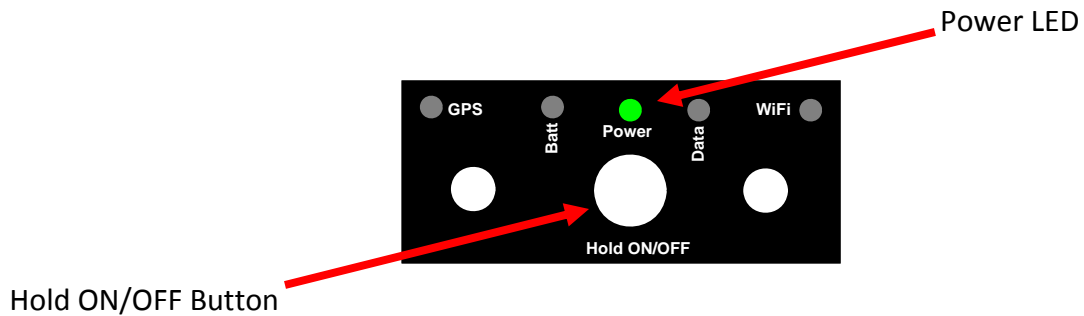
Remove the 4 screws that hold on the LINC cover and insert a fully charge battery.



Install fully charged battery

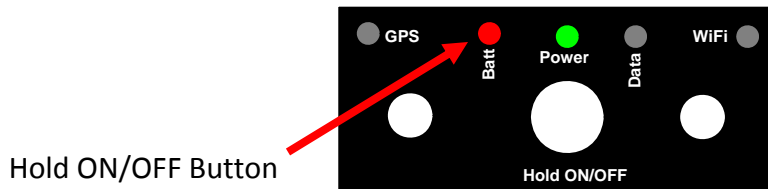
3.0 Turning On/Off the LINC:

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.



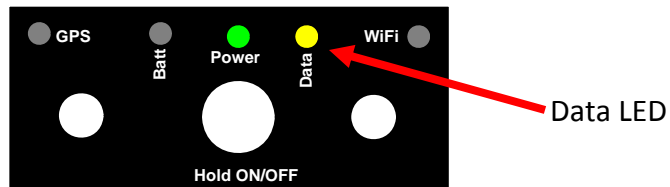
3.1 Low Battery Indicator:

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



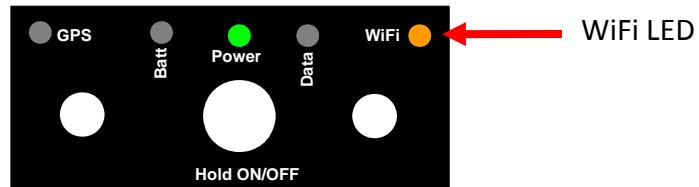
3.2 Data Indicator:

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



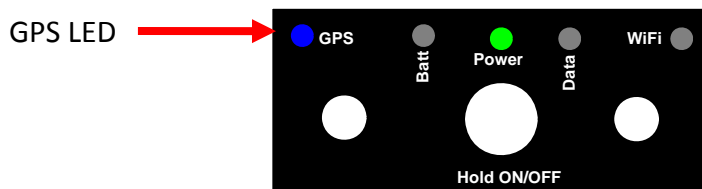
3.3 WiFi Indicator:

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.



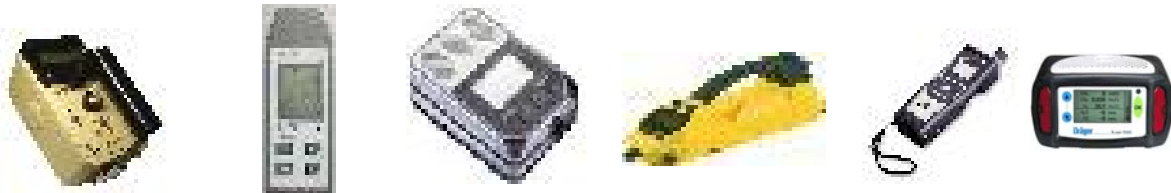
3.4 GPS Indicator:

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 status bar at the bottom provides system and operational information.

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

Status Bar Information:

- STATUS: Exercise
- IF TESTING SET TEST
- % Usable Battery: 91%
- Current Battery Voltage: 4.4V
- Signal Strength: -19 dBm
- Connection Indication: [Indicator]
- Communications Processing Indicator: [Indicator]
- Total Number of Samples: 899
- Total Time Sampling: 00:17:55
- User ID: [Field]
- Source Meter: [Field]
- User Identification Field: [Field]




- **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.

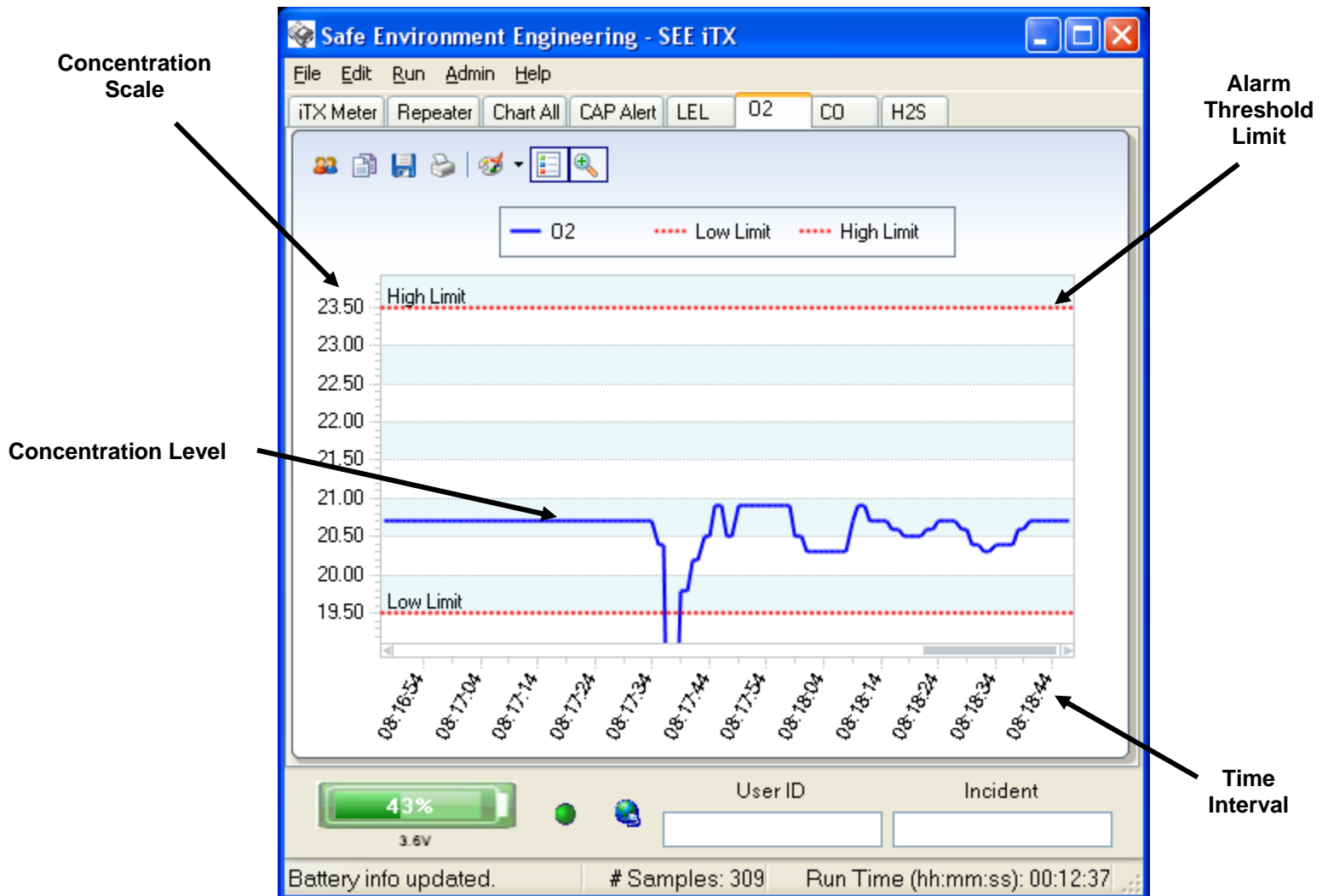
- **Signal Strength** – Current signal strength to the instrument Dongle.
- **Communications Processing Indicator** – This indicator has 3 states:
 -  Grey – The application is idle
 -  Green – The application is processing data from the meter
 -  Red – The wireless link is disconnected and data is not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



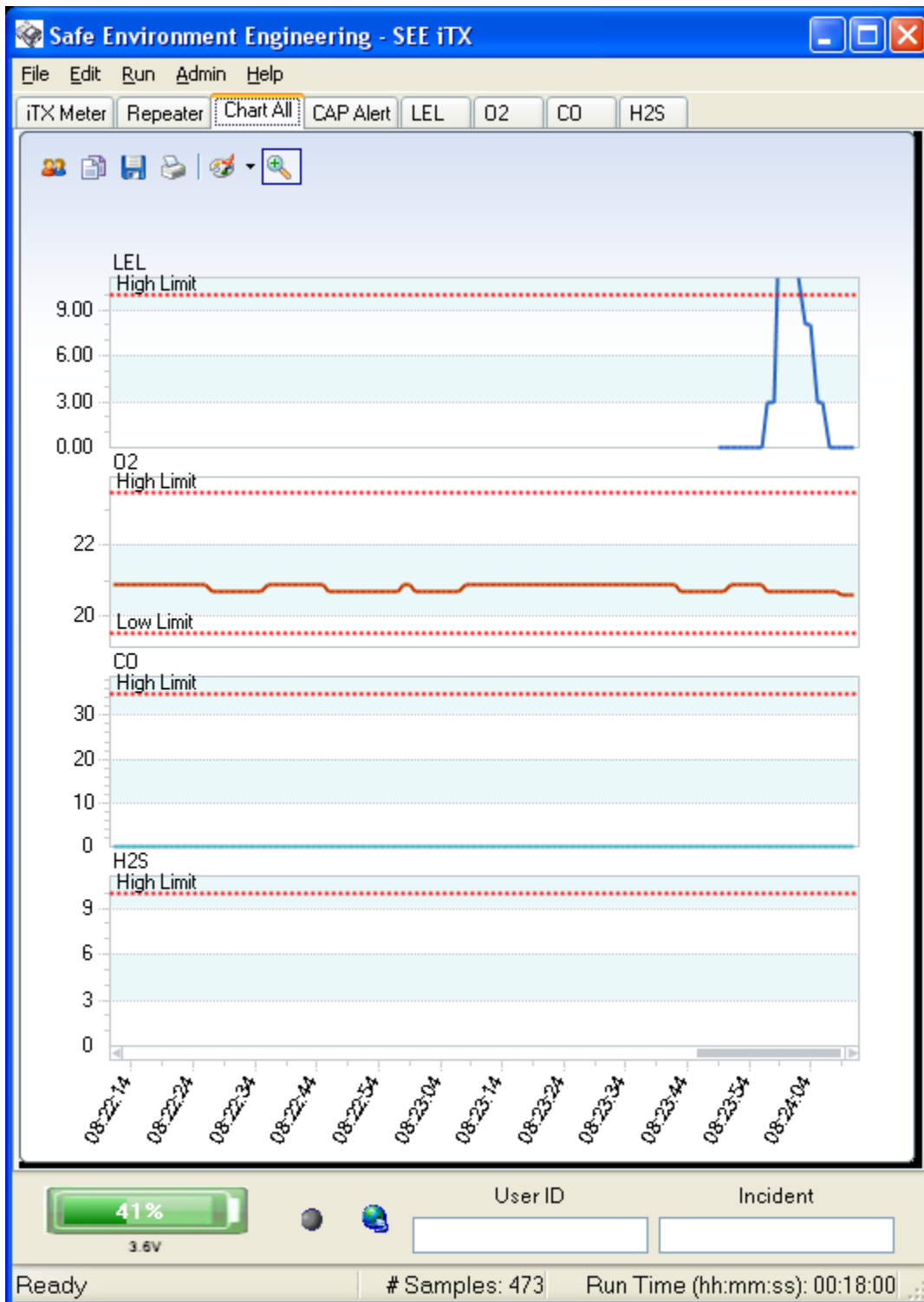
- If the monitor application is hidden by another display it is immediately displayed on top of any other application.
- **Units of Measure** – Units of measure used for each reading

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

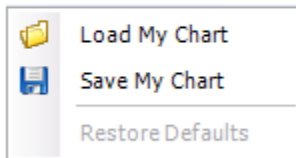


The Chart All Tab allows all the strip charts to be viewed simultaneously. Depending on the number of substances being monitoring resizing the display is advised for easy viewing.

4.1.3 iTX Strip Chart – Settings

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

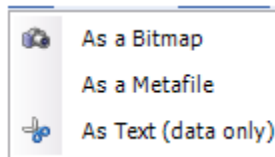
Chart Settings



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.

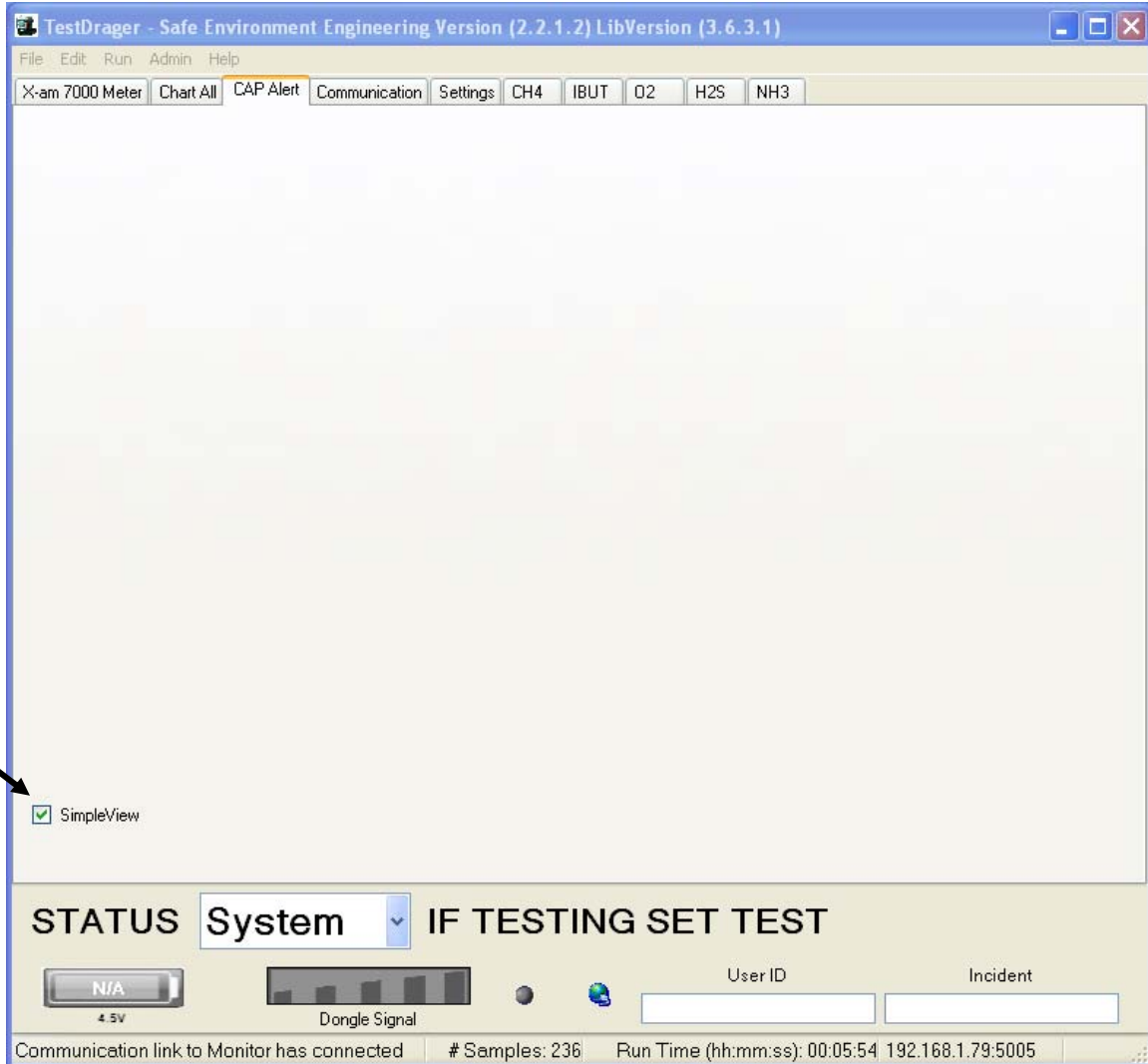
Palette selection choose one of the colors from a drop down menu to set the color scheme for the chart.

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.

The screenshot shows the 'TestDrager - Safe Environment Engineering Version (2.2.1.2) LibVersion (3.6.3.1)' window. The 'CAP Alert' tab is active. The 'Alert Section' includes: Identifier (SEE__20100202144819_531), Sender (empty), Date Sent (2010-02-02T14:48:19-08:00), Msg Type (Update), Source (Drager X-am 7000,TestDrager.xml,0000000050), and Scope (Restricted). The 'Email' section includes: Receiver(s) (empty), Email Sender (CAP@safeenv.com), Email Server (empty), Port (80), and Password (masked). The 'Area' section includes: Area Description (empty) and Circle (34.4423, -118.596 0). The 'Info' section includes: Category (Other), Urgency (Immediate), Date Expires (2010-02-03T14:48:19-08:00), Contact Info (empty), Head Line (CH4:0;%LEL;Green;IBUT;0;ppm;Green;O2;20.9;vol%;Green;H2S;0;ppm;Green;NH3;0;ppm;Green), Info Description (empty), Instruction (Sensors:5,Battery:100%,SignalStrength:0), and InfoURL (empty). At the bottom, there are checkboxes for 'SimpleView' and 'Type In Your Own Headline', and a 'Send CAP Alert Message Email' button. The status bar shows 'STATUS System IF TESTING SET TEST' and various system metrics.

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 an 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.

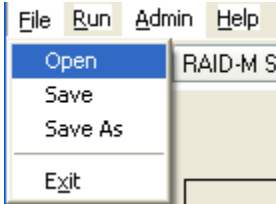
- **Sensor Server Interface** – Enables posting data to a central server for data sharing, storage, and real-time multi-party data display. Either web posting OR UDP sends are supported. Selecting either Post URL or UDPSend will transmit Candidate alerts, and selecting Readings will stream sensor readings 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:

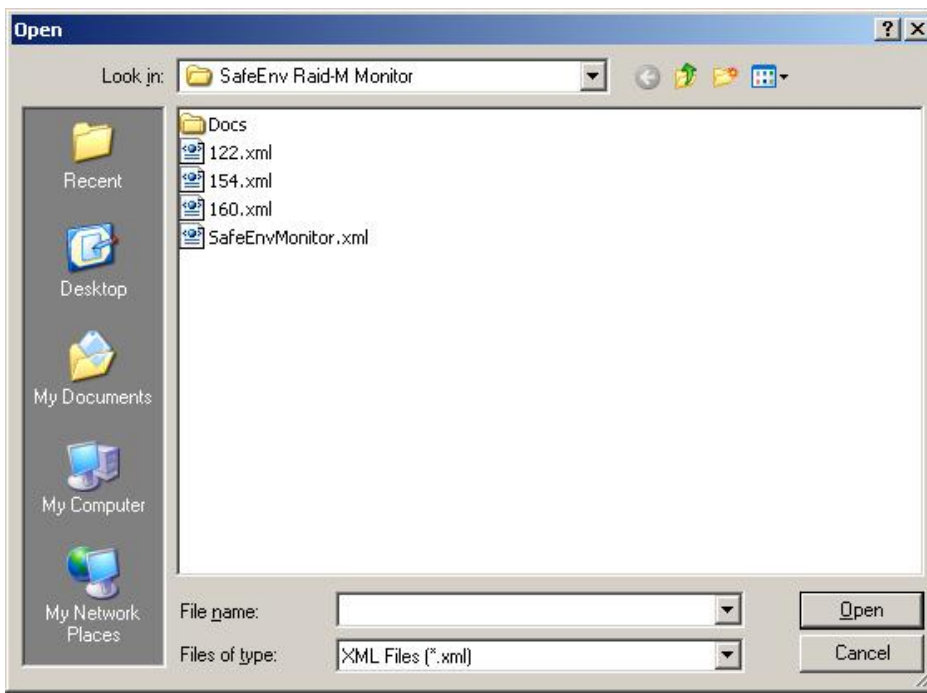
Locate the Number on the bottom of the Dongle:



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:

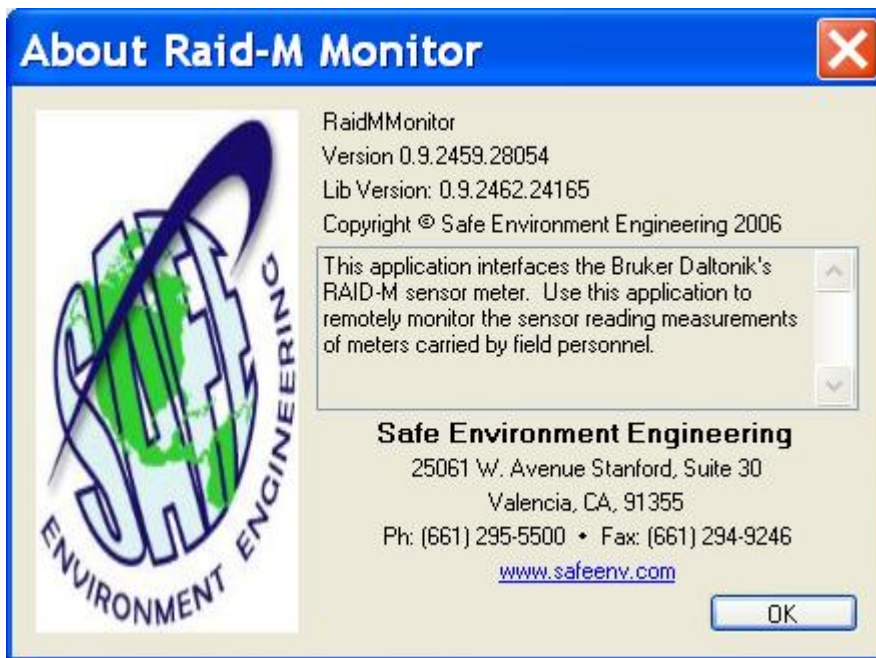


To Stop Select Stop from the Run menu:



6.0 Help:

Application and contact information:



Appendix A

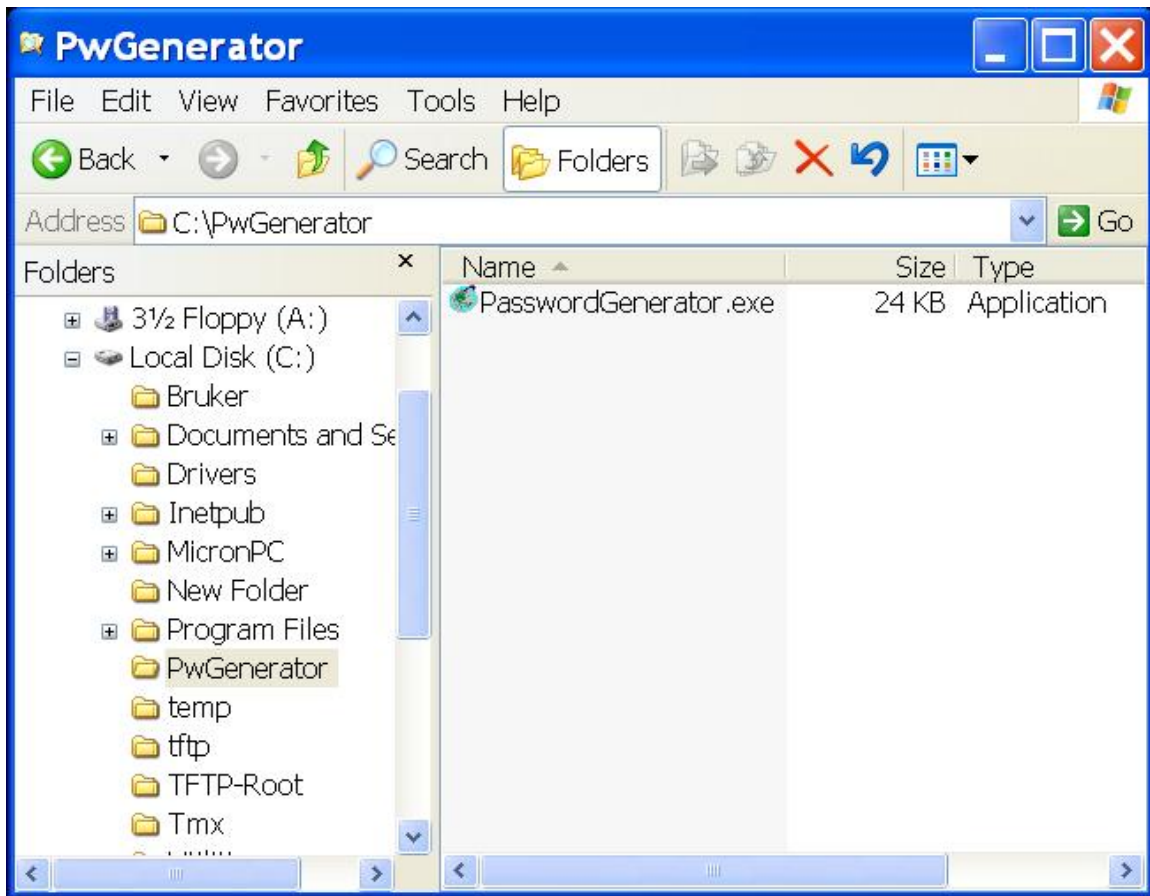
Administration Setting and Logging

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.

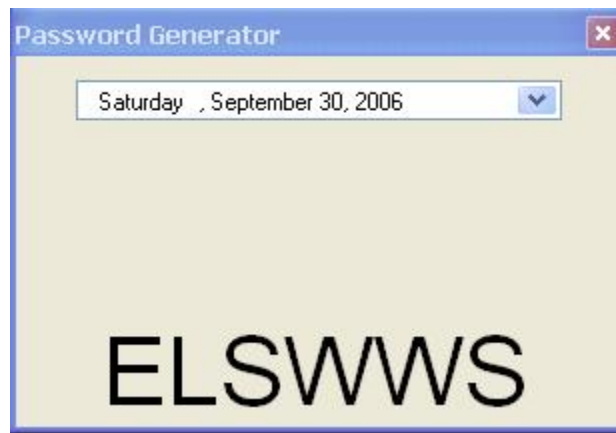
1.0 Password Generator:

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:

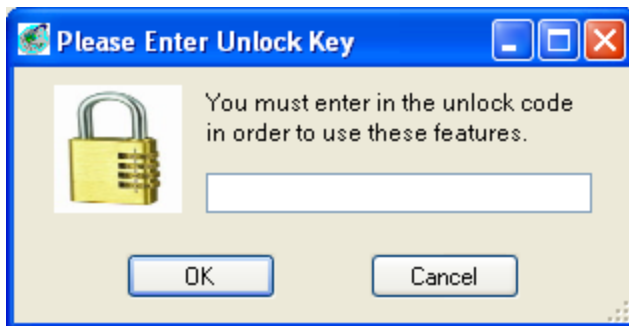


Double clicking on the PasswordGenerator icon will generate the password of the day.



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.

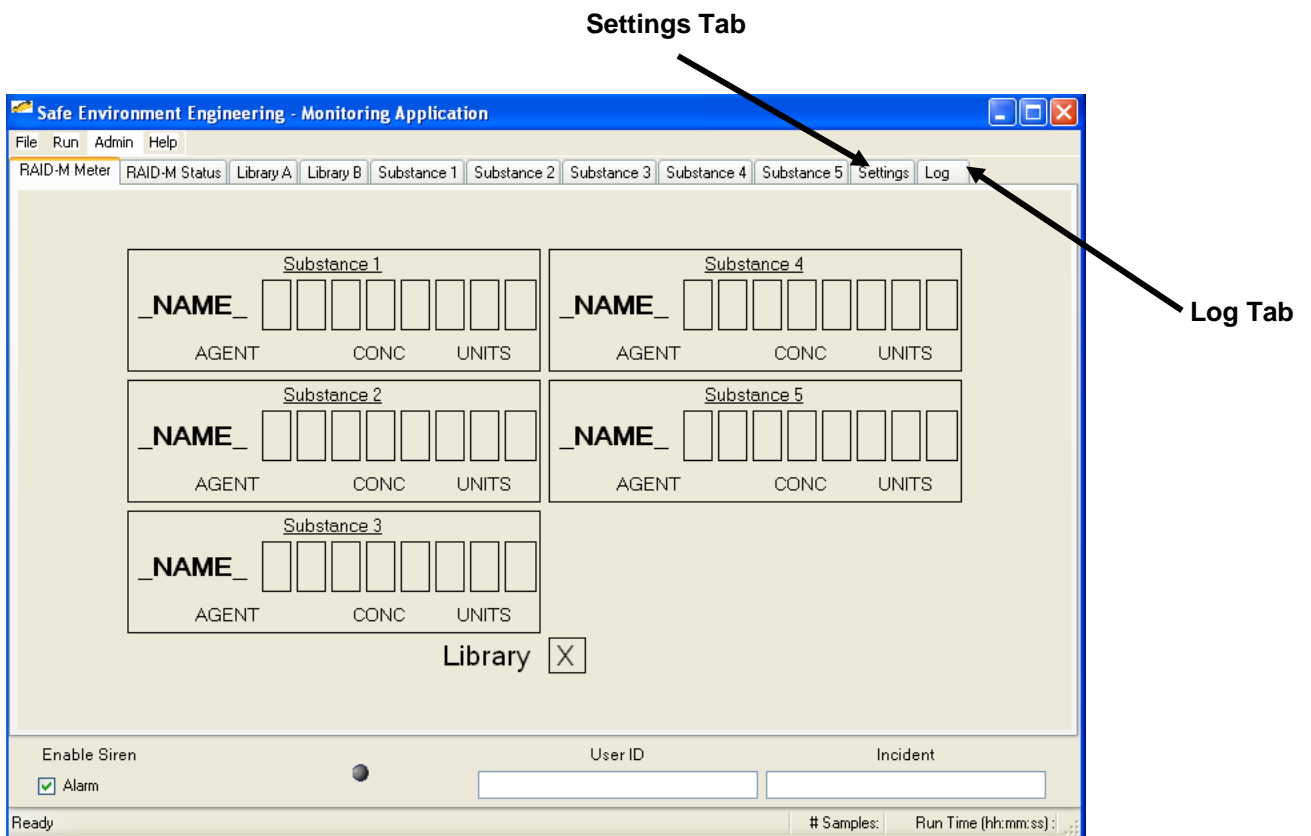
Enter the password into the Unlock Key and select OK:



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 → Meter's IP Address

Network Communications Port → Port

Meter Display Picture Button → View Meter

Dongle IP Address (used on meters with embedded Dongles) → DongleIP

Alarm Threshold Values → Low Limit, High Limit

Test Alarms Not Operational → Test Alarms

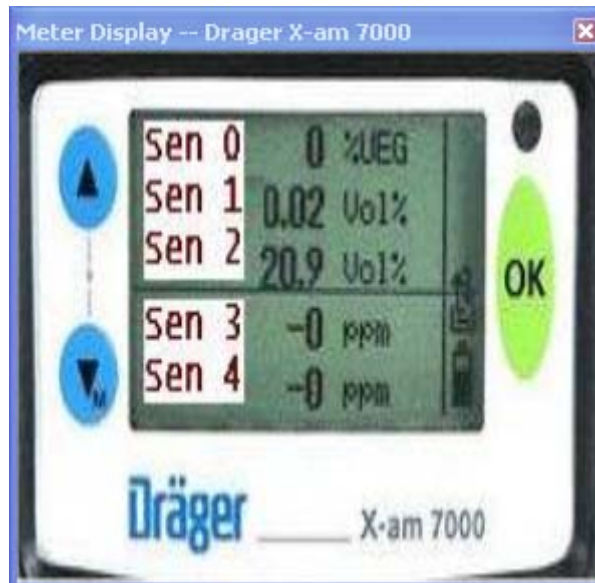
Activate Changes → Configure

Save Settings → Save Settings

Channel	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		

- **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 and values:

Count	20	std. dev.	168
Min Interval	0	Errors	
Avg Interval	999		
Max Interval	1492		

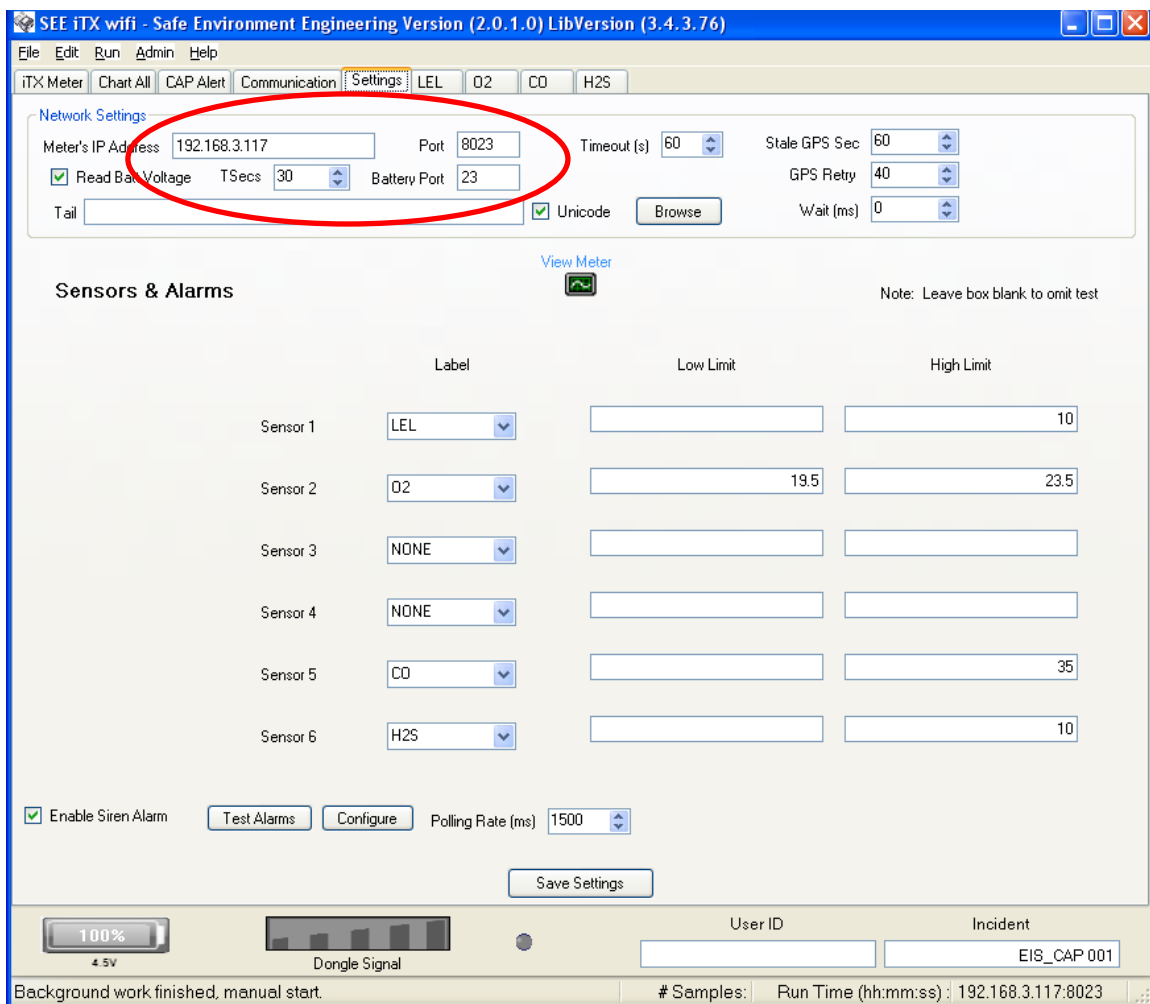
Additional interface elements include a 'Update Meters' checkbox (checked), 'Enable Siren' and 'Alarm' checkboxes (checked), and input fields for 'User ID' and 'Incident'. The status bar at the bottom indicates 'Communication link was connected', '# Samples: 20', and 'Run Time (hh:mm:ss): 00:00'. Arrows from external labels point to these specific fields: '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; 'Standard Deviation' points to the 'std. dev.' field; 'Error Count' points to the 'Errors' field; and 'Raw Data' points to the list of hexadecimal strings.

- **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.

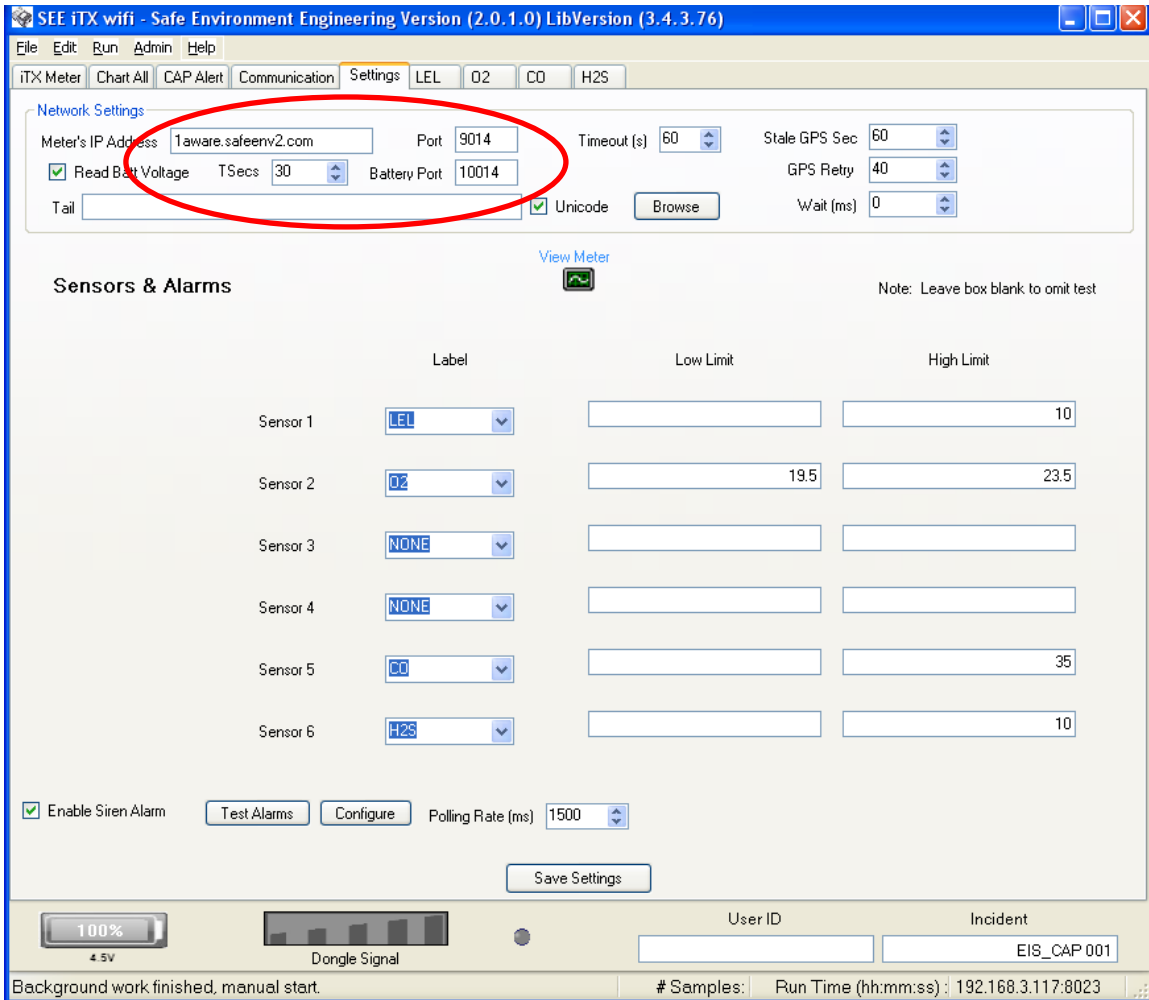
- 1) Double Click the icon of the instrument you want to modify. If you are using the short cuts data is already preloaded otherwise select File and Open to select a template you will use to modify.
- 2) Open the Setting Tab as described in Appendix A and B.



- 3) Make the necessary changes.

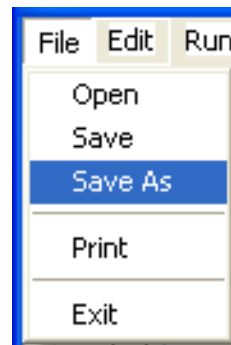
For this example we will change the setting for a Dongle using local WiFi to a connection using Ethernet or a cell card.

- 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

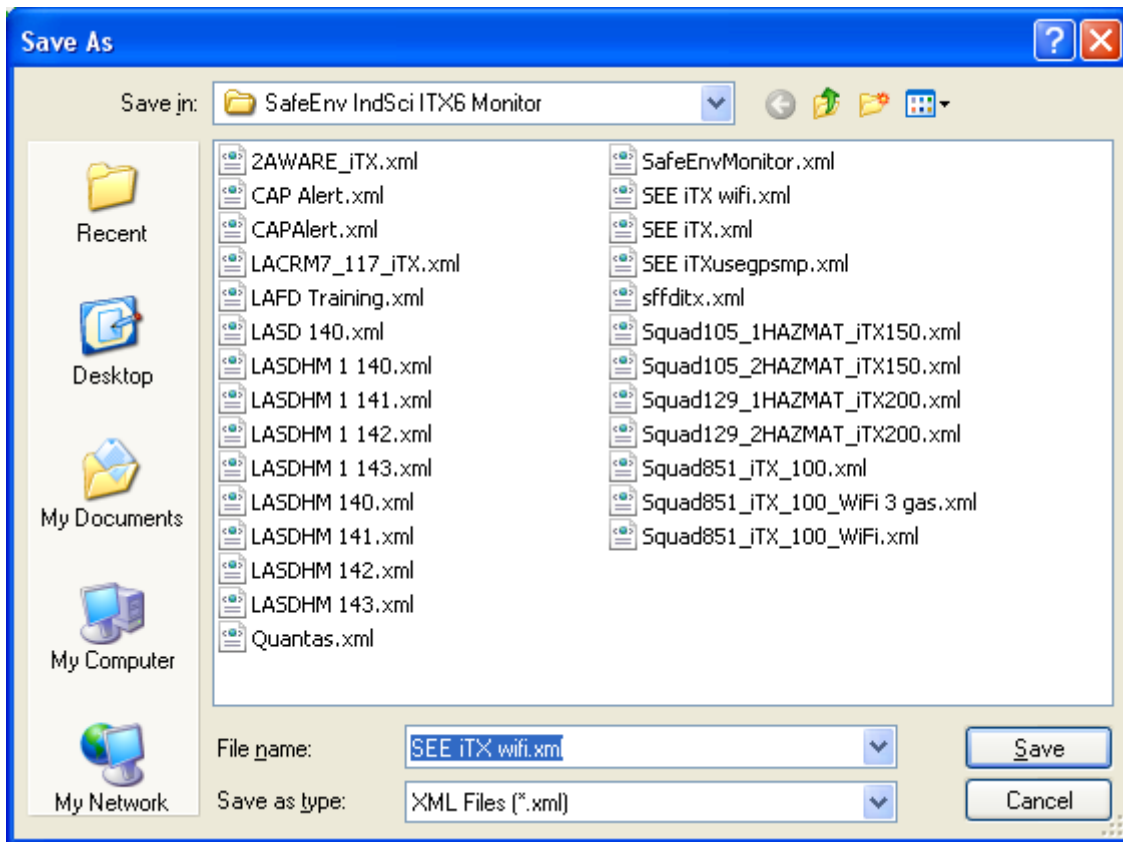


Note the changes made in the Network Settings section

4) Select File then Save As



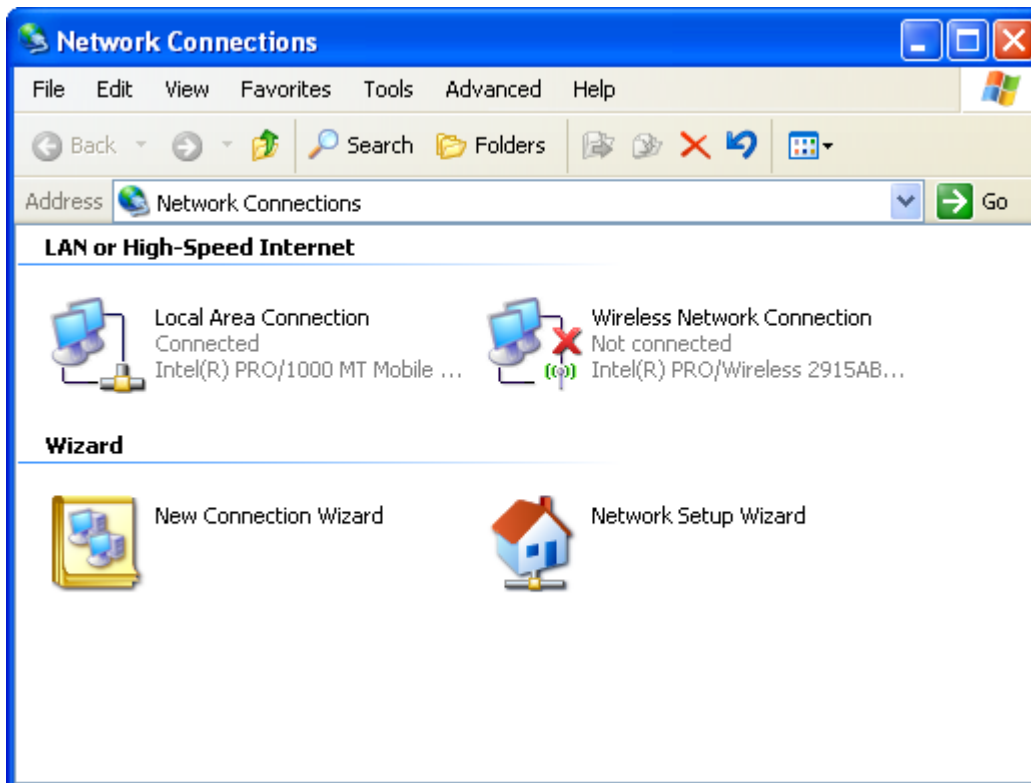
5) Create a new File name and then Save



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.

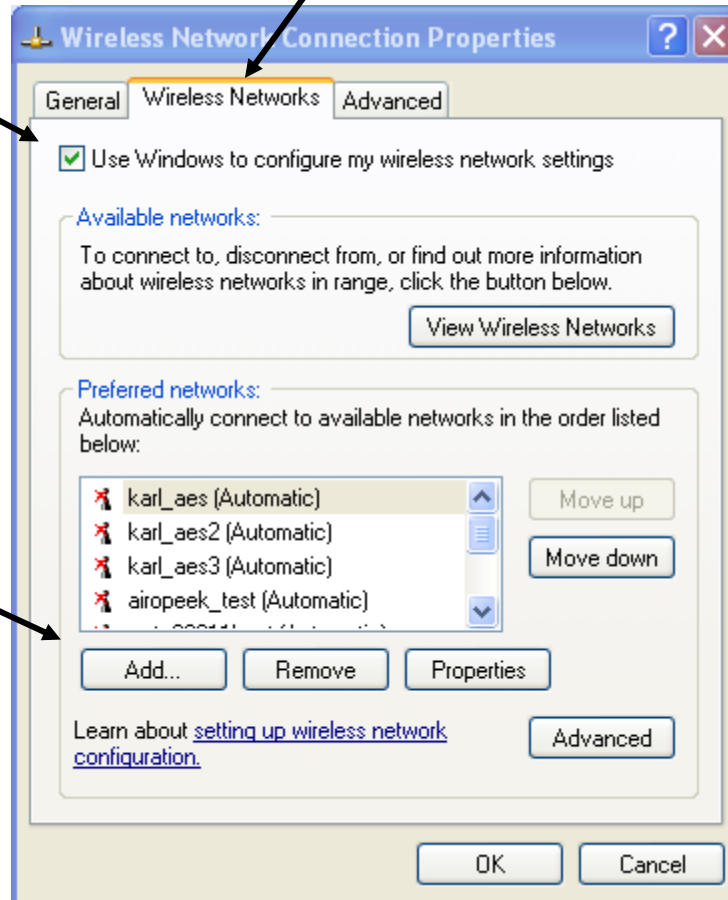
- 1) Go to the Control Panel and open Network Connections. Then right click on Wireless Network Connections and select Properties.



- 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

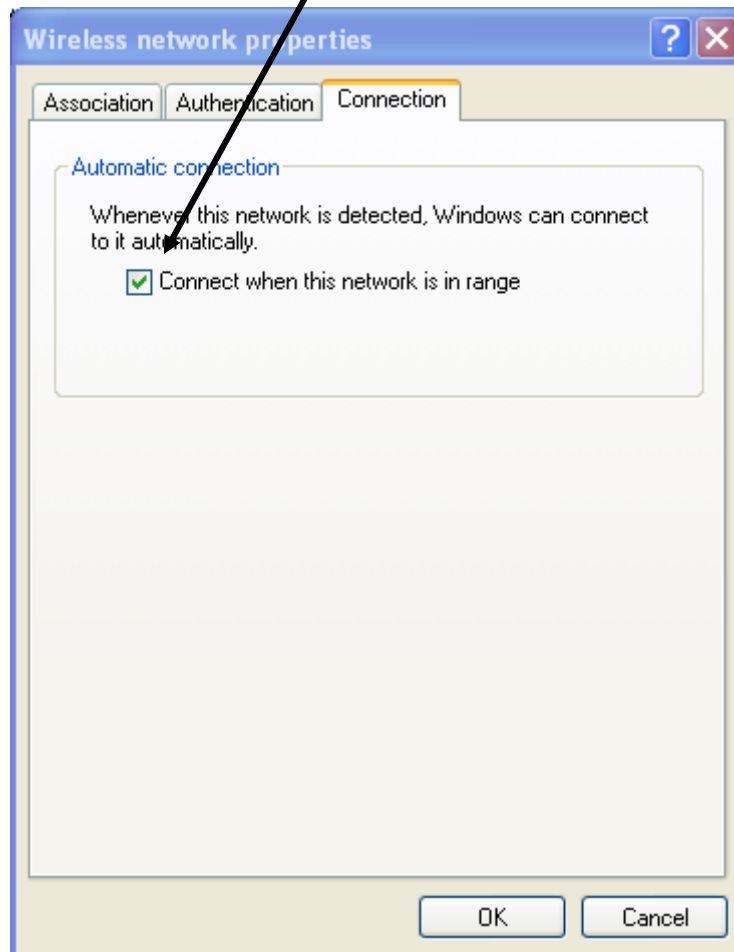
The key is provided for me automatically

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

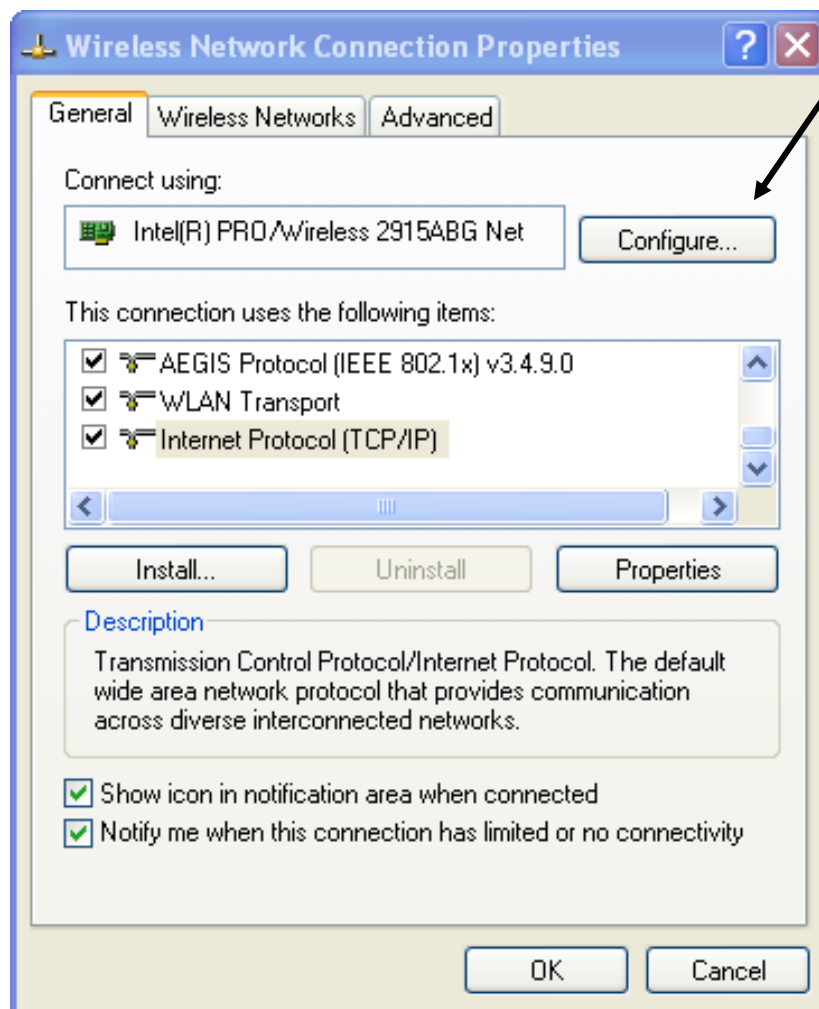
OK Cancel

Set as shown

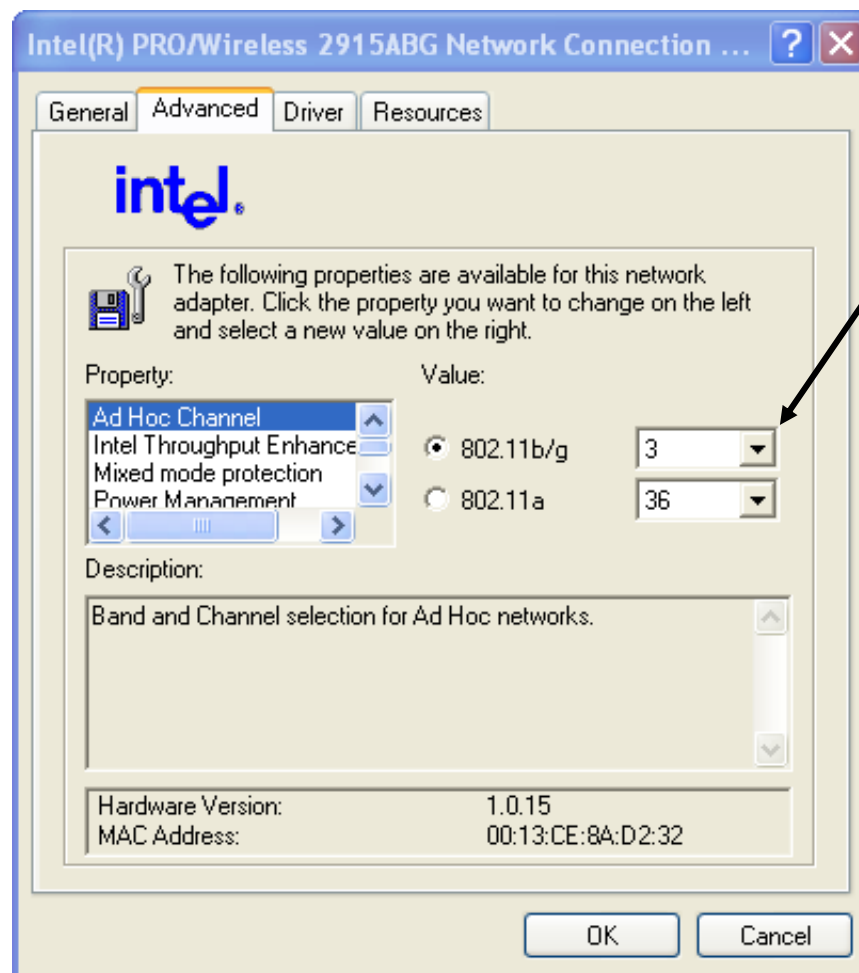
- 4) Under the Connection tab be sure that the “Connect when this network is in range” box is checked. Now click on the OK button. If you get a warning about using an unsecured network click “Continue Anyway”.



- 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.

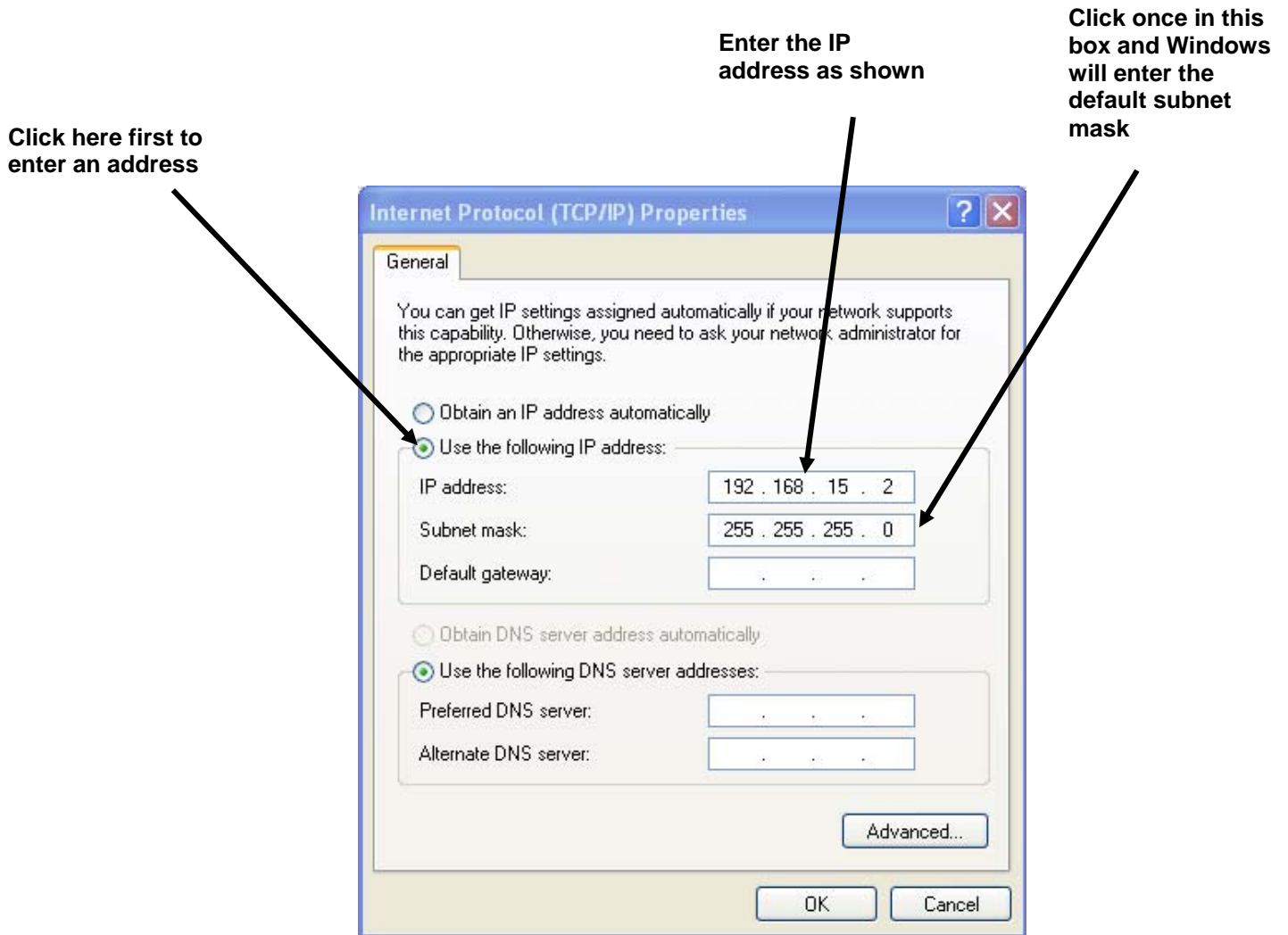


- 6) Set the ad hoc or general radio settings to be B/G channel 3 and click the OK button. You may not have separate settings for your ad hoc connections on your wireless adapter so you might have to manually set the radio to the correct band and channel.

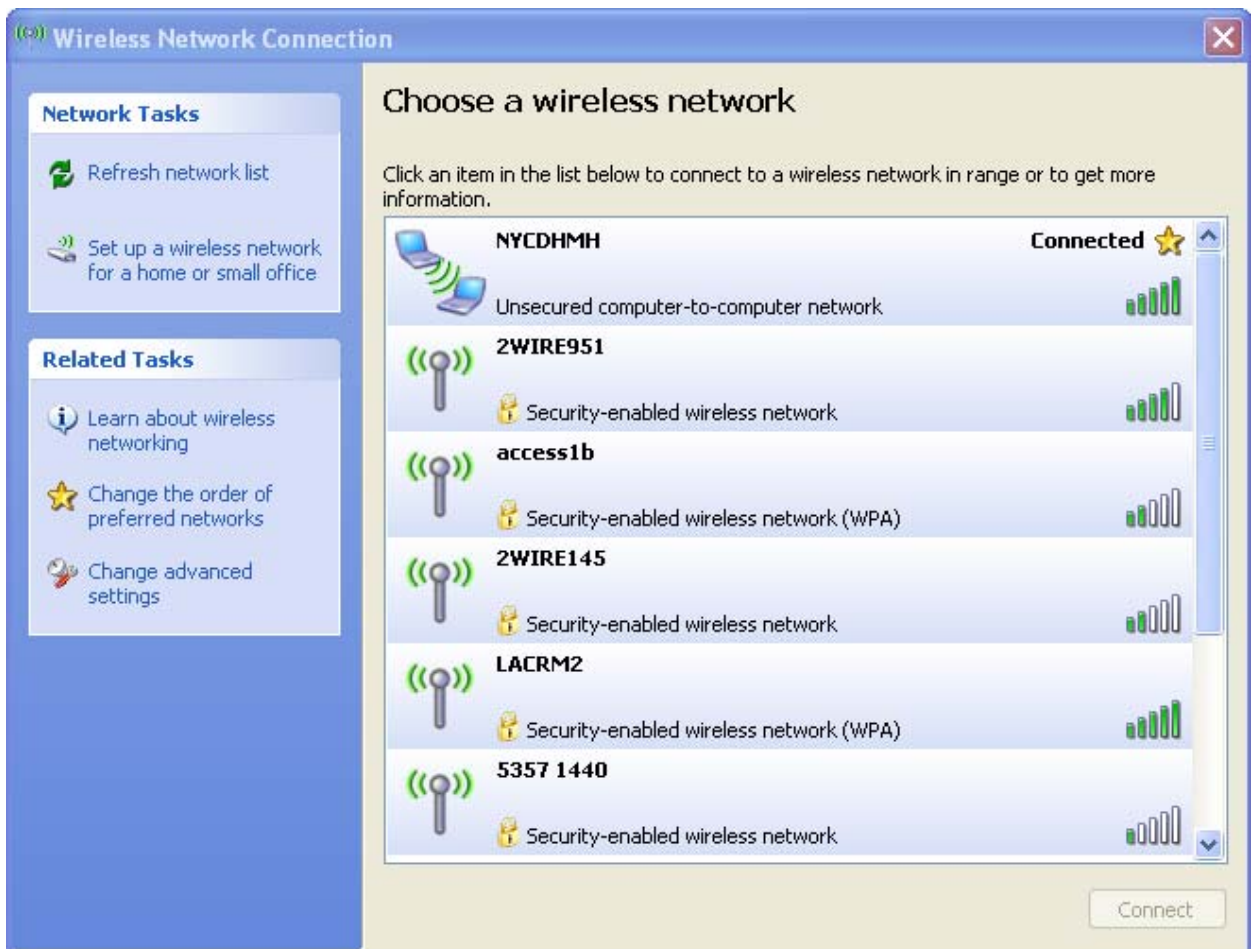


- 7) Because we are not connecting to an access point, we will also need to set the network connection to a static IP address in the same network domain as the Dongle. In this example we will be using 192.168.15.2 for the laptop address.

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

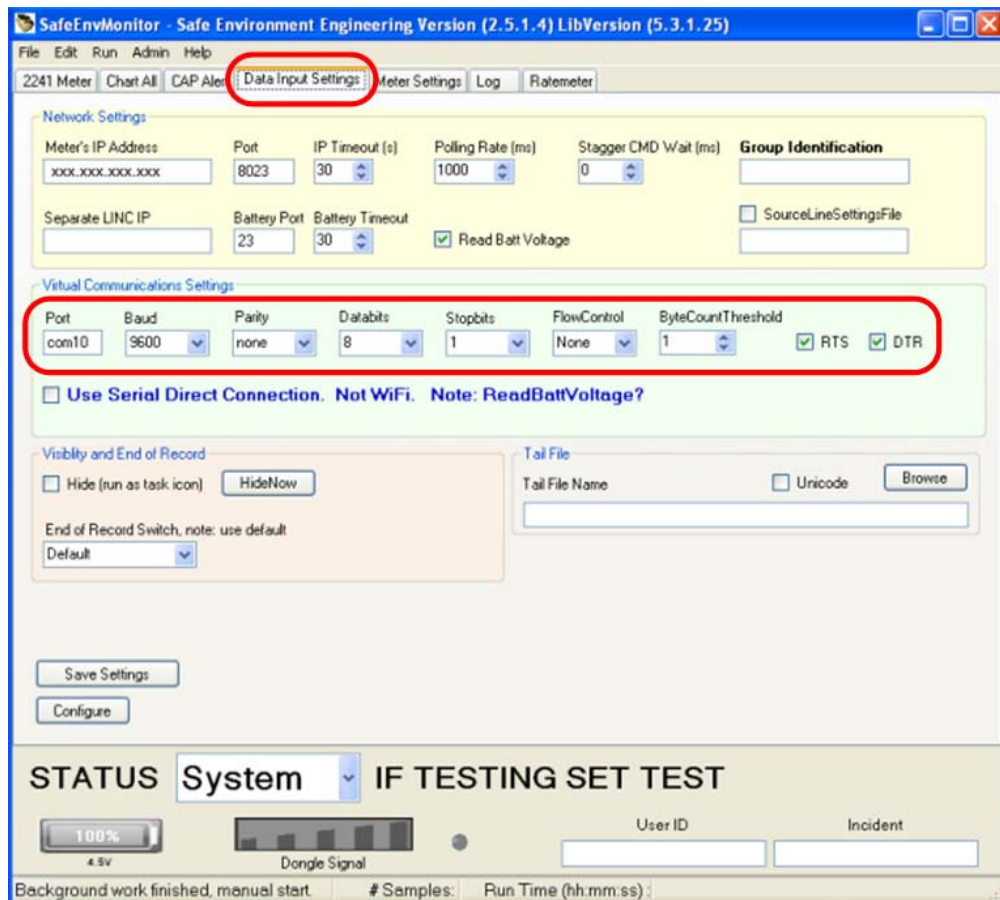
Installation of USB Drivers for Meter Applications

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.



Future Technology Devices International Ltd

Application Note AN_104

**FTDI Drivers Installation guide for
Windows XP**

Document Reference No. FT_000093

Version 1.0

Issue Date: 2008-09-23

Future Technology Devices International Ltd (FTDI)

373 Scotland Street, Glasgow G5 8QB United Kingdom

Tel.: +44 (0) 141 429 2777 Fax: + 44 (0) 141 429 2758

E-Mail (Support): support1@ftdichip.com Web: <http://www.ftdichip.com>

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Acronyms and Abbreviations

Terms	Description
CDM	Combined Driver Model. FTDI's Windows driver that supports both D2XX and VCP interfaces.
VCP	Virtual COM Port. Emulation of a legacy RS232 COM port.

Table 1.1 Acronyms and Abbreviations

1 Introduction

This document is intended to guide the reader through the process of installing FTDI's combined driver model (CDM) driver for the Microsoft Windows XP operating system. The CDM driver provides access to both virtual COM port (VCP) and FTDI's proprietary "direct" (D2XX) interfaces.

2 Installing CDM Drivers

2.1 Installing Via The Found New Hardware Wizard

To install CDM drivers for an FTDI device under Windows XP, follow the instructions below:

- If a device of the same type has been installed on your machine before and the drivers that are about to be installed are different from those installed already, the original drivers need to be uninstalled. Please refer to the [Uninstalling CDM Drivers](#) section of this document for further details of this procedure.
- Download the latest available CDM drivers from the [FTDI web site](#) and unzip them to a location on your PC.
- If you are running Windows XP or Windows XP SP 1, temporarily disconnect your PC from the Internet. This can be done by either removing the network cable from your PC or by disabling your network card by going to the "Control Panel\Network and Dial-Up Connections", right-clicking on the appropriate connection and selecting "Disable" from the menu. The connection can be re-enabled after the installation is complete. This is not necessary under Windows XP SP 2 if configured to ask before connecting to Windows Update. Windows XP SP 2 can have the settings for Windows Update changed through "Control Panel\System" then select the "Hardware" tab and click "Windows Update".
- Connect the device to a spare USB port on your PC. If the device is based on the FT2232, the Microsoft composite device driver is automatically loaded in the background. Once the composite driver has been installed Windows Found New Hardware Wizard will launch. If there is no available Internet connection or Windows XP SP 2 is configured to ask before connecting to Windows Update, the screen shown in Figure 2.1 is displayed. Select "No, not this time" from the options available and then click "Next" to proceed with the installation. If there is an available Internet connection, Windows XP will silently connect to the Windows Update website and install any suitable driver it finds for the device in preference to the driver manually selected.



Figure 2.1

- Select "Install from a list or specific location (Advanced)" as shown in Figure 2.2 below and then click "Next".



Figure 2.2

- Select "Search for the best driver in these locations" and enter the file path in the combo-box ("C:\CDM 2.02.04" in Figure 2.3 below) or browse to it by clicking the browse button. Once the file path has been entered in the box, click next to proceed.

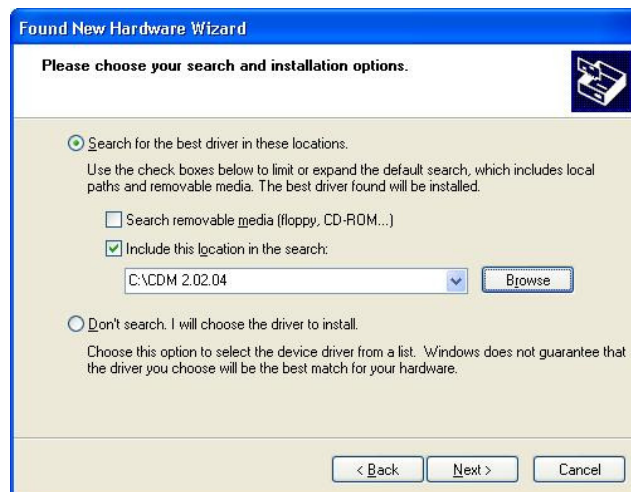


Figure 2.3

- If Windows XP is configured to warn when unsigned (non-WHQL certified) drivers are about to be installed, the message dialogue shown in Figure 2.4 will be displayed unless installing a Microsoft WHQL certified driver. Click on "Continue Anyway" to continue with the installation. If Windows XP is configured to ignore file signature warnings, no message will appear.



Figure 2.4

- The screen shown in Figure 2.5 will be displayed as Windows XP copies the required driver files.



Figure 2.5

- Windows should then display a message indicating that the installation was successful (Figure 2.6). Click "Finish" to complete the installation for the first port of the device.



Figure 2.6

- If the device is based on the FT2232, the Found New Hardware Wizard will continue by installing the USB Serial Converter driver for the second port of the FT2232 device. The procedure for installing the second port is identical to that for installing the first port from the first screen of the Found New Hardware Wizard. This is done automatically if the driver is Microsoft WHQL certified. If the device is not based on the FT2232, the COM port emulation driver is loaded as indicated in the following steps.
- The Found New Hardware Wizard will launch automatically to install the COM port emulation drivers. As above, select "No, not this time" From the options and click "Next" to proceed with the installation (Figure 2.7).



Figure 2.7

- Select "Install from a list or specific location (Advanced)" as shown in Figure 2.8 below and then click "Next".



Figure 2.8

- Select "Search for the best driver in these locations" and enter the file path in the combo-box ("C:\CDM 2.02.04" in figure 2.9 below) or browse to it by clicking the browse button. Once the file path has been entered in the box, click next to proceed.



Figure 2.9

- If Windows XP is configured to warn when unsigned (non-WHQL certified) drivers are about to be installed, the message dialogue shown in Figure 2.10 will be displayed unless installing a Microsoft WHQL certified driver. Click on "Continue Anyway" to continue with the installation. If Windows XP is configured to ignore file signature warnings, no message will appear.



Figure 2.10

- The screen shown in Figure 2.11 will be displayed as Windows XP copies the required driver files.

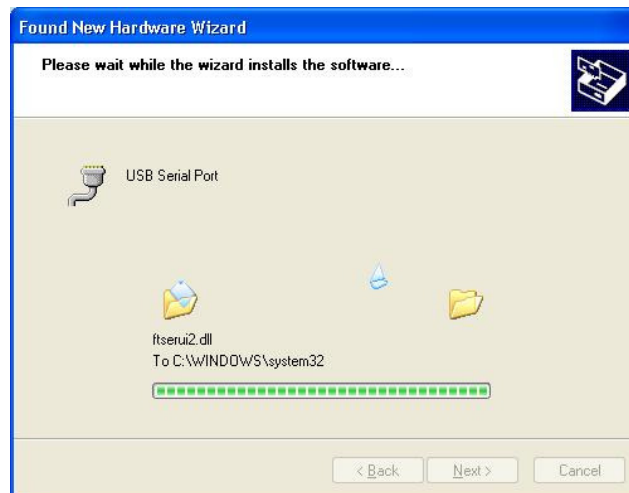


Figure 2.11

- Windows should then display a message indicating that the installation was successful (Figure 2.12). Click "Finish" to complete the installation for the first port of the device.



Figure 2.12

- If the device is based on the FT2232, the second port must also be installed. The procedure for installing the second port is identical to that for installing the first port from the first screen of the Found New Hardware Wizard for the USB Serial Port device. If the driver is Microsoft WHQL certified, this is done automatically.
- Open the Device Manager (located in "Control Panel\System" then select the "Hardware" tab and click "Device Manger") and select "View > Devices by Connection", the device appears as a "USB Serial Converter" with an additional COM port with the label "USB Serial Port" (Figure 2.13). If the device is based on the FT2232, two ports will be available from a composite USB device.

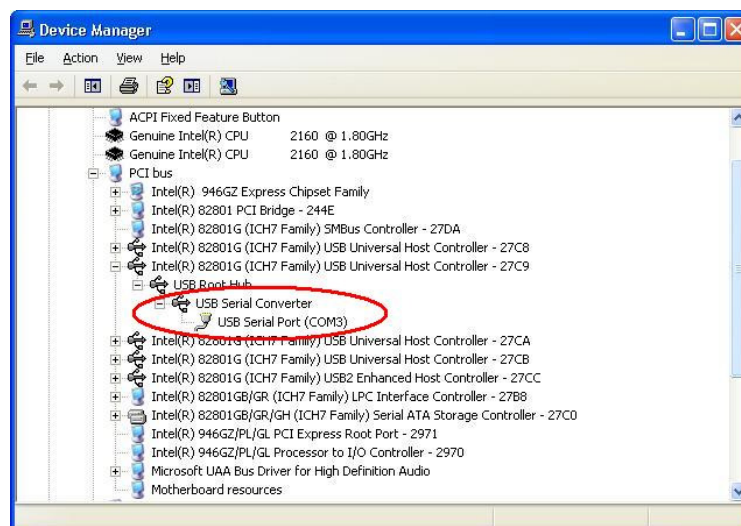


Figure 2.13

- In the case of the FT2232, port A of the FT2232 will be installed as COMX and port B will be installed as COMX+1 where COMX is the first available COM port number.

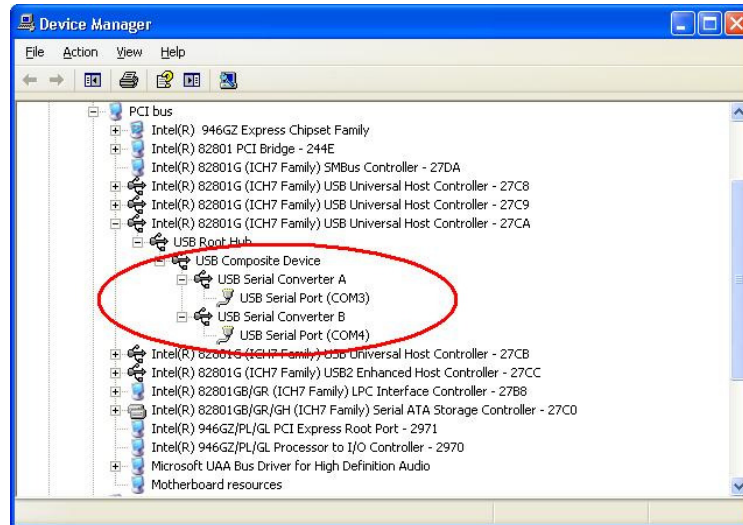


Figure 2.14

2.2 Installing Using DPInst

In the case of a Microsoft WHQL certified driver package, it is possible to pre-install the driver package using the Microsoft Driver Install Frameworks (DIFx) tools. The simplest tool provided is the Driver Package Installer (DPInst). When placed in the same directory as the INF files for the driver package, simply run DPInst.exe and the certified driver package will be installed on the machine.

The current FTDI CDM driver package supports 32-bit and 64-bit systems through common INF files. DPInst has separate executables for 32-bit and 64-bit installation. This means that if a single solution is desired for 32-bit and 64-bit systems, the developer must be able to detect which version of DPInst is required for the system the driver is being installed on.

For more information on DPInst, see the [FTDI Windows Driver Pre-Installation application note](#).

2.3 Installing From Windows Update

If a certified driver is available for the target operating system, it is possible to install the driver from the Windows Update web site.

Directions to install the driver from Windows Update are very similar to those outlined in [2.1 Installing Via The New Hardware Wizard](#), except that the “Yes, this time only” or “Yes, now and every time I connect a device” option should be selected on the first screen of the wizard when asked if Windows Update should be checked for a driver. If the wizard finds a matching driver on Windows Update, the driver will be automatically downloaded and installed for the device.

3 Uninstalling CDM Drivers

FTDI no longer supply an uninstaller program as part of the driver package. Consequently, a new method for uninstalling has to be used. Devices can be removed using the Device Manager by simply right-clicking on the device and selecting "Uninstall". This will delete the associated registry entries for that device only.

Under Windows XP, driver files and OEM INF and PNF files must be removed manually or by using a custom application. OEM INF and PNF files are located in the Windows\Inf directory and can be identified by searching for a VID and PID string matching the device installed e.g. VID_0403&PID_6001. Once the matching OEM INF files are found (e.g. oem10.inf for FTDIBUS.INF and oem11.inf for FTDIPORT.INF), the corresponding PNF files must also be removed (e.g. oem10.pnf and oem11.pnf). Driver files are located in the Windows\System32 and Windows\System32\Drivers directories.

Some points to note about this un-installation method:

- In the case of FT2232 devices, a composite device is also installed. This can also be removed by right-clicking on the composite device in the Device Manager and selecting "Uninstall".
- If the VCP driver has been installed, the COM port driver should be removed before the bus driver. If the bus is removed first, the COM port will no longer appear in the Device Manager.
- If the driver files are deleted while other installed devices still require them those devices will not work correctly. This can be fixed by right clicking the device and selecting "Reinstall Driver" which will replace the missing files.
- If a device to be uninstalled is not connected to the PC, the device can still be removed by setting the device manager to show phantom devices. This can also allow a virtual COM port to be uninstalled if the bus layer has been removed first. Instructions on how to display phantom devices are given in the [Advanced Driver Options application note](#).

4 Troubleshooting

4.1 Windows XP Cannot Find Drivers For My Device

This error can occur if the VID and PID programmed into the device EEPROM do not match those listed in the INF files for the driver. The VID and PID programmed into the device EEPROM may be found by using the USBView utility from the FTDI web site. These can then be checked against the VID and PID entries in the driver INF files. If they do not match, that driver cannot be installed for that device without either re-programming the device EEPROM or modifying the list of VID and PID numbers in the INF files.

Please note that only your own company VID and PID or FTDI's VID (0x0403) and FTDI PID issued for use by your company should be used in the EEPROM and INF/INI files.

End customers should obtain modified drivers from the OEM of the device, and not necessarily edit the files themselves.

4.2 Windows XP Forces A Reboot After Installing a Device

This problem can occur if an application is accessing a file while the New Hardware Wizard is trying to copy it. This usually occurs with the FTD2XX.DLL file. Selecting not to restart the computer then unplugging and re-plugging the device may allow the device to function properly without restarting. Restarting the machine will allow the device to work correctly.

4.3 Driver Installation Fails And Windows XP Gives Error Code 10

Windows error code 10 indicates a hardware error or failed driver installation. This error may appear if a device has insufficient power to operate correctly (e.g. plugged into a bus powered hub with other devices), or may indicate a more serious hardware problem. Also, it may be indicative of USB root hub drivers being incorrectly installed.

Please refer to the example schematics on the FTDI web site for standard device configurations. If the error persists, please contact the FTDI support department.

4.4 Windows XP Displays An Error And Then Terminates Installation

If the following screen is displayed with this message, Windows XP has been configured to block the installation of any drivers that are not WHQL certified.



Figure 4.1

Two options are available to successfully install the device. Either a certified version of the driver can be installed (if available) or the driver signing options can be changed to either warn or ignore to allow the installation to complete.

To change the current driver signing setting, go to "Control Panel\System", click on the "Hardware" tab and then click "Driver Signing". The desired signing option may then be selected.

5 Contact Information

Head Office - Glasgow, UK

Future Technology Devices International Limited
373 Scotland Street
Glasgow G5 8QB
United Kingdom
Tel: +44 (0) 141 429 2777
Fax: +44 (0) 141 429 2758
E-Mail (Sales): sales1@ftdichip.com
E-Mail (Support): support1@ftdichip.com
E-Mail (General Enquiries): admin1@ftdichip.com
Web Site URL: <http://www.ftdichip.com>
Web Shop URL: <http://apple.clickandbuild.com/cnb/shop/ftdichip>

Branch Office - Taiwan

Future Technology Devices International Limited (Taiwan)
4F, No 16-1, Sec. 6 Mincyuan East Road
Neihu District
Taipei 114
Taiwan, R.O.C.
Tel: +886 2 8791 3570
Fax: +886 2 8791 3576
E-Mail (Sales): tw.sales1@ftdichip.com
E-Mail (Support): tw.support1@ftdichip.com
E-Mail (General Enquiries): tw.admin1@ftdichip.com
Web Site URL: <http://www.ftdichip.com>

Branch Office - Hillsboro, Oregon, USA

Future Technology Devices International Limited (USA)
7235 NW Evergreen Parkway, Suite 600
Hillsboro, OR 97124-5803
USA
Tel: +1 (503) 547-0988
Fax: +1 (503) 547-0987
E-Mail (Sales): us.sales@ftdichip.com
E-Mail (Support): us.support@ftdichip.com
E-Mail (General Enquiries): us.admin@ftdichip.com
Web Site URL: <http://www.ftdichip.com>

Distributors and Sales Representatives

Please visit the Sales Network page of the FTDI Web site for the contact details of our distributor(s) in your country.

Appendix A – Revision History

Version 0.1	First Draft	08/09/2008
Version 1.0	First Release	23/09/2008