Instrument Management Software

User's Manual

Version 1.0

NOTICE: The contents of this manual are subject to change without notice.

Product Name: Instrument Management Software (IMS)

Model Numbers: PC-IMS

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1-1 Product Overview

Setra Systems, Inc. includes the Instrument Management Software utility (IMS) with the purchase of their particle counter products to support the operation and management of the instrument. The IMS utility provides for the following key functions to easily manage the instrument:

- Data Download – Extract all or specific records off the instrument to the PC
- Select Data Columns – Allows User to display and report selected fields from recorded data
- Remote Diagnostics – Allows a Setra Systems service engineer to remotely diagnose an instrument
- In-field Firmware Updates – Allows Bug fixes and Feature Upgrades to be installed on an instrument
- Real-Time Graphing – Allows for remote control and data logging of an instrument and real-time graphing on a PC

This IMS utility provides strong interface control, ease of use in exporting data or graphs, and time-saving settings of customer's default or custom parameters. The remote operation features of the Real-Time Graphing function allows for direct connectivity using a USB or Ethernet cable, it can also be easily setup for remote monitoring of a single instrument from across the facility over a local area network, or from anywhere in the world connecting through the Internet.

This user manual provides a detailed description of these features as well as instructions for the proper installation and use of this IMS.

This software is designed to support the use of particle counters and air quality monitors from Setra Systems. Our goal is to provide an intuitive and feature-rich user experience.

Thank you,

1-2 Installation

To install the IMS software utility, access to the internet through a normal web browser must be available from the PC (most all Windows based browsers will work).

1. Insert the USB key that came with the Setra Systems particle counter or air quality monitor into a USB slot on the PC, and then access that removable device drive from the list of drives under My Computer.
2. Select the Instrument Management Software folder, then select and run IMS Install file.
3. This will open up the PC's default browser, and connect to the IMS download/install server. Press the Install button on the bottom left of the browser page (see figure 1.1 below). This will download a file to your PC called Setup.Exe, select and run this file.

Figure 1.1
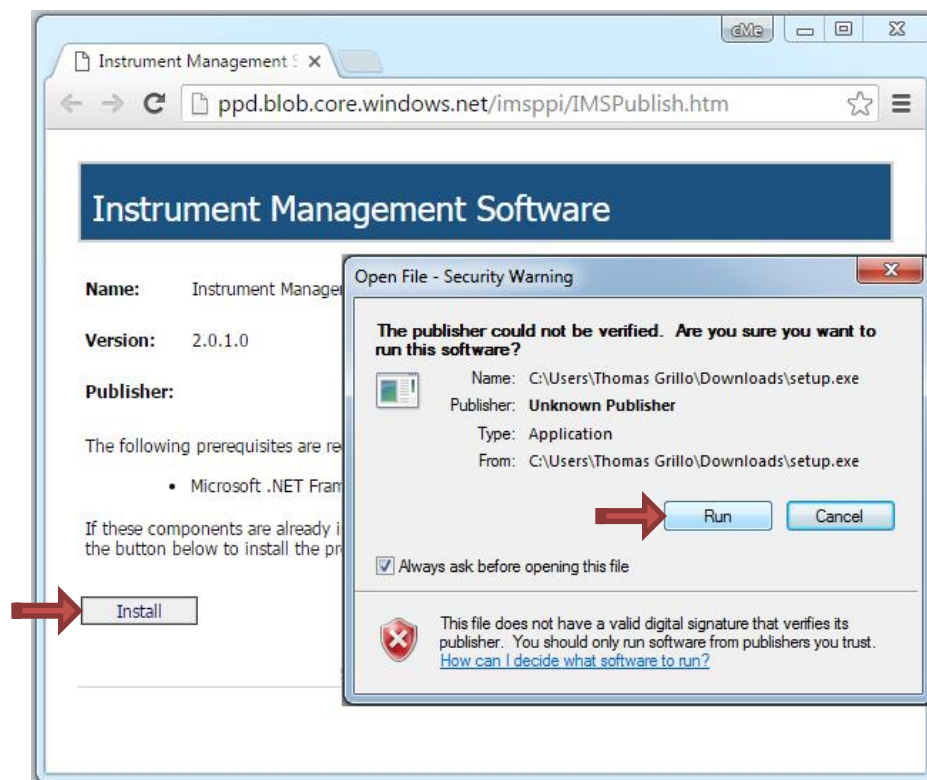
4. When the security warning window appears, click Run (see figure 1.1 above – For Windows 8 or 10 you must click more and accept). The software will install and create a Program Folder in your Windows Start \ All Programs list called Instrument Management Software.

1-3 Starting the IMS Utility Program

To start the IMS Software, click on the desktop icon installed during the Setup, or the software can be accessed through Start\ All Programs \ Instrument Management Software.

1-3 Operational Flow Chart
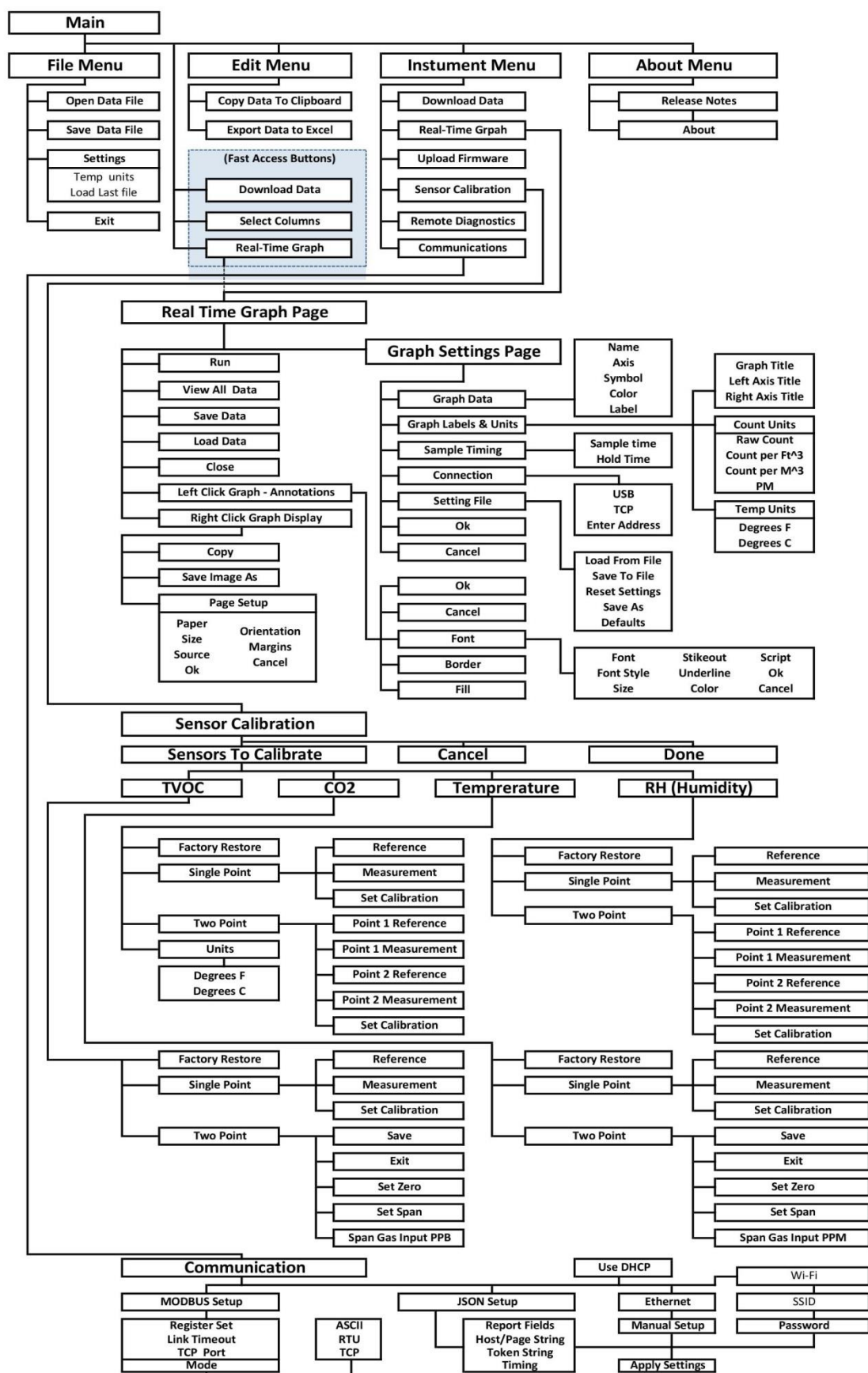
2-1 Main Screen
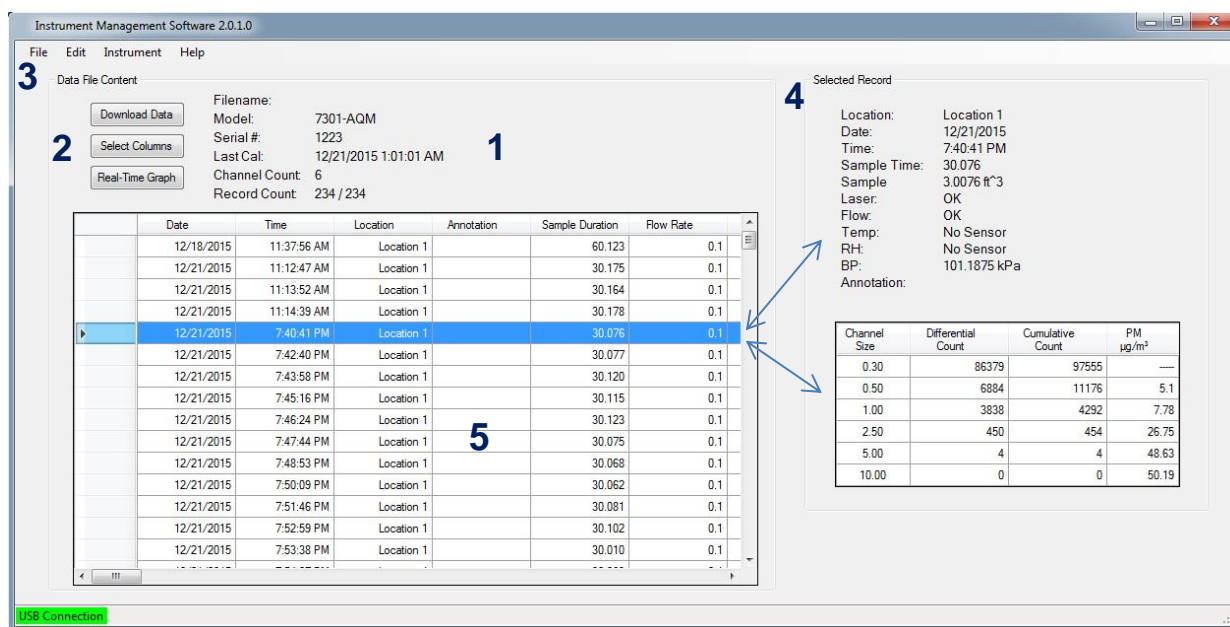
1. Currently Displayed Data File Information

This section of the main screen displays the Filename, if saved, the instrument model, last calibration date, number of channels reported from instrument and the total record count for the downloaded file.
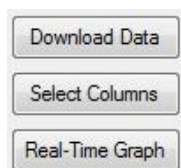
2. Fast Access Command Buttons

These three buttons allow for quick access to the Download Data, Select Columns and the Real-Time Graph commands. These are the most commonly used commands for the utility.
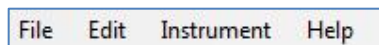
3. File Menu

The file menu allows access to all commands and main functions for the software. (See section 2.2 for more detailed description)

4. Selected Record Details

The Selected Record section of the main screen display provides detailed information about the current highlighted record in the downloaded data section (#5). This detailed data includes the current record's time, date, location, sample time, notes, sensor status for the particle counter, and calculated data for differential and cumulative counts, as well as particle matter value by channel expressed in mass (µg/m³). Alarm Data is shown in **RED.**

5. Current Data

The current data is displayed in columns and can be customized by utilizing the Select Columns command.

2-2 Getting Started – Downloading Data & Selecting Columns

To Download Data, you must follow the following steps:

1. Turn on and connect the Setra Systems Instrument to the PC using the approved USB Cable (part number AS-99022).

Download Data
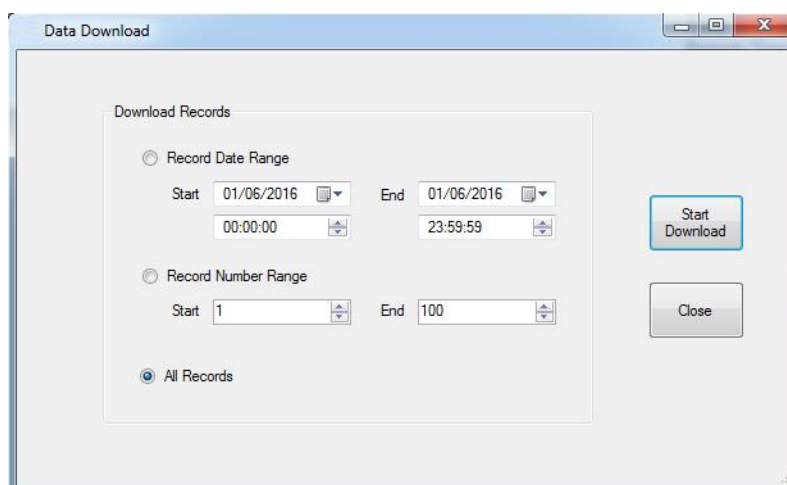
2. Select the Download Data button on the main screen, or access this command from the Instrument File Menu. The data will be copied to the PC and populate the main screen. Select the data to be downloaded by date or record number range.
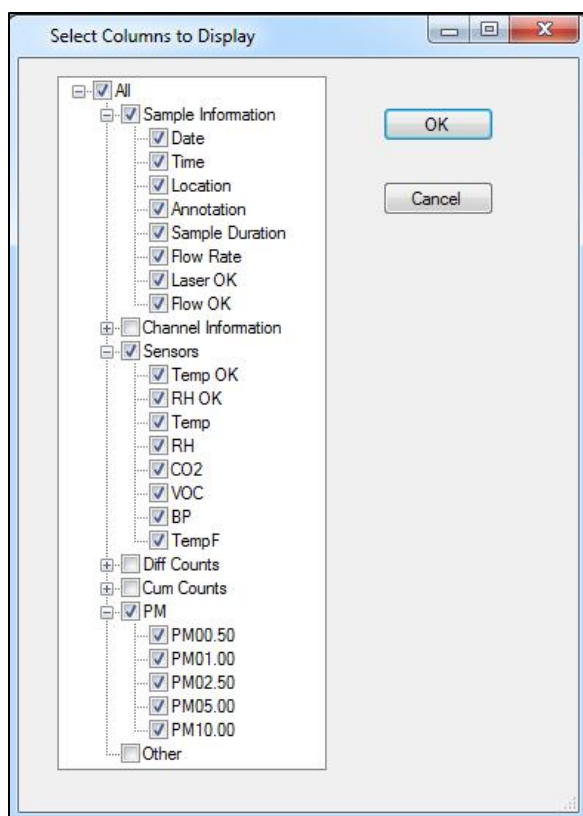
3. Access the File Menu \ Save Data File and save the file to your computer.

Select Columns

It is important to note that all 76 columns of possible data that can be displayed are copied to the PC and will appear on screen. The software allows the user to specify which of these columns to display or export via the Select Columns Button on the Main screen.

Clicking on the Select Columns button will bring up the Select Columns to Display window.

Only the field with its check box selected will be displayed or exported. Uncheck the boxes for all data fields that should not be displayed or exported.

For example, if your system does not utilize environmental sensors, you can deselect those data fields and they will not be displayed or used in your reports.

Note that all 76 data fields are saved in the file, and that the Select Columns option only affects the display and export functions. This means that omitted fields can be recovered at some future time by simply reselecting the box for any omitted data field.

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2-3 Data File Menu

The access, opening and saving of data files that are downloaded to your PC from the Instrument are managed from this File Menu.

File	
Open Data File...	← Opens Data Files saved to PC
Save Data File...	← Saves the current Data File on screen
Settings...	← Save settings for Temperature Units and Load Recent File on Startup
Exit	← Closes the program
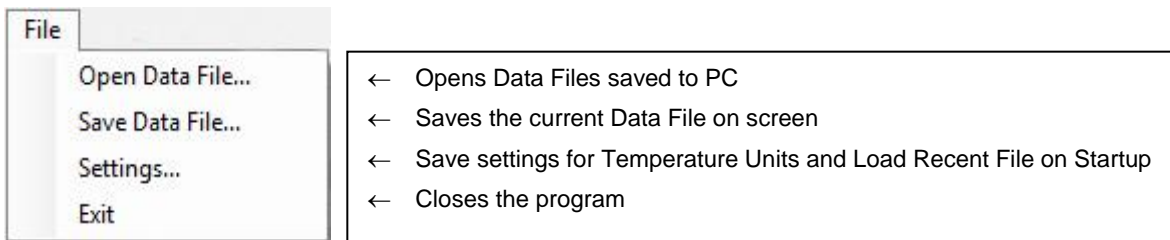
2-4 Edit File Menu

The edit file menu provides for exporting of the data through the use of Windows Clipboard, or through a direct command to open Excel in a new workbook which copies and pastes the selected columns of data from the current data file being displayed on screen.

Edit	
Copy Data to Clipboard	← Copies the current data on screen to the windows clipboard
Export Data to Excel	← Automatically copies onscreen data, opens Excel and pastes the data
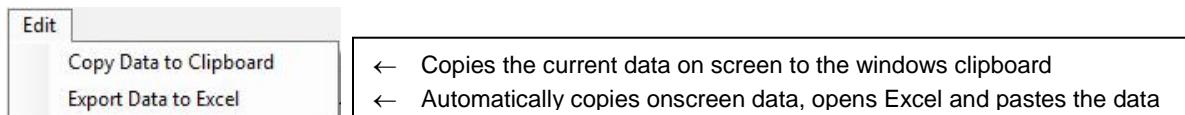
2-5 Instrument Menu

The Instrument Menu allows access to all the key functions while interfacing with the instrument. These functions include **Download Data**, **Real-Time Graph**, **Sensor Calibration, Communication Setup Date/Time Clock Calibration, Remote Diagnostics**, and **Upload Firmware**. These functions are explained in more detail in the subsequent sections.

Instrument	
Download Data	← Starts the data download from the connected instrument
Real-Time Graph	← Starts the Real-Time Graph remote operation screen
Sensor Calibration	← Opens the environmental sensor calibration window
Communication Setup	← Opens Communication Setup Screen
Date/Time clock calibration	← Opens the Date & Time clock calibration screen
Remote Diagnostic	← Starts remote diagnostic session with Authorized Service Engineer
Upload Firmware	← Starts firmware upload to connected instrument

2-6 About Menu

The About Menu provides information about the current version and a link to display the current version's release notes.

Help	
Release Notes	← Opens information about current release notes for this software
About	← Opens onscreen window for current version information
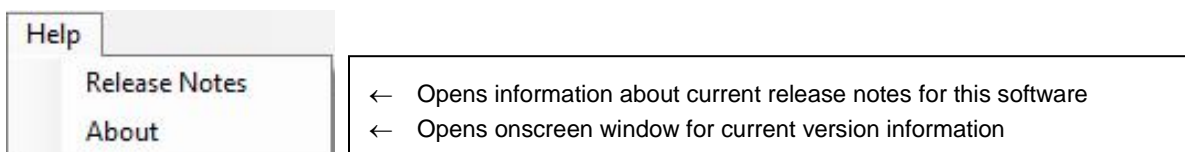
2-7 Quick Access Buttons

The quick access buttons are conveniently located on the top left section of the main screen display, and provide for easy access to the most commonly used functions.

Download Data	← Starts the data download from the connected instrument
Select Columns	← Select the Data Columns to be displayed and copied to clipboard
Real-Time Graph	← Fast Access to Real-Time Graph remote operation screen

2-3 Connection Indication

USB Connection

No Connection

The connection indication is located in the bottom left corner of the main screen. This provides a visual indication that the instrument is connected to the PC properly and that there is connectivity to the software. When the instrument is successfully connected this will be displayed as a green rectangular icon and state Connected. If the software cannot find an instrument then No Connection is indicated in red. In such a case, the device or the cable should be checked.

3-1 Real-Time Graph (RTG) & Remote Operation

The IMS utility allows for remote operation of a single Setra Systems instrument through the software and PC. This function requires a direct connection to the PC, either through the USB cable or through an Ethernet cable. The connection can also be achieved through TCP connection over a network or through the internet from across the globe.

Real-Time Graph

The Utility is accessed by selecting the Real-Time Graph Icon from the quick access command buttons, or from the Instrument Menu.

Notes:

- The Real-Time Graph will collect and save the information from the remote operation session, but will only save this information as graph data. For the complete data download you must pull the data from the Setra Systems Instrument using a USB memory Stick or external USB drive, or by connecting directly with the USB cable and running the Download Data function
- During remote operation, the sampling can be interrupted locally on the instrument if necessary.
- The settings created in the Remote Operation Settings will overwrite the sample setup information (Sample Time & Hold Time) in the instrument.

Real-Time Graph (RTG) & Remote Operation (3-1 continued)
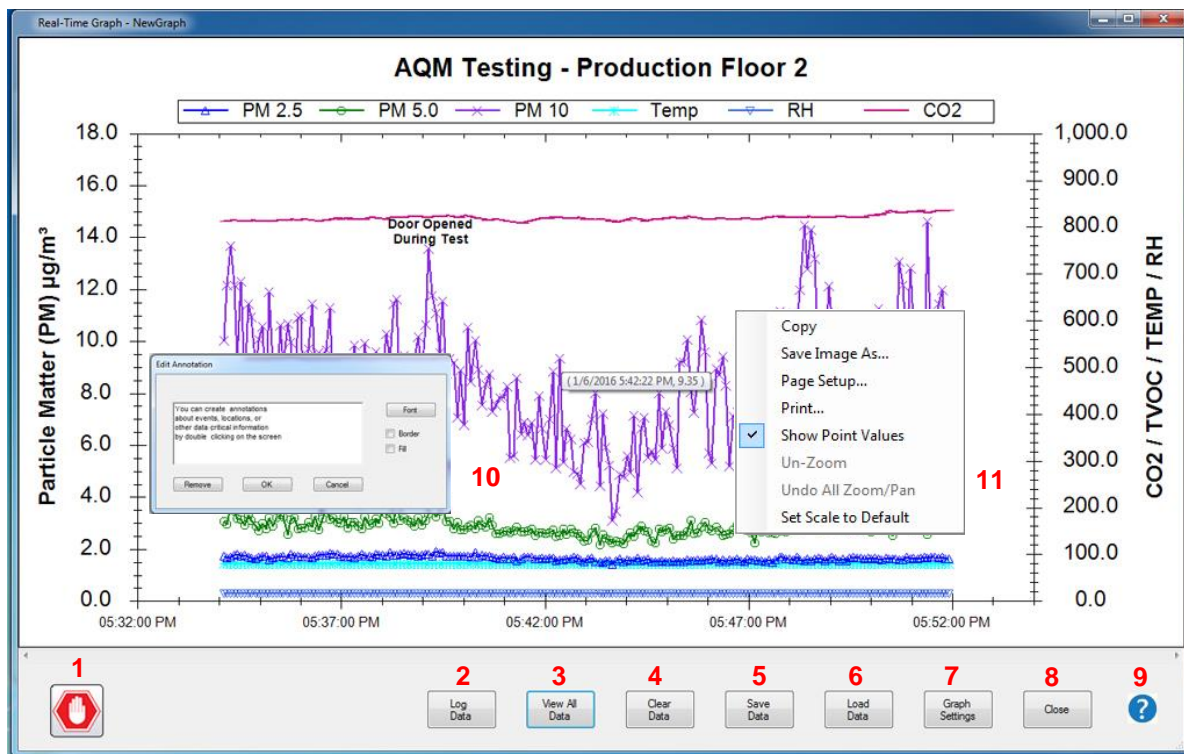
1. **Start and stop sampling icon buttons** - Controls the instrument connected to the PC to begin sampling or to stop sampling

2. **Log Data** – Allows for the creation of a user named CSV log file that will append and update with each sample cycle during Real Time Graph Operation.

3. **View All Data** – After zooming in on data on screen or moving data left or right, this will restore the graphical display to show all sample records taken for this file from the beginning up to the current sample. This can be done while the instrument is sampling and will not interfere with its sampling operation.

4. **Clear Data** – Clears the screen of the current graph. If the graph is not saved, it will prompt and give the choice to save or discard the current data onscreen.

5. **Save Data** – Opens the windows save file dialogue window, allowing for the file to be saved to the PC.

6. **Load Data** – Load a previously saved data file.

7. **Graph Settings** – Opens the Graph Settings Page (see next section).

8. **Close** – Ends the session and closes the window.

9. **On Screen Annotation** – Double left click on the graph display to open the window to write, edit, format and move onscreen user created notations related to the data. This is saved with the graph and appears onscreen.

10. **Graph Image Control Window** – Right click on screen opens window that allows for copying the graph, saving as an image, page setup, printing, etc.

11. **Help Menu** – Select to access on screen help.

3-2 Real-Time Graph Settings

The Real-Time Graph feature for remote operation and visual display of sample data in real time is able to be customized to user preferred settings. It is also the screen for setting up the communications mode the instrument and software will use to communicate.

1. **Axis** – Turn on/off channel/sensor data or set to display on left or right axis.

2. **Symbol** – Choose the symbol for the data point for that channel/sensor.

3. **Color** – Choose the color for the channel/sensor data to use on the graph.

4. **Label** – Create custom label for specific channel or sensor.

5. **Graph Title** – Change the graph title.

6. **Left Axis Title** – Change the left axis title.

7. **Right Axis Title** – Change the right axis title.

8. **Count Units** – Select Raw Count, Count per M^3, Count per Ft^3, or PM.

9. **Temp. Units** – choose the temperature units (Celsius or Fahrenheit).

10. **Sample Time**- Amount of time set for sample (hh:mm:ss).

11. **Hold Time** – Amount of time set for delay before next sample begins (hh:mm:ss).

12. **Log Scale** – Turns on feature for values to display in Log Scale on graph.

13. **Connection Type** – Select USB or TCP/IP for connection method to instrument.

14. **Enter IP address** of instrument (default IP address is 10.0.0.249).

15. **Load From File** – Previously saved settings can be loaded from a file.

16. **Reset Settings** – Resets all settings on screen to factory default.

17. **Save to File** – Saves the current settings to a file for later use.

18. **Save as Default** – Saves the current settings to be default when started.

19. **Ok** – Acknowledges and accepts the current settings and returns to RTG screen.

20. **Cancel** – Cancels the current settings page and returns to the RTG Screen.

3-2 Real-Time Graph Connecting

The Real-Time Graph feature is available over a standard USB A to B cable that allows for easy direct connection and remote control of the instrument from the PC.

The software also permits connection by TCP/IP over an Ethernet cable or through the optional Wi-Fi option if available on the Setra Systems Instrument. The Ethernet connection can be over a CAT5 cable directly between the PC and the Instrument. It will automatically detect and correct as if a crossover cable was in use. It can also connect through a hub, switch or router, making it accessible throughout a local area network.

With router setting access (check with your IT Administrator) Port Forwarding can be enabled for the instrument's IP address within the local area network, then externally using the router's IP address on the Internet, the instrument can be made available for remote access and control from across the world over the world wide web.

1. **Connecting Using a USB Cable**
   a. Connect the USB-A/B cable to the instrument and to the PC
   b. With the IMS Software on, and the **Real-Time Graph settings** page accessed, select the button for USB connection.
   c. Set sample & hold timing and other settings for graph.
   d. Select OK to return to the graph page.
   e. Select the Run Icon, and the instrument will begin sampling and plotting your values onscreen.

2. **Connecting using a Direct Ethernet Cable or through a router or switch**
   a. Connect an Ethernet cable between the Instrument and the PC.
   b. Turn on the instrument and go to **Settings\Communications\MOBUS setup** and make sure that **TCP** is the selected protocol, hit **Apply Settings**.
   c. Select Ethernet Option and uncheck **USE DHCP**.
   NOTE: You can use the IMS software and instrument using the DHCP function, and allowing the router to assign the instrument's IP address. If DHCP is being used, skip to step N.
   d. Enter IP Address and Gateway for connecting to the PC. The default is 10.0.0.249 for the instrument. The Gateway should be 255.255.0.0
   You do not require a DNS gateway address, but you can enter 10.0.0.1
   e. Press the **Apply Settings Button**, and exit back to the main screen.
   f. From the PC, access your **Network and Sharing Center**.
   g. On the left side select **Change Adapter Settings**.
   h. Select the local area network adapter that the Ethernet cable is connected to and make sure it is enabled, right click and select **properties**.
   i. From the Adapter Properties screen, select and highlight the **Internet Protocol Version 4 (TCP/IPv4)** and select **Properties**.
   j. Change the General Settings to Use the following IP address:
   k. Enter an IP address that begins with the same format as the instrument, and make it one number off from the instrument. (example: instrument = 10.0.0.249, set the PC to 10.0.0.248)
   l. Enter the <u>same</u> Subnet Mask.
   m. Press Ok and Exit out of the Network adapter and Network Connections screens. (Note: You may need to go to the instrument communications page and reselect "Apply Settings" again.) Then go to main home screen.
   n. Begin sampling using the **Real-Time Graph Run Button**.

4-1 Sensor Calibration

The IMS utility also supports field calibration for its environmental sensors to allow for creating correlation to an in-house temperature and humidity standard, or to provide field calibrations for CO2 or TVOC testing. Single or two point calibrations can be supported using the IMS software depending on the reference standards or reference gases that are available in the field.

To begin a sensor calibration, select Sensor Calibration from the Instrument File Menu at top of the main IMS screen. This will open the Sensor Calibration Window. Select the sensors to calibrate by selecting the boxes next to the sensors name on the top left of the window. If the sensor is working and connected, it will allow you to access the calibration section of the page for that instrument sensor.

1. **Single Point Calibration or Offset** – This utility allows for a single point offset in the event only one reference standard point is possible. (An example would be ambient air temperature when an environmental chamber is not readily available – See image above.)
   a. Select Single Point for Calibration for the sensor you are adjusting.
   b. Read the value on the reference standard you want to calibrate the Setra Systems Instrument to match; enter that value in the Point 1 – Reference window.
   c. Read the value on the Setra Systems instrument sensor and enter that value in to the Measurement window.
   d. Press Set Calibration.

Sensor Calibration (4-1 continued)

2. **Two Point Calibration or Offset –** This utility also allows for a two point offset to be calibrated when multiple reference standard points are possible for calibration. (An example is Humidity chamber with 20% and 80% salt solutions available. You can set both low and high point on the sensor adjustment curve for the best accuracies. See RH adjustment above.)

   a. Select Two Point for Calibration for the sensor you are adjusting.
   b. Read the value on the reference standard you want to calibrate the Setra Systems Instrument to match, enter that value in the Point 1 – Reference window.
   c. Read the value on the Setra Systems instrument sensor and enter that value in to the Measurement window.
   d. Next adjust your environmental condition to the 2nd point in the range that is to be calibrated.
   e. Read the 2nd value on the reference standard you want to calibrate the Setra Systems Instrument to match, enter that value in the Point 2 – Reference window.
   f. Read the value displayed on the Setra Systems instrument and enter that value in to the point-2 Measurement window.
   g. Press Set Calibration.

Sensor Calibration (4-1 continued)

When a two-point gas calibration is selected from the calibrations page for CO2 or TVOC for Models 5301-AQM, 5302-AQM, 7301-AQM and 7302-AQM -- a special sensor calibration window will open and provide step by step instructions related to that sensor.

Preparation for CO2 and TVOC gas calibration.

1.   Analytical gas canister regulator for regulating flow to 0.3 Liter/min.

2.   Analytical Gases for calibration as follows:
        a.   zero Gas - this is clean air with no VOCs and no CO2 in the mixture. This is typically pure Nitrogen or similar.
        b.   CO2 span gas – use 2500 or 4000 ppm mixture for span calibration.
        c.   TVOC span gas – use Isobutylene – 40 ppm span gas. The instrument reads in ppb for TVOC, this is equal to 40,000 ppb. Lower ppm span gas will lend to better accuracy on the low end of the range, such as 7500 ppb span gas.
        d.   The tubing from the regulator to the AQM calibration hood should be VOC free.
        e.   The AQM Calibration cap, model AS-99041A is shown here.

3.   Personal Computer with Setra Systems IMS software installed and a USB connection cable.
        a.   With IMS software running, connect USB cable to the PC and to the Air Quality Monitor, with the AQM powered on.

4.   Connecting the AQM Calibration Cap to the instrument and to the test gas canister.
        a.   Connect the regulator to the gas canister (zero, CO2, or TVOC)
        b.   Connect tubing to regulator output and to appropriate barb fitting on AQM Calibration Cap, depending upon which gas is being calibrated.
        c.   Align pins in bottom of Calibration Cap with holes on top of AQM sensor assembly grill. Secure with thumb turn screw. Do not over-tighten.
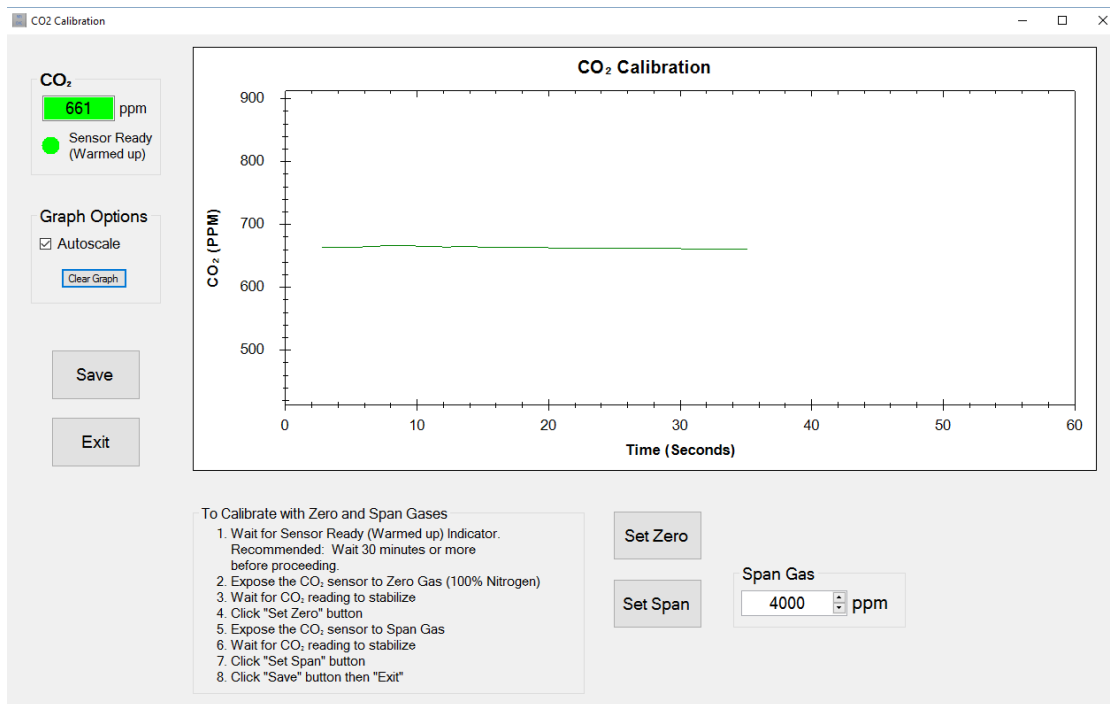
(Typical test setup shown)

Sensor Calibration (4-1 continued)

The CO2 Sensor calibration page is show below.

It is important to note that when facing the front of the Air Quality Monitor not to directly breathe on the sensor.

1. **CO2 Two Point Calibration** – The CO2 calibration for using a zero and span gas is set using this smart interface screen from the software utility as shown above.
   Note: <u>**for best results power instrument on for 30 - 120 minutes before calibration**</u>.
   a. Select **Two Point** Calibration from **Sensor Calibration Screen**.
   b. Secure the AQM Cal Hood and tubing to the sensor on the unit
   c. Connect the tubing to the regulator and zero gas tank.
   d. Wait for the lamp temperature to stabilize (this can take up to 30 minutes).
   e. Turn on the zero gas and allow for the reading to stabilize. The Red PPM data field will turn green (see top left of image above)
   f. Select "**Set Zero**" button.
   g. Switch regulator and tubing to the span gas cylinder to be used.
   h. Set the **Span Gas** value on the software screen under Span Gas.
   i. Open the valve and expose the sensor to the span gas, waiting for the reading to stabilize.
   j. Click "**Set Span**" Button.
   k. Press the **Save** Button.

2. **TVOC Two Point Calibration** – The calibration for the TVOC 2 point zero and span gas calibration is identical to the CO2 calibration. Values will be in parts per biliion (ppb)

4-2 Communications

The IMS utility allows for setup of the instrument's communication parameters. These include Ethernet, Wi-Fi, MODBUS, and JSON configurations.
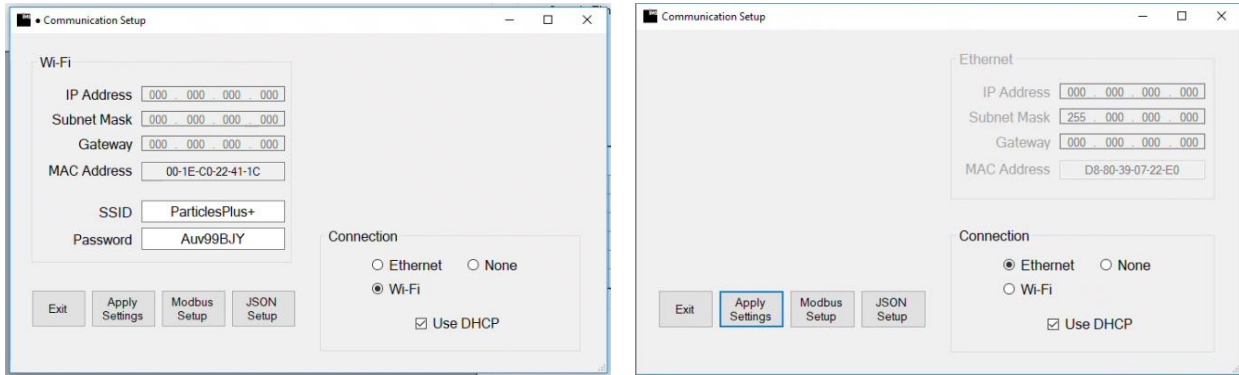
USE DHCP – This radio button when selected allows for a network switch, router, or server to assign a Dynamic IP address to the instrument. If this is unchecked, then the IP Address, Subnet Mask and Gateway can be input manually to allow for a Static connection.

Ethernet – This radio button activates the Ethernet connection port/jack on the instrument, and allows you to set up the network communication parameters.

Wi-Fi – This radio button activates the optional onboard wireless connection with SSID (which is case sensitive) and the password. This allows you to set up the network communications parameters for Wi-Fi.
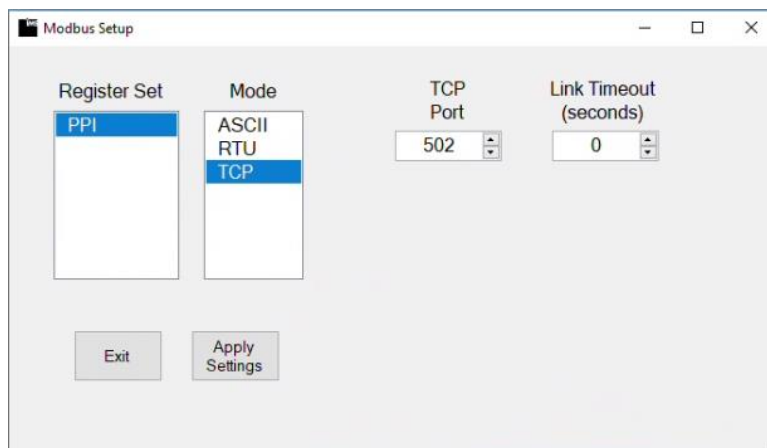
MODBUS Setup – When selected this opens up the MODBUS communications settings screen for communications setup with a remote monitoring system, SCADA, or PLC.

JSON Setup – When selected this opens up the JSON Internet of Things (IOT) screen allowing for communications to be sent to remote servers over a local network or the internet.

Apply Settings – When selected, the communications processor applies the settings and establishes the connection desired. The IP Address window will state *"Waiting For IP Address"*

Communications (4-2 continued)

MODBUS Setup Screen – The MODBUS Setup screen allows for the configuration of the instrument register set, TCP Port and Link Timeout. For additional ASCII and RTU settings (address, connection speed and connection type) utilize the MODBUS settings screen in the Instrument's Settings\Communications\MODBUS Settings Screen.
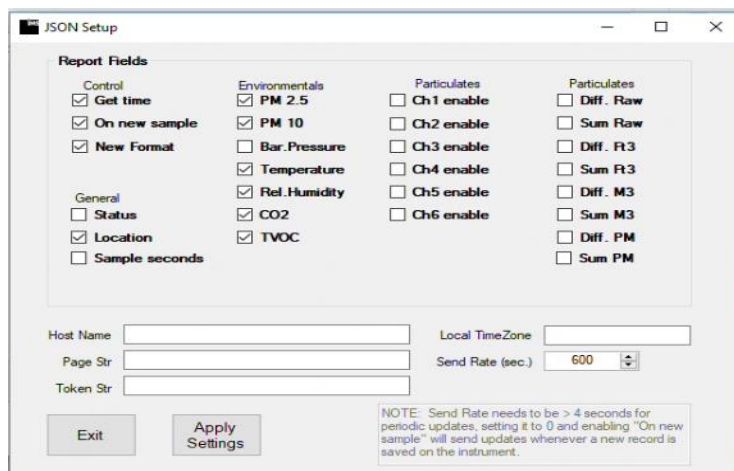

Register Set – This field allows for the selection of any available Register Sets. Only one register set is currently available.

Mode – This field allows for the selection of the MODBUS protocol type - ASCI, RTU, and TCP.

TCP Port – This field allows for the setting of the TCP port if the TCP Protocol (Mode) is selected.

Link Timeout – Setting the Link Timeout to 0 disables the timeout function. Setting to some non-zero value sets up a timeout duration for the link so that more than this duration occurs from the last received Modbus message (or from initial setup of the link) the instrument connection will be reset and re-opened in anticipation of the next message. This is intended to reset connections through external routers or the like in the event that the connection gets dropped.

JSON Setup Screen – The JSON Setup screen allows for the configuration of the instrument to communicate over a local network or across the internet, utilizing the JSON Internet of Things protocol. The server communications parameters and the data selection to be reported is set from this screen.

Communications (4-2 continued)

JSON Setup Screen – Report Fields

Control Fields –

Get Time – This is a legacy field mostly to sync a remote server (perhaps in a different time-zone) with the local instrument; this is typically left blank for newer installs

On New Sample – Sends values to server at the end of each sample

New Format – This is the current" format - unchecking it provides compatibility with older legacy installations..

General –

Status – Includes the instruments system status values

Location – Includes the Location listed for that sample with the reported values.

Sample Seconds – The length of time, in seconds, the sample was taken

Environmental – reports on sensors chosen that are installed in the instrument

These values include: PM 2.5, PM10, Barometric Pressure, Temperature, Relative Humidity, CO2 (if installed) and TVOC (if installed)

Particulates – reports on sensors chosen that are installed in the instrument

Enable channels: Channel enable (Ch.1 though Ch.6)

Unit Selection: Select the units required for the report either Cumulative (Sum) or Differential for Raw Counts, Count/Ft3, Count/M3, and PM values.

JSON Setup Screen – Server Connection Fields

Host Name – The IP Address or HTTP Address for the Server

Page String – Value required for certain JSON servers to send data to multiple pages (ie: widgets)

Token String - When a device needs to access an IoT hub, it requests a signed token from the token service. The device can authenticate with the custom identity registry/authentication scheme to determine the device identity that the token service uses to create the token.

Local Time Zone – Required if Servers are in different time zones for time sync with server and device

Send Rate – This sets the length of time that the instrument will send data to the server if "ON NEW SAMPLE" is not chosen in the Control fields. This was originally used to send the data currently on the screen (instead of the recorded data) to the server periodically. For a logging system with new installations a better solution is to utilize the "**On New Sample"** function.

4-3 Calibrate/Adjust Instrument Clock

Calibrate Clock – The instruments can have their internal clocks calibrated.   Most electronic devices and processors utilize an oscillator that can be fine-tuned to provide accurate indication over long lengths of time, allowing multiple instruments to be synchronized with one another which is critical when compiling data from multiple units that were in use simultaneously.

The steps for the process are listed on screen as shown in the image above.

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