

SOFTWARE INSTRUCTION MANUAL



Instrument Control Software Version 3.5



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USER NOTES

1. INTRODUCTION

This manual describes sensor-e.com, a graphical interface that permits users to connect to the standard suite of ambient and stack-gas TML instruments from remote locations and to operate those instruments as easily as if the user were sitting in front of the instrument.

The user interface is simple and intuitive. Anyone who is familiar with TML's instruments can use sensor-e.com. The figure below shows the primary sensor-e.com interface to a remote instrument.

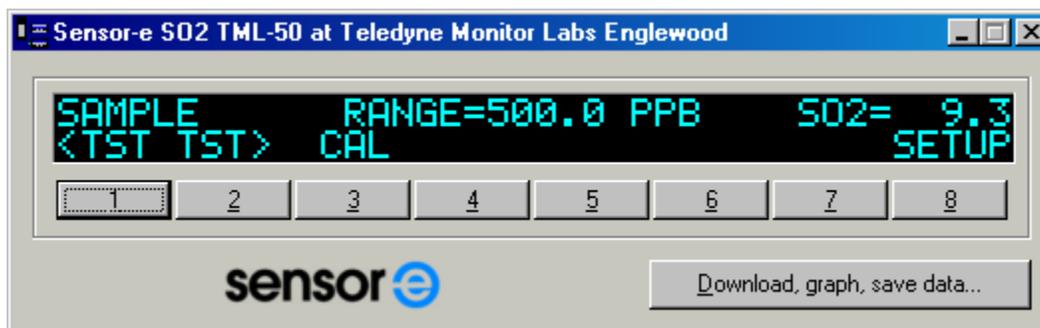


Figure 1-1: Front Panel Window

sensor-e.com features a graphical display that emulates the real instrument's look with a push button, menu-driven interface. In addition to the basic front-panel functionality, sensor-e.com also includes advanced data acquisition system and sequence configuration functions (*AMX instruments only*).

1.1. Features

sensor-e.com provides a simple means to connect to multiple local or remote TML instruments, view their status, and change their settings.

Use sensor-e.com to connect to multiple instruments at the same or different sites simultaneously, optionally using TML's multidrop protocol or a code-operated RS-232 switch.

User interface is identical to that built into TML's instruments. Anyone who is familiar with the user interface built into TML's instruments can use sensor-e.com immediately.

Full access to all the capabilities built into the instrument.

Works with most of TML's standard, microprocessor-based instruments.

Download the DAS data that are stored in the instrument, view it on screen, graphically plot it, and save it to a file (*AMX instruments only*).

Access the DAS configuration from an instrument, modify it, save it on the local computer, and then send the modified configuration to the instrument (*newer AMX instruments only*).

Download the sequence configuration from an TML-700 calibrator, modify it, save it on the local computer, and then send the modified configuration to the instrument (*TML-700 calibrators with firmware revision D.3 or higher*).

sensor-e.com can edit the DAS or sequence configuration *off-line*, saving money in long distance phone charges.

sensor-e.com uses Windows modem support for maximum compatibility with a customer's equipment. sensor-e.com also supports older modems directly even if Windows does not support them.

1.2. Supported Instruments

Since sensor-e.com uses standard commands that are built into all TML instruments, it will work with all TML microprocessor-based instruments. However, sensor-e.com works much better with AMX instruments because of the higher baud rates supported by AMX instruments.

When connecting to older instruments operating at 2400 baud, it takes nearly one second for sensor-e.com to transmit a button press and receive the display contents. When connecting to AMX instruments operating at 19,200 baud, the same action will appear instantaneously.

Some of the DAS functionality is supported only by newer revisions of firmware. Please refer to the tables in Appendix A to find out if your instrument's firmware revision is supported. Consult our sales department or the sensor-e.com website to find out if and how it can be upgraded to support that functionality:

<http://www.sensor-e.com>

The basic front-panel functionality is supported by all our analyzers.

1.3. System Requirements

sensor-e.com runs only on 32-bit Windows operating systems (Windows 95/98/ME/NT/2000/XP). Do not attempt to run the program on Windows 3.1.

sensor-e.com requires 4–20 MB of RAM during normal operation, 5 MB of disk space for installation, and more disk space for storing DAS data and scripts.

Some versions of Windows 95 and NT4 may not have the correct common user interface dynamic link libraries that sensor-e.com requires in order to display checkboxes in the DAS configuration tree. These checkboxes make it convenient to select DAS channels and parameters to download DAS data from. See Section 4.6 for a work-around solution.

The problem can be corrected by installing Microsoft Internet Explorer 5.0 or higher. Please point your internet browser to this location to see the latest updates: <http://windowsupdate.microsoft.com/>

1.4. Typographic Conventions Used in this Manual

All of the examples used in this manual refer to specific instruments and sites. Keep in mind that names of instruments and sites will be different from those of the user.

In this manual, names of push buttons on the actual instrument front panel are indicated using bold characters, for example, **SETUP**. Push button sequences are denoted by a series of button names, separated by dashes, such as **SETUP-MORE-COMM-BAUD**.

sensor-e.com menus are depicted in bold, as in **File-New**. Buttons in dialog boxes and on the toolbar are shown as bitmap images, like this: .

Names of items such as files and setup variables are indicated using italicized characters, as in *RS232_MODE*.

1.5. Installing sensor-e.com

If the installation file was downloaded, simply locate the file named *sensor-e.com.Installer.X.X.exe* on the hard drive and double-click on it, then follow the instructions. (X.X being the revision number).

If sensor-e.com was received on CD, locate your CD drive in Explorer, locate the file named *sensor-e.com.Installer.X.X.exe* and double-click on it, then follow the instructions. (X.X being the revision number).

The sensor-e.com installer is a stand-alone, executable installation routine, which copies the following files to the hard drive into a user-selected directory/folder:

sensor-e.com.exe - the program

README.txt - a readme file with late-breaking news and latest changes to the program. You will have a chance to read this file during installation.

sensor-e.com.license.agreement.txt - the software license agreement to which you have to agree upon installation of sensor-e.com. You will have a chance to read this file during installation.

sensor-e.com User Manual.pdf - User manual in Acrobat PDF format for printing purposes (also included in Windows Help format in the program).

sensor-e.com.chm - Online help file in Windows HTML-Help format.

For advanced users: Upon installation, sensor-e.com creates the following registry entries. These entries - including all previously stored program and window settings - are completely removed when uninstalling sensor-e.com. Note that network configuration files (site, instrument and DAS settings) are not affected by uninstalling sensor-e.com.

HKEY_CURRENT_USER\Software\Monitor Labs Instrumentation\sensor-e.com

DAS Settings

Recent File List

Settings

NOTE

If there already is a previous version of sensor-e.com installed, the installation utility will prompt to replace the previous version. However, the previous version can be "upgraded" to the latest version by selecting "NO" when prompted to uninstall. This will leave the existing program settings (window locations, last used configuration files etc.) intact and only over-write any existing files listed above. This is recommended for upgrades of version 3.0 and above.



CAUTION

Site and instrument definitions created with older versions of sensor-e.com are stored in the network configuration files (.cfg). These files may not be compatible with the latest version of sensor-e.com. When upgrading from version 1.17 to sensor-e.com 3+, these sites and instruments may need to be re-defined. In this case, we recommend to select "YES" from the uninstall prompt and then choose a different directory to install sensor-e.com 3.5. This will still leave the old 1.17 installation intact but will reset the program configuration settings. Note that old and new versions will share the same registry entries and, for example, a change in windows locations in version 3.5 will also be used for version 1.17. This makes it easy to maintain identical program settings for both versions.



For safety, we recommend to make a backup of all configuration and script files before installing or upgrading sensor-e.com. We cannot take any responsibility for lost files, time or revenue due to lost or altered configuration settings and files.

The sensor-e.com installer is virus-checked and safe to run. Never accept installation files from third parties (including your TML distributor or representative), always download your own copy and do not trust that executables sent to you from anybody outside of TML are safe to run. If in doubt, run a virus checker before and after running the installer file.

Uninstalling sensor-e.com versions 3 and higher with the provided uninstallation utility (to be found in the sensor-e.com program group) or when running the Installer again and selecting YES to uninstall previous versions, will delete all of the registry entries (program and DAS settings) and the entire folder with sensor-e.com files. The installer will not delete the folder if files were added by the user (e.g., network configuration files, DAS scripts etc.). In this case, only the originally installed files will be removed. Likewise, if the program group folder is open in Explorer during the uninstallation, it will not be removed, only its shortcuts. Registry entries created by sensor-e.com versions lower than 3 may not be removed properly upon installing version 3 and higher but this should not cause any problems.

USER NOTES

2. CONFIGURATION

This section explains how to configure sensor-e.com to connect to an instrument.

2.1. Main Application Window

The following figure shows the top-level window of sensor-e.com. This window will always be open in addition to one window for each instrument front panel.



Figure 2-1: Main Application Window

All configuration tasks can be carried out with the buttons on the toolbar, which are summarized in the table below.

Table 2-1: Main Application Window Toolbar Buttons

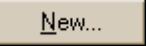
Button	Menu Equivalent	Description
	File-Connect	Connects to an instrument
	File-New	Creates a new, empty network configuration
	File-Open	Opens an existing network configuration
	File-Save	Saves current network configuration
	Settings-Instruments	Edits list of instruments
	Settings-Sites	Edits list of sites
	Settings-Modems	Edits list of non-Windows modems
	Settings-Options	Changes program options
	Help-About sensor-e.com	Displays the sensor-e.com help file

2.2. Quick Start (Direct Cable Connection)

This section explains how to get the software running as quickly as possible with a local instrument that is connected to a host computer via a direct serial cable. This is useful for getting acquainted with the program and to test and setup instruments before deployment.

Configure sensor-e.com

When sensor-e.com is run for the first time at least one site and one instrument need to be created.

Step	Action	Comment
1.	Select Settings-Sites from the menu or click on the  toolbar button	Create a site.
2.	Click on  to create a new site	
3.	Specify the site's properties.	
4.	Click  to finish	
5.	Select Settings-Instruments from the menu or click on the  toolbar button	Create an instrument.
6.	Click on  to create a new instrument and specify the instrument's properties	
7.	Click  to finish	
8.	Attach a serial cable	Refer to the following paragraph.
<p>Attach a serial cable from the computer's COM (Serial) port that was specified in the site configuration to the RS-232 port of the instrument. The cable must be a "straight-through" cable with a DB-9, female plug on the instrument's site and either a DB-9 or DB-25, female plug at the computer's side. Please refer to the computer's user manual on how to use the Serial port. Make sure that the plugs are securely fastened to ensure proper connection.</p>		
9.	Configure the COM port	Refer to the following paragraphs.
<p>From the Windows START menu, select Settings-Control Panels-Ports and make sure that the computer's COM/Serial port is configured to the same baud rate as specified in the Instrument settings above. The COM settings must be as follows:</p> <p>BAUD rate: up to 19200 kbaud, we recommend 9600. Longer cables may require lower baud rates. E-series instruments support up to 115 kbaud.</p> <p>Data bits: 8</p> <p>Parity: None</p> <p>Stop bits: 1</p> <p>Flow control: None</p> <p>Optionally, newer instruments support Xon/Xoff flow control, which must be enabled in both the instrument and sensor-e.com and must also be available for all instruments within one multi-drop chain.</p> <p>Once all settings are configured, perform the remaining steps to connect to the instrument.</p>		
10.	Click  on the toolbar or select File-Connect from the menu	sensor-e.com displays the Instrument connection dialog box (refer to Figure 2-2).
11.	Click on the name of the desired instrument	In this example, you would click on <i>Local Instrument</i> (refer to Figure 2-2).

12. Click  to finish.

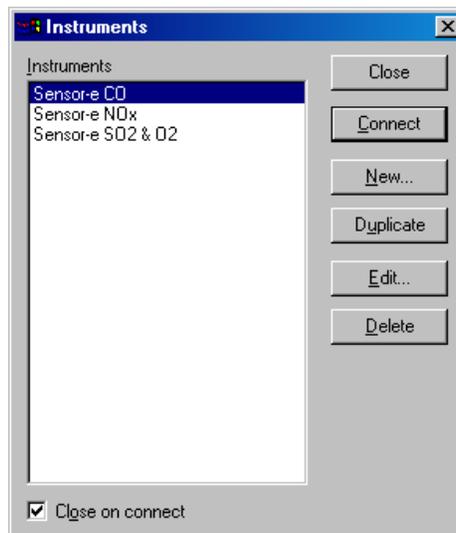


Figure 2-2: Connection Dialog

2.3. Physical Instrument Settings

This section briefly explains how to configure an TML analyzer to work with sensor-e.com. Refer to the instrument's manual for detailed information.

Baud Rate

In most instruments pressing **SETUP-MORE-COMM-BAUD** sets the baud rate. The higher the baud rate, the faster the communication with the instrument. However, long serial cables or those with low quality, poor cable connection or noisy phone lines (when using a modem) may require lower baud rates. You may have to experiment to find the optimal baud rate for connection. Keep in mind that the baud rate specified in sensor-e.com needs to match the baud rate of the instrument! Baud rates vary between 2400 and 19200 baud (115000 in E-series models).

ID Number

The instrument ID allows you to use more than one instrument on a multi-drop setup as well as multiple instruments of the same model. In most instruments, pressing **SETUP-MORE-COMM-ID** sets the instrument's ID.

Xon/Xoff Handshaking

Flow control improves communication between host computer and instrument and may prevent many transfer failures (particularly when uploading the DAS configuration). To enable *Xon/Xoff* flow control in sensor-e.com, it must also be enabled in the instrument by setting the instrument's *RS232_MODE* variable properly.

Older TML instruments do not have *Xon/Xoff*, hence, the default value for flow control in sensor-e.com is set to *NONE*.

Modem

Modem support can be enabled in instruments by setting the *RS232_MODE* and the *MODEM_INIT* setup variables properly. Please consult the instrument documentation and/or the factory for details on doing this.

If modem support is enabled it is critical that "computer" mode is also enabled. Otherwise, the instrument will try to send the modem initialization string to the modem when the instrument powers up. Most likely, the modem is also in echo mode at that time and the modem will echo an AT command to the instrument returning an AT echo from the instrument in an indefinite loop.

In addition, most of TML's instruments have a password protection capability in which the instrument will only accept commands after a password has been submitted. This security feature must be used carefully with modems. The problem is that while the modem is answering an incoming call, it sends status messages such as "RING" and "CONNECT" to the instrument, to which the instrument responds "MUST LOG ON" if the security mode is enabled. These messages sent by the instrument may cause some modems to hang up during the call. So the modem must be configured, using the *MODEM_INIT* setup variable, to not issue responses to the instrument if the security feature is used. This is accomplished in some modems with the AT command "Q1".

2.4. Global Options

Global application settings can be accessed by selecting **Settings-Options** or the  toolbar button. This dialog is *tabbed* because it contains several categories of settings (refer to the following figure).

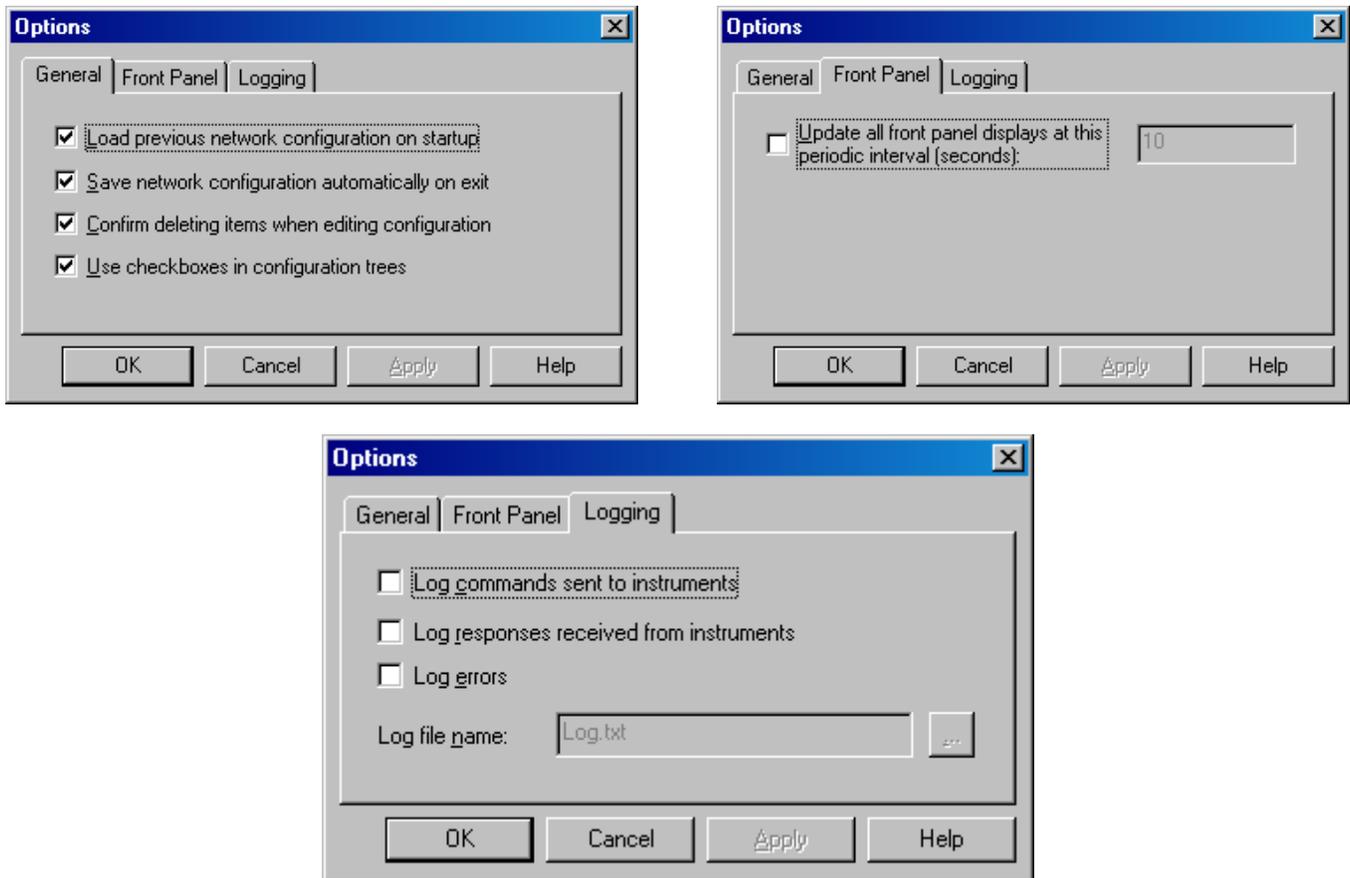


Figure 2-3: Global Program Options Dialogs

Global sensor-e.com program options are stored in the computer's registry. See Section 1.5 for installed registry keys. The global options are summarized in the table below.

Table 2-2: Global Options

Tab	Property	Description
General	Load previous network configuration on startup	If checked, sensor-e.com will attempt to open the network configuration file it was using previously. If sensor-e.com cannot open the file —because the file has been moved or renamed— it will issue an error message and the file will have to be opened manually using the File-Open menu or the  toolbar button.
General (continued)	Save network configuration automatically on exit	If checked, sensor-e.com will automatically save the network configuration when it exits. If it's not checked and the configuration is modified, sensor-e.com will prompt to save the configuration when it exits. This is useful to temporarily modify some settings but not save them.
	Confirm deleting items when editing configuration	If checked, sensor-e.com will prompt for all delete actions.
	Use checkboxes in configuration trees	If checked, sensor-e.com will attempt to use checkboxes in configuration trees. Some versions of Windows do not support the checkboxes.
Front Panel	Update all front panel displays at this periodic interval (seconds)	If checked, sensor-e.com will update all the front panel windows at the specified periodic rate. The default is checked and set to 10 seconds. When using slow connections, this setting should not be set too low. For example, if 5 instruments are simultaneously connected over a 2400 baud connection, and the update period is set to 5 seconds, sensor-e.com will not be able to fetch the display contents from all 5 instruments within 5 seconds. This will result in display requests getting queued up, which will make sensor-e.com appear unresponsive to key presses. In this example, an update interval of 15 seconds is more appropriate. Keep in mind that the front panel display is always refreshed immediately whenever a button is pressed. If this option is unchecked, sensor-e.com will only refresh the front panel when a button is pressed.
Logging (Advanced Feature)	Log commands sent to instruments	If checked, sensor-e.com will write each command that it sends to an instrument to the log file.
	Log responses received from instruments	If checked, sensor-e.com will write each response that it receives from an instrument to the log file.
	Log errors	If checked, sensor-e.com will write error messages to the log file.

2.5. The sensor-e.com Network: Instruments and Sites. Cable, Modem and Ethernet Connections

sensor-e.com works with three distinct types of objects: *instruments*, *sites*, and *connectors*. The diagram below shows how these three objects (using modems as connectors) are related to each other and to the physical equipment. Other *connectors* can be: direct cable, RS-232 to Ethernet converter or direct Ethernet connection (future instruments)

In the figure below, everything inside the box labeled “sensor-e.com” represents sensor-e.com program objects, not physical equipment. From left to right, the diagram shows instruments, sites, and modems. Everything else in the diagram represents physical equipment. Notice how sensor-e.com program objects mirror the arrangement of the physical equipment.

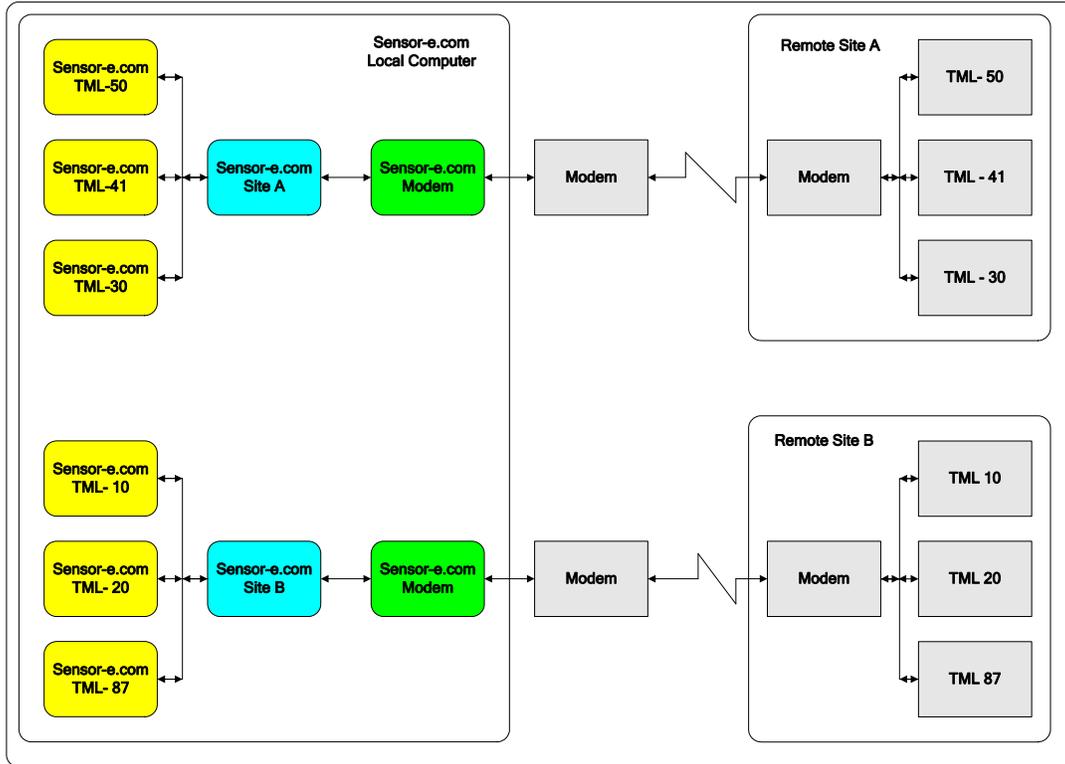


Figure 2-4: Instruments, Sites, and Connectors

2.5.1. Configuring sensor-e.com Instruments

sensor-e.com maintains a list of all the instruments, which can be accessed by selecting **Settings-Instruments** or clicking on the  toolbar button (refer to the following figure). This dialog is similar to the connection dialog shown in Figure 2-2, except that the CONNECT button is not available and the “Close on connect” option is grayed-out. Each instrument in the list represents one monitor or calibrator. sensor-e.com maintains separate properties for each instrument.

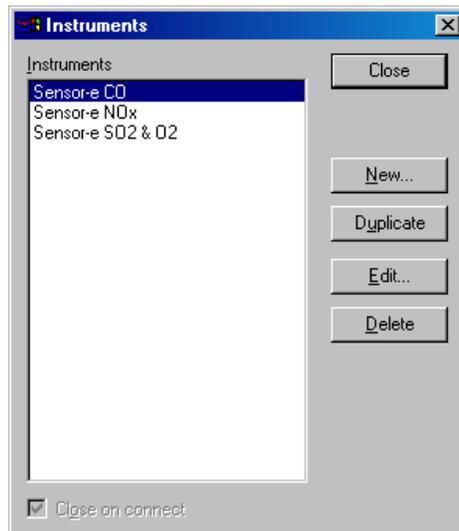


Figure 2-5: Instrument Dialog Box

2.5.1.1. To open the Instrument Properties dialog box

Step	Action	Comment
1.	Using the mouse, click on the desired instrument	
2.	Click on  or double-click on the instrument	The Instrument Properties dialog box appears (refer to Figure 2-6).

Most of the instrument properties are optional and are included for maximum compatibility with all of TML's instruments. The  button in the *Basic* tab (Figure 2-6) will reset all options to their default values. Notice that only the instrument-specific communication settings appear in this dialog box. The remaining communication settings are specified on a site-by-site basis. The following section describes all instrument properties.

2.5.1.2. Instrument Properties Tabs

Basic Tab

The following figure shows the instrument properties screen Basic tab. Table 2-3 identifies the instrument properties and provides a brief description of each property.

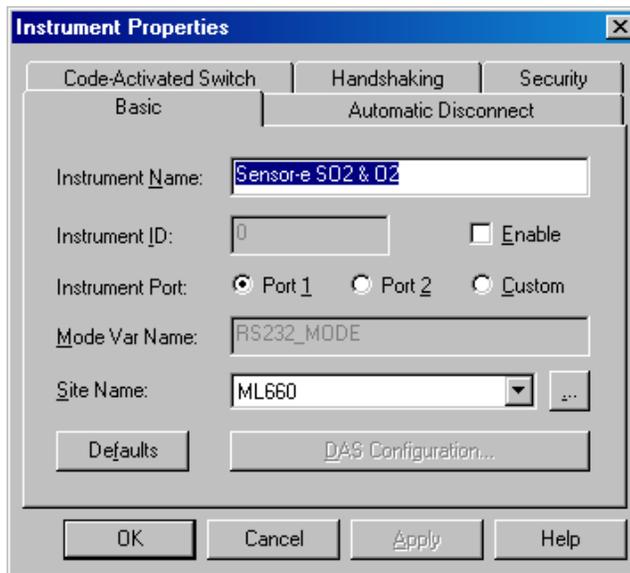
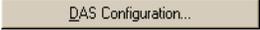


Figure 2-6: Instrument Properties Dialog Box, Basic Tab

Table 2-3: Instrument Properties, Basic Tab

Property	Description
Instrument Name	A user-defined name for the instrument. We recommend to use the model number and an identifier (if more than one of the same model are used) This name also appears in graphs and window captions as well as data file names.
Instrument ID	An ID number for the instrument. Not needed for single-instrument operation. Must be unique if the TML multidrop protocol is being used. Also, it must match the ID number specified by the <i>MACHINE_ID</i> setup variable in the instrument, or in the SETUP-MORE-COMM-ID menu in most instruments. Used only if <i>Enable</i> is checked.
Instrument Port	One of several RS-232 ports of the instrument that sensor-e.com is connected to. Some newer instruments use different names for the setup variables that control the RS-232 port settings; the <i>Custom</i> option allows specifying the variable name.
Mode Var. Name	Setup variable name in the instrument for the RS-232 port settings. Used only if the <i>Instrument Port</i> property is set to <i>Custom</i> .
Site Name	The site that the instrument resides at. Select the site from the list or define a new site by clicking on  .
	Sets all the properties for the instrument to their default values.
DAS configuration 	Permits <i>off-line</i> editing of the instrument's DAS configuration. Enabled only if instrument has DAS and sensor-e.com was connected to the instrument and downloaded its DAS configuration at least once. After connecting to an instrument, it takes a few seconds to make this option available. During this time, sensor-e.com does not respond to any user input.
Sequence configuration 	Permits <i>off-line</i> editing of the instrument's sequence configuration. Enabled only if instrument is an TML-700 and sensor-e.com was connected to it and downloaded its sequence configuration at least once. Also takes several seconds to become available.

Automatic Disconnect Tab

The following figure shows the instrument properties screen Automatic Disconnect tab. Table 2-4 identifies the instrument properties and provides a brief description of each property.

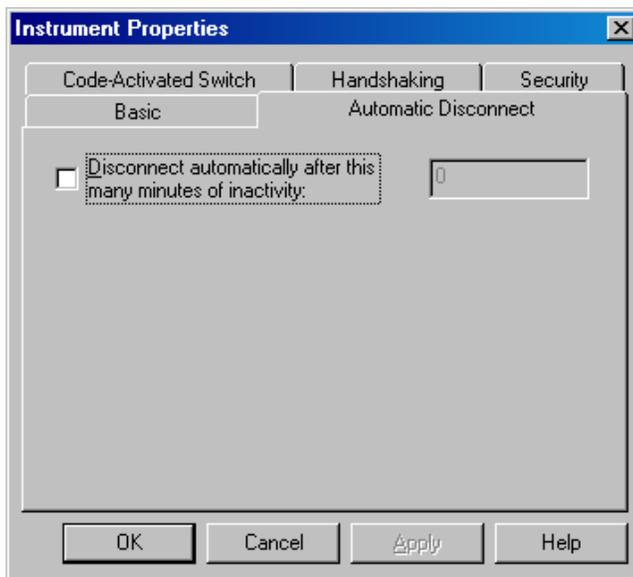


Figure 2-7: Instrument Properties Dialog Box, Automatic Disconnect Tab

Table 2-4: Instrument Properties, Automatic Disconnect Tab

Property	Description
Automatically disconnects sensor-e.com from the instrument (minutes)	If checked, sensor-e.com will automatically disconnect from the instrument, including hanging up the modem, after the specified number of minutes of inactivity. The inactivity timer is reset to zero every time a button on the front panel window is pressed. Automatic disconnect is disabled while the DAS or sequence configuration dialog boxes are open!

Code Activated Switch Tab

The following figure shows the instrument properties screen Code Activated Switch tab. Table 2-5 identifies the instrument properties and provides a brief description of each property.

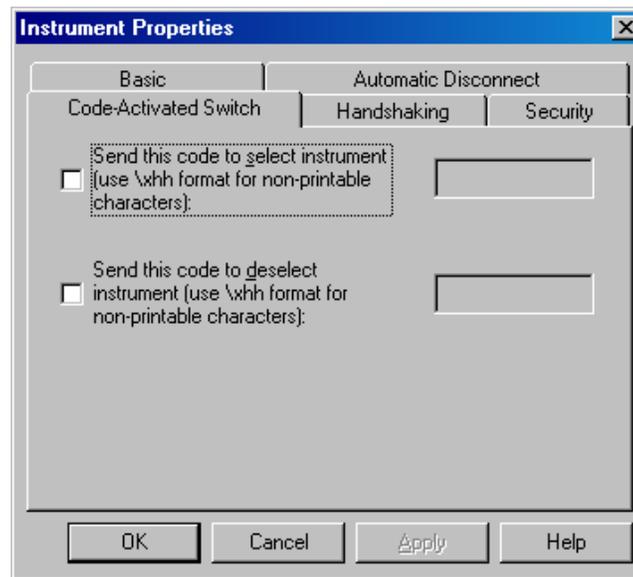


Figure 2-8: Instrument Properties Dialog Box, Code Activated Switch Tab

Table 2-5: Instrument Properties, Code Activated Switch Tab

Property	Description
Send this code to select instrument	This property allows connecting to multiple instruments by means of a code-operated RS-232 switch (COS) instead of the TML multidrop protocol. sensor-e.com will transmit the characters specified in this property before communicating with the instrument. Non-printable characters can be encoded by entering them as a backslash character (\), followed by a lower case 'x', followed by two hex digits. For example, enter the Ctrl-D (ASCII code 4) character in the switch prefix property as "\x04". If a hexadecimal sequence is followed by a character in the hexadecimal range (i.e. 0-9 or A-D), that character must also be entered using hexadecimal notation. For instance, to enter the sequence <Ctrl-D><2> to select port 2 on the COS, "\x04\x32" must be entered (04 for D, 32 for 2). See COS manual; available at the sensor-e.com website: http://www.sensor-e.com
Send this code to deselect instrument	Like " <i>Send this code to select instrument</i> " accept that it's sent to the code-operated RS-232 switch after sensor-e.com is finished communicating with the instrument. This property can be used to restore the switch position to a specific port. Most communication with the instrument — pressing a button, for instance — takes only a few seconds.

Handshaking Tab

The following figure shows the instrument properties screen Handshaking tab. Table 2-6 identifies the instrument properties and provides a brief description of each property.

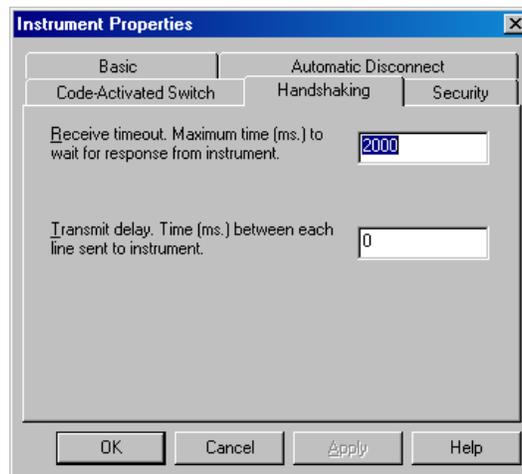


Figure 2-9: Instrument Properties Dialog Box, Handshaking Tab

Table 2-6: Instrument Properties, Handshaking Tab

Property	Description
Receive timeout	Maximum time (in milliseconds) that sensor-e.com waits for a response from the instrument after a command is sent. The instrument’s response time varies depending on a number of factors, including its operating firmware, the connection type, the baud rate, etc.
Transmit delay	Most of the instruments do not use any conventional RS-232 handshaking, such as RTS/CTS or XON/XOFF. Newer instruments do support XON/XOFF handshaking, which sensor-e.com also supports (<i>see site configuration</i>). This transmit delay property inserts a brief delay between each line of DAS or sequence configuration information that sensor-e.com sends to the instrument, in lieu of conventional handshaking. This transmit delay prevents sensor-e.com from overflowing the receive buffers of slower instruments, which will cause them to reject the DAS or sequence configuration.

Security Tab

The following figure shows the instrument properties screen Security tab.

Table 2-7 identifies the instrument properties and provides a brief description of each property.

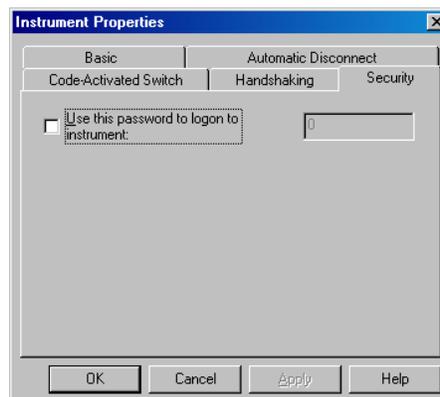


Figure 2-10: Instrument Properties Dialog Box, Security Tab

Table 2-7: Instrument Properties, Security Tab

Property	Description
Use this password to logon to an instrument	If checked, sensor-e.com will use the specified password to logon to the instrument when establishing a connection. Most of TML's instruments have some password mode in which the instrument will only accept commands after a password has been submitted. Also refer to the section titled <i>Modems</i> below.

2.5.2. Configuring Sites

sensor-e.com maintains a list of all the sites, which can be accessed by selecting **Settings-Sites**, as shown below. Each site represents one physical site or one physical port on the host PC, at which multiple instruments may reside. sensor-e.com maintains separate properties for each site. To modify the properties for a site, double-click on the name, which will display the dialog box shown in Figure 2-11.

2.5.2.1. To modify Site settings

Step	Action	Comment
1.	While in the Site dialog box, double-click on the desired site (refer to Figure 2-5)	The Site dialog box will open (refer to Figure 2-11).
2.	Click on  or double-click on the instrument	The Site Properties dialog box appears (refer to Figure 2-11).

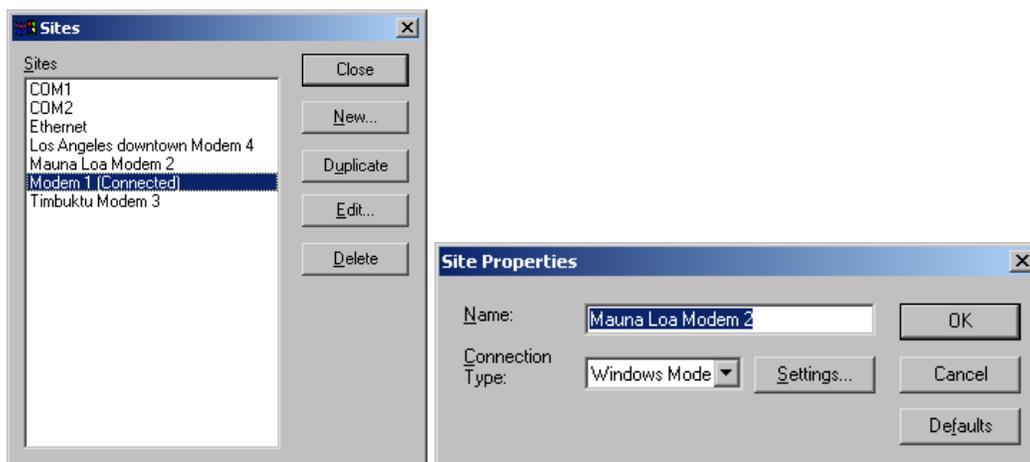


Figure 2-11: Site List Dialog and Site Properties Dialog

The site maintains all of the information necessary to connect to a particular site, including connection type (direct cable or a modem), telephone number, connection speed, etc. One site may be shared by several instruments. Since each site requires one COM port, modem or Ethernet address on the computer, a user may only connect simultaneously to as many different sites as there are COM ports or modems. Ethernet connection allows multiple sites with different IP addresses and is limited only by the bandwidth of the host computer's TCP/IP connection. However, a user can connect simultaneously to many different instruments at a single site, using either the TML multidrop feature or a code-operated RS-232 switch. Regardless of the number of COM ports or modems, a user can specify multiple sites for the same port. In this case, only one site can be used at a time. A click on  will reset all of the properties to their default values. The table below describes the site connection properties shown in Figure 2-11.

Table 2-8: Site Properties

Property	Description
Name	A user-defined name for the site. The name appears in graphs and window captions. The site name is combined with the instrument name to form a title for dialog boxes and graphs. For example, a “sensor-e SO2 & O2” instrument name and a “ML660” site name are combined for front panel window titles such as “sensor-e SO2 & O2 at ML660”
Connection Type	Selects whether the connection is made by means of a direct cable, modem or by TCP/IP (Ethernet). Two kinds of modems are supported: Windows (TML) modems and non-Windows modems. The use of Windows modems is recommended, however, some older modems may not be supported by Windows. In these cases, the non-Windows modem support can be used. The TCP/IP option is an experimental implementation only at this time and is supported only for a few specific RS-232 to Ethernet converters. Once a connection type is selected, it must be configured by clicking on  .

2.5.3. Direct Cable Connections

If a site’s *Connection Type* property is set to *Direct Cable*, then clicking on  will display the first dialog box shown in the following figure.

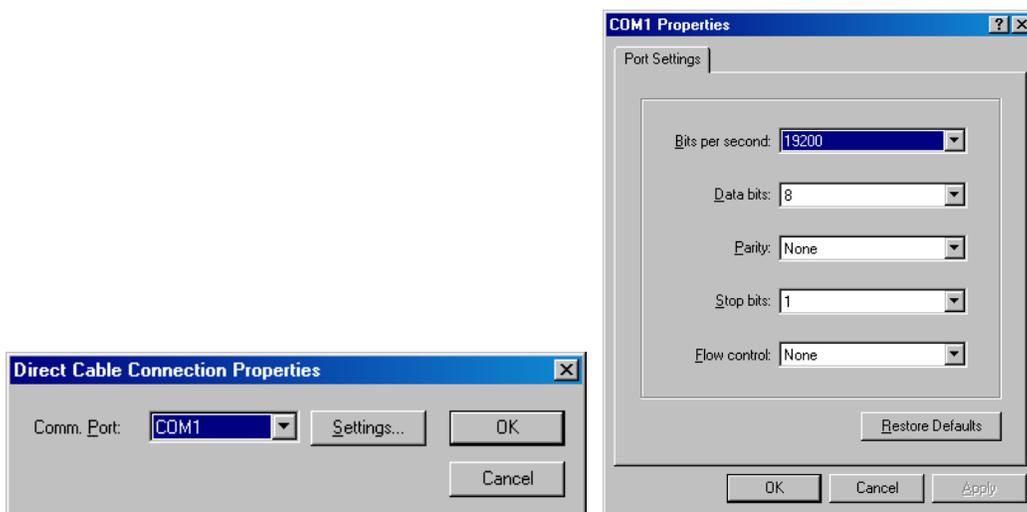


Figure 2-12: Direct Cable Connection Properties and Port Settings Dialogs

The first dialog box only displays the COM ports that are present on the host computer. It is possible that even though a COM port is physically present, it is reserved by some other application, and consequently it doesn’t appear in the list. Furthermore, devices such as mouse, games and terminal programs may be using one COM port. Even though these ports would show in the list, they cannot be used for sensor-e.com. sensor-e.com needs a dedicated, free COM port to operate (However, several programs can share one COM port if operated in alternating sequence, one at a time). Select the COM port to use and click on , which will display the second dialog box in Figure 2-12.

This dialog box is a standard Windows dialog. sensor-e.com only uses the *Bits per second*, *Data bits*, *Parity*, *Stop bits*, and *Flow control (NONE or XON/XOFF only)* properties, even if the COM port hardware has more settings. sensor-e.com does not support *Hardware (RTS/CTS)* flow control because none of the instruments do. sensor-e.com does support *XON/XOFF* flow control, but all instruments at one site need to do so. In that case, *XON/XOFF* flow control needs to be enabled in each instrument by setting its *RS232_MODE* variable.

2.5.4. Windows (TML) Modem Connections

If a site's *Connection Type* property is set to *Windows Modem*, then clicking on  will display the following dialog box.



Figure 2-13: Windows Modem Connection Properties Dialog

Editing the Windows modem settings must be done using the Windows Control Panel or the software provided by the modem manufacturer. This approach was chosen in order to keep sensor-e.com as simple as possible. The following table describes the Windows modem connection properties.

Table 2-9: Windows Modem Connection Properties

Property	Description
Modem	The Windows modem to use. Configure the modem with the Windows Control Panel.
Telephone Number	The telephone number to dial if the connection is a modem connection. Insert the tilde (~) character to impose a delay in the dialing process.
Connection Timeout	The maximum number of seconds to wait for the modem connection to be established.

2.5.5. Non-Windows Modem Connections

If a site's *Connection Type* property is set to *Other Modem*, then clicking on  will display the following dialog box.

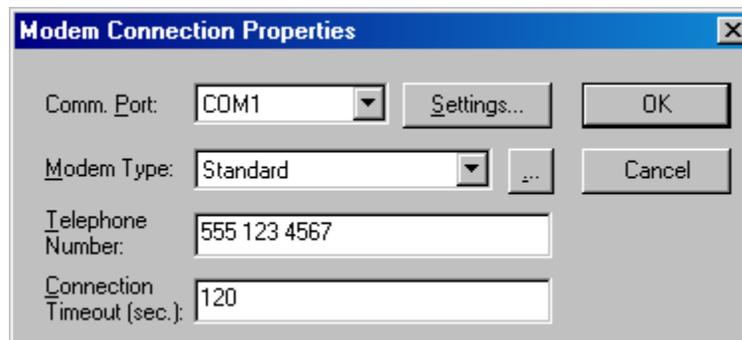


Figure 2-14: Non-Windows Modem Connection Properties Dialog

Notice that this connection type has properties in common with both the direct cable and Windows modem connection types. As for direct cable connections, this dialog box only displays the COM ports that are present on the host computer. It is possible that even though a COM port is physically present on the computer, it is reserved by some other application and does not appear in the list. Select the

COM port to be used and click on , which will display the same port settings dialog box as for direct cable connections. A modem type must be selected as well. If no modem types are defined, click on  to define a modem type (see the section below). The table below describes the non-Windows modem connection properties shown in Figure 2-14.

Table 2-10: Non-Windows Modem Connection Properties

Property	Description
Comm. Port	The COM port on the computer that the modem is attached to. Most internal modems emulate a COM port. Consult the modem documentation or the Windows Control Panel to determine which COM port the modem emulates.
Modem Type	The modem type to use. Click on  to define or edit a modem type.
Telephone Number	The telephone number to dial if the connection is a modem connection. Insert the tilde (~) character to impose a delay in the dialing process.
Connection Timeout	The maximum number of seconds to wait for the modem connection to be established.

2.5.6. Modems

sensor-e.com maintains a list of all the non-Windows modems, which can be accessed by selecting

Settings-Modems or clicking on the  toolbar button (refer to Figure 2-15). The list of Windows modems is maintained and managed by the Windows operating system, not sensor-e.com.

Each modem represents one type of modem that can be used to connect to a site. This is the modem attached to the computer running sensor-e.com, not the modem at the remote site.

Usually, the standard Hayes-compatible modem will work. But if the modem requires special settings, a new modem type can be defined and select it in the site connection dialog.

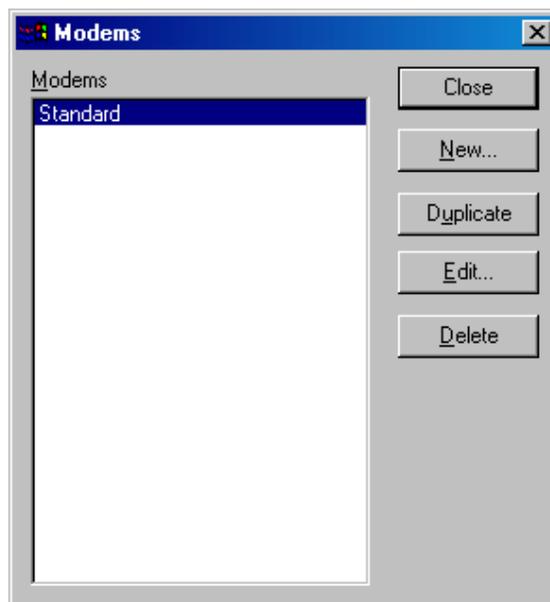


Figure 2-15: Modem List Dialog

The modem properties are shared by all sites using that modem type, so only one modem configuration has to be created for each type of modem. sensor-e.com maintains separate properties for each modem type. To modify the properties for a modem, select the modem in the list with the mouse and click on , which will display the dialog box shown in the following figure.

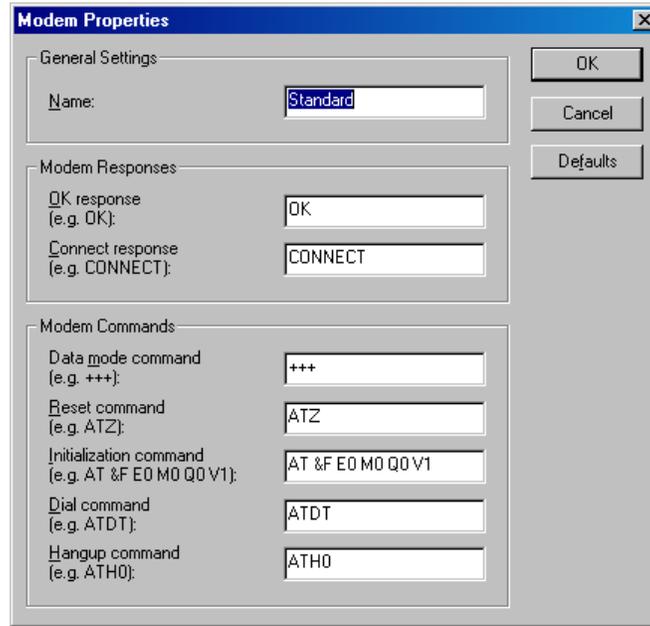


Figure 2-16: Modem Properties Dialog

The default properties should work for most standard modems. If properties were changed, clicking on **Defaults** will reset all parameters to the defaults. Notice that the commands include the “AT” command prefix. When sensor-e.com establishes a non-Windows modem connection it sends the commands to the modem in the following order:

- Reset command (e.g. “ATZ”)
- Wait for OK response (e.g. “OK”)
- Initialization command (e.g. “AT &F E0 M0 Q0 V1”)
- Wait for OK response (e.g. “OK”)
- Dial command + telephone number (e.g. “ATDT555 123 4567”)
- Wait for connect response (e.g. “CONNECT”)

When sensor-e.com terminates a non-Windows modem connection it sends the commands to the modem in the following order:

- Wait 1 second
- Data mode command (e.g. “+++”)
- Wait for OK response (e.g. “OK”)
- Hangup command (e.g. “ATH0”)
- Wait for OK response (e.g. “OK”)
- Reset command (e.g. “ATZ”)
- Wait for OK response (e.g. “OK”)

The following table describes the modem type properties.

Table 2-11: Modem Properties

Property	Description
Name	A user-defined name for the modem. Should be something descriptive, such as the manufacturer and model name. For user interface only.
OK response	The string that the modem sends to sensor-e.com to indicate successful execution of a command.

Property	Description
Connect response	The string that the modem sends to sensor-e.com to indicate that a connection has been established.
Data mode command	The command that switches the modem from online mode into data mode.
Reset command	The command that resets the modem to its power up state.
Initialization command	The command that initializes the modem.
Dial command	The command that tells the modem to dial a telephone number, using either tone or pulse dialing.
Hangup command	The command that tells the modem to hang up.

2.5.7. Ethernet Connections

If the Connection Type is set to TCP/IP, clicking on  will bring up TCP/IP Connection Properties dialog box in which the IP (Internet Protocol) address and the TCP Port need to be specified (refer to the following figure). The TCP/IP option is an experimental implementation only at this time and is not supported by TML. It works only for a few specific RS-232 to Ethernet converters. Please monitor our website for more information on this issue. Manufacturer and model information will be provided as soon as testing is completed.



Figure 2-17: TCP/IP Connection Properties Dialog Box

Future E-series instruments may have the option for internal TCP/IP connectivity.

2.6. Configuration Storage

sensor-e.com stores information in different places, as described below.

2.6.1. Global Options

sensor-e.com stores its global options in the computer's registry under

HKEY_CURRENT_USER\Software\Monitor Labs Instrumentation\sensor-e.com

Global options include all of the settings in the **Settings-Options** menu, the name of the network configuration file last used, the names of the most recently used network configuration files, the global DAS record selection criteria, and the position and size of various windows and dialog boxes. sensor-e.com permits changing the size of many dialog boxes and windows, and it remembers the last used size and position of each window. sensor-e.com also remembers the names of the four most recently used network configuration files, which appear in the **File** menu.

2.6.2. sensor-e.com Network Configuration:

The sensor-e.com network configuration (see Section 2.5), which consists of instruments, sites, and non-Windows modems, is stored in a file traditionally called *sensor-e.com.cfg*, which - by default - is located in the same directory as *sensor-e.com.EXE*. However, the network configuration can be stored in a file with any name and a *.CFG* extension in any location on disk or a local area network. This enables creating different configuration files to represent different networks and to share configuration settings with other users.

sensor-e.com also stores the DAS or sequence configuration for each instrument in this file. This allows you to create predefined standard DAS and sequence configurations and easily upload them to an instrument upon connection. These configurations can also be edited offline after they were created or downloaded without connecting to an instrument. Maintaining different *.CFG* files allows to create any number of instruments, each with distinct names, and various configurations to suit all needs.

2.6.3. sensor-e.com Network Configuration File Types

sensor-e.com supports two different network configuration file formats: a binary format (*.CFG*) and a text format (*.CFX*). The binary format is used for operation and the text format is provided for future versions of sensor-e.com to be able to read configurations created by earlier versions. Configurations can be stored in either format for sensor-e.com to work. However, the *.CFX* format stores only the instrument, site, and modem configuration. It does not store the DAS and sequence configuration for an instrument. To store the DAS and sequence configuration for each instrument, the *.CFG* format must be used.

To save a configuration in the text format, select **File–Save As** and select *Text network configuration Files* from the *Save as type* drop-down field. Enter the file name, and click on .

NOTE

.CFX configuration files should not be directly edited because syntax or typographical errors could render a configuration file unreadable by sensor-e.com or the instrument.



sensor-e.com displays the name of the currently used configuration file in the title bar of its main application window.

sensor-e.com also indicates that a configuration has been modified by appending “(Modified)” to the configuration file name in the application’s title bar:

2.6.4. Saving Network Configuration Files

The current network configuration can be saved at any time by clicking on the  toolbar button or by selecting File-Save from the main menu.

sensor-e.com will automatically save modified configuration files upon exiting if that option was enabled in the Settings-Options menu. However, if that option was not enabled and the configuration has been modified before exiting the program, sensor-e.com will prompt to save the changes.

2.6.5. Opening Network Configuration Files with Windows Shortcuts

Different network configurations can be maintained and easily used by creating a Windows shortcut that specifies the configuration file on sensor-e.com’s command line. A user could, for example, create a different icon on the desktop to represent each network configuration. To do this, simply locate the *.CFG* file and right-click and drag the icon to the desktop, then select "Create Shortcut" from the menu.

3. BASIC OPERATION

3.1. Connecting to an Instrument

To connect to an instrument and display its *Front Panel Window*, click on , type *Ctrl-C* on the computer keyboard, or select **File-Connect** from the *Main Application Window*. See Figure 2-2 for an example of the connection dialog box.

There are three ways to establish the connection:

Select an instrument from the list and click on .

Press *Enter* on the computer keyboard.

Double-click on the instrument name in the list.

If the “*Close on connect*” option at the bottom of the connection dialog is checked, the dialog window will automatically close while sensor-e.com establishes the connection. If this option is not checked, the dialog will remain open, permitting the user to initiate several connections in one step.

If the connection is via a direct cable, the *Front Panel Window* should promptly display the contents of the instrument’s physical display. If the connection is via a modem, it will take some time for sensor-e.com to dial the remote site. Ethernet connection speed may vary depending on the internet speed.

sensor-e.com establishes the front panel first and then connects to the underlying software. The front panel cannot be used until the button *Download, graph, save data...* is displayed in black. Older instruments without this functionality can be used right away.

sensor-e.com may not be able to connect to the instrument for many reasons. The wrong COM port or settings may be in use. The cable may be the wrong type or low quality. The wrong modem type may be selected. The connection may be a direct cable connection when it should be a modem connection. The cables may not be attached. The instrument ID may be incorrect. A switch prefix may be in use when it should not be, or is not in use when it should be.

3.2. Front Panel Buttons

A button on the *Front Panel Window* can be activated two different ways: by clicking on the button with the mouse, or by typing key 1–8 on the computer keyboard. As buttons on the *Front Panel Window* are activated, the graphical display changes.

NOTE

While using sensor-e.com, be careful not to change any setting that may affect the RS-232 connection, such as the RS-232 mode, the baud rate, or the instrument ID number.



3.3. Disconnecting From an Instrument

To disconnect from an instrument, press the *Esc* key on the computer keyboard while the *Front Panel Window* is displayed, or click on  in the upper right hand corner of the *Front Panel Window*. sensor-e.com will prompt for confirmation and will also prompt if the DAS settings were changed without saving or uploading them. When all instruments from a particular site are closed, the site and modem connection is closed, too.

3.4. Exiting sensor-e.com

To exit sensor-e.com, press *Alt-F4* on the computer keyboard while the *Main Application Window* is displayed (see Figure 2-1), or click on  in the upper right hand corner of the *Main Application Window* or select **File-Exit** from the main menu.

sensor-e.com will prompt the user if there is any front panel left open and if the network configuration file was changed and not yet saved.

4. DAS CONFIGURATION AND DATA ACCESS

A major feature of sensor-e.com is its ability to modify the built-in DAS configuration and access the DAS data in a remote instrument. The current instrument configuration can be downloaded, modified, and then sent back to the instrument. Once the DAS configuration was downloaded, it can be edited off-line, saving money on long distance phone connections to the instrument.

NOTE

Sending a DAS configuration to the instrument will completely replace its existing configuration and discard all of the instrument's stored data. We suggest that you download any data and save both data and the configuration on local disk before making any changes to the DAS.



DAS data can be safely downloaded, graphed and saved in a file without discarding the configuration or data in the instrument. The DAS configuration can also be changed by using the instrument's own menus through the *Front Panel Window* by pressing the appropriate buttons. Changing the configuration using the instrument's own menus will only discard data stored in the instrument if the number of records or parameters is changed. sensor-e.com can also be used to automatically download data in unattended mode and to append the data to existing files (see Section 4.12).

4.1. Supported Instruments

The DAS capability of sensor-e.com is only supported by AMX-based analyzers, not calibrators, as shown in Table 4-1. Remote DAS configuration is only supported in AMX instruments with library revision 2.1 or higher. Check the library revision of an instrument by pressing **SETUP-CFG** or in the *Instrument Information Dialog*. Please see Appendix A for compatibility issues on advanced DAS functionality:

Table 4-1: Instruments Containing DAS

Instrument	
SO2 TML-50	CO TML-30
H2S TML-87	O3 TML-10
TRS TML-60	NH3 TML-42
NOx TML-41	CO2 TML-20

Upon connection to an instrument, sensor-e.com attempts to determine if that instrument contains the DAS capability, and if so, it enables the  button in the *Front Panel Window* (see Figure 1-1). If this button is not enabled even though the instrument has the DAS capability, simply disconnect from the instrument and reconnect.

4.2. DAS Configuration and Downloaded Data Dialog

Click on  in the *Front Panel Window* (see Figure 1-1) or select **Download, graph, save data...** in the system menu (icon in the top-left corner of the instrument window) to display the following dialog box:

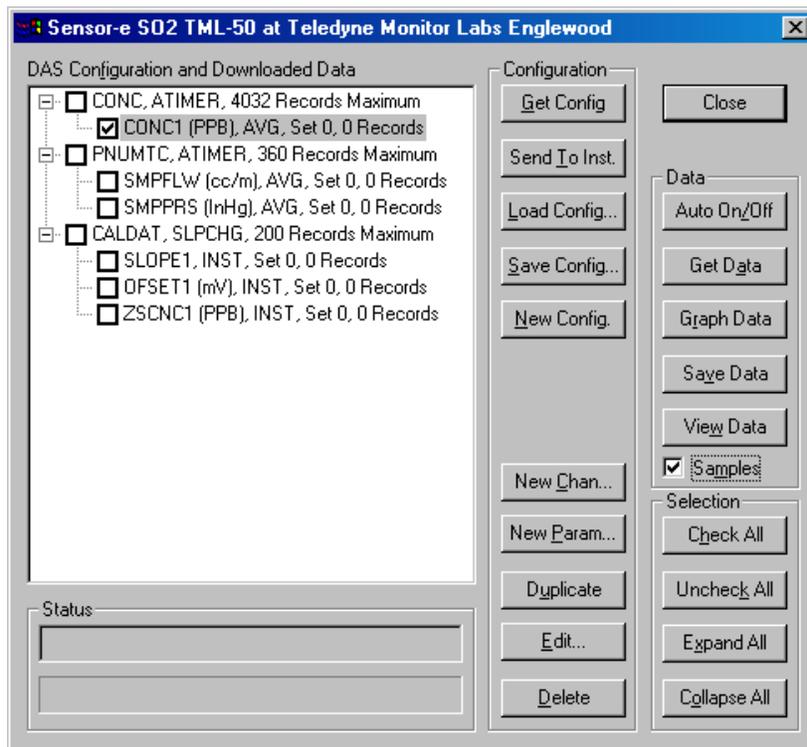


Figure 4-1: DAS Configuration and Downloaded Data Dialog

This dialog box displays both the DAS configuration and the number of records downloaded for each parameter. Initially, the configuration list is empty. Press the **Get Config** button to download the instrument's DAS configuration. This dialog box can also be entered off-line when editing the instrument's properties by clicking on **DAS Configuration...**. When the DAS configuration is edited off-line, the buttons related to downloading, uploading, and data access are disabled. Note that the configuration must have been downloaded at least once to edit it off-line. A new configuration can be edited off-line without prior download.

The table below summarizes the functions of the buttons in the *DAS Configuration and Downloaded Data Dialog* (Figure 4-1).

Table 4-2: DAS Configuration and Downloaded Data Dialog Buttons

Button	Description
Configuration Buttons	
Get Config	Downloads the DAS configuration from the instrument into sensor-e.com and discards any data stored in sensor-e.com.
Send To Inst.	Sends the DAS configuration in sensor-e.com to the instrument. This will completely replace the instrument's current DAS configuration and discard all of the data stored in the instrument.
Load Config...	Loads the DAS configuration from a text file stored on the computer. This configuration may be edited and saved on the computer again, or it may be sent to an instrument. This configuration file may have been downloaded from the instrument using the "D PRINT SCRIPT" RS-232 command, or it may have been created using the Save Config... button in sensor-e.com.
Save Config...	Saves the DAS configuration to a text file on the computer. This configuration file is suitable for uploading to the instrument via its RS-232 interface.
New Config.	Creates a new, empty DAS configuration.

Button	Description
New Chan...	Creates a new channel.
New Param...	Creates a new parameter on the selected channel.
Duplicate	Creates a duplicate of the selected channel or parameter. This button facilitates creating channels or parameters that are minor variations of existing ones. When selected, it will prompt for a new channel name. Channel names must be unique.
Edit...	Edits the properties of the selected parameter or channel.
Delete	Deletes the selected parameter or channel.
Data Buttons	
Auto On/Off	Turns the automatic data download feature on and off.
Get Data	Downloads the data for the selected parameter or channel from the instrument.
Graph Data	Graphs the data for the selected parameter or channel.
Save Data	Saves the data for the selected parameter or channel in a text file.
View Data	Views the data for the selected parameter or channel as a table on the computer screen.
<input type="checkbox"/> Samples	Enables downloading, viewing, or saving the number of samples in each average. Only newer instruments support this option.
Selection Buttons	
Check All	Selects all the channels and parameters in the list.
Uncheck All	Unselects all the channels and parameters in the list.
Expand All	Expands all the channels in the list, showing all the parameters.
Collapse All	Collapses all the channels in the list, hiding all the parameters.

4.3. Downloading the DAS Configuration

Download the remote instrument's DAS configuration by clicking on . Any DAS data that were previously downloaded by sensor-e.com will be discarded (but are not affected within the instrument).

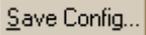
sensor-e.com stores the last used DAS configuration of any instrument in the network configuration file (.CFG). If the configuration was already downloaded from this instrument, the DAS configuration will appear in the dialog. After downloading the DAS configuration, which should take a few seconds, the dialog box will look similar to the following example:

In Figure 4-1, the channels have been expanded to show all the parameters. The dialog box displays a summary of the channels, including the channel name, the triggering event, and the maximum number of records the channel stores. The parameter summary includes the parameter name and numeric units, the sampling mode, the record set number, and the number of records actually downloaded from the instrument. Since no data have been downloaded yet, the number of records is zero for all the parameters.

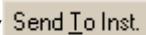
4.4. Saving the DAS Configuration

Saving the DAS configuration of any instrument to disk is useful to maintain several different measurement protocols (frequent data acquisition for trouble-shooting and engineering, long-term averages for monitoring, etc.) or simply to keep a backup when replacing the firmware of the analyzer.

There are two ways to save the DAS configuration. sensor-e.com automatically stores the DAS configuration in its network configuration file when the configuration file is saved. This copy is not permanent. The second way is to save the DAS configuration as a text file on disk. When using the

 button, sensor-e.com prompts for a file name. The default file name format is:

“<Instrument Name>-< Instrument Serial Number> DAS Configuration.txt”

This name can be changed to any other file name. Once saved as a text file, it can be loaded by using the  button or uploaded to the instrument by using sensor-e.com () or a simple terminal program.

4.5. Modifying the DAS Configuration

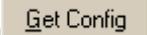
sensor-e.com can only modify the DAS configuration in AMX instruments with library revision 2.4 or higher. This section assumes familiarity with configuring the DAS in an instrument. Refer to the built-in DAS manual (*Built-In DAS Manual.doc*) for more information on configuring the DAS. sensor-e.com facilitates configuring the instrument’s DAS in the following ways:

sensor-e.com takes advantage of the larger area of the computer screen to display more of the DAS configuration than the instrument can on its instrument display.

sensor-e.com validates the user’s inputs and verifies that the configuration is successfully sent to the instrument. An error message is displayed on unsuccessful upload.

sensor-e.com allows to load DAS configurations stored on the computer and to send them to the instrument, making it quick and easy to load the same configuration into multiple instruments.

sensor-e.com can store many DAS configurations on the computer, allowing a user to download different configurations for different purposes.

To download the current configuration, click on . To start a new, empty configuration, click on . To start with a configuration that was previously saved, click on .

4.5.1. Adding or Modifying a Channel

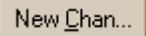
A channel can be expanded to see its parameters by clicking on the “+” boxes next to the channel names. A channel can also be expanded or collapsed by double-clicking on it. To add a new channel, either click on  or right-click on any existing channel, which will bring up the context menu shown below, and select **New Channel**. The maximum number of channels that can be configured is 20 per instrument. The maximum number of parameters created by sensor-e.com in each channel is 10 and the maximum number of data records in each channel is 64000. However, the A-series analyzers are limited by 64 KB data memory, hence the average number of records (depending on the number of channels and parameters and if the number of samples in a concentration average is recorded) is much lower, typically around 3000-12000 records. Sensor-e instruments can have up to 50 parameters per channel if entered via the instrument’s front panel and have 1 MB of data storage capacity or the ability to store up to about 1000000 records.



Figure 4-2: DAS Channel Context Menu

To edit the existing channel, select **Edit** will bring up the following tabbed dialog

– Adding or Modifying a Channel

Channel or click on , which box.

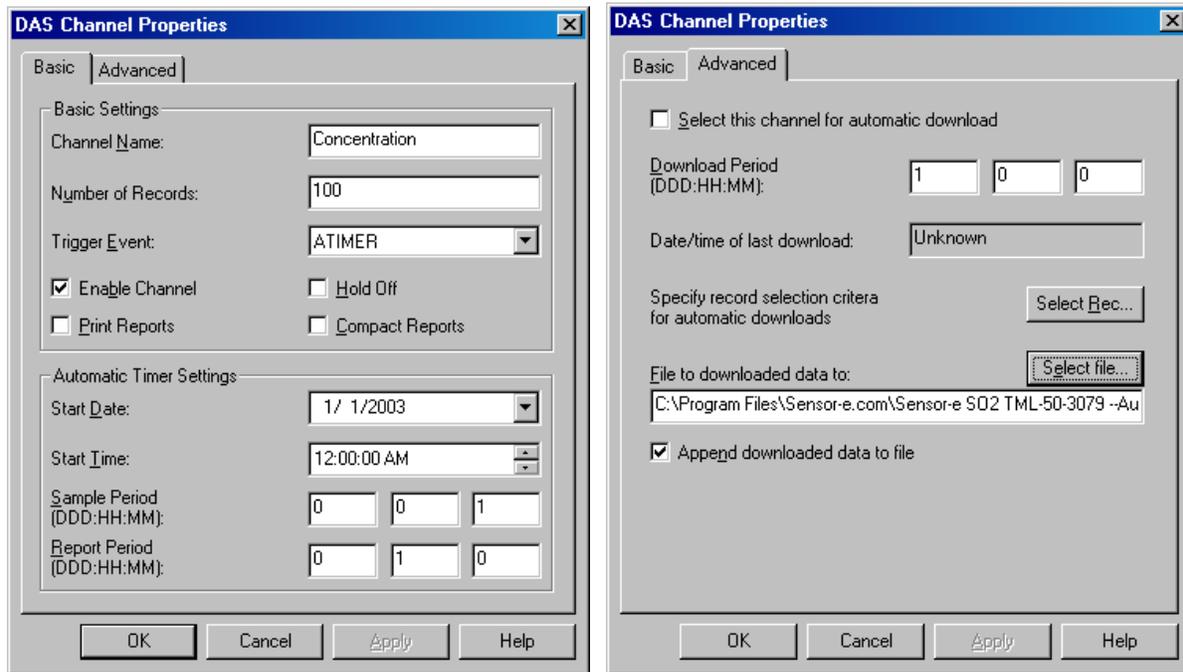


Figure 4-3: DAS Channel Properties Dialog – Basic and Advanced Tabs

The following table describes the tab parameter properties shown above.

Table 4-3: DAS Channel Properties

Tab	Property	Description
Basic	Channel Name	The name of the channel, up to 20 characters long. For RS-232 reports of this channel, the name will be truncated to 6 characters in order to maintain a neat printed format. The name should not contain any spaces.
	Number of Records	The number of records to store for this channel. The maximum number of records that can be stored (across all channels) typically ranges from 3000–12000 and depends on the number of parameters in each channel and the number of channels.
	Trigger Event	The instrument event that triggers recording of this channel: an automatic timer event, a calibration event, or a warning event.
	Enable Channel	If checked, the channel will store records. If unchecked, the channel will not store records. This property can disable a channel without having to delete it.
	Hold Off	If checked, this channel will not store any records during the hold off interval (calibration period). If unchecked, this channel will store records regardless of the hold off state.
	Print Reports	If checked, this channel will print each record that it stores to the RS-232 interface (and dump it to e.g. a Terminal program). If unchecked, it will store the record but not print it. When sensor-e.com is connected to the instrument, the records will not be printed to the RS-232 interface, regardless of the setting of this property.

Tab	Property	Description
Basic (cont.)	Compact Reports	If checked, records printed to the RS-232 will be printed with up to 5 records per line. If unchecked, each record will be printed on a separate line. This property only applies if the <i>Print Reports</i> property is checked.
	Start Date	The date when the DAS starts storing records. By default, this is a date in the past, but if set to the future, the instrument won't start storing records until that date.
	Start Time	Time on the starting date when the DAS should start storing records.
	Sample Period	Number of days, hours, and minutes, measured from the starting date and time, between each sampl ed data point. At least one of the three fields of this property must be non-zero.
	Report Period	Number of days, hours, and minutes, measured from the starting date and time, between each report ed record. At least one of the three fields of this property must be non-zero. If sample period is larger or identical to the report period, the resulting value will be an instantaneous value every <i>report period</i> . If the sample period is smaller than the report period (and the parameter is set to AVG), the resulting value is an average over <i>Report/Sample</i> number of instantaneous values every <i>report period</i> .
Advanced	Select this channel for automatic download	If checked, data for this channel will be downloaded automatically when the  button is pressed.
	Download Period	This is the number of days, hours, and minutes, between each automatic data download. At least one of the three fields of this property must be non-zero.
	Date/time of last download	The last date and time that data was downloaded from this channel. This is a read-only field, it cannot be modified
	Specify record selection criteria for automatic downloads	This specifies the criteria for downloading data records automatically. This selection criteria is separate from the global one used with the  button, and is specified for each channel to afford maximum flexibility.
	File to download data to	This is the file to download data too automatically. The name can be freely chosen, i.e. with user-defined extension .csv, .prn, .dat, .sensor-e.com etc for easier import into data analysis programs.
	Append downloaded data to file	If checked, sensor-e.com will append new data to the existing file. Otherwise it will completely overwrite the file.

4.5.2. DAS Channel Names

When a channel's properties are edited, sensor-e.com checks to make sure that the channel name is unique and contains valid characters. sensor-e.com does not perform this check when downloading a configuration from an instrument or when loading a configuration from a file because it assumes that the names are already valid in these cases. If the name is invalid because it isn't unique or because it contains invalid characters, sensor-e.com will display an error message and remain in the channel property dialog.

When editing the DAS channel names through the front panel push buttons, the instrument will only allow to use upper case characters with no more than 6 characters. However, sensor-e.com permits the use of longer names and lower case characters. When viewing the channel names using the instrument's menus, however, the display will be truncated to 6 characters (with the remaining name stored and recognized in memory). This limitation is due to the size of the instrument's display.

Some older instruments with DAS support may require unique, 6 character names. If long channel names create problems, we recommend making the names unique within the first 6 characters and, failing that, make the names no longer than 6 characters. The names are not case-sensitive in any instrument.

4.5.3. Duplicating a Channel

sensor-e.com can duplicate a channel and all its properties including parameters. Simply select a channel and click on  or right-click on a channel and select **Duplicate Channel** from the context menu. sensor-e.com will create a new channel and prompt the user for a new channel name to ensure a unique name.

4.5.4. Deleting a Channel

To delete a channel, simply select the channel and click on . Alternatively, the user can right-click on a channel and select **Delete Channel** from the context menu. In either case, sensor-e.com prompts to confirm the deletion. Prompts like this can be disabled in the **Settings-Options** menu. When a channel is deleted, all the parameters in it and all the data downloaded for the channel are automatically deleted as well. It is recommended to make frequent backups of DAS scripts on disk to avoid duplicate work in case of accidental deletion.

4.5.5. Adding or Modifying a Parameter

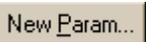
In order to capture any data, a channel must contain at least one parameter. To add a new parameter to a channel, either click on  while a channel is selected, or right-click on any existing parameter in the channel, which will bring up the menu shown below, and select **New Parameter**. If sensor-e.com refuses to create a new parameter, the maximum number of parameters may have been exceeded. The maximum number of channels is 20 per instrument. The maximum number of parameters created by sensor-e.com in each channel is 10 and the maximum number of data records in each channel is 64000. However, the A-series analyzers are limited by 64 KB data memory, hence the average number of records (depending on the number of channels and parameters and if the number of samples in a concentration average is recorded) is much lower, typically around 3000-12000 records. Sensore-e instruments can have up to 50 parameters per channel if entered via the instrument's front panel and have 1 MB of data storage capacity or the ability to store up to about 100000 records.



Figure 4-4: DAS Parameter Context Menu – Adding or Modifying a Parameter

To edit any existing parameter, click on **Edit Parameter** or , which will bring up the following dialog box.

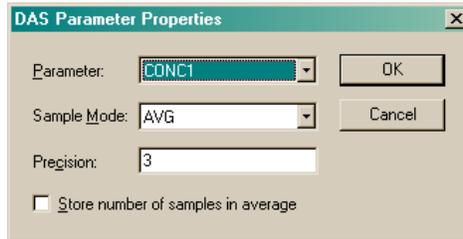


Figure 4-5: DAS Parameter Properties Dialog

The following table describes the parameter properties shown above.

Table 4-4: DAS Parameter Properties

Property	Description
Parameter	This is the instrument-specific parameter to sample. The list of parameters differs from instrument to instrument and even from one instrument firmware version to another.
Sample Mode	This is the mode to sample the parameter with. Choices are AVG (average), INST (instantaneous), MIN (minimum), or MAX (maximum).
Precision	This is the numeric precision to use when displaying a parameter value (range 0-4). It is used to display the parameter values in the menus and in the RS-232 reports. It is used by sensor-e.com when viewing and saving downloaded data.
Store number of samples in average	This option will store the number of samples in each concentration average (no other parameters). This option is only available in newer instruments and will be disabled if the instrument doesn't support it.

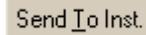
4.5.6. Duplicating a Parameter

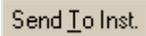
To duplicate a parameter and all its properties, simply select a parameter and click on  or right-click on a parameter and select **Duplicate Parameter** from the context menu. sensor-e.com will create a new parameter of the same type and add it to the end of the channel's parameter list. The parameter name can be identical to the original without conflict. This can be used to, e.g., sample one parameter using the MIN, AVG, and MAX sampling modes.

4.5.7. Deleting a Parameter

To delete a parameter, simply select the parameter and click on . Alternatively, the user can right-click on a parameter and select **Delete Parameter** from the context menu. In either case, sensor-e.com prompts to confirm the deletion. This prompt can be disabled in the **Settings-Options** menu.

4.6. Sending the DAS Configuration to the Instrument

To send the DAS configuration to the instrument, click on . Sending the DAS configuration to the instrument will completely replace the instrument's current DAS configuration and discard all of the data stored in the instrument. Therefore, sensor-e.com will prompt to confirm the operation before proceeding.

Older analyzer firmware revisions may not support this functionality, see Appendix A or the website for more information. In this case, the  and other buttons will be grayed-out.

If the send operation is successful, sensor-e.com will display the following dialog box.



Figure 4-6: Successful DAS Send Dialog

If the send operation is unsuccessful, sensor-e.com will display the following dialog box. Some possible causes of this error are that a channel name contains spaces or that the instruments receive buffer overflowed while receiving the DAS configuration. Try enabling one or more handshaking options, particularly the *Transmit Delay* option in the instrument properties dialog. Also, lowering the baud rate often solves this problem.

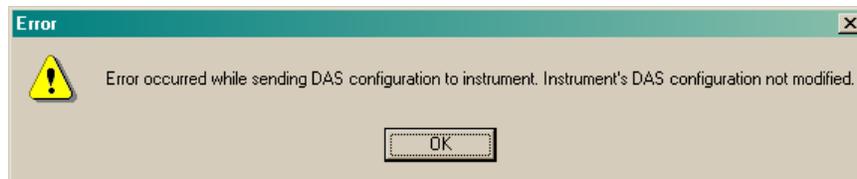


Figure 4-7: Unsuccessful DAS Send Dialog

4.7. Downloading DAS Data

To download DAS data, check the desired channels or parameters in the dialog box by clicking in the checkboxes next to each name. (The checkboxes may not appear in some versions of Windows. If this is the case, the problem can be fixed by upgrading to Internet Explorer 5.0 or higher and NT 4.0, service pack 4 or higher.) A work-around is to right-click on a channel or parameter and use **Select Channel** or **Select Parameter** to select it or deselect it. The checkmark next to the menu item shows the channel's or parameter's current selection state.

When a channel is selected or deselected, all of its parameters are automatically selected or deselected, too. Alternatively, the user can choose to SELECT ALL or DESELECT ALL by using the

appropriate buttons on the bottom right of the window. Upon clicking on **Get Data**, sensor-e.com will present the following record selection dialog to choose which records should be downloaded. See table for explanation of each option.

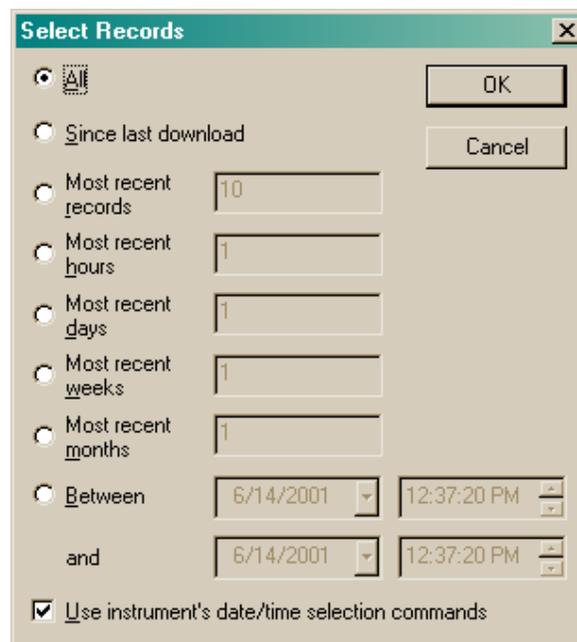


Figure 4-8: Select Records Dialog

The following table describes the properties shown above.

Table 4-5: Select Records Dialog

Property	Description
All	Downloads all the records stored in the instrument for the selected channels or parameters.
Since last download	Downloads all the records stored since the last download.
Most recent records	Downloads the most recent N records.
Most recent hours	Downloads the records from the most recent N hourly intervals. For instance, a value of 1 will download all records from the beginning of the current hour; a value of 2, from the beginning of the previous hour, etc.
Most recent days	Downloads the records from the most recent N daily intervals.
Most recent weeks	Downloads the records from the most recent N weekly intervals.
Most recent months	Downloads the records from the most recent N monthly intervals.
Between, and	Downloads only the records between specified range of dates and times.
Use instrument's date/time selection commands	If checked sensor-e.com will let the instrument search for records within the requested date/time range using the instrument's date/time records. This may speed up download times, as only the requested data are downloaded. However, some instruments are very slow at this, particularly if the DAS data files in the instrument are large, and sensor-e.com might timeout while waiting for the instrument to respond (set time-out period in the Instrument Properties - Handshaking dialog). If sensor-e.com cannot successfully use this option with an instrument, simply uncheck it and sensor-e.com will download all the records and then filter out the ones that are not in the requested date/time range, using the date/time listing of the downloaded file. This is potentially slower, but may be more reliable. Only newer firmware revisions will support this functionality, see website for a table of supported firmware revisions.

Specify the record selection criteria to use and click on  to begin downloading. Note that DAS data downloads can take several minutes, depending on the baud rate and how many data were selected. There is no option to cancel a download once initiated because the instruments don't offer any interrupt capability.

Instruments actually store DAS records approximately one second after the programmed time. For instance, if an instrument is programmed to store a record at 10:00:00, it will actually store it at 10:00:01. This slight delay ensures that the record is stored after the sampling interval is completed. It is important to be aware of this behavior when using the *between* option above, and set the ending time a few seconds beyond the last time of desired download. For example, if records up to 10:00:00 are desired, the ending time limit should be 10:00:05.

For instruments that do not support the date range download, sensor-e.com must download all the records and then discard the ones outside the requested date range. Thus, in many instruments it takes just as long to download records by date range as it does to download all the records. After the records have been downloaded, the *DAS Configuration and Downloaded Data Dialog* might look like the following figure:

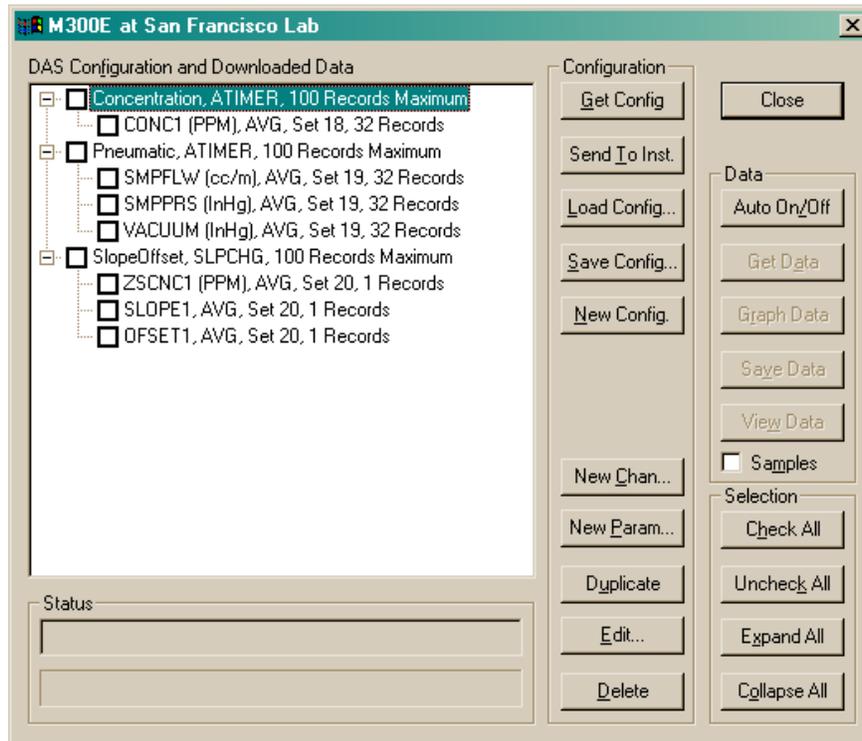


Figure 4-9: Downloaded DAS Data

Note the number of records that were downloaded from the *Concentration* and *Pneumatic* channels (32), and from the *SlopeOffset* channel (1).

sensor-e.com remembers the downloaded DAS data as long as it is connected to the instrument or until the configuration is downloaded again. When the instrument is disconnected, the data are discarded to conserve memory.

4.7.1. DAS Record Sets

sensor-e.com implements the notion of a *record set*. Each time DAS data are downloaded from an instrument, sensor-e.com increments the record set number. Only parameters downloaded as part of the same record set may be combined in group operations, such as graphing, saving to a file, or viewing. Records downloaded from different channels are implicitly in different record sets. In the example above three record sets are created: 18, 19, and 20. Records from different record sets cannot be mixed because they may contain a different number of records or have different time stamps or intervals.

4.8. Graphing DAS Data

After downloading data, they can be graphed in a window by selecting one or more parameters in the *Parameters* list that are in the same record set and clicking **Graph Data**. All parameters will be plotted on the same graph.

The *Graph Window* can be resized by dragging the window border with the mouse. sensor-e.com remembers the position and size of the last closed graph window. Up to three graph windows can be opened at any time. When graphing data that are significantly different in magnitude, each parameter should be graphed in a separate window as shown in the following figure.

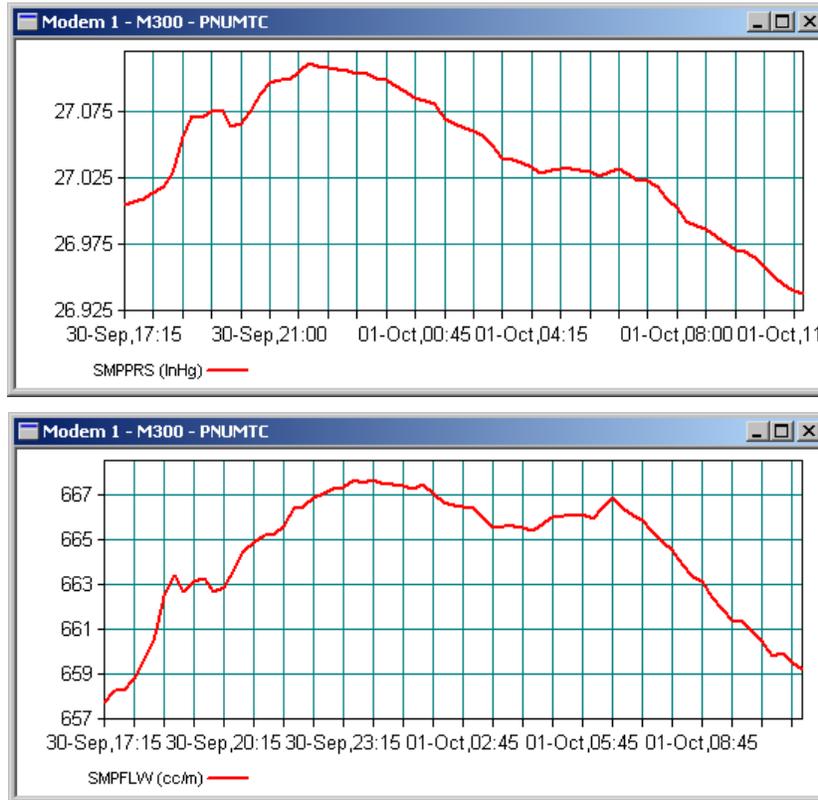


Figure 4-10: Graphing Multiple DAS Parameters with Different Scales

In the example above, each graph window has a different Y-axis scale that is appropriate for the range of data values being graphed; as all data stem from the same record set, X-axes are time-aligned.

The primary purpose of the *Graph Window* is to preview the data. For more sophisticated graphs we recommend downloading and saving the data, and then import them into e.g., a spreadsheet program.

4.9. Viewing DAS Data

Data can also be viewed on-screen in table format. To view DAS data, select one or more parameters from the same record set or an entire channel and click . This will display the data in a table format like that shown in Figure 4-11.

This window can be resized by dragging its edges with the mouse and adjusting the column widths as needed. sensor-e.com remembers the position and size of the dialog, except for the column layout, which changes with different parameters.

Time Stamp	SMPFLW...	SMPPRS...	VACUUM...	Samples
06/16/2001 11:13:01	751.4	30.0	6.8	1
06/16/2001 11:14:01	751.4	30.0	6.8	1
06/16/2001 11:15:01	751.4	30.0	6.8	1
06/16/2001 11:16:01	751.4	30.0	6.8	1
06/16/2001 11:17:01	751.4	30.0	6.8	1
06/16/2001 11:18:01	751.4	30.0	6.8	1
06/16/2001 11:19:01	751.4	30.0	6.8	1
06/16/2001 11:20:01	751.4	30.0	6.8	1
06/16/2001 11:21:01	751.4	30.0	6.8	1
06/16/2001 11:22:01	751.4	30.0	6.8	1

Figure 4-11: Viewing DAS Data

Newer versions of the DAS can store the number of samples in an average. If this option is enabled for a parameter, there will be an additional column after each parameter showing the number of samples in each average, as shown in the example below. This extra column will only show after a parameter is storing the number of samples. Storing the number of samples will decrease the maximum possible number of data that can be stored in the DAS!

4.9.1. Changing the Precision of DAS Data When Viewing or Saving

Downloaded data are formatted using the precision setting specified in the instrument's DAS configuration. However, DAS data are always downloaded in their full resolution, hence, the precision of downloaded data can be changed for viewing or saving by editing the parameter's properties and changing the precision as desired.

4.10. Saving DAS Data

After download, data can be saved to a file by selecting one or more parameters in the *Parameters* list and clicking **Save Data**. Only data from the same record set can be saved in the same file. sensor-e.com will store each selected parameter in a separate column in the file, separated by commas so that the file can be imported into other programs, such as a spreadsheet program for further analysis. The following figure shows a sample of a saved data file, which is similar to the view format shown above, except, that the saved file separates date and time columns.

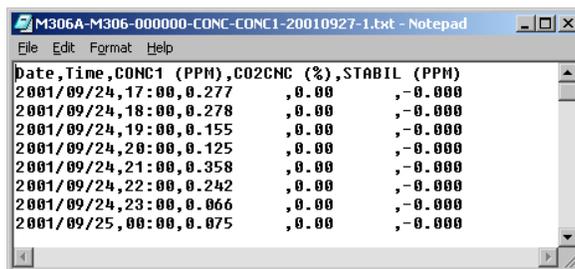


Figure 4-12: Saved DAS Data

The first line in the example above is the header line, which labels the columns. The data records begin on the second line, and each consists of a complete time stamp and one or more readings. All fields are separated by commas. Storing the number of samples will create another column labeled "Samples," which shows how many samples are in each average reading. Renaming this output file to an extension ".csv" enables to launch it directly into Microsoft Excel when double-clicking on the file.

4.10.1. DAS Data File Names

sensor-e.com utilizes the long filename capability of Windows to help distinguish data files:

"<Instrument Name>-< Instrument Serial Number>-<Channel Name>-<1st Parameter Name>-<YYYYMMDD>-<Record Set #>.txt"

4.10.2. Saving DAS Data to an Existing File

DAS data can be appended to an existing file by following the same steps as for saving the data. Instead of accepting the automatically generated file name, simply click on an existing file in the file save dialog. sensor-e.com will prompt to replace the file with the new data or to append the new data to the end of the file. When appending data, sensor-e.com will not write a new header line.

Caution: sensor-e.com allows appending data from different parameters or channels. This is because the program does not log all saved data file names. Make sure to append data only to a file with compatible column format, otherwise data may not line up with their correct date/time stamps.

4.11. Discarding DAS Data

sensor-e.com stores the downloaded DAS data as long as it is connected to the instrument. When the instrument is disconnected, the data are discarded to conserve memory. Make sure to download and save data before they get overwritten in the DAS.

DAS data can consume up to several megabytes of the computer's RAM memory. If the host computer is experiencing memory shortages, try reducing the data amount that sensor-e.com stores by only downloading required data. Furthermore, data are duplicated for every graph window that is displayed.

4.12. Downloading DAS Data Automatically

sensor-e.com can be configured to download DAS data automatically at periodic intervals. Different intervals and record selection criteria can be chosen for each channel. Each channel must be configured separately for automatic download using the *advanced* tab of the channel property dialog (see Figure 4-3).

4.12.1. Configuring Channels for Automatic Download

sensor-e.com allows to specify the download period, the record selection criteria, the data file name, and whether to append to or replace the data file, on a channel-by-channel basis. When combining "Since last download." with the "Append downloaded data to file" option, the instrument's DAS storage capacity is essentially only limited by the host computer's disk space. Auto-download configuration has to be done only once, sensor-e.com stores the automatic settings in its network configuration file.

4.12.2. Selecting Channels for Automatic Download

After configuring the channels on how to automatically download, they also need to be checked for download. This is done by checking the checkbox next to the channel's name in the DAS configuration list or right-clicking on a channel and clicking Select Channel in the context menu. Or the option "Select this channel for automatic download" in the *advanced* tab can be used.

4.12.3. Activating Automatic Download Mode

Finally, press Auto On/Off to activate automatic mode. While this button is pressed, all of the other buttons in the DAS configuration dialog are disabled and the user cannot access any front panel, the main window or any other sensor-e.com settings. This is to prevent conflicts between automatic and manual downloads. To regain access to the windows, simply de-press Auto On/Off, finish the desired operation, then press the button again to resume automatic mode.

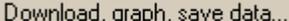
4.12.4. File Names for Automatic Download

The file name that sensor-e.com generates when clicking in the *Advanced* tab has a different default format from the file name that sensor-e.com generates when saving data manually:

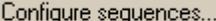
"<Instrument Name>-< Instrument Serial Number>-<Channel Name>-Auto.txt"

Unlike the file name format for manual saves, the date and record set number are not included. This is because sensor-e.com will repeatedly add data to this file or replace it entirely, hence those additional fields are meaningless in automatic mode.

5. TML-700 CALIBRATOR SEQUENCES

sensor-e.com includes support for modifying the sequence configuration in TML-700 calibrators. sensor-e.com can only modify the sequence configuration in TML-700 calibrators with firmware revision D.3 or higher. However, calibrators with firmware prior to D.3 can still be edited through the front panel. The user interface for sequence configuration is very similar to that for configuring the DAS. If sensor-e.com detects that the instrument is an TML-700 calibrator, the front-panel DAS configuration button, , is changed to . The TML-700 does not contain a DAS and stores sequences in a different memory space than the DAS is usually saved. The current sequence configuration can be downloaded, saved, modified, and sent it back to the instrument. Sending a sequence configuration to the instrument will completely replace its existing configuration. A sequence configuration can also be changed by using the instrument's own menus through the *Front Panel Window* (see Figure 1-1).

5.1. Sequence Configuration Dialog

Clicking  in the *Front Panel Window* or clicking **Configure Sequences...** in the *System Menu* (top left corner of each window) of the *Front Panel Window* will produce the following dialog box.

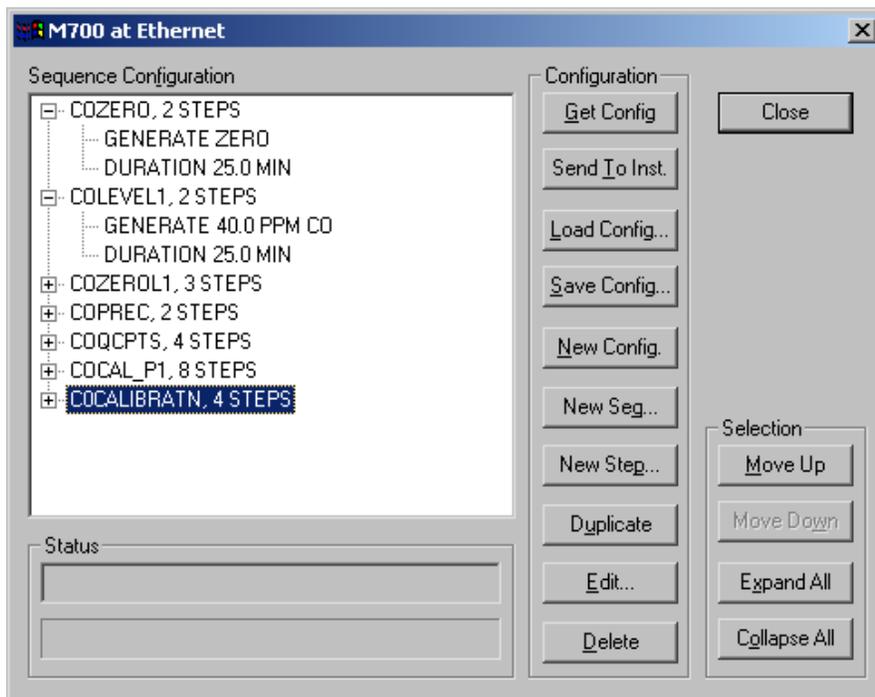


Figure 5-1: Sequence Configuration Dialog

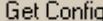
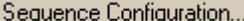
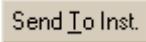
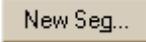
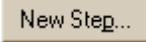
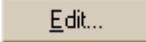
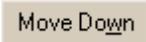
Initially, this window is empty. Download the instrument's sequence configuration using the  button. It is also possible to open this dialog off-line when editing the instrument's properties (see Figure 5-1) by clicking on . When editing the sequence configuration off-line, the buttons related to downloading and uploading are disabled. The following table summarizes the functions of the buttons in the *Sequence Configuration Dialog*.

Table 5-1: Sequence Configuration Dialog Buttons

Property	Description
Configuration Buttons	
	Downloads the sequence configuration from the instrument into sensor-e.com.
	Sends the sequence configuration in sensor-e.com to the instrument. This will completely replace the instrument's current sequence configuration.
	Loads a sequence configuration from a text file stored on the computer. This configuration may be edited and saved on the computer again, or it may be sent to an instrument. This configuration file may have been downloaded from the instrument using the "C PRINT SCRIPT" RS-232 command or it may have been created using  in sensor-e.com.
	Saves the sequence configuration to a text file on the computer. The format of this configuration file is suitable for uploading to the instrument via its RS-232 interface.
	Creates a new, empty sequence configuration.
	Creates a new sequence.
	Creates a new step in the selected sequence.
	Creates a duplicate of the selected sequence or step. When creating a duplicate, sensor-e.com will prompt for a new, unique sequence name.
	Edits the properties of the selected sequence or step.
	Deletes the selected sequence or step.
Selection Buttons	
	Moves the selected sequence or step up one position relative to the other sequences or steps.
	Moves the selected sequence or step down one position relative to the other sequences or steps.
	Expands all the sequences in the list, showing all the steps.
	Collapses all the sequences in the list, hiding all the steps.

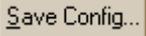
5.2. Downloading a Sequence Configuration

Download the remote instrument's sequence configuration by clicking . sensor-e.com stores the sequence configuration in the network configuration file (.CFG). If the configuration from this instrument was already downloaded, the sequence configuration will appear in the dialog.

In Figure 1-1 some sequences have been expanded to show the steps. The dialog box displays a summary of each sequence, including the sequence name, the number of steps in the sequence, and the number of times the sequence will run when executed. Below each sequence is a list of steps in the sequence. Each step summary shows the step type and the properties that are specific to that step type. For instance, a *generate* step shows the concentration and gas that will be generated; a *delay* step shows the duration of the delay; and a *standby* step shows no additional properties.

5.3. Saving a Sequence Configuration

There are two ways to save a sequence configuration. sensor-e.com automatically stores the sequence configuration in its network configuration file when saving it. The second way is to save the sequence

configuration as a text file using . sensor-e.com will prompt for a file name, the default format is:

“<Instrument Name>-<Instrument Serial Number> Sequence Configuration.txt”

Once saved as a text file, it can be loaded again using  button.

5.4. Modifying a Sequence Configuration

sensor-e.com can only modify the sequence configuration in TML-700 calibrators with firmware revision D.3 or higher. This section assumes familiarity with configuring the sequences in an instrument. sensor-e.com facilitates configuring the instrument's sequences in the following ways:

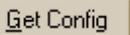
sensor-e.com takes advantage of the larger area of the computer screen to display more of the sequence configuration than the instrument can with its vacuum fluorescent display.

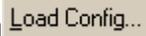
sensor-e.com validates the user's inputs and verifies that the configuration is successfully sent to the instrument. Scripts with unsupported entries are rejected by the instrument!

sensor-e.com allows to load sequence configurations stored on the computer and to send them to the instrument, making it quick and easy to load the same configuration into multiple instruments.

sensor-e.com can store many sequence configurations on the computer, allowing the download of different configurations for different purposes.

The basic procedure for modifying the instrument's sequence configuration is to download the current configuration from the instrument, modify it, and then send it back to the instrument and saving it to disk for backup purposes. These steps are discussed in more detail below.

To download the current configuration, click .

To start a new, empty configuration by clicking  or load a previously saved sequence by clicking .

5.4.1. Adding or Modifying a Sequence

Expand a sequence to see its steps by clicking on the “+” box next to the sequence name. To add a new sequence, either click on  or right-click on any existing sequence, which will bring up the context menu shown below, and select New Sequence. If sensor-e.com will not create a new sequence, it's because the maximum number of sequences have already been created. The number of sequences or steps is limited only by available memory. However, sensor-e.com limits the number of sequences and steps to 100 sequences and 100 steps per sequence. These limits are larger than the TML-700 can actually accommodate.

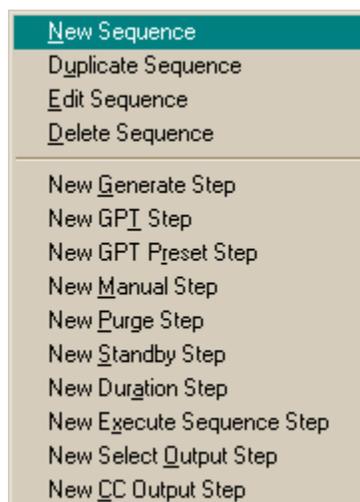


Figure 5-2: Sequence Context Menu – Adding or Modifying a Sequence

To edit an existing sequence, click on **Edit Sequence** in the context menu , which will bring up the dialog box in Figure 5-3. Table 5-2 describes the sequence properties shown in the following figure.

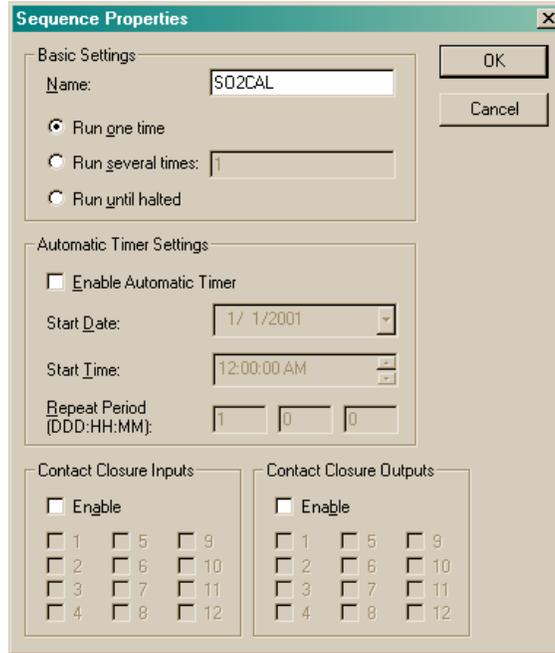


Figure 5-3: Sequence Properties Dialog

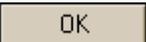
The following table describes the properties shown above.

Table 5-2: Sequence Properties

Property	Description
Name	Name of this sequence. The name cannot contain any spaces.
Run mode	<p>Run one time: runs the sequence one time when it’s executed. This is the usual case.</p> <p>Run several times: runs the sequence the number of times specified (0-100). Note that a value of 0 is the same as <i>Run until halted</i>, and a value of 1 is the same as <i>Run one time</i>.</p> <p>Run until halted: runs the sequence indefinitely until interrupted by pressing STBY on the front panel.</p>
Enable Automatic Timer	If checked, the sequence will be executed automatically at timed intervals and the Start Date , Start Time , and Repeat Period properties will be enabled.
Start Date	Date when the sequence should first execute. It is typically a date in the past, but if it is a date in the future, the instrument won’t execute the sequence until that date.
Start Time	Time on the starting date when the sequence should first execute.
Repeat Period	Number of days, hours, and minutes, measured from the starting date and time, between each execution of the sequence. At least one of the three fields of this property must be non-zero.
Contact Closure Inputs	If Enable checked, the sequence will execute when the contact closure input pattern specified by checkboxes 1–12 is detected. If Enable is unchecked, the sequence will ignore the contact closure inputs.

Property	Description
Contact Closure Outputs	If Enable checked, the contact closure outputs will be set to the pattern indicated by checkboxes 1–12 when the sequence is executed. If Enable is unchecked, the contact closure outputs will not be altered when the sequence executes. Note that there is a contact closure output step that can alter the contact closure outputs at any point in the sequence.

5.4.2. Sequence Names

When editing a sequence's properties and clicking , sensor-e.com checks that the sequence name is unique and contains valid characters. sensor-e.com does not perform this check when downloading a configuration from an instrument or when loading a configuration from a file because it assumes that the names are already valid in these cases. If the name is invalid because it isn't unique or because it contains invalid characters, sensor-e.com will display the error shown in the following figure and remain in the sequence property dialog.

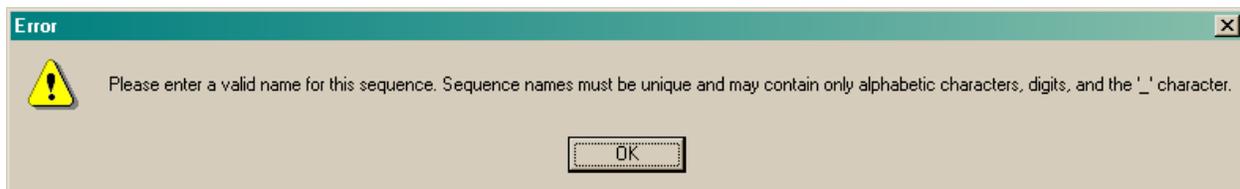


Figure 5-4: Invalid Sequence Name Dialog

When editing the sequence names using the instrument's own menus, the instrument will only allow upper case characters, numbers, and the '_' character. However, sensor-e.com will permit longer names and lower case characters. When viewing the sequence names using the instrument's menus, however, the names may be truncated to fit on the display. This limitation is due to the size of the instrument's display. The names are not case-sensitive.

5.4.3. Duplicating a Sequence

Duplicate a sequence by clicking  or right-click on the sequence and select **Duplicate Sequence** from the context menu. sensor-e.com will prompt for a new, unique sequence name.

5.4.4. Moving a Sequence

To move a sequence relative to the other sequences, select the sequence and reposition it using the  and  buttons.

5.4.5. Deleting a Sequence

To delete a sequence, simply select the sequence and click on . Alternatively, right-clicking on a sequence and selecting **Delete Sequence** from the context menu will do the same. In either case, sensor-e.com will confirm the deletion with a dialog box like that is shown in the following figure. When a sequence is deleted, all the steps in it are automatically deleted as well. Such prompts can be disabled in the **Settings-Options** menu.

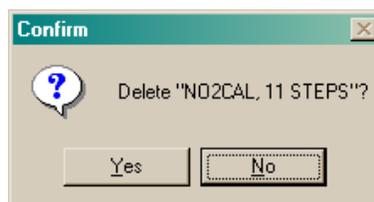


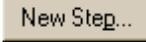
Figure 5-5: Delete Sequence Confirmation Dialog

5.4.6. Adding Steps to a Sequence

Sequences consist of a list of steps that are executed. There are several different types of steps, summarized in the table below. Refer to the TML-700 manual for a detailed description of these step types.

Table 5-3: Sequence Step Types

Step Type	Description
GENERATE	Generates a concentration of specified gas and units.
GPT	Generates a GPT consisting of NO and O ₃ .
GPT PRESET	Generates a GPT-preset consisting of NO and O ₃ .
MANUAL	Generates gas under manual control using the specified gas, flows, and O ₃ generator setting.
PURGE	Purges the system with high flowrate and zero air.
STANDBY	Stops all actions and puts calibrator in standby mode.
DELAY	Generates a delay of the specified action (in minutes)
EXECUTE SEQUENCE	Executes a sequence by name (subroutine call).
SELECT OUTPUT	Specifies which output valve to open when generating gas. This functionality is available only for firmware E.4 and higher.
SET CC OUTPUT	Sets the contact closure outputs to the specified pattern. This functionality is available only for firmware E.4 and higher.

To add a step to a sequence, select a sequence and click . The following dialog box opens.

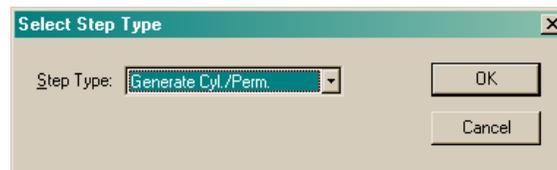


Figure 5-6: Select Step Type Dialog

Select one of the available step types from the list and click on . The context menu will appear (see Figure 5-7). Steps that are not supported by a particular firmware revision will not be available from this drop-down menu.

A step can also be added by right-clicking on a sequence and selecting one of the step types from the sequence context menu. Alternatively, right-clicking on a step within the sequence will bring up the slightly different sequence step context menu shown below. Click on one of the step types to add a step. If sensor-e.com will not create a new step, it is because the maximum number of steps has already been created for the sequence (100).

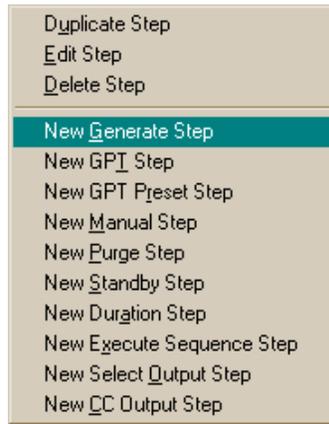


Figure 5-7: Sequence Step Context Menu

5.4.7. Generate Step

Editing a *Generate* step will bring up the following dialog box. The properties are described in Table 5-4.

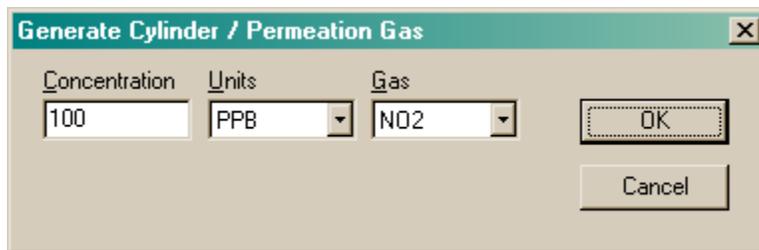


Figure 5-8: Generate Step Properties Dialog

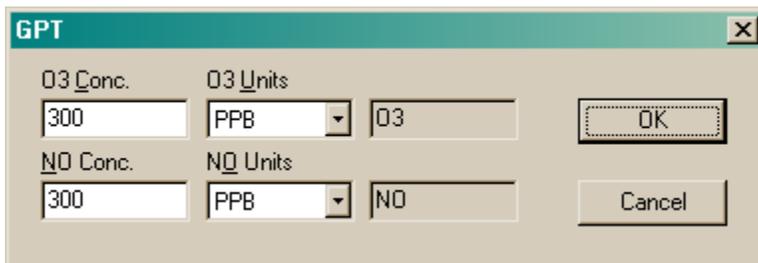
The following table describes the properties shown above.

Table 5-4: Generate Step Properties

Property	Description
Concentration	The numeric concentration to generate.
Units	The concentration unit to use. The TML-700 will perform any necessary unit conversions.
Gas	The gas type to generate. sensor-e.com permits to specify several different gases, although the TML-700 may not be able to generate them all. In this case, it will simply generate zero air.

5.4.8. GPT and GPT Preset Steps

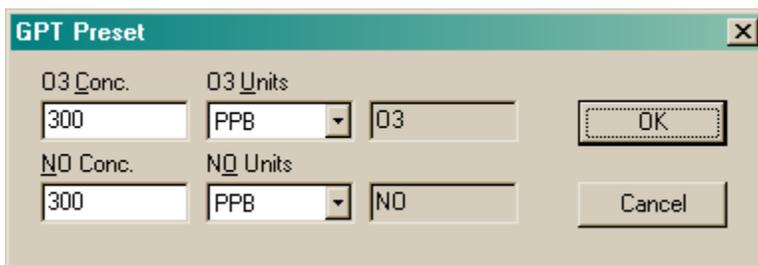
A *GPT* step will display the following property dialog.



Gas	Concentration	Units	Target
O3	300	PPB	O3
NO	300	PPB	NO

Figure 5-9: GPT Step Properties Dialog

A *GPT Preset* step will display the following property dialog.



Gas	Concentration	Units	Target
O3	300	PPB	O3
NO	300	PPB	NO

Figure 5-10: GPT Preset Step Properties Dialog

These two steps are almost identical. The properties are described in the following table.

Table 5-5: GPT and GPT Preset Step Properties

Property	Description
O3 Conc.	The numeric concentration of O ₃ gas to generate.
O3 Units	The O ₃ concentration unit to use. The TML-700 will perform any necessary unit conversions.
NO Conc.	The numeric concentration of NO gas to generate.
NO Units	The NO concentration units to use.

5.4.9. Manual Steps

A *Manual* step will display the following property dialog. The properties are described in Table 5-6.

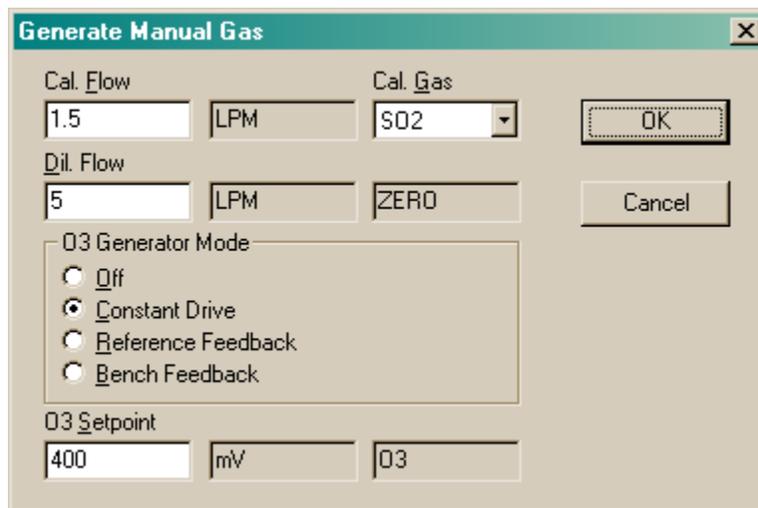


Figure 5-11: Manual Step Properties Dialog

Table 5-6: Manual Step Properties

Property	Description
Cal. Flow	Flow rate of calibration gas (LPM - liters per minute).
Cal. Gas	The gas type to generate. Although sensor-e.com permits to specify several different gases, the TML-700 may not be able to generate them all. If the TML-700 cannot generate a specified gas, it will simply generate zero air.
Dil. Flow	Flow rate of the diluent gas (LPM - liters per minute).
O3 Generator Mode	For manual GPT. If Constant Drive or Reference Feedback are selected, the units for O ₃ are mV. If Bench Feedback is selected, the units for O ₃ are PPB.
O3 Setpoint	The mV or PPB setting for O ₃ .

5.4.10. Duration Steps

Property dialog box & properties table.



Figure 5-12: Duration Step Properties Dialog

The following table describes the property shown above.

Table 5-7: Duration Step Properties

Property	Description
Duration	The duration of the step in minutes.

5.4.11. Execute Sequence Steps

Property dialog box and properties table.



Figure 5-13: Execute Sequence Step Properties Dialog

The following table describes the property shown above.

Table 5-8: Execute Sequence Step Properties

Property	Description
Sequence	The name of the sequence to edit. For convenience, all the names of existing sequences will appear in the dropdown list. However any name can be entered into the <i>Sequence</i> field. If the specified sequence does not exist when the TML-700 tries to execute this step, the TML-700 will return to standby mode.

5.4.12. Select Output Steps

Property dialog & properties table.



Figure 5-14: Select Output Step Properties Dialog

The following table describes the property shown above.

Table 5-9: Select Output Step Properties

Property	Description
Output Port	Opens output valve A or B when generating gas. Note that this is an optional feature in the TML-700. This step will be ignored if the TML-700 doesn't have this option.

5.4.13. Select Output Steps

There are two ways to control the contact closure outputs while executing a sequence. The contact closure outputs can be specified as one of the sequence properties, in which case the outputs will remain the same during the execution of the sequence. Or one or more *set CC output* steps can be inserted in a sequence, which allows to change the contact closure outputs while the sequence is executing, for example, to control other equipment. This option is only available for firmware revision E.4 or higher.

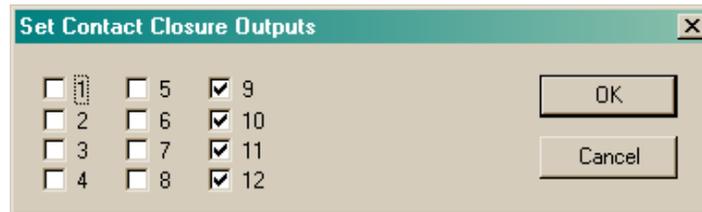


Figure 5-15: Set CC Output Step Properties Dialog

The following table describes the property shown above.

Table 5-10: Set CC Output Step Properties

Property	Description
Output Pattern	The contact closure outputs will be set to the pattern indicated by checkboxes 1–12 when the step is executed.

5.4.14. Duplicating a Step

To duplicate an existing step, select the step to duplicate and click  or right-click on the step and select **Duplicate Step** from the context menu. sensor-e.com will duplicate the step and add it to the end of the sequence, but it can be repositioned using  and  buttons.

5.4.15. Moving a Step

To move a step relative to the other steps in the sequence, select the step and reposition it using the  and  buttons.

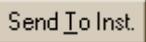
5.4.16. Deleting a Step

To delete a step from a sequence, select the step and click . Right-clicking on a step and selecting **Delete Step** from the context menu will do the same. In either case, sensor-e.com will confirm the deletion with a dialog box like the following figure. Such confirmation prompts can be disabled in the **Settings-Options** menu.



Figure 5-16: Delete Step Confirmation Dialog

5.5. Sending the Sequence Configuration to the Instrument

To send the sequence configuration to the instrument, click . **Sending the sequence configuration to the instrument will completely replace the instrument's current sequence configuration.** Therefore, sensor-e.com will confirm the operation with the following dialog box before proceeding.

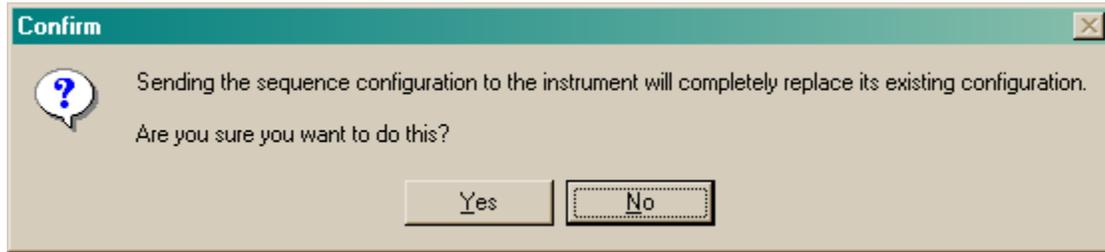


Figure 5-17: Sequence Send Configuration Confirmation Dialog

If the send operation is successful, sensor-e.com will display the following dialog box:

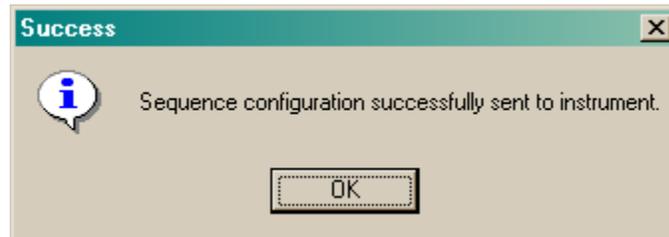


Figure 5-18: Successful Sequence Send Dialog

If the send operation is unsuccessful, sensor-e.com will display the following dialog box. Some possible causes of this error are that a sequence name contains spaces or that the instruments receive buffer overflowed while receiving the sequence configuration or that an incompatible sequence was loaded from disk and sent to the instrument. Try enabling one or more handshaking options, particularly the *Transmit Delay* option in the instrument properties dialog or trouble-shoot the configuration for compatibility.

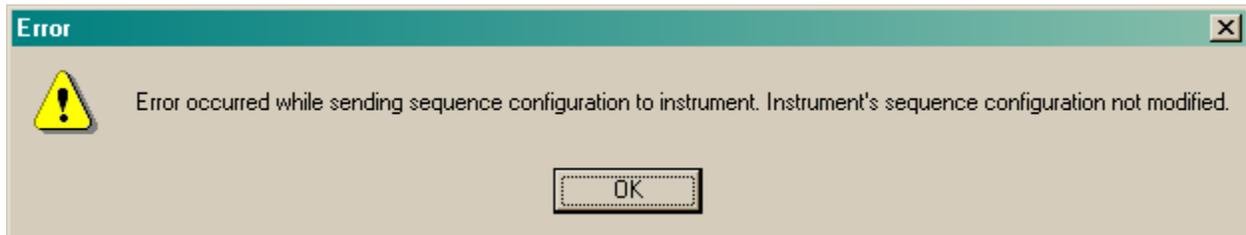


Figure 5-19: Unsuccessful Sequence Send Dialog

6. ADVANCED FEATURES

6.1. Instrument Information Dialog

Whenever sensor-e.com connects to an instrument it interrogates the instrument to determine the type of instrument and its capabilities. Since sensor-e.com supports all standard TML instruments (except industrial ozone), there are many options to be supported on an instrument-by-instrument basis.

If sensor-e.com doesn't seem to support a particular capability that the instrument has, sensor-e.com's instrument information dialog should show the capabilities sensor-e.com thinks the instrument has. This is mainly a diagnostic tool, but offers information similar to that found under the instrument's own **SETUP-CFG** menu.

To view the instrument information dialog, connect to an instrument and click on the system menu in the upper left-hand corner of the *Front Panel Window*. Then click on the **Instrument information...** menu item. This should bring up a dialog like the following. The fields shown in the dialog are described in Table 6-1.

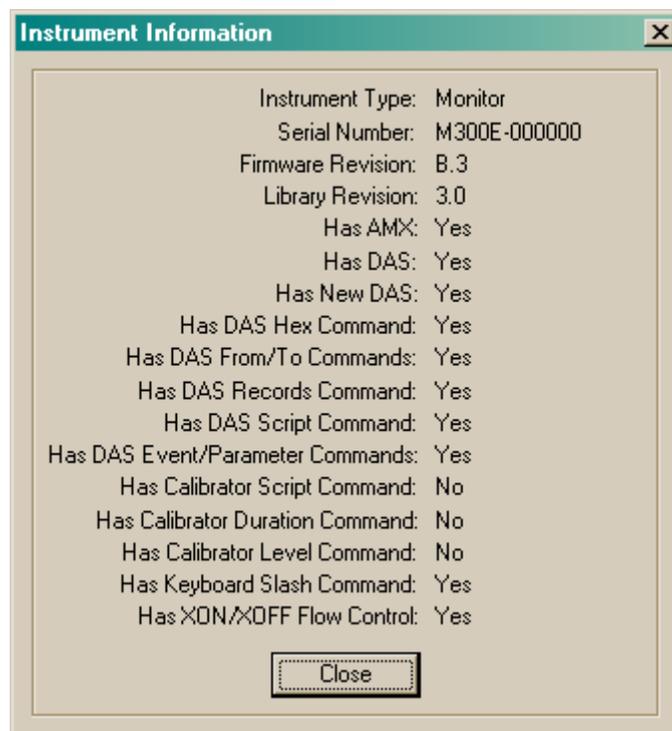


Figure 6-1: Instrument Information Dialog

Table 6-1: Instrument Information Dialog

Field	Description
Instrument Type	Monitor or Calibrator.
Serial Number	Instrument's serial number. If the instrument doesn't have a serial number, it displays "000000."
Firmware Revision	Revision number of the instrument firmware. If sensor-e.com cannot determine the firmware revision number, it displays "Unknown."
Library Revision	Revision number of the standard library used by the instrument firmware. If sensor-e.com cannot determine the library revision number, it displays "Unknown."

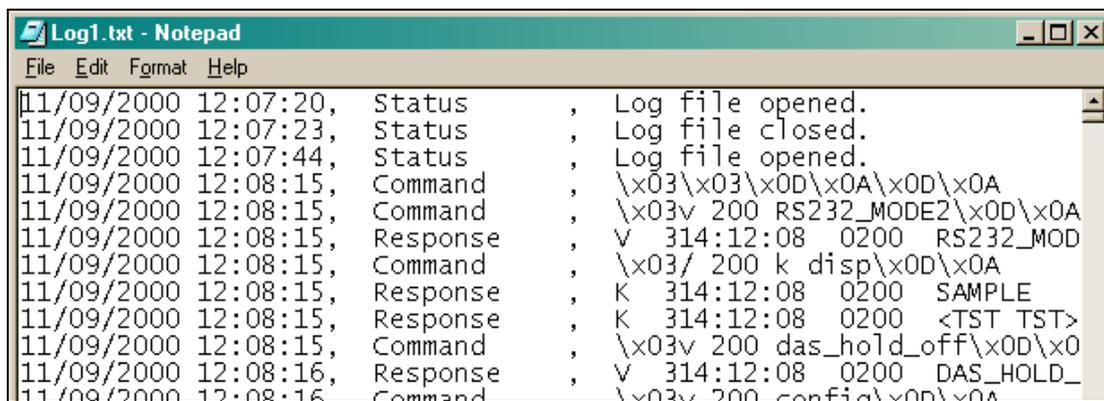
Field	Description
Has AMX	Yes = has AMX operating system. No = has older operating system.
Has DAS	Yes = Has DAS. No = Does not have DAS.
Has New DAS	Yes = Has DAS from standard library revision 3.0 that is flash-friendly and much faster. No = Earlier DAS.
Has DAS Hex Command	Yes = DAS supports <i>HEX</i> option to download records in compressed hex format. This is faster and more reliable than text format. No = DAS supports downloading records only in text format.
Has DAS From/To Commands	Yes = DAS supports <i>FROM/TO</i> options to download records by date/time. No = DAS doesn't have these options. Download by date/time range is still supported, but has to be done by sensor-e.com on the host computer rather than in the instrument.
Has DAS Records Command	Yes = DAS supports <i>RECORDS</i> option for requesting most recent records. No = DAS lacks this option.
Has DAS Script Command	Yes = DAS supports <i>SCRIPT</i> option for downloading and uploading DAS configuration. Necessary for sensor-e.com to support DAS configuration. No = sensor-e.com lacks this option. sensor-e.com can still download the configuration and data even if the instrument lacks this option.
Has DAS Event/Parameter Commands	Yes = DAS has <i>EVENT</i> and <i>PARAMETER</i> commands for requesting lists of events and parameters in instrument. Necessary for sensor-e.com to support DAS configuration. No = sensor-e.com lacks these commands. sensor-e.com can still download the configuration and data even if the instrument lacks these commands.
Has Calibrator Script Command	Yes = Calibrator supports <i>SCRIPT</i> option for downloading and uploading sequence configuration. Necessary for sensor-e.com to support sequence configuration. No = sensor-e.com lacks these commands. sensor-e.com cannot download or modify the sequence configuration if the instrument lacks this option.
Has Calibrator Duration Command	Yes = Calibrator uses the new <i>DURATION</i> step name. No = Calibrator uses the old <i>DELAY</i> step name.
Has Calibrator Level Command	Yes = Calibrator supports extensions that include the <i>LEVEL</i> command. No = Calibrator doesn't support these extensions.
Has Keyboard Slash Command	Yes = Instrument uses newer style commands for "pressing" keys and getting the display contents. No = Instrument uses very old style commands.
Has New DAS	Yes = Has DAS from standard library revision 3.0 that is flash-friendly and much faster. No = Earlier DAS.

Field	Description
Has XON/XOFF Flow Control	<p>Yes = Instrument has bi-directional XON/XOFF flow control. This is useful when using sensor-e.com to upload large DAS or sequence configurations to the instrument. This does not mean that XON/XOFF flow control is enabled in this instrument, only that it is available.</p> <p>No = Instrument either lacks XON/XOFF flow control entirely or supports it only when sending data, and not when receiving.</p>

6.2. Communication Logging

sensor-e.com has a communication logging feature that is capable of recording all commands sent to the instruments, all responses from the instruments, errors that occur, and status changes. The logging feature can be configured in the *Logging* tab in the **Settings-Options** menu.

This logging feature is intended to be used as a diagnostic tool by advanced users. For instance, when having problems connecting to an instrument, message logging shows what was transmitted to and received from the instrument. This logging feature is a simple alternative to using an external RS-232 monitor. The following figure shows a sample log file.



```

11/09/2000 12:07:20, Status, Log file opened.
11/09/2000 12:07:23, Status, Log file closed.
11/09/2000 12:07:44, Status, Log file opened.
11/09/2000 12:08:15, Command, \x03\x03\x0D\x0A\x0D\x0A
11/09/2000 12:08:15, Command, \x03v 200 RS232_MODE2\x0D\x0A
11/09/2000 12:08:15, Response, V 314:12:08 0200 RS232_MOD
11/09/2000 12:08:15, Command, \x03/ 200 k disp\x0D\x0A
11/09/2000 12:08:15, Response, K 314:12:08 0200 SAMPLE
11/09/2000 12:08:15, Response, K 314:12:08 0200 <TST TST>
11/09/2000 12:08:15, Command, \x03v 200 das_hold_off\x0D\x0A
11/09/2000 12:08:16, Response, V 314:12:08 0200 DAS_HOLD_
11/09/2000 12:08:16, Command, \x03v 200 confia\x0D\x0A

```

Figure 6-2: Sample Log File

Each log entry resides on a single line in the log file, and consists of three fields: a time stamp, a classification code (see the following table), and a message. The fields are separated by commas, making it easy to import the log file into another program. The *time stamp* field shows the date and time, to the nearest second. The time stamp has the same format as that in DAS data files saved by sensor-e.com. The *classification code* field indicates the type of log entry. It can be one of the values in the following table.

Table 6-2: Log Entry Classification Codes

Code	Description
Misc	Miscellaneous log entry (currently there are no entries of this type).
Status	Status change, such as opening or closing the log file.
Command	A command sent to an instrument.
Response	A response from an instrument.
Error	Any error, including communication errors or internal errors.

The *message* field contains the text of the log entry. It may be an error or status message generated internally by sensor-e.com, or a command sent to an instrument, or a response from an instrument. Non-printable characters are represented as hexadecimal characters of the form “\xhh”, where the “hh” part is the hexadecimal character code.

Beware that the log files can get very large. For example, if automatic display updating at 5-second intervals is enabled, sensor-e.com stores about 280 bytes per display update, per instrument in the log file. That works out to about 67.2 kbytes per hour, or about 1.6 MB per day, per instrument. Also, the log file is locked for access while sensor-e.com is running.

Timeout errors will always appear in the log file. These are not necessarily errors, though they might be. In some cases, the sensor-e.com can detect the end of a transmission of data from an instrument only by waiting for a timeout to occur. Rather than have sensor-e.com determine whether a timeout is normal or an error, it is easier to record all timeouts as errors in the log file.

APPENDIX A. FIRMWARE COMPATIBILITY

A.1. Remote (RS-232) Configuration of DAS

Whereas the basic functionality (remote control of the front panel functions) of sensor-e.com works with all of our standard analyzers, new features that are introduced from time to time may require updates of the analyzer's firmware. The DAS feature built into AMX instruments was created around 1996. But the ability to configure the DAS through the RS-232 interface wasn't added to the standard libraries until revision 2.1 in 1999.

sensor-e.com only supports configuring the DAS in the DAS Configuration Dialog if the instrument has library revision 2.1 or higher. This capability corresponds to the "Has Calibrator Script Command" field in the Instrument Information Dialog.

sensor-e.com can download the DAS configuration and data in all instruments containing the DAS because this was an original requirement of the DAS. That is why with some instruments; sensor-e.com shows the DAS Configuration Dialog but disables some buttons used for uploading DAS configuration and others.

A.2. Number of Samples in Concentration Average

Another new feature of sensor-e.com is to store the number of samples in averaged DAS concentration data.

Newer firmware also allows sensor-e.com to use the internal DAS clock when extracting a range of data (instead of "all" data). This feature speeds up download because it transfers only those data that were requested. Previous versions of sensor-e.com and older firmware revisions downloaded all data and then extracted the range of interest locally (i.e. in computer memory).