Fox Thermal

THERMAL MASS FLOW METER
& TEMPERATURE TRANSMITTER

FT4A View™

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Notice

FOX THERMAL

This publication must be read in its entirety before performing any operation. Failure to understand and follow these instructions could result in serious personal injury and/or damage to the equipment. Should this equipment require repair or adjustment beyond the procedures given herein, contact the factory at:

FOX THERMAL
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Download Technical Data Sheets from our website:
www.foxthermal.com

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Fox FT4A Manuals:
- **Model FT4A Instruction Manual**

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INTRODUCTION

Introduction

Introduction
Thank you for purchasing the Model FT4A Thermal Gas Mass Flow meter from Fox Thermal Instruments. The Model FT4A is one of the most technically advanced flow meters in the world. Extensive engineering effort has been invested to deliver advanced features, accuracy measurement performance, and outstanding reliability.

The new FT4A View™ software allows users to easily display data and configure the FT4A to their specific application parameters. Then, log flow/temperature data to an Excel® file. The software can also access the new Gas-SelectX® gas menu and the Calibration Validation diagnostic function using the CAL-V™ test.

The Model FT4A is available with two different options: the RS485 Communication option or the Pulse Output option. The FT4A View™ Software has been developed to react intuitively to the type of FT4A meter with which it is interfacing.

This Manual contains the installation and operation instructions for the FT4A View™ Software.

This manual is divided into the following sections: Introduction, Installation, Operation, Glossary and Index.

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Installation

Installation

Open the enclosure by unscrewing the enclosure cap, loosen the two captive screws on the display assembly and rotate it open. Connect the FT4A to a PC with a USB (type A, mini) cable. If the PC is connected to the internet and running Windows®, the PC will try to automatically load the VCP driver. If the driver does not load automatically, download the VCP driver at: www.ftdichip.com/Drivers/VCP.htm

> **NOTE!** The latest version of the FT4A View™ software is available for download at www.foxthermal.com/products/FT4A.php#FT4Aview

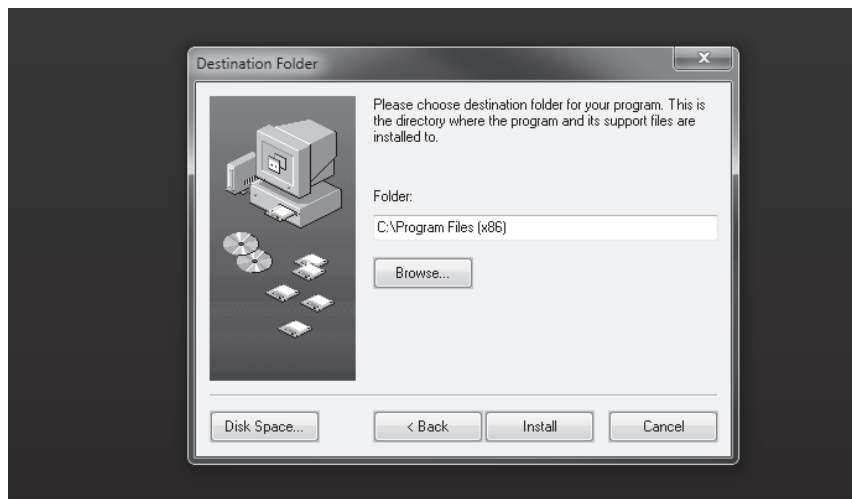*Fig. 2.1: Online Download Location for FT4A View™ Software*

1 - Choose the FT4A View™ Software Sub-menu

2 - Click the button to download software

Installation

To install the FT4A View™ program, run the "FT4AView_V#.##-setup.exe" file that is located in the downloaded file. After clicking "Next" the screen will show:

Select the folder in which you wish to install FT4A View™, then click "Install".
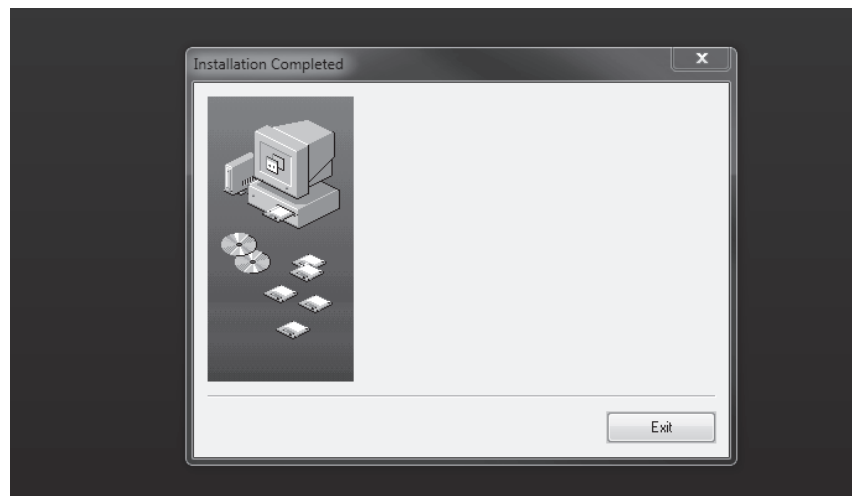
When the program is done installing, you may exit, then restart your computer.

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Installation

COM Port Assignment

Be sure to have your FT4A connected by USB to a PC or laptop before opening FT4A View™. Upon opening FT4A View™ for the first time, Windows® will assign a "virtual COM port". The COM port number that has been assigned will appear automatically in the drop down box. If the correct COM Port does not appear, go to Control Panel/Device Manager and click on Ports (COM & LPT). The COM port number should be displayed under the USB symbol.

If prompted, enter the assigned COM port in FT4A View™ by using the drop down menu and press **OK**.

NOTE! The FT4A Meter must be plugged into the computer in order for the system to register it.

Fig. 2.2: COM Port Selection Window
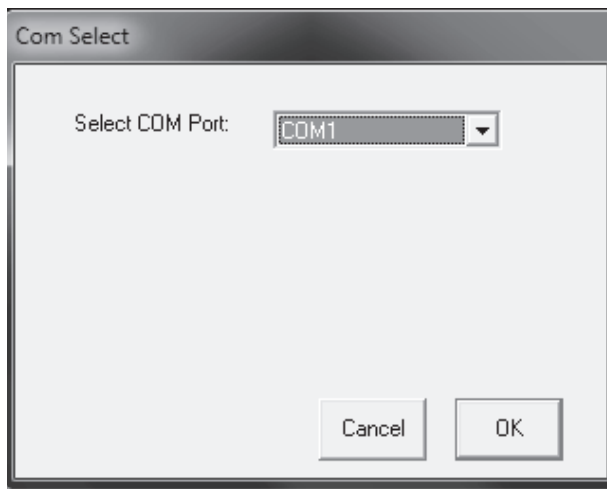
Operation

Main Screen
The image below depicts the main screen that appears upon entering FT4A View™.

Fig. 3.1: FT4A View™ Main Screen

> **NOTE!** Data on the screen is refreshed at user selected update rate. See p. 10 for more information on setting up Charts.

Charts Button
This calls up two charts that can be configured for either temperature or flow. Each chart can be individually enlarged and rescaled from the original default settings. For more information on how to change the charts settings, refer to p. 10.

> **NOTE!** It can be set for either automatic or manual scaling.

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Data Log
This function allows all selected data to be logged to an Excel® file at the specified sample time. All readings are time/date stamped. For more information on using the Data Logger function, refer to p. 17.

Configure
This allows the operator to go in and set the application parameters. This can be done either via the FT4A View™ software or manually via the instrument's display. For more information on configuring application parameters, refer to p. 12.

Simulation
This function can be used to verify that all the flow meter outputs are working properly. The easiest way to perform this check is to enter a specific temperature/flow rate. The corresponding analog outputs can be verified using a DMM and using a watch for the pulse. Refer to Page 18 for more information on how to use the Simulation function.

CAL-V™
The CAL-V™ calibration validation test can be performed while the unit is still in the pipe (even if a no flow condition cannot be established) or out of the pipe. CAL-V™ does the following:
  •   Validates the zero stability of the meter
  •   Checks thermal conductivity (heat transfer) repeatability of the sensor
The CAL-V™ calibration validation test is explained in greater detail on p. 23.

Tot24 Log
Pressing this button takes the user to a listing of totals: yesterday's total followed by 40 24-hour totals. The start time begins and is reset when the totalizer is reset

Config Log
The Configuration Log button takes the user to a listing of the meter's current configuration settings.

CAL-V™ Log
The CAL-V™ Log saves CAL-V™ data such as current CAL-V™, current CAL-V™ error %, current CAL-V™ pass/fail, previous CAL-V™ error %, and previous CAL-V™ pass/fail.
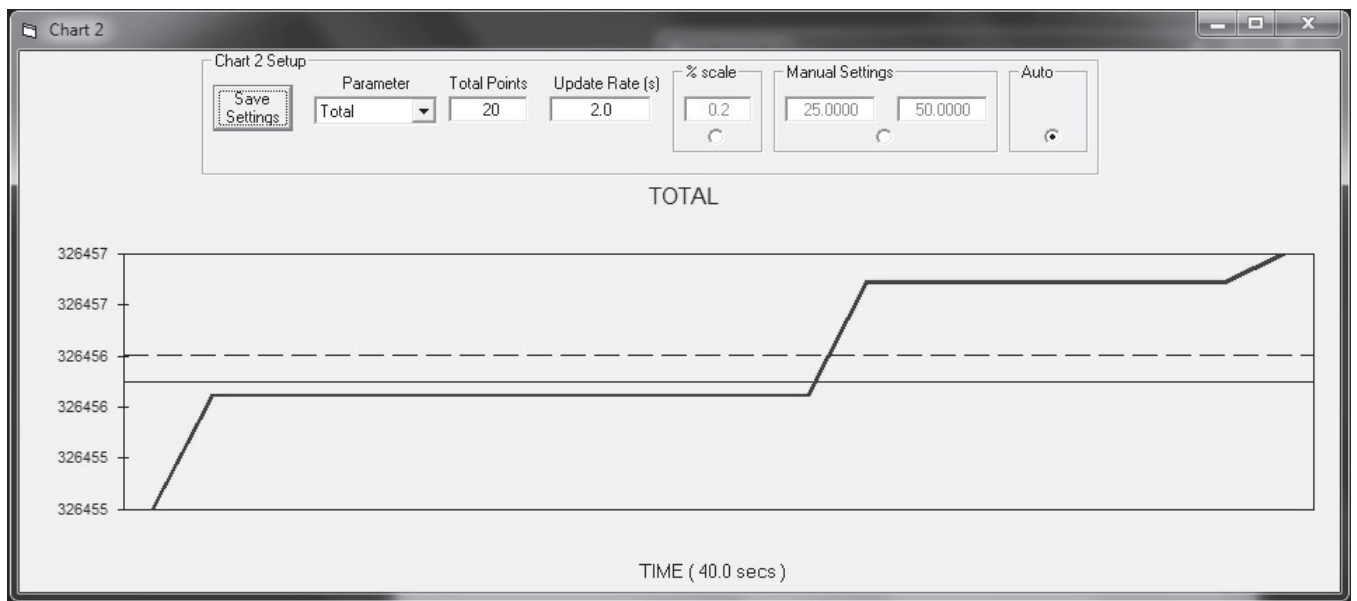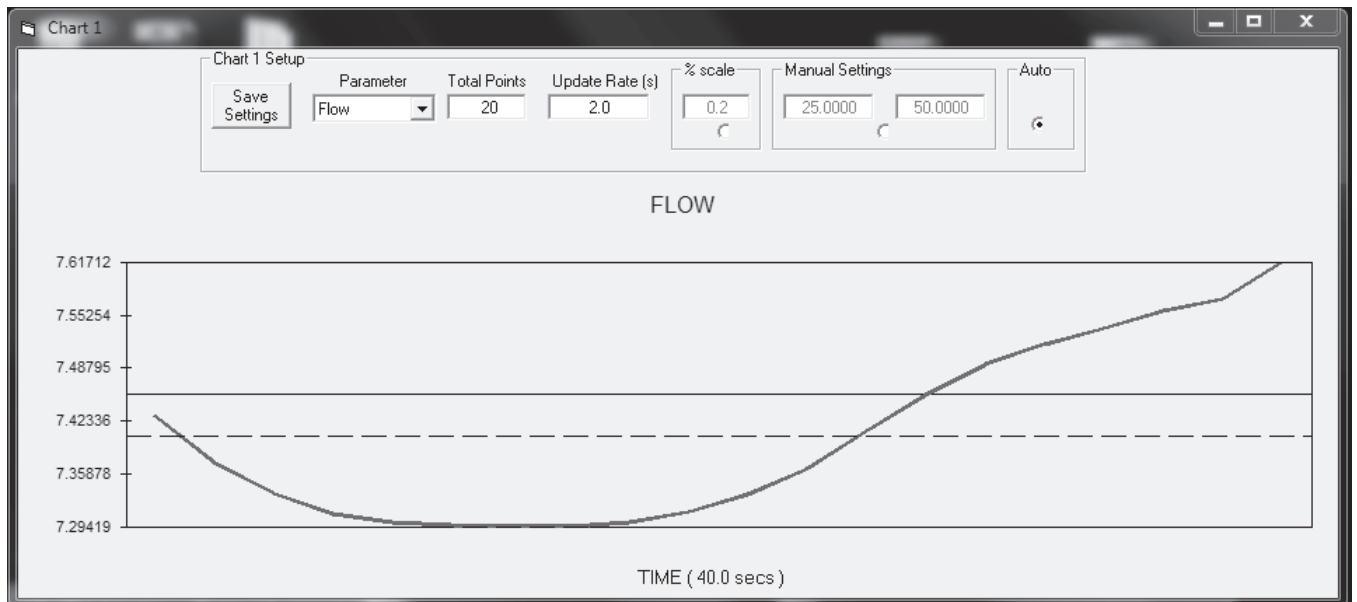
Exit
Exit the application

Operation

Charts Settings

From the main menu screen, click on "Charts". Two charts, one for flow and the other for temperature, will appear side-by-side.

Fig. 3.2: Chart Settings Window - Charts 1 and 2

Each chart can be selected for flow, temperature or total flow and scaled in one of three ways: a plus/minus percent scale, inputting min/max values manually, or real-time automatic scaling.

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Save Setting
The user can save any new chart settings on the main page window. These settings can then be closed by clicking on the "X" at the top right corner of the window.

Parameters
All meter operating parameters can easily be selected for charting: flow, temperature or total flow.

Total Points
The total points specifies the number of points plotted on the graph. Older data is automatically omitted.

Update Rate
The update rate controls the data refresh rate.

Percent (%) Scale
This sets the scale to a plus/minus specified percentage from the initial measured value. Typically, the minimum/maximum is scaled at plus/minus 10% of that initial value.

Manual Chart Setting
The Manual mode allows a user to input min/max values for chart scaling. When entering new values, press enter for them to take effect.
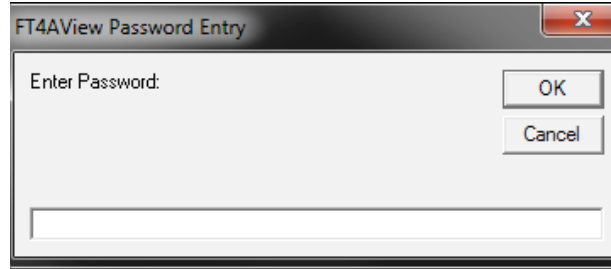
Automatic Chart Setting
Automatic mode lets the program adjust the scaling on a real-time basis based on the entire range of values.
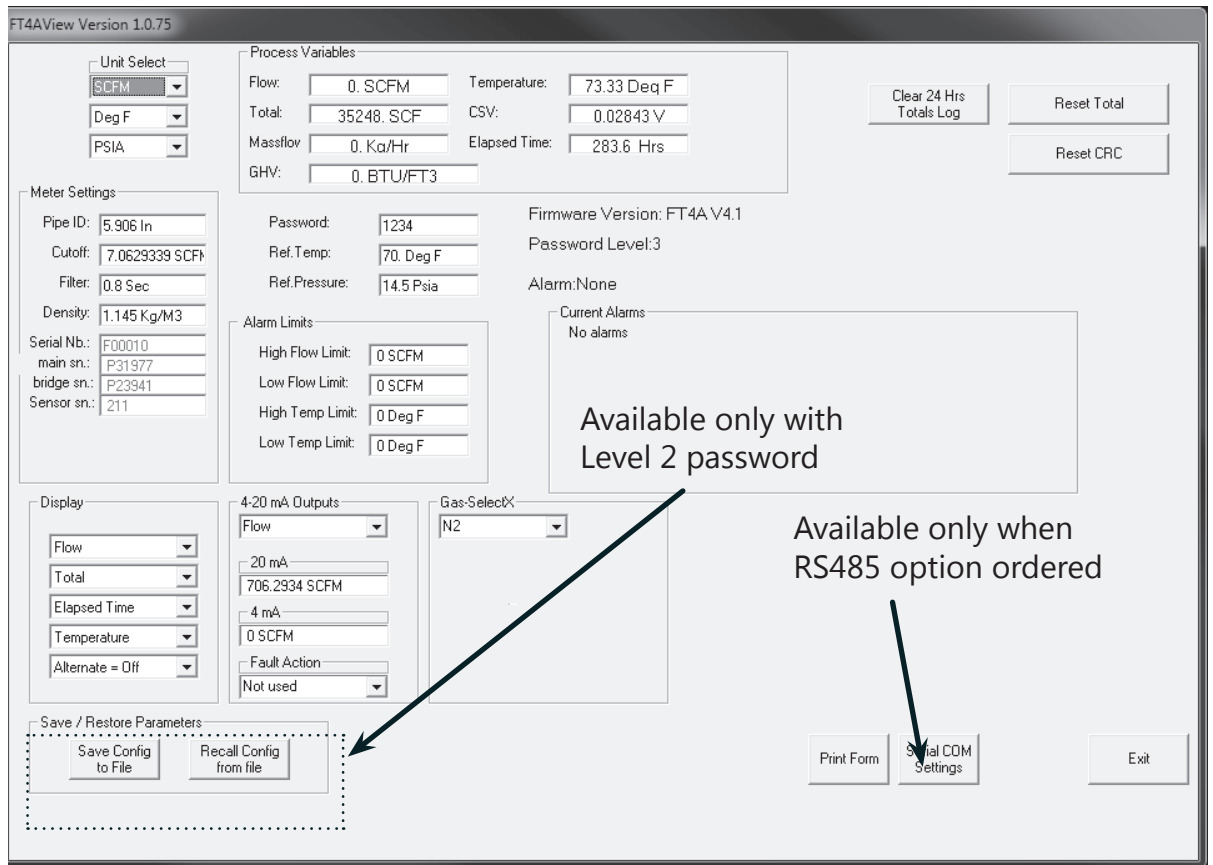
Operation

Configure

From the main menu, click on the "Configure" button and enter the requested password for either Level I (1234) or Level II (9111) access.

Fig. 3.3: Password Window

NOTE! Most users will only need access to the Level I screen to do basic setting of units, alarms and output scaling.

Fig. 3.4: Level II Configuration Screen - RS485 Option

Available only with Level 2 password

Available only when RS485 option ordered

NOTE! The "Save/Restore Parameter" options in both Figures 3.4 and 3.5 are not available using a Level 1 password.

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Fig. 3.5: Level II Configuration Screen - Pulse Output Option

The FT4A View software is an intuitive program that recognizes the meter configuration automatically. The meter configuration determines whether the screen in Fig 3.4 or 3.5 will appear.

The RS485 settings can be accessed by clicking on the "Serial COM Settings" button highlighted by the arrow in Figure 3.4.

The Pulse Output settings can be accessed in the "Frequency Output Configuration" and "Digital Output Select" fields highlighted by the two arrows in Fig. 3.5.

Unit Select
The "Unit Select" section is used to change the desired units in the flow rate, temperature and reference pressure parameters.

Process Properties
   Pipe Inner Diameter (ID): The pipe inner diameter can be entered in either inches or millimeters, depending on whether the flow or mass measurement units selected are metric or US standard. Once entered, the program will automatically recalculate the pipe cross-sectional area for the velocity/flow calculations. A precise ID is required to ensure accurate flow measurement.

Operation

Process Properties (Cont'd)

Cut-off: A gas flow rate at - or below - the cut-off setting will cause the meter to read zero. Default cut-off is set to 1% of maximum flow value.

Filter: Changing this value will increase or decrease the damping of the flow rate reading. Increase the setting to increase damping. The default setting is 0.8 (see FT4A Manual for more details).

Serial Numbers: Serial numbers of the meter, the main board, bridge and sensor (factory set).

Display
With the top four drop-down boxes, the user can choose the data to display. By selecting "Alternate", the screen automatically switches between the data screens.

Alarm Limits
Users can set both high/low alarms for both flow and temperature. When a limit is reached, an alarm message is displayed. In addition, if the meter's digital output is activated, breaching the alarm limit automatically activates a discrete output to control an external buzzer, light or some other way to alert the operator.

Analog 4 to 20 mA
The FT4A has one analog 4 to 20 mA output that is configurable for either flow or temperature. Though the FT4A will already be scaled for the specific application coming from the factory, FT4A View™ allows the operator to easily re-scale the 4 to 20 mA output as needed.

Process Variables
Flow: Current flow rate in selected units
Total: Cumulative mass or volume flow in selected units
Velocity: Flow velocity
Temperature: Gas temperature (Fahrenheit or Celsius)
CSV: Current sense voltage
Elapsed Time: Time since the Totalizer was reset

Reference Conditions
Reference temperature and pressure are the standard (or normal) temperature and pressure (STP) for which the flow rate is calculated.

Gas-SelectX®
This menu allows the user to choose from a list of gases. More information on Gas-SelectX® can be found on p. 20.

OPERATION

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Digital Output Select
This selection configures the FT4A digital output for either pulses (counts) or as an alarm discrete output.

If the pulses (counts) output is selected, it can be programmed in three different ways using the pull-down menu "Frequency Output Configuration".

- Maximum flow and maximum frequency
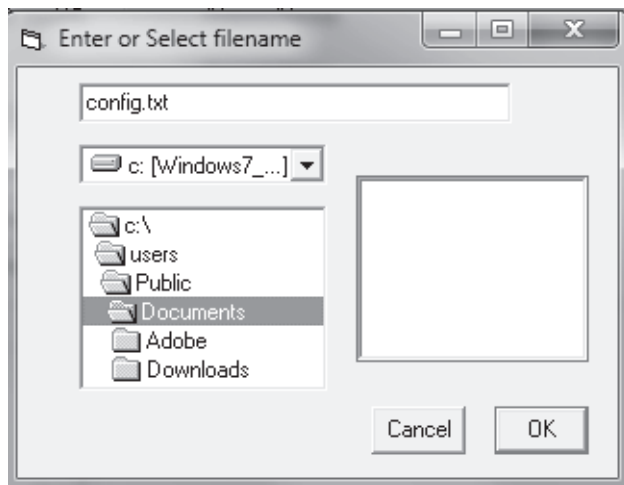- Pulses per Unit
- Units per Pulse

NOTE! This is only available on a meter configured for Pulse Output. If RS485 option has been ordered, the Pulse option is not available.

Save Current Configuration to File
The current configuration parameters are saved to a text file.

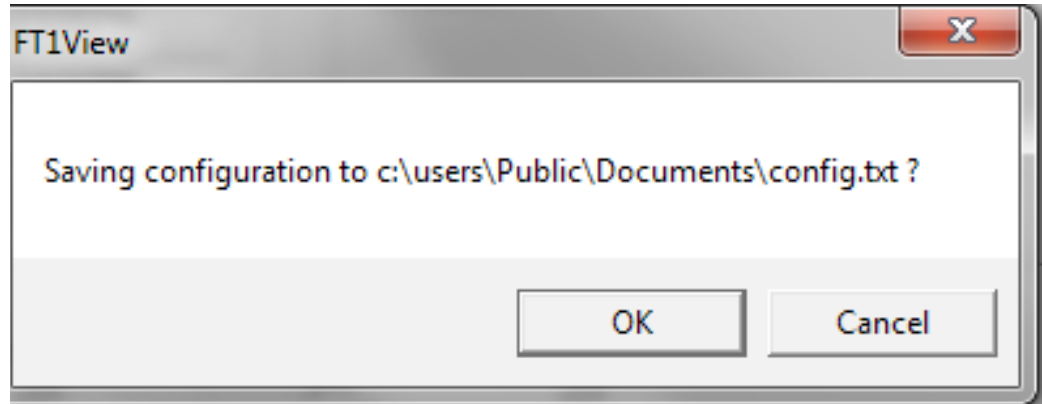*Fig. 3.6: Save Current Configuration to File Window*

Select an existing file to overwrite or a new file name and then press **OK**. A confirmation window will be shown.

NOTE! This feature is only accessed with a Level II password.

Fig. 3.7: Confirmation of Saved Configuration Window

Recall Configuration to File
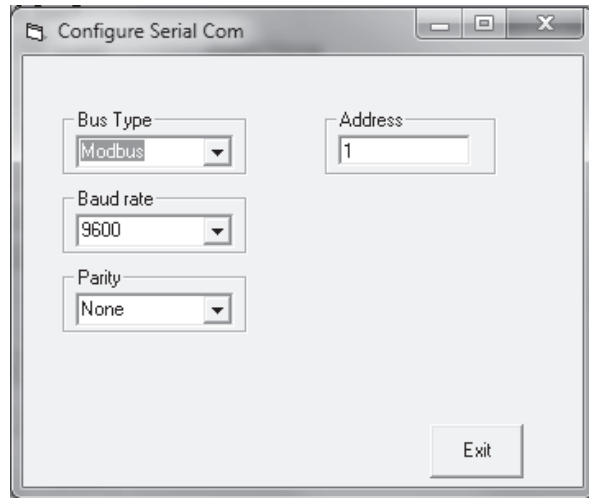This allows the operator to recall an existing FT4A configuration file.

NOTE! This feature is only accessed with a Level II password.

Serial COM Settings
Use this function to set the serial communication settings for any of the optional FT4A bus communication boards.

Fig. 3.8: Select Serial Communication Window

NOTE! This is only available on a meter configured for RS485 Modbus RTU or HART. If the Pulse Output option has been ordered, the RS485 Modbus RTU option is not available.

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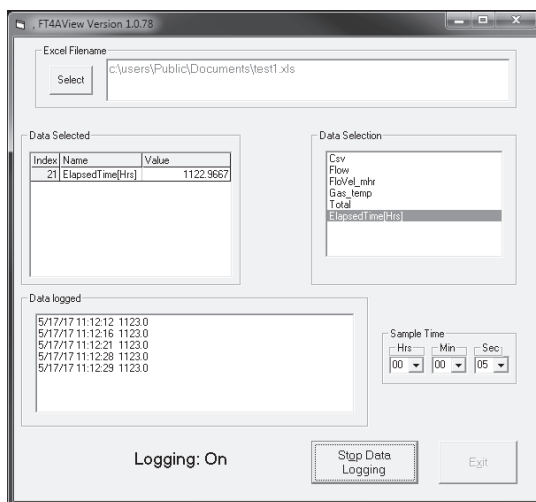
Operation

Data Logger

The Data Logger screen can be accessed from the main screen. Clicking the "Data Logger" function will prompt the user for a password. Enter a Level I or Level II password and the Data Logger window will appear.

Fig. 3.11: Data Logger Window - Logging Turned Off
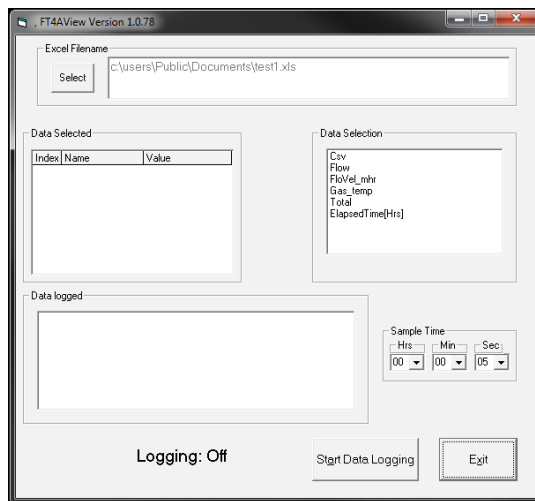
Select the sample time from the drop down menu, and then select the required data from the Data Selection list. Select or create a name for the Excel® file and then press the "Start Data Logging" button.

Fig. 3.12: Data Logger Window - Logging Turned On
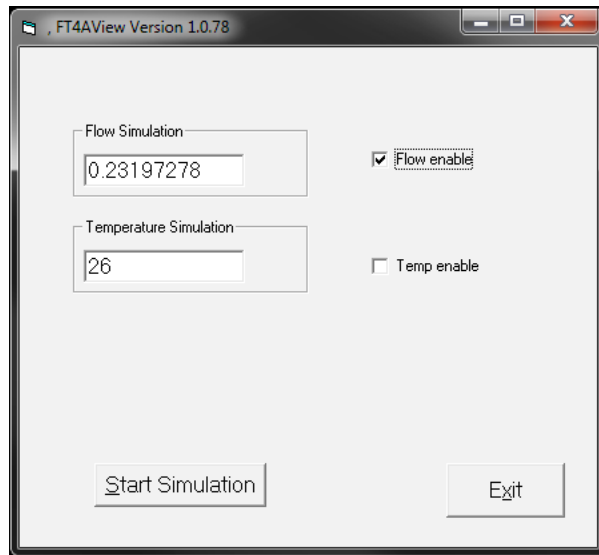

When "Start Data Logging" is pressed, the data is recorded in the specified Excel® file - and also displayed in the Data Logged window. Pressing "Stop Data Logging" ends data acquisition.
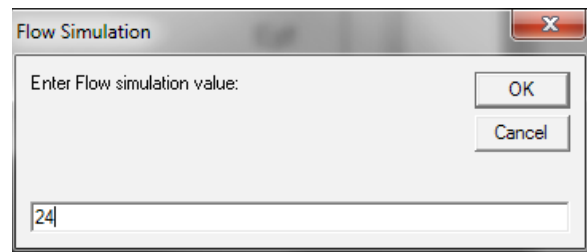
Operation

Simulation Mode

After clicking on "Simulation", a password will be requested. Enter the password and then the Simulation screen will be shown.

Fig. 3.13: Simulation Mode Window

The simulation mode simulates flow rate, temperature and/or CSV. Click on the required data and enter a value. Simulation mode allows users to verify the analog output, digital outputs and totalizer at simulated flow rates and temperature.
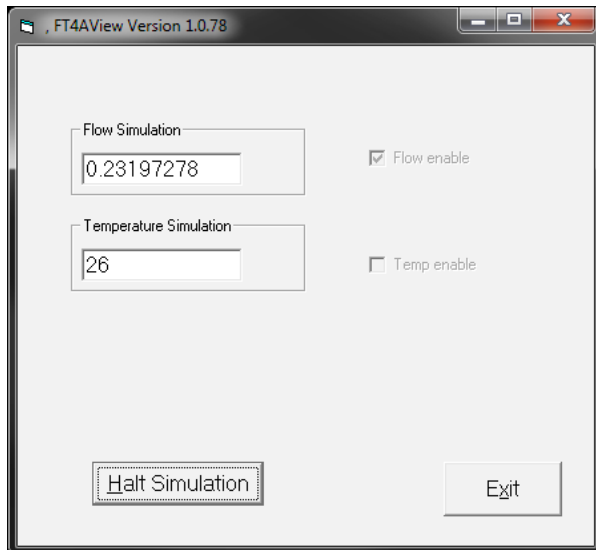
Fig. 3.14: Entering a Simulation Value

Enter the value, click **OK**, select the corresponding checkbox, and press "Start Simulation".

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Fig. 3.15: Simulation Running

In Simulation mode, all FT4A outputs and the Totalizer respond as if in normal measurement mode. Click "Halt Simulation" to end.

Operation

Gas-SelectX® Gas Menu

This menu allows the user to select a gas or gas mix from a pre-calibrated list of gases/gas mixtures available on the Fox Model FT4A flow meter. When entering the FT4A gas menu the user will have three choices:

1. Pure Gas Menu (PUR) - a list of 11 gases
2. Gas Mix (MIX) - a mixture of any gases available in the Pure Gas menu except Natural Gas (total must equal 100%)
3. Oil & Gas Mix (O&G Mix) Menu - any combination of the 12 gases in the Oil & Gas menu (total must equal 100%)

Pure Gas Menu	Mixed Gas Menu**	O & G Gas Menu**
Air	Air	Methane (C1)
Argon	Argon	Ethane (C2)
Butane	Butane	Propane (C3)
Carbon Dioxide (CO2)	Carbon Dioxide (CO2)	i-Butane (C4)
Methane	Ethane	n-Butane (C4)
Natural Gas *	Methane	Pentanes (C5)
Nitrogen	Nitrogen	Hexanes (C6)***
Oxygen	Oxygen	Carbon Dioxide (CO2)
Helium	Helium	Nitrogen
Hydrogen	Hydrogen	Heptanes (C7)**
Propane	Propane	Octanes (C8)**
		Nonanes+ (C9+)****

Natural gas refers to pipeline quality dry natural gas, whereas naturally occurring gas from oil fields constitutes a special gas mix of which the composition is to be entered in the O&G gas menu.

*** The molar mass of the gases are programmable in 0.1% increments. Gases may be mixed in any proportion equaling 100%. Round compositions to the nearest percentage; rounding errors to be added/subtracted to Hexanes (C6).*

****Per BLM 43 CFR subparts 3175.119 and 3175.126: when the concentration of C6+ (C6 and higher) is less than 0.5 percent, Heptanes, Octanes and Nonanes+ can be combined with Hexanes and will be considered Hexanes+. Users electing to use this method must enter the 60% n-hexane, 30% n-heptane and 10% n-octane concentration as the Hexanes concentration and enter 0% in heptanes, octanes, and nonanes fields.*

*****Total of all gases C9 & greater (C9+).*

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Fig. 3.16: Gas-SelectX® Menu in Configuration Screen
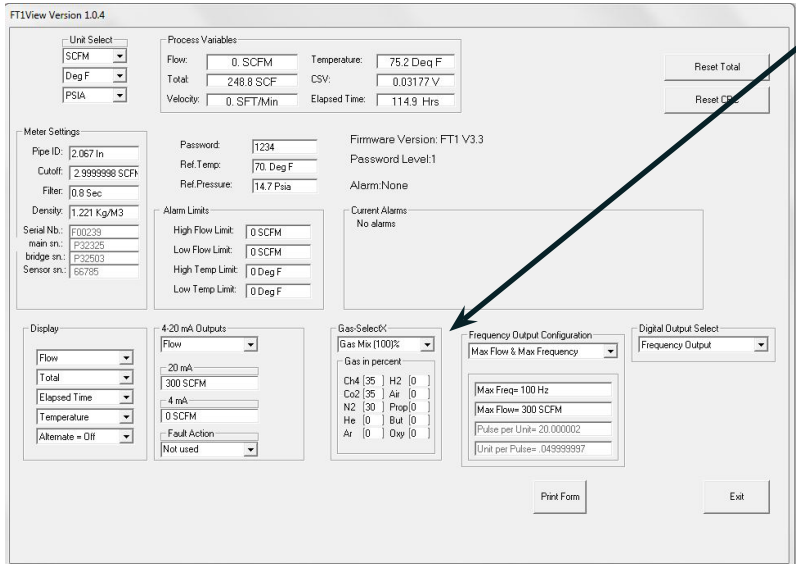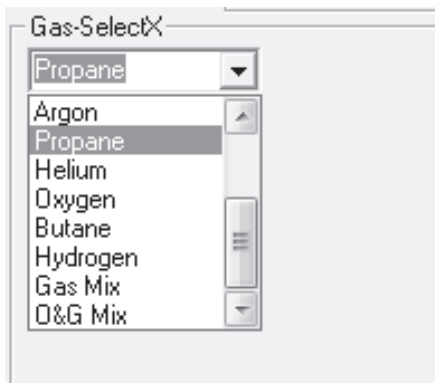

Gas-SelectX® Menu location

NOTE! A list of pure and mixed gases available on the FT4A flow meter are kept on the Fox website at www.foxthermal.com.

NOTE! Gases are in mole percentages

Fig. 3.17: Setting the Gas-SelectX® Gas

Operation

Fig. 3.18: Setting the Gas-SelectX® Gas Mix

Fig. 3.19: Setting the Gas-SelectX® Oil & Gas Gas Mix

OPERATION

In the first example, Propane has been chosen from the list of gas options. The last two options are "Gas Mix" and "O&G Mix". When the "Gas Mix" or "O&G Mix" options are chosen, a series of additional gas concentration fields will appear. Each field is labeled according to the gases available in that menu. A default amount will appear in each field, but these can be changed to any percentage between 0.0 and 100.0. All remaining gases **not** used in the Gas Mix must be changed to 0.0. The total for the gases chosen for the mix must equal 100.0%.

NOTE! If the total of the three gases is greater or less than 100.0%, an alarm will show. Adjust the percentages until 100.0% is achieved.

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Operation

CAL-V™

CAL-V™ is performed to verify the proper operation of the FT4A Fox meter. From the Main Menu, click on the "CAL-V" button to access the CAL-V™ Menu Window.

Fig. 3.20: CAL-V™ Menu Window
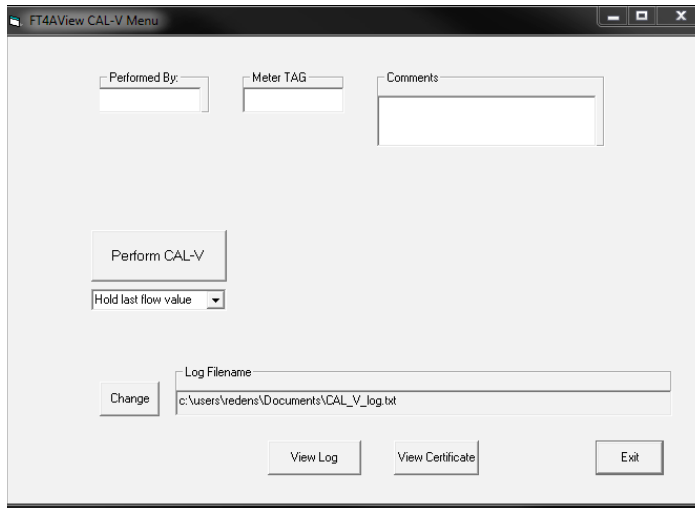
On the CAL-V™ Menu, there are fields to enter information about the person performing the test, meter tag information, and any other important information may be entered into the comments area.

A drop-down menu allows the user to choose between these two options:
  • Flow goes to Zero during CAL-V™
 • Flow holds the last value during CAL-V™

The user can also specify a particular folder name and location for the data to be stored in a log to access test results at later times.

Please note that the test will take about four minutes. The flow measurement will stop and go to zero for this period unless the "hold last value" option has been chosen.

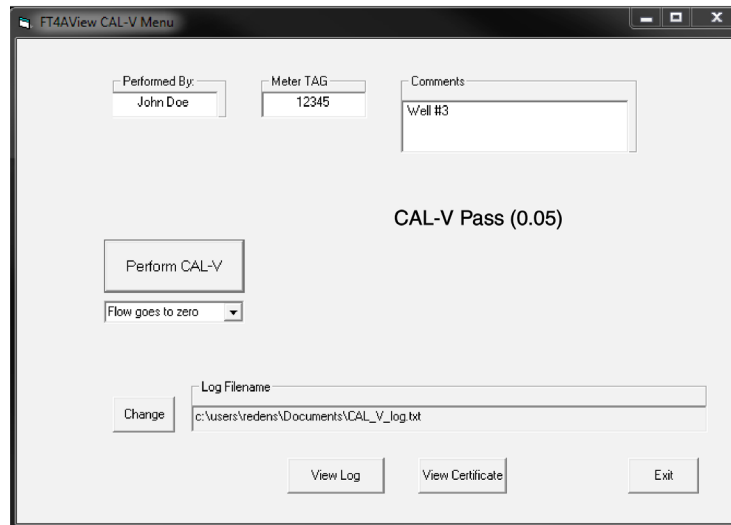When ready to start, click the "Perform CAL-V Verify" button.

Operation

Fig. 3.21: Running a CAL-V™ Test
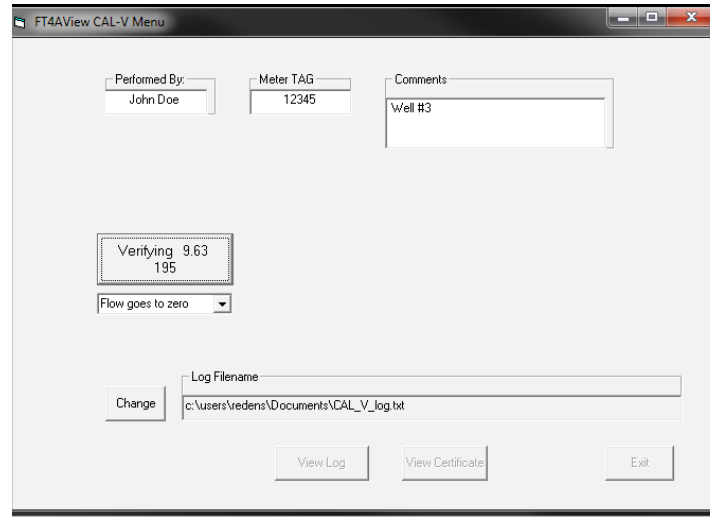
The CAL-V™ test window will display the current calculated value as the microprocessor adjusts current to the sensor. At the end of the test, a Pass/Fail message will be displayed.

Fig. 3.22: CAL-V™ Check Results Window

Operation

CAL-V™ Certificate

The "CAL-V™ Certificate" button will display the latest certification. When performing CAL-V™, all the data is logged into a CAL-V™ log file with all pertinent data, including the serial number. You can choose to create multiple logs by changing the file name and location on the CAL-V™ window. A laptop can be used to perform the CAL-V™ on a different FT4A meter. When a CAL-V™ certificate is requested, the program will search the log file for the specific serial number and will display only the last check performed.
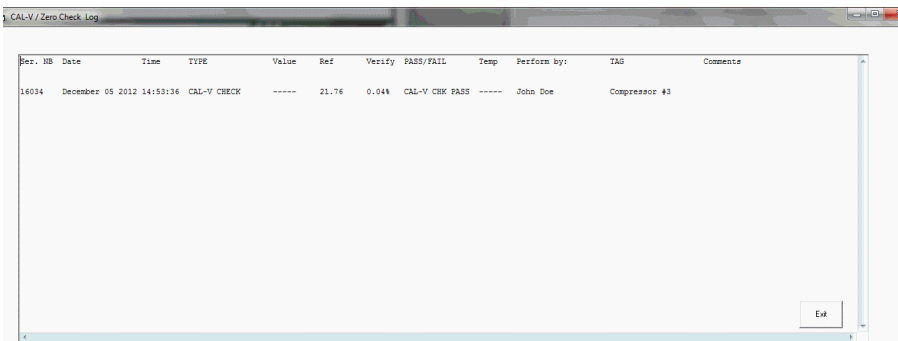
Fig. 3.23: CAL-V™ Certificate

Diagnostic Tests Log

The Diagnostic Tests Log button allows the operator to view a log of previous CAL-V™ checks that have been run on the meter. Be sure to access the correct log by choosing the correct file name in the CAL-V Log Filename box.

Fig. 3.24: CAL-V™ Log

Definitions

COM	Communication
CSV	Current Sense Voltage
DMM	Digital Multimeter
ID	Inner Diameter
mA	Milliamps
PC	Personal Computer
RTD	Resistance Temperature Detector
STP	Standard Temperature and Pressure
TSI	Temperature Sense Current

APPENDICES

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APPENDICES

Notes and Information

Definition of Terms