TM500™ View Software
Instruction Manual

Document: S-IM-TM500 | Rev A_PN 113322

www.sierrainstruments.com

GLOBAL SUPPORT LOCATIONS: WE ARE HERE TO HELP!

For Global Service Centers, go to http://www.sierrainstruments.com/facilities.html

CORPORATE HEADQUARTERS

5 Harris Court, Building L Monterey, CA 93940
Phone (831) 373-0200 Fax (831) 373-4402
info@sierrainstruments.com
www.sierrainstruments.com

EUROPE HEADQUARTERS

Bijlmansweid 2 1934RE Egmond aan den Hoef
The Netherlands
Phone +31 72 5071400 Fax +31 72 5071401
sales@sierrainstruments.nl

ASIA HEADQUARTERS

Second Floor Building 5, Senpu Industrial Park
25 Hangdu Road Hangtou Town
Pu Dong New District, Shanghai, P.R. China
Postal Code 201316
Phone: + 8621 5879 8521 Fax: +8621 5879 8586

Warnings and Cautions

General Safety Information

We use caution and warning statements throughout this book to draw your attention to important information.

Symbol Key		
Symbol	Symbol Meaning	Description
	Warning	This statement appears with information that is important to protect people and equipment from damage. Pay very close attention to all warnings that apply to your application.
	Caution/Note	This statement appears with information that is important for protecting your equipment's performance. Read and follow all cautions that apply to your application.

CAUTION

- Caution! Before making adjustments to the TM500, verify the flow meter is not actively monitoring or reporting to any master control system. Adjustments to the electronics will cause direct changes to flow control settings.

- Caution! All flow meter connections, isolation valves and fittings for hot tapping must have the same or higher pressure rating as the main pipeline.

- Caution! The flow meter electronics and sensor probe have been manufactured and calibrated to operate as a unit. The flow meter will not operate properly if parts are replaced from another meter.

- Caution! Printed circuit boards are sensitive to electrostatic discharge. To avoid damaging the board, follow these precautions to minimize the risk of damage:
  - before handling the assembly, discharge your body by touching a grounded, metal object
  - handle all cards by their edges unless otherwise required
  - when possible, use grounded electrostatic discharge wrist straps when handling sensitive components

Notice

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:

Sierra Instruments
5 Harris Court, Building L
Monterey, CA 93940
North America: 1-831-373-0200
www.sierrainstruments.com

Sierra Instruments believes that the information provided herein is accurate however be advised that the information contained herein is NOT a guarantee for satisfactory results. Specifically, this information is neither a warranty nor guarantee, expressed or implied, regarding performance; merchantability; fitness; or any other matter with respect to the products; nor recommendation for the use of the product/process information in conflict with any patent. Please note that Sierra Instruments reserves the right to change and/or improve the product design and specification without notice.

Introduction

Thank you for purchasing the TM500™ Thermal Gas Mass Flow Meter from Sierra Instruments. The TM500 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 TM500-View™ software allows users to easily display data and configure the TM500 to their specific application parameters. The software can also access the Gas-Mix™ menu, the TM-Cal™ calibration validation diagnostic test, and log flow/temperature data to an Excel file.

The TM500 is available with Modbus or HART communication options and the Gas-Mix option. The TM500-View software has been developed to react intuitively to the type of TM500 meter with which it is interfacing.

This manual contains the installation and operation instructions for the TM500-View software.

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

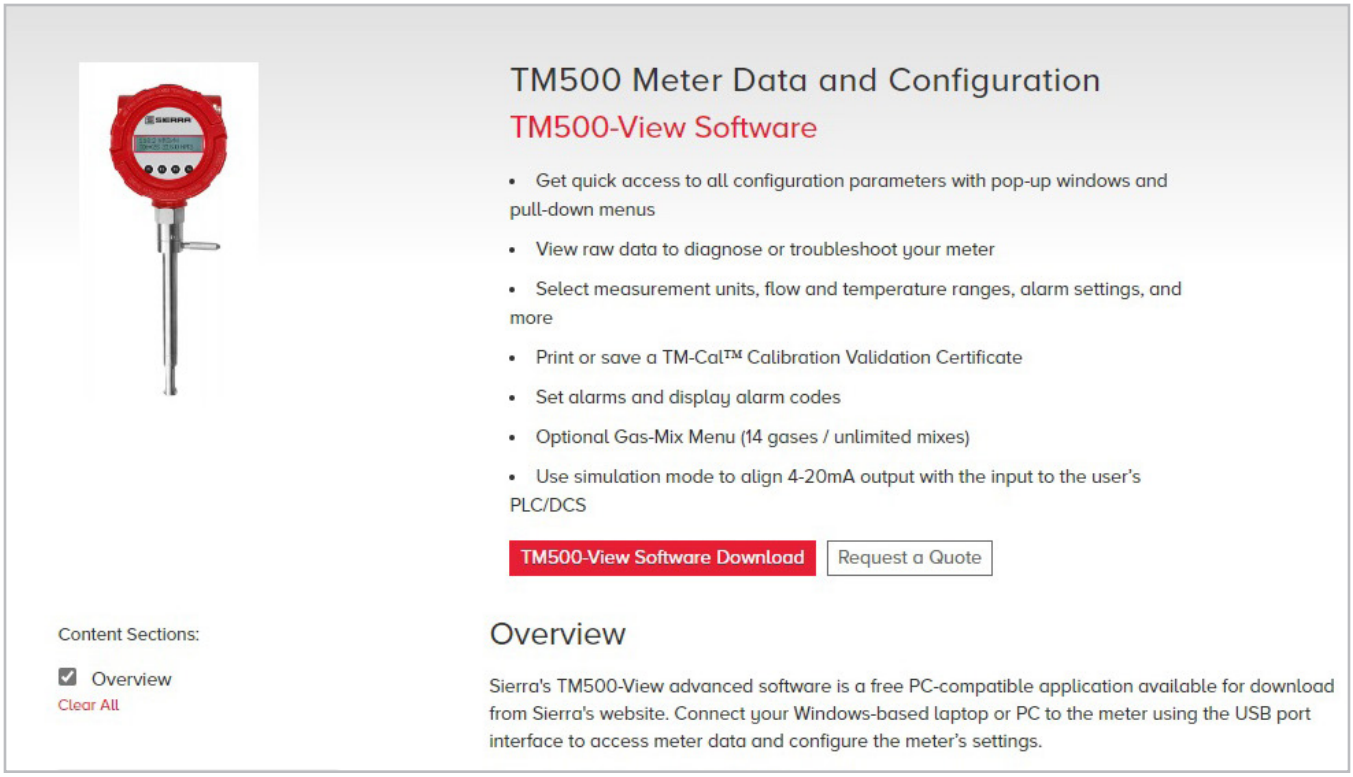
Installation

Unscrew the rear enclosure cap to access the wiring terminals and USB communication port. Connect the TM500 to a PC with a USB (type A, micro 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

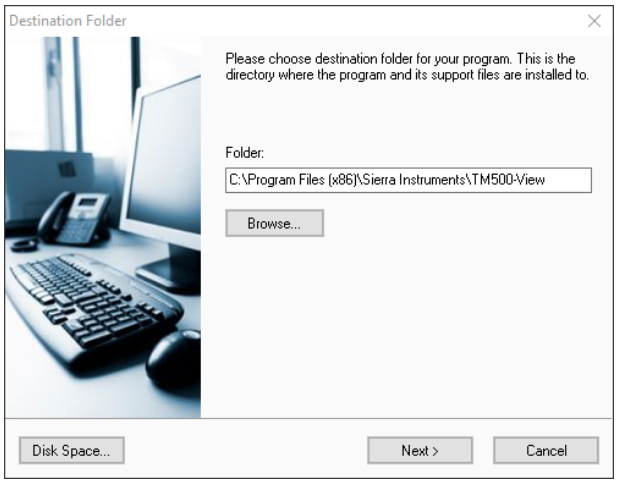
NOTE! The latest version of the TM500-View™ software is available for download at https://www.sierrainstruments.com/products/upgrades/tm500-view.html

Fig. 2.1: Online Download Location for TM500-View™ software

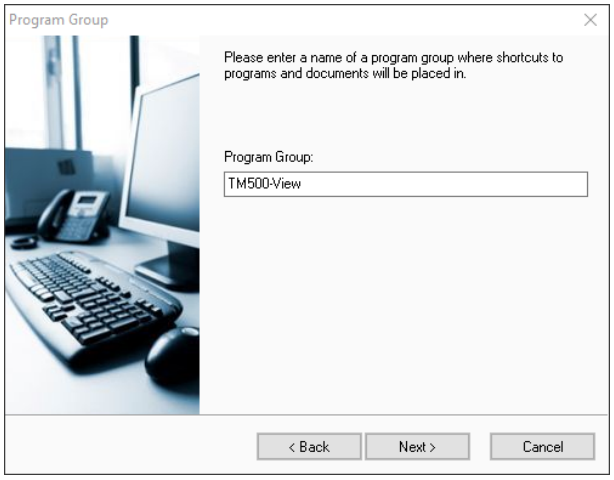
1 - Click on the TM500-View™ software download button



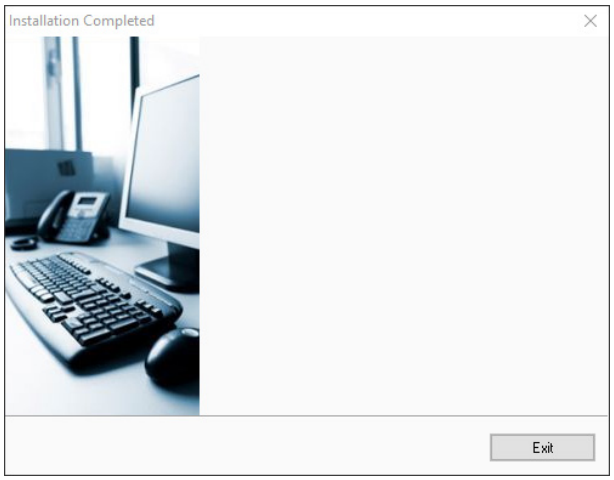
To install the TM500-View™ software program, run the "TM500-View software_V#.##-setup.exe" file that is located in the downloaded file. After clicking "Next" the screen will show:



Select the folder in which you wish to install TM500-View software, then click "Install."



When the program is done installing, you may exit, then restart your computer.



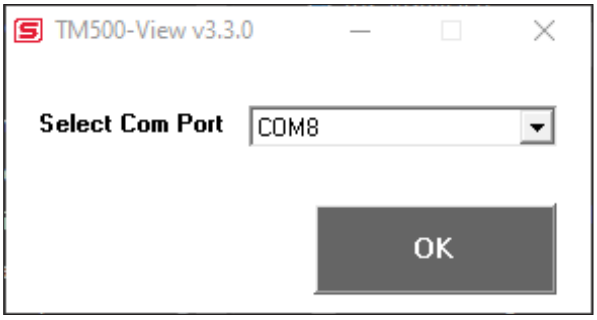
COM Port Assignment

Be sure to have your TM500 connected by USB to a PC or laptop before opening TM500-View software. Upon opening TM500-View software 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 TM500-View software™ by using the drop down menu and press **OK.**

NOTE! The TM500 meter must be plugged into the computer in order for the system to register it.

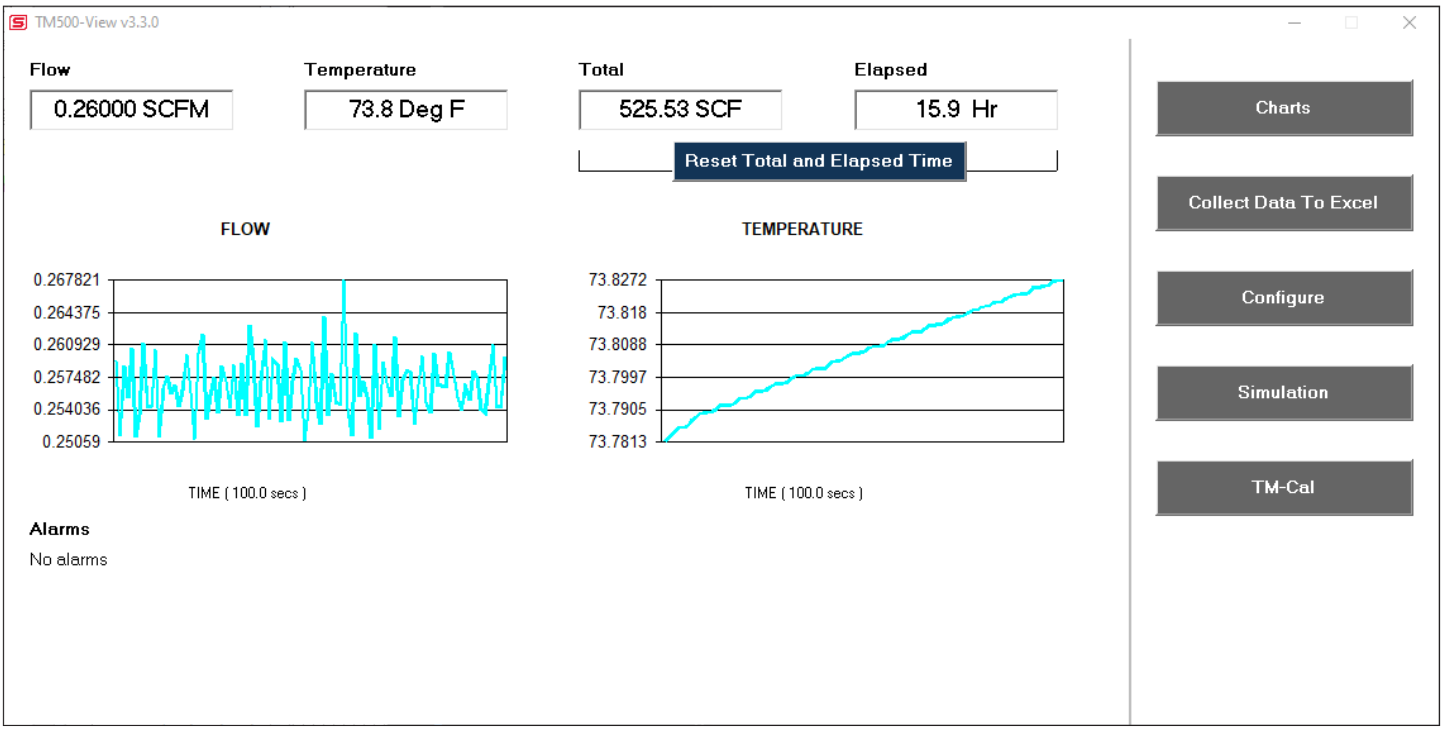
Fig. 2.2: COM Port Selection Window



Main Screen

The image below depicts the main screen that appears upon entering TM500-View software.

Fig. 3.1: TM500-View™ software Main Screen



Charts Button

This calls up two charts that can be configured for either temperature or flow. Each chart can be individually enlarged and re-scaled from the original default settings. For more information on how to change the charts settings, refer to p. 12.

NOTE! The charts are refreshed at user selected update rate. See p. 12 for more information on setting up charts.

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 "Data Logger" on page 17.

Configure

This allows the operator to go in and set the application parameters. This can be done either via the TM500-View™ software or manually via the instrument's display. For more information on configuring application parameters, refer to p. 14.

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 timer for the pulse. Refer to p. 18 for more information on how to use the Simulation function.

TM-Cal™

Sierra Instruments has developed the TM-Cal™ Calibration Validation to help our customers avoid sending the meter back for annual or biennial re-calibrations. Calibration Validation allows our customers to validate the accuracy and functionality of the meter in the field with the push of a button. By performing a simple test, the operator can verify that the meter is running accurately. TM-Cal™ ensures the repeatability, functionality of the sensor and its associated signal processing circuitry, and cleanliness of the sensor.

The TM-Cal™ calibration validation test can be performed while the unit is still in the pipe. The TM-Cal™ calibration validation test is explained in greater detail on p. 21.

Alarms

The unit can be configured for high/low alarms for either flow or temperature. The "alarms window" displays any alarms or warnings.

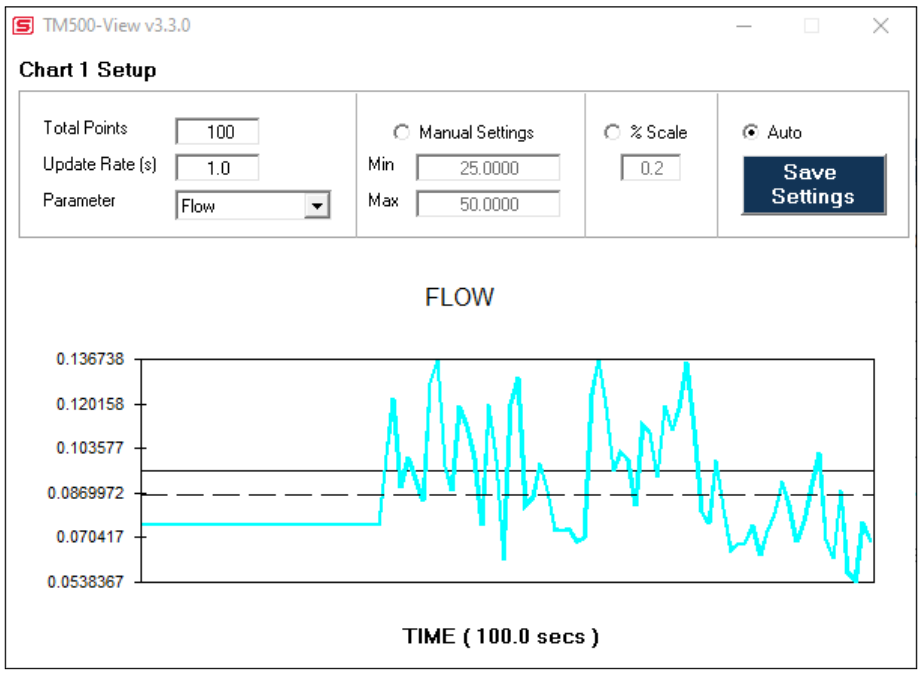
Exit

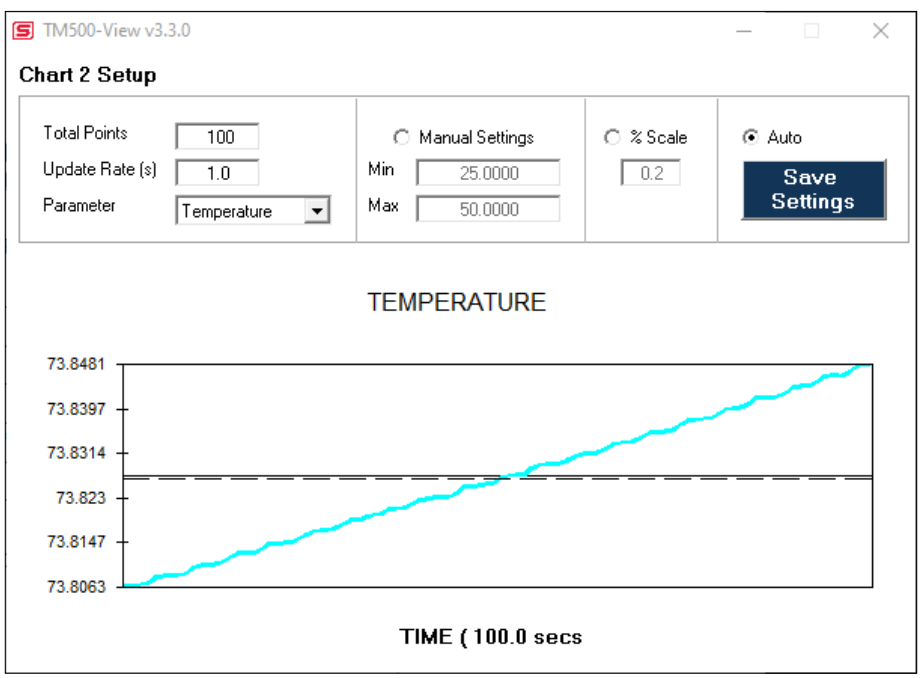
Exit the application.

Charts Settings

From the main menu screen, click on "Charts". Two charts will appear side-by-side. 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.

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





Save Setting

Click the Save Settings button to save the chart settings to the main page window. These settings can then be closed by clicking on the "X" at the top right corner of the window.

Parameters

Flow, temperature or total flow can easily be selected for charting.

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, click on Save Settings 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.

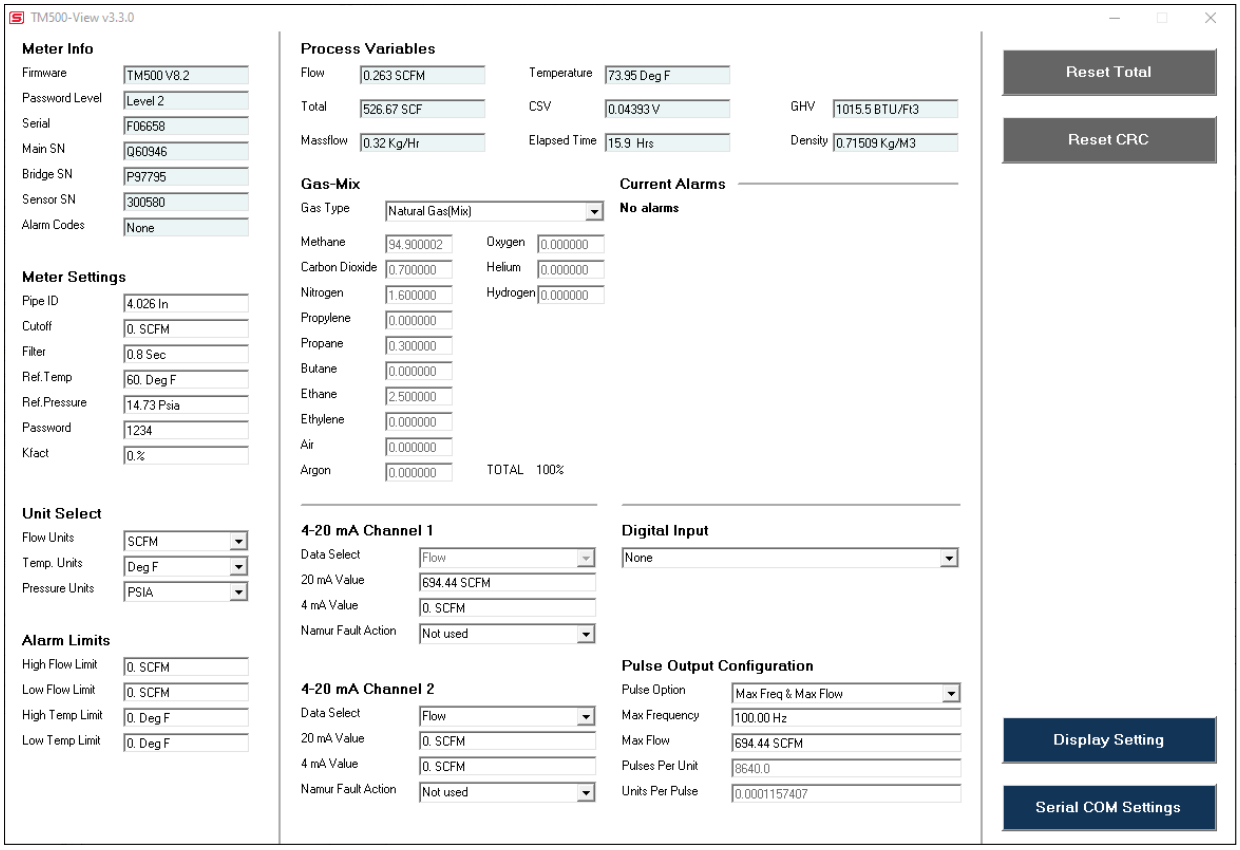
Configure

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



The RS485 and HART settings can be accessed by clicking on the "Serial COM Settings" button.

The Pulse Output settings can be accessed in the "Pulse Output Configuration" and "Digital Output Select" fields.

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.

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 seconds (see TM500 Instruction Manual for more details).

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

Display

The four drop-down boxes can be used to select the data to present on Screen 1 and Screen 2 of the flow meter 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 4-20mA

The TM500 has two analog 4-20mA outputs. Channel one is always set to output flow, and channel two is configurable for either flow or temperature. Though the TM500 will be scaled for the specific application coming from the factory, TM500-View TM software allows the operator to easily re-scale the 4-20mA output as needed.

Process Variables

Flow: Current flow rate in selected units
Total: Cumulative mass or volume flow in selected units
Velocity: Massflow
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-Mix™

This menu allows the user to choose from a list of gases. More information on Gas-Mix™ can be found on p. 19.

Digital Output Select

This selection configures the TM500 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".

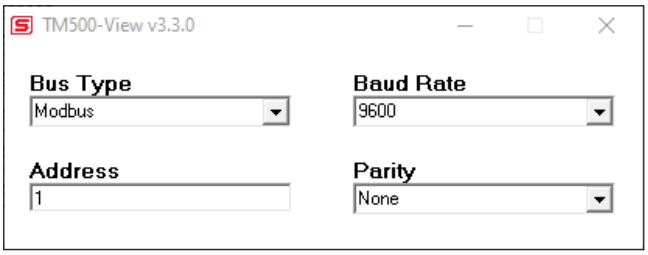
Maximum flow and maximum frequency

Pulses per Unit
Units per Pulse

Serial COM Settings

Use this function to set the serial communication settings for any of the TM500 communication options.

Fig. 3.8: Select Serial Communication Window



NOTE: This is only available on meters with the RS485 or HART serial communication options.

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.

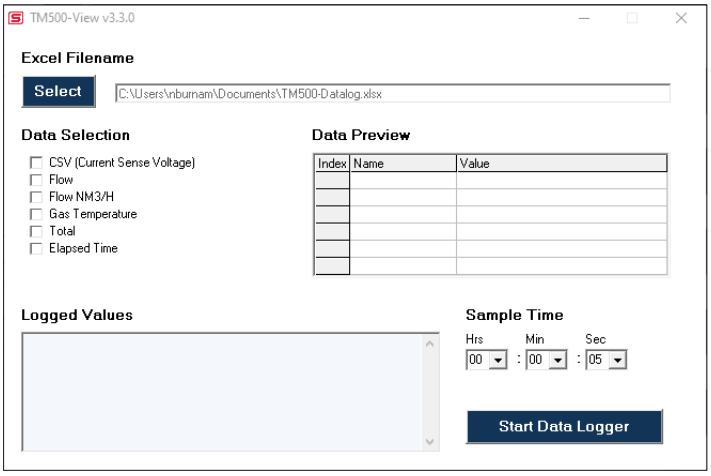


Fig. 3.11: Data Logger Window - Logging Turned Off
Select the sample time from the drop down menu, and then select the required data from the Data Selection list. Select or create a name for the Excel® file and then press the "Start Data Logging" button.

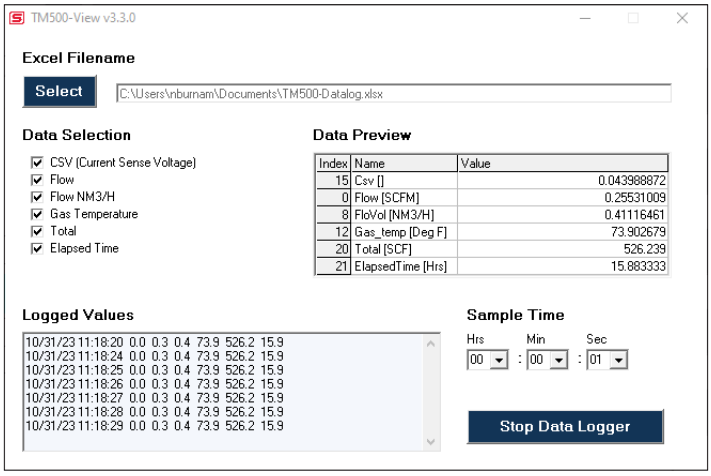


Fig. 3.12: Data Logger Window - Logging Turned On
When "Start Data Logging" is pressed, the data is recorded in the specified Excel® file - and also displayed in the Data Logged window. Pressing "Stop Data Logging" ends data acquisition.

Simulation Mode

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

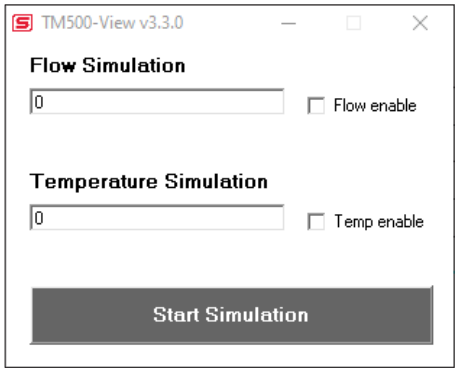


Fig. 3.13: Simulation Mode Window
The simulation mode simulates flow rate or temperature. Click on the required data and enter a value. Simulation mode allows users to verify the operation of the analog output, digital outputs and totalizer at simulated flow rates and temperature.

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

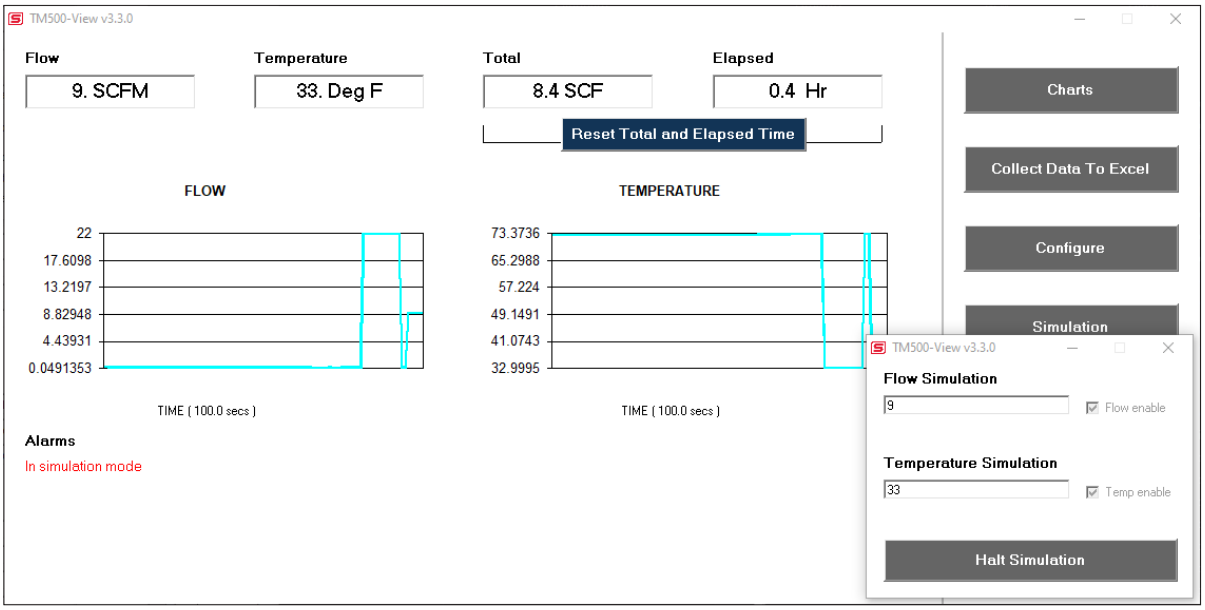


Fig. 3.15: Simulation Running

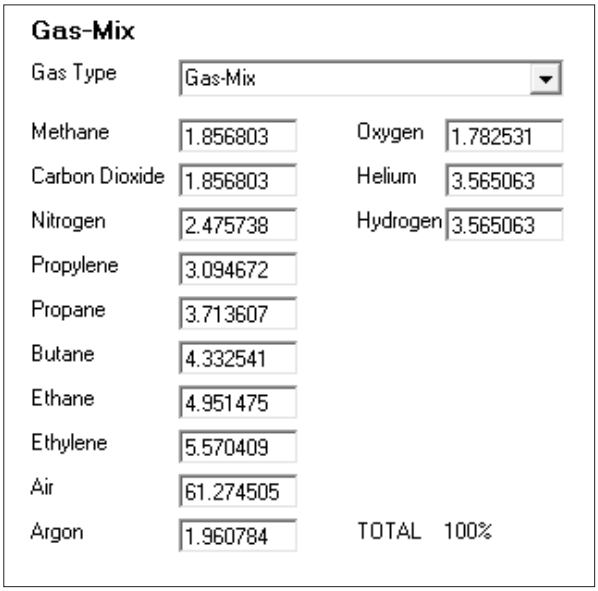
In Simulation mode, all TM500 outputs and the Totalizer respond as if in normal measurement mode. Click "Halt Simulation" to end.

Gas-Mix™ Gas Menu

Each TM500 flow meter is calibrated in the factory and pre-programmed with the gas specified in the order. If the Gas-Mix option is ordered, the pure or gas mixture gas can be changed. To choose what gas or gas mixture flow for the TM500 to monitor, select from the list of gases under Gas-Mix:

- Methane
- Hydrogen
- Carbon Dioxide
- Nitrogen
- Propylene
- Propane
- Butane
- Ethane
- Ethylene
- Air
- Argon
- Oxygen
- Helium
- Natural Gas (Mix)
- Gas Mix

Fig. 3.16: Gas-Mix™ Menu



NOTE: A list of pure and mixed gases available on the TM500 flowmeter are kept on the Sierra website at www.sierrainstruments.com.

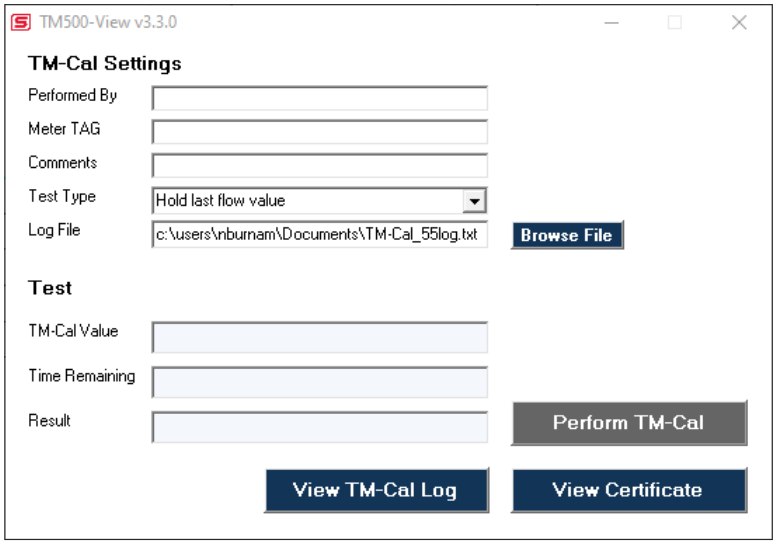
When the "Gas-Mix" option is chosen, a series of additional gas concentration fields will appear. These fields are labeled "CH4%", "CO2%", etc. A default amount will appear in each field, these can be changed to any percentage between 1 and 100. The total for the gases in the Gas-Mix must equal 100% or an error will occur.

NOTE: If the total of all gases is greater or less than 100%, an alarm will show. Adjust the percentages until 100% is achieved.

TM-Cal™

TM-Cal™ is performed to verify the proper operation of the TM500 flow meter. From the Main menu, click on the "TM-Cal" button to access the TM-Cal™ Menu Window.

Fig. 3.18: TM-Cal™ Test Menu Window



On the TM-Cal™ 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.

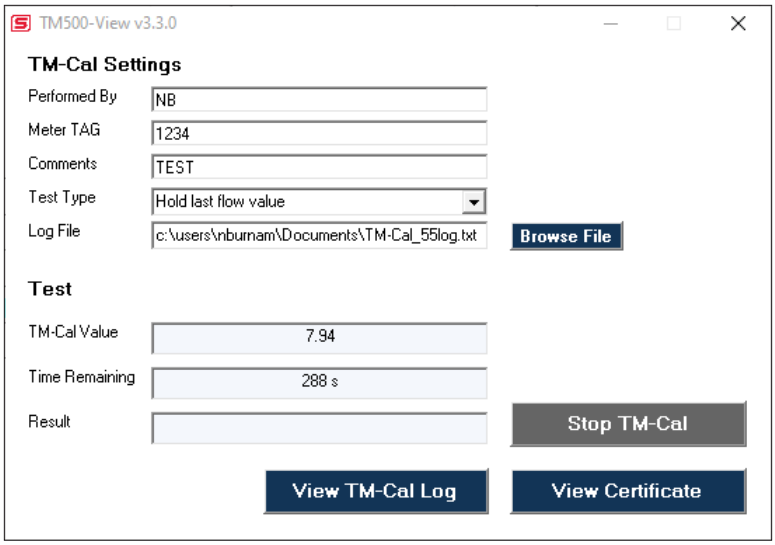
A drop-down menu allows the user to choose between these two options:
Flow goes to Zero during TM-Cal™
Flow holds the last value during TM-Cal™

Please note that the test will take about four minutes. If the "go to zero" option is chosen, the flow measurement will stop and go to zero for this period. If the "hold value" option has been chosen, the totalizer will continue to increment..

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.

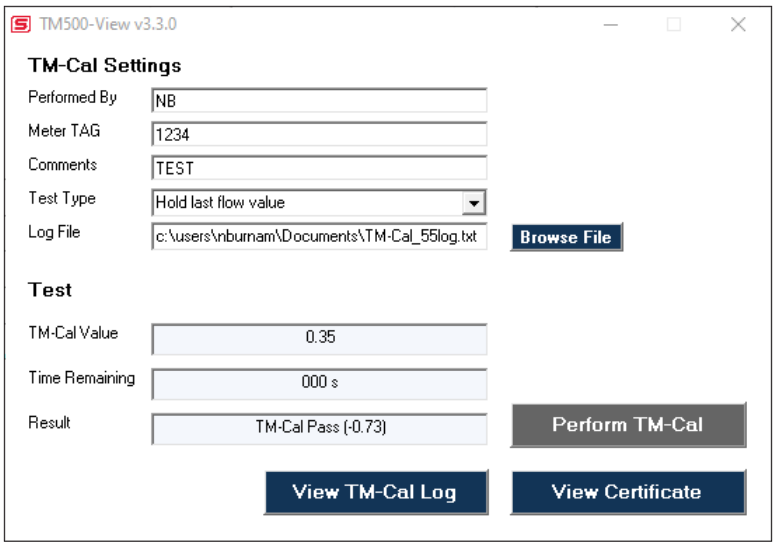
When ready to start, click the "Perform TM-Cal" button.

Fig. 3.19: Running a TM-Cal™ Test



A Pass/Fail message for the TM-Cal™ test will be displayed at the test conclusion.

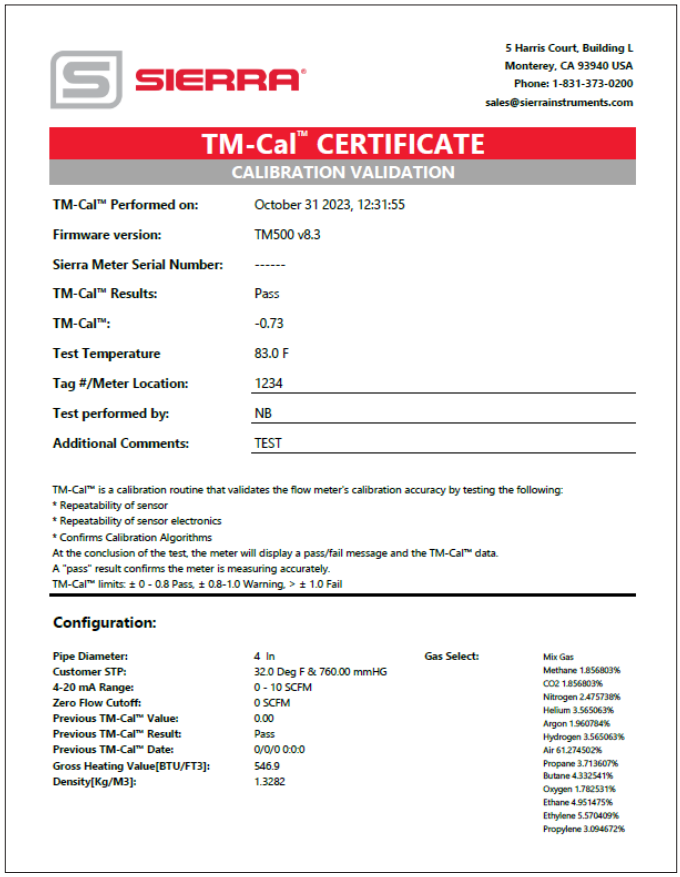
Fig. 3.20: TM-Cal™ Results Window



TM-Cal™ Certificate

The TM-Cal™ Certificate function displays the latest certification. When performing a TM-Cal™ test, all the data is logged into a log file with all pertinent data, including the serial number. A laptop or PC can be used to perform the TM-Cal™ test on the TM500 meter. When a TM-Cal™ certificate is requested, the program will search the log file for the specific serial number and will display only the last check performed.

Fig. 3.21: TM-Cal™ Certificate



SIERRA

5 Harris Court, Building L
Monterey, CA 93940 USA
Phone: 1-831-373-0200
sales@sierrainstruments.com

TM-Cal™ CERTIFICATE

CALIBRATION VALIDATION

TM-Cal™ Performed on:	October 31 2023, 12:31:55
Firmware version:	TM500 v8.3
Sierra Meter Serial Number:	------
TM-Cal™ Results:	Pass
TM-Cal™:	-0.73
Test Temperature	83.0 F
Tag #/Meter Location:	1234
Test performed by:	NB
Additional Comments:	TEST

TM-Cal™ is a calibration routine that validates the flow meter's calibration accuracy by testing the following:
* Repeatability of sensor
* Repeatability of sensor electronics
* Confirms Calibration Algorithms
At the conclusion of the test, the meter will display a pass/fail message and the TM-Cal™ data.
A "pass" result confirms the meter is measuring accurately.
TM-Cal™ limits: ± 0 - 0.8 Pass, ± 0.8-1.0 Warning, > ± 1.0 Fail

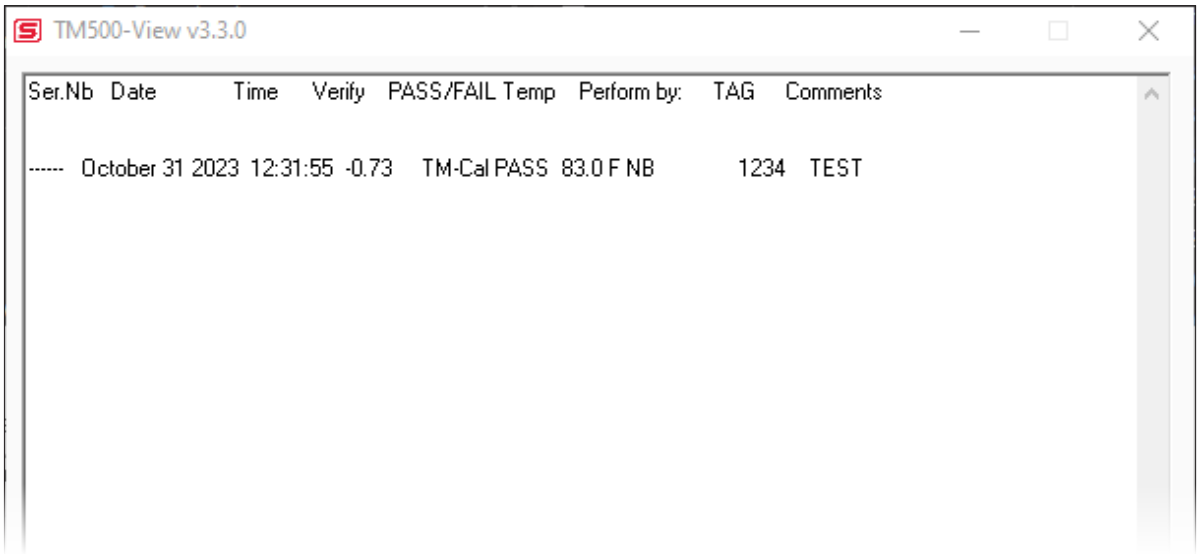
Configuration:

Pipe Diameter:	4 In	**Gas Select:**	Mix Gas
Customer STP:	32.0 Deg F & 760.00 mmHG		Methane 1.856803%
4-20 mA Range:	0 - 10 SCFM		CO2 1.856803%
Zero Flow Cutoff:	0 SCFM		Nitrogen 2.475738%
Previous TM-Cal™ Value:	0.00		Helium 3.565063%
Previous TM-Cal™ Result:	Pass		Argon 1.960784%
Previous TM-Cal™ Date:	0/0/0 0:0:0		Hydrogen 3.565063%
Gross Heating Value[BTU/FT3]:	546.9		Air 61.274502%
Density[Kg/M3]:	1.3282		Propane 3.713607%
			Butane 4.332541%
			Oxygen 1.782531%
			Ethane 4.951475%
			Ethylene 5.570409%
			Propylene 3.094672%

TM-Cal™ Log

The "View TM-Call Log" button allows the operator to view a log of previous TM-Cal™ tests that have been executed on the meter.

Fig. 3.22: TM-Cal™ Log



TM500-View v3.3.0

Ser.Nb	Date	Time	Verify	PASS/FAIL	Temp	Perform by:	TAG	Comments
------	October 31 2023	12:31:55	-0.73	TM-Cal PASS	83.0 F	NB	1234	TEST

Definition

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

Index

Sierra Instruments Inc.
5 Harris Court, Building L
Monterey, CA 93940
North America: 1-831-373-0200
www.sierrainstruments.com