Entech Model 1900 Multi-Canister Sampling System

Manual
Ver 1.0
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1900 Manual Contents

Section 1. 1900 Introduction.

The Entech 1900 Multi-Channel Canister Sampler is Entech's next generation solution for collecting air samplers in Silonite coated canisters for analysis in the laboratory by GC/MS or GC/FID/MS.

The 1900 is a dual channel canister sampler. Channel 1 can be configured a few different ways to improve system flexibility. A single canister can be attached to Channel 1 for event triggered sampling based on other sensors or remote sampling requests. The 8-Channel expander can be added for programmed sampling or extended 8 event sampling. A 24 Canister External Sample Pack can be added for continuous monitoring of C2-C12 compounds, Air Toxics compounds, Carbonyls, or many odor producing compounds (available late 2016) into twenty four 600 cc canisters.

The Channel 1 and 2 flow rates are determined by the rate of change in canister pressure. The flow rate range is determined by the orifices in the internal CS1200. These orifices are inexpensive compared to mass flow controllers. The target flow rate range can be changed simply by changing the orifice. An internal Flow Professor sets the CS1200 to the targeted flow rate using an automated procedure in the software.

Samples are not pressurized during collection which avoids the condensation of water. This improves the recovery of polar compounds and eliminates liquid water induced chemical reactions. Although a pump is used to increase the rate at which fresh sample is drawn into the sampler, the sample entering the canisters never gets exposed to that pump as it is downstream from the ports to which the sample canisters are connected. This eliminates the following problems:

A dramatically improved flow path creates far less potential for carryover relative to other commercially available samplers. Mass flow controllers and solenoid valves have been eliminated to remove their elastomeric seals which have been shown to outgas VOC's making it more difficult to achieve VOC free blanks down to sub-ppbv levels. The flow path is Silonite coated for maximum inertness. The 1900 uses a unique approach to start, control, and stop the sampling process. It maintains both a clean and easily serviceable sample train, ensuring years of accurate collection of time integrated canister samples.

A full WIN10 Touch Screen Tablet with Wifi and a 6 hour battery backup is integrated into the panel as the 1900's controller. It allows advanced remote operations which reduces the need for programming in the field. The software can leak check all sample positions prior to sampling to ensure proper sample collection. If a position is found with a leak the 1900 can be programmed to skip a position if the canister does not meet initial vacuum requirements.

We value any feedback from our users on how we can improve our products and manuals. If you have any feedback on the 1900 or this manual you can contact us through our website at www.entechinst.com or through the support e-mail address at

support@entechinst.com.

WARRANTY

The seller warrants each standard Product sold by it to be free from defects in material and workmanship for the periods and in accordance with the terms and conditions stated below. The warranty period for any Entech products, parts or accessories sold hereunder is limited to 90 days unless an alternative warranty period is specified by Seller on the face of Seller's quotation or is otherwise agreed upon between buyer and seller in writing.

Unless otherwise provided in a software license agreement between Seller and Buyer, Seller warrants software media and firmware media furnished by Seller for use with a Seller's Products to be free of those defects in materials which cause failure to execute programming instructions. This warranty applies only to unlicensed software media and firmware properly installed for a period of 90 days and does not apply to interruptions or errors in operation. Title to software or firmware licensed or sub-licensed by Seller shall remain with Seller or Seller's licensors, as the case may be an the terms and conditions of the applicable license agreement, including any warranty provisions, shall prevail over any contrary terms and conditions herein.

The warranty period begins upon completion of installation where installation is paid for by Buyer or included in the purchase price. However, if Buyer schedules or delays installation more than 30 days after delivery, then the warranty period starts on the 31st day from date of shipment. In all other cases the warranty period begins on the date of shipment from Seller to the original Buyer.

The sole and exclusive remedy under warranty shall be replacement of defective parts, or at Seller's option, repair of instrument malfunctions which in sole opinion of Seller are due or traceable to defects in original materials or workmanship, provided that, Seller may, as an alternative, elect to refund an equitable portion of the purchase price of the Product. Repair of defective products may be performed at customer's site or upon shipment back to Entech at Entech's sole discretion. Replacement or repair under warranty does not extend the original warranty period.

This warranty does not cover Buyer supplied software and hardware, equipment warranted by another manufacturer, or replacement of expendable items and those of limited life.

Section 2. 1900 Installation.

Site Requirements

Power

CAUTION: The electrical requirements in this document are for typical laboratories in the US and Canada. In all other countries please check with your local Entech representative to ensure the 1900 is compatible with the local electricity supply before beginning the installation.

The 1900 should be within 6 ft (1.8 m) of its power source.

AC Power between 90-260 VAC.

It is capable of 12 VDC Operation with the optional internal inverter.

The 1900 uses about 50 W of power, or about 0.5 A at 120 VAC. With the optional 12 VDC to 120 VAC inverter, the 1900 can be operated off a 12 VDC battery or fuel cell. At 50 to 60 W, the current requirement is about 5 A from the 12 VDC source.

Dimensions

The 1900 is a 19” Rack Mount. It is 7.0” H X 18” D. It weighs 12 lbs with an additional 4 lbs if the 8 Channel expansion option is present.

Temperature Range:

The 1900 can operate in enclosures with a temperature range from -10° C to 50° C.

Computer Requirements

New 1900s come with a tablet that is placed on the front of the 1900.

These requirements are provided in case the user would like to replace the tablet with a larger PC or laptop.

The computer must meet Entech's current computer requirements: 4 GB RAM, WIN 7, 8.1, or 10 Professional, 64 Bit, .Net Framework 4.5, with a Pentium Dual-Core I5 Processor or better. It must have all of the most current Microsoft updates (go to the Microsoft website for these). If the Intel Extensible 3.0 Driver Installer is present on the computer it must be uninstalled (WIN7 computers only). If the computer has USB SS or 3.0 ports they must not be used (WIN7 computers only).

Computers purchased in 2016 or later must be Windows 10. Any computer which does not have USB 2.0 ports or which does not allow the uninstallation of USB 3.0 drivers must be Windows 10.

The computer must be logged in as an Administrator during software loading and instrument operations.

Software Installation. This should not normally be necessary when the 1900 is new as it is shipped with a pre-programmed tablet. These requirements are provided in case a user would like to replace the tablet with a larger PC or laptop.

Transfer the 1900 Software to a folder on the tablet desktop.

Unzip the folder to the desktop if necessary.

Create a shortcut to the application by selecting the application file (Entech1900.exe) and select "Send to Desktop (create shortcut)".

This program must always be run as an administrator. To facilitate this right click on the “Entech1900.exe” shortcut and select properties. Click “Compatibility” on the properties screen. At the bottom check “Run this Program as an Administrator” then “Apply”. Then click “Change Settings for All Users”. Check “Run this Program as an Administrator” at the bottom. Then click “Apply” then “OK”. Click “OK” at the bottom of the Properties screen to exit it.

Ensure that the tablet is disconnected from the 1900.

Install the FTDI Drivers by double-clicking the "CDM20830_Setup" file.

Select "Extract"

Click "Next"

Drivers should install with a green check mark and have a status of "Ready to Use".

Click "Finish".

Open the software. Go to settings and configure the 1900. (Usually this should only be needed if the software is loaded on a different computer, or if the installed restrictors are changed.) Go to “File” and “Save Config”.

Installation Overview

Hardware Installation

Flow Professor Pressure Sensor Calibration for Channel 1

Flow Professor Pressure Sensor Calibration for Channel 2

Calibration of the Channel 1 8 Sample Option Pressure Sensors

Zeroing the Pump Flow

Configure the Settings

Configuration of the Local Atmospheric Pressure

Calibration of the CS1200 Target Flow Rates

Leak checking the 1900

Hardware Installation

Unpack the 1900 and place it within 6 ft of its power source. The 1900 was designed to be used in either a 19” rack mount cabinet or on a counter top. Position the 1900 such that there will be minimal exposure to traffic to avoid damage to the canister and 1/8” tubing attached to the front of the 1900.

Install the tablet.

Power Off. Disconnect the power cable from the outlet.

Remove the 1900 top cover. Find the Tablet’s Micro USB cable inside the 1900 body. Run it through the small hole on the front of the 1900.

Remove the tablet bracket clamps from the front of the 1900. Put the tablet on the bracket and then secure in place with the bracket clamps.

Plug the short USB cable into the tablet and the USB port on the front of the 1900.

Plug the Micro USB cable into the tablet. The micro USB cable provides power to the tablet. With tablets the micro USB cable can provide power or USB communications but not both simultaneously.

Leave the top off the 1900 for the next step.

Check interior boards and cables. With the power off and the power cord disconnected push in on all cable connections between cables and cables and boards to ensure none of them came loose during shipping.

Replace the 1900 top cover.

Connect the power cable to the rear of the 1900 and plug into a 120 VAC power outlet. Power On.

Remove the 1/8” brass plug from the sampling bulkheads on the front of the 1900 and attach the 1/8” lines. Two Silonite coated 1/8” X 4’ lines are provided with each 1900. An additional eight lines are included as part of the the 8 Position Option. After the leak

checks of the sampling positions are complete remove the lines and replace the plugs to seal the sample positions. The 1900 ships with the sampling positions sealed to prevent contamination. The brass plugs should not be removed until ready to perform sampling. If there is a need to ship the 1900 to a different location reconnect the plugs to keep foreign volatile and non-volatile contaminants out of the system during shipment and before sampling.

Once the 1900 is positioned where the sampling is to occur, attach the sample inlet line to the 1/4" fitting labeled "Sample Inlet" on the middle, rear of the 1900. Use tubing that is both non-absorptive and non-adsoptive to prevent losses and future memory effects. Teflon is highly inert but will absorb and outgas freons, making it a poor choice for volatile sampling. Using 1/4" Silonite tubing, the 1900 can be placed 10-20 feet away from the air to be sampled without loss of target VOCs.

Flow Professor Pressure Sensor Calibration for Channel 1

Open the 1900 software and go to the "View" screen

Move the Rotary Valve position to "Position 1" by selecting "Position 1" from the drop down menu (you may have to do this more than once or try selecting a different position and then position 1). Skip this step if the eight position option is not present.

Send the Channel 1 Flow Professor to a closed position. Note the current position of the Channel Flow Professor. There should be no flow when the position is 5000. To be extra sure the position will be adjusted to between 2000-3000. Look at the Position. Subtract 2500 from the position. Enter this value in the Motor Steps Box. Click Spin Close (if it happened that the position was less than or equal to 2500 when starting this procedure click "Spin Open" instead). There should be a little motor noise and the position should change to 2500.

Go to "Settings" then "FP CAL". Make a note of the current zero and gain for Flow Professor 1.

Attach a canister that has been evacuated fully with an Entech 3100 series canister cleaner to the CH1 Position 1 bulkhead (if the 8 position option is not present connect to the available Channel 1 bulkhead). WARNING: ALWAYS FINGER TIGHTEN THE 1/4" NUT ONTO THE CANISTER VALVE. It should be possible to turn the nut at least 1.5-2 revolutions by hand, otherwise the nut may either be cross threaded or may have been overtightened in the past causing the threads to distort. If a nut has been damaged to the point that finger tightening can no longer be done, then the adapter fitting should be replaced. The ability to finger tighten is the only way to prevent cross threading and subsequent damage to the expensive canister valve. Open the valve on the canister.

Adjust the zero until the Channel 1 (Flow Professor 1) pressure reads 0.1 psia +/- 0.1 psia. A change of 10-20 to the zero is usually needed to see a clear change in the pressure reading. Click on the zero value in the second column, type in a new value, and then click "Apply". Continue adjusting the zero until the Flow Professor 1 Pressure reads 0.1 +/- 0.1 psia.

Close the valve on the evacuated canister and disconnect it from the 1900.

Adjust the gain until the Channel 1 (Flow Professor 1) pressure reads local atmospheric psia +/- 0.1 psia. (At sea level local atmospheric pressure averages about 14.70 psia. The current local atmospheric pressure can be obtained from local airports.) A change of 30-40 to the Gain is usually needed to see a clear change in the pressure reading. Click on the gain value in the third column, type in a new value, and then click “Apply”. Continue adjusting the gain until the Flow Professor 1 Pressure reads local atmospheric pressure +/- 0.1 psia.

Repeat the previous four steps until both the local atmospheric pressure and the evacuated canister pressure are within 0.1 psia of their targeted values.

Click “File” then “Save FP Calibration” to permanently save the new zero and gain values. If the FP calibration is not saved the values will be lost when the software is closed. Close the 1900 software and then reopen it.

Flow Professor Pressure Sensor Calibration for Channel 2.

Calibrating the Flow Professor 2 Pressure Sensor is done nearly the same way.

Send the Channel 2 Flow Professor to a closed position. Click “View”. Note the current position of the Channel Flow Professor. There should be no flow when the position is 5000. To be extra sure the position will be adjusted to between 2000-3000. Look at the Position. Subtract 2500 from the position. Enter this value in the Motor Steps Box. Click Spin Close (if it happened that the position was less than or equal to 2500 when starting this procedure click “Spin Open” instead). There should be a little motor noise and the position should change to 2500.

Go to “Settings” then “FP CAL”. Make a note of the current zero and gain for Flow Professor 2.

Attach a canister that has been evacuated fully with an Entech 3100 series canister cleaner to the CH2 bulkhead. Open the valve on the canister.

Adjust the zero until the Channel 2 (Flow Professor 2) pressure reads 0.1 psia +/- 0.1 psia. A change of 10-20 to the zero is usually needed to see a clear change in the pressure reading. Click on the zero value in the second column, type in a new value, and then click “Apply”. Continue adjusting the zero until the Flow Professor 2 Pressure reads 0.1 +/- 0.1 psia.

Close the valve on the evacuated canister and disconnect it from the 1900.

Adjust the gain until the Channel 2 (Flow Professor 2) pressure reads local atmospheric psia +/- 0.1 psia. (At sea level local atmospheric pressure averages about 14.70 psia. The current local atmospheric pressure can be obtained from local airports.) A change of 30-40 to the Gain is usually needed to see a clear change in the pressure reading.

Click on the gain value in the third column, type in a new value, and then click “Apply”. Continue adjusting the gain until the Flow Professor 2 Pressure reads local atmospheric pressure +/- 0.1 psia.

Repeat the previous four steps until both the local atmospheric pressure and the evacuated canister pressure are within 0.1 psia of their targeted values.

Click “File” then “Save FP Calibration” to permanently save the new zero and gain values. If the FP calibration is not saved the values will be lost when the software is closed. Close and reopen the 1900 software.

Calibration of the Channel 1 8 Position Option Pressure Sensors

These are the eight individual pressure sensors that are part on the eight position option. There is a pressure sensor on each canister position.

Go to the "View" screen.

Move the rotary valve to position 0 by selecting position 0 from the drop down menu under the "1900 Instrument" section. (This may need to be done a couple times or a different position may need to be selected first and then position 0.)

Go to “Settings” and select “UNICARD CAL”.

Make a note of the current (fifth and sixth columns) zero and gain values for all of the (Channel 1) positions.

Attach a canister that has been evacuated fully with an Entech 3100 series canister cleaner to the CH1 Position 1 bulkhead. WARNING: ALWAYS FINGER TIGHTEN THE 1/4” NUT ONTO THE CANISTER VALVE. It should be possible to turn the nut at least 1.5-2 revolutions by hand, otherwise the nut may either be cross threaded or may have been overtightened in the past causing the threads to distort. If a nut have been damaged to the point that finger tightening can no longer be done, then the adapter fitting should be replaced. The ability to finger tighten is the only way to prevent cross threading and subsequent damage to the expensive canister valve. Open the valve on the canister.

Adjust the zero (fourth column) until the Pos. 1 Pessure (second column) reads 0.1 psia +/- 0.1 psia. A change of 10-20 to the zero is usually needed to see a clear change in the pressure reading. Click on the zero value in the fourth column, type in a new value, and then click “Apply”. Continue adjusting the zero until the Position 1 Pressure reads 0.1 +/- 0.1 psia.

Close the valve on the evacuated canister and disconnect it from the 1900.

Adjust the gain (third column) until the Position 1 Pressure reads local atmospheric psia +/- 0.1 psia. (At sea level local atmospheric pressure averages about 14.70 psia. The local atmospheric pressure can be obtained from local airport websites.) A change of

30-40 to the Gain is usually needed to see a clear change in the pressure reading. Click on the gain value in the third column, type in a new value, and then click “Apply”. Continue adjusting the gain until the Position 1 Pressure reads local atmospheric pressure +/- 0.1 psia.

Repeat the previous five steps until both the local atmospheric pressure and the evacuated canister pressure are within 0.1 psia of their targeted values.

Click “File” then “Save Unicard Calibration” to permanently save the new zero and gain values. If the Unicard calibration is not saved the values will be lost when the software is closed.

Repeat steps the steps above for Positions 2 to 8.

Please note that the zeroes and gains may be very different. The pressure sensors on position one and two will have similar zero and gain values (about 140 for the gain and 1050 for position one and two on one system). Those for positions three through eight will be similar to each other (about 1630 for the gain and 20 for the zero). This difference in the zero and gain values is due to the different types of circuits that control the two sets of pressure sensors. Channels one and two are on P1 and P2. Channels three to eight are on MFC1 to MFC6.

Close and reopen the 1900 software.

Zeroing the Pump Flow

Go to “Settings” then “Unicard CAL”.

If the pump is off, press the "Zero Pump Flow" button to zero the pump flow sensor automatically. (The pump can be manually controlled in the "View" tab by selecting Pump On or Pump Off. When the pump is on it is quiet but fairly easy to hear.)

When finished, click “File” and select “Save Unicard Calibration”.

Close and reopen the 1900 software.

Why is this step important? The 1900 has a thermistor inside that is used to measure the pump flow. When the pump flow is on the thermistor should have a reading that is 40-50 DAC (a Entech assigned measurement unit) higher than when the pump is off. The software uses the thermistor to verify that the pump is on and inlet is not clogged.

Configure the Settings

The configuration settings are used to tell the 1900 what to due during sampling.

Click “Settings” at the top to go to the Settings screen. The click “CONFIG” on the left.

For each channel, select the currently installed restrictor on the CS1200 (#0 - #7).

For each channel, select the sample canister volume that will be used for sampling.

For each channel, input a default sampling duration (in minutes). The default is 2.0 minutes.

For Channel 2, select how often (in days) the auto sample interval will be executed. Set to 0 to disable this feature.

Set the desired Target Vacuum remaining to be used for all samples. The default is 4” Hg.

Set the Maximum allowed starting psia (if above this number the sample will not start). The default is 3.00 psia.

Set the Maximum allowed ending psia. if the pressure goes above this number while sampling the sampling will end immediately. The default value is 12.50 psia.

Set the Leak Check parameters.

Duration - The length of the "hold" when leak checking. The duration is the time between the initial pressure reading and final pressure reading of the leak check. The default value is 0.5 min.

Max Leak Rate - The maximum amount of leakage during the Duration, in psid, that is allowed before a leakcheck fails. The default value is 0.09 psia.

Max Start Psia - The maximum starting psia. A sampling event will not continue if the initial position psia is above the Maximum Start Psia. The default value is 1.00 psia.

Click “File” on the left and select “Save Config” to save any changes.

Close and reopen the 1900 software.

Configuration of the Local Atmospheric Pressure

Go to “Settings” then “FP CAL”.

For relative pressure, select either "Yes" which requires the entry of the elevation in feet to set local atmospheric psia OR select "No" to directly set the local atmospheric psia if known. The current local atmospheric pressure can be obtained from local airports. Once the local atmospheric pressure is input click “Apply”.

Click “File” then “Save FP Calibration” to permanently save the new local atmospheric pressure. If the FP calibration is not saved the value will be lost when the software is closed.

Close and reopen the software.

Leakchecking the 1900

All positions should be leak checked during the installation.

The default leak check parameters are a maximum leakage (pressure increase) of 0.09 psia in a duration of 30 seconds (or a rate 0.18 psia/min). The maximum starting psia is 1.00 psia. These parameters can be changed on the Configuration Settings screen to better suit user needs. Go to “Settings” then “Config”. Verify the Leak Check settings are correct.

Click “View”. Send the Flow Professor(s) for the channel(s) to be leakchecked to a closed position. Check the current Position of the Flow Professor(s). There should be no flow when the position is 5000. To be extra sure the position will be adjusted to between 2000-3000. Look at the Position. Subtract 2500 from the position. Enter this value in the Motor Steps Box. Click Spin Close (if it happened that the position was less than or equal to 2500 when starting this procedure click “Spin Open” instead). There should be a little motor noise and the position should change to 2500.

Go to the Leak Check screen (click “Leak Check” at the top).

Connect fully evacuated canisters to the positions that will be checked (if only a limited number of cans are available just check one to a few positions at a time, move the cans to new positions, leak check, and continue until all of the positions have been checked.) WARNING: ALWAYS FINGER TIGHTEN THE 1/4” NUT ONTO THE CANISTER VALVE. It should be possible to turn the nut at least 1.5-2 revolutions by hand, otherwise the nut may either be cross threaded or may have been overtightened in the past causing the threads to distort. If a nut have been damaged to the point that finger tightening can no longer be done, then the adapter fitting should be replaced. The ability to finger tighten is the only way to prevent cross threading and subsequent damage to the expensive canister valve.

In the leak check table click the position(s) to be checked until a small check mark appears in the box(es). Then click “Clear”. Clear is used to clear any old leak check results that are present. If old results are present for a position the leak check procedure will skip that position.

Open the valve(s) on the can(s) to apply vacuum to the line and then close the valve.

Then click “Start” on the left. The leak check results will be displayed when complete.

If a position has a leak troubleshoot until the leak is isolated and fixed. The presence of some water vapor in the line may cause the pressure in the line to rise by 0.1-0.2 psia but if the pressure continues to increase by more than 0.1 psia per minute there is a leak. **CAUTION: NEVER USE PRESSURIZED HELIUM (OR ANY PRESSURIZED GAS) TO CHECK FOR LEAKS ON THE 1900.** The 15 psia pressure sensors can be damaged with a little as 10 psig of pressure. Instead just slightly snug each fitting and

then observe the pressure rise rate. There are also fittings inside the 1900 that may need to be tightened after shipping.

To repeat the leak check of a position proceed as before but the previous results must be cleared before a second leak check can proceed. Uncheck the boxes in front of the passing leak checks. Leave only the line with the failed leak check marked. Then click “Clear” on the left. The software will now be able to recheck the position.

Calibration of the CS1200 Target Flow Rates for Channel 2 and Channel 1 if the 8 Position Option is not Present.

This procedure should only be needed if the CS1200 in the 1900 or its orifice are changed, or its Flow Professor is replaced.

Go to the “Method” screen. Click “Channel 1 (2)” to view the Channel 1 (2) Calibration Method. Note: The method screen is mostly used to determine or check target flow rates and calibrate the CS1200. The conditions on the method screen are not used during sampling. The sampling conditions come from the Configuration Settings screen.

Confirm that the displayed Canister Volume and Target Vacuum Left values are correct, if not, change the values in the configuration settings and save the changes.

Select the fill duration for the samples that will run on the Channel 1 (2) position(s).

Confirm that the displayed Optimal Restrictor value is the same as the installed restrictor for Channel 1 (2). If the displayed Optimal Restrictor is not the restrictor physically in the Channel 1 (2) CS1200 then the Channel 1 (2) restrictor will need to be replaced with one of the displaced value and on the “Configuration Settings Screen the installed restrictor will need to be changed ”. (Click “Settings” at the top and then “Config” on the left. Save the changes when done.)

Confirm that the ballast value is not highlighted in red. If so, the ballast configuration value will need to be changed to the suggested value (hovering tihe mouse over the pulldown while highlighted red will advise of the correct ballast size). If necessary the correct ballast will need to be put CH 1 (2) bulkhead on the front of the 1900 a little later.

Attach a vacuum source to the CAL VAC port on the front of the 1900.

Connect CAL 1 to the Channel 1 Position 1 bulkhead with 1/8” Calibration Tubing or Calibration Tubing and Ballast Assembly. (For the 1900 without the optional 8 positions on Channel 1 (or Channel 2) connect the calibration tubing with appropriate ballast between CAL 1 (2) and the Channel 1 (2) bulkhead). For this procedure it is very important that the calibration tubing provided in the installation kit be used as it has a known volume.

Confirm that the inlet port on the back of the 1900 is not capped or blocked to allow air flow through the system.

Press "START Ch1 (2)" to start the calibration, follow any instructions displayed.

Calibration will proceed automatically until finished (around 15 to 20 minutes).

Repeat the steps above for the other Channel.

When finished, move the rotary valve (Channel 1 8 Position Option Only) to the home position by going to the Sequence (click “Sequence” at top) screen, clicking “COMMANDS”, and selecting “Home”.

Section 3. 1900 Hardware.

Options

Part Number:	Description:
1900-8CH-EXPAND	Optional 8-Position Expander
1900-01	DC Inverter (for battery, solar, or fuel cell power).

Components

Sample Pump. The 1900 contains a small sample pump that is used to pull sample through the sampling line at 1-3 liters/min. This brings fresh sample into the sampling manifold to prevent compositional changes when the 1900 is a much as 10-20 feet away from the inlet as can be the case at many monitoring stations.

Flow Controls. Flow control in the 1900 is accomplished using modified versions of Entech's Flow Professor and CS1200. The flow rate is adjustable over a wide range from 0.2 to 200 cc/min. Specific ranges are determined by the restrictors in the CS1200s. Refer to the table below if the 1900's flow range needs to be changed:

Restrictor Code	Part Number	Flow Range
0	01-39-23000S	100-300 cc/min
1	01-39-23010S	50-160 cc/min
2	01-39-23030S	17-50 cc/min
2+	01-39-23060S	10-27 cc/min
3	01-39-23080S	5-17 cc/min
4	01-39-23240S	2-5 cc/min
4+	01-39-23480S	1.0-2.5 cc/min
5	01-39-24010S	0.4-1.2 cc/min
6	01-39-24020S	0.2-0.6 cc/min

Zeno Data Logger: Connects to "MODEN/LOGGER INTERFACE" on the rear of the 1900. Male 232, 9600 Baud, 8.1.0, none. Zeno Data Logger External Control for programming, starting, stopping, and status retrieval.

I**nputs:** On the rear of the 1900. Digital inputs with a current requirement of < 1ma.

CH1 START
CH2 START

Outputs: 0-5 VDC Analog Signals.

CH1 FLOW
CH2 FLOW

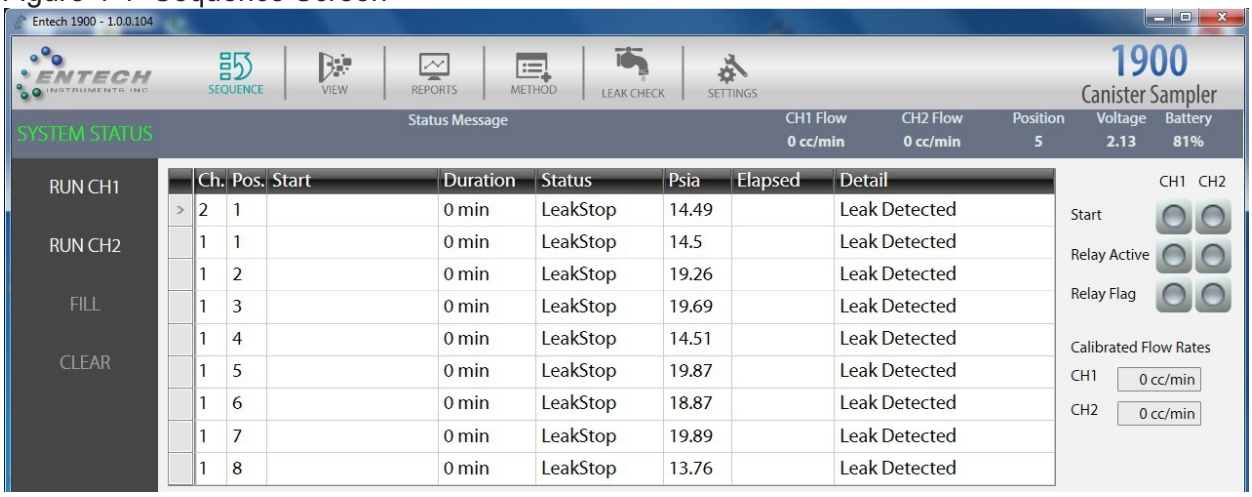
CH1 PRESSURE
CH2 PRESSURE
CH1 ACTIVE
CH2 ACTIVE
PUMP FLOW
VALVE POSITION. Rotary valve position. V = Position * 0.625V.

CH1 ANALOG CAN PRESSURE. These are the analog outputs for the pressure sensors on positions 1 through 8.

Section 4. 1900 Software Overview.

The Entech 1900 software must always be run as administrator. The executable is Entech1900.exe and is located on the computer's desktop. It is located in a file named Entech 1900 W.X.Y.ZZ. W.X.Y.ZZ is the version number and an example of an actual version number is 1.0.0.70. Below is a picture (Figure 4-1) of the Sequence Screen, which is the first screen to appear when the software is opened.

Figure 4-1 Sequence Screen



1900 Software Screen Overview

The first four items are the same on all of the Entech 1900 software screens:

In the upper left "Entech 1900 - 1.0.0.70" shows the **software version** is 1.0.0.70.

In the upper right the **red "X"** can be used to exit the software.

Buttons: These are at the top of the screen and are used to switch between software screens.

Sequence: Toggles the Sequence screen.

View: Toggles the View screen.

Reports: Toggles the Reports Screen.

Method: Toggles the method screen.

Leak Check: Toggles the Leak Check screen.

Settings: Toggles the Configuration Screen.

System Status Bar: This shows the system status, error messages, the Channel 1 Flow, the Channel 2 Flow, the position of the rotary valve, the voltage of the rotary valve, and the computer's remaining battery life. If "System Status" is green the 1900, computer, and software are communicating with each other. If "System Status" is red they are not communicating.

Control Column: These are commands and pulldowns. They vary with the different screens.

Main Box: This varies for the different screen and sometimes with different control column selections.

Sequence Screen: The Sequence screen programs the sampling event dates, times, and duration. Its controls are used to start and stop sampling events.

Control Column for the Sequence Screen: Refer to Figure 4-2.

Run CH1: Button used to start the Channel 1 sequence.

Run CH2: Button used to start the Channel 2 sequence.

Fill: Used only with the optional 8 positions for channel 1. After a channel one position's time and duration are entered, that line can be used to fill subsequent lines in the sequence table. Click on the line that was entered then use the shift key with the arrow key on the keyboard or hold the control key while clicking other subsequent (lower) positions with the mouse to select the positions to be filled. Next click "Fill". The duration will be the same for all filled lines and the start time for subsequent lines will be two minutes after the end of the duration for the starting or previous filled line. For example, if the entered line had a start time of 1:00 pm on 4/28/16 and a duration of 24 hours (1440 minutes) the first filled line would start on 4/29 at 1:02 pm and the third on 4/30 at 1:04 pm.

Figure 4-2 Sequence Control Column

Clear: Clears the selected position(s) in the sequence. Any position must be cleared before another (a second) sampling event can take place on that position.

Main Box for the Sequence Screen: Each row in the sequence is one sampling event. The columns in the sequence table are explained below. Refer to Figure 4-3.

Ch: Shows if it is channel 1 or channel 2.

Pos: Shows the canister position on the front of the 1900.

Start: The date and time the 1900 begins sampling that line in the sequence table. If no Start is entered sampling will begin at one minute past the current time.

Duration: User entered sampling time in minutes. The default duration appears automatically and comes from the Configuration Settings (Click “Settings” at the top and then “Config” on the left.) screen but the user can type in a different duration.

Status: Shows the status of the sequence line.

Error: Something is not right. Check Detail for more information.

Disabled: Not eligible to run.

Enabled: Eligible to run.

Leakstop: The leak check failed. Either the starting pressure was too high or there was too much leakage during the leak check.

Psia: Shows the current pressure of that position in PSIA (psi absolute).

Elapsed: Shows the length of time since sampling began.

Detail: Contains additional information about the status, sampling information, and error messages.

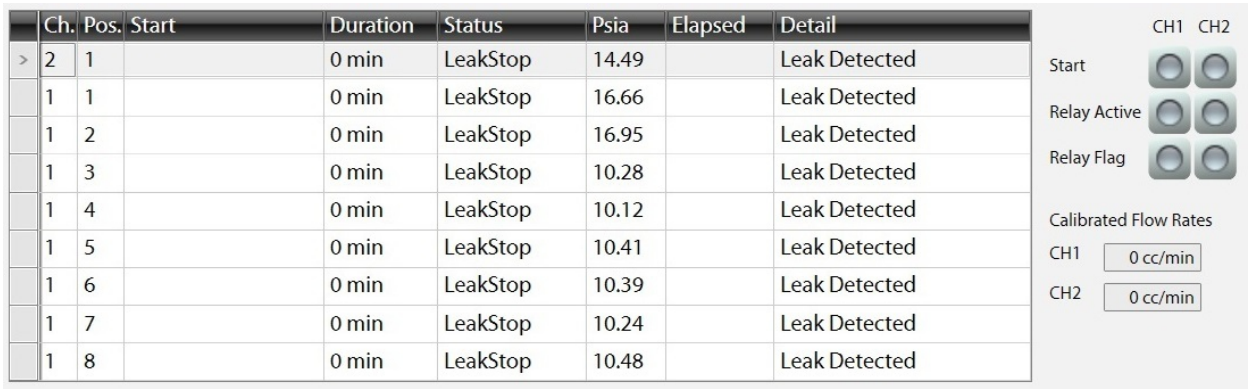
Enter Start: A start date and time needs to be entered in Start. If no time is entered the sampling will begin one minute after the time when “Run Ch1” or “Run Ch2” is clicked.

Blank: There is nothing in the Detail column.

Ready to Schedule: The position is ready to run but needs a Duration and Start (date/time).

Enter a Duration: A duration must be entered or the default duration (set on the “Configuration Settings” screen will be used.

Figure 4-3 Main box for the Sequence Screen



	Ch.	Pos.	Start	Duration	Status	Psia	Elapsed	Detail
>	2	1		0 min	LeakStop	14.49		Leak Detected
	1	1		0 min	LeakStop	16.66		Leak Detected
	1	2		0 min	LeakStop	16.95		Leak Detected
	1	3		0 min	LeakStop	10.28		Leak Detected
	1	4		0 min	LeakStop	10.12		Leak Detected
	1	5		0 min	LeakStop	10.41		Leak Detected
	1	6		0 min	LeakStop	10.39		Leak Detected
	1	7		0 min	LeakStop	10.24		Leak Detected
	1	8		0 min	LeakStop	10.48		Leak Detected

Status and Start Box: This is located in the upper right of the Main Box. It has Start (ready to start), Relay Active, and Relay Flag indicator lights. There are separate lights for Channel 1 and Channel 2.

Start: Indicates that the start signal was received.

Relay Active: Indicates that the remote start contact has been triggered.

Relay Flag: Indicates a sample is being taken. While this is lit any remote start signals will be ignored.

Calibrated Flow Rates: User entered calibrated flow rate for each channel.

View Screen:

The View screen does not have a control column.

Main Box for the View Screen: Refer to Figure 4-4.

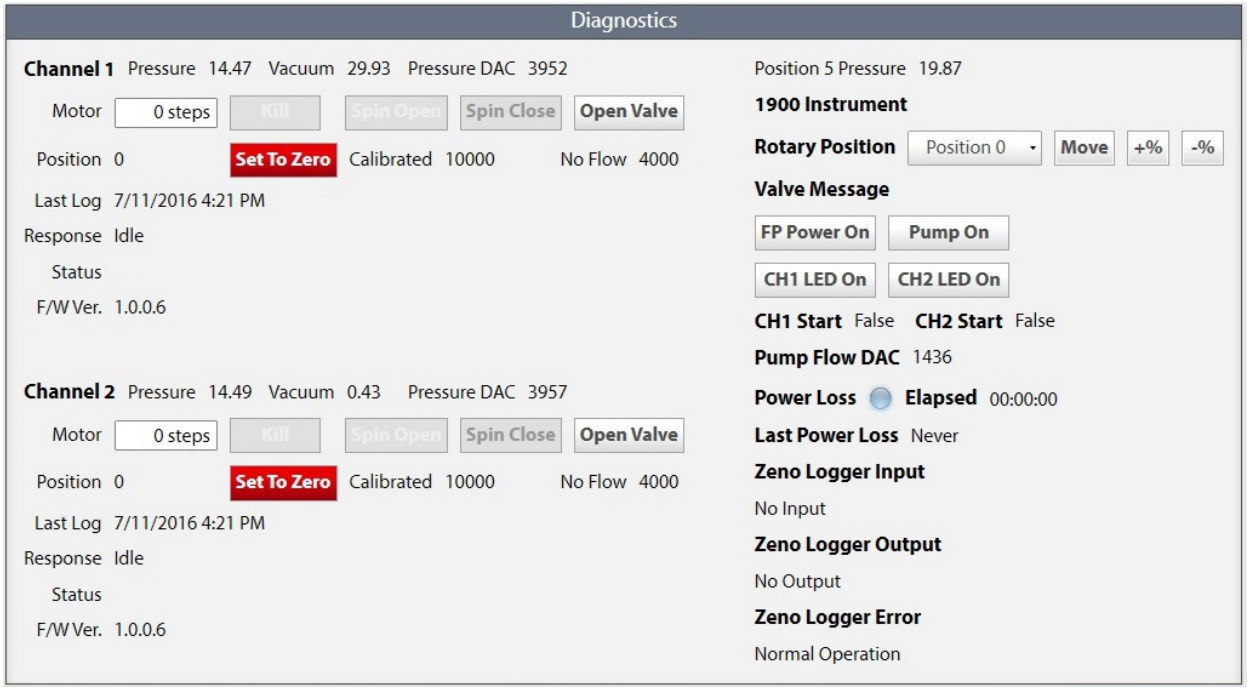
Channel 1 and 2 Controls and Feedback: These are the same for both channels.

Pressure: Shows the channel's current pressure reading in psia.

Vacuum: Shows the channel's vacuum reading in "Hg".

Pressure DAC: Shows the output of the pressure sensor as a DAC (Digital to Analog Convertor value.).

Figure 4-4 Main box for the View Screen



Motor:

Step Box: User entered number of steps for the motor to move.

Kill: Stops the motor.

Spin Open: The flow professor motor will spin the CS1200 open. The number of steps it spins is from the Step Box.

Spin Close: The flow professor motor will spin the CS1200 closed. The number of steps it spins is from the Step Box.

Open Valve: Has nothing to do with the motor. Opens the shutoff valve for the Flow Professor. This valve is in the calibration box.

Position:

Position: Show the channel's CS1200 position in steps. 0 means the CS1200 is a closed as it can be. It is only normal to see this if the CS1200 has not been calibrated. 5000 steps is fully closed.

Set to Zero: Sets the zero position of the CS1200. To set to zero click "Spin Close" then click "Set to Zero".

Calibrated: The calibrated position of the CS1200 for the target flow rate.

No Flow: Position of the CS1200 at which there is no flow after calibration.

Last Log: The last date and time a command was sent to the Flow Professor.

Response:

Error: No COM with that channel's Flow Professor.

Idle: The Flow Professor is ready and waiting for a command.

Status: Shows the date and time of the last command sent to the Flow Professor and the command. If the 1900 software is opened and there is no COM with the 1900 the status will be "Device is not responding. Last Communication: Never."

F/W Ver.: Must be 1.0.0.6. If anything else is present troubleshoot. Most commonly the issue is that the 1900 is not

communicating with the computer.

1900 Statuses and Controls: On the right of the View Screen.

Position: Shows the current position.

Pressure: Current Pressure.

Pulldown: Used to select the rotary valve position. The valve will move as soon as a new position is selected. When Idle the default position of the rotary valve is 0. Zero is the position halfway between positions 8 and 1. There are also half positions. These can be used to shut off flows and for leak checking and troubleshooting.

+%: Used during valve alignment and troubleshooting. Move the valve slightly to a more positive voltage.

+%: Used during valve alignment and troubleshooting. Move the valve slightly to a more negative voltage.

FP Power On: Turns the flow professor on and off. The software will try to reset in 5 seconds but a click should be heard.

Pump On: Turns the sampling Pump on and off.

CH1 LED On: Turns on the Ch1 LED. This is used for troubleshooting.

CH2 LED On: Turns on the Channel 2 LED. This is used for troubleshooting.

CH1 Start: True if channel one has a start signal. False if it does not.

CH2 Start: True if channel two has a start signal, False if it does not.

Pump Flow DAC: This shows if the pump is running. The DAC value should rise if the pump is off.

Power Loss: Indicator if power was lost to the computer. It shows that the computer is not charging. Red means power has been lost. Clear means the computer has power.

Elapsed: Shows how long the power has been lost.

Last Power Lost: Shows the last time power was lost. This is

from when the software was opened.

Zeno Logger Input: Shows the command from the Zeno logger.

No Input: The Zeno logger is not connected, the 1900 is not connected to the computer or there is no COM.

Zeno Logger Output:

No Output: The Zeno logger is not connected, the 1900 is not connected to the computer or there is no COM.

Zeno Logger Error:

Normal Operation:

Reports Screen: Refer to Figure 4-5. This screen accesses a data log containing the data for the current and previous sampling event.

Control Column for the Reports Screen:

File:

Current: Shows what is currently sampling.

Archive: File load allows the loading of any recorded sampling events in the weekly log.

Main Box for the Reports Screen:

CH: Shows the Channel.

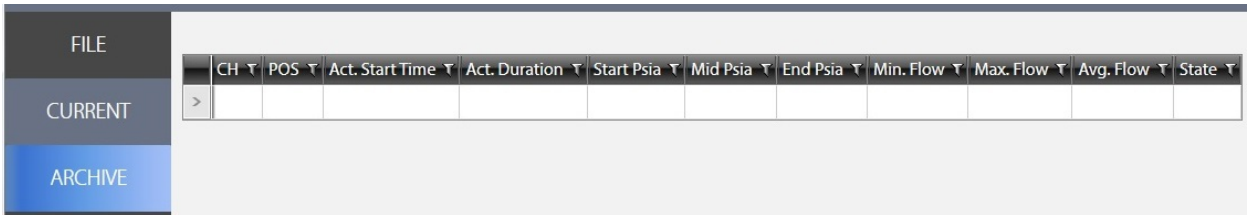
POS: Shows the rotary valve position.

Act. Start Time: Shows the actual start time of the canister sampling event.

Act. Duration: Shows the actual duration of the canister sampling event.

Start Psia: Shows the starting pressure in psia at the beginning of the sampling event.

Figure 4-5 The Reports Screen



Mid Psia: Shows the pressure in psia at the midpoint of the sampling event.

End Psia: Shows the pressure in psia at the end of the sampling event.

Min. Flow: Shows the minimum flow rate during the sampling event in cc/min.

Max. Flow: The maximum flow rate during the sampling event.

Avg. Flow: The average flow during the sampling event.

State: The final state of the sampling when it ended. If the sampling ended early or aborted the reason for the abort will be listed. The State will say "Running" if it is tracking a currently running sample.

Method Screen: The Method screen is used to set and test the flow rates with the Flow Professor in the 1900. All of the settings are from the Configuration Settings screen except the Fill duration and ballast. Refer to Figure 4-6.

Control Column for the Method Screen:

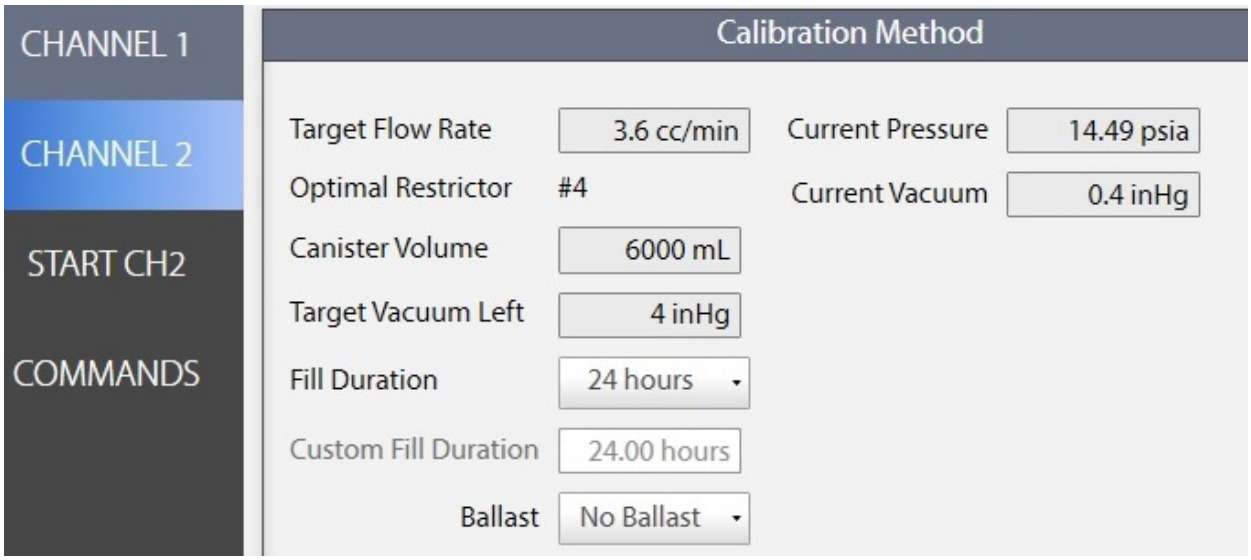
CHANNEL 1: Activates Channel 1.

CHANNEL 2: Activates Channel 2.

START CH1 or **START CH2:** Start button for the active channel. This is only present before it is clicked to activate the start. This starts the calibration of the CS200 on the active channel.

Continue Ch1 or **Continue CH2:** Continue to the next step in the calibration of

Figure 4-6 1900 Method Screen



the active channel. Check the screen for instructions and complete them before continuing.

Abort CH1 or **Abort CH2:** Stops whatever is happening on the active channel

Commands:

Measure CH1 Flow Rate or **Measure CH2 Flow Rate:** Measures the flow rate of active channel. This is used to verify the target flow is set correctly as a spot check.

Abort CH1 Flow Rate or **Abort CH2 Flow Rate:** Stops the flow rate measurement of the active channel.

Main Box for the Method Screen:

Target Flow Rate: Shows the calculated target flow rate in cc/min. The value is calculated from the values in “Configuration Settings”. Those values can be adjusted if the target flow rate needs to change.

Optimal Restrictor: Shows the optimal restrictor for the target flow rate.

Canister Volume: The volume of the attached sample canister. The value comes from the “Configuration Settings”. It can be changed there.

Target Vacuum Left: This is how much vacuum in “Hg the users would like to remain in the sample canister at the end of the sampling event. The value comes from the “Configuration Settings”. It can be changed there..

Fill Duration: Use the pulldown to select the fill time or “Custom”. If “Custom” is selected the target fill duration in hours must be entered in the box below the fill duration pulldown.

Custom Fill Duration: If “Custom” is selected with the Fill Duration Pulldown the duration in hours is entered in this box.

Ballast: The ballast is used to select the ballast size that is connected to the Channel 1 or Channel 2 Flow Professor. Options are:

No Ballast: Use for target flows up to 5 cc/min.

100 cc: Use for target flows between 5 and 100 cc/min.

600 cc: Use for target flows of over 100 cc/min.

Current Pressure: Shows the current pressure reading in psia for the selected channel.

Current Vacuum: Shows the current vacuum reading in in Hg for the currently selected channel.

Leak Check Screen:

Control Column for the Leak Check screen: Refer to Figure 4-7.

Figure 4-7 The Control Column for the Leak Check

Start: Begins the leak check procedure.

Clear: Clears the values in the leak check table. Values from previous leak checks must be cleared before that channel can be leak checked again.

Select All: Activates all lines in the leak check table.

Deselect All: Deactivates all lines in the leak check table.

Main Box for the Leak Check Screen: Refer to Figure 4-8.

The Leak Check Table:

Checkbox: Marking the box activates it for an automated leak check or flush. (It takes one click in the box to activate or deactivate it.)

Ch.: Shows the Channel to be leak checked, 1 or 2.

Pos.: Shows the channel 1 position to be leak checked. (Channel 2 always has a 1 for this.)

Volt: Shows the 1900 rotary valve encoder reading.

Target Volt: Shows the target 1900 rotary valve encoder reading. The target voltages are listed

Position Target Voltage

Figure 4-8 1900 Leak Check Screen Main Box

	Ch.	Pos.	Volt.	Target Volt.	Start Psia	End Psia	Result	Detail
>	2	1	0	0	0	0		
	1	1	0	4.62	0	0		
	1	2	0	4	0	0		
	1	3	0	3.38	0	0		
	1	4	0	2.75	0	0		
	1	5	0	2.12	0	0		
	1	6	0	1.5	0	0		
	1	7	0	0.87	0	0		
	1	8	0	0.25	0	0		

Leak Check Settings

Max Leak	0.09 psia
Duration	0.5 min
Max Start Psia	1.00 psia

1	4.62
2	4.00
3	3.38
4	2.75
5	2.12
6	1.50
7	0.87
8	0.25

Start Psia: Pressure in psia of the channel and position being leak checked at the start of the leak check.

End Psia: Pressure in psia of the channel and position being leak checked at the end of the leak check.

Result: Shows the result of the leak check.

Detail: May have more information about the leak check result.

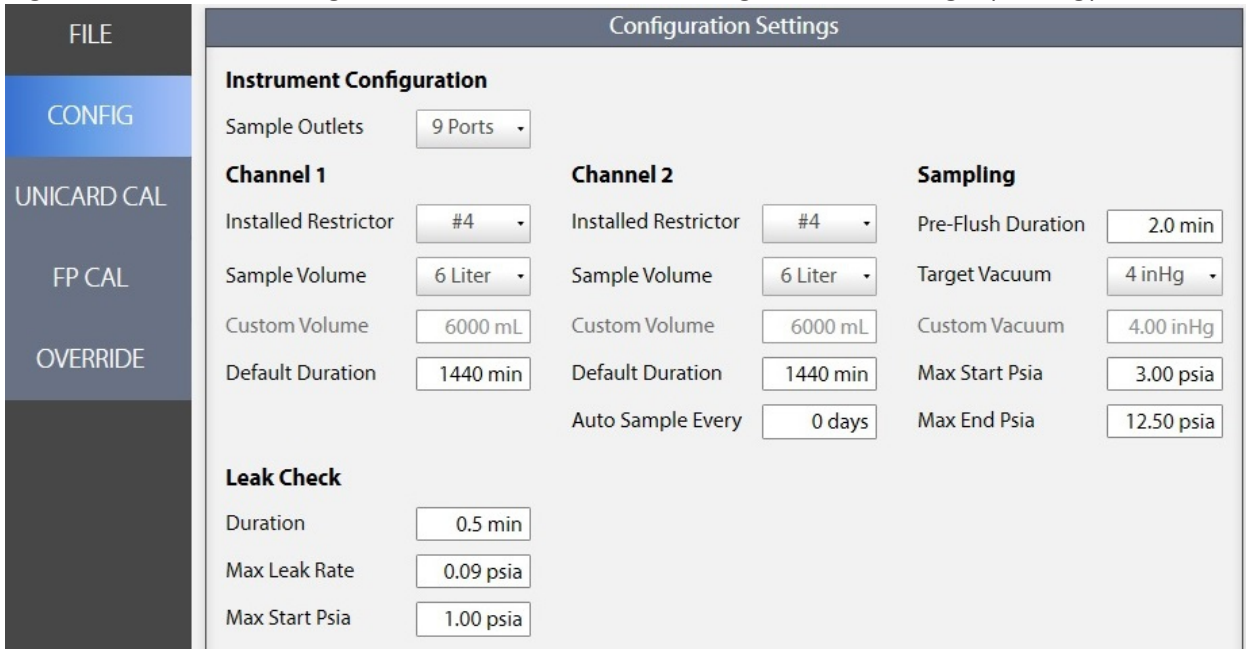
Leak Check Settings: In the upper right of the View box.

Max Leak: User entered maximum acceptable leakage in psid during the duration of the leak check.

Duration: Length of the leak check in minutes. It is user entered.

Max. Start Psia: Maximum starting canister pressure in psia. If the

Figure 4-9 1900 Settings Control Column and Configuration Settings (Config) Main Box



canister pressure is above this value sampling will not occur or the next canister in the sampling sequence will be filled.

Settings Screen: If any changes are made to the settings they must be saved (File - Save Config, Save Unicard Calibration, Save FP Calibration, or Save Override for the changes to be kept after the software is closed.)

Control Column for the Settings Screen: Refer to Figure 4-9.

File: Changes depending on which view is toggle in the View box. The selections are Save Config, Save Unicard Calibration, Save FP Calibration, or Save Override

Config: Toggle the Configuration Settings into the View box.

Unicard Cal: Toggles the Unicard Calibration into the View box.

FP Cal: Toggles the Flow Professor Calibration into the View box.

Override: Toggles the Override screen into the View box.

Main Box for the Settings Screen:

Configuration Settings Main Box: Refer to Figure 4-9. The defaults for the Sequence, Leak Check, and Method screens are set on this screen.

Instrument Configuration: Use the pulldown to select if the 1900 has two sample ports or 9 sample ports.

Channel 1:

Installed Restrictor: Use the pulldown to select the Entech restrictor currently installed on Channel 1.

Sample Volume: Use the pulldown to select the canister size connected to channel 1. Use “Custom” if the sample volume is not present and then enter the sample volume in the Custom Volume box.

Custom Volume: Enter the volume in liters if “Custom” is selected for the sample volume.

Default Duration: Enter the default channel 1 sampling event duration time in minutes.

Channel 2:

Installed Restrictor: Use the pulldown to select the Entech restrictor

currently installed on Channel 2.

Sample Volume: Use the pulldown to select the canister size connected to channel 2. Use “Custom” if the sample volume is not present and then enter the sample volume in the Custom Volume box.

Custom Volume: Enter the volume in liters if “Custom” is selected for the sample volume.

Default Duration: Enter the default channel 2 sampling event duration time in minutes.

Auto Sample Every: Enter the number of days.

Sampling:

Pre-Flush duration: Time in minutes for the flush pump to run before sampling begins.

Target Vacuum: User entered in “Hg. This is how much vacuum the users would like to remain in the sample canister at the end of the sampling event.

Max. Start Psia: Maximum allowed canister pressure in psia at the beginning of sampling. If the canister pressure is above this value sampling will not occur or on Channel 1 only, a different position will be used for sampling if the Channel 1 8 position option is present and a second canister is set up for sampling.

Max. End Psia: The maximum allowable pressure in the canister. Sampling will stop when this pressure is reached. This is to keep the canister from reaching atmospheric pressure during sampling. There are three advantage to stopping the sampling prior to reach atmospheric pressure. First, it ensures there will be enough vacuum in the canister to maintain a constant flow throughout the entire sampling process in order that a true average concentration can be found. Second, it provide verification that the 1900 was not contaminated from the time sampling finished to the time the sample was analyzed. If all canister sampling stops when the pressure reaches 2 psia below atmospheric pressure then all the canisters should still be at 2 psia when they are analyzed (or surrogate spiked or pressurized just prior to analysis). Last, if water reactive compounds such as formaldehyde, H_2S, or mercaptans are to be analyzed it has been shown that there stability in canisters decreases as the amount of water increases. Stopping the sampling at 7 psia and then performing a 2-3X dilution with dry UHP nitrogen or surrogate in the laboratory allows these and other reactive compounds to be monitored successfully with the canister method.

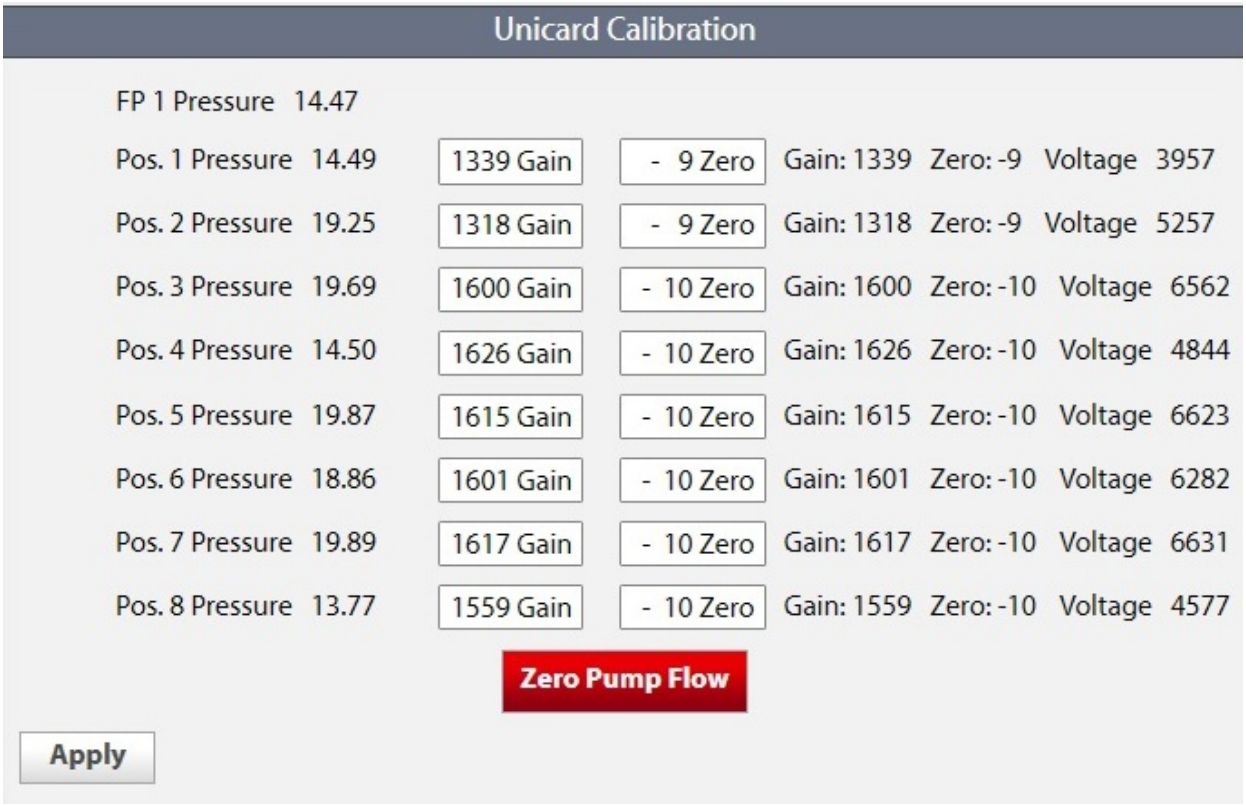


Figure 4-10 Unicard Calibration Screen in the Settings Main Box.

Leak Check:

Duration: Length of the leak check in minutes. It is user entered.

Max Leak: User entered maximum acceptable leakage in psid during the duration of the leak check.

Max. Start Psia: Maximum starting canister pressure in psia for the leak check. If the canister pressure is above this value the leak check will not pass.

Unicard Calibrations Main Box: Refer to Figure 4-10. Refer to the installation section of the manual for information on how to calibrate the 1900's pressure sensors. If any changes are made on the Unicard

Position # Pressure: These are the pressure sensors on positions 1-8 of Channel 1. The columns are in order from left to right: Name of the pressure sensor, the Current pressure reading, a Box to enter a new Gain value, a Box to enter a new Zero value, the currently applied Gain value, the currently applied Zero value, and the current DC voltage in mV.

Rotary Valve Voltage: Normally the factory default settings are used.

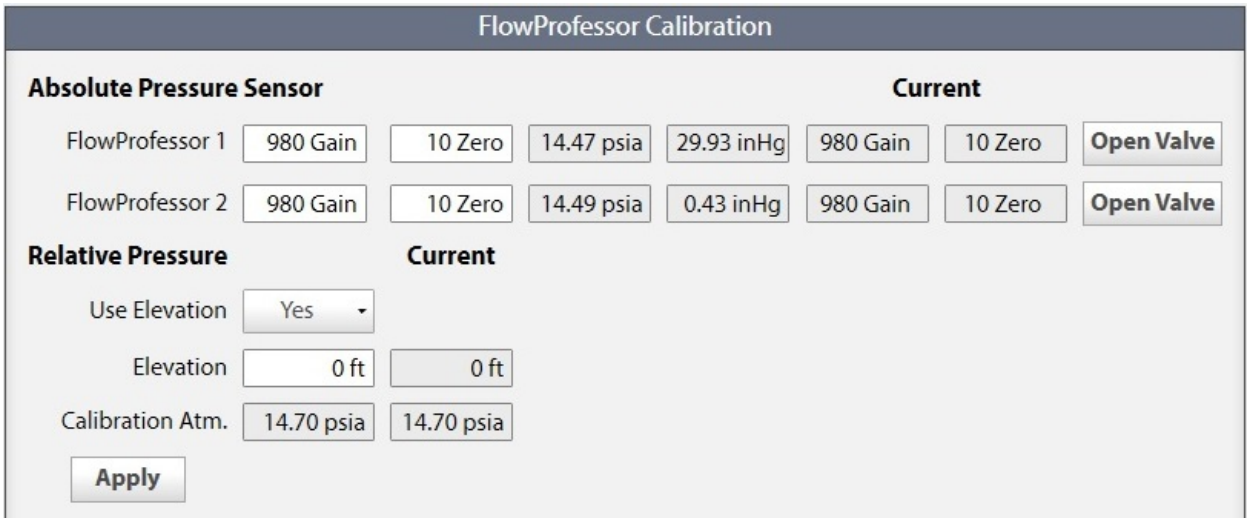


Figure 4-11 Flow Professor Screen in the Settings Main Box.

Apply: Click to use the newly entered zero and gain values. The values in the last two columns should change. The pressure reading that is being calibrated should also change. To permanently save the new values use “File” “Save Unicard Calibration” otherwise the new values will be lost when the software is closed.

Zero Pump Flow: Used to “Zero” the pump flow temperature reading. The pump flow temperature can be zeroed when the pump is off and at room or ambient temperature. It is for manual use only. The software periodically zeroes the pump flow when the pump is not running. The Zeroed Pump Flow provides a point of reference for when flows start.

Flow Professor Calibration Main Box: Refer to Figure 4-11. Refer to the installation section of this manual for a procedure to calibrate the 1900’s Flow Professor Pressure Sensors.

Absolute Pressure Sensor: These are the pressure sensors for Flow Professor 1 and Flow Professor 2. The columns are in order from left to right: Name of the Pressure Sensor, a Box to enter a new Gain value, a Box to enter a new Zero value, the current pressure reading (psia), the current vacuum reading (”Hg), the currently applied Gain value, and the currently applied Zero value.
Open/Close Valve: Click to open or close its Flow Professor’s shutoff valve. Open Valve becomes Close Valve once the valve is opened and vice versa.

Relative Pressure:

Current: This column shows the current values.

Use Elevation: Pulldown. to select **Yes** to set the “Calibration Atm.” to local atmospheric pressure using the elevation or **No** to directly enter the local atmospheric pressure in the Calibration Atm. box.

No: Only the Calibration Atm. box will be present.

Yes: A box pops up for the Elevation. When the elevation is typed in the box the Calibration Atm will change.

Apply: Click to use the newly entered zero and gain values or any newly entered values for relative pressure. The values in the last two columns should change. The Flow Professor pressure reading that is being calibrated should also change. To permanently save the new values use "File" "Save FP Calibration" otherwise the new values will be lost when the software is closed.

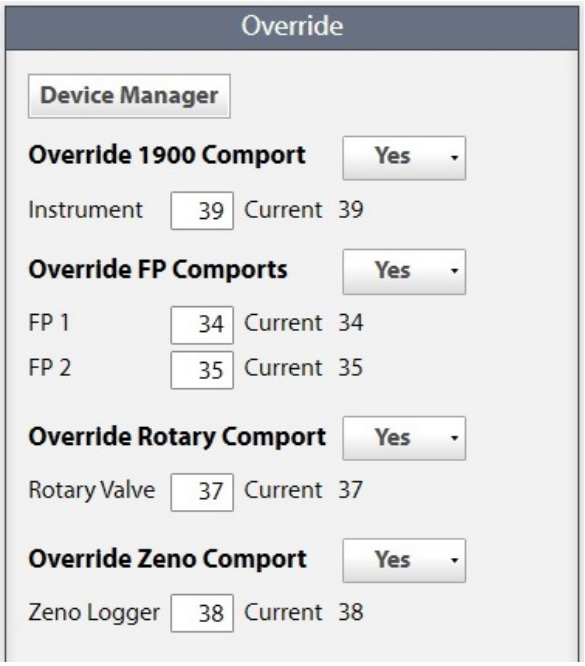


Figure 4-12 Override Screen in the Settings Main Box

Override Main Box: Only use this on the direct advice of Entech personnel. It is used to tell the computer exactly which COM port is associated with which component in the 1900. Refer to Figure 4-12.

Override 1900 Comport: Select Yes to Override or No not to.

Instrument: Shows the Comport the user associated with the 1900.

Current: If "No" is selected for Override 1900 Comport this will show the Comport the software has found the 1900 on. If "Yes" is selected it will copy the Comport the user associated with the 1900.

Override FP Comports: Select Yes to Override or No not to.

FP1 or FP2: Shows the Comports the user associated with the FP1 (Channel 1 Flow Professor) and FP2 (Channel 2 Flow Professor).

Current: If "No" is selected for Override 1900 Comport these will show the Comport the software has found FP1 and FP2 on. If "Yes" is selected the software will copy the Comports the user associated with the FP1 and Fp2.

Override Rotary Comport: Select Yes to Override or No not to.

Rotary: Shows the Comport the user associated with the IMS controller

for the rotary valve actuator the is part of the Channel 1 8 position sampling option.

Current: If “No” is selected for Override 1900 Comport this will show the Comport the software has found the 1900 on. If “Yes” is selected it will copy the Comport the user associated with the 1900.

Override Zeno Logger Comport: Select Yes to Override or No not to.

Zeno Logger: Shows the Comport the user associated with the Zeno Logger if attached to the 1900.

Current: If “No” is selected for Override Zeno Comport this will show the Comport on which the software has found the Zeno logger. If “Yes” is selected it will copy the Comport the user associated with the Zeno Logger.

Section 5. 1900 Operations.

Scheduling & Running A Sample

Do this first step only if the 8 position option is present. Confirm the rotary valve is in the home position (position 0). Move it to the home position if necessary. (Go to the “View” screen. Select rotary valve position of 0 with the pulldown. It may be necessary to do this a couple times or send to position 6 and then to 0. You should hear the rotary valve move.)

Connect evacuated sample canisters to the positions to be used for samples but do not open the canister. WARNING: ALWAYS FINGER TIGHTEN THE 1/4” NUT ONTO THE CANISTER VALVE. It should be possible to turn the nut at least 1.5-2 revolutions by hand, otherwise the nut may either be cross threaded or may have been overtightened in the past causing the threads to distort. If a nut has been damaged to the point that finger tightening can no longer be done, then the adapter fitting should be replaced. The ability to finger tighten is the only way to prevent cross threading and subsequent damage to the expensive canister valve.

A leak check must be performed. Even a relatively small leak can cause significant contamination of the canister if the period of time before sampling is several days. Remember that the 1900 has no way of opening the canister valve at the start of sampling. The canister valve must be opened by the operator before leaving There must be some reassurance that the system is leak tight before trusting that the canister will be clean and ready to accept the sample when the time for sampling arrives.

Open the evacuated canister valve after connecting. The canister pressure should be displayed in the Sequence tab for each position connected under "Psia". Leak check the canister as explained in the installation section of this manual.

If the canister psia is below the maximum starting psia set in the configuration settings, the position will be enabled and display "Ready to Schedule" in the grid row.

To schedule, click the “Start” cell of that position and then select the desired start date and time. The start date and time may also be typed in, The format is:

“YYYY-MM-DD HH:MM” - The time must be 24 hour time in this format.

Enter the desired sample duration in minutes.

Select "RUN CH1" if the scheduled sample position is a Channel 1 position, otherwise, select "RUN Ch2".

The sample will be prepped and queued to run at the scheduled time.

To start the sampling click “Run CH1” and/or “Run CH2)”.

Both channels can be run simultaneously.

If necessary, to abort the current sample, select "ABORT CH1" or "ABORT CH2" (These appear after “Run CH1” or “Run CH2“ are clicked”.)

Status messages are displayed to inform the user of the current state and the CH 1 or 2 Sampling LED will be lit on the front if the channel is sampling (including if it is queued to sample).

If a position needs to be sampled after its first sampling event is complete its line in the sequence table must be cleared. To do this select that line and unselected all other positions in the sequence table. Then click “Clear”. Another way to clear the table is to simply close the software and reopen it.

Section 6. 1900 Troubleshooting.

No Power:

Unplug the 1900. Check the 2A fuse on the rear of the 1900 and verify it has not blown.

If the fuse is good verify the power outlet is working with a lamp or radio.

Communication (COM) Issues:

No COM the first time the software is loaded at the installation. The very first time the 1900 software is opened on a new computer some files are created. If these files an not ready by the time the opening software is ready for them the 1900 may not have COM. In this situation simply close and then reopen the software a second time. The files should have been created during the first opening of the software. There should be no COM issues any subsequent times the software is run.

COM issues after the installation. Most of the time COM issues can be resolved be simply closing the software, powering off the 1900 and tablet and then restarting the 1900, tablet, and the software. Sometimes it may be necessary to unplug the USB cable and then plug it back in. One of the must common causes of no COM is that the equipment is not powered on.

Override COM Issues. If Override is activated for the COM ports the software will only look for the 1900 components at the COM ports specified on Override screen. Try deactivating Override (Select “No” on the Override screen and then “File” “Save Override”.) settings and closing the 1900 software. Check the Override screen to see if the COM ports changed. If they did either continue to run with Override deactivated (initial software opening will be a little slower) or enter the new COM port values on the Override screen and activate Override.

Communication Setup. This should not normally be necessary when the 1900 is new as it is shipped with a pre-programmed tablet but can be used to troubleshoot COM issues. On most new computers it should not be needed either.

Plug in and power on the 1900 instrument.

Allow device drivers to install for the hub and serial comports.

Navigate to Device Manager (Run 1900 Software -> Go to Settings -> Click Override -> Click Device Manager).

Select the "Ports (COM & LPT)" section to view the comports attached to the device.

Confirm that there are (6) USB Serial Ports shown. These are usually numbered consecutively (ex: 11, 12, 13, 14, 15, 16) but not always.

Note that these ports will not always appear in order (ex: 12, 13, 14, 15, 11, 7).

Record the comport numbers (ex: COM11, COM12, COM13, COM14, COM15, and COM16).

On the Settings-Override screen select "No" for the "Override 1900 Comport" setting.

Select "Yes" for the "Override FP Comports" setting.

Select "No" for the "Override Rotary Comport" setting.

Select "FILE" then "Save Override".

Restart the1900 Software.

"SYSTEM STATUS" on the status bar should be green. Green indicates the 1900 is link active (in other words it has COM (is communicating) with the computer and software). If “SYSTEM STATUS” is red the 1900 is not link active. Make sure the 1900’s power is on, try closing the software and reopening it, reboot the computer, and if those do not help contact your local Entech representative for support.

Navigate again to the Override screen.

Take note of the "Current" values of the Instrument comport and the Rotary comport (they should both be one of the comports that was recorded in step 8). These comports should NOT be used as comport values for the FP 1 and 2 comports.

The FP 1 and FP 2 Comports will often be the second and third comport in the consecutive comport list (ex. If comports are 11, 12, 13, 14, 15, try 12 for FP 1 and 13 for FP 2).

Click “File” “Save Override” to save the Override file. Restart the software.

Navigate to the "View" tab on the top menu.

If Channel 1 (FP1) and Channel 2 (FP2) display a response of "Idle", both devices are communicating.

If Response is "Error" and status displays "Device not responding", wait for a brief moment to see if either Channel re-connects if it is disconnected.

Navigate to the Override screen and try a different comport from the list recorded from step 8 for the channel that is not communicating (again, using one that is not already taken by the Instrument, Rotary Valve, or any of the communicating FP devices).

After the correct comports have been found, save the override file and restart the software.

Advanced Communication Setup. Only use this if the normal communications setup is not working.

Plug in and power on the 1900 instrument.

Allow device drivers to install for the hub and serial comports.

Navigate to Device Manager (Run 1900 Software -> Go to Settings -> Click Override -> Click Device Manager).

Select the "Ports (COM & LPT)" section to view the comports attached to the device.

Confirm that there are (6) USB Serial Ports shown. These are usually numbered consecutively (ex: 11, 12, 13, 14, 15, 16) but not always.

Open (double click) each COM port one at a time, click “Details” to either “Device Instance Path” or “Device Driver Instance Path”. Record the path for each COM port.

COM 34	FTDI\VID_403+PID_6001+ENGKVGBA\0000
COM 35	FTDI\VID_403+PID_6001+ENGKVGBB\0000
COM36	FTDI\VID_403+PID_6001+ENGKVGBC\0000
COM37	FTDI\VID_403+PID_6001+ENGKVGBD\0000
COM38	FTDI\VID_403+PID_6011+ENGKUE5A\0000
COM39	FTDI\VID_403+PID_6011+ENGKUSMA\0000

Four of the paths will be identical except for the red letter. This means they are connected to the hubchip in the 1900 and that they are USB to Serial Convertor A, B, C, and D respectively on the hubchip. On the Override screen FP 1 is USB to Serial Convertor A, FP 2 is B, C is unused, and Rotary Valve is USB to Serial Convertor D. Enter the respective COM port numbers for the FPs (Flow Professors) and the Rotary Valves on the Override screen and save the values (File -> Save Override).

The remaining two COM ports are either the 1900 or the Zeno Logger. There is no pattern in the Device Patch that will consistently show which is which. Therefore the COM ports numbers must be entered into override and switched if necessary using trial and error. Save the Override values and exit the software. Reopen the software. If the 1900 has COM the values are correct. In not switch the values and try again.

Alternative Way to Access Device Manager with Windows 10. Note that this may vary by computer.

Start Menu -> All Apps -> Windows System -> Control Panel -> System and Security -> System -> Device Manager.

What to do if the Computer is not finding the drivers:

Normally this procedure should only be needed if the 1900's tablet is replaced.

Sometimes during the initial loading of the software the computer may not find the drivers needed for the 1900 or it may only find some of them. The COM ports will be listed under Other Devices but not under Ports - COM and LPT.

Wait 20 minutes. If the computer has not found them within 20 minutes it probably has stopped trying. On some computers it just takes a while for the drivers to load.

Unplug the USB cable. Reboot. Plug the USB cable back in.

Go to other devices. Click on a Port. Then select "Update Driver Software". Update from the internet. The FTDI devices in the 1900 are Windows Certified and are readily available from the internet.

Maintanence:

CS1200 Position Calibration

This is done at the factory so it should not need to be done on new 1900s. It may need to be done if the following parts in the 1900 are replaced: a CS1200, a Flow Professor, or a Flow Professor board.

Open the 1900 software.

Navigate to "View" on the top menu.

Under Channel 1, type "5000" steps into the Motor input box.

Unscrew and remove the top panel of the 1900 instrument.

Gently put a finger on FP drive shaft or mark with Sharpie (Texter, Marker). Press the "Spin Close" button to spin the CS1200 Closed. You should be able to see or fell the drive shaft rotate.

Observe the Channel 1 CS1200 (the left hand side if facing the front of the 1900).

If the CS1200 stops spinning, press the "Spin Close" button again.

Repeat the previous three steps until the motor begins stalling. (It will jitter back and

forth and the shaft will no longer be spinning. The motor sound will also be different.) Press the "Kill" button to stop the motor if this happens.

Select "Set to Zero" to set the Position as step position 0. Watch the CS1200 motor to see if it turns then “Spin Open”. If the motor does not turn click “Set to Zero”. Then use your fingers to help the motor turn when “Spin Open” is clicked. Sometimes just a little more torque is needed.

The steps are basically the same for Channel 2 with the Channel 2 CS1200 being on the right side (if facing the front of the 1900).

Leaks:

Do NOT use pressurized helium (with an electronic leak detector) to isolate leaks as it can damage the CS1200s in the 1900.

Do the CS1200 Position Calibration. If the encoder reading is not accurate it could be that the CS1200 is not being closed during the leak check.

One key is to isolate the leaks as much as possible. If the 8 position option is present send the Channel 1 valve to position 0, Use the leak check screen (refer to the installation chapter to isolate leaks to specific valve positions if possible (8 sample option only). If the leak is still present it is at or after the rotary valve. If the leak is no longer present it is at or before the rotary valve.

Most leaks will be found at the connection to the sample canister. The fitting may be loose or the fitting or canister valve may need replacement.

Flow Issues:

Canister did not fill:

Canister valve may not have been opened.

Channel may not have been started.

Canister may have been connected to the wrong port.

The 8 position valve may be misaligned or not moving. Check Alignment and troubleshoot.

Inlet filter may be completely clogged.

Sample Canister Overfilled:

The configuration settings may not be correct.

There may be a leak.

Sample Canister Underfilled:

The configuration settings may not be correct.

The inlet filter may be partially clogged.

With the 8 position option the rotary valve may be partially misaligned.

Vacuum Issues

Message “Flow Calibration Vacuum could not reach 20” Hg””. Change the vacuum source. Often canisters are used to provide vacuum. This message indicates the canister has too much pressure and needs to be evacuated.

Section 7. External Control of the 1900.

Internet:

The 1900's tablet computer is internet capable. It can be connected to the internet to allow the operator to log in remotely and control or check the 1900.

Non-Internet External Signals and Control Options:

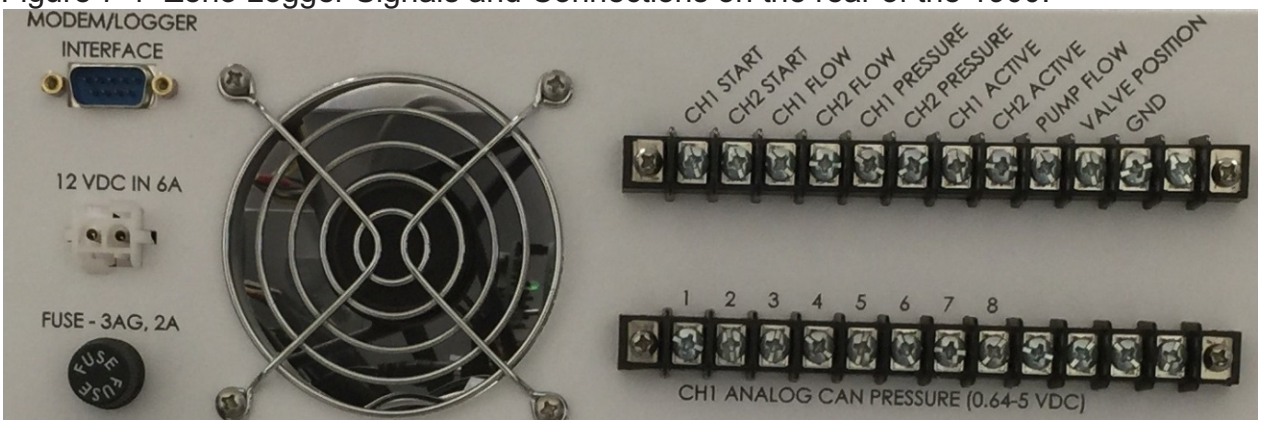
The 1900 can be monitored and controlled externally to provide greater operational flexibility and enhanced QA utilizing existing data management strategies (eg., data loggers). A dedicated serial port is provided on the back of the 1900 for interfacing to a Coastal Environmental Systems, Inc. Zeno 3200 data logger (or equivalent) to provide communications via standard DOT commands (covered later in this section). In addition terminals on the rear of the 1900 provide the following analog and digital information. Refer to Figure 7-1.

Upper Terminal

CH1 Start (5 VDC = no, <1 VDC = yes, 1ma/CMOS or Relay)
CH2 Start (5 VDC = no, <1 VDC = yes, 1ma/CMOS or Relay)
CH1 Pressure (0-5 VDC)
CH2 Pressure (0-5 VDC)
CH1 Flow Rate (0-5 VDC)
CH2 Flow Rate (0-5 VDC)
CH1 Active (5 VDC = no, 0.2 VDC = yes)
CH2 Active (5 VDC = no, 0.2 VDC = yes)
Pump Flow > 1 L/min (5 VDC = no, 0.2 VDC = yes)
VALVE POSITION (VDC = Position * 0.625 VDC)
GND (Ground)

Lower Terminal. These pressures on the 8 optional channel 1 positions. (0-5 VDC).

Figure 7-1 Zeno Logger Signals and Connections on the rear of the 1900.



Open loop monitoring of signals through any data logger can be easily performed to create additional feedback on the canister sampling process. The signals can be monitored every 5 to 15 minutes to get readings of the flow and pressure, to verify a channel is active, or to verify the 8 position valve is on the correct position (measure the voltage then divide by 0.625 to get an integer position between 1 and 8.

External Event Control:

The CH1 Start and the CH2 Start on the external connector allows the 1900 to start collecting sample based on a digital low or a contact closure to ground. This can be in response to an alarm on some other CEM monitor (eg., Ozone, NOx, etc.) or based on a dial in request from the operator through a local data logger.

To use the external start feature, the sampling information must already be entered in the 1900 software in the sequence table and the 1900 must be ready for sampling. There is no way to change the sampling duration for a 1 hour to 24 hour duration with this feature. However, if Channel 1 is set up for a 1 hour sampling and Channel 2 is set up for a 24 hour sampling the user will have some flexibility when starting the sampling remotely.

If the 1900 is intentionally set up to be started remotely, the Time should be set to be several weeks (or months) in the future. When a contact closure (digital low) is detected with a minimum duration of 2 seconds then the time for that channel is updated to the present time. If the pump is currently off, the Time will be set to the current time plus the flush time. That way the sampling will actually commence at the updated time shown in the sequence table.

Combined with the 8 position option, the remote start feature can be used to collect a number of sample remotely through Channel 1. By setting up several canisters on the optional 8 positions and providing start dates one or two months in the future, filling can be initiated for each canister sequentially. As long as the request to start is provided to the 1900 after the last canister sampling on Channel 1 has completed, then the 1900 will start the next sampling. Through the other positions on the Zeno connector on the rear of the 1900 the flows, pressures, channel active, and rotary valve position can be monitored remotely to verify that the needed samples are indeed being collected.

DOT Command 1900 Control

DOT Commands add a higher level of control to the 1900 because now flow rates and sampling durations are under external control as well. Communications are via a 2-wire plus ground RS232 connection operating at 9600 baud with 8 bits, 1 stop bit, no party, and hardware off.

In the following DOT command descriptions, [soh] - start of header = ASCII character 1, and [cr] - carriage return = ASCII character 13. Each field is space delimited. The quotation marks are not sent, but denote the ASCII equivalent for everything within the quotations are sent and received. The response from the 1800 back to the data logger is for conformational purposes.

Set Time: Input Format: [soh]".352 hh:mm:ss MM/DD/YY !CS"[cr]
Output Response ".352 hh:mm:ss MM/DD/YY !CS"[cr]
Where hh = hour, mm = minute, ss = seconds, MM = Month, DD = Day, YY = Year, CS = Checksum (modulo 100). Allows the sampler date and time to be set remotely.

Start Can: Input Format: [soh]".400 ff c ddd rrrr !CS"[cr]
Output Response ".400 ff c dddd rrr ![cr]
Where ff is the preflush time, c is the channel number (1 or 2), dddd is the duration from 0001 to 9999 (minutes), and rrrr is the flow rate (0000).

Stop Can: Input Format: [soh]".401 c [CS"[cr]
Output Format: ".401 c !CS"[cr}
Where c is the channel number (1 or 2).

Canister Status: Input Format: [soh]".402 c !CSx"[cr]
Output Response: ".402 c hh:mm:ss MM/DD/YY pp PPPP FFFF dddd tttt !CSy"[cr]
Where c is the channel (1 or 2), hh:mm:ss MM/DD/YY are the Time (start date and time) from the current canister, pp is the rotary valve position, FFFF is the current flow, dddd is the total sampling duration, tttt is the sampling time remaining, CSx is the checksum from the logger, CSy is the new checksum from the 1900 Response screen.

Port Set: Input Format: [soh]".403 pp !CS"[cr]
Output Response: ".403 pp !CS"[cr]
Where pp is the optional 8 position rotary valve position. The command sends the rotary valve to port pp to allow status information to be retrieved or to prepare for a new Start Can (.400) command at the new port location.

If a message is received, but the calculated modulo 100 checksum does not agree with the value sent, then the "." in the response will be replaced with a "?", indicating that the command should be sent again.

If a message is received that has the correct checksum, but the command is not understood, the 1900 will respond by echoing the command (minus the initial [soh] as usual) and will append the words "invalid command" after the echoed command, followed by a new checksum and carriage return (" !CS"[cr]).

Entech 1900 Flow Diagram