ENTECH INSTRUMENTS

1900 & 1916 Multicanister Sampler

Manual Version 3.0

October 2022

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113 Single Channel 1900 Flow Diagram.

Section 1. 1900 Introduction.

1.1. 1900/1916 DO's and DO NOT DO's.

1.1.1. DO NOT connect or disconnect the DB15 cable between the 1900 and the 1916 while the 1900 (The 1900 provides power to and controls the 1916.) and its computer are powered up. Doing so can damage the mini-U (mini-Unicard) board inside the 1900 which would then require replacement.

1.1.2. DO clean and blank certify all NEW canisters individually before sampling into them with a 1900.

1.1.3. DO fingertighten all nuts before final tightening with a wrench. Use a backing wrench whenever possible while tightening a nut with a wrench. If it is not possible to use a backing wrench then use your free hand to support the item the nut is being connected for items such as canister valves.

1.1.4. DO NOT use pressurized gas to leak check the 1900. This can damage the internal CS1200 diaphragms and internal 1900 pressure sensors.

1.1.5. DO NOT restrict the sample inlet line in any way. This includes not putting restrictors on the sample inlet or sample line.

1.1.5. DO read all of the instructions in the installation section of this manual before beginning the installation.

1.2. Introduction.

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

1.2.2. The 1900 is a dual channel canister sampler. Two sampling channels are available and can be configured a few different ways to improve system flexibility. A single canister can be attached to Channel 1 or Channel 2 for event triggered sampling based on other sensors or remote sampling requests. A 1916 may be added to Channel 1 or Channel 2 to add 16 additional sampling positions to either or both 1900 channels. Channel 1 also has an optional 8-Position Expander (not compatible with a 1916 on Channel 1) to add 8 sampling positions to Channel 1 without adding a 1916. (The 8-Position Expander is not available for Channel 2.) Note that there is a single channel version of the 1900 available for users that do not need dual channels.

1.2.3. Both a 1916 (Channel 2) and the 8 position option (Channel 1) can be added for programmed sampling or extended event sampling. A 24-Canister External Sample Pack is

available for continuous monitoring of C2-C12 compounds, air toxic compounds, carbonyls, and many other odor-producing compounds into 600 cc canisters.

1.2.4. Each 1916 adds sixteen sample positions to either Channel 1 or Channel 2 or both. Each channel can have its own 1916 and both channels can use their 1916s simultaneously. Each 1916 is controlled by the 1900 and the 1900 software. Each 1916 receives power from the 1900 as well. Like the 1900, the 1916 is rack mountable. Each 1916 can hold up to sixteen 3.2 liter or smaller canisters, up to eight 6 liter canisters (alternating positions, for example, 1, 3, 6, 8, 9, 11, 14, 16), or up to four 15 liter canisters (one on each corner). Additional 6 or 15 liter canisters can be added by connecting the canisters to the 1916 ports with the appropriate SS (stainless stell) fittings and Silonite coated stainless steel tubing.

1.2.5. The Channel 1 and 2 flow rates are calculated from the rate of change in canister pressure. The flow rate range is determined by the restrictors in the internal CS1200s. These restrictors are inexpensive compared to electronic mass flow controllers. The 1900 target flow rate range can be changed simply by changing the restrictor. An internal Flow Professor sets the CS1200 to the targeted flow rate using an automated procedure in the software.

1.2.6. 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.

1.2.7. A dramatically improved flow path creates far less potential for carryover relative to other commercially available samplers. The flow path has been improved by eliminating electronic mass flow controllers and solenoid valves in order to remove elastomeric seals which have been shown to outgas VOCs (Volatile Organic Chemicals) making it more difficult to achieve VOC free blanks down to sub-ppbv levels.

1.2.8. The flow path is Silonite coated for maximum inertness.

1.2.9. 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 Touch Screen Controller with Wifi is integrated into the panel as the 1900's computer on most 1900 models. The controller allows advanced remote operations which reduce 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 the initial vacuum requirements.

1.2.10. We value any feedback from our users on how we can improve our products and manuals. If you have any feedback on the 1900, the 1916, 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.

1.3. Models and Options.

1.3.1. 01-1900 1900 Canister Sampler. This is a dual channel canister sampler.

1.3.2. 01-1900-CH1 1900 Single Channel Canister Sampler.

1.3.3. 01-1900-8CH-EXPAND 8 Position Expansion Option for 1900 Channel 1.

1.3.4. 01-1900-NC Dual Channel Canister Sampler without the controller.

1.3.5. 01-1900-RACK Rack, 1900/1916. Rack for a 19” Rack Mount.

1.3.6. 01-1916 1916 16 Position Sampler for the 1900. This is separate module that adds sixteen positions to Channel 1 or Channel 2. One can be placed on each channel.

1.3.7. 01-1900-01 DC Inverter Option. For battery, solar, or fuel cell power.

1.4. Warranty.

1.4.1. Please refer to https://www.entechinst.com/warranties/ for warranty information.

Section 2. 1900 Installation.

2.1. Power.

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

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

2.1.3. AC Power must be between 90-260 VAC. Two outlets are needed. One for the 1900 power cord and one for the 1900 controller power cord which connects to the rear of the 1900.

2.1.4. The 1900 is capable of 12 VDC Operation with the optional internal inverter.

2.1.5. 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 with a 12 VDC battery or fuel cell. At 50 to 60 W, the current requirement is about 5 A from the 12 VDC source.

2.1.6. Power for a 1916 is provided by a power/communications cable between the 1916 and the 1900.

2.1.7. Please be aware that 1900 itself does not have a battery, nor does its controller have a battery to power the controller. The controller is a standard computer that has a CMOS battery to keep the system date and time if there is no power. If a user needs to keep the controller on during a power outage they should source a UPS (Uninterrupted Power Supply) system. Alternative a laptop could be used in that situration. Be aware that the 1900 would also need a UPS system to keep it on in the event of a power loss.

2.2. Dimensions.

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

2.2.2. The 1916 is a 19” Rack Mount. It is 8.42” H X 26” D. The top width is 25.18” W. The bottom width is 16”. The mounting rails for the rack mount (19” equipment rack) are 36.25” D. It weighs 26 lbs. It can hold up to sixteen Entech canisters of a 3.2 liter or lower volume. It can hold up to eight six liter Entech canisters.

2.3. Temperature Range.

2.3.1. The 1900 and 1916 must operate in enclosures with a stable temperature. The temperature can range from -10° C to 50° C.

2.4. Computer Requirements.

2.4.1. Most new 1900s come with a Controller that is placed on the front of the 1900. It controls the 1900 and any 1916s connected to the 1900. The 1900 is also available without a Controller and the computer requirements for users that prefer that model are located in the user service manual. (Note that the Entech supplied controller is strongly recommended.)

2.5. Software Installation.

2.5.1. Software installation is not be necessary with most new 1900s as most are shipped with a Controller preloaded with software. The 1900 User Service Manual covers software reloading and patches for those who need that. Those instructions are provided in case a user would like to replace the Controller with a different PC, or laptop or if they need to update the software. Entech recommends using only Entech provided Controllers with the 1900. Replacement Controllers should be ordered directly from Entech.

2.5. New 1900 Installation Overview.

2.5.1. Hardware Installation.

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2.5.3. Changing the Computer's Time Zone Settings.

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2.5.6. Channel 1 8 Position Option Pressure Sensor Calibration Verification.

2.5.7. Check the Alignment of the Channel 1 8 Position Option Rotary Valve.

2.5.8. Check the Alignment of 1916 Rotary Valves.

2.5.9. Leak check the 1900.

2.5.10. Check the Flow Rate Benchmarks.

2.6. Hardware Installation.

2.6.1. 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 countertop. 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.

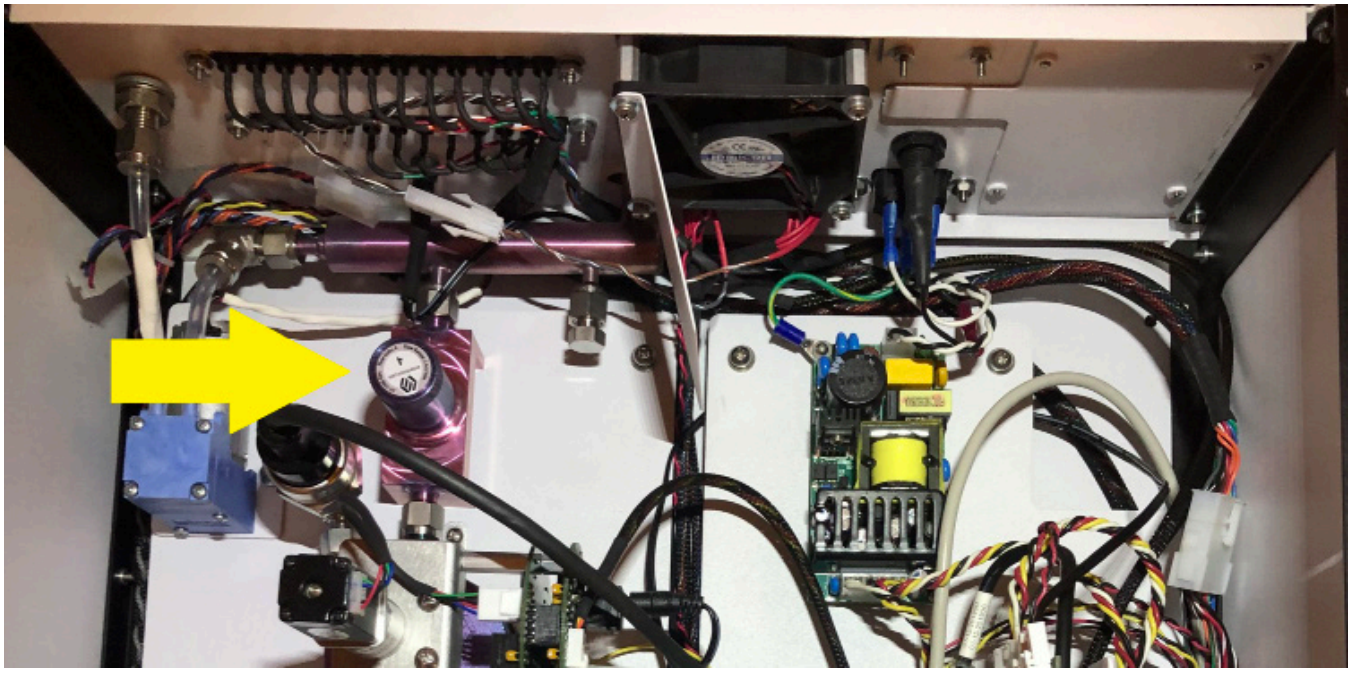
2.6.2. Remove the 1900 top cover.

2.6.3. Check interior boards and cables. With the power off and the power cord unplugged ground yourself on the frame of the 1900 and push in on all cable connections between cables, and cables and boards to ensure none of them came loose during shipping. Be aware that it is not uncommon for cables (particularly the internal USB) cable that do not have clips on their connectors to become a little loose during shipment. Simply holding the connector and pushing it into its board or the opposite cable can make the installation of the 1900 go much more smoothly by preventing issues.

2.6.4. Check the restrictors on Channel 1 and 2 then make note of their number (a measure of their flow range), for example: 1, 2, 2+, etc. (Note refer to figure 3.2.1 to determine if the restrictor flow rate range is correct for your project. The restrictor will need to be replaced if its flow range does not meet project needs. If a restrictor is replaced new flow rate benchmarks will need to be generated.) This information will be used when configuring the channels later in the installation. Refer to figure 2.6.4.

2.6.5. Install the Controller. The Controllers for new 1900s come preloaded with 1900 software so there is no need to load software on them. In addition all sensors will have been calibrated and the flow rate benchmarks determined at Entech before shipment.

Figure 2.6.4. The yellow arrow is pointing at the restrictor on Channel 1.



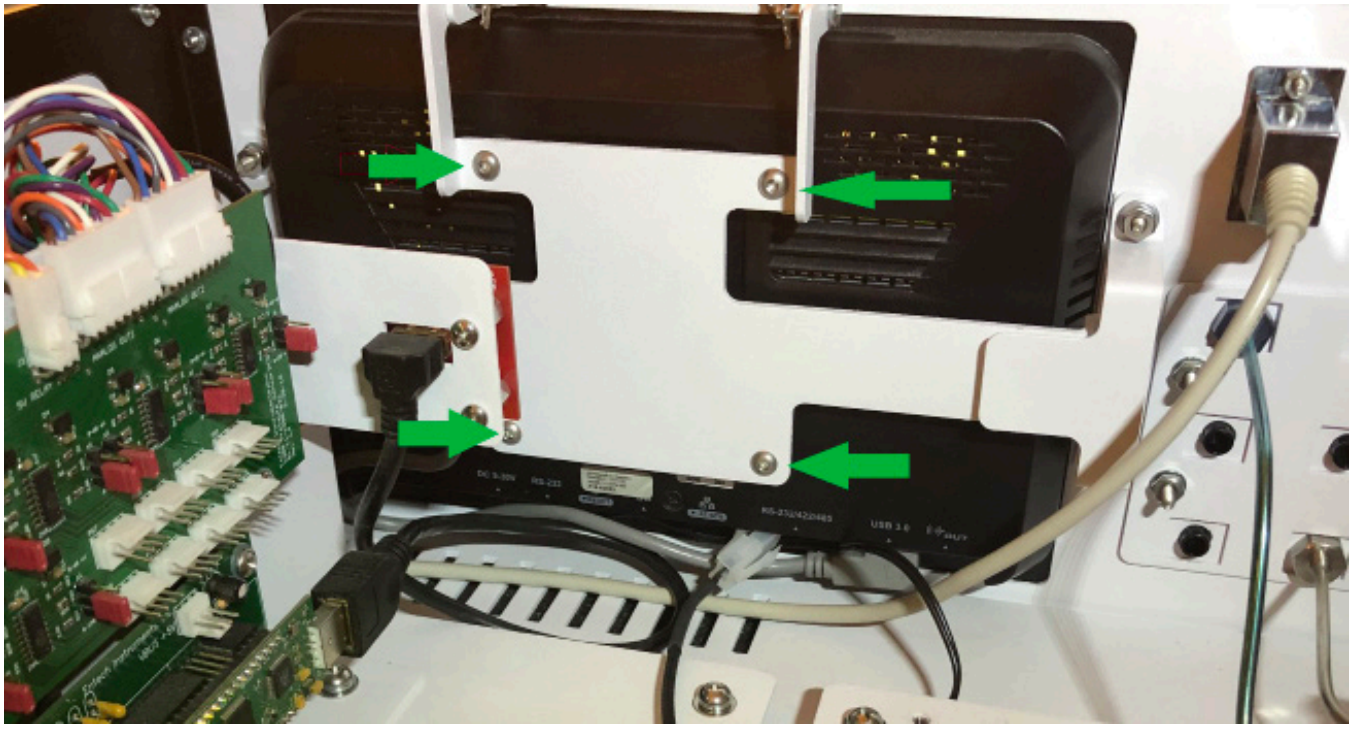


Figure 2.6.5.1. Above. The four green arrows shows the four screws which secure the Controller to the front of the 1900.

Figure 2.6.5.2. Above. The red arrow shows the internal USB cable connecting to the bottom of the Controller on the front of the 1900. The yellow arrow show the internal computer power cord connecting to the Controller.

Figure 2.6.5.4. Below. The yellow arrows show the main power cable and the Controller power cable connecting to the rear of the 1900.

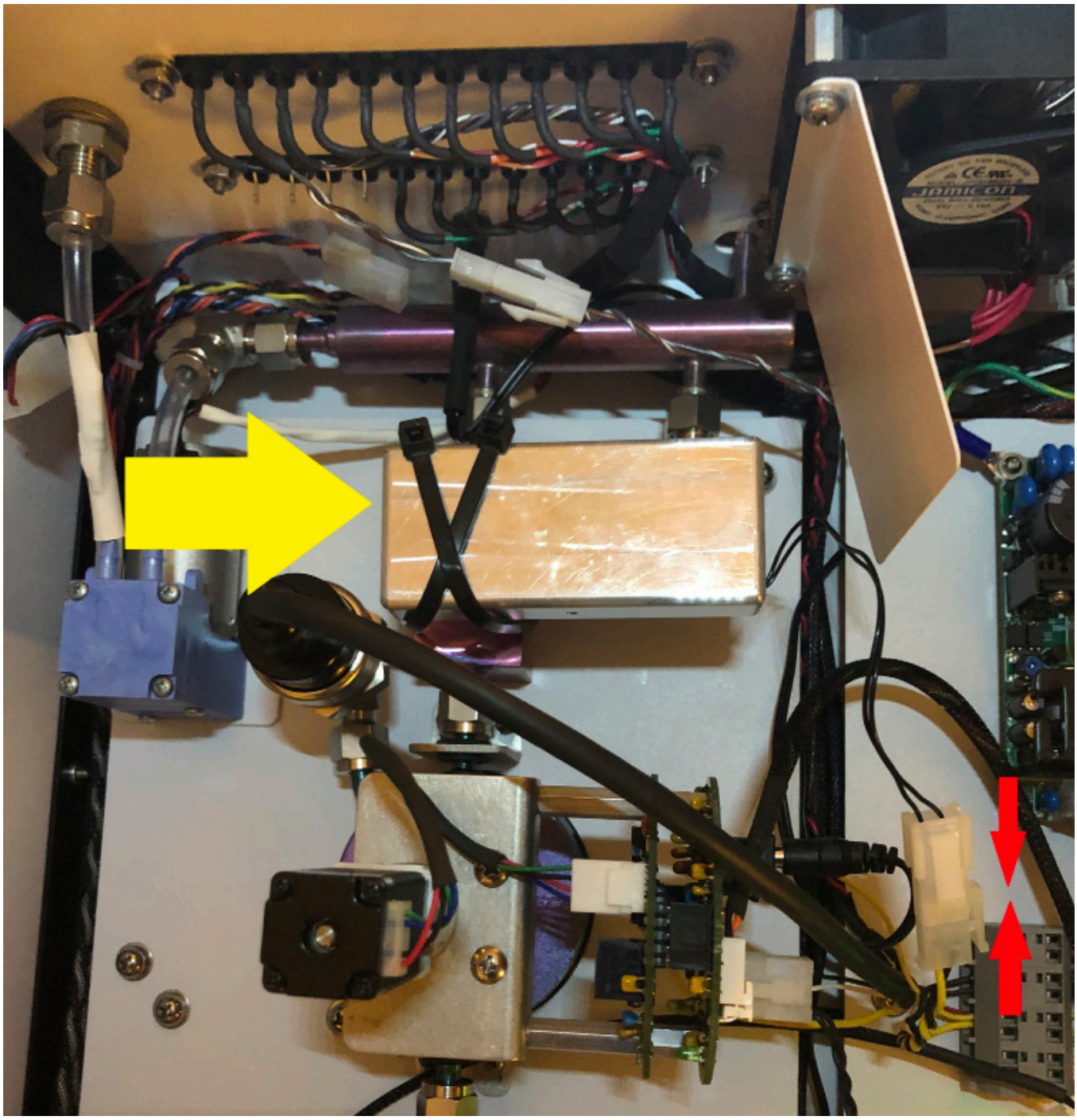


Figure 2.6.5.6. Above. The yellow arrow shows the restrictor heater secured to the Channel 1 restrictor by two zip ties. The red arrows show the heater power cable connection.

2.6.5.1. Verify the Controller and 1900 are powered off. If necessary disconnect the power cords from the electrical outlet. Find the four screws that secure the Controller to its bracket and secure the Controller to the bracket. Refer to figure 2.6.5.1.

2.6.5.2. Find the short USB cable in the 1900 which connects to the red USB I/O board and connect it to the Controller. Refer to figure 2.6.5.2.

2.6.5.3. Find the black Controller power cable in the 1900 and connect it to the Controller.

Refer to figure 2.6.5.2.

2.6.5.4. Connect the Controller power cord to “Controller 12V, 3 A” on the rear of the 1900. This is the external cable which will connect to the power outlet. Do not plug the cord into the outlet yet. Refer to figure 2.6.5.4.

2.6.5.5. Connect the 1900 power cord to the rear of the 1900. Do not plug the cord into the outlet yet. Refer to figure 2.6.5.4.

2.6.5.6. Refer to figure 2.6.5.6. Find the restrictor heater and zip ties in the 1900 install kit.

2.6.5.6. Leave the Controller powered off.

2.6.6. Replace the 1900 top cover.

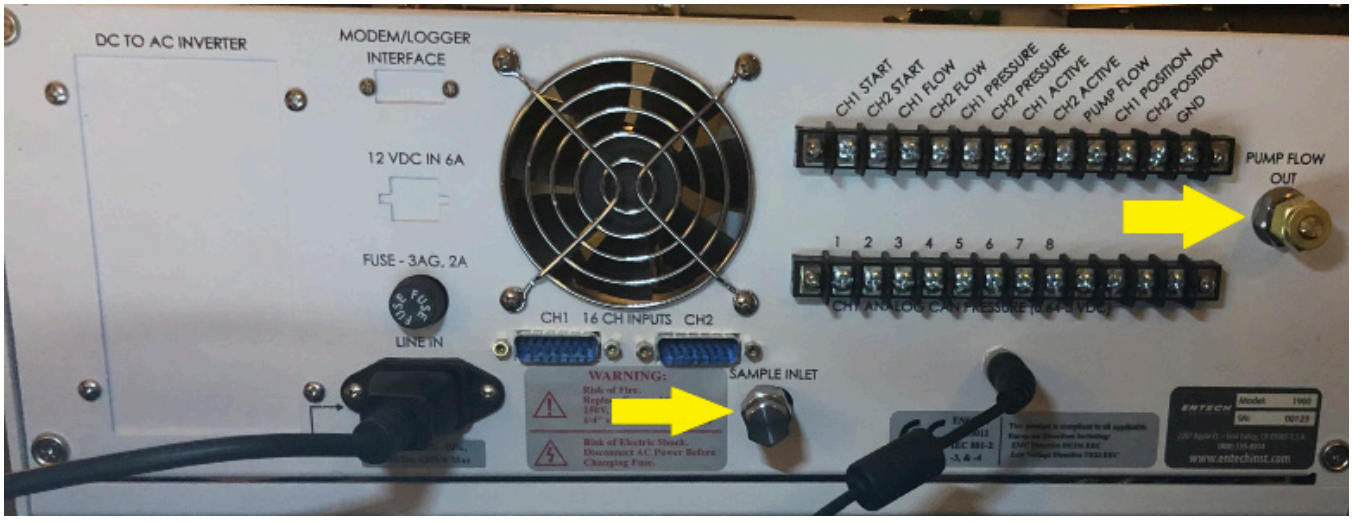
2.6.7. Remove the plug on the pump flow out port and the cap on the sample inlet port on the rear of the 1900. Refer to figure 2.6.7.

2.6.8. Move the 1900 into its final position in the rack or on the counter.

2.6.9. Attach the sample inlet line to the 1/4” fitting labeled “Sample Inlet” (Refer to figure 2.6.7.) on the middle, rear of the 1900. The sample inlet line should be new tubing that is both non-absorptive and non-adsorptive 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. Be aware that the Sample Inlet port cannot be restricted in any way by the user as this may damage the flow control assembly. This would include actual restrictors (typically a fitting with a number stamped on it) or through the use of tubing with too small of an internal diameter.

2.6.10. Refer to figure 2.6.10a and 2.6.10b. An inlet filter is included as part of the 1900

Figure 2.6.7. Above. The yellow arrows point to the Sample Inlet bulkhead and the Pump Flow Out bulkhead.



installation kit. The filter should be connected to the inlet end (the end outside the shelter) of the sampling tube which goes to the 1900. It should not be connected directly to the sample inlet on the rear of the 1900. The filter should be sheltered to prevent rain from entering it.

Figure 2.6.10a. Below. Sample Inlet Filter and Orientation.

2.6.11. Connect an exhaust line to the pump flow out bulkhead (Refer to figure 2.6.7.) on the rear of the 1900.

2.6.12. Remove the 1/8" brass plugs from the sampling bulkheads on the front of the 1900 and attach the 1/8" lines from the install kit. 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.

2.6.13. Two Silonite coated 1/8" X 4' lines are provided with each two channel 1900. An additional eight lines are included as part of the 8 Position Option. For the installation connect lines to all sampling positions so that all sample positions can be leakchecked. Refer to figure 2.6.13.

2.7. Optional 1916 Installation.

2.7.1. **CAUTION:** When installing the 1916 it is critical that the 1900 is powered off along with its computer. Failure to turn off the 1900 and its computer during the connection (or disconnection) of the DB15 cable may damage the mini-U (mini-Unicard or mini-universal control card) board in the 1900.

2.7.2. Be aware that a 1916 cannot connect to Channel 1 if the 8 Position Option is installed on Channel 1. Internal hardware modifications would be required to add the 8 Position Option. Undoing these internal modifications would be required if a user would like to use a 1916 on Channel 1 instead of the 8 Position Option. Contact your local Entech representative if more information is needed.

2.7.3. Unpack the 1916 and place it near the 1900. The 1916 was designed to be used in either a 19" rack mount cabinet or on a counter top. Position the 1916 such that it is close enough for the tubing and cable from the 1900 to reach the 1916. The tubing must reach from Channel 1 or 2 on the 1900 to the sampling port on the lower left front of the 1916. Entech provides a 4' (120 cm) piece of 1/8" Silonite coated tubing for this purpose. This tubing should be kept as short as possible to allow the CS1200 sensor to respond as quickly as possible to changes in the pressure in the canister.

2.7.4. Refer to figures 2.7.4a and 2.7.4b. If the 1916 will be on Channel 1 connect the

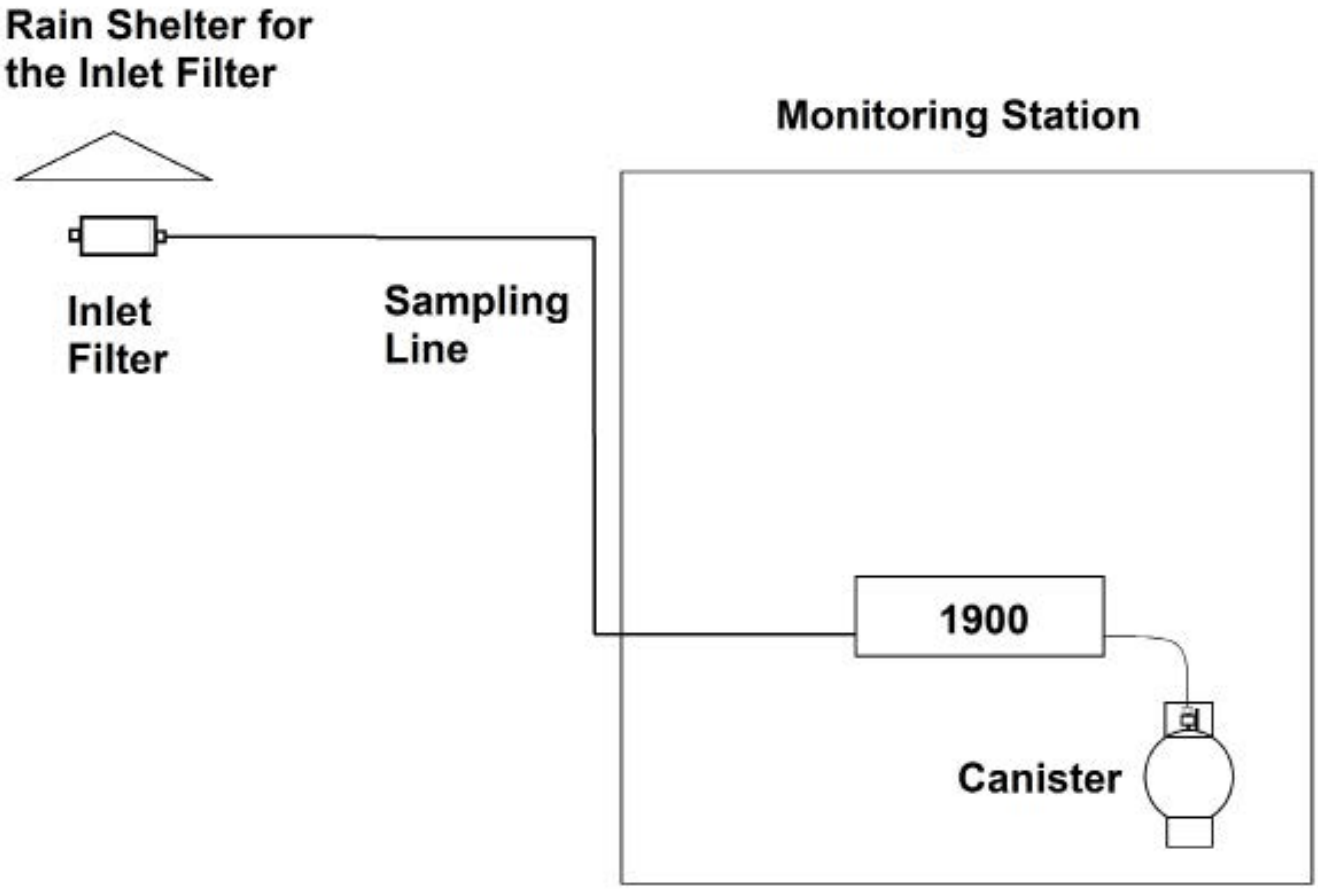
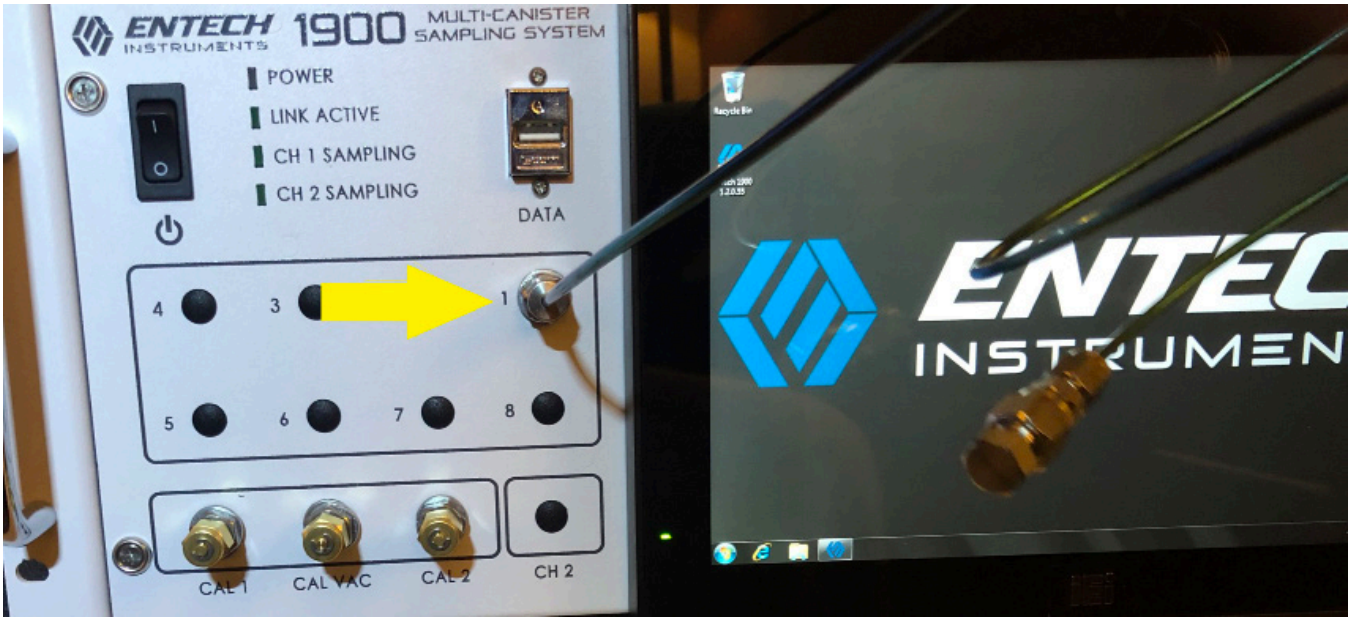


Figure 2.6.10b. Above. Shows the 1900 Inlet Filter under a rain shelter on the exterior end of the sampling line.

Figure 2.6.13. Below. Shows a 1/8" sample line connected to Channel 1 on a single channel 1900.



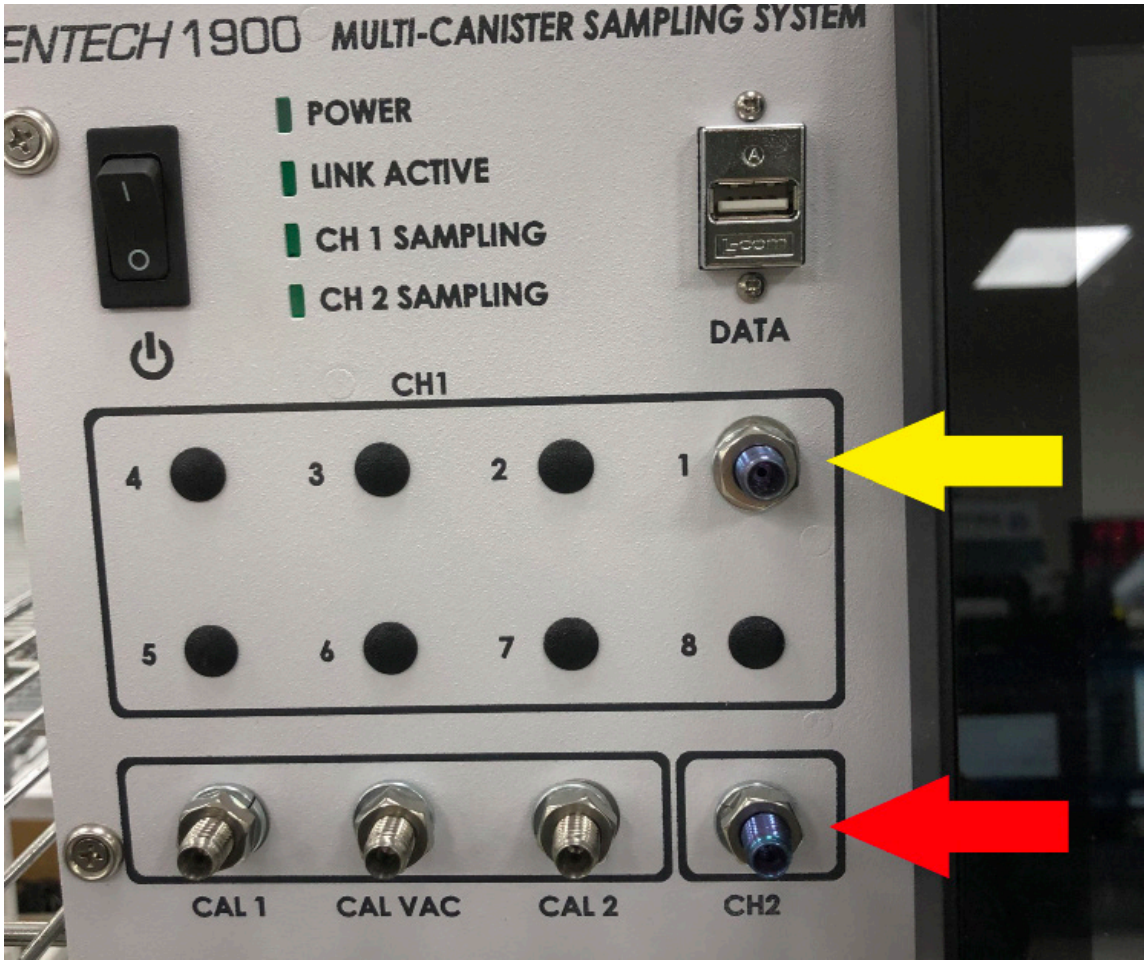


Figure 2.7.4a. Above. The yellow arrow shows where to connect the sample line from a 1916 to Channel 1. The red arrow shows where to connect a 1916 line to Channel 2.

Figure 2.7.4b. Below. The red arrow shows where to connect the sample line from the 1900 to a 1916.

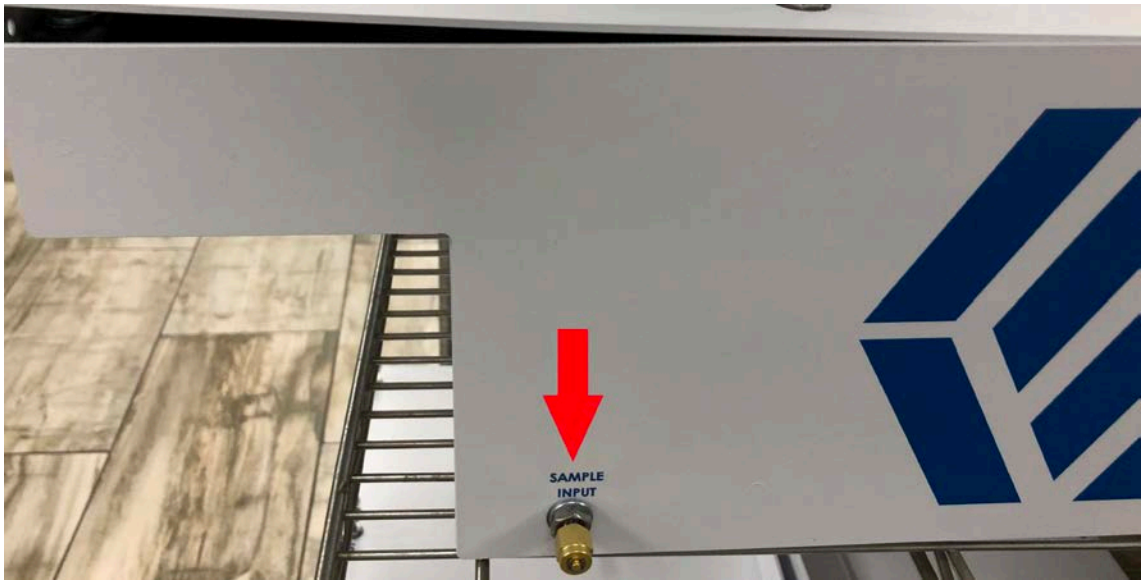
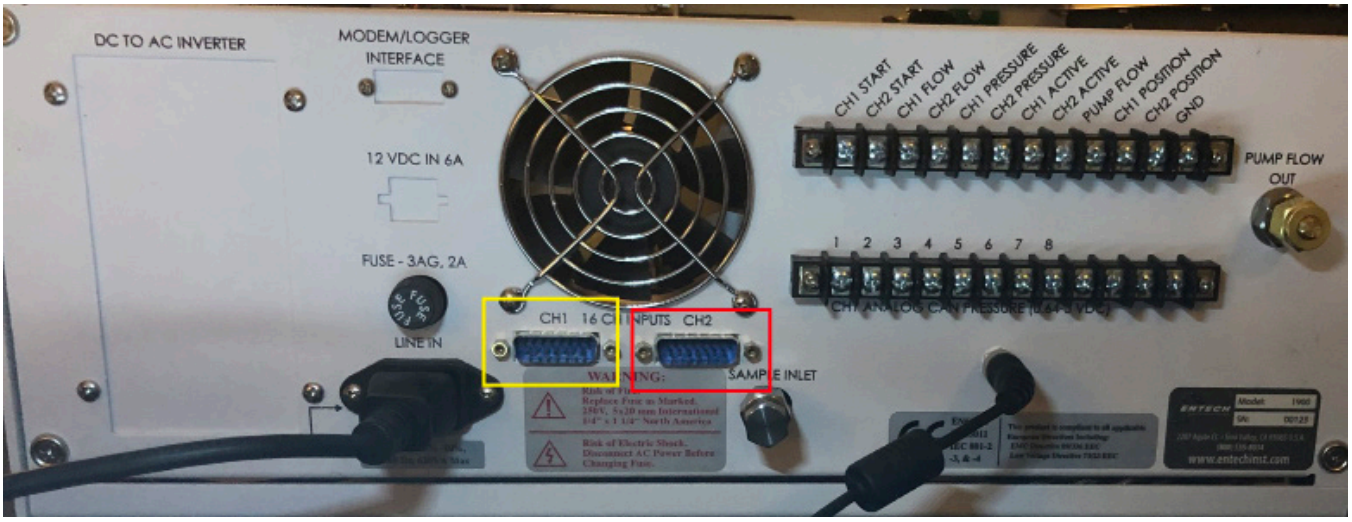


Figure 2.7.6a. Below. The yellow box shows where to connect the the DB15 cable on the rear of a 1900 for a 1916 on Channel 1. The red box shows where to connect the the DB15 cable on the rear of a 1900 for a 1916 on Channel 2.



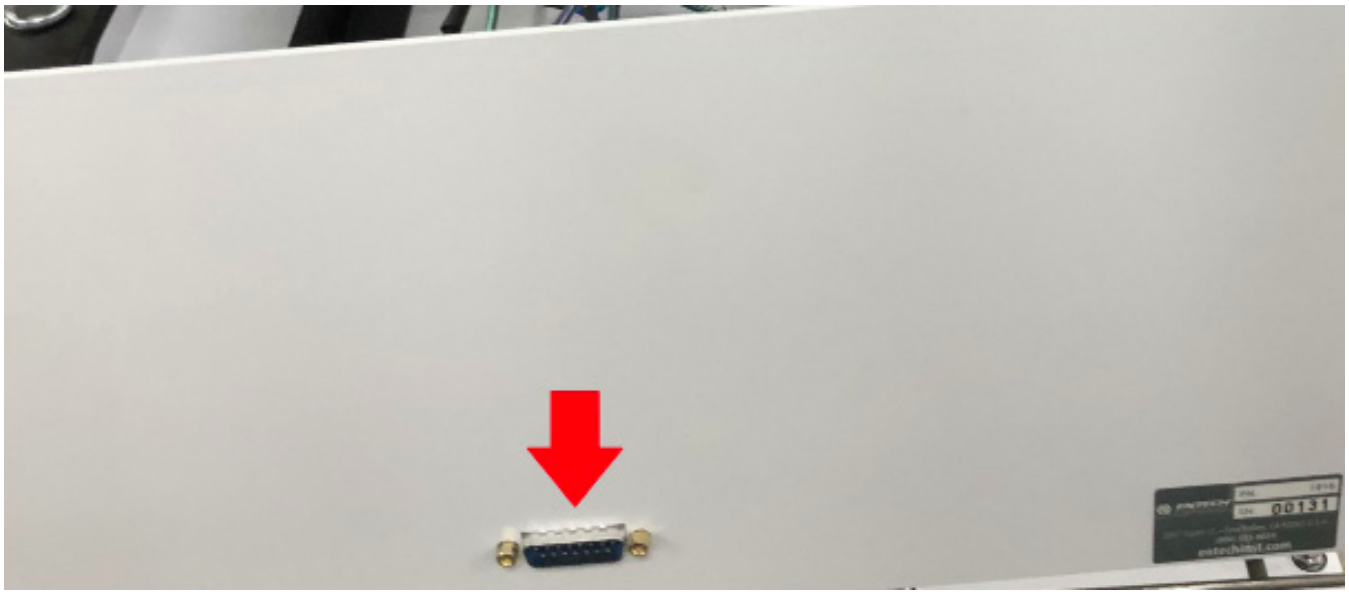
tubing in the installation kit to CH1 #1 port on the front of the 1900.

2.7.5. If a 1916 will be on Channel 2 connect the tubing in the installation kit to the CH2 port on the front of the 1900.

2.7.6. Refer to figures 2.7.6a and 2.7.6b. Connect the DB15 power and communications cable to the rear of the 1916. If the 1916 is on Channel 1 connect the other end of the DB15 cable to the connector (16 CH inlet) labelled “CH1” on the rear of 1900. If the 1916 is on Channel 2 connect the other end of the DB15 cable to the connector labelled “CH2” on the rear of 1900.

2.7.7. No other connections are needed as the 1916 uses the DB15 cable for both power and communication with the software.

Figure 2.7.6b. Below. The red arrow shows where to connect the DB15 cable from a 1900 to a 1916.



2.8. Power Up.

2.8.1. Plug the 1900 power cords into a 120 VAC power outlet. Both cords must be on the same circuit to prevent grounding issues.

2.8.2. Power on the 1900 and its Controller (computer).

2.9. Changing the Computer's Time Zone

2.9.1. This should only need to be done at new 1900 installations, or if the 1900 computer (Controller) is replaced, or if the 1900 is moved to a different time zone.

2.9.2. Refer to figure 2.9.2. Click the date and time in the lower right of the Controller screen. Then click "Change date and time settings..." (For users of WIN10 computers right click on the date and time in the lower right corner and click "Adjust/Time".)

2.9.3. Refer to figure 2.9.3. In the Clock settings, go to the Date and Time tab and select "Change time zone…"

2.9.4. Refer to figure 2.9.4. Select the correct Time Zone, click "OK". Then, on the main clock configuration window, click "Apply" then "OK" to save the settings.''

2.9.5. Changing the time zone is complete.

2.10. Disable Internet Time Synchronization.

2.10.1. This is optional.

2.10.2. Go to the Internet Time settings tab and click on the "Change settings…"

2.10.3. Uncheck "Synchronize with an Internet time server", click "OK". Then, on the main clock configuration window, click "Apply" then "OK" to save the settings.

2.11. Configure the 1900 Software Settings.

2.11.1. Refer to Section 4 - Software Overview for more detailed explainations of each setting. The configuration settings are used to tell the 1900 what to do during sampling and leak checking. Many users can use the defaults provided by the software but the settings can be changed to better suit project needs. After the initial setup most settings will only be changed if a part is replaced or if the 1900 is moved to a different location.

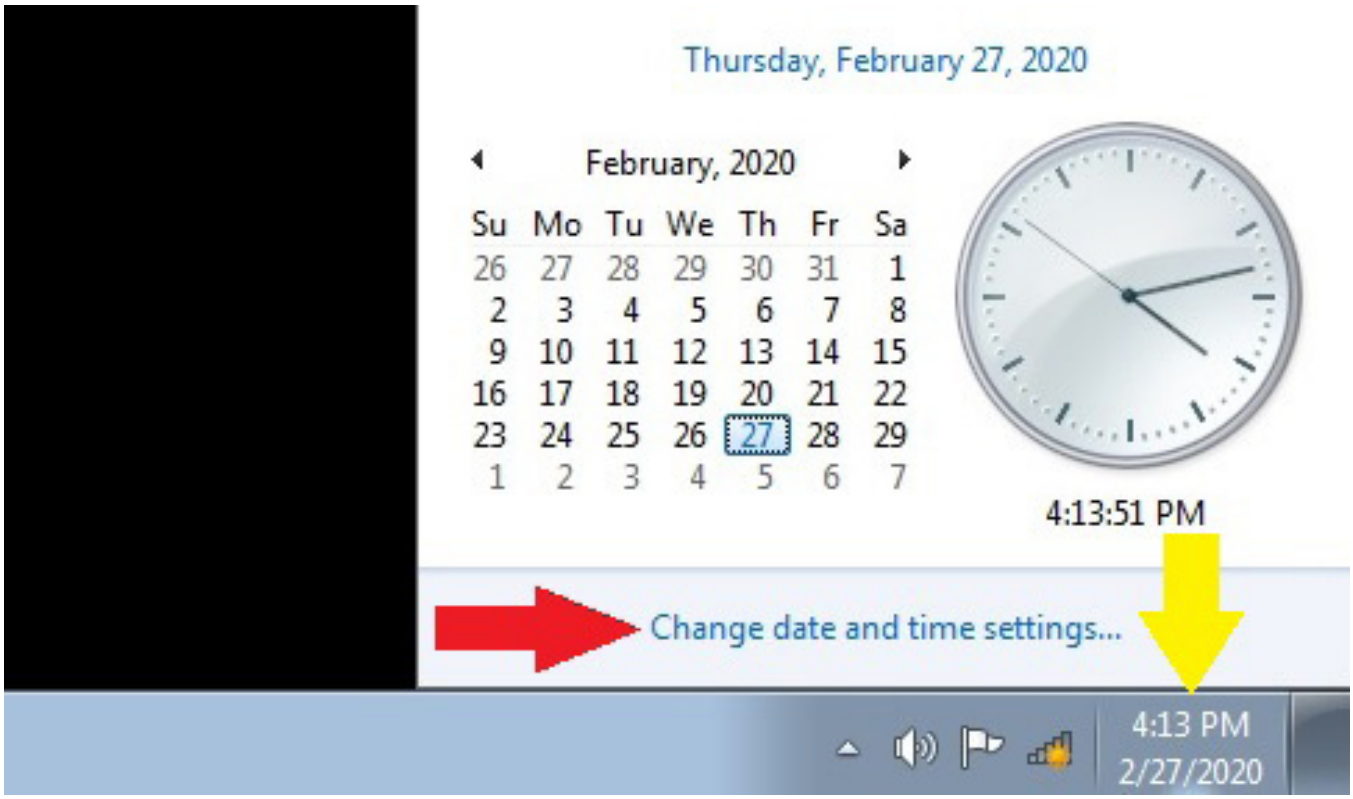


Figure 2.9.2. Above. The yellow arrow shows where to click the date and time on lower right of the computer screen. The red arrow show where to click "Change Date and Time Settings".

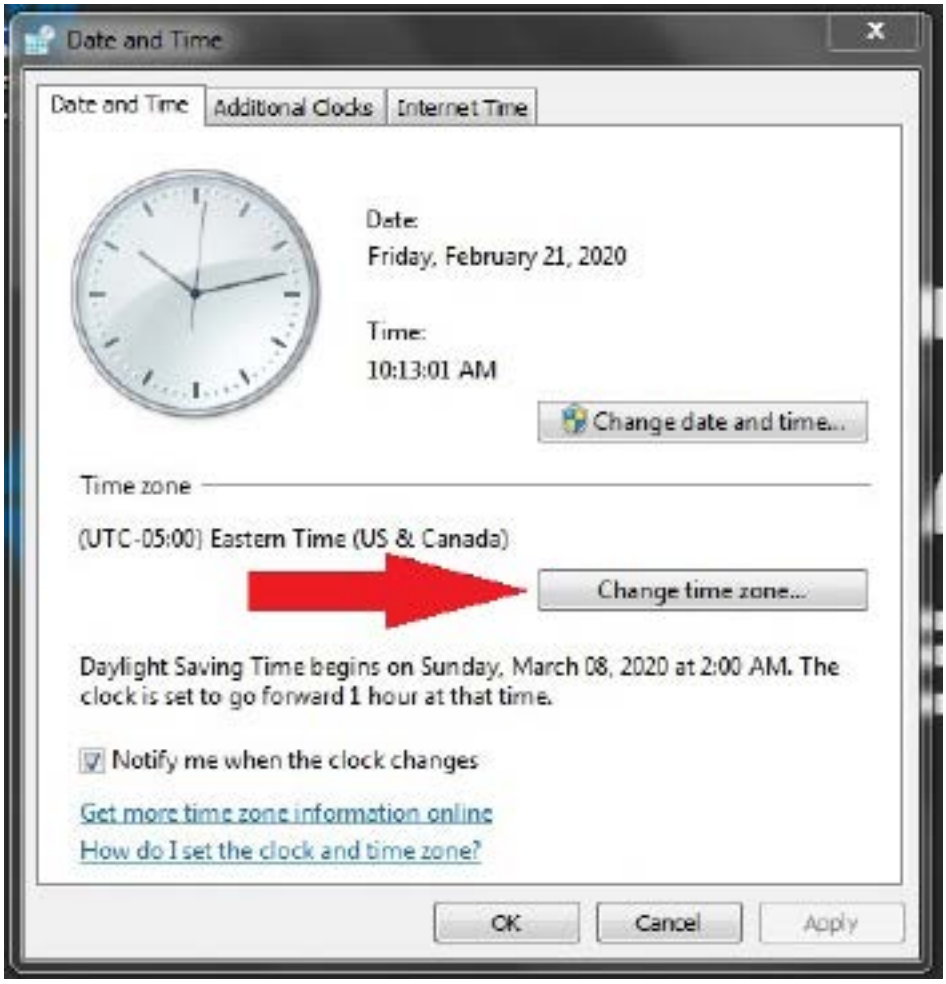
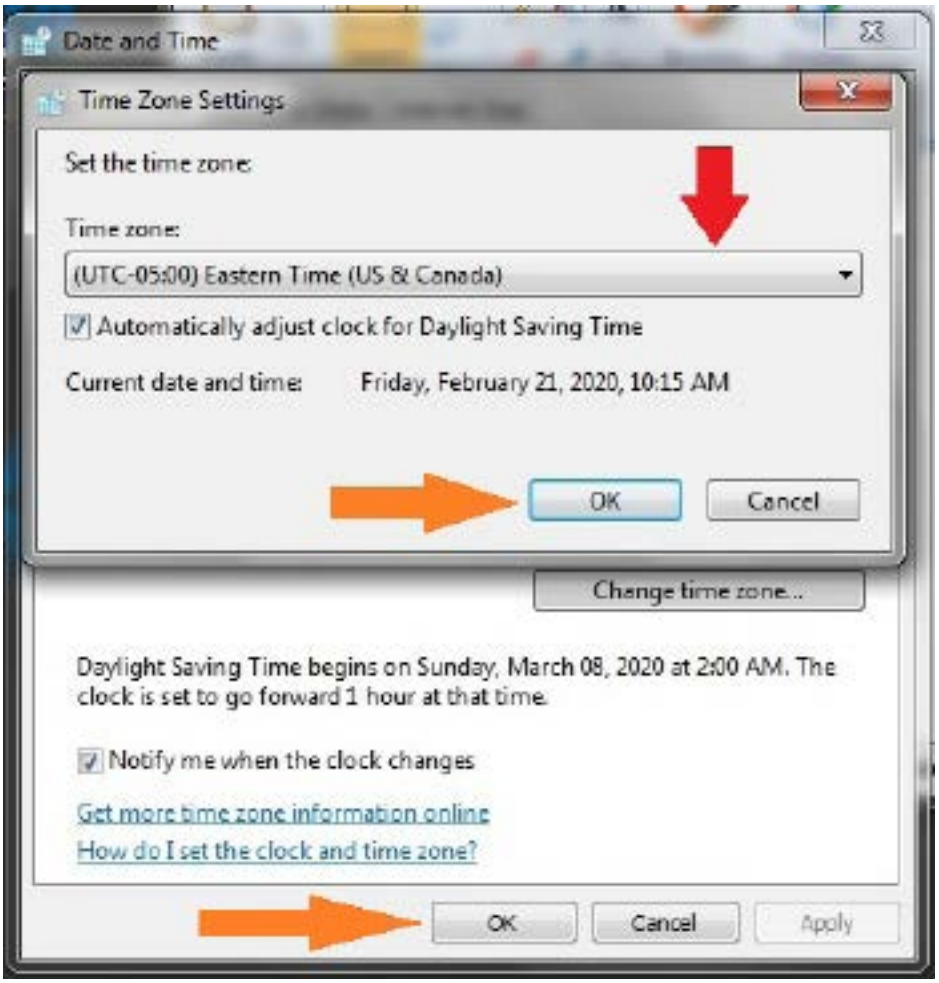


Figure 2.9.3. Right. The red arrow shows where to click "Change Time Zone".

Figure 2.9.4. Right. Red arrow shows the Time Zone pulldown. Use this to select the desired time zone. Then click the two "OK" buttons marked by the orange arrows to exit the date/time screens.



2.11.2. Configure Settings - Configuration.

2.11.2.1. Click "Settings" at the top to go to the Settings screen. Then click "CONFIG" on the left. Refer to figure 2.11.2.1. This shows very typical settings for the 1900.

2.11.2.2. Configure the system:

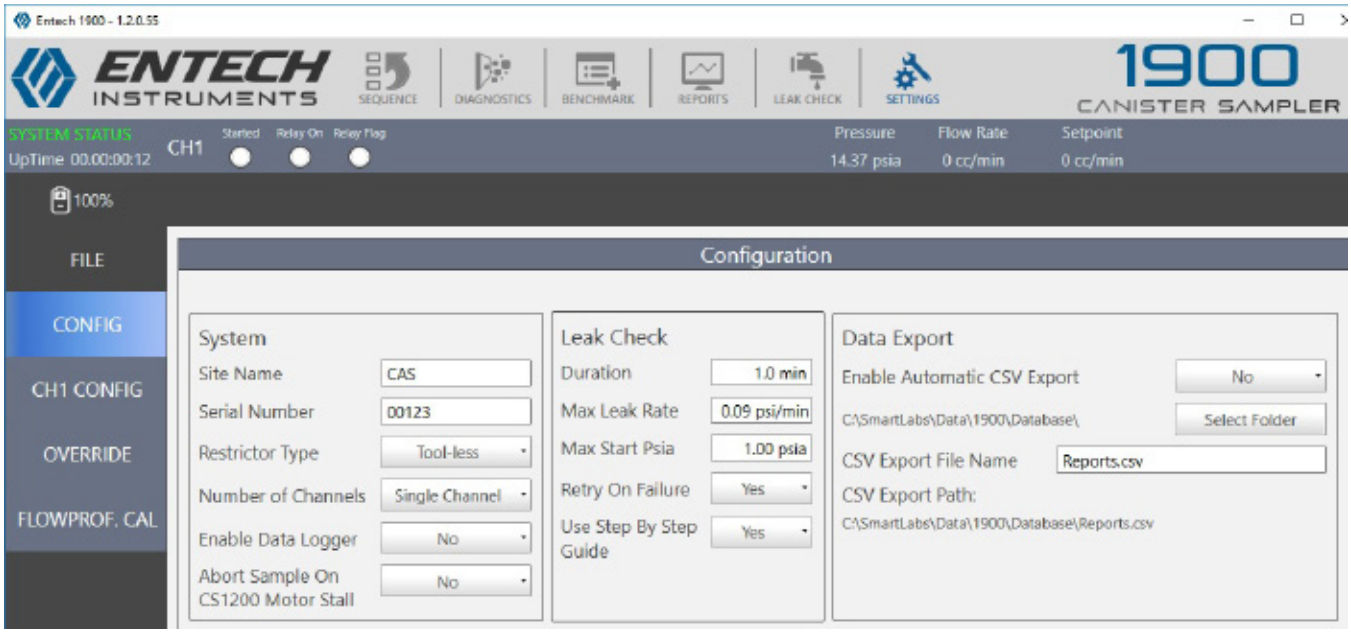
2.11.2.2.1. Site Name: Enter the site name (location or address) in the box.

2.11.2.2.2. Serial Number: Enter the serial number of the 1900 in the box.

2.11.2.2.3. Restrictor Type: Select "Tool-less" with the pulldown. Units that were purchased prior to October 2019 will be "Traditional" if they have not been upgraded. The traditional restrictors require wrenches for removal and replacement. Tool-less restrictors use an O-ring seal and can be removed with one's fingers. (In figure 2.6.4 a yellow arrow is pointing at a Tool-less Restrictor. The traditional restrictor looks like a 1/4" SS Union with a number stamped on it and requires wrenches for removal.)

2.11.2.2.4. Number of Channels: Select "Dual Channel" if the 1900 has both Channel 1 and Channel 2. Select "Single Channel" if the 1900 has only one channel (only Channel 1 with one CS1200 and one Flow Professor inside the 1900).

Figure 2.11.2.1. Settings - Config.



2.11.2.2.5. Enable Data Logger: Select “Yes” if one is present on or will be added to the 1900. Otherwise select “No”.

2.11.2.3. Configure Leak Check: This configures the settings for the leak check screen. These settings are not used during sampling.

2.11.2.3.1. Duration: Enter 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 “1.0 min”.

2.11.2.3.2. Max Leak Rate: Enter the maximum allowable amount of leakage during the Duration, in psid, before a leak check fails. The default value is “0.09 psia/min”.

2.11.2.3.3. Max Start Psia: Enter the maximum starting psia. A leak check on a position will not continue if the initial position psia is above the Maximum Start Psia. The default value is “1.00 psia”.

2.11.2.3.4. Retry on Failure: Set to “Yes” or “No”. The default value is “Yes”. If the leak check fails and yes is selected the leak check will be attempted again. This is to allow the user to tighten nuts and fittings in case one was a little loose. One of the most common causes of leaks is for the user to forget to tighten with a wrench after the initial finger tightening of the sampling line to the canister valve.

2.11.2.3.5. Use Step by Step Guide: Set to “Yes” or “No”. The default value is “No”. Select “Yes” to use a step by step leak checking guide. New 1900 users should use the guide.

2.11.2.4. Configure Data Export:

2.11.2.5. Enable Automatic CSV Report: Select “Yes” to enable the report or “No” to

disable the report. If enabled a hourly report will be created by the software. This report will be overwritten by the next report.

2.11.2.6. Select Folder: If an Automatic CSV Report is enabled click “Select Report”, choose (Click the folder on the pop up menu.) the file on the computer for the report, and click “OK”.

2.11.2.7. CSV Export File Name: Type in the desired file name for the report.

2.11.2.8. CSV Export Path: Verify this shows the folder followed by the filename after they have been selected or entered. (Refer to the previous two items.)

2.11.2.9. While still on the “Settings” - “Configuration” screen click “File” on the left and select “Save Configuration” to save any changes.

2.11.3. Configure Settings - CH1 Config.

2.11.3.1. Click “Settings” at the top to go to the Settings screen. Then click “CH1 CONFIG” on the left. Refer to figure 2.11.3.1. It shows typical settings for Channel 1 when set up for one hour sampling.

2.11.3.2. Configure the Instrument:

2.11.3.2.1. Positions: Use the pulldown to set the positions to “16” if Channel 1 is connected to a 1916, “8” if the 8 position option is installed, or “1” if neither of those are present.

2.11.3.2.2. Restrictor: Use the pulldown to select the restrictor installed on Channel 1. The restrictor number was noted during the hardware installation earlier. If necessary verify the restrictor number by removing the top cover of the 1900 and checking the number on the restrictor.

2.11.3.2.3. CS1200 Max Step Position: The default value for this is 20000 steps. It is not normally necessary to change this value.

2.11.3.3. Configure Flow Rate Calculator: No changes are needed.

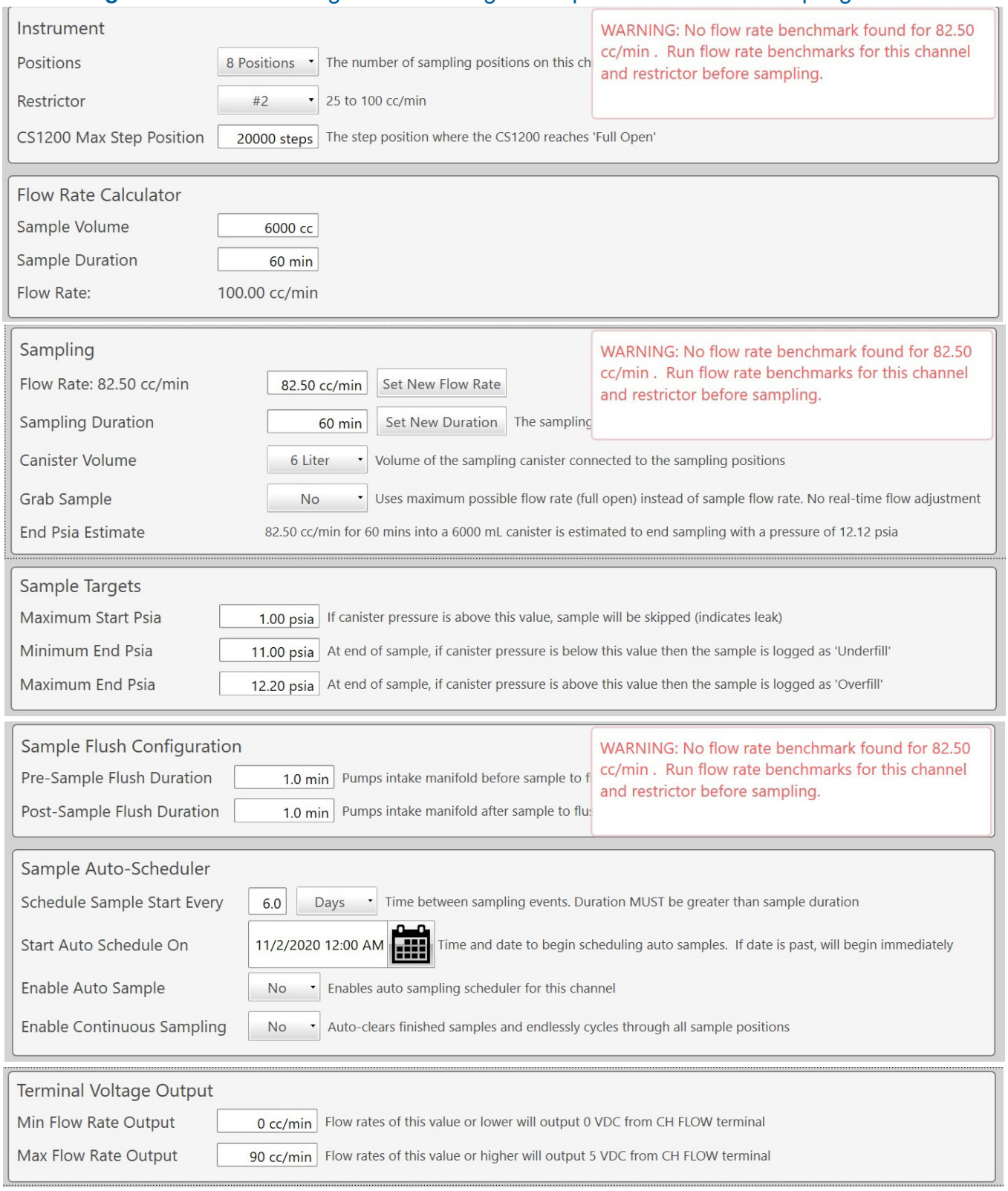
2.11.3.4. Configure Sampling:

2.11.3.4.1. Flow Rate: Enter the target flow rate in cc/min then click Set New Flow Rate.

2.11.3.4.1.1. To calculate the flow rate the canister volume and sampling duration are needed.

2.11.3.4.1.2. In addition for elevations that are significantly above sea level the local average atmospheric pressure at the sampling site is needed. To adjust the flow rate for the local atmospheric pressure simply divide the local pressure by the sea level pressure.

Figure 2.11.3.1. Settings - CH1 Config. Set up for a 60 minute sampling event.



It is important that the pressure units are on an absolute pressure scale when doing this calculation.

2.11.3.4.1.3. Also, most users would like the canisters to finish below local atmospheric pressure. This lets users know that there was not significantly leakage into the sample canister and that the sampling event completed successfully. Successfully meaning that the 1900 maintained a constant flow rate all through the entire sampling. For most users this means that sampling must stop at 10-20% below local atmospheric pressure. This is done by multiplying the initial flow rate by 0.8 to 0.9. In the calculation below it is called a can vacuum factor.

2.11.3.4.1.4. Calculation:

Target Flow (cc/min) = (Canister Volume (cc) / Duration (minutes)) * (Local Pressure / Sea Level Pressure) * Can Vacuum Factor

2.11.3.4.1.5. Example for 1 hour sampling into a 6 liter can in Houston, TX (at sea level).

Target Flow (cc/min) = (6000 cc / 60 minutes) * (14.696 psia / 14.696 psia) * 0.85
= 85 cc/min

2.11.3.4.1.6. Example for 1 hour sampling into a 6 liter can in a suburb of Denver, CO (at over 5000 ft. above sea level).

Target Flow (cc/min) = (6000 cc / 60 minutes) * (12.2 psia / 14.696 psia) * 0.85
= 70.6 cc/min

2.11.3.4.2. Sampling Duration: Enter the sampling time then click Set Duration.

2.11.3.4.3. Canister Volume: Use the pulldown to select the canister volume. If necessary select “Custom” and enter the canister volume in the box..

2.11.3.4.4. Grab Sample: Select “Yes” if Channel 1 will be used for grab sampling and has the Grab Sampling “Restrictor”. (The grab sampling restrictor is marked with a “99”.) Select “No” if Channel 1 will be used with restrictors with numbers from 0 to 7.

2.11.3.4.5. End PSIA Estimate: This is calculated by the software based on the values entered for sampling parameters.

2.11.3.5. Configure Sample Targets:

2.11.3.5.1. Max Start Psia: Enter the desired maximum pressure at the start of sampling in psia. If the pressure in the canister exceeds this value sampling will be cancelled. There is one exception to the cancellation. If Channel 1 has the 8 position option or a 1916, if Channel 1 is running in the “Autosample” mode, if another Channel 1 position is enabled for sampling, and if that position is eligible for sampling (Max Start Psia not exceeded, the old sampling information cleared, etc.), the sampling event will be moved to that position and

proceed as normal. The default “Max Start Psia” is 3.0 psia.

2.11.3.5.2. Min End Psia: Enter the desired minimum pressure at the end of sampling in psia. If the pressure does not reach this value during sampling then the sampling will be flagged as “Underfilled”. Things to check if a canister is underfilled: Was the canster valve opened?, Was the flow rate set high enough?

2.11.3.5.3. Max End Psia: Enter the desired maximum pressure at the end of sampling in psia. If the pressure reaches this value during sampling then sampling will stop and the sampling will be flagged as “Overfilled”. Stopping (with the exception of grab sampling) will occur even if the sampling duration is not complete. For example, if the Max End Psia is 13 and if the sampling duration is 60 minutes and if the Channel 1 pressure reaches 13 psia at 45 minutes into sampling then sampling will stop at 45 minutes. (Troubleshooting would be required to determine the cause of the issue. Most likely this would be a leak at the canister connection to the sample line due to the failure of the operator to leak check before sampling. Another possible cause would be a flow rate that was set too high.) The Max End Psia is ignored for Grab Sampling as the final pressure is expected to be at or very close to local atmospheric pressure.

2.11.3.6. Configure Sample Flush Configuration:

2.11.3.6.1. Pre-Flush Duration: Enter the desired time in minutes. The default is “1.0 minute”.

2.11.3.6.2. Post-Flush Duration: Enter the desired time in minutes. The default is “1.0 minute”.

2.11.3.7. Configure Sample Autoschedule:

2.11.3.7.1. Schedule Sample Start Every: This is the time between sampling events and must be greater than the sample duration.

2.11.3.7.1.1. Box: Type the number of time units in the box.

2.11.3.7.1.2. Pulldown: Use to select the unit of Time. The choices are minutes, hours, days and weeks.

211.3.7.2. Start Autoschedule On: Use the calendar to select the date to start the autoschedule and then type in the start time. Be aware that if the start time is past then Autoschedule will start immediately.

2.11.3.7.3. Enable Autosampling: If autosampling will be used set to “Yes”. If it will not be used set to “No”. Note that autosampling continues indefinitely for the time and duration selected for every autosample interval starting at the start date and time until autosample is disabled.

2.11.3.7.4. Enable Continuous Sampling: If continuous sampling will be used set to “Yes”.

If it will not be used set to “No”. Note that continuous sampling can only be used if Channel 1 is set up with the 8 position option or with a 1916. If enabled the 1900 will go through each enabled sampling event in the 1900 sequence table (for Channel 1) in order. If enabled it will not be necessary to clear sequence lines before the next sampling event. Enabled positions will be sampled in numerical order in the sequence table. (One may use “Set as Start Item” to change the initial starting position.) When the last enabled position is reached sampling will go to the numerically earliest enabled position on Channel 1. Each sampling event will start two minutes after the previous event ended.

2.11.3.8. Configure Terminal Voltage Outputs:

2.11.3.8.1. Min Flow Rate: Set this to 0 cc/min.

2.11.3.8.2. Max Flow Rate: Enter “20 cc/min” for flow rates of less then 20 cc/min if used with a datalogger. Enter “150 cc/min” for flow rates of 20-150 cc/min if used with a datalogger.

2.11.3.9. Save any Changes. While still on the “Settings”- “CH1 - Config” screen click “File” on the left and select “Save Configuration”.

2.11.3.10. Close and reopen the 1900 software.

2.11.4. Configure Settings - CH2 Config.

2.11.4.1. Click “Settings” at the top to go to the Settings screen. Then click “CH2 CONFIG” on the left. Refer to figure 2.11.4.1. It shows typical settings for Channel 2 when set up for one hour sampling.

2.11.4.2. Configure the Instrument:

2.11.4.2.1. Positions: Use the pulldown to set the positions to “16” if Channel 2 is connected to a 1916 or “1” if no 1916 is present.

2.11.4.2.2. Restrictor: Use the pulldown to select the restrictor installed on Channel 2. The restrictor number was noted during the hardware installation earlier. If necessary verify the restrictor number by removing the top cover of the 1900 and checking the number on the restrictor.

2.11.4.2.3. CS1200 Max Step Position: The default value for this is 20000 steps. It is not normally necessary to change this value.

2.11.4.3. Configure Flow Rate Calculator: No changes are needed.

2.11.4.4. Configure Sampling:

2.11.4.4.1. Flow Rate: Enter the target flow rate in cc/min then click Set New Flow Rate.

2.11.4.4.1.1. To calculate the flow rate the canister volume and sampling duration are needed.

2.11.4.4.1.2. In addition for elevations that are significantly above sea level the local average atmospheric pressure at the sampling site is needed. To adjust the flow rate for the local atmospheric pressure simply divide the local pressure by the sea level pressure. It is important that the pressure units are on an absolute pressure scale when doing this calculation.

2.11.4.4.1.3. Also, most users would like the canisters to finish below local atmospheric pressure. This lets users know that there was not significantly leakage into the sample canister and that the sampling event completed successfully. Successfully meaning that the 1900 maintained a constant flow rate all through the entire sampling. For most users this means that sampling must stop at 10-20% below local atmospheric pressure. This is done by multiplying the initial flow rate by 0.8 to 0.9. In the calculation below it is called a can vacuum factor.

2.11.4.4.1.4. Calculation:

Target Flow (cc/min) = (Canister Volume (cc) / Duration (minutes)) * (Local Pressure / Sea Level Pressure) * Can Vacuum Factor

2.11.4.4.1.5. Example for 24 hour sampling into a 6 liter can in Houston, TX (at sea level).

Target Flow (cc/min) = (6000 cc / 1440 minutes) * (14.696 psia / 14.696 psia) * 0.85
= 3.54 cc/min

2.11.4.4.1.6. Example for 24 hour sampling into a 6 liter can in a suburb of Denver, CO (at over 5000 ft. above sea level).

Target Flow (cc/min) = (6000 cc / 1440 minutes) * (12.2 psia / 14.696 psia) * 0.85
= 3.01 cc/min

2.11.4.4.2. Sampling Duration: Enter the sampling time then click Set Duration.

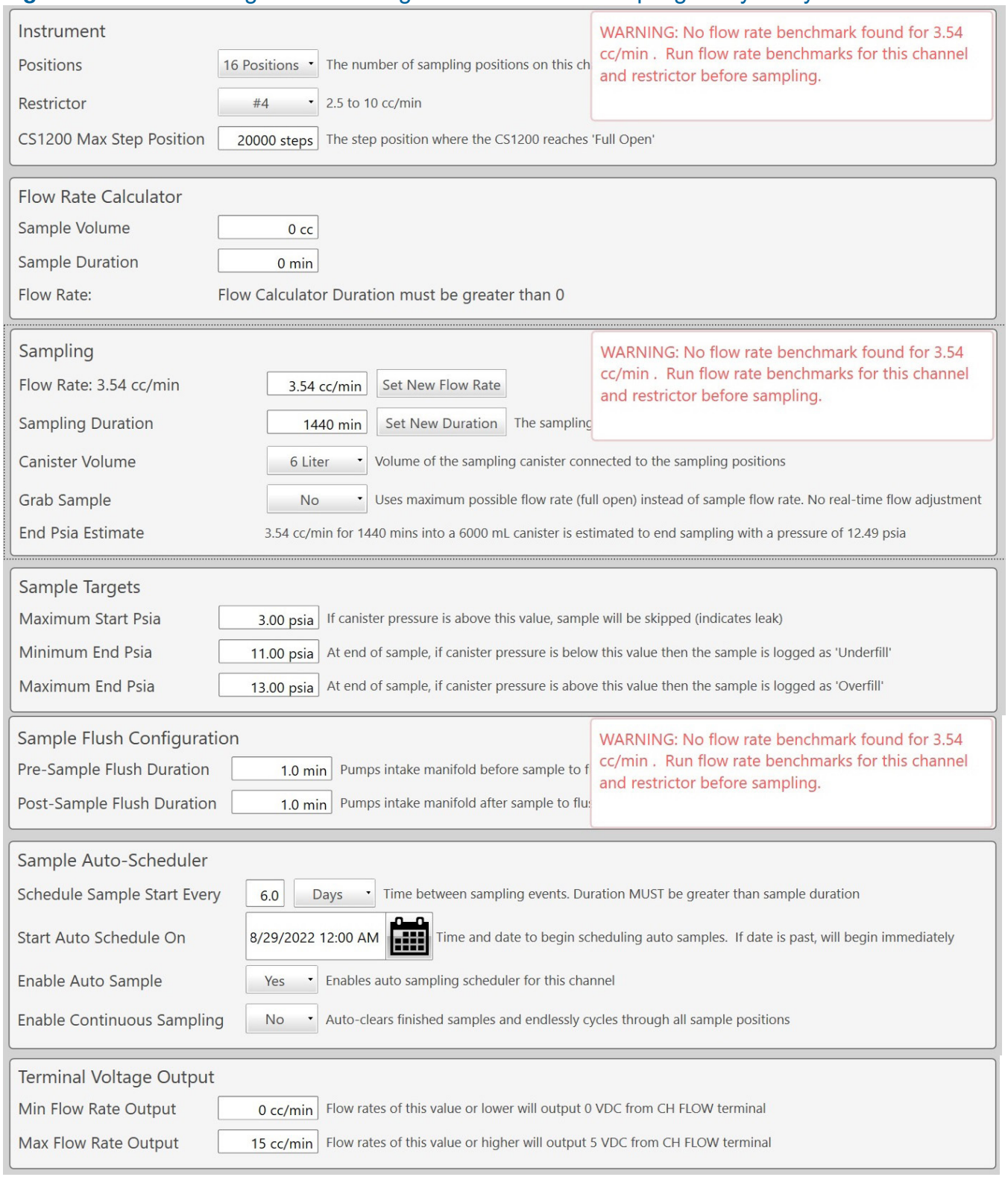
2.11.4.4.3. Canister Volume: Use the pulldown to select the canister volume. If necessary select “Custom” and enter the canister volume in the box..

2.11.4.4.4. Grab Sample: Select “Yes” if Channel 2 will be used for grab sampling and has the Grab Sampling “Restrictor”. (The grab sampling restrictor is marked with a “99”.) Select “No” if Channel 2 will be used with restrictors with numbers from 0 to 7.

2.11.4.4.5. End PSIA Estimate: This is calculated by the software based on the values entered for sampling parameters.

2.11.4.5. Configure Sample Targets:

Figure 2.11.4.1. Settings - CH2 Config. Set for 24 hour sampling every 6 days into a 6 liter can.



2.11.4.5.1. Max Start Psia: Enter the desired maximum pressure at the start of sampling in psia. If the pressure in the canister exceeds this value sampling will be cancelled. There is one exception to the cancellation. If Channel 2 has a 1916, if Channel 2 is running in the “Autosample” mode, if another Channel 2. position is enabled for sampling, and if that position is eligible for sampling (Max Start Psia not exceeded), the old sampling information cleared, etc.) and the sampling event will be moved to that position and proceed as normal. The default “Max Start Psia” is 3.0 psia.

2.11.4.5.2. Min End Psia: Enter the desired minimum pressure at the end of sampling in psia. If the pressure does not reach this value during sampling then the sampling will be flagged as “Underfilled”. Things to check if a canister is underfilled: Was the canster valve opened?, Was the flow rate set high enough?

2.11.4.5.3. Max End Psia: Enter the desired maximum pressure at the end of sampling in psia. If the pressure reaches this value during sampling then sampling will stop and the sampling will be flagged as “Overfilled”. Stopping (with the exception of grab sampling) will occur even if the sampling duration is not complete. For example, if the Max End Psia is 13 and if the sampling duration is 60 minutes and if the Channel 2 pressure reaches 13 psia at 45 minutes into sampling then sampling will stop at 45 minutes. (Troubleshooting would be required to determine the cause of the issue. Most likely this would be a leak at the canister connection to the sample line due to the failure of the operator to leak check before sampling. Another possible cause would be a flow rate that was set too high.) The Max End Psia is ignored for Grab Sampling as the final pressure is expected to be at or very close to local atmospheric pressure.

2.11.4.6. Configure Sample Flush Configuration:

2.11.4.6.1. Pre-Flush Duration: Enter the desired time in minutes. The default is “1.0 minute”.

2.11.4.6.2. Post-Flush Duration: Enter the desired time in minutes. The default is “1.0 minute”.

2.11.4.7. Configure Sample Autoschedule:

2.11.4.7.1. Schedule Sample Start Every: This is the time between sampling events and must be greater than the sample duration.

2.11.4.7.1.1. Box: Type the number of time units in the box.

2.11.4.7.1.2. Pulldown: Use to select the unit of Time. The choices are minutes, hours, days, and weeks.

211.4.7.2. Start Autoschedule On: Use the calendar to select the date to start the autoschedule and then type in the start time (or select the time). Be aware that if the start time is past then Autoschedule will start immediately.

2.11.4.7.3. Enable Autosampling: If autosampling will be used set to “Yes”. If it will not be used set to “No”. Note that autosampling continues indefinitely for the time and duration selected for every autosample interval starting at the start date and time until Autosample is disabled.

2.11.4.7.4. Enable Continuous Sampling: If continuous sampling will be used set to “Yes”. If it will not be used set to “No”. Note that continuous sampling can only be used if Channel 2 is set up with a 1916. If enabled the 1900 will go through each enabled sampling event in the 1900 sequence table (for Channel 2) in order. If enabled it will not be necessary to clear sequence lines before the next sampling event. Enabled positions will be sampled in numerical order in the sequence table. (One may use “Set as Start Item” to change the initial starting position.) When the last enabled position is reached sampling will go to the numerically earliest enabled position on Channel 2. Each sampling event will start two minutes after the previous event ended.

2.11.4.8. Configure Terminal Voltage Outputs:

2.11.4.8.1. Min Flow Rate: Set this to 0 cc/min.

2.11.4.8.2. Max Flow Rate: Enter “20 cc/min” for flow rates of less then 20 cc/min if used with a datalogger. Enter “150 cc/min” for flow rates of 20-150 cc/min if used with a datalogger.

2.11.4.9. Save any Changes. While still on the “Settings”- “CH1 - Config” screen click “File” on the left and select “Save Configuration”.

2.11.4.10. Close and reopen the 1900 software.

2.11.5. Check the Pressure Sensor Calibration Values.

2.11.5.1. This should only need to be done the first time the 1900 is set up or if the computer is replaced.

2.11.5.2. Find the instrument check out sheets in the boxes that came with the 1900.. On the second page you can find the pressure calibration values. Refer to the green and red boxes in figure 2.11.5.2.

2.11.5.3. Click “Settings” and then “FlowProf. Cal”. Refer to figure 2.11.5.3.

2.11.5.4. Verify the zero and gain values for Flow Professor 1 and 2 match the values in the red box on the check out sheet. (Note single channel 1900s only have Channel 1 and any values for FlowProfessor 2 are to be left as the defaults in the software in that case.)

2.11.5.5. If the values differ type in the values from the check out sheet into the boxes on the Flow Professor Calibration screen and click “Apply Changes”. Next click “File” and select “Save Flow Professor Calibration”. Close and reopen the 1900 software.

2.11.5.6. If the 1900 does not have the optional 8 positions on Channel 1 go to the next topic, otherwise click “Settings” and then “Unicard Cal”. Refer to figure 2.11.5.6 to find the factory calibrated values for the 8 Position Option Pressure Sensors..

2.11.5.7. Verify the zero and gain values for the Position 1 to 8 zero and gain values match the values in the green box on the check out sheet.

2.11.5.8. If the values differ type the values from the check out sheet into the boxes on the Unicard Calibration screen and click “Apply Changes”. Next click “File” and select “Save Unicard Calibration”. Close and reopen the 1900 software.

2.12. Checking the Alignment of the Channel 1 8 Position Option Rotary Valve.

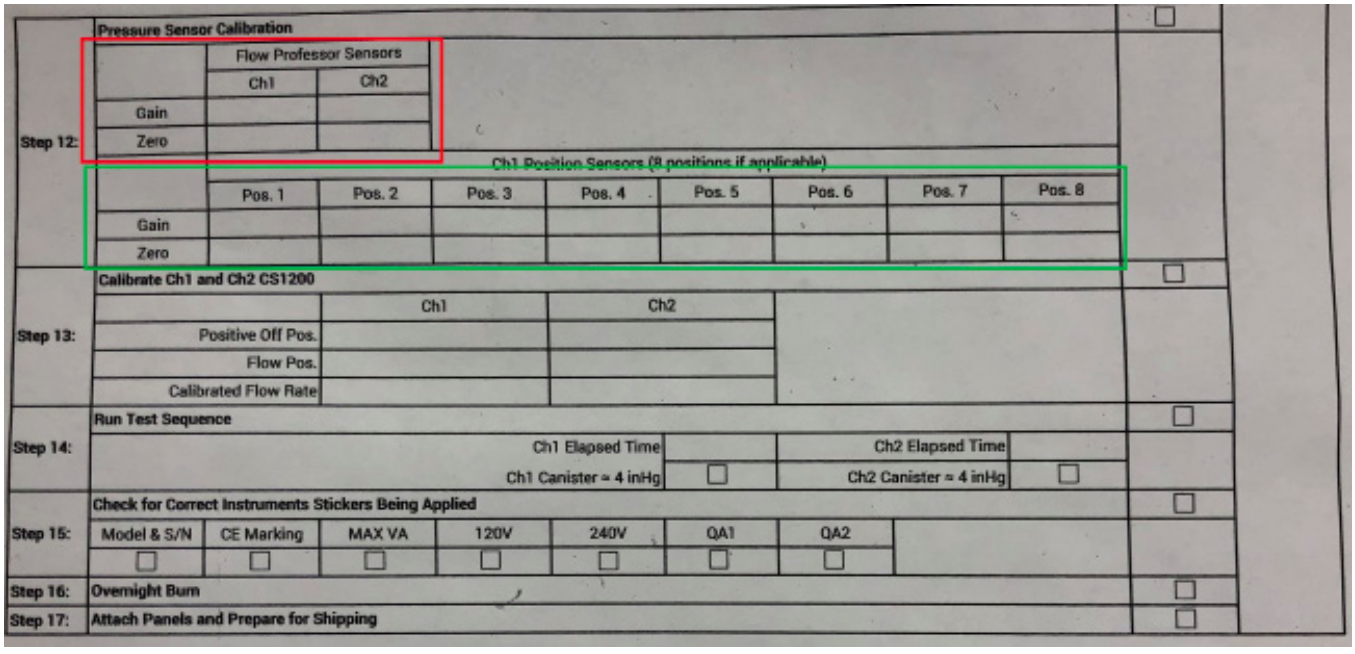
2.12.1. This procedure is used to confirm alignment of the Channel 1 8 Position Option Rotary Valve. If the user finds that the alignment is off please refer to the “1900 Rotary Valve Alignment Procedure” in the 1900 User Service Manual.

2.12.2. Read the entire topic before starting.

2.12.3. It is very important that before using a 1900 with the 8 Position Option that the 8 \Position Option rotary valve must be known to be aligned and moving to its correct positions.

2.12.4. Send the rotary valve to position 1.5. (Go to “Diagnostics” - “Rotary Valve”. Use the pulldown to select position 1.5. Click “Move”.)

Figure 2.11.5.2. 1900 Check Sheet Second Page. Red box highlights the calibrated Flow Professor Pressure Values. the Green box highlight the calibrated pressure sensor values for the 8 position option pressure sensors.



2.12.5. Open all Channel 1 sample positions (ports) to the atmosphere. Note the 1900 pressure for the Channel 1 sample positions (Found on the “Diagnostics” - “Rotary Valve” screen.) and the Channel 1 CS1200 pressure sensor (the CH1 pressure reading at the top of the software). All Channel 1 positions should be at the local atmospheric pressure (14.7 psia at sea level).

2.12.6. If the CH1 pressure is not at atmospheric go to the CS1200 screen and spin the CS1200 open 10000 steps. Once the CH1 pressure goes to atmospheric pressure spin the CS1200 closed 10000 steps. If the CH1 pressure drops significantly below atmospheric pressure during the procedure repeat this step as needed if the procedure must be repeated..

2.12.7. Connect an evacuated canister to 1-2 (Channel 1 Position 2) on the 1900. (It is possible to use another position during valve alignment although that is not covered in this procedure.) Open the valve on the evacuated canister. Note the pressure of 1-2. It should be under vacuum. Note the CH1 Pressure. It should still be at atmospheric pressure.

2.12.8. Go to the 1900 “Diagnostics” - “CS1200” screen. Verify that the Current Position is about 2000.

2.12.9. Go to 1900 “Diagnostics” - “Rotary Valve”.

2.12.9.1. For Channel 1 click “-%” to move the valve slightly forward.

2.12.9.2. Wait 10 seconds to observe a pressure change to well below atmospheric pressure.

2.12.9.3. If there is no pressure change, repeat steps the previous two steps until there is a pressure change..

2.12.10. If a presssure change is observed and the encoder voltage is not 4.08V +/- 0.02 (4.08 is the expected encoder voltage at which flow should begin from position 2 (0.08 is added to 4.00 for a total of 4.08V)), then refer to the “1900 Rotary Valve Alignment Procedure” in Section

Figure 2.11.5.3. Settings - FlowProf Cal.

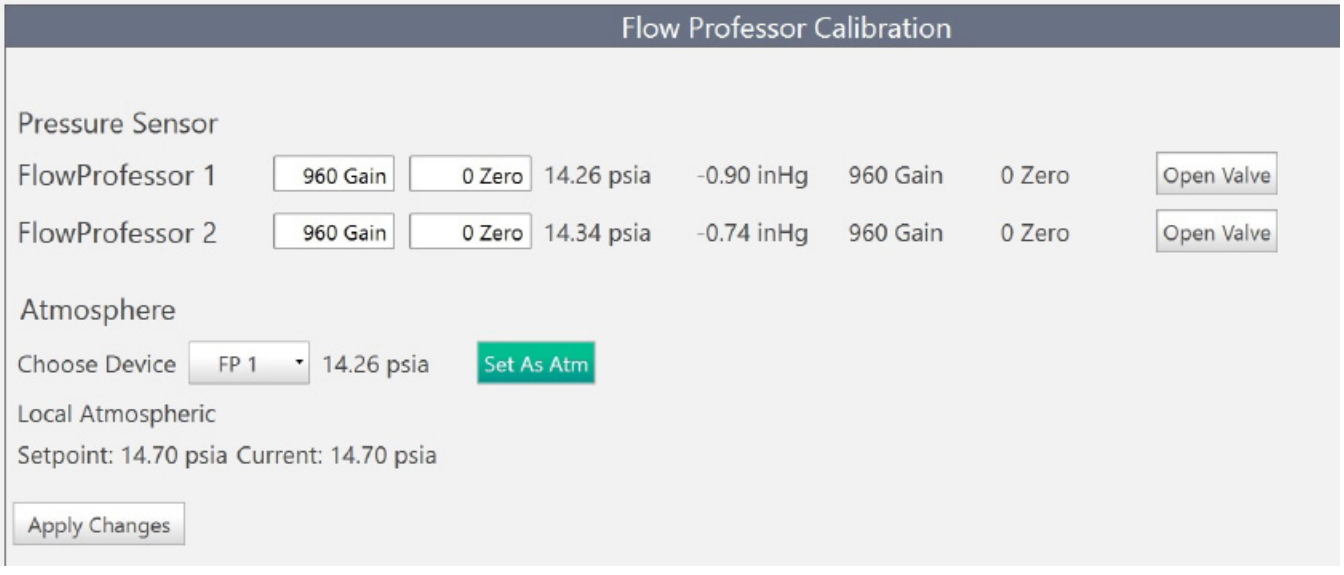
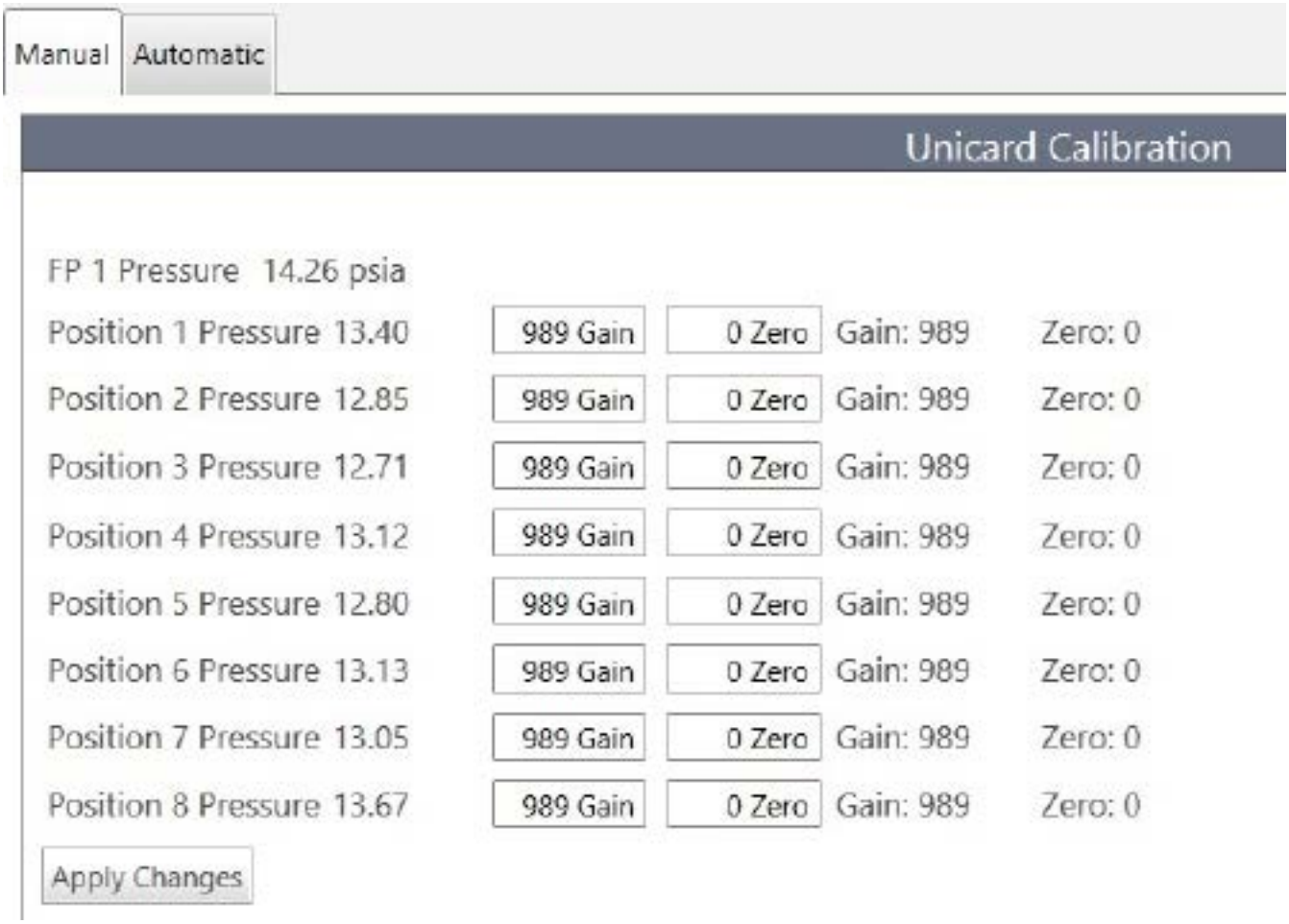


Figure 2.11.5.6. Settings - Unicard Cal.



7 of the 1900 User Service Manual and do the Minor 1900 Rotary Valve Alignment Procedure.

2.12.11. If the pressure dropped at 4.08V +/- 0.02 then the optional 1900 8 Position Rotary Valve is properly aligned.

2.13. Checking the Alignment of a 1916 Rotary Valve.

2.13.1. This procedure is used to confirm alignment of a 1916 Rotary Valve. If the user finds that the alignment is off please refer to the “1916 Rotary Valve Alignment Procedure” in Section 6 of the 1900 User Service Manual. Read the entire topic and then decide which of the alignment procedures to use based on the result of the check below.

2.13.2. Open port 3 and port 4 on the 1916 ports to the atmosphere. Send the 1916 to port 3 (“Diagnostics” - “Rotary Valve” then use the position pulldown to select position 3 and then click “Move”.) Note the 1900 pressure for the channel to which the 1916 is connected. The 1900 channel pressure should be the local atmospheric pressure (14.7 psia at sea level).

2.13.3. Connect an evacuated canister to port 4 on the 1916. (It is possible to use another

position during the valve alignment check although that is not covered in this procedure.) Open the valve on the evacuated canister. Note the pressure on the 1916's channel. It should read the local atmospheric pressure.

2.13.4. Go to the 1900 "Diagnostics" - "CS1200" screen. Verify that the Current Position is about 2000.

2.13.5. Go to 1900 "Diagnostics" - "Rotary Valve".

2.13.5.1. For the appropriate channel "-%" to move the valve slightly forward.

2.13.5.2. Wait 10 seconds to observe a pressure change to well below atmospheric pressure.

2.13.5.3. If there is no change, repeat steps 1 and 2.

2.13.5.4. Once a change is observed if the Voltage is 3.96V +/- 0.02 the 1916 valve is properly aligned.

2.13.5.5. If the pressure change is observed and the encoder voltage is not 3.96V +/- 0.02 (3.96 is the expected encoder voltage at which flow should begin from position 4 (0.06 is added to 3.90 for a total of 3.96V)), then refer to the "1916 Rotary Valve Alignment Procedure" in Section 6 of the 1900 User Service Manual and do the Minor 1916 Rotary Valve Alignment Procedure.

2.14. Leak Checking the 1900.

2.14.1.  **WARNING: NEVER USE PRESSURIZED HELIUM (OR ANY PRESSURIZED GAS) TO CHECK FOR LEAKS ON THE 1900.** The pressure used may damage the CS1200 diaphragms (This is related to both the amount of pressure and the side of the CS1200 from which the pressure is applied.) or damage the 15 psia pressure sensors. The sensors can be damaged with a little as 10 psig of pressure.

2.14.2. All positions must be leak checked during the installation.

2.14.3. Verify the Leak Check settings are correct. Go to "Settings" then "Config". The default leak check parameters are a "Max Leak Rate" (pressure increase) of 0.09 psia/min during a leak check with a duration of 1 minute. The "Max Start Psia" is 1.00 psia. These parameters can be changed on the "Settings" - "Config" screen to better suit user needs. Use "File" and select "Save Configuration" to save any changes made and then close and reopen the software.

2.14.4. Click "View" - "CS1200".

2.14.5. Send the Flow Professor(s) for the channel(s) to be leak-checked to 2000 steps. (Check the current Position of the Flow Professor(s). If not 2000 enter the the difference (in steps) in the steps box and “Spin Open” or “Spin Close” to reach 2000 steps.) This step must be taken to verify the CS1200 is closed before leakchecking. If the CS1200 is open the position will appear to leak.

2.14.6. Connect fully evacuated canisters to the positions that will be checked. (If only a limited number of cans are available just leak check one to a few positions at a time.)

2.14.7.  **WARNING:** Always fingertighten the 1/4” nut onto the canister valve first before doing the final tightening with a wrench. The final tightening with the wrench should be about 1/4 - 1/2 turn past fingertight.

2.14.8. It should be possible to turn the nut at least 1.5-2 revolutions by hand, otherwise the nut may either have been crossthreaded or overtightened in the past causing the threads to distort. If a nut has been damaged to the point that fingertightening can no longer be done, then the adapter fitting should be replaced. The ability to fingertighten is the only way to prevent crossthreading and subsequent damage to the expensive canister valve. If the threads on a valve are damaged the valve will need to be replaced.

2.14.9. In the leak check table click the position(s) to be leak 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 leak check data is present for a position the leak check procedure will skip that position.

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

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

2.14.12. 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.

2.14.13. To troubleshoot leaks just slightly snug each fitting and then observe the pressure rise rate. There are also fittings inside the 1900 (and 1916 if present) that may need to be tightened.

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

position.

2.14.15. Repeat the previous six paragraphs for any additional positions that need to be leakchecked.

2.14.16. After the leak checks of the sampling positions are complete remove any lines that will not be used right away for sampling and replace the 1/8” plugs to seal the sample positions. Put caps into the open lines. Removing unneeded lines provides a neater appearance. Plugging and capping the lines and sample positions keeps dust and contaminants out the the sample lines and positions

2.14.17. The 1900 ships with the sampling positions sealed to prevent contamination. 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.

2.15. Setting the Flow Rate Benchmarks.

2.15.1. The initial flow rate benchmarks are set at Entech during the instrument’s checkout procedure and should be included on the computer. At a new 1900 installation there should be no need to regenerate the Flow Rate Benchmarks provided that the restrictor is not changed to a different size or that the Flow Professor Assembly or CS1200 Assembly are not replaced at the installation. Typically 1900s ship with the restrictors that are requested for the customer’s application provided the sampling time and canister volume are given to Entech at the time of ordering.

2.15.2. If the Flow Rate Benchmarks must be set refer to Setting the Flow Rate Benchmarks Procedure in the 1900 User’s Service Manual for instructions.

2.16. Setting the Local Atmospheric Pressure.

2.16.1. These is done at the initial installation after the pressure sensor calibration has been verified. After that it would not need to be done unless the 1900 is moved to a location at a significantly different elevation.

2.16.2. The local atmospheric pressure is used to determine if the target flow rate should meet the user needs. Higher elevations (lower atmospheric pressures) requires lower flow rates if all other variables (canister size, duration, final vacuum...) are the same.

2.16.3. Remove the cap or plug from one position on each channel.

2.16.4. If a 1916 is present on a channel or if Channel 1 has the 8 position option go to “Diagnostics” - “Rotary Valves”.

2.16.4.1. For Channel 1 use the Channel 1 pulldown to select the open rotary valve position and then click “Move”.

2.16.4.2. For Channel 2 use the Channel 2 pulldown to select the open rotary valve position and then click “Move”.

2.16.4.3. This step is necessary to ensure the CS1200 pressure sensor is inline with room air.

2.16.5. Go to “Settings” then “FLOWPROF. CAL”.

2.16.6. Refer to the orange box in figure 2.16.6. Verify that both the FP1 Pressure and the FP2 Pressure read very close to local atmospheric pressure. If they do not read near local atmospheric pressure contact your local Entech representativefor help troubleshooting.

2.16.7. Refer to the red box in figure 2.16.6. Use the “Choose Device” pulldown to select “FP1”. The Flow Professor 1 pressure in the orange box should match the reading after the pulldown and be very close to the actual local atmospheric pressure. Click the “Set As Atm” button.

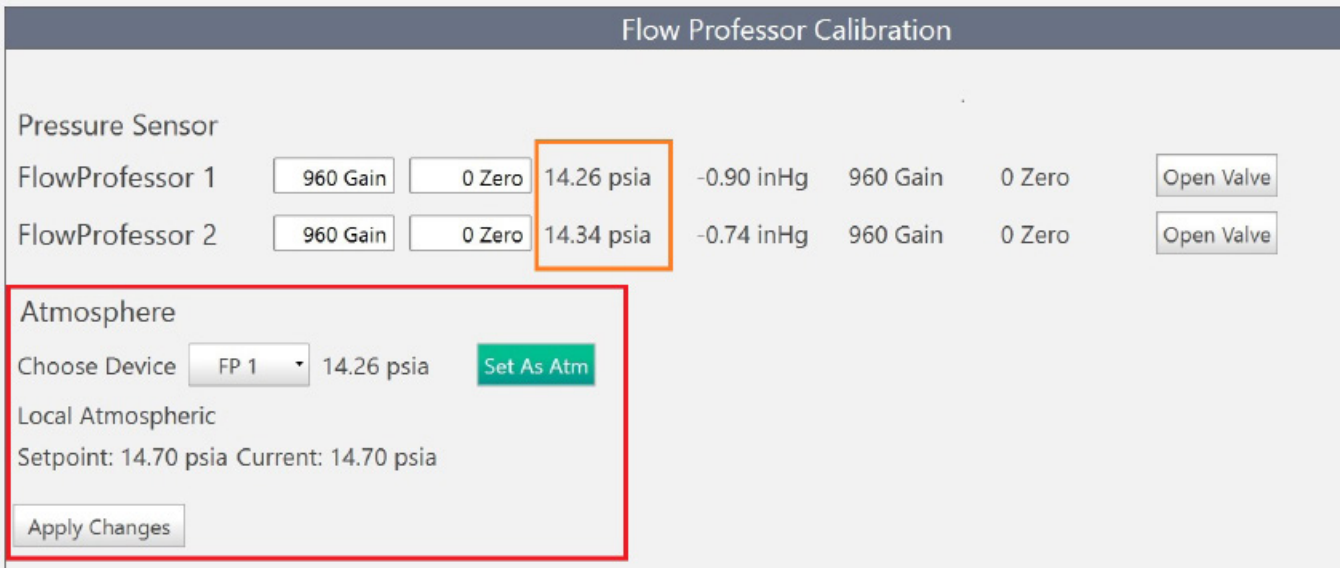
2.16.8. Click “Apply Changes.”

2.16.9. 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.

2.16.10. If the 1900 has Channel 2 (a dual channel 1900) set the Local Atmospheric Pressure for it.

2.16.11. Refer to the red box in figure 2.16.6. Use the “Choose Device” pulldown to select

Figure 2.16.6. Settings - FlowProf Screen with section that are relevant to the Configuration of the Local Atmospheric Pressure in orange and red boxes.



“FP2”. The Flow Professor 2 pressure in the orange box should match the reading after the pulldown and be very close to the actual local atmospheric pressure. Click the “Set As Atm” button.

2.16.12. Click “Apply Changes.”

2.16.13. 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.

2.16.14. Close and reopen the software.

2.17. 1900 and 1916 Boxes.

2.17.1. All 1900 and 1916 packing materials must be saved in case an instrument needs to be shipped to a designated Entech Support Center for service. Note that the return of the unit for service must be authorized before the instrument is shipped back. This typically involmes the issuance of an RMA (Returned Material Autothorization) number which must be written in several places on the outside of the box.

Section 3. 1900 Hardware.

3.1. Sample Pump.

3.1.1. 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 as much as 10-20 feet away from the sample inlet as can be the case at many monitoring stations.

3.2. Flow Controls.

3.2.1. 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 0.1 to 450 cc/min. Specific ranges are determined by the restrictors in the CS1200s. Refer to the figure 3.2.1 below if the 1900's flow range needs to be changed.

Figure 3.2.1. Screw-In Replacable Flow Restrictor Chart.

Restrictor Code	Part Number	Description
99	01-39-1900-R99	1900 Grab Sampler Restrictor
0	01-39-1900-R00	150-450 cc/min
1	01-39-1900-R01	50-150 cc/min
2	01-39-1900-R02	20-60 cc/min
2+	01-39-1900-R02+	12-36 cc/min
3	01-39-1900-R03	7-21 cc/min
3+	01-39-1900-R03+	4-12 cc/min
4	01-39-1900-R04	2-6 cc/min
4+	01-39-1900-R04+	1-3 cc/min
5	01-39-1900-R05	0.5-1.5 cc/min
6	01-39-1900-R06	0.2-0.6 cc/min
7	01-39-1900-R07	0.1-0.3 cc/min

3.2.2. If a restrictor is replaced its flow rate benchmarks must be deleted and recalibrated. Refer to the User Service Manual for information on Setting the Flow Rate Benchmarks.

3.3. Filter.

3.3.1. A 10 micron inlet filter assembly (P/N: 01-39-1900-030) is included with all 1900 instrument configurations. It should be connected to the inlet of the sampling line to which the user connects the 1900. The filter assembly is pictured in figure 2.6.10a.

3.3.2. The 10 micron inlet filter filter should be connected to the sampling line outside of the sampling shelter. The sampling line goes into the shelter and connects to the sampling port on the rear of the 1900. This large filter is the primary filter. There is a secondary filter inside the 1900 to prevent clogs in the 1900's restrictors.

3.3.3. Replacement of the inlet filter is as needed. Some may need a more specific replacement interval. These users may use a replacement interval of once every 6 months if sampling is continuous or annually if the 1900 is used infrequently.

3.3.4. After the replacement of the filter go to "Diagnostics" - "Instrument". In the "System Log" box click "Reset" for both Channel 1 and 2. This will reset both the "CH1 Total Liters Sampled" and "CH2 Total Liters" Sampled for Channel 1 to 0 liters. The sum of the total liters sampled for Channels 1 and 2 is an indication of how much air has been pulled through the 1900's inlet filter and sampling pump. The user may use this as an indication of when to replace the sample inlet filter. The Total Liters Sampled assumes a flow of 1 liter/minute through the sampling pump.

3.4. Data Logger.

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

3.4.2. The Data Logger Option is a communication cable for a data logger (computer) that attaches to the back of the instrument and is exclusive to the front data port. This module listens for remote commands transmitted by another device or software that complies with the DOT commands found in the User Service Manual.

3.5. Inputs.

3.5.1. On the rear of the 1900. Digital inputs with a current requirement of < 1ma. Refer to figure 3.5.1.

3.5.1.1. CH1 START

3.5.1.2. CH2 START

Figure 3.5.1. 1900 Inputs and Outputs.

Label	Type	Voltage	Description
1 – 8	Analog Output	0 – 5 VDC	Pressure sensor voltage for each port on the 8-channel option
CH1 Start CH2 Start	Contact Closure	Open/GND	GND: Start sampling
CH1 Flow CH2 Flow	Analog Output	0 – 5 VDC	Voltage representing the flow rate of the channel (scale is determined by max flow setting in software)
CH1 Pressure CH2 Pressure	Analog Output	0 – 5 VDC	Pressure sensor voltage for each CS1200E Passive Canister Sampler
CH1 Active CH2 Active	Digital Output	0.2 – 5 VDC	Low: Waiting to start sample or Sampling Hi: Not Sampling or waiting to start
Pump Flow	Analog Output	0 – 5 VDC	Voltage representing the flow of the internal vacuum pump (0.2VDC = Flow is good 5 VDC = Not Flowing)
Valve Position	Analog Output	0-5 VDC	Encoder voltage for the Rotary valve on the 8-channel option
GND			System Ground

3.6. Outputs.

3.6.1. 0-5 VDC Analog Signals. Refer to figure 3.5.1.

3.6.1.1. 1-8: These are the analog outputs for the pressure sensors on positions 1 through 8 of the Channel 1 8 Position Option.

3.6.1.2. CH1 FLOW.

3.6.1.3. CH2 FLOW.

3.6.1.4. CH1 PRESSURE.

3.6.1.5. CH2 PRESSURE.

3.6.1.6. CH1 ACTIVE.

3.6.1.7. CH2 ACTIVE.

3.6.1.8. PUMP FLOW.

3.6.1.9. CH1 POSITION: Channel 1 1916 or 8 Position Option Rotary Valve position. The valve position and DC voltage should match the values in the softaware.

3.6.1.9.1. 1916.

1916 Position	Expected VDC
1	4.84
2	4.53

3	4.22
4	3.90
5	3.59
6	3.28
7	2.97
8	2.66
9	2.34
10	2.03
11	1.72
12	1.41
13	1.10
14	0.78
15	0.47
16	0.16

3.6.1.9.1.1. 1916 Position = (5 - (VDC - 0.16)) / 0.3125 VDC is the DC voltage between CH1 Position and GND.

3.6.1.9.2. 8 Position Option

Valve Position	Expected VDC
1	4.62
2	4.00
3	3.37
4	2.75
5	2.12
6	1.50
7	0.87
8	0.25

3.6.1.9.2.1. Valve Position = (5 - (VDC - 0.35)) / 0.625 VDC is the DC voltage between CH1 Position and GND.

3.6.1.10. CH2 POSITION: Channel 2 1916 Rotary Valve position. The valve position and DC voltage should match the values in the softaware.

1916 Position	Expected VDC
1	4.84
2	4.53
3	4.22
4	3.90
5	3.59
6	3.28
7	2.97
8	2.66

9	2.34
10	2.03
11	1.72
12	1.41
13	1.10
14	0.78
15	0.47
16	0.16

3.6.1.10.1. 1916 Position = (5 - (VDC - 0.16)) / 0.3125 VDC is the DC voltage between CH2 Position and GND.

3.7. Spare Parts List for the 1900.

3.7.1. 01-45-00006-01 **1900 STYLUS PEN.**

3.7.2. 01-30-40400 **¼" Nickel Ferrule, 10 pack.**

3.7.3. 01-39-1900-030 **1" (10 µm) INLET FILTER ASSEMBLY.**

3.7.4. 01-17-10020 **2A FUSE, 3AG.**

3.7.5. 01-39-CS12-KIT **CS1200 O-RING KIT.**

3.7.6. 01-39-90000 **SC 63 mm SS DIAPHRAGM.**

3.7.7. 01-11-1900-012 **1900 MINI-U PCBA, TESTED.**

3.7.8 01-39-1900-R99 **1900 Grab Sampler Restrictor.** (It is an empty restrictor body and does not contain a restrictor element.)

3.7.9. 01-39-1900-R00 **1900 RESTRICTOR, 150-450 CC/MIN.**

3.7.10. 01-39-1900-R01 **1900 RESTRICTOR, 50-150 CC/MIN.**

3.7.11. 01-39-1900-R02 **1900 RESTRICTOR, 20-60 CC/MIN.**

3.7.12. 01-39-1900-R02+ **1900 RESTRICTOR, 12-36 CC/MIN.**

3.7.13. 01-39-1900-R03 **1900 RESTRICTOR, 7-21 CC/MIN.**

.

3.7.14. 01-39-1900-R03+ **1900 RESTRICTOR, 4-12 CC/MIN.**

3.7.15. 01-39-1900-R04 **1900 RESTRICTOR, 2-6 CC/MIN.**

3.7.16. 01-39-1900-R04+ **1900 RESTRICTOR, 1-3 CC/MIN.**

3.7.17. 01-39-1900-R05 **1900 RESTRICTOR, 0.5-1.5 CC/MIN.**

3.7.18. 01-39-1900-R06 **1900 RESTRICTOR, 0.2-0.6 CC/MIN.**

3.7.19. 01-39-1900-R07 **1900 RESTRICTOR, 0.1-0.3 CC/MIN.**

3.7.20. 01-06-08060 **1/8" X 4'L FSLD Tubing with fittings.** (As needed. Sample line in the front of the 1900 with the fittings to attach to the 1900 and the canister.) It is the 1/8" line with the can attachment assembly.

3.7.21. These items are parts of the can attachment assembly (01-30-76010). The ¼" SS Cap should not need to be replaced very often.

3.7.21.1. 01-30-04028 **¼" SS Nut.** (As needed.)

3.7.21.2. 01-30-04031 **¼" SS Ferrule Set.** (Nickel ferrule could be used. You cannot re move the nickel ferrules from 01-30-02017 due to the clearance needed for the ferrule removal tool.) (As Needed.)

3.7.21.3. 01-30-02017 **1/8"-1/4" Tx Reducer.** (As needed.)

3.7.21.4. 01-30-04025 **¼" SS Cap.** (As needed. Only if cap is lost.)

3.8. Service Parts List for the 1916.

3.8.1. 01-30-40400 **¼" Nickel Ferrule, 10 pack.**

3.8.2. 01-30-04028 **1/4" SS Nut.**

3.8.3. 01-30-04025 **1/4" SS Cap.**

3.8.4. 01-06-08061 **1/8" X 4" FSL SS TUBE WITH 1/8" FITTINGS.** (Line between the 1900 and 1916.)

3.8.5. 01-19-1916-092 **1/8"T X 1/4"T, 24"L RT ANGLE TUBE.** (LINE FROM ROTARY] VALVE TO CANISTER)

3.8.6. 01-19-1916-093 **1/8"T X 1/4"T, 12" STRT TUBE.** (LINE FROM ROTARY VALVE] TO CANISTER)

3.9. Service Tools for the 1900 and 1916.

3.9.1. SAE Open End Wrenches. Important sizes: ¼", 5/16",7/16", 3/8", ½", and 9/16".

3.9.2. Needle Nose Pliers.

3.9.3. Phillips head screwdrivers. Small and medium.

3.9.4. Tubing cutter.

3.9.5. Box cutter.

3.9.6. Outlet tester.

3.9.7. Voltmeter.

3.9.8. SAE hex keys. Important sizes are 1/16”, and 9/64”.

3.9.9. 01-30-40900 1/4’ NICKEL FERRULE REMOVER.

3.9.10. 01-39-CS12-TOOL CS1200 BACKPLATE WRENCH. (TO REMOVE BACK COVER. REQUIRED.)

3.10. Ordering Parts and Tools.

3.10.1. For the United States, Canada, or any other country which does not have a distributor for Entech Instruments, Inc.:

3.10.1.1. To place an order please contact orders@entechinst.com.

3.10.1.2. For help determining which parts are needed please contact support@entechinst.com.

3.10.1.3. For quotes please contact your local Entech representative or sales@entechinst.com.

3.10.1.4. Quotes can also be requested or orders placed through the Entech Store at www.entechinst.com if an account is created.

3.10.2. For countries with a distributor please contact your local distributor directly for quotes, help determining parts, and to place orders.

3.10.3. If you are in a country other than the United States or Canada and do not know if you have a distributor for your country or do not know how to contact your distributor please email info@entechinst.com and request the contact information for your local distributor. Alternatively one may look up their distributor on the Entech website, https://www.entechinst.com/about/distributors/.

Section 4. 1900 Software Overview.

4.1. General.

4.1.1. The Entech 1900 software must always be run as an 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 1.2.0.49. Below is a picture (Figure 4.1) of the Sequence Screen, which is the first screen to appear when the software is opened.

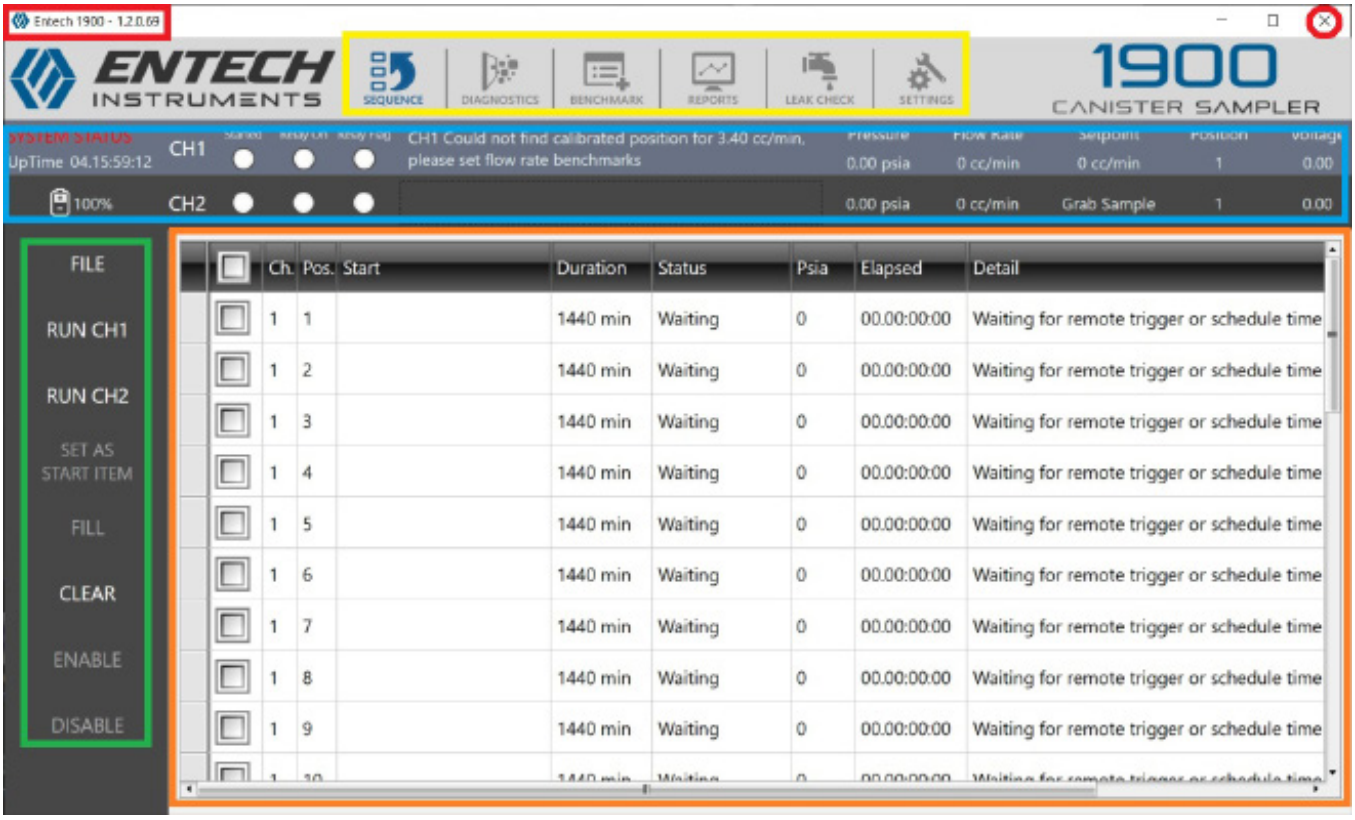
4.1.2. Be aware that all data for the 1900 software is found in the C:\SmartLabs.

4.2. 1900 Software Screen Overview.

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

4.2.1.1. In the upper left **"Entech 1900 - 1.2.0.55"** shows the software version is 1.2.0.55. In figure 4.1 this is in a red box.

Figure 4.1. 1900 Sequence Screen with Channel 1 with an 8 position optoin and Channel 2 with a 1916. Key areas of the screen are in colored boxes or circles.



4.2.1.2. In the upper right the **"X"** can be used to exit the software. In figure 4.1 this is in a red circle.

4.2.1.3. Buttons: These are at the top of the screen and are used to switch between software screens. In figure 4.1 these are in a yellow box.

4.2.1.3.1. **Sequence:** Toggles the Sequence screen.

4.2.1.3.2. Diagnostics: Toggles the Diagnostics screen.

4.2.1.3.3. Benchmark: Toggles the Benchmark screen.

4.2.1.3.4. Reports: Toggles the Reports Screen.

4.2.1.3.5. Leak Check: Toggles the Leak Check screen.

4.2.1.3.6. Settings: Toggles the Configuration Screen.

4.2.1.4. System Status Bar: This is in the light blue box near the top of the screen in figure 4-1. This shows the system (COM or communications) status, Channel 1 and Channel 2 statuses (started, relay on, relay flag) and error messages, 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 with each other. "UpTime" shows how long the software has been open.

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

4.2.1.4.1.1. Started: Indicates that the start signal was received.

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

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

4.2.1.4.1.4. Pressure: Shows the channel's actual pressure in psia.

4.2.1.4.1.5. Flow Rate Actual: Shows the channel's actual flow rate in cc/min.

4.2.1.4.1.6. Flow Rate Setpoint: Shows the current calculated flow rate setpoint in cc/min. Note that this may vary slightly during a sampling event.

4.2.1.4.1.7. Position: 8 positions option (Channel 1 only) or 1916 rotary valve position.

4.2.1.4.1.8. Voltage: 8 positions option (Channel 1 only) or 1916 rotary valve encoder

voltage. The voltage shows the valve position.

4.2.1.5. Control Column: These are commands and pull-downs. They vary with the different screens (Sequence, Diagnostics, ...). In figure 4.1 the control column is in a green box on the left of the screen.

4.2.1.6. Main Box: This varies for the different screens and sometimes with different control column selections. In figure 4.1 the main box is shown in an orange box. It occupies most of the screen.

4.3. Sequence Screen.

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

Figure 4.3.2.1. Sequence Control Column.

4.3.2. Control Column for the Sequence Screen.

4.3.2.1. Refer to figure 4.3.2.1.

4.3.2.2. File. Allows the user to load, and save sequences.

4.3.2.2.1. Load Sequence. Loads a previously saved sequence into the sequence table.

4.3.2.2.2. Save Sequence. Saves the sequence currently in the sequence table.

4.3.2.2. Run CH1: Button used to start the Channel 1 sequence. When clicked choose one of the following options:

4.3.2.2.1. Run Sequence - Auto: If Channel 1 does not have the 8 Position Option or a 1916 this will be the only option and Channel 1 will sample one time. If Channel 1 has an 8 Position Option or a 1916 sampling will start at the first (in order from 1-1 to 1-8 (8 Position Option) or 1-16 (1916)) scheduled or waiting (non-disabled position) event for Channel 1 from the top of the sequence table. Note that once the sequence is started, “Scheduled” and “Waiting” will change to “Queued” (or “Sampling” if sampling starts immediately). The sequence will stop when it runs out of “Queued” events.

4.3.2.2.2. Run Sequence - Begin at Start Item: Only available if Channel 1 has an 8 Position Option or a 1916. If the user has set a position as the start item (see below) this will start sampling at that

position. Runs will continue to the bottom of the Channel 1 positions (1- 8 for the 8 Position Option or 1-16 for a 1916 on Channel 1) and then go to position 1-1, and continue sampling at each position until reaching the position before the start position. Only positions with a run status of “Waiting” or “Scheduled” will be run.

4.3.2.2.3. Run Selected Item: Only available if Channel 1 has an 8 Position Option or a 1916. The user must select one position by putting a check in the box in front of the item. This item will only run the one position selected and no others.

4.3.2.3. Run CH2: Button used to start the Channel 2 sequence. When clicked choose one of the following options:

4.3.2.3.1. Run Sequence - Auto: If Channel 2 does not have a 1916 this will be the only option and Channel 2 will sample one time. If Channel 2 has a 1916 then sampling will start at first (in order from 2-1 to 2-16) “Scheduled” or “Waiting” (non-disabled and positions) event for Channel 2 from the top of the sequence table. Note that once the sequence is started, “Scheduled” and “Waiting” will change to “Queued” (or “Sampling” if sampling starts immediately). The sequence will stop when it runs out “Queued” events.

4.3.2.3.2. Run Sequence - Begin at Start Item: Only available if Channel 2 has a 1916. If the user has set a position as the start item (see below) this will start sampling at that position. Runs will continue to 2-16 if a 1916 is on Channel 2 and then go to position 2-1, and continue sampling at each position until reaching the position before the start position. Only positions with a run status of “Waiting” or “Scheduled” will be run.

4.3.2.3.3. Run Selected Item: Only available if Channel 1 or 2 has a 1916. The user must select one position by putting a check in the box in front of the item. This item will only run the one position selected and no others on the channel.

4.3.2.4. Set As Start Item: The 1900 defaults to starting at the first enabled position in the sequence table for a channel and then samples the positions in order. To set a different position as the first position (Subsequent samples will follow in numerical order after the starting position.) put a checkmark in front of only that position in the sequence table and then click “Set as Start Item”.

4.3.2.5. Fill: Used only with the optional 8 positions for Channel 1, or a 1916 on either channel. After a position’s sampling start time and duration are entered, that line can be used to fill other lines in the sequence table. Select (check the box of) the line that was entered then select the other 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 previously filled line.

4.3.2.5.1. For example, if the entered line had a start time of 1:00 pm on 4/28/19 and a duration of 24 hours (1440 minutes) the first filled line would start on 4/29/19 at 1:02 pm and the third on 4/30/19 at 1:04 pm.

4.3.2.6. Clear: Select what and how to clear from the menu:

4.3.2.6.1. Clear All: Clears all set items in the sequence table whether selected (The sequence line is checked.) or not as long as their status is not “Running”.

4.3.2.6.2. Clear Selected Items: Clears only the selected (checked) lines in the sequence table as long as their status is not “Running”.

4.3.2.6.3. Force Clear Selected Items: This is rarely used. Select any sequence lines with the status of “Running”. Then click “Clear” and select “Force Clear Selected Items”. The selected lines should be cleared.

4.3.2.6.4. Note: Unless continuous sampling is enabled each sequence line must be cleared before the 1900 will sample that position again.

4.3.2.7. Enable: Click to enable a disabled position with a checkmark in the checkbox. If watching the software closely the status will change to “None” briefly and then to “Waiting”.

4.3.2.8. Disable: Click once to disable any positions with a checkmark in the checkbox. The status will change to “Disabled” and the detail will change to “Disabled”.

4.3.3. Main Box for the Sequence Screen.

4.3.3.1. Each row in the sequence is one sampling event. The columns in the sequence table are explained below. Refer to figure 4.3.3.1. Also, note the arrows on the right and bottom of the screen. Use the arrows to show parts of the sequence table that are not currently visible.

4.3.3.2. Checkbox: Use to select sequence lines for changes with the following items in the

Figure 4.3.3.1. Main box for the Sequence Screen. This sequence table has Channel 1 configured with the 8 Channel option and Channel 2 configured with a 1916.

Ch.	Pos.	Start	Duration	Status	Psia	Elapsed	Detail
1	1		60 min	AttachCan	7.34	00.00:00:00	Attach new canister or open canister valve
1	2		60 min	AttachCan	7.34	00.00:00:00	Attach new canister or open canister valve
1	3		60 min	AttachCan	14.33	00.00:00:00	Attach new canister or open canister valve
1	4		60 min	AttachCan	14.33	00.00:00:00	Attach new canister or open canister valve
1	5		60 min	AttachCan	14.33	00.00:00:00	Attach new canister or open canister valve
1	6		60 min	AttachCan	14.33	00.00:00:00	Attach new canister or open canister valve
1	7		60 min	AttachCan	14.33	00.00:00:00	Attach new canister or open canister valve
1	8		60 min	AttachCan	14.33	00.00:00:00	Attach new canister or open canister valve
2	1		1440 min	AttachCan	14.4	00.00:00:00	Attach new canister or open canister valve
2	2		1440 min	Waiting	0	00.00:00:00	Waiting for remote trigger or schedule time

sequence control column: Set as Start Item, Fill, Clear, Enable, and Disable.

4.3.3.3. Ch: Shows if the channel is Channel 1 or Channel 2.

4.3.3.3. Pos: Shows the canister position on the front of the 1900 (Channel 1 8 position option) or 1916.

4.3.3.4. 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 after "Start" is clicked.

4.3.3.5. 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.

4.3.3.6. Status: Shows the status of the sequence line.

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

4.3.3.6.2. Start Time Overlaps with a Scheduled Sample: This means at least two sampling events overlap. Overlap includes the pre-flush and post-flush durations as well as the two minutes between sampling events to allow for rotary valve movement and CS1200 movement.

4.3.3.6.3. Disabled: Not eligible to run.

4.3.3.6.4. Waiting: Ready and waiting to run and will run if the user uses "Run CH.." - "Run Sequence - Auto" or "Run Sequence" - "Begin at Start Item". It will also run if a start signal is received.

4.3.3.6.4.1. If no day/time is entered and "Autosample" is enabled for the channel the sampling for that line will start at the scheduled day and time.

4.3.3.6.4.2. If no day/time is entered and "Autosample" is not enabled:

4.3.3.6.4,2.1. If the sequence line is the first eligible sampling run (for the selected start position) in the sequence table sampling will start after the one minute sample pre-flush.

4.3.3.6.4.2.2. If it is not the first eligible sampling run in the sequence table sampling will start two minutes after sampling ended in the preceding sampling run.

4.3.3.6.5. Leakstop: The leak check failed. The canister pressure is/was too high.

4.3.3.6.6. Scheduled: Ready and waiting to run. The user has scheduled a day and time for the sampling. The 1900 is waiting for a sequence start ("Run Sequence - Auto" or "Begin at Start Item") or a start signal.

4.3.3.6.7. Attach Can: The run is scheduled but the pressure is too high. If the can is already attached either the canister valve is not open or the canister pressure is too high.

4.3.3.6.8. Queued: A status of “Scheduled” and “Waiting” changes to “Queued” once sampling started (“Run CH1/2” - “Run.....”). It means the position is ready to go and the sequence is running.

4.3.3.7. Psia: Shows the current pressure of that position in PSIA (psi absolute). This shows the pressure reading of the channel’s Flow Professor for channels set up for a single channel or with a 1916. (If the 1916 is on position 1 the reading will be shown on position 1. Positions 2-16 will be blank for psia.) If the 8 position option is present on Channel 1 the readings of each individual position’s pressure sensor will be shown.

4.3.3.8. Elapsed: Shows the length of time since sampling began.

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

4.3.3.9.1. Waiting for Remote Trigger or Schedule Time: No start date or has been 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.

4.3.3.9.2. Attach New Canister or Open Canister Valve: The pressure sensor reading is too high. Possibilities: Canister on the position has already been filled, canister leaked, no canister is connected, or the user forgot to open the canister valve.

4.3.3.10. Name: User entered sample name or site name. On the extreme right of the sequence table. Use the arrows at the bottom of the sequence screen to view it.

4.3.3.11. Canister ID: User entered canister identifier such as a serial number. On the extreme right of the sequence table. Use the arrows at the bottom of the sequence screen to view it.

4.4. Diagnostics Screen.

4.4.1. One term that is used a lot on the Diagnostics Screens is “DAC”. DAC is the Digital to Analog Converter value. The software uses it to convert voltages to the readings seen in the software.

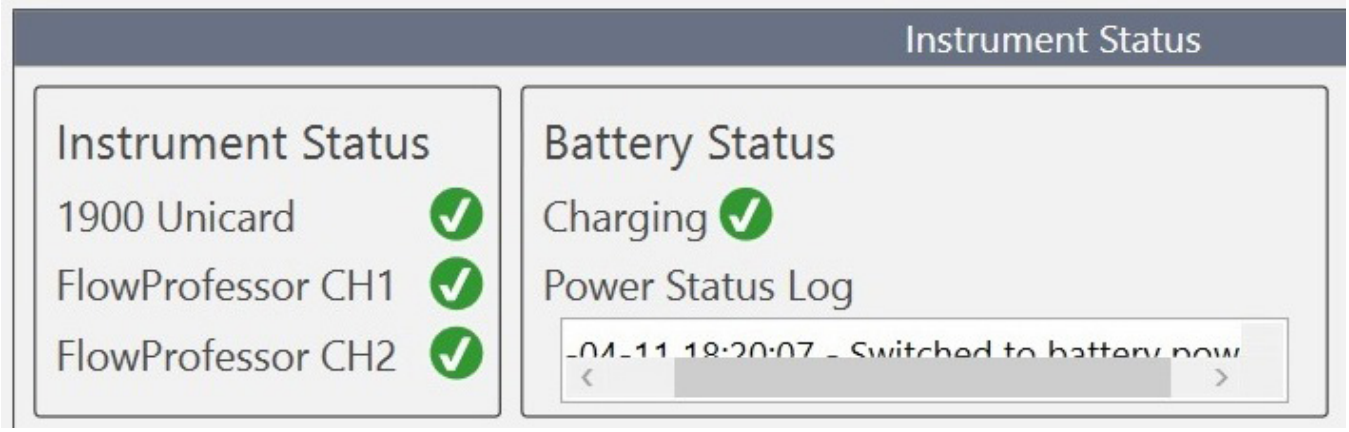
4.4.2. Control Column for the Diagnostics Screen.

4.4.2.1. Refer to figure 4.4.2.1.

4.4.2.2. Status: Click to toggle the Diagnostics - Status screen.

Figure 4.4.2.1. Control Column for the Diagnostics Screen.

Figure 4.4.3.1. Diagnostics Screen - Status Main Box.



4.4.2.4. Instrument: Click to toggle the Diagnostics - Instrument screen.

4.4.2.4. CS1200: Click to toggle the Diagnostics - CS1200 Screen.

4.4.2.5. Rotary Valve: Click to toggle the Diagnostics - Rotary View Screen. This will only be present if a channel is configured for eight or sixteen positions.

4.4.3. Main Box for the Diagnostics - Status Screen.

4.4.3.1. Refer to figure 4.4.3.1.

4.4.3.2. Instrument Status Box.

4.4.3.2.1. 1900 Unicard: If a green check mark is present the 1900 Mini-Unicard is communicating with the software and computer. If a red X is present the Mini-Unicard is not communicating.

4.4.3.2.2. Flow Professor CH1: If a green check mark is present the Flow Professor on Channel 1 is communicating with the software and computer. If a red X is present it is not.

4.4.3.2.3. Flow Professor CH2: If a green check mark is present the Flow Professor on Channel 2 is communicating with the software and computer. If a red X is present it is not.

4.4.3.3. Battery Status Box: This shows the status of the battery in the 1900's computer. If the computer is on battery power (not charging) the status will show that and how long it has been on battery power.

4.4.3.4. Remote Serial Command Status Box: Refer to section 4.4 of the 1900 User Service Manual.

4.4.4. Main Box for the Diagnostics - Instrument Screen.

4.4.4.1. Refer to figure 4.4.4.1.

4.4.4.2. Intake Pump Box:

4.4.4.2.1. Enable Diagnostics: Click to activate the pump diagnostics. A second click turns off the diagnostics.

4.4.4.2.2. Pump On: Click to activate the sampling pump. A second click turns off the pump.

4.4.4.3. System Log Box:

4.4.4.3.1. Reset: (For Channel 1 Total Liters Sampled.) Sets the Channel 1 Total Liters Sampled to 0 liters.

4.4.4.3.2. Reset: (For Channel 2 Total Liters Sampled.) Sets the Channel 2 Total Liters Sampled to 0 liters.

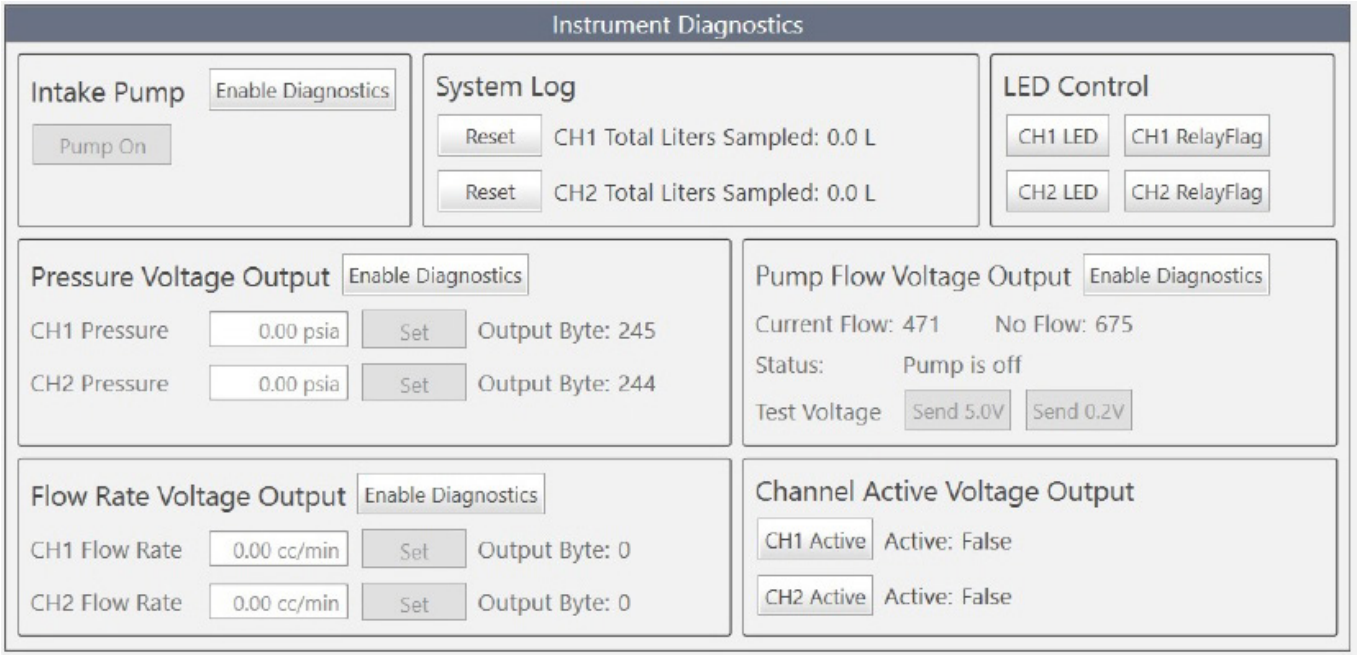
4.4.4.3.3. Note: The sum of the total liters sampled for Channels 1 and 2 is an indication of how much air has been pulled through the 1900's inlet filter and sampling pump. The user may use this as an indication of when to replace the sample inlet filter. After the sample inlet filter is replaced both Channel 1 and Channel 2 Total Liters Sampled should be reset. The liters sampled assumes a flow of 1 liter/minute through the sampling pump.

4.4.4.4. LED Control Box:

4.4.4.4.1. CH1 LED: Activates and deactivates the Channel 1 Sampling LED on the front of the 1900.

4.4.4.4.2. CH2 LED: Activates and deactivates the Channel 2 Sampling LED on the front of the 1900.

Figure 4.4.4.1. Diagnostics Screen - Instrument Main Box.



4.4.4.4.3. CH1 Relay Flag: Activates and deactivates the Channel 1 Relay Flag. This just indicates to the software that a sampling event is occuring. The Relay Flag LEDs are used to indicate that a sampling has been started and that any further start signals will be ignored for the duration of sampling.

4.4.4.4.4. CH2 Relay Flag: Activates and deactivates the Channel 2 Relay Flag. This just indicates to the software that a sampling event is occuring. The Relay Flag LEDs are used to indicate that a sampling has been started and that any further start signals will be ignored for the duration of sampling.

4.4.4.5. Pressure Voltage Output Box:

4.4.4.5.1. Enable Diagnostics: Click to activate and deactivate the Pressure Voltage Output Controls.

4.4.4.5.2. Channel 1 and Channel 2 both have the following:

4.4.4.5.2.1. Box to enter the pressure in psia.

4.4.4.5.2.2. Set button: Click to input the pressure typed in the box.

4.4.4.5.2.3. Output Byte: Shows the DAC value of the pressure entered.

4.4.4.6. Pump Flow Voltage Output Box:

4.4.4.6.1. Enable Diagnostics: Click to activate and deactivate the Pump Flow Voltage Output Controls.

4.4.4.6.2. Current Flow: Shows the current flow as a DAC value.

4.4.4.6.3. No Flow: Shows the DAC values when there is no flow (idle state).

4.4.4.6.4. Status: Shows if the pump is off or on.

4.4.4.6.5. Test Voltage:

4.4.4.6.5.1. Send 5.0V: Button to send 5.0 VDC to test the pump electronics.

4.4.4.6.5.2. Send 0.2V: Button to send 0.2 VDC to test the pump electronics.

4.4.4.7. Flow Rate Voltage Output Box:

4.4.4.7.1. Enable Diagnostics: Click to activate and deactivate the Flow Rate Voltage Output Controls.

4.4.4.7.2. Channel 1 and Channel 2 both have the following:

4.4.4.7.2.1. Box to enter the test flow rate in cc/min.

4.4.4.7.2.2. Set button: Click to input the test flow rate.

4.4.4,.7.2.3. Output Byte: Shows the DAC value of the test flow rate.

4.4.4.8. Channel Active Voltage Output Box:

4.4.4.8.1. CH1 Active: Click button to activate and deactivate the Channel 1 Voltage. Active will show “False” when not active and “True” when the Channel 1 Voltage is active.

4.4.4.8.2. CH2 Active: Click the button to activate and deactivate the Channel 2 Voltage. Active will show “False” when not active and “True” when the Channel 2 Voltage is active.

4.4.5. Main Box for the Diagnostics - Status CS1200 Screen.

4.4.5.1. Refer to figure 4.4.5.1. These are the controls and diagnostics for the CS1200s in the 1900.

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

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

4.4.5.2.2. Vacuum: Shows the channel’s vacuum reading in “-psig” (negative psi gauge).

4.4.5.2.3. DAC: Shows the output of the pressure sensor as a DAC value.

Figure 4.4.5.1. Diagnostics Screen - CS1200 Main Box.

4.4.5.2.4. 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.

4.4.5.2.5. Move:

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

4.4.5.2.5.2. Stop: Stops the CS1200 motor.

4.4.5.2.5.3. Spin Open: The Flow Professor motor will spin the CS1200 open. The number of steps it attempts to spin is in the Step Box.

4.4.5.2.5.4. Spin Close: The Flow Professor motor will spin the CS1200 closed. The number of steps it attempts to spin is in the Step Box.

4.4.5.2.5.5. Open Valve: Opens the calibration shutoff valve for the that channel's Flow Professor. This valve is part of the calibration assembly and has nothing to do with the Flow Professor motor.

4.4.5.2.5.6. Zero Position: Click to set the zero position of the CS1200.

4.4.5.2.6. Position Information:

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

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

4.4.5.2.6.3. Positive off: Position of the CS1200 at which there is no flow after calibration.

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

4.4.5.2.6.5. Response:

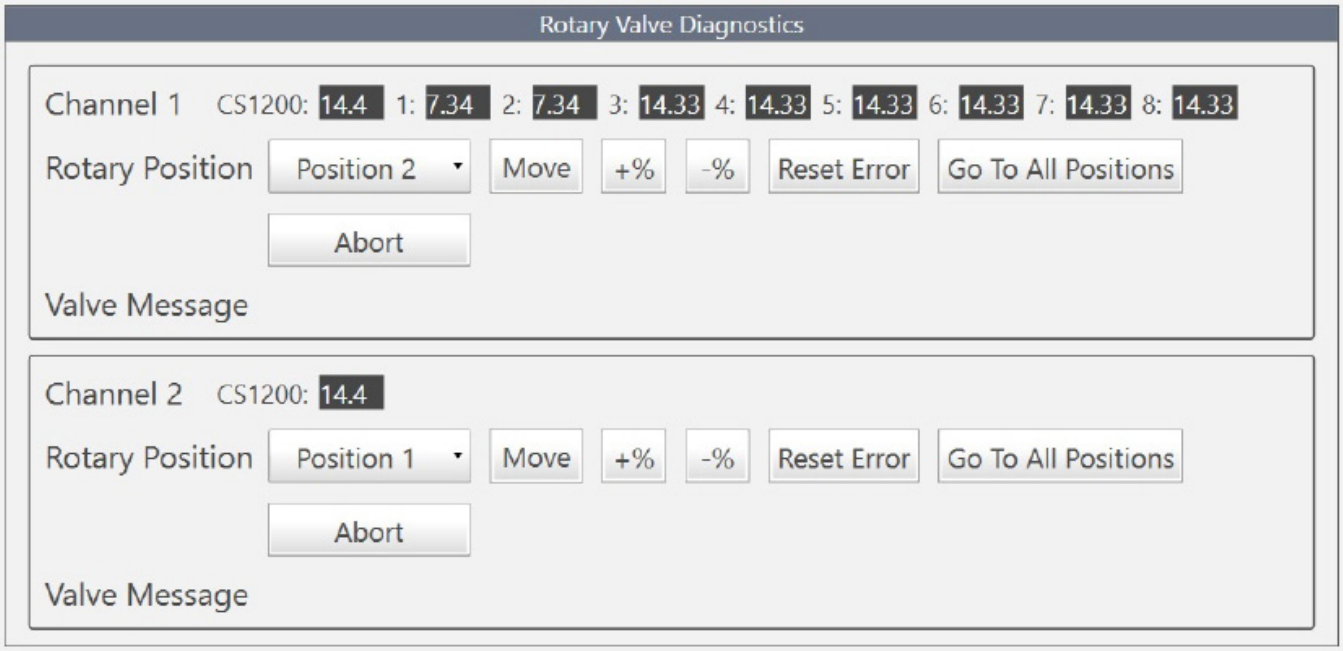
4.4.5.2.6.5.1. Error: No COM with that channel's Flow Professor.

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

4.4.5.2.5.6. Status: Shows the date and time of the last command sent to the Flow Professor and the command.

4.4.6. Main Box for the Diagnostics - Rotary Valve Screen.

Figure 4.4.6.1. View Screen Rotary Valve Main Box. The 8 position option is on Channel 1 and Channel 2 has a 1916.



4.4.6.1. Refer to figure 4.4.6.1. Rotary valves controls and statuses for each configured 8 or 16 position rotary valve will be shown.

4.4.6.2. Channel 1/2 CS1200: Shows the pressure sensor readings of each channel's CS1200 respectively.

4.4.6.2.1. Channel 1: If the 8 position option is present then the pressure readings of each optional position's pressure sensor is shown in a box under the number of that position.

4.4.6.3. Rotary Position:

4.4.6.3.1. Pulldown: Used to select the target rotary valve position. 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. The half positions can be used to shut off flows during leak checking and troubleshooting.

4.4.6.3.2. Move: Click to move the valve to the target position selected with the pulldown.

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

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

4.4.6.3.5. Reset Error: Click to clear error messages.

4.4.6.3.6. Go To All Positions: The rotary valve moves to each position in order.

4.4.6.3.7. Abort: Stops the rotary valve movement.

4.4.6.3.8. Valve Message Error: Shows any error messages for the valve such as that the valve is not communicating.

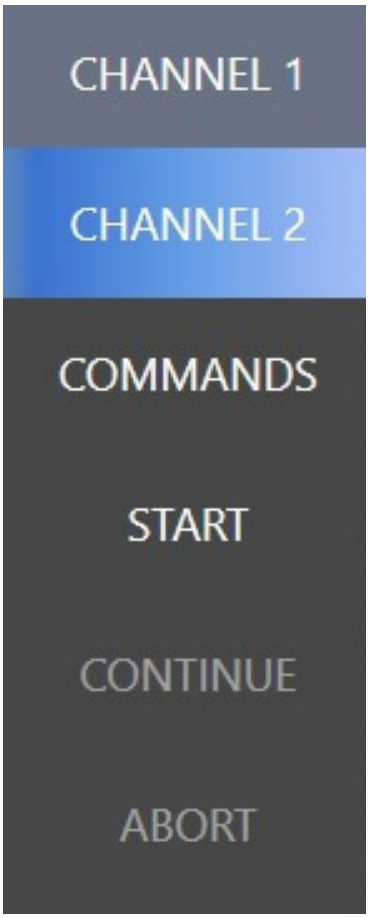
4.5. Benchmark Screen.

4.5.1. The Benchmark screen is used to set and test the flow rates with the Flow Professors in the 1900. All of the settings are from the Configuration Settings screen except the "Required Ballast" which is determined by the software.

4.5.2. Control Column for the Benchmark Screen.

4.5.2.1. Refer to figure 4.5.2.1.

Figure 4.5.2.1. The Control Column for the Benchmark Screen.



4.5.2.2. CHANNEL 1: Toggles Channel 1 benchmark screen.

4.5.2.3. CHANNEL 2: Toggles Channel 2 benchmark screen.

4.5.2.4. COMMANDS: These are used for spot checks of flow rates on the active channel or to check a flow rate with a different ballast size for troubleshooting. To use the commands below connect a vacuum source to "CAL VAC" on the front of the 1900 and connect the calibration tubing and ballast. For Channel 1 the calibration tubing and ballast assembly connects between "CAL1" and "CH1" Position "1" on the front of the 1900. For Channel 2 the calibration tubing and ballast assembly connects between "CAL2" and "CH2 "on the front of the 1900.

4.5.2.4.1. Clear Current Benchmarks: Software clears any benchmark positions for the CS1200 from the data table.

4.5.2.4.2. Measure Flow Rate - No Ballast: Measures the flow rate of the active channel. No ballast should be present on the calibration tubing or active channel.

4.5.2.4.3. Measure Flow Rate - 100 cc Ballast: Measures the flow rate of the active channel. The 100 cc ballast should be present on the calibration tubing for the active channel.

4.5.2.4.4. Measure Flow Rate - 600 cc Ballast: Measures the flow rate of the active channel. The 600 cc ballast should be present on the calibration tubing for the active channel.

4.5.2.5. START: Start button for the active channel. This starts the calibration of the

CS1200 on the active channel.

4.5.2.6. CONTINUE: Continue to the next step in the calibration of the active channel. Check the screen for instructions and complete them before continuing.

4.5.2.7. ABORT: Stops whatever is happening on the active channel.

4.5.3. Main Box for the Benchmark Screen.

4.5.3.1. Refer to figure 4.5.3.1. Channel 1 and 2 both have the Flow Rate Benchmarks on this screen. Only the active channel is shown at any given time.

4.5.3.2. Equipped Restrictor: Shows the currently configured restrictor for the channel.

4.5.3.3. Last Flow Rate: Shows the last measured flow rate for the channel.

4.5.3.4. Required Ballast: Shows the ballast needed to calibrate the CS1200 to the target flow. Ballast sizes are as follows:

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

4.5.3.4.2. 100 cc: Use for target flows between 5 and 100 cc/min.

4.5.3.4.3. 600 cc: Use for target flows of over 100 cc/min.

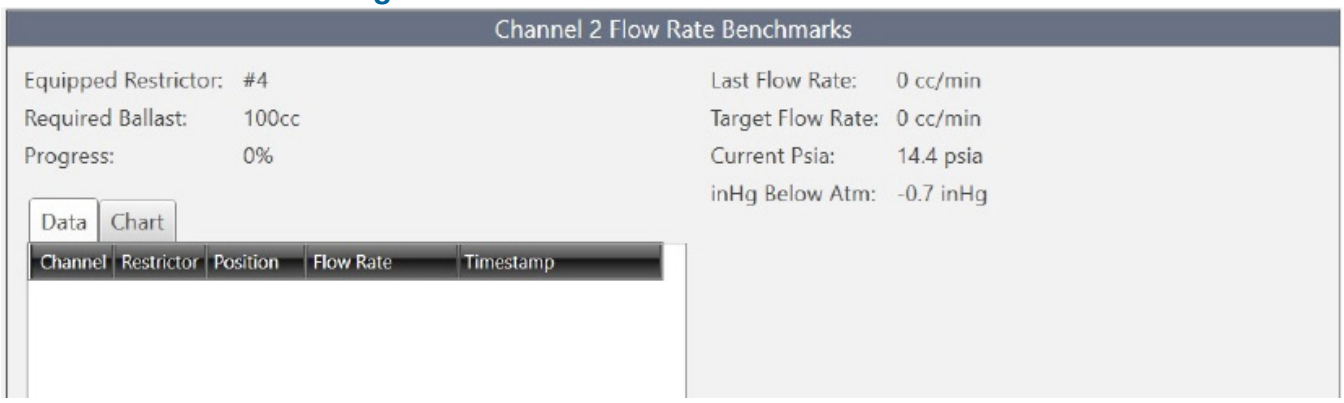
4.5.3.5. Target Flow Rate: Shows the calculated target flow rate in cc/min. The value is calculated from the values in “Settings”. The “Settings” can be adjusted if the target flow rate needs to change.

4.5.3.6. Progress: Shows an estimate of the completeness of the CS1200 calibration in percent.

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

4.5.3.8. in Hg Below Atm: Shows the current vacuum reading in inches of Hg below

Figure 4.5.3.1. Benchmark Screen Main Box.



atmospheric pressure for the active channel.

4.5.3.9. Data: Shows the channel, restrictor, position, flow rate, and time stamp for any calibrated flow rates on that channel.

4.5.3.10. Chart: Shows the flow stability chart for the CS1200. This is a plot of the flow rate vs. psia. It can provide information which is useful for troubleshooting.

4.6. Reports Screen.

4.6.1. Refer to figure 4.6.1. This screen accesses a data log containing the data for the current and previous sampling event.

4.6.2. Control Column for the Reports Screen.

4.6.2.1. File:

4.6.2.1.1. Export to PDF | Last 7 Days | Order by Descending: Exports the last 7 days of reports to pdfs in descending time order (newest to oldest).

4.6.2.1.2. Export to PDF | Last 7 Days | Order by Ascending: Exports the last 7 days of reports to pdfs in ascending time order (oldest to newest).

4.6.2.1.3. Export to PDF | Last 30 Days | Order by Descending: Exports the last 30 days of reports to pdfs in descending time order (newest to oldest).

4.6.2.1.4. Export to PDF | Last 30 Days | Order by Ascending: Exports the last 30 days of reports to pdfs in ascending time order (oldest to newest).

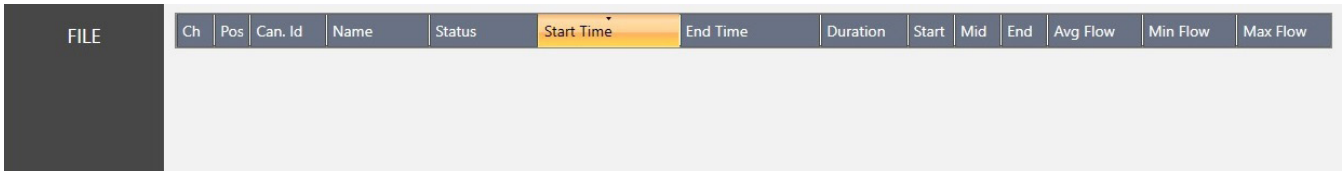
4.6.2.1.5. Export to PDF | All Dates | Order by Descending: Exports all available reports to pdfs in descending time order (newest to oldest).

4.6.2.1.6. Export to PDF | Last 30 Days | Order by Ascending: Exports all available reports to pdfs in ascending time order (oldest to newest).

4.6.2.1.7. Export to XLS | All Dates | Order by Descending: Exports the all reports data to XLS (Microsoft Excel) files in descending time order (newest to oldest).

4.6.3. Main Box for the Reports Screen.

Figure 4.6.1. 1900 Reports Screen.



4.6.3.1. CH: Shows the Channel.

4.6.3.2. Pos: Shows the rotary valve position.

4.6.3.3. Can Id: The canister identity (serial number) from the Sequence screen.

4.6.3.4. Name: The site name from the Sequence screen.

4.6.3.5. Status: The final status of sampling when sampling ended. If the sampling ended early or aborted the reason for the abort will be listed. The Status will say “Running” if it is tracking a position that is currently sampling.

4.6.3.6. Start Time: Shows the time that the sampling event began.

4.6.3.7. End Time: Shows the time that the canister sampling event finished.

4.6.3.8. Duration: Shows the length of the canister sampling event. End Time minus Start Time.

4.6.3.9. Start: Shows the canister pressure in psia when the sampling event began.

4.6.3.10. Mid: Shows the canister pressure in psia at the midpoint (halfway point) of the sampling event.

4.6.3.11. End: Shows the canister pressure in psia when the sampling event finished.

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

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

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

Figure 4.7.1.1. 1900 Leak Check Screen Control Column.

4.7. Leak Check Screen.

4.7.1. Control Column for the Leak Check screen.

4.7.1.1. Refer to figure 4.7.1.1.

4.7.1.2. RUN CH1: Begins the leak check procedure for any Channel 1 positions with checks in the checkbox.

4.7.1.3. CONTINUE CH1: During the leak check the software may ask the user to do things such as connecting a canister or opening a valve on the canister. After the user completes the software request they must click “CONTINUE CH1” for the leak check to resume. This is used primarily during leak checks if the Step by Step Leck Check Guide is enabled.

4.7.1.4. ABORT CH1: Stops the leak check on Channel 1.

4.7.1.5. RUN CH2: Begins the leak check procedure for any Channel 2 positions with checks in the checkbox.

4.7.1.6. CONTINUE CH2: During the leak check the software may ask the user to do things such as connecting a canister or opening a valve on the canister. After the user completes the software request they must click “CONTINUE CH2” for the leak check to resume. This is used primarily during leak checks if the Step by Step Leck Check Guide is enabled.

4.7.1.7. ABORT CH2: Stops the leak check on Channel 2.

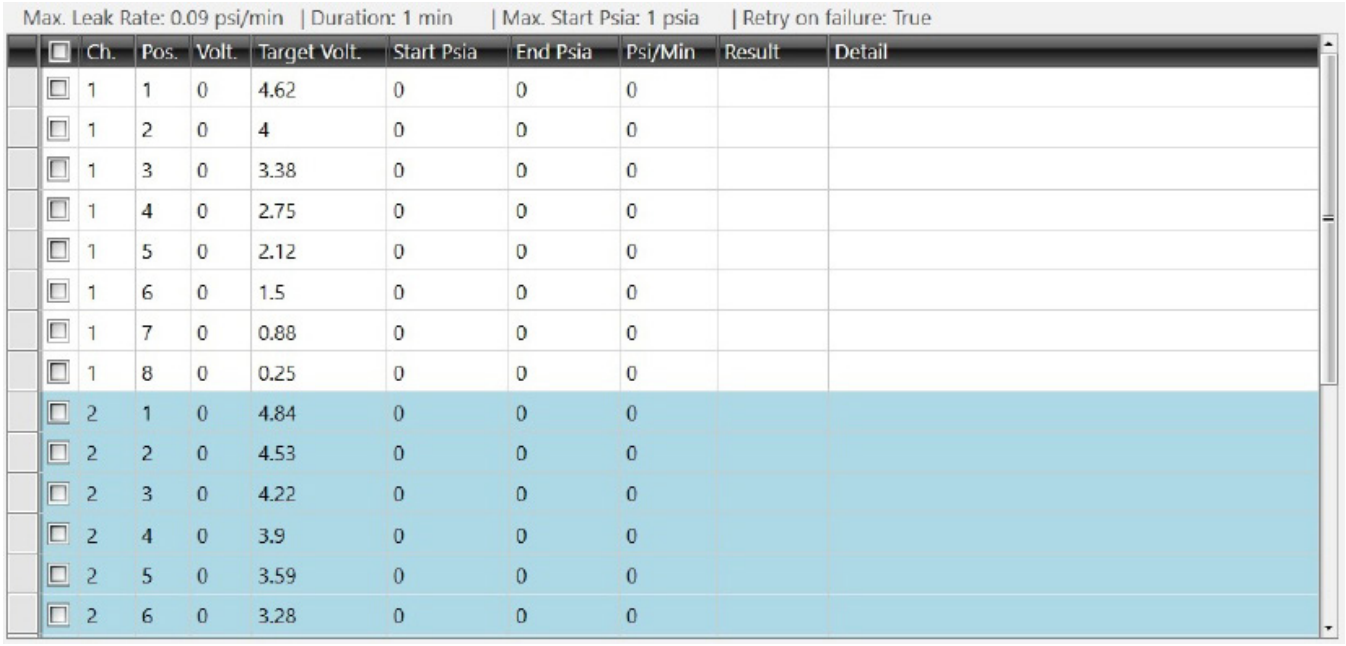
4.7.1.8. CLEAR: Clears the values in the leak check table. Values from previous leak checks must be cleared before that channel can be leak checked again.

4.7.2. Main Box for the Leak Check Screen.

4.7.2.1. Refer to figure 4.7.2.1.

4.7.2.2. Leak Check Settings Overview: Located at the top of the main box. The values

Figure 4.7.2.1. 1900 Leak Check Screen Main Box. Channel 1 is set up with the 8 position option and Channel 2 is connected to a 1916.



Ch.	Pos.	Volt.	Target Volt.	Start Psia	End Psia	Psi/Min	Result	Detail
1	1	0	4.62	0	0	0		
1	2	0	4	0	0	0		
1	3	0	3.38	0	0	0		
1	4	0	2.75	0	0	0		
1	5	0	2.12	0	0	0		
1	6	0	1.5	0	0	0		
1	7	0	0.88	0	0	0		
1	8	0	0.25	0	0	0		
2	1	0	4.84	0	0	0		
2	2	0	4.53	0	0	0		
2	3	0	4.22	0	0	0		
2	4	0	3.9	0	0	0		
2	5	0	3.59	0	0	0		
2	6	0	3.28	0	0	0		

shown come from the “Settings” - “Configuration” screen.

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

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

4.7.2.2.3. Max Start Psia: Maximum starting canister pressure in psia for the leak leak. If the canister pressure is above this value the leak check will skip to the next selected position in the leak check table.

4.7.2.2.4. Retry on Failure: Must be “True” (Set on the “Settings” - “Configuration” screen.) for the software to automatically retry the leak check if a leak check fails or “False” for no retry.

4.7.2.3. The Leak Check Table:

4.7.2.3.1. 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.)

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

4.7.2.3.3. Pos.: Shows the rotary valve position to be leak checked.

4.7.2.3.4. Volt: Shows the 1900 rotary valve encoder reading.

4.7.2.3.5. Target Volt: Shows the target 1900 rotary valve encoder reading. The target voltages (VDC) are listed below:

8 Position Option Valve.

Rotary Valve Position	Target Voltage (VDC)
1	4.62
2	4.00
3	3.38
4	2.75
5	2.12
6	1.50
7	0.87
8	0.25

1916 Valve.

Rotary Valve Position	Target Voltage (VDC)
1	4.84
2	4.53
3	4.22
4	3.90
5	3.59
6	3.28
7	2.97
8	2.66
9	2.34
10	2.03
11	1.72
12	1.41
13	1.10
14	0.78
15	0.47
16	0.16

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

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

4.7.2.3.8. Psi/Min: Shows the leak rate in psia/min.

4.7.2.3.9. Result: Shows the result of the leak check.

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

4.8. Settings Screen.

4.8.1. If any changes are made to the Settings the changes must be saved (“File” and then select “Save Configuration”, “Save Unicard Calibration”, “Save Flow Professor Calibration”, or “Save Override”.) for the changes to be kept after the software is closed.

4.8.2. Control Column for the Settings Screen.

4.8.2.1. Refer to figure 4.8.2.1.

4.8.2.2. File: Changes depending on which screen is toggled in the Main box. The selections are: "Save Configuration", "Save Unicard Calibration", "Save FP Calibration", or "Save Override". In addition when on the "Settings" - "Override" screen one can access "Device Manager" on the computer by clicking "File" and selecting "Device Manager".

Figure 4.8.2.1. Settings - Control Column.

4.8.2.3. Config: Toggles the Configuration Settings into the Main box.

4.8.2.4. CH1 Config: Toggles the Channel 1 Configuration Settings into the Main box.

4.8.2.5. CH2 Config: Toggles the Channel 2 Configuration Settings into the Main box.

4.8.2.6. Override: Toggles the Override screen into the Main box.

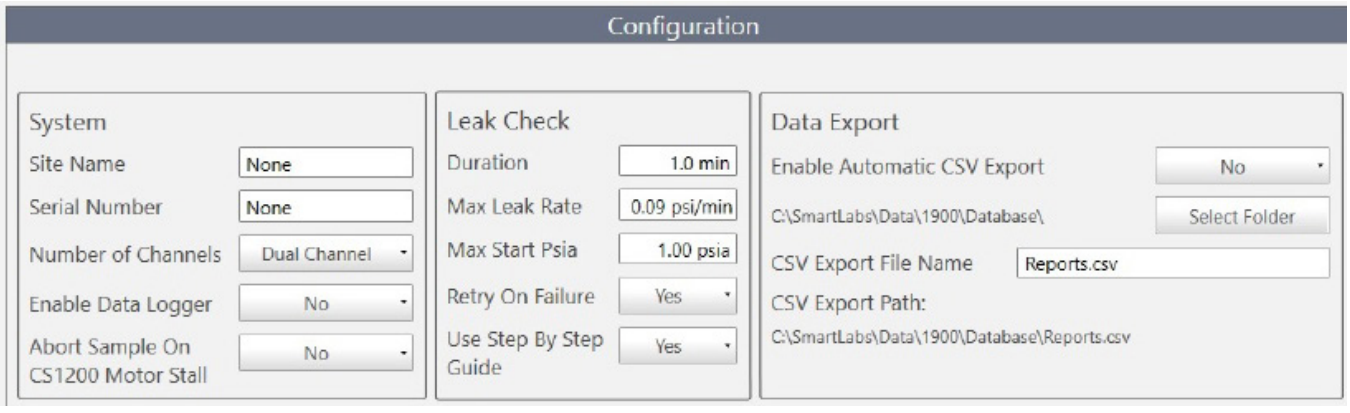
4.8.2.7. Cal: Toggles the Unicard Calibration into the Main box.

4.8.2.8. FlowProf. Cal: Toggles the Flow Professor Calibration into the Main box.

4.8.3. Main Box for the Settings - Config Screen.

4.8.3.1. Refer to figure 4.8.3.1. The defaults for the Sequence, Leak Check, and Method screens are set here. If changes are made on this screen the user must click "File" and then "Save Configuration" while the Settings - Configuration screen is still open to permanently keep the changes. Otherwise they will revert to the original settings when the software is closed and reopened.

Figure 4.8.3.1. Settings - Configuration Main Box.



4.8.3.2. System Box:

4.8.3.2.1. Site Name: The user may enter the 1900's sampling location here.

4.8.3.2.2. Serial Number: The user may enter the 1900's serial number here.

4.8.3.2.3. Restrictor Type: Use the pulldown to select "Traditional" (an inline restrictor that requires wrenches for replacement or "Tool-Less" for the new screw in type restrictors that do not require wrenches (The only tool needed is a screwdriver to remove the 1900 top cover.) for replacement.

4.8.3.2.4. Number of Channels: Pulldown to select "Dual Channel" for 1900's with Channel 1 and Channel 2 or "Single Channel" for 1900's with only Channel 1.

4.8.3.2.5. Enable Data Logger: Select "Yes" if a data logger is connected to the 1900 or "No" if no data logger is connected.

4.8.3.2.6. Abort Sample on CS1200 Motor Stall: Select "Yes" to have the 1900 abort sampling if a Flow Professor motor stalls or select "No" to have it continue sampling if the Flow Professor motor stalls.

4.8.3.3. Leak Check Box:

4.8.3.3.1. Duration: Length of the leak check in minutes. It is user entered. 1.0 minutes is the default value.

4.8.3.3.2. Max Leak Rate: User entered maximum acceptable leakage in psid during the duration of the leak check. 0.09 psi/min is the default value.

4.8.3.3.3. 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. 1.00 psia is the default value.

4.8.3.3.4. Retry on Failure: Select "Yes" to retry the leak check if it fails or "No" to not retry the leak check.

4.8.3.3.5. Use Step by Step Guide: Select "Yes" to have the software guide the user through the leak check or "No" not to.

4.8.3.4. Data Export Box:

4.8.3.4.1. Enable Automatic CSV Export: Select "Yes" to enable or "No" to disable. If enabled an hourly report will be generated by the 1900 to the CSV Export Path if the software is open. Each hourly report overwrites the previous hourly report. This report shows the following: Channel, Position, Canister ID, Name, Channel State, Start Time, End Time, Duration, Start Psia, Mid Psia, End Psia, Avg Flow, Min Flow, Max Flow Rate.

4.8.3.4.2. Select Folder: Click the button to select the directory on the computer in which to store the exported data.

4.8.3.4.3. CSV Export File Name: Enter the name of the .csv file for data export.

4.8.3.4.4. CSV Export Path: Shows the complete export file folder and filename.

4.8.4. Main Box for the Settings - CH 1 Config Screen.

4.8.4.1. Refer to Figure 4.8.4.1. The defaults for sampling on Channel 1 and setting the Channel 1 flow rate are set on the CH1 Config Screen. If changes are made in any box on this screen the user must click “File” and then “Save Configuration” while the Channel 1 Configuration screen is still open to permanently keep the changes. Otherwise they will revert to the original settings when the software is closed and reopened.

4.8.4.2. Instrument: The instrument box is used to set up the Channel 1 hardware configuration.

4.8.4.2.1. Positions: Use the pulldown to select if Channel 1 has 1 position, 8 positions (The 8 position option is present.), or 16 positions (Channel 1 is connected to a 1916.)

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

4.8.4.2.3. CS1200 Max Step Position: The default is 20000. The maximum number of steps that the Flow Professor is allowed to open the CS1200 on Channel 1.

4.8.4.3. Flow Rate Calculator. This box has a flow rate calculator. The flow rate calculator is intended to provide a rough idea of the target flow. It does not account for the altitude of the sampling location or the desired final pressure of the sample canister. At sea level the target flow rate should be set 10-20% below the flow rate calculated with this flow rate calculator. At sampling elevations significantly higher than sea level the user should apply a factor to account for the change in atmospheric pressure at the higher elevation.

4.8.4.3.1. Sample Duration: Enter the default Channel 1 sampling event duration time in minutes.

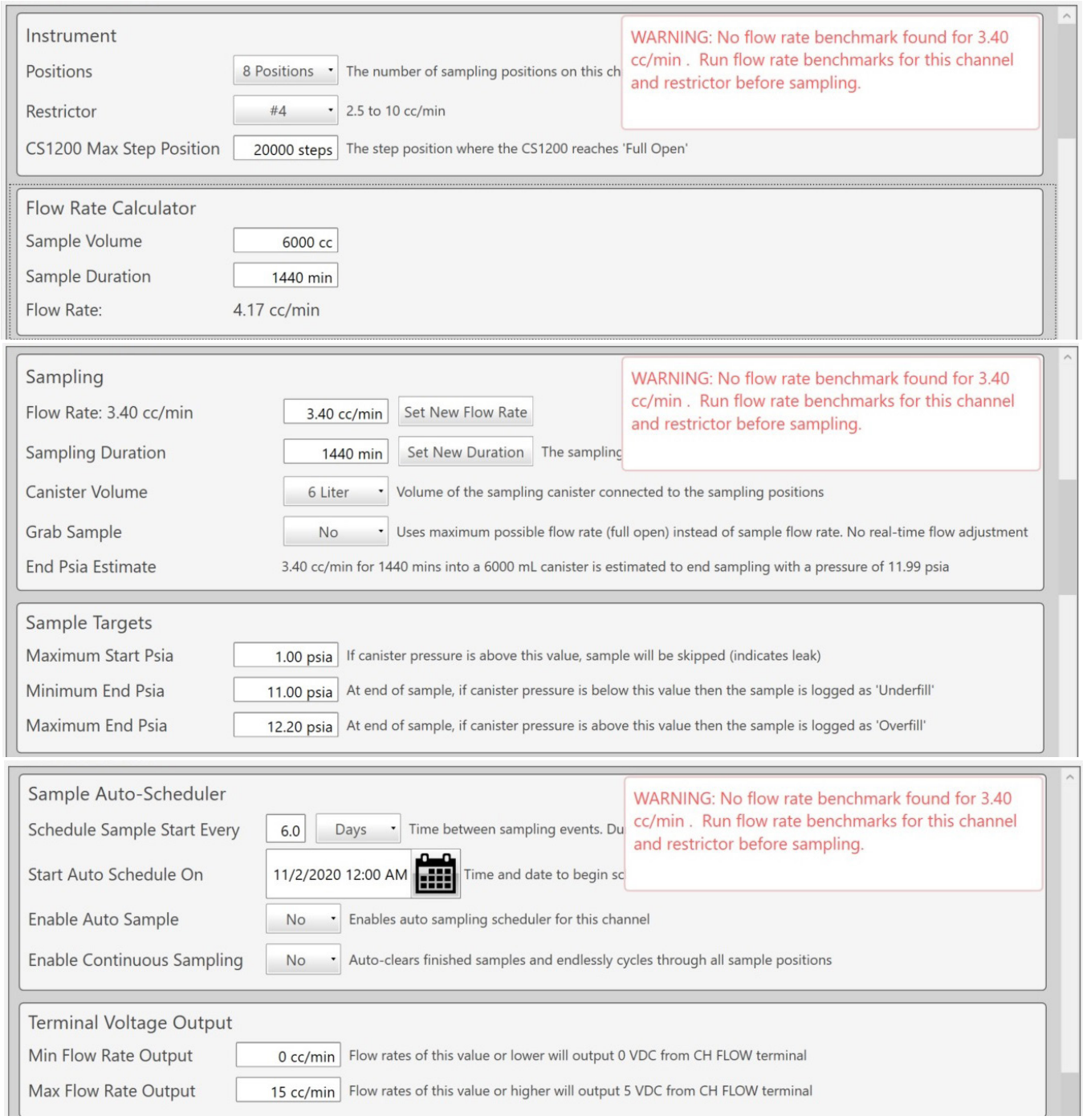
4.8.4.3.2. Canister Volume: Use the pulldown to select the size of the canister connected to Channel 1. Use “Custom” if the sample volume is not present and then enter the sample volume in ml in the the Custom Volume box which appears when “Custom” is selected.

4.8.4.3.3. Flow Rate. Calculated flow rate based on the canister volume and sample duration only.

4.8.4.4. Sampling: The sampling box is used to set sampling setpoints and targets.

4.8.4.4.1. Flow Rate: XXX cc/min. Shows the current target flow rate for Channel 1.

Figure 4.8.4.1. Settings - Channel 1 Configuration. The 8 position option is present.



4.8.4.4.1.1. Flow rate box. To change the flow rate enter a new flow rate in the box.

4.8.4.4.1.2. Set new flow rate. Click the button to set the flow rate.

4.8.4.4.2. Sample Duration: Enter the default Channel 1 sampling event duration time in minutes.

4.8.4.4.3. Canister Volume: Use the pulldown to select the size of the canister connected to Channel 1. Use “Custom” if the sample volume is not present and then enter the sample volume in ml in the the Custom Volume box which appears when “Custom” is selected.

4.8.4.4.4. Grab Sample: Use the pulldown to select “Yes” if the sampling event will be a Grab (unrestricted) sampling event or “No” if Channel 1 will use time intergrated sampling. When the Grap Sample is selected the CS1200 will open to its maximum value (20000 is the default.) for the duration of sampling. There is no real time adjustment to the sample flow when Grab Sample is selected.

4.8.4.4.5. End Psia Estimate: An estimate of the final psia in the canister based on the information entered in the sampling box of the Channel 1 Configuration screen.

4.8.4.4. Sample Targets. The sample target box shows important values that the software uses during sampling.

4.8.4.4.1. 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 unless the 8 position option or a 1916 is on Channel 1 and a second canister is set up for sampling. In that situation the 1900 will check the max start psia of that canister and if acceptable, sampling will occur on that canister. The default value is 3.00 psia. A pressure above the Max Start Psia indicates a leak therefore the sample position will be skipped or sampling will be aborted if the Max. Start Psia is exceeded.

4.8.4.4.2. Min End Psia: The minimum allowable pressure in the canister at the end of sampling. This is user defined. If this pressure is not achieved by the end of the sampling event there will be a message (“Underfill”) in the detail column of the sequence screen and on the report to alert the user. Sampling will stop at the scheduled end of sampling time. The default value is 11.00 psia.

4.8.4.4.3. 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 advantages to stopping the sampling prior to reaching 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 provides 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 least 2 psia below atmospheric pressure 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 their 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. Max End Psia is user defined. If the user does not want the sampling to stop early they can increase this value. If this pressure is achieved before the end of the sampling event there will be a message in the detail column of the sequence screen and on the report to alert the user. The default value is 13.00 psia. If the sample reaches the Max Sample Psia the sample will be flagged as “Overfill”.

4.8.4.5. Sample Flush Durations. Box that shows the durations of the sample flushes.

These flushes pull fresh sample through the sample inlet filter, sample inlet line, and 1900 internal sample manifold.

4.8.4.5.1. Pre-Flush Duration: Time in minutes for the flush pump to run before sampling begins. The default value is 1.0 minute.

4.8.4.5.2. Post-Flush Duration: Time in minutes for the flush pump to run after sampling end. The default value is 1.0 minute.

4.8.4.5.3. Additional information about flushes.

4.8.4.5.3.1. Pre and post flushes currently do not have any set limits, it is possible to set them to a duration of zero if a pre or post flush is not needed.

4.8.4.5.3.2. It is important to note that flush durations add to the total "run" time of a sampling event. If there is a sample duration of 60 mins, a pre flush of 1 minute, and a post flush of 1 minute, the total run (sampling event) time would be 62 mins. 1 minute is typically used for the pre and post flushes as 1 minute allows the rotary valves to move into position for the next sampling event although that would happen at the start of the next event even if the duration was set to 0.

4.8.4.5.3.3. Very long flush times would make it difficult to do "back to back" sample runs. Entech does not recommend taking samples that have no grace period (flushes or extra time) between samplings. For example, a schedule of 60 minute duration samples that run every 60 minutes would be difficult if not impossible to successfully sample because it takes time to open and move CS1200s, rotary valves, etc. Typically it is a good idea to allocate about 2-4 mins for sample start and sample end. So a more reasonable sampling duration would be something like 55 minute sampling duration every 60 minutes, which results in some empty time between samples if the 1900 is stuck opening or closing something.

4.8.4.5.3.4. The CS1200 is opened only at start of sampling and closed at the end of sampling. The CS1200 is either closed or the rotary valve is in an off position when flushing occurs.

4.8.4.6. Sample Auto Schedule: This box has the autosampling parameters.**:**

4.8.4.6.1. Schedule Sample Start Every: Use the time units pulldown to select "Minutes", "Hours", "Days", or "Weeks" then enter the number of time units in the box.

4.8.4.6.2. Start Auto Schedule On: Type the date and time for sampling to begin in the box or click the calendar icon and select the date and time for sampling to begin.

4.8.4.6.3. Enable Auto Sample: Select "No" not to use the autosample function. Select "Yes" to use it. If enabled the first sampling event will begin on the "Start On" date and time and then the sampling event will be repeated every "Sample Every" time period after the "Start On" date and time. For example if "Sample Every" is set to 1 week and "Start On" is set to Monday, 4/22/2019 at 03:00 a.m. then the first sampling will start on Monday,

4/22/2019, at 3:00 a.m. The next sampling will start on Monday, 4/29/2019, at 3:00 a.m., then Monday, 5/6/2019 at 3:00 a.m., ... until the user changes the AutoSample settings. Be aware that once setup this will continue indefinitely as long as the 1900 is powered on, the 1900 software is open, and there are positions “Waiting” (status of “Waiting”) to run. Also, note that the user must swap in a different canister between each sampling event and clear previous samping event information.

4.8.4.6.3.1. If autosample is enabled and an error occurs with the autosample scheduled sample then the software will abort that sample position and move to the next available sample position on that channel and schedule the next sampling time.

4.8.4.6.3.2. Here is an example for a 1900 with a 1916. The user wants grab samples taken at 15 minute intervals.

4.8.4.6.3.2.1. The user starts the sequence (“Run” - “Run Sequence - Auto”) at 12:08 p.m.

4.8.4.6.3.2.2. The first sample is auto scheduled for 12:15 p.m on position 3.

4.8.4.6.3.2.3. The software starts the sample at 12:15 by checking the starting pressure on position 3 to verify the pressure does not exceed the maximum acceptable psia.

4.8.4.6.3.2.4. The canister pressure is above max start psia so the software cancels the sample.

4.8.4.6.3.2.5. At this point the current time is 12:16 p.m.

4.8.4.6.3.2.6. The next auto schedule is 15 minutes later at 12:30 p.m.

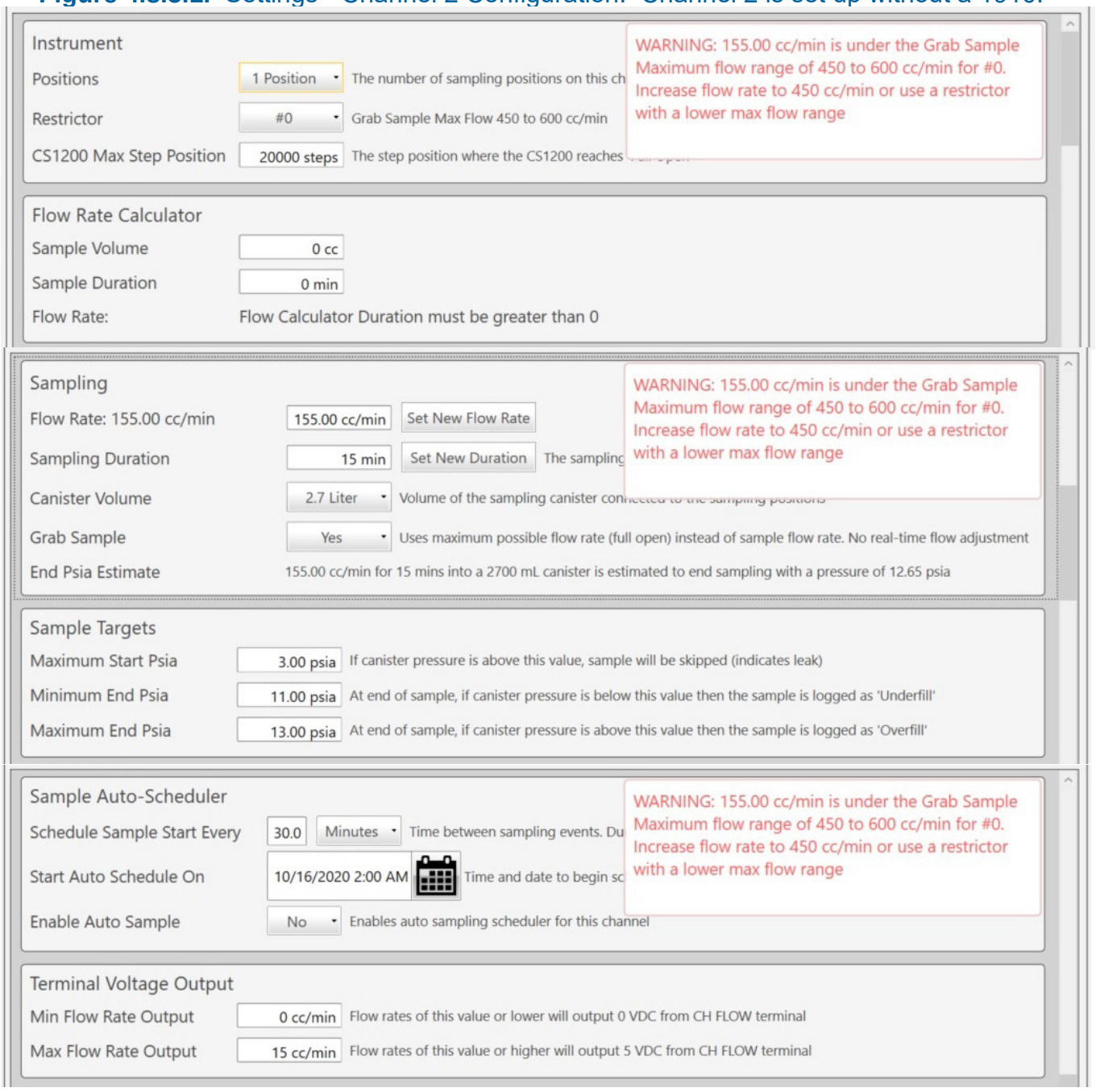
4.8.4.6.3.2.7. The software now schedules the next available position (position 4) for 12:30 p.m.

4.8.4.6.3.2.8. At 12:30 the software starts the sample and checks the starting pressure on position 4. If the starting pressure is good and any other initial checks pass the sample will be taken. If an initial check fails the sample will be cancelled and the software will wait for the next sampling event.

4.8.4.6.3.2.9. The software will stop once all enabled sampling positions on the sampling channel have attempted a sample. If the user would like the software to clear and wrap around to start again at the first sample position then this is the point where Continuous Sampling would come into play. If Continuous Sampling is enabled, the software will start clearing items and retrying (always at the next sample interval, so it never runs 2 samples for the same start time). The user must change the filled canisters to evacuated ones or the 1900 will keep checking previously sampled positions to see if their max psia is acceptable for sampling.

4.8.4.6.4. Enable Continuous Sampling: This can only be used if Channel 1 is set up with the 8 Position Option or with a 1916. Select “No” not to use the Continuous Sampling

Figure 4.8.5.1. Settings - Channel 2 Configuration. Channel 2 is set up without a 1916.



function. Select “Yes” to use it. If enabled the 1900 will go through each enabled sampling event in the 1900 sequence table in order. If enabled it will not be necessary to clear sequence lines before the next sampling event. Enabled positions will be sampled in numerical order in the sequence table. (One may use “Set as Start Item” to change the initial starting position.) When the last enabled position is reached sampling will go to the numerically earliest enabled position on Channel 1. Each sampling event will start two minutes after the previous event ended.

4.8.4.6.4.1. The purpose of the Continuous Sampling setting is to give the 1900 sequence table permission to automatically reset the sequence items while the 1900 is running. This is equivalent to the software automatically requeuing a completed or canceled sequence

item. If continuously sampling is not enabled the user needs to clear previously completed sequence lines if there is prior sample data in those lines. With Continuous Sampling the software clears the sequence line when the 1900 comes back to that position. Then the software will perform the normal validation checks to see if that position can be run again. The most important validation check is to verify that the canister's psia is low enough to begin sampling..

4.8.4.6.4.2. Continuous Sampling is mostly a convenience feature so users do not need to clear sequence lines themselves. It is called Continuous Sampling because there is little need for the person changing out the cans to have any interaction with the actual software. The person would just change cans and the software would continue to sample with no need for a person to clear out sequence lines. This is targeted at 1900s with dual 1916s sampling very frequently as there would be a fair amount of time spent with resetting all the completed sequence lines and re-scheduling. The 1900 and 1916s would never stop sampling. The software would just loop from position to position and just keep going through each sample positions checking each one in turn.

4.8.4.6.4.3. Be aware that if nobody replaces the canisters the 1900 would keep trying to rerun the same cans over and over again and give the error message that the canister psia was too high for sampling. This would occur even if none of the filled canisters have been changed. The software expects a person to change the cans at some point so that it can actually sample. If continuous sampling is not enabled, the sequence will simply stop once there are no more "blank" or "queued" sampling positions.

4.8.4.7. Terminal Voltage Output. Box to set the flow rate output voltages on the rear of the 1900.

4.8.4.7.1. Min Flow Rate: The minimum allowable flow rate on Channel 1. This flow rate will output a voltage of 0.2 VDC from the Channel 1 Flow terminal.

4.8.4.7.2. Max Flow Rate: The maximum allowable flow rate on Channel 1. This flow rate will output a voltage of 5.0 VDC from the Channel 1 Flow terminal.

4.8.5. Main Box for the Settings - CH 2 Config Screen.

4.8.5.1. Refer to Figure 4.8.5.1. The defaults for sampling on Channel 2 and setting the Channel 2 flow rate are set on the CH2 Config Screen. If changes are made in any box on this screen the user must click "File" and then "Save Configuration" while the Channel 2 Configuration screen is still open to permanently keep the changes. Otherwise they will revert to the original settings when the software is closed and reopened.

4.8.5.2. Instrument: The instrument box is used to set up the Channel 2 hardware configuration.

4.8.5.2.1. Positions: Use the pulldown to select if Channel 2 has 1 position, or 16 positions (Channel 2 is connected to a 1916.) Note that although 8 positions is shown as an option for Channel 2, the 8 position option is not available for Channel 2 (and therefore not supported

by the 1900 software).

4.8.5.2.2. Restrictor: Use the pulldown to select the restrictor currently installed on Channel 2.

4.8.5.2.3. CS1200 Max Step Position: The default is 20000. The maximum number of steps that the Flow Professor is allowed to open the CS1200 on Channel 2.

4.8.5.3. Flow Rate Calculator. This box has a flow rate calculator. The flow rate calculator is intended to provide a rough idea of the target flow. It does not account for the altitude of the sampling location or the desired final pressure of the sample canister. At sea level the target flow rate should be set 10-20% below the flow rate calculated with this flow rate calculator. At sampling elevations significantly higher than sea level the user should apply a factor to account for the change in atmospheric pressure at the higher elevation.

4.8.5.3.1. Sample Duration: Enter the default Channel 2 sampling event duration time in minutes.

4.8.5.3.2. Canister Volume: Use the pulldown to select the size of the canister connected to Channel 2. Use “Custom” if the sample volume is not present and then enter the sample volume in ml in the the Custom Volume box which appears when “Custom” is selected.

4.8.5.3.3. Flow Rate. Calculated flow rate based on the canister volume and sample duration only.

4.8.5.4. Sampling: The sampling box is used to set sampling setpoints and targets.

4.8.5.4.1. Flow Rate: XXX cc/min. Shows the current target flow rate for Channel 2.

4.8.5.4.1.1. Flow rate box. To change the flow rate enter a new flow rate in the box.

4.8.5.4.1.2. Set new flow rate. Click the button to set the flow rate.

4.8.5.4.2. Sample Duration: Enter the default Channel 2 sampling event duration time in minutes.

4.8.5.4.3. Canister Volume: Use the pulldown to select the size of the canister connected to Channel 2. Use “Custom” if the sample volume is not present and then enter the sample volume in ml in the the Custom Volume box which appears when “Custom” is selected.

4.8.5.4.4. Grab Sample: Use the pulldown to select “Yes” if the sampling event will be a Grab (unrestricted) sampling event or “No” if Channel 2 will use time intergrated sampling. When the Grap Sample is selected the CS1200 will open to its maximum value (20000 is the default.) for the duration of sampling. There is no real time adjustment to the sample flow when Grab Sample is selected.

4.8.5.4.5. End Psia Estimate: Any estimate of the final psia in the canister based on the

information entered in the sampling box of the Channel 2 Configuration screen.

4.8.5.4. Sample Targets. The sample target box shows important values that the software uses during sampling.

4.8.5.4.1. 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 unless a 1916 is on Channel 2 and a second canister is set up for sampling. In that situation the 1900 will check the max start psia of that canister and if acceptable, sampling will occur on that canister. The default value is 3.00 psia. A pressure above the Max Start Psia indicates are leak therefore the sample position will be skipped or sampling will be aborted.

4.8.5.4.2. Min End Psia: The minimum allowable pressure in the canister at the end of sampling. This is user defined. If this pressure is not achieved by the end of the sampling event there will be a message ("Underfill") in the detail column of the sequence screen and on the report to alert the user. Sampling will stop at the scheduled end of sampling time. The default value is 11.00 psia.

4.8.5.4.3. 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 advantages to stopping the sampling prior to reaching 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 provides 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 their 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. Max End Psia is user defined. If the user does not want the sampling to stop early they can increase this value. If this pressure is achieved before the end of the sampling event there will be a message in the detail column of the sequence screen and on the report to alert the user. The default value is 13.00 psia. If the sample reaches the Max Sample Psia the sample will be flagged as "Overfill".
"

4.8.5.5. Sample Flush Durations. Box that shows the durations of the sample flushes. These flushes pull fresh sample through the sample inlet filter, sample inlet line, and 1900 internal sample manifold.

4.8.5.5.1. Pre-Flush Duration: Time in minutes for the flush pump to run before sampling begins. The default value is 1.0 minute.

4.8.5.5.2. Post-Flush Duration: Time in minutes for the flush pump to run after sampling ends. The default value is 1.0 minute.

4.8.5.5.3. Additional information about flushes.

4.8.5.5.3.1. Pre and post flush currently do not have any set limits, it is possible to set them to a duration of zero if a pre or post flush is not needed.

4.8.5.5.3.2. It is important to note is that flush durations add to the total "run" time of a sampling event. If there is a sample duration of 60 mins, a pre flush of 1 minute, and a post flush of 1 minute, the total run time would be 62 mins. 1 minute is typically used for the pre and post flushes as 1 minute allows the rotary valves to move into position for the next sampling event although that would happen at the start of the next event even if the duration was set to 0.

4.8.5.5.3.3. Very long flush times would make it difficult to do "back to back" sample runs. Entech does not recommend taking samples that have no grace period (flushes or extra time) between samplings. For example, a schedule of 60 minute duration samples that run every 60 minutes would be difficult if not impossible to successfully sample because it takes time to open and move CS1200s, rotary valves, etc. Typically it is a good idea to allocate about 2-4 mins for sample start and sample end. So a more reasonable sampling duration would be something like a 55 minute sampling duration every 60 minutes, which results in some empty time between samples if the 1900 is stuck opening or closing something.

4.8.5.5.3.4. The CS1200 is opened only at start of sampling and closed at the end of sampling. The CS1200 is either closed or the rotary valve is in an off position when flushing occurs.

4.8.5.6. Sample Auto Schedule: This box has the autosampling parameters**:**

4.8.5.6.1. Schedule Sample Start Every: Use the time units pulldown to select "Minutes", "Hours", "Days", or "Weeks" then enter the number of time units in the box.

4.8.5.6.2. Start Auto Schedule On: Type the date and time of sampling to begin in the box or click the calendar icon and select the date and time for sampling to begin.

4.8.5.6.3. Enable Auto Sample: Select "No" not to use the Auto Sample function. Select "Yes" to use it. If enabled the first sampling event will begin on the "Start On" date and time and then the sampling event will be repeated every "Sample Every" time period after the "Start On" date and time. For example if "Sample Every" is set to 1 week and "Start On" is set to Monday, 4/22/2019 at 03:00 a.m. then the first sampling will start on Monday, 4/22/2019, at 3:00 a.m. The next sampling will start on Monday, 4/29/2019, at 3:00 a.m., then Monday, 5/6/2019 at 3:00 a.m., ... until the user changes the Auto Sample settings. Be aware that once setup this will continue indefinitely as long as the 1900 is powered on, the 1900 software is open, and there are positions "Waiting" (status of "Waiting") to run. Also, note that the user must swap in a different canister between each sampling event and clear previous samping event information.

4.8.5.6.3.1. If autosample is enabled and an error occurs with the autosample scheduled sample then the software will abort that sample position and move to the next available

sample position on that channel and schedule that position for the next sampling time.

4.8.5.6.3.2. Here is an example for a 1900 with a 1916. The user wants grab samples taken at 15 minute intervals.

4.8.5.6.3.2.1. The user starts the sequence (“Run” - “Run Sequence - Auto”) at 12:08 p.m.

4.8.5.6.3.2.2. The first sample is auto scheduled for 12:15 p.m on position 3.

4.8.5.6.3.2.3. The software starts the sample at 12:15 by checking the starting pressure on position 3 verify the pressure does not exceed the maximum acceptable psia.

4.8.5.6.3.2.4. The canister pressure is above max start psia so the software cancels the sample.

4.8.5.6.3.2.5. At this point the current time is 12:16 p.m.

4.8.5.6.3.2.6. The next auto schedule is 15 minutes later at 12:30 p.m.

4.8.5.6.3.2.7. The software now schedules the next available position (position 4) for 12:30 p.m.

4.8.5.6.3.2.8. At 12:30 the software starts the sample and checks the starting pressure on position 4. If the starting pressure is good and any other initial checks pass the sample will be taken. If an initial check fails the sample will be cancelled and the software will wait for the next sampling event.

4.8.5.6.3.2.9. The software will stop once all enabled sampling positions on the sampling channel have attempted a sample. If the user would like the software to clear and wrap around to start again at the first sample position then this is the point where Continuous Sampling would come into play. If Continuous Sampling is enabled, the software will start clearing items and retrying (always at the next sample interval, so it never runs 2 samples for the same start time). The user must change the filled canisters to evacuated ones or the 1900 will keep checking previously sampled positions to see if their max psia is acceptable for sampling.

4.8.5.6.4. Enable Continuous Sampling: This can only be used if Channel 2 is set up with the 8 position option or with a 1916. Select “No” not to use the Continuous Sampling function. Select “Yes” to use it. If enabled the 1900 will go through each enabled sampling event in the 1900 sequence table in order. If enabled it will not be necessary to clear sequence lines before the next sampling event. Enabled positions will be sampled in numerical order in the sequence table. (One may use “Set as Start Item” to change the initial starting position.) When the last enabled position is reached sampling will go to the numerically earliest enabled position on Channel 2. Each sampling event will start two minutes after the previous event ended.

4.8.5.6.4.1. The purpose of the Continuous Sampling setting is to give the 1900 sequence

table permission to automatically reset the sequence items while the 1900 is running. This is equivalent to the software automatically requeuing a completed or canceled sequence item. If Continuous Sampling is not enabled the user needs to clear previously completed sequence lines if there is prior sample data in those lines. With Continuous Sampling the software clears the sequence line when the 1900 comes back to that position. Then the software will perform the normal validation checks to see if that position can be run again. The most important validation check is to verify that the canister's psia is low enough to begin sampling..

4.8.5.6.4.2. Continuous Sampling is mostly a convenience feature so users do not need to clear sequence lines themselves. It is called Continuous Sampling because there is little need for the person changing out the cans to have any interaction with the actual software. The person would just change cans and the software continues to sample with no need for a person to clear out sequence lines. This is targeted at 1900s with dual 1916s sampling very frequently as there would be a fair amount of time spent with resetting all the completed sequence lines and re-scheduling. With Continuous Sampling the 1900 and 1916s would never stop sampling. The software would just loop from position to position and just keep going through each sample position checking each one in turn.

4.8.5.6.4.3. Be aware that if nobody replaces the canisters the 1900 would keep trying to rerun the same cans over and over again and give the error message that the canister psia was too high for sampling. This would occur even if none of the filled canisters have been changed. The software expects a person to change the cans at some point so that it can actually sample. If Continuous Sampling is not enabled, the sequence will simply stop once there are no more "blank" or "queued" sampling positions.

4.8.5.7. Terminal Voltage Output. Box to set the flow rate output voltages on the rear of the 1900.

4.8.5.7.1. Min Flow Rate: The minimum allowable flow rate on Channel 2. This flow rate will output a voltage of 0.2 VDC from the Channel 2 Flow terminal.

4.8.5.7.2. Max Flow Rate: The maximum allowable flow rate on Channel 2. This flow rate will output a voltage of 5.0 VDC from the Channel 2 Flow terminal.

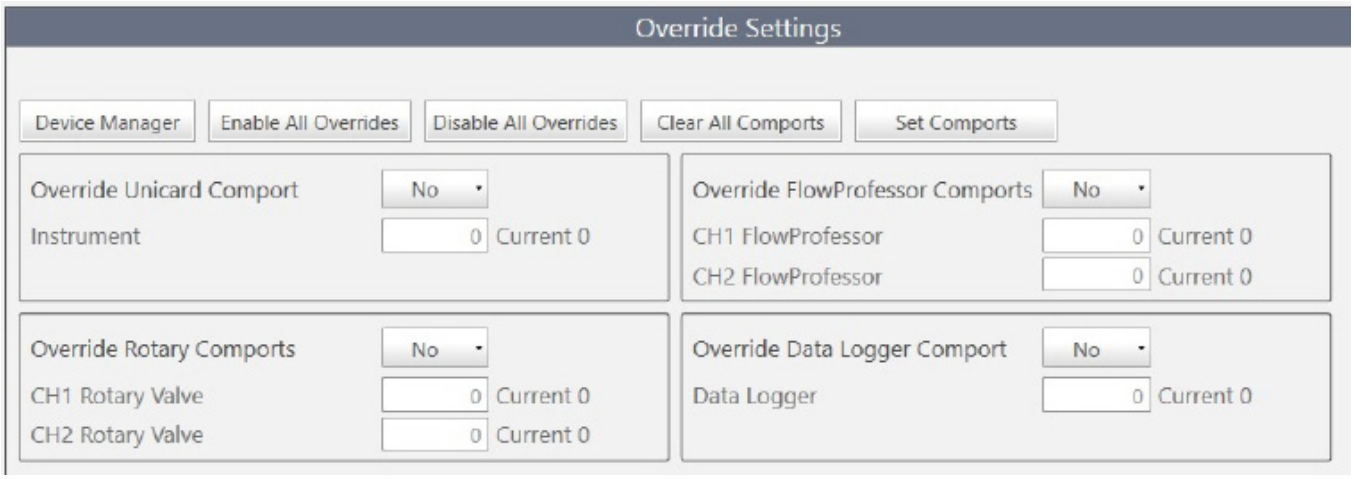
4.8.6. Main Box for the Settings - Override Screen.

4.8.6.1. Refer to figure 4.8.6.1. 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.

4.8.6.2. Device Manager: Accesses Device Manager on the 1900's computer.

4.8.6.3. Enable All Overrides: Selects "Yes" for Override Unicard COM port, Override Flow Professor COM ports, Override Rotary Valve Comports (Only use if the 8 Position Option or a 1916 is configured on Channel 1, or if a 1916 is configured on Channel 2.), and Override Data Logger. Overrides may also be enabled individually.

Figure 4.8.7.1. Settings - Override.



4.8.6.4. Disable All Overrides: Selects "No" for Override Unicard COM port, Override Flow Professor COM ports, Override Rotary COM ports, and Override Data Logger. Overrides may also be disabled individually.

4.8.6.5. Clear All COM Ports: Clears all COM ports set in boxes for Instrument, CH1 Flow Professor, CH2 Flow Professor, CH1 Rotary Valve, CH2 Rotary Valve, and Data Logger.

4.8.6.6. Set COM Ports: If Override is not selected the 1900 software will find the COM ports when it is opened. Clicking the "Set COM ports" puts the COM ports which the software found into the COM port boxes. The user can then "Enable All Overrides" or only some overrides.

4.8.6.7. Override Unicard COM Port: Select "Yes" to Override or "No" not to.

4.8.6.7.1. Instrument: The box shows the COM port the user associated with the 1900.

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

4.8.6.8. Override Flow Professor COM Ports: Select "Yes" to Override or "No" not to.

4.8.6.8.1. CH1 Flow Professor: The box shows the COM port the user associated with the Channel 1 Flow Professor.

4.8.6.8.2. Current: If "No" is selected for Override Flow Professor COM ports current will show the COM port on which the software has found the Channel 1 Flow Professor. If "Yes" is selected the software will copy the COM ports the user associated with the Channel 1 Flow Professor.

4.8.6.8.3. CH2 Flow Professor: The box shows the COM port the user associated with the Channel 2 Flow Professor.

4.8.6.8.4. Current: If "No" is selected for Override Flow Professor COM ports current will

show the COM port on which the software has found the Channel 2 Flow Professor. If “Yes” is selected the software will copy the COM ports the user associated with the Channel 2 Flow Professor.

4.8.6.9. Override Rotary COM port: Select “Yes” to Override or “No” not to.

4.8.6.9.1. CH1 Rotary Valve: Shows the COM port the user associated with the IMS controller for the Channel 1 rotary valve actuator that is part of the Channel 1 8 positionsampling option or a Channel 1 1916.

4.8.6.9.2. Current: If “No” is selected for Override 1900 COM port this will show the COM port on which the software has found the Channel 1 rotary valve. If “Yes” is selected it will copy the COM port the user associated with the Channel 1 rotary valve.

4.8.6.9.3. CH2 Rotary Valve: Shows the COM port the user associated with the IMS controller for the Channel 2 rotary valve actuator that is part of the Channel 2 1916.

4.8.6.9.4. Current: If “No” is selected for Override 1900 COM port this will show the COM port on which the software has found the Channel 2 rotary valve. If “Yes” is selected it will copy the COM port the user associated with the Channel 2 rotary valve.

4.8.6.10. Override Data Logger COM port: Select “Yes” to Override or “No” not to.

4.8.6.10.1. Data Logger: Shows the COM port the user associated with the Data logger if attached to the 1900.

4.8.6.10.2. Current: If “No” is selected for Override Data Logger COM port this will show the COM port on which the software has found the datalogger. If “Yes” is selected it will copy the COM port the user associated with the Data Logger.

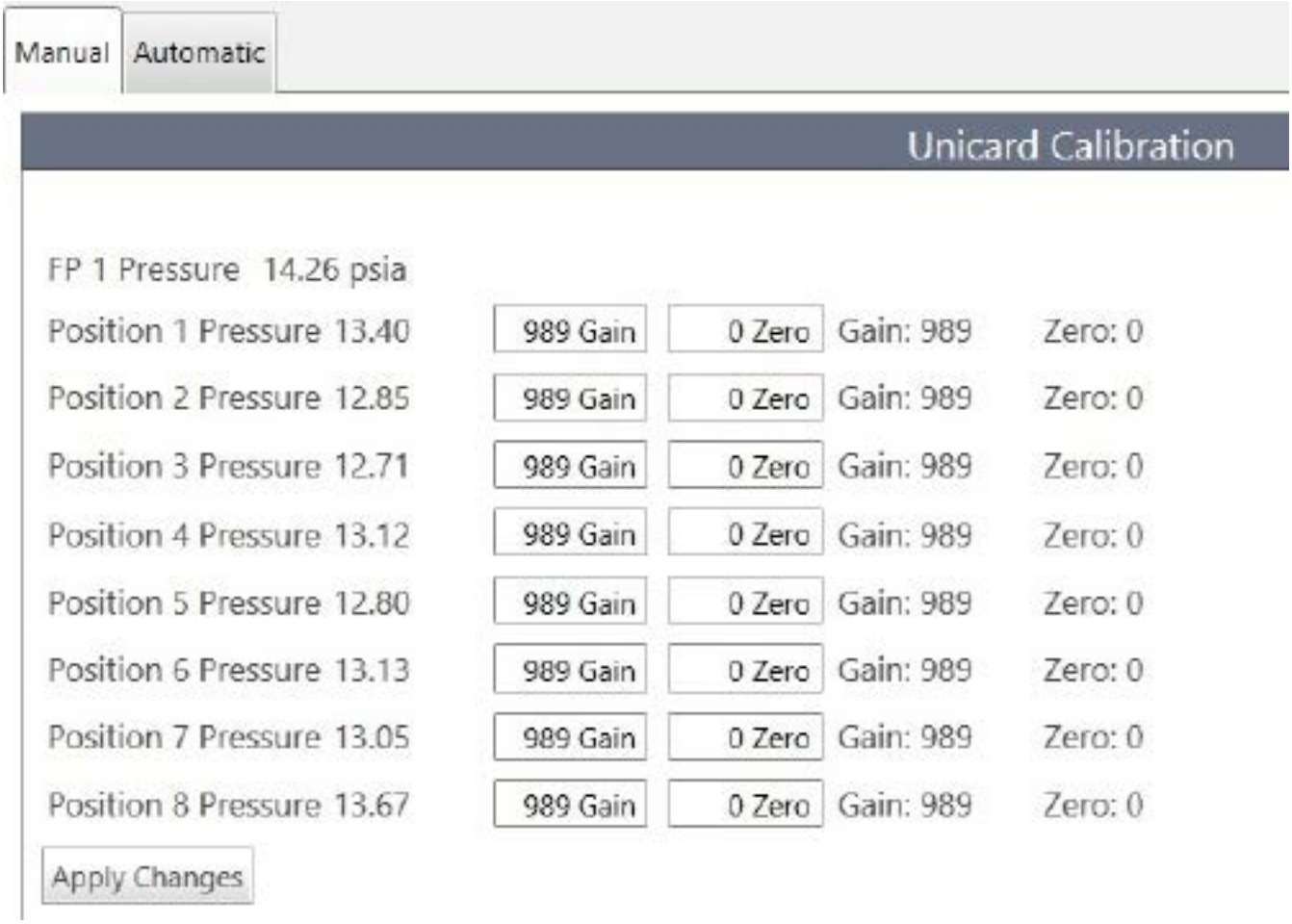
4.8.7. Main Box for the Settings - Unicard Cal Screen - Manual.

4.8.7.1. Refer to figure 4.8.7.1. Refer to the 1900 User Service Manual for information on how to calibrate the 1900’s pressure sensors. If any changes are made to the Unicard Calibration one must click File and Select “Save Unicard Calibration” to permanently save the changes or they will be lost when the software is closed. The Unicard Calibration screen is only used for the eight pressure sensors of the 8 Position Option for Channel 1 if present.

4.8.7.2. This screen can be used for troubleshooting but is primarily used to manually calibrate the pressure sensor that are part of the 8 Position Option for Channel 1.

4.8.7.3. 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, and the currently applied Zero value.

Figure 4.8.8.1. Settings - Unicard Calibration - Manual screen.



4.8.7.4. Apply Changes: 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.

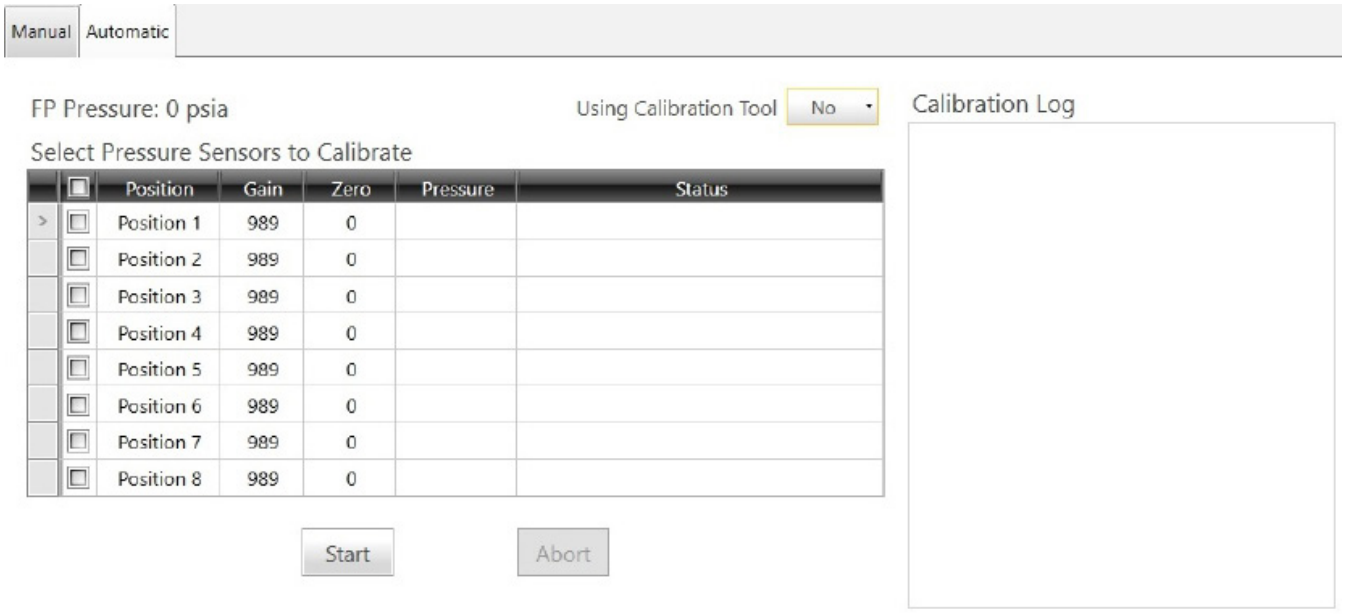
4.8.8. Main Box for Settings - Unicard Calibration - Automatic.

4.8.8.1. Refer to Figure 4.8.8.1. Refer to the 1900 User Service Manual for information on how to calibrate the 1900 Channel 1 8 Position Option Pressure Sensors. If any changes are made to the Unicard Calibration one must click File and Select “Save Unicard Calibration” to permanently save the changes or they will be lost when the software is closed. Unicard Calibration Automatic is only used to calibrate the pressure sensors on the Channel 1 8 Position Option.

4.8.8.2. FP Pressure: Shows the current Channel 1 Flow Professor pressure reading in psia.

4.8.8.3. Using Calibration Tool: Select “Yes” if the calibration tool is used or “No” if it is

Figure 4.8.9.1. Settings - Unicard Calibration - Automatic screen.



not used. The calibration tool is a collection of tubing and fittings that connect CAL1 to all Channel 1 positions (1-1 to 1-8). A vacuum source must also be connected to CALVAC.

4.8.8.4. Automatic Pressure Sensor Calibration Table Columns: These are the pressure sensors on positions 1 to 8 of the Channel 1 8 Position Option. The columns are in order from left to right:

4.8.8.4.1. Checkbox: Use the checkbox in the header to select (checked) or deselect (unchecked) all 8 Position Option sensors for calibration. Each position can be selected or deselected individually by clicking the box in front of it. When selected a checkmark will appear in the box. To deselect click the checkbox and the mark will disappear. Unchecked positions will not be calibrated.

4.8.8.4.2. Position: Shows the position of the rotary valve in the 8 Position Option for Channel 1.

4.8.8.4.3. Gain: Shows the current Gain value of the position's pressure sensor.

4.8.8.4.4. Zero: Shows the current Zero value of the position's pressure sensor.

4.8.8.4.5. Pressure: Current pressure reading of the position.

4.8.8.4.6. Status: Status of the position's automatic calibration.

4.8.8.5. Start: Click to begin the automatic pressure sensor calibration.

4.8.8.6. Abort: Click to stop the automatic pressure sensor calibration.

4.8.8.7. Calibration Log: Shows information from the automatic pressure sensor calibration.

4.8.9. Main Box for the Settings - FlowProf. Cal Screen.

4.8.9.1. Refer to Figure 4.8.9.1. Refer to the User Service Manual for a procedure to calibrate the 1900's Flow Professor Pressure Sensors.

4.8.9.2. Pressure Sensor: These are the pressure sensors for Flow Professor 1 (Channel 1) and Flow Professor 2 (Channel 2). The columns are in order from left to right: Flow Professor, 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.

4.8.9.3. Open/Close Valve: "Open Valve" becomes "Close Valve" once the valve is opened and vice versa. Click to open or close the Evacuation Valve on the calibration manifold. Flow Professor 1 controls the CH1 Evacuation Valve. Flow Professor 2 controls the CH2 Evacuation Valve.

4.8.9.4. Atmosphere:

4.8.9.4.1. Current: This column shows the current values.

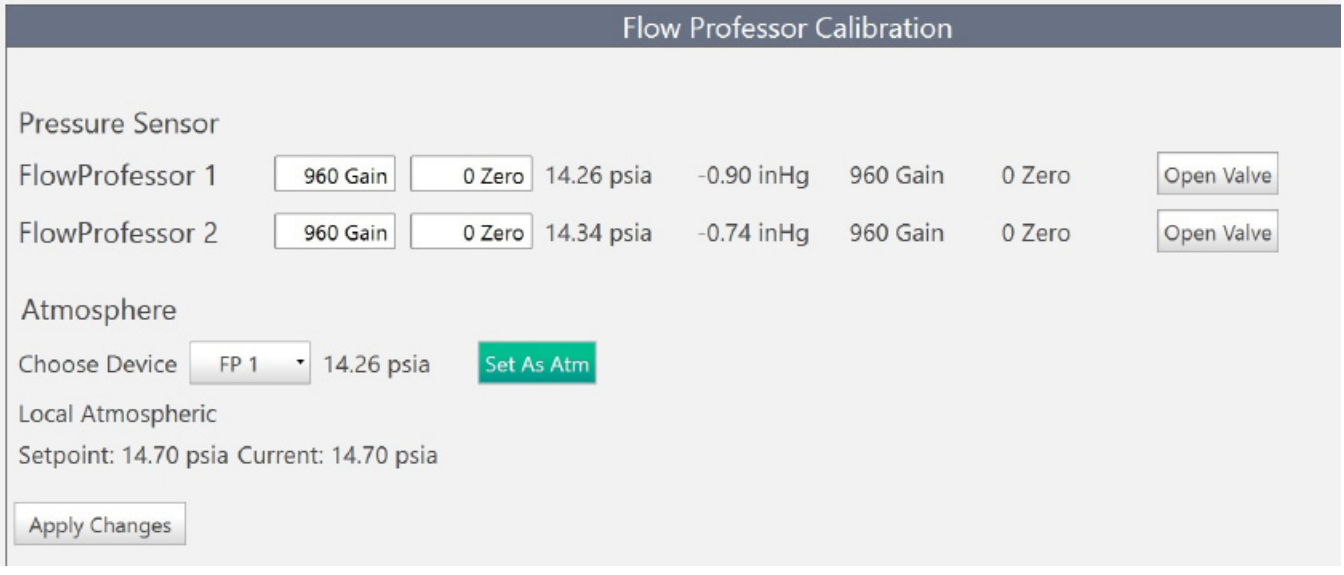
4.8.9.4.2. Choose Device: Use to select FP1 (CH1) or FP2 (CH2) for setting the local atmospheric pressure.

4.8.9.4.3. Pressure reading: In Psia. Shows the current pressure reading of the pressure sensor on the chosen Flow Professor (Channel).

4.8.9.4.4. Set as Atm: Click to set the current reading of the chosen Flow Professor as local atmospheric pressure for that channel (Flow Professor).

4.8.9.4.5. Local Atmospheric Setpoint: Shows the currently set local atmospheric pressure for the chosen Channel (Flow Professor).

Figure 4.8.9.1. Settings - Flow Professor Calibration Screen.



4.8.9.4.6. Local Atmospheric Current: Shows the current pressure reading.

4.8.9.5. Apply Changes: 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 click “File” and select “Save Flow Professor Calibration” otherwise the new values will be lost when the software is closed.

Section 5. 1900 Field Operations.

5.1. Setting up the 1900 for Sampling Events.

5.1.1. Most 1900 sampling conditions should have been entered during the 1900's installation. Refer to the installation and software overview sections of this manual for additional information if needed. This topic will focus on the items that the user may need to change or check in the field.

5.1.2. The following screens are the most important for setting sampling parameters:

5.1.2.1. Sequence: Event start time, duration, and position.

5.1.2.2. Settings - Configurations: Site name, leak check parameters for the Leak Check screen.

5.1.2.3. Settings - CH1 Config: Auto Sample, Continuous Sampling, sampling parameters, flush parameters, target vacuum, maximum start pressure, and maximum fill pressure for Channel 1.

5.1.2.4. Settings - CH2 Config: Auto Sample, Continuous Sampling, sampling parameters, flush parameters, target vacuum, maximum start pressure, and maximum fill pressure for Channel 2.

5.1.3. If the user makes any changes to a Settings screen they must save these changes by clicking "File" and selecting "Save....." before leaving the screen. After any changes are made to a Settings screen the software must be closed and reopened.

5.2. Connect Canisters to the 1900.

5.2.1. Canisters with Micro-QT valves: Entech's Micro-QT valves are a type of quick connection (tool-free) valve. If using canisters with Micro-QT valves be aware that the canister valve opens when the male valve is connected to the female MQT valve. Both the male and female MQT valve close when the valves are disconnected from each other. The 1900 user will need to adapt the procedures in this manual so they are appropriate for canisters with Micro-QT valves. The procedures in this manual are written for canisters with 1/4" shutoff valves that are opened and closed with handles or knobs.

5.2.2. WARNING: ALWAYS FINGERTIGHTEN THE 1/4" NUT ONTO THE CANISTER VALVE before the final tightening of the nut with a wrench. The ability to fingertighten is the only way to prevent cross threading and subsequent damage to the expensive canister valve. It should be possible to turn the nut at least 1.5-2 revolutions by hand, otherwise

the nut may either be crossthreaded or may have been overtightened in the past causing the threads to distort. If fingertightening is not possible try putting a new 1/4" nut onto the canister valve. If this other nut threads on easily then the nut on the sample line has been damaged to the point that finger tightening can no longer be done, and the entire adapter fitting with nut should be replaced. Once the nut is fingertight do the final tighening with a wrench until just snug (About 1/4-1/2 turns past fingertight.). If the nut does not thread on easily try a different canister.

5.2.3. Connect evacuated sample canisters to the positions to be used for samples but do not open the canister valves.

5.2.4. After the canisters are connected 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.

5.3. Leak Check the Attached Canisters.

5.3.1. 8 Position Option preliminary step. 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 "0" with the pull-down. Click "Move". You should hear the rotary valve move.)

5.3.2. Also, be aware that the internal CS1200s are expected to be closed. This is normally not an issue if the 1900 has been working properly as the CS1200 is put into the closed position at the end of each sample collection. If can be an issue if the power is interrupted or if the user closes the software, aborts a routine, or is familiarizing themselves with the software.

5.3.3. Do a fast leak check. This is to make sure there an no major leaks before starting the normal leak check. This is only appropriate for non-1916 positions. For 1916s skip to the normal leak check below.

5.3.3.1. Open the evacuated canister valve after connecting to the sample line and then close the canister valve five seconds later. The canister pressure should be displayed in the Sequence tab for each position connected under "Psia". Verify the canister psia is below the maximum starting psia set on "Settings" - "Configuration" (used by the leak check screen to check for leaks after connecting canisters but before starting the 1900 sequence) and "Settings"- "Config CH1" or "Config CH2" (used to check for leaks immediately before the start of a sampling event).

5.3.3.2. Note the starting pressure. In ten seconds note the ending pressure. Verify the pressure has not increased by more than 0.1 psia in ten seconds. If the fast leak check fails stop and troubleshoot. Otherwise continue to the normal leak check.

5.3.4. Do a normal leak check.

5.3.4.1. Verify the Leak Check settings are correct. Go to “Settings” then “Config”. The default leak check parameters are a maximum leakage (pressure increase) of 0.09 psia/min during a leak check with a duration of 1 minute. The maximum starting psia is 1.00 psia. These parameters can be changed on the Settings - Configuration screen to better suit user needs.

5.3.4.2. Click “View” - “CS1200”.

5.3.4.3. Send the Flow Professor for the channel to be leakchecked to 2000 steps. (Check the current Position of the Flow Professor(s). If not 2000 enter the difference in the steps box and “Spin Open” or “Spin Close” to reach 2000 steps.) Open will increase the number of steps that the CS1200 is open. Close will decrease the steps.

5.3.4.4. In the leak check table click the box in front of 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 po sition.

5.3.4.5. Open the valve(s) on the canister(s) to apply vacuum to the line, wait ten seconds, and then close the valve(s).

5.3.4.6. Then click “Start”. The leak check results will be displayed when complete.

5.3.4.7. To repeat the leak check of a failed 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. Click “Start” to rerun the leak check. Refer to 5.3.4.8 and 5.3.4.9 for information on troubleshooting leaks.

5.3.4.8. If a position has a leak troubleshoot until the leak is isolated and fixed. As an alternative, if a 1916 or Channel 1 8 Positon Option position has a leak then another one of the 1916 or 8 Positon Option positions could be used instead.

5.3.4.9. Troubleshooting:

5.3.4.9.1. Slightly snug each fitting and then observe the pressure rise rate. There are also fittings inside the 1900 that may need to be tightened.

5.3.4.9.2. The presence of some moisture 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. If this appears to happen simply repeat the leakcheck of that position.

5.3.4.9.3. In most cases if a leak occurs it is at the connection of the canister to the sampler. Try putting a different canister on that position or replacing the fitting to which the canister is connected.

5.3.4.9.4. In rare cases the CS1200 may have lost its zero position. Refer to the 1900 User Service Manual for a procedure to rezero the CS1200.

5.3.4.9.5. If the leak check failed due to the pressure being over the max. start psia the possibly the user forgot to open and close the valve prior to the leak check.

5.3.4.9.6. 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 the sampling shelter. A leak check provides reassurance that a position's canister will be ready to accept the sample when the time for sampling arrives. If a leak occurs the canister could be contaminated with air from the sampling shelter or it could be above the maximum starting psia which could cause a sampling event to be skipped.

5.3.4.10. Once the leak check of each canister passes and the canister valves have been reopened (after the leak check) set up the sample sequence.

5.4. Sequence Basics.

5.4.1. When using this section of the manual please read this entire topic and all of the next topic, Sampling Examples, before setting up your sequence.

5.4.2. Things to know:

5.4.2.1. For 1916s and the Channel 1 8 Position Option the 1900 uses a no pass by sequencing logic. This means that sampling must proceed in order by positions.

5.4.2.2. When starting a run by clicking "Run CH1" or "Run CH2" and selecting "Run Sequence - Auto" the no pass by logic means that enabled runs on Channel 1 must proceed in position order from 1-1 to 1-8 (for the 8 Position Option) or 1-1 to 1-16 (for a 1916) and enabled runs on Channel 2 (with a 1916) must proceed in position order from 2-1 to 2-16.

5.4.2.3. When starting a run by clicking "Run CH1" or "Run CH2" and selecting "Run Sequence - Begin at Start Item" the user must first choose a single line in the sequence table by checking the box in front of the line and then click "Set as Start Item" on the left of the screen. The no pass by logic means that enabled runs on the Channel will begin at the selected line of the sequence and then proceed in position order to the last enabled sample position for the channel in the sequence table. If all positions are enabled this would be 1-8 (8 Position Option on Channel 1), 1-16 (1916 on Channel 1), or 2-16 (1916 on Channel 2). After sampling is complete for the numerically last enabled position on the channel sampling will wrap around to the first enabled position (If all positions are enabled for the channel this would be 2-1 or 1-1.) and then continue to the last enabled sample position before the start position.

5.4.2.4. Any positions in the sequence table which will not be used should be disabled. Disable the position(s) by checking the box in front of the sequence line and clicking "Disable" on the left. The status of the position's sequence line will change to "Disabled".

5.4.2.5. A disabled position can be reactivated by checking the box in front of the sequence line and clicking “Enable” on the left. The status of the position’s sequence line should change to “Waiting” or “Scheduled”. If there is a timing conflict between the enabled sequence lines the status may change to “Error” instead. Resolve any timing conflicts before starting sampling.

5.4.2.6. The 1900 will attempt to run any sequence line with a status of “Scheduled” or “Waiting”. “Scheduled” samplings will occur at the date and time in the sequence table. “Waiting” samplings will occur two minutes after “Run CH1” or “Run CH2” is clicked and one of the “Run....” options is selected if they are the first run. After the first runs these will occur two minutes after the preceding enabled sampling.

5.4.2.7. The sequence table is updated automatically about once per minute. This means that it takes up to one minute for any changes to become permanent. If one accidentally clears the entire sequence then quickly closing the software may allow one to retrieve the original sequence when the software is reopened. (Fast timing is key and the original sequence may not always be retrieved.) It also means that if a user changes a sequence they must wait at least a minute before closing the software or the change may be lost. One thing the user may notice is that if the status is changed from “Enabled” to “Disabled” or vice versa the status will change first and then shortly later the color of the sequence line will change. Once the line color changes the change is stored.

5.4.3. Things to know when Auto Sample is Disabled.

5.4.3.1. Note that Autosample mode can be disabled on the “Settings” - “CH1 Config” or “CH2 Config” screens. Refer to figures 4.8.4.1 and 4.8.5.1. If it is disabled one must click “File” select “Save Configuration”, and then close and reopen the software.

5.4.3.2. The above information all applies.

5.4.4. Things to know when in the Autosample mode:

5.4.4.1. Note that Autosample mode can be enabled on the “Settings” - “CH1 Config” or “CH2 Config” screens. If it is enabled one must click “File”, select “Save Configuration”, and then close and reopen the software. Autosample mode can be used regardless of the number of positions (1, 8, or 16) on the Channel.

5.4.4.2. If “Continuous Sampling” is enabled (“Settings” - “CH1 Config” or CH2 Config”) in the “Autosampling” box (Note that “Continuous Sampling” is not available for a Channel with just a single position.) there will be no need to clear sequence lines between runs. “Continuous Sampling” can only be used if autosampling is enabled. If enabled the 1900 will continue to attempt to sample on the scheduled days and times until aborted.

5.4.4.3. Be aware that in the Auto Sample mode that if a run is in the sequence table it will be run regardless of whether or not anyone starts a run on the channel. This allows the 1900 to resume sampling in the event of power flickers without the user returning to the site or logging in remotely.

5.4.5. Auto Sampling box (This is a repeat of information from the Software Overview Section.):

5.4.5.1. Sample Every: Use the time units pulldown to select “Minutes”, “Hours”, “Days”, or “Weeks” then enter time in the box.

5.4.5.2. Start On: Type the date and time for sampling to begin in the box or click the calendar icon and select the date and time for sampling to begin.

5.4.5.3. Enable Auto Sample: Select “No” not to use the Auto Sample function. Select “Yes” to use it. If enabled the first sampling event will begin on the “Start On” date and time and then the sampling event will be repeated every “Sample Every” time period after the Start On date and time. For example if the Sample Every is set to 1 week and the Start On is set to Monday, 4/22/2019 at 03:00 am then the first sampling will start on Monday, 4/22/2019, at 3:00 am. The next sampling will start on Monday, 4/29/2019, at 3:00 am, then Monday, 5/6/2019 at 3:00 am,.... until the user changes the Auto Sample settings. Be aware that once set up Auto Sample will continue indefinitely as long as the 1900 is powered on and the 1900 software is open. Also, note that the user must swap in a different canister between each sampling event.

5.4.5.4. Enable Continuous Sampling: This can only be used if Channel 1 is set up with the 8 position option or for either channel with a 1916. Select “No” not to use the Continuous Sampling function. Select “Yes” to use it. If enabled the 1900 will go through each enabled sampling event in the 1900 sequence table in order. If enabled it will not be necessary to clear sequence lines before the next sampling event. Enabled positions will be sampled in numerical order in the sequence table. (One may use “Set as Start Item” to change the initial starting position.) When the last enabled position is reached sampling will go to the numerically earliest enabled position on the Channel. Each sampling event will start two minutes after the previous event ended.

5.5. Sequence Examples.

5.5.1. The situations below are meant to illustrate how everything works together. For simplicity the examples are mostly for a single channel 1900 (Channel 1 only). The examples apply to Channel 2 as well. Channel 1 and Channel 2 on dual channel 1900’s operate independently of each other. The examples show the canister size, restrictor, and duration. These items should have already been set up during the initial installation. The restrictor size is also shown. If it is necessary to replace the restrictor inside the unit then a new set of flow rate benchmarks for the new restrictor must be generated. Refer to the User Service Manual if necessary to replace the restrictor.

5.5.2. Situation 1: The user has a single channel 1900 (1 position only on Channel 1). The user would like to sample every Tuesday for 8 hours into a 6 liter canister. Sampling should start at 8 a.m. on each sampling day. The first sampling will occur on Tuesday, June 16, 2020.

5.5.2.1. On “Settings” - “CH1 Config” screen:

5.5.2.1.1. Verify “Restrictor” is “3”.

5.5.2.1.2. Verify “Sample Every” is “7” “Days”.

5.5.2.1.3. Set “Start On” to “June 16, 2020 8:00 AM”.

5.5.2.1.4. Verify “Enable Autosample” is “Yes”.

5.5.2.1.5. Verify “Sample Duration” is “480” minutes.

5.5.2.1.5. Verify “Canister Size” is “6 liters”.

5.5.2.1.6. Verify all other parameters are set to the values required for the project.

5.5.2.2. Immediately click “File” and select “Save Configuration”. Then close and reopen the software.

5.5.2.3. When the software opens, the sequence table will show “Start” as June 16, 2020 8:00 a.m. The status will be “Scheduled”. Detail will show “Autosample Scheduled Run.”

5.5.2.4. Review the rest of the sequence table to verify it is correct.

5.5.2.5. Click “Run CH1” and select “Run Sequence - Auto”.

5.5.2.6. Once the run is done the user will need to clear the sampling results before the 1900 will run the next sample. Once clear the sequence table will show “Start” as June 23, 2020 8:00 a.m.

5.5.2.7. Click “Run CH1” and select “Run Sequence - Auto” to start the 1900 for the next sampling event.

5.5.3. Situation 2: The user has a single channel 1900 with a 1916. The user would like to sample every six days for 24 hours into a 6 liter canister. Sampling should start at 12:00 a.m every sampling day. The first sampling will occur on Tuesday, June 16, 2020.

5.5.3.1. On “Settings” - “CH1 Config” screen:

5.5.3.1.1. Verify “Restrictor” is “4”.

5.5.3.1.2. Verify “Sample Every” is “6” “Days”.

5.5.3.1.3. Set “Start On” to “June 16, 2020 12:00 AM”. Verify “Enable Autosample” is “Yes”.

5.5.3.1.4. Verify “Enable Continuous Sampling” is “Yes”

5.5.3.1.5. Verify “Sample Duration” is “1440” minutes.

5.5.3.1.6. Verify “Canister Size” is “6 liters”.

5.5.3.1.7. Verify all other parameters are set to the values required for the project.

5.5.3.2. Immediately click “File” and select “Save Configuration” then close and reopen the software.

5.5.3.3. When the software opens the sequence table will show “Start” as June 16, 2020 12:00 AM for line the first enabled line in the sequence. The status will be “Scheduled”. Detail will show “Autosample Scheduled Run.” All other enabled sequence lines for Channel 1 will show a status of “Waiting”.

5.5.3.4. Review the rest of the sequence table to verify it is correct.

5.5.3.5. To change the start line in the sequence click the box at the front of the line that you want the sampling to start with and click set as start item. If this is done you must use “Run CH1” - “Run Sequence - Begin at Selected Item” to start the sampling sequence. Otherwise click “Run CH1” - “Run Sequence - Auto” to begin the sequence.

5.5.3.6. Since Auto Sample is set up the run will start automatically on June 16, 2020 at 12:00 a.m.

5.5.3.7. Once the sequence line is done the 1900 will go to the next enabled line in the sequence table which will start on June 22, 2020 at 12:00 a.m. Sampling events will happen every 6 days thereafter until all enabled positions have collected a sample. At this point the 1900 will clear the original first line without the user needing to clear it. The next sampling will occur on that position. The same will be repeated for all sequence lines indefinitely.

5.5.3.8. When in the Continuous Autosample mode if an enabled position has a pressure that is too high the sequence will go to the next enabled position to see if that position’s pressure is below the maximum psia and it will repeat this until if finds a position with a pressure below the maximum psia. At that point sampling will begin at the position with the pressure below the “Max Start Psia”. (The “Max Start Psia” is a type of leak check to verify the pressure in the canister has not risen too high between the initial leak check when the canister was connected and the time of sampling.)

5.5.4. Situation 3: User is remotely starting a 1-hour sampling event into a 6 liter canister in response to a trigger. The user has a single channel 1900 with the 8 position option. The user would like to sample occasionally by remotely triggering 1 hour sampling into a 6 liter canister at infrequent intervals.

5.5.4.1. On the “Settings” - “CH1 Config” screen:

5.5.4.1.1. Verify “Restrictor” is “1”.

5.5.4.1.2. Verify “Enable Autosample” is “No”.

5.5.4.1.3. Verify “Enable Continuous Sampling” is “No”.

5.5.4.1.4. Verify “Sample Duration” is “60” minutes.

5.5.4.1.5. Verify “Canister Size” is “6 liters”.

5.5.4.1.6. Verify all other parameters meet the project requirements.

5.5.4.2. Immediately click “File” and select “Save Configuration” if any changes are needed. If changes were made then close and reopen the software.

5.5.4.3. Connect one or more canisters to the Channel 1 positions. Leak check the canisters. If they pass, open the canister valves, and make note of the positions available for sampling.

5.5.4.4. At the time of sampling log in remotely. Choose a sampling position with an acceptable starting canister pressure.

5.5.4.5. Review the rest of the sequence table to verify it is correct.

5.5.4.6. On the 1900 sequence screen click the box in front of the sequence line for that position and click “Set as Start Item”.

5.5.4.7. On the sequence screen click “Run CH1” and select “Run Selected Position”.

5.5.4.8. Repeat as needed.

5.5.5. Situation 4: Three 3-hour sampling events every 3 days into 6 liter canisters. The user has a single channel 1900 with the 8 position option. Sampling events will start at 1 a.m., 5 a.m., and 3 p.m. The first day of sampling is 6/24/2020. In this example the user will set up only the first two sampling days.

5.5.5.1. On “Settings” - “CH1 Config” screen:

5.5.5.1.1. Verify “Restrictor” is “3”.

5.5.5.1.2. Verify “Enable Autosample” is “No”. Since sample will not be taken at regular intervals (exactly the same period of time between each sample) Autosample and Continuous Sampling cannot be used.

5.5.5.1.3. Verify “Enable Continuous Sampling” is “No”

5.5.5.1.4. Verify the “Sample Duration” is “180” minutes.

5.5.5.1.5. Verify the “Canister Size” is “6 liters”.

5.5.5.1.6. Verify all other parameters meet project requirements.

5.5.5.2. Immediately click “File” and select “Save Configuration” then close and reopen the software.

5.5.5.3. On the sequence screen disable two positions (for example 1-1 and 1-3). Check the boxes in front of the two positions to select them then click “Disable”.

5.5.5.4. Review the rest of the sequence table to verify it is correct.

5.5.5.5. Connect the canisters to the enabled positions and leak check them. Resolve any leaks that are found. It is very important that any leaks that are found are resolved. If a canister is above its “Max Start Psia” that sampling event will not start and the software will wait for the next event.

5.5.5.6. For positions 1-2, and 1-4 to 1-8 of the sequence verify the duration is “180 min”. Change the duration if needed.

5.5.5.7. In the start column of sequence set the start dates and times as follows:

Position	Date	Time
1-2	6/24/2020	1:00 AM
1-4	6/24/2020	5:00 AM
1-5	6/24/2020	3:00 PM
1-6	6/27/2020	1:00 AM
1-7	6/27/2020	5:00 AM
1-8	6/27/2020	3:00 PM

5.5.5.8. Uncheck all boxes except line 2 (position 1-2). (There must be a check in the box for 1-2.) Click “Set as Start Item”.

5.5.5.9. Then click “Run CH1” and select “Run Sequence - Begin at Start Item”.

5.5.5.10. Be aware that since Auto Sample cannot be used, if a canister is over the maximum start psia then that event will be skipped and the 1900 will go to the half position (The failed sample position plus 0.5. For example if position 4 was at too high of a starting pressure then the sampling would be cancelled and the rotary valve would move to position 4.5 to wait for the next sampling event. The 1916 works a little differently. Since the half positions are very close together a 1916 in the above situation would move the rotary valve from 4 to 5 and then await the next sampling.) and wait for the next sampling event to begin.

5.5.6. Situation 5: The user has a dual channel 1900 with the two 1916s. They will be doing grab samples into 2 liter canisters following an event. For the sake of this example the event will occur on 6/25/2020 at 8 a.m. They will take a grab sample every 10 minutes for the first hour, then every 1 hour for the next 6 hours, then every 4 hours for one day, then daily for a week, and then once per week for two months.

5.5.6.1. On “Settings” - “CH1 Config” screen:

5.5.6.1.1. Verify “Grab Sample” is “Yes”.

5.5.6.1.2. Verify “Enable Autosample” is “No”. Since sample will not be taken at regular intervals (exactly the same period of time between each sample) Auto Sample and Continuous Sampling cannot be used. (It could be done by changing the settings a few times if the user logs in remotely but that will not be covered here.)

5.5.6.1.3. Verify “Enable Continuous Sampling” is “No”

5.5.6.1.4. Verify “Canister Size” is “Custom” and “2000 ML” is in the custom volume box.

5.5.6.1.5. Verify the “Sample Duration” is “4” minutes.

5.5.6.1.6. Verify all other parameters meet project requirements.

5.5.6.2. Immediately click “File” and select “Save Configuration”.

5.5.6.3. On “Settings” - “CH2 Config” screen:

5.5.6.3.1. Verify “Grab Sample” is “Yes”.

5.5.6.3.2. Verify “Enable Autosample” is “No”. Since samples will not be taken at regular intervals (exactly the same period of time between each sample) Auto Sample and Continuous Sampling cannot be used. (It could be done by changing the settings if the user logs in remotely but that will not be covered here.)

5.5.6.3.3. Verify “Enable Continuous Sampling” is “No”.

5.5.6.3.4. Verify “Canister Size” is “Custom” and “2000 ML” is in the custom volume box.

5.5.6.3.5. Verify the “Sample Duration” is “4” minutes.

5.5.6.3.6. Verify all other parameters meet project requirements.

5.5.6.4. Immediately click “File” and select “Save Configuration” then close and reopen the software.

5.5.6.3.7. For the purpose of this example the user will start the sampling on positions 1-10 and 2-3.

5.5.6.3.8. For all sample positions verify that the sample duration is 4 minutes. (Be aware that there is a gap of two minutes between samplings (to allow for rotary valve movement) plus the preflush time and postflush times that are one minute each. (One minute is the default value but these default times can be changed.) For this example the preflush time and the postflush time must be set to 1.0 minutes. This results in a cycle time between runs

of 8 minutes.

5.5.6.3.9. Connect the canisters to the enabled positions and leak check them. Resolve any leaks that are found. It is very important that any leaks are resolved. If a canister is above its “Max Start Psia” that sampling event will not start and the software will wait for the next event.

5.5.6.3.10. In the start column of sequece set the start dates and times as follows:

Position	Date	Time
1-10	6/25/2020	8:00 AM
1-11	6/25/2020	8:10 AM
1-12	6/25/2020	8:20 PM
1-13	6/25/2020	8:30 AM
1-14	6/25/2020	8:40 AM
1-15	6/25/2020	8:50 AM
1-16	6/25/2020	10:00 AM
1-1	6/25/2020	11:00 AM
1-2	6/25/2020	12:00 PM
1-3	6/25/2020	1:00 PM
1-4	6/25/2020	2:00 PM
1-5	6/25/2020	3:00 PM
1-6	6/25/2020	8:00 PM
1-7	6/26/2020	12:00 AM
1-8	6/26/2020	6:00 AM
1-9	6/26/2020	12:00 PM
2-3	6/26/2020	4:00 PM
2-4	6/26/2020	8:00 PM
2-5	6/27/2020	8:00 PM
2-6	6/28/2020	8:00 PM
2-7	6/29/2020	8:00 PM
2-8	6/30/2020	8:00 PM
2-9	7/1/2020	8:00 PM
2-10	7/2/2020	8:00 PM
2-11	7/3/2020	8:00 PM
2-12	7/10/2020	8:00 PM
2-13	7/17/2020	8:00 PM
2-14	7/24/2020	8:00 PM
2-15	7/31/2020	8:00 PM
2-16	8/7/2020	8:00 PM
2-1	8/14/2020	8:00 PM
2-2	8/21/2020	8:00 PM

5.5.6.3.11. At this point all positions on the 1916s are full. The user will need to return and remove canisters to load the last couple runs to complete the two months of weekly

sampling:

8/28/2020	8:00 PM
9/4/2020	8:00 PM
9/11/2020	8:00 PM

5.5.6.3.12. Uncheck all boxes except position 1-10. (There must be a check in the box for 1-10.) Click “Set as Start Item”.

5.5.6.3.13. The click “Run CH1” and select “Run Sequence - Begin at Start Item”.

5.5.6.3.14. Uncheck all boxes except line position 2-3. (There must be a check in the box for 2-3.) Click “Set as Start Item”.

5.5.6.3.15. Then click “Run CH2” and select “Run Sequence - Begin at Start Item”.

5.6. Start the Sampling Sequence.

5.6.1. Please read the previous two topics in this section completely before this topic.

5.6.2. No samples will run until a start condition is detected:

5.6.3. Start Conditions:

5.6.3.1. User presses “Run CH....” and selects an option to begin the sequence.

5.6.3.2. Contact closure detected for that channel. This is on the terminal block on the rear of the 1900. One can connect a cable from CH1 Start or CH2 Start and GND to a sensor that can send a contact closure signal to automatically trigger a run.

5.6.3.3. A DOT command to start the channel is received through the RS232 data logger COM port.

5.6.3.4. The sample was previously running and was interrupted due to power loss or computer reboot. In this case the 1900 software will automatically restart the sequence.

5.6.4. If the first item (or item designated as the “Start Item”) has a scheduled start date and time then the 1900 will abide by that schedule and perform a countdown until the start date and time. If the first item (or item designated as the “Start Item”) is blank then the sampling will begin immediately.

5.6.5. After this point upon conclusion of the initial sample, the 1900 will collect samples in pure sequential mode, where it will collect a sample on the next position that is enabled. If the next position has a valid schedule, the 1900 will abide by that schedule. If a position is errored or completed (still has data from prior run), the 1900 will skip to the next enabled position. If the next enabled position has a status of “Waiting”, that position will begin the

sampling immediately after completing the two minute time between positions and the “Pre-Flush Duration”. (The “Post-Flush is completed at the end sampling on that position. And so on and so forth.

5.6.6. Conditions which prevent a position from being run:

5.6.6.1. The position is “Disabled” by user.

5.6.6.2. The position has an error condition. Examples are:

5.6.6.2.1. The current canister pressure is above the “Max Start Psia”.

5.6.6.2.2. The start time is invalid (due to overlap with another sampling event including the two minutes between each sample collection plus the pre-sampling and post-sampling flush time, etc).

5.6.6.3. The position (sequence line) has already completed and the position (sequence line) has not been cleared. This will occur if the 1900 is not set up in the “Auto Sample” mode (“Settings” - “CH1 Config” or “CH2 Config”) with the “Enable Continuous Sampling” set to “Yes”. With “Auto Sample” and “Continuous Sampling” enabled the 1900 software will automatically clear the item then wait a few seconds to check for valid starting conditions (Pressure below max start psia, rotary valve reaching the target position, etc.).

5.6.6.4. Note that a scheduled date and time or lack thereof is not a required starting condition. An enabled position without a scheduled date and time (Status will be “Waiting”.) will be auto scheduled to the current time plus 2 mins plus the pre-flush duration.

5.6.6.5. Unless the continuous sampling setting is enabled (only available in the Auto Sample mode) users will need to clear out a position (sequence line) before it can be reused for another sample.

5.7. During Sampling.

5.7.1. Status messages are displayed to inform the user of the current state of the sample collection and the 1900/1916.

5.7.2. Be aware that the CH 1 and 2 Sampling LEDs on the front of the 1900 will be lit if the channel is sampling (including if the 1900 is queued (Waiting to collect sample after a start signal.) to sample).

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

5.7.4. Be aware a status of “Waiting” basically means run immediately after the preceding sample collection event.

5.8. Removing the Canisters.

5.8.1. Once sampling is complete close the 1/4” shutoff valve on the canister and remove it.

5.8.2. If another sample will be taken on that position connect the new canister to the position, leak check, and run as above. Be aware that unless Continuous Sampling is enabled the information must be cleared from the sample position (sequence line) before another sample can be taken.

5.8.3. If no samples will be taken on that position for a while put a 1/4” cap into the fitting on the position and snug it in place to prevent contamination of the sampling line.

5.9. Printing Reports.

5.9.1. A summary of each sampling event is saved for each sampling event.

5.9.2. To access this summary click “Reports” at the top of the screen. The reports screen will show a summary of sampling events.

5.9.3. To print the event click “File” (on the left) and select one of the export options to create a report with the sampling data. By default the report will save in C:\SmartLabs\Data\1900\Database in the format of YYYYMMDDHHmm.pdf (or .xls) (Y - year, M - Month, D - Day of month, H - hour, m - minute) for example, 202005131318.pdf. When the report is created the operator may save it to a different directory or to a different filename.

5.9.4. Once the report is created it can be opened and printed.

5.10. Resampling.

5.10.1. For various reasons it may be necessary to resample. Usually this would be caused by a leak at the canister or possibly because the canister filled too quickly.

5.10.2. Connect a new canister and leak check it. Verify the leak rate and initial pressure for the canister are acceptable.

5.10.3. It may be necessary to clear the sequence table if Continuous Sampling is not enabled.

5.10.4. Set up the run in the sequence table just like a normal sampling event and start sampling.

5.11. Shutting Down the 1900 for the Season.

5.11.1. If the 1900 will not be used for an extended time (weeks or months) the best thing to do is simply turn off the 1900 and its computer. The two power cords on the rear of the 1900 should then be unplugged from their outlets until needed again. This will protect the 1900's electronics from electrical issues (such as power surges or lightning) that may occur while the 1900 is not in use. The sampling ports and inlets should also be plugged or capped to prevent debris or contamination from entering the unit.

5.11.2. If the 1900 will not be used for a short period of time simply power off the 1900 and its computer. Sampling ports and lines should be plugged or capped when not sampling.

5.12. 1900 response to power outages.

5.12.1. The 1900 response to a power outage depends on when the power outage occurs. The controller and software have been designed with restart capabilities to help with this.

5.12.2. The following scenarios can occur with power outages, keep in mind this assumes there is a power outage that cuts power to everything. If the controller has power it will continue to monitor and wait for communication to resume with the 1900. The the sampling will eventually abort if the scheduled sample duration elapses and move on to the next scheduled item. There is only so much that can be done if the 1900 instrument does not have power, because even if the controller (computer) itself has enough power back up to run the software it will not be able to move the rotary valve, read pressures, or move the CS1200.

5.12.2.1. Power outage before sampling. This is probably the worst case scenario because if there is a power outage before sample count down begins and the power outage lasts past the scheduled start time then the entire sample event will be skipped because the start time will have passed.

5.12.2.2. Power outage during sampling. The 1900 will auto boot up and resume sampling if there is time left during the sampling duration when power resumes. We expect most power outages will occur during a sampling event, but really that depends on the duration of the sample event. This feature is more useful the for longer sample durations because it is easier to resume and recover ampling when there is more time left.

5.12.2.3. Power outage after sampling. Same as the first one (Power outage before sample), if there is no power while another scheduled sample is due to begin then it will be skipped when power is restored. The sequence will automatically restart if it was running when the power was lost.

5.12.2.3.1. What would happen if the next item's start time has passed? The 1900 will keep going until there were no more items left in the sequence, so if the next item's start time had already passed the 1900 would move on to the next item in the sequence. Having a fully pop-

ulated sequence table with everything scheduled ahead of time would be ideal for such situations……”

Section 6. 1900 Troubleshooting.

6.1. This section focuses on basic 1900 troubleshooting steps. Please refer to the 1900 User Service Manual for additional troubleshooing information.

6.2. No Power.

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

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

6.2.3. There are two power cords, one for the 1900 and one for the computer. Both must be plugged into good outlets.

6.3. Communication (COM) Issues.

6.3.1. COM issues after the installation. Most of the time COM issues can be resolved by simply closing the software, powering off the 1900 and computer followed by restarting the 1900, computer, and the software. (The software will open automatically when the computer is turned on. Sometimes it may be necessary to unplug the internal USB cable and then plug it back in. One of the must common causes for no COM is that the instrument is not powered on.

6.4. Leaks.

6.4.1. **DO NOT** use pressurized helium (with an electronic leak detector) to isolate leaks as pressurized gas will damage the CS1200(s) in the 1900.

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

6.5. Flow Issues.

6.5.1. Canister did not fill:

6.5.1.1. Canister valve may not have been opened.

6.5.1.2. Channel may not have been started.

6.5.1.3. Canister may have been connected to the wrong sample position.

6.5.1.4. The 8 position valve or the 1916 valve may be misaligned or not moving. Check the valve alignment and troubleshoot.

6.5.1.5. The inlet filter may be completely clogged.

6.5.2. Sample Canister Overfilled:

6.5.2.1. The configuration settings may not be correct.

6.5.2.2. There may be a leak.

6.5.3. Sample Canister Underfilled:

6.5.3.1. The configuration settings may not be correct.

6.5.3.2. The inlet filter may be partially clogged.

6.5.3.3. With the 8 position option or a 1916 the rotary valve may be partially misaligned.

Section 7. 1900 Preventative Maintenance.

7.1. PM (Preventative maintenance) Tasks and Schedule.

Frequency	Task
6-12 months	Replace the 1900 Inlet Filter annually or after each 6 months of continuous use.
3 years	Replace CS1200 O-Rings.
Annually	Pressure sensor calibration.
Monthly	Reboot the computer.
Monthly	Make a backup copy of the Smartlabs directory on the computer to facilitate recovery if the computer must be replaced.
Monthly	If error logging is turned on then on a monthly basis any logs over one month old should be deleted from C:\SmartLabs\Data\1900\Logs.

7.1.1. Refer to the 1900 User Service Manual for instructions on the pressure sensor calibration and CS1200 O-ring replacement.

Section 8. External Control of the 1900.

8.1. Internet.

8.1.1. The 1900's controller is Internet capable. It can be connected to the Internet to allow the operator to log in remotely and control or check the 1900.

8.1.2. The controller which ships with the 1900 has built in WIFI capsbilities and a connection available for a LAN cable.

8.2. Non-Internet External Signals and Control Options.

8.2.1. 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 ("MODEM/LOGGER INTERFACE" is the RS232 port on the rear of the 1900 for a datalogger.) is provided on the back of the 1900 for interfacing to a data logger (or equivalent) to provide communications via standard DOT commands. In addition terminals on the rear of the 1900 provide the following analog and digital information. Refer to figure 8.2.1.

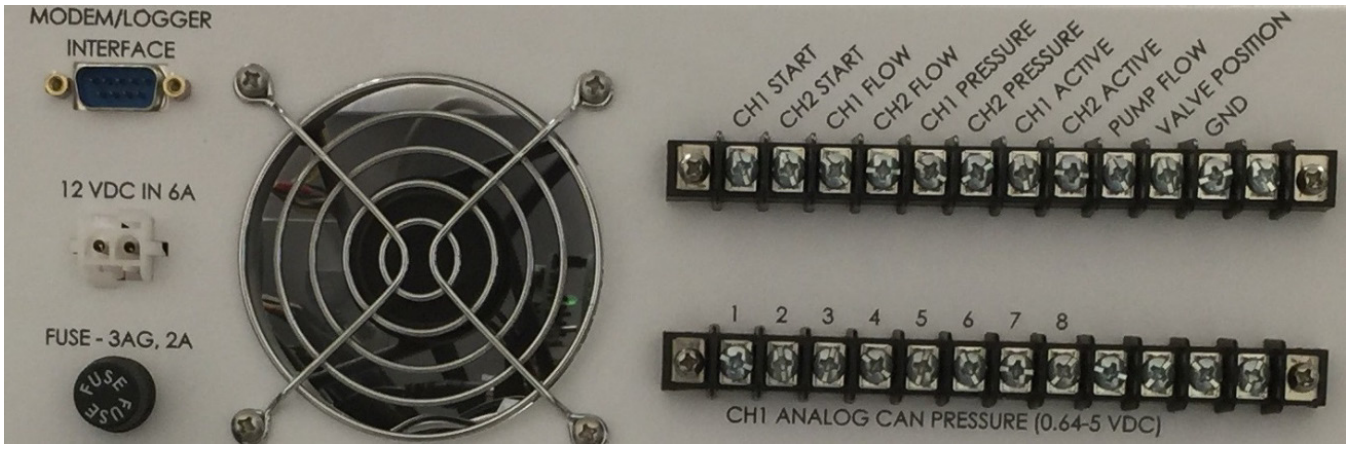
8.2.2. Upper Terminal:

8.2.2.1. CH1 Start. (5 VDC = no, <1 VDC = yes, 1ma/CMOS or Relay),

8.2.2.2. Start. (5 VDC = no, <1 VDC = yes, 1ma/CMOS or Relay),

8.2.2.3. CH1 Pressure. (0-5 VDC),

Figure 8.2.1. Data Logger Signals and Connections on the rear of the 1900.



8.2.2.4. CH2 Pressure. (0-5 VDC).

8.2.2.5. CH1 Flow Rate. (0-5 VDC).

8.2.2.6. CH2 Flow Rate. (0-5 VDC).

8.2.2.7. CH1 Active. (5 VDC = no, 0.2 VDC = yes.

8.2.2.8. CH2 Active. (5 VDC = no, 0.2 VDC = yes).

8.2.2.9. Pump Flow > 1 L/min. (5 VDC = no, 0.2 VDC = yes).

8.2.2.10. VALVE POSITION. (VDC = Position * 0.625 VDC).

8.2.2.11. GND. (Ground).

8.2.3. Lower Terminal. These are the pressure readings of the sensors in the 8 optional Channel 1 positions. (0-5 VDC). 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.

8.3. External Event Control.

8.3.1. The “CH1 Start” and the “CH2 Start” together with “GND” (Ground) on the external terminal connector allow 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.

8.3.2. 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 sample collection remotely.

8.3.3. If the 1900 is intentionally set up to be started remotely, the 1900 can be set up weeks or months before. Simply load canisters, leak check them, and leave the canister valves open. Then enable the positions with cans in the sequence table. Disable any positions which do not have canisters. Verify the information in the sequence table is correct (duration specifically). The statuses should either be “Waiting” or “Scheduled”.

8.3.4. 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 two minutes and the pre-sampling flush time. That way the sampling will actually commence at the updated time shown in the sequence table.

8.3.5. For a channel with a 1916 or the 8 position option (Channel 1 only) sampling will start on the next enabled position (for the channel) that the 1900 or 1916 is currently on if available for sampling (enabled and with the pressure below the “Max Start Psia”). If the channel is not available the rotary valve will move to the next enabled position with a pressure below the “Max Start Psia” and start sampling.

8.3.6. If the user would like the sampling to start at a specific position on the channel they must send the rotary valve to that position before the sampling trigger (either before leaving the shelter after setting up the canisters or by remotely logging in over the internet). To change the valve position go to the “DIAGNOSTICS” screen and click “ROTARY VALVE”. Use the pulldown for that position’s channel to select the desired position then click “MOVE”. Then confirm the valve has moved to the position by checking the channel’s “Position” in the status bar.

8.3.7. A few things to be aware of when using a contact closure to start a sampling event:

8.3.7.1. The request to start the 1900 must be provided to the 1900 after the previous sampling (including the post flush duration) has completed.

8.3.7.2. A contact closure start will only start a single position for sampling. Additional samplings (positions) require additional contact closure starts.

8.3.7.3. A contact closure start will also start a sampling event at a scheduled time (position status of “Schedule” with a date and time in the “Start” column of the sequence table. Be aware that the 1900 will wait for the scheduled time and then start sampling.

8.3.8. The other positions on the Terminal blocks on the rear of the 1900 can be used to remotely monitor the flows, pressures, channel active, and rotary valve position to verify that the needed samples are indeed being collected.

8.4. Dataloggers.

8.4.1. A datalogger is a coputer that connects to a serial port that the 1900 listens to for commands.

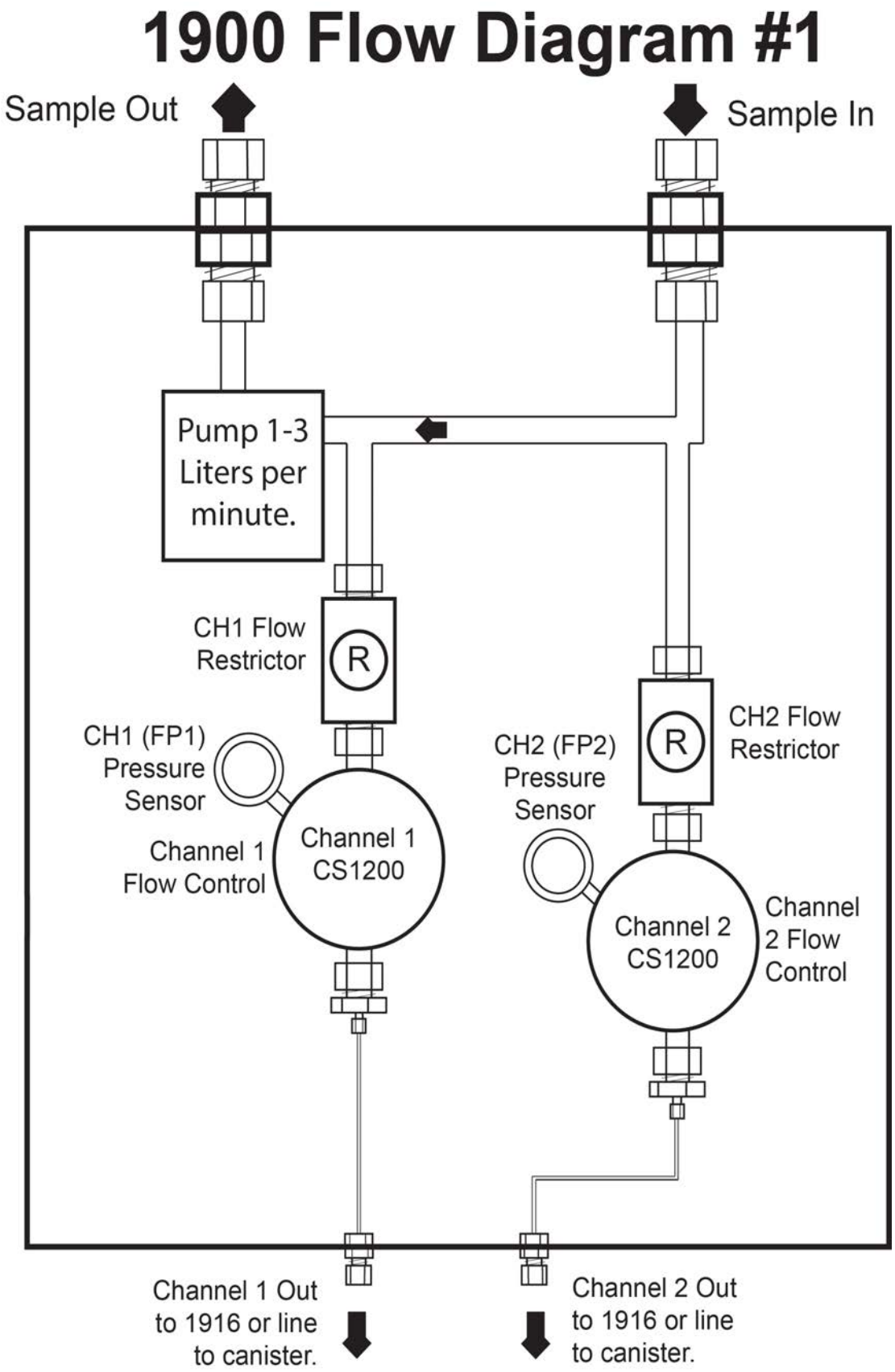
8.4.2. To use a datalogger the user would need to implement an entire system with a program on their end and a RS232 serial connection which could send the 1900 DOT commands to the datalogger COM port in the 1900. The 1900 softweare does not have any built in support for any common datalogger interface. In other words a programmer would be needed to use a datalogger..

8.4.3. User must educate themselves on how to use the RS232 remote control and

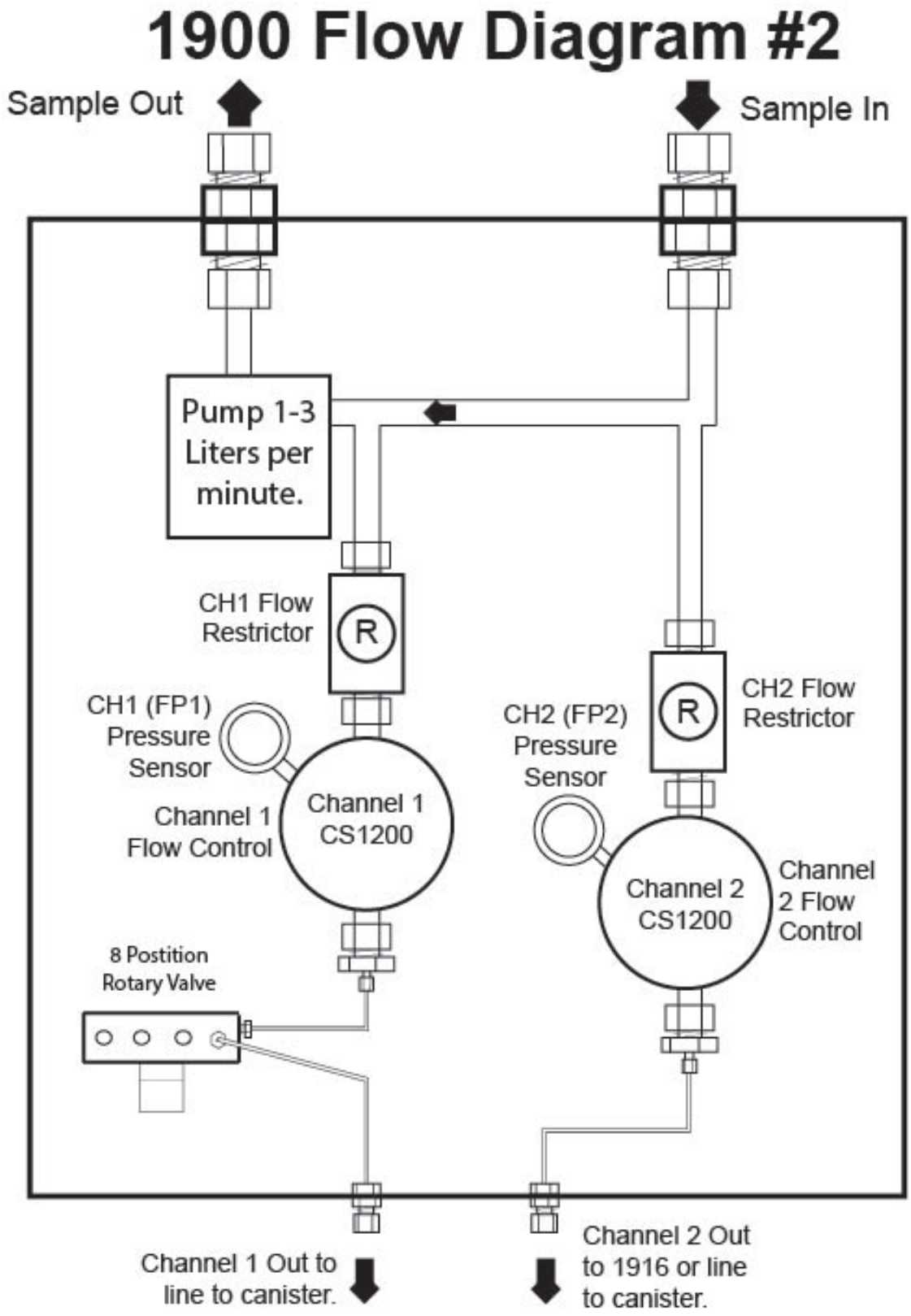
datalogger. More information to inform datalogger users is provided in Section 4 of the 1900 User Service Manual.

Appendices.

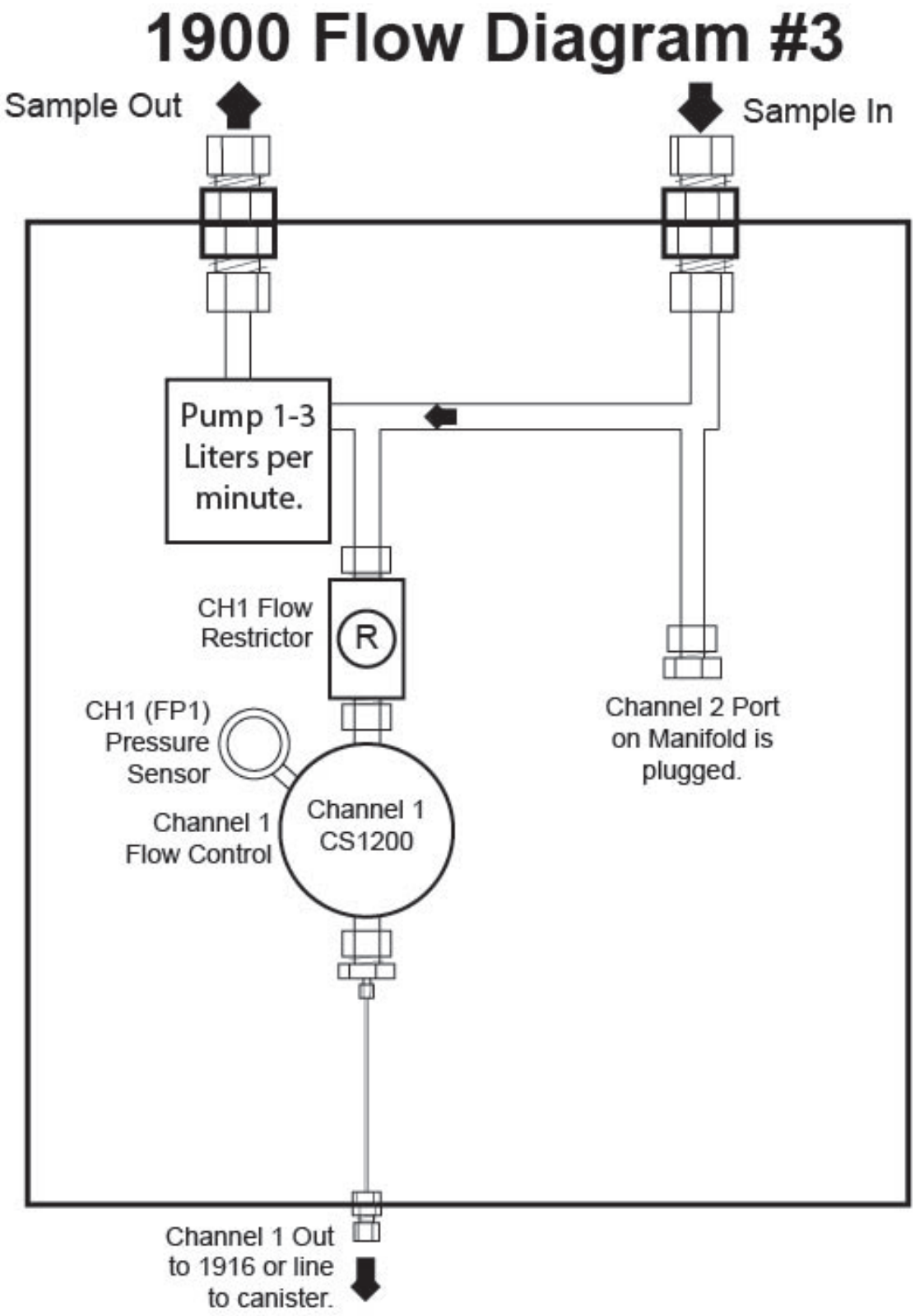
Dual Channel 1900 Flow Diagram.



Dual Channel 1900 with 8 Position Option Flow Diagram.



Single Channel 1900 Flow Diagram.



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