ENTECH INSTRUMENTS

1900 & 1916 Multicanister Sampler

User Service Manual Version 3.0

October 2022

Table of Contents

Section 1. 1900 User Service Manual 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 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 (and a backing wrench),

1.1.4. DO NOT use pressurized helium (with an electronic leak detector) or any other pressurized gas to isolate leaks as it can damage the CS1200s and pressure sensors in the 1900.

1.2. Introduction.

1.2.1. The purpose of this manual is to separate out the tasks and information that a typical 1900/1916 user would not need during typical sampling operations and a typical installation. It is a supplement to the 1900/1916 User Manual and contains information on specific tests and maintenance procedures.

1.2.2. In most cases if information is presented in one of the manuals it will not be presented in both manuals. Some exceptions will be made for very useful or relevant infomation. Generally the User Manual focuses on the information needed to set up and operate a 1900 while the User Service Manual focuses on troubleshooting, calibration of sensors, procedures that are not needed during a normal installation or operations, and special software for testing data loggers.

1.3. Warranty.

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

1.4. Ordering Parts.

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

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

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

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

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

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

1.4.3. 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. A list of distributors is also available on www.entechinst.com.

1.5. 1900 and 1916 shipping boxes.

1.5.1. Entech recommends that users keep the 1900 and 1916 shipping boxes in case the instruments must be shipped to other locations.

1.5.2. Damage to instruments due to improper packaging for user shipments is not covered under warranty.

1.6. Returned Material Authorizations (RMAs).

1.6.1. An RMA must be obtained before sending a system into an Entech Service Center for repairs, upgrades, or service.

1.6.2. A copy of the RMA must be included inside the box with the instrument.

1.6.3. The RMA number should be written in several places on different sides of the shipping boxes.

1.6.4. The instruments must be shipped in Entech provided boxes. Contact your local Entech representative if replacement boxes need to be ordered.

Section 2. 1900 Troubleshooting.

2.1. No Power.

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

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

2.1.3. Also remember there are two power cords, one for the 1900 and one for the computer. Both must be plugged in.

2.2. Communication (COM) Issues.

2.2.1. No COM the first time the software is loaded at the installation. The very first time the 1900 software is opened on a new computer (controller) some files are created. If these files are not ready by the time the software is ready for them (as the software opens) then the 1900 may not have COM. In this situation simply close and then reopen the software a second time. The files should have been created during the first opening of the software. This COM issue should never recur.

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

2.2.3. Override COM Issues. If Override is activated for the COM ports the software will only look for the 1900 components at the COM ports specified on Override screen. Try deactivating Override (Select “No” on the Override screen and then “File” - “Save Override”.) settings and closing the 1900 software. Then open the software.

2.2.3.1. Check the Override screen to see if the COM ports changed from what was entered before deactivating Override. If they did either continue to run with Override deactivated (initial software opening will be a little slower) or enter the new COM port values on the Override screen and activate Override again.

2.2.3.2. Override should not normally be necessary when the 1900 is new as it is shipped with a pre-programmed controller but can be used to troubleshoot COM issues. On new, replacement computers override should not typically be needed.

2.2.4. Checking the 1900 COM ports.

2.2.4.1. Plug in and power on the 1900 instrument.

2.2.4.2. Allow device drivers to install for the hub and serial COM ports.

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

2.2.4.4. Select (double click) the “Ports (COM & LPT)” line to view the COM ports attached to the device.

2.2.4.5. Confirm that there are (6) USB Serial Ports shown. These are usually numbered consecutively (ex: 11, 12, 13, 14, 15, 16). Note that these ports will not always appear in order (ex: 12, 13, 14, 15, 11, 7....). Record the COM port numbers (ex: COM11, COM12, COM13, COM14, COM15, and COM16).

2.2.5. On the “Settings” - “Override” screen:

2.2.5.1. Select “No” for the “Override 1900 COM Port” setting.

2.2.5.2. Select “No” for the “Override FP COM Ports” setting.

2.2.5.3. Select “No” for the “Override Rotary COM Port” setting.

2.2.5.4. Select “FILE” then “Save Override”.

2.2.5.5. Close and restart the1900 Software.

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

2.2.7. Advanced Communication Setup:

2.2.7.1. Only use this if the normal communications setup is not working.

2.2.7.2. Plug in and power on the 1900 instrument.

2.2.7.3. Allow device drivers to install for the hub and serial COM ports.

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

2.2.7.5. Click “Ports (COM & LPT)” to view the COM ports attached to the device.

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

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

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

2.2.7.8. Four of the paths will be identical except for the red letter. (The paths are not necessarily identical on different 1900s.) This means they are connected to the hubchip in the 1900 and that they are USB to Serial Converter A, B, C, and D respectively on the hubchip. On the Override screen FP 1 is USB to Serial Converter A, FP 2 is B, C is unused, and Rotary Valve is USB to Serial Converter D. Enter the respective COM port numbers for the FPs (Flow Professors) and the Rotary Valves on the Override screen and save the values (File -> Save Override).

2.2.7.9. The remaining two COM ports are either the 1900 or the Datalogger. There is no pattern in the Device Path that will consistently show which is which. Therefore the COM port numbers must be entered on the Override screen and switched if necessary using trial and error. Save the Override values and exit the software. Reopen the software. If the 1900 has COM the values are correct. If not switch the values and try again.

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

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

2.2.9. Other ideas.

2.2.9.1. Sometimes during the initial loading of the software the computer may not find the drivers needed for the 1900 or it may only find some of them. The COM ports will be listed under Other Devices but not under Ports - COM and LPT. Wait 20 minutes. If the computer has not found them within 20 minutes it probably has stopped trying. On some computers it just takes a while for the drivers to load.

2.2.9.2. Unplug the USB cable. Reboot. Plug the USB cable back in. Close and reopen the software.

2.2.9.3. Open Device Manager. Click on “Other Devices”. Click on a Port. Then select “Update Driver Software”. Update from the Internet. The FTDI devices in the 1900 are Windows Certified and are readily available from the Internet.

2.3. Leaks.

2.3.1. Do NOT use pressurized helium (with an electronic leak detector) or any other pressurized gas to isolate leaks as it can damage the CS1200s and pressure sensors in the

1900.

2.3.2. Rezero the CS1200. If the step number is not accurate it could be that the CS1200 was not closed fully during the leak check.

2.3.3. Isolate the leaks as much as possible when troubleshooting. If the 8 Position Option is present send the Channel 1 rotary valve to position 0. Connect an evacuated canister to a Channel 1 position. Open the canister valve to apply vacuum to that position for 10 seconds then close the canister valve. Note the pressure 10 seconds after the valve is closed and 40 seconds after the valve is closed. Check to verify the final pressure is still well under vacuum and the leak rate is acceptable. If a leak is still found it is either at or after the rotary valve in the sample flow path. It the leak is no longer present the leak is at or before the rotary valve in the sample flow path. If a leak is found try rezeroing the CS1200 and repeat the leak check.

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

2.4. Leak Checking the 1900.

2.4.1. Refer to the installation section of the 1900 User Manual for the basic daily leak checks. The leak checks below are more specific and should be used if a leak is found with the basic tests or strongly suspected..

2.4.2. Restrictor Zone Leak Check.

2.4.2.1. When to use this test:

2.4.2.1.1. The normal 1900 leak checks pass but:

2.4.2.1.1.1. The 1900 has faster than expected flow rates for its restrictor.

2.4.2.1.1.2. Or the flow rate exceeds the restrictor's maximum range during the setting of the flow rate benchmarks.

2.4.2.2. Tools Needed:

2.4.2.2.1. Phillips Screwdriver.

2.4.2.2.2. Two 1/2" - 9/16 Open Ed Combination Wrenches.

2.4.2.3. Parts Needed:

2.4.2.3.1. 1/4" Plug. Part number 01-30-04026. Brass is preferred for this test as brass is softer then stainless steel making restrictor assembly thread damage less likely.

2.4.2.3.2. 1/4" Cap. Part number 01-30-04028B. Brass is preferred for this test as brass is

softer then stainless steel making thread damage less likely on the nut on the CS1200.

2.4.2.3.3. 1900 Calibration Tubing. (Note that this is a piece of tubing that come with a 100 cc vacuum manifold in the installation kits of new 1900s. It is important that this tubing is obtained from Entech so the length and internal diameter are correct.)

2.4.2.4. Procedure:

2.4.2.4.1. Remove the top panel of 1900.

2.4.2.4.2. Disconnect the sampling manifold from both channels at the restrictor assemblies.

2.4.2.4.3. Plug the restrictor assembly by connecting a 1/4" plug to the restrictor assembly where the sampling manifold had connected.

2.4.2.4.4. Attach a vacuum source to the "CAL VAC" port on the front of the 1900. The vacuum source may be an evacuated canister or an oilless vacuum pump.

2.4.2.4.5. Attach the calibration tubing from CAL 1 (for Channel 1) or CAL 2 (for Channel 2), to position 1 of the channel that is being leak tested.

2.4.2.4.6. If the channel's rotary valve is not already on position 1 then click "Diagnostics" then "Rotary Valve". Use the pulldown to select "Position 1" then click "Move". After a few seconds the channel should have a position of 1 in the status bar.

2.4.2.4.7. Click "Diagnostics" then "CS1200". Send the Flow Professor(s) for the channel(s) to be leak-checked to 15000 steps. Check the "Current Position" of the channel's Flow Professor. If not 15000 enter the the difference in the steps box and "Spin Open" or "Spin Close" to reach 15000 steps. Usually the CS1200 will be at about 2000 steps. In that case type "13000" in the "Move" box and then click "Spin Open". After a few seconds "Current Position" should be "15000 Steps". This step must be taken to verify the CS1200 is open for the restrictor leak check. The plug on the inlet to the restrictor assembly will prevent flow through the CS1200 unless a leak is present.

2.4.2.4.8. While still on the "Diagnostics" - "CS1200" screen click "Open Valve". This will apply vacuum from the vacuum source to the CS1200 and the restrictor area.

2.4.2.4.9. Wait for the vacuum to stabilize, at least one minute. With the more restrictive restrictors (#6, #7) more time may be needed. Click "Close Valve" on the "Diagnostics" - "CS1200" screen. Watch the pressure for the next minute. If the leak rate exceeds the target leak rate (0.09 psia/min) then repeat the test. If the leak rate is slower in the second test you may need to allow more time for the vacuum to stabilize.

2.4.2.4.10. If the leak is still present disconnect the restrictor assembly from the internal CS1200. Cap the open port on the CS1200.

2.4.2.4.11. Repeat the leak checks in steps 2.4.2.4.8 and 2.4.2.4.9 above. If the leak is still present it is in or after (towards the sampling canister) the CS1200. If the leak is no longer

present the leak is in the restrictor assembly. Either replace the restrictor assembly or its components.

2.4.2.4.12. If the leak was still present, if it was on Channel 1, and if Channel 1 has the 8 position option:

2.4.2.4.12.1. Remove the pressure sensor from the CS1200 and cap that port on the CS1200 with a 1/4" cap. Repeat the leak check in steps 2.4.2.4.8 and 2.4.2.4.9 but read the pressure from the sensors on the individual lines.

2.4.2.4.12.2. If the leak is still present it was not due to the CS1200 pressure sensor. Continue troubleshooting from the CS1200 towards the canister.

2.4.2.4.12.3. If the leak is gone replace the CS1200 pressure sensor. It is PN: 01-03-31901.

2.4.2.4.13. Click "Diagnostics" then "CS1200". Send the Flow Professor for the channel that was leak checked to 2000 steps. Check the "Current Position" of the channel's Flow Professor. Type "13000" in the "Move" box and then click "Spin Close". After a few seconds the "Current Position" should change to "2000 Steps". This step must be taken so the 1900 is ready for its next leak check and samples.

2.4.3. Check for a leak through a CS1200.

2.4.3.1. When to use this test:

2.4.3.1.1. The normal 1900 leak check fails and fails again after checking or replacing the connections for that position on the front of the 1900.

2.4.3.1.2. Or if a Canister was filled to local atmospheric pressure or significantly higher than the target pressure after having passed the leak check when the canister was connected.

2.4.3.2. Tools Needed:

2.4.3.2.1. Phillips Screwdriver.

2.4.3.2.2. Two 1/2" - 9/16 Open End Combination Wrenches.

2.4.3.2.3. Evacuated Canister. (Canister under full vacuum.)

2.4.3.3. Parts Needed:

2.4.3.3.1. 1/4" Plug. Part number 01-30-04026. Brass is preferred for this test as brass is softer then stainless steel making restrictor assembly thread damage less likely.

2.4.3.3.2. 1/4" Cap. Part number 01-30-04028B. Brass is preferred for this test as brass is softer then stainless steel making thread damage less likely on the nut on the CS1200.

2.4.3.4. Procedure:

2.4.3.4.1. Connect an evacuated canister to a 1900 channel/position. Leak check it the normal way as described in the 1900 User Manual. If it fails that leak check continue.

2.4.3.4.2. Remove the top panel of 1900.

2.4.3.4.3. Disconnect the sampling manifold from both channels at the restrictor assemblies.

2.4.3.4.4. Plug the restrictor by connecting a 1/4” plug to the restrictor assembly where the sampling manifold had connected.

2.4.3.4.5. Connect an evacuated canister on the port to be leak checked on the front of the 1900 or 1916.

2.4.3.4.6. Use the rotary valve controls to send the 1900 or 1916 to that position.

2.4.3.4.7. Open the valve on the canister to put the CS1200 zone under vacuum. Wait 10 seconds. Close the valve on the canister. After 1 minute note the pressure, P1. Wait one more minute and note the pressure, P2.

2.4.3.4.8. If the P2 is not more than 0.1 psia higher than P2 then the leak found in step 1 is due to a leak through the CS1200 body (the CS1200 is not closing properly). If the leak found in step 1 is still present then there is a leak elsewhere between the body of the CS1200 and the evacuated canister.

2.4.3.4.9. Corrective action if the leak is found to be through the CS1200 body.

2.4.3.4.9.1. Do the side load adjustment (Refer to topic 3.9 in this manual.) and rezero the C1200. If the issue continues then replace parts.

2.4.3.4.9.2. Replace the CS1200.

2.4.3.4.9.3. Replace the Flow Professor motor.

2.4.3.4.9.4. The CS1200 and Flow Professor motor can be replaced together by ordering both.

2.4.4. Rotary Valve Cross Port Leaks.

2.4.4.1. Cross port leaks are leaks that occur between ports on a rotary valve. They are caused by a damaged valve or valve rotor.

2.4.4.2. Place evacuated cans on every other position . Perform a leak check of the positions with evacuated canisters.

2.4.4.3. Typically a cross port leak is due to scoring of the valve rotor. If the scoring is present on the rotor then each port with an evacuated canister should have a leak.

2.4.4.4. Conceivably a cross port leak could be between a small number of positions. A leak could happen this way if the valve body was scored.

2.4.4.5. The solution for cross port leaks is to open the valve and inspect its interior surfaces for scoring and damage.

2.4.4.6. If damage is found replace the valve:

2.4.4.6.1. 1916 Rotary Valve - PN: 01-31-303020 FSL 17/16 Valve Head with Standoff

2.4.4.6.2. 8 Position Option Rotary Valve - PN: 01-31-30220S SC 9/8 Valve Head with Standoff

2.4.4.7. If damage is not found to the interior surface of the valve replace the rotor:

2.4.4.7.1. 1916 Rotor - PN: 01-31-30340 17/16 Top Load Rotor, SSASD16MWE

2.4.4.7.2. 8 Position Option Rotor - PN: 01-31-30240 9/8 Rotor, SSACSD8MWE

2.5. Flow Issues.

2.5.1. Canister did not fill:

2.5.1.1. Canister valve may not have been opened.

2.5.1.2. Channel may not have been started.

2.5.1.3. Canister may have been connected to the wrong position or channel.

2.5.1.4. The rotary valve may be misaligned or not moving. Check valve alignment and troubleshoot.

2.5.1.5. Inlet filter may be completely clogged.

2.5.2. Sample Canister Overfilled:

2.5.2.1. The configuration settings may not be correct.

2.5.2.2. There may be a leak.

2.5.3. Sample Canister Underfilled:

2.5.3.1. The configuration settings may not be correct.

2.5.3.2. The inlet filter may be partially clogged. Be aware that if the exterior temperature and humiditiy are high it is possible for moisture to condense in the 1900 restrictor. The

heater on the 1900's restrictors is designed to prevent this.

2.5.3.3. With the 8 Position Option the rotary valve may be partially misaligned.

2.5.3.4. The CS1200 opened all the way without an increase in flow. Possible reasons for this are:

2.5.3.4.1. The canister is closed.

2.5.3.4.2. The CS1200 is stuck in the closed position and needs manual help to break free. Refer to the procedure for Zeroing the CS1200.

2.5.3.4.3. The CS1200 diaphragm is damaged.

2.5.3.4.4. The 1916 rotary valve calibration is off and when the valve is sent to the target position it does not end up at the target position.

2.5.3.4.5. There is some restriction in the line or elsewhere downstream from the restrictor that is preventing flow from reaching the target, even with CS1200 fully open.

2.5.3.4.6. There is restriction upstream of the restrictor which causes the inlet pressure to be below atmospheric pressure.

2.6. Vacuum Issue Message while Setting the Flow Rate Benchmarks.

2.6.1. "Flow Calibration Vacuum could not reach 20" Hg". Change the vacuum source. Often canisters are used to provide vacuum. This message indicates the canister has too much pressure and needs to be evacuated in order to continue the setting of the flow rate benchmarks..

2.7. Enabling the 1900 Detailed Sampling Log.

2.7.1. Detailed sampling data logging is sometimes used by Entech personnel to troubleshoot the 1900 and its accessories. Mostly this is used for issues that are out of the ordinary and more challenging to diagnose. The procedure below explains how to turn the detailed sampling logs on and off. If the logs are on then more computer memory will be used.

2.7.2. Procedure:

2.7.2.1. Close the 1900 software.

2.7.2.2. Go to C:\SmartLabs\Data\1900\Configuration.

2.7.2.3. Find the file named “Default.1900V1.Config”.

2.7.2.4. Right-click, select “Open With…”, from the list of programs select “Notepad”. (If Notepad is not shown, select “Choose another app” to find it.)

2.7.2.5. In Notepad, find the following line: “<EnableSamplingLog>false</EnableSamplingLog>”.

2.7.2.6. Change “false” to “true”, like so: “<EnableSamplingLog>true</EnableSamplingLog>”.

2.7.2.7. Save the file in Notepad.

2.7.2.8. Restart the 1900 software.

2.7.2.9. Schedule and run samples as before. The 1900 will automatically log detailed information about each sampling event to assist with troubleshooting and diagnostics.

2.7.2.10. If any issues occur, please send the log to your local Entech Representative to assist with troubleshooting.

2.7.2.11. The sampling logs will be in C:\SmartLabs\Data\1900\Diagnostics.

2.7.2.12. The name of the sampling log file will be the Channel then position then date and time. The file name will be as follows: CH[1 or 2] – POS[1-16] Year.Month.Day.Hour.Minute.1900.SamplingLog, with the date and time pertaining to the time the sample was started.

2.7.2.12.1. For example: “CH1-POS8 2020.06.08.14.29” would equate to Sample on Channel 1, Position 8, started on June 8, 2020 at 2:29 p.m.

2.7.2.13. Once detailed sample logs are no longer needed the data logging can be turned off by reversing the procedure above. This will save memory on the computer.

2.7.2.14. Note: If detailed sampling logs are turned on then any log files that are over one month old should be deleted monthly. This is to prevent the logs from using too much space on the hard drive. The files are located in C:\SmartLabs\Data\1900\Diagnostics.

2.8. Testing the Remote Start Function.

2.8.1. Power on the 1900. Open the 1900 software.

2.8.2. At the terminal blocks on the rear of the 1900 jumper (with a wire is OK) from CH1 START or CH2 START to GND.

2.8.3. Check the 1900 software to see if the “Relay On” light is lit on the status bar. If “Relay On” is lit it indicates the contact is detected as closed.

Section 3. 1900 Maintenance.

3.1. Changing the filter.

3.1.1. 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.

3.1.2. The 10 micron inlet filter should be connected is to the sampling line outside of the sampling shelter. Simply remove the old filter and replace it with a new one.

3.1.3. Replacement of the inlet filter is as needed. Some users 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.

3.1.4. 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 the “CH1 Total Liters Sampled” and “CH2 Total Liters” Sampled for Channel 1 and Channel 2 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.

3.2. CS1200 Zeroing.

3.2.1. This is done at the factory if the 1900 is purchased with the controller (computer) so it should not need to be done on most new 1900s. It may need to be done if the following parts in the 1900 are replaced: a CS1200, a Flow Professor, or a Flow Professor board. It may also need to be done if a run is aborted or for other reasons.

3.2.2. The procedure below was written for Channel 1. When zeroing the Channel 2 CS1200 just substitute a “2” for the “1” in the procedure as written below.

3.2.2.1. CAUTION: This procedure requires that the 1900’s top cover be open with the power on. The user must be very careful not to touch boards in order to prevent electrical shocks.

3.2.2.2. Open the 1900 software.

3.2.2.3. Navigate to “View” on the top menu then click “CS1200” on the left.

3.2.2.4. Under Channel 1, type “4000” steps into the Move Steps box.

3.2.2.5. Unscrew and remove the top panel of the 1900 instrument.

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

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

3.2.2.8. When the CS1200 stops spinning, press the “Spin Close” button again.

3.2.2.9. Repeat the previous three steps until the motor begins stalling. (It will jitter back and forth and the shaft will no longer be spinning. The motor sound will also be different.) Press the “Stop” button to stop the motor when this happens.

3.2.2.10. Click “Zero Position” to set that Position as step position 0.

3.2.2.11. Change the number in the Move Steps box from 4000 to 2000.

3.2.2.12. While watching the CS1200 motor to see if it turns click “Spin Open”.

3.2.2.12.1. If the motor turns without stalling then CS1200 Zeroing is complete. Just leave the CS1200 at 2000 steps.

3.2.2.12.2. If the motor does not turn:

3.2.2.12.2.1. Step 1. Click “Zero Position”. Then use your fingers to help the motor turn when “Spin Open” is clicked. Sometimes just a little more torque is needed.

3.2.2.13.2.2. Step 2. Set the position in the Move Steps box to 1000. Click “Spin Close” until stalling occurs.

3.2.2.13.2.3. Step 3. Click “Zero Position”.

3.2.2.13.2.4. Step 4. Set the position in the Move Steps box to “2000”. Click “Spin Open”.

3.2.2.13.2.5. Step 5. If the motor turns without stalling then CS1200 Zeroing is complete. Just leave the CS1200 at 2000 steps.

3.2.2.13.2.6. Step 6. If the motor does not turn go back to step 1.

3.3. Setting the Flow Rate Benchmarks.

3.3.1. This procedure should only be needed if the CS1200 in the 1900 or its restrictor are changed, or its Flow Professor is replaced. The benchmarks must be regenerated even if the restrictors are the same restrictor number. (Regenerating the flow rate benchmarks for restrictors with the same restrictor number gives the user the best possible flow rate calibration and it also verifies that there are no flow issues with the new restrictor or the rest of the unit.)

3.3.2. Tools Needed:

3.3.2.1. Vacuum Source. This can be an evacuated canister for low flow rates or preferably a good quality oilless vacuum pump capable of achieving a vacuum of at least 25” Hg. The #0 and #1 restrictors require an oil-free vacuum pump.

3.3.2.2. 7/16” X 3/8” Open End Combination Wrenches.

3.3.2.3. 9/16” X 1/2” Open End Combination Wrenches.

3.3.2.4. 01-39-1900-010 1900 Calibration Ballast Assembly. This is a combination of the 100 cc calibration ballast and the calibration tubing. It is sold as an assembly. Refer to figure 3.3.2.4. The calibration tubing is the 1/8” Teflon tubing.

3.3.2.5. 01-39-FP-BALLAST-600 600 CC BALLAST ASSY (Only required for calibrating a channel with a #0 restrictor.)

3.3.2.6. Miscellaneous tubing and fittings to connect the vacuum source to the CALVAC bulkhead.

3.3.3. Note: Never try to calibrate Channel 1 and Channel 2 simultaneously. They must be calibrated separately.

3.3.4. Note: Never use quick connects on the 100 or 600 cc calibration ballast. Quick connect fittings slow the evacuation of the ballast and increase the calibration time. The

Figure 3.3.2.4. 1900 Calibration Ballast Assembly. The calibration tubing is connected to the ballast/tee assembly.

quick connects would also slightly increase the total volume which could csuse the calibratoin to be off.

3.3.5. Note: If calibrating a fast flow rate of greater than 80 cc/min for Channel 1 with the 8 Position Option the calibration will proceed much faster if an oilless double stage pump can be connected to the CAL VAC port on the front of the 1900 as the vacuum source.

3.3.6. Note: A condensed version of flow rate benchmark calibration instructions appears on the status line of the software during the flow rate benchmark calibration.

3.3.7. Confirm that the sample inlet port and the pump flow out port on the rear of the 1900 are not capped or blocked to allow air flow through the system.

3.3.8. Connect a vacuum source to the “CALVAC” port (bulkhead) on the front of the 1900. (Use the sample line from the channel being calibrated to connect an evacuated 6 liter canister for flows less than 80 cc/min. Alternatively an oilles diaphragm pump may be used.) If the vacuum source is an oilless pump turn the pump on. If the vacuum source is an evacuated canister open the canister valve to apply vacuum.

3.3.9. Go to the “Settings” - “CH1 Config” (or “CH2 Config”). Verify the following are correct: “Restrictor”, “Sample Duration”, “Canister Volume”, and “Target Vacuum”. Also verify that the correct flow rate is set. If any changes are made click “File” and select “Save Configuration” before leaving the “CH1 Config” (or “CH2 Config”) screen or any changes will be lost. Then close and reopen the software. Note the Restrictor number. Use the chart below to determine if only the flow calibration tubing is needed for the benchmark calibration or if the tee and a ballast must also be used.

Restrictor Code	Ballast required for generating the flow rate benchmarks.
#0	600 cc Ballast
#1	100 cc Ballast
#2	100 cc Ballast
#2+	100 cc Ballast
#3	100 cc Ballast
#3+	100 cc Ballast
#4	Calibration Tubing Only
#4+	Calibration Tubing Only
#5	Calibration Tubing Only
#6	Calibration Tubing Only
#7	Calibration Tubing Only

3.3.10. Connect the calibration tubing with the tee and ballast assembly (if required) between the bulkhead of the channel being calibrated (Channel 2 or Channel 1 Position 1) and the “CAL” bulkhead on the front of the 1900.

3.3.11. Go to the “Benchmark” screen. Click “Channel 1” (or “Channel 2”) to view the Channel 1 (2) Flow Rate Benchmarks.

3.3.12. Before the Flow Benchmarks can be measured one must first clear the old values if present. Click “COMMANDS” and select “CLEAR CURRENT BENCHMARKS”. A warning message will appear requiring that you click “CONTINUE” within (30) seconds to clear the table. Click “CONTINUE”.

3.3.13. Click “START” and then follow the onscreen instructions.

3.3.14. Setting of the flow rate benchmarks takes about 30-40 minutes. Calibrating the benchmarks for a #6 restrictor will take longer. Calibrating the benchmarks for a #7 restrictor will take much longer.

3.3.15. Once complete wait five minutes to allow plenty of time for the benchmarks to save automatically.

3.3.16. When finished, remove the calibration tubing, ballast, and vacuum source. If present reconnect the 1916 to CH1 (or CH2) on the front of the 1900.

3.4. NIFTY Ferrules.

3.4.1. Some of the connections in the 1900 use Entech’s Nickel ferrules. For instructions on using these ferrules should replacement become necessary refer to figure 3.4.1.

3.5. Flow Professor Pressure Sensor Calibration for Channel 1.

3.5.1. Skip this first step if Channel 1 does not have the 8 Position Option or if it is not connected to a 1916.

3.5.1.1. Open the 1900 software and go to the “Diagnostics” - “Rotary Valve” screen. Refer to figure 3.5.1.1.

3.5.1.2. Move the Rotary Valve position to “Position 5” by selecting “Position 5” from the pulldown for Channel 1. Then click “Move”. Next send the Rotary Valve to position 1 by selecting “Position 1” from the pulldown and clicking “Move”.

3.5.2. Send the Channel 1 Flow Professor to the closed position.

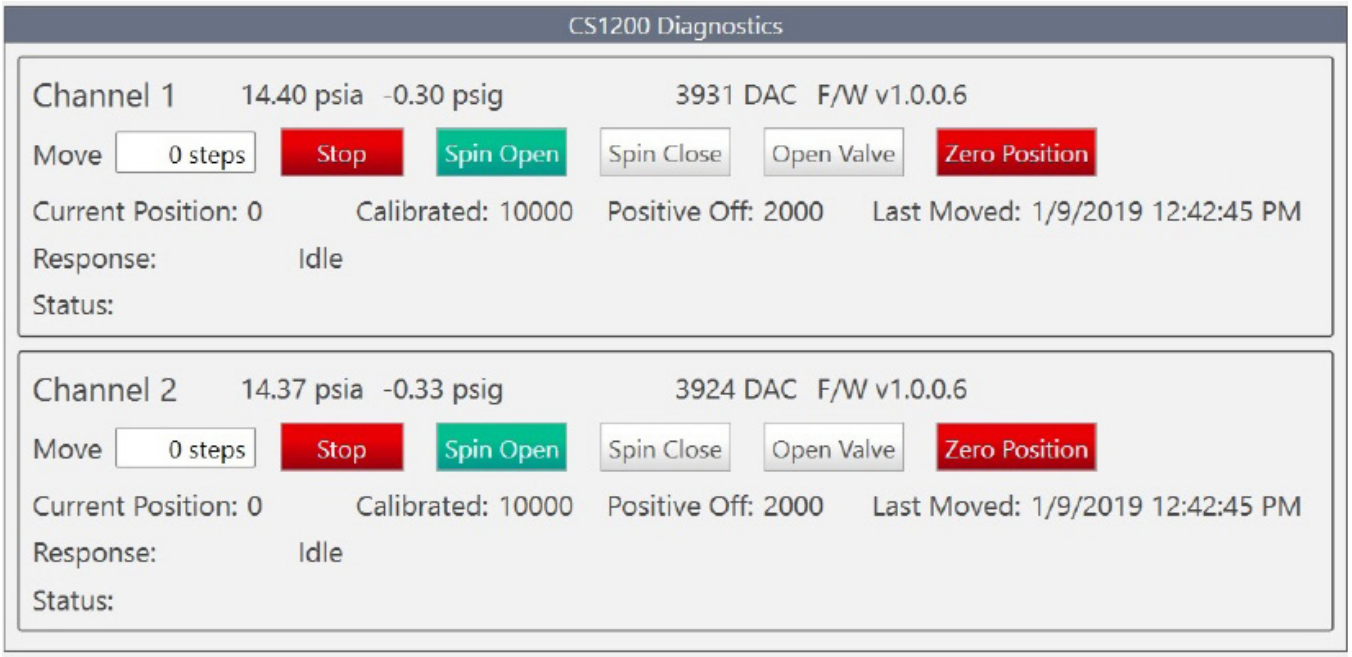
3.5.2.1. Go to “View” - “CS1200”. Refer to figure 3.5.2.1. The current Channel 1 position should be 2000. There should be no flow through the CS1200 if the position is 2000.

3.5.2.2. If the position is higher than 2000. Subract 2000 from the current steps. Enter the result in the steps box. Then click “Spin Close” (Channel 1). There should be a little noise from the Flow Professor motor and the position should change to 2000.

3.5.3. Calibrate the sensor.

Figure 3.4.1. NIFTY ferrule instructions.

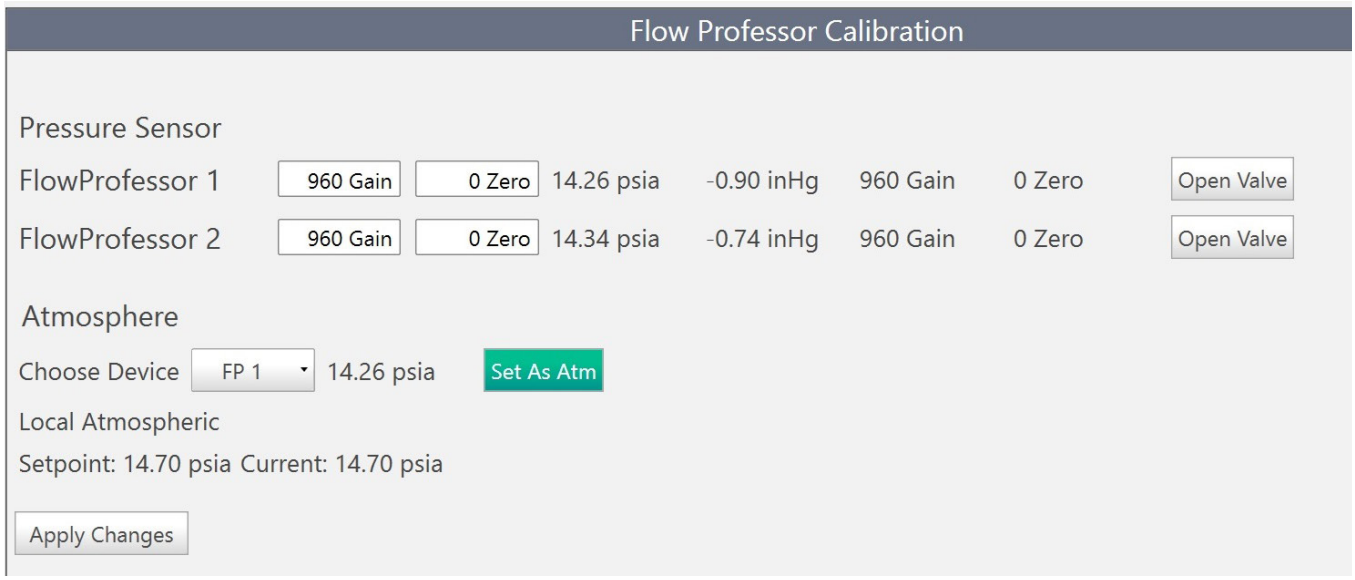
Figure 3.5.2.1. View - CS1200 screen.



3.5.3.1. Go to “Settings” then “FLOWPROF. CAL”. Refer to figure 3.5.3.1. Make a note of the current zero and gain for Flow Professor 1.

3.5.3.2. Attach a canister that has been evacuated fully with an Entech 3100D canister cleaner to the Channel 1 (CH1 Position 1 bulkhead for the 8 position option, Channel 1 1916 position 1 if Channel 1 is connected to a 1916, or the CH1 bulkhead on the front of the 1900 if neither the 1916 nor 8 position option are not present). WARNING: ALWAYS FINGERTIGHTEN THE 1/4” NUT ONTO THE CANISTER VALVE before the final tightening with a wrench. The final tightening should be about 1/4-1/2 turn past fingertight. 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 a nut has been damaged to the point that finger tightening can no longer be done, then the adapter fitting should be replaced. The ability to fingertighten is the only way to prevent

Figure 3.5.3.1. View - CS1200 screen.



cross threading and subsequent damage to the expensive canister valve. Open the valve on the canister.

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

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

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

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

3.5.3.7. After the Channel 1 calibration is complete and the canister is removed find “Choose a Device” on the “FLOWPROF.” CAL screen and select “FP1”. Click “Set As Atm”. This will set the current pressure reading as the local atmospheric pressure.

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

3.6. Flow Professor Pressure Sensor Calibration for Channel 2.

3.6.1. Skip this step if Channel 2 is not connected to a 1916.

3.6.1.1. Open the 1900 software and go to the “View” - “Rotary Valve” screen. Refer to figure 3.5.2.1.

3.6.1.2. Move the Channel 2 Rotary Valve position to “Position 5” by selecting “Position 5” from the pulldown. Then click “Move”. Next send the Rotary Valve to position 1 by selecting “Position 1” from the pulldown and clicking “Move”.

3.6.2. Send the Channel 2 Flow Professor to the closed position.

3.6.2.1. Go to “View” - “CS1200”. Refer to figure 3.5.2.1. The current Channel 2 position should be 2000. There should be no flow through the CS1200 if the position is 2000.

3.6.2.2. If the positions is higher than 2000. Subract 2000 from the current steps. Enter the result in the steps box. Then click “Spin Close”. There should be a little noise from the Flow Professor motor and the position should change to 2000.

3.6.3. Calibrate the sensor.

3.6.3.1. Go to “Settings” then “FLOWPROF. CAL”. Refer to figure 3.5.3.1. Make a note of the current zero and gain for Flow Professor 2.

3.6.3.2. Attach a canister that has been evacuated fully with an Entech 3100D canister cleaner to Channel 2 (CH2 1916 position 1 if Channel 2 is connected to a 1916, or the CH2 bulkhead on the front of the 1900 if no 1916 is present). **WARNING:** ALWAYS FINGERTIGHTEN THE 1/4” NUT ONTO THE CANISTER VALVE first and then use a wrench for the final tightening of an additional 1/4-1/2 turn. 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 a nut has been damaged to the point that finger tightening can no longer be done, then the adapter fitting should be replaced. The ability to fingertighten is the only way to prevent crossthreading and subsequent damage to the expensive canister valve.

3.6.3.3. Open the valve on the canister.

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

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

3.6.3.6. Adjust the gain until the Channel 2 (Flow Professor 2) pressure sensor reads local atmospheric psia +/- 0.1 psia. (At sea level local atmospheric pressure averages about 14.70 psia.

3.6.3.7. The current local atmospheric pressure can be obtained from local airports or with a barometer app on cellphones.) A change of 30-40 to the Gain is usually needed to see a clear change in the pressure reading. Click on the gain value in the third column, type in a new value, and then click “Apply”. Continue adjusting the gain until the Flow Professor 2 Pressure reads local atmospheric pressure +/- 0.1 psia.

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

3.6.3.9. After the Channel 2 calibration is complete and the canister is removed find “Choose a Device” on the FlowProf CAL screen and select “FP2”. Click “Set As Atm”. This will set the current pressure reading as the local atmospheric pressure.

3.6.4. Save the FP Calibration. Click “File” then “Save FP Calibration” to permanently save

the new zero and gain values. If the FP calibration is not saved the values will be lost when the software is closed. Close the 1900 software and then reopen it.

3.7. Manual Calibration of the Channel 1 8 Position Option Pressure Sensors.

3.7.1. This procedure is for the eight individual pressure sensors that are part of the eight position option. There is a pressure sensor on each canister position. Two procedures are included for the calibration of these sensors: Manual Calibration and Automatic Calibration. Chose one procedure or the other to calibrate the sensors for the 8 Position Option. In general the Automatic procedure would be preferred.

3.7.2. Go to the “Diagnostics” - “Rotary Valve” screen.

3.7.3. Move the Channel 1 rotary valve to position 0 by selecting position 0 using pulldown and clicking “Move”.

3.7.4. Go to “Settings” - “UNICARD CAL”. Refer to figure 3.7.4.

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

3.7.6. Attach a canister that has been evacuated fully with an Entech 3100 series canister cleaner to the CH1 Position 1 bulkhead.

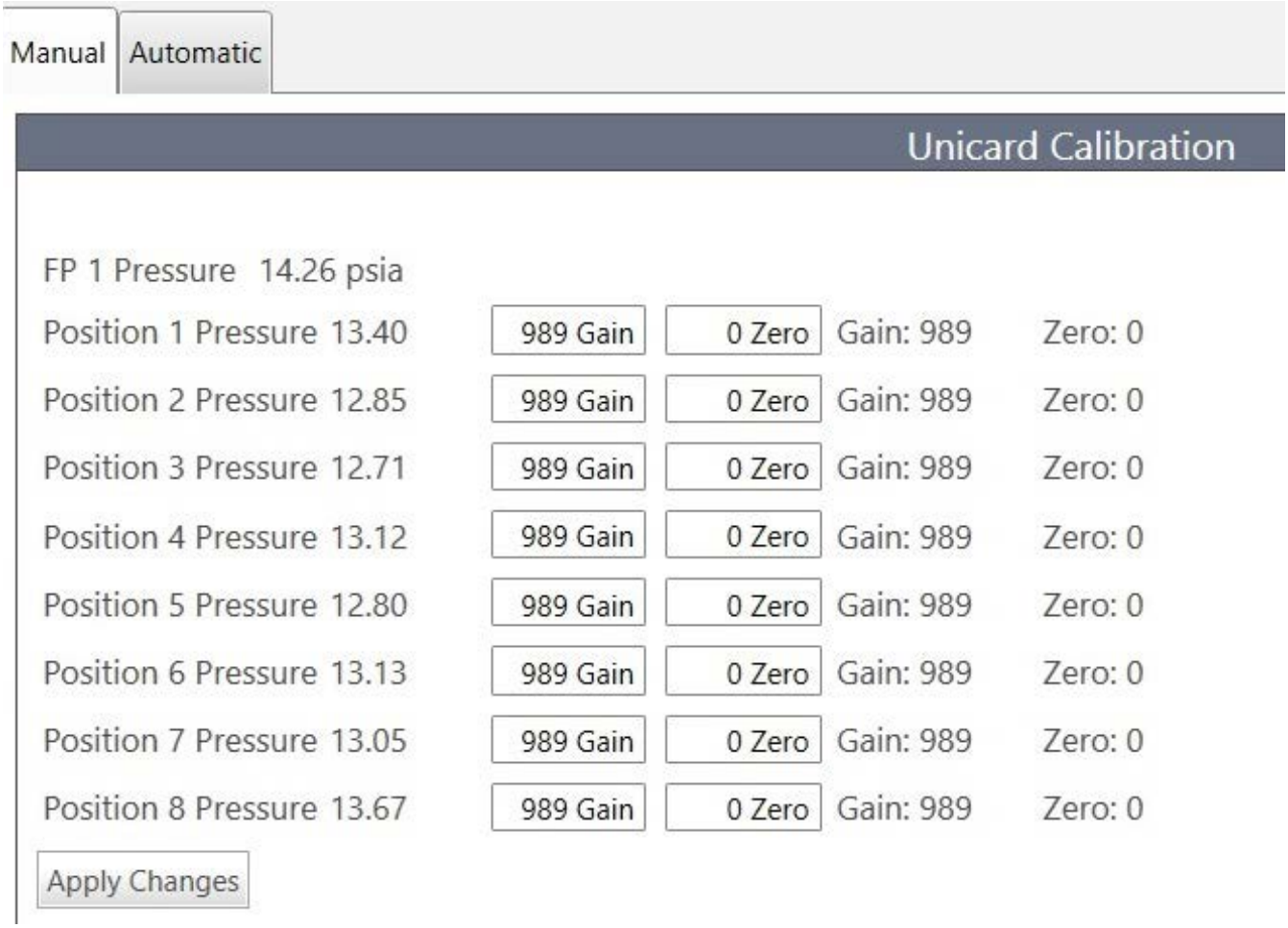
3.7.7.  **CAUTION:** Always finger tighten the 1/4” nut onto the canister valve.

3.7.8. It should be possible to turn the nut at least 1.5-2 revolutions by hand before the final tightening with a wrench, otherwise the nut may either be cross threaded or may have been overtightened in the past causing the threads to distort. If a nut has been damaged to the point that 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. Open the valve on the canister.

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

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

Figure 3.7.4. Settings - Unicard Calibration - Manual Screen.



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

3.7.12. Repeat the previous five steps until both the local atmospheric pressure and the evacuated canister pressure are within 0.1 psia of their targeted values. Click “File” then “Save Unicard Calibration” to permanently save the new zero and gain values. If the Unicard calibration is not saved the values will be lost when the software is closed. Repeat the steps above for Positions 1-2 to 1-8.

3.7.13. Please note that the zeroes and gains may be very different. The pressure sensors on position one and two will have similar zero and gain values (about 140 for the gain and 1050 for position one and two on one system). Those for positions three through eight will be similar to each other (about 1630 for the gain and 20 for the zero on one system). This difference in the zero and gain values is due to the different types of circuits that control the two sets of pressure sensors. Positions 1-1 and 1-2 are on the P1 and P2 circuits. Positions 1-3 to 1-8 are on the MFC1 to MFC6 circuits.

3.7.14. Close and reopen the 1900 software.

3.8. Automatic Calibration of the Channel 1 8 Position Option Pressure Sensors.

3.8.1. This procedure is for the eight individual pressure sensors that are part of the eight position option. There is a pressure sensor on each canister position. Two procedures are included for the calibration of these sensors: Manual Calibration and Automatic Calibration. Chose one procedure or the other to calibrate the sensors for the 8 position option. In general the Automatic procedure would be preferred.

3.8.2. Refer to figure 3.8.2.

3.8.3. Before the Automatic Calibration can begin the Channel 1 Flow Professor pressure sensor must be calibrated as it is used as the reference pressure reading for the automatic calibration procedure.

3.8.4. Assemble a calibration tool. A calibration tool connects all eight Channel 1 positions to the “CAL 1” port on the front of the 1900 using fittings and 1/8” Teflon tubings. Connect the calibration tool to “CAL 1” and all Channel 1 positions. Connect an evacuated canister (or other vacuum source) to “CAL VAC” on the front of the 1900 and open its valve.

3.8.5. Select “Yes” for Using Calibration Tool.

3.8.6. Put checks in front of all positions to enable them for the calibration procedure.

3.8.7. Click “Start”.

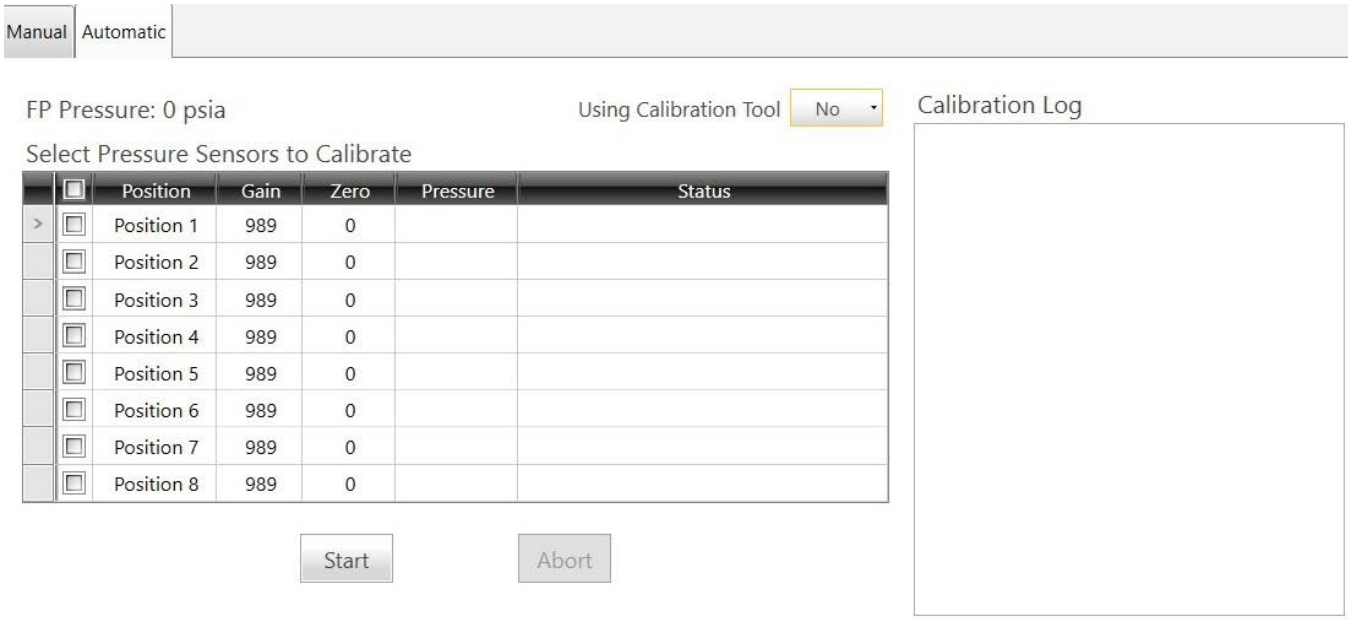
3.8.8. If one must stop the calibration the user can click “Abort”.

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

3.8.10. Please note that the zeroes and gains may be very different. The pressure sensors on position 1-1 and 1-2 will have similar zero and gain values (about 140 for the gain and 1050 for position one and two on one system). Those for positions 1-3 through 1-8 will be similar to each other (about 1630 for the gain and 20 for the zero). This difference in the zero and gain values is due to the different types of circuits that control the two sets of pressure sensors. Positions 1-1 and 1-2 are on the P1 and P2 circuits. Channels 1-3 to 1-8 are on the MFC1 to MFC6 circuits.

3.8.11. Close and reopen the 1900 software.

Figure 3.8.2. Settings - Unicard Calibration - Automatic Screen.



3.9. Side Load Adjustment.

3.9.1. This topic explains how to correct possible side load issues with the CS1200 within the 1900. A side load occurs when the stepper motor hex driver is not centered directly above the adjustment screw of the CS1200. This causes the hex driver to bind against the wall when it rotates.

3.9.2. Tools Needed:

3.9.2.1. Phillips screw driver.

3.9.2.3. Open End Wrench, 9/16".

3.9.3. Side Load Removal Procedure. To remove any side load on the CS1200 adjustment motor you will need to loosen the fittings that are attached to the CS1200's inlet and outlet ports (both CS1200's if more than one in the 1900). Then reposition the CS1200 so that the side load no longer exists (to test the side load spin the CS1200 360 degrees and watch the motor to make sure it does not stop at any point). Once the side load is gone slowly retighten the CS1200's inlet and outlet fittings, make sure that the CS1200 does not move.

3.9.3.1. Power off the 1900 and its computer. Remove the top cover of the 1900.

3.9.3.2. First loosen the fittings attached to the CS1200 inlet and outlet ports. You do not need to remove them completely, only enough to move the CS1200. Refer to figure 3.9.3.2.

3.9.3.3. Move the CS1200 forward and back until the there is no side load on the motor shaft. Refer to figure 3.9.3.3.

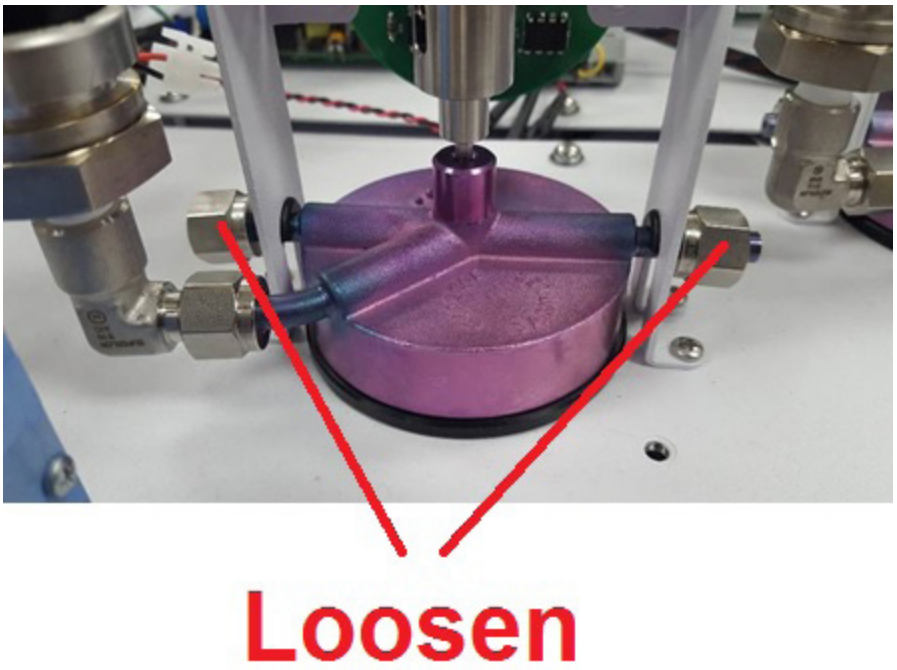


Figure 3.9.3.2. Shows the nuts which must be loosened for the side load adjustment. Note that no tubing is shown in the picture as the 1900 pictured was being assembled when the photo was taken.

3.9.3.4. Test that the side load is gone by spinning the CS1200 motor at least 360 degrees in both directions. The motor should be able to do this without stopping at any point.

3.9.3.5. Now slowly retighten the CS1200 inlet and outlet port fittings but do not let the CS1200 move, you may need to tighten both fittings at the same time by doing a half turn on the inlet fitting then a half turn on the outlet fitting (back and forth until both fittings are fully tightened).

3.9.3.6. If this fails to remove the side load from the motor shaft you may need to adjust the tubing connected to the CS1200 outlet port and front panel. Bend the tube as little as possible in the direction needed to remove the side load on the motor shaft then perform the steps in this procedure again.

3.9.3.7. A leak check is required after this adjustment.

3.9.3.8. Replace the 1900 top cover when done.

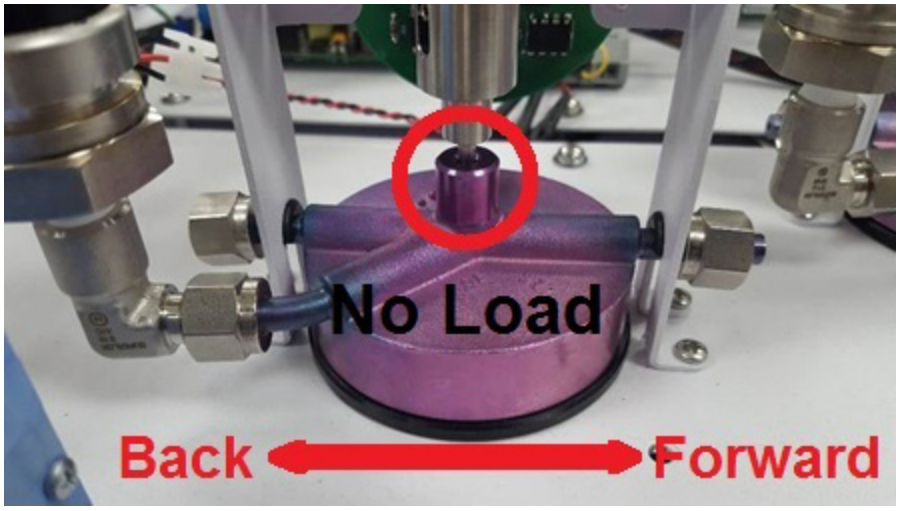


Figure 3.9.3.3. Shows how to move the CS1200 body to remove side load from the CS1200 motor..

3.10. 1900 DC Voltage Checks.

3.10.1. Background: This topic explains how to check and troubleshoot the DC voltages in an Entech 1900 Canister Sampler. The procedures may be useful when the unit is not powering up properly (power light does not come on and the fuse looks good or if the power light is flashing), or there are inconsistent readings of voltages or pressure in the software. These tests should not be done except on the direct advice of your local Entech representative.

3.10.2. Tools reguired:

3.10.2.1. Phillips Screwdriver.

3.10.2.2. Voltmeter.

3.10.3. DC Voltage Test 1:

3.10.3.1. Check the voltages at the DC Voltage Distribution Bar. Refer to figure 3.10.3.1.

3.10.3.2. Expected voltages are:

3.10.3.2.1. Black to White: -5 VDC.

3.10.3.2.2. Black to Yellow: 24 VDC.

Figure 3.10.3.1. 1900 DC Voltage Distribution Bar.

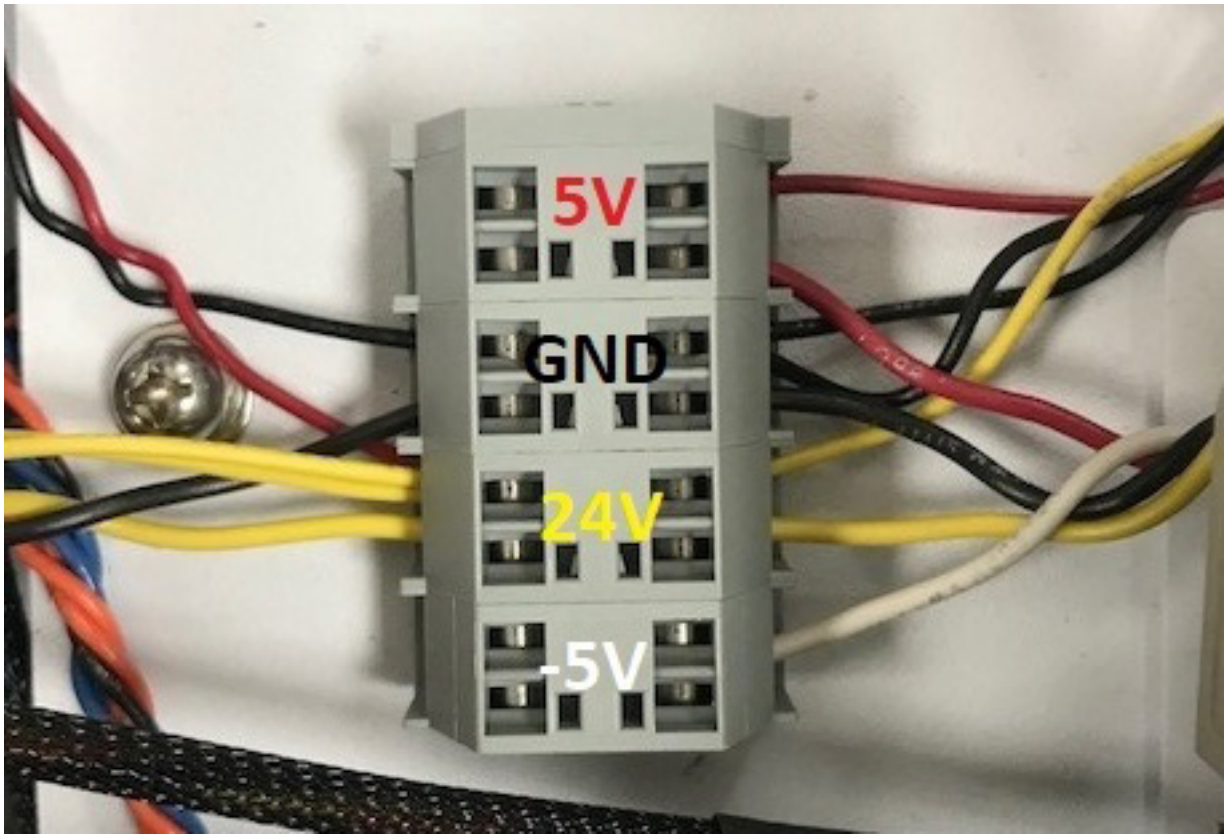
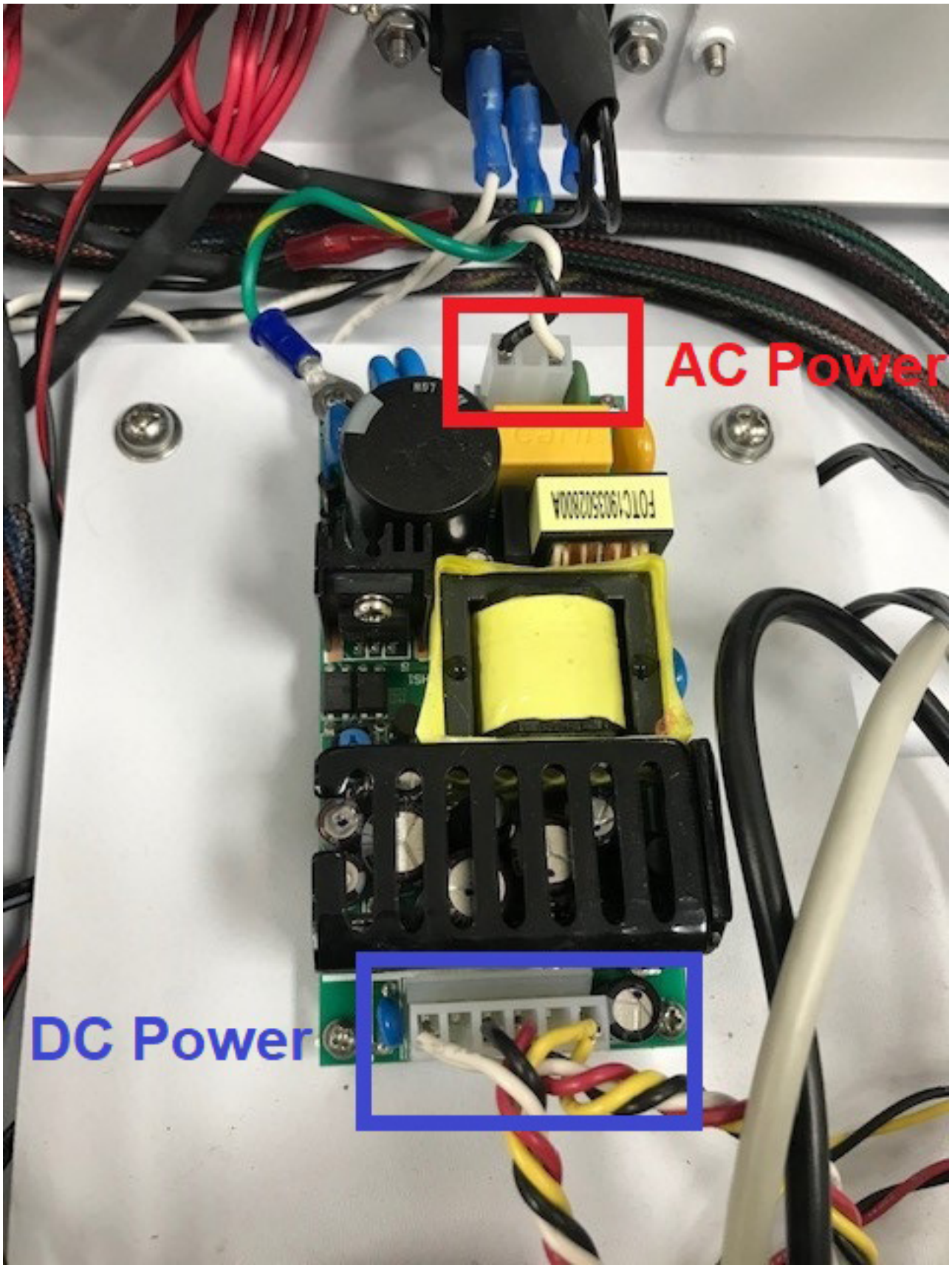


Figure 3.10.4. 1900 DC Power Supply the AC Power and DC Power cables' connections to it.



3.10.3.2.3. Black to Red: 5 VDC.

3.10.3.3. If the voltages are inconsistent or not close to these values go to DC Voltage Test 2.

3.10.3.4. If the voltages are close to the expected values go to DC Voltage Test 4.

3.10.4. DC VoltageTest 2: This test is done if there is an issue at the DC Distribution Bar in DC Voltage Test 1. Refer to figure 3.10.4.

3.10.4.1. At the DC Power Cable connection test the DC voltages. Expected voltages are:

3.10.4.1.1. Black to White: -5 VDC.

3.10.4.1.2. Black to Yellow: 24 VDC.

3.10.4.1.3. Black to Red: 5 VDC.

3.10.4.2. If the voltages are inconsistent or not close to these values test the AC Power on the other end of the power supply. (Set Voltmeter to read AC and then test the black to white on the AC power connector.)

3.10.4.3. If the AC power is a consistent 110-240 VAC power off the 1900. (The 1900 only uses DC power internally. The AC from the power outlet is converted to DC at the power supply. Then DC is used for all the 1900's power needs.) If the AC power is not a consistent 110-240 VAC then go to AC Voltage Test 3.

3.10.4.4. Unplug the DC power cable from the power supply. Power on the 1900. Test the DC voltages directly on the DC pins. If the voltages are now those expected contact your local Entech representative for more assistance in troubleshooting. If the voltages are still inconsistent or are not the expected values. then replace the power supply. The DC power supply is 01-25-20140 5V, 24V, -5V OUTPUT POWER SUPPLY.

3.10.5. AC Voltage Test 3: This test should only be used if the AC is still inconsistent or not the expected voltage (110-240 VAC).

3.10.5.1. Set Voltmeter to read AC and then test the black to white of the AC power connector on the DC power supply. Refer figure 3.10.4. If the VAC is off (not a consistent voltage between 110 and 240 VAC), then continue.

3.10.5.2. Start at the power outlet, then the 1900 end of the power cord. If the outlet voltage is inconsistent or off find a good working power outlet. If the voltage at the end of the power cable is inconsistent or off replace the power cord.

3.10.5.3. With the power off test the AC power coming into the power switch on the upper left of the front of the 1900 (AC power black to White). Refer to figure 3.10.5.3. Make sure the VAC is the expected value and consistent.

Figure 3.10.5.3. 1900 AC Power Switch.

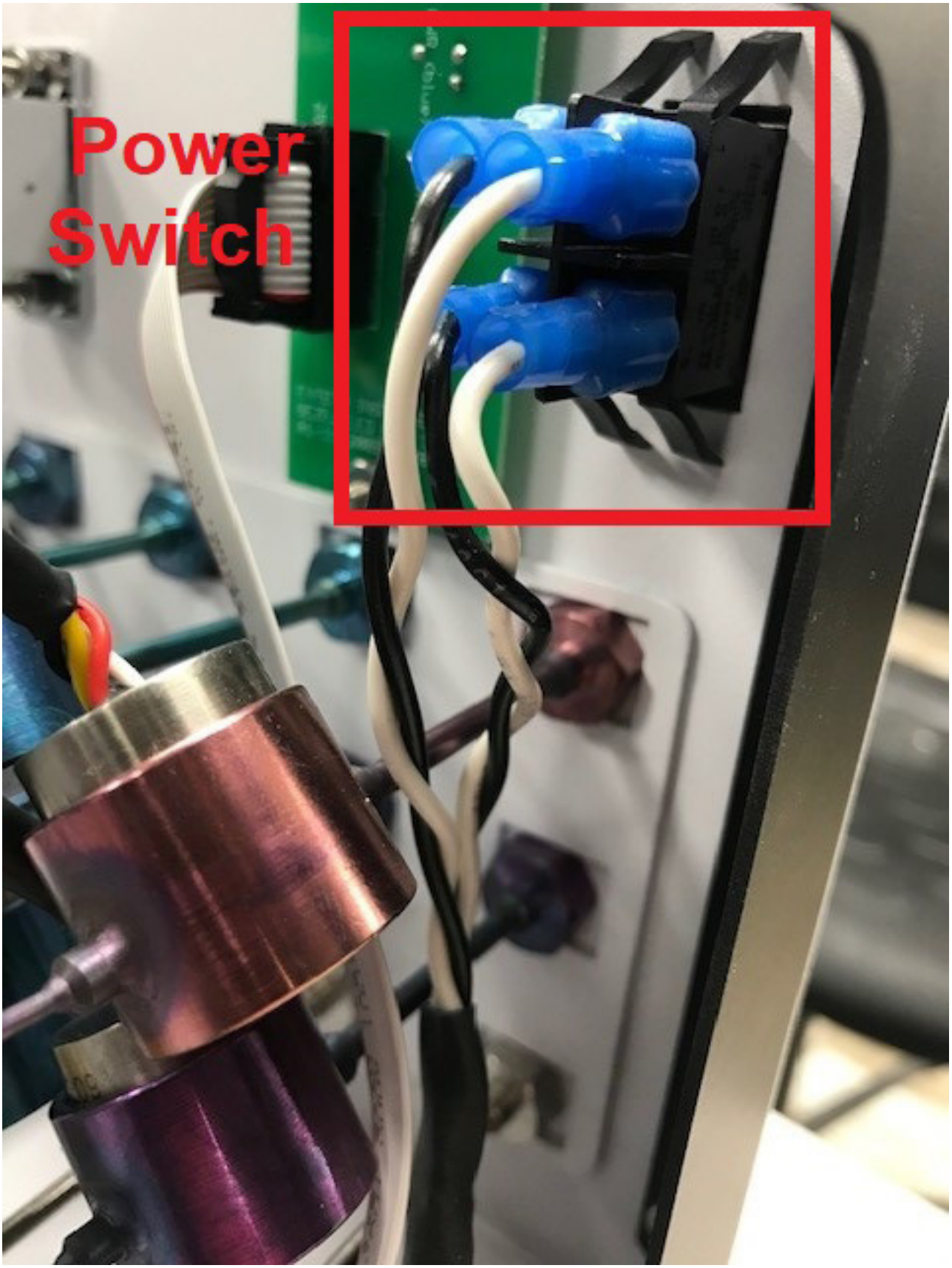
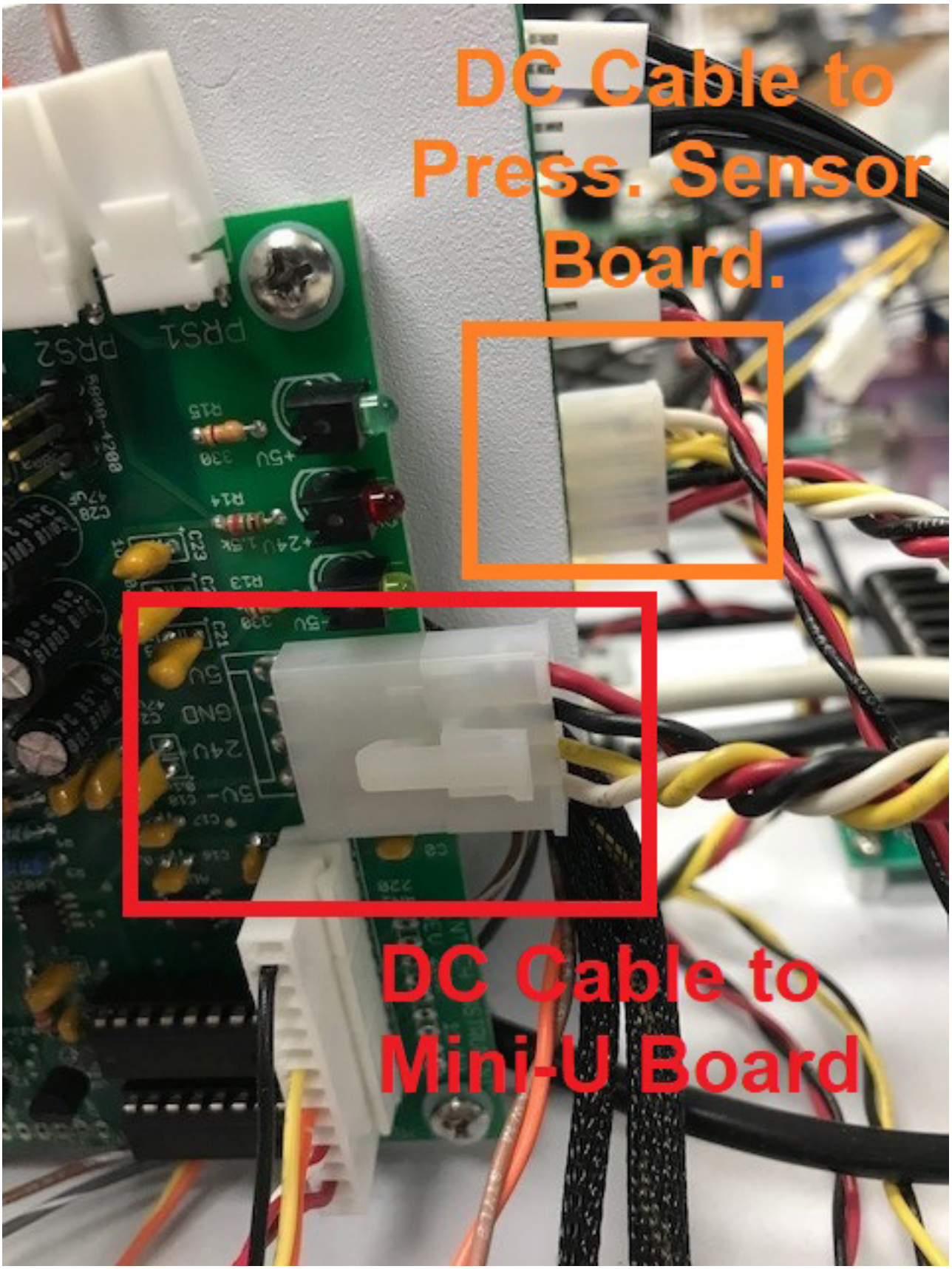


Figure 3.10.6. 1900 DC Power Cable Connection to the Mini-U and the Pressure Sensor Board.



3.10.5.4. Turn the power on and test the power coming out of the power switch.

3.10.5.5. If any issues are found with the AC power at the power switch then replace it. It is part number 01-19-1900-090 1900 AC POWER CABLE.

3.10.6. DC Voltage Test 4: Refer to the figure 3.10.6.

3.10.6.1. Set the voltmeter to read DC voltages. Use the voltmeter to test the voltages at the solder tabs just before the DC Power Cable connectors (in the red box for the Mini-U board and in the orange box for the Pressure Sensor board). Test +5 to GND, -5 to GND, and +24 to GND. If any of the voltages are inconsistent or not close to the expected values unplug both cables from the boards.

3.10.6.2. Test the DC voltages at the connectors at the ends of both cables. Expected voltages are:

3.10.6.2.1. Black to White: -5 VDC.

3.10.6.2.2. Black to Yellow: 24 VDC.

3.10.6.2.3. Black to Red: 5 VDC.

3.10.6.3. If the voltages are off or inconsistent go to Test 2. If the output DC voltages are good at the power supply replace the DC power supply cable between the Mini-U and Pressure Sensor boards and the power supply. The cable is part number 01-18-1900-060 1900 DC Power Cable.

3.10.6.4. If the power readings at the ends of the cable are good reconnect the Mini-U end of the cable to the mini-U. Check the voltages at the tabs on the mini-U again. If they are off or inconsistent replace the Mini-U board. It is part number 01-11-1900-012BCT 1900 MINI-U PCBA TESTED, MODIFIED.

3.10.6.5. If the power at the Mini-U end of the cable is good reconnect the Pressure Sensor Board end to the Pressure Sensor Board. Check the voltages at the tabs on the Pressure Sensor board again. If they are off or inconsistent replace the Pressure Sensor board. It is part number 01-11-1900-032 1900 PRESSURE SENSOR PCBA.

3.10.6.6. If the voltages are now good there must have been a bad connection of the DC Power Cable to either the Mini-U or the Pressure Sensor board. If the issue recurs replace the 1900 DC Power Cable (PN: 01-18-1900-060).

Section 4. External Control of the 1900.

4.1. DOT Command 1900 Control.

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

4.1.2. The following are DOT command descriptions: [soh] - start of header = ASCII character 1, and [cr] - carriage return = ASCII character 13. Each field is space delimited. The quotation marks are not sent, but denote the ASCII equivalent for everything within the quotations are sent and received. The response from the 1900 back to the data logger is for conformational purposes.

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

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

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

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

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

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

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

4.2. Enabling a Datalogger on a 1900.

4.2.1. Go to the Settings - Config.

4.2.2. Find “Enable Datalogger”. Use the pulldown to set it to “Yes”.

4.2.3. Click “File” and then select “Save Configuration”.

4.2.4. Close and reopen the 1900 software.

4.3. 1900 Software. Diagnostics - Status Screen - Remote Serial Command Box.

4.3.1. Most of the Diagnostics - Status screen is covered in the 1900 User Manual in the software overview section. This topic covers the Remote Serial Command Box on that screen. It is included in the User Service Manual as most users do not use data loggers with their 1900s as the Remote Serial Command box only appears in the software if a datalogger is enabled in the 1900 software. Refer to figure 4.3.1.

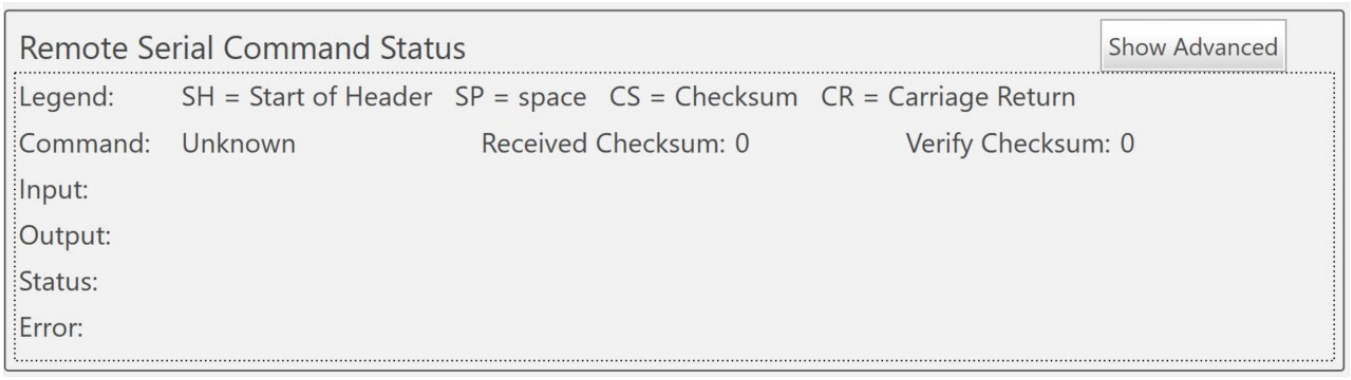
4.3.2. Remote command Status Box.

4.3.2.1. Show Advanced button: Toggles Input Hex, Output Hex, and up/down nagigation arrows into and out of the Remote Command Status Box

4.3.2.2. Legend:

4.3.2.2.1. SH = Start of Header.

Figure 4.3.1. Diagnostics - Status - Remote Serial Command Status Box.



4.3.2.2.2. SP = Space.

4.3.2.2.3. CS = Checksum.

4.3.2.2.4. CR = Carriage Return.

4.3.4.3. Command:

4.3.4.4. Received Checksum:

4.3.4.5. Verify Checksum:

4.3.4.6. Input Hex:

4.3.4.7. Input:

4.3.4.8. Output Hex:

4.3.4.9. Output:

4.3.4.10. Status:

4.3.4.11. Error:

4.4 Datalogger Tester Software.

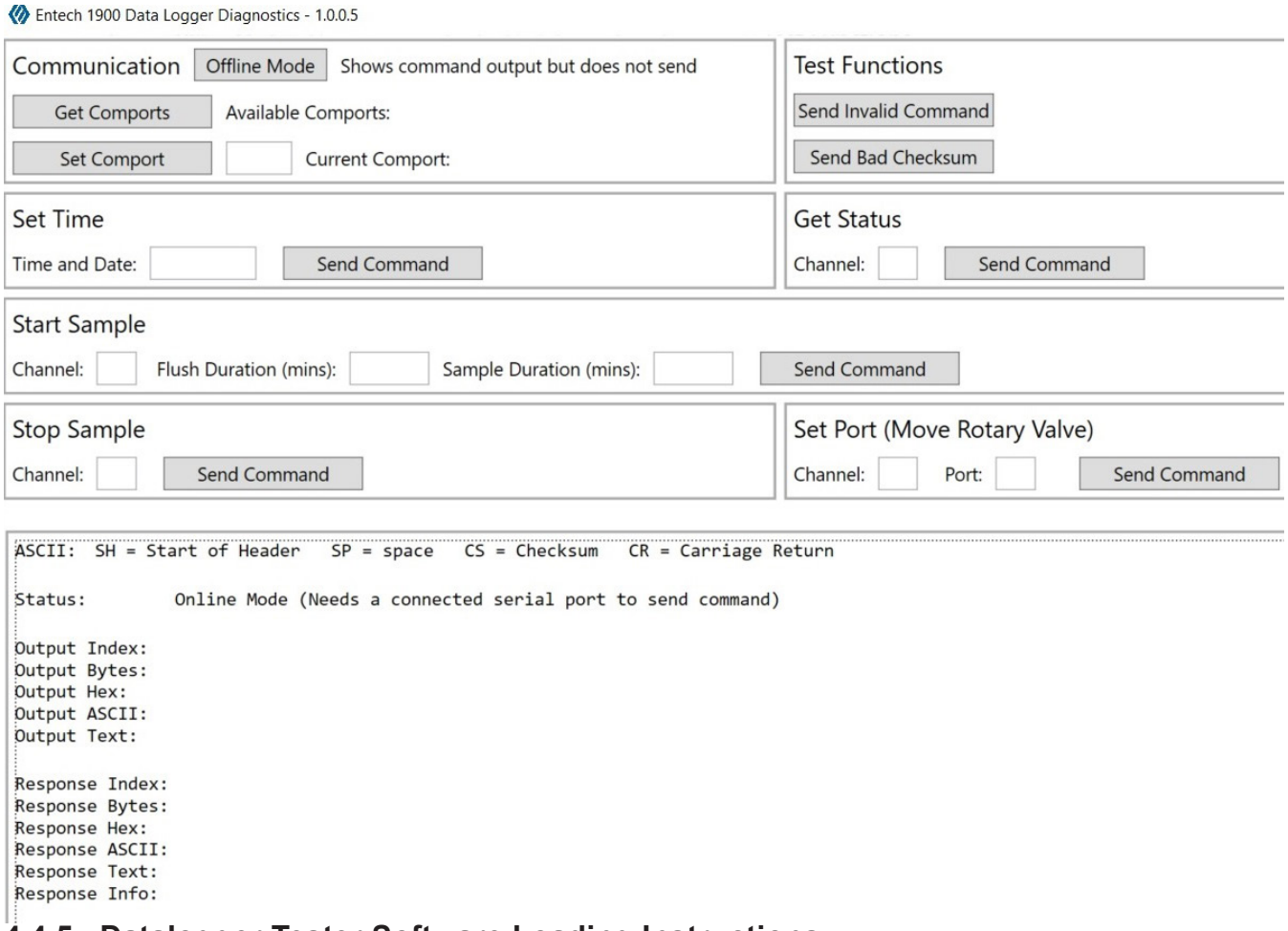
4.4.1. A “Datalogger” is really just another computer that is sending a command through the serial cable and the 1900 software is listening to this COM port for any commands from a datalogger. These commands will be coming from either a datalogger or a remote computer that is separate from the 1900. The purpose of the datalogger diagnostic tool is to pretend to be a datalogger that you can then connect to the 1900 datalogger COM port via a cable and can send commands to the 1900 for testing. The dalalogger tester software can also be used to monitor the 1900 controller to make sure the commands are received and to ensure the 1900 responds to the command with the expected information.

4.4.2. The typical setup (for development and testing): Laptop running Datalogger Diagnostic software ->------serial cable(RS232)-> Null Modem OR cable ending in female DB9 connector -> 1900 controller (via “Data Logger” connection on the back).

4.4.3. Refer to figure 4.4.3.

4.4.4. The Datalogger Tester software is a serial command diagnostic tool program to assist users in the developing and using the 1900 remote serial commands. This diagnostic tool will provide detailed information on all the commands, and will show the proper format for them (in hexadecimal, binary, and string formats).

Figure 4.4.3. Datalogger Diagnostics Software.



4.4.5. Datalogger Tester Software Loading Instructions:

4.4.5.1. Obtain a link to the Data Logger Diagnostics software from your local Entech representative. Download “DataLoggerDiagnostics 1.0.0.5.zip” and copy it onto the C drive on the computer.

4.4.5.2. Unzip the folder to the desktop.

4.4.5.3. Double-click on “ZenologgerTest.exe”, which is inside the DataLoggerDiagnostics 1.0.0.5 folder. Be aware that Zenologger is a datalogger brand. The tester software is not specific to that brand.

4.4.5.4. Set the COM port of the serial port that is sending commands to the 1900 (or use offline mode).

4.4.5.5. Set the parameters of the command you are sending (i.e. Channel, Port, etc).

4.4.5.6. Hit the “Send Command” button.

4.4.5.7. Read the output for additional information on what was sent for the command.

4.4.5.8. Wait for response from the 1900 (if not in offline mode). This can take 20-30 seconds.

4.5. Datalogger Diagnostics Software Overview. Refer to figure 4.4.1.

4.5.1. Software Version. This is at the top of the software screen.

4.5.2. Minimize, Maximize, and Close icons. These are located in the upper right of the software screen.

4.5.3. Communications Box:

4.5.3.1. Offline Mode Toggle: Click to switch back and forth from the offline to the online mode.

4.5.3.2. Get COM Ports: Click to see the next available (not in use) COM port on the computer.

4.5.3.3. Set COM Port: Enter a COM Port in the box and then click “Set COM Port” for the datalogger to use that COM port while using the Datalogger Diagnostic software. The currect datalogger COM port is also shown.

4.5.4. Test Functions Box:

4.5.4.1. Send Invalid Command: Click to send an Invalid Command to the datalogger.

4.5.4.2. Send Bad Check Sum: Click to send a Bad Check Sum to the datalogger.

4.5.5. Set Time Box:

4.5.5.1. Enter a date and time in the box and then click “**Send Command**” to send the date and time to the datalogger.

4.5.6. Get Status Box:

4.5.6.1. Enter the channel number in box and click “Send Command” to get the status of the channel.

4.5.6. Start Sample Box:

4.5.6.1. Channel Box: Enter the channel (1 or 2) to be tested.

4.5.6.2. Flush Duration Box: Enter the sampling flush duration in minutes.

4.5.6.3. Sample Duration Box: Enter the sample duration in minutes.

4.5.6.4. Send Command button: Click to start the sampling event.

4.5.7. Start Sample Box:

4.5.7.1. Channel Box: Enter the channel (1 or 2) to be tested.

4.5.7.2. Send Command button: Click to stop the sampling event.

4.5.8. Set Port (Move Rotary Valve) box:

4.5.7.1. Channel Box: Enter the channel (1 or 2) to be tested.

4.5.8.2. Position Box: Enter the position (1-8 for the 8 position option or 1-16 for a 1916) to be tested.

4.5.8.3. Send Command button: Click to move the rotary valve on the selected channel to the selected positions.

Section 5. Software Loading.

5.1. Software loading was included in the 1900 User Service Manual as most 1900s are shipped with software preloaded on a Controller. Many users may never need to load the 1900 software. This procedure is included in case the user ever wants or needs to load the 1900 software on a different computer either to replace the 1900 Controller or for user reference on their office computer. Please be aware that Entech has found that Entech sourced Controllers offer the best performance and reliability.

5.2. Computer Requirements.

5.2.1. Most new 1900s come with a Controller that fastens to the front of the 1900. It controls the 1900 and any 1916s connected to the 1900.

5.2.2. A different computer must meet Entech's current computer requirements: 4 GB RAM, WIN 10 or 11 Professional, 64 Bit, .Net Framework 4.5 or higher, with a Pentium Dual-Core I5 Processor or better. It must have all of the most current Microsoft updates (go to the Microsoft website for these).

5.2.3. The user must be logged onto the computer as an Administrator during software installation.

5.3. New 1900 Software Installation Overview.

5.3.1. Run 1900 setup.

5.3.2. Run the driver installer.

5.3.3. Setup the 1900 executable to run as an administrator.

5.3.4. Change the Computer's Time Zone Settings.

5.3.5. Disable Internet Time Synchronization.

5.3.6. Configure the 1900 Software Settings.

5.3.7. Zero the Channel 1 and Channel 2 CS1200s.

5.3.8. Flow Professor Pressure Sensor Calibration for Channel 1.

5.3.9. Flow Professor Pressure Sensor Calibration for Channel 2.

5.3.10. Calibration of the Channel 1 8 Sample Option Pressure Sensors.

5.3.11. Configuration of the Local Atmospheric Pressure.

5.3.12. Leak check the 1900.

5.3.13. Calibration of the CS1200 Flow Rate Benchmarks.

5.4. Software Installation.

5.4.1. This should not normally be necessary when the 1900 is new as it is shipped with a Controller preloaded with software. These instructions are provided in case a user would like to replace the Controller with a different PC or laptop. Entech recommends using only Entech sourced Controllers with the 1900. Users may find that loading software unto their work computer is useful for training, troubleshooting, or assisting other operators in their networks.

5.4.2. It is important to use the installer in the software media. The installer will set up the computer so the 1900 software will open every time the computer is turned on. This allows the 1900 to keep sampling and stop sampling as scheduled if power is temporarily lost while the 1900 is configured in the Auto Sample mode in the software.

5.4.3. Make a directory called “c:/EntechFiles” on the computer and transfer the 1900 Software to it.

5.4.4. Unzip the software folder if needed.

5.4.5. Go into the folder and run “Entech1900setup”.

5.4.6. Setup will create a shortcut to the 1900 executable on the desktop.

5.4.7. Ensure that the 1900’s USB cable is not connected to the computer. If this cable is connected before the drivers are loaded it will interfere with the proper loading of the USB drivers.

5.4.8. Install the FTDI Drivers: Double the “CDM21228_Setup” file. This is usually in a directory called “Drivers” that is part of the software package.

5.4.8.1. Select “Extract”

5.4.8.2. Click “Next”

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

5.4.8.4. Click “Finish”.

5.4.9. Set Entech1900.exe to run as an administrator: The 1900 program must always run as an administrator. This is very important for the support of remote login. To facilitate this right click on the “Entech1900.exe” shortcut and select properties. Click “Compatibility”

on the properties screen. At the bottom put a check mark in front of “Run this Program as an Administrator” then click “Apply”. Then click “Change Settings for All Users”. Check “Run this Program as an Administrator” at the bottom. Click “Apply” then “OK”. Click “OK” at the bottom of the Properties screen to exit it.

5.4.10. Connect the USB cable to the computer. Allow a few minutes for the computer to find the 1900 drivers.

5.4.11. The 1900 software package should also have a copy of the 1900 manual. Create a shortcut to this on the desktop.

5.5. Changing the Computer’s Time Zone Settings.

5.5.1. Follow the instructions in the section of the same name in Section 2 (Installation) of the 1900 User Manual.

5.6. Disable Internet Time Synchronization.

5.6.1. Optional. Follow the instructions in the section of the same name in Section 2 (Installation) of the 1900 User Manual.

5.7. Configure the 1900 Software Settings.

5.7.1. Follow the instructions in the section of the same name in Section 2 (Installation) of the 1900 User Manual. The configuration settings are used to tell the 1900 what to do during sampling and leakchecking.

5.8. Channel 1 or Channel 2 Zeroing.

5.8.1. Refer to “CS1200 Zeroing” in Section 3 (1900 Maintainence) of this manual (1900 User Service Manual). This procedure is used to set the zero position on the CS1200s in the 1900. The zero position must be known and set prior pressure sensor calibration.

5.9. Flow Professor Pressure Sensor Calibration for Channel 1.

5.9.1. Follow the instructions in the topic of the same name in Section 3 of this manual.

5.10. Flow Professor Pressure Sensor Calibration for Channel 2.

5.10.1. Follow the instructions in the topic of the same name in Section 3 of this manual.

5.11. Calibration of the Channel 1 8 Sample Option Pressure Sensors.

5.11.1. Follow the instructions in “Manual Calibration of the Channel 1 8 Position Option Pressure Sensors” or “Automatic Calibration of the Channel 1 8 Position Option Pressure Sensors” in Section 3 of this manual.

5.12. Configuration of the Flow Rate Benchmarks.

5.12.1. Follow the instructions in the topic of the same name in Section 3 of this manual.

5.13. Disabling Startup of Software during Computer Bootup.

5.13.1. This should not be done for routine 1900 software installation. There are two situations where it may be useful:

5.13.1.1. The user has a reason to load an older version of software when a newer version is on the computer. If they do this both the newer and older versions will open on startup. The user must follow the instructions below to disable the version of the 1900 software that they do not want to open on computer start up.

5.13.1.2. Disabling the start on start up on computers only used for troubleshooting, training, or assisting other operators.

5.13.2. Windows 7 Embedded. (Older 1900 controllers used this operating system.)

5.13.2.1. Go to Control Panel.

5.13.2.2. Go to Administrative Tools.

5.13.2.3. Go to System Configuration.

5.13.2.4. Select Start Up tab.

5.13.2.5. If you have more than one version of the 1900 software both will show up on the start up tab, just uncheck the version you don’t want to boot.

5.13.3. Windows 10.

5.13.3.1. Open Task Manager.

5.13.3.2. Click the Startup Tab.

5.13.3.3. Disable any programs that you do not want to start on computer start up.

5.14. Enabling Tablet Mode on a WIN 10 Controller.

5.14.1. This procedure is used if the Controller is not showing an onscreen keyboard. This happens very rarely and it is due to the computer thinking it is a desktop computer with a physical mouse and keyboard for hardware.

5.14.2. Way #1. Enable “Tablet Mode”. This will make it so the Controller acts like a tablet, which includes an automatic on screen keyboard. Open the notification center (bottom right), click the “Tablet mode” button. The keyboard will now appear when selecting text inputs.

5.14.3. Way 2. In Windows search bar type “Ease of Access”, then click on Ease of Access Keyboard Settings, set “Use the On-Screen Keyboard” to On.

Section 6. 1916 Rotary Valve Maintenance and Troubleshooting.

6.1. Background:

6.1.1. The Entech 1916 uses Entech's new digital actuator. These actuators are completely different than the ones used in Entech's previous generations of instruments. The alignment procedure is also completely different. The valves on the new actuators should never be turned manually to bring them into alignment as had been done with the 1816 or similar systems since this can damage the digital actuators.

6.1.2. 1916 Rotary Valve Expected Voltages:

Sample Position	Output VDC
1	4.84 V
2	4.53 V
3	4.22 V
4	3.90 V
5	3.59 V
6	3.28 V
7	2.97 V
8	2.66 V
9	2.34 V
10	2.03 V
11	1.72 V
12	1.41 V
13	1.10 V
14	0.78 V
15	0.47 V
16	0.16 V

6.1.3. When adjusting the encoder, it should always be first turned into the body of the actuator. The closer the encoder is to the actuator the more stable it seems to be during realignment. It is possible for the encoder to bottom out against the main part the actuator. In this case turn the encoder the opposite direction so it moves away from the main part of actuator until the correct voltage is reached. The actuator will adjust from 0.0 to 5.0 volts and then go back to 0.0 V. On the 1916 Rotary Valve each position is 0.3125 Volts from each other.

6.1.4. Refer to the figure 6.1.4 for the position of the 1916 Encoder and its setscrew.

Figure 6.1.4. 1916 Actuator showing its encoder and encoder setscrew.

6.2. 1916 Rotary Valve Alignment.

6.2.1. Tools needed:

6.2.1.1. Phillips Screwdriver.

.

6.2.1.2. 1/16” Hex Key (Allen wrench).

6.2.1.3. Needle nose pliers (optional).

6.2.1.4. Evacuated Canister.

6.2.2. When may the Stream Select Valve Require Alignment?

6.2.2.1. The canister is not filling to the expected final pressure or the 1900 is not reaching the target flows. It will be necessary to troubleshoot to verify that the rotary valve is the cause of the issue before continuing. Any of the valve realignment procedures below may be needed in this case. Try the Minor Alignment procedure if there is a good reason to believe the valve is only slightly out of alignment. Use the Exact Position Alignment procedure if the valve seems to be on a position other than its setpoint (i.e., setpoint of 2 and user clicks move, after which the valve is at 6). Otherwise use the Major Valve Alignment procedure.

6.2.2.1.1. Procedure to confirm the flow issue is in the 1916.

6.2.2.1.1.1. Disconnect the 1916 tubing from the 1900 channel bulkhead on the front of the 1900 but leave the cable connected between the 1900 and the 1916. Connect an evacuated canister to the now open port on the front of the 1900 (where the 1916 line had connected) channel with a piece of tubing and fittings. Set up and start a sampling event. If the 1900 is now able to achieve the target flow rate and achieve the final target vacuum then troubleshooting should focus on the 1916. Reconnect the 1916 sample line to the 1900. If the flow issue persisted and the canister was not able to achieve the expected final target vacuum then troubleshoot the 1900.

6.2.2.2. After Actuator Replacement. New actuators come pre-aligned so no more than a minor alignment or alignment verification should be necessary.

6.2.2.3. Actual actuator voltages that are significantly different than the expected voltages. When the valve is on position 4 the valve voltage should read 3.90 +/- 0.05. For the expected valve voltages of other sample positions refer to the table in section 6.1 of this manual. The voltages of other valve positions should be within +/- 0.05 Volts of the expected voltage. A significant difference in the setpoint voltage versus the actual voltage may indicate a problem with the actuator. The minor alignment procedure should be attempted but if it does not help contact your local Entech representative for help with troubleshooting if needed.

6.2.2.4. Sample is not collecting at the expected position but rather it is collecting at a different position. Use the Exact Position Alignment Procedure.

6.2.3. Major 1916 Valve Alignment Procedure.

6.2.3.1. This procedure is used when the position of the 1916 valve is unknown.

6.2.3.2. Open all 1916 ports to the atmosphere. 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).

6.2.3.3. Connect an evacuated canister to port 4 on the 1916. (It is possible to use another position during valve alignment although that is not covered in this procedure.) All other ports on the 1916 should be open to the atmosphere. Open the valve on the evacuated canister. Note the pressure on the 1916's channel. If it has gone under vacuum the 1916 is on position 4. Either do the exact position realignment procedure or minor alignment procedure as appropriate. Otherwise (still at atmospheric pressure) continue.

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

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

6.2.3.5.1. Start advancing the stream select valve (SSV) by one position and wait several seconds between positions to see if there is any (ANY) decrease in pressure. You are looking for position 4, but the valve may be so far off that it might just "sweep" past port 4 quickly and then become isolated again. Therefore, even a drop of 0.5 psi cannot be ignored.

6.2.3.5.2. When a drop is observed, move the valve to the position that the valve was on just before the pressure drop. (If the valve was "on 7" and it was just sent it to "8" and the pressure dropped then send the valve back to "7".) Do not be concerned if the position is not reading "4". At this point, the position that is shown may be way off.

6.2.3.5.3. For the 1916 channel click "-%" to move the valve slightly forward.

6.2.3.5.4. Wait 10 seconds to observe a pressure change to well below atmospheric pressure. If there is no change, repeat steps 2-3.

6.2.3.5.5. If steps 6.2.3.5.3 and 6.2.3.5.4 do not result in a pressure drop below atmospheric pressure within 50 clicks of "-%" then the valve is not near port 4 after all. Go back to step 1.

6.2.3.6. If a change is observed and the encoder voltage is not 3.96 V +/- 0.02 (3.96 is the expected voltage at which flow should begin from position 4 (0.06 is added to 3.90 for a total of 3.96 V)), then loosen the absolute encoder set screw and turn the encoder until the voltage indicates 3.96 V +/- 0.02. Tighten the setscrew, but do not overtighten.

6.2.3.7. The 1916 Valve is aligned. Do the Alignment Confirmation Procedure to verify proper alignment.

6.2.4. Minor 1916 Valve Alignment Procedure.

6.2.4.1. This procedure is used to optimize the alignment of the 1916. The 1916 must be known to be pulling to the correct port during sampling.

6.2.4.2. Open port 3 and port 4 on the 1916 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).

6.2.4.3. Connect an evacuated canister to port 4 on the 1916. (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 on the 1916's channel. It should read the local atmospheric pressure.

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

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

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

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

6.2.4.5.3. If there is no change, repeat steps 6.2.4.5.1 and 6.2.4.5.2.

6.2.4.6. After a pressure change to well below atmospheric pressure is observed, loosen the absolute encoder set screw and turn the encoder until the voltage indicates 3.96 V +/- 0.02 (3.96 is the expected voltage at which flow should begin from position 4 (0.06 is added to 3.90 for a total of 3.96 V). Tighten the setscrew, but do not overtighten.

6.2.4.7. The 1916 stream select valve is aligned. Do the Alignment Confirmation Procedure to verify proper alignment.

6.2.5. Exact Position Alignment Procedure

6.2.5.1. Note how many positions the 1916's actual position is off from the setpoint and write it down in case needed later. Verify the valve is turning by sending the 1916 to the next position. ("Diagnostics" - Rotary Valve" - Select the position with the pulldown. - "Move".) Put an evacuated can on that position and open the canister valve. If the pressure for the 1900's channel drops the valve is moving. If the valve is not moving troubleshoot until resolved. Otherwise continue.

6.2.5.2. Loosen the Encoder Set Screw. Then adjust the encoder until it reads the correct voltage for the position the 1916 valve is at (use the expected voltages from the beginning of the TechNote). Tighten the set screw.

6.2.5.3. Do the Minor Stream Select Valve Alignment Procedure to ensure the valve is fully and properly aligned.

6.2.6. Alignment Verification Procedure

6.2.6.1. This procedure is used to verify the optimal alignment of the 1916. The 1916 must be known to be pulling from the correct position during sampling.

6.2.6.2. 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).

6.2.6.3. Connect an evacuated canister to port 4 on the 1916. (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 on the 1916's channel. It should read the local atmospheric pressure.

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

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

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

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

6.2.6.5.3. If there is no change, repeat steps 6.2.6.5.1 and 6.2.6.5.2.

6.2.6.6. Once a change is observed if the Voltage is 3.96V +/- 0.02 the 1916 valve is properly aligned. If not loosen the set screw. Then turn the encoder to adjust the voltage to 3.96 V +/- 0.02 and tighten the setscrew. Redo this procedure once to verify alignment if any adjustment was made to the encoder.

6.3. 1916 Encoder Test 1.

6.3.1. Power off the 1900 and computer (shut off).

6.3.2. Unplug the cable between the 1900 and 1916.

6.3.3. Refer to the figures 6.1.4 and 6.3.3.

6.3.4. Turn on the 1900. (No need to turn on the computer.)

6.3.5. Where the 1900 cable plugs into the rear of the 1900 test for 5 VDC and 24 VDC (refer to figure 6.3.5) by testing pin 6 (24 vdc) to pin 8 (ground). Repeat the test for pin 7 (5

Figure 6.3.3. The red box shows the test points on the rear of the 1900 for the 1916 encoder voltage. The yellow box shows the connect points for the cable between the 1900 and the 1916.

VDC) to pin 8.

6.3.6. If these are good turn off the 1900. Plug in cable back into the 1900 and disconnect the other end from the 1916.

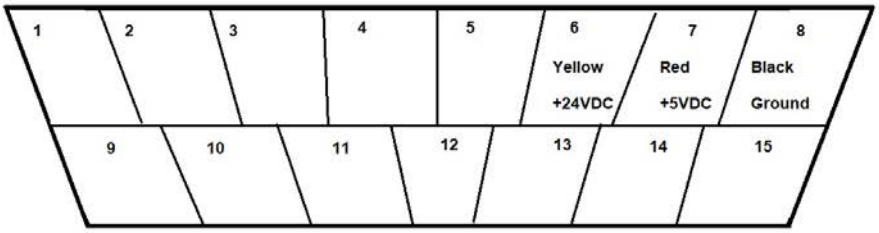
6.3.7. Turn on the 1900. Test pin 6 to 8 and pin 7 to 8 on the 1916 end of the cable. The results should be 5 VDC from 7 to 8 and 24 VDC from 6 to 8. Refer to figure 6.3.5.

6.3.8. Power off the 1900. (Computer should still be off.)

6.3.9. Reconnect the DB15 cable to the 1916.

Figure 6.3.5. Test point at the 1900 1916 DB-15 Connectors and at the 1916 end of the DB15 Cable.

1916 DB15 Connector on rear of 1900.



6.4. 1916 Encoder Test 2.

6.4.1. Refer to the red box in figure 6.3.3 for the 1916 test points. For this test the 1916 cable must be connected to the 1900 and the 1916. Check the voltage (5 VDC target) between CH1 and Ground (or CH2 and Ground if the 1916 is on Channel 2). Does voltage agree with the voltage for the channel in the 1900 software (in the Status box) to the voltage given in the software for the 1916 rotary valve?

6.5. 1916 Encoder Test 3.

6.5.1. Tools Needed:

6.5.1.1. Phillips Screwdriver.

6.4.1.2. 1/16” Hex Key (Allen wrench).

6.4.1.3. Needle nose pliers (optional).

6.5.2. Refer to the figure 6.1.4 for the location of the Encoder and its setscrew.

6.5.3. Open the top of the 1916.

6.5.4. The 1900 and its controller must be powered on for this test. Note the 1916 valve position and voltage. On the back of the 1916 check the voltage between CH1 and GRND. (Refer to figure 6-2.) Note the voltage. This voltage will be used later. Does voltage between CH1 and Ground match the voltage in the software?

6.5.6. Find the encoder on the 1916 actuator (refer to attached picture). Use a 1/16” hex to loosen the set screw for the encoder. Turn the encoder one half of a full turn. (either direction). Note 1916 encoder voltage and positions. On the back of the 1916 check the voltage between CH1 and GRND. Note the voltage. Does it match the software?

6.5.7. When done loosen the encoder set screw and turn the encoder back to its original voltage. This should keep the 1916 rotary valve properly aligned. Then tighten the encoder set screw.

6.6. 1916 Encoder Test 4.

6.6.1. Send the 1916 from position 1 to position 16. Does it finish on position 16? Does the voltage appear to spike while the valve is moving?

6.7. 1916 Rotor Inspection and Replacement.

6.7.1. Parts Needed:

6.7.1.1. 01-31-30340 17/16 Top-LD Rotor.

6.7.2. Tools and Supplies Needed:

6.7.2.1. Entech Screwdriver.

6.7.2.2. Phillips Screwdriver.

6.7.2.3. Adjustable Wrench.

6.7.2.4. KimWipes (a small low lint paper tissue for lab use, any brand may be used).

6.7.2.5. Clean, inert compressed gas. UHP Nitrogen or Helium may be used.

6.7.3. Procedure:

6.7.3.1. Close all canisters connected to Channel 1. Any canisters with MQT fittings must be removed. If this step is not done any canisters with open valves (or connect with MQT fittings) will fill with air when the rotor is removed.

6.7.3.2. Open the 1900 and use the controls to send the 8 Position Option Rotary Valve to position 1. (Diagnostics - Rotary Valve - Use the pulldown to select position 1. - Click Move.) Close the 1900 software, turn off the 1900, and remove the 1900 top cover.

6.7.3.3. Grasp the valve cover (“Preload Assembly”) with your fingers and turn it counter-clockwise to remove it. It may be necessary to use an adjustable wrench to loosen it. If this is necessary, hold the valve firmly with one hand to prevent it from slipping in its collar. An alternative if the cover is difficult to remove is to put a screwdriver next to a nut (nut but not tubing as the tubing could be damaged) going into the valve and push it down to keep the valve from moving.

6.7.3.4. Once the valve cover is removed use the Entech screwdriver to make a small mark on top of the rotor at the common port on the valve. This mark will make it easier to replace the rotor in the correct orientation later. Then use the magnet end of the Entech screwdriver to remove the rotor. If the rotor does not come out easily then while being careful not to scratch the inner surface of the valve gently pry the the top of rotor until it loosens up and remove it with the magnet.

6.7.3.5. Checking the Rotor. Inspect the working surface (whitish polymer) of the rotor. Look for excessive discoloration (some is normal), scratches, or shiny metal flakes. If any of these are present, the rotor should be replaced. Scratches may not always be obvious visually.

Place the rotor on a KimWipe. Then wash hands thoroughly with soap and water. Carefully pick up the rotor without touching the polymer surface. Using a fingernail feel between the slots in the rotor (run the fingernail between the slots) to feel for any scratches. If present replace the rotor.

6.7.3.6. While the rotor is out of the valve inspect the inner surfaces of the valve for scoring (scratches in the valve surface). If scoring is found then the valve must be replaced. The replacement valve is pn: 01-31-30320S FSL 17/16 VALVE HEAD W. STANDOFF.

6.7.3.7. If the rotor will reused, it can be cleaned by wiping the polymer surface with a KimWipe and then blowing it off with a clean, dry, solvent free compressed gas (UHP Nitrogen or Helium).

6.7.3.8. To replace the rotor in the valve (with a new rotor use the Entech screwdriver to make a mark on top of the rotor in the same position as on the old rotor) use the mark on top the rotor to line up the “post” on the bottom of the rotor with the slot in the bottom of the valve (on top of the valve standoff). Set the rotor in the valve so the mark is slightly to the left or right to ensure the rotor does not immediately go in the slot. Then put a finger on top of the rotor and slowly turn it towards the slot. The rotor should drop in with a slight “Click” sound and you should feel it drop into position. Next replace the valve cover (preload assembly).

6.7.3.9. Next power on the 1900 and open its software. First check the alignment of the 1916 Rotary Valve (Alignment Verification Procedure) then leak check position 1-1 by connecting an evacuated canister to it and verifying that 1-1 is leak tight.

6.7.3.10. Once the rotary valve alignment has been checked and the 1916 has been confirmed as leak tight the 1900/1916 is ready to resume normal operations.

Section 7. 1900 8 Position Option Rotary Valve Maintenance and Troubleshooting.

7.1. 1900 8 Position Option Rotary Valve Alignment.

7.1.1. Background:

7.1.1.1. The Entech 1900 Channel 1 8 Position Option uses Entech's digital actuator. These actuators are completely different than the ones used in Entech's previous generations of instruments. The alignment procedure is also completely different. The valves on the new actuators should never be turned manually to align the valves as had been done with earlier systems since this can damage the digital actuators and flow path tubes.

7.1.1.2. Expected Voltages for the 1900 8 Position Option Rotary Valve:

Stream	Output VDC
1	4.62 V
2	4.00 V
3	3.37 V
4	2.75 V
5	2.12 V
6	1.50 V
7	0.87 V
8	0.25 V

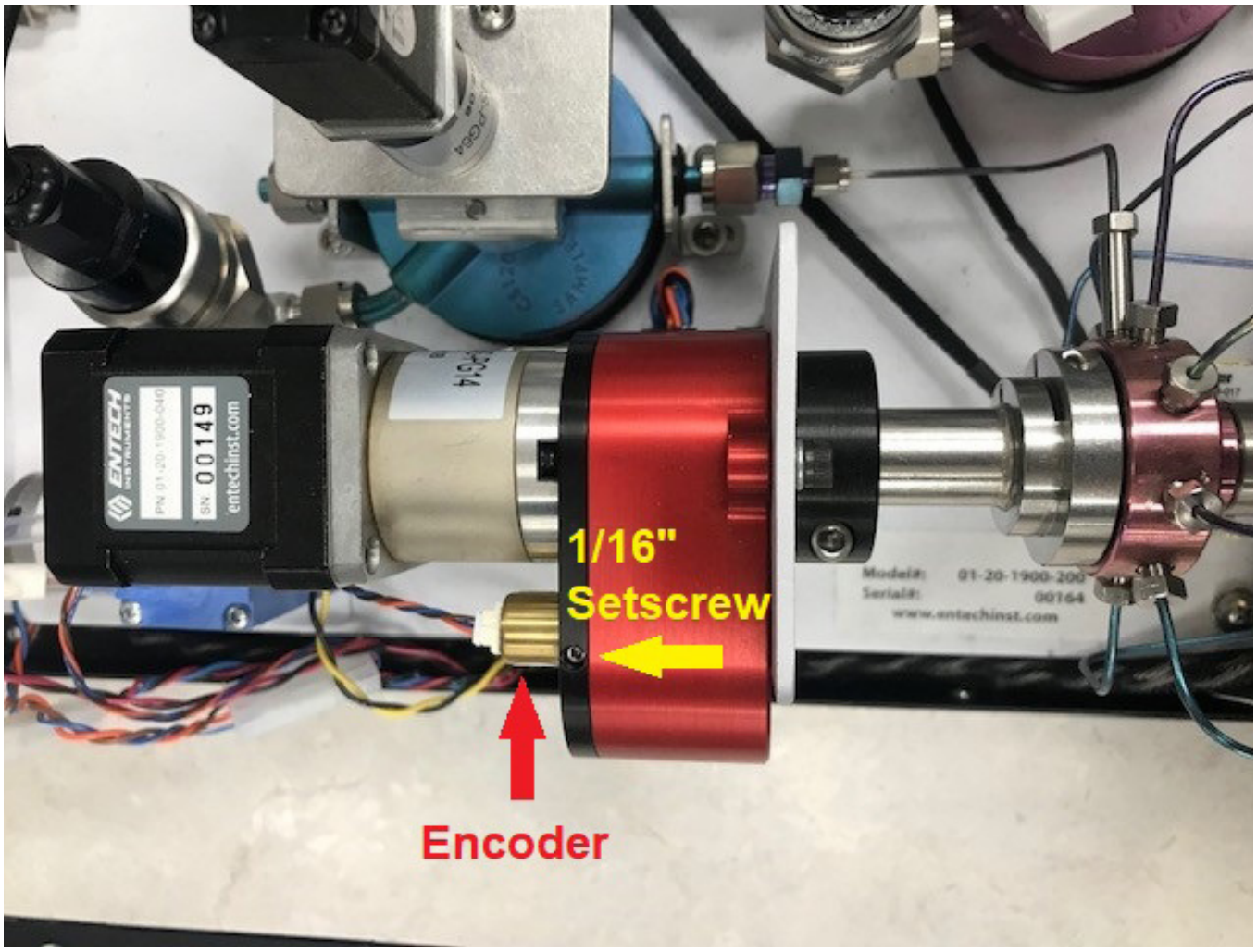
7.1.1.3. When adjusting the encoder, it should always be first tightened towards the body of the actuator. The encoder readings seem more stable during alignment if the encoder is closer to the body of the actuator. It is possible for the encoder to bottom out against the body of the actuator. In this case turn the encoder away from the body of actuator until the correct voltage is reached. The actuator will adjust from 0.0 to 5.0 volts and then go back to 0.0 V. On the stream select valve each position is 0.625 Volts from each other.

7.1.1.4. Refer to figure 7.1.1.4 for the position of the Encoder and its setscrew on the 8 Position Actuator.

7.1.1.5. When may the Rotary Valve Require Alignment?

7.1.1.5.1. Canisters not filling to the expected final vacuum or low flows during sampling. Any of the valve realignment procedures below may be needed in this case. Try the

Figure 7.1.1.4. 1900 8 Position Option Actuator showing its encoder and encoder setscrew.



Minor Alignment Procedure if there is good reason to believe the valve is only slightly out of alignment. Otherwise use the Major Valve Alignment procedure. It will be necessary to troubleshoot to verify that the optional Channel 1 Rotary Valve is the cause of the flow problems before continuing to the alignment procedures.

7.1.1.5.1.1. Procedure to confirm the flow issue is in the optional 8 Position Rotary Valve. Remove the top cover from the 1900. Disconnect the tubing that connects the Channel 1 CS1200 to the rotary valve at the front of the CS1200 (the end closest to the front of the 1900). Connect an evacuated canister to the front of the CS1200 with a piece of tubing. Set up a sampling event, leak check the line, open the valve on the evacuated canister, and then start a sampling event. If the 1900 is now able to achieve the target flow rate and achieve the final target vacuum then troubleshooting should focus on the rotary valve. Reconnect the line to the front of the CS1200 then realign and troubleshoot the rotary valve. If the flow issue persist and the canister is not able to achieve the expected final target vacuum then troubleshoot the CS1200, inlet sampling lines, restrictor assembly, and the inlet filter.

7.1.1.5.2. After Actuator Replacement. New actuators come pre-aligned so no more than a minor alignment or alignment verification should usually be necessary. Do the alignment verification to verify the actuator is properly aligned after actuator replacement.

7.1.1.5.3. Output voltages are significantly different than the expected voltages. When the valve is on position 2 the valve voltage should read 4.00 +/- 0.05. Use the Minor Realignment Procedure if the voltage is off by more than this. If the output voltage remains significantly off from the expected voltage contact Entech for assistance with troubleshooting.

7.1.1.5.4. The sample is collected on a different position than expected or the rotary valve is known to be on a different position. Use the Exact Position Alignment Procedure below.

7.1.2. Tools needed:

7.1.2.1. Phillips Screwdriver.

7.1.2.2. 1/16" Hex Key (Allen wrench).

7.1.2.3. Needle nose pliers (optional).

7.1.3. Major Rotary Valve Alignment Procedure:

7.1.3.1. This procedure is used when the position of the valve is unknown or incorrect.

7.1.3.2. Open all Channel 1 (CH1) sample 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).

7.1.3.3. If the Channel 1 pressure is not at atmospheric pressure go to the CS1200 screen and spin the CS1200 open 10000 steps. Once the Channel 1 pressure goes to atmospheric pressure spin the CS1200 closed 10000 steps. If the Channel 1 pressure drops significantly below atmospheric pressure during the rest of this procedure repeat this step as needed.

7.1.3.4. Connect an evacuated canister to 1-2 (Channel 1 Position 2) on the 1900. (It is possible to use another position during valve alignment. Position 2 was chosen as its expected voltage is a nice round number.) Open the valve on the evacuated canister. Note the pressure of position 1-2. It should be under vacuum. Note the CS1200 CH1 Pressure. If the CH1 Pressure is under vacuum the rotary valve is on position 2. Either do the exact position realignment procedure or minor alignment procedure as appropriate. Otherwise (CH1 Pressure still at atmospheric pressure) continue.

7.1.3.5. Go to the 1900 "Diagnostics" - "CS1200" screen. Verify that the Current Position is about 2000. (This shows the CS1200 is closed.)

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

7.1.3.6.1. Start advancing the CH1 rotary valve by 0.5 positions (Select the position with the pulldown and click "Move" and wait several seconds between positions to see if there is any (ANY) decrease in pressure. You are looking for position 2, but the valve may be so far off that it might just "sweep" past port 2 quickly and then become isolated again. Therefore, even a

drop of 0.5 psi cannot be ignored. (If the pressure drops to near vacuum go to step 6 and then go to the Minor Valve Alignment procedure. That large of a pressure drop indicates the rotary valve is on position 2 and very close to the proper alignment.)

7.1.3.6.2. When a drop is observed, move the valve to the position that the valve was on just before the pressure drop. (If the valve was "on 7.5" and it was just sent it to "8" and the pressure dropped then send the valve back to "7.5".) Do not be concerned if the position is not reading "2". At this point, it may be way off.

7.1.3.6.3. For Channel 1 click "-%" to move the valve slightly forward.

7.1.3.6.4. Wait 10 seconds to observe a pressure change to well below atmospheric pressure. If there is no change, repeat steps 7.1.3.6.2 and 7.1.3.6.3.

7.1.3.6.5. If steps 7.1.3.6.2 and 7.1.3.6.3 do not result in a pressure drop below atmospheric pressure within 50 clicks of "-%" then the valve is not near position 2 after all. Go back to step 7.1.3.6.1.

7.1.3.6.6. If a change is observed and the encoder voltage is not 4.08 V +/- 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 4.08 V.)), then loosen the absolute encoder set screw and turn the encoder until the voltage indicates 4.08 V +/- 0.02. Tighten the setscrew, but do not overtighten.

7.1.3.7. The 1900 Rotary Valve is aligned. Do the Alignment Confirmation Procedure to verify the valve's alignment.

7.1.4. Minor Rotary Valve Alignment Procedure

7.1.4.1. This procedure is used when the rotary valve is expected to be close to its expected position.

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

7.1.4.3. Open all Channel 1 sample 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).

7.1.4.4. If the Channel 1 pressure is not at atmospheric pressure 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 the alignment procedure below repeat this step as needed.

7.1.4.5. Connect an evacuated canister to 1-2 (Channel 1 Position 2) (Note that the rotary valve should still be on position 1-2.) on the 1900. (It is possible to use another position during valve alignment although that is not covered here.) Open the valve on the evacuated canister. Note the pressure of position 1-2. It should be under vacuum. Note the CH1 CS1200 Pres-

sure.

7.1.4.6. If the CH1 CS1200 Pressure Sensor is under vacuum the rotary valve is on position 2.

7.1.4.6.1. Loosen the setscrew.

7.1.4.6.2. Turn the encoder until its voltage reads about 4.00 +/- 0.02 VDC.

7.1.4.6.3. Tighten the setscrew (Do not overtighten.) then repeat the Minor Rotary Valve Alignment Procedure from the beginning.

7.1.4.7. If the Channel 1 Pressure is still at atmospheric pressure) continue.

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

7.1.4.7.2. Go to the 1900 “Diagnostics” - “Rotary Valve” screen. Use the “Rotary Position” pulldown to select position “1.5”. Then click “Move” to send to rotary valve to position 1.5.

7.1.4.7.3. Click “-%”. (It is located to the right of “Move”.)

7.1.4.7.4. Wait 10 seconds to observe a pressure change to well below atmospheric pressure. If there is no change, repeat step 7.1.4.7.3.

7.1.4.7.5. Once a change is observed loosen the absolute encoder set screw and turn the encoder until the Channel 1 Voltage in the Status Box indicates 4.08V +/- 0.02. Tighten the setscrew, but do not overtighten.

7.1.4.8. The 1900 Rotary Valve is aligned. Do the Alignment Confirmation Procedure to verify the valve’s alignment.

7.1.5. Exact Position Alignment Procedure

7.1.5.1. Loosen the Encoder Set Screw. Then adjust the encoder until it reads the correct voltage for the actual position of the stream select valve. Tighten the set screw.

7.1.5.2. Do the Minor Stream Select Valve Alignment Procedure to make sure the valve is fully and properly aligned.

7.1.6. Alignment Confirmation Procedure

7.1.6.1. This procedure is used to confirm alignment of the Channel 1 8 Position Option Rotary Valve. Before using the procedure the valve must be known to be aligned and moving to its correct positions.

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

7.1.6.3. 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).

7.1.6.4. 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.

7.1.6.5. 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.

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

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

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

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

7.1.6.7.3. If there is no change, repeat steps 7.1.6.7.1 and 7.1.6.7.2.

7.1.6.7.4. If a 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 4.08 V)), then do the Minor 1900 Rotary Valve Alignment Procedure above.

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

7.2. Analog Output Noise Test.

7.2.1. Go to ‘Diagnostics” - “INSTRUMENT”.

7.2.2. In the “Intake Pump” box click “Enable Diagnostics”. Turn the pump “ON”. (Click “Pump On”.)

7.2.3. In the “Pressure Voltage Output” box click “Enable Diagnostics”.

7.2.4. Enter “15 psia” in the Channel 1 pressure box then click “Set”, output byte should show “255”.

7.2.5. Enter “15 psia” in the Channel 2 Pressure box then click “Set”, output byte should show

“255”.

7.2.6. In the “Flow Rate Voltage Output” box click “Enable Diagnostics”.

7.2.7. Enter “15 cc/min” in the Channel 1 Flow Rate box then click “Set”, output byte should show “255”. (Note for this test to work then the Max Flow Rate Output on the Settings - CH1 Config screen must be set to 15.)

7.2.8. Enter “15 cc/min” in the Channel 2 Flow Rate box then click “Set”, output byte should show “255”. (Note for this test to work then the Max Flow Rate Output on the Settings - CH2 Config screen must be set to 15.)

7.2.9. In the Pump Flow Voltage box click “Enable Diagnostics”.

7.2.10. Click “Send 5.0 V”.

7.2.11. In the Channel Active Voltage Output box click “Enable Diagnostics”.

7.2.12. Click “CH1 Active”. Its Active status will change to “TRUE”. This sends 5 VDC to “CH1 Active” on the rear of the 1900.)

7.2.13. Click “CH2 Active”. Its Active status will change to “TRUE”. This sends 5 VDC to “CH2 Active” on the rear of the 1900.)

7.2.14. Wait about a minute while these outputs are on and monitor the analog input readings (pressure sensors, encoder, and current flow). This can be any one of the following:

7.2.14.1. If the 8 Position Option is present, any position pressure sensor reading for Channel 1 positions 1-8.

7.2.14.2. If 8 position option is connected to Channel 1 or a 1916 is attached to either Channel 1 or Channel 2, observe encoder readings in the status bar at top of the software.

7.2.14.3. If neither of the above, monitor the “Current Flow” number in the Pump Flow Voltage Output diagnostics box

7.2.15. Look for erratic and jumpy readings indicating large amounts of noise or disruption in the board (IC).

7.3. 8 Position Option Rotor Check and Replacement.

7.3.1. Parts Needed:

7.3.1.1. 01-31-30240 9 Port, 8 Pos Rotor. This will only be needed if the rotor is found to be damaged or if the user has decided to replace the rotor before inspecting it.

7.3.2. Tools and Supplies Needed:

7.3.2.1. Entech Screwdriver or other small magnet suitable for removing the rotor from the valve.

7.3.2.2. Phillips Screwdriver.

7.3.2.3. Adjustable Wrench.

7.3.2.4. 5/32" Hex Key.

7.3.2.5. KimWipes (A small low lint paper tissue for lab use. The brand is not critical.)

7.3.2.6. Clean, inert compressed gas.

7.3.3. Procedure:

7.3.3.1. Close all canisters connected to Channel 1. Any canisters with MQT fittings must be removed. If this step is not done any canisters with open valves will fill with air when the rotor is removed.

7.3.3.2. Open the 1900 and use the controls to send the 8 Position Option Rotary Valve to position 1. (Diagnostics - Rotary Valve - Use the pulldown to select position 1. - Click Move.) Close the 1900 software, turn off the 1900, and remove the 1900 top cover.

7.3.3.3. Grasp the valve cover ("Preload Assembly") with your fingers and turn it counter-clockwise to remove it. It may be necessary to use an adjustable wrench to loosen it. If this is necessary, hold the valve firmly with one hand to prevent it from slipping in its collar. An alternative if the cover is difficult to remove is to put a screwdriver next to a nut going into the valve and push it down to keep the valve from moving.

7.3.3.4. Once the valve cover is removed use the Entech screwdriver to make a small mark on top of the rotor at the common port on the valve. This mark will make it easier to replace the rotor in the correct orientation later. Then use the magnet end of the Entech screwdriver to remove the rotor. If the rotor does not come out easily then being careful not to scratch the inner surface of the valve gently pry the top of rotor until it loosens up and remove it with the magnet.

7.3.3.5. Checking the Rotor. Inspect the working surface (whitish polymer) of the rotor. Look for excessive discoloration (some is normal), scratches, or shiny metal flakes. If any of these are present, the rotor should be replaced. Scratches may not always be obvious visually. Place the rotor on a KimWipe. Then wash hands thoroughly with soap and water. Carefully pick up the rotor without touching the polymer surface. Using a fingernail feel between the slots in the rotor (run the fingernail between the slots) to feel for any scratches. If present replace the rotor.

7.3.3.6. While the rotor is out of the valve inspect the inner surfaces of the valve for scoring (scratches in the valve surface). If scoring is found then the valve must be replaced. The re-

placement valve is pn: 01-31-30220S   SC (Silonite Coated) 9/8 Rotary Valve with Standoff.

7.3.3.7. If the rotor will reused, it can be cleaned by wiping the polymer surface with a Kim-Wipe and then blowing it off with a clean, dry, solvent free compressed gas (UHP Nitrogen or Helium in an Entech canister at 10-20 psig will work.).

7.3.3.8. To replace the rotor in the valve (with a new rotor use the Entech screwdriver to make a mark on top of the rotor in the same position as on the old rotor) use the mark on top the rotor to line up the “post” on the bottom of the rotor with the slot in the bottom of the valve (on top of the valve standoff). Set the rotor in the valve so the mark is slightly to the left or right of its original position to ensure the rotor does not immediately go in the slot. Then put a finger on top of the rotor and slowly turn it towards the slot. The rotor should drop in with a slight “Click” sound and you should feel it drop into position. Next replace the valve cover (preload assembly).

7.3.3.9. Next power on the 1900 and open its software. First check the alignment of the 1900 8 Position Option Valve (Alignment Verification Procedure) then leak check position 1-1 by connecting an evacuated canister to it and verifying that 1-1 is leak tight.

7.3.3.10. Once the aligment has been confirmed and the 1900 is leak tight normal operations can resume.

Technical Support

In the US and Canada as well as in countries without an Entech Instruments, Inc. distributor please email support@entechinst.com or call 805-527-5939, ext. 1, for support.

In all other countries please contact your local Entech distributor for support.

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