

Integrating the FlowVPE System from C Technologies, Inc. with PendoTECH Control Systems

Introduction

PendoTECH TFF Process Control System, Five Station TFF Screening System, and Normal Flow Filtration Screening System (NFFSS) are powerful tools designed to automate a range of process development activities primarily around purification/filtration in product development labs. These control systems can run automated recipes with little to no user interaction while collecting data from a wide range of sensors and logging to a central data file. One of the most important elements in these development activities is being able to accurately determine the concentration of the product of interest. One of the best inline systems for protein concentration in-line is the FlowVPE System and this pairs with the highly flexible and configurable PendoTECH systems. This Technical Note will describe how to integrate a FlowVPE System with a PendoTECH Control System so all process data can be viewed and trended on one interface and also, all data logged with the proper time sync to one data file for future graphing and analysis. It can be rather tedious alone to merge multiple data files after a process run is complete.

This Technical Note is divided into these sections:

1. Configuring the FlowVPE Output
2. Integration to the PendoTECH TFF Process Control System
3. Integration to the PendoTECH Five Station TFF Screening System
4. Integration to the PendoTECH Normal Flow Filtration Screening System (NFFSS)

1. Configuring the FlowVPE Output

- a) Hardware interface: First, the hardware interface must be configured with a connector to facilitate safe and secure connection to the interfaced system as required. The connector (PendoTECH part number MC-7138K27) should be installed to the NI 9265 interface signal as shown. Use a cable mount as shown in the Figure 1 to secure the connector to the top of the unit to provide proper strain relief.



Figure 1 PendoTECH connector to NI 9265 Box

- b) As shown, the BROWN wire is installed into position 0 and the BLUE wire in position 1:



Figure 1. Connector wire connections to NI 9265 Box

Here is the completed installation with the power supply wired into positions 8 and 9.

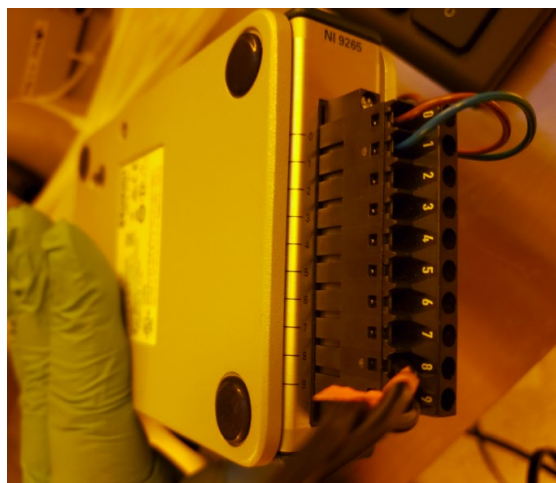
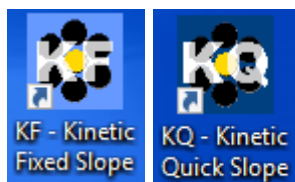


Figure 3. All wire connections to NI 9265 Box

- c) The FlowVPE laptop is connected to the USB port of the NI 9265 box.

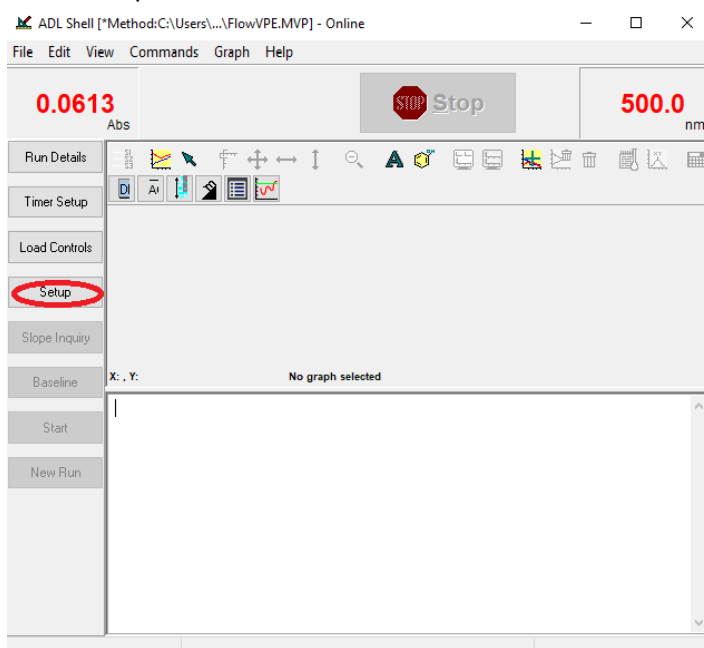


- d) Open the KF or KQ software by double clicking the desktop icon and wait for it to fully load.

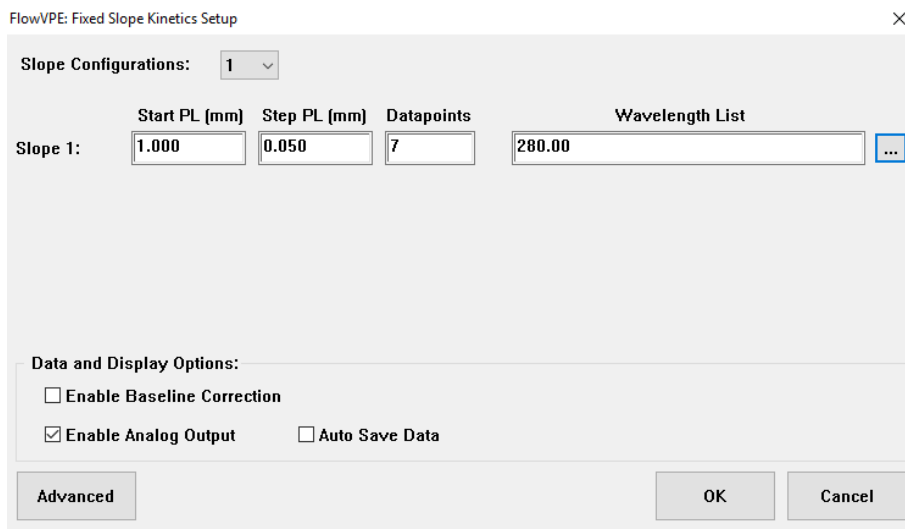


- e) Make sure to follow the proper loading procedure and load the appropriate flow cell + Fibrette in Load Controls prior to clicking Setup.

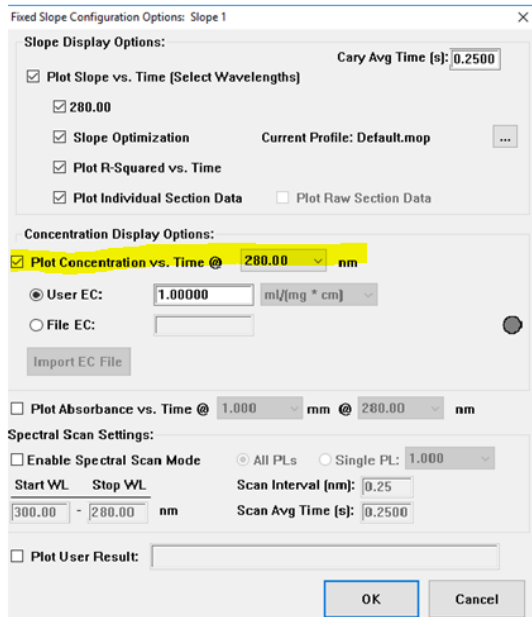
f) Click "Setup"



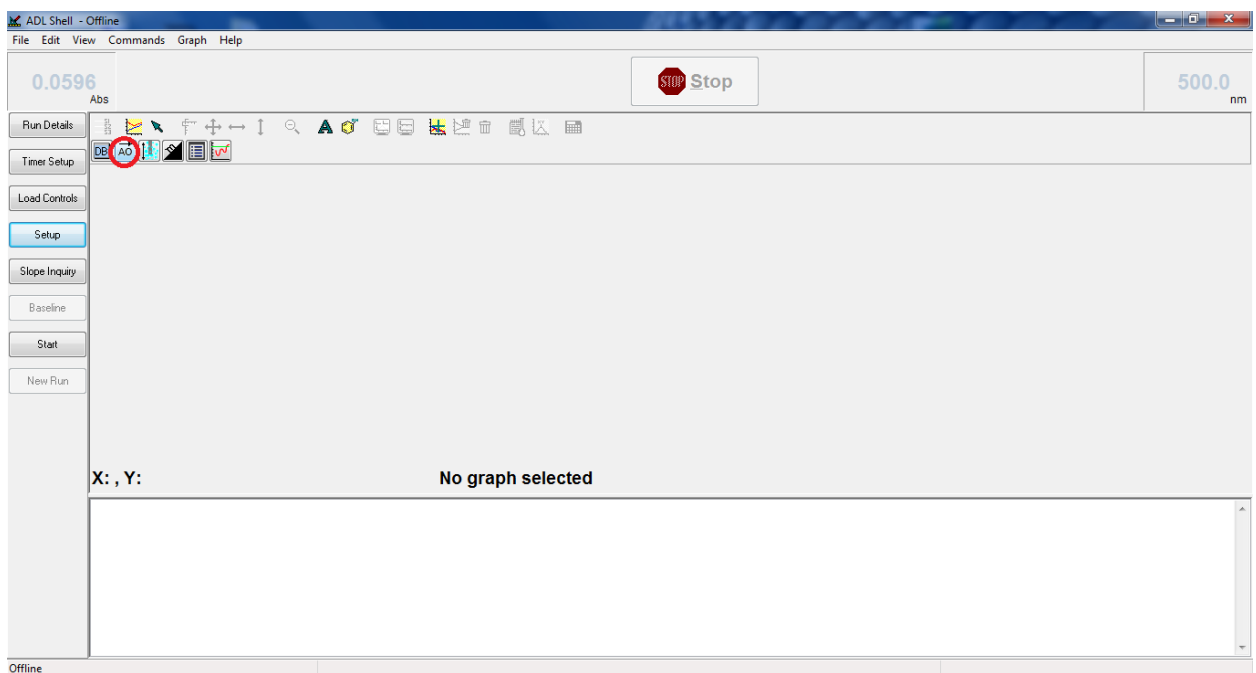
g) Check Enable Analog Output and click the ellipses button "..." for advanced settings.



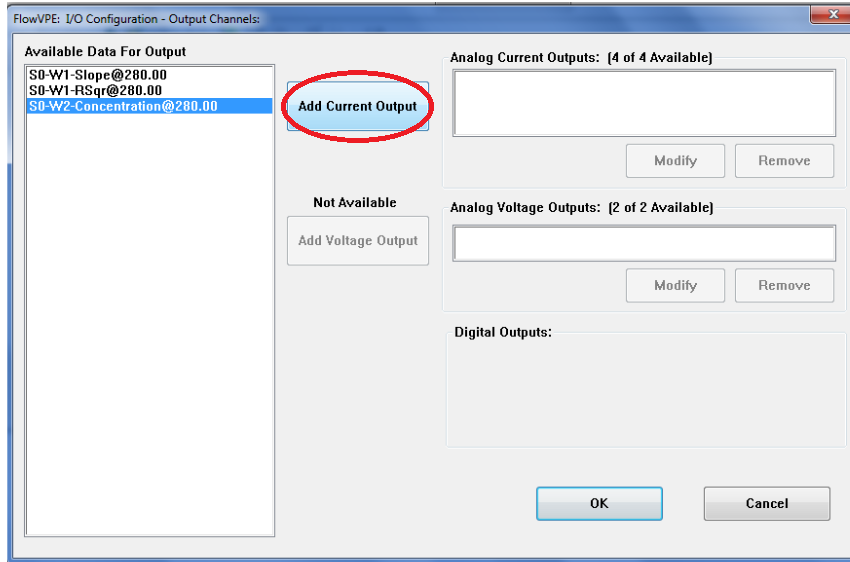
h) Check Plot concentration vs time and click ok.



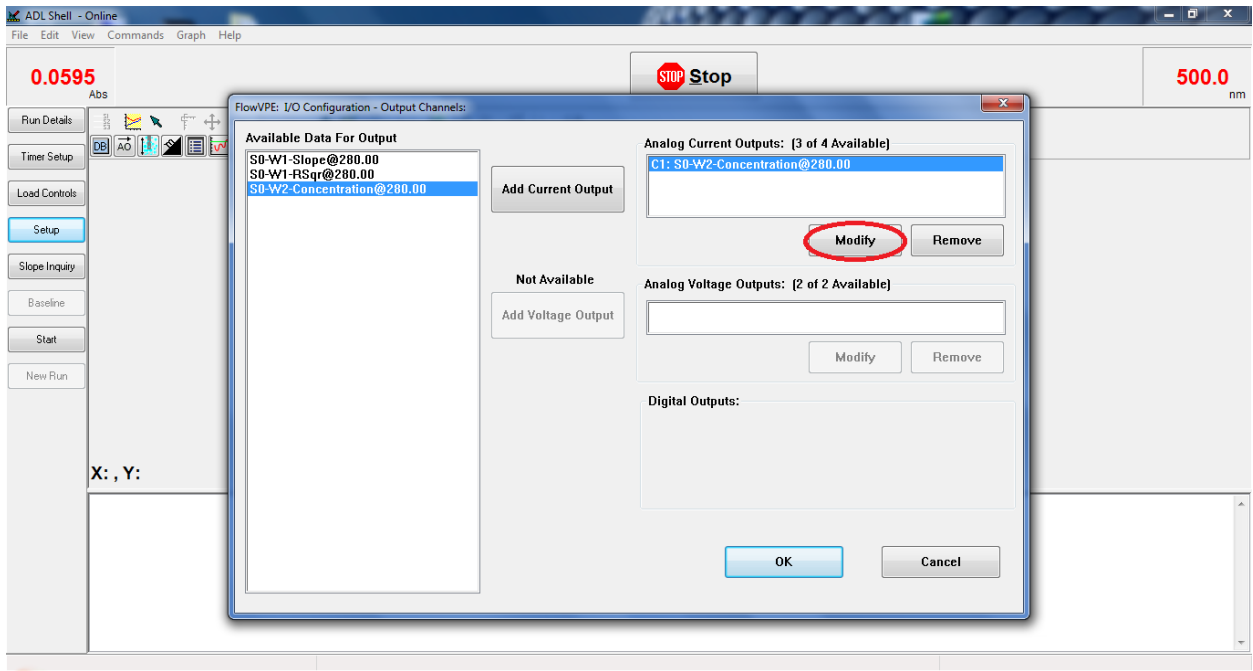
i) Click "Ao" from the tool bar



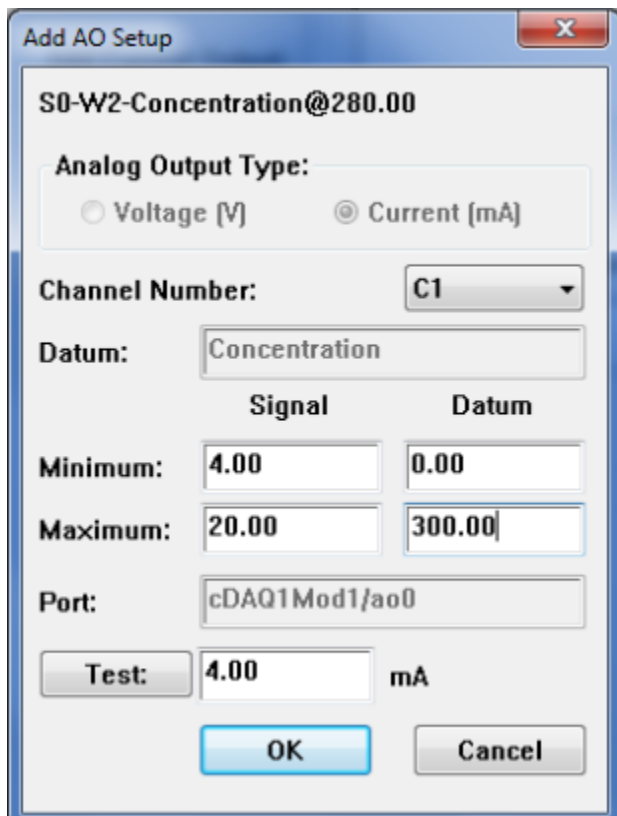
j) Add Current Output



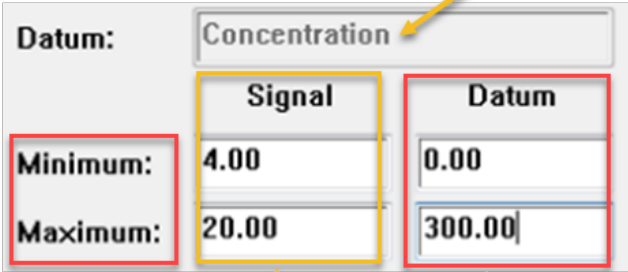
k) Click "Modify" to bring up the setup screen.



l) The following dialog box will appear:



m) Setup the parameters on the following screen and then click OK.



Concentration shown here

Enter minimum & maximum values

Datum:	Concentration
Minimum:	4.00
Maximum:	20.00
Signal	Datum
	0.00
	300.00

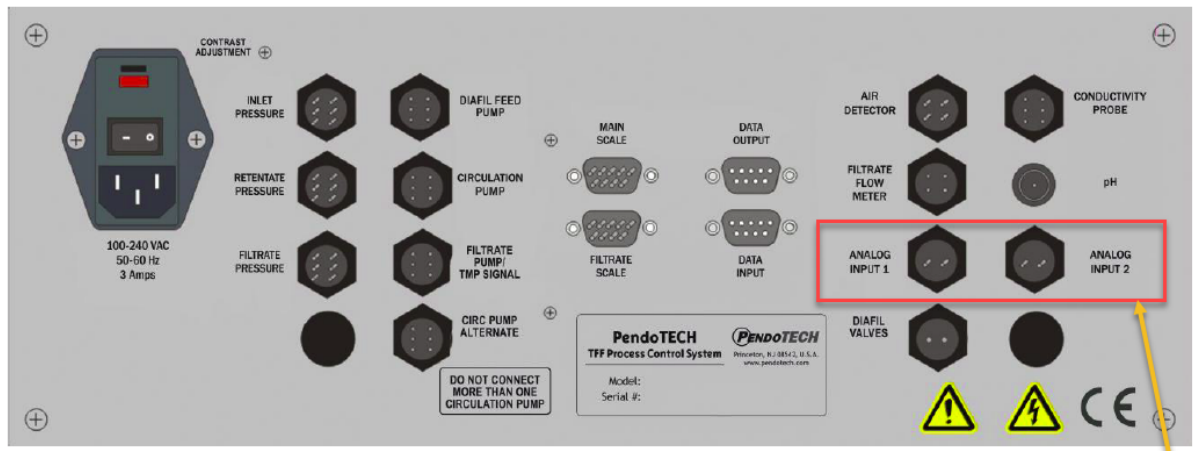
For interface to the PendoTECH Systems, these values must be set as shown

Enter the concentration range that is desired to the logged and trended
IMPORTANT NOTE: THESE ARE THE SAME VALUES THAT MUST BE ENTERED IN THE PENDOTECH SYSTEM

n) Click OK and return to main program when max concentration value is entered.

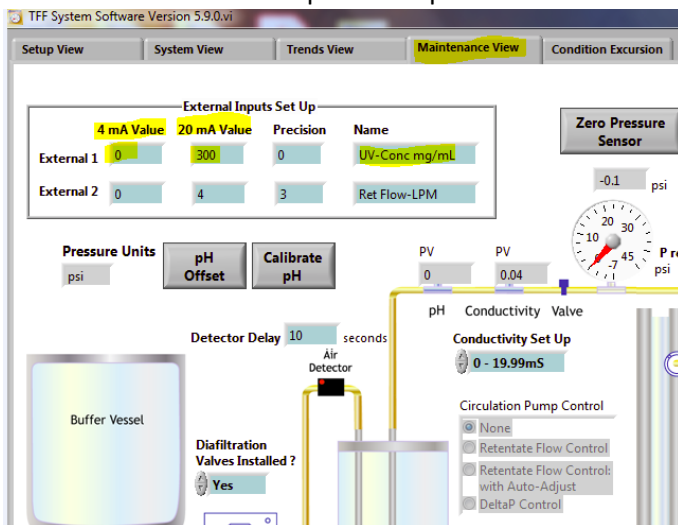
2. Integration to the PendoTECH TFF Process Control System

- a) This following cable from PendoTECH is required: 1 each of PDKT-UV-PCS
- b) Confirm the PendoTECH Control System is Powered OFF
- c) Connect the cable from the connector installed on the NI 9265 to one of the two analog input connectors rear panel on the TFF Process Control System



Connect to either of these (Analog 1 is recommended because Analog 2 is reserved for the Retentate Flow Meter if being used, but either can be used)

- d) Power on the Control System
- e) Launch the PC software
- f) Once fully opened, refer to the Maintenance View on the PC software where the range is configured to match those entered in the FlowVPE software (as shown in 1-I). The values are entered in the External Inputs Set Up as shown:



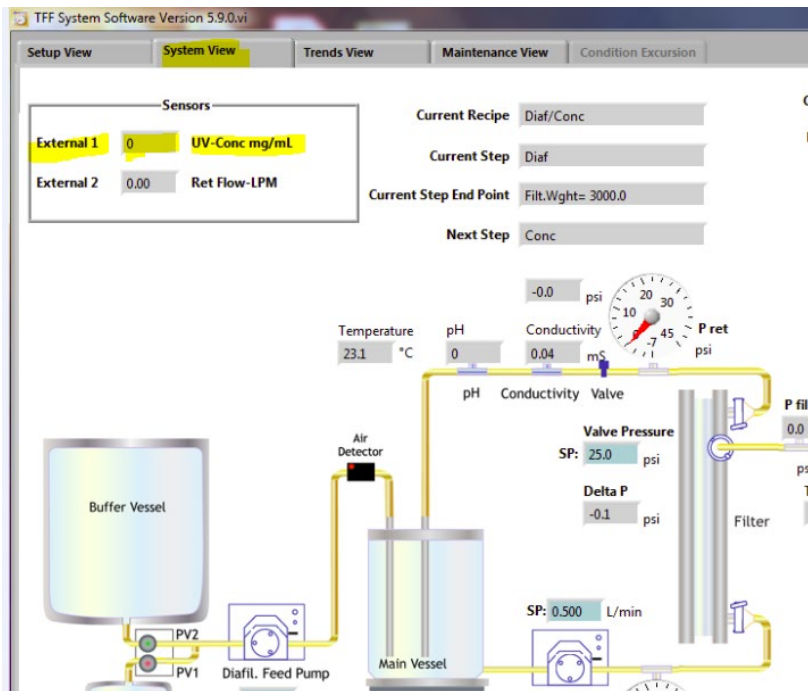
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These values are saved until changed by the user so this only needs to be done once. The values will be stored and reloaded each time the software is opened.

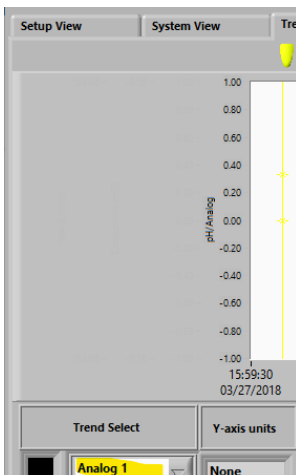
The precision is a drop down menu allowing the user to define how many decimal places the reading should display and this should be set to 0.

The name is simply a text field to name the data stream and this will appear on the System View and also in the data file.

Here is how the value appears on the System View:



The value from the FlowVPE that is shown on the System View is written to the data file along with the name given, and it may be trended on the Trends View:

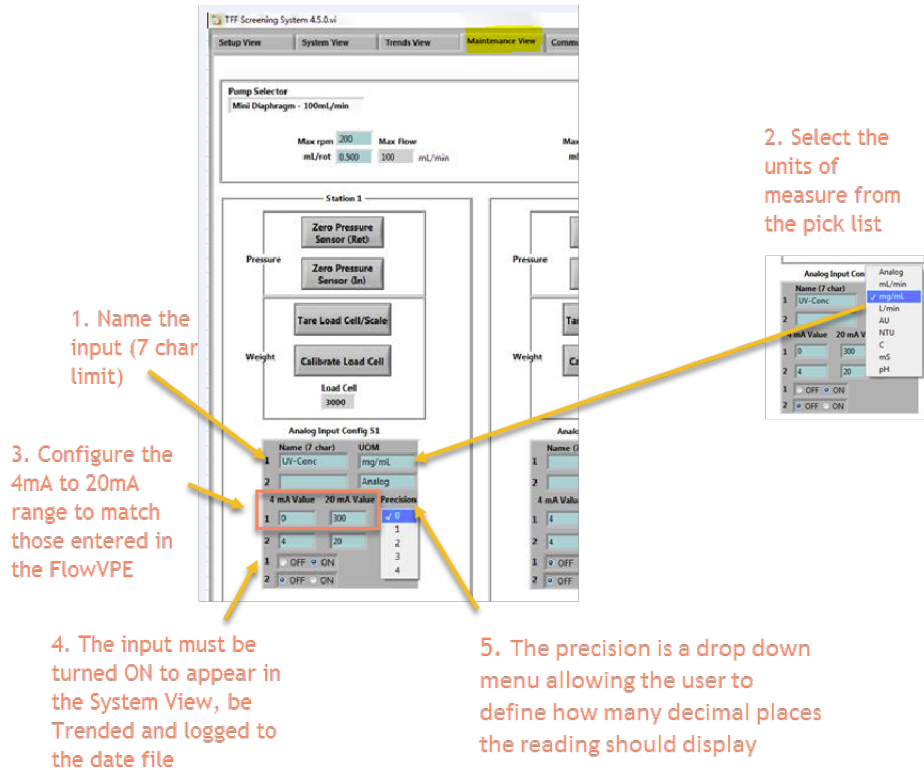


3. Integration to the PendoTECH Five Station TFF Screening System

- a) This following cable from PendoTECH is required: PDKT-UV-5TFF
- b) Confirm the System is Powered OFF
- c) Connect the cable from the connector installed on the NI 9265 to one of the 10 analog input connectors left side panel on the Five Station TFF Screening System. There are 2 available for each station as shown:



- d) Power on the System
- e) Launch the PC software
- f) Once fully opened, refer to the Maintenance View on the PC software where the input is configured using the instructions as shown including setting the digits of precision to 1:



1. Name the input (7 char limit)

2. Select the units of measure from the pick list

3. Configure the 4mA to 20mA range to match those entered in the FlowVPE

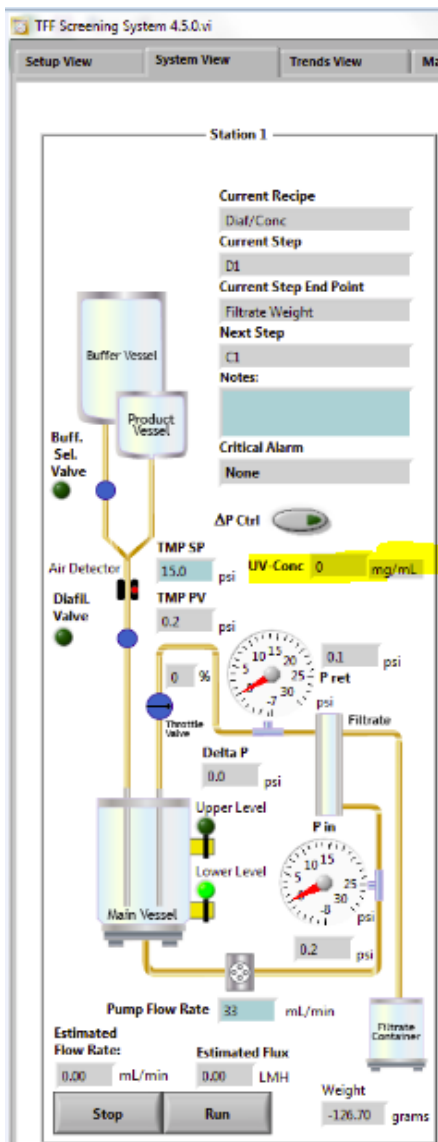
4. The input must be turned ON to appear in the System View, be Trended and logged to the date file

5. The precision is a drop down menu allowing the user to define how many decimal places the reading should display

- g) These values are saved until changed by the user so this only needs to be done once. The values will be stored and reloaded each time the software is opened.

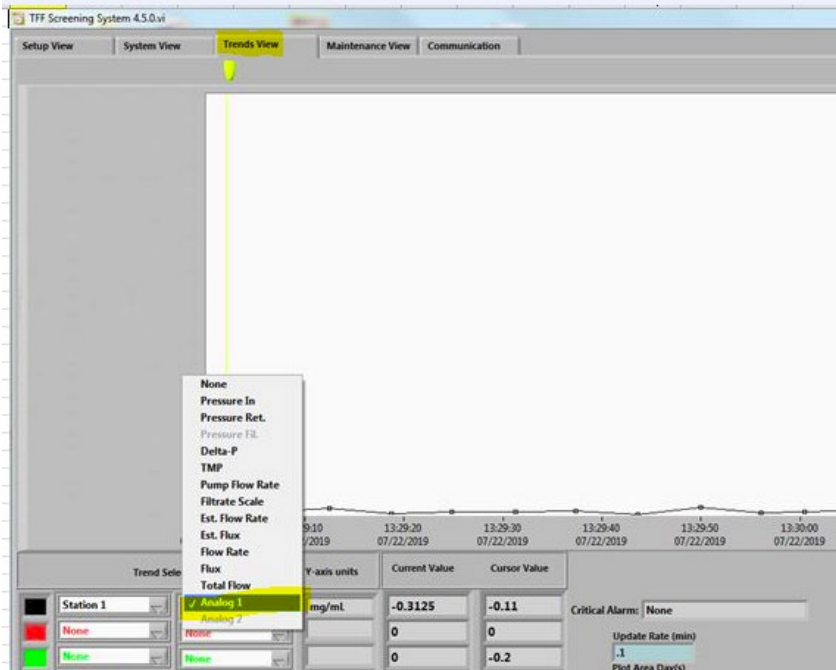
Technical Note

h) Here is how the value appears on the System View:

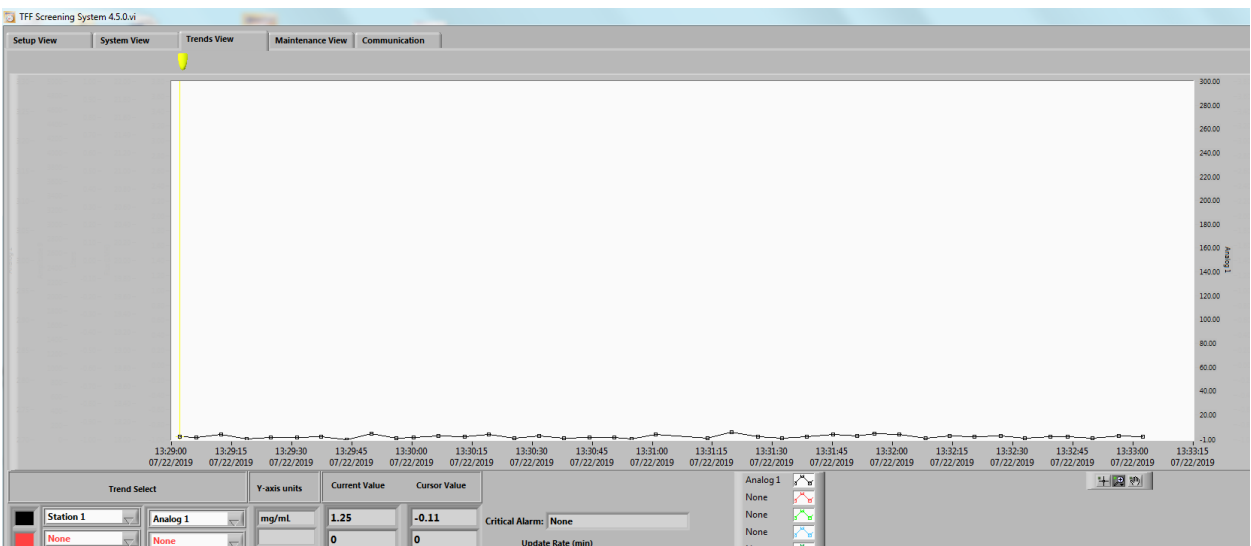


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- i) The value is written to the data file along with the name given, and it may be trended on the Trends View. Select the corresponding Station number from the first column and then from the 2nd pick list, select the input to be trended:



- j) It will then appear on the trend plot with the other data desired to be trended along with its units listed (the units cannot be listed on the Y-axis because the Analog inputs can have a long list of options):



- k) The data and its name that is simply a text field is used to name the data points and its units will appear on the System View and also in the data file.

4. Integration to the PendoTECH Normal Flow Filter Screening System (NFFSS)

- a) This following cable from PendoTECH is required: 1 each of PDKT-M8M-M8M
- b) Confirm the PendoTECH NFFSS System is Powered OFF
- c) Connect the cable from the connector installed on the NI 9265 to one of the four milliamp analog inputs on the Expansion Module (PendoTECH Part Number: PDKT-BOX-NFFSS) . With use of the Expansion Module, individual transmitters may be connected to one of the Analog Input connector on the rear of the NFFSS System.
- d) The mA inputs are marked and are on the top row of connectors and there is one for each station. So connect the input to the connector for the desired station in use.

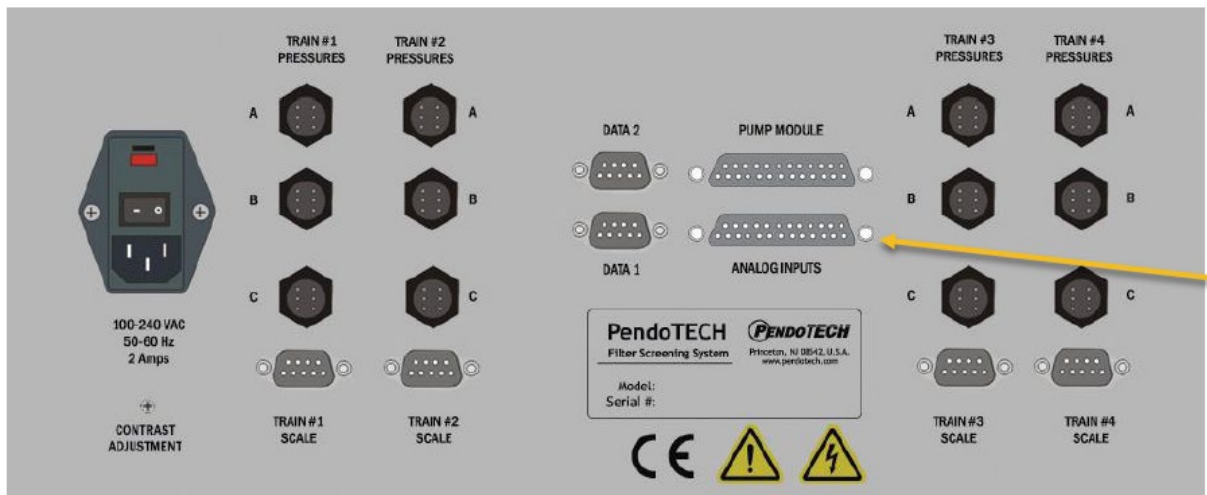
Expansion Module for the NFFSS - Use milliamp inputs which are on the top row- and not Voltage on the bottom row



- e) Make sure the Expansion Module is connected to the rear panel of the NFFSS System with a 25 pin cable to the Analog Inputs Connector:



Expansion Module for the NFFSS 25 pin connector to system back panel



- f) Power on the Control System
- g) Analog inputs must be ENABLED on the NFFSS control box. To access the set-up menus on the NFFSS, press the SETUP key on the keypad (must be in STOP mode to access these menus). Use the UP and DOWN arrows on the keypad to navigate between the menu choices and press ENT

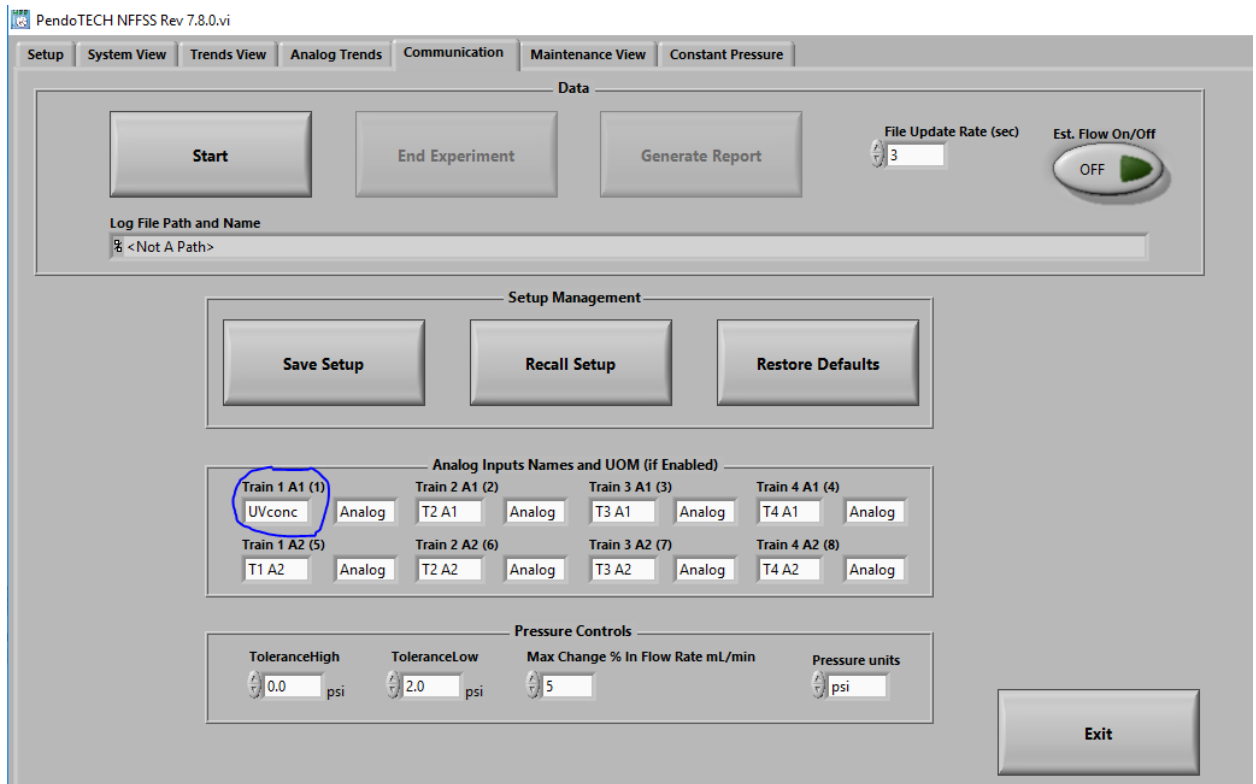
to access the individual menu. Select the Analog Inputs Menu then ENT and press the UP arrow to enable analog inputs.

- h) There are 8 available analog inputs for the NFFSS, however the aim is to set channels 1-4 to “4mA value= 0; 20mA value= maximum range is configured to match those entered in the FlowVPE software” and ZERO for the number of decimal places.

<h3>Analog Inputs</h3>	<p>Press ENT and the following screen appears. Use the UP and DOWN arrow keys Enable the Analog Input feature. NOTE: When this is selected, the 8 analog values are added to the end of the data collection screen.</p>	<p>Press ENT and the following screen appears. Use the UP and DOWN arrow keys to select the desired the analog input channel to set up. 1-4 are 4-20mA inputs for Trains1-4; 5-8 are 0-10V inputs for Trains1-4</p>
<pre>Setup Mode -> Analog Inputs</pre>	<pre>Setup Mode -> Analog Inputs Analog in: Disabled</pre>	<pre>Setup Mode -> Analog Inputs Analog Input 1 Enter to set range</pre>
<p>Press ENT and if input 1-4 is selected the first screen below appears and if 5-8 is selected, the second screen appears. Enter the respective value. Press the UP arrow button to clear an entry. Press ESC to exit.</p>	<p>Press ENT and one of the following screens appears. Enter the respective value. Press the UP arrow button to clear an entry. Press ESC to exit.</p>	<p>Use the UP and DOWN arrow keys to select zero through six decimal places Press ENT when done.</p>
<pre>Setup Mode -> Analog Inputs Analog Input X 4mA Value: X.XX</pre>	<pre>Setup Mode -> Analog Inputs Analog Input X 20mA Value: X.XX</pre>	<pre>Setup Mode -> Analog Inputs Analog Input X Decimal plc:2</pre>

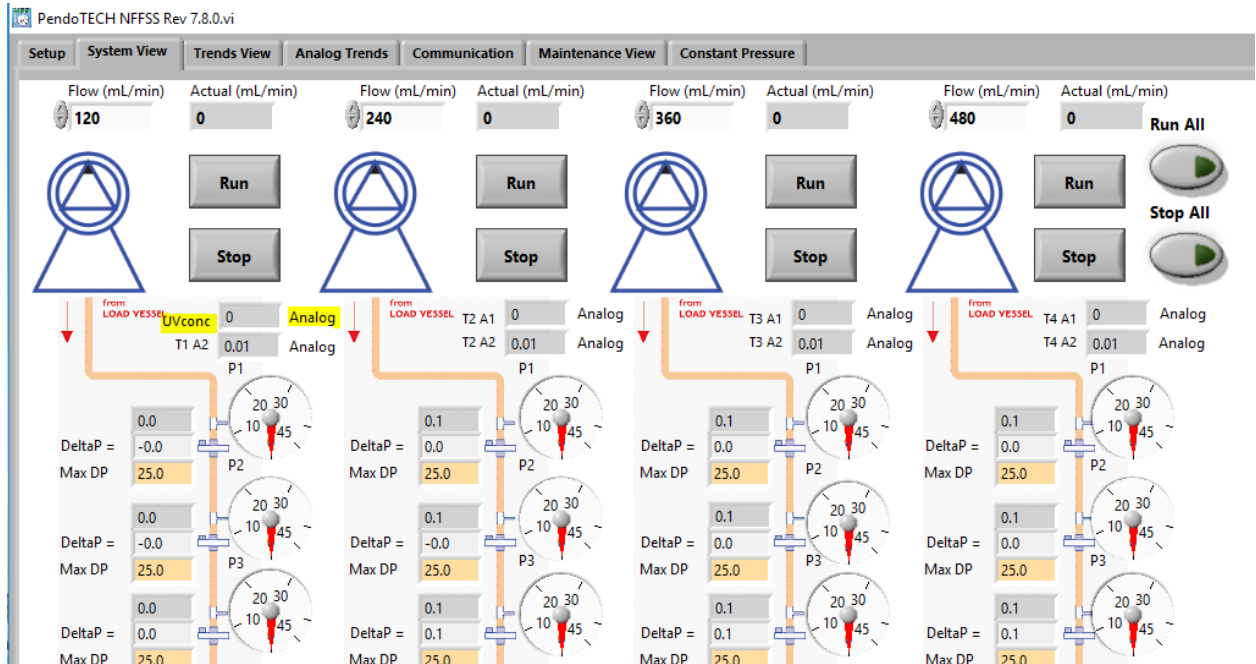
- i) Press ESC to return to return to the main screen on the NFFSS Control Box.
- j) Launch the PC software
- k) Once fully opened, refer to the Communication Tab View on the PC software where the input fields are labeled and units selected. There are default entries of TxA1 and TxA2 where x is the train number. You can replace these fields with a custom field of up to 6 characters. This product was not specifically designed for processes with varying concentration of mg/mL is not a choice, so this can remain as units of Analog in the drop down list. These values are saved until changed by the user so this only needs to be done once. The name is simply a text field to name the data stream and this will appear on the System View, Trends View and also in the data file.

Technical Note



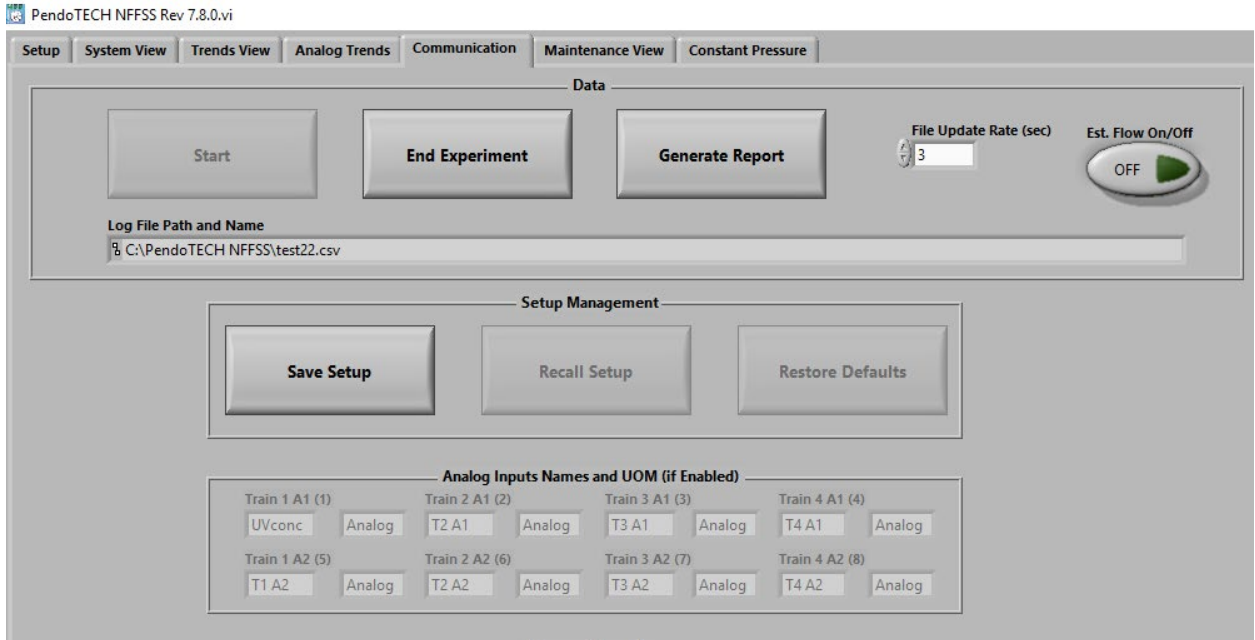
The values will be stored and reloaded each time the software is opened. In the example above, it is connected to Train 1, A1:

l) The labels will then appear on the System View:



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- m) Once the data file is started, the labels and units cannot be changed and the file is formatted and also trending can be done:



- n) Values can be trended on the Analog Trend tab by turning on the desired Trend Select from the list (click it and the green indicator lights up). The Name and Units appear in the tabular format and also in the legend.

