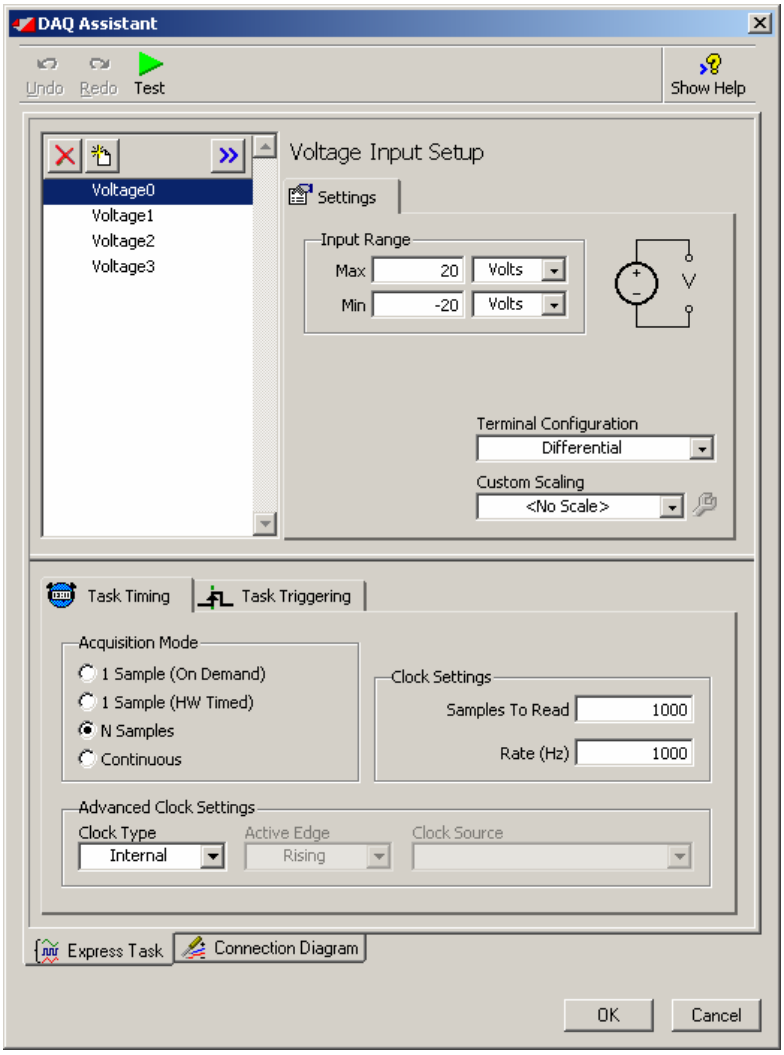
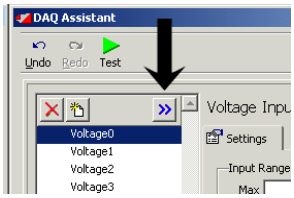
Configuring Temperature, Pressure, Flowrate, Pump Speed (Analog Inputs), Pump Speed (Analog Output), Pump Start/Stop (Digital Output), Using a Global Variable and Data Logging to Excel File in LabVIEW
ver 6.06

Analog Inputs

a. Open a new VI in LabVIEW and separate the front panel and block diagram (control T).
b. Right-click on the block diagram and navigate to Functions>>Input>>DAQ Assistant.
c. When you place the DAQ Assistant on the block diagram, you will see a configuration box. Choose Analog Input>>Voltage.
d. You will then see a page with the DAQ device listed. Expand the + (plus) sign if necessary and a list of channels will appear (e.g. ai0 thru ai7). Choose the channels for the analog inputs according to where they are wired on the terminal block. To select more than one channel, choose the first channel, then hold down the <CTRL> key and left-click on all subsequent channels. Click "Finish"
e. You will now have a menu that looks like the following:





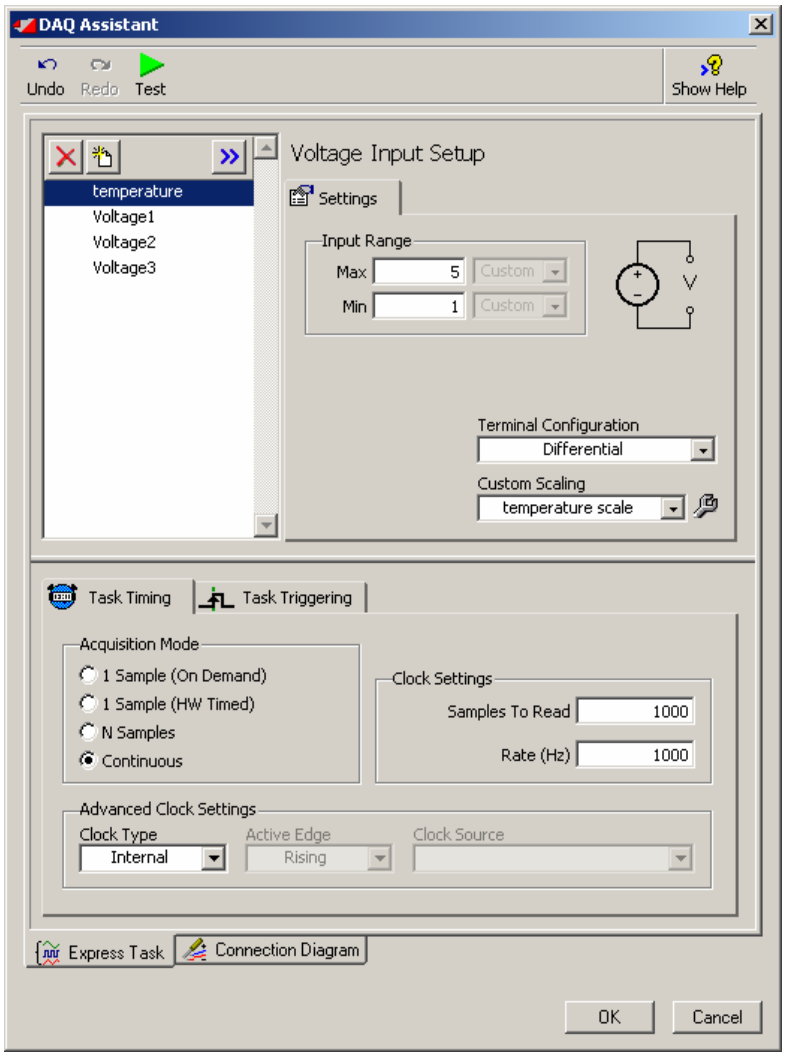
f. Expand the Task Window in the view box on the left using the blue >> to show your "n" number of channels. You will configure each channel separately. Now condense the Task Window to show the settings for each channel.

g. For the first channel, right click and rename. Set the Input Range to correspond with the sensor wired to that channel and set Terminal Configuration to Differential.

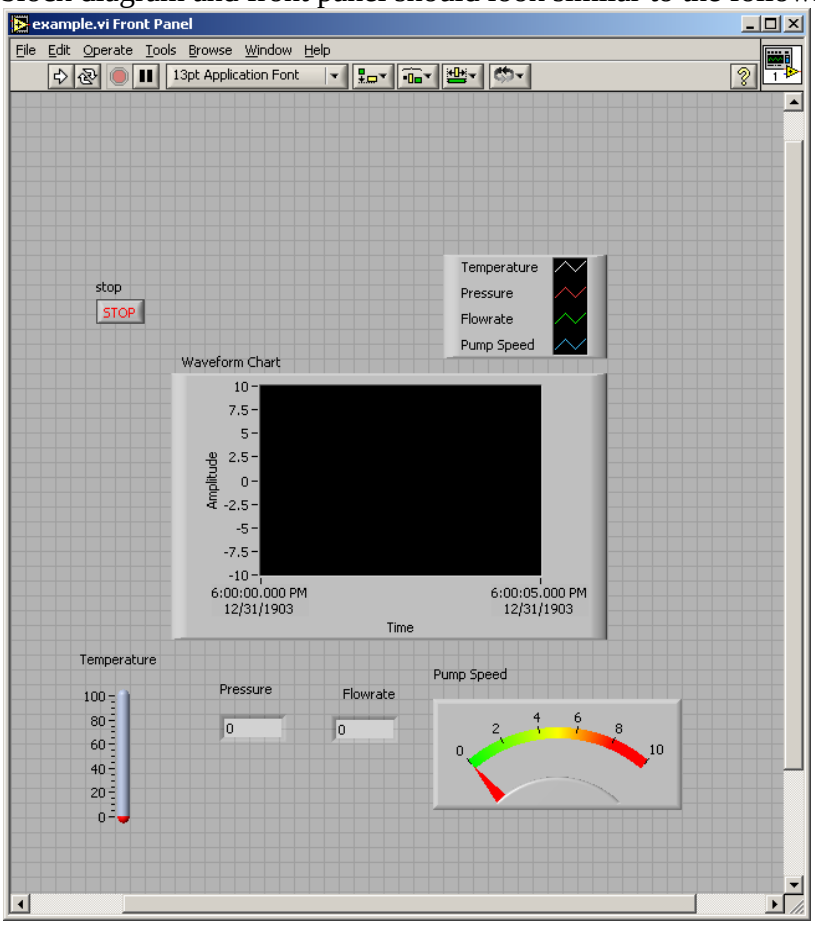
h. Select a Custom Scaling appropriate for the sensor. You can create a new one or use the wrench icon to edit an existing one.

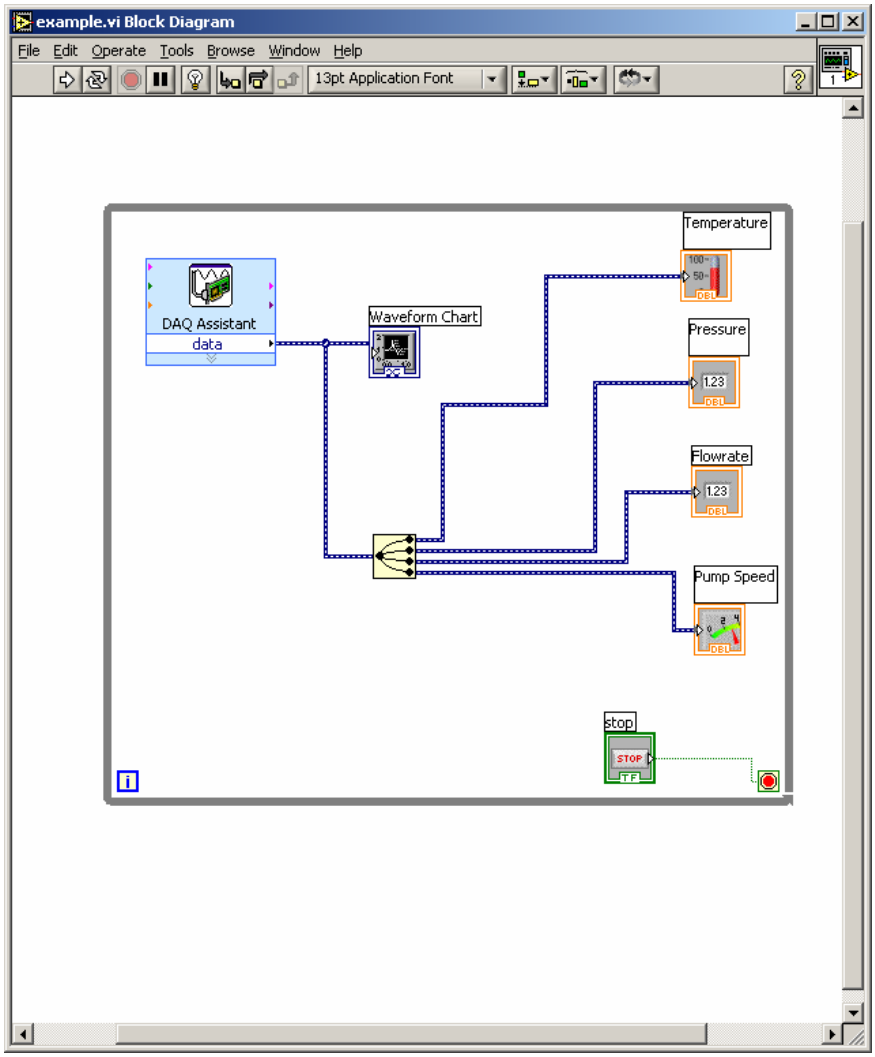
i. Change the Acquisition Mode to continuous. Leave everything else as default (you can play with the "samples to read" and "rate", but make sure the rate is always greater than or equal to "Samples to Read").

j. The configuration box should now look like the following:



k. Configure the remaining channels in the same manner, then click OK..
l. You will now have a block diagram with a single DAQ Assistant icon. Navigate to All Functions>>Structures>>While Loop. Draw a “while loop” around the icon and leave enough space inside the loop to add some functions.
m. Place a “Waveform Chart” (Controls>>Graph Indicators>>Waveform Chart) on the front panel. Expand the legend on the chart to show all your channels (mouse should be a double arrow). Connect the “data” out on the DAQ assistant to the “Waveform Chart” on the block diagram.
n. Put a stop button (Controls>>Buttons>>Stop Button) on the front panel and wire it to the conditional terminal at the lower right of the while loop on the block diagram.
o. Put a “Split Signal” (Functions>>Signal Manipulation>>Split Signal) on the Block Diagram to split your channels into discrete signals. You can then manipulate the separate channels. The “Split Signal” function is, by default, a single channel. Place your mouse over the function until you get a “double arrow”. Then expand the Split Signal into as many channels as you need.
p. Create indicators for each of your channels. For example, try (Controls>>Numeric Indicators>>Meter). Double click and item’s description to rename.
q. Your block diagram and front panel should look similar to the following:





Analog Output

a. For Analog Output, go through the same steps as above (except choose Analog Output>>Voltage in step "C"). Select 1 Sample (ON Demand) as the generation Mode.
b. When you finish configuring the Analog Output Assistant, place it in a separate "While Loop" below the Analog Input While Loop.
c. Place a "Simulate Signal" VI (Functions>>Input>>Simulate Signal) to the left of the Analog Output DAQ Assistant. Choose DC under "Signal type" in the configuration window. De-select Automatic from the Number of samples and select one sample, then click OK. The Simulate Signal will create the DC voltage signal needed to control the pump. Wire it to the Analog Output DAQ Assistant.

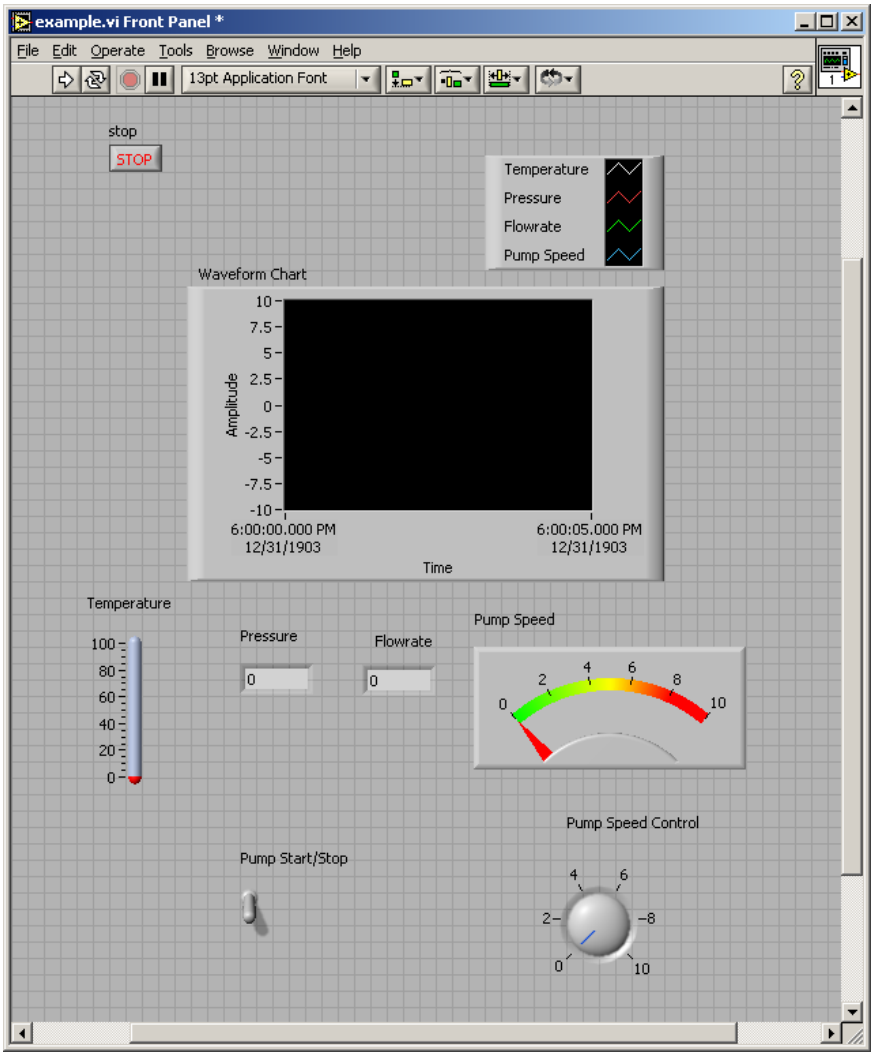
d. Place a Numeric Control, for example, Dial (Controls>>Numeric Controls>>Dial) on the front panel.
e. Wire this numeric to the "Offset" input on the "Simulate Signal" VI. This will modify the DC value of the Analog Output, and thus, the value of the pump speed control.

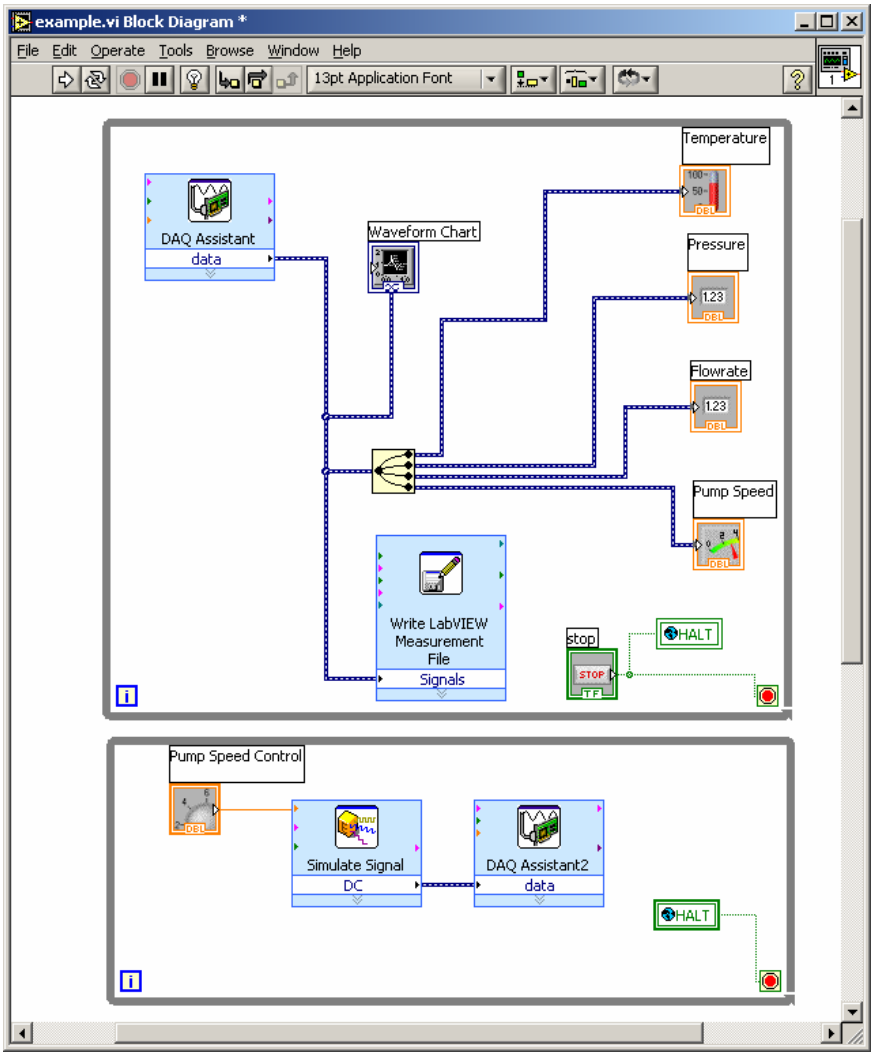
Excel File Function

a. Navigate to Functions>>Output>>Write to LVM. Set this icon on the block diagram in the upper (Analog Input) while loop. You will get a configuration menu similar to the steps above.
b. Browse/Choose your desired file name location (make sure your file has an ".xls" extension so it will save to Microsoft Excel). Leave the "Action" parameter as default (Save to one file). Choose whether you want to append or overwrite the file. Choose "One header only" under "Segment headers" and "One column only" under "X Value Columns". (X Value is the time in our example.) Leave "Delimiter" as "Tab". Click OK.
c. Wire the combined signal from the Analog Input DAQ Assistant to the input of the "Write LVM File" VI.

Global Variable to pass "loop stop" from top loop to bottom loop

a. When two loops are running parallel, you need to use a global variable to pass data/values between the two loops. Therefore, to pass a stop signal between the two loops, a global will be needed.
b. To create a global, navigate to Functions>>All Functions>>Structures>>Global Variable and drag it to the top while loop..
c. When you place a global on the block diagram, it will be blank with a question mark in it. Double click on it and a front panel will appear. A Global variable is a regular VI with a front panel, but no block diagram. Place a Stop Button on the front panel. Give the stop button a unique name by double clicking on the default label (e.g. HALT). Save the Global and close it.
d. You will now have a blank Global Variable on the block diagram. Left-click on it and choose the name you gave it (it should be the only choice).
e. Create a copy of the Global and put it in the lower while loop (using Edit>>Copy/Paste). In the top loop, wire the Stop Global variable to the existing stop button.
f. In the bottom loop, right-click on Stop Global Variable and click "Change to Read". Globals have bi-directional communication. You can either write to them, or read from them. We will be reading from this global in the bottom loop.
g. Delete any existing stop button in the bottom loop and wire the Stop Global Variable to the execution control terminal (red stop sign). Your front panel and block diagram should be similar to the following:


example.vi Front Panel *
File Edit Operate Tools Browse Window Help
13pt Application Font
stop
STOP
Temperature
Pressure
Flowrate
Pump Speed
Waveform Chart
10
7.5
5
2.5
0
-2.5
-5
-7.5
-10
Amplitude
6:00:00.000 PM
12/31/1903
6:00:05.000 PM
12/31/1903
Time
Temperature
100
80
60
40
20
0
Pressure
0
Flowrate
0
Pump Speed
0
2
4
6
8
10
Pump Start/Stop
Pump Speed Control
0
2
4
6
8
10



Digital Output

a. For Digital Output, go through the same steps as above (except choose Digital I/O Line Output in the DAQ Assistant). Select your "channel" where the pump start/stop is wired (Port and Line). Select 1 Sample (ON Demand) as the generation Mode and check Invert Line.
b. Go ahead and make another while loop and use the Stop Global Variable.
c. Add some type of switch or button to the front panel to operate the pump. In this example, Controls>>Buttons>>Vertical Toggle Switch.
d. In order to connect this scalar switch to the data array of the Digital Output DAQ Assistant, we will use a Merge Signals (Functions>>Signal Manipulation>>Merge Signals) much like we used a Split Signals to separate the Analog Inputs. Add a Merge Signals to the block diagram.
e. Wire the Pump Start/Stop switch to the Merge Signals and use the double arrow curser to condense the Merge Signals to one channel.

f. Wire the output of the Merge Signals to the data of the Digital Output DAQ Assistant. The Digital Output section of the block diagram should look like the following: