



Measure, Analyze, and Save I-V of Diodes.vi

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Connector Pane

Measure, Analyze, and Save I-V of Diodes.vi



Measure, Analyze, and Save I-V of Diodes.vi contains a state machine that is meant to measure, analyze, and save the I-V characteristics of a diode in series with a resistor on a breadboard using the NI myDAQ data acquisition device. The channel AO0 is used to output a voltage to the breadboard, AI0 is used to measure the voltage across the resistor, and AI1 is used to measure the voltage across the diode. The states are as follows:

Initialize Specifications for Measurement:

The user is prompted if they want to input their own measurement specifications or demo the VI with recommended values (for either the linear or log case). The inputted values are checked so that the diode is not put in danger. If the inputted values are safe, the user is sent to the Pre-Measurement state. Otherwise, they are sent to the Input Error state.

Pre-Measurement (Calculate Voltage Array):

The input values are used to create an array of voltages using the "Calculate Voltage Array" sub VI that will be sent to the output of the NI myDAQ device. If the voltage is high enough to exceed the peak current, the creation of the array will cease. Then the user is sent to the Measurement state.

Measurement:

The inputted values are sent to the "Measure I-V of Diodes" sub VI. The output voltage, current, and diode voltage measurements are outputted as an array indicator and are plotted to the XY Graph "I (mA) vs. V_Diode (V)". A value of 0 V is then sent to the NI myDAQ to turn off the LED after all measurements have been collected. The data is sent to the "Format Data String" sub VI which formats the data into a comma-separated values file. The user is prompted on whether they want to choose the filename and path for the saved data or have a default name and path chosen for them. The file path is outputted as an indicator and the user is prompted to either go to the Analysis state or Reset Values and Restart/Stop state.

Analysis:

The current measurements are sent to the "Indices of Negative Array Elements" sub VI. The outputted array containing the indices of the negative current values and the voltages are both sent to the "Remove Elements from Array by Index" sub VI, which removes any data points with negative current so that they are not out of range for the logarithm of base 10 function. The logarithm of base 10 of the current is then calculated and plotted against the voltage values in the "Log (I (mA)) vs. V_Diode (V)" XY Graph. A linear best fit is also calculated and plotted. The slope and y-intercept from the best fit line are used to calculate the ideality factor and forward voltage when the current is 1.5 mA. The user is then sent to the Reset Values and Restart/Stop state.

Reset Values and Restart/Stop:

The user is prompted if they want to restart or stop the state machine. All front panel indicator values are reset.

Input Error:

The user is notified that there was an error with their input. Then the state machine restarts.

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Log (I (mA)) vs. V_{Diode} (V)

Log (I (mA))

V_{Diode} (V)

Log (I (mA))

V_{Diode} (V)

Y-Intercept

0

V_F @ 1.5 mA (V)

0

Coefficient of Determination

0

Slope

0

Saturation Current (mA)

0

Ideality Factor

0

Electron Charge (C)

0

Boltzmann Constant (eV/K)

0

Room Temperature (K)

0

LabVIEW Home and Student Edition



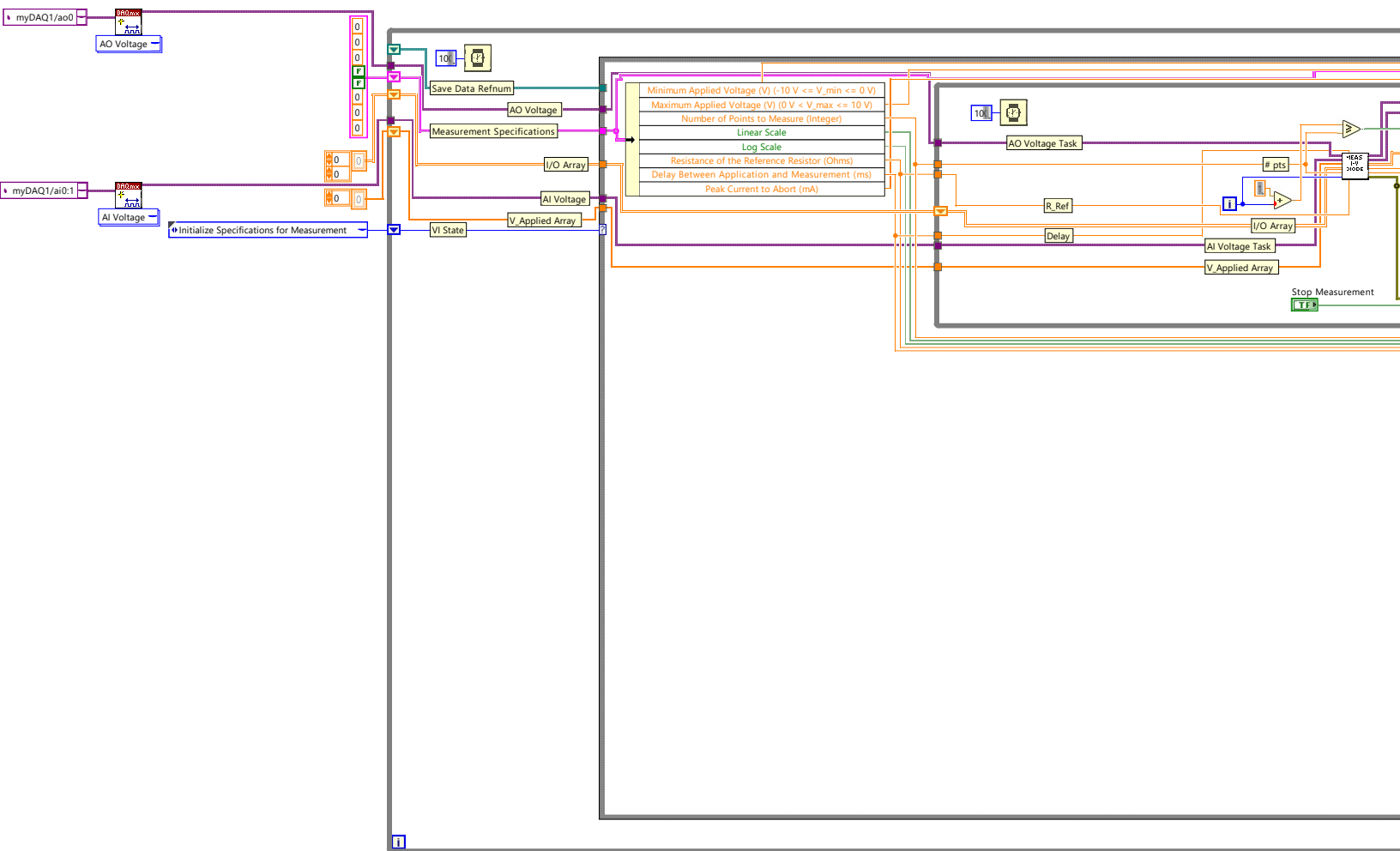
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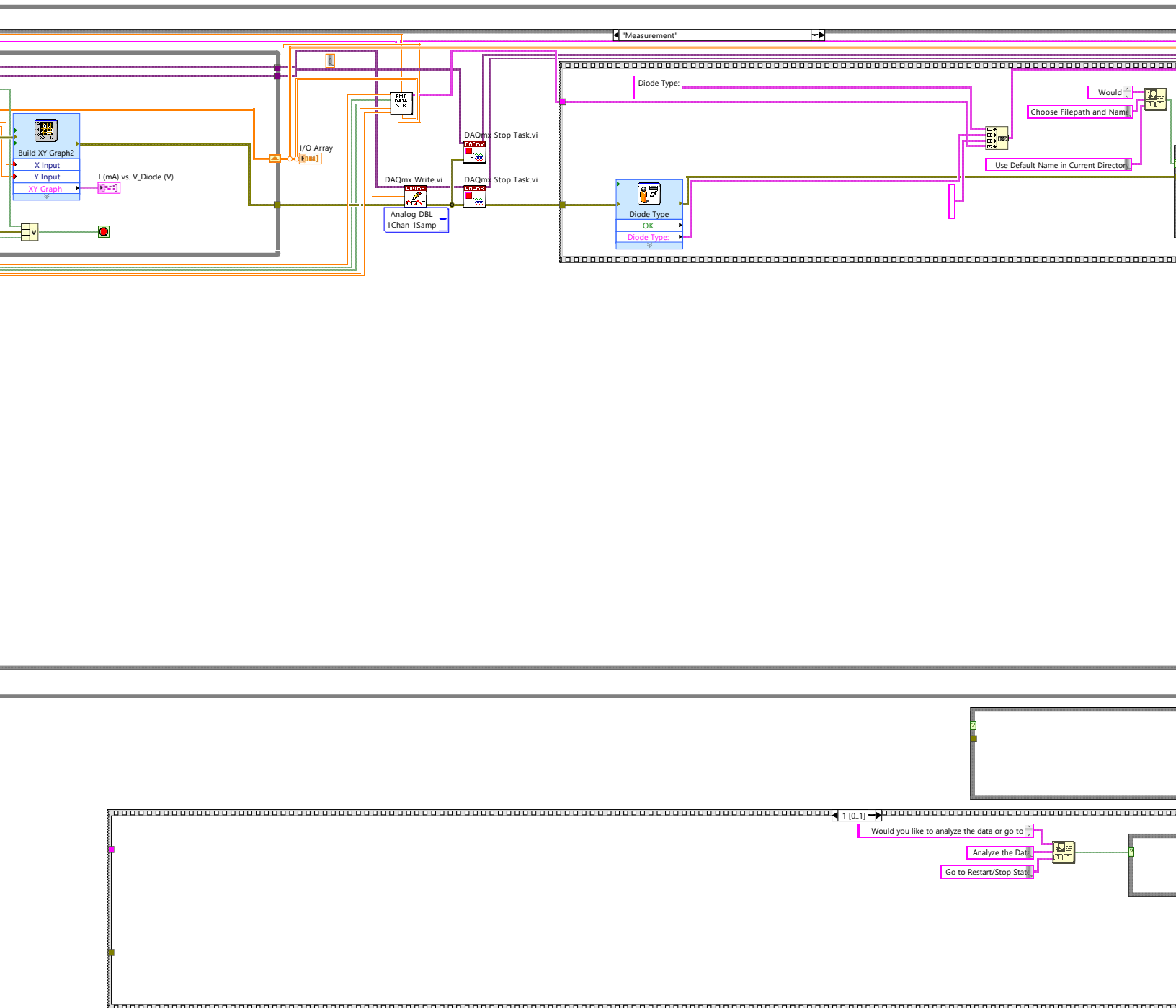
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Block Diagram



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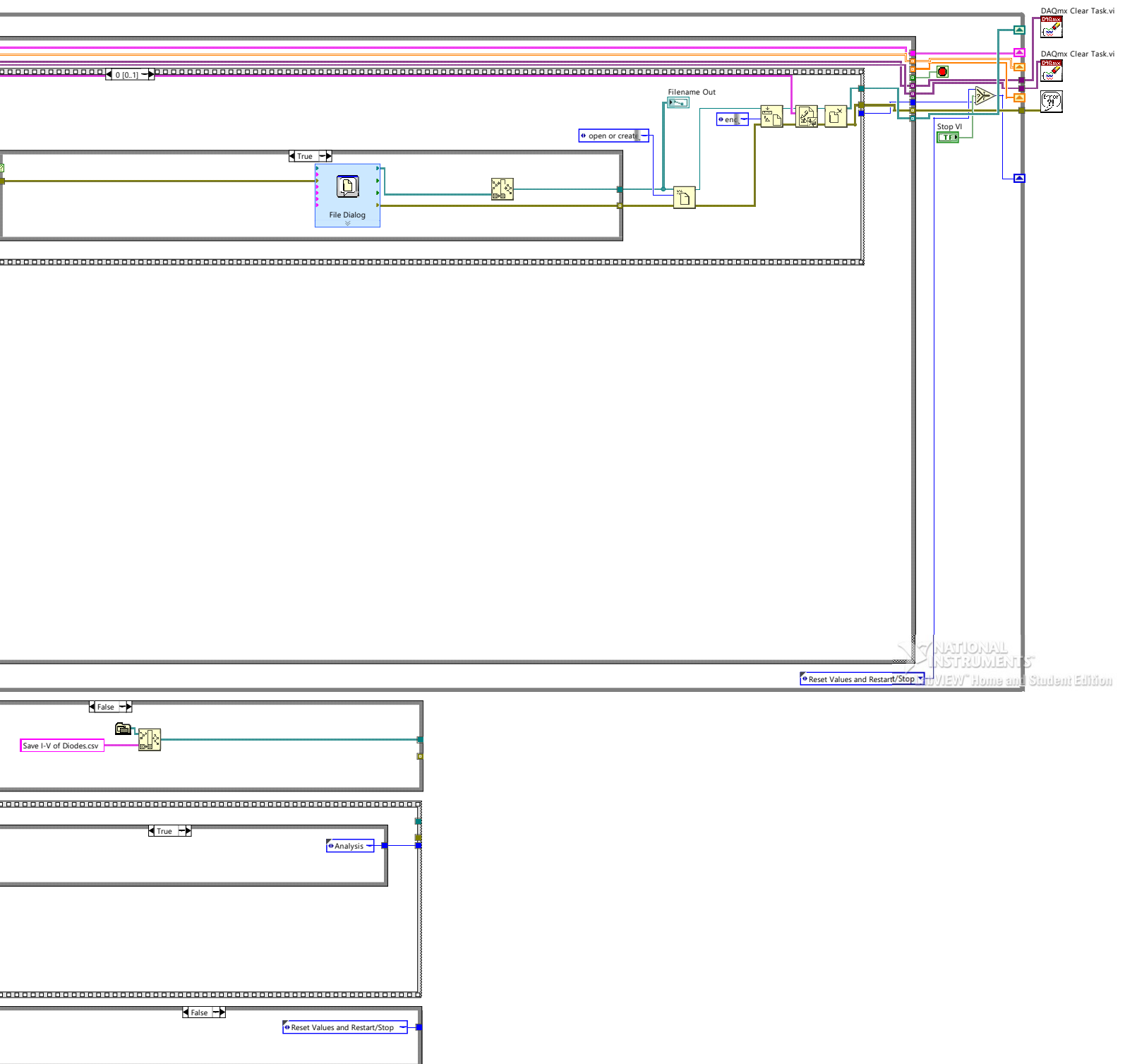


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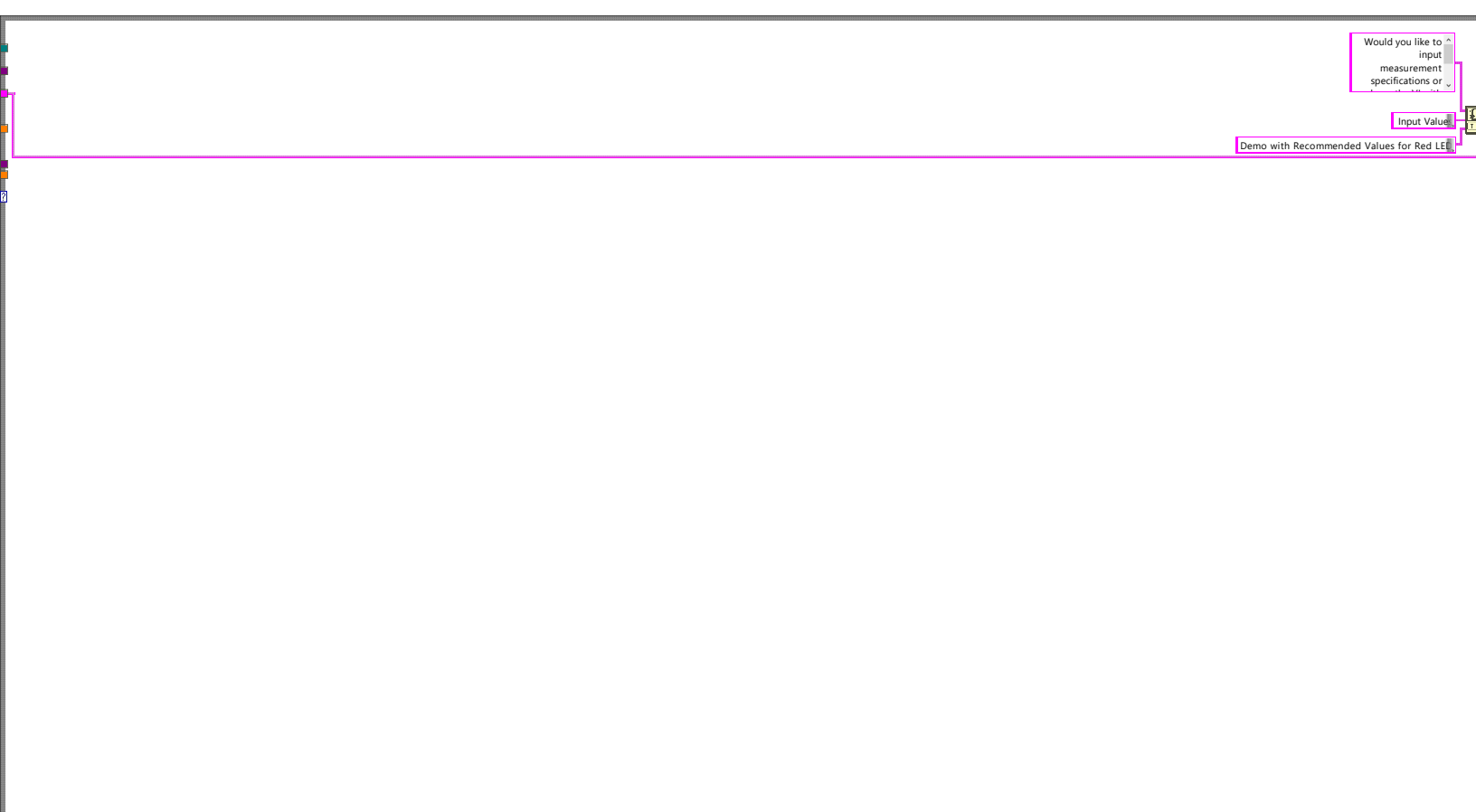


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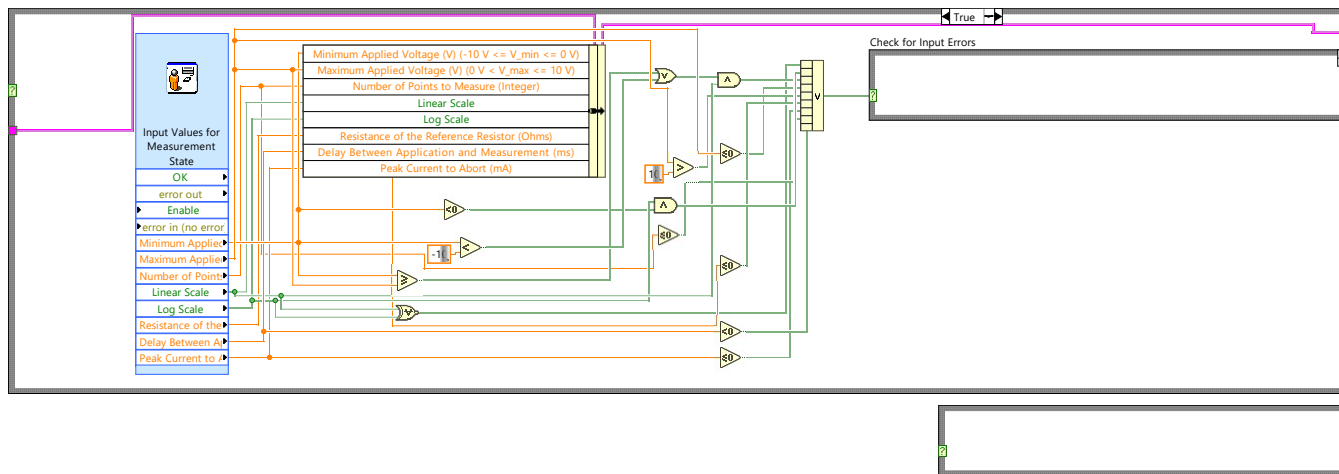
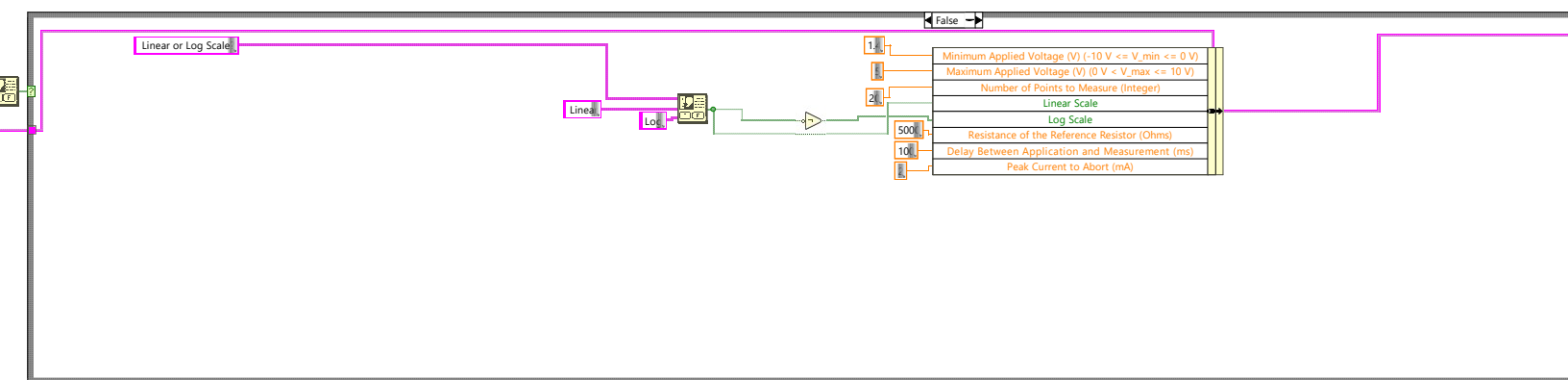
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"Initialize Specifications for Measurement", Default



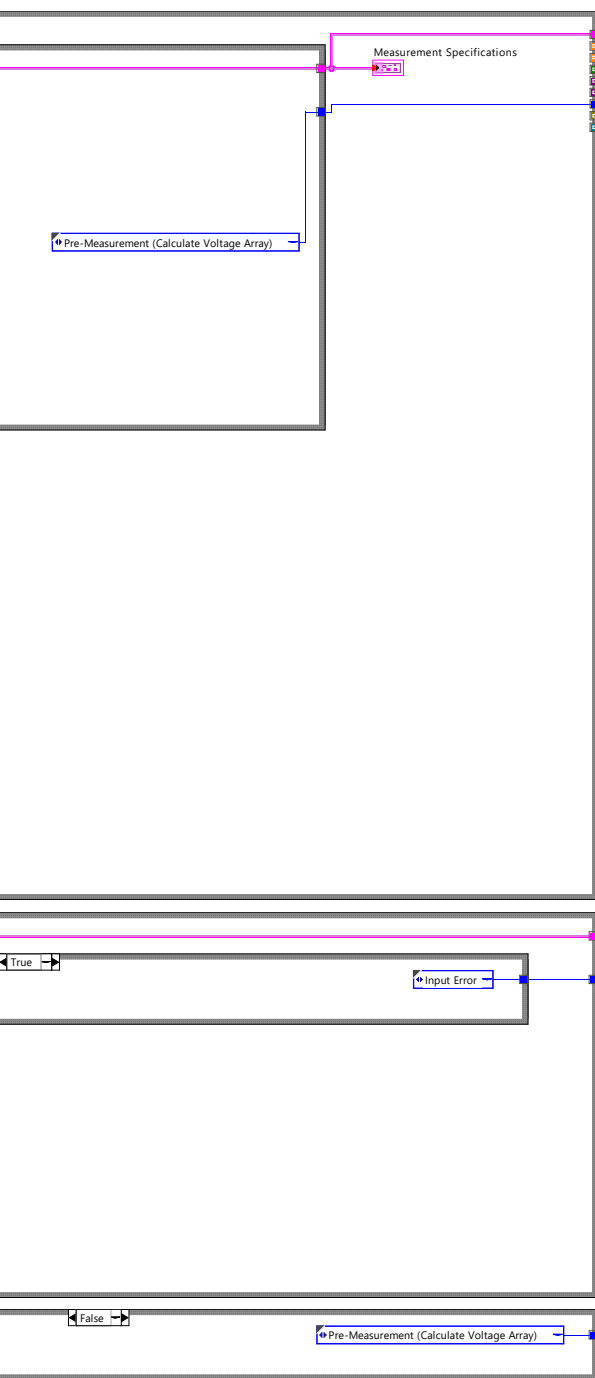


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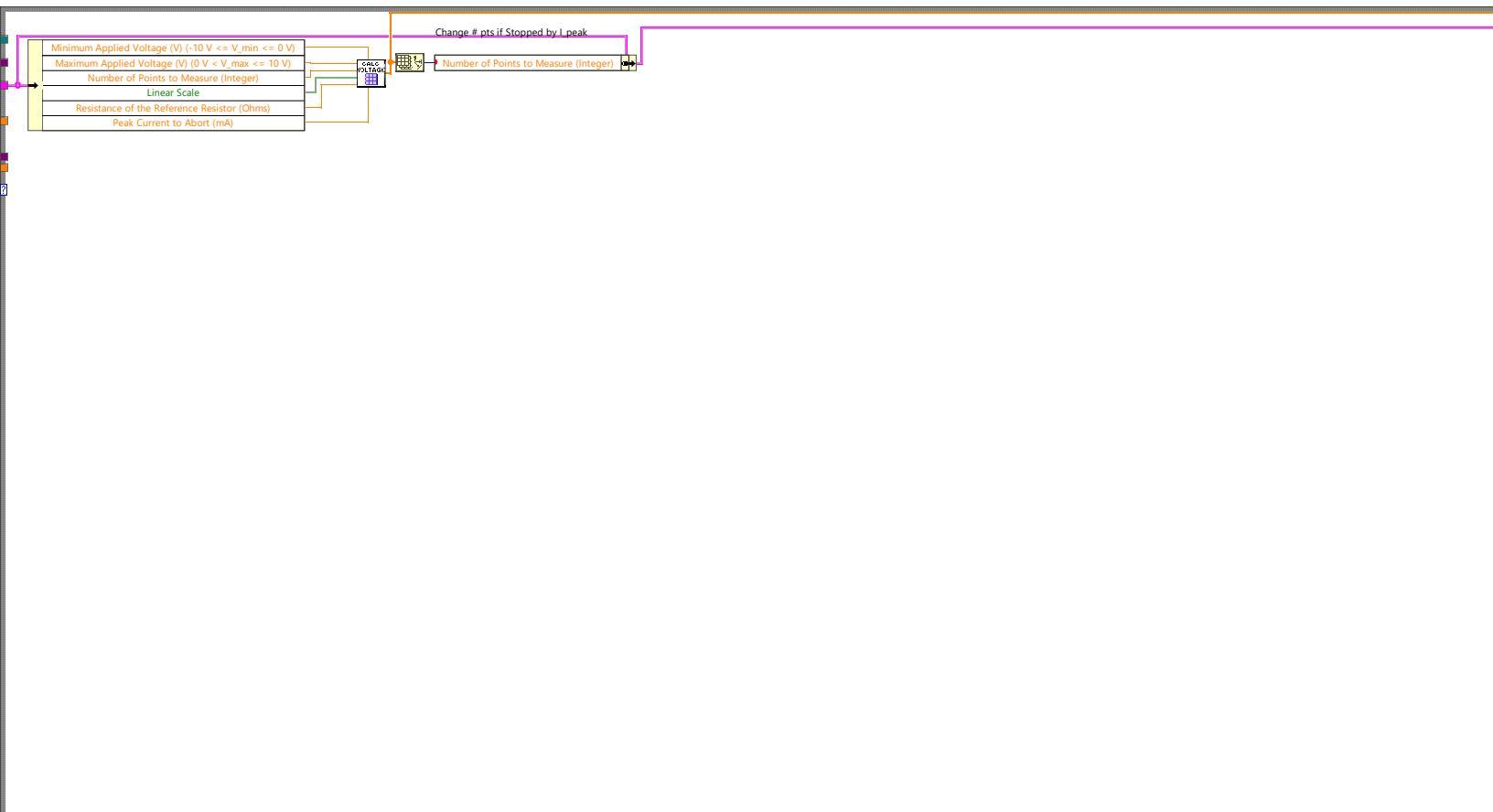


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Pre-Measurement (Calculate Voltage Array)

Would you like to start the measurement or skip to the restart/stop state?

Start Measurement

Go to Restart/Stop State





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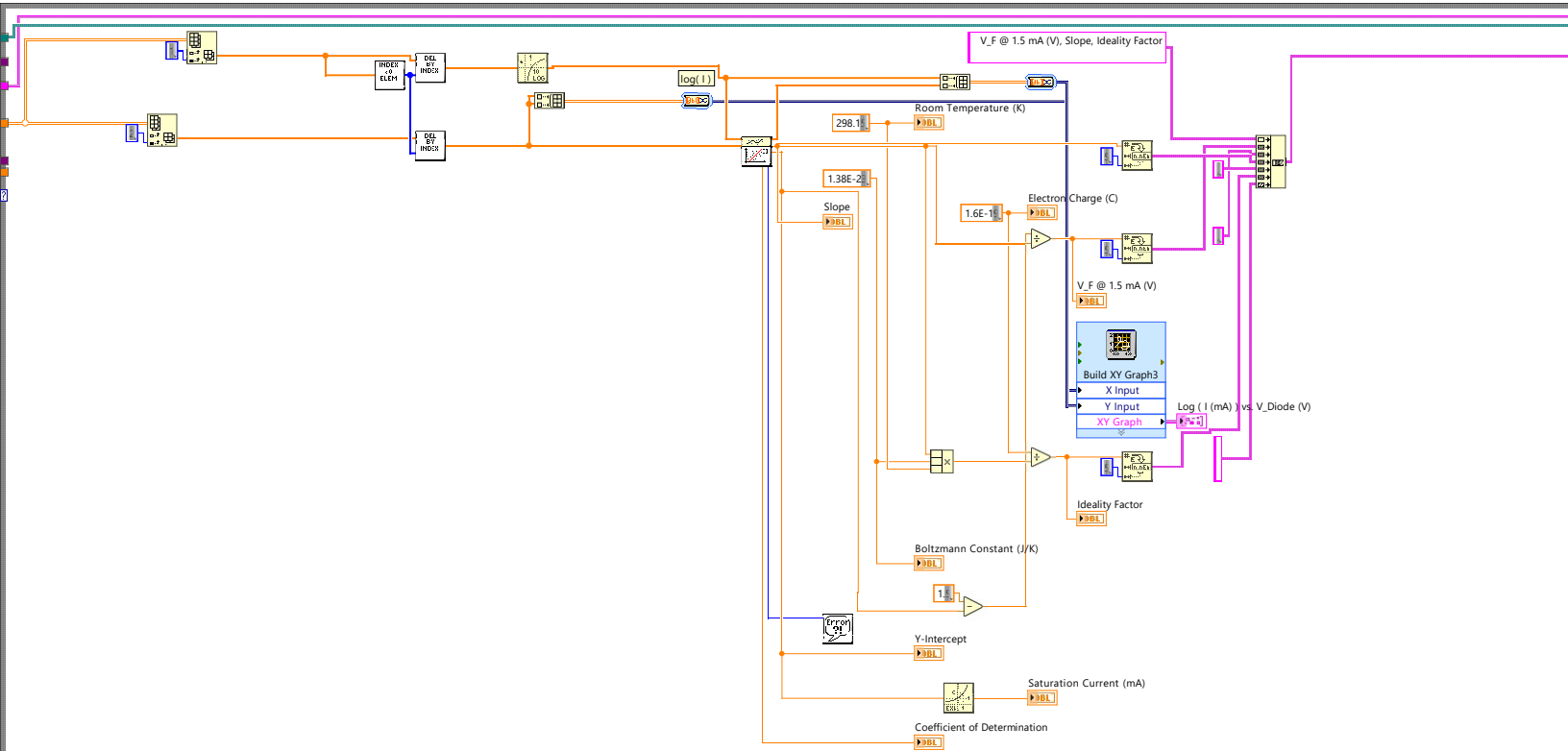


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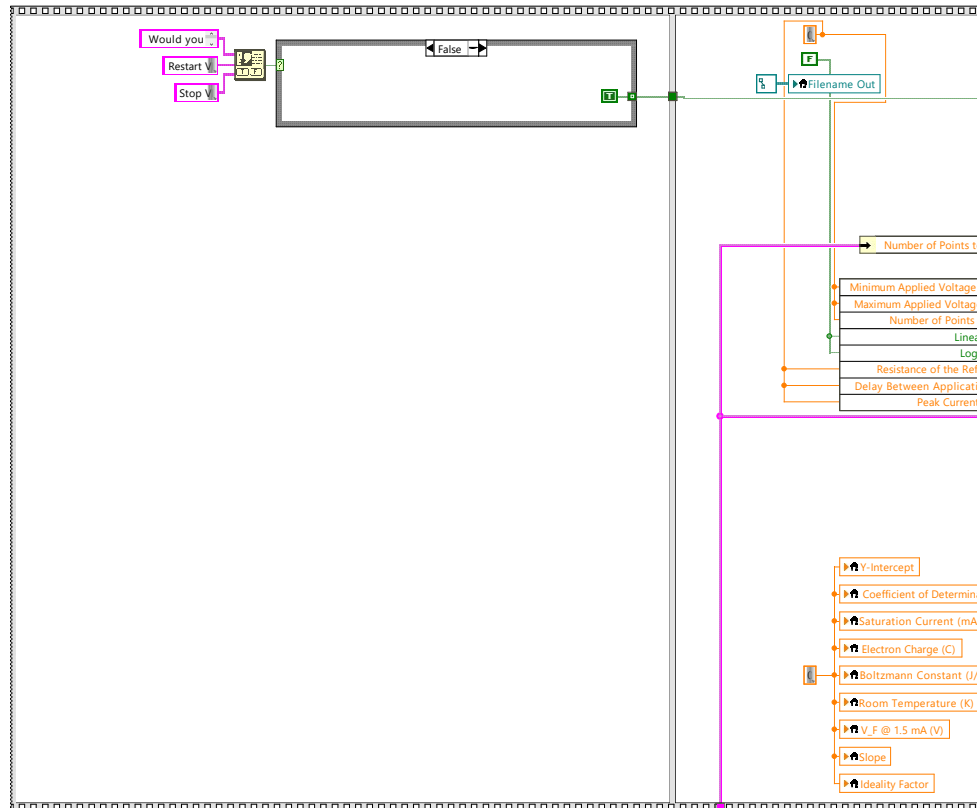
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"Analysis"

"Reset Values and Restart/Stop"



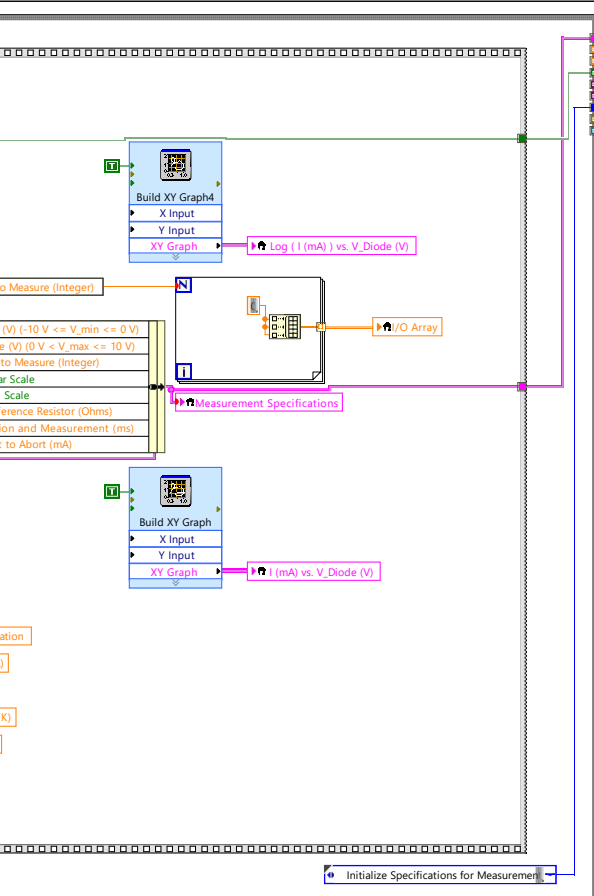
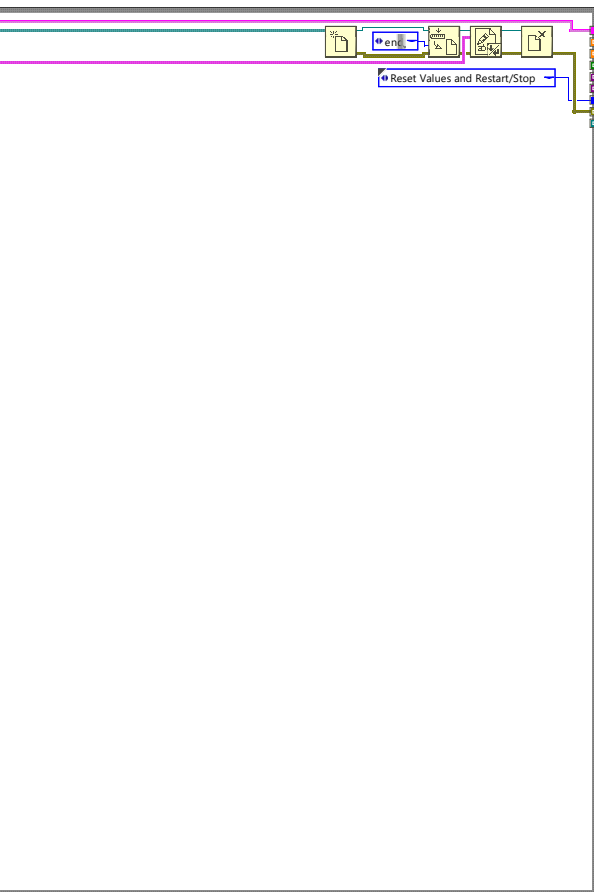


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There was an error with your input. Please re-read the conditions and start over.





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Input Error

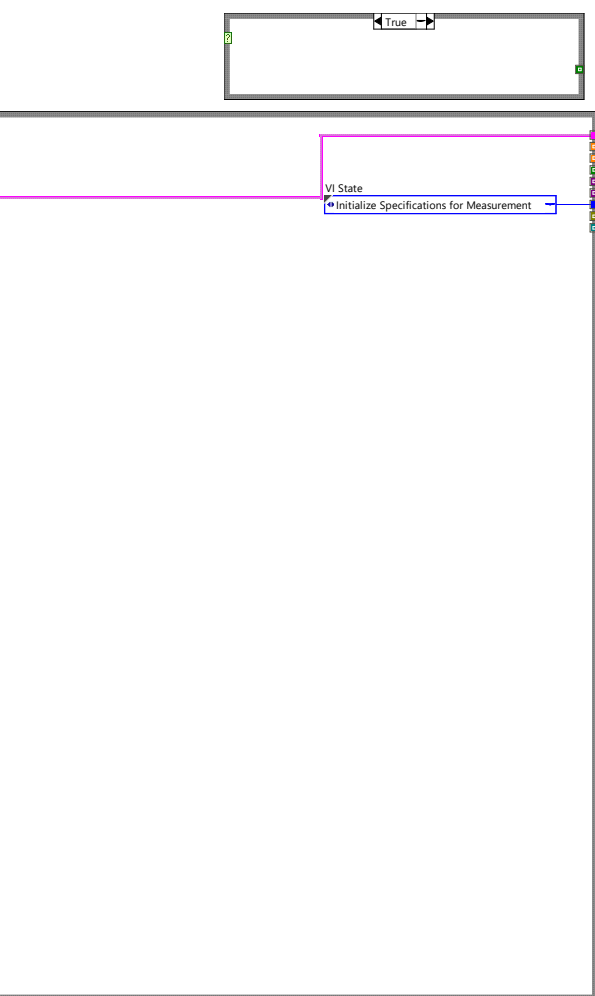


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Express VI Configuration Information