LabVIEW DIC DAQ

1. **Objective**

The *DIC DAQ* LabVIEW project is a collection of template VIs for simple data acquisition and DIC triggering applications. This document briefly describes the VIs and other information about using the VIs contained in the *DIC Hardware Trigger* LabVIEW project.

1. **Hardware Trigger VIs**

*Not complete.*

1. **Image Acquisition VIs**

*Not complete.*

1. **Simple DAQ VIs**
   1. *Simple DAQ.vi*

Records analog data at specified rate. Writes raw voltage data to CSV file.

1. **SubVIs**
   1. Chart VIs
      1. *Raw to engr\_Linear.vi*

Applies linear slope and offset to raw data.

* + 1. *Zero signal.vi*

Adds zero value to raw data when enabled. Captures raw data as new zero value when zero button is pressed.

* 1. Control VIs
     1. *Snap control.vi*

Snap control switches control on for single loop iteration. Cases are depicted in Table 4.

* 1. File writing VIs
     1. *File Path Suffix.vi*

Adds suffix to file name with same file type and file path.

* + 1. *Write CSV.vi*

Writes data to file path (comma delimited & 6 decimal places).

* + 1. *Write CSV\_Channel info.vi*

Writes channel names, AS numbers, scale, and offset to separate .csv file in the same folder as data file.

* 1. IO VIs
     1. *Digital Output Trigger.vi*

Writes true, pause, false to digital output DAQmx task (using DAQmx write function) and increments image count when true.

* + 1. *Read Analog Input.vi*

Uses DAQmx read function to read NChan and NSamp for analog input DAQmx task. Averages NSamp for each channel.

* 1. Timing VIs
     1. *DAQmx Rate.vi*

Uses the DAQmx timing function to define the samples per channel and sample rate of DAQmx task.

* + 1. *Hz to ms.vi*

Converts hertz to milliseconds

* + 1. *Loop period.vi*

Multiplies the sample frequency by the averaging divisor to determine the period of the while loop.

* + 1. *Relative time.vi*

“Absolute time” mode sets the timestamp to the current time. “Relative time” mode subtracts the initial time from the current time to determine the relative timestamp from when the record control is switched on.

1. **Variables**

Recording parameters should be set on the front panel by the user before running the program. Other constants can be edited in the back panel for unique design in data acquisition.

* 1. *Chart history*

Constant is equal to a cluster of zeros to reset the chart history. Create new constant cluster of zeros when cluster size is changed (when number of channels is changed).

* 1. *Samples per channel*

Constant is equal to the number of samples a channel will collect per over the loop period. This value is set as the ‘samples per channel’ in the analog input DAQmx task.

* 1. *Averaging divisor*

*The Sample frequency [Hz]* is multiplied by the *Averaging divisor* constant to determine the *Loop frequency [Hz]*. The while loop is iterated faster than the intended sampling frequency so that the data samples collected in the last loop iteration of the sampling period is averaged to represent the analog data values for each channel.

* 1. *Sample rate mode*

One of two discrete recording options defined by the open tab in the top section of the front panel when the program is run. Synchronous rate mode records analog data from DAQ1 and triggers cameras (or records analog data from DAQ 2) at the defined *Sampling frequency [Hz]*. Separate rate mode records analog data from DAQ1 at the defined *Sampling frequency [Hz]*. Separate rate mode triggers cameras (or records analog data from DAQ 2) every number of iterations defined by the *Image Multiple*.

* 1. *Loop frequency [Hz]*

*The Sample frequency [Hz]* is multiplied by the *Averaging divisor* constant to determine the *Loop frequency [Hz]*. The *Loop frequency [Hz]* determines the rate of the analog input DAQmx task.

* 1. *Loop period [ms]*

The calculated length of time over which the while loop is iterated (how long the loop will wait before refreshing).

* 1. *Sample frequency [Hz]*

User input defines the frequency at which data will be recorded.Also labeled as *DAQ1 Sample frequency [Hz]* and *DAQ1 Freq. [Hz].*

* 1. *File path*
  2. *Time*
  3. *DO Trigger Task*
  4. *AI Task*
  5. *Scale [Unit/V] & Offset [Unit]*
  6. *Zero Signal [V]*

1. **Edit the number of channels**

The following steps can be used to edit the number of channels for data collection Hardware Trigger and Simple DAQ VIs.

* 1. Land channels in data acquisition unit.
  2. Open NI Max > open analog input task > add or remove channels from analog input task > save task
  3. Run the task in NI Max to check that the channels reading signals.
  4. Open LabVIEW program > Ctrl + E to open back panel
     1. For descriptions of VIs and icons: Crtl + H for context help
  5. Change cluster size of analog signal waveform charts
     1. Inside the while loop are two brown Waveform Chart icons for Analog Signals (Engineering units and Raw voltage). Prior to the brown Waveform Chart icons, are the yellow ‘Array to Cluster’ icons.
     2. Right click the ‘Array to Cluster’ icon > Cluster size > Change number of elements to the number of channels > Ok
     3. Do the same for the other ‘Array to Cluster’ icon for the other analog signal chart
  6. Create new constant for chart history
     1. To the left of the back panels are two history data property nodes
     2. Delete the brown constants (zeros) connected to them
     3. Right click the history data property node > Create constant > connect the constant to both history data property nodes
  7. Ctrl + E to open front panel
  8. On the RAW tab, click and drag to increase or decrease the number of legend items to match the number of channels
  9. Click and drag the Zero Signal array to increase or decrease the number of rows for the number of channels
  10. On the ENGR tab, click and drag to increase or decrease the number of legend items to match the number of channels
  11. Click and drag the Scale and Offset array to increase or decrease the number of rows for the number of channels
  12. Read the instructions before running the program. Run the program to check that data is recording as intended.