Waveform Processing Custom Device

Version 1.0.0
8 March 2016

Overview

The Waveform Processing Custom Device is designed as a general-purpose custom device which can be modified to perform processing on waveforms present in an NI VeriStand System Definition. The current release of the custom device supports processing waveforms to return a running average as well as the most recent single-point value of the custom device.

Current Limitations

1. Currently the custom device only supports processing waveforms which are acquired through a DAQ task in the VeriStand system definition.
2. The custom device applies selected processing steps to all waveforms.
3. Note that the custom device will return data to the VeriStand engine no faster than the waveform task read rate configured in the system definition. See Appendix A.
4. The device only supports two processing steps currently – returning the most recent single-point value of a waveform or the running average. Other custom processing steps must be added to the custom device source code manually.

User Interface Description

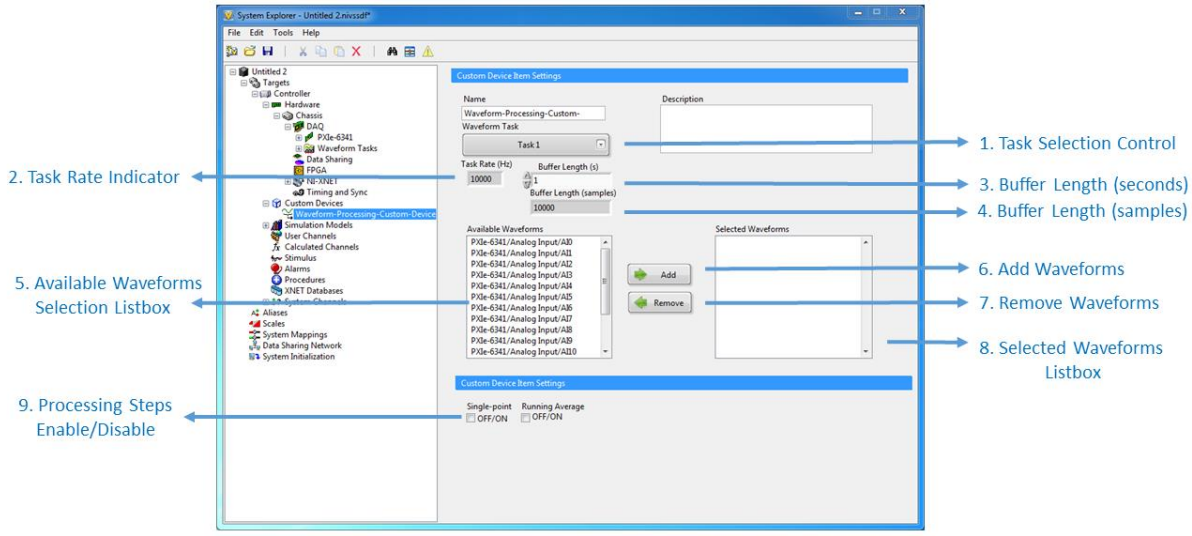

Figure 1 : Initial configuration with task selected

1. Task Selection Control—This drop-down box is automatically populated with all **Analog Input Tasks** currently present in DAQ section of the system definition. When a new task is selected the custom device will populate the **Available Waveforms** listbox with all of the analog input waveform channels associated with the selected task.

2. Task Rate Indicator—This field is automatically populated with the analog acquisition rate (in samples/second) of the DAQ task selected by the user. This task rate is used to calculate the number of samples present in the custom device'

3. Buffer Length (seconds) —This control allows the user to configure the buffer size of the custom device. This custom device maintains a buffer of the configured size which stores the waveform data of all channels for the specified buffer length in seconds.

4. Buffer Length (samples) —This indicator automatically displays how many samples will be present in the custom device buffer for each waveform with the selected buffer length and given task rate.

5. Available Waveforms Selection Listbox— This listbox initially contains all analog input waveform channels associated with the user selected task. Select one or more waveforms from this list and click the **Add** control to configure the waveform for processing.

6. Add Waveforms—Clicking the **Add** control causes all waveforms currently selected in the **Available Waveforms** control to be added to the **Selected Waveforms** listbox. A processing results section will be added for each waveform channel selected when the **Add** control is pressed.

7. Remove Waveforms—Clicking the **Remove** control causes all waveforms currently selected in the **Selected Waveforms** control to be removed from the **Selected Waveforms** listbox and added to the **Available Waveforms** listbox. The corresponding processing results section will be removed for each waveform channel selected when the **Remove** control is pressed.

8. Selected Waveforms Listbox—This listbox is initially empty and is populated by waveforms selected by the user for processing. Select one or more waveforms to be removed from the configuration before pressing the **Remove** control.

9. Processing Steps Enable/Disable— Each processing step can be toggled using the Enable/Disable checkboxes in this section. Currently both processing steps are applied to all waveform channels selected for processing in the custom device.

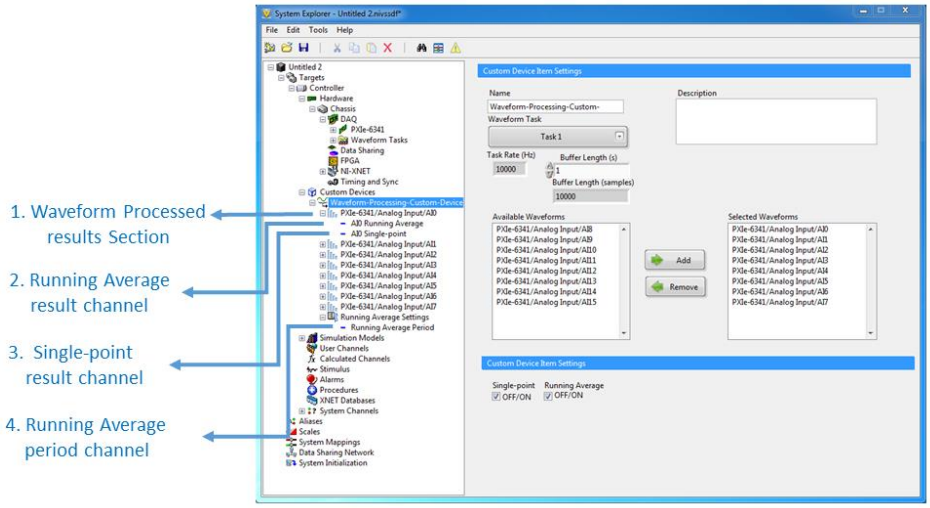

Figure 2 : Custom device with 8 AI waveform channels selected

1. Waveform Processed results section— This section is added to the system definition when a waveform channel is configured for processing. This section is a container for the custom device output channels which contain the processing results.
2. Running Average result channel— This channel returns the single-point running average of the corresponding input waveform channel. The running average period is defined by the **Running Average period** (4) channel.
3. Single-point result channel— This channel returns the most recent single-point value of the corresponding input waveform channel.
4. Running Average period channel— This is a parameter channel which is used to define the period of the running average processing step at run-time. **Note:** Setting the running average period to a greater duration than the custom device buffer (configured on the main page of the custom device) will result in an error **(Error -5012 : Attempted to write out of range)** and the custom device will close.

Appendix A

Custom Device timing consideration—This custom device operates by processing waveform data in an asynchronous process which runs at a rate independent of the VeriStand PCL.

The asynchronous process reads input waveform data whenever it is made available by the VeriStand engine. **The asynchronous process can therefore only execute and return data to VeriStand after waveform data is made available to read from the VeriStand engine.** The rate at which VeriStand reads and publishes waveform data is configured under **Timing Settings** on the Waveform Task configuration page of the system definition.

DAQ waveforms are set to read at 10 Hz (every 0.1 seconds, as shown below) by default. **Therefore, by default the Waveform Processing custom device will only provide updated values to the PCL at 10 Hz.** Change the default read size to increase the rate at which new values are published to the PCL, but be aware that this will impact overall system performance.