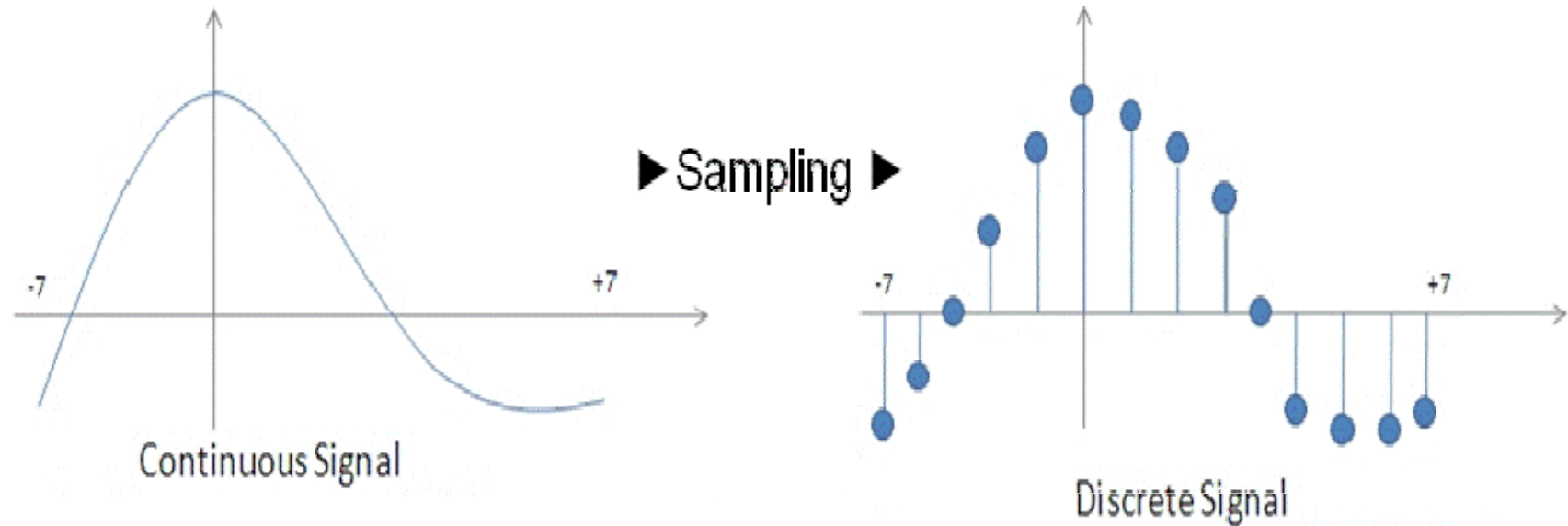


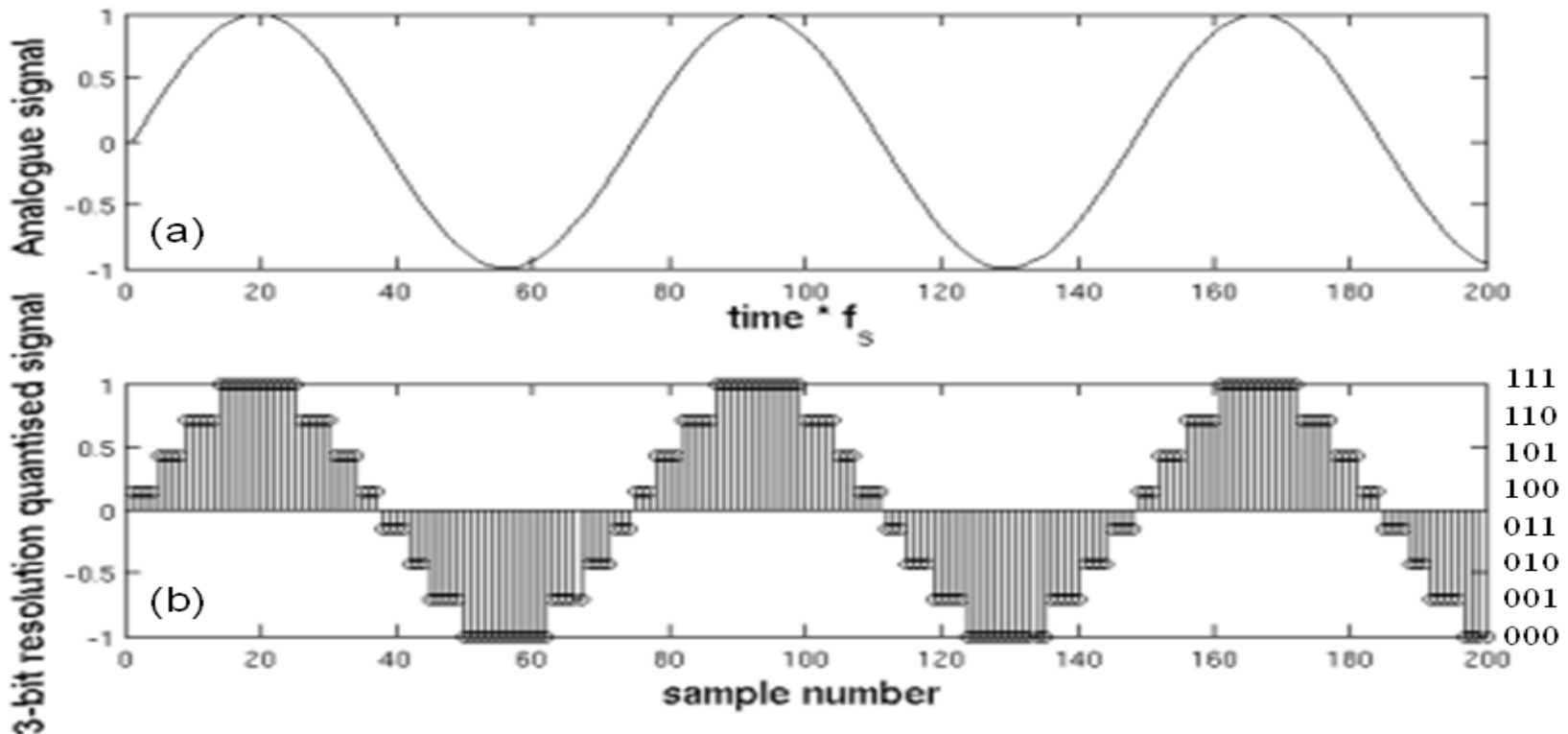
DATA ACQUISITION USING LABVIEW/ELVIS

Sampling



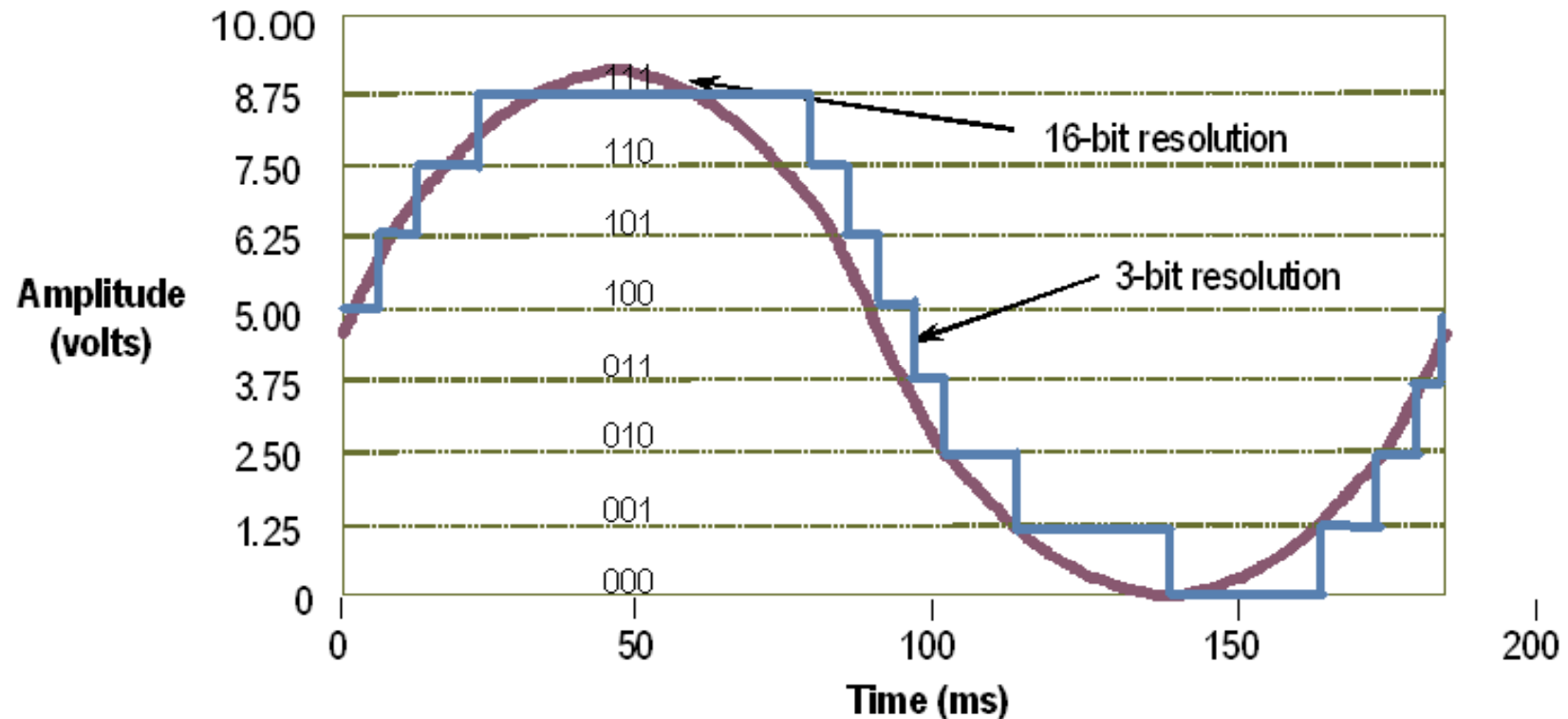
- Sampling is a process whereby data is acquired from an analog signal by an ADC at discrete time intervals.
- Sampling rate is the rate at which the signal is sampled.
- Higher sampling rate achieves better conversion of the analog signals.
- The minimum sampling rate required to represent the signal should be at least twice the maximum frequency of the analog signal under test – this is the Nyquist sampling rate.

Analogue-to-Digital Converter



- Analog to digital conversion is the process whereby the analog signal is converted into a digital code.
- Resolution is the number of bits the ADC uses to represent the digital data.
- An 8 bit ADC gives 256 levels (2^8) compared to a 12 bit ADC that has 4096 levels (2^{12}).

Digital-to-Analog Converter



- Digital to analog converter generates an analog output from a digital input.
- The DAC's performance is limited by the number of bits.
- The figure above shows how a sinusoid waveform is converted by a 3 bit DAC (a 16-bit one is also shown for comparison).

Integrated DAQ on ELVIS

Impedance Analyzer

- 0.2 Hz to 35 kHz Range
- NPN, PNP, Diode

Other Analyzers:

- Bode Analyzer
- 2-wire Current Voltage Analyzer
- 3-Wire Current Voltage Analyzer

Prototyping Board

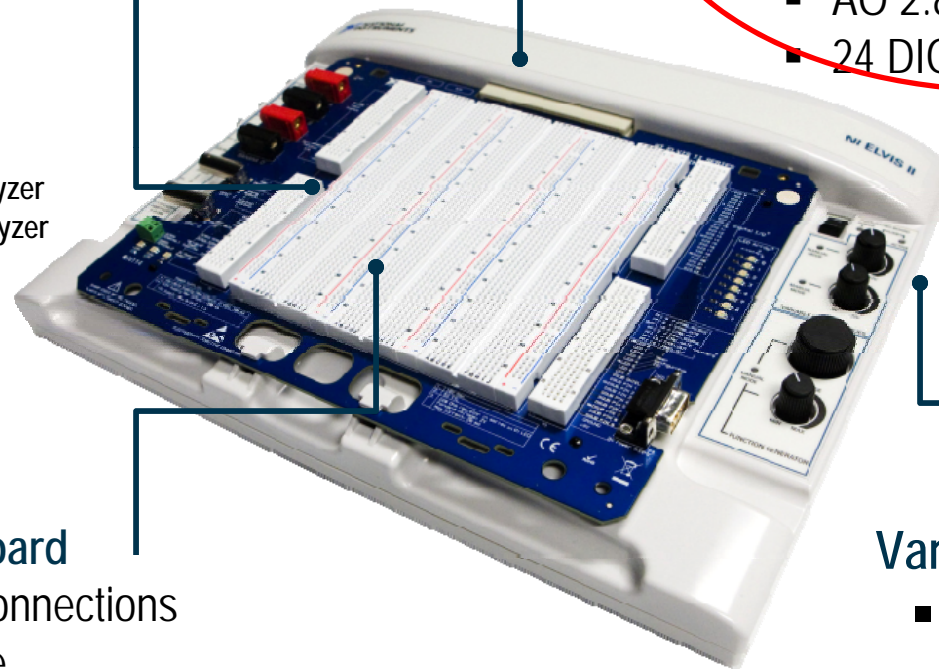
- Updated connections
- Detachable
- User-defined Banana Plugs, BNC, D-Sub connectors

Integrated DAQ

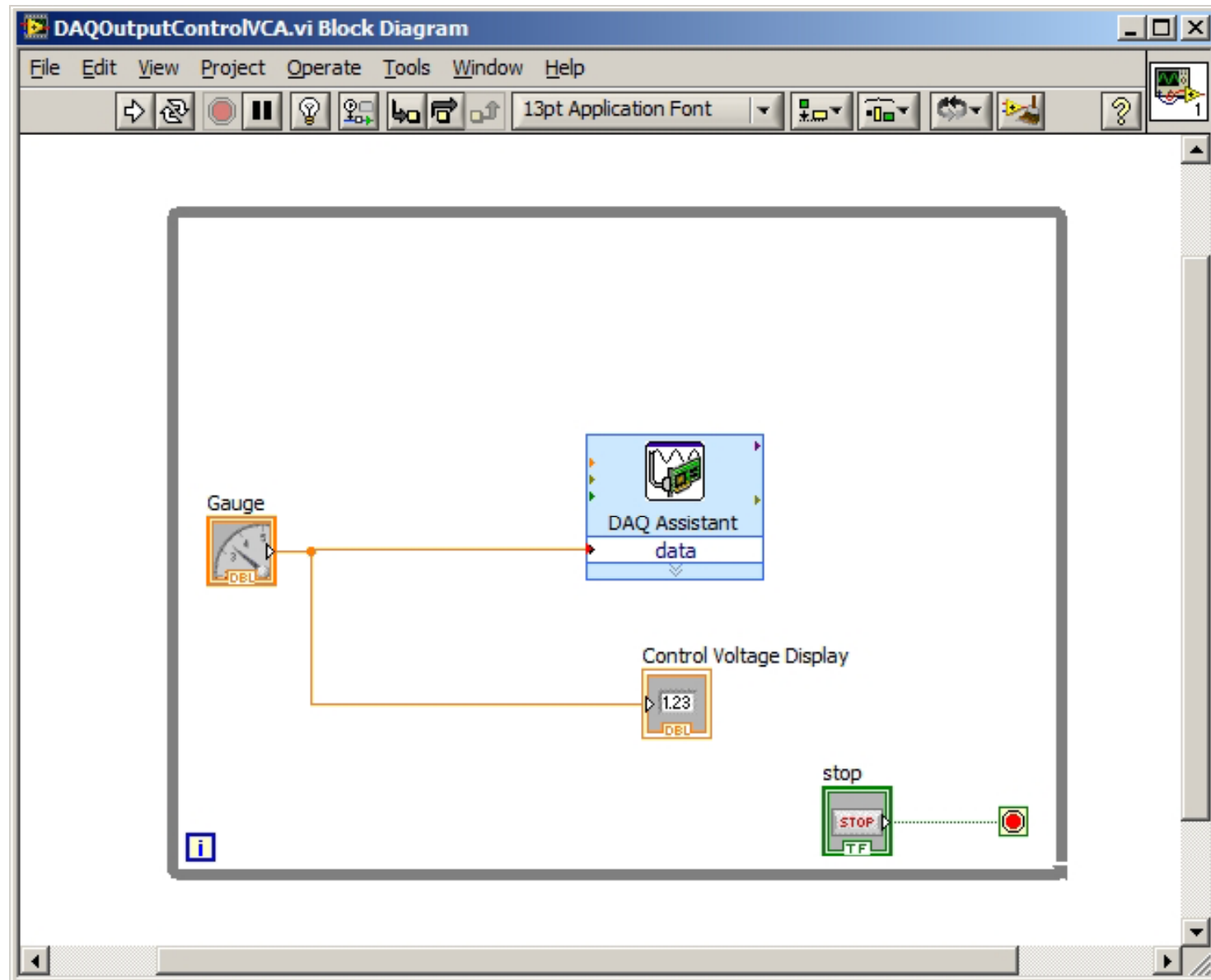
- AI sampling rate 1.25 MS/s single channel, 500kS/s two channel
- 16 bit resolution
- AO 2.8 MS/s update rate
- 24 DIO lines, 15 PFI, 2 CTR

Variable Power Supply

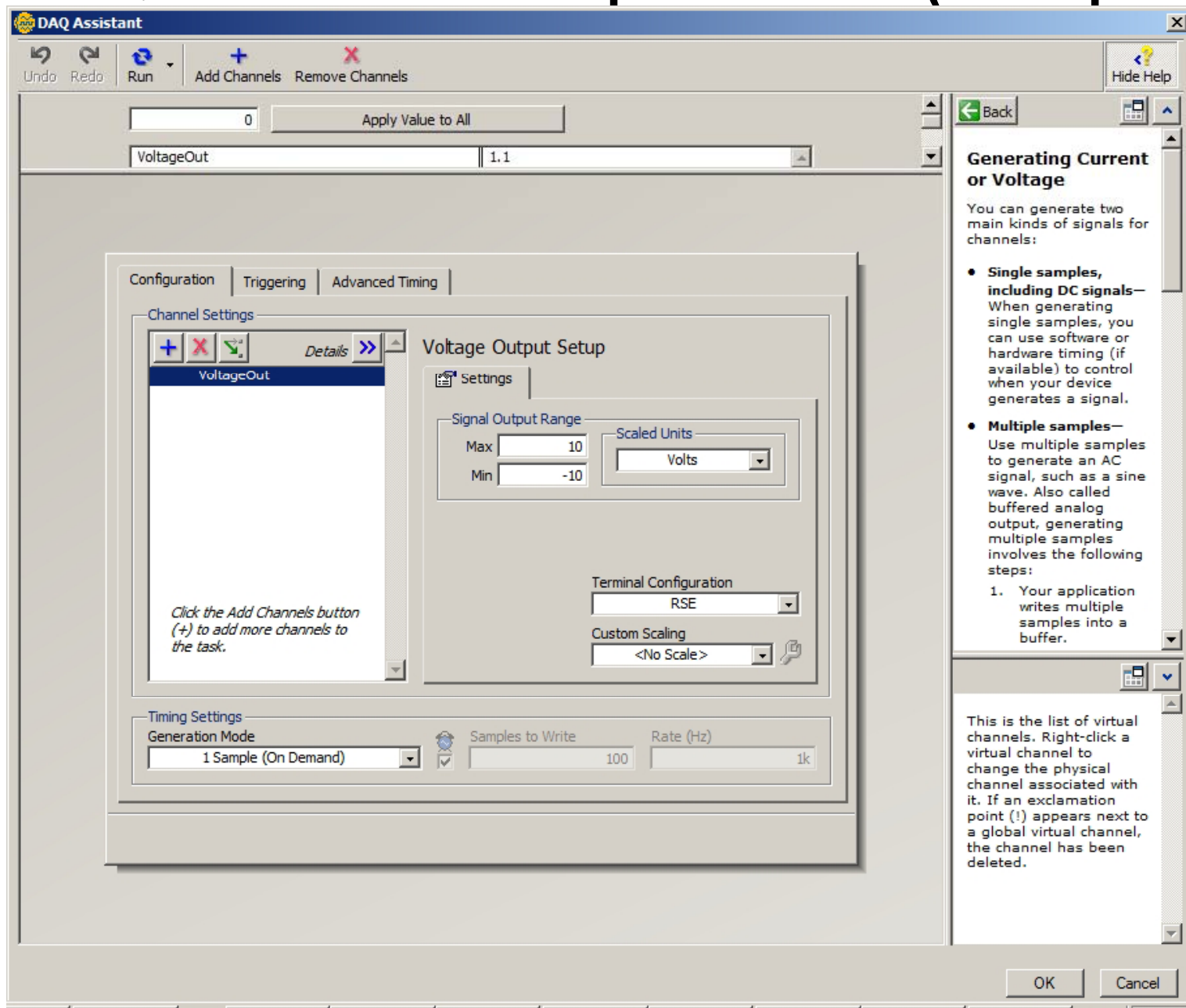
- 10 bit resolution
- 0 to +12V, 0 to -12V
- 500 mA current range



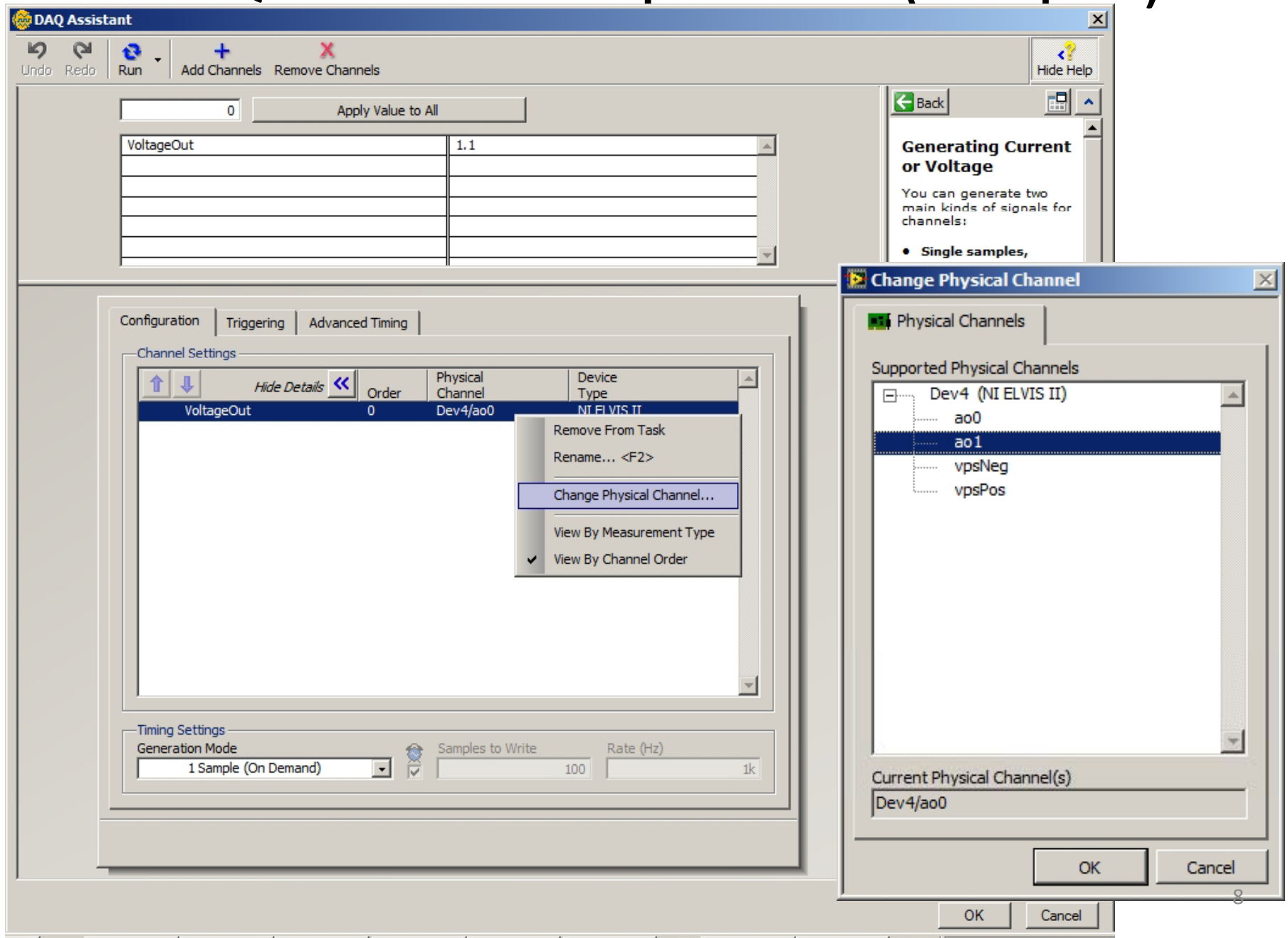
DAQ Output on ELVIS using LabVIEW



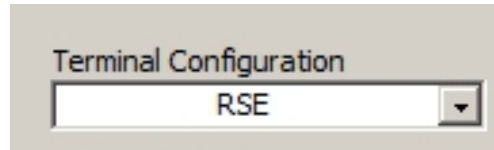
DAQ Assistant Express VI (Output)



DAQ Assistant Express VI (Output)



Terminal Configuration



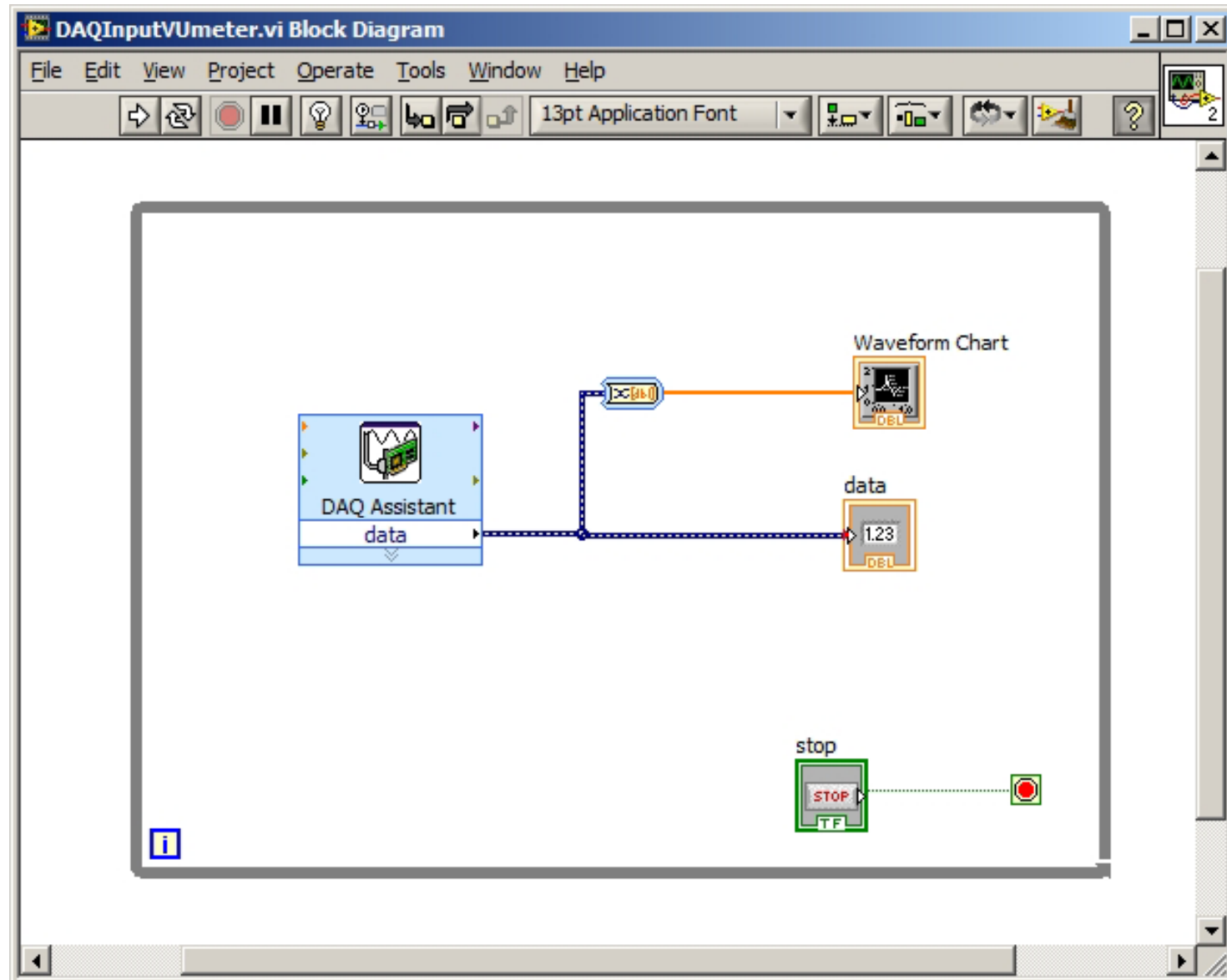
- Specifies the grounding mode used:
- **Differential**—Measures the difference between the positive and negative inputs and provides good rejection of common-mode voltage and noise.
- **RSE (Reference Single-Ended)**—Measurement made with respect to common ground.
- **NRSE**—Measurement made with respect to AISENSE.
- **Pseudodifferential**—The positive and negative inputs for the physical channel are referenced to measurement system ground through different impedances. The pseudodifferential terminal configuration measures the difference between the positive and negative inputs.
- **Let NI-DAQ Choose**—NI-DAQ decides which terminal configuration to use based on the physical channels you use.

Timing Mode

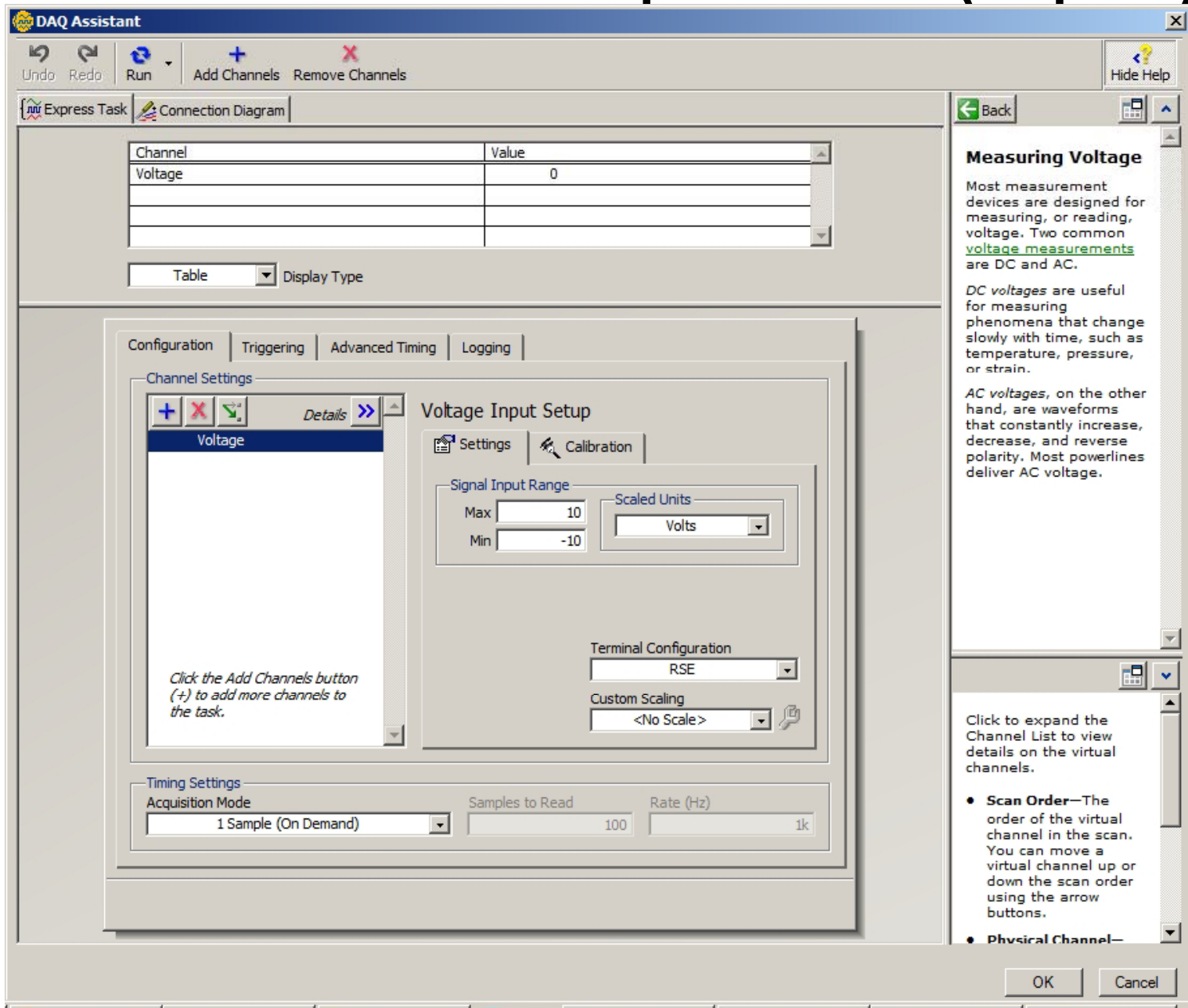


- **1 Sample (On Demand)** specifies that the task acquire or generate one sample.
- **1 Sample (HW Timed)** specifies that the task acquire or generate one sample on an edge of a hardware clock.
- **N Samples** specifies that the task acquire or generate a finite number of samples, specified by **Samples To Read/Write**.
- **Continuous Samples** specifies that the task acquire or generate data until stopped (buffer size).

DAQ Input on ELVIS using LabVIEW



DAQ Assistant Express VI (Input)



DAQ Assistant Express VI (Input)

The screenshot displays the DAQ Assistant Express VI (Input) interface. The main window has a toolbar with 'Undo', 'Redo', 'Run', 'Add Channels', and 'Remove Channels'. Below the toolbar, there are tabs for 'Express Task' and 'Connection Diagram'. The 'Express Task' tab is active, showing a table with columns 'Channel' and 'Value'. The table contains one row with 'Voltage' and '0'. Below the table, there is a 'Display Type' dropdown set to 'Table'.

On the right side of the main window, there is a 'Measuring Voltage' help window. It contains the text: 'Most measurement devices are designed for measuring, or reading, voltage. Two common voltage measurements are DC and AC.'

In the center of the main window, there is a 'Configuration' tab. It contains a 'Channel Settings' section with a table showing the current channel configuration. The table has columns 'Order', 'Physical Channel', and 'Device Type'. The first row shows '0', 'Dev4/ai1', and 'NI ELVIS II'. A context menu is open over this row, with options: 'Remove From Task', 'Rename... <F2>', 'Change Physical Channel...', 'View By Measurement Type', and 'View By Channel Order' (which is checked).

Below the 'Channel Settings' section, there is a 'Timing Settings' section. It includes an 'Acquisition Mode' dropdown set to '1 Sample (On Demand)', a 'Samples to Read' input field set to '100', and a 'Rate (Hz)' input field set to '10k'.

Overlaid on the bottom right of the main window is the 'Change Physical Channel' dialog box. It has a 'Physical Channels' tab. The 'Supported Physical Channels' list shows 'Dev4 (NI ELVIS II)' expanded, with a list of channels from 'ai0' to 'ai13'. 'ai1' is selected. The 'Current Physical Channel(s)' field at the bottom shows 'Dev4/ai1'. There are 'OK' and 'Cancel' buttons at the bottom of the dialog.