

CREATING LABVIEW INSTRUMENTS TO INSTRUMENT CIRCUIT SIMULATIONS IN NATIONAL INSTRUMENTS MULTISIM*

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Abstract

This module provides a brief introduction to creating LabVIEW instruments to instrument circuit simulations in National Instruments Multisim. Multisim is fully featured SPICE schematic capture and simulation tool used for circuit design, simulation, and in combination with Ultiboard for layout of custom PCBs.

1 Creating LabVIEW Instruments in MultiSim

Multisim ships with four different virtual NI LabVIEW instruments: a microphone, speaker, signal generator, and signal analyzer. The symbols are shown in Figure 1 and the speaker front panel is shown in Figure 2.

Microphone - Records audio from the computer sound device and outputs the sound data as a signal source.

Speaker - Plays input signal using the computer sound device.

Signal Generator - Generates and outputs a sine, triangle, square, or sawtooth wave.

Signal Analyzer - Displays time-domain data, auto power spectrum, or running average of input signal.

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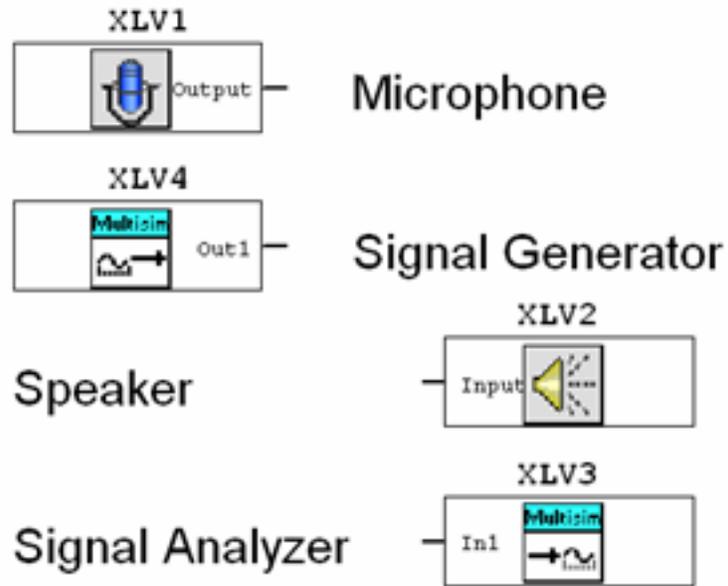


Figure 1: NI LabVIEW Instrument Symbols

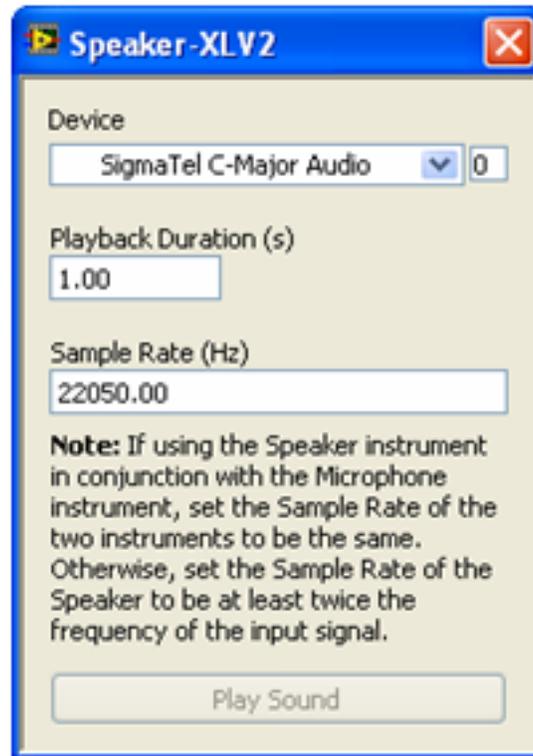


Figure 2: Sample NI LabVIEW Front Panel

Custom instruments can be created using the NI LabVIEW graphical development environment. Instruments that are created using NI LabVIEW can take advantage of the full functionality of the NI LabVIEW development system including data acquisition, instrument control, mathematical analysis, and so on.

For example, you can create an instrument that acquires data from the real world using a National Instruments data acquisition device or modular instrument. Multisim will then use that data as a signal source for circuit simulation.

You can also create an instrument that displays simulation data simultaneously with multiple measurements (running average and power spectrum, for example) made from that simulation data.

NI LabVIEW instruments can be either input instruments or output instruments. Input instruments receive simulation data for display or processing. Output instruments generate data to use as a signal source in simulation. A NI LabVIEW instrument cannot be both an input and output instrument.

Additionally, input and output instruments behave differently. Input instruments continuously receive simulation data from Multisim while simulation is active.

In contrast, at the beginning of circuit simulation, output instruments will first generate a finite amount of data and return that data to Multisim. Multisim will then use that data for circuit simulation. Output instruments do not continuously generate data while simulation is running. To cause an output instrument to generate new data, you must stop and restart simulation.

Output instruments allow the user or creator of the instrument to determine whether the instrument repeats the output data. The LabVIEW instrument must be configured to repeat its output data periodically, or else the simulator will assume the output is 0V once it has no data remaining from the instrument.

Alternatively, if you configure the instrument and repeat the output data, the instrument will loop and repeat its output periodically until the simulation has stopped.

Input instruments allow the user or creator of the instrument to set a sampling rate. This sampling rate is the rate at which the instrument receives data from Multisim. This sampling rate is analogous to the sampling rate you would set for a physical data acquisition device or modular instrument that acquires data from the real world. You should observe the Nyquist sampling theorem when choosing a sampling rate for your instrument. Note that the higher the value of the sampling rate, the slower simulation will run.

To create and modify NI LabVIEW instruments, you must have the NI LabVIEW 8.0 (or later) Development System.

To use NI LabVIEW instruments, you must have the NI LabVIEW Run-Time Engine installed on your computer. The version of this Run-Time Engine must correspond to the version of the NI LabVIEW Development System used to create the instrument. The Multisim installer includes the NI LabVIEW Run-Time Engine 8.0 as part of the Electronics Workbench Shared Components installation.