How to setup the Lock in Amplifier (LIA) on LabVIEW FPGA

Hardware Requirement

1. cRIO-9104 chassis
2. cRIO-9012 or other controller
3. One NI-9233 module.
Note: By default, the NI-9233 module is configured to be plugged into the first slot of cRIO-9104 and to use channel 0 as measurement signal and channel 1 as reference signal.
4. Signal Generator or other signal source

Software Requirement

- LabVIEW 8.5
- LabVIEW FPGA 8.5
- LabVIEW Real-time 8.5
- NI-RIO 2.4
- [Fixed-Point Math Library for LabVIEW FPGA 8.5](#)

Steps to Run the Demo

1. Open LIA.lvproj
2. Find the CompactRIO RT target and set the correct IP according to your system configuration

Note: If your HW setup is different from the default settings, you can create your own RT target, FPGA target, NI-9233 module and corresponding FPGA I/Os. Then, you should copy the following items under your new FPGA target.

- LIA_FPGA.vi – Top FPGA VI. You should make the proper changes on the nodes in this VI according to your new configuration.
- FPGASubVIs – Folder contains the LIA subVIs on the FPGA target.
- SignalOut – DMA Target to Host FIFO, which is used to send raw acquired data to the host.
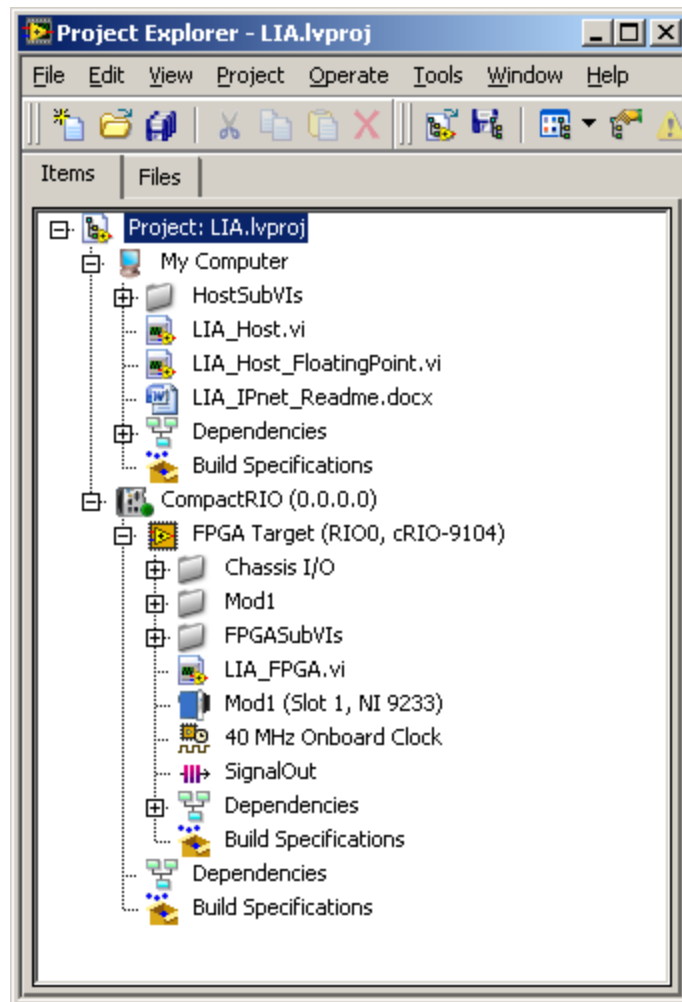
3. Compile the LIA_FPGA VI if necessary.

4. Open **LIA_Host.vi**, which is the host VI of the demo.
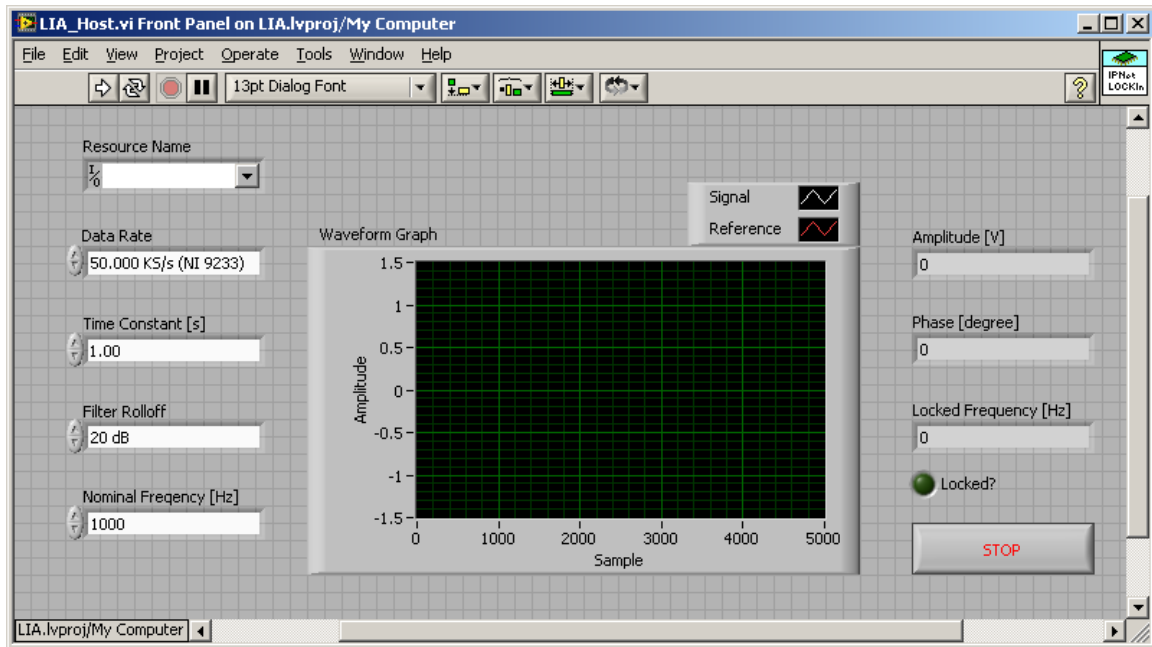
5. Choose the correct RIO resource in the **Resource Name** control.

6. Specify the **Time Constant [s]** control value, which is time constant of the LIA.

7. Specify the **Filter Rolloff** control value, which is the side lobe suppression of the low pass filter.

8. Set the **Nominal Frequency [Hz]** of phase locked loop. The frequency should be close to the frequency in reference channel. But they do not need to be identical. Phase locked loop will lock to the actual frequency.

9. Run the host VI.

10. Check the **Locked?** indicator. If it is on, phase locked loop has locked on the reference frequency. Indicator **Locked Frequency [Hz]** shows the frequency of reference channel. **Amplitude [V]** and **Phase [degree]** show the amplitude and phase of measurement channel.

To compare the fixed point lock-in amplifier result with the floating point implementation, you can downloaded the Lock-In Amplifier Start-Up Kit and extracted NILockinStartupKit.llb to the same folder as the project. Open and run LIA_Host_FloatingPoint.vi to get the floating point result.