

# Getting Started with the LabVIEW™ DSP Module

Version 1.0

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## Introduction

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Use this tutorial to learn how to create, build, download, and run a DSP VI on a digital signal processor (DSP).

This tutorial assumes you are familiar with basic LabVIEW concepts. Refer to the *Getting Started with LabVIEW* manual, available by selecting **Start»Programs»National Instruments»LabVIEW 7.1 Embedded Edition»LabVIEW Manuals** and opening `gtstrtlv.pdf`, for exercises that teach you basic LabVIEW concepts.

This tutorial uses the Heterodyne VI, located in the `labview embedded\examples\EmbeddedDSP` directory, and an NI SPEEDY-33 board. This example shows double-sideband modulation, also called signal heterodyning or signal mixing.



**Note** You also can use a Texas Instruments 6711 DSK or a Spectrum Digital 6713 DSK target.

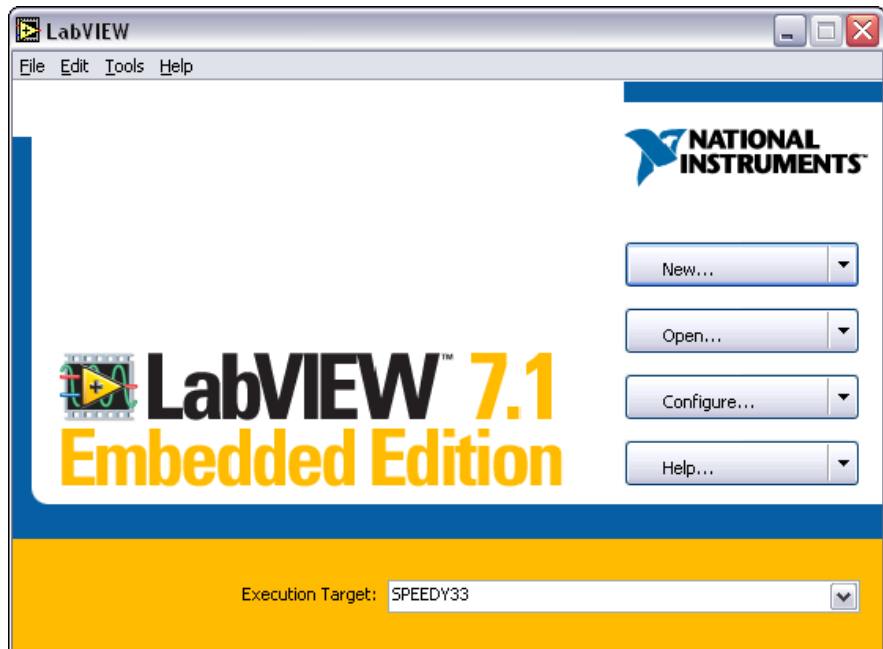
# Launching LabVIEW Embedded Edition and Selecting the Target

Complete the following steps to launch LabVIEW Embedded Edition and select the DSP target.

1. Launch LabVIEW Embedded Edition.
2. In the **LabVIEW** dialog box, shown in Figure 1, select **SPEEDY33** from the **Execution Target** pull-down menu.



**Note** If you are using another supported target, select that target in the **Execution Target** pull-down menu instead of **SPEEDY33**.



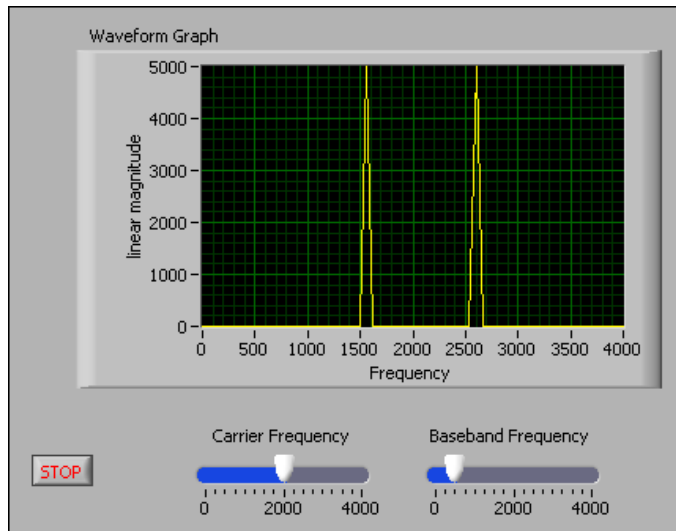
**Figure 1.** LabVIEW Dialog Box

3. Click the **Open** button, navigate to `labview embedded\examples\EmbeddedDSP`, and open `Heterodyne.vi`.

# Looking at the Front Panel and Block Diagram

Figure 2 shows the front panel of the Heterodyne VI. You create user interfaces for DSP VIs in the same way you create user interfaces in LabVIEW for Windows.

The waveform graph on the front panel displays the heterodyned signal. You can use the slider controls on the front panel to modify the carrier frequency and baseband frequency of the signal.



**Figure 2.** Heterodyne VI Front Panel

Select **Window»Show Block Diagram** and look at the VIs that the Heterodyne VI uses.



**Tip** Press the <Ctrl-E> keys to switch from the front panel to the block diagram or from the block diagram to the front panel.

Figure 3 shows the block diagram of the Heterodyne VI. The following VIs are used in the Heterodyne VI:

- **Simulate Signal Express VI**—Generates sine waves. One instance generates the carrier frequency, and one instance generates the baseband frequency. The two sine waves are multiplied together, which results in a mixed signal. The product of these two signals is the input to the Default AO Elemental I/O Node.
- **Spectral Measurements Express VI**—Computes the FFT and displays the signal on a waveform graph on the front panel.
- **Analog Output Elemental I/O Node**—Writes data to the Digital-to-Analog (D/A) converter, also known as a CODEC (coder-decoder), on the SPEEDY-33 target. You can configure how the VI writes data to the analog output by double-clicking the Elemental I/O Node.

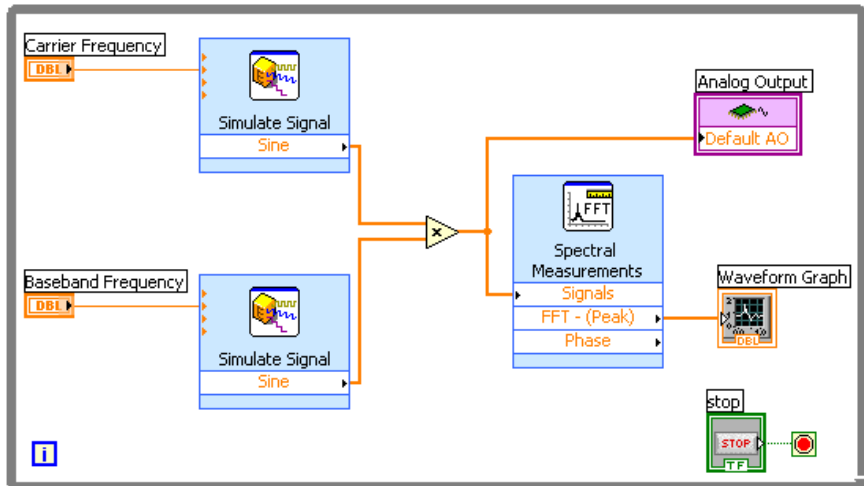
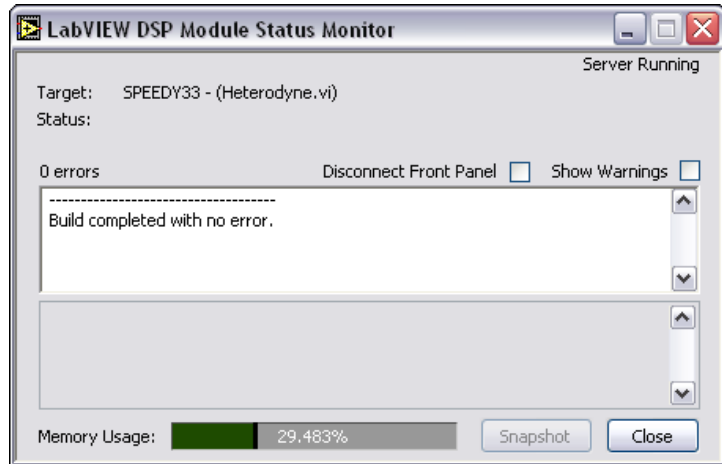


Figure 3. Heterodyne VI Block Diagram

# Running the VI

Click the **Run** button to build, download, and run the DSP VI on the SPEEDY-33 target. When you click the **Run** button, the **LabVIEW DSP Module Status Monitor** window, shown in Figure 4, appears and displays the progress of the build, download, and execution of the DSP VI on the SPEEDY-33 target.



**Figure 4.** LabVIEW DSP Module Status Monitor Window

When the VI is running on the DSP target, the front panel moves to the front. You can modify the carrier frequency and baseband frequency using the slider controls on the front panel. When you change the carrier frequency or baseband frequency, the DSP VI writes the values to the DSP target at run time without modifying any of the other code. The waveform graph on the front panel shown in Figure 2 displays the frequency response of the signal. If you plug in speakers or headphones to the analog output on the SPEEDY-33 board, you also can hear the changes to the carrier frequency and baseband frequency.

Click the **Stop** button to stop the VI.

Refer to the `labview\embedded\examples\EmbeddedDSP` directory for additional DSP Module examples.

# Where to Go for Support

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The National Instruments Web site is your complete resource for technical support. At [ni.com/support](http://ni.com/support) you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world to help address your support needs. For telephone support in the United States, create your service request at [ni.com/support](http://ni.com/support) and follow the calling instructions or dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

Australia 1800 300 800, Austria 43 0 662 45 79 90 0,  
Belgium 32 0 2 757 00 20, Brazil 55 11 3262 3599,  
Canada 800 433 3488, China 86 21 6555 7838,  
Czech Republic 420 224 235 774, Denmark 45 45 76 26 00,  
Finland 385 0 9 725 725 11, France 33 0 1 48 14 24 24,  
Germany 49 0 89 741 31 30, India 91 80 51190000,  
Israel 972 0 3 6393737, Italy 39 02 413091, Japan 81 3 5472 2970,  
Korea 82 02 3451 3400, Lebanon 961 0 1 33 28 28,  
Malaysia 1800 887710, Mexico 01 800 010 0793,  
Netherlands 31 0 348 433 466, New Zealand 0800 553 322,  
Norway 47 0 66 90 76 60, Poland 48 22 3390150,  
Portugal 351 210 311 210, Russia 7 095 783 68 51,  
Singapore 1800 226 5886, Slovenia 386 3 425 4200,  
South Africa 27 0 11 805 8197, Spain 34 91 640 0085,  
Sweden 46 0 8 587 895 00, Switzerland 41 56 200 51 51,  
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