
# Demo Application: *Signal Tracker*

**Bruno Paillard**
**et**
**Alex Boudreau**

November 11, 2000

# 1 Introduction

This document describes a LabView application, which is used to demonstrate the LabView interface to the Signal Ranger DSP board. This application loads and launches a real time DSP code, and then allows the user to interract with it. This user interraction is in the form of *Reads* of DSP variables and vectors, and *Writes* of parameters that act on the real time processing.

# 2 What it does

This application uses the Signal Ranger board to sample a signal on one of its inputs, and compute its average energy spectrum. At the same time, and synchronously to the input sampling, it is possible to generate an output vector. In effect, the application works as a limited functionality spectrum analyzer.

The measured spectrum includes the gains, delays and anti-aliasing filters of the AICs.

# 3 What is Real Time, what is not

For this application the generation of the output reference signal and the acquisition of the input signal on the AIC are implemented in real time on the DSP.

All user interactions, including the display of time and frequency responses, and various warning conditions, as well as actions and parameters from the user, are implemented on the PC and not synchronized with the DSP processing.

This LabView application simply sends a new vector of output data to the DSP, waits until the DSP has finished processing it, then retrieves the corresponding vector of input data. It then computes the energy spectrum and manages the display.

Upon reception of a new vector of data, the DSP simply outputs every sample on the selected AIC, synchronously samples the input of the AIC, and stores the input vector. When requested, it sends the input vector to the PC for FFT processing and display.

# 4 Running the demo

To run the demo, you must have a Signal Ranger board, powered and connected to the USB port of a PC. Additionally, you can have an unknown system (filter) connected between the analog output and input of the DSP board (minimally a simple cable, connecting output to input).

The following files must be in the same directory, from which you will execute the demo:

- **SRangerSignalTracker.llb** LabView library containing the Vis of the SignalTracker demo.
- **SRanger.llb** LabView library containing the user Vis of the LabView interface.
- **SRangerU.llb** LabView library containing the utility Vis of the LabView interface.
- **SRKernel.out** COFF file of the Signal Ranger kernel.
- **Demo2_SR.out** COFF file of the SignalTracker demo.
- **SRanger.dll** Low-level board communications dll.
- **SignalTracker.exe** Windows executable of the demo (if you do not have LabView installed on your PC).

If you do have LabView installed on your PC Simply double click on the SRangerSignalTracker.llb icon. If you don't, use the "SignalTracker.exe" executable that has been built for the demo.

You are then presented with the following front panel:

*Note: Fonts might not appear correctly if the font size in the Windows display settings is not set to "small fonts".*

To run the application, simply click on the arrow at the top left of the window.

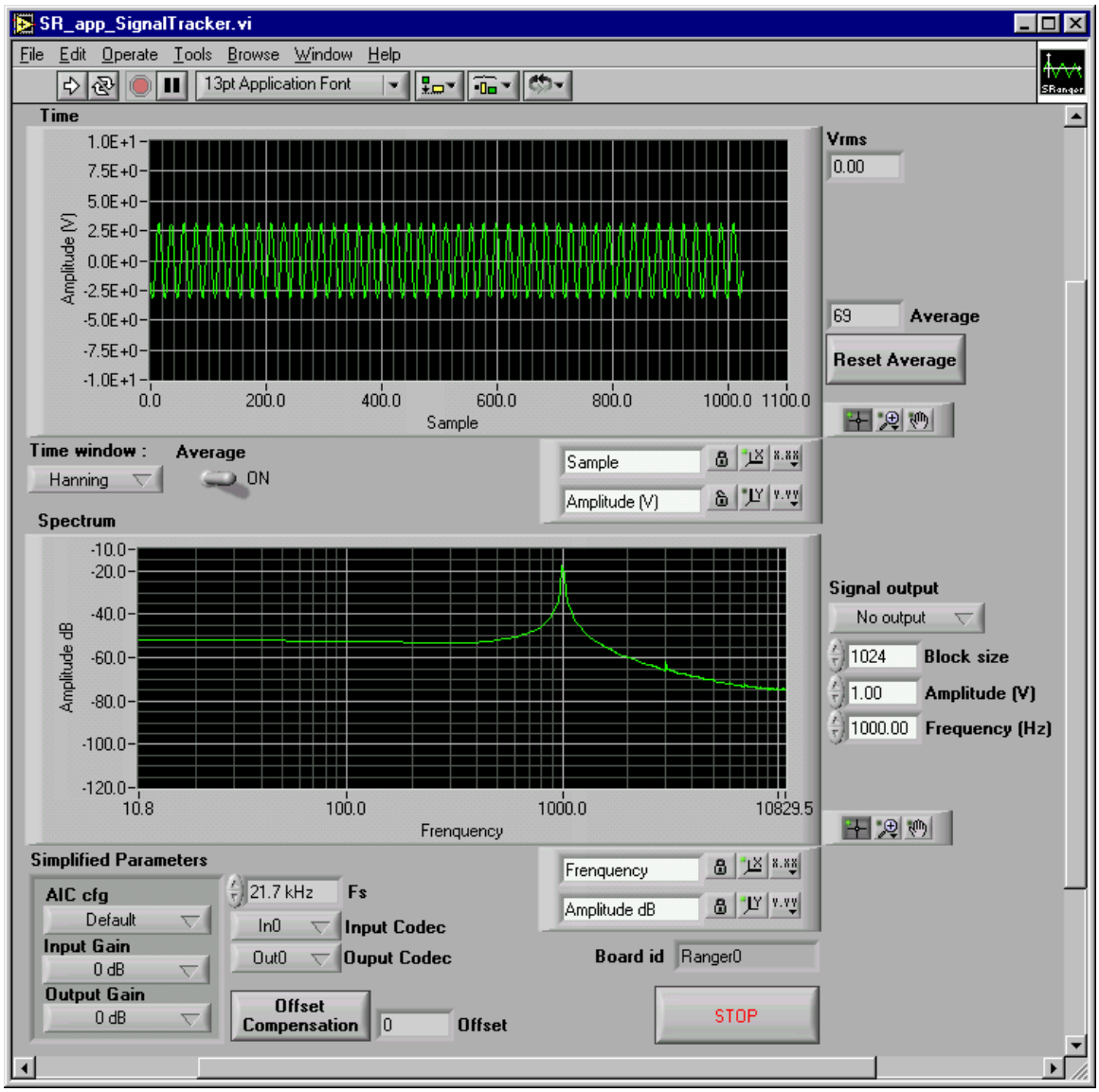


**Figure 1 Front panel of the demo application**

## 5 User interface

All controls except the **Board id** control can be operated while the application is running and have a dynamic action on the real time process executing on the DSP.

- **Board id** Selects which Signal Ranger board to use for the test. If only one is connected to the USB port, "Ranger0" should be used. If not, change the index to match the desired board.

- **Simplified parameters** Controls for the configuration of the Analog Interface Circuits.
  - **AIC cfg** Input/Output configuration:
    - Default: routes the In and Out signals to the RCA connectors
    - Analog loopback: puts the selected AIC in analog loopback
    - Digital loopback: puts the selected AIC in digital loopback
  - **Input Gain**: Sets the input gain from –36db to +24db in 3db steps
  - **Output Gain**: Sets the output gain from –36db to +24db in 3db steps
- **Fs** Sets the sampling frequency, as well as the cutoff frequency of the anti-aliasing filters (0.45Fs).
- **Input AIC** Selects an AIC (from 0 to 7) from which to sample the input signal.
- **Output AIC** Selects an AIC (from 0 to 7) to which to route the white test signal.
- **Time** Displays the sampled signal from the selected input. The x-axis is in number of samples. The y-axis is in volts (assuming the RCA connector is used as the input and the AIC is not in loopback). The dynamic range for the input signal is +-10V. This display is updated as fast as the PC allows.
- **Spectrum** Displays the averaged energy spectrum of the input signal. The x-axis is in Hz. The y-axis is in db.
- **Buttons**
  - **Stop** Stops the application.
  - **Reset Average** Resets the spectrum average.
  - **Offset compensation** The DC offset of the analog input is measured and thereafter subtracted from the input. This control triggers the following operations:
    - Mutes the output.
    - Measures the input for a short period of time.
    - Averages the measured DC offset of the input over that period of time.
    - Resumes the generation of the output signal, and use the new average value as the offset compensation on the input (subtract the offset from the acquired samples).

*Note: For a best estimation of the low frequency components of the signal, it is useful to perform an offset compensation procedure. Since the offset can vary with temperature, it is best to repeat this procedure as long as the AIC has not reached its equilibrium temperature).*

- **Offset** Indicates the averaged value of the input offset of the AIC, after the offset calibration has completed. This value is expressed in 16 bits, 2's complement notation.
- **Average** Indicates the number of vectors taken into the average so far.

- **Vrms** Indicates the RMS value of the displayed input signal.
- **Signal output** This control allows the selection of various test signals. The default is "No signal".
- **Block Size** Adjusts the size of the input and output vectors processed.
- **Amplitude** Adjusts the peak voltage of the output signal.
- **Frequency** Adjusts the frequency of the output signal. It is only used for periodic test signals.
- **Input Saturation** This indicator will light up when the input signal acquired by the AIC is above 30000, or below –30000 (about 90% of the input dynamic range). If this is the case, the following steps can be taken: