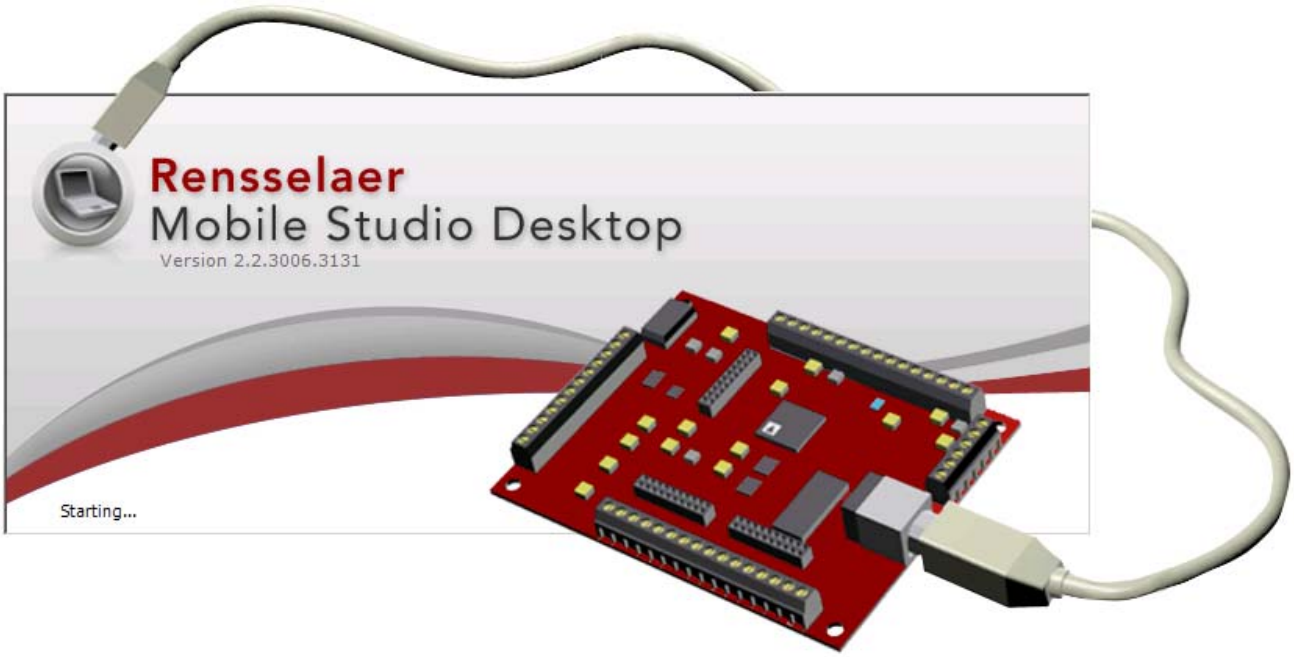
MOBILE STUDIO DESKTOP SOFTWARE

USER MANUAL



Rensselaer Polytechnic Institute

TABLE OF CONTENTS

FUNCTIONS OF MOBILE STUDIO DESKTOP

OBJECTIVE

To learn how to use the various functionalities of Mobile Studio Desktop program

MATERIALS

- Rensselaer Mobile Studio I/O Board, drivers installed
- Mini-USB to USB connector cable
- Mobile Studio Desktop program, fully installed
- Windows XP/Vista

FUNCTIONS

I. FUNCTION GENERATOR

1) Select the "Function Generator" icon third from the top along the left-hand side of the program, as shown in Figure 1.0 below.

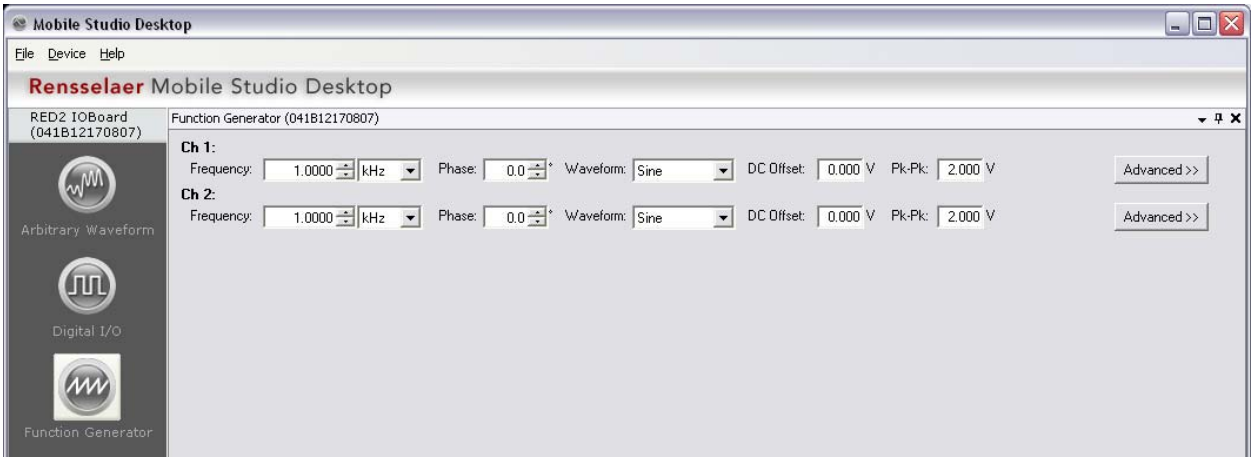


Figure 1.0: Function Generator

2) Specifics for the signals in both channels can be changed in this feature as listed below and shown in Figure 1.1.

Frequency: value and units in Hz/kHz

Phase : value and units in degrees

Waveform: sine wave, triangle wave, square wave

DC Offset: value in volts

Peak-to-Peak Voltage: value in volts

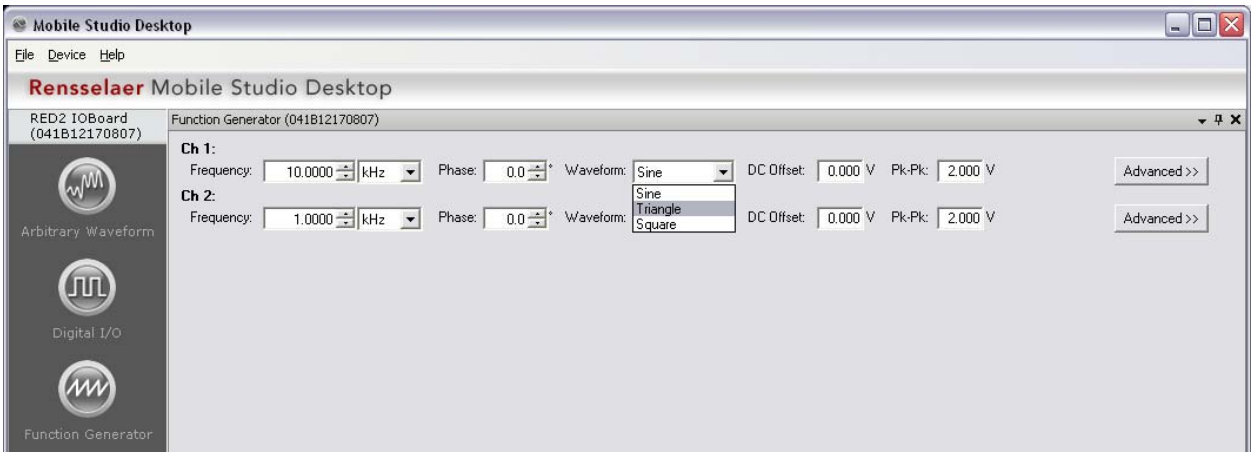


Figure 1.1: Function Generator Settings

3) By selecting "Advanced" on the right next to either channel, further settings can be altered as shown in Figure 1.2 and mentioned below.

Fine Adjustment: minimum and maximum values and units in Hz/kHz
Sample Rate: ranging from 44.000 SPS to 1.434 MSPS
Frequency Sweep:
- Number of iterations
- Beginning Frequency: value and units in Hz/kHz
- Ending Frequency: value and units in Hz/kHz
- Sweep Time (time duration of sweep): value in seconds
- Interval (time interval between frequencies in the sweep): value in milliseconds

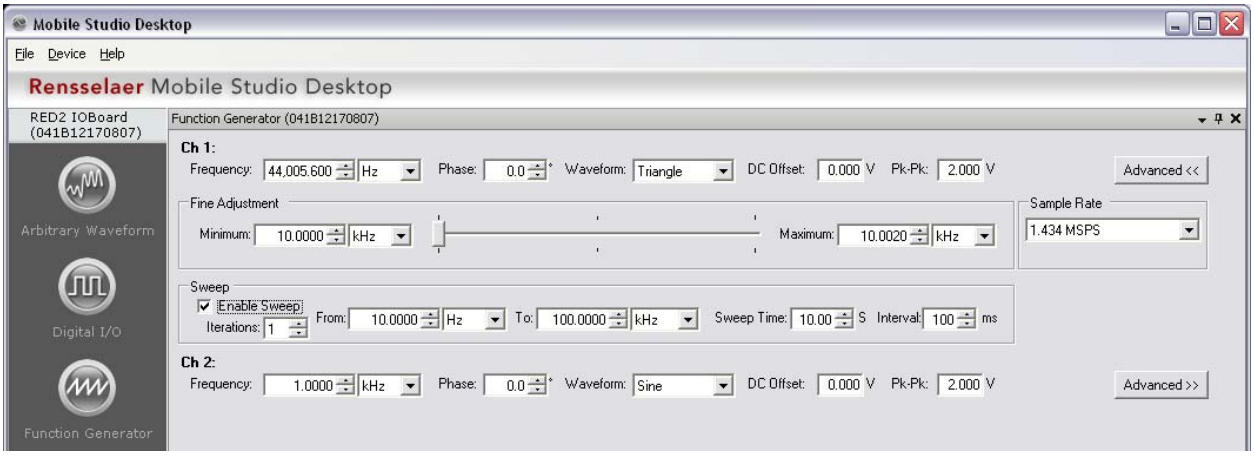


Figure 1.2: Advanced Function Generator Settings

4) Once you have selected settings for the sweep, clicking on the checkbox labeled "Enable Sweep" will begin the frequency sweep for the parameters currently set.

5) Close out of the Function Generator by clicking on the "X" in the upper right corner.

II. OSCILLOSCOPE

1) Select the “Oscilloscope” icon third from the bottom along the left panel of the screen, shown in Figure 2.0.

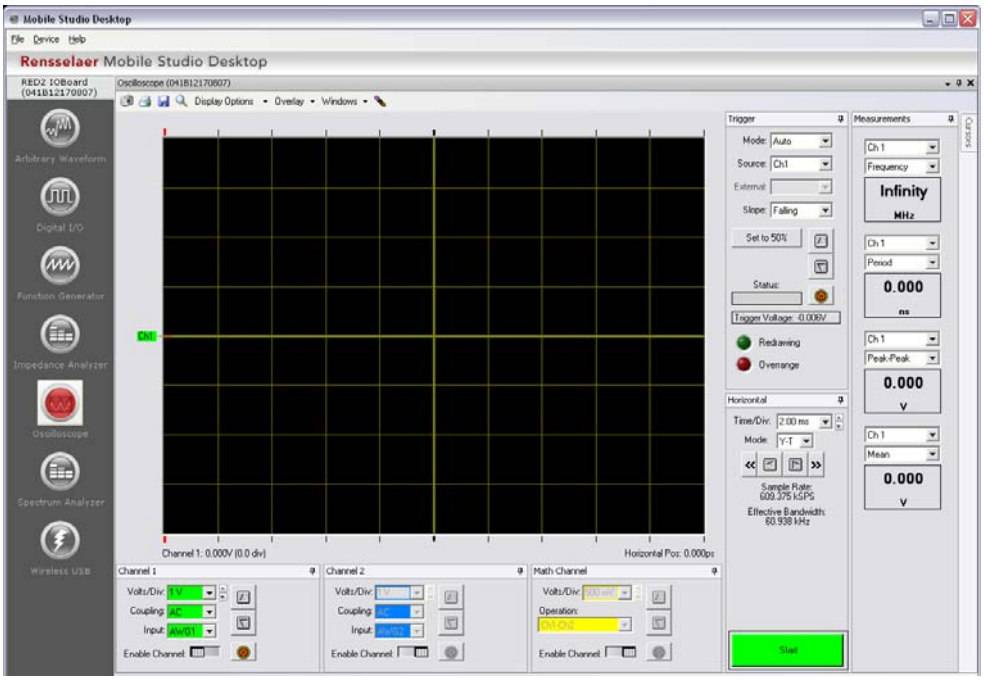


Figure 2.0: Oscilloscope Function

2) Settings can be changed as listed below in each channel when the channel switch at the bottom is turned “On” when positioned to the left.

Volts/Division: from 10 mV to 5 V
Coupling: DC, AC, Ground (GND)
Input: A1 Single-ended (SE), A1 Differential (DIFF), Arbitrary Waveform Generator 1 (AWG1), Arbitrary Waveform Generator 2 (AWG2)

3) There are various panels in this view such as “Trigger”, “Measurements” and “Cursors” which can be docked or hidden to allow for more viewing room in the window by pressing on the pushpin icon .

4) Selecting the *Function Generator* icon while the *Oscilloscope* is still in the window will display both interfaces and allow for simultaneous adjustments and viewing, as shown below in Figure 2.1.

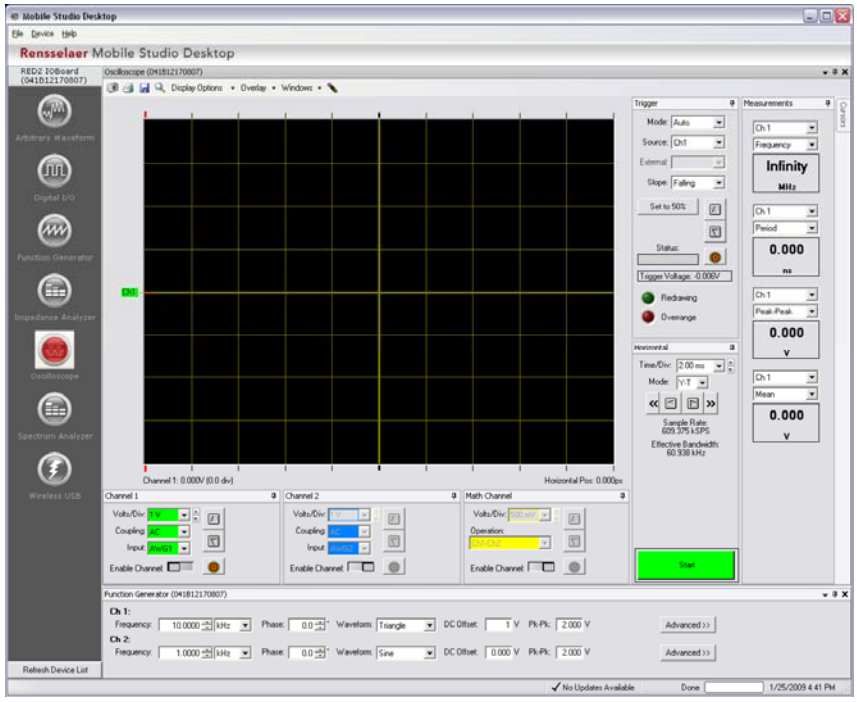


Figure 2.1: Oscilloscope and Function Generator Simultaneous Interface

5) For the ability to have specific settings automatically opened with the program, click on "File → Save Settings" as shown in Figure 2.2 below.

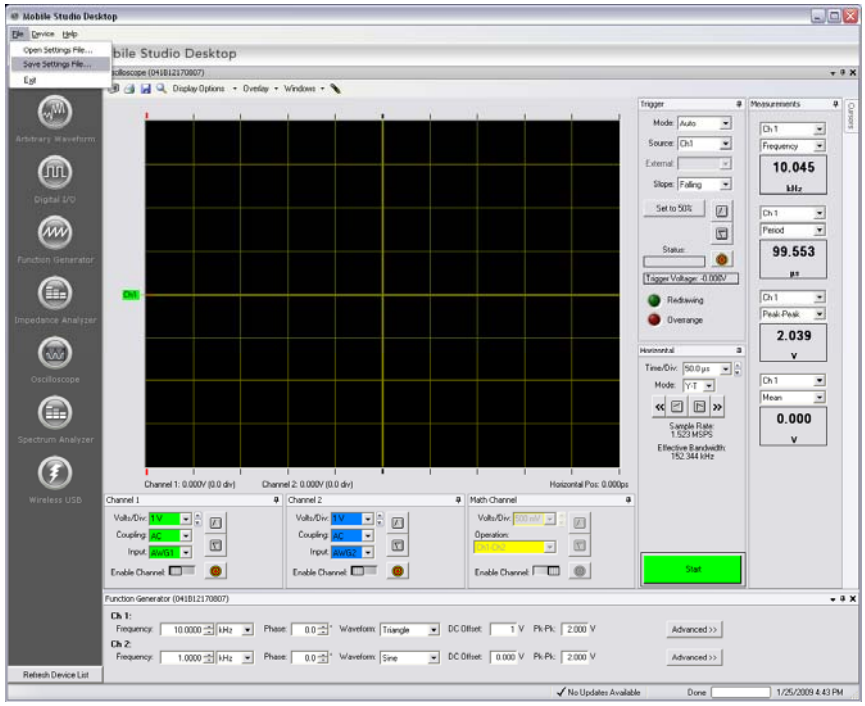


Figure 2.2: Save Settings File

6) A Save Window will pop up and allows the user to choose the directory and name the settings file, shown in Figure 2.3.

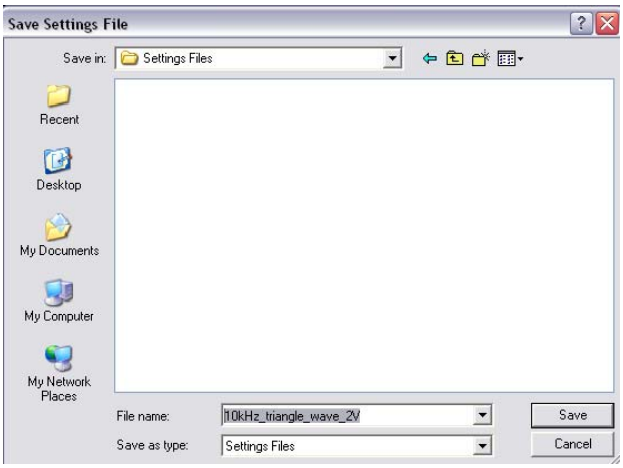


Figure 2.3: Save Settings Window

In order to load the setup, double-click on the file and it will automatically open the program with the setup loaded as saved.

Example:

Set the following settings on the function generator:

Channel 1

Frequency: 10.000kHz Waveform: Triangle DC Offset: 1V Pk-Pk: 2.00V

Channel 2

Frequency: 5.000kHz Waveform: Square DC Offset: 0V Pk-Pk: 1.00V

Set the following settings on the oscilloscope:

Channel 1

Volts/Div: 1V Coupling: DC Input: AWG1 Enable Channel: On (to the left)

Channel 2

Volte/Div: 1V Coupling: DC Input AWG2 Enable Channel: On (to the left)

Change the centering of the signal in channel 2 along the vertical axis by clicking on the large up and down arrows  to move the signal up or down to view both signals easily.

By pressing “Start” the oscilloscope will show the following waveform in Figure 2.4.

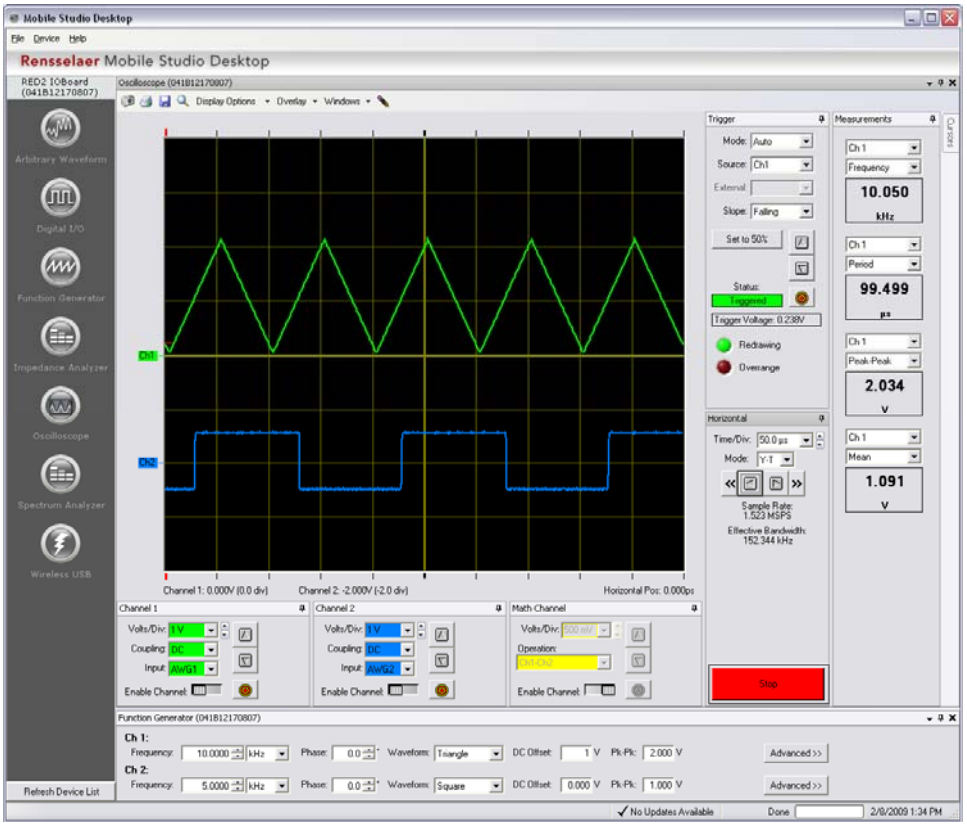


Figure 2.4: Triangle and Square Waveform Example

7) In order to make more accurate measurements of the voltage readings, select the *Cursors* tab along the right and the panel will pop out from the side. Pressing the pushpin icon will dock the panel in the view.

8) Checking the "Enable" box will display the cursors for the channels being shown. Clicking and dragging the green and blue lines will allow the user to position the cursors to their desired location for taking measurements. The numerical values are displayed in the panel as well as the automatically calculated delta between each pair of cursors. These functions are displayed in Figure 2.5.

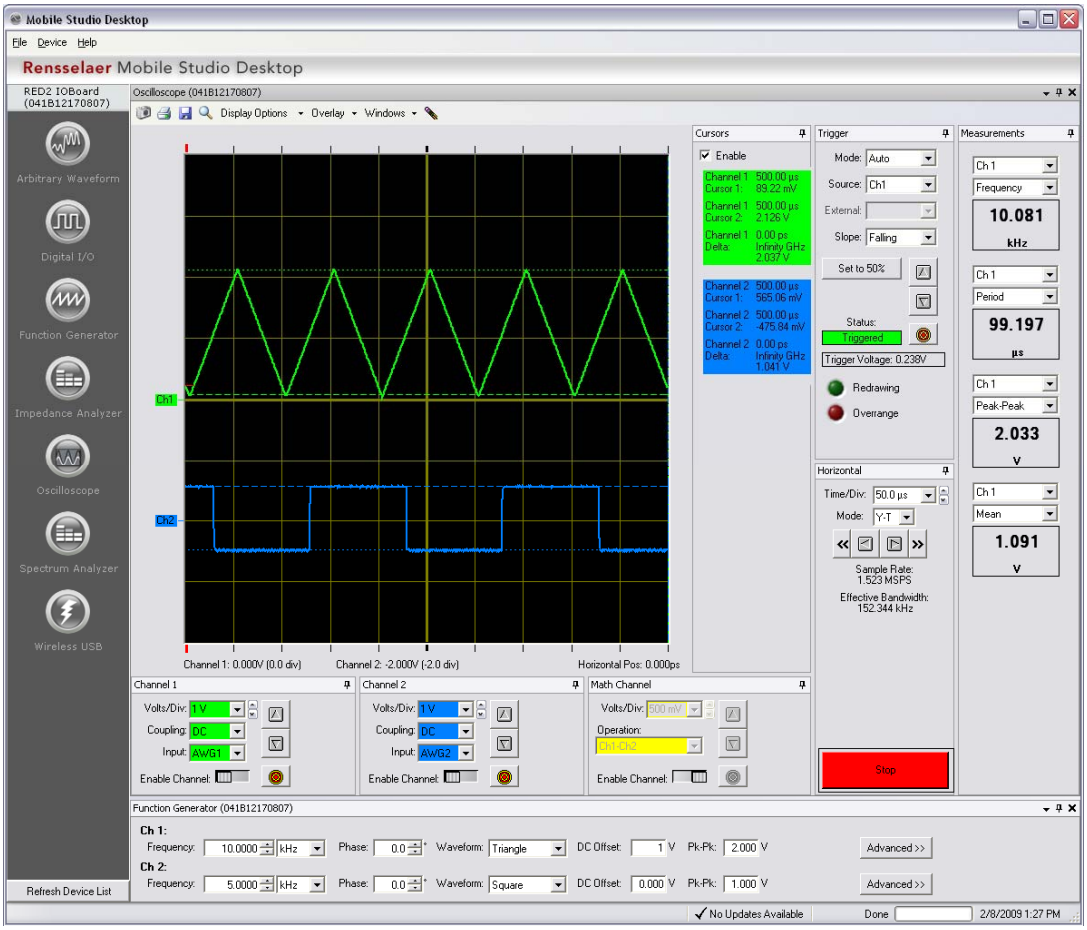


Figure 2.5: Cursor Measurements

9) To increase the width of the signal waveform trace, choose "Display Options → Trace Width" and choose the appropriate number option desired (1, 2, 4, or 8), shown in Figure 2.6 below.

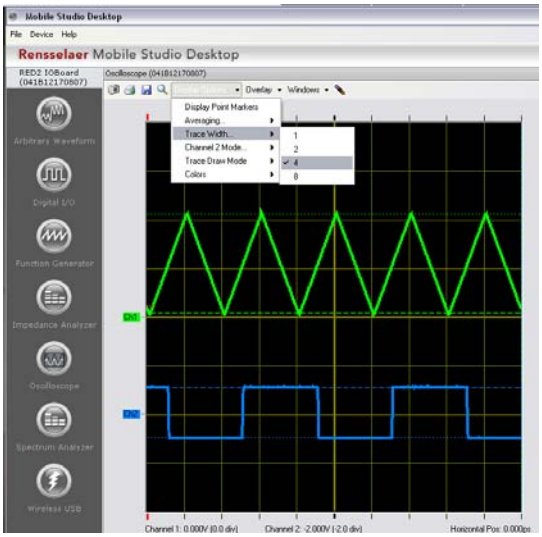


Figure 2.6: Trace Width Options

10) To capture a screenshot image of the oscilloscope, click “Stop” to choose the image to be captured. Click on the camera icon  to save the screenshot.

11) A Save Window will pop up allowing the user to save the image in a specific directory and in a variety of different formats (PNG, BMP, JPEG, GIF), shown in Figure 2.7.

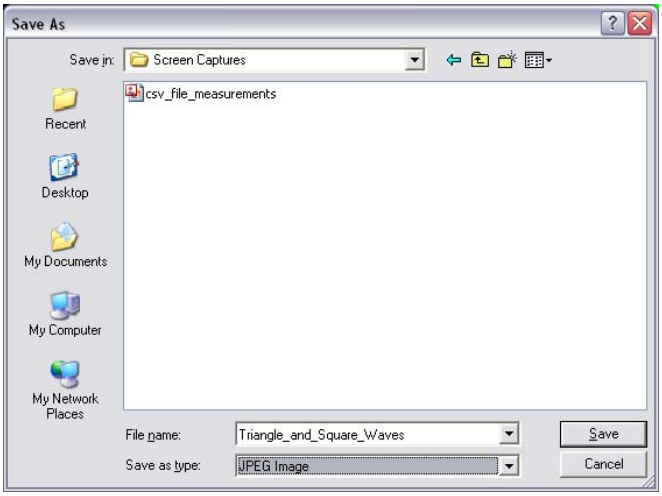


Figure 2.7: Save Screenshot Window

12) A window with screenshot options will pop up to allow the directory to be changed as well as the background color (black or white) to be chosen. Click “Save” when finished, shown in Figure 2.8 below.

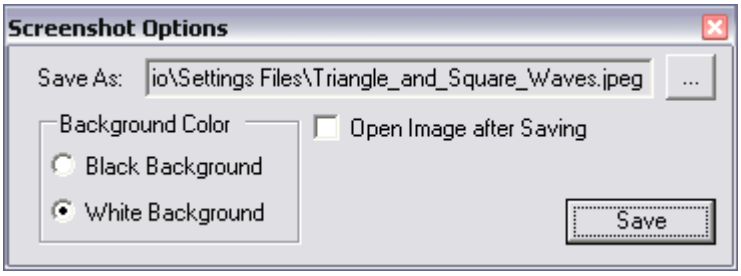


Figure 2.8: Screenshot Options

13) Close out of both the *Oscilloscope* and *Function Generator* windows by clicking the “X” buttons.

III. ARBITRARY WAVEFORM GENERATOR

1) Open the "Arbitrary Waveform Generator" by selecting the icon on the top of the left panel, which should bring up the window below shown in Figure 2.0.

NOTE: The *Function Generator* and *Arbitrary Waveform Generator* cannot be open simultaneously, otherwise an error will occur informing the user of this restriction.

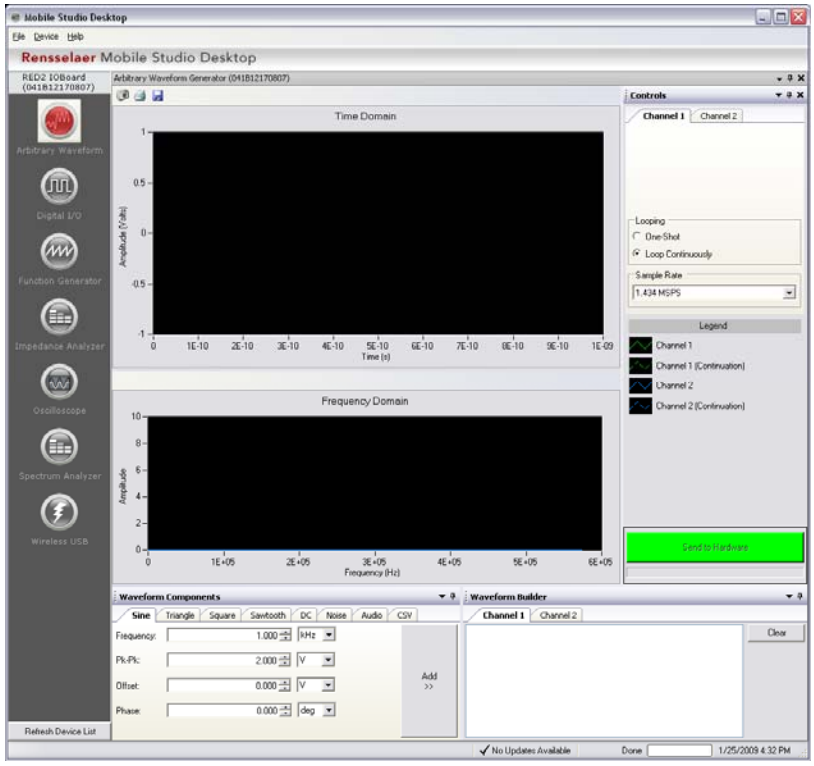


Figure 3.0: Arbitrary Waveform Generator

2) This function allows the user to customize the waveforms being generated by the Arbitrary Waveform Generators 1 and 2 (AWG1 and AWG2). There are multiple choices for different waveforms along with parameters unique to each wave.

Waveform Options: Sine, Triangle, Square, Sawtooth, DC, Noise, Audio, CSV (upload)

3) Once a waveform and its parameters are chosen, clicking the "Add" button in the *Waveform Components* will submit the signal to the *Waveform Builder* on the specific channel selected (Channel 1 or Channel 2).

4) When the signal is added to the *Waveform Builder* it displays in the *Time Domain* and *Frequency Domain* windows, shown in Figure 3.1 below.

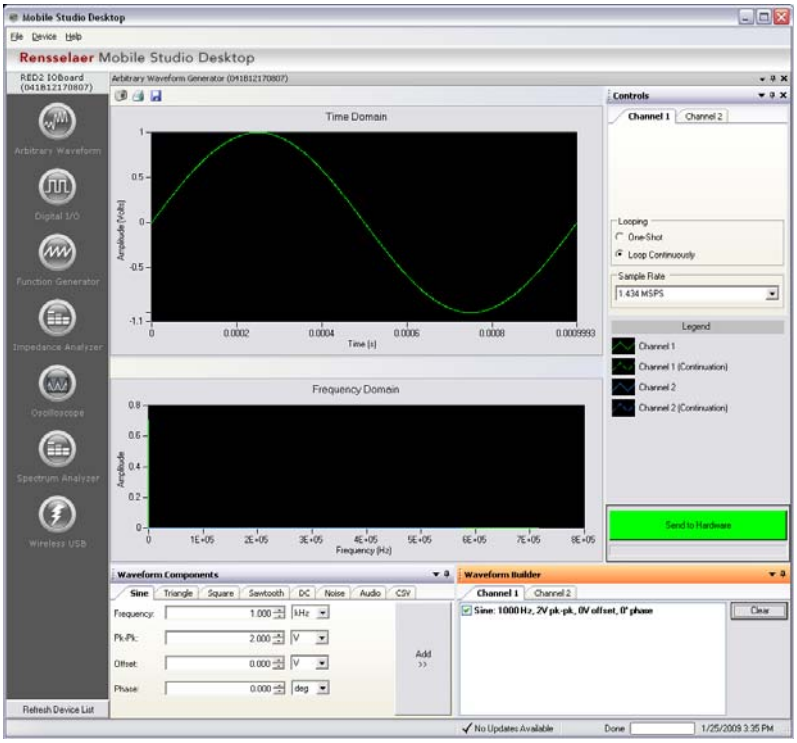


Figure 3.1: Arbitrary Waveform Generator Display

5) Multiple signals can be added on the same channel and the resulting signal combination is displayed when the signals are selected in the checkbox in the Waveform Builder, shown in Figure 3.2 below.

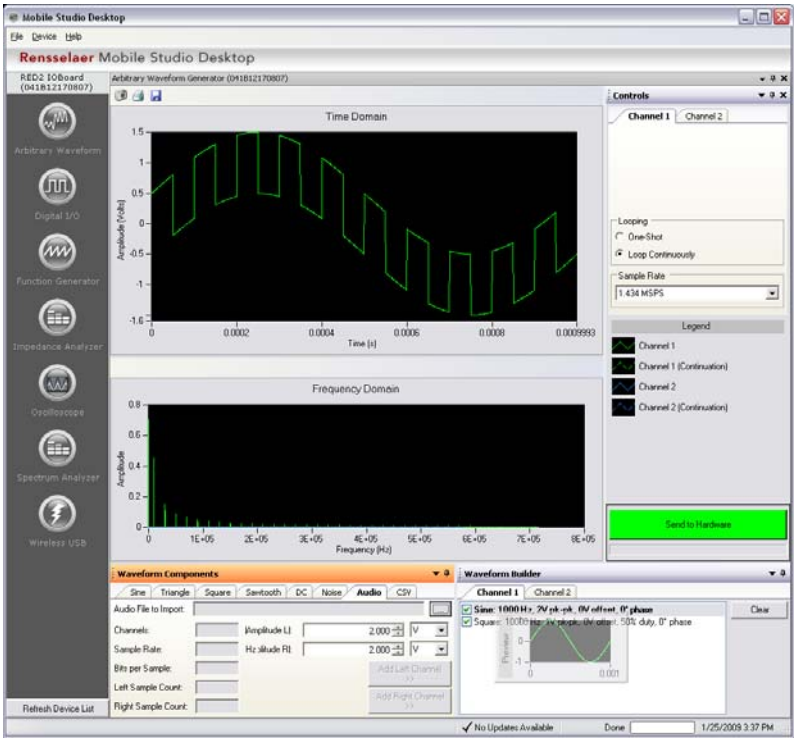


Figure 3.2: Multiple Waveforms in the Arbitrary Waveform Generator

By hovering over a specific signal in the builder, a transparent display of the single original waveform highlighted will appear.

6) This functionality also allows for the user to draw and alter waveforms as desired by right clicking and drawing in the Time Domain window to change the waveform, as shown below in Figure 3.3.

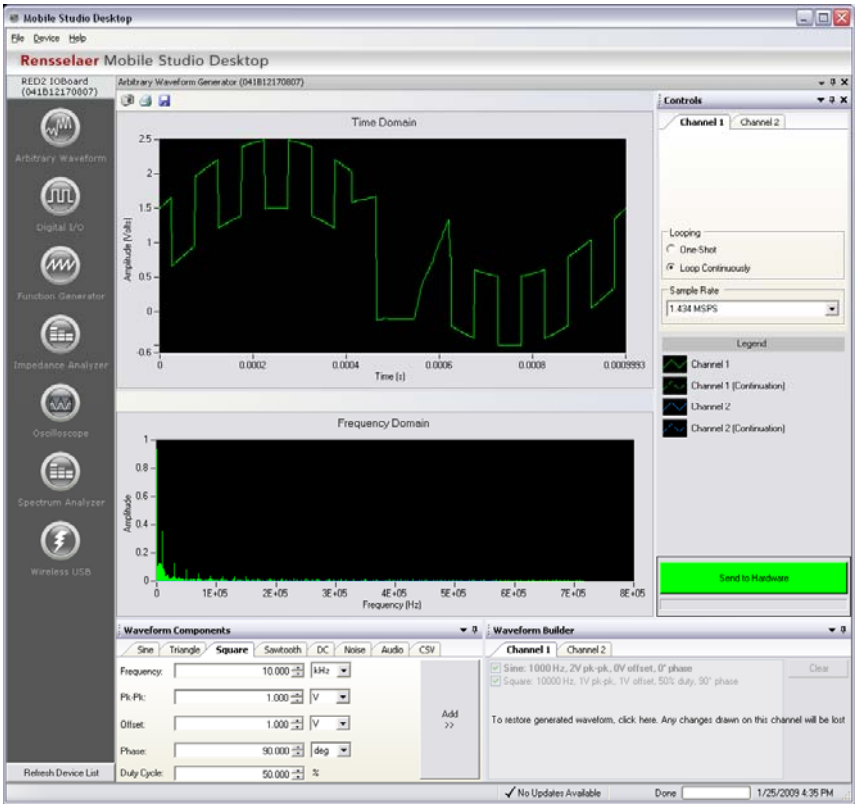


Figure 3.3: Manual Alteration of Waveforms

7) To restore the signal to the original waveforms chosen, click in the *Waveform Builder* panel window and the manual changes will be erased.

8) For the Audio or CSV tabs, files can be uploaded and added to the desired channels for use. CSV files can be created from Microsoft Word Excel by saving the raw data point values as a .csv file.

9) To implement the waveforms created in this function, clicking on the green “Send to Hardware” button will send the information to the respective Arbitrary Waveform Generator output pins to be used as desired.

10) Close the *Arbitrary Waveform Generator* by clicking on the “X” button in the upper right corner of the window. Continue with the *Oscilloscope* or *Spectrum Analyzer* to view and analyze the signals.

IV. SPECTRUM ANALYZER

1) Open the *Spectrum Analyzer* by selecting the icon second from the bottom on the panel along the left side of the window, shown in Figure 4-0 below.

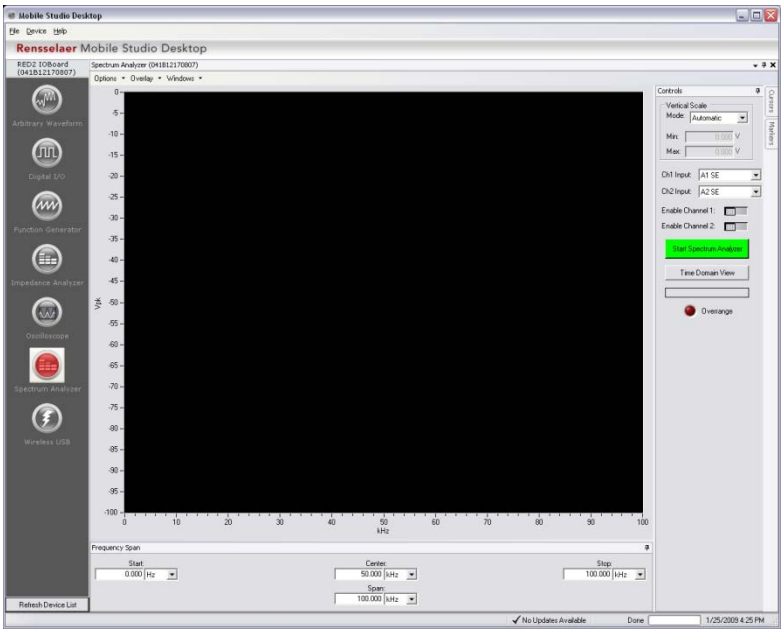


Figure 4-0: Spectrum Analyzer

2) To view the frequency representation of signals that have been sent from the *Function Generator* or *Arbitrary Waveform Generator* to both channels, set the "Ch1 Input" and "Ch2 Input" to AWG1 and AWG2, respectively, as shown in Figure 4-1.

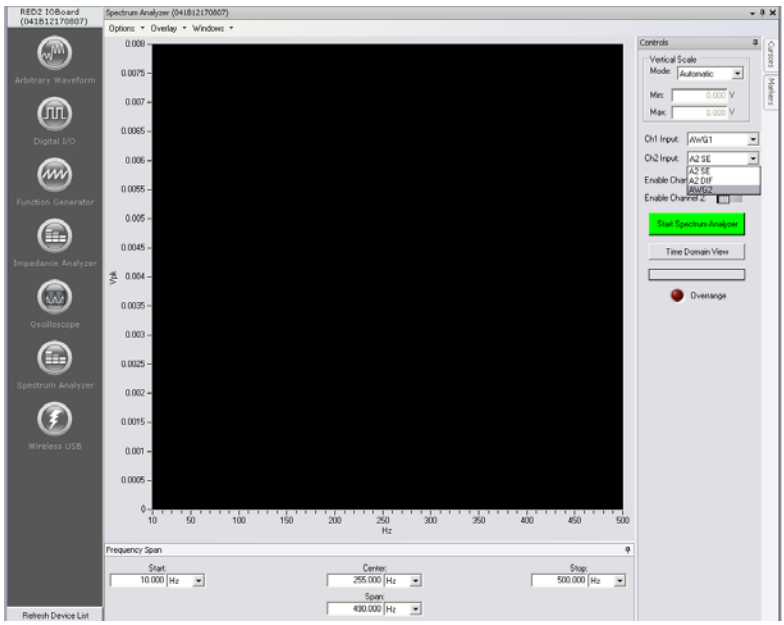


Figure 4-1: Setting Channel Inputs

3) To set the range of frequencies in view for the Spectrum Analyzer, change the values of the “Start”, “Center” and “Stop” frequencies as needed.

4) Click “Start Spectrum Analyzer” to begin analyzing the signals in the window, shown in Figure 4-2 below. The input signals can be manipulated simultaneously by opening the *Function Generator* or *Arbitrary Waveform Generator* and changing the parameters.

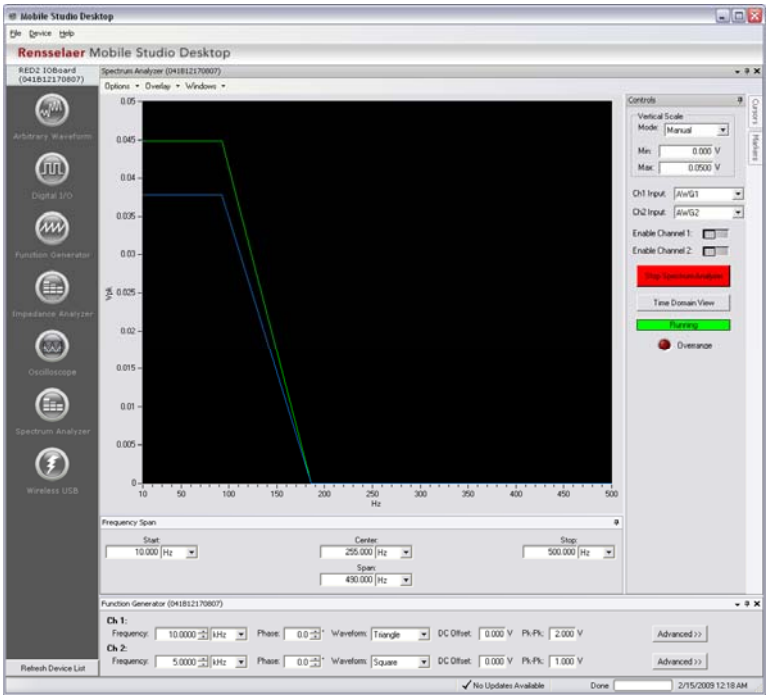


Figure 4-2: Analyzing Signals

5) The time domain representation of the signals can be view in this window by holding down the “Time Domain View” button on the controls panel along the right side of the window.

6) The cursor functionality for the *Spectrum Analyzer* can be used similarly as in the *Oscilloscope* function. Choose the “Cursors” tab along the right-hand side of the window to view the pop-up menu. To dock this menu, choose the pushpin icon . Choose the cursors desired by clicking in the checkbox next to the appropriate cursor, shown in Figure 4-3.

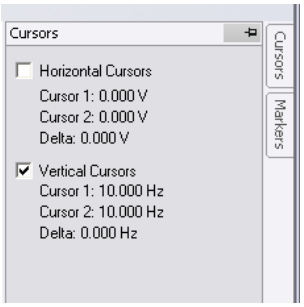


Figure 4-3: Cursors Menu

7) The cursors can be adjusted to measure the desired points by clicking and dragging the lines to the desired positions on the screen, shown in Figure 4-4. The differences in the positions of the cursors is calculated and displayed along with the values at each of the cursors in the “Cursors” panel.

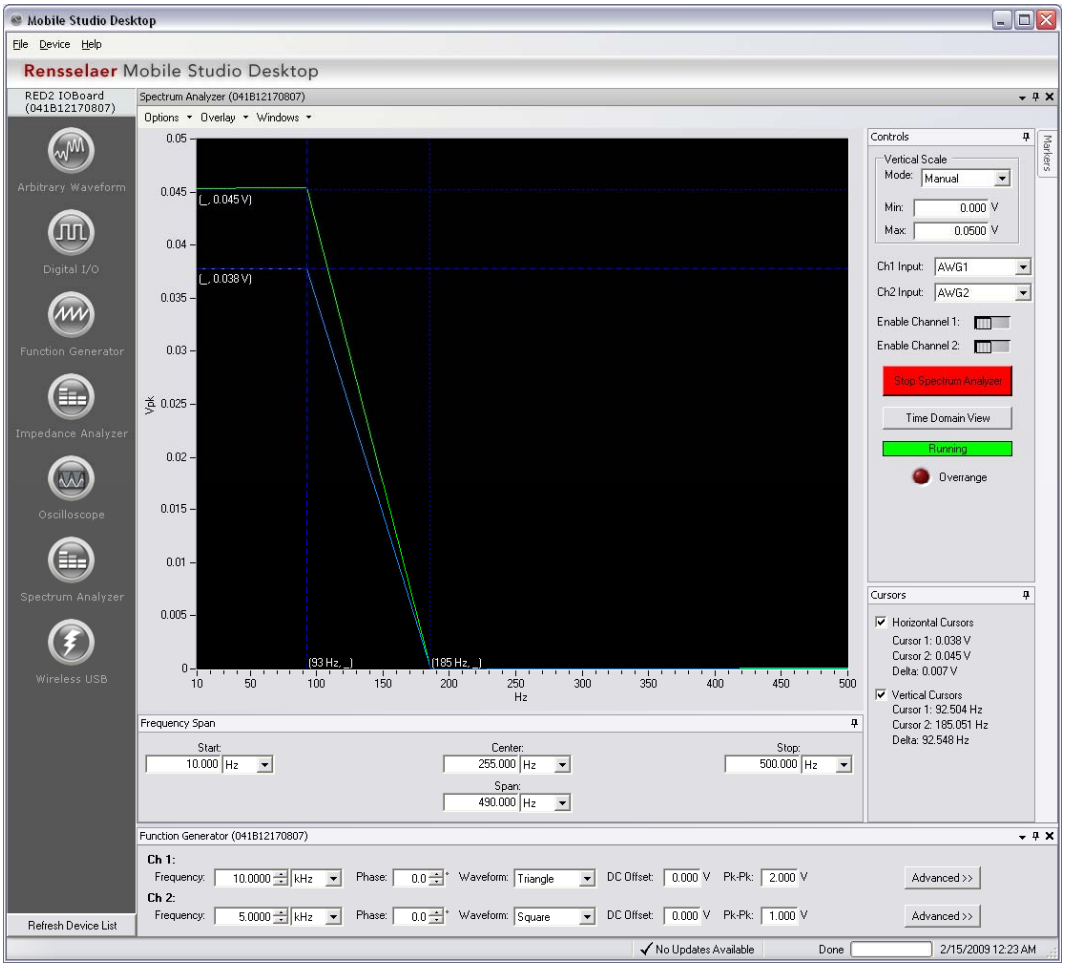


Figure 4-4: Cursor Measurements

8) The channels shown in the view can be changed by enabling/disabling either channel with the switches along the right-hand side panel.

9) Close the Spectrum Analyzer window by clicking on the “X” in the upper right-hand corner.

V. *DIGITAL I/O*

1) Open the Digital I/O Function by selecting the icon second form the top along the left panel, shown in Figure 5-0.

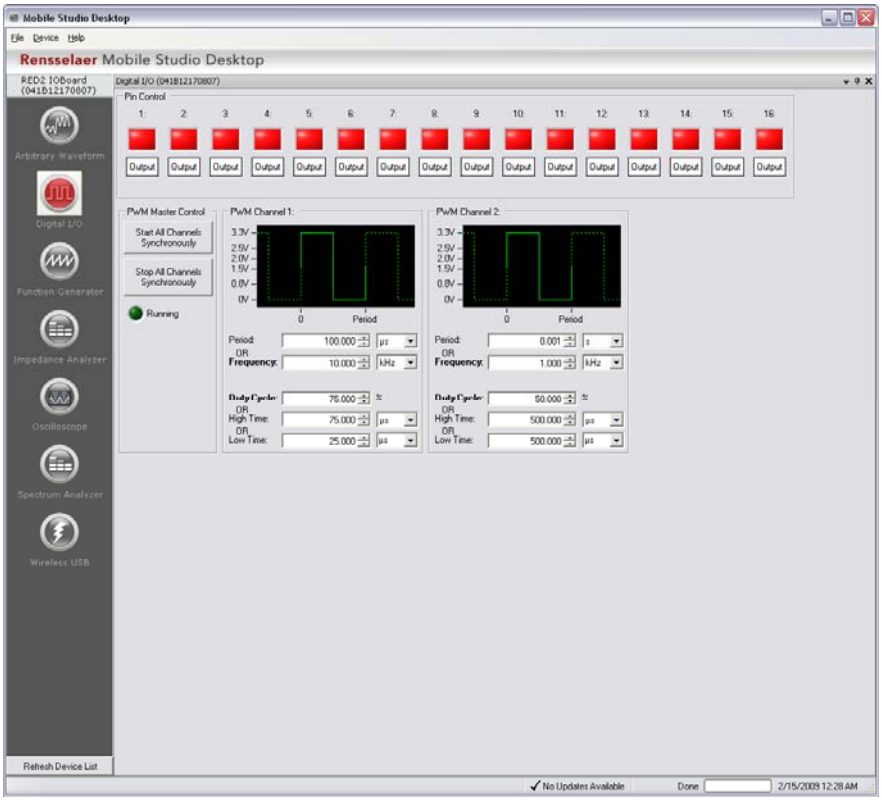


Figure 5-0: Digital I/O Function

2) Each of the digital channels can be used as either input or output ports for information. By clicking on the box labeled “Output” under any channel, it toggles to being an input and displays “Input” under the channel selected, as shown in Figure 5-1 for Channel 9.

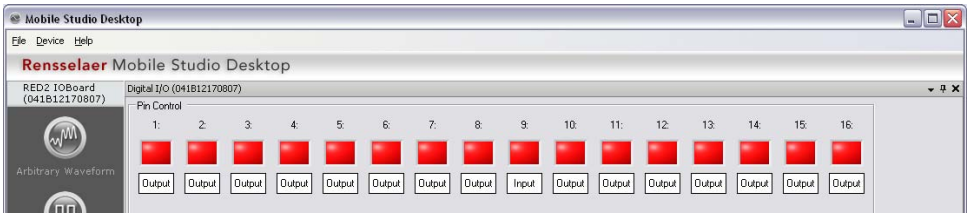


Figure 5-1: Input/Output Toggle

3) To control a channel by another channel, manually jumper the two channels (one output and one input) with a wire in the pins of the board, such as connecting channels one and nine.

4) Clicking on the red box of an output channel allows the user to change the on/off status of the channel, denoting by the changing colors of green/red, shown by pressing on the red box of channel 3 in Figure 5-2.

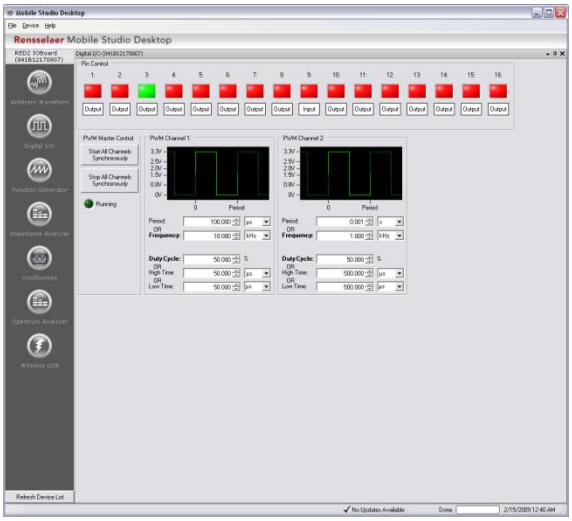


Figure 5-2: Channel 3 On

5) Once jumpered, changing the status of the output channel will automatically change the status of the connected input channel, shown in Figure 5-3 after only clicking on Channel 1.

Figure 5-3: Jumper Connection Control

6) These channels can be connected to other circuitry and used as either input or output controls as desired.

7) Close the Digital I/O window by clicking on the “X” in the upper right corner of the window.