

## ▶ SBench 6 Academic Guide

### Academic Guide to SBench 6 – Example 1

This example shows a simple example of creating a waveform, making basic measurements on it and then applying the Fast Fourier Transform (FFT). This example assumes that you have already installed the SBench 6 software. It would also be helpful to have reviewed the SBench 6 manual sections outlined in the “Using SBench 6 as a Learning Tool” note.

#### Using the Spectrum Control Center to Create a Demo Card

Open the Spectrum Control Center. The Spectrum Control center allows you to create a demo card based on any of Spectrums broad line of digitizer and arbitrary waveform generator products and see them operate, even without hardware. Once the control center is open, click on the ‘Add Democard’ button. Select and add an M4i.4451-x8 digitizer and an M4i.6631-x8 arbitrary waveform generator. As shown in Figure 1.

After adding the demo cards, click on the Quit bar.

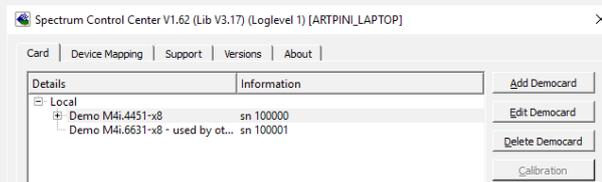


Figure 1: Add a software simulated demo card to the system using the control center

#### Starting SBench 6

Open SBench 6. The Welcome to SBench 6 screen, shown in Figure 2, shows the two demo cards that were loaded previously. Click on the M4i.6631-x8, this is a dual channel arbitrary function generator, a check mark should appear. Click on the Start SBench6 bar.

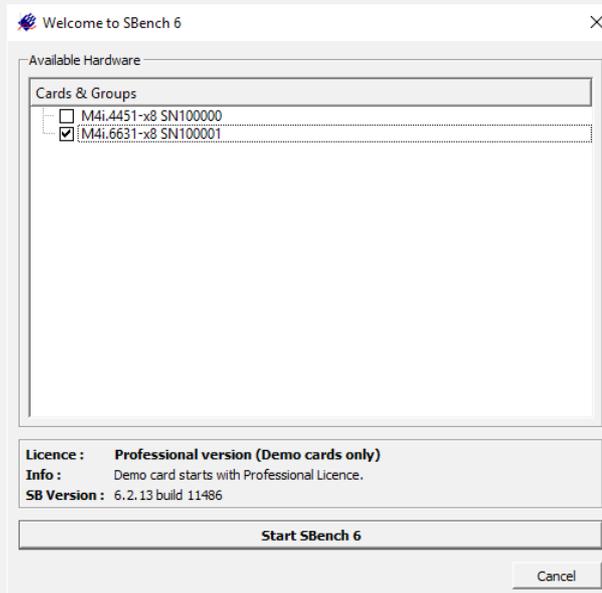
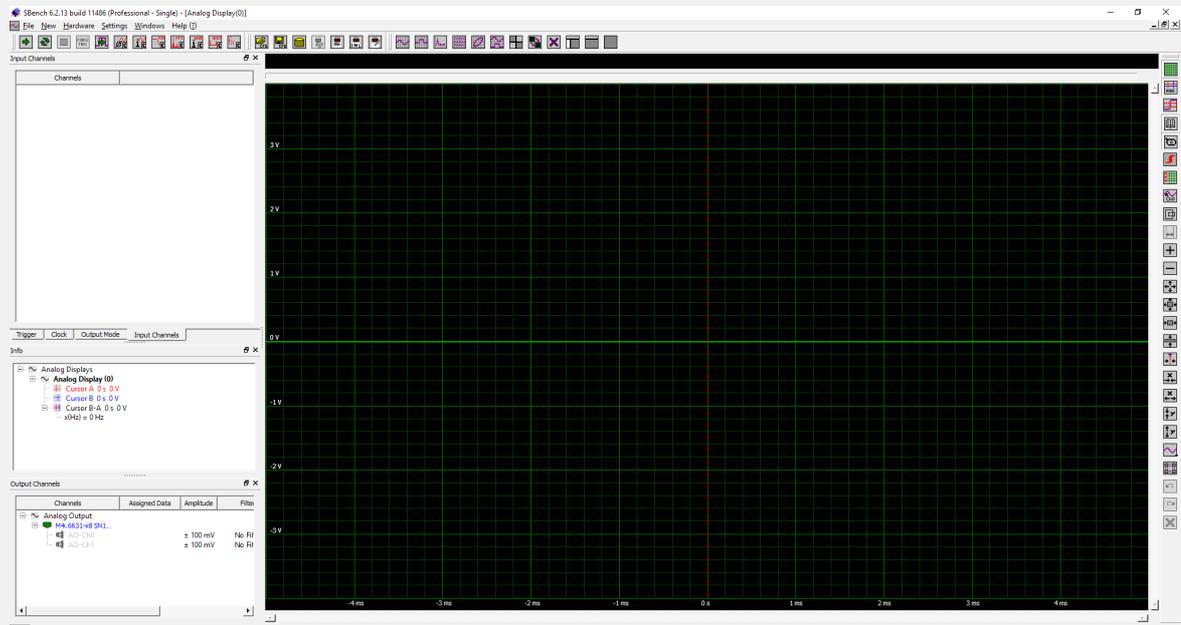


Figure 2: Card Selection in SBench 6

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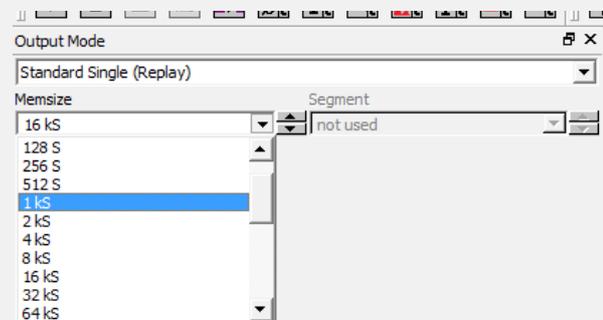
SBench 6 will open as shown in Figure 3:



**Figure 3: SBench 6 open screen**

## Setting Up the Memory Size

The default memory size for SBench 6 is 16kSamples we will reduce this to a 1 kS record. Click on the Output Mode tab in the Hardware and Channel pane in the upper left portion of the SBench screen. Click on the down arrow of the MemSize field. A pull down scroll list will show the available memory configuration as shown in Figure 4. Scroll down to 1 kS entry and click on it. MemSize should now report 1kS.



**Figure 4: Memory Selection in SBench 6**

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### Creating a Waveform with Easy Generator

Find the Easy Generator icon on the Main Toolbar as shown in Figure 5.

Click on the Easy Generator icon, the Easy Generator dialog will appear.

Click on the A0-Ch1 tab, click on the Enabled check box, the check mark should disappear and the waveform section icons will darken indicating that they are no longer enabled.

Click on the A0-Ch0 tab then click on the Rect button to create a rectangular or square wave waveform in the selected channel. The signal frequency and amplitude will be the default values of 100 kHz and 1000 mV peak to peak. Click on the Start bar to create the waveform.

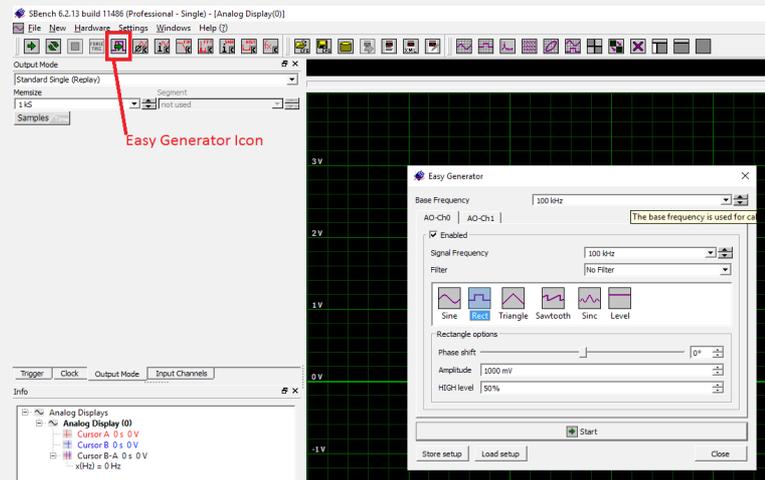


Figure 5: Integrated Easy Generator Tool

Close the Easy Generator dialog.

### Viewing the Waveform

Click on the Input Channels Tab in the Hardware and Channel pane. A waveform should be listed Easy Generator\_0. Click and drag the Easy Generator\_0 waveform to the Analog Display Window. The waveform will be listed in the display header and the waveform will appear as shown in Figure 6.

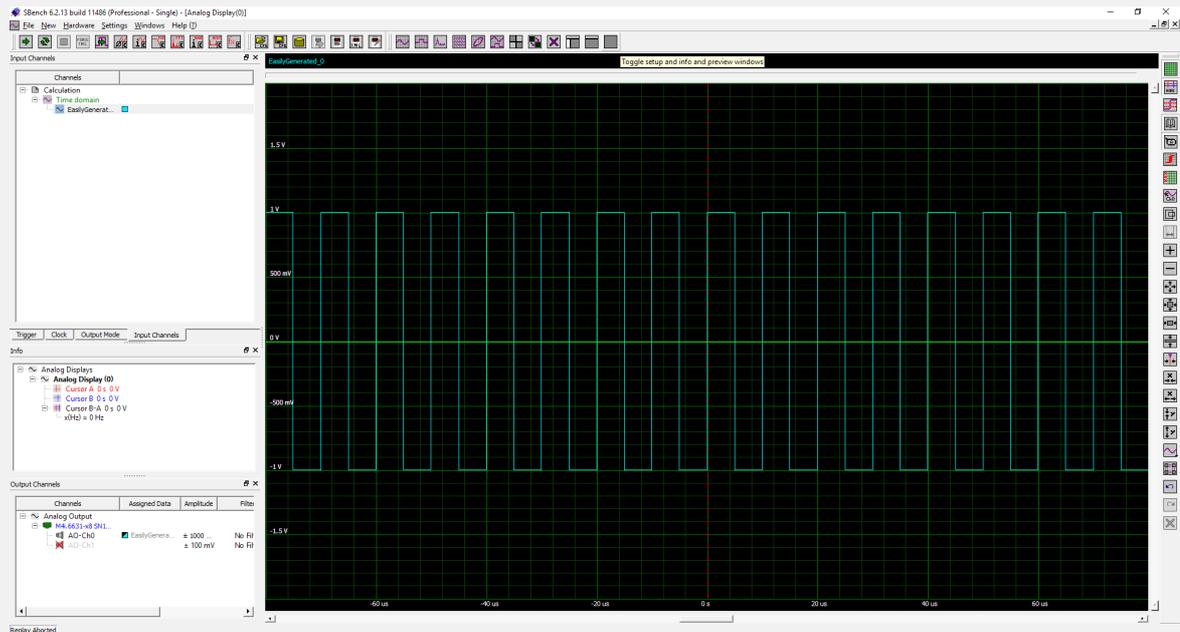


Figure 6: Easy Generator waveform shown in SBench 6 display

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Use the X and Y zoom controls, highlighted on the Display Toolbar to the right of the waveform display in Figure 6, to change the view of the waveform like that shown in Figure 7. The Display Toolbar contains many options for expanding the display using zoom. Consult the SBench 6 User Manual for all the details.

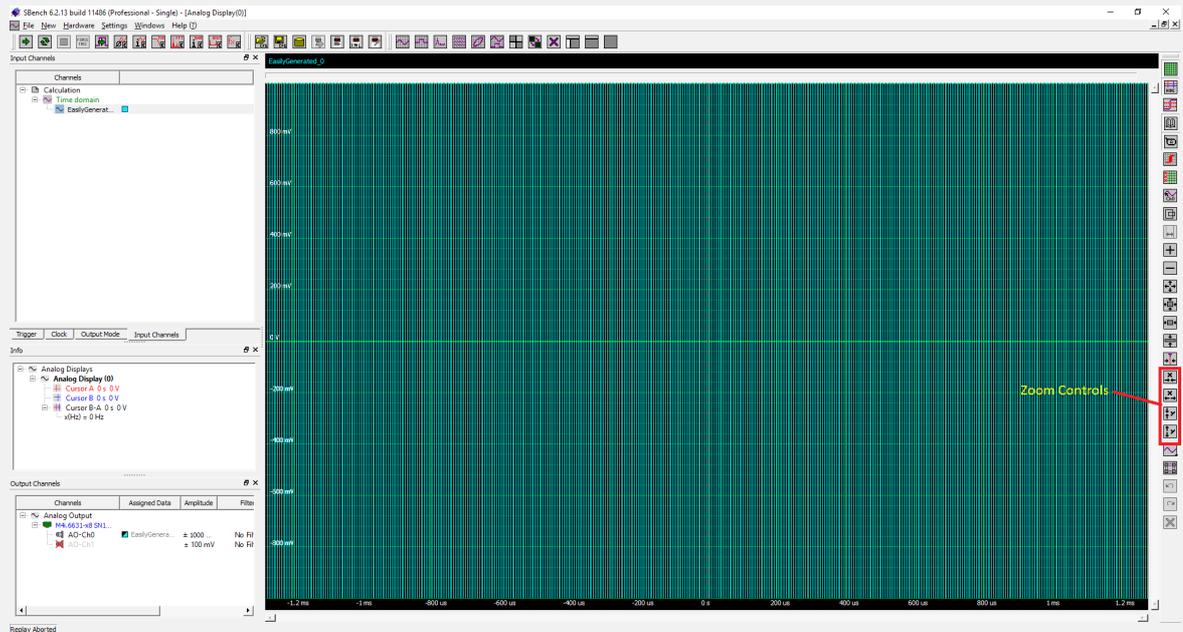
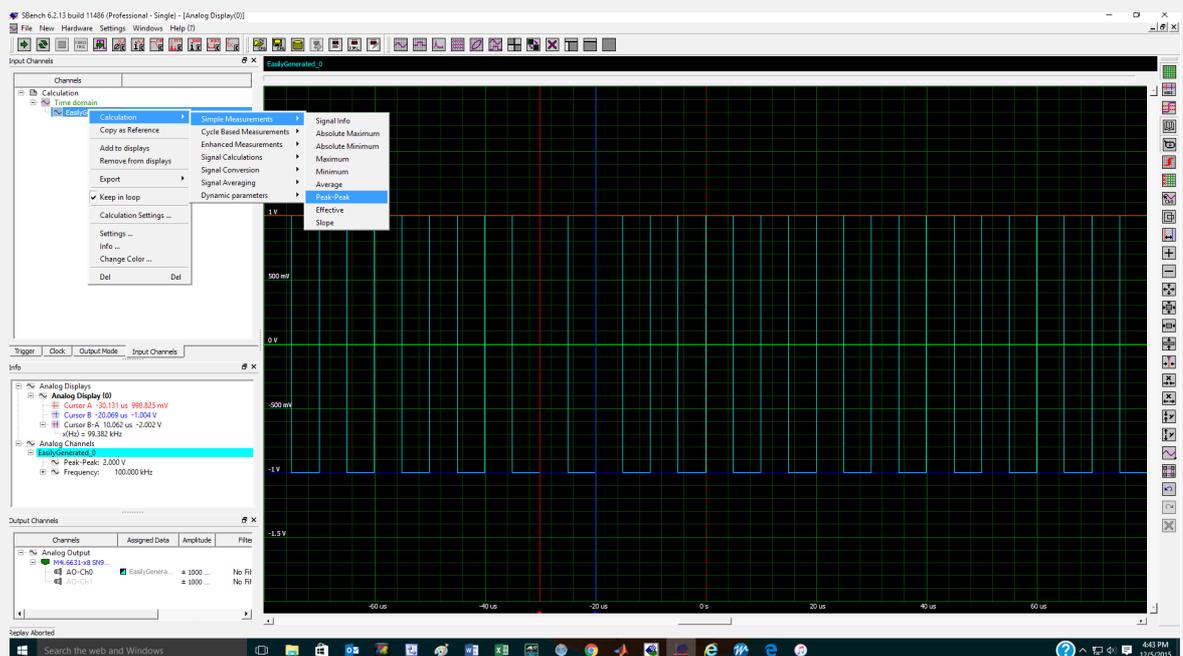


Figure 7: Zoom functions in SBench 6 display

## Measuring the Waveform

The waveform can be measured using cursors or by applying parameter measurements. Both methods are illustrated in Figure 8.



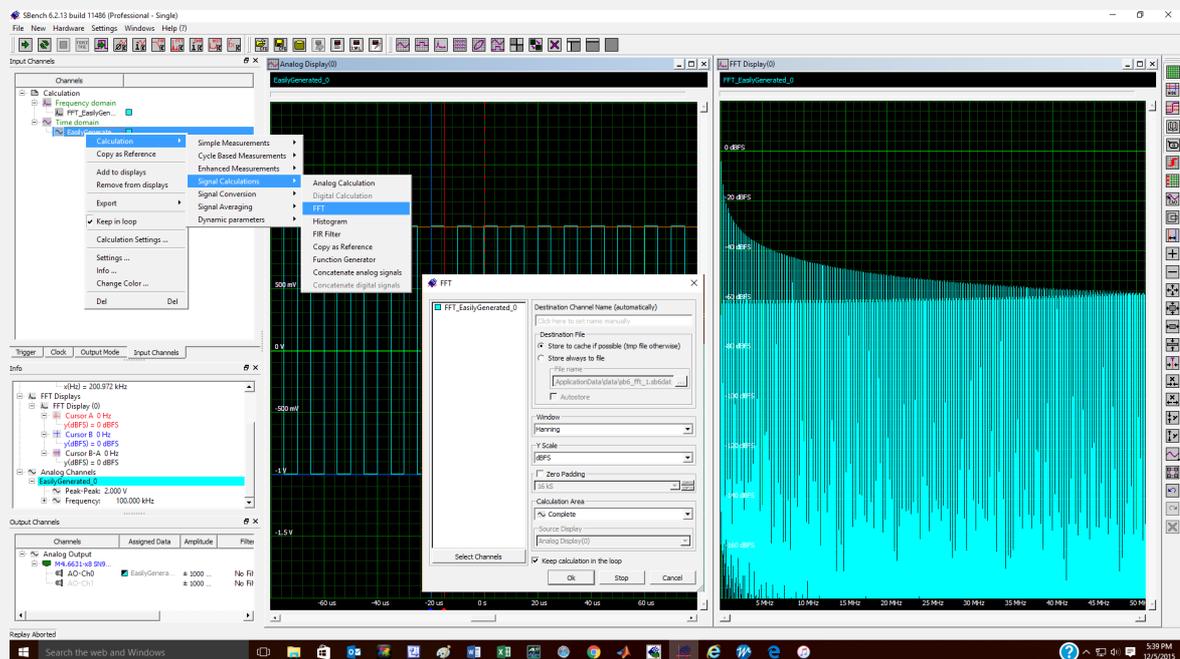
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Cursors can be evoked by moving the mouse cursor onto the display and then left clicking and dragging. A pair of horizontal and vertical red lines will track the mouse location. Drag the red cursor to the desired point on the waveform. Right click and drag a pair of blue cursor lines will track the pointing device location on the waveform. In the Info pane to the left of the display grid there is a cursor readout providing the horizontal and vertical locations of each cursor pair. In addition the cursor vertical and horizontal differences are posted.

An alternative technique is to use measurements. Right click on the waveform name in the input channels tab, a pop up will appear. One of the selections is Calculation, left click on that selection and another pop up will offer a variety of analysis tools. The first two, Simple Measurements and Cycle Based Measurements offer amplitude and time base parameters respectively. Click on Simple Measurements and select Peak to Peak from the next popup. Repeat the process and select Cycle Based Measurements. This time select Frequency from the resulting list. Both of these measurement readout will appear in the Info pane along with the cursor readouts as shown in Figure 8.

## Analyzing Waveforms

Right clicking on any waveform name in the Input channel pane will bring up a popup as we saw previously, If we follow through then another pop up menu offers a choice including Signal Calculations, Signal Conversion, and Signal Averaging. Any of these selections provide a set of related analysis tools. Figure 9 is composite graphic showing the steps to apply the FFT to the waveform:



**Figure 9: Setting up a FFT function in SBench 6**

Right click on the waveform name in the Input Channels pane.

- Select Calculation from the resulting popup
- Left click on the Signal Calculations selection

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- Left click on FFT in the resulting pop up
- The FFT setting box will appear, leave all the default values and click on Start

The FFT will appear in its own display grid, to the right of the original analog signal grid as shown in Figure 9:

The FFT can be expanded horizontally by zooming but if we want to expand the lower frequency range it is easier to right click on the horizontal axis of the FFT display near the bottom border of the grid. A popup box will allow the left and right border limits to be changed as shown in Figure 10.

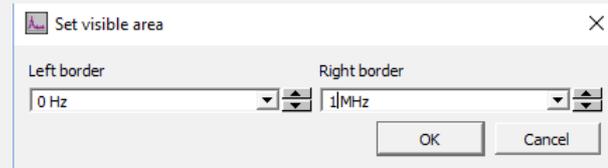


Figure 10: Set visible area by right-clicking on the horizontal axis

Set the display limits to 0 and 1 MHz as shown.

The FFT display will now run between the set limits as shown in Figure 11

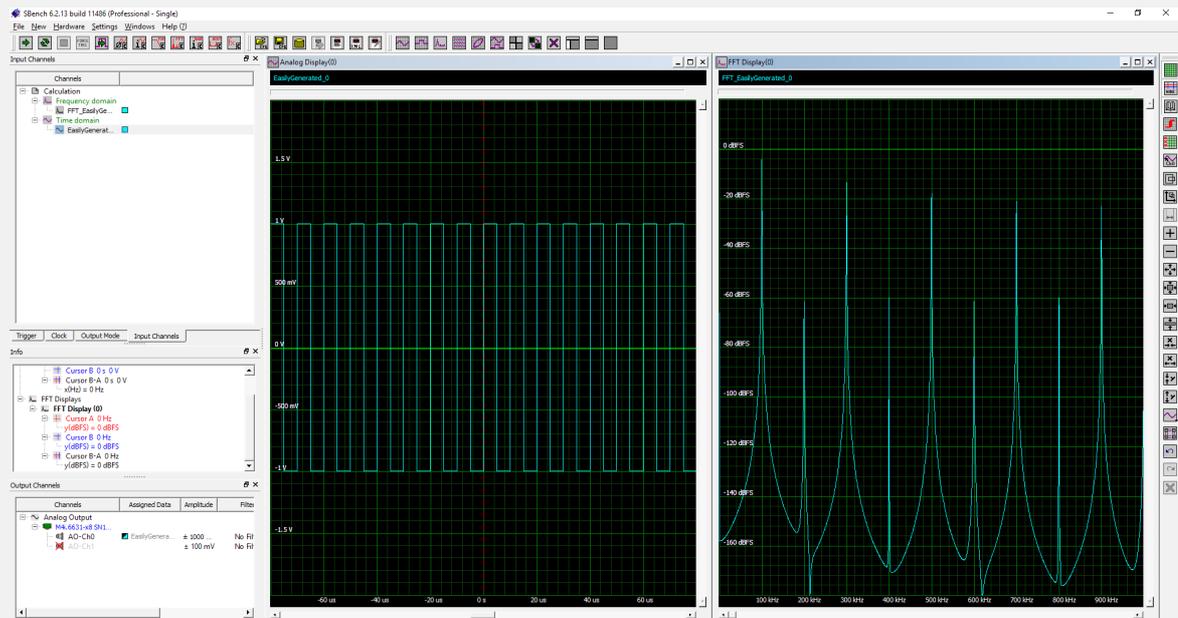


Figure 11: FFT display zoomed to the area between 0 Hz and 1 MHz

## Conclusion

In this example we have created a waveform, made some basic measurements, and performed an FFT. Along the way we've used some common SBench 6 tools like cursors and zoom. This is just the beginning of the things you can do with SBench 6.

Good Luck with your new toy!