

Howard University Mobile Studio Lab Tutorial



Source: www.mwftr.com/MobileLab.html by

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Fall 2006

HU Mobile Studio Lab Components

- Software

- **Mobile Lab Desktop** from RPI

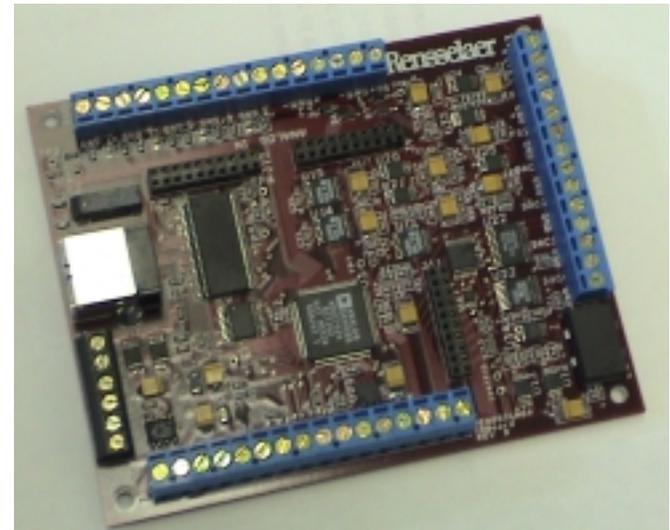


- Download Place (**temporary**) for Executable File: <http://www.hirstbrook.com/MSD.html>

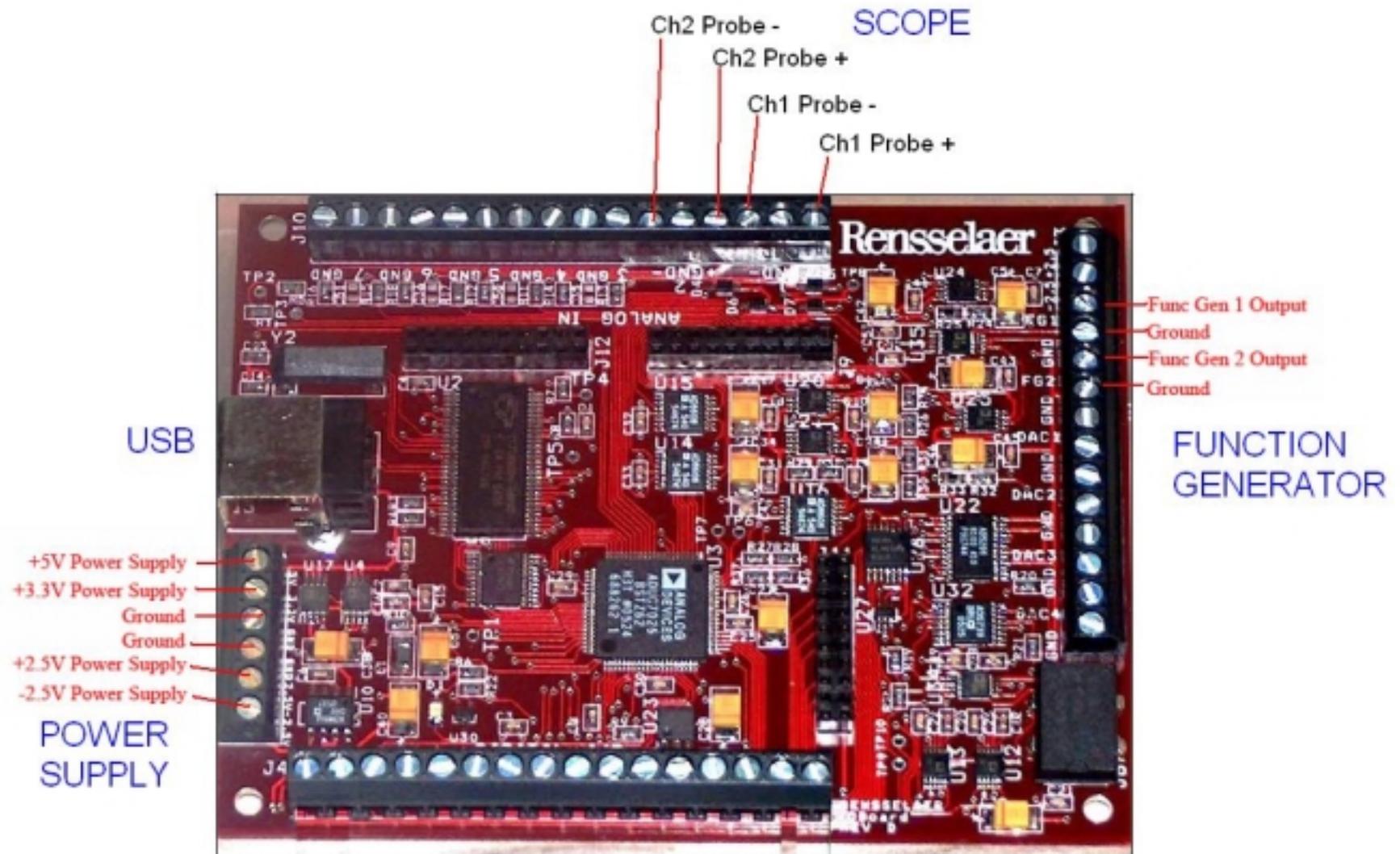
- Hardware

- PC or Laptop or TabletPC on Windows XP

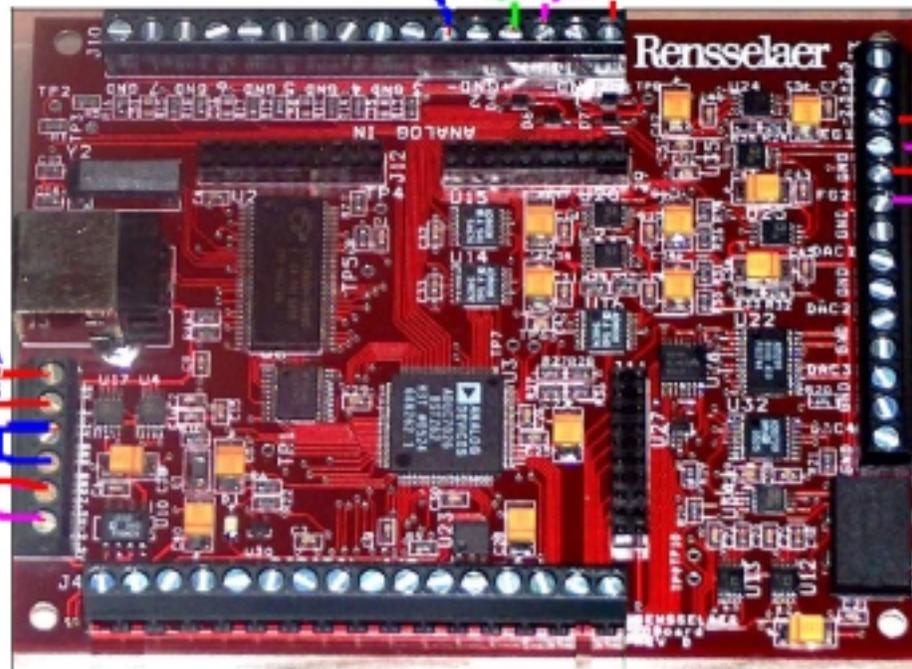
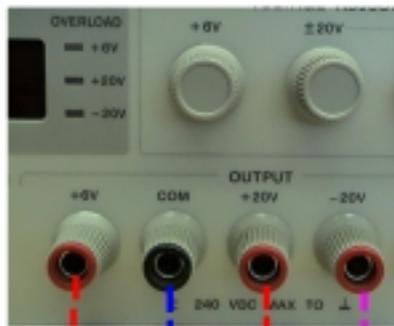
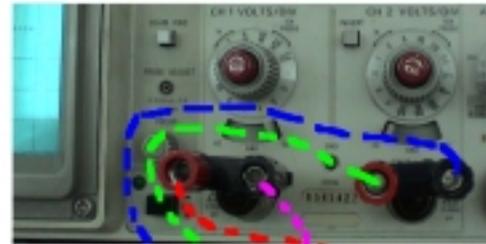
- **IOBoard** from RPI



IOBoard Functionality

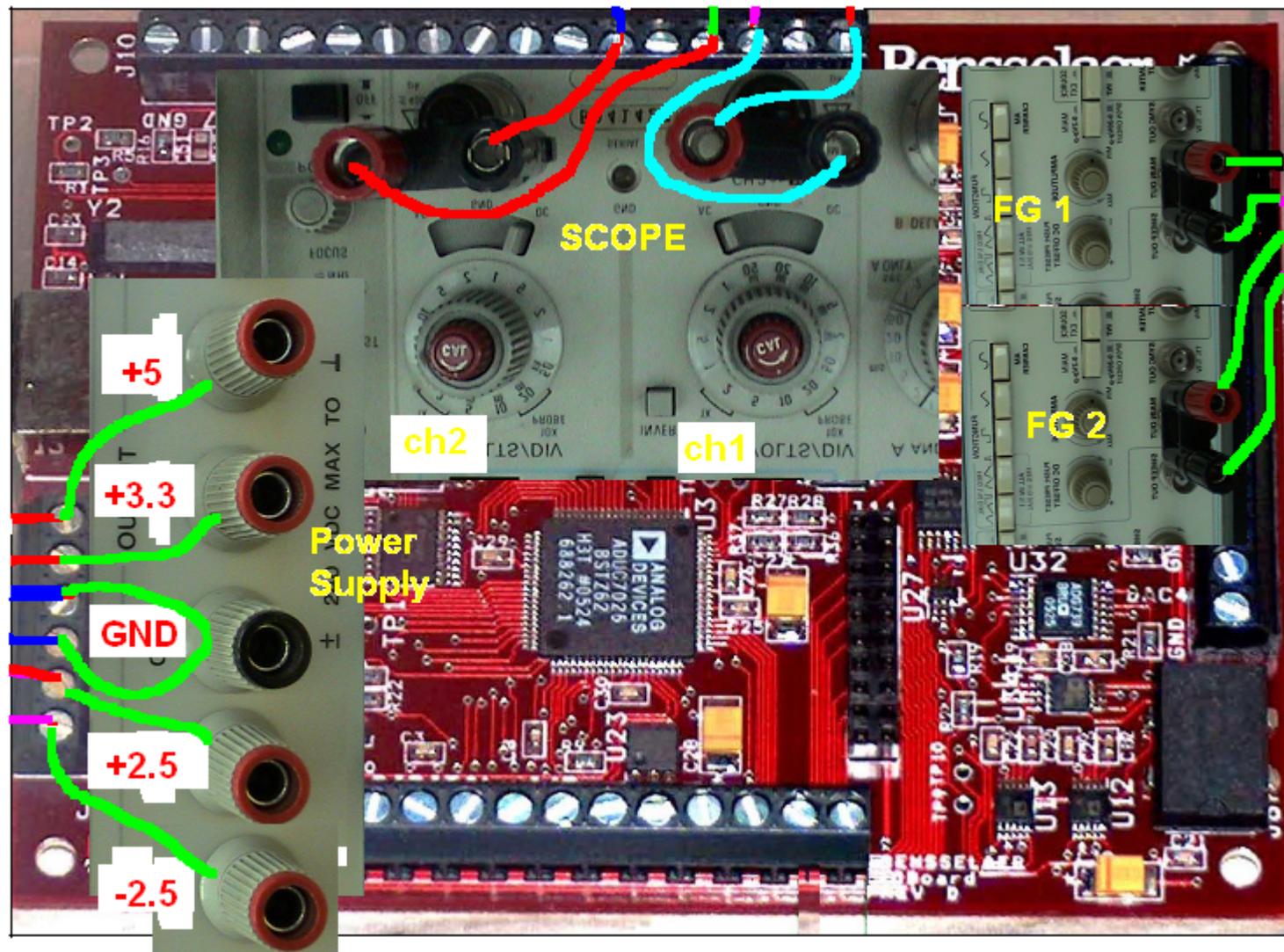


Equipment and Probe/Connector Substitution



- A Fixed +5V
- B Fixed +3.3V
- C Fixed +2.5V
- D Fixed -2.5V

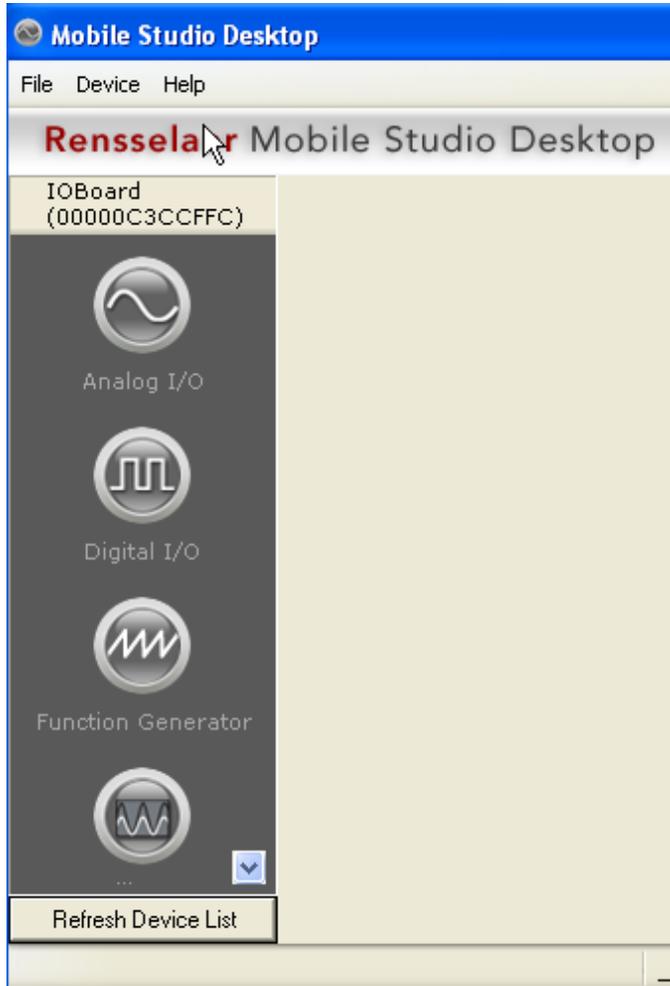
In other words – 4 pieces of equipment inside the *IOBoard* !!



Mobile Studio Desktop Functionality



Mobile Studio Desktop



- Initial Window
- Can choose multiple functions at the same time

Scope Function



Oscilloscope

The screenshot displays the Rensselaer Mobile Studio Desktop software interface. The main window is titled "Oscilloscope (00000C3CCFFC)" and features a central grid for waveform display. On the right side, there are control panels for "Trigger" and "Horizontal" settings. The "Trigger" panel includes a "Mode" dropdown set to "Auto", a "Source" dropdown set to "Ch1", and a "Slope" dropdown set to "Rising". Below these are buttons for "Set to 50%", "Autoset", and "Status", along with a "Trigger Voltage" field set to "0.000V". The "Horizontal" panel shows a "Time/Div" dropdown set to "500 uS", a "Mode" dropdown set to "Y-T", and a "Sample Rate" field set to "113.8 kSPS". A prominent green "Start" button is located at the bottom right of the interface.

At the bottom of the interface, there are two channel configuration panels. The "Channel 1" panel shows "Volts/Div: 500 mV", "Coupling: DC", and "Input: ADCl". The "Channel 2" panel shows "Volts/Div: 500 mV", "Coupling: DC", and "Input: ADCl". A "Math Channel" panel is also visible, showing "Volts/Div: 500 mV", "Operation: CH1-CH2", and "Enable Channel" options.

An inset image on the left side shows a physical oscilloscope control panel. Red arrows point from the physical knobs and buttons to their corresponding software controls in the screenshot. A blue circle highlights the physical knobs for "CH 1 VOLTS/DIV", "CH 2 VOLTS/DIV", and "A AND B SEC/DIV". A yellow arrow points from the physical "A AND B SEC/DIV" knob to the software "Time/Div" dropdown. A red arrow points from the physical "CH 1 VOLTS/DIV" knob to the software "Volts/Div" dropdown for Channel 1. Another red arrow points from the physical "CH 2 VOLTS/DIV" knob to the software "Volts/Div" dropdown for Channel 2. A red arrow points from the physical "TRIGGER" knob to the software "Trigger" panel. A red arrow points from the physical "MODE" knob to the software "Mode" dropdown. A red arrow points from the physical "SLOPE" knob to the software "Slope" dropdown. A red arrow points from the physical "START" button to the software "Start" button.

At the bottom right of the software interface, the text "Start Button" is written in red, with a red arrow pointing to the green "Start" button.



Oscilloscope

Scope and Function Gen Functions



Function Generator

Mobile Studio Desktop

File Device Help

Rensselaer Mobile Studio Desktop

IOBoard (00000C3CCFFC)

Oscilloscope (00000C3CCFFC)

Display Options - Overlay - Windows -

Cursor

Meas.

Trigger

Mode: Auto

Source: Ch1

External: -

Slope: Rising

Set to 50%

Horizontal

Time/Div: 500 μ s

Mode: Y-T

Sample Rate: 65.6 kSPS

Stop

Channel 1: -0.250V (-0.5 div) Channel 2: 0.000V (0.0 div) Horizontal Pos: 0.000ps

Channel 1

Volts/Div: 500 mV

Coupling: DC

Input: DC

Channel 2

Volts/Div: 1 V

Coupling: DC

Input: AOC2

Math Channel

Volts/Div: 500 mV

Operation: Ch1-Ch2

Function Generator (00000C3CCFFC)

Ch 1:

Frequency: 4 kHz Phase: 0.0 Waveform: Sine Offset: 0 V Pk-Pk: 1.094 V Sweep >>

Ch 2:

Frequency: 0 Hz Phase: 0.0 Waveform: Sine Offset: 0.000 V Pk-Pk: 0.745 V Sweep >>

Refresh Device List

Done 8/28/2006 3:32 PM

start Mobile Studio Desktop EN 3:32 PM

Scope & Function Gen with Cursor Option

The screenshot displays the Rensselaer Mobile Studio Desktop software interface. The main window is titled "Oscilloscope (00000C3CCFFC)". The interface includes a menu bar (File, Device, Help), a toolbar with icons for display options, overlay, and windows, and a sidebar with icons for IOBoard, Analog I/O, Digital I/O, Function Generator, Oscilloscope, and Spectrum Analyzer. The central area shows an oscilloscope display with two channels (Ch1 and Ch2) and a math channel. A context menu is open over the display, listing options: Channel 1, Channel 2, Math Channel, Trigger, Horizontal, Cursor (highlighted), and Measurements. The cursors panel on the right shows settings for Channel 1 and Channel 2, including Cursor 1 and Cursor 2 values. The trigger panel shows settings for Mode (Auto), Source (Ch1), External, Slope (Rising), and Delta. The horizontal panel shows Time/Div (500 μ s) and Mode (Y-T). The function generator panel at the bottom shows settings for Ch 1 and Ch 2, including Frequency, Phase, Waveform, Offset, and Pk-Pk. The status bar at the bottom shows "Done" and the date/time "8/28/2006 3:17 PM".

Mobile Studio Desktop

File Device Help

Rensselaer Mobile Studio Desktop

IOBoard (00000C3CCFFC)

Oscilloscope (00000C3CCFFC)

Display Options Overlay Windows

- Channel 1
- Channel 2
- Math Channel
- Trigger
- Horizontal
- Cursor
- Measurements

Channel 1: 0.000V (0.0 div) Channel 2: 0.000V (0.0 div) Horizontal Pos: 0.000ps

Channel 1: Volts/Div: 500 mV Coupling: DC Input: FUNC1

Channel 2: Volts/Div: 1V Coupling: DC Input: FUNC1

Math Channel: Volts/Div: 500 mV Operation: Ch1-Ch2

Cursor 1: Channel 1 0.00 pS

Cursor 2: Channel 2 1.230 V

Channel 1 Delta: Channel 1 0.00 pS

Channel 2 Delta: Channel 2 Infinity GHz 1.230 V

Trigger: Mode: Auto Source: Ch1 External: Slope: Rising Delta: Set to 50%

Horizontal: Time/Div: 500 μ s Mode: Y-T Sample Rate: 65.6 kSPS

Function Generator (00000C3CCFFC)

Ch 1: Frequency: 1 kHz Phase: 0- π Waveform: Sine Offset: 0.000 V Pk-Pk: 0.745 V Sweep >>

Ch 2: Frequency: 0 Hz Phase: 0- π Waveform: Sine Offset: 0.000 V Pk-Pk: 0.745 V Sweep >>

Refresh Device List

Done 8/28/2006 3:17 PM

start Mobile Studio Desktop EN 3:17 PM

Scope & Function Gen with Measurement Option

The screenshot displays the Rensselaer Mobile Studio Desktop software interface. The main window is titled "Oscilloscope (00000C3CCFFC)" and shows a waveform on a grid. The waveform is a square wave with a period of 1.881 ms and a peak-to-peak voltage of 0.907 V. The oscilloscope settings are as follows:

- Channel 1: Volts/Div: 500 mV, Coupling: DC, Input: FUNC1
- Channel 2: Volts/Div: 1 V, Coupling: DC, Input: FUNC1
- Math Channel: Volts/Div: 500 mV, Operation: Ch1-Ch2
- Horizontal: Time/Div: 500 μ S, Mode: Y-T
- Trigger: Mode: Auto, Source: Ch1, Slope: Rising
- Sample Rate: 65.6 kSPS

The Function Generator (00000C3CCFFC) is also visible, showing the following settings:

- Ch 1: Frequency: 1 kHz, Phase: 0, Wavform: Square, Offset: 0.000 V, Pk-Pk: 0.745 V
- Ch 2: Frequency: 0 Hz, Phase: 0, Wavform: Sine, Offset: 0.000 V, Pk-Pk: 0.745 V

The software interface includes a sidebar with icons for Analog I/O, Digital I/O, Function Generator, Oscilloscope, and Spectrum Analyzer. The Windows taskbar at the bottom shows the Start button, taskbar icons, and the system tray with the date and time (8/28/2006 3:20 PM).

Scope function with Line Width Selection

The screenshot displays the Rensselaer Mobile Studio Desktop software interface. The main window is titled "Oscilloscope (0000C3CCFFC)". A context menu is open over the waveform, with the "Trace Width..." option selected. The menu lists options: 1, 2 (checked), 4, and 8. The oscilloscope shows two channels: Channel 1 (green) and Channel 2 (blue), both displaying sine waves. The Math Channel is set to "Ch1:Ch2" (yellow). The interface includes a left sidebar with icons for Analog I/O, Digital I/O, Function Generator, Oscilloscope, and Spectrum Analyzer. The bottom status bar shows the date and time: 8/28/2006 3:16 PM.

Mobile Studio Desktop

File Device Help

Rensselaer Mobile Studio Desktop

IOBoard (0000C3CCFFC)

Oscilloscope (0000C3CCFFC)

Display Options - Overlay - Windows -

Channel 1: 0.000V (0.0 div) Channel 2: 0.000V (0.0 div) Horizontal Pos: 0.000ps

Channel 1: Volts/Div: 500 mV Coupling: DC Input: FUNC1

Channel 2: Volts/Div: 1V Coupling: DC Input: FUNC1

Math Channel: Volts/Div: 500 mV Operation: Ch1:Ch2

Trigger: Mode: Auto Source: Ch1 External: Slope: Rising

Horizontal: Time/Div: 500 uS Mode: Y-T Sample Rate: 65.6 kSPS

Function Generator (0000C3CCFFC)

Ch 1: Frequency: 1 kHz Phase: 0.00 Waveform: Sine Offset: 0.000 V Pk-Pk: 0.745 V Sweep >>

Ch 2: Frequency: 0 Hz Phase: 0.00 Waveform: Sine Offset: 0.000 V Pk-Pk: 0.745 V Sweep >>

Refresh Device List

start Mobile Studio Desktop EN 8/28/2006 3:16 PM

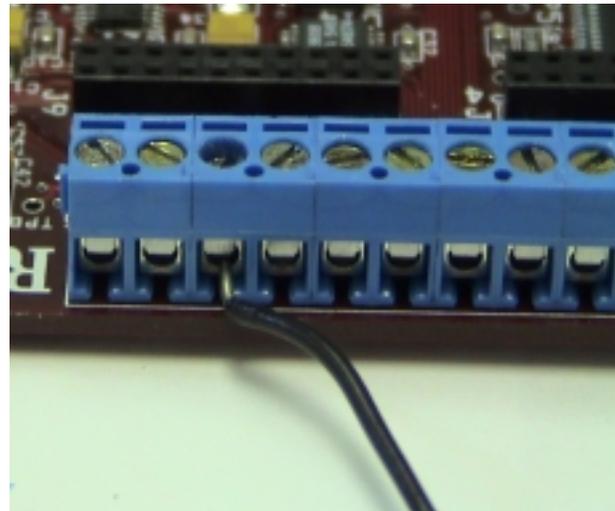
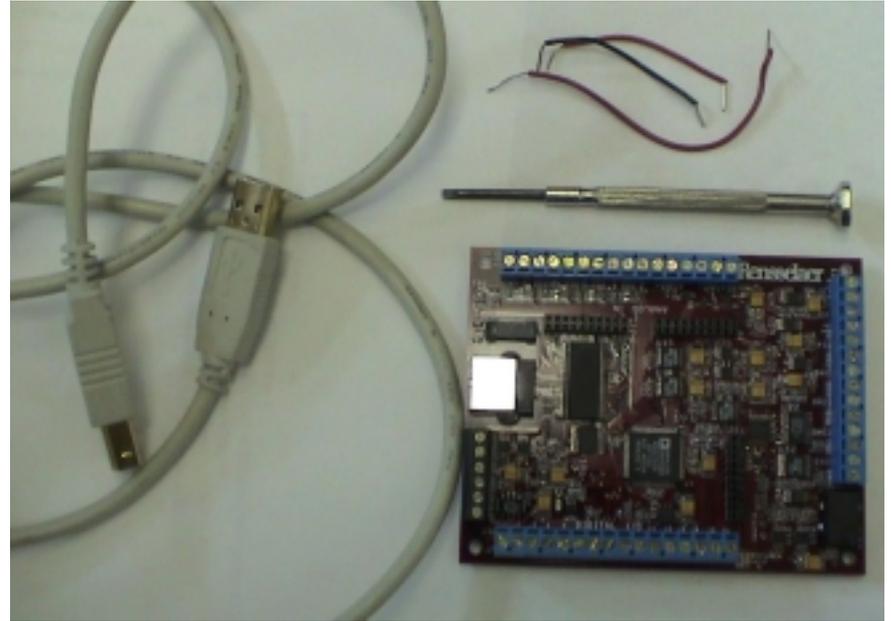
Example Lab – Voltage across a resistor

- Lab Ex1
 - Purpose: Familiarity with HU Mobile Lab Studio
 - Equipment List: None
 - Preparation: HU Mobile Studio, Wires, Breadboard, 2 Resistors
 - Procedure 1:
 - Connect 2 resistors (10K and 20K) in series
 - Apply +5V at the two ends of the series resistors
 - Measure the voltage across each resistor
 - Verify the “Voltage Divider”
 - Procedure 2:
 - Do the same experiment as Procedure 1 while, in place of the +5V above, applying 400Hz sinusoidal source with peak-to-peak voltage of 1V.

Lab Ex1 in Mobile Studio Lab

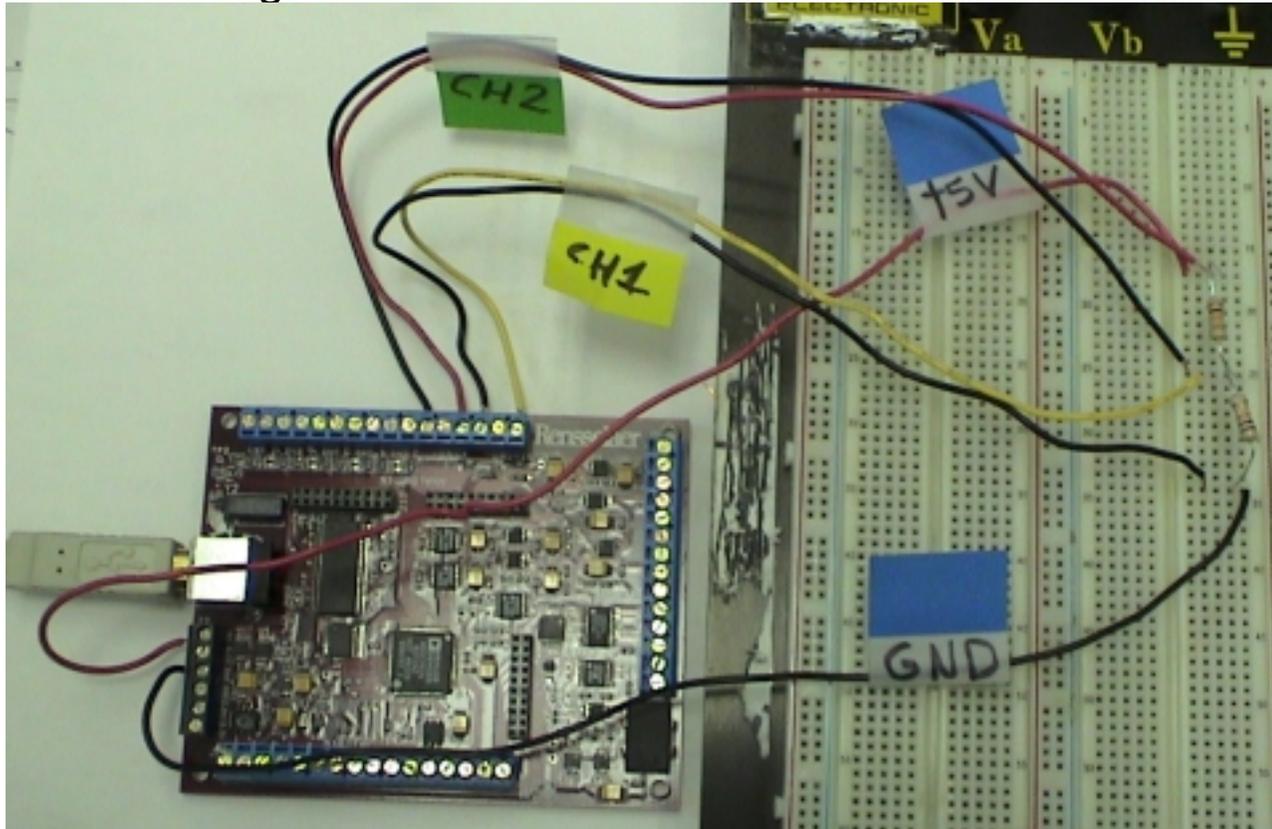
– Preparation:

- IOBoard
- USB Cable
- Wires
- Small Screw Driver
- Wire cutter/stripper



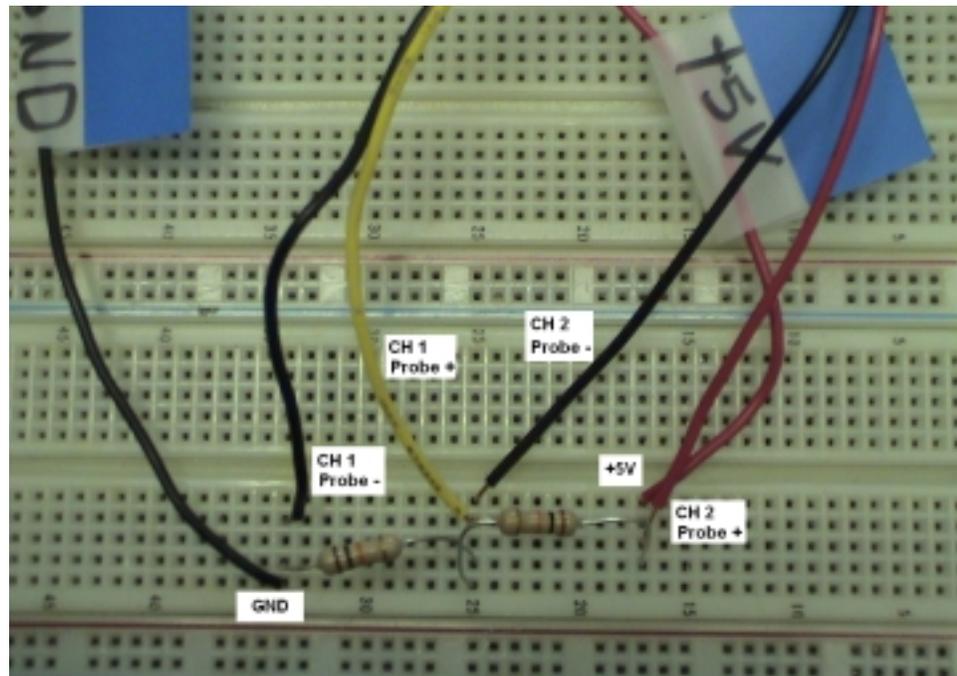
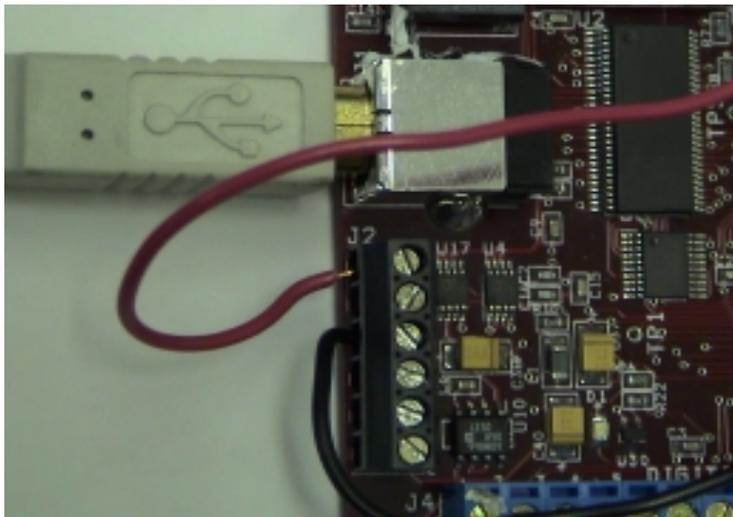
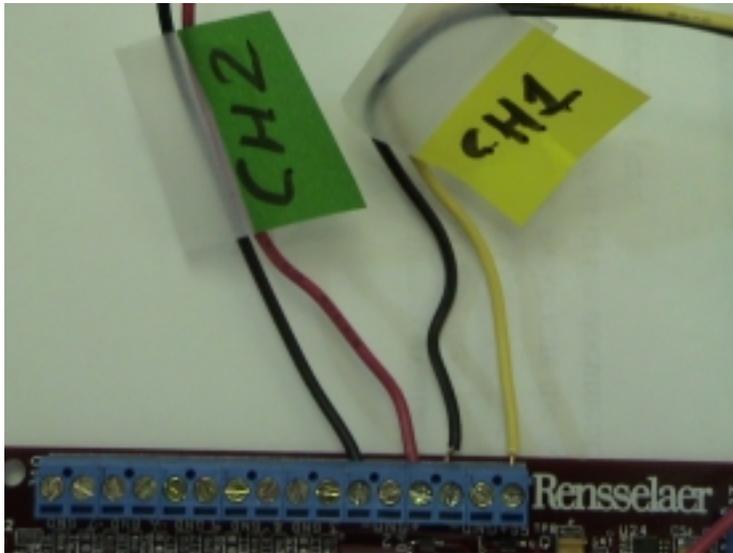
Lab Ex1 in Mobile Studio Lab

- Procedure 1
 - Step 1: Circuit and Connection
 - Scope Ch1 for lower resistor
 - Scope Ch2 for upper resistor
 - +5V voltage source across the series resistors



Lab Ex1 in Mobile Studio Lab

– Step 1 – connection details



Lab Ex1 in Mobile Studio Lab

- Procedure 1

- Step 2: USB connection between IOBOARD and PC [Laptop, TabeItPC, etc]
- Step 3: Run “Mobile Studio Desktop”
- Step 4: Select “scope” from the vertical bar
- Step 5: Click ‘Start’

Screen Shot

The screenshot displays the Rensselaer Mobile Studio Desktop software interface. The main window shows a dual-channel oscilloscope with two waveforms: a blue waveform (Channel 1) and a green waveform (Channel 2). The interface includes a top menu bar with 'File', 'Device', and 'Help'. Below the menu bar, the title bar reads 'Rensselaer Mobile Studio Desktop'. The left sidebar contains icons for 'Analog I/O', 'Digital I/O', 'Function Generator', 'Oscilloscope', and 'Spectrum Analyzer'. The right sidebar shows the 'Measurements' panel with four measurement entries for Channel 1 and Channel 2, each displaying a 'Mean' value of 1.762 V and 3.583 V respectively. The bottom panel shows the configuration for Channel 1, Channel 2, and a Math Channel. Channel 1 is set to 2V, Channel 2 to 2V, and the Math Channel to 200mV. The 'Enable Channel' buttons for Channel 1 and Channel 2 are highlighted with red boxes and labeled 'Center Position' and 'Ch2 Enable/Disable Toggle' respectively. A red box at the top right contains the text 'Move your cursor to the measurement tab. Select channel and 'Mean' value'. The Windows taskbar at the bottom shows the 'start' button, the 'Mobile Studio' application icon, and the system clock displaying '8/31/2006 2:52 PM'.

File Device Help

Rensselaer Mobile Studio Desktop

10Board (60000C3CCFFC) Oscilloscope (00000C3CCFFC)

Display Options ▾ Overlay ▾ Windows ▾

Measurements

Channel	Measurement	Value	Unit
Ch 1	Mean	1.762	V
Ch 1	Mean	1.762	V
Ch 2	Mean	3.583	V
Ch 2	Mean	3.583	V

Channel 1: 0.000V (0.0 div) Channel 2: 0.000V (0.0 div) Horizontal Pos: 0.000ns

Channel 1: Volts/Div: 2V, Coupling: DC, Input: ADC1

Channel 2: Volts/Div: 2V, Coupling: DC, Input: ADC2

Math Channel: Volts/Div: 200mV, Operation: CH1-CH2

Center Position

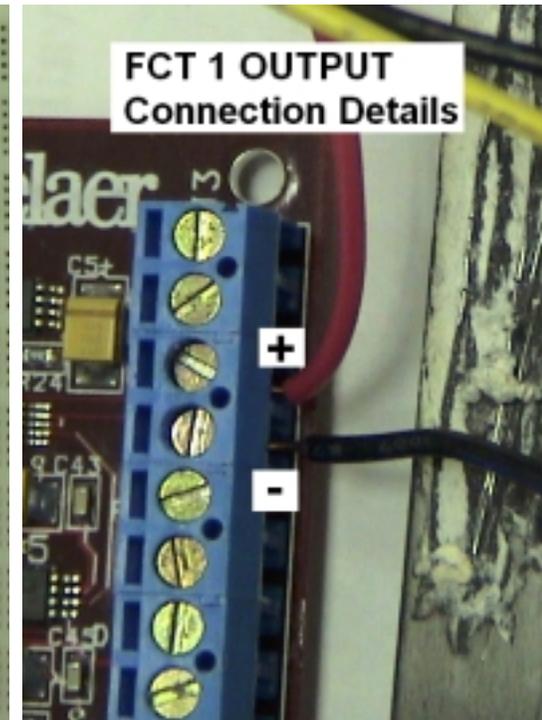
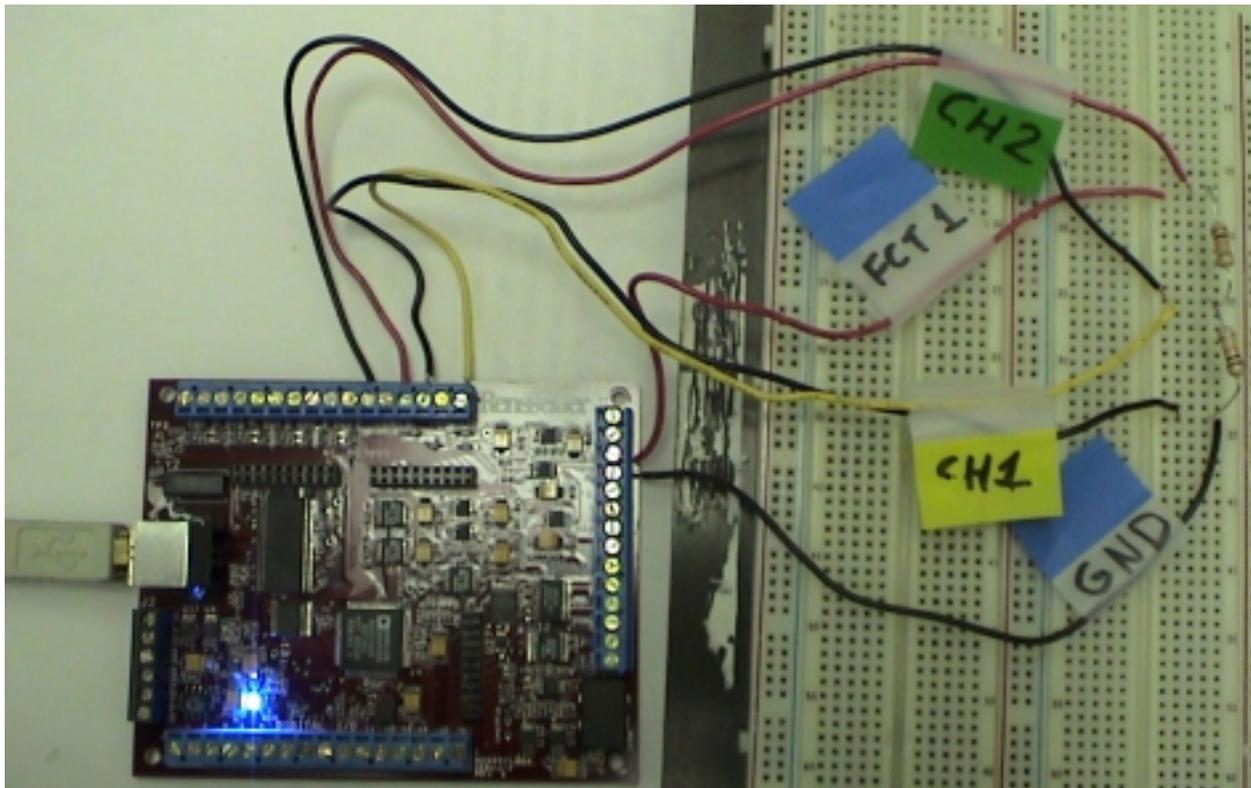
Ch2 Enable/Disable Toggle

Move your cursor to the measurement tab. Select channel and 'Mean' value

start Mobile Studio ... 8/31/2006 2:52 PM

Lab Ex1 in Mobile Studio Lab

- Procedure 2 – Voltage Divider with Sinusoidal Signal
 - Step 1: Circuit and Connection
 - Scope Ch1 for lower resistor
 - Scope Ch2 for upper resistor
 - Function generator 1 output across the series resistors

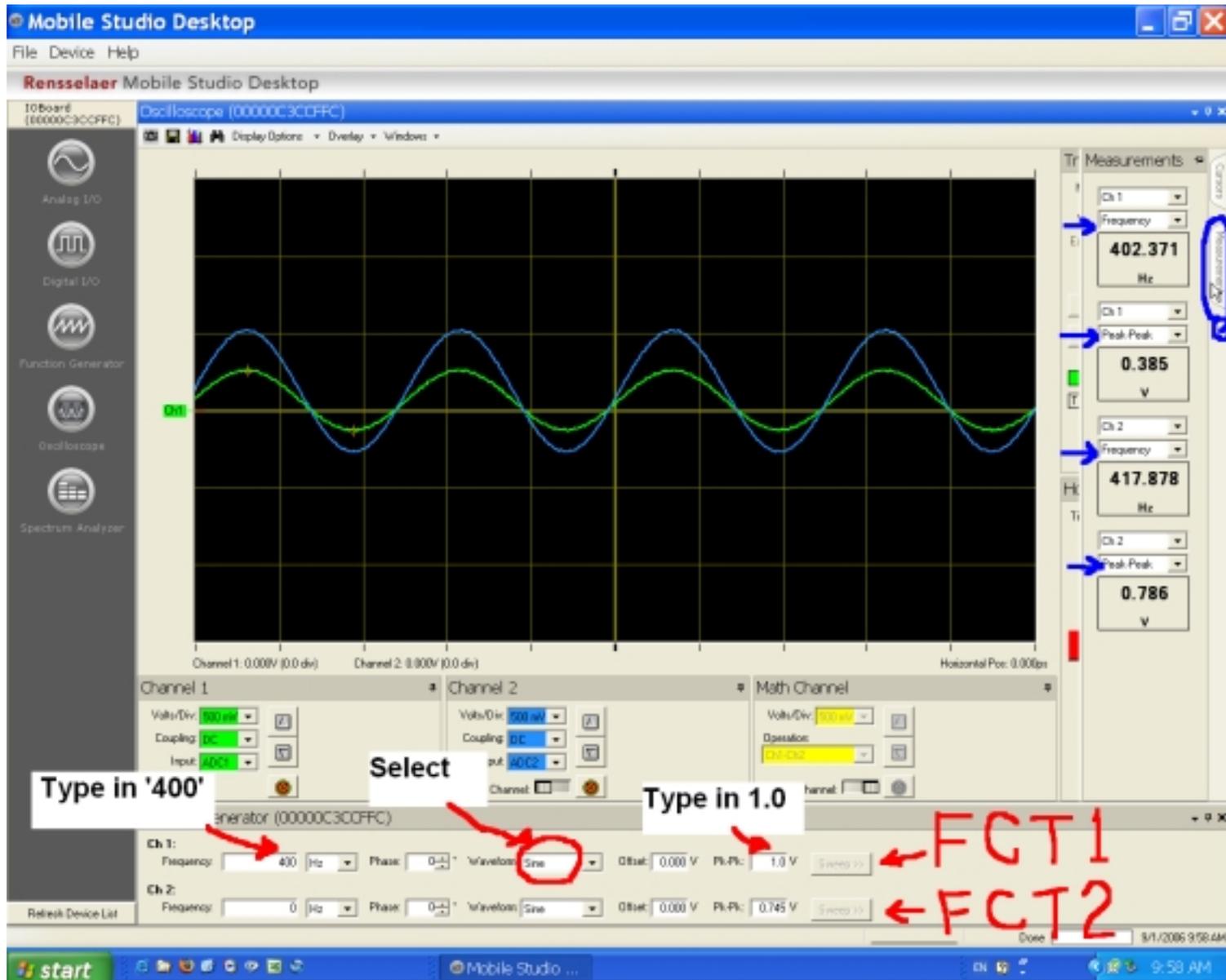


Lab Ex1 in Mobile Studio Lab

- Procedure 2

- Step 2: USB connection between IOBOARD and PC [Laptop, TabletPC, etc]
- Step 3: Run “Mobile Studio Desktop”
- Step 4: Select “scope” from the vertical bar and Click “start”
- Step 5: Select “Function Generator” from the vertical bar
- Step 6: Arrange two function windows appropriately.

Screen Shot



End of Tutorial

- If you have any question, please call me or send me email: ckim@howard.edu
- Thanks. -Charles Kim