Agilent Multichannel Streaming Example Program

User's Guide

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Agilent Technologies

Contents

Introduction

The M9392A Soft Front Panel cannot be used to make Multichannel Streaming measurements. To make it easy to demonstrate a multichannel system or to get started using the M9392A IVI COM driver to programmatically control a Multichannel Streaming session, an example program is provided. The example program has been created using Microsoft Visual Studio C# 2008.

The **MultichannelStreamingExample** program is available with source code to allow engineers to begin making Multichannel Streaming measurements immediately. The source code shows which IVI COM command sequences are *required* and which test techniques are *recommended*. The solution can be built on a 32-bit operating system (OS); however, a 64-bit OS is recommended.
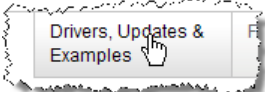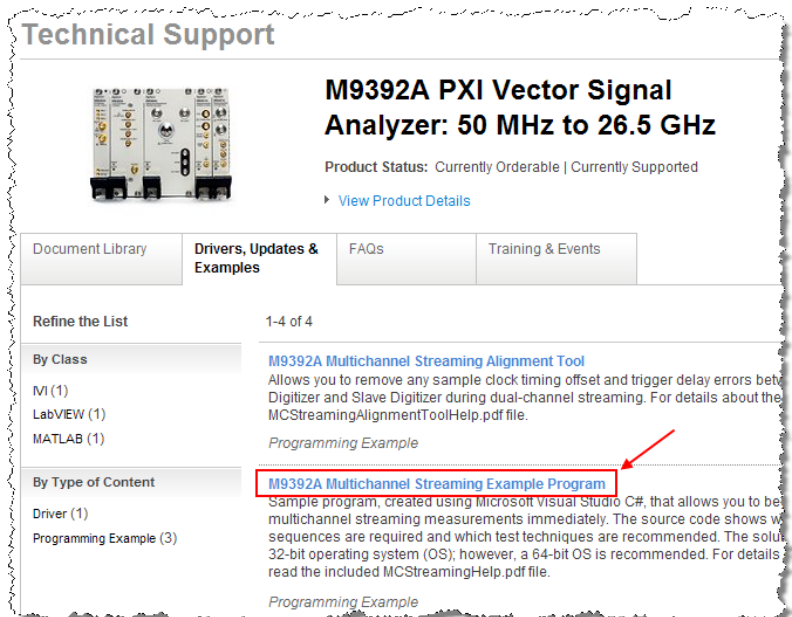
Getting Started

Requirements

- An application development environment that supports C# (such as Microsoft Visual Studio)
- M9392A software version 1.2.0.xxxx or greater must be installed (to download the latest version, go to www.agilent.com/find/M9392A).

Download the Example Program

To get started, download the multichannel streaming example program:

1. Go to www.agilent.com/find/M9392A.

2. Click the "Visit Technical Support" link.

3. Click the "Drivers, Updates and Examples" tab.

4. Click "**M9392A Multichannel Streaming Example**" to access the *MultichannelStreamingExample.zip* file and extract the contents to your chosen directory on your PC. The document you are reading (MCStreamingHelp.pdf) is included in the zipped folder.

5. Build and Run the project: /MultiChannelStreamingExample/MultiChannelStreamingExample.sln

6. After a few seconds the program GUI will appear.

Configure the Master and Slave instruments

If you intend to run this program to control real hardware, you must first configure the master and slave instruments in the configuration store:

1. Before you start, make sure you completed all software and hardware installation instructions from the M9392A Startup Guide (http://cp.literature.agilent.com/litweb/pdf/M9392-90001.pdf). Remember that the configuration comprises two complete M9392A Vector Signal Analyzers in the same chassis.

2. Use Agilent Connection Expert (an Agilent IO Libraries Suite utility) to ascertain the VISA address and slot number of each module. Notice that the information in the right pane is relevant to the highlighted module in the left pane.
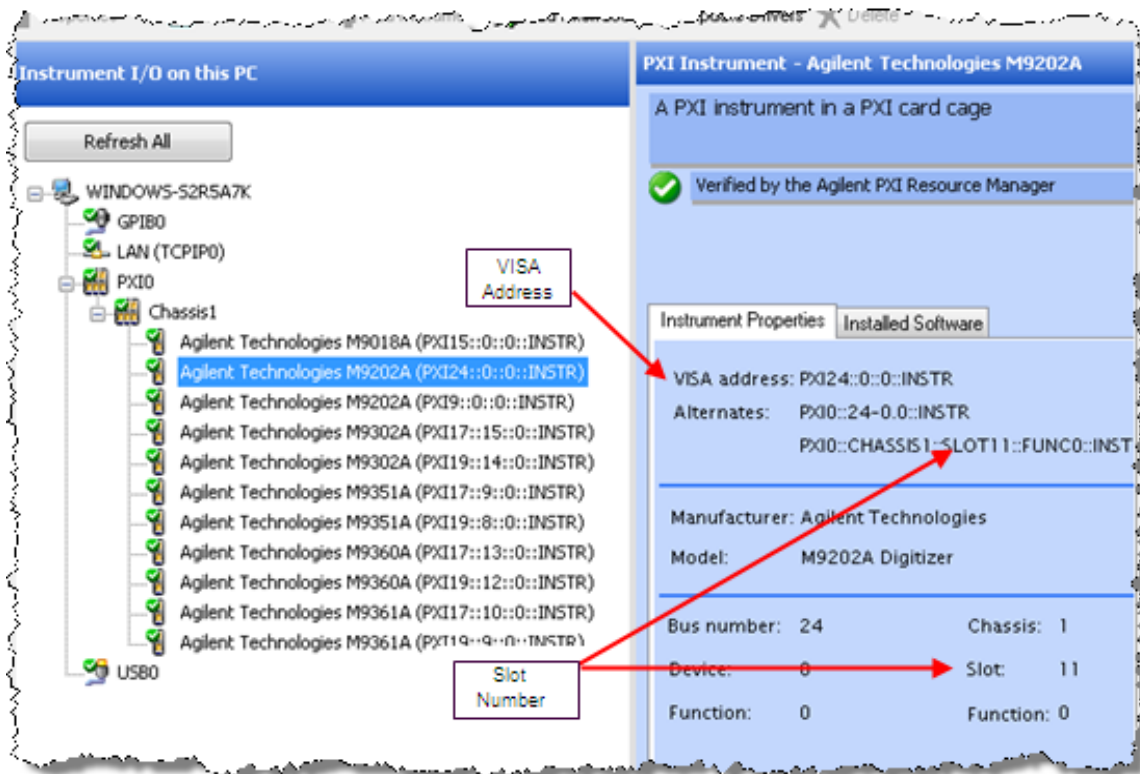
3. Use the M9392A Soft Front Panel (SFP) to create master and slave configurations:
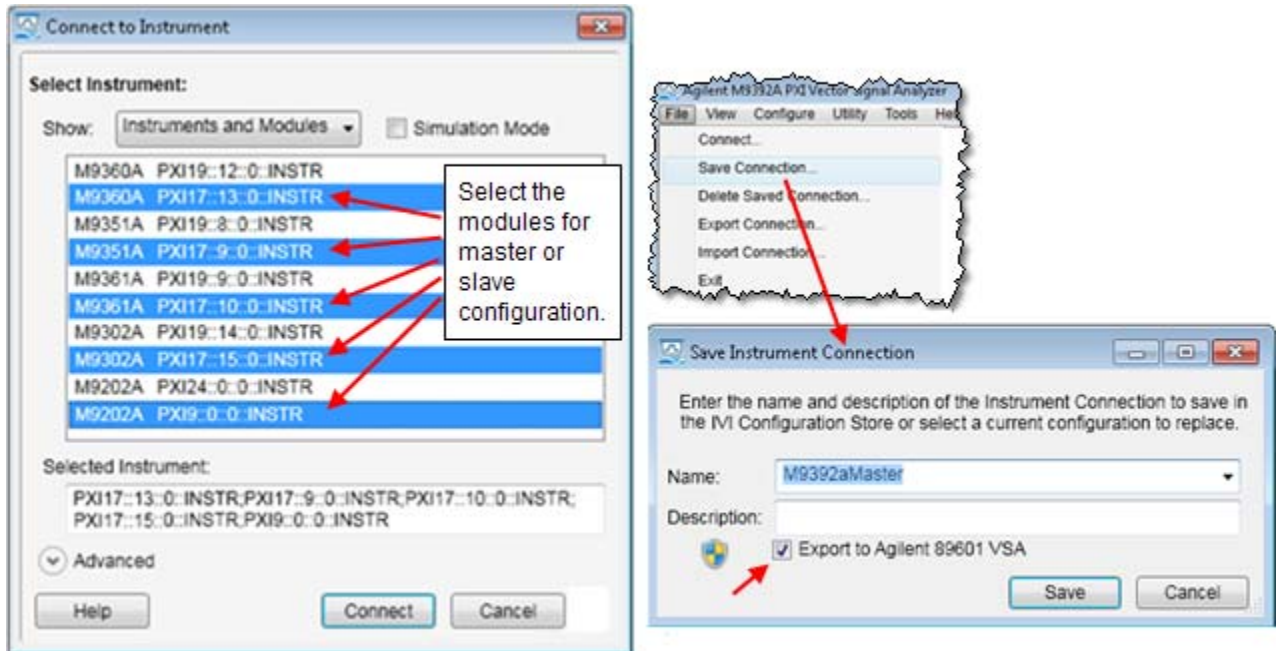
a. Open the M9392A SFP.

b. In the *Connect to Instrument* dialog, highlight the modules you want to save as a master, and then click **Connect**. This initializes the master modules and opens the SFP main window.

c. Select **File > Save Configuration**.

d. In the *Save Instrument Connection* dialog, type in "MasterVSA", make sure the checkbox for "Export to Agilent 89601 VSA" is checked, and then click **Save**. You have now saved the master configuration.

e. Select **File > Connect**.

f. In the *Connect to Instrument* dialog, notice your master configuration is named. Also notice the non-master modules are highlighted – these should be the slave modules. Make sure the modules you want to save as a slave are highlighted, and then click **Connect**. This initializes the slave modules and opens the SFP main window.

g. Select **File > Save Configuration**.

h. In the *Save Instrument Connection* dialog, type in "SlaveVSA", make sure the checkbox for "Export to Agilent 89601 VSA" is checked, and then click **Save**. You have now saved the slave configuration.
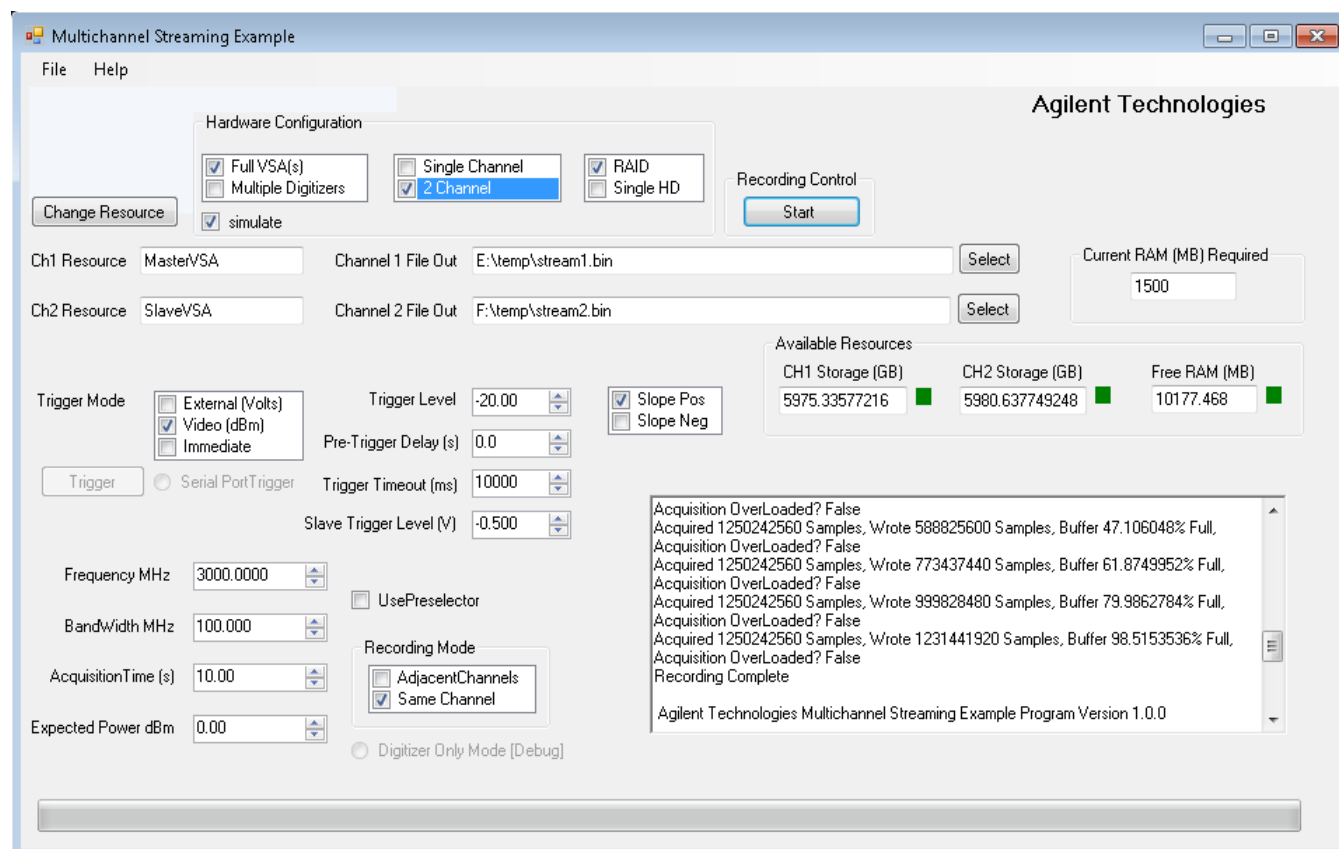
Cable the M9392A Instruments for Streaming

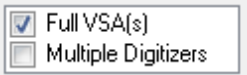To the two existing cabled M9392A instruments, add the appropriate cabling kit to complete the dual-channel configuration. See the M9392A Configuration Guide (http://cp.literature.agilent.com/litweb/pdf/5990-8254EN.pdf) for details.
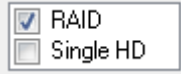
Touring the Example Program
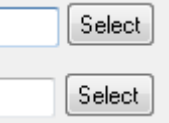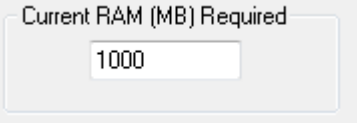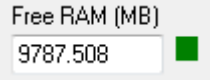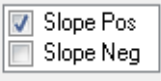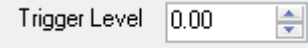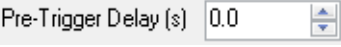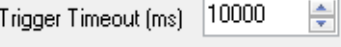
Refer to the table below for usage information about the multichannel streaming example program.
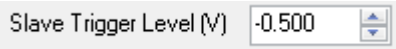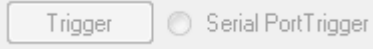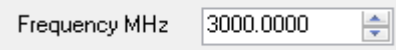
For more information on M9392A streaming, refer to the M9392A Multichannel Streaming white paper, located at http://cp.literature.agilent.com/litweb/pdf/5991-0221EN.pdf.

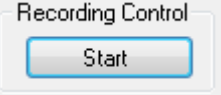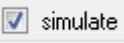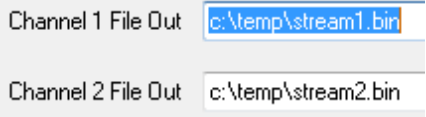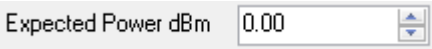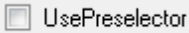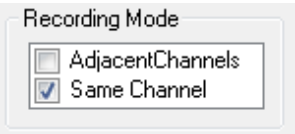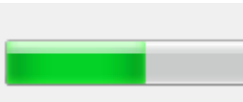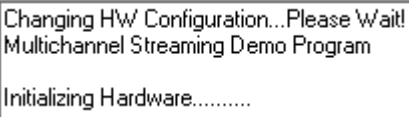| User Interface Item	Purpose	Description
File Help	Program menus	Dropdown menus for **File** and **Help**
Load Config Save Config Open DataViewer Exit	File Menu	**Load Config** – allows the user to load a previously saved measurement configuration. **Save Config** – allows the user to save a measurement configuration. **Open DataViewer** – opens Agilent's free Streaming DataViewer. **Exit** – terminates the program.
M9392A System Information About	Help Menu	**M9392A System Information** – displays the model, serial number, slot number, and the hardware rev of all modules allocated to Ch1 resource and Ch2 resource (if 2 channels are selected). **About** – displays the current revision of the example program.

User Interface Item	Purpose	Description
Change Resource	Change IVI resource	**Change Resource** – configures/re-configures the resources entered into Ch1 resource and Ch2 resource (if 2 channels are selected).
☑ Full VSA(s) ☐ Multiple Digitizers	Select basic hardware type	**Full VSA(s)** – provides automatic program control for 1 or 2 full M9392A instruments.
		Multiple Digitizers – provides automatic program control for 1 or 2 digitizer-only M9392A instruments. In digitizer-only mode, center frequency is set to 500 MHz and expected power is set to -4 dBm.
☑ Single Channel ☐ 2 Channel	Select the number of channels	**Single Channel** – selects the IVI resource on Ch1 resource input and instantiates a driver session.
		2 Channel – selects the IVI resources in Ch1 resource and Ch2 resource and instantiates a driver session on each IVI resource.
☑ RAID ☐ Single HD	Select Final Storage	**RAID** – establishes that the hardware is connected to a viable RAID system. Since data can be written to RAID as fast as it is acquired, less RAM resources are required.
		Single HD – establishes that the final storage is to a single hard disk drive. This means for wide bandwidth captures for more than a few seconds large amounts of RAM will be required. Selecting Single HD allows all the free RAM to be allocated to the streaming process.
Recording Control Start	Start, Acquisition.	In the executable only version of the code these three buttons are on a different thread so that the GUI remains active over long recordings.
		Start – starts an acquisition based on the measurement configuration you have set in the GUI.
☑ simulate	Configure Simulation mode	**NOTE**: The program will always start in simulation mode, basically guaranteeing the program will not crash due to bad IVI hardware config.
		Simulate – allows you to use the example program to make simulated acquisitions without having any hardware connected.
Ch1 Resource MasterVSA Ch2 Resource SlaveVSA	IVI Hardware Configurations	**Ch1 Resource** – is the IVI configuration used by hardware configured as the Master channel.
		Ch2 Resource – is the IVI configuration used by hardware configured as the Slave channel.
		If only one channel is selected, Ch2 will not be used.
Channel 1 File Out c:\temp\stream1.bin Channel 2 File Out c:\temp\stream2.bin	Set streaming file names	**Channel 1 File Out** – sets the destination of the output streaming file on Ch1.
		Channel 2 File Out – sets the destination of the output streaming file on Ch2.

User Interface Item	Purpose	Description
	Select or browse or select a streaming file	Use the Select buttons to browse for previous file names, find new drives, or create new file destinations. It is possible to store each stream on a different volume. This is required when employing a dual controller JMR RAID system.
	Current RAM required	**Current RAM (MB) required** – estimates the RAM required based on the current configuration settings. If RAM required is greater than Free RAM, then a streaming record cannot be made.
	Current Free Space on storage medium	**Ch1 Storage(GB)** – uses Windows to calculate the free space on the allocated drive volume. If the space required for the current settings exceeds the available space the green box (🟩) will turn red (🟥) and the program will not allow a streaming record to be made. **Ch2 Storage(GB)** – uses Windows to calculate the free space on the allocated drive volume. If the space required for the current settings exceeds the available space the green box (🟩) will turn red (🟥) and the program will not allow a streaming record to be made.
	Free System RAM	**Free RAM (MB)** – indicates the amount of free RAM available for streaming acquisition. If current RAM required is larger than Free RAM (MB), then the green box (🟩) will turn red (🟥) and the program will not allow a streaming record to be made.
	Trigger Slope	**Slope Pos** – sets the trigger slope to positive. **Slope Neg** – sets the trigger slope to negative.
	Trigger Level	**Trigger Level** – sets the trigger level for digitizer on Ch1 (the master). If Video Trigger is selected, then the units are in dBm. If External trigger is selected, then the units are in Volts.
		Pre-Trigger Delay (s) – sets the pre-trigger delay on each digitizer. If 2 channels are selected, pre-trigger will be applied to both channels. Pre-trigger can be set as much as 75% of the current acquisition time but no more. If acquisition time is 10 seconds and pre-trigger is set to 2 seconds. The total recording will be 10 seconds long. The first two seconds of the data will be pre-trigger data. **NOTE**: Pre-trigger is wholly dependent on the amount of system RAM.
	Trigger Timeout	**Trigger Timeout (ms)** – sets the amount of time an active streaming acquisition will wait for a trigger before terminating.

User Interface Item	Purpose	Description
Slave Trigger Level (V) -0.500	Slave Trigger Level (2 Channels only)	**Slave Trigger Level (V)** – Only applies when <u>2 channels are selected</u>. Sets the level of the trigger received from the master trigger out. If in external trigger mode on the master digitizer (CH1), the master trigger out does not need to be connected to the Master Trig 1 input. In external trigger mode the Trig out of the master must be connected to the Slave Digitizer Trig 1 input. For external trigger on master with 2 channels, set this value to between -0.5 V and -0.25 V. If in Video trigger mode on the master digitizer (CH1), the master trigger out must be connected to both master Trig 1 input and slave Trig 1 input. Set the slave voltage somewhere between -0.5 V and -0.25 V.
Trigger Mode ☐ External (Volts) ☐ Video (dBm) ☑ Immediate	Trigger Mode	**External (Volts)** – sets the trigger on the master digitizer (Ch1) to External. **Video (dBm)** – sets the trigger on the master digitizer (Ch1) to Video **Immediate** – triggers a streaming acquisition as soon as the hardware is ready. **NOTE**: Only valid for <u>single-channel mode</u>. If 2 channels are selected, triggering will be defaulted to Video trigger mode.
Trigger ○ Serial PortTrigger	Serial Port Trigger	**Trigger** – Use this button to issue a serial port trigger at any time. **Serial Port Trigger** – If selected, the master digitizer is set to External Trigger mode. Pressing the trigger button will send a trigger voltage down a serial port cable between 0V and 5V. *Not completed at this time.*
Frequency MHz 3000.0000		**Frequency MHz** – sets the center frequency of the acquisition. If in multiple digitizer mode, this will set digitizer IF frequency (default 500 MHz).
BandWidth MHz 100.000	Acquisition Bandwidth	**Bandwidth MHz** – sets the cardinal sample rate appropriate to this bandwidth on both channels. If bandwidth is set to 50 MHz, a sample rate of 62.5MSa/s will be set. If bandwidth is set to 51 MHz, then the next highest cardinal sample rate is 125MSa/s. For streaming the cardinal sample rates are 125MSa/s, 62.5MSa/s, 31.25MSa/s, 15.625MSa/s. If the bandwidth requested * 1.25 falls between any two cardinal sample rates then the highest sample rate is selected.
AcquisitionTime (s) 1.00	Acquisition Time	**Acquisition Time (s)** – requested recording time for each channel.

User Interface Item	Purpose	Description
Expected Power dBm 0.00	Expected Power	**Expected Power dBm** – sets the gain in the M9392A front end so that the digitizer is always near full scale. For proper sensitivity, you should always try to provide an accurate value for expected power. Remember with signals that have a high Peak-to-Average ratio (PAR or Power Factor), this value should be added to the CW power output of the source. For example, for -10 dBm source output power with a modulated signal having PAR of 10 dB, expected power should be set to approximately 0 dBm.
UsePreselector	Use Preselector	**UsePreselector** – Turns on the M9360A preselector only if the M9392A instrument is set in highband (above 2.75 GHz) and bandwidth is set to 40 MHz or less.
Recording Mode ☐ AdjacentChannels ☑ Same Channel	Recording Mode	Useful only when 2 channels are selected. **AdjacentChannels** – If Full VSA instruments are used this mode will set the slave channel center frequency to Frequency MHz + Bandwidth MHz, thus accommodating making adjacent channel measurements. **NOTE**: This is not supported in for digitizer-only configurations using multiple digitizers. **Same Channel** – sets both channels to the same center frequency (for full VSAs) or the same IF frequency (for digitizer-only configurations using multiple digitizers).
○ Digitizer Only Mode [Debug]	Digitizer Only Mode	**Digitizer Only Mode (debug)** – allows support to debug front-end hardware independently of digitizers. *Not Available at this time.*
[progress bar]	Progress Bar	**Progress Bar** – This is the streaming progress bar. The bar will fill 100% Green after acquisition has completed, until that point it will provide an accurate indicator of progress. **NOTE**: When using simulated data, the actual simulated acquisition time can be different from the acquisition time set in the GUI.
Changing HW Configuration...Please Wait! Multichannel Streaming Demo Program Initializing Hardware..........	Update Status	This window provides status information about the current configuration. It updates approximately once per second during a streaming acquisition to provide the current status of the acquisition and display any API errors.

Leveraging the Example Program Source Code

The source code for this program can be used as a basis for your own control programs. This is a C# solution. If you have a copy of Visual Studio or Visual Studio C# Express, you can modify this version of the program and then run it. If this is not required and you have already installed Agilent M9392A software version 1.2.0.xxxx, then you can run the program executable from:

<Your folder>/MultiChannelStreamingExample/MultiChannelStreamingDemo/bin/<Your processor>/
Release/MultiChannelStreamingDemo.exe

Clarification: "<Your processor>" is either x64 or Itanium.

NOTICES:

- This program does not run well on a 32-bit OS.

- If you modify the source code, then the example should be considered unsupported.