

**Using the Agilent  
U2500A Series USB  
Simultaneous Sampling  
Multifunction Data  
Acquisition Devices with  
MATLAB Software**

**Quick Start Guide**



**Agilent Technologies**

## Notices

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### Manual Part Number

U2541-90033

### Edition

Second Edition, February 20, 2013

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#### CAUTION

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#### WARNING

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# 1 Introduction

MATLAB® Data Acquisition Toolbox is a well known data analysis software environment and programming language. MATLAB software enables you to configure, control, and acquire data from the U2500A Series USB simultaneous sampling multifunction data acquisition devices. Once data is in MATLAB, you can analyze and visualize that data using interactive tools and command-line functions for data analysis tasks such as signal processing, statistical analysis, digital filtering, and curve fitting. MATLAB is also used for generating waveforms and developing Test & Measurement applications.

MATLAB supports the U2500A Series USB simultaneous sampling multifunction data acquisition devices using MATLAB, MATLAB's Data Acquisition Toolbox, and a software adaptor. The models in the U2500A Series family that are supported are the U2531A, U2541A, and U2542A.

In order to use these devices with MATLAB, you need to install MATLAB and Agilent software components and applications, connect the USB multifunction DAQ device, install the respective drivers, and verify the whole operation with the MATLAB example for U2500A Series hardware. These steps are described in this document.



**Figure 1-1** U2500A Series USB simultaneous sampling multifunction data acquisition devices

## 2 Install the Software Components and Applications

Install the software components and applications in the following order as described in this section of the getting started guide:

- MATLAB and MATLAB's Data Acquisition Toolbox
- the U2500A Series hardware drivers
- the Agilent Measurement Manager (this also installs the Agilent IO Libraries Suite if not already installed)
- the U2500A Series IVI-COM driver
- the U2500A Series MATLAB DAQ adaptor<sup>[1]</sup>

### Minimum system requirements

Prior to any installation or configuration, please ensure that your PC meets the following minimum system requirements.

**Processor** 1.6 GHz Pentium® IV or higher

**Operating system** Windows® XP Professional or Home Edition (Service Pack 1 or later), or Windows® Vista 32-Bit (Business, Ultimate, Enterprise Home Basic, and Home Premium)

**Browser** Microsoft® Internet Explorer 5.01 or higher

**Available RAM** 512 MB or higher recommended

**Hard-disk space** 1 GB

**Video** Super VGA 800×600 (1024×768 recommended)

**Prerequisites** Agilent IO Libraries Suite 15.1<sup>[2]</sup>, Agilent T&M Toolkit Runtime version 2.1<sup>[3]</sup>, Agilent T&M Toolkit Redistributable Package 2.1 patch<sup>[2]</sup>, Microsoft® .NET Framework version 2.0<sup>[2]</sup>

<sup>[1]</sup> Compatible with MATLAB versions up to R2007a and Windows editions up to Windows XP

<sup>[2]</sup> Available on the Agilent Automation-Ready CD-ROM

<sup>[3]</sup> Bundled with the Agilent Measurement Manager software application installer

Follow the instructions below to install the software components:

### Installing MATLAB and MATLAB's Data Acquisition Toolbox

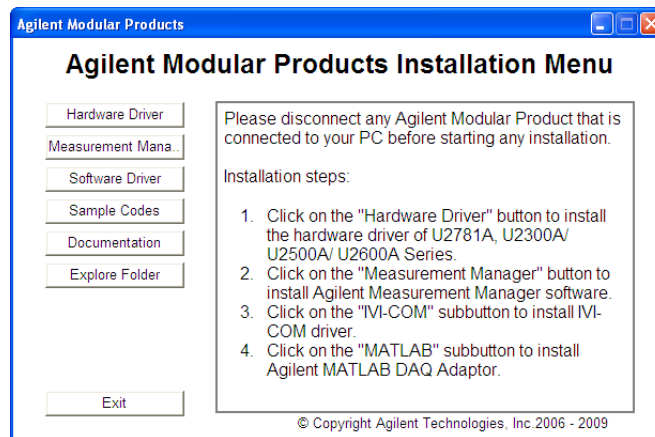
- 1 You can install the MATLAB software directly from the MATLAB installation DVD or from the MathWorks web site. (A MathWorks account is required.) If you do not already have MATLAB and MATLAB's Data Acquisition Toolbox, you can request a trial at: <http://www.mathworks.com/agilent/daq/tryit.html>.
- 2 Follow the on-screen prompts to install MATLAB and this toolbox.

### Installing the U2500A Series hardware drivers

#### NOTE

Please ensure that there are no instruments connected to the PC when installing the driver.

- 1 Verify that your PC meets the minimum system requirements as stated in “[Minimum system requirements](#)” on page 3.
- 2 Insert the *Agilent USB Modular Products Product Reference CD-ROM*. The application automatically loads the “Agilent Modular Products Installation Menu” as shown.



- 3 Click **Hardware Driver** to begin the installation. Click **Next** to proceed. Follow the instructions on the screen to proceed with the installation.

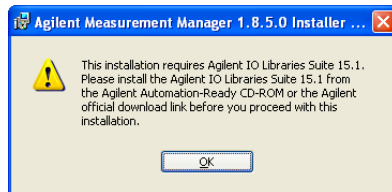
- 4 Click **Install** to begin the installation.
- 5 Click **Finish** when the installation has completed.

### Installing the Agilent Measurement Manager

#### NOTE

Ensure that you have completed the steps for “[Installing the U2500A Series hardware drivers](#)” on page 4 before you proceed.

- 1 Click **Measurement Manager** to begin the installation. Click **Next** to proceed.
- 2 Click **Install** to begin the installation. Follow the instructions on the screen to proceed with the installation.
- 3 If you do not have the Agilent IO Libraries Suite pre-installed, a dialog box will appear to remind you that the Agilent IO Libraries Suite is required to be installed prior to the installation the Agilent Measurement Manager.



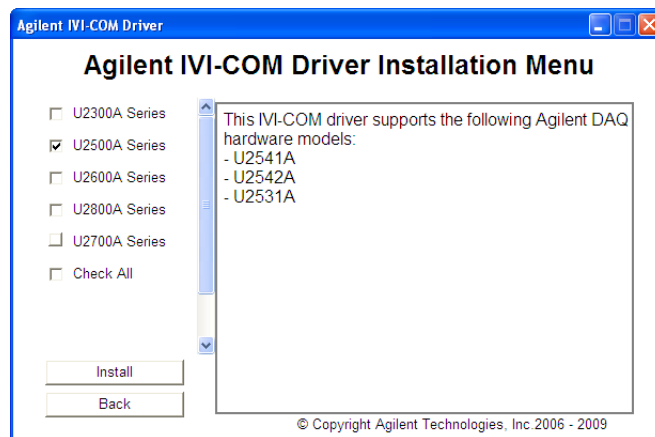
- 4 Click **OK** to exit the Agilent Measurement Manager installation. Install the Agilent IO Libraries Suite from the Agilent Automation Ready CD-ROM or from the Agilent official download link: <http://www.agilent.com/find/iolib>
- 5 Once the Agilent IO Libraries Suite installation has completed, repeat [step 1](#) to install the Agilent Measurement Manager.
- 6 If you do not have any of the other prerequisites installed, the InstallShield Wizard software prerequisite will appear. Click **OK** to begin the installation of the listed missing prerequisites. The installation of the Agilent Measurement Manager software will proceed as normal.
- 7 Click **Finish** when the installation has completed.

## Installing the U2500A Series IVI-COM drivers

### NOTE

- Ensure that you have completed the steps for “Installing the U2500A Series hardware drivers” on page 4 before you proceed.
- The IVI Shared Components must also be installed prior to installing the IVI-COM driver. Find the IVI Shared Components at the IVI web site here: <http://www.ivifoundation.org>.
- If needed, the IVI-COM driver may also be downloaded from <http://www.agilent.com/find/ivi-com>.

- 1 Click **Software Driver > IVI-COM** to begin the installation.



- 2 Select the U2500A Series check box. Click **Install** to begin the installation. Follow the instructions on the screen to proceed with the installation.
- 3 Click **Finish** when the installation has completed.

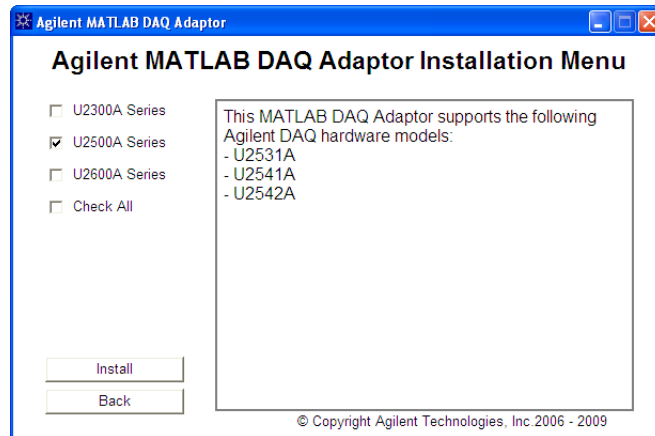


## Installing the U2500A Series MATLAB DAQ Adaptor

### NOTE

If needed, the U2500A Series MATLAB DAQ Adaptor may also be downloaded from [http://www.agilent.com/find/matlab\\_u2500a](http://www.agilent.com/find/matlab_u2500a).

- 1 Click **Software Driver > MATLAB** to begin the installation.



- 2 Select the U2500A Series check box. Click **Install** to begin the installation. Follow the instructions on the screen to proceed with the installation.
- 3 Click **Finish** when the installation has completed.

## 3 Connect the Module

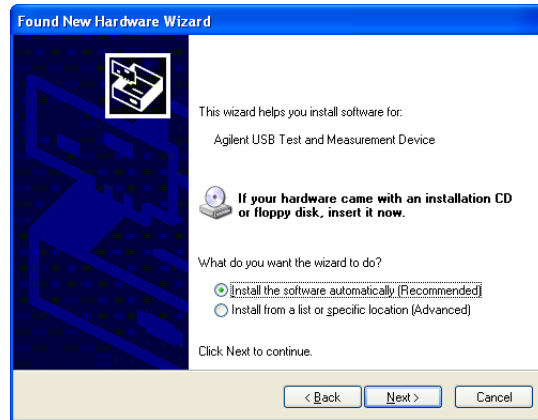
### NOTE

Ensure that all the required software components and applications are installed before proceeding. See “[Install the Software Components and Applications](#)” on page 3 for more information.

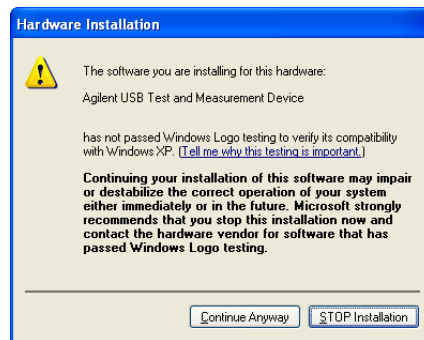
- 1 After all the installations have completed, connect the power supply to your instrument.
- 2 Connect the U2500A Series to any USB port on your PC with the bundled USB cable.
- 3 Your PC will automatically detect the connected unit and the Found New Hardware Wizard window will appear. Select Yes, this time only and click **N**ext to proceed.



- 4 Select **Install the software automatically (Recommended)** and click **Next**.



- 5 A warning message will appear on the Hardware Installation window. Click **Continue Anyway** to proceed with the installation of the USB multifunction DAQ device.

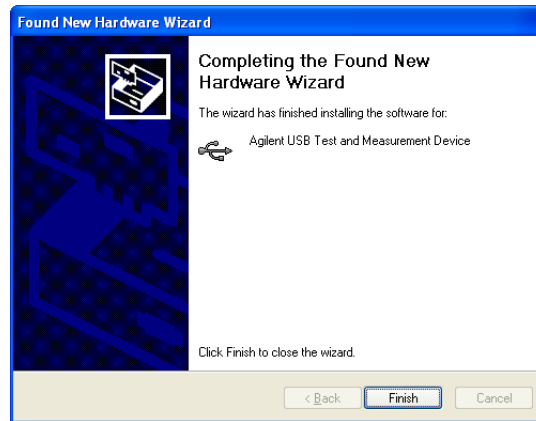


## NOTE

If you do not wish to receive similar warning messages in the future, follow the instructions below.

- 1 Go to **Start > Control Panel** and double-click **System**.
- 2 Select the **Hardware** tab and click **Driver Signing** on the Drivers panel.
- 3 The **Driver Signing Options** dialog box will appear.
- 4 Select **Ignore** to disable the warning message.

6 Click **Finish** to complete the installation.



If you have more than one type of USB instrument connected, you will need to go through the driver installation procedures again for each USB instrument connected.

## 4 Verify Your Module Connection

The Agilent Connection Expert is one of the utilities of the Agilent IO Libraries Suite. The Connection Expert configures the connected instruments and enables communication. It is able to automatically detect the U2500A Series USB simultaneous sampling multifunction data acquisition devices plugged into the PC.

- 1 Go to **Start > All Programs > Agilent IO Libraries Suite > Agilent Connection Expert** to launch the Connection Expert.
- 2 The detected USB multifunction DAQ device will be visible on the Instrument I/O on this PC explorer pane. Right-click on the USB multifunction DAQ device instrument on the explorer pane.
- 3 A context menu will appear. Select **Send Commands To This Instrument**.
- 4 The Agilent Interactive IO dialog box will appear. Click **Send & Read** to send the \*IDN? default command. The instrument response should appear in the Instrument Session History panel.

### NOTE

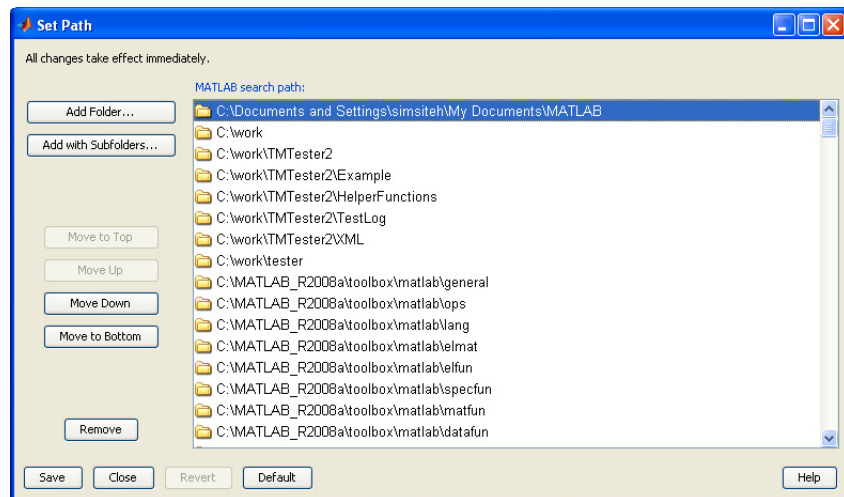
Repeat this verification for all applicable modules connected to your PC.

## 5 Locate and Add the MATLAB DAQ Adaptor Folder

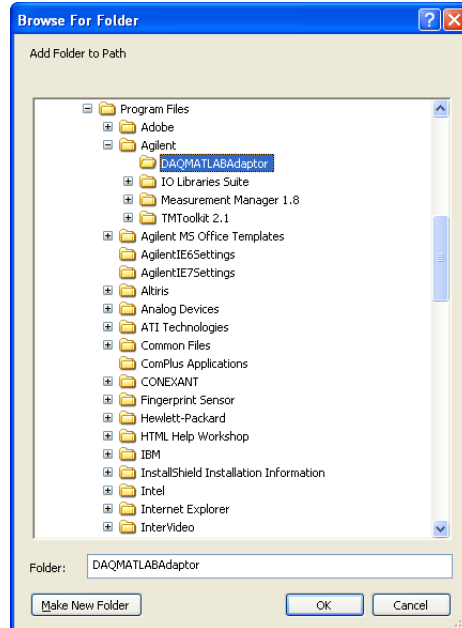
Follow the instructions below to locate and add the folder in which the MATLAB DAQ adaptor has been installed. The folder contains a file in the form `AgilentU2500.dll`, which works for all U2500A Series hardware.

### Launch MATLAB.

- 1 Click **File > Set Path**. The Set Path window appears as shown.



- 2 Click **Add Folder**. The Browse For Folder window appears as shown. Use this window to locate the AgilentU2500.dll file. The default MATLAB DAQ Adaptor directory is C:\Program Files\Agilent\DAQMATLABAdaptor.



- 3 Click **OK**. The folder is then added. Click **Save** and then click **Close**.
- 4 Open the MATLAB example program. Change the AgilentU2500 name to the name of your adaptor by editing the program. Then run the example program. Your output should look similar to the example shown below.
- 5 Once you add the .dll file to the path in the steps above, you need to register it. (This is a one time step.) You can register the .dll in the MATLAB Command Window: `daqregister('C:\Program Files\Agilent\DAQMATLABAdaptor\U2500 Series\AgilentU2500.dll')`
- 6 Execute the MATLAB example program called “daqstartup” in the MATLAB Command Window to confirm that everything is installed correctly. (You can download this example application at [http://www.agilent.com/find/matlab\\_u2500A](http://www.agilent.com/find/matlab_u2500A).) Your output should look similar to the results shown below:

## Output example

```
>>daqstartup

ans=

AdaptorDllName: 'C:\Program Files\Agilent\DAQMATLABAdaptor\
AgilentU2500.dll'

AdaptordllVersion: '1,2,0,0'

AdaptorName: 'agilentu2500'

BoardNames: {U2541A}

InstalledBoardIds: {'0'}

ObjectConstructorName: {1x3 cell}

ans=

AdaptorName: 'agilentu2500'

Bits: 16

Coupling: {'DC Coupled'}

DeviceName: 'U2541A'

DifferentialIDs: [1x32 double]

Gains: [1 2 4 8]

ID: '0'

InputRanges: [8x2 double]

MaxSampleRate: 250000

MinSampleRate: 3

NativeDataType: 'int16'

Polarity: {'Unipolar' 'Bipolar'}

SampleType: 'Scanning'

SingleEndedIDs: [1x64 double]

SubsystemType: 'AnalogInput'

TotalChannels: 64

VendorDriverDescription: 'IVI Driver for AgilentU254x family of USB DAQ
modules.'

VendorDriverVersion: '2.0.12.1'
```



## 6 For More Information

- 1 Request a trial of MATLAB and MATLAB's Data Acquisition Toolbox:  
<http://www.mathworks.com/agilent/daq/tryit.html>
- 2 Learn more about using MATLAB software with the U2500A Series devices:  
<http://www.mathworks.com/agilent/daq/overview>
- 3 Learn how to use the Data Acquisition Toolbox to create MATLAB scripts by reading the user documentation for the Data Acquisition Toolbox:  
<http://www.mathworks.com/access/helpdesk/help/toolbox/daq/index.html>
- 4 Learn how to use MATLAB software with other Agilent hardware:  
<http://www.mathworks.com/agilent/overview>

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