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

KEYSIGHT
TECHNOLOGIES

Quick Start
Guide

Notices

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Manual Part Number

U2541-90033

Edition

Edition 4, June 1, 2017

Printed in:

Printed in Malaysia

Published by:

Keysight Technologies
Bayan Lepas Free Industrial Zone,
11900 Penang, Malaysia

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Table of Contents

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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 adapter. 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 Keysight 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 Keysight Measurement Manager (this also installs the Keysight IO Libraries Suite if not already installed)

– the U2500A Series IVI-COM driver

– the U2500A Series MATLAB DAQ adapter[1]

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   Keysight IO Libraries Suite 15.1[2], Keysight T&M Toolkit Runtime version 2.1[3], Keysight T&M Toolkit Redistributable Package 2.1 patch[2], Microsoft$^®$.NET Framework version 2.0[2]

[1] Compatible with MATLAB versions up to R2007a and Windows editions up to Windows XP

[2] Available on the Keysight Automation-Ready CD-ROM

[3] Bundled with the Keysight 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 website. (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/keysight/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 8.

2 Insert the *Keysight USB Modular Products Product Reference CD-ROM*. The application automatically loads the "Keysight Modular Products Installation Menu" as shown.
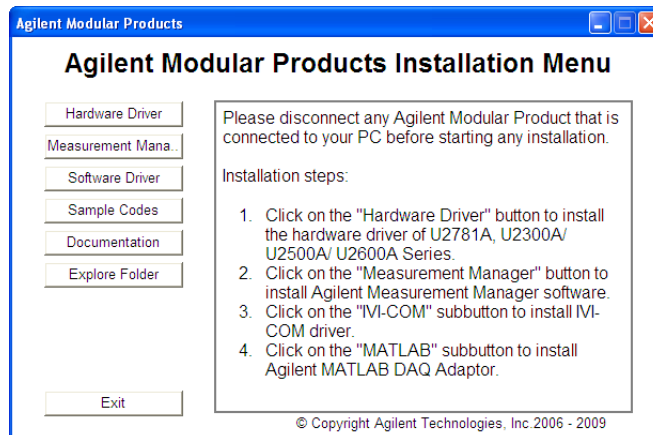
3 Click **Hardware Driver** to begin the installation. Click **Next** to proceed. Follow the instructions on the screen to proceed with the installation.
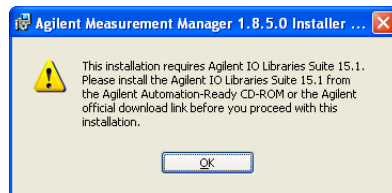
4 Click **Install** to begin the installation.

5 Click **Finish** when the installation has completed.

Installing the Keysight Measurement Manager

<table>
<tr><td>NOTE</td><td>Ensure that you have completed the steps for "Installing the U2500A Series hardware drivers" on page 9 before you proceed.</td></tr>
</table>

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 Keysight IO Libraries Suite pre-installed, a dialog box will appear to remind you that the Keysight IO Libraries Suite is required to be installed prior to the installation the Keysight Measurement Manager.


4 Click **OK** to exit the Keysight Measurement Manager installation. Install the Keysight IO Libraries Suite from the Keysight Automation Ready CD-ROM or from the Keysight official download link: http://www.keysight.com/find/iolib.

5 Once the Keysight IO Libraries Suite installation has completed, repeat step 1 to install the Keysight 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 Keysight Measurement Manager software will proceed as normal.

7 Click **Finish** when the installation has completed.

Installing the U2500A Series IVI-COM drivers

– The IVI Shared Components must also be installed prior to installing the IVI-COM driver. Find the IVI Shared Components at the IVI website here: http://www.ivifoundation.org.

– If needed, the IVI-COM driver may also be downloaded from http://www.keysight.com/find/ivi-com.

1 Click **Software Driver** > **IVI-COM** to begin the installation.
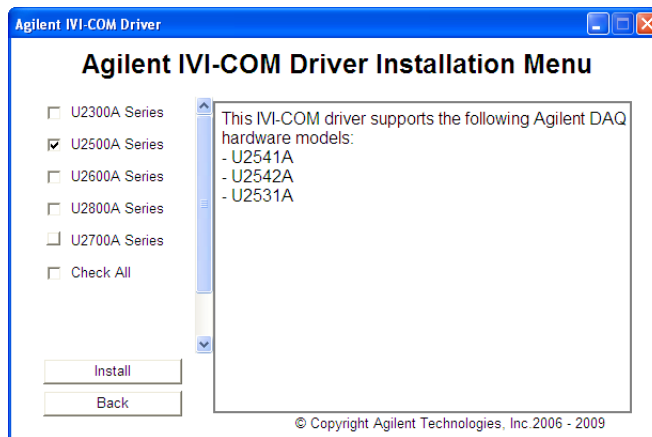
2 Select the U2500A Series check box. Click **Install** to begin the installation. Follow the instructions on the screen to proceed with the installation.

3 Click **Finish** when the installation has completed.

Installing the U2500A Series MATLAB DAQ Adapter

NOTE   If needed, the U2500A Series MATLAB DAQ Adapter may also be downloaded from http://www.keysight.com/find/matlab_u2500a.

1   Click **Software Driver** > **MATLAB** to begin the installation.
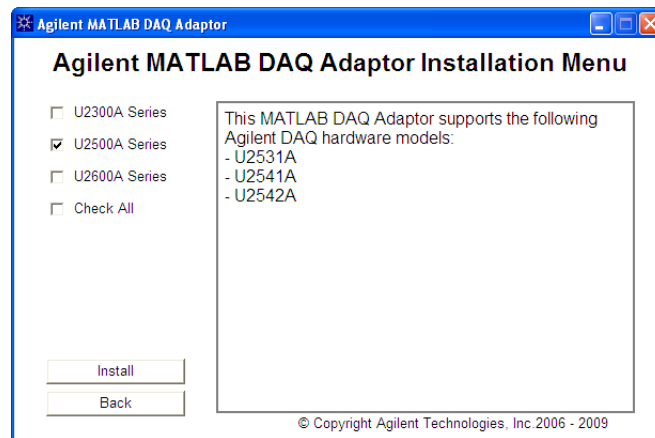
2   Select the U2500A Series check box. Click **Install** to begin the installation. Follow the instructions on the screen to proceed with the installation.

3   Click **Finish** when the installation has completed.

3   Connect the Module

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 **Next** to proceed.

4 Select Install the software automatically (Recommended) and click **Next**.
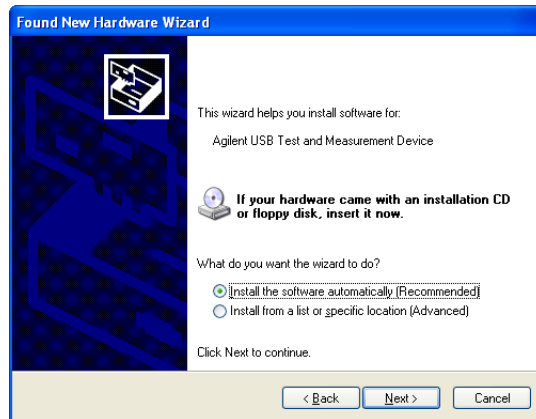
5 A warning message will appear on the Hardware Installation window. Click **Continue Anyway** to proceed with the installation of the USB multifunction DAQ device.
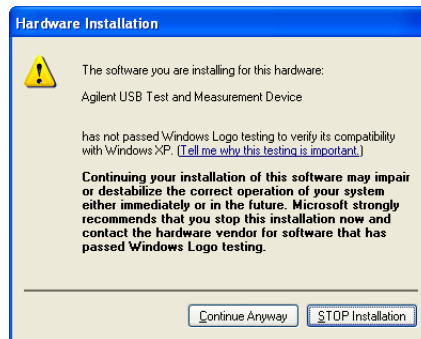

| NOTE | If you do not wish to receive similar warning messages in the future, follow the instructions below. |

– Go to **Start** > **Control Panel** and double-click **System**.

– Select the Hardware tab and click **Driver Signing** on the Drivers panel.

– The Driver Signing Options dialog box will appear.

– Select Ignore to disable the warning message.

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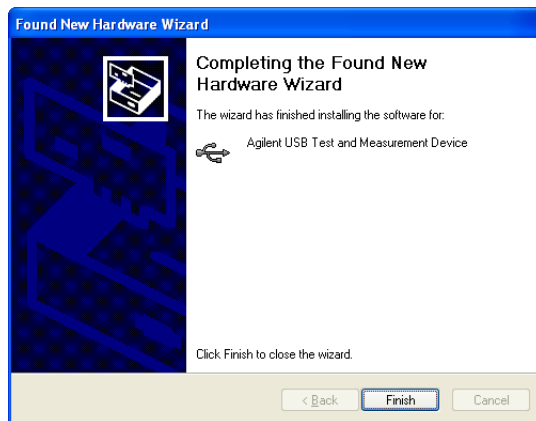
If you have more than one type of USB instrument connected, you will need to go through the driver installation procedures again for each USB instrument connected.

4 Verify Your Module Connection

The Keysight Connection Expert is one of the utilities of the Keysight 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** > **Keysight IO Libraries Suite** > **Keysight 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 Keysight 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 Adapter Folder

Follow the instructions below to locate and add the folder in which the MATLAB DAQ adapter has been installed. The folder contains a file in the form `keysightU2500.dll`, which works for all U2500A Series hardware.

Launch MATLAB.

1 Click **File** > **Set Path**. The Set Path window appears as shown.
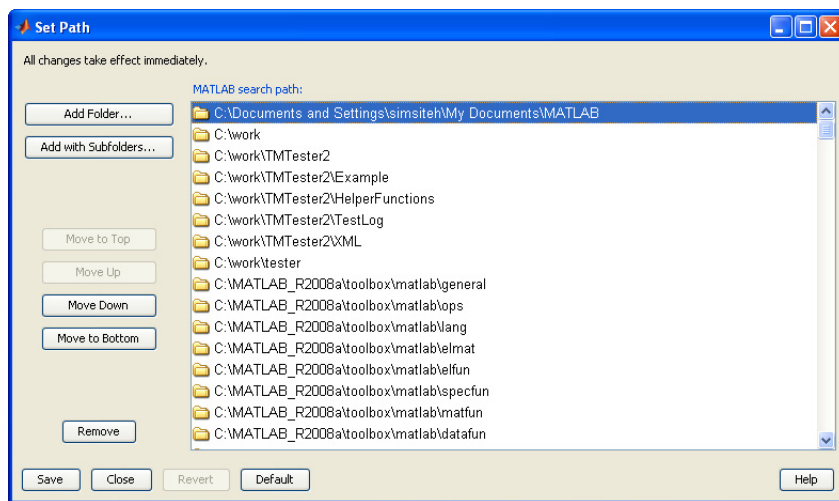
2 Click **Add Folder**. The Browse For Folder window appears as shown. Use this window to locate the `keysightU2500.dll` file. The default MATLAB DAQ Adapter directory is `C:\Program Files\Keysight\DAQMATLABAdapter`.
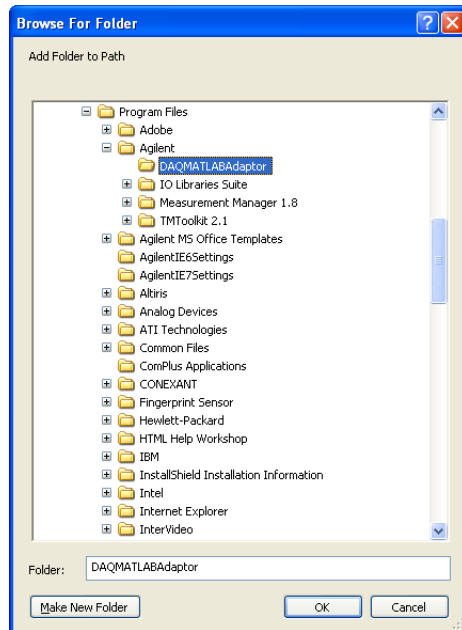
3 Click **OK**. The folder is then added. Click **Save** and then click **Close**.

4 Open the MATLAB example program. Change the keysightU2500 name to the name of your adapter 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\Keysight\ DAQMATLABAdapter\U2500 Series keysightU2500.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.keysight.com/find/ matlab_u2500A.) Your output should look similar to the results shown below:

Output example

```
>>daqstartup
ans=
AdapterDllName: 'C:\Program Files\Keysight\DAQMATLABAdapter\
keysightU2500.dll'
AdapterdllVersion: '1,2,0,0'
AdapterName: 'keysightu2500'
BoardNames: {U2541A}
InstalledBoardlds: {'0'}
ObjectConstructorName: {1x3 cell}
ans=
AdapterName: 'keysightu2500'
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 keysightU254x 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/keysight/daq/tryit.html

2 Learn more about using MATLAB software with the U2500A Series devices:
http://www.mathworks.com/keysight/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 Keysight hardware:
http://www.mathworks.com/keysight/overview

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