

Getting Started with Test Automation in LabVIEW[®]

APPLICATION NOTE



As the number of interfaces and functionality integrated into devices under test continues to increase, automated testing becomes more valuable as a tool to cover more test requirements in less time.

High speed serial interfaces (HSSI) are no exception. Thankfully, most of the tests and measurements for HSSI can still be accomplished by oscilloscopes. In this article, we are going to describe three steps to get started automating oscilloscopes in LabVIEW. The Tektronix 5 Series B MSO oscilloscope will be used in this example, but the steps described in the application note apply to other Tektronix and Keithley products.

Three Steps to Automating Tektronix Oscilloscopes in LabVIEW:

- 1. Install software and driver.
- 2. Set up instrument driver.
- 3. Start measurement with a built-in example.

Install Software and Driver

- 1. Download and install LabVIEW if you haven't yet.
- 2. Download and install latest NI-VISA <u>HERE</u>. (NI-VISA is a general purpose instrument driver required to automate the oscilloscope within LabVIEW.)

Setting Up an Instrument Driver

- 1. Launch LabVIEW.
- 2. Select Help -> Find Instrument Drivers to launch Instrument Driver Finder.



3. Select *Tektronix* as Manufacturer and type "MSO" in Additional Keywords to narrow the search results. Click on *Search*.

| Connected Instruments | Welcome Yi-Hsiang, The NI Instrument Driver Finder helps you find and install LabVIEW Plug and Play instrument drivers quickly and easily. If you require other types of instrument drivers, such as IVI or VXIPNP, you can use the Instrument Driver Network at ni.com/idnet. |
|---|--|
| | Change User |
| | Scan for Instruments |
| | Manufacturer |
| | Tektronix |
| | Additional Keywords |
| | mso |
| ~ | NI Certified Drivers Only |
| figure your search manually using these controls. | |
| | Rack Search > Close Help |

4. Now the related Instrument Drivers are shown in the list. Select the one(s) that you would like to install, and then click *Install*.

| Driver | NI Certified | A . | Driver Technol | ome | ^ |
|---------------------------|--------------|-----|-----------------|-----------------|------|
| tkdpo4k Instrument Driver | Yes | P | Plug and Play | (project-style) | |
| tkdpo7k Instrument Driver | Yes | | | 4 | |
| tkmso5x Instrument Driver | Yes | R | Required Supp | oort Software: | |
| | | N | NI-VISA | | |
| | | | Min Version | n - 5.4 | |
| | | | Driver Revision | | |
| | | 1 | 1.5 | | |
| | | N | Manufacturer: | | |
| | | T | Tektronix | | |
| | | N | Model(s) Supp | oorted: | |
| | | N | MSO64B | | |
| | | N | MSO66B | | |
| | | | MSO64 | | |
| | | Ň | MSO54 | | |
| | | N | MSO56 | | |
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| | | | DDAA | | ~ |
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| | < Back | Ins | stall > | Close | Heln |

5. Once the instrument driver installation is complete, the next step is to launch an example program.

Start Measurement with a Built-In Example

1. From LabVIEW start, select *Help -> Find Examples* to launch LabVIEW Example Finder.

| | Show Context Help Lock Context Help | Ctrl+H Ctrl+Shift+L | | | |
|-----------------|--|------------------------------|----------|---|-----------------------------|
| 🕑 Li | LabVIEW Help Explain Error | Ctrl+? | | | |
| 1 | Find Examples Find Instrument Drivers Web Resources | | | < 6/8 > | >> |
| | Activate LabVIEW Compone Activate Add-ons Check for Updates Customer Experience Impro | nts vement Program | re Wa | Get Support Find support resources inclu documentation, examples, a | uding and |
| Crea | Patents About LabVIEW | | | downloads. Learn about sup or open a service request w engineer. | oport services ith an NI |
| | | | | Read more | |
| | | | ~ | | |
| Find Driver | s and Add-ons | Community and Su | pport | | |
| Connect to devi | ces and expand the | Participate in the discussio | n forums | | |

2. From LabVIEW Example Finder, select *Browse -> Hardware Input and Output -> Instrument Drivers -> LabVIEW Plug and Play*. A list of examples that are relevant to the installed instrument drivers is displayed.

| rowse Search | Double-click an example to open it. | | Information |
|-----------------------|--|-----|--|
| | Pavorites | ^ | Description: |
| Browse according to: | 📴 Fundamentals | | Demonstrates how to set up an |
| Task | Hardware Input and Output | | oscilloscope automatically. You |
| | GPIB GPIB | | can configure this VI to acquire a |
| O Directory Structure | Cal Instrument Drivers | | by following the following steps: |
| | labVIEW Plug and Play | | |
| | Tektronix MSO5X Series Acquire Continuous Waveform.vi | | 1. Specify a valid VISA resource to use. |
| | Tektronix MSO5X Series Acquire Digital Group Waveform.vi | D | 2. Specify a channel. 3. Specify a time-out value for |
| | Tektronix MSO5X Series Acquire Digital Waveform.vi | Ð | 4. Specifies the start and end |
| | Tektronix MSO5X Series Acquire Math Waveform.vi | D | 5. Run this VI. The Waveform |
| | Tektronix MSO5X Series Acquire Multiple Digital Waveform.vi | Ð | acquire. |
| | Tektronix MSO5X Series Acquire Multiple Waveform.vi | Ð | Requirements |
| | Tektronix MSO5X Series Acquire Waveform Digitizer.vi | Ð | |
| | Tektronix MSO5X Series Acquire Waveform Measurement.vi | D | |
| Visit ni.com | Tektronix MSO5X Series Acquire Waveform.vi | | |
| rduare | Tektronix MSO5X Series Edge Triggered Acquisition Waveform.vi | | |
| Find hardware | Tektronix MSO5X Series Load Waveform | ▶ ~ | |

- 3. From the list of examples, select *MS05X Series Acquire Waveform.vi*. Connect the MS0 5 Series oscilloscope through either Ethernet, USB, or GPIB connection.
- 4. Open the example VI which will display the Front Panel. The Front Panel is the User Interface portion of a LabVIEW script, while the source code is referred to as a Block Diagram. Before executing the example, select your instrument in the VISA resource name dropdown (A) and afterward click on the Run button (B). The waveform captured from the oscilloscope now populates on the Waveform Graph.



5. In order to see the block diagram click *Window -> Show Block Diagram*. The Block Diagram will look like the following figure. It is the graphical source code connecting to the front panel user interface design.



- 6. For this example, you will see the source code is relatively straightforward. It consists of primarily four functions from the Tektronix 5 Series MSO instrument driver. These are:
 - a. Initialize establish communication with the instrument.
 - b. Auto Setup configure the oscilloscope to evaluate all input waveforms for optimum conditions of displaying the waveforms.
 - c. Read (Single Waveform) initiate acquisition of the channel and return the waveform from the channel.
 - d. Close terminate the software connection to the instrument.

Next Step

LabVIEW Instrument Drivers provides not only the built-in examples, but also a set of application programming interfaces (APIs) that enable the user to control the instrument. The API can be found on the block diagram by right-clicking, *Functions Palettes -> Instrument IO -> Instrument Drivers*.

| Structures Aray Cluster, Class, & Variant Image: Comparison Waveform Collection Image: Comparison Waveform Collection Image: Collection |
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| Configure Action-Status Data Utility |

In general, Instrument Driver APIs have *Initialize* and *Close* as the default required functions. These two are for initializing the instrument connection, and closing the connection cleanly, respectively. The rest of APIs are grouped into the following categories:

- 1. Configure. Oscilloscope parameter settings such as sample rate, record length, and channel settings. The *Configure* palette also contains settings for oscilloscope measurements, clock recovery functions, and probe options.
- 2. Action-Status. Perform an action of the oscilloscope, such as enabling AFG or digital outputs, performing deskew, or querying the instrument status.
- 3. Data. Reading measurement data from the oscilloscope. This palette includes functions for fetching a waveform, reading the digital voltmeter, or reading measurement results.
- 4. Utility. Utility functions such as resetting the instrument, executing a self-test, or querying the instrument for errors.

If you are interested in learning more about the Instrument Driver APIs, the VI Tree is a special non-executable VI providing a hierarchical overview of all functions contained within the Instrument Driver API. The VI Tree is one of the easiest and fastest ways to find a necessary function.



Resources

Getting Started with Oscilloscope Automation by Python Getting Started with Oscilloscope Automation in C#

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