Using Agilent Command Expert with Microsoft® Excel

Application Note

...for fast and easy instrument control!

About Agilent Command Expert

Agilent Command Expert is a FREE software application that provides fast and easy instrument control in many PC application environments! Command Expert combines instrument command sets, documentation, syntax checking, and command execution all in one simple interface. Instrument command sets are available for instruments that use Standard Commands for Programmable Instrumentation (SCPI) or IVI-COM drivers. Command Expert helps you to:

- Find instrument commands
- Access command documentation
- Verify command syntax
- Build instrument command sequences
- Execute instrument command sequences
- Integrate sequences into the Visual Studio®, Excel, LabVIEW, Agilent VEE, or Agilent SystemVue PC application environment
- Generate code for command sequences in Visual C#, Visual Basic .NET, and Visual C/C++
- Profile command execution time
- Debug command sequences using breakpoints and single-stepping

You can use Command Expert as a standalone instrument control application, or you can integrate Command Expert into Visual Studio, Excel, LabVIEW, Agilent VEE, or Agilent SystemVue. This application note shows how to use Agilent Command Expert to control instruments and manipulate instrument data in Microsoft Excel.

Agilent Technologies

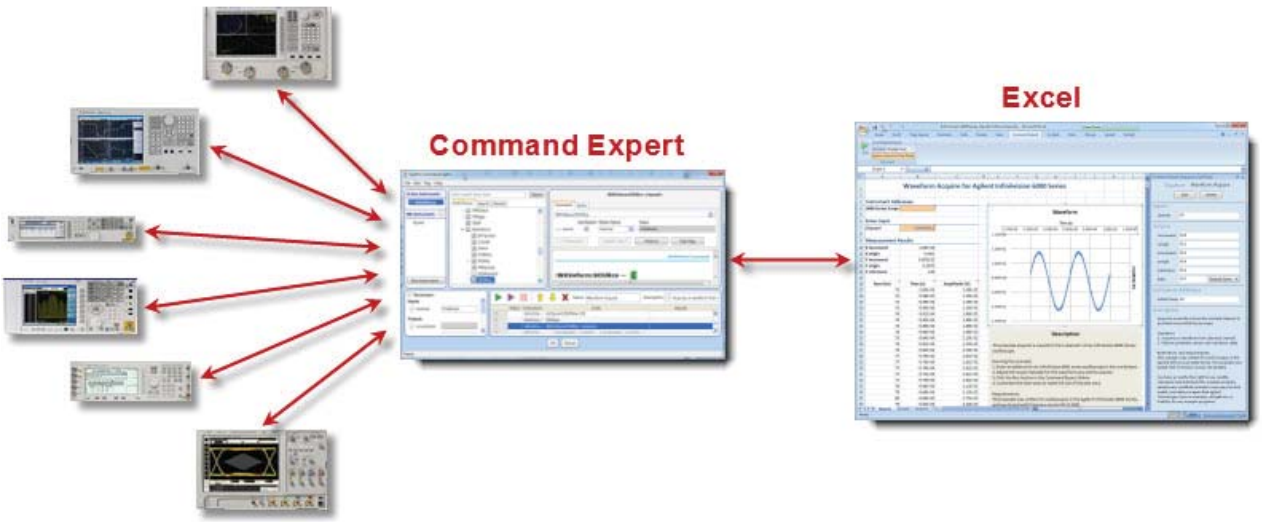
The Command Expert Excel Add-In

The Command Expert Excel Add-In allows you to:

- Create, edit, control, and debug a Command Expert sequence from an Excel workbook.
- Configure instrument parameters in the Excel workbook, and transfer measurement data from the instrument to the workbook.

A Command Expert sequence is a series of steps that are executed in order to connect to an instrument, configure an instrument, and perform measurements. The sequence takes instrument inputs such as instrument address, range, offset, voltage level, and sample rate from the workbook. After running the sequence, measurement data is returned to the workbook for processing and display. This provides easy access to Excel's powerful spreadsheet and graphing capabilities to analyze and display measured data.

The Command Expert Excel Add-In works with Excel 2007 and Excel 2010.

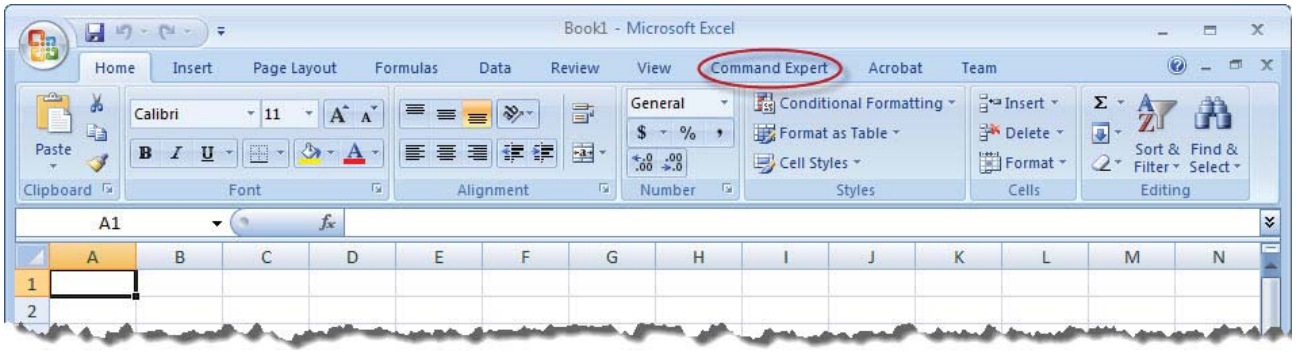


Command Expert provides the following kinds of steps:

- Connect steps (to connect to instruments)
- Command steps (SCPI or IVI-COM commands)
- Wait statements
- Comments
- Steps to control timeouts and error handling

Installing the Excel Add-In

If you already have Excel 2007 or Excel 2010 installed, installing Command Expert automatically installs the Command Expert Excel Add-In. After installation, you can access the Command Expert Add-In from the **Command Expert** tab in Excel:



You can download Command Expert from www.agilent.com/find/commandexpert.

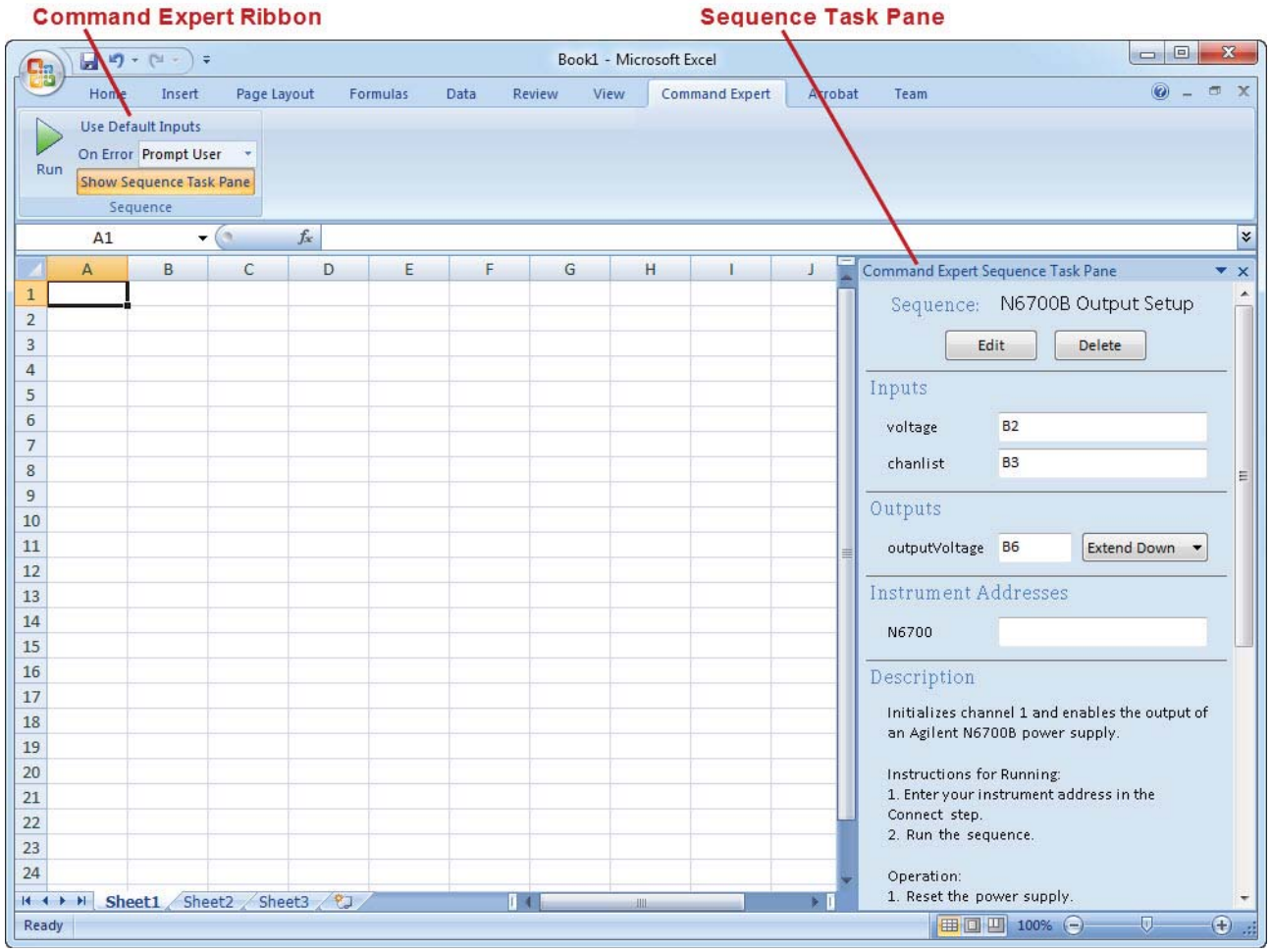
Internet access and command sets After installing Command Expert, you will need internet access to download SCPI command sets or IVI instrument drivers for your instruments. If you work in a secure environment with limited internet access, you can still use Command Expert:

- For SCPI command sets, you can configure Command Expert to use a folder on your hard drive as a source of SCPI command sets. After downloading and installing the SCPI command sets you need, you will not need further access to the Command Expert server.
- For IVI instrument drivers, the IVI-COM command sets are extracted automatically from the drivers. After downloading and installing the drivers you need, you will not need further internet access.

Each SCPI and IVI-COM command set works with a specific set of supported instrument models.

The Excel Add-In Interface

Clicking the **Command Expert** tab displays the Excel Add-In interface in an Excel workbook:



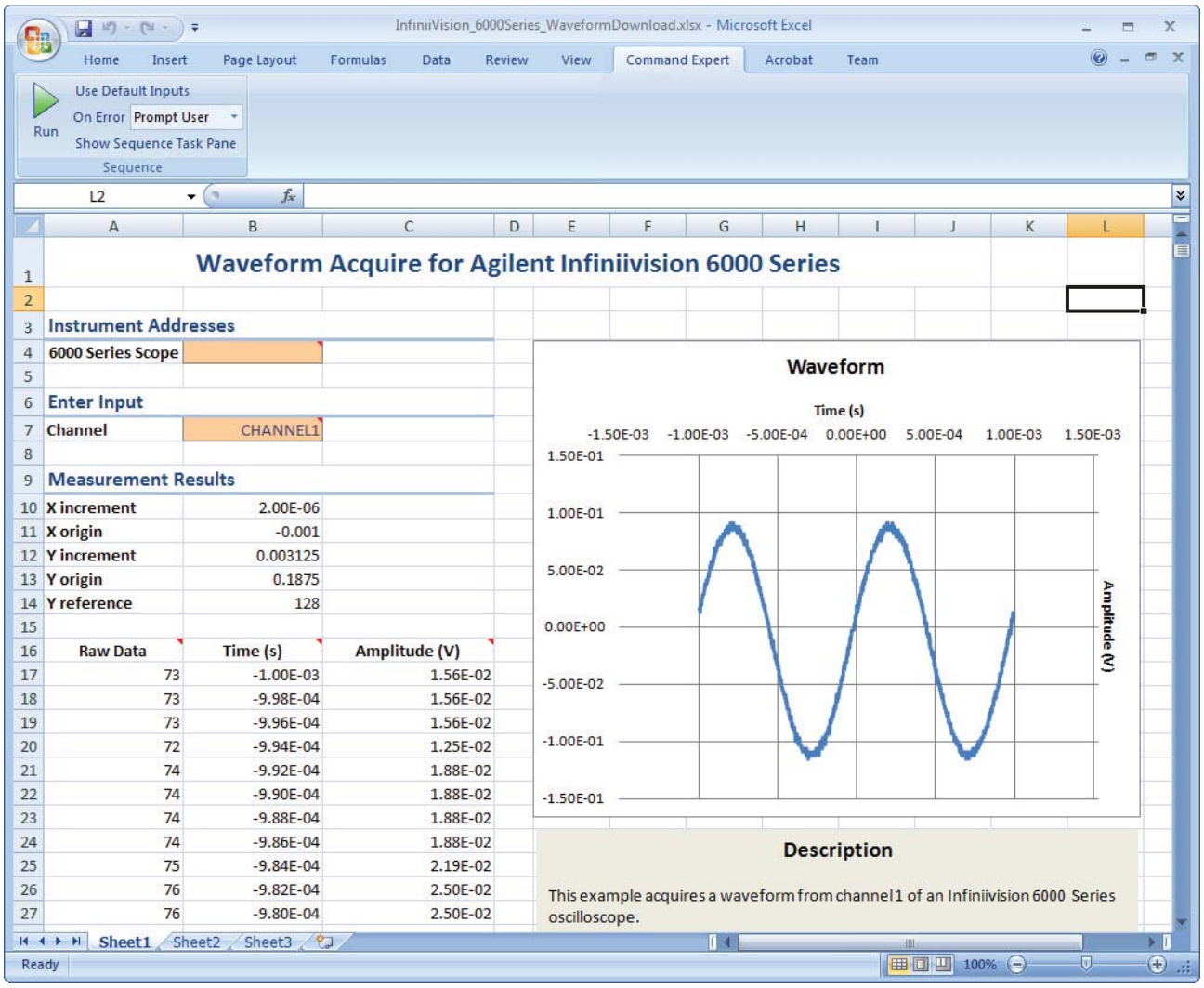
The **Command Expert Ribbon** contains high-level sequence settings and a Run button to run the sequence. Clicking the **Show Sequence Task Pane** button opens the Sequence Task Pane on the right side of the display.

The **Sequence Task Pane** is where you add a sequence to a workbook, open the sequence for editing, and map sequence inputs and outputs to cells in the workbook.

> Open and save Command Expert workbooks as you would ordinary Excel workbooks, using the Excel Save, Save As, and Open commands.

Excel Examples

Command Expert comes with a number of preconfigured examples for popular instruments. The example shown below (filename: *InfiniiVision_6000Series_WaveformDownload.xlsx*) acquires and displays a waveform from an Agilent InfiniiVision 6000 Series Oscilloscope. We will use this example to demonstrate how Command Expert operates in Excel.



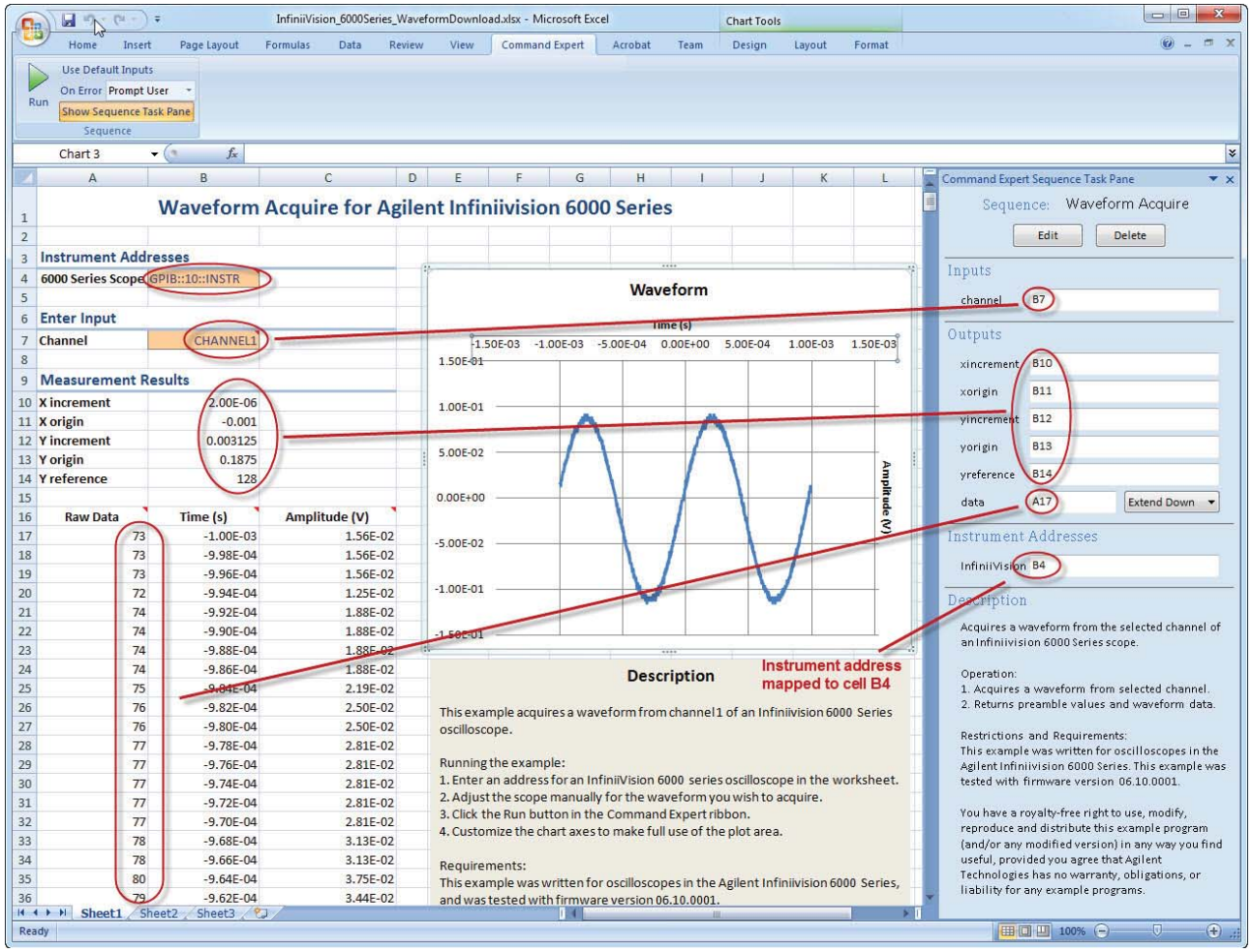
When you click

, the associated Command Expert sequence runs using input values from the workbook; for example, the Channel parameter. The sequence executes a number of instrument control steps, and writes measurement results back to the worksheet where they are displayed.

Working offline In the example above, when connected to an actual instrument, the instrument address would appear in cell B4. The absence of an instrument address indicates that we are working offline. Working offline is a simulation mode where you can view and perform commands as usual, but the commands return default values. This is a good way to explore a command set, view documentation, and prototype sequences without having to connect to a physical instrument.

Input and Output Mappings in Excel

As shown below, the Sequence Task Pane maps cell B7 to the Channel input parameter in the Command Expert sequence; this selects the oscilloscope channel for measurements. The five output parameters, B10 though B14, are the waveform measurement values used in the chart. Raw data is listed starting at cell A17 and is displayed in the chart.



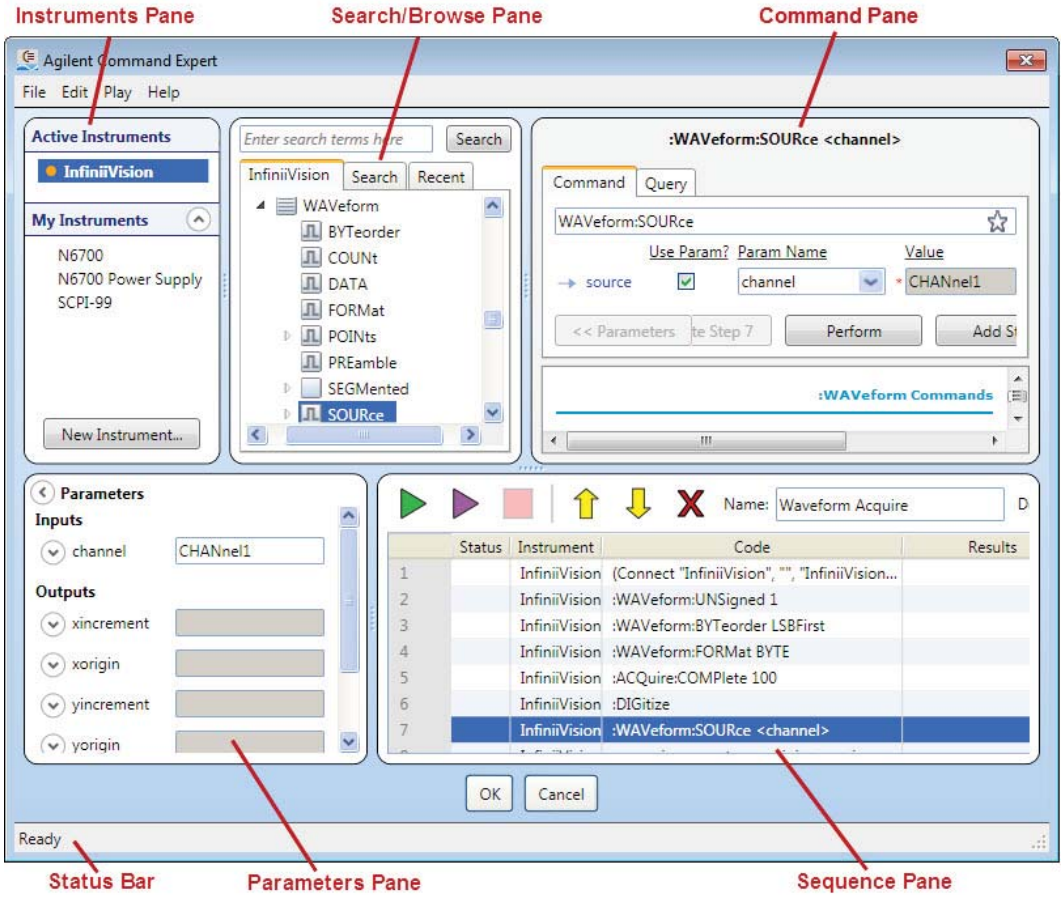
By entering the instrument address in cell B4, you can connect to the Infiniivision instrument. Now when you run the example, the sequence makes measurements on the specified channel, and writes actual instrument measurement results back to the workbook for analysis and display.

Additional required software Be sure to install Agilent IO Libraries Suite to find and communicate with instruments. You can download Agilent IO Libraries Suite from www.agilent.com/find/iosuite.

Viewing and Editing the Sequence

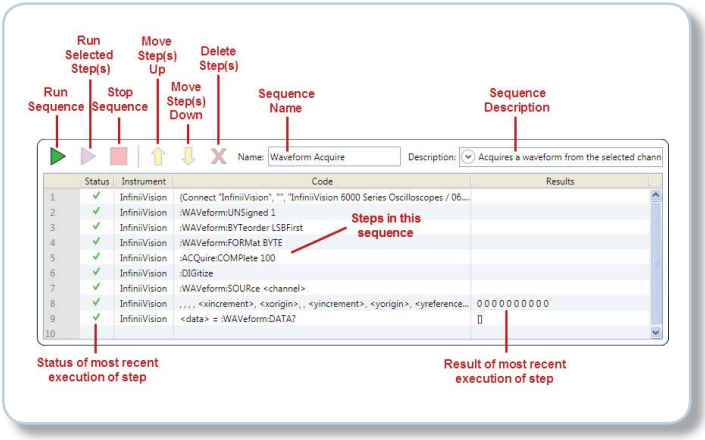
Clicking

in the Sequence Task Pane opens the Command Expert interface showing the Command Expert Sequence associated with this workbook:



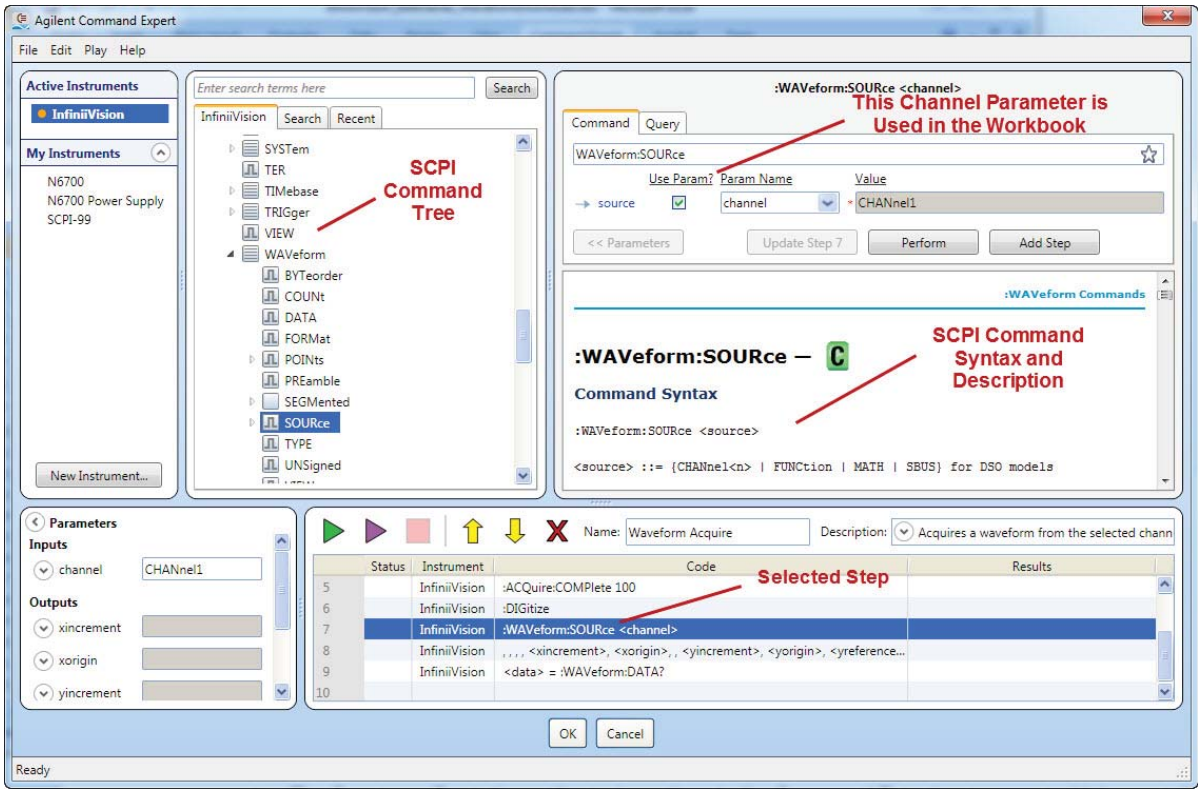
- The Instruments Pane shows your instruments and lets you connect to them.
- The Parameters Pane shows sequence parameters and lets you view and edit their names and values.
- The Status Bar shows progress messages as Command Expert performs operations.
- The Search/Browse Pane shows you the commands for the selected instrument and lets you search for commands.
- The Command Pane shows the selected command and its documentation, and lets you execute the command.
- The Sequence Pane shows the various steps in the Command Expert sequence and lets you edit the sequence and replay commands.

The Sequence Pane has these features:



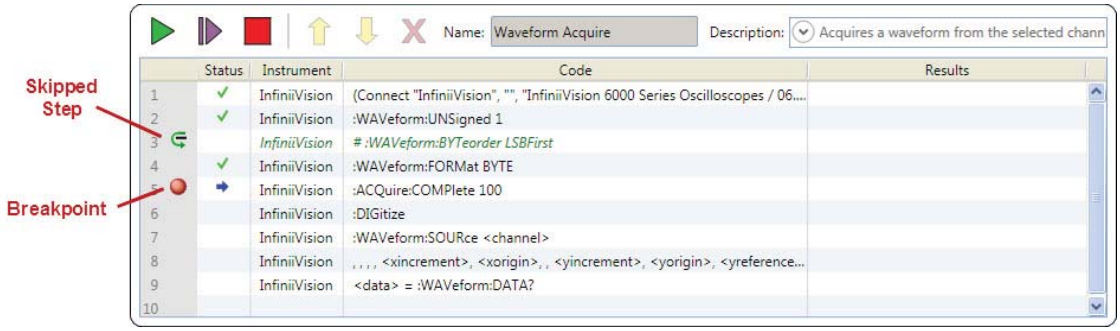
Selecting a Step

Selecting a step in the Sequence Pane reveals details about the command and, if applicable, how the command parameter is mapped to the Excel workbook:



Debugging a Sequence

You can debug a sequence by inserting breakpoints. When Excel runs the sequence, execution pauses at the first step with a breakpoint, and Command Expert opens in debug mode. In debug mode you can single-step the sequence, monitor parameters and results, replay the sequence, and play selected steps. When you are ready to run the sequence without pausing at the breakpoint, remove the breakpoint and run the sequence normally from Excel.

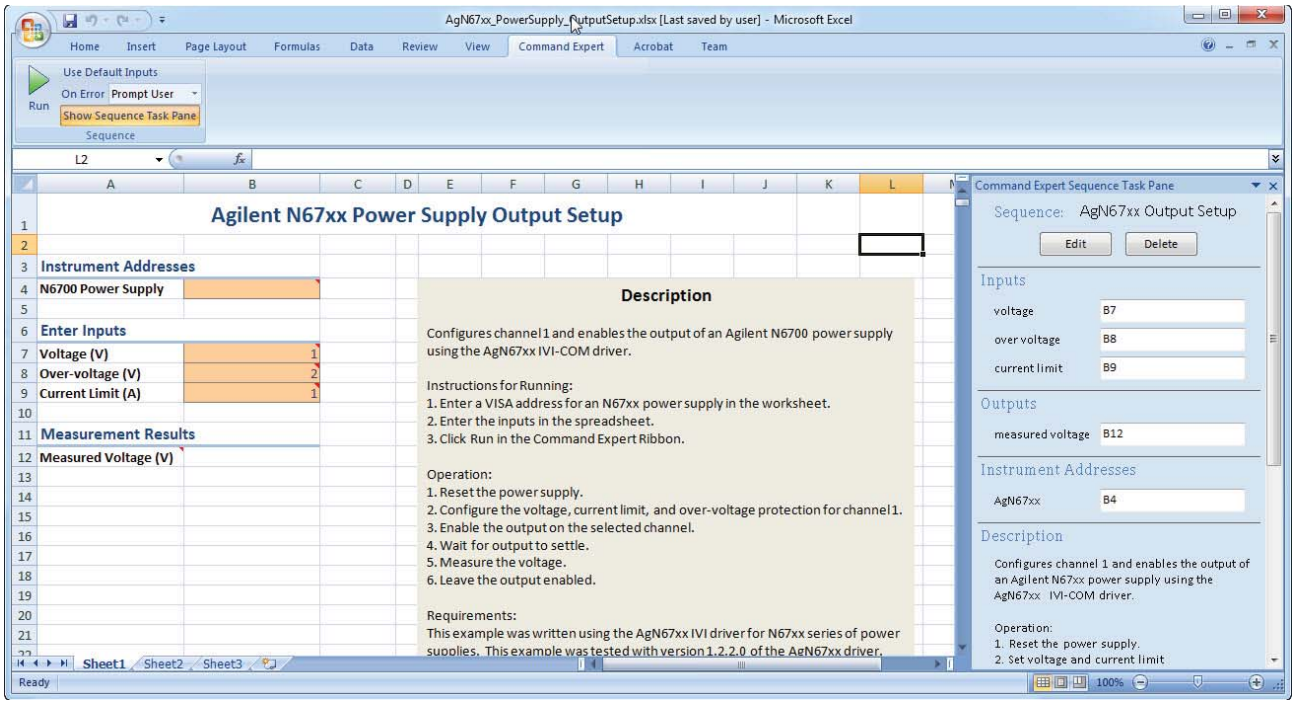


You can also skip steps to help with debugging.

Substituting an instrument You can temporarily switch command sets in a sequence to see the effects of switching to a different instrument. Any commands that aren't supported by the new instrument are highlighted in red.

Using IVI-COM

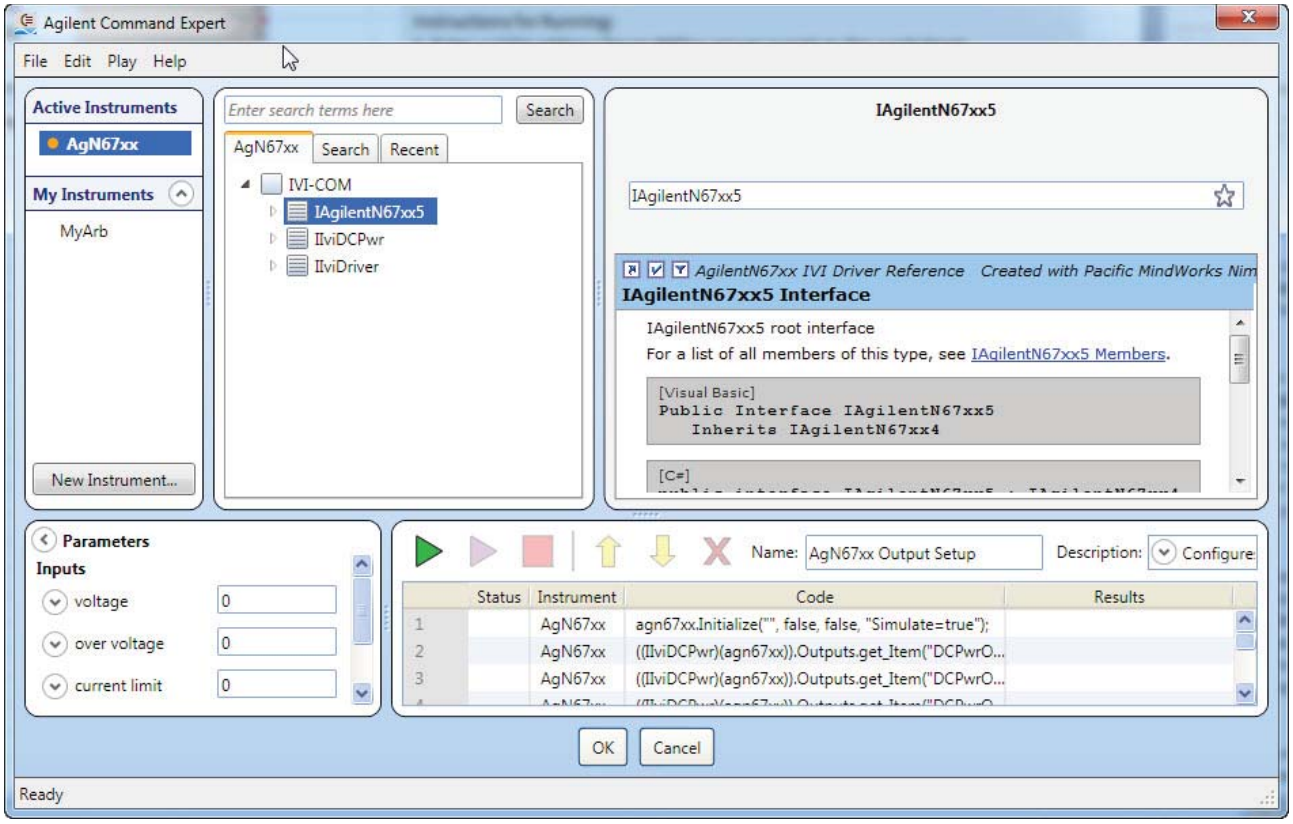
If you prefer, you can use IVI-COM commands instead of SCPI commands. Command Expert has a number of IVI-COM examples and the operation is very similar to SCPI. The example below (filename: *AgN67xx_PowerSupply_OutputSetup.xlsx*) uses IVI-COM command sets.



IVI-COM command sets and drivers IVI-COM command sets are automatically extracted from IVI-COM drivers. You must install an IVI-COM driver (outside of Command Expert) before you can use the driver's command set in Command Expert. You can download Agilent IVI-COM drivers from www.agilent.com/find/ivi.

Using IVI-COM Cont'd

The Command Expert IVI-COM interface is very similar to the SCPI interface. All elements within the interface operate as described earlier in this application note.



Using Command Expert with Non-Agilent Instruments

You can use Command Expert with any SCPI instrument that follows the SCPI-99 standard, using the Generic SCPI-99 Instrument command set. This command set provides the commands that are common to SCPI-99 instruments.

You can also use direct commands to send additional SCPI commands. Using direct commands, you can send any SCPI command to any SCPI instrument.

Any instrument that has an IVI-COM driver can be used with Command Expert, regardless of the vendor.

How to Get Started

The easiest way to get started using Command Expert is to browse through the example folders and select an example that is similar to your test and measurement application. Examples are located in:

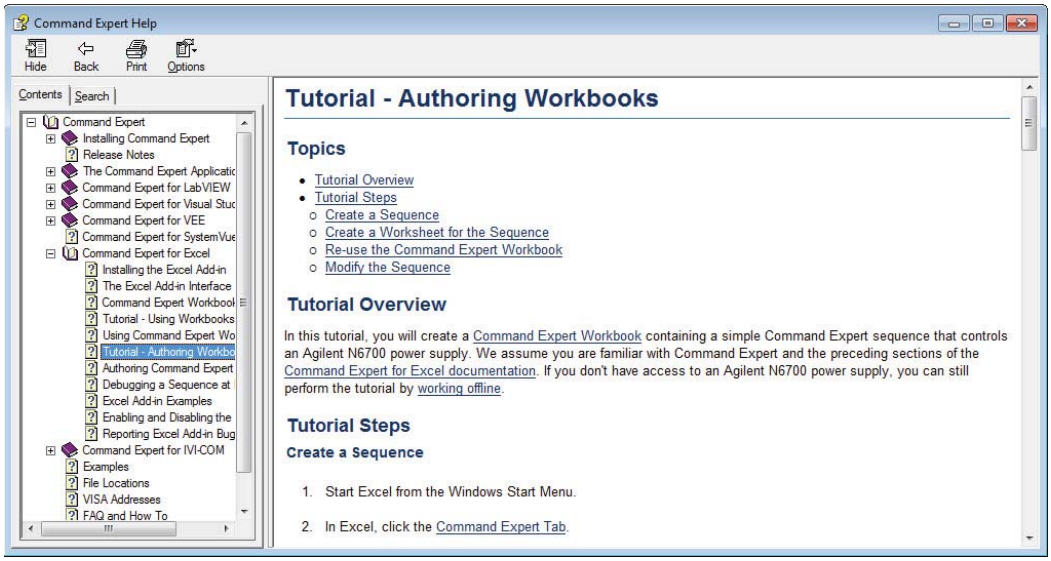
- *C:\Documents and Settings\All Users\Agilent\Command Expert\Examples* (for Windows XP)
- *C:\ProgramData\Agilent\Command Expert\Examples* (for Windows 7)

Excel examples are in these subfolders:

- *\Scpi\Excel* (SCPI examples)
- *\IviCom\Excel* (IVI-COM examples)

Command Expert has extensive application documentation containing FAQs, tutorials, examples, and getting started information. You can use one of these tutorials for step-by-step information on how to use Command Expert with Excel:

- Tutorial - Using Workbooks
- Tutorial - Authoring Workbooks



PC Operating Requirements

Operating System	Windows XP, Service Pack 2 or above, 32-bit only. Editions: Home, Professional Windows 7, 32-bit or 64-bit. Editions: Starter, Home Basic, Home Premium, Professional, Ultimate, or Enterprise
Disk	At least 1GB free disk space
Agilent IO Libraries Suite	Version 15.0 or above www.agilent.com/find/iosuite
Monitor	At least 1024x768 monitor resolution
Browser	Internet Explorer 6 or above (7 or above recommended)

You can find the current list of instrument SCPI command sets at: www.agilent.com/find/commandsetlist

Application Development Environment Requirements

Visual Studio	Visual Studio 2005, 2008, 2010 or above
LabVIEW	LabVIEW 8.2.1 or above.
VEE	VEE Pro 9.22 or above.
Excel	Excel 2007 or Excel 2010.

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Singapore	1 800 375 8100
Taiwan	0800 047 866
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Denmark	45 45 80 12 15
Finland	358 (0) 10 855 2100
France	0825 010 700*
	*0.125 €/minute
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