Keysight Technologies
Accelerate Program Development using Command Expert with Keysight VEE Pro

Application Note

KEYSIGHT
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This application note contains two main sections:

– Command Expert Basics
  Introduces you to the Command Expert user interface and shows n example sequence.

– Command Expert in the Keysight VEE Pro Environment
  Describes how to how to run and edit Command Expert sequences from Keysight VEE Pro.

Keysight Command Expert for fast and easy instrument control!

Keysight Technologies, Inc. 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, command sequences, documentation, syntax checking, and command execution in one simple interface. 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 MATLAB, Visual Studio, Excel, LabVIEW, KeysightVEE, or Keysight SystemVue PC application environment

– Generate code for command sequences in MATLAB, Visual C#, Visual Basic .NET, and Visual C/C++

– Profile command execution time

– Debug command sequences using breakpoints and single-stepping

Instrument command sets are available for instruments that use Standard Commands for Programmable Instrumentation (SCPI) or IVI-COM drivers.

Command Expert Basics

This section describes how to download, install, and start Command Expert, and uses an example sequence to show the features of the Command Expert user interface.
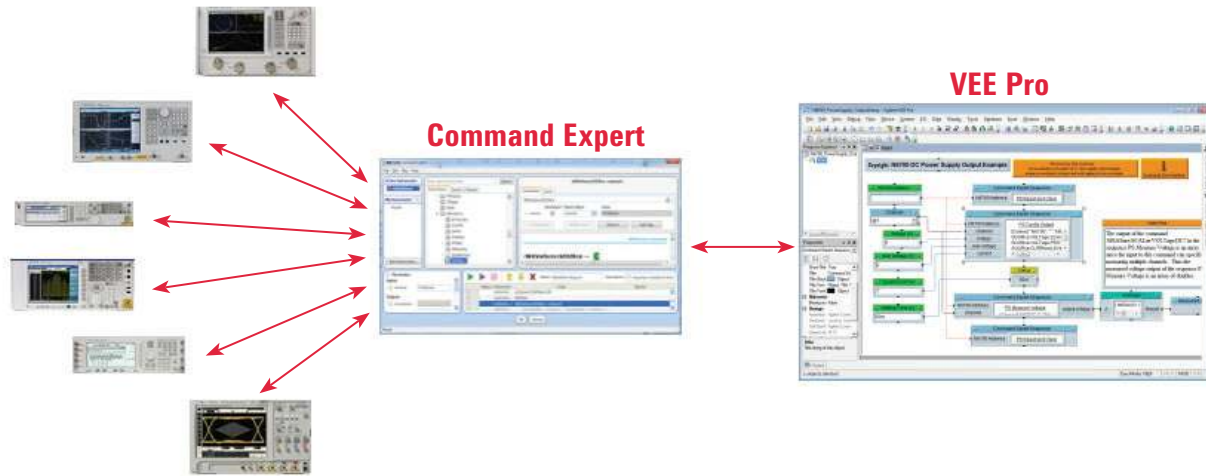

Figure 1. Command Expert and VEE Pro Integration

Installing the Software

1. Download and install the Keysight IO Libraries Suite (Version 15.0 or above). This software is required by Command Expert and VEE Pro to find and communicate with instruments. You can download Keysight IO Libraries Suite from www.keysight.com/find/iosuite.

2. Purchase a license and install VEE Pro. Command Expert can be used with VEE Pro 9.22 or above. You can find out more about VEE Pro at www.keysight.com/find/veepro.

3. Download and install Command Expert. If VEE Pro is already installed, the Command Expert VEE Pro Add-On will be installed automatically. You can download Command Expert from www.keysight.com/find/commandexpert.

Figure 2. Command Expert Icon

Starting Command Expert

Click **Start > All Programs > Keysight Command Expert > Keysight Command Expert**.
The Command Expert opening window (Welcome Window) is shown below.

Command Expert comes with a number of preconfigured examples for popular instruments. The installation software installs an example instrument named *N6700* that provides the commands for the Keysight N6700B Power Supply. We will use this instrument and the *N6700_PowerSupply_OutputSetup* example to introduce you to the Command Expert user interface.
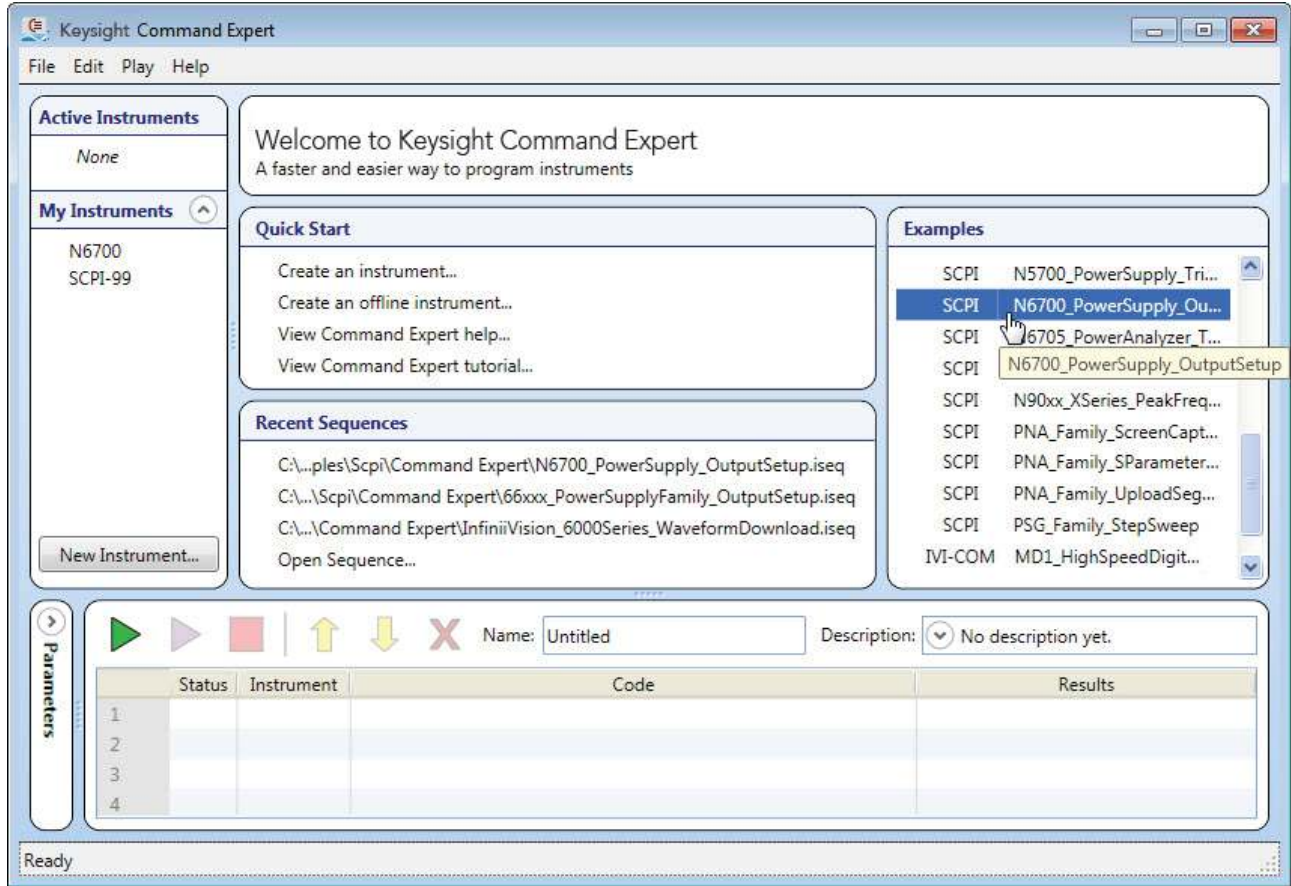

Figure 3. Command Expert Welcome Window

Internet access and command sets

The N6700 instrument and its SCPI command set are installed by default. For other instrument examples, you will be prompted to install the instrument's command set. After installing Command Expert, you will need Internet access to download SCPI command sets or IVI-COM instrument drivers for your instruments. If you work in a secure environment with limited Internet access, you can still use Command Expert. Simply download the SCPI command sets or IVI-COM instrument drivers using a computer with internet access. You can then transfer the command sets or drivers to the computer with no internet access (using a USB drive, for example).

The Command Sequence

The command sequence for the *N6700_PowerSupply_OutputSetup* example is shown in the Sequence Pane in the graphic below. A Command Expert sequence is a series of steps that are executed in order to connect to an instrument, configure an instrument, set outputs, and perform measurements.
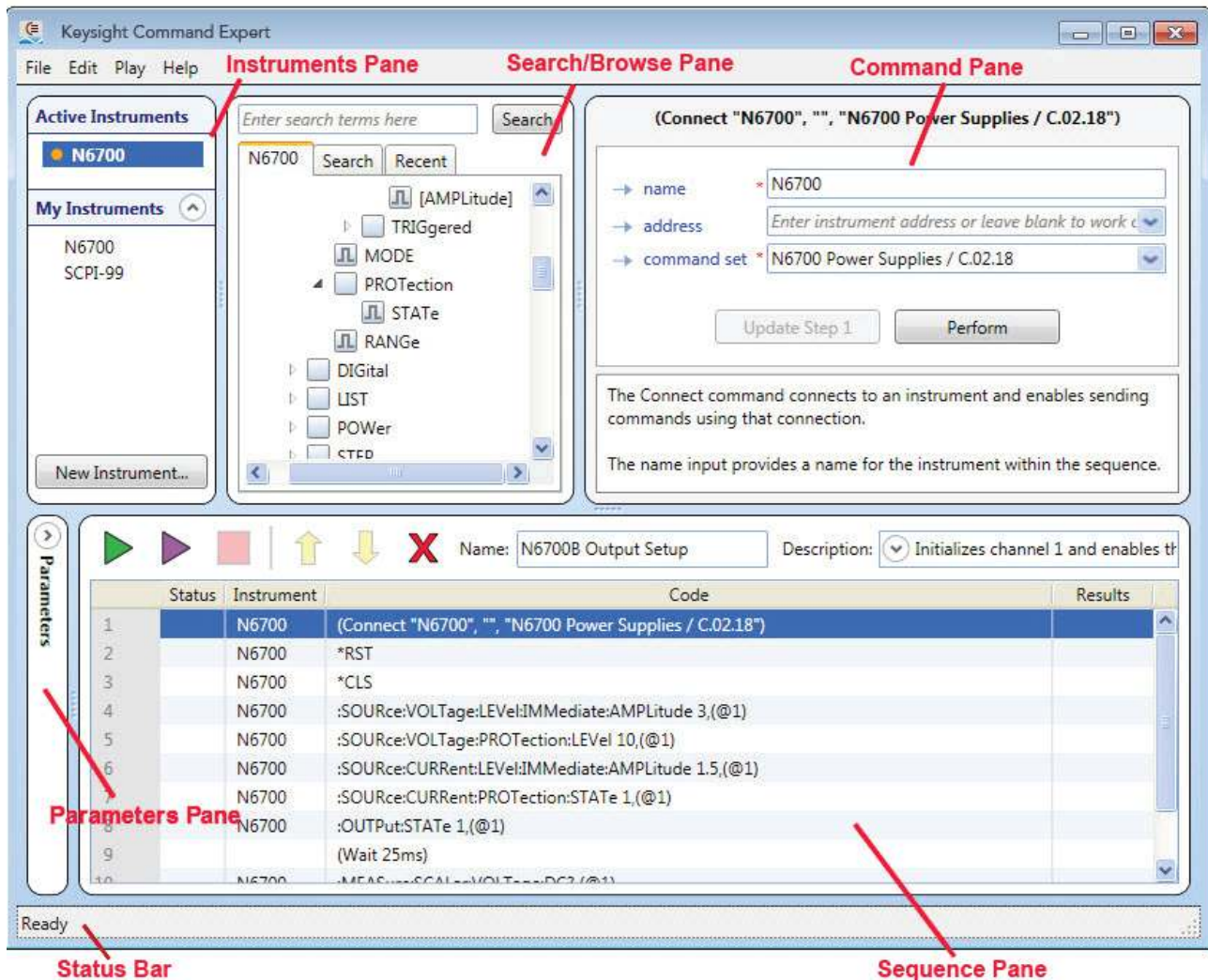

Figure 4. Command Expert User Interface Overview

- The **Instruments Pane** shows your instruments and lets you connect to them.
- 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 **Status Bar** shows progress messages as Command Expert performs operations.
- The **Parameters Pane** expands to show sequence parameters and lets you view and edit their names and values.
- 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 the following features:
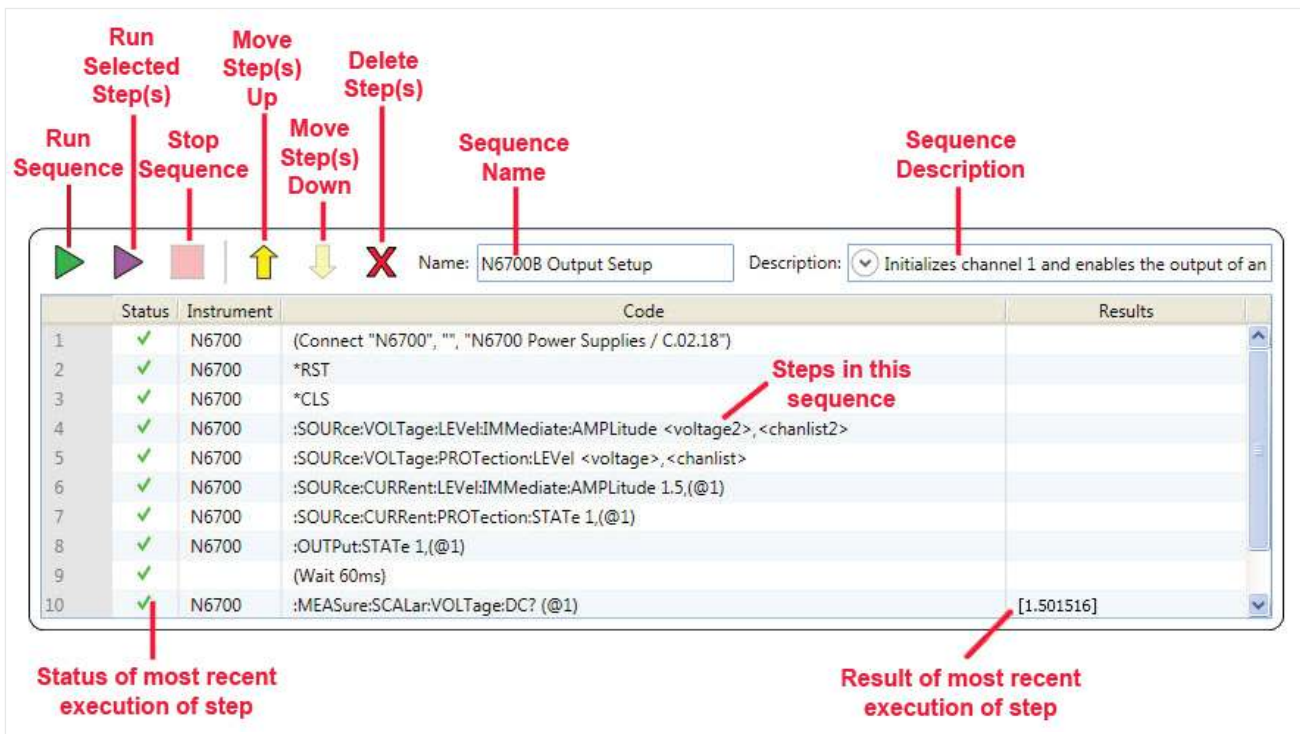
Figure 5. Sequence Pane Details

Working offline

The absence of a specific instrument address in step 1 of the sequence shown above indicates that we are working offline. To connect to an actual instrument, select step 1 in the Sequence Pane, and enter the instrument address in the address field in the Command Pane.

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.

Sequence Steps

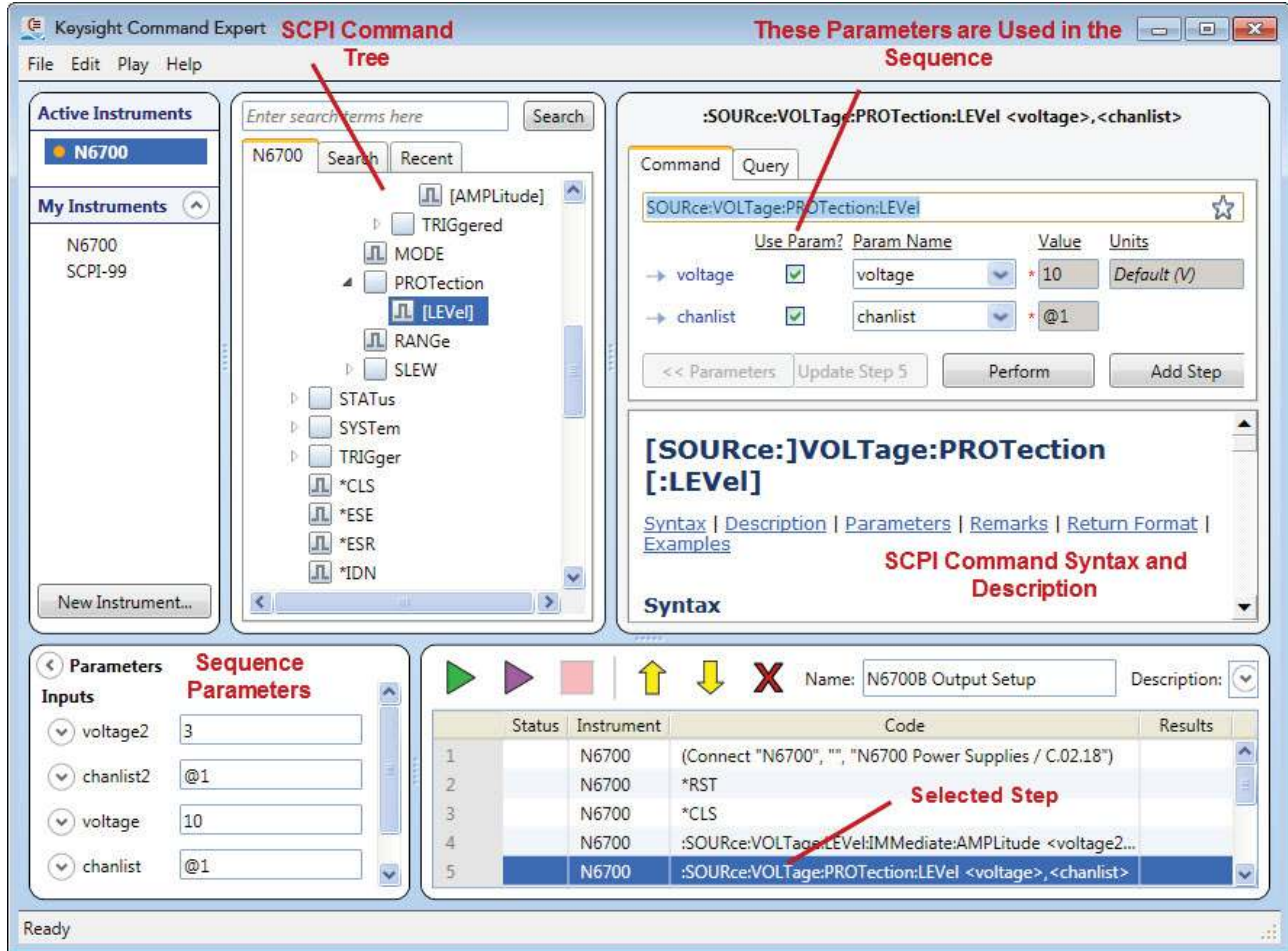Selecting a step in the Sequence Pane reveals details about the command and its parameters.

Figure 6. Command Details

Command Expert uses these types 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

Sequence Debugging

You can debug a sequence by inserting breakpoints. When you run the sequence, execution pauses at the first step with a breakpoint and Command Expert enters single-step mode. In single-step 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.
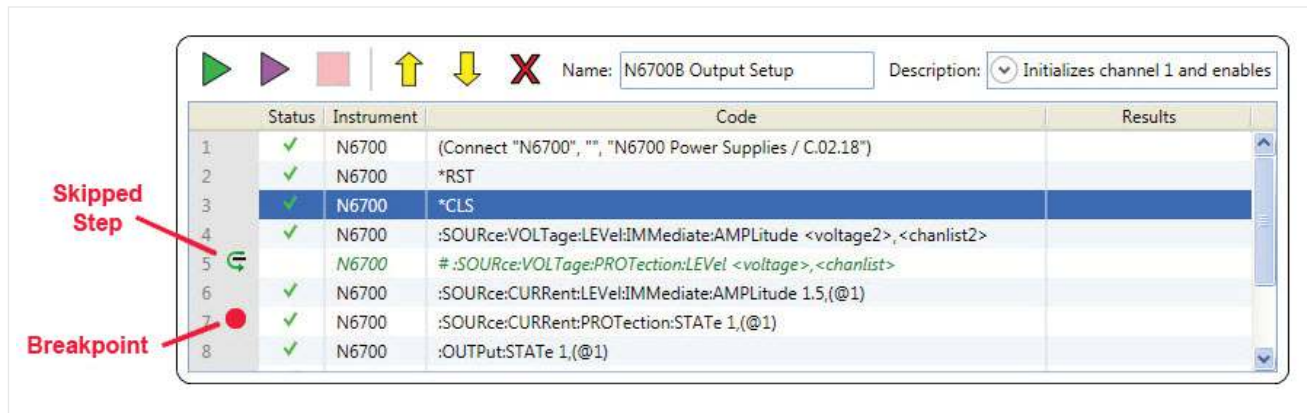

Figure 7. Debugging the Sequence

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: *N67xx_PowerSupply_OutputSetup.xlsx*) uses IVI-COM commands:
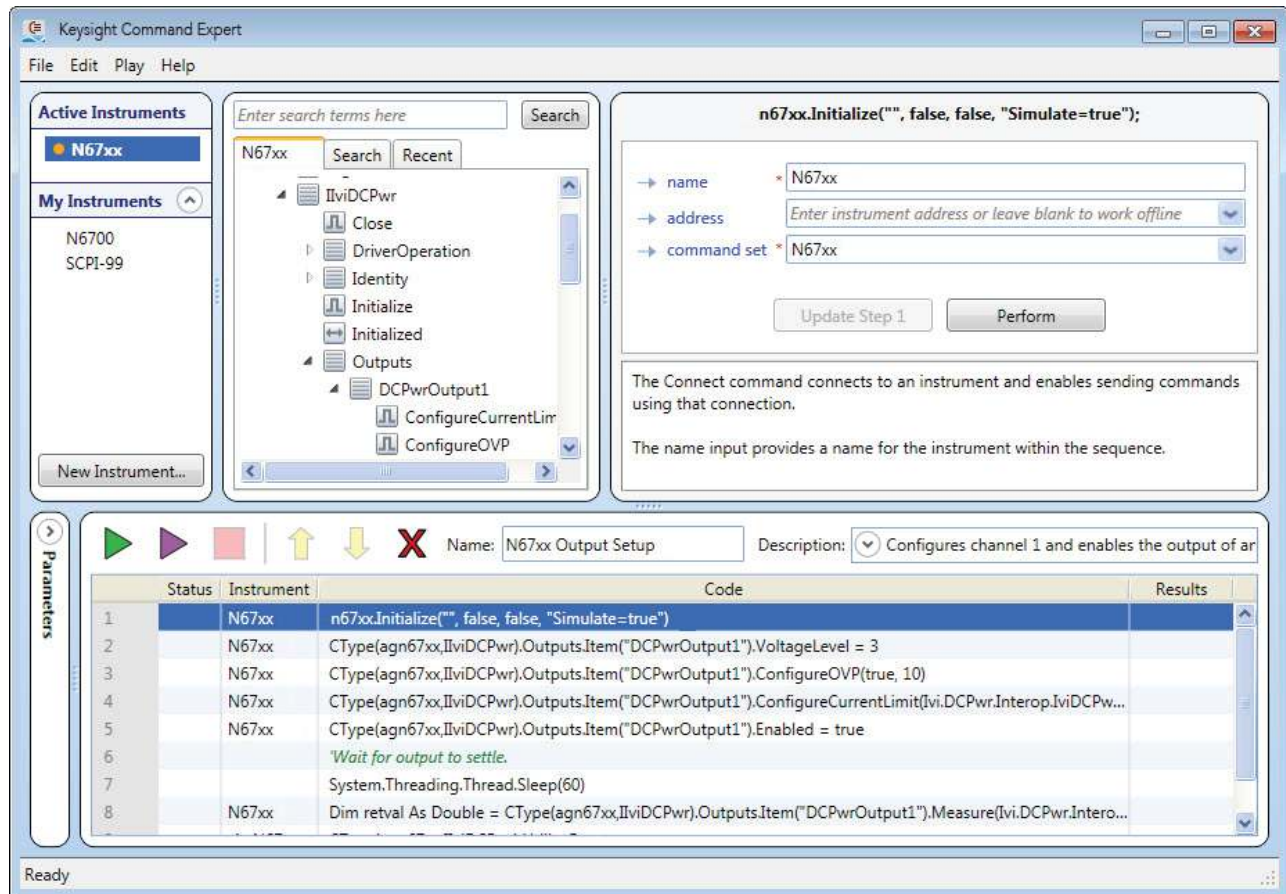

Figure 8. IVI-COM Commands

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 Keysight IVI-COM drivers from www.keysight.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. For more information, see *Command Expert for IVI-COM Tutorial* in the Command Expert help:
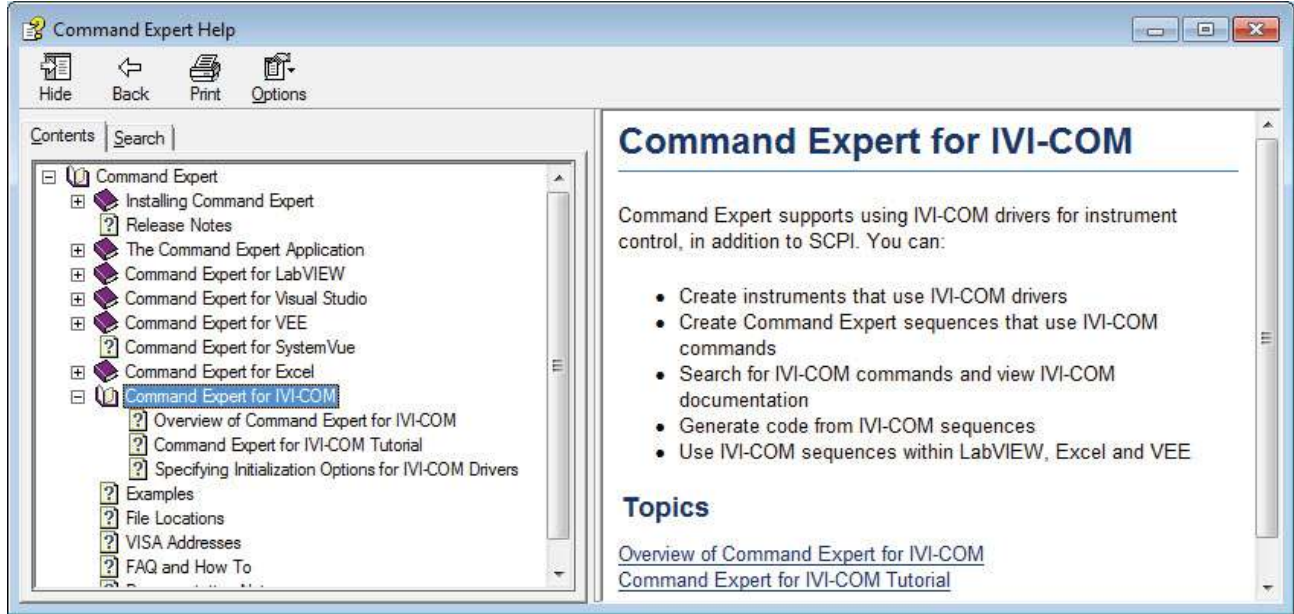

Figure 9. IVI-COM Help

Using Command Expert with Non–Keysight 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 manufacturer.

Getting Started with Command Expert

To get started using Command Expert, you can start with one of the many example sequences and modify that sequence, or you can create your own sequence. For a step-by-step tutorial showing how to create a sequence, see *Command Expert Tutorial* in the Command Expert help:

Figure 10. Command Expert Tutorial

Command Expert in the VEE Pro Environment

The Command Expert VEE Add-On lets you use Command Expert within VEE Pro to create and run instrument command sequences. The add-on provides a new VEE object called the *Command Expert Sequence Object*:
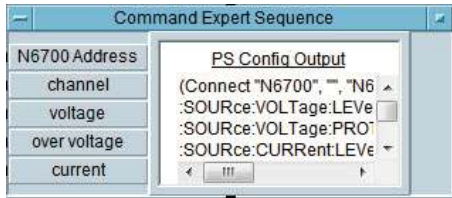

Figure 11. Command Expert Sequence Object

VEE Pro Examples

Command Expert comes with a number of examples showing how to use Command Expert and VEE Pro to control instruments. We will use the *N6700_PowerSupply_OutputSetup.vee* example to demonstrate how to use Command Expert with VEE Pro to control a Keysight N6700 Power Supply:
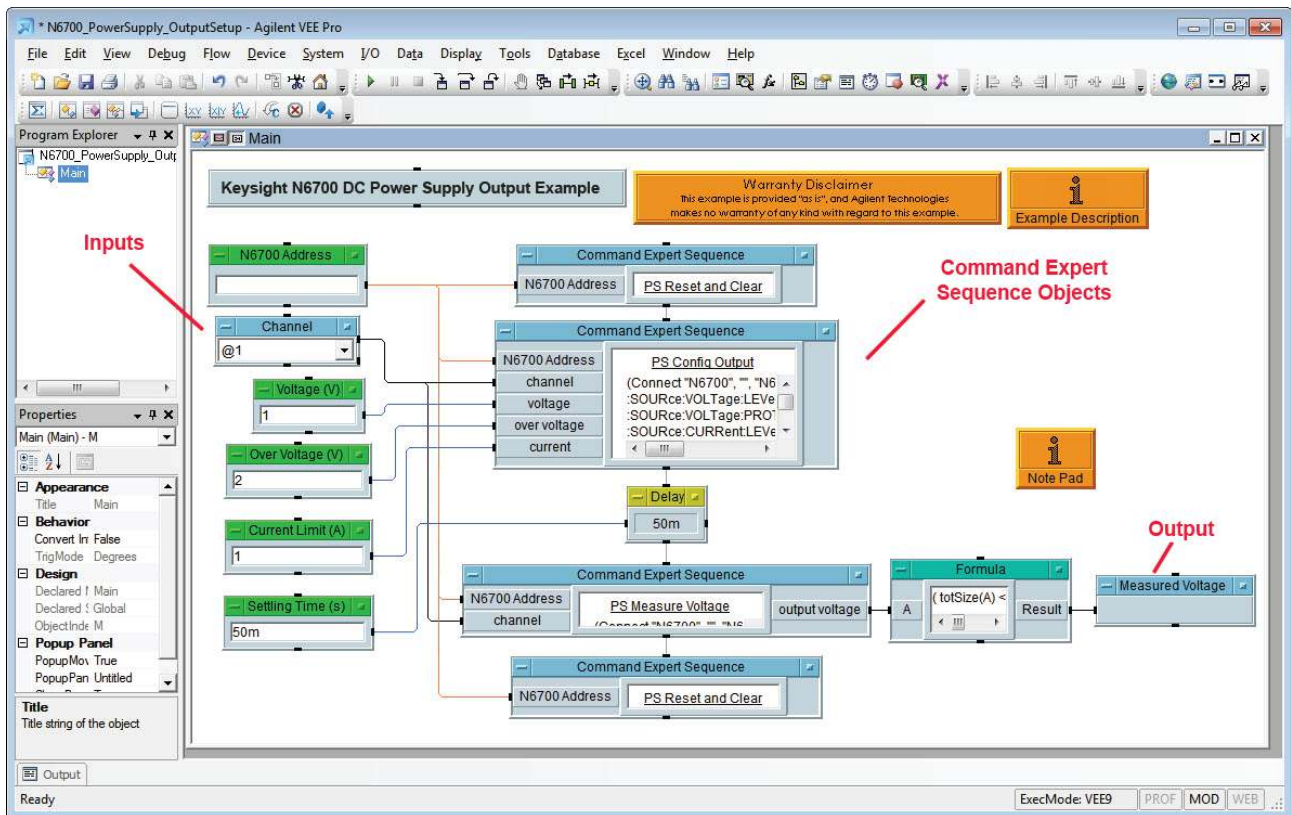

Figure 12. Command Expert VEE Pro Example

This example contains three Command Expert Sequence Objects that:

– Reset and clear the power supply (this object is used twice – once at the beginning and once at the end)

– Set the power supply's voltage, current, over-voltage, and over-current protection

– Measure the output voltage

To run the example in VEE, configure the inputs and click **Debug > Run/Resume**. The measured voltage is output and displayed in the Measured Voltage box.

Working offline

In the example above, the absence of a specific N6700 Address indicates that we are working offline. To connect to an actual instrument, enter a valid instrument address.

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.

Editing Command Expert Sequence Objects

To modify a Command Expert Sequence Object, double-click in the center of the object:
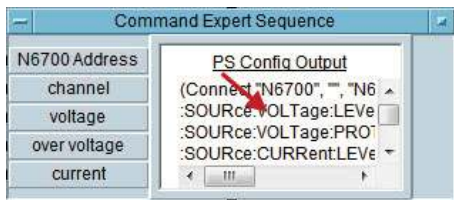

Figure 13. Click the Center of the Command Expert Sequence Object

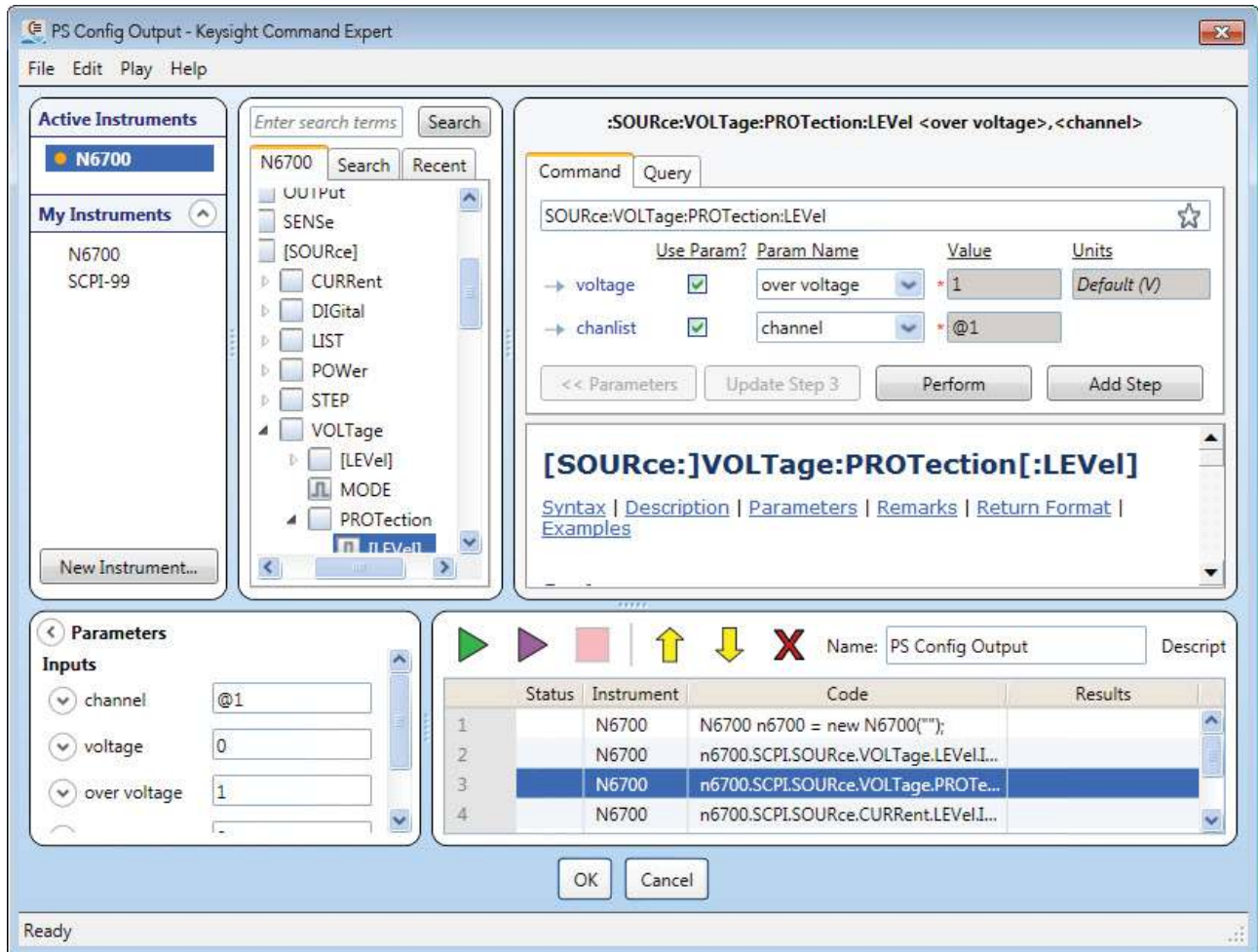Command Expert opens displaying the corresponding command sequence:

Figure 14. Corresponding Command Expert Sequence

You can now use Command Expert to edit the command sequence as shown earlier in this document. When finished editing, click **OK** to save the updated command sequence into the Command Expert Sequence Object or **Cancel** to cancel changes and return to the VEE application.

Using IVI-COM

The preceding example used SCPI commands. 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 shows the Command Expert IVI-COM sequence associated with a VEE Command Expert Sequence Object:
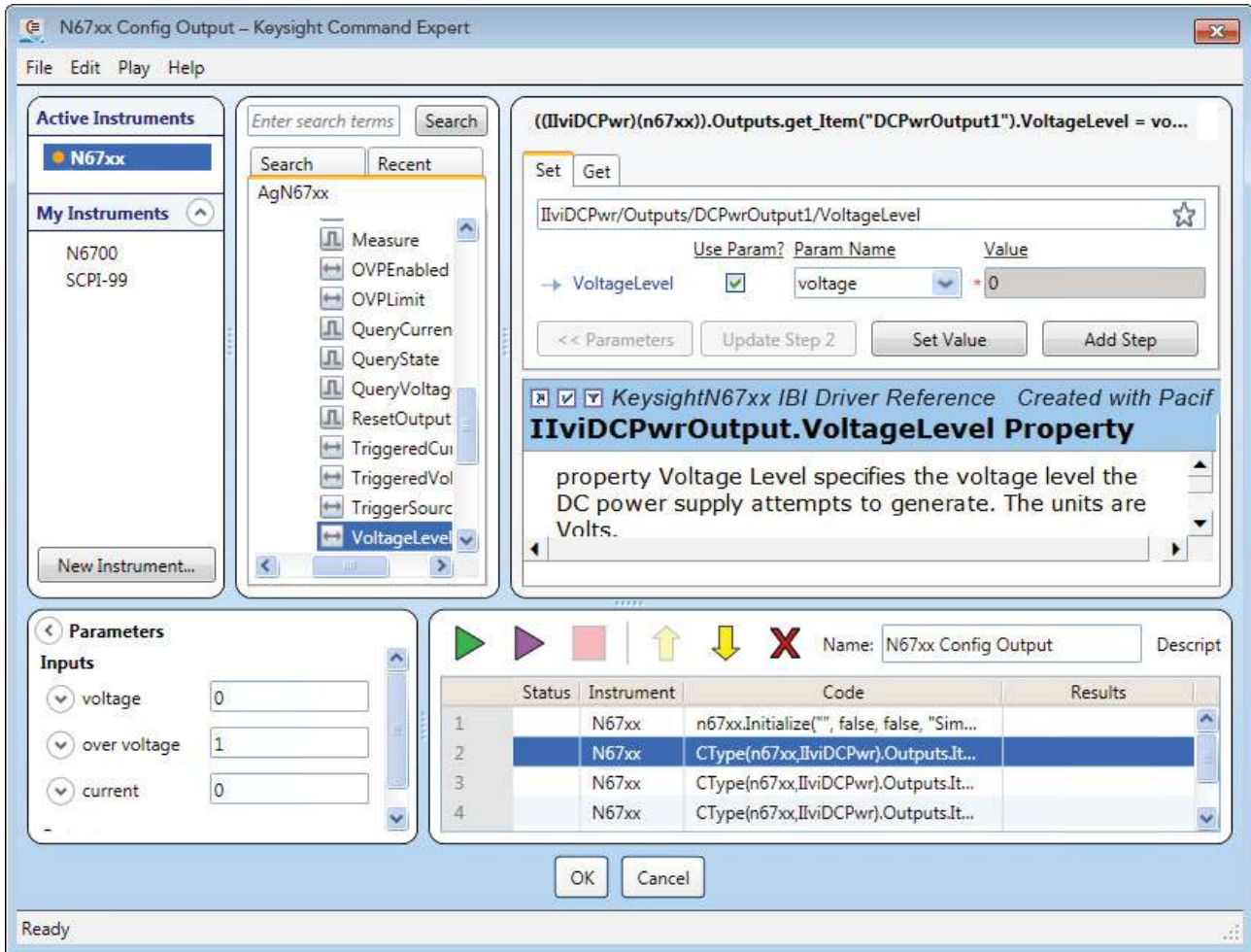

Figure 15. Command Expert IVI-COM Sequence

Where to Go Next

An easy way to get started using Command Expert with VEE Pro 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\Keysight\Command Expert\Examples* (for Windows XP)
– *C:\ProgramData\Keysight\Command Expert\Examples* (for Windows 7)

VEE Pro examples are in these subfolders:

– *\Scpi\VEE* (SCPI examples)
– *\IviCom\VEE* (IVI-COM examples)

Command Expert has extensive application documentation containing FAQs, tutorials, examples, and getting started information. You can use the VEE Add-on Tutorial, available in the Command Expert help, for step-by-step information on how to use Command Expert with VEE Pro:
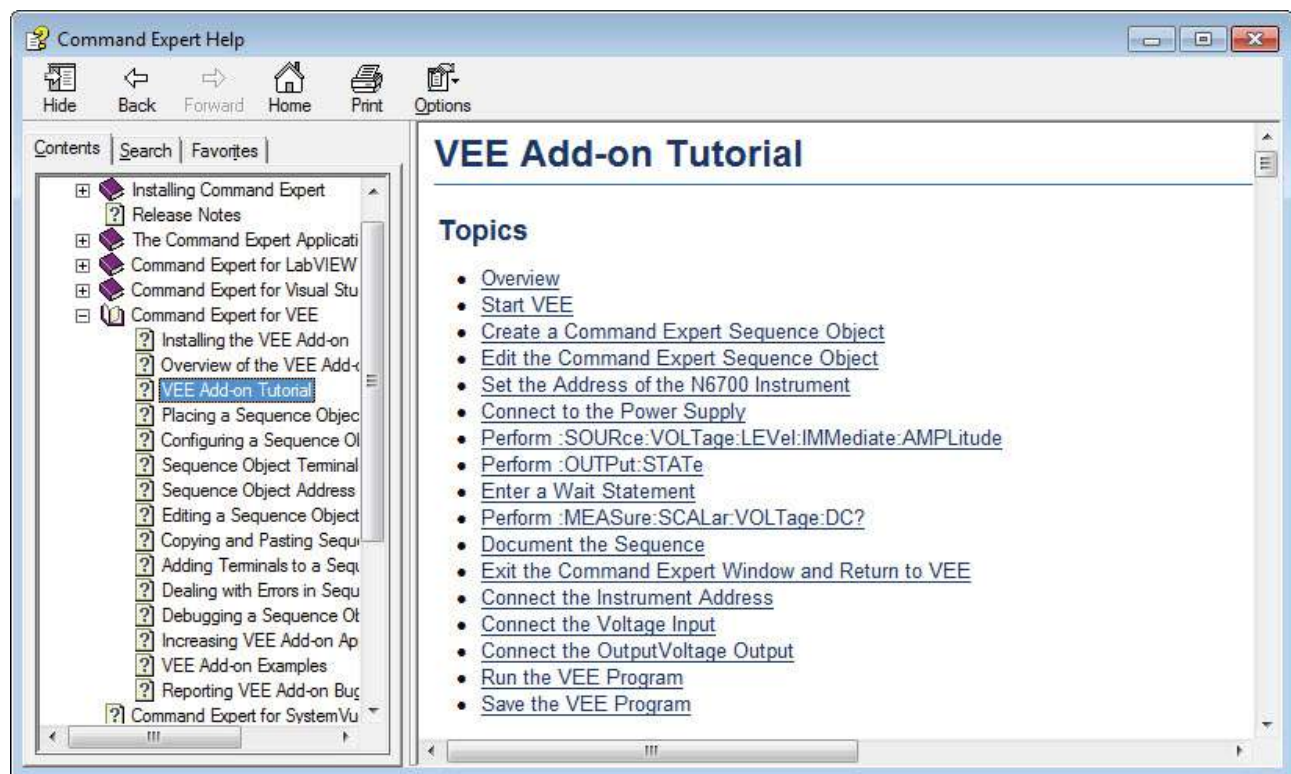

Figure 16. VEE Pro Add-On Tutorial

You can find more information on Command Expert, including links to other application notes, at www.keysight.com/find/commandexpert.

Command Expert 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
Keysight IO Libraries Suite	Version 15.0 or above www.keysight.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.keysight.com/find/commandsetlist

Application Development Environment Requirements	
MATLAB	MATLAB R2009a or above and Instrument Control Toolbox
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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