

# Keysight DigitalTestApps

# Notices

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## In This Book

This book is an introduction to the Keysight DigitalTestApps Remote Programming Interface. For more information, please see the *Keysight DigitalTestApps Programming Guide*.



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# 1 Introduction to Programming

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This document introduces the basics for remote programming of an automated test application. The programming commands provide the means of remote control. Basic operations that you can do remotely with a computer and an automated test application running on an oscilloscope or PC include:

- Launching and closing the application.
- Configuring the options.
- Running tests.
- Getting results.
- Controlling when and where dialogs get displayed.
- Saving and loading projects.

You can accomplish other tasks by combining these functions.

Computers communicate to an automated test application running on an oscilloscope by sending and receiving messages over a Microsoft .NET Remoting interface. This may be accomplished in any of three ways:

- 1** Using one of the remote client executables provided by Keysight Technologies in the N5452A Automated Test Application Remote Development Toolkit.
- 2** Create a custom remote client containing commands written in a .NET 2.0 (or newer) programming language such as C# 2.0. Freely available samples are provided by Keysight Technologies in the Automated Test Application Remote Development Toolkit.
- 3** Perform graphical programming using National Instrument's LabVIEW 8.5 environment.

## How to Use This Toolkit

### Remote Development Toolkit

If you haven't done this already, download and install on your development computer the N5452A Automated Test Application Remote Development Toolkit from the Keysight web site at "[www.keysight.com/find/scope-apps](http://www.keysight.com/find/scope-apps)". This toolkit contains helpful guides, executable sample clients (including source code), and projects to help you get started developing your own remote client. It contains programming examples written in Microsoft C# 2.0 (which may be compiled using a .NET 2.0-compatible compiler such as Microsoft Visual Studio 2008), Python, and in National Instruments LabVIEW (which requires the LabVIEW 8.5 environment).

#### NOTE

After installing the toolkit on your development computer, you can access its contents by using either the "Keysight Automated DigitalTest App Remote Toolkit" shortcut on your desktop or the Start menu path: **All Programs > Keysight DigitalTest Applications > Remote Development Toolkit**.

### Usage Scenarios

If one of the following scenarios describes what you need to do, read the topics listed in the section to learn more about it.

- **"I want to write commands for the 'Automation' tab of my automated test application"** on page 8
- **"I want to try a sample remote client provided by the toolkit"** on page 9
- **"I am using a test harness that can execute .NET assemblies"** on page 9
- **"I am using a test harness that can execute Python"** on page 10
- **"I want to develop my own remote client using a Microsoft .NET programming language"** on page 10
- **"I am using LabVIEW"** on page 11

#### **I want to write commands for the 'Automation' tab of my automated test application**

In this *Getting Started Guide*, see:

- Chapter 1:
  - Programming Languages: **"ARSL"** on page 14

In the *Programming Guide*, see:

- Chapter 1:
  - Opening paragraphs



- Remote Interface Documentation
- Chapter 3:
  - The Automated Test Remote Scripting Language (ARSL)
- Chapter 4:
  - All

### **I want to try a sample remote client provided by the toolkit**

In this *Getting Started Guide*, see:

- Chapter 1:
  - **“System Requirements”** on page 12

In the *Programming Guide*, see:

- Chapter 1:
  - Opening paragraphs
  - Remote Interface Documentation
- Chapter 2:
  - All
- Troubleshooting:
  - As needed.

### **I am using a test harness that can execute .NET assemblies**

In this *Getting Started Guide*, see:

- Chapter 1:
  - **“System Requirements”** on page 12
  - Programming Languages: **“.NET”** on page 15

In the *Programming Guide*, see:

- Chapter 1:
  - Opening paragraphs
  - Remote Interface Documentation
  - .NET Interface
- Chapter 3:
  - Microsoft .NET
- Chapter 4:
  - All

### I am using a test harness that can execute Python

In this *Getting Started Guide*, see:

- Chapter 1:
  - **"System Requirements"** on page 12
  - Programming Languages: **"Python"** on page 15

In the *Programming Guide*, see:

- Chapter 1:
  - Opening paragraphs
  - Remote Interface Documentation
  - .NET Interface
- Chapter 3:
  - Python
- Chapter 4:
  - All

### I want to develop my own remote client using a Microsoft .NET programming language

In this *Getting Started Guide*, see:

- Chapter 1:
  - **"System Requirements"** on page 12
  - Programming Languages: **".NET"** on page 15

In the *Programming Guide*, see:

- Chapter 1:
  - Opening paragraphs
  - Remote Interface Documentation
  - .NET Interface
- Chapter 3:
  - Microsoft .NET
- Chapter 4:
  - All
- Chapter 5:
  - Simple Remote Client
  - ARSL Command Line Utility Implementation
  - Simple GUI Remote Client Implementation
  - Message Handling Remote Client Implementation

- Troubleshooting:
  - As needed.

### I am using LabVIEW

In this *Getting Started Guide*, see:

- Chapter 1:
  - “**System Requirements**” on page 12
  - Programming Languages: “**LabVIEW**” on page 15

In the *Programming Guide*, see:

- Chapter 1:
  - Opening paragraphs
  - Remote Interface Documentation
  - LabVIEW Interface
- Chapter 4:
  - All
- Chapter 5:
  - LabVIEW Simple Remote Client
  - LabVIEW Demo Client Construction
- Troubleshooting:
  - As needed.

## System Requirements

This section describes how to configure the computers on which the automated test application and the remote client program are running to enable remote control of the automated test application.

### On the Server

For automated test applications that run directly on a Windows-based oscilloscope, "machine" below refers to the oscilloscope. For automated test apps that run on a separate computer, "machine" below means refers to that computer.

- 1 Your client computer must be able to access the machine via your network.
- 2 (Real-time 9xxx and 9xxx Series Infiniium versions 3.19 and older only, Remote Interface versions 1.90 and older only) An automated test application remote control license must be installed on the oscilloscope.

#### NOTE

A single application remote control license enables control of all remote-capable automated test applications installed on the oscilloscope.

To purchase an N5452A remote programming option license, please visit "[www.keysight.com/find/scope-apps](http://www.keysight.com/find/scope-apps)".

- 3 A remote-capable automated test application must be installed on the machine and fully licensed on the oscilloscope.
- 4 The Windows Firewall on the machine must have these port exceptions defined (this is automatically taken care of during installation of a remote-capable automated test application):

Legacy (Agilent) apps require ports 9944 and 49944

Keysight apps require ports 49944 and 59944

Various names may exist for these exceptions (differences are unimportant).

- 5 The automated test application must be running on the machine. Launch it in one of these ways:
  - a To launch applications that run directly on the oscilloscope:
    - (Infiniium real-time only) Use the Infiniium menu system: **Analyze > Automated Test Apps > (application name)**
    - or -
    - (FlexDCA only) Use the FlexDCA menu system: **Apps > Automated Test Apps > (application name)**
    - or -
    - Use the Keysight IO Libraries utility and the GPIB command:
 

```
:SYSTEM:LAUNCH "application name"
```

where application name is the name as it appears in the menu (case sensitive).

(Infiniium 3.00 or newer) If the same name appears in another Infiniium menu (for example, Demos), you must prefix the name with as many backslash-separated segments as needed to make a unique path, for example "Automated Test Apps\USB Test").

- b** To launch applications that run on a separate computer:
  - Use the Windows Start Menu.
  - or -
  - (Infiniium real-time only) Use the Infiniium offline menu system: **Analyze > Automated Test Apps > (application name)**
  - or -
  - (FlexDCA only) Use the FlexDCA menu system: **Apps > Automated Test Apps > (application name)**

## On the Client

The "computer" below refers to the PC on which you are running your remote client program.

- 1** The computer must be able to access the server (defined above) via your network.
- 2** The computer must have Microsoft .NET 3.5 installed.
- 3** (LabVIEW clients only) The computer must have LabVIEW 8.5 installed.
- 4** Your remote client must be able to access the .NET assembly that defines the Automated Test Engine interface:
  - Legacy (Agilent) apps: Agilent.Infiniium.AppFW.Remote.dll
  - Keysight apps: Keysight.DigitalTestApps.Framework.Remote.dll

(Please see the readme.txt file in the "Agilent-Keysight Transition" or "Keysight Apps Only" subdirectories for more information on the Agilent-to-Keysight transition.)

## Programming Languages

You may program a Keysight DigitalTest app using different languages, according to your preferences and requirements:

- Using the Automated Test Engine Remote Scripting Language, or ARSL.
- Using a .NET language, such as C#.
- Using the LabVIEW graphical programming environment.

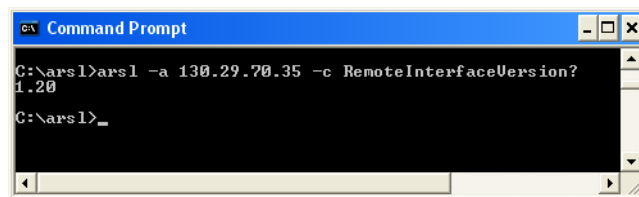
### ARSL

ARSL commands are SCPI-like text that enable you to automate an application with a minimum of programming expertise. They may be sent to an automated test application using either of the following methods:

- 1 Using the ARSL Command Line Utility.

This tool is provided in the Remote Development Toolkit in the "Tools" folder and is executed in a Command Prompt window.

Here is an example of an ARSL command being executed in the utility:



```

Command Prompt
C:\arsl>arsl -a 130.29.70.35 -c RemoteInterfaceVersion?
1.20
C:\arsl>_

```

In the example, the utility is running on a PC, the automated test application is running on an oscilloscope at IP address 130.29.70.35, and the command being sent is a property query to discover the version of the app's remote interface (1.20).

ARSL syntax has a simple mapping to .NET languages and can be used to query and set properties and execute methods, even those with custom type parameters.

You may execute files containing scripts of ARSL commands, too.

ARSL is appropriate to use only when you do not require conditional or looping algorithms or callback constructs, such as event subscriptions. If you need these additional capabilities, use .NET programming.

In addition to providing the ARSL Command Line Utility itself, the Toolkit also provides the Visual Studio project and source code used to build the tool.

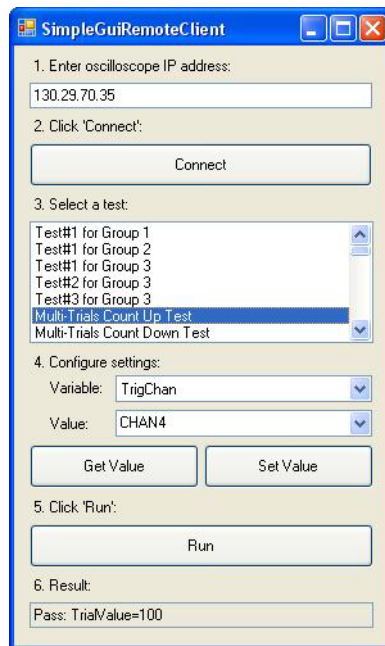
- 2 Using the .NET API method, `ExecuteArsl()`.

ExecuteArsI() may be called by any .NET program or from scripting languages that provide support for .NET interfaces, such as Python.

## .NET

Use of a .NET language enables access to the full spectrum of automated test application programming capabilities, although it does require software programming skills.

Here is an example of a C#-based remote client, the "Simple GUI Remote Client":



## Python

You may use the Python programming language to automate Keysight oscilloscopes as well. By adding the "Python for .NET" module, which is compatible with versions up to 2.7, you can develop scripts using both "method call" and SCPI-like "text based" paradigms.

## LabVIEW

Remote Clients constructed using National Instrument's LabVIEW graphical programming environment are also possible. Please see the Toolkit for details.

# 1 Introduction to Programming



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