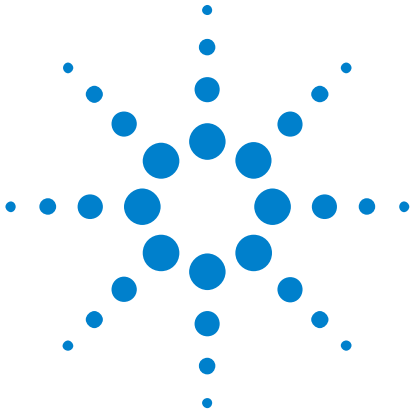

# Agilent eMMC Test Application

## Programmer's Reference

Agilent Technologies

# Notices



## Trademarks

Microsoft®, MS-DOS®, Windows®, Windows 2000®, and Windows XP® are U.S. registered trademarks of Microsoft Corporation.

Adobe®, Acrobat®, and the Acrobat Logo® are trademarks of Adobe Systems Incorporated.

## Manual Part Number

Version 01.00.0000

## Edition

January 16, 2013

Available in electronic format only

Agilent Technologies, Inc.
1900 Garden of the Gods Road
Colorado Springs, CO 80907 USA

## Warranty

**The material contained in this document is provided "as is," and is subject to being changed, without notice, in future editions. Further, to the maximum extent permitted by applicable law, Agilent disclaims all warranties, either express or implied, with regard to this manual and any information contained herein, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Agilent shall not be liable for errors or for incidental or consequential damages in connection with the furnishing, use, or performance of this document or of any information contained herein. Should Agilent and the user have a separate written agreement with warranty terms covering the material in this document that conflict with these terms, the warranty terms in the separate agreement shall control.**

## Technology Licenses

The hardware and/or software described in this document are furnished under a license and may be used or copied only in accordance with the terms of such license.

## Restricted Rights Legend

If software is for use in the performance of a U.S. Government prime contract or subcontract, Software is delivered and licensed as "Commercial computer software" as defined in DFAR 252.227-7014 (June 1995), or as a "commercial item" as defined in FAR 2.101(a) or as "Restricted computer software" as defined in FAR 52.227-19 (June 1987) or any equivalent agency regulation or contract clause. Use, duplication or disclosure of Software is subject to Agilent Technologies' standard commercial license terms, and non-DOD Departments and Agencies of the U.S. Government will receive no greater than Restricted Rights as defined in FAR 52.227-19(c)(1-2) (June 1987). U.S. Government users will receive no greater than Limited Rights as defined in FAR 52.227-14 (June 1987) or DFAR 252.227-7015 (b)(2) (November 1995), as applicable in any technical data.

## Safety Notices

**CAUTION**

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

**WARNING**

**A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.**

# In This Book

This book is your guide to programming the Agilent Technologies eMMC Test Application.

- Chapter 1, “Introduction to Programming,” starting on page 7 describes compliance application programming basics.
- Chapter 2, “Configuration Variables and Values,” starting on page 11, Chapter 3, “Test Names and IDs,” starting on page 15, and Chapter 4, “Instruments,” starting on page 21, provide information specific to programming the eMMC Test Application.

**How to Use This Book**

Programmers who are new to compliance application programming should read all of the chapters in order. Programmers who are already familiar with this may review chapters 2, 3, and 4 for changes.

# Contents

# 1 Introduction to Programming



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

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

You can accomplish other tasks by combining these functions.

# Remote Programming Toolkit

The majority of remote interface features are common across all the Agilent Technologies, Inc. family of compliance applications. Information on those features is provided in the N5452A Compliance Application Remote Programming Toolkit available for download from Agilent here: "www.agilent.com/find/scope-apps-sw". The eMMC Test Application uses Remote Interface Revision 2.20. The help files provided with the toolkit indicate which features are supported in this version.

In the toolkit, various documents refer to "application-specific configuration variables, test information, and instrument information". These are provided in Chapters 2, 3, and 4 of this document, and are also available directly from the application's user interface when the remote interface is enabled (View>Preferences::Remote tab::Show remote interface hints). See the toolkit for more information.

# Licensing

To enable programming of compliance applications on your oscilloscope, please visit "www.agilent.com/find/scope-apps" to purchase an N5452A remote programming option license.

# 1 Introduction to Programming

# 2 Configuration Variables and Values

The following table contains a description of each of the eMMC Test Application options that you may query or set remotely using the appropriate remote interface method. The columns contain this information:

- GUI Location — Describes which graphical user interface tab contains the control used to change the value.
- Label — Describes which graphical user interface control is used to change the value.
- Variable — The name to use with the SetConfig method.
- Values — The values to use with the SetConfig method.
- Description — The purpose or function of the variable.

For example, if the graphical user interface contains this control on the **Set Up** tab:

- Enable Advanced Features

then you would expect to see something like this in the table below:

**Table 1** Example Configuration Variables and Values

| GUI Location | Label | Variable | Values | Description |
|---|---|---|---|---|
| Set Up | Enable Advanced Features | EnableAdvanced | True, False | Enables a set of optional features. |

and you would set the variable remotely using:

```
ARSL syntax
-----------
arsl -a ipaddress -c "SetConfig 'EnableAdvanced' 'True'"

C# syntax
---------
remoteAte.SetConfig("EnableAdvanced", "True");
```

Here are the actual configuration variables and values used by this application:

**NOTE** Some of the values presented in the table below may not be available in certain configurations. Always perform a "test run" of your remote script using the application's graphical user interface to ensure the combinations of values in your program are valid.

**NOTE** The file, ""ConfigInfo.txt"", which may be found in the same directory as this help file, contains all of the information found in the table below in a format suitable for parsing.

**Table 2** Configuration Variables and Values

| GUI Location | Label | Variable | Values | Description |
|---|---|---|---|---|
| Confgure | CMD Channel | CMDCHAN | CHANnel1, CHANnel2, CHANnel3, CHANnel4 | The channel to get CMD from. |
| Confgure | CMD Memory | CMDCHANWFM | WMEMory1, WMEMory2, WMEMory3, WMEMory4 | The waveform memory to get CMD from. |
| Confgure | Clock Channel | CKCHAN | CHANnel1, CHANnel2, CHANnel3, CHANnel4 | The channel to get clock from. |
| Confgure | Clock Memory | CKCHANWFM | WMEMory1, WMEMory2, WMEMory3, WMEMory4 | The waveform memory to get clock from. |
| Confgure | DAT Channel | DATCHAN | CHANnel1, CHANnel2, CHANnel3, CHANnel4 | The channel to get DAT from. |
| Confgure | DAT Memory | DATCHANWFM | WMEMory1, WMEMory2, WMEMory3, WMEMory4 | The waveform memory to get DAT from. |
| Confgure | DAT Pin Under Test | DATPin | (Accepts user-defined text), DAT0, DAT1, DAT2, DAT3, DAT4, DAT5, DAT6, DAT7 | Enter the DAT pin DAT0-7 that is being tested |

**Table 2** Configuration Variables and Values (continued)

| GUI Location | Label | Variable | Values | Description |
|---|---|---|---|---|
| Confgure | Limited Waveform Files | WFMFilesLim | Y, N | Select "Yes" if the waveform files were created knowing they are the beginning of a command cycle for CMD tests or knows read or write data for DAT tests. Select "No" if waveform files are uncertain. If "Yes" is selected, the basic logic of the test will be ignored. (i.e. DAT test logic uses all three channels to guarantee a data burst is read or write, only Clock and DAT would be required if "No" selected.) In short, if "Yes" is selected, the user is guarunteeing the data presented with the .wfm is the correct data to be measured. |
| Confgure | Number of Clock Edge Measurements | NumMeas | (Accepts user-defined text), 200 | Enter the number of clock edges to Measure |
| Confgure | Use Waveform Files | WFMFiles | Y, N | Select Yes to use loaded .wfm files, No to use real time signals |
| Confgure | Vcc | VccVal | (Accepts user-defined text), 1.7, 1.825, 1.95, 2.7, 3.25, 3.6 | Enter the Vcc Value being tested |
| Confgure | Vccq | VccqVal | (Accepts user-defined text), 1.1, 1.2, 1.3, 1.7, 1.825, 1.95, 2.7, 3.25, 3.6 | Enter the Vccq Value being tested |
| Run Tests | Event | RunEvent | (None), Fail, Margin < N, Pass | Names of events that can be used with the StoreMode=Event or RunUntil RunEventAction options |
| Run Tests | RunEvent=Margin < N: Minimum required margin % | RunEvent_Margin < N_MinPercent | Any integer in range: 0 <= value <= 100 | Specify N using the 'Minimum required margin %' control. |
| Set Up | Device ID | pcboOverallDeviceID | (Accepts user-defined text) | This option allow user to key in related test details. |

**Table 2** Configuration Variables and Values (continued)

| GUI Location | Label | Variable | Values | Description |
|---|---|---|---|---|
| Set Up | Speed Grade | DeviceType | Backwards, High-speed, Dual-rate, HS200 | This option allow user to select specific speed grade. |
| Set Up | Test Mode | TestMode | Compliance, Custom | This option allow user to select test mode. |
| Set Up | User Comment | txtOverallUserComment | (Accepts user-defined text) | This option allow user to key in related test detail. |
| Set Up | User Comment | txtOverallUserComment | (Accepts user-defined text) | This option allow user to key in related test detail. |
| Set Up | User Description | pcboOverallDeviceDescription | (Accepts user-defined text) | This option allow user to key in test detail. |

# 3 Test Names and IDs

The following table shows the mapping between each test's numeric ID and name. The numeric ID is required by various remote interface methods.

- Name – The name of the test as it appears on the user interface **Select Tests** tab.
- Test ID – The number to use with the RunTests method.
- Description – The description of the test as it appears on the user interface **Select Tests** tab.

For example, if the graphical user interface displays this tree in the **Select Tests** tab:

- All Tests
  - Rise Time
  - Fall Time

then you would expect to see something like this in the table below:

**Table 3** Example Test Names and IDs

| Name | Test ID | Description |
|---|---|---|
| Fall Time | 110 | Measures clock fall time. |
| Rise Time | 100 | Measures clock rise time. |

and you would run these tests remotely using:

```
ARSL syntax
-----------
arsl -a ipaddress -c "SelectedTests '100,110'"
arsl -a ipaddress -c "Run"

C# syntax
---------
remoteAte.SelectedTests = new int[]{100,110};
remoteAte.Run();
```

Here are the actual Test names and IDs used by this application:

**NOTE** The file, ""TestInfo.txt"", which may be found in the same directory as this help file, contains all of the information found in the table below in a format suitable for parsing.

**Table 4** Test IDs and Names

| Name | TestID | Description |
|---|---|---|
| Duty Cycle: Dual Rate | 300 | Duty Cycle for Dual Rate Device interface timing |
| Duty Cycle: HS200 | 403 | Duty Cycle for HS200 Device interface timing |
| Vih(CMD) | 3 | Vih for Bus Signal Levels (CMD) |
| Vih(Clock) | 1 | Vih for Bus Signal Levels (Clock) |
| Vih(DAT) | 9 | Vih for Bus Signal Levels (CMD) |
| Vil(CMD) | 4 | Vil for Bus Signal Levels (CMD) |
| Vil(Clock) | 2 | Vil for Bus Signal Levels (Clock) |
| Vil(DAT) | 10 | Vil for Bus Signal Levels (DAT) |
| Voh(CMD): Open Drain | 7 | Voh for Bus Signal Levels (CMD) |
| Voh(CMD): Push-Pull | 5 | Voh for Bus Signal Levels (CMD) |
| Voh(DAT) | 11 | Voh for Bus Signal Levels (DAT) |
| Vol(CMD): Open Drain | 8 | Vol for Bus Signal Levels (CMD) |
| Vol(CMD): Push-Pull | 6 | Vol for Bus Signal Levels (CMD) |
| Vol(DAT) | 12 | Vol for Bus Signal Levels (DAT) |
| fOD Clock frequency Identification Mode: Backward-compatible | 201 | fOD for Backward Compatible Device interface timing |
| fOD Clock frequency Identification Mode: High-speed | 101 | fOD for High-speed Device interface timing |
| fpp Clock frequency Data Transfer Mode: Backward-compatible | 200 | fpp for Backward Compatible Device interface timing |
| fpp Clock frequency Data Transfer Mode: High-speed | 100 | fpp for High-speed Device interface timing |
| tFALL(CMD) Output Fall Time: Dual Rate | 308 | tFALL(CMD) for Dual Rate Device interface timing |
| tFALL(CMD) Output Fall Time: High-speed | 111 | tRISE(CMD) for High-speed Device interface timing |
| tFALL(DAT) Output Fall Time: Dual Rat | 313 | tFALL(DAT) for Dual Rate Device interface timing |

**Table 4** Test IDs and Names (continued)

| Name | TestID | Description |
|---|---|---|
| tFALL(DAT) Output Fall Time: High-speed | 117 | tFALL(DAT) for High-speed Device interface timing |
| tIH(CMD) Input Hold Time: Backward-compatible | 207 | tIH(CMD) for Backward Compatible Device interface timing |
| tIH(CMD) Input Hold Time: HS200 | 405 | tIHddr(CMD) for HS200 Device interface timing |
| tIH(CMD) Input Hold Time: High-speed | 107 | tIH(CMD) for High-speed Device interface timing |
| tIH(DAT) Input Hold Time: HS200 | 409 | tIH(DAT) for HS200 Device interface timing |
| tIH(DAT) Input Hold Time: High-speed | 113 | tIH(DAT) for High-speed Device interface timing |
| tIH(DAT) Input Setup Time: Backward-compatible | 211 | tIH(DAT) for Backward Compatible Device interface timing |
| tIHddr(CMD) Input Hold Time: Dual Rate | 304 | tIHddr(CMD) for Dual Rate Device interface timing |
| tIHddr(DAT) Input Hold Time: High-speed | 310 | tIHddr(DAT) for Dual Rate Device interface timing |
| tISU(CMD) Input Setup Time: Backward-compatible | 206 | tISU(CMD) for Backward Compatible Device interface timing |
| tISU(CMD) Input Setup Time: HS200 | 404 | tISU(CMD) for HS200 Device interface timing |
| tISU(CMD) Input Setup Time: High-speed | 106 | tISU(CMD) for High-speed Device interface timing |
| tISU(DAT) Input Setup Time: Backward-compatible | 210 | tISU(DAT) for Backward Compatible Device interface timing |
| tISU(DAT) Input Setup Time: HS200 | 408 | tISU(DAT) for HS200 Device interface timing |
| tISU(DAT) Input Setup Time: High-speed | 112 | tISU(DAT) for High-speed Device interface timing |
| tISUddr(CMD) Input Setup Time: Dual Rate | 303 | tISUddr(CMD) for Dual Rate Device interface timing |
| tISUddr(DAT) Input Setup Time: Dual Rate | 309 | tISUddr(DAT) for Dual Rate Device interface timing |
| tODLY(CMD) Output Delay Time: Dual Rate | 305 | tODLY(CMD) for Dual Rate Device interface timing |
| tODLY(CMD) Output Delay Time: High-speed | 108 | tODLY(CMD) for High-speed Device interface timing |

**Table 4** Test IDs and Names (continued)

| Name | TestID | Description |
|---|---|---|
| tODLY(DAT) Output Delay Time: High-speed | 114 | tODLY(DAT) for High-speed Device interface timing |
| tODLYddr(DAT) Output Delay Time: Dual Rate | 311 | tODLYddr(DAT) for Dual Rate Device interface timing |
| tOH(CMD) Output Hold Time: Backward-compatible | 209 | tOH(CMD) for Backward Compatible Device interface timing |
| tOH(CMD) Output Hold Time: Dual Rate | 306 | tOH(CMD) for Dual Rate Device interface timing |
| tOH(CMD) Output Hold Time: High-speed | 109 | tOH(CMD) for High-speed Device interface timing |
| tOH(DAT) Output Hold Time: High-speed | 115 | tOH(DAT) for High-speed Device interface timing |
| tOH(DAT) Output Setup Time: Backward-compatible | 213 | tOH(DAT) for Backward Compatible Device interface timing |
| tOSU(CMD) Output Setup Time: Backward-compatible | 208 | tOSU(CMD) for Backward Compatible Device interface timing |
| tOSU(DAT) Output Setup Time: Backward-compatible | 212 | tOSU(DAT) for Backward Compatible Device interface timing |
| tPERIOD Clock frequency: HS200 | 400 | tPERIOD for HS200 Device interface timing |
| tRISE(CMD) Output Rise Time: Dual Rate | 307 | tRISE(CMD) for Dual Rate Device interface timing |
| tRISE(CMD) Output Rise Time: High-speed | 110 | tRISE(CMD) for High-speed Device interface timing |
| tRISE(DAT) Output Rise Time: Dual Rate | 312 | tRISE(DAT) for Dual Rate Device interface timing |
| tRISE(DAT) Output Rise Time: High-speed | 116 | tRISE(DAT) for High-speed Device interface timing |
| tTHL Clock Fall Time: Backward-compatible | 205 | tTHL for Backward Compatible Device interface timing |
| tTHL Clock Fall Time: Dual Rate | 302 | tTHL for Dual Rate Device interface timing |
| tTHL Clock Fall Time: HS200 | 402 | tTHL for HS200 Device interface timing |
| tTHL Clock Fall Time: High-speed | 105 | tTHL for High-speed Device interface timing |
| tTLH Clock Rise Time: Backward-compatible | 204 | tTLH for Backward Compatible Device interface timing |

**Table 4** Test IDs and Names (continued)

| Name | TestID | Description |
|---|---|---|
| tTLH Clock Rise Time: Dual Rate | 301 | tTLH for Dual Rate Device interface timing |
| tTLH Clock Rise Time: HS200 | 401 | tTLH for HS200 Device interface timing |
| tTLH Clock Rise Time: High-speed | 104 | tTLH for High-speed Device interface timing |
| tVW(DAT) Output Valid Window Time: HS200 | 410 | tVW(DAT) for HS200 Device interface timing |
| tWH Clock High Time: Backward-compatible | 202 | tWH for Backward Compatible Device interface timing |
| tWH Clock High Time: High-speed | 102 | tWH for High-speed Device interface timing |
| tWL Clock Low Time: Backward-compatible | 203 | tWL for Backward Compatible Device interface timing |
| tWL Clock Low Time: High-speed | 103 | tWL for High-speed Device interface timing |

# 3 Test Names and IDs

# 4 Instruments

The following table shows the instruments used by this application. The name is required by various remote interface methods.

- Instrument Name — The name to use as a parameter in remote interface commands.
- Description — The description of the instrument.

For example, if an application uses an oscilloscope and a pulse generator, then you would expect to see something like this in the table below:

**Table 5** Example Instrument Information

| Name | Description |
|---|---|
| scope | The primary oscilloscope. |
| Pulse | The pulse generator used for Gen 2 tests. |

and you would be able to remotely control an instrument using:

```
ARSL syntax (replace [description] with actual parameter)
------------------------------------------------------------------------
arsl -a ipaddress -c "SendScpiCommandCustom 'Command=[scpi
command];Timeout=100;Instrument=pulsegen'"

arsl -a ipaddress -c "SendScpiQueryCustom 'Command=[scpi
query];Timeout=100;Instrument=pulsegen'"


C# syntax (replace [description] with actual parameter)
------------------------------------------------------------------------
SendScpiCommandOptions commandOptions = new SendScpiCommandOptions();
commandOptions.Command = "[scpi command]";
commandOptions.Instrument = "[instrument name]";
commandOptions.Timeout = [timeout];
remoteAte.SendScpiCommand(commandOptions);

SendScpiQueryOptions queryOptions = new SendScpiQueryOptions();
queryOptions.Query = "[scpi query]";
queryOptions.Instrument = "[instrument name]";
queryOptions.Timeout = [timeout];
remoteAte.SendScpiQuery(queryOptions);
```

Here are the actual instrument names used by this application:

NOTE

The file, ""InstrumentInfo.txt"", which may be found in the same directory as this help file, contains all of the information found in the table below in a format suitable for parsing.

**Table 6** Instrument Names

| Instrument Name | Description |
|---|---|
| scope | The primary oscilloscope. |

# Index

# Index