Keysight N5431A/B XAUI Compliance Application

KEYSIGHT TECHNOLOGIES

Programmer's Reference

Notices

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In This Book

This book is your guide to programming the Keysight Technologies N5431A/B XAUI Compliance 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 19 provide information specific to programming the N5431A/B XAUI Compliance 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 Keysight Technologies, Inc. family of compliance applications. Information on those features is provided in the N5452A Compliance Application Remote Programming Toolkit available for download from Keysight here: "www.keysight.com/find/scope-apps-sw". The N5431A/B XAUI Compliance Application uses Remote Interface Revision 2.80. 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.keysight.com/find/scope-apps" to purchase an N5452A remote programming option license.

2 Configuration Variables and Values

The following table contains a description of each of the N5431A/B XAUI Compliance 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	Amplitude Test Mode	AmpTestMode	AVERAGE, WORSTCASE	Select the test pattern to use for all tests.
Confgure	Bit Error Ratio Level, BER	BER	E6, E7, E8, E9, E10, E11, E12, E13, E14, E15, E16, E17, E18	Select the number of BER for jitter tests.
Confgure	D+ Channel	DPChan	CHAN1, CHAN2, CHAN3, CHAN4	Select the channel number for D+.
Confgure	D- Channel	DNChan	CHAN1, CHAN2, CHAN3, CHAN4	Select the channel number for D-.
Confgure	Data Lane	DataLaneS	Lane 0, Lane 1, Lane 2, Lane 3	Select data lane under test.
Confgure	Lagging ISI Filter Coefficients	LagCo	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18	Select the number of lagging ISI Filter coefficients for jitter tests.
Confgure	Lane 0 Channel	Lane0Chan	CHAN1, CHAN2, CHAN3, CHAN4	Select the channel number for Lane 0.
Confgure	Lane 1 Channel	Lane1Chan	CHAN1, CHAN2, CHAN3, CHAN4	Select the channel number for Lane 1.
Confgure	Lane 2 Channel	Lane2Chan	CHAN1, CHAN2, CHAN3, CHAN4	Select the channel number for Lane 2.
Confgure	Lane 3 Channel	Lane3Chan	CHAN1, CHAN2, CHAN3, CHAN4	Select the channel number for Lane 3.
Confgure	Leading ISI Filter Coefficients	LeadCo	0, -1, -2, -3, -4, -5, -6, -7, -8, -9, -10, -11	Select the number of leading ISI Filter coefficients for jitter tests.

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
Confgure	Mask Test Averaging	Avg_Mask	0, 2, 4, 8, 16, 32, 64, 128, 256	Select the averaging number for Mast Test.
Confgure	Memory Depth	MemDepth	262144, 524288, 320000, 640000, 1025000, 1280000, 1920000, 2E+6, 4E+6, 5E+6, 8E+6	Please select memory depth of the oscilloscope to acquire data.
Confgure	Number of UI	NoOfUI	312500, 318750, 375000, 500000, 1000000	Select the number of UI to capture data.
Confgure	PLL Bandwidth	PLLbandwidth	1, 0	Select the PLL Bandwidth.
Confgure	Report Test Time	TimeReport	true, false	Choose whether to report time-stamp and test time for each test.
Confgure	Sampling Rate	SamplingRate	20E+09, 40E+09	Select the Sampling Rate to use.
Confgure	Test Pattern	Pattern	55, CJPAT, HFTP, LFTP, MFTP, CRPAT	Select the test pattern in use for all Clause 47 and 54 tests.
Confgure	Transition Time Measurement Thresholds	Threshold	thrd1, thrd2	Select the measurement threshold level.
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	DeviceType	DeviceType	XAUI, 10GBASE-CX4	DeviceType
Set Up	cbLane0	cbLane0	0.0, 1.0	cbLane0
Set Up	cbLane1	cbLane1	0.0, 1.0	cbLane1
Set Up	cbLane2	cbLane2	0.0, 1.0	cbLane2
Set Up	cbLane3	cbLane3	0.0, 1.0	cbLane3

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
Set Up	cmbBitRate	cmbBitRate	(Accepts user-defined text), 10 GbE XAUI 3.125Gbps, 10 GFC XAUI 3.1875Gbps, XAUI Based 3.75Gbps, OBSAI RP3 768Mbps, OBSAI RP3 1.536Gbps, OBSAI RP3 3.072Gbps, SRIO Short 1.25Gbps, SRIO Short 2.5Gbps, SRIO Short 3.125Gbps, SRIO Long 1.25Gbps, SRIO Long 2.5Gbps, SRIO Long 3.125Gbps, CPRI-LV 614.4 Mbps, CPRI-LV 1.2288Gbps, CPRI-LV 2.4576Gbps, CPRI-LV 3.072Gbps, CPRI-HV 614.4 Mbps, CPRI-HV 1.2288Gbps, CPRI-HV 2.4576Gbps	cmbBitRate
Set Up	cmbConnectionType	cmbConnectionType	(Accepts user-defined text), Differential, Single-ended	cmbConnectionType
Set Up	maskType	maskType	A, B	maskType
Set Up	pcboOverallDeviceID	pcboOverallDeviceID	(Accepts user-defined text)	pcboOverallDeviceID
Set Up	txtOverallUserComment	txtOverallUserComment	(Accepts user-defined text)	txtOverallUserComment

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
Baud Rate Test	100	The baud rate of the device under test (DUT) must be within the conformance limits specified in 47.3.3 of IEEE 802.3.
CX4 Baud Rate Test	1000	The baud rate of the device under test (DUT) must be within the conformance limits specified in 54.6.3.3 of IEEE 802.3.
CX4 Fall Time Test	1500	The fall time of the device under test (DUT) must be within the conformance limits specified in 54.6.3.7 of IEEE 802.3.
CX4 Rise Time Test	1400	The rise time of the device under test (DUT) must be within the conformance limits specified in 54.6.3.7 of IEEE 802.3.
Deterministic Jitter Test	1700	The deterministic transmit jitter of the device under test (DUT) must be within the conformance limits specified in 54.6.3.8 of IEEE 802.3.
Deterministic Jitter Test (Far-end)	610	The DUT must conform to the jitter requirements specified in clause 47.3.3.5 of IEEE 802.3
Deterministic Jitter Test (Near-end)	600	The DUT must conform to the jitter requirements specified in clause 47.3.3.5 of IEEE 802.3
Differential Output Amplitude Test	1200	The differential output amplitude of the device under test (DUT) must be within the conformance limits specified in 54.6.3.4 of IEEE 802.3.
Differential Output Template Test	1900	The DUT's transmitter meets the eye template requirements specified in clause 54.3.3.5. of IEEE 802.3
Driver Eye Template Test (Far-end)	410	The DUT's transmitter meets the eye template requirements specified in clause 47.3.3.5. of IEEE 802.3 (require either Near-end or Far-end test only)
Driver Eye Template Test (Near-end)	400	The DUT's transmitter meets the eye template requirements specified in clause 47.3.3.5. of IEEE 802.3 (require either Near-end or Far-end test only)
Driver Output Amplitude Test (Far-end)	210	The driver differential output amplitude of the device under test (DUT) must be within the conformance limits specified in clause 47.3.3.2 of IEEE 802.3.
Driver Output Amplitude Test (Near-end)	200	The driver differential output amplitude of the device under test (DUT) must be within the conformance limits specified in clause 47.3.3.2 of IEEE 802.3.
Driver Single-ended Output Swing Maximum Absolute Test (Tx+)	301	The single-ended output swing of the device under test (DUT) must be within the conformance limits specified in clause 47.3.3.2 of IEEE 802.3.

Table 4 Test IDs and Names (continued)

Name	TestID	Description
Driver Single-ended Output Swing Maximum Absolute Test (Tx-)	303	The single-ended output swing of the device under test (DUT) must be within the conformance limits specified in clause 47.3.3.2 of IEEE 802.3.
Driver Single-ended Output Swing Minimum Absolute Test (Tx+)	302	The single-ended output swing of the device under test (DUT) must be within the conformance limits specified in clause 47.3.3.2 of IEEE 802.3.
Driver Single-ended Output Swing Minimum Absolute Test (Tx-)	304	The single-ended output swing of the device under test (DUT) must be within the conformance limits specified in clause 47.3.3.2 of IEEE 802.3.
Fall Time Test	951	The fall time of the device under test (DUT) must be within the conformance limits - value > 60ps.
Fall Time Test	950	The fall time of the device under test (DUT) must be within the conformance limits specified in 47.3.3.3 of IEEE 802.3.
Lane-to-Lane Amplitude Difference	1250	The differential output amplitude of the device under test (DUT) must be within the conformance limits specified in 54.6.3.4 of IEEE 802.3. It will report the worst case result.
Random Jitter Test	1600	The random transmit jitter of the device under test (DUT) must be within the conformance limits specified in 54.6.3.8 of IEEE 802.3.
Rise Time Test	901	The rise time of the device under test (DUT) must be within the conformance limits - value > 60ps.
Rise Time Test	900	The rise time of the device under test (DUT) must be within the conformance limits specified in 47.3.3.3 of IEEE 802.3.
Total Jitter Test	1800	The total transmit jitter of the device under test (DUT) must be within the conformance limits specified in 54.6.3.8 of IEEE 802.3.
Total Jitter Test (Far-end)	510	The DUT must conform to the jitter requirements specified in clause 47.3.3.5 of IEEE 802.3
Total Jitter Test (Near-end)	500	The DUT must conform to the jitter requirements specified in clause 47.3.3.5 of IEEE 802.3

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	scope

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