Keysight N6460B Mobile High Definition Link (MHL) Source Compliance Test Application

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Programmer's Reference

Notices

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In This Book

This book is your guide to programming the Keysight Technologies N6460B Mobile High Definition Link (MHL) Source Compliance 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 9, Chapter 3, “Test Names and IDs,” starting on page 15, and Chapter 4, “Instruments,” starting on page 31, provide information specific to programming the N6460B Mobile High Definition Link (MHL) Source Compliance 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 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/rpi. The N6460B Mobile High Definition Link (MHL) Source Compliance Test Application uses Remote Interface Revision 3.40. 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.

2 Configuration Variables and Values

The following table contains a description of each of the N6460B Mobile High Definition Link (MHL) Source Compliance 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'"
```

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```
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	CableEmbedEnable	CableEmbedEnable	1.0, 0.0	.
Confgure	Clock Divider	ClockDivider	30, 40	Enter the Clock Divider Ratio (Data Rate/Clock Frequency)
Confgure	Clock Divider	ClockDivider	30, 40	Enter the Clock Divider Ratio (Data Rate/Clock Frequency)
Confgure	Clock Jitter Tolerance	ClkJittTolerance	0.25, 0.10	.
Confgure	Clock PLL Loop Bandwidth	ClockPLL	2.0E+6, 4.75E+6	Enter the clock PLL loop bandwidth
Confgure	Clock PLL Loop Bandwidth MHL 3.0	ClockPLL30	(Accepts user-defined text), 1.0E+6	Enter the clock PLL loop bandwidth for MHL 3.0 tests
Confgure	Common-mode (Clock) Channel	SourceCommonConnectionType	0, 1, 2, 3, 4	Identifies the common mode or clock channel to process.
Confgure	Data Rate	datarate	(Accepts user-defined text), 0, 811.0E+6, 2.25E+9, 3E+9, 6E+9	Specify the data rate of the device.
Confgure	Data Size	SampL	(Accepts user-defined text), 2E+6, 5E+6, 10E+6	Specify the data size to capture.
Confgure	Differential (Data) Channel	SourceDiffConnectionType	0, 1, 2, 3, 4	Identifies the differential channel to process.

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
Confgure	Differential clock waveform file name	DiffWfmFileClk	(Accepts user-defined text), None	This variable use to store the directory of the differential clock waveform file.
Confgure	Differential waveform file name	DiffWfmFilePRBS	(Accepts user-defined text), None	This variable use to store the directory of the differential data waveform file.
Confgure	Equalizer Mode	EquCoef	No EQ, 5M, 2M	Specify the equalizer mode to use for sink test
Confgure	EqualizerType	EqualizerType	FIR, InfiniiSim	Specify the equalizer type to use
Confgure	Eye Diagram Mask Movement	EyeMove	1, 2	Eye Diagram Mask Movement: (1) Best Center will automatically search for violations on both sides of the eye and center the mask between violations. (2) Manual mode will do a one change center find and then allow the user to manually move the data eye, it will not perform any eye centering routines.
Confgure	Log GPIB Commands	LogIO	true, false	Logs GPIB traffic into log directory.
Confgure	Number of Averages for Jitter	AvgJit	(Accepts user-defined text), 10	Enter the number of measurements to average for clock jitter measurement.
Confgure	Offline Data Signal Type	DataOfflineInput	(Accepts user-defined text), None	This variable use to store the directory of the single ended negative clock waveform file.
Confgure	Probe Head	ProbeHead	N5380, N5444, N7010, Others	Probe head used for single ended and differential measurement
Confgure	Sample Rate, GSa/s	SRate	80.0E+9, 40.0E+9, 20.0E+9, 10.0E+9	Specify the sample rate to use for all tests.

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
Confgure	Scope Bandwidth	ScopeBand	4E+9, 5E+9, 6E+9, 7E+9, 8E+9, 9E+9, 10E+9, 11E+9, 12E+9, 13E+9, 14E+9, 15E+9, 16E+9, 17E+9, 18E+9, 19E+9, 20E+9, 21E+9, 22E+9, 23E+9, 24E+9, 25E+9, 26E+9, 27E+9, 28E+9, 29E+9, 30E+9	Select the bandwidth to set the scope at for testing
Confgure	Single ended negative waveform file name	DNWfmFileClk	(Accepts user-defined text), None	This variable use to store the directory of the single ended negative data waveform file.
Confgure	Single ended negative waveform file name	DNWfmFilePRBS	(Accepts user-defined text), None	This variable use to store the directory of the single ended negative data waveform file.
Confgure	Single ended positive waveform file name	DPWfmFileClk	(Accepts user-defined text), None	This variable use to store the directory of the single ended positive data waveform file.
Confgure	Single ended positive waveform file name	DPWfmFilePRBS	(Accepts user-defined text), None	This variable use to store the directory of the single ended positive data waveform file.
Confgure	Single-ended Vd+ Channel	VDPChan	1, 2	Identifies the Vd+ channel for Single-Ended Measurements.
Confgure	Single-ended Vd- Channel	VDNChan	3, 4	Identifies the Vd- channel for Single-Ended Measurements.
Confgure	Single-ended eCBUS-S+ Channel	ClkPChan	1, 2	Identifies the eCBUS-D+ channel for Single-Ended Measurements.
Confgure	Smoothing Points (Intra-Pair Skew)	SmoothPoint	30, 50, 100, 150, 200, 250, 300, 350, 400, 450, 500, 550, 600, 650, 700, 750	Select the number of smoothing points to be applied to the common mode signal for Intra-Pair Skew tests.
Confgure	Test Point Mask	TPMask	, TP2	Specify the test point mask for sink test eye test.
Run Tests	Event	RunEvent	(None), Fail, Margin < N, Pass	Names of events that can be used with the StoreMode=Event or RunUntil RunEventAction options

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
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	CTS	optCTS	CTS 2.1/1.3, CTS 2.0, CTS 1.2, CTS 3.2, CTS 3.3	Select the CTS reference.
Set Up	Offline Enable	OfflineEnable	0.0, 1.0	Enable the use of saved waveform to perform the tests.
Set Up	PowerSupplyAddr	PowerSupplyAddr	(Accepts user-defined text)	Optional user comments displayed in the test report.
Set Up	ShowCalibrationTe sts	EnableDUTAutomation	0.0, 1.0	Specify whether to show calibration tests
Set Up	ShowCalibrationTe sts	ShowCalibrationTests	0.0, 1.0	Specify whether to show calibration tests
Set Up	Type of DUT	DUTTypeOpt	Source, Sink, Dongle	Select the type of DUT to use.
Set Up	Type of DUT connection	optConnection	Single-ended only, SE/ Diff/ CM	Select the type of DUT connection to use.
Set Up	User Comments	UserCommentTxt	(Accepts user-defined text)	Optional user comments displayed in the test report.

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:

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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
3.1.1.1 Standby (Off) Output Voltage: Voff(Vterm-max)	16	Measures that the MHL source output voltage is within the specified level limits when the source device is in standby or power-off
3.1.1.1 Standby (Off) Output Voltage: Voff(Vterm-min)	15	Measures that the MHL source output voltage is within the specified level limits when the source device is in standby or power-off
3.1.1.10 MHL Clock Duty Cycle(Vterm-max)[Highest Supported Data Bit Rate in Normal Mode]	65	Measures the MHL clock duty cycle
3.1.1.10 MHL Clock Duty Cycle(Vterm-max)[Highest Supported Frequency in Normal Mode]	24	Measures the MHL clock duty cycle
3.1.1.10 MHL Clock Duty Cycle(Vterm-min)[Highest Supported Data Bit Rate in Normal Mode]	59	Measures the MHL clock duty cycle
3.1.1.10 MHL Clock Duty Cycle(Vterm-min)[Highest Supported Frequency in Normal Mode]	19	Measures the MHL clock duty cycle
3.1.1.11 MHL Clock Jitter (Vterm-max)[Highest Supported Data Bit Rate in Normal Mode]	67	Measures the clock TIE peak-to-peak measurement
3.1.1.11 MHL Clock Jitter (Vterm-max)[Highest Supported Frequency in Normal Mode]	33	Measures the clock TIE peak-to-peak measurement
3.1.1.11 MHL Clock Jitter (Vterm-max)[Lowest Data Bit Rate]	66	Measures the clock TIE peak-to-peak measurement
3.1.1.11 MHL Clock Jitter (Vterm-max)[Lowest Frequency]	25	Measures the clock TIE peak-to-peak measurement

Table 4 Test IDs and Names (continued)

Name	TestID	Description
3.1.1.11 MHL Clock Jitter (Vterm-min)[Highest Supported Data Bit Rate in Normal Mode]	61	Measures the clock TIE peak-to-peak measurement
3.1.1.11 MHL Clock Jitter (Vterm-min)[Highest Supported Frequency in Normal Mode]	32	Measures the clock TIE peak-to-peak measurement
3.1.1.11 MHL Clock Jitter (Vterm-min)[Lowest Data Bit Rate]	60	Measures the clock TIE peak-to-peak measurement
3.1.1.11 MHL Clock Jitter (Vterm-min)[Lowest Frequency]	1	Measures the clock TIE peak-to-peak measurement
3.1.1.12 MHL Data Eye Diagram(Vterm-max)[Highest Supported Data Bit Rate in Normal Mode]	71	Eye diagram with mask test
3.1.1.12 MHL Data Eye Diagram(Vterm-max)[Highest Supported Frequency in Normal Mode]	35	Eye diagram with mask test
3.1.1.12 MHL Data Eye Diagram(Vterm-max)[Lowest Data Bit Rate]	70	Eye diagram with mask test
3.1.1.12 MHL Data Eye Diagram(Vterm-max)[Lowest Frequency]	28	Eye diagram with mask test
3.1.1.12 MHL Data Eye Diagram(Vterm-min)[Highest Supported Data Bit Rate in Normal Mode]	69	Eye diagram with mask test
3.1.1.12 MHL Data Eye Diagram(Vterm-min)[Highest Supported Frequency in Normal Mode]	34	Eye diagram with mask test
3.1.1.12 MHL Data Eye Diagram(Vterm-min)[Lowest Data Bit Rate]	68	Eye diagram with mask test
3.1.1.12 MHL Data Eye Diagram(Vterm-min)[Lowest Frequency]	4	Eye diagram with mask test

Table 4 Test IDs and Names (continued)

Name	TestID	Description
3.1.1.14 MHL Clock Duty Cycle(Vterm-max)[Highest Supported Data Bit Rate in PackedPixel Mode]	40	Measures the MHL clock duty cycle
3.1.1.14 MHL Clock Duty Cycle(Vterm-min)[Highest Supported Data Bit Rate in PackedPixel Mode]	38	Measures the MHL clock duty cycle
3.1.1.15 MHL Clock Jitter (Vterm-max)[Highest Supported Data Bit Rate in PackedPixel Mode]	41	Measures the clock TIE peak-to-peak measurement
3.1.1.15 MHL Clock Jitter (Vterm-min)[Highest Supported Data Bit Rate in PackedPixel Mode]	39	Measures the clock TIE peak-to-peak measurement
3.1.1.16 MHL Data Eye Diagram(Vterm-max)[Highest Supported Data Bit Rate in PackedPixel Mode]	43	Eye diagram with mask test
3.1.1.16 MHL Data Eye Diagram(Vterm-max)[Highest Supported Frequency in PackedPixel Mode]	430	Eye diagram with mask test
3.1.1.16 MHL Data Eye Diagram(Vterm-min)[Highest Supported Data Bit Rate in PackedPixel Mode]	42	Eye diagram with mask test
3.1.1.16 MHL Data Eye Diagram(Vterm-min)[Highest Supported Frequency in PackedPixel Mode]	420	Eye diagram with mask test
3.1.1.17 MHL Clock Jitter in Normal Mode(+43ps)(Vterm-max)[Highest Supported Data Bit Rate]	128	Measures the clock TIE peak-to-peak measurement
3.1.1.17 MHL Clock Jitter in Normal Mode(+43ps)(Vterm-max)[Lowest Data Bit Rate]	126	Measures the clock TIE peak-to-peak measurement

Table 4 Test IDs and Names (continued)

Name	TestID	Description
3.1.1.17 MHL Clock Jitter in Normal Mode(+43ps)(Vterm-min)[Highest Supported Data Bit Rate]	122	Measures the clock TIE peak-to-peak measurement
3.1.1.17 MHL Clock Jitter in Normal Mode(+43ps)(Vterm-min)[Lowest Data Bit Rate]	120	Measures the clock TIE peak-to-peak measurement
3.1.1.17 MHL Clock Jitter in Normal Mode(-43ps)(Vterm-max)[Highest Supported Data Bit Rate]	129	Measures the clock TIE peak-to-peak measurement
3.1.1.17 MHL Clock Jitter in Normal Mode(-43ps)(Vterm-max)[Lowest Data Bit Rate]	127	Measures the clock TIE peak-to-peak measurement
3.1.1.17 MHL Clock Jitter in Normal Mode(-43ps)(Vterm-min)[Highest Supported Data Bit Rate]	123	Measures the clock TIE peak-to-peak measurement
3.1.1.17 MHL Clock Jitter in Normal Mode(-43ps)(Vterm-min)[Lowest Data Bit Rate]	121	Measures the clock TIE peak-to-peak measurement
3.1.1.18 MHL Data Eye Diagram in Normal Mode(+43ps)(Vterm-max)[Highest Supported Data Bit Rate]	108	The test confirms that the MHL output after a compliant cable has signal quality that meets the eye opening and clock jitter required by the specification in Normal Mode.
3.1.1.18 MHL Data Eye Diagram in Normal Mode(+43ps)(Vterm-max)[Lowest Data Bit Rate]	106	The test confirms that the MHL output after a compliant cable has signal quality that meets the eye opening and clock jitter required by the specification in Normal Mode.
3.1.1.18 MHL Data Eye Diagram in Normal Mode(+43ps)(Vterm-min)[Highest Supported Data Bit Rate]	102	The test confirms that the MHL output after a compliant cable has signal quality that meets the eye opening and clock jitter required by the specification in Normal Mode.
3.1.1.18 MHL Data Eye Diagram in Normal Mode(+43ps)(Vterm-min)[Lowest Data Bit Rate]	100	The test confirms that the MHL output after a compliant cable has signal quality that meets the eye opening and clock jitter required by the specification in Normal Mode.

Table 4 Test IDs and Names (continued)

Name	TestID	Description
3.1.1.18 MHL Data Eye Diagram in Normal Mode(-43ps)(Vterm-max)[Highest Supported Data Bit Rate]	109	The test confirms that the MHL output after a compliant cable has signal quality that meets the eye opening and clock jitter required by the specification in Normal Mode.
3.1.1.18 MHL Data Eye Diagram in Normal Mode(-43ps)(Vterm-max)[Lowest Data Bit Rate]	107	The test confirms that the MHL output after a compliant cable has signal quality that meets the eye opening and clock jitter required by the specification in Normal Mode.
3.1.1.18 MHL Data Eye Diagram in Normal Mode(-43ps)(Vterm-min)[Highest Supported Data Bit Rate]	103	The test confirms that the MHL output after a compliant cable has signal quality that meets the eye opening and clock jitter required by the specification in Normal Mode.
3.1.1.18 MHL Data Eye Diagram in Normal Mode(-43ps)(Vterm-min)[Lowest Data Bit Rate]	101	The test confirms that the MHL output after a compliant cable has signal quality that meets the eye opening and clock jitter required by the specification in Normal Mode.
3.1.1.19 MHL Clock Jitter in PackedPixel Mode(+43ps)(Vterm-max)[Highest Supported Data Bit Rate]	130	Measures the clock TIE peak-to-peak measurement
3.1.1.19 MHL Clock Jitter in PackedPixel Mode(+43ps)(Vterm-min)[Highest Supported Data Bit Rate]	124	Measures the clock TIE peak-to-peak measurement
3.1.1.19 MHL Clock Jitter in PackedPixel Mode(-43ps)(Vterm-max)[Highest Supported Data Bit Rate]	131	Measures the clock TIE peak-to-peak measurement
3.1.1.19 MHL Clock Jitter in PackedPixel Mode(-43ps)(Vterm-min)[Highest Supported Data Bit Rate]	125	Measures the clock TIE peak-to-peak measurement
3.1.1.2 Single-Ended High Level Voltage: Vse_high(Vterm-max) [Lowest Data Bit Rate]	47	Measures the single-ended high output voltage level
3.1.1.2 Single-Ended High Level Voltage: Vse_high(Vterm-max) [Lowest Frequency]	9	Measures the single-ended high output voltage level

Table 4 Test IDs and Names (continued)

Name	TestID	Description
3.1.1.2 Single-Ended High Level Voltage: Vse_high(Vterm-min) [Lowest Data Bit Rate]	44	Measures the single-ended high output voltage level
3.1.1.2 Single-Ended High Level Voltage: Vse_high(Vterm-min) [Lowest Frequency]	2	Measures the single-ended high output voltage level
3.1.1.20 MHL Data Eye Diagram in PackedPixel Mode(+43ps)(Vterm-max)[Highest Supported Data Bit Rate]	110	The test confirms that the MHL output after a compliant cable has signal quality that meets the eye opening and clock jitter required by the specification in Normal Mode.
3.1.1.20 MHL Data Eye Diagram in PackedPixel Mode(+43ps)(Vterm-min)[Highest Supported Data Bit Rate]	104	The test confirms that the MHL output after a compliant cable has signal quality that meets the eye opening and clock jitter required by the specification in Normal Mode.
3.1.1.20 MHL Data Eye Diagram in PackedPixel Mode(-43ps)(Vterm-max)[Highest Supported Data Bit Rate]	111	The test confirms that the MHL output after a compliant cable has signal quality that meets the eye opening and clock jitter required by the specification in Normal Mode.
3.1.1.20 MHL Data Eye Diagram in PackedPixel Mode(-43ps)(Vterm-min)[Highest Supported Data Bit Rate]	105	The test confirms that the MHL output after a compliant cable has signal quality that meets the eye opening and clock jitter required by the specification in Normal Mode.
3.1.1.3 Single-Ended Low Level Voltage: Vse_low(Vterm-max) [Lowest Data Bit Rate]	48	Measures the single-ended low output voltage level
3.1.1.3 Single-Ended Low Level Voltage: Vse_low(Vterm-max) [Lowest Frequency]	11	Measures the single-ended low output voltage level
3.1.1.3 Single-Ended Low Level Voltage: Vse_low(Vterm-min) [Lowest Data Bit Rate]	45	Measures the single-ended low output voltage level
3.1.1.3 Single-Ended Low Level Voltage: Vse_low(Vterm-min) [Lowest Frequency]	10	Measures the single-ended low output voltage level
3.1.1.4 Differential Output Swing Voltage: Vdfswing(Vterm-max)[Lowest Data Bit Rate]	53	Measures the differential output voltage swing amplitude

Table 4 Test IDs and Names (continued)

Name	TestID	Description
3.1.1.4 Differential Output Swing Voltage: Vdfswing(Vterm-max)[Lowest Frequency]	12	Measures the differential output voltage swing amplitude
3.1.1.4 Differential Output Swing Voltage: Vdfswing(Vterm-min)[Lowest Data Bit Rate]	50	Measures the differential output voltage swing amplitude
3.1.1.4 Differential Output Swing Voltage: Vdfswing(Vterm-min)[Lowest Frequency]	8	Measures the differential output voltage swing amplitude
3.1.1.5 Common Mode Output Swing Voltage: Vcmswing(Vterm-max)[Lowest Data Bit Rate]	62	Measures the swing voltage of the common-mode output signal
3.1.1.5 Common Mode Output Swing Voltage: Vcmswing(Vterm-max)[Lowest Frequency]	27	Measures the swing voltage of the common-mode output signal
3.1.1.5 Common Mode Output Swing Voltage: Vcmswing(Vterm-min)[Lowest Data Bit Rate]	56	Measures the swing voltage of the common-mode output signal
3.1.1.5 Common Mode Output Swing Voltage: Vcmswing(Vterm-min)[Lowest Frequency]	26	Measures the swing voltage of the common-mode output signal
3.1.1.6 Differential Fall Time: Tf_df(Vterm-max)[Highest Supported Data Bit Rate in Normal Mode]	55	Measures the fall time of the differential output signal.
3.1.1.6 Differential Fall Time: Tf_df(Vterm-max)[Highest Supported Frequency in Normal Mode]	14	Measures the fall time of the differential output signal.
3.1.1.6 Differential Fall Time: Tf_df(Vterm-min)[Highest Supported Data Bit Rate in Normal Mode]	52	Measures the fall time of the differential output signal.

Table 4 Test IDs and Names (continued)

Name	TestID	Description
3.1.1.6 Differential Fall Time: Tf_df(Vterm-min)[Highest Supported Frequency in Normal Mode]	6	Measures the fall time of the differential output signal.
3.1.1.6 Differential Rise Time: Tr_df(Vterm-max)[Highest Supported Data Bit Rate in Normal Mode]	54	Measures the rise time of the differential output signal.
3.1.1.6 Differential Rise Time: Tr_df(Vterm-max)[Highest Supported Frequency in Normal Mode]	13	Measures the rise time of the differential output signal.
3.1.1.6 Differential Rise Time: Tr_df(Vterm-min)[Highest Supported Data Bit Rate in Normal Mode]	51	Measures the rise time of the differential output signal.
3.1.1.6 Differential Rise Time: Tr_df(Vterm-min)[Highest Supported Frequency in Normal Mode]	5	Measures the rise time of the differential output signal.
3.1.1.7 Common Mode Fall Time: Tf_cm(Vterm-max)[Highest Supported Data Bit Rate in Normal Mode]	64	Measures the fall time of the common-mode output signal
3.1.1.7 Common Mode Fall Time: Tf_cm(Vterm-max)[Highest Supported Frequency in Normal Mode]	23	Measures the fall time of the common-mode output signal
3.1.1.7 Common Mode Fall Time: Tf_cm(Vterm-min)[Highest Supported Data Bit Rate in Normal Mode]	58	Measures the fall time of the common-mode output signal
3.1.1.7 Common Mode Fall Time: Tf_cm(Vterm-min)[Highest Supported Frequency in Normal Mode]	7	Measures the fall time of the common-mode output signal

Table 4 Test IDs and Names (continued)

Name	TestID	Description
3.1.1.7 Common Mode Rise Time: Tr_cm(Vterm-max)[Highest Supported Data Bit Rate in Normal Mode]	63	Measures the rise time of the common-mode output signal
3.1.1.7 Common Mode Rise Time: Tr_cm(Vterm-max)[Highest Supported Frequency in Normal Mode]	22	Measures the rise time of the common-mode output signal
3.1.1.7 Common Mode Rise Time: Tr_cm(Vterm-min)[Highest Supported Data Bit Rate in Normal Mode]	57	Measures the rise time of the common-mode output signal
3.1.1.7 Common Mode Rise Time: Tr_cm(Vterm-min)[Highest Supported Frequency in Normal Mode]	3	Measures the rise time of the common-mode output signal
3.1.1.8 Intra-Pair Skew: Tskew_Df(Vterm-max) [Lowest Frequency]	18	Measures the timing skew in the differential signal pair
3.1.1.8 Intra-Pair Skew: Tskew_Df(Vterm-min) [Lowest Frequency]	17	Measures the timing skew in the differential signal pair
3.7.2.1 Single-Ended High Level Output Voltage of Differential TMDS Data	2040	This test confirms that the single-ended high level voltage of the differential TMDS data is within the specified limits
3.7.2.13 Rise Time Of Differential TMDS Data	2070	This test confirms that the rise time of Differential TMDS Data is within the specified limits.
3.7.2.14 Fall Time Of Differential TMDS Data	2080	This test confirms that the fall time of Differential TMDS Data is within the specified limits.
3.7.2.17 Peak-Peak Amplitude of Differential TMDS Data	2090	This test confirms that the Peak-Peak Amplitude of Differential TMDS Data is within the specified limits.
3.7.2.2 Single-Ended Low Level Output Voltage of Differential TMDS Data	2050	This test confirms that the single-ended low level voltage of the differential TMDS data is within the specified limits.
3.7.2.20 Single-Ended MHL Clock Frequency	2330	This test confirms that the Single-Ended MHL Clock Frequency is within the specified limits. This test is applied only to the DUT with eCBUS-S.

Table 4 Test IDs and Names (continued)

Name	TestID	Description
3.7.2.21 Single-Ended MHL Clock Front Porch	2360	This test confirms that the Single-Ended MHL Clock Front Porch time is within the specified limits. This test is applied only to the DUT with eCBUS-S.
3.7.2.22 Single-Ended MHL Clock Back Porch	2370	This test confirms that the Single-Ended MHL Clock Back Porch time is within the specified limits. This test is applied only to the DUT with eCBUS-S.
3.7.2.23 Rise Time of Single-Ended MHL Clock	2340	This test confirms that the rise time of Single-Ended MHL Clock is within the specified limits. This test is applied only to the DUT with eCBUS-S.
3.7.2.24 Fall Time of Single-Ended MHL Clock and eCBUS-S FWD Data	2430	This test confirms that the fall time of Single-Ended MHL Clock and eCBUS-S FWD Data is within the specified limits. This test is applied only to the DUT with eCBUS-S.
3.7.2.25 Peak-Peak Amplitude of eCBUS-S FWD Data	2440	This test confirms that the Peak-Peak Amplitude of eCBUS-S FWD Data is within the specified limits. This test is applied only to the DUT with eCBUS-S.
3.7.2.26 eCBUS-S clock jitter at TP2	2490	Measures the clock TIE peak-to-peak measurement
3.7.2.26 eCBUS-S clock jitter at TP2 (No cable embed)	2495	Measures the clock TIE peak-to-peak measurement
3.7.2.27 Differential TMDS Data Eye Diagram at TP2 (Negative Skew)	2020	The test confirms that the MHL output after a compliant cable has signal quality that meets the eye opening and clock jitter required by the specification in Normal Mode.
3.7.2.27 Differential TMDS Data Eye Diagram at TP2 (No Cable Embed)	2030	The test confirms that the MHL output after a compliant cable has signal quality that meets the eye opening and clock jitter required by the specification in Normal Mode.
3.7.2.27 Differential TMDS Data Eye Diagram at TP2 (Positive Skew)	2010	The test confirms that the MHL output after a compliant cable has signal quality that meets the eye opening and clock jitter required by the specification in Normal Mode.
3.7.2.29 eCBUS-S FWD Data Eye Diagram at TP2	2480	This test confirms that the eCBUS-S FWD Data Eye Diagram is within the specified limits. This test is applied only to the DUT with eCBUS-S.
3.7.2.29 eCBUS-S FWD Data Eye Diagram at TP2 (No cable embed)	2485	This test confirms that the eCBUS-S FWD Data Eye Diagram is within the specified limits. This test is applied only to the DUT with eCBUS-S.
3.7.2.29 eCBUS-S FWD Data Eye Diagram at TP2 (No cable embed)	12485	This test confirms that the eCBUS-S FWD Data Eye Diagram is within the specified limits. This test is applied only to the DUT with eCBUS-S.

Table 4 Test IDs and Names (continued)

Name	TestID	Description
3.7.2.5 Differential Output Swing Voltage of Differential TMDS Data	2060	This test confirms that the differential swing voltage of the differential TMDS data is within the specified limits.
3.7.2.7 Single-Ended High Level Output Voltage of Single-Ended MHL CLK	2300	This test confirms that the single-ended high level voltages of the single-ended MHL CLK and eCBUS-S FWD Data are within the specified limits. This test is applied only to the DUT with eCBUS-S.
3.7.2.7 Single-Ended High Level Output Voltage of Single-Ended eCBUS-S FWD Data	2400	This test confirms that the single-ended high level voltages of the single-ended MHL CLK and eCBUS-S FWD Data are within the specified limits. This test is applied only to the DUT with eCBUS-S.
3.7.2.8 Single-Ended Low Level Output Voltage of Single-Ended MHL CLK	2310	This test confirms that the single-ended low level voltages of the single-ended MHL CLK and eCBUS-S FWD Data are within the specified limits. This test is applied only to the DUT with eCBUS-S.
3.7.2.8 Single-Ended Low Level Output Voltage of Single-Ended eCBUS-S FWD Data	2410	This test confirms that the single-ended low level voltages of the single-ended MHL CLK and eCBUS-S FWD Data are within the specified limits. This test is applied only to the DUT with eCBUS-S.
3.7.2.9 Single-Ended Output Swing Voltage of Single-Ended MHL CLK	2320	This test confirms that the single-ended output swing voltages of the Single-Ended MHL CLK and eCBUS-S FWD Data are within the specified limits. This test is applied only to the DUT with eCBUS-S.
3.7.2.9 Single-Ended Output Swing Voltage of Single-Ended eCBUS-S FWD Data	2420	This test confirms that the single-ended output swing voltages of the Single-Ended MHL CLK and eCBUS-S FWD Data are within the specified limits. This test is applied only to the DUT with eCBUS-S.
4.7.2.14 Single-Ended High Level Output Voltage of eCBUS-S BWD Data	3010	This test confirms that the single-ended high level voltage of eCBUS-S BWD Data output is within the specified limits. This test is applied only to the DUT with eCBUS-S.
4.7.2.15 Single-Ended Low Level Output Voltage of eCBUS-S BWD Data	3020	This test confirms that the single-ended low level voltage of eCBUS-S BWD Data output is within the specified limits. This test is applied only to the DUT with eCBUS-S.
4.7.2.16 Single-Ended Output Swing Voltage of eCBUS-S BWD Data	3030	This test confirms that the single-ended output swing voltage of eCBUS-S BWD Data output is within the specified limits. This test is applied only to the DUT with eCBUS-S.
4.7.2.20 Rise Time of eCBUS-S BWD Data	3040	This test confirms that the rise time of eCBUS-S BWD Data output is within the specified limits. This test is applied only to the DUT with eCBUS-S.

Table 4 Test IDs and Names (continued)

Name	TestID	Description
4.7.2.21 Fall Time of eCBUS-S BWD Data	3050	This test confirms that the fall time of eCBUS-S BWD Data output is within the specified limits. This test is applied only to the DUT with eCBUS-S.
4.7.2.22 Peak-Peak Amplitude of eCBUS-S BWD Data	3060	This test confirms that the Peak-Peak Amplitude of eCBUS-S BWD Data output is within the specified limits. This test is applied only to the DUT with eCBUS-S.
4.7.2.24 eCBUS-S BWD Data Eye Diagram at TP1(10MHz jitter MHL Clock/500kHz jitter TMDS Data)	3070	This test confirms that the eCBUS-S BWD Data Eye Diagram at TP1 is within the specified limits. This test is applied only to the DUT with eCBUS-S.
4.7.2.24 eCBUS-S BWD Data Eye Diagram at TP1(7MHz jitter MHL Clock/1MHz jitter TMDS Data)	3080	This test confirms that the eCBUS-S BWD Data Eye Diagram at TP1 is within the specified limits. This test is applied only to the DUT with eCBUS-S.
4.7.2.24 eCBUS-S BWD Data Eye Diagram at TP1(for Calibration Only)	3090	This test confirms that the eCBUS-S BWD Data Eye Diagram at TP1 is within the specified limits. This test is applied only to the DUT with eCBUS-S.
5.7.2.16 Output DC Voltage of eCBUS-S BWD Data	4010	This test confirms that the DC voltage level of eCBUS-S BWD data output signal is within the specified limits.
5.7.2.17 Single-Ended Output Swing Voltage of eCBUS-S BWD Data	4030	This test confirms that the single-ended output swing voltage of eCBUS-S BWD Data output is within the specified limits. This test is applied only to the DUT with eCBUS-S.
5.7.2.19 eCBUS-S BWD Data Eye Diagram at TP3(10MHz jitter MHL Clock/500kHz jitter TMDS Data)	4070	This test confirms that the eCBUS-S BWD Data Eye Diagram at TP1 is within the specified limits. This test is applied only to the DUT with eCBUS-S.
5.7.2.19 eCBUS-S BWD Data Eye Diagram at TP3(7MHz jitter MHL Clock/1MHz jitter TMDS Data)	4080	This test confirms that the eCBUS-S BWD Data Eye Diagram at TP1 is within the specified limits. This test is applied only to the DUT with eCBUS-S.
DC Offset for N5380A	31	
Differential TMDS Data Eye Diagram at TP2	12010	The test confirms that the MHL output after a compliant cable has signal quality that meets the eye opening and clock jitter required by the specification in Normal Mode.
Differential TMDS Data Eye Diagram at TP2 (Negative Skew)	12020	The test confirms that the MHL output after a compliant cable has signal quality that meets the eye opening and clock jitter required by the specification in Normal Mode.

Table 4 Test IDs and Names (continued)

Name	TestID	Description
Differential TMDS Data Eye Diagram at TP2 (No Cable Embed)	12030	The test confirms that the MHL output after a compliant cable has signal quality that meets the eye opening and clock jitter required by the specification in Normal Mode.
Please select test point in Set Up tab	9999	
Please select test point in Set Up tab	8888	
Please select test point in Set Up tab	7777	
Please select test point in Set Up tab	3333	
Sink Clock Jitter	29	Measures the clock TIE peak-to-peak measurement at TP2.
Sink Data Eye Diagram	30	Eye-diagram with mask test for TP2.
Sink Single-Ended High Level Voltage: Vse_high	36	Measures the single-ended high output voltage level
Sink Single-Ended Low Level Voltage: Vse_low	37	Measures the single-ended low output voltage level
Store eCBUS-S FWD Waveform	3000	This test captures and stores eCBUS-S FWD waveform to be subtracted from eCBUS-S BWD data.
Store eCBUS-S FWD Waveform	4000	This test captures and stores eCBUS-S FWD waveform to be subtracted from eCBUS-S BWD data.
Store eCBUS-S FWD Waveform	13075	This test captures and stores eCBUS-S FWD waveform to be subtracted from eCBUS-S BWD data.
Store eCBUS-S FWD Waveform(10MHz jitter MHL Clock/500kHz jitter TMDS Data)	3075	This test captures and stores eCBUS-S FWD waveform to be subtracted from eCBUS-S BWD data.
Store eCBUS-S FWD Waveform(10MHz jitter MHL Clock/500kHz jitter TMDS Data)	4075	This test captures and stores eCBUS-S FWD waveform to be subtracted from eCBUS-S BWD data.
Store eCBUS-S FWD Waveform(7MHz jitter MHL Clock/1MHz jitter TMDS Data)	3085	This test captures and stores eCBUS-S FWD waveform to be subtracted from eCBUS-S BWD data.
Store eCBUS-S FWD Waveform(7MHz jitter MHL Clock/1MHz jitter TMDS Data)	4085	This test captures and stores eCBUS-S FWD waveform to be subtracted from eCBUS-S BWD data.

Table 4 Test IDs and Names (continued)

Name	TestID	Description
eCBUS-S BWD Data Eye Diagram at TP1	13070	This test confirms that the eCBUS-S BWD Data Eye Diagram at TP1 is within the specified limits. This test is applied only to the DUT with eCBUS-S.
eCBUS-S FWD Data Eye Diagram at TP2	12480	This test confirms that the eCBUS-S FWD Data Eye Diagram is within the specified limits. This test is applied only to the DUT with eCBUS-S.
eCBUS-S clock jitter at TP2	12490	Measures the clock TIE peak-to-peak measurement
eCBUS-S clock jitter at TP2 (No cable embed)	12495	Measures the clock TIE peak-to-peak measurement

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

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