Keysight U7238C/D MIPI D-PHY Compliance Application

KEYSIGHT TECHNOLOGIES

Programmer's Reference

Notices

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CAUTION

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In This Book

This book is your guide to programming the Keysight Technologies U7238C/D MIPI D-PHY 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 23, and Chapter 4, “Instruments,” starting on page 31, provide information specific to programming the U7238C/D MIPI D-PHY 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 U7238C/D MIPI D-PHY Compliance 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.

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 U7238C/D MIPI D-PHY 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	CLK Connection Type	ClkConnectionType	Single Ended, Differential	Identifies the Clock connection type.
Confgure	CLK(Diff)	ClkChan	CHAN1, CHAN2, CHAN3, CHAN4, CHAN0	Identifies the oscilloscope channels probing clock(differentially). This value will be use if the Connection Type set to "Differential". CAUTION: Differential Clock input will not be able to run ALL clock related tests.
Confgure	CLKn	ClkNChan	CHAN1, CHAN2, CHAN3, CHAN4	Identifies the oscilloscope channels probing clock. This value will be use if the Connection Type set to "Single Ended".
Confgure	CLKp	ClkPChan	CHAN1, CHAN2, CHAN3, CHAN4	Identifies the oscilloscope channels probing clock. This value will be use if the Connection Type set to "Single Ended".
Confgure	ClockNWfmFile(Must be hidden)	ClockNWfmFile	(Accepts user-defined text), None	For supporting offline.
Confgure	ClockPWfmFile(Must be hidden)	ClockPWfmFile	(Accepts user-defined text), None	For supporting offline.

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
Confgure	DataNWfmFile(Must be hidden)	DataNWfmFile	(Accepts user-defined text), None	For supporting offline.
Confgure	DataPWfmFile(Must be hidden)	DataPWfmFile	(Accepts user-defined text), None	For supporting offline.
Confgure	DiffClockWfmFile(Must be hidden)	DiffClockWfmFile	(Accepts user-defined text), None	For supporting offline.
Confgure	Dn	DataNChan	CHAN1, CHAN2, CHAN3, CHAN4	Identifies the oscilloscope channels probing Dn signal.
Confgure	Dp	DataPChan	CHAN1, CHAN2, CHAN3, CHAN4	Identifies the oscilloscope channels probing Dp signal.
Confgure	Export Tested Waveform Data	RawDataExport	non, all, bin, wfm	Specifies whether to export waveform data that used in the test. Selecting to export will cause the tests take slightly longer time to complete.
Confgure	Eye Height	Eye_Height_limit	(Accepts user-defined text), 0.14	Specifies the limit for the Eye Height value. By default, this value is set to 140mVpp.
Confgure	Eye Height Location	Eye_Height_location	(Accepts user-defined text), 50	Specifies the location for the eye height of the eye. By default,this value is set to 50.
Confgure	Eye Width	Eye_Width_limit	(Accepts user-defined text), 0.5	Specifies the limit for the Eye Width value. By default, this value is 0.5UI. UI value is dependent on selected data rate.
Confgure	HS Data Rate Check	HSDataRateCheck	1, 0	Enable this setting to perform HS Data Rate verification when running the HS tests. Select "Disable" to skip the HS data rate verification process. This option only affects HS tests.
Confgure	HS Full Dynamic Range	HSFullDynamicRange	YES, NO	To enable/disable the use of full dynamic range when measuring HS data electrical characteristic. LP trigger threshold will be changed when this feature is turned on.

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
Confgure	High Threshold [Window Trigger Mode ONLY]	WindowTriggerHighThreshold	(Accepts user-defined text), 0.6	High trigger level used when the "Trigger Method" option is set to "Window".
Confgure	Histogram Result	HistogramMeasResult	MODE, MEAN	Select the histogram statistical result to be used in VOL and VOH tests.
Confgure	Hysteresis Level	Hysteresis_Level	(Accepts user-defined text), 0	Hysteresis Level: Specify the value of the hysteresis level voltages used in setting the measurement thresholds. By default, this value is set to 0V.
Confgure	Hysteresis Range	Hysteresis_Range	(Accepts user-defined text), 0.050	Specify the value of the hysteresis range used in setting the measurement thresholds. By default, this value is set to +/-50mV.
Confgure	LP Escape Timeout	LPEscapeTimeOut	(Accepts user-defined text), 0	Time in seconds the application will wait for the LP Escape signal to appear in each observation. Select 0 if the DUT is capable of outputting LP escape mode continuously. This option only affects LP tests that need LP Escape signal.
Confgure	LP Escape User Prompt	LPUserPrompt	ENABLE, DISABLE	Enable this setting to prompt user to set the DUT to Escape Mode before the tests are run. Select "Disable" if the DUT is capable of outputting LP escape mode continuously. This option only affects LP tests that need LP Escape signal.
Confgure	LP Observations	NumLPElectricalTestObservation	(Accepts user-defined text), 10	Number of LP measurement instances to be observed.
Confgure	LP Trigger Threshold	LPTriggerThreshold	(Accepts user-defined text), 0.650	Trigger level for LP edges, set it such that it will not trigger wrongly on HS. Possible values are between 0.200 and 0.880. The D-PHY specification recommends 0.550-0.880.

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
Confgure	Low Threshold [Window Trigger Mode ONLY]	WindowTriggerLowThreshold	(Accepts user-defined text), -0.1	Low trigger level used when the "Trigger Method" option is set to "Window".
Confgure	Manual Vertical Max voltage level	MaxVoltageLevel	(Accepts user-defined text), 1.50	Determine the max voltage level for each channel. This value will be observed only when Signal Scaling Mode is MANUAL. The D-PHY specification for VOH recommends 1.10 - 1.30V. This value should be greater than VOH to allow some headroom. Default value is 1.50V.
Confgure	Manual Vertical Min voltage level	MinVoltageLevel	(Accepts user-defined text), -0.40	Determine the min voltage level for each channel. This value will be observed only when Signal Scaling Mode is MANUAL. The D-PHY specification for VOL recommends -0.05 - 0.05V. This value should be greater than VOL to allow some headroom. Default value is -0.40V.
Confgure	Measurement Time Range(ns)	LPMeasurementTimeRangeInns	(Accepts user-defined text), 160	Specifies the time range in nanoseconds the application will be using when measuring DC and transition time of LP signal. Set it such that only one transition is visible when measuring.
Confgure	Minimum Valid HS Length	MinValidHSLength	(Accepts user-defined text), 0.0, 500e-9, 1.50e-6	Set this value to avoid extremely short HS stream, default value is 1.5 µs. Set value to 0 to disable this feature.

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
Confgure	Number of ULPS Slew Edge	ULPSSlewEdge	(Accepts user-defined text), 10	Set this value to get number of ULPS slew edge. This value will only affect ULPS Clock Tx Slew Rate test. This value will affect the number of rising/falling edge when performing the measurement. For example: The default value is set to 10. ClockP risng will digitize 10 time and get the average value. ClockP falling will digitize 10 time and get the average value. ClockN risng will digitize 10 time and get the average value. ClockN falling will digitize 10 time and get the average value.
Confgure	PSearch High Threshold [VOHHS ONLY]	VOHHS_HighThres	(Accepts user-defined text), 0.250	High threshold used in the serial pattern search performed in the VOHHS test. The search is to identify and locate the conformant pattern of "011111" within the data burst as part of the test procedure. The serial pattern search requires the Low Threshold and High Threshold to be set properly in order to work.
Confgure	PSearch Low Threshold [VOHHS ONLY]	VOHHS_LowThres	(Accepts user-defined text), 0.150	Low threshold used in the serial pattern search performed in the VOHHS test. The search is to identify and locate the conformant pattern of "011111" within the data burst as part of the test procedure. The serial pattern search requires the Low Threshold and High Threshold to be set properly in order to work.
Confgure	Pattern Check	Pattern_check	1, 0	Enable or disable the pattern check "011111" and "100000" for VOHHS and VOD tests only.
Confgure	Save ULPS Wfm	SaveULPSWfm	1, 0	Save the waveform when running ULPS mode.
Confgure	Scope Sampling Rate	ScopeSampleRate	10e9, 20e9	The scope sampling rate. Default value 10GSa/s.

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
Confgure	Signal Scaling Mode	SignalScalingMode	AUTO, MANUAL	Set signal scaling to AUTO or MANUAL mode. AUTO: Use the scope autoscale to determine the vertical range of each channel. Only for signals with LP and HS intervals less than 60ms. MANUAL: Set the vertical range for each channel based on the manual vertical max and min voltage level settings. "MANUAL" mode is used as default setting for Signal Scaling Mode because "AUTO" mode does not work for all test signals. For example, "AUTO" mode does not work for test signal with long HS-burst that is more than 60ms.
Confgure	Single-Ended HS Threshold Level	HSSETriggerThreshold	(Accepts user-defined text), 0.200	Trigger level for Single-Ended HS edges. This is the voltage level that will be used by the application to determine edges of single-ended HS signal. Possible values are between 0 and 0.650.
Confgure	Slew rate test CLoad(pF)	SlewrateCLoad	(Accepts user-defined text), 0, 5, 20, 70	Load capacitance to determine the LP Slew Rate min and max values.
Confgure	Switch Matrix Data Lane Probing Method	SwitchMatrixProbeMethod	SMA, DiffProbe	The method used to connect the data lane testpoint to the scope. This option is used when the Switch Matrix option is enabled.
Confgure	THSBurstStart Threshold	THSBurstStartThreshold	(Accepts user-defined text), 0.080, 0.180	Threshold value used to determine the starting location of the HS burst data.

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
Confgure	THSprepareStart Threshold	THSprepareStartThreshold	(Accepts user-defined text), 0.550, 0.080	Threshold value used to determine the starting location of the THSprepare parameter. The D-PHY specification define this value to use the VIL(max) which is 0.550V. When using the default 0.550V as the threshold, the app will not support data signals that are not terminated properly as the differential data level may not cross this voltage level. For debugging purposes, this value can be set to 0.080V to support testing with improper terminated data signals.
Confgure	Time Range(ns)	GlobalOperationTimeStep	(Accepts user-defined text), 200, 300, 400, 500	Specify the value of time range(nanoseconds) to be used when perform measurement on the HS exit/entry sequence. This config is only applicable to the tests in Global Operation test group. For example, set it such that the TLPX, THS-PREPARE, THS-ZERO and THS-SYNC are visible on the oscilloscope display when measuring for HS Entry tests. By default, this value is set to 200ns.
Confgure	Transition Time Histogram Window	HSTrTfHistogramWindow	(Accepts user-defined text), 0.1, 0.2, 0.5	This config is used to specify the position of histogram window for Rise and Fall times measurement. For example, if 0.5UI is selected, the histogram is placed from zero crossing position to +0.5UI position at upper threshold and from -0.5UI position to zero crossing point at lower threshold for rise time measurement. Default value is 0.5UI. This config is only applicable to 1.3.11, 1.3.12, 1.4.11, 1.4.12 tests.
Confgure	Transition Time Measurement Lower Threshold(%)	HSACLowerThreshold	(Accepts user-defined text), 20	Specifies in percentage the lower measurement threshold for transition time measurement.

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
Confgure	Transition Time Measurement Upper Threshold(%)	HSACUpperThreshold	(Accepts user-defined text), 80	Specifies in percentage the upper measurement threshold for transition time measurement.
Confgure	Trigger Check	TriggerCheck	0, 1	Enable/disable valid test signal trigger checking. Enable: Application will check if any valid trigger condition is met by making a dummy test acquisition upon setting up required trigger conditions. An exception will be thrown if NO trigger condition is met within a timeout duration specified in the "Trigger Timeout" configuration option. Disable: Application will NOT perform any signal trigger checking when performing the tests.
Confgure	Trigger Method	TriggerMethod	0, 1	Set the signal triggering method to find burst data.
Confgure	Trigger Timeout [ms]	TriggerTimeout	(Accepts user-defined text), 150000, 10000	This option is specify as a whole number in mili-seconds (does not accept decimal point values) with a minimum of 1000 ms. This option DOES NOT affect LP tests that need LP Escape signal. For those mentioned tests, please refer to the "LP Escape Timeout" configuration option.
Confgure	Tskew Histogram Window	TskewHistogramWindow	0.0, 0.010, 0.020, 0.070	Increase the Tskew histogram window for short HS stream that may not have enough data points for histogram measurement. Default value is ±10mV.
Confgure	Ulinst Min	Ulinst_Min_limit	(Accepts user-defined text), 0	Specifies the limit for the Ulinst min value define by the DUT.
Confgure	UseWfmFile(Must be hidden)	UseWfmFile	(Accepts user-defined text), 0.0, 1.0	For supporting offline
Confgure	VIDTH(max)	VIDTHMax	(Accepts user-defined text), 0.070	VIDTH(max) is used to determine the stop point for THS-PREPARE. Please see D-Phy specification for the allowable value.

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
Confgure	VIH(min)	VIHMin	(Accepts user-defined text), 0.880, 0.740	VIH(min) is used to determine the ending point for CLK TX TEOT. The default value for VIH(min) is 880mV(for HS rate ≤ 1.5Gbps) and 740mV(for HS rate > 1.5Gbps). Please see D-Phy specification for the allowable value.
Confgure	VIL(max)	VILMax	(Accepts user-defined text), 0.550	VIL(max) is used to determine the starting point for TLPX and THS-PREPARE. Please see D-Phy specification for the allowable value.
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	CTS Version	CTSVersion	v1.2	CTSVersion
Set Up	ClkEscapeMode	ClkLPEscapeMode	0.0, 1.0	Escape Mode in Clock Lane. Check this if the device has LP Escape mode on the clock lane. Escape Mode in Clock Lane.
Set Up	ClockULPSMode	ClkULPSMode	0.0, 1.0	ULPS Mode in Clock Lane. Check this if the device has ULPS mode on the clock lanes. ULPS Mode in Clock Lane.
Set Up	DataEscapeMode	LPEscapeMode	0.0, 1.0	Escape Mode in Data Lane. Check this if the device has LP Escape mode on the data lanes. Escape Mode in Data Lane.
Set Up	DeviceID	DeviceID	(Accepts user-defined text)	Device ID
Set Up	FixtureSetup	FixtureSetup	Auto Load Switching, Manual Load Switching	Auto or Manual Switching Auto or Manual Switching
Set Up	HSDataRate	HSDataRate	(Accepts user-defined text)	High Speed Data Rate High Speed Data Rate

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
Set Up	ShowInfoTest	ShowInfoTest	0.0, 1.0	Show Informative Test. Check this to enable or disable informative test group. Show Informative Test.
Set Up	UserComment	UserComment	(Accepts user-defined text)	User Comment
Set Up	pcbClockContinuousMode	pcbClockContinuousMode	0.0, 1.0	For continuos clock. Check this if clock lane has no LP. For continuos clock.
Set Up	pcbDataContinuousMode	pcbDataContinuousMode	0.0, 1.0	For continuos data. Check this if data lane has no LP. For continuos data.
Set Up	pcbLane0	Lane0	0.0, 1.0	Data Lane - Lane0
Set Up	pcbLane1	Lane1	0.0, 1.0	Data Lane - Lane1
Set Up	pcbLane2	Lane2	0.0, 1.0	Data Lane - Lane2
Set Up	pcbLane3	Lane3	0.0, 1.0	Data Lane - Lane3

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
1.1.1 LP TX Thevenin Output High Voltage Level (VOH)	821	Thevenin output high level.
1.1.1 LP TX Thevenin Output High Voltage Level (VOH) ESCAPEMODE	8211	Thevenin output high level using Escape Mode.
1.1.2 LP TX Thevenin Output Low Voltage Level (VOL)	822	Thevenin output low level.
1.1.2 LP TX Thevenin Output Low Voltage Level (VOL) ESCAPEMODE	8221	Thevenin output low level using Escape Mode.
1.1.3 LP TX 15%-85% Rise Time (TRLP)	824	15%-85% rise time of LP signal.
1.1.3 LP TX 15%-85% Rise Time (TRLP) ESCAPEMODE	8241	15%-85% rise time of LP signal. (Escape Mode)
1.1.4 LP TX 15%-85% Fall Time (TFLP)	825	15%-85% fall time of LP signal.
1.1.4 LP TX 15%-85% Fall Time (TFLP) ESCAPEMODE	8251	15%-85% fall time of LP signal in Escape Mode.
1.1.5 LP TX Slew Rate Vs. CLoad (Margin)	8292	Slew rate at different capacitance load condition. Note: Please set the value of Cload in the configuration tab before running the test.
1.1.5 LP TX Slew Rate Vs. CLoad (Max)	829	Slew rate at different capacitance load condition. Note: Please set the value of Cload in the configuration tab before running the test.
1.1.5 LP TX Slew Rate Vs. CLoad (Min)	8291	Slew rate at different capacitance load condition. Note: Please set the value of Cload in the configuration tab before running the test.
1.1.6 LP Clock TX Pulse Width of LP TX Exclusive-OR Clock (TLP-PULSE-TX)	1827	Pulse width measurement for all pulses of the LP exclusive-OR clock excluding the first pulse and last pulse for clock lane.
1.1.6 LP Clock TX Pulse Width of LP TX Exclusive-OR Clock (TLP-PULSE-TX) [Initial]	18271	Pulse width measurement for first pulse of the LP exclusive-OR clock for clock lane.

Table 4 Test IDs and Names (continued)

Name	TestID	Description
1.1.6 LP Clock TX Pulse Width of LP TX Exclusive-OR Clock (TLP-PULSE-TX) [Last]	18272	Pulse width measurement for last pulse of the LP exclusive-OR clock for clock lane.
1.1.6 LP TX Pulse Width of LP TX Exclusive-OR Clock (TLP-PULSE-TX)	827	Pulse width measurement for all pulses of the LP exclusive-OR clock excluding the first pulse and last pulse.
1.1.6 LP TX Pulse Width of LP TX Exclusive-OR Clock (TLP-PULSE-TX) [Initial]	8271	Pulse width measurement for first pulse of the LP exclusive-OR clock.
1.1.6 LP TX Pulse Width of LP TX Exclusive-OR Clock (TLP-PULSE-TX) [Last]	8272	Pulse width measurement for last pulse of the LP exclusive-OR clock.
1.1.7 LP Clock TX Period of LP TX Exclusive-OR Clock (TLP-PER-TX)	1828	Period of the LP exclusive-OR clock for clock lane.
1.1.7 LP TX Period of LP TX Exclusive-OR Clock (TLP-PER-TX)	828	Period of the LP exclusive-OR clock.
1.2.1 LP Clock TX Thevenin Output High Voltage Level (VOH)	1821	Thevenin output high level for Clock lane.
1.2.1 LP Clock TX Thevenin Output High Voltage Level (VOH) ESCAPEMODE	18211	Thevenin output high level for clock lane using Escape Mode.
1.2.1 ULPS Clock TX Thevenin Output High Voltage Level (VOH) ULPSMODE	28211	Thevenin output high level for clock lane using ULPS Mode.
1.2.2 LP Clock TX Thevenin Output Low Voltage Level (VOL)	1822	Thevenin output low level for clock lane.
1.2.2 LP Clock TX Thevenin Output Low Voltage Level (VOL) ESCAPEMODE	18221	Thevenin output low level for clock lane using Escape Mode.
1.2.2 ULPS Clock TX Thevenin Output Low Voltage Level (VOL) ULPSMODE	28221	Thevenin output low level for clock lane using Escape Mode.
1.2.3 LP Clock TX 15%-85% Rise Time (TRLP)	1824	15%-85% rise time of LP signal on clock lane.

Table 4 Test IDs and Names (continued)

Name	TestID	Description
1.2.3 LP Clock TX 15%-85% Rise Time (TRLP) ESCAPEMODE	18241	15%-85% rise time of LP signal on clock lane using Escape Mode.
1.2.3 ULPS Clock TX 15%-85% Rise Time (TRLP) ULPSMODE	28241	15%-85% rise time of LP signal on clock lane using Escape Mode.
1.2.4 LP Clock TX 15%-85% Fall Time (TFLP)	1825	15%-85% fall time of LP signal for clock lane.
1.2.4 LP Clock TX 15%-85% Fall Time (TFLP) ESCAPEMODE	18251	15%-85% fall time of LP signal for clock lane using Escape Mode.
1.2.4 ULPS Clock TX 15%-85% Fall Time (TFLP) ULPSMODE	28251	15%-85% fall time of LP signal for clock lane using Escape Mode.
1.2.5 LP CLK Slew Rate Vs. CLoad (Margin)	18292	Slew rate at different capacitance load condition. Note: Please set the value of Cload in the configuration tab before running the test.
1.2.5 LP CLK Slew Rate Vs. CLoad (Min)	18291	Slew rate at different capacitance load condition. Note: Please set the value of Cload in the configuration tab before running the test.
1.2.5 LP Clock TX Slew Rate Vs. CLoad (Max)	1829	Slew rate at different capacitance load condition. Note: Please set the value of Cload in the configuration tab before running the test.
1.2.5 ULPS CLK Slew Rate Vs. CLoad (Margin) ULPSMODE	28292	Slew rate at different capacitance load condition. Note: Please set the value of Cload in the configuration tab before running the test.
1.2.5 ULPS CLK Slew Rate Vs. CLoad (Min) ULPSMODE	28291	Slew rate at different capacitance load condition. Note: Please set the value of Cload in the configuration tab before running the test.
1.2.5 ULPS Clock TX Slew Rate Vs. CLoad (Max) ULPSMODE	2829	Slew rate at different capacitance load condition. Note: Please set the value of Cload in the configuration tab before running the test.
1.3.1 HS Entry: DATA TLPX	511	Length of any Low-Power state period.
1.3.10 HS Data TX Common-Level Variations Above 450MHz (VCMTX(HF))	818	Common-level variations above 450MHz.
1.3.11 HS Data TX 20%-80% Rise Time (tR)	81101	20%-80% rise time of the HS differential signal. ComplianceTranTimeMax is 0.3*UI for Datarate ≤ 1Gbps, 0.35*UI for Datarate > 1Gbps and ≤ 1.5Gbps , 0.4*UI for Datarate > 1.5Gbps.

Table 4 Test IDs and Names (continued)

Name	TestID	Description
1.3.12 HS Data TX 80%-20% Fall Time (tF)	81111	80%-20% fall time of the HS differential signal. ComplianceTranTimeMax is 0.3*UI for Datarate ≤ 1Gbps, 0.35*UI for Datarate > 1Gbps and ≤ 1.5Gbps , 0.4*UI for Datarate > 1.5Gbps
1.3.13 HS Exit: DATA TX THS-TRAIL	546	Time to drive flipped differential state after last payload data bit of a HS transmission burst. ComplianceTimingMin is based on 60ns+n*4*UI.
1.3.14 HS Exit: DATA TX TREOT	549	30%-85% rise time and fall time
1.3.15 HS Exit: DATA TX TEOT	547	Time from start of THS-TRAIL period to start of LP-11 state. ComplianceTimingMax is based on 105ns+n*12*UI.
1.3.16 HS Exit: DATA TX THS-EXIT	548	Time to drive LP-11 after HS burst.
1.3.2 HS Entry: DATA TX THS-PREPARE	557	Time to drive LP-00 to prepare for HS Transmission. ComplianceTimingMin is based on 40ns+4*UI. ComplianceTimingMax is based on 85ns+6*UI.
1.3.3 HS Entry: DATA TX THS-PREPARE+THS-ZERO	558	THS-PREPARE+Time to drive HS-0 before Sync sequence. ComplianceTimingMin is based on 145ns+10*UI.
1.3.4 HS Data TX Differential Voltage(VOD0 Pulse)	8131	HS transmit differential voltage.
1.3.4 HS Data TX Differential Voltage(VOD1 Pulse)	8132	HS transmit differential voltage.
1.3.5 HS Data TX Differential Voltage Mismatch (Pulse)	8141	VOD mismatch when output is Differential-1 or Differential-0.
1.3.6 HS Data TX Single Ended Output High Voltage(VOHHS Pulse)	8151	HS Single Ended output high voltage.
1.3.7 HS Data TX Static Common Mode Voltage(Vcmtx)	811	HS transmit static common-mode voltage.
1.3.8 HS Data TX Vcmtx Mismatch	812	VCMTX mismatch when output is Differential-1 or Differential-0.
1.3.9 HS Data TX Common-Level Variations Between 50-450MHz (VCMTX(LF))	819	Common-level variation between 50-450MHz.
1.4.1 HS Entry: CLK TX TLPX	5510	Length of any Low-Power state period.

Table 4 Test IDs and Names (continued)

Name	TestID	Description
1.4.10 HS Clock TX Common-Level Variations Above 450MHz (VCMTX(HF))	1818	Common-level variations above 450MHz.
1.4.11 HS Clock TX 20%-80% Rise Time (tR)	181101	20%-80% rise time of the HS differential signal. ComplianceTranTimeMax is 0.3*UI for Datarate ≤ 1Gbps, 0.35*UI for Datarate > 1Gbps and ≤ 1.5Gbps , 0.4*UI for Datarate > 1.5Gbps.
1.4.11 HS Clock TX 20%-80% Rise Time (tR)	181102	20%-80% rise time of the HS differential signal. ComplianceTranTimeMax is 0.3*UI for Datarate ≤ 1Gbps, 0.35*UI for Datarate > 1Gbps and ≤ 1.5Gbps , 0.4*UI for Datarate > 1.5Gbps.
1.4.12 HS Clock TX 80%-20% Fall Time (tF)	181111	80%-20% fall time of the HS differential signal. ComplianceTranTimeMax is 0.3*UI for Datarate ≤ 1Gbps, 0.35*UI for Datarate > 1Gbps and ≤ 1.5Gbps , 0.4*UI for Datarate > 1.5Gbps.
1.4.12 HS Clock TX 80%-20% Fall Time (tF)	181112	80%-20% fall time of the HS differential signal. ComplianceTranTimeMax is 0.3*UI for Datarate ≤ 1Gbps, 0.35*UI for Datarate > 1Gbps and ≤ 1.5Gbps , 0.4*UI for Datarate > 1.5Gbps.
1.4.13 HS Exit: CLK TX TCLK-TRAIL	543	Time to drive HS differential state after last payload clock bit of HS transmission burst.
1.4.14 HS Exit: CLK TX TREOT	559	30%-85% rise time and fall time
1.4.15 HS Exit: CLK TX TEOT	544	Time from start of TCLK-TRAIL period to start of LP-11 state. ComplianceTimingMax is based on 105ns+n*12*UI.
1.4.16 HS Exit: CLK TX THS-EXIT	556	Time to drive LP-11 after HS burst.
1.4.17 HS Clock Instantaneous (UIinst)(Max)	911	Maximum UI instantaneous of HS Clock.
1.4.17 HS Clock Instantaneous (UIinst)(Min)	914	Minimum UI instantaneous (Min) of HS Clock.
1.4.18 Clock Lane HS Clock Delta UI (UI variation)	1911	Clock Lane HS Clock Delta UI
1.4.2 HS Entry: CLK TX TCLK-PREPARE	552	Time to drive LP-00 to prepare for HS clock transmission.
1.4.3 HS Entry: CLK TX TCLK-PREPARE+TCLK-ZERO	554	TCLK-PREPARE + Time for lead HS-0 drive period before starting Clock.
1.4.4 HS Clock TX Differential Voltage(VOD0 Pulse)	18131	HS clock transmitter differential voltage.

Table 4 Test IDs and Names (continued)

Name	TestID	Description
1.4.4 HS Clock TX Differential Voltage(VOD1 Pulse)	18132	HS clock transmitter differential voltage.
1.4.5 HS Clock TX Differential Voltage Mismatch (Pulse)	18141	VOD mismatch when output is Differential-1 or Differential-0.
1.4.6 HS Clock TX Single Ended Output High Voltage(VOHHS Pulse)	18151	HS Single Ended output high voltage.
1.4.7 HS Clock TX Static Common Mode Voltage(Vcmtx)	1811	HS transmit static common-mode voltage for Clock.
1.4.8 HS Clock TX Vcmtx Mismatch	1812	VCMTX mismatch when output is Differential-1 or Differential-0.
1.4.9 HS Clock TX Common-Level Variations Between 50-450MHz (VCMTX(LF))	1819	Common-level variation between 50-450MHz.
1.5.1 HS Entry: CLK TX TCLK-PRE	551	Time that the HS clock shall be driven prior to any associated Data Lane beginning the transition time from LP to HS mode. ComplianceTimingMin is based on 8*UI.
1.5.2 HS Exit: CLK TX TCLK-POST	555	Time that the transmitter shall continue sending HS clock after the last associated Data Lane has transitioned to LP mode. ComplianceTimingMin is based on 60ns+52*UI.
1.5.3 HS Clock Rising Edge Alignment to First Payload Bit	912	Test will pass when there is a rising edge during the first payload bit. "First Payload Bit Alignment" will be set to '0' ONLY when a rising edge is detected during the first payload bit.
1.5.4 Data-to-Clock Skew (TSKEW(TX))(Max,Min)	913	Data to Clock Skew [measured at transmitter].
1.5.4 Data-to-Clock Skew (TSKEW(TX))(Mean)	9131	Data to Clock Skew [measured at transmitter].
HS Data Eye Height (Informative)	915	HS Data Eye Height
HS Data Eye Width (Informative)	916	HS Data Eye Width.

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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