Keysight D9010EBZC 10GBASE-T Compliance Application

KEYSIGHT

PROGRAMMER'S REFERENCE

Notices

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In This Book

This book is your guide to programming the Keysight Technologies D9010EBZC 10GBASE-T 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 9, Chapter 3, “Test Names and IDs,” starting on page 19, and Chapter 4, “Instruments,” starting on page 27 provide information specific to programming the D9010EBZC 10GBASE-T 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/test application. The programming commands provide the means of remote control. Basic operations that you can do remotely with a computer and a compliance/test 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/test 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 D9010EBZC 10GBASE-T Compliance Application uses Remote Interface Revision 6.12. 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 D9010EBZC 10GBASE-T 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
Configure	#Averages (PSD Test)	PwrSpecDenAvgs	(Accepts user-defined text), 10, 20, 30, 40, 50	Select number of averages for PSD test using Spectrum Analyzer.
Configure	#Averages (Power Level Test)	PwrLvlAvgs	(Accepts user-defined text), 10, 20, 30, 40, 50	Select number of averages for Power Level Test using Spectrum Analyzer.
Configure	#Averages (Transmitter Linearity Test)	TransLinAvgs	(Accepts user-defined text), OFF, 10, 20, 30, 40, 50	Select number of averages for Transmitter Linearity Test using Spectrum Analyzer.
Configure	Apply Bandpass Filter for Jitter Tests	JitterBPF	True, False	Apply a bandpass filter to the input of the Jitter Tests.
Configure	Band Pass Filter Bandwidth	HPFBandwidth	(Accepts user-defined text), 100E+3, 500E+3, 1E+6, 2E+6, 3E+6, 4E+6, 5E+6, 10E+6	Select the Bandwidth of the Band Pass Filter.
Configure	Band Pass Filter Center Frequency	CenterFreq	(Accepts user-defined text), 1E+6, 5E+6, 10E+6, 50E+6, 100E+6, 200E+6, 300E+6	Select the Center Frequency of the Band Pass Filter.
Configure	Command File (PSD Test)	PwrSpecDenComdFile	ESA, MXA, EXA, PSA, Script1, Script2, Script3	Select the command file for Spectrum Analyzer.

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
Configure	Command File (Power Level Test)	PwrLvlComdFile	ESA, MXA, EXA, PSA, Script1, Script2, Script3	Select the command file for Spectrum Analyzer.
Configure	Command File (Transmitter Linearity Test)	TransLinComdFile	ESA, MXA, EXA, PSA, Script1, Script2, Script3	Select the command file for Spectrum Analyzer.
Configure	Connection Pair (Negative)	DNChan	CHAN1, CHAN2, CHAN3, CHAN4	Select the channel number for connection pair negative.
Configure	Connection Pair (Positive)	DPChan	CHAN1, CHAN2, CHAN3, CHAN4	Select the channel number for connection pair positive.
Configure	Frequency Resolution Step (PSD Test)	PwrSpecFreqRes	200E+03,300E+03, 400E+03,500E+03, 600E+03,700E+03, 800E+03,900E+03, 1E+06, 2E+06, 3E+06, 4E+06, 5E+06	Select the frequency resolution step use in plotting the graph for external Spectrum Analyzer. For smaller step, test run will be longer to acquire the data. Unit: Hz.
Configure	Input Impedance (Power Level Test)	PwrLvlInputImpedance	1, 2	Select the input impedance for the power level test.
Configure	Intermodulation Tolerance (Transmitter Linearity Test)	TransLinInterTol	100E+03,200E+03, 300E+03,400E+03, 500E+03,600E+03, 700E+03,800E+03, 900E+03, 1E+06, 1.1E+06, 1.2E+06	Select the tolerance for intermodulation.
Configure	Jitter Type	JitterType	period, TIE	Select the type of Jitter for Transmitter Timing Jitter Test.
Configure	MDIPairB_ReturnLoss	MDIPairB_ReturnLoss	(Accepts user-defined text)	To enable RPI access to Return Loss data files.
Configure	MDIPairC_ReturnLoss	MDIPairC_ReturnLoss	(Accepts user-defined text)	To enable RPI access to Return Loss data files.
Configure	MDIPairD_ReturnLoss	MDIPairD_ReturnLoss	(Accepts user-defined text)	To enable RPI access to Return Loss data files.
Configure	MDI_ReturnLoss	MDI_ReturnLoss	(Accepts user-defined text)	To enable RPI access to Return Loss data files.
Configure	Maximum Output Droop Negative For Pair A	WavDroopNegPath_PairA	(Accepts user-defined text), -	Set the path for the waveform to be used for the Maximum Output Droop Negative test.

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
Configure	Maximum Output Droop Negative For Pair B	WavDroopNegPath_PairB	(Accepts user-defined text), -	Set the path for the waveform to be used for the Maximum Output Droop Negative test.
Configure	Maximum Output Droop Negative For Pair C	WavDroopNegPath_PairC	(Accepts user-defined text), -	Set the path for the waveform to be used for the Maximum Output Droop Negative test.
Configure	Maximum Output Droop Negative For Pair D	WavDroopNegPath_PairD	(Accepts user-defined text), -	Set the path for the waveform to be used for the Maximum Output Droop Negative test.
Configure	Maximum Output Droop Positive For Pair A	WavDroopPosPath_PairA	(Accepts user-defined text), -	Set the path for the waveform to be used for the Maximum Output Droop Positive test.
Configure	Maximum Output Droop Positive For Pair B	WavDroopPosPath_PairB	(Accepts user-defined text), -	Set the path for the waveform to be used for the Maximum Output Droop Positive test.
Configure	Maximum Output Droop Positive For Pair C	WavDroopPosPath_PairC	(Accepts user-defined text), -	Set the path for the waveform to be used for the Maximum Output Droop Positive test.
Configure	Maximum Output Droop Positive For Pair D	WavDroopPosPath_PairD	(Accepts user-defined text), -	Set the path for the waveform to be used for the Maximum Output Droop Positive test.
Configure	Memory Depth of Power Test	MemDepth_Power	8388608, 4194304, 2097152, 1048576	Select the memory depth of the oscilloscope for power tests.
Configure	Memory Depth of Transmitter Linearity Test	MemDepth_TransLin	8388608, 4194304, 2097152, 1048576, 524288	Select the memory depth of the oscilloscope for Transmitter Linearity tests.
Configure	Offline Mode Enabled	OfflineEnable	0.0, 1.0	Enable using saved waveform to run the test.
Configure	Power Tests (PSD & Power Level test) For Pair A	WavTM5Path_PairA	(Accepts user-defined text), -	Set the path for the waveform to be used for the PSD & Power Level test.
Configure	Power Tests (PSD & Power Level test) For Pair B	WavTM5Path_PairB	(Accepts user-defined text), -	Set the path for the waveform to be used for the PSD & Power Level test.
Configure	Power Tests (PSD & Power Level test) For Pair C	WavTM5Path_PairC	(Accepts user-defined text), -	Set the path for the waveform to be used for the PSD & Power Level test.

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
Configure	Power Tests (PSD & Power Level test) For Pair D	WavTM5Path_PairD	(Accepts user-defined text), -	Set the path for the waveform to be used for the PSD & Power Level test.
Configure	Reference Level (PSD Test)	PwrSpecDenRefLev	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20	Select the reference level for Spectrum Analyzer.
Configure	Reference Level (Power Level Test)	PwrLvlRefLev	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20	Select the reference level for Spectrum Analyzer.
Configure	Reference Level (Transmitter Linearity Test)	TransLinRefLev	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20	Select the reference level for Spectrum Analyzer.
Configure	Resolution Bandwidth (PSD Test)	PwrSpecDenResBW	10E+03, 30E+03, 100E+03,300E+03, 400E+03,500E+03, 600E+03,700E+03, 800E+03,900E+03, 1E+06, 2E+06, 3E+06, 4E+06, 5E+06	Select the resolution bandwidth for Spectrum Analyzer.
Configure	Resolution Bandwidth (Power Level Test)	PwrLvlResBW	10E+03, 30E+03, 100E+03,300E+03, 400E+03,500E+03, 600E+03,700E+03, 800E+03,900E+03, 1E+06, 2E+06, 3E+06	Select the resolution bandwidth for Spectrum Analyzer.
Configure	Resolution Bandwidth (Transmitter Linearity Test)	TransLinResBW	(Accepts user-defined text), 10E+03, 50E+03, 100E+03,200E+03, 300E+03,400E+03, 500E+03	Select the resolution bandwidth for spectral analysis. Note: This config value will be changed depending on the datarate. 5G mode will be 50% of this value, and 2.5G mode will be 25% of this value.
Configure	Sampling Rate	SamplingRate	20E+9, 40E+9, 32E+9, 64E+9, 8e9, 16e9	Select the Sampling Rate to use.
Configure	Signal Check	EnableSignalCheck	1.0, 0.0	When signal check is enabled, the input signal is pre-tested and verified to be within a reasonable range of timing and voltage limits. This can be useful for detecting problems like cabling errors before a test is run.

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
Configure	Signal Type	cmbConnectionType	Differential, Single-ended	Select the type of signal supplied to the oscilloscope. Differential Signal - 2 channels is needed and only a single 10G pair can be connected at once. Single-Ended Signal - each pair requires only 1 channel and up to 4 pairs can be connected at once. A balun can be used to convert a single-ended signal to differential signal.
Configure	Spectral Windowing (PSD Test)	PwrSpecDenWindow	1, 2, 3, 4	Select the windowing function applied to the input data segment before implement FFT using oscilloscope.
Configure	Spectral Windowing (Power Level Test)	PwrLvlWindow	1, 2, 3, 4	Select the windowing function applied to the input data segment before implement FFT using oscilloscope.
Configure	Spectral Windowing (Transmitter Linearity Test)	TransLinWindow	1, 2, 3, 4	Select the windowing function applied to the input data segment before implement FFT using oscilloscope.
Configure	Start Frequency (PSD Test)	PwrSpecDenStarFreq	0, 30E+03, 10E+04, 1E+06, 2E+06, 3E+06, 5E+06, 10E+06, 20E+06, 30E+06	Select the start frequency for Spectrum Analyzer.
Configure	Start Frequency (Power Level Test)	PwrLvlStarFreq	300E+03, 10E+04, 1E+06, 2E+06, 3E+06, 5E+06, 10E+06, 20E+06, 30E+06	Select the start frequency for Spectrum Analyzer.
Configure	Start Frequency (Transmitter Linearity Test)	TransLinStarFreq	1E+06, 2E+06, 3E+06, 5E+06, 10E+06, 20E+06, 30E+06	Select the start frequency of the measurement range.
Configure	Stop Frequency (PSD Test)	PwrSpecDenStopFreq	1E+09, 2E+09, 3E+09, 4E+09, 5E+09, 6E+09, 7E+09	Select the stop frequency for Spectrum Analyzer.

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
Configure	Stop Frequency (Power Level Test)	PwrLvlStopFreq	200E+06,300E+06, 400E+06,500E+06, 600E+06,700E+06, 800E+06,900E+06, 1E+09, 2E+09, 3E+09	Select the stop frequency for Spectrum Analyzer.
Configure	Stop Frequency (Transmitter Linearity Test)	TransLinStopFreq	350E+06,360E+06, 370E+06,380E+06, 390E+06,400E+06, 450E+06	Select the stop frequency of the measurement range. Note: This config value will be changed depending on the datarate. 5G mode will be 50% of this value, and 2.5G mode will be 25% of this value.
Configure	Supress change pair prompt	10GSupChangeConn	False, True	Prevent the prompt to change pairs from being shown when a single pair is selected.
Configure	Test Pair	10GTestPair	ALL, Pair A, Pair B, Pair C, Pair D	Determines the 10GBase-T pair or pairs tested. This setting applies to all tests.
Configure	Test Type (PSD Test)	PwrSpecDenTestType	Auto, File, Manual	Select the test type for Power Spectral Density tests.
Configure	Test Type (Power Level Test)	PwrLvlTestType	Auto, File, Manual	Select the test type for Power Level tests.
Configure	Test Type (Transmitter Linearity Test)	TransLinTestType	Auto, File, Manual	Select the test type for Transmitter Linearity tests.
Configure	Timeout (Power Level Test)	PwrLvlTimeOut	30000, 60000, 100000, 150000, 200000	Set the timeout for the power level test.
Configure	Timeout (Transmitter Linearity Test)	TransLinTestTimeOut	30000, 60000, 100000, 150000, 200000	Set the timeout for the Transmitter Linearity Test.
Configure	Transmitter Timing Jitter & Transmit Clock Frequency Test For Pair A	WavTM2Path_PairA	(Accepts user-defined text), -	Set the path for the waveform to be used for the Transmitter Timing Jitter (Master) test.
Configure	Transmitter Timing Jitter & Transmit Clock Frequency Test For Pair B	WavTM2Path_PairB	(Accepts user-defined text), -	Set the path for the waveform to be used for the Transmitter Timing Jitter (Master) test.

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
Configure	Transmitter Timing Jitter & Transmit Clock Frequency Test For Pair C	WavTM2Path_PairC	(Accepts user-defined text), -	Set the path for the waveform to be used for the Transmitter Timing Jitter (Master) test.
Configure	Transmitter Timing Jitter & Transmit Clock Frequency Test For Pair D	WavTM2Path_PairD	(Accepts user-defined text), -	Set the path for the waveform to be used for the Transmitter Timing Jitter (Master) test.
Configure	Transmitter Timing Jitter (Slave)	WavTM3Path_PairD	(Accepts user-defined text), -	Set the path for the waveform to be used for the Transmitter Timing Jitter (Slave) test.
Configure	Two Tone Frequency Pair 1 For Pair A	WavTM4DT1Path_PairA	(Accepts user-defined text), -	Set the path for the waveform to be used for the Two Tone Frequency Pair 1 test.
Configure	Two Tone Frequency Pair 1 For Pair B	WavTM4DT1Path_PairB	(Accepts user-defined text), -	Set the path for the waveform to be used for the Two Tone Frequency Pair 1 test.
Configure	Two Tone Frequency Pair 1 For Pair C	WavTM4DT1Path_PairC	(Accepts user-defined text), -	Set the path for the waveform to be used for the Two Tone Frequency Pair 1 test.
Configure	Two Tone Frequency Pair 1 For Pair D	WavTM4DT1Path_PairD	(Accepts user-defined text), -	Set the path for the waveform to be used for the Two Tone Frequency Pair 1 test.
Configure	Two Tone Frequency Pair 2 For Pair A	WavTM4DT2Path_PairA	(Accepts user-defined text), -	Set the path for the waveform to be used for the Two Tone Frequency Pair 2 test.
Configure	Two Tone Frequency Pair 2 For Pair B	WavTM4DT2Path_PairB	(Accepts user-defined text), -	Set the path for the waveform to be used for the Two Tone Frequency Pair 2 test.
Configure	Two Tone Frequency Pair 2 For Pair C	WavTM4DT2Path_PairC	(Accepts user-defined text), -	Set the path for the waveform to be used for the Two Tone Frequency Pair 2 test.
Configure	Two Tone Frequency Pair 2 For Pair D	WavTM4DT2Path_PairD	(Accepts user-defined text), -	Set the path for the waveform to be used for the Two Tone Frequency Pair 2 test.
Configure	Two Tone Frequency Pair 3 For Pair A	WavTM4DT3Path_PairA	(Accepts user-defined text), -	Set the path for the waveform to be used for the Two Tone Frequency Pair 3 test.

Table 2 Configuration Variables and Values (continued)

GUI Location	Label	Variable	Values	Description
Configure	Two Tone Frequency Pair 3 For Pair B	WavTM4DT3Path_PairB	(Accepts user-defined text), -	Set the path for the waveform to be used for the Two Tone Frequency Pair 3 test.
Configure	Two Tone Frequency Pair 3 For Pair C	WavTM4DT3Path_PairC	(Accepts user-defined text), -	Set the path for the waveform to be used for the Two Tone Frequency Pair 3 test.
Configure	Two Tone Frequency Pair 3 For Pair D	WavTM4DT3Path_PairD	(Accepts user-defined text), -	Set the path for the waveform to be used for the Two Tone Frequency Pair 3 test.
Configure	Two Tone Frequency Pair 4 For Pair A	WavTM4DT4Path_PairA	(Accepts user-defined text), -	Set the path for the waveform to be used for the Two Tone Frequency Pair 4 test.
Configure	Two Tone Frequency Pair 4 For Pair B	WavTM4DT4Path_PairB	(Accepts user-defined text), -	Set the path for the waveform to be used for the Two Tone Frequency Pair 4 test.
Configure	Two Tone Frequency Pair 4 For Pair C	WavTM4DT4Path_PairC	(Accepts user-defined text), -	Set the path for the waveform to be used for the Two Tone Frequency Pair 4 test.
Configure	Two Tone Frequency Pair 4 For Pair D	WavTM4DT4Path_PairD	(Accepts user-defined text), -	Set the path for the waveform to be used for the Two Tone Frequency Pair 4 test.
Configure	Two Tone Frequency Pair 5 For Pair A	WavTM4DT5Path_PairA	(Accepts user-defined text), -	Set the path for the waveform to be used for the Two Tone Frequency Pair 5 test.
Configure	Two Tone Frequency Pair 5 For Pair B	WavTM4DT5Path_PairB	(Accepts user-defined text), -	Set the path for the waveform to be used for the Two Tone Frequency Pair 5 test.
Configure	Two Tone Frequency Pair 5 For Pair C	WavTM4DT5Path_PairC	(Accepts user-defined text), -	Set the path for the waveform to be used for the Two Tone Frequency Pair 5 test.
Configure	Two Tone Frequency Pair 5 For Pair D	WavTM4DT5Path_PairD	(Accepts user-defined text), -	Set the path for the waveform to be used for the Two Tone Frequency Pair 5 test.
Configure	Type of connection	TypeConn	Probe	This is only applied for Single-Ended Signal.
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 <= 99	Specify N using the 'Minimum required margin %' control.
Set Up	DisturbingSignal	DisturbingSignal	0.0, 1.0	DisturbingSignal On Off selection
Set Up	OfflineEnable	OfflineEnable	0.0, 1.0	Enable testing using saved waveforms.
Set Up	Remote Connection	RemoteConnection	None, SASICL, SAIP, NASICL, NAIP, PGSICL, PGIP	
Set Up	Spectral Analysis	cmbSpecAnalysis	Use Oscilloscope, Use Spectrum Analyzer	Select the instrument used for spactral analysis. Spectral Analysis
Set Up	Technology Rate	TechRate	10G	
Set Up	Technology Spec	TechSpec	IEEE, MGBase-T, NBase-T	
Set Up	ckBAmpCorrectDat a	ckBAmpCorrectData	0.0, 1.0	Enable Balun Correction
Set Up	ckBypassVNACal	ckBypassVNACal	0.0, 1.0	Bypass VNA Calibration checkBoxBypassCal
Set Up	ckUSBMPC	ckUSBMPC	0.0, 1.0	
Set Up	pcbRemoteSicl	pcbRemoteSicl		Set GPIB sicl address
Set Up	pcboReturnLoss	ReturnLossTest	Connect to External Instrument, Use Data File	VNA Connection

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. Listed at the end, you may also find:

- Deprecated IDs and their replacements.
- Macro IDs which may be used to select multiple related tests at the same time.

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
MDI Return Loss	110	To verify the MDI Return Loss is within the conformance limits specified in 55.8.2.1 of IEEE Std. 802.3 - 2018 Edition.
MDI Return Loss	3110	To verify the MDI Return Loss is within the conformance limits specified in IEEE Std. 802.3 - 2018 Edition, 2.5G/5GBASE-T, Section 126.8.2.1 MDI return loss.
MDI Return Loss	4110	To verify the MDI Return Loss is within the conformance limits specified in IEEE Std. 802.3 - 2018 Edition, 2.5G/5GBASE-T, Section 126.8.2.1 MDI return loss.
MDI Return Loss	1110	To verify the MDI Return Loss is within the conformance limits specified in MGBASE-T Ethernet Specification, MGBASE-T-TI101-R.
MDI Return Loss	2110	To verify the MDI Return Loss is within the conformance limits specified in MGBASE-T Ethernet Specification, MGBASE-T-TI101-R.
Maximum Output Droop Negative	1102	The magnitude of both the positive and negative droop of the device under test (DUT) must be within the conformance limits specified in 55.5.3.1 of IEEE Std. 802.3 - 2012 Edition.
Maximum Output Droop Negative	2102	The magnitude of both the positive and negative droop of the device under test (DUT) must be within the conformance limits specified in 55.5.3.1 of IEEE Std. 802.3 - 2012 Edition.
Maximum Output Droop Negative	102	The magnitude of both the positive and negative droop of the device under test (DUT) must be within the conformance limits specified in 55.5.3.1 of IEEE Std. 802.3 - 2018 Edition.
Maximum Output Droop Negative	3102	The magnitude of both the positive and negative droop of the device under test (DUT) must be within the conformance limits specified in IEEE Std. 802.3 - 2018 Edition.
Maximum Output Droop Negative	4102	The magnitude of both the positive and negative droop of the device under test (DUT) must be within the conformance limits specified in IEEE Std. 802.3 - 2018 Edition.
Maximum Output Droop Positive	1101	The magnitude of both the positive and negative droop of the device under test (DUT) must be within the conformance limits specified in 55.5.3.1 of IEEE Std. 802.3 - 2012 Edition.

Table 4 Test IDs and Names (continued)

Name	TestID	Description
Maximum Output Droop Positive	2101	The magnitude of both the positive and negative droop of the device under test (DUT) must be within the conformance limits specified in 55.5.3.1 of IEEE Std. 802.3 - 2012 Edition.
Maximum Output Droop Positive	101	The magnitude of both the positive and negative droop of the device under test (DUT) must be within the conformance limits specified in 55.5.3.1 of IEEE Std. 802.3 - 2018 Edition.
Maximum Output Droop Positive	3101	The magnitude of both the positive and negative droop of the device under test (DUT) must be within the conformance limits specified in IEEE Std. 802.3 - 2018 Edition.
Maximum Output Droop Positive	4101	The magnitude of both the positive and negative droop of the device under test (DUT) must be within the conformance limits specified in IEEE Std. 802.3 - 2018 Edition.
Power Level	112	To verify that the transmitter power level is within the conformance limits specified in 55.5.3.4 of IEEE Std. 802.3 - 2018 Edition.
Power Level	3112	To verify that the transmitter power level is within the conformance limits specified in IEEE Std. 802.3 - 2018 Edition.
Power Level	4112	To verify that the transmitter power level is within the conformance limits specified in IEEE Std. 802.3 - 2018 Edition.
Power Level	1112	To verify that the transmitter power level is within the conformance limits specified in MGBASE-T Ethernet Specification, MGBASE-T-TI101-R.
Power Level	2112	To verify that the transmitter power level is within the conformance limits specified in MGBASE-T Ethernet Specification, MGBASE-T-TI101-R.
Transmit Clock Frequency	113	The transmit clock frequency of the device under test (DUT) must be within the conformance limits specified in 55.5.3.5 of IEEE Std. 802.3 - 2018 Edition.
Transmit Clock Frequency	3113	The transmit clock frequency of the device under test (DUT) must be within the conformance limits specified in IEEE Std. 802.3 - 2018 Edition.
Transmit Clock Frequency	4113	The transmit clock frequency of the device under test (DUT) must be within the conformance limits specified in IEEE Std. 802.3 - 2018 Edition.
Transmit Clock Frequency	1113	The transmit clock frequency of the device under test (DUT) must be within the conformance limits specified in MGBASE-T Ethernet Specification, MGBASE-T-TI101-R.
Transmit Clock Frequency	2113	The transmit clock frequency of the device under test (DUT) must be within the conformance limits specified in MGBASE-T Ethernet Specification, MGBASE-T-TI101-R.

Table 4 Test IDs and Names (continued)

Name	TestID	Description
Transmitter Power Spectral Density	103	To verify that the transmitter power spectral density meets the conformance limits specified in 55.5.3.4 of IEEE Std. 802.3 - 2018 Edition.
Transmitter Power Spectral Density	3103	To verify that the transmitter power spectral density meets the conformance limits specified in IEEE Std. 802.3 - 2018 Edition.
Transmitter Power Spectral Density	4103	To verify that the transmitter power spectral density meets the conformance limits specified in IEEE Std. 802.3 - 2018 Edition.
Transmitter Power Spectral Density	1103	To verify that the transmitter power spectral density meets the conformance limits specified in MGBASE-T Ethernet Specification, MGBASE-T-TI101-R.
Transmitter Power Spectral Density	2103	To verify that the transmitter power spectral density meets the conformance limits specified in MGBASE-T Ethernet Specification, MGBASE-T-TI101-R.
Transmitter Timing Jitter (Master)	1100	The transmitter timing jitter of the device under test (DUT) must be less than the conformance limits specified in 55.5.3.3 of IEEE Std. 802.3 - 2012 Edition.
Transmitter Timing Jitter (Master)	2100	The transmitter timing jitter of the device under test (DUT) must be less than the conformance limits specified in 55.5.3.3 of IEEE Std. 802.3 - 2012 Edition.
Transmitter Timing Jitter (Master)	100	The transmitter timing jitter of the device under test (DUT) must be less than the conformance limits specified in 55.5.3.3 of IEEE Std. 802.3 - 2018 Edition.
Transmitter Timing Jitter (Master)	3100	The transmitter timing jitter of the device under test (DUT) must be less than the conformance limits specified in IEEE Std. 802.3 - 2018 Edition.
Transmitter Timing Jitter (Master)	4100	The transmitter timing jitter of the device under test (DUT) must be less than the conformance limits specified in IEEE Std. 802.3 - 2018 Edition.
Transmitter Timing Jitter (Slave)	1104	The transmitter timing jitter of the device under test (DUT) must be less than the conformance limits specified in 55.5.3.3 of IEEE Std. 802.3 - 2012 Edition.
Transmitter Timing Jitter (Slave)	2104	The transmitter timing jitter of the device under test (DUT) must be less than the conformance limits specified in 55.5.3.3 of IEEE Std. 802.3 - 2012 Edition.
Transmitter Timing Jitter (Slave)	104	The transmitter timing jitter of the device under test (DUT) must be less than the conformance limits specified in 55.5.3.3 of IEEE Std. 802.3 - 2018 Edition.
Transmitter Timing Jitter (Slave)	3104	The transmitter timing jitter of the device under test (DUT) must be less than the conformance limits specified in IEEE Std. 802.3 - 2018 Edition.

Table 4 Test IDs and Names (continued)

Name	TestID	Description
Transmitter Timing Jitter (Slave)	4104	The transmitter timing jitter of the device under test (DUT) must be less than the conformance limits specified in IEEE Std. 802.3 - 2018 Edition.
Two Tone Frequency Pair 1	3105	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 126.5.3.2 of IEEE Std. 802.3 - 2018 Edition.
Two Tone Frequency Pair 1	4105	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 126.5.3.2 of IEEE Std. 802.3 - 2018 Edition.
Two Tone Frequency Pair 1	1105	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 55.5.3.2 of IEEE Std. 802.3 - 2012 Edition.
Two Tone Frequency Pair 1	2105	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 55.5.3.2 of IEEE Std. 802.3 - 2012 Edition.
Two Tone Frequency Pair 1	105	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 55.5.3.2 of IEEE Std. 802.3 - 2018 Edition.
Two Tone Frequency Pair 1 Transmitter Nonlinear Distortion	4115	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 126.5.3.2 of IEEE Std. 802.3 - 2018 Edition.
Two Tone Frequency Pair 2	3106	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 126.5.3.2 of IEEE Std. 802.3 - 2018 Edition.
Two Tone Frequency Pair 2	4106	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 126.5.3.2 of IEEE Std. 802.3 - 2018 Edition.
Two Tone Frequency Pair 2	1106	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 55.5.3.2 of IEEE Std. 802.3 - 2012 Edition.
Two Tone Frequency Pair 2	2106	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 55.5.3.2 of IEEE Std. 802.3 - 2012 Edition.
Two Tone Frequency Pair 2	106	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 55.5.3.2 of IEEE Std. 802.3 - 2018 Edition.
Two Tone Frequency Pair 2 Transmitter Nonlinear Distortion	4116	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 126.5.3.2 of IEEE Std. 802.3 - 2018 Edition.

Table 4 Test IDs and Names (continued)

Name	TestID	Description
Two Tone Frequency Pair 3	3107	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 126.5.3.2 of IEEE Std. 802.3 - 2018 Edition.
Two Tone Frequency Pair 3	4107	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 126.5.3.2 of IEEE Std. 802.3 - 2018 Edition.
Two Tone Frequency Pair 3	1107	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 55.5.3.2 of IEEE Std. 802.3 - 2012 Edition.
Two Tone Frequency Pair 3	2107	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 55.5.3.2 of IEEE Std. 802.3 - 2012 Edition.
Two Tone Frequency Pair 3	107	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 55.5.3.2 of IEEE Std. 802.3 - 2018 Edition.
Two Tone Frequency Pair 3 Transmitter Nonlinear Distortion	4117	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 126.5.3.2 of IEEE Std. 802.3 - 2018 Edition.
Two Tone Frequency Pair 4	3108	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 126.5.3.2 of IEEE Std. 802.3 - 2018 Edition.
Two Tone Frequency Pair 4	4108	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 126.5.3.2 of IEEE Std. 802.3 - 2018 Edition.
Two Tone Frequency Pair 4	1108	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 55.5.3.2 of IEEE Std. 802.3 - 2012 Edition.
Two Tone Frequency Pair 4	2108	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 55.5.3.2 of IEEE Std. 802.3 - 2012 Edition.
Two Tone Frequency Pair 4	108	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 55.5.3.2 of IEEE Std. 802.3 - 2018 Edition.
Two Tone Frequency Pair 4 Transmitter Nonlinear Distortion	4118	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 126.5.3.2 of IEEE Std. 802.3 - 2018 Edition.
Two Tone Frequency Pair 5	3109	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 126.5.3.2 of IEEE Std. 802.3 - 2018 Edition.

Table 4 Test IDs and Names (continued)

Name	TestID	Description
Two Tone Frequency Pair 5	4109	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 126.5.3.2 of IEEE Std. 802.3 - 2018 Edition.
Two Tone Frequency Pair 5	1109	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 55.5.3.2 of IEEE Std. 802.3 - 2012 Edition.
Two Tone Frequency Pair 5	2109	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 55.5.3.2 of IEEE Std. 802.3 - 2012 Edition.
Two Tone Frequency Pair 5	109	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 55.5.3.2 of IEEE Std. 802.3 - 2018 Edition.
Two Tone Frequency Pair 5 Transmitter Nonlinear Distortion	4119	To verify that the spurious free dynamic range of the transmitter meets the conformance limits specified in 126.5.3.2 of IEEE Std. 802.3 - 2018 Edition.

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
pg	The signal source.
pwrsupply	The power supply.
VNA	The Vector Network Analyzer.
sa	The Spectrum Analyzer.
Infiniium	The primary oscilloscope.
pulsegen	The pulsegen.

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