

TekExpress® Ethernet Electrical Testing

Application Help

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Contents

Contacting Tektronix	
List of Figures	7
List of Tables	
Welcome	
Getting help and support	
Conventions	
Related documentation	
Technical support	
Getting started	14
Minimum system requirements	
Instruments and accessories required	
Installing the software	
Application directories	
File name extensions	
View software version	
Operating basics	
Launch the application	
Application panels overview	
Global application controls	
Application controls	
Options menu overview	
TekExpress instrument control settings	
View connected instruments	
Configure email settings	
Setup panel	
Setup panel overview	
Set DUT parameters	
Select tests	
Set acquisition tab parameters	
Set configuration tab parameters	
Set preferences tab parameters	
Status panel	
Status panel overview	
Results panel	
Results panel overview	
View test-related files	
Plots panel.	58
Plots panel overview.	
Reports panel	
Reports panel overview	
Select report options	
View a report	62
Report contents	
Running tests	
•	

100BASE-T-Mult Pair connection diagram. 79 100BASE-T connection diagram. 89 10BASE-T connection diagram. 83 Prerequisite. 96 Compensate the signal path. 96 Compensate the signal path. 97 View test results. 97 Saving and recalling test setup. 98 Save a test setup files overview. 98 Save a test setup. 98 Create a test setup from default settings. 99 Create a test setup from default setting one. 99 SCPI Commands. 100 About SCPI commands. 100 Socket configuration for SCPI commands. 100 TEKEX.P*CDPC? 107 TEKEX.P*COURE_MODE 107 TEKEX.P*ACQUIRE_MODE 107 TEKEX.P*ACQUIRE_MODE 108 TEKEX.P*COURE_MODE 109 TEKEX.P*INFO? 108 TEKEX.P*INFO? 108 TEKEX.P*INFO? 109 TEKEX.P*INFO? 109 TEKEX.P*INFO? 109 TEKEX.P	1000BASE-T connection diagram	64
100BASE-T connection diagram. 98 10BASE-T connection diagram. 93 Prerequisite. 96 Compensate the signal path. 96 Running tests. 97 View test results. 97 Saving and recalling test setup. 98 Test setup files overview. 98 Save a test setup from default settings. 98 Create a test setup from default settings. 99 SCPI Commands. 100 About SCPI commands. 100 Socket configuration for SCPI commands. 100 Socket configuration for SCPI commands. 100 TEKEX.Pr.OPC? 107 TEKEX.Pr.ACQUIRE, MODE 107 TEKEX.Pr.NPO? 108 TEKEX.Pr.NPO? 108 TEKEX.Pr.NPO? 109 TEKEX.Pr.NPO? 109 TEKEX.Pr.NPO? 109 TEKEX.Pr.NPO? 1	1000BASE-T-Multi Pair connection diagram	
10BASE-T connection diagram. 93 Prerequisite. 96 Compensate the signal path. 96 Running tests. 97 Saving and recalling test setup. 98 Test setup files overview. 98 Save a test setup. 98 Open (load) a saved test setup. 98 Create a test setup from default settings. 98 Create a test setup from default settings. 99 SCPI Commands. 100 About SCPI commands. 100 Socket configuration for SCPI commands. 100 TekEXP.*DN? 106 TEKEXP.*CQUIRE_MODE 107 TEKEXP.ACQUIRE_MODE? 107 TEKEXP.ACQUIRE_MODE? 107 TEKEXP.NRO? 108 TEKEXP.NRO? 108 TEKEXP.INSTRUMENT. 108 TEKEXP.INSTRUMENT. 109 TEKEXP.NDE? 109 TEKEXP.NDE 110 TEKEXP.NDE 110 TEKEXP.NDE? 110 TEKEXP.NDE 110 TEKEXP.NDE 110 TEKEXP.NDE 110 </td <td>100BASE-T connection diagram</td> <td></td>	100BASE-T connection diagram	
Prerequisite 96 Compensate the signal path	10BASE-T connection diagram	
Compensate the signal path	Prereguisite	
Running fests. 97 View test results. 97 Saving and recalling test setup. 98 Test setup files overview. 98 Save a test setup. 98 Open (Ioda) a saved test setup. 98 Create a test setup using an existing one. 99 SCPI Commands. 100 About SCPI command. 100 Socket configuration for SCPI commands. 100 Socket configuration for SCPI commands. 100 TEKEXP*OPC? 107 TEKEXP*OPC? 107 TEKEXP-ACQUIRE_MODE 107 TEKEXP-ACQUIRE_MODE? 107 TEKEXP-INSTRUMENT 108 TEKEXP-INSTRUMENT 108 TEKEXP-INSTRUMENT? 109 TEKEXP-NODE? 110	Compensate the signal path	
View test results.	Running tests	
Saving and recalling test setup. 98 Test setup files overview. 98 Save a test setup. 98 Open (load) a saved test setup. 98 Create a test setup from default settings. 98 Create a test setup using an existing one. 99 SCPI Commands. 100 About SCPI command. 100 Socket configuration for SCPI commands. 100 TEKEXP-'DNP. 106 TEKEXP-'DNP. 106 TEKEXP-'DNP. 107 TEKEXP-'DNP. 106 TEKEXP-'DNP. 107 TEKEXP-SQUIRE_MODE. 107 TEKEXP-INFO? 107 TEKEXP-INSTRUMENT 108 TEKEXP-INSTRUMENT? 108 TEKEXP-INSTRUMENT? 109 TEKEXP-INSTRUMENT? 109 TEKEXP-INSTRUMENT? 109 TEKEXP-INSTRUMENT? 109 TEKEXP-INSTRUMENT? 109 TEKEXP-MODE? 110 TEKEXP-POPUP? 110 TEKEXP-POPUP? 110 TEKEXP-REPORT? 111 TEKEXP-REPORT? 11	View test results	
Test setup files overview. 98 Save a test setup. 98 Open (load) a saved test setup. 98 Create a test setup from default settings. 98 Create a test setup using an existing one. 99 SCPI Commands. 100 About SCPI command. 100 Socket configuration for SCPI commands. 100 TEKEXP.*OPC? 107 TEKEXP.*OPC? 107 TEKEXP.*OPC? 107 TEKEXP.*OPC? 107 TEKEXP.ACQUIRE_MODE 107 TEKEXP.ACQUIRE_MODE? 107 TEKEXP.ACQUIRE_MODE? 108 TEKEXP.INSTRUMENT. 108 TEKEXP.INSTRUMENT? 109 TEKEXP.INSTRUMENT? 109 TEKEXP.LASTERROR? 109 TEKEXP.POPUP 110 TEKEXP.POPUP 110 TEKEXP.POPUP 110 TEKEXP.REPORT. 112 TEKEXP.REPORT. 112 TEKEXP.REPORT. 113 TEKEXP.REPORT? 111 TEKEXP.REPORT?	Saving and recalling test setup	
Save a test setup. 98 Open (load) a saved test setup. 98 Create a test setup from default settings. 98 Create a test setup using an existing one. 99 SCPI Commands. 100 About SCPI command. 100 Scket Configuration for SCPI commands. 100 TEKEXP.*'IDN?. 106 TEKEXP.*'IDN?. 106 TEKEXP.*'IDN?. 107 TEKEXP.ACQUIRE_MODE 107 TEKEXP.ACQUIRE_MODE?. 107 TEKEXP.INSTRUMENT? 108 TEKEXP.INSTRUMENT. 108 TEKEXP.INSTRUMENT? 109 TEKEXP.INSTRUMENT? 109 TEKEXP.INSTRUMENT? 109 TEKEXP.POPUP. 110 TEKEXP.POPUP. 110 TEKEXP.POPUP. 110 TEKEXP.POPUP? 111 TEKEXP.REPORT? 112 TEKEXP.REPORT? 113 TEKEXP.SELECT? 113 TEKEXP.SATE 113 TEKEXP.VALUE? 114 TEKEXP.SATE?	Test setup files overview.	98
Open (load) a saved test setup 98 Create a test setup from default settings 98 Create a test setup using an existing one 99 SCPI Commands 100 About SCPI commands 100 Socket configuration for SCPI commands 100 TEKEXP**IDN2 106 TEKEXP**IDN2 106 TEKEXP**IDN2 107 TEKEXP**IDN2 107 TEKEXP**ACQUIRE_MODE 107 TEKEXP**ACQUIRE_MODE? 107 TEKEXP**ACQUIRE_MODE? 107 TEKEXP**INSTRUMENT 108 TEKEXP**INSTRUMENT 108 TEKEXP**INSTRUMENT? 109 TEKEXP**INSTRUMENT? 109 TEKEXP**INSTRUMENT? 109 TEKEXP**INSTRUMENT? 109 TEKEXP**POPUP 110 TEKEXP**DOPUP 110 TEKEXP**POPUP 110 TEKEXP**REPORT. 111 TEKEXP***********************************	Save a test setup	98
Create a test setup from default settings. 98 Create a test setup using an existing one. 99 SCPI Commands. 100 About SCPI command. 100 Socket configuration for SCPI commands. 100 TEKEXP.*IDN?. 106 TEKEXP.*OPC? 107 TEKEXP.*OPC? 107 TEKEXP.ACQUIRE_MODE 107 TEKEXP.ACQUIRE_MODE? 107 TEKEXP.PORT 108 TEKEXP.INFO? 108 TEKEXP.INSTRUMENT 108 TEKEXP.INSTRUMENT? 109 TEKEXP.INSTRUMENT? 109 TEKEXP.MODE 110 TEKEXP.MODE? 110 TEKEXP.POPUP? 110 TEKEXP.POPUP? 111 TEKEXP.REPORT? 111 TEKEXP.SELECT 112 TEKEXP.SELECT 113 TEKEXP.STATE 113 TEKEXP.STATE 113 TEKEXP.VALUE? 114 TEKEXP.VALUE? 114 TEKEXP.VALUE? 114 <td< td=""><td>Open (load) a saved test setup</td><td>98</td></td<>	Open (load) a saved test setup	98
Create a test setup using an existing one 99 SCPI Commands 100 About SCPI command. 100 Socket configuration for SCPI commands. 100 TEKEXP*IDN? 106 TEKEXP*OPC? 107 TEKEXP.*CQUIRE_MODE. 107 TEKEXP.ACQUIRE_MODE? 107 TEKEXP.SCORT. 108 TEKEXP.INSTRUMENT 108 TEKEXP.INSTRUMENT 108 TEKEXP.INSTRUMENT? 109 TEKEXP.INSTRUMENT? 109 TEKEXP.MODE? 110 TEKEXP.MODE? 110 TEKEXP.POPUP 110 TEKEXP.POPUP? 110 TEKEXP.REPORT. 111 TEKEXP.REPORT. 111 TEKEXP.REPORT. 111 TEKEXP.REPORT. 111 TEKEXP.REPORT. 111 TEKEXP.REPORT. 112 TEKEXP.REPORT. 111 TEKEXP.REPORT. 112 TEKEXP.SELECT. 112 TEKEXP.SELECT. 113 TEKEXP.STATE	Create a test setup from default settings	98
SCPI Commands. 100 About SCPI commands. 100 Socket configuration for SCPI commands. 100 TEKEXP:*IDN? 106 TEKEXP:*OPC? 107 TEKEXP:ACQUIRE_MODE. 107 TEKEXP:INSTRUMENT. 108 TEKEXP:INSTRUMENT? 109 TEKEXP:LASTERROR? 109 TEKEXP:MODE. 110 TEKEXP:POPUP. 110 TEKEXP:REPORT. 110 TEKEXP:REPORT. 111 TEKEXP:REPORT. 111 TEKEXP:SELECT. 112 TEKEXP:SELECT. 113 TEKEXP:SELECT. 113 TEKEXP:SELECT. 113 TEKEXP:SELECT. 113 TEKEXP:STATE. 113 TEKEXP:STATE. 113 TEKE	Create a test setup using an existing one	99
About SCPI command. 100 Socket configuration for SCPI commands. 100 TEKEXP.*OPC? 106 TEKEXP.*OPC? 107 TEKEXP.*ACQUIRE_MODE 107 TEKEXP.*ACQUIRE_MODE? 107 TEKEXP.*INSTRUMENT. 108 TEKEXP.INSTRUMENT. 108 TEKEXP.INSTRUMENT. 109 TEKEXP.INSTRUMENT? 109 TEKEXP.INSTRUMENT? 109 TEKEXP.INSTRUMENT? 109 TEKEXP.INSTRUMENT? 109 TEKEXP.MODE 110 TEKEXP.NODE 110 TEKEXP.POPUP. 110 TEKEXP.POPUP. 110 TEKEXP.REPORT. 111 TEKEXP.SELECT. 112 TEKEXP.SELECT. 113 TEKEXP.SELECT. 113 TEKEXP.SETUP. 113 TEKEXP.SETUP. 113 TEKEXP.SETUP. 113 TEKEXP.SATE? 114 TEKEXP.VALUE? 114 TEKEXP.VALUE? 115 Command parameters. 127 Referencocs. 129	SCPI Commands	100
Socket configuration for SCPI commands 100 TEKEXP:*IDN? 106 TEKEXP:*IDN? 106 TEKEXP:*ACQUIRE_MODE 107 TEKEXP:ACQUIRE_MODE? 107 TEKEXP:ACQUIRE_MODE? 107 TEKEXP:EXPORT 108 TEKEXP:INSTRUMENT 108 TEKEXP:INSTRUMENT 108 TEKEXP:INSTRUMENT? 109 TEKEXP:INSTRUMENT? 109 TEKEXP:INSTRUMENT? 109 TEKEXP:INSTRUMENT? 109 TEKEXP:MODE 110 TEKEXP:MODE? 110 TEKEXP:POPUP 110 TEKEXP:ROPORT? 111 TEKEXP:REPORT? 111 TEKEXP:SELECT 112 TEKEXP:SELECT? 113 TEKEXP:STATE 113 TEKEXP:STATE? 113 TEKEXP:VALUE? 114 TEKEXP:VALUE? 115 Command parameters. 127 References. 129 1000BASE-T and 1000BASE-T-Multi Pair. 129 <td>About SCPI command</td> <td>100</td>	About SCPI command	100
TEKEXP: 'IDN? 106 TEKEXP: 'OPC? 107 TEKEXP: ACQUIRE_MODE 107 TEKEXP: ACQUIRE_MODE? 107 TEKEXP: SACQUIRE_MODE? 107 TEKEXP: SACQUIRE_MODE? 107 TEKEXP: SACQUIRE_MODE? 107 TEKEXP: SACQUIRE_MODE? 108 TEKEXP: INSTRUMENT 108 TEKEXP: INSTRUMENT? 109 TEKEXP: LASTERROR? 109 TEKEXP: MODE 110 TEKEXP: MODE 110 TEKEXP: MODE? 110 TEKEXP: POPUP? 110 TEKEXP: POPUP? 110 TEKEXP: REPORT 111 TEKEXP: REPORT 111 TEKEXP: SELECT 112 TEKEXP: SELECT? 113 TEKEXP: SELECT? 113 TEKEXP: STATE? 113 TEKEXP: STATE? 114 TEKEXP: STATE? 114 TEKEXP: STATE? 115 Command parameters 115 Examples 127 References	Socket configuration for SCPI commands	100
TEKEXP:*OPC? 107 TEKEXP:ACQUIRE_MODE. 107 TEKEXP:ACQUIRE_MODE? 107 TEKEXP:EXPORT 108 TEKEXP:INFO? 108 TEKEXP:INSTRUMENT 108 TEKEXP:INSTRUMENT? 109 TEKEXP:INSTRUMENT? 109 TEKEXP:MODE 109 TEKEXP:MODE 110 TEKEXP:MODE? 110 TEKEXP:POPUP 110 TEKEXP:REPORT. 111 TEKEXP:REPORT. 111 TEKEXP:REPORT. 111 TEKEXP:REPORT. 111 TEKEXP:REPORT. 111 TEKEXP:RESULT? 112 TEKEXP:SELECT. 112 TEKEXP:SELECT. 113 TEKEXP:SETUP. 113 TEKEXP:SETUP. 113 TEKEXP:STATE. 113 TEKEXP:VALUE 114 TEKEXP:VALUE 115 Command parameters. 115 Examples. 127 References 129 1000BASE-T template 129 1000BASE-T template 129 <td>TEKEYD·*IDN2</td> <td>100</td>	TEKEYD·*IDN2	100
TEKEXP:ACQUIRE_MODE 107 TEKEXP:ACQUIRE_MODE? 107 TEKEXP:ACQUIRE_MODE? 107 TEKEXP:INSTRUME_MODE? 108 TEKEXP:INSTRUMENT 108 TEKEXP:INSTRUMENT 109 TEKEXP:INSTRUMENT? 109 TEKEXP:INSTRUMENT? 109 TEKEXP:LASTERROR? 109 TEKEXP:MODE 110 TEKEXP:MODE? 110 TEKEXP:POPUP 110 TEKEXP:POPUP? 111 TEKEXP:REPORT. 111 TEKEXP:REPORT. 111 TEKEXP:REPORT. 111 TEKEXP:REPORT. 112 TEKEXP:REPORT. 112 TEKEXP:RESULT? 112 TEKEXP:SELECT. 113 TEKEXP:SELECT 113 TEKEXP:SETUP. 113 TEKEXP:SETUP. 113 TEKEXP:STATE. 113 TEKEXP:VALUE? 114 TEKEXP:VALUE? 115 Command parameters. 112 Texamples. 127 References 129 1000BASE-T template		100
TEKEXP:ACQUIRE_MODE? 107 TEKEXP:ACQUIRE_MODE? 108 TEKEXP:INFO? 108 TEKEXP:INSTRUMENT 108 TEKEXP:INSTRUMENT? 109 TEKEXP:INSTRUMENT? 100 TEKEXP:MODE 110 TEKEXP:POPUP. 110 TEKEXP:REPORT. 111 TEKEXP:RESULT? 111 TEKEXP:RESULT? 112 TEKEXP:SELECT. 113 TEKEXP:SELECT? 113 TEKEXP:STATE? 113 TEKEXP:STATE? 114 TEKEXP:STATE? 115 Command parameters. 115 Examples 129		107
TEKEXP:EXPORT 108 TEKEXP:INFO? 108 TEKEXP:INSTRUMENT 108 TEKEXP:INSTRUMENT? 109 TEKEXP:LIST? 109 TEKEXP:INSTRUMENT? 109 TEKEXP:MODE 110 TEKEXP:POPUP 110 TEKEXP:POPUP? 110 TEKEXP:REPORT 111 TEKEXP:RESULT? 111 TEKEXP:RESULT? 112 TEKEXP:RESULT? 112 TEKEXP:SELECT 113 TEKEXP:SELECT? 113 TEKEXP:SETUP 113 TEKEXP:STATE? 114 TEKEXP:STATE? 113 TEKEXP:VALUE 114 TEKEXP:VALUE 115 Command parameters 129 1000BASE-T		107
TEKEXP:INFO? 108 TEKEXP:INSTRUMENT 109 TEKEXP:INSTRUMENT? 109 TEKEXP:LASTERROR? 109 TEKEXP:LASTERROR? 109 TEKEXP:MODE 110 TEKEXP:MODE 110 TEKEXP:POPUP 110 TEKEXP:POPUP? 110 TEKEXP:REPORT 111 TEKEXP:REPORT? 111 TEKEXP:SELECT 112 TEKEXP:SELECT? 113 TEKEXP:SELECT? 113 TEKEXP:STATE 113 TEKEXP:STATE? 114 TEKEXP:VALUE 114 TEKEXP:STATE? 115 Command parameters 115 Examples 127 References 129 1000BASE-T and 1000BASE-T-Multi Pair 129 1000BASE-T template 129		107 108
TEKEXP:INSTRUMENT. 100 TEKEXP:INSTRUMENT? 109 TEKEXP:INSTRUMENT? 109 TEKEXP:LASTERROR? 109 TEKEXP:LIST? 109 TEKEXP:MODE 110 TEKEXP:MODE? 110 TEKEXP:POPUP 110 TEKEXP:POPUP? 111 TEKEXP:REPORT 111 TEKEXP:REPORT? 111 TEKEXP:SELECT 112 TEKEXP:SELECT? 113 TEKEXP:STATE 113 TEKEXP:STATE? 114 TEKEXP:VALUE? 114 TEKEXP:VALUE? 115 Command parameters. 112 Tereferences. 129 1000BASE-T template 129		100
TEKEXP: INSTRUMENT 100 TEKEXP: INSTRUMENT? 109 TEKEXP: LASTERROR? 109 TEKEXP: LIST? 109 TEKEXP: MODE 110 TEKEXP: MODE? 110 TEKEXP: POPUP 110 TEKEXP: POPUP? 110 TEKEXP: REPORT 111 TEKEXP: REPORT? 111 TEKEXP: SELECT 112 TEKEXP: SELECT? 113 TEKEXP: STATE 113 TEKEXP: STATE 114 TEKEXP: VALUE? 114 TEKEXP: VALUE? 115 Command parameters. 127 References. 129 1000BASE-T template 129		100
TEKEXP:LASTERROR? 109 TEKEXP:LASTERROR? 109 TEKEXP:LASTERROR? 109 TEKEXP:LIST? 109 TEKEXP:MODE 110 TEKEXP:MODE? 110 TEKEXP:POPUP 110 TEKEXP:POPUP? 111 TEKEXP:REPORT 111 TEKEXP:REPORT? 111 TEKEXP:SELECT 112 TEKEXP:SELECT? 113 TEKEXP:SETUP 113 TEKEXP:STATE 113 TEKEXP:VALUE? 114 TEKEXP:VALUE? 115 Command parameters 115 Examples 127 NO0BASE-T and 1000BASE-T-Multi Pair 129		100
TEREAF: LASTERRORY 109 TEKEXP:LIST? 109 TEKEXP:MODE 110 TEKEXP:MODE? 110 TEKEXP:POPUP 110 TEKEXP:POPUP? 111 TEKEXP:REPORT 111 TEKEXP:REPORT? 111 TEKEXP:SELECT 112 TEKEXP:SELECT? 113 TEKEXP:STATE? 113 TEKEXP:VALUE? 114 TEKEXP:VALUE? 115 Command parameters. 115 Examples. 127 References. 129 1000BASE-T and 1000BASE-T-Multi Pair. 129		109
TEREXP.INOT 109 TEKEXP:MODE 110 TEKEXP:MODE? 110 TEKEXP:POPUP 110 TEKEXP:ROPORT 111 TEKEXP:REPORT 111 TEKEXP:REPORT? 111 TEKEXP:SELECT 112 TEKEXP:SELECT? 113 TEKEXP:SETUP 113 TEKEXP:STATE 113 TEKEXP:STATE? 114 TEKEXP:VALUE 114 TEKEXP:VALUE? 115 Command parameters 115 Examples 127 References 129 1000BASE-T and 1000BASE-T-Multi Pair 129		
TEREXP.WODE 110 TEKEXP:MODE? 110 TEKEXP:POPUP 110 TEKEXP:REPORT 111 TEKEXP:REPORT 111 TEKEXP:REPORT? 111 TEKEXP:RESULT? 112 TEKEXP:SELECT 112 TEKEXP:SELECT? 113 TEKEXP:SETUP 113 TEKEXP:STATE 113 TEKEXP:VALUE 114 TEKEXP:VALUE? 115 Command parameters 115 Examples 127 References 129 1000BASE-T and 1000BASE-T-Multi Pair 129		
TEREAP:MODE? 110 TEKEXP:POPUP 110 TEKEXP:POPUP? 111 TEKEXP:REPORT 111 TEKEXP:REPORT? 111 TEKEXP:RESULT? 112 TEKEXP:SELECT. 112 TEKEXP:SELECT? 113 TEKEXP:SETUP. 113 TEKEXP:STATE 113 TEKEXP:STATE? 114 TEKEXP:VALUE 114 TEKEXP:VALUE? 115 Command parameters 115 Examples 127 References 129 1000BASE-T and 1000BASE-T-Multi Pair 129 1000BASE-T template 129		
TEKEXP: POPUP 110 TEKEXP: POPUP? 111 TEKEXP: REPORT 111 TEKEXP: REPORT? 111 TEKEXP: RESULT? 112 TEKEXP: SELECT. 112 TEKEXP: SELECT? 113 TEKEXP: SETUP 113 TEKEXP: STATE 113 TEKEXP: STATE? 114 TEKEXP: VALUE 114 TEKEXP: VALUE 115 Command parameters 115 Examples 127 References 129 1000BASE-T template 129		
TEKEXP:POPUP? 111 TEKEXP:REPORT. 111 TEKEXP:REPORT? 111 TEKEXP:RESULT? 112 TEKEXP:SELECT 112 TEKEXP:SELECT? 113 TEKEXP:SETUP 113 TEKEXP:STATE 113 TEKEXP:STATE? 114 TEKEXP:VALUE 114 TEKEXP:VALUE? 115 Command parameters 115 Examples 127 References 129 1000BASE-T template 129		
TEKEXP:REPORT. 111 TEKEXP:REPORT? 111 TEKEXP:RESULT? 112 TEKEXP:SELECT. 112 TEKEXP:SELECT? 113 TEKEXP:SETUP. 113 TEKEXP:STATE. 113 TEKEXP:STATE? 114 TEKEXP:VALUE. 114 TEKEXP:VALUE. 115 Command parameters. 115 Examples. 127 References 129 1000BASE-T and 1000BASE-T-Multi Pair. 129		
TEKEXP:REPORT? 112 TEKEXP:RESULT? 112 TEKEXP:SELECT 112 TEKEXP:SELECT? 113 TEKEXP:SETUP 113 TEKEXP:STATE 113 TEKEXP:STATE? 114 TEKEXP:VALUE 114 TEKEXP:VALUE? 115 Command parameters 115 Examples 127 References 129 1000BASE-T and 1000BASE-T-Multi Pair 129 1000BASE-T template 129		
TEKEXP:RESULT? 112 TEKEXP:SELECT 112 TEKEXP:SELECT? 113 TEKEXP:SETUP 113 TEKEXP:STATE 113 TEKEXP:STATE? 114 TEKEXP:VALUE 114 TEKEXP:VALUE? 115 Command parameters 115 Examples 127 References 129 1000BASE-T and 1000BASE-T-Multi Pair 129 1000BASE-T template 129		
TEKEXP:SELECT. 112 TEKEXP:SELECT? 113 TEKEXP:SETUP. 113 TEKEXP:STATE 113 TEKEXP:STATE? 114 TEKEXP:VALUE. 114 TEKEXP:VALUE? 115 Command parameters. 115 Examples. 127 References. 129 1000BASE-T and 1000BASE-T-Multi Pair. 129 1000BASE-T template 129		
TEKEXP:SELECT? 113 TEKEXP:SETUP 113 TEKEXP:STATE 113 TEKEXP:STATE? 114 TEKEXP:VALUE 114 TEKEXP:VALUE? 115 Command parameters 115 Examples 127 References 129 1000BASE-T and 1000BASE-T-Multi Pair 129 1000BASE-T template 129		
TEKEXP:SETUP		
TEKEXP:STATE. 113 TEKEXP:STATE? 114 TEKEXP:VALUE. 114 TEKEXP:VALUE? 115 Command parameters. 115 Examples. 117 References. 129 1000BASE-T and 1000BASE-T-Multi Pair. 129 1000BASE-T template 129		
TEKEXP:STATE? 114 TEKEXP:VALUE 114 TEKEXP:VALUE? 115 Command parameters 115 Examples 117 References 129 1000BASE-T and 1000BASE-T-Multi Pair 129 1000BASE-T template 129		
TEKEXP:VALUE		
IEKEXP:VALUE? 115 Command parameters 115 Examples 127 References 129 1000BASE-T and 1000BASE-T-Multi Pair 129 1000BASE-T template 129		
Command parameters	TEKEXP:VALUE?	
Examples	Command parameters	
References	Examples	
1000BASE-T and 1000BASE-T-Multi Pair	References	
1000BASE-T template 129	1000BASE-T and 1000BASE-T-Multi Pair	
	1000BASE-T template	
1000BASE-T peak voltage	1000BASE-T peak voltage	
1000BASE-T droop	1000BASE-T droop	129
1000BASE-T jitter (with TX_TCLK)130	1000BASE-T jitter (with TX_TCLK)	

1000BASE-T jitter (without TX_TCLK)	130
1000BASE-T distortion	132
1000BASE-T return loss	132
1000BASE-T CM voltage	132
100BASE-T template	132
100DASE T differential output voltage	132
100DASE T signal amplitude symmetry	133
100DASE T rise and fall time	
100DASE T waveform aversheet	
100DASE T return loss	
100DASE T duty evelo distortion	
10BASE-T link pulse	
10BASE-T differential voltage	
10BASE-T harmonic	
10BASE-T return loss	
10BASE-T jitter	
10BASE-T CM Voltage	136
Index	137

List of Figures

Figure 1: Options menu	21
Figure 2: TekExpress Ethernet measurements	
Figure 3: Configuration tab: Global Settings	31
Figure 4: Configuration tab: Measurements Settings	31
Figure 5: Configuration tab: Bandwidth limiting	32
Figure 6: Connection diagram for SHORT Calibration	
Figure 7: Configuration Panel to select Signal Source and to perform Return Loss Calibration	40
Figure 8: Calibration panel before performing calibration	41
Figure 9: Calibration panel after calibration is performed for OPEN, SHORT, and LOAD and then Apply	41
Figure 10: Connection diagram for SHORT Calibration	42
Figure 11: Calibration output for SHORT calibration	42
Figure 12: Connection diagram for OPEN Calibration	43
Figure 13: Calibration output for OPEN calibration	43
Figure 14: Calibration output for LOAD calibration	44
Figure 15: Calibration output for LOAD calibration	44
Figure 16: Return Loss Signal Source selection, with Do not use configuration	45
Figure 17: AWG with Return Loss waveform loaded	45
Figure 18: AFG with Return Loss waveforms loaded	46
Figure 19: JigMatch calibration configuration panel	47
Figure 20: Configuration Panel for selecting Signal Source and to perform JigMatch Calibration	48
Figure 21: Connection diagram to measure Disturbing Signal using JigMatch	49
Figure 22: Disturber Compensation in JigMatch	49
Figure 23: Connection diagram to measure linearities of Test Fixture using JigMatch	50
Figure 24: Test Fixture Compensation in JigMatch	50
Figure 25: Connection diagram to measure linearities of the Test Fixture using JigMatch	51
Figure 26: Test Fixture Compensation in JigMatch	51
Figure 27: JigMatch Signal Source selection, with "Do not use" configuration	52
Figure 28: AWG with Test Mode 1 waveform loaded	52
Figure 29: AWG with Test Mode 4 waveform loaded	53
Figure 30: AFG with Test Mode 1 waveform loaded	53
Figure 31: AFG with Test Mode 4 waveform loaded	54
Figure 32: Test status view	55

Figure 33: Log view	56
Figure 34: 1000BASE-T Template, Peak Volt, and Droop (Without Disturber)	64
Figure 35: 1000BASE-T Template, Peak Volt, and Droop (With Disturber)	65
Figure 36: Distortion with Disturber with Clock	
Figure 37: Distortion with Disturber without Clock	
Figure 38: Distortion without Disturber with Clock	
Figure 39: Distortion without Disturber without Clock	
Figure 40: Master and Slave Jitter without Clock	70
Figure 41: Master Filtered Jitter with Clock - Connection 1	71
Figure 42: Master Filtered Jitter with Clock - Connection 2	
Figure 43: Master Unfiltered Jitter with Clock	73
Figure 44: Slave Filtered Jitter with Clock - Connection 1	74
Figure 45: Slave Filtered Jitter with Clock - Connection 2	75
Figure 46: Slave Unfiltered Jitter with Clock	
Figure 47: 1000BASE-T CM Voltage	77
Figure 48: 1000BASE-T Transmitter Return Loss	
Figure 49: 1000BASE-T Receiver Return Loss	79
Figure 50: 1000BASE-T-Multi Pair Template, Peak Volt, and Droop (Without Disturber)	
Figure 51: 1000BASE-T-Multi Pair Template, Peak Volt, and Droop (With Disturber)	
Figure 52: Distortion with Disturber with Clock	
Figure 53: Distortion with Disturber without Clock	
Figure 54: Distortion without Disturber with Clock	
Figure 55: Distortion without Disturber without Clock	
Figure 56: Master and Slave Jitter without Clock	84
Figure 57: Master Filtered Jitter with Clock - Connection 1	
Figure 58: Master Filtered Jitter with Clock - Connection 2	85
Figure 59: Master Unfiltered Jitter with Clock	85
Figure 60: Slave Filtered Jitter with Clock - Connection 1	
Figure 61: Slave Filtered Jitter with Clock - Connection 2	
Figure 62: Slave Unfiltered Jitter with Clock	
Figure 63: 1000BASE-T-Multi Pair CM Voltage	
Figure 64: 1000BASE-T-Multi Pair Transmitter Return Loss	
Figure 65: 100BASE-T connection diagram for all tests except Return Loss	
Figure 66: 100BASE-T Transmitter Return Loss	
Figure 67: 100BASE-T Receiver Return Loss	

Figure 68: 10BASE-T MAU, Jitter, TP_IDL Load With TPM, Link Pulse Timing With TPM, and Link Pulse Load With TPM	93
Figure 69: 10BASE-T TP_IDL Load Without TPM, Jitter, Link Pulse Load Without TPM, Harmonic, and Link Pulse Timing	04
Figure 70: 10BASE-T Transmitter Return Loss	94 95
Figure 71: 10BASE-T Receiver Return Loss	96

List of Tables

Table 1: Product Information	
Table 2: System requirements	14
Table 3: Instruments and accessories required for Ethernet application	14
Table 4: Application directories and usage	
Table 5: Application panels overview	19
Table 6: Application controls description	20
Table 7: DUT tab settings	27
Table 8: Test Selection tab settings	
Table 9: Acquisitions tab settings	
Table 10: Configuration tab settings	
Table 11: Return Loss test method configuration and bandwidth limiting	
Table 12: Measurements configuration for Analyze 1000BASE-T and 1000BASE-T-Multi Pair	
Table 13: Measurements configuration for Analyze 100BASE-T	
Table 14: Measurements configuration for Analyze 10BASE-T	
Table 15: Measurements configuration for Acquire 1000BASE-T	
Table 16: Measurements configuration for Acquire 100BASE-T	
Table 17: Measurements configuration for Acquire for 10BASE-T	
Table 18: Preferences tab settings	54
Table 19: Status panel Log View controls	56
Table 20: Report options	61
Table 21: Parameter Name and Value for DUT tab	
Table 22: Parameter Name and Value for Test Selection tab	
Table 23: Parameter Name and Value of Acquisitions	119
Table 24: Parameter Name and Value for Preferences tab	
Table 25: Parameter Name and Value for Acquire (1000BASE-T)	119
Table 26: Parameter Name and Value for Acquire (100BASE-T)	
Table 27: Parameter Name and Value for Acquire (10BASE-T)	121
Table 28: Parameter Name and Value for Analyze (1000BASE-T)	123
Table 29: Parameter Name and Value for Analyze (100BASE-T)	124
Table 30: Parameter Name and Value for Analyze (10BASE-T)	124
Table 31: Parameter Name and Value for General	126

Welcome

Welcome to the TekExpress® Ethernet Electrical Testing software application. The application provides more visibility into your Ethernet designs with 1000BASE-T/100BASE-TX/10BASE-T PHY measurements as outlined in IEEE 802.3 Section 40, ANSI X3.263, and IEEE 802.3 Section 14 specific measurements for different Ethernet standards to the already existing rich tool set of generic jitter, timing, and signal quality measurements in the 5/6/6B Series MSO oscilloscope.



Key features of TekExpress Ethernet include:

- Solution offers most comprehensive Ethernet PHY test coverage supporting multiple speeds.
- Highly optimized, intuitive user interface flow that sets up the test configuration for easy ethernet electrical validation.
- · Compliance and margin testing for accurate analysis and improved interoperability.
- · Time-domain and frequency-domain measurements made with single analysis instrument.
- Jitter and timing measurements with and without filters.
- Amplitude and droop testing for transmitter performance.
- · User-defined mode enables flexible parameter control for characterization and margin analysis.
- · Detailed test reports with margin and statistical information and analysis.
- · Ability to modify limits of test parameters in TekExpress for debug and characterization.
- Ability to easily configure multiple test runs.
- · Ability to preview test mode waveform prior to running the tests.
- · Additional Peak Distortion Vs Phase Offset and Error Values Vs Symbol Number plots for 1000BASE-T distortion test.
- Plot panel is available to view the plot for Return Loss measurement.
- · Ability to test multiple pairs together for 1000BASE-T.
- · Ability to import VNA results and generate report using TekExpress Application.

Getting help and support

Conventions

Help uses the following conventions:

- The term "Application" and "Software" refers to the TekExpress Ethernet Electrical Testing Application.
- The term "DUT" is an abbreviation for Device Under Test.
- The term "select" is a generic term that applies to the different methods of choosing a screen item (button, control, list item): using a mouse or using the touch screen.

Icon	Meaning
	This icon identifies important information.
\wedge	This icon identifies conditions or practices that could result in loss of data.
8	This icon identifies additional information that will help you use the application more efficiently.

Related documentation

The following documentation is available as part of the TekExpress® Ethernet Electrical Testing Application.

Table 1: Product Information

Item	Purpose	Location
Help	Application operation and User Interface help	
Table continued		

Item	Purpose	Location
PDF of help	Printable version of the compiled help	REVOLUTION/BRING
		PDF file that ships with TekExpress Ethernet solution (TekExpress-Ethernet-Solution-Software-Printable-Help-EN-US.pdf).
		You can download the PDF version of the manual from the Tektronix website.
		Part number: 077-1635-03
		www.tek.com/en

Technical support

Tektronix values your feedback on our products. To help us serve you better, please send us your suggestions, ideas, or comments on your application or oscilloscope. Contact Tektronix through mail, telephone, or the Web site, <u>www.tek.com</u>

When you contact Tektronix Technical Support, please include the following information (be as specific as possible):

General Information

- All instrument model numbers
- · Hardware options, if any
- Probes used
- · Your name, company, mailing address, phone number, and FAX number
- · Please indicate if you would like to be contacted by Tektronix about your suggestion or comments.

Application Specific Information

- Software version number
- · Description of the problem such that technical support can duplicate the problem
- If possible, save the setup files for all the instruments used and the application.
- If possible, save the TekExpress setup files, log.xml, *.TekX (session files and folders), and status messages text file.
- · If possible, save the waveform on which you are performing the measurement as a .wfm file.

Getting started

Minimum system requirements

The following table shows the minimum system requirements to install and run the TekExpress Ethernet solution.

Table 2: System requirements

Component	Description	
Oscilloscope	MSO54, MSO56, MSO58, MSO58B, MSO64, MSO64B, MSO66B or MSO68B	
Firmware	Firmware Version: 1.28.2 or above	
Software	 IronPython 2.7.3 installed PyVisa 1.0.0.25 installed Microsoft .NET 4.0 Framework Microsoft Internet Explorer 7.0 SP1 or greater, or other Web browser for viewing reports Adobe Reader software 7.0 or greater for viewing portable document format (PDF) files 	

Instruments and accessories required

The following table lists the instruments and accessories required for this application.

Table 3: Instruments and accessories required for Ethernet application

Instrument/Accessory	Model number	Quantity
Oscilloscope	MSO54, MSO56, MSO58, MSO58B, MSO64, MSO64B, MSO66B, or MSO68B	One
Arbitrary Function Generator	AFG3000, AFG31102, AFG31152, AFG31252	One
Arbitrary Waveform Generator	AWG520xAWG5000 SeriesAWG7000 Series	One

Table continued...

Instrument/Accessory	Model number	Quantity
Fixtures	TF-GBE-BTP	One
	1000/100/10BASE-T Basic Test Package (consists of test fixture PCB set and RJ45 interconnect cable).	
	TF-GBE-JTC 103 meter	One
	1000BASE-T jitter test channel cable	
	TF-GBE-SIC (Short 4-inch (0, 1-meter) RJ45 interconnect cable)	One
Differential Probes	• TDP1500	Тwo
	• P6247	
	• P6248	
	• TDP3500	

Note:

- TF-GBE-ATP fixture set contains TF-GBE-BTP and TF-GBE-JTC fixtures.
- TF-GBE-BTP fixture set contains TF-GBE-SIC.
- TF-GBE-BTP is required for Jitter-Slave test only.
- TPA-BNC adapter is required for P6247 and P6248 differential probes.
- For 1000BASE-T Slave jitter testing an additional differential probe is required.
- For 1000BASE-T-Multi Pair testing, additional two probes are required.

Installing the software

Complete the following steps to download and install the latest Ethernet application. See Minimum system requirements for compatibility.

- 1. Go to www.tek.com.
- Click Downloads. In the Downloads menu, select DOWNLOAD TYPE as Software and enter *Ethernet* in the MODEL OR KEYWORD field and click SEARCH.

	⊥ Download		
>			
1	DOWNLOAD TYPE	MODEL OR KEYWORD	
	Manual	Start typing	SEARCH

- 3. Select the latest version of software and follow the instructions to download. Copy the executable file to the oscilloscope.
- **4.** Double-click the executable and follow the on-screen instructions. The software is installed at C:\Program Files\TekExpress\TekExpress Ethernet.
- 5. Select Applications > TekExpress Ethernet from the TekScope menu to Launch the application.

Application directories

TekExpress Ethernet application

The TekExpress Ethernet application files are installed at the following location:

C:\Program Files\Tektronix\TekExpress\TekExpress Ethernet

8/20/2024 1:56 AM	File folder
8/20/2024 2:04 AM	File folder
8/20/2024 1:56 AM	File folder
8/28/2024 8:50 PM	File folder
8/20/2024 1:56 AM	File folder
	8/20/2024 1:56 AM 8/20/2024 2:04 AM 8/20/2024 1:56 AM 8/28/2024 8:50 PM 8/20/2024 1:56 AM

The following table lists the application directory names and their purpose:

Table 4: Application directories and usage

Directory names	Usage
AWG Waveforms	Contains waveform files
Bin	Contains TekExpress Ethernet application libraries
Compliance Suites	Contains compliance-specific files
Examples	Contains examples for SCPI commands
ICP	Contains instrument and TekExpress Ethernet application-specific interface libraries
Images	Contains images of the TekExpress Ethernet application
Lib	Contains utility files specific to the TekExpress Ethernet application
Licenses	Contains license files specific to the TekExpress Ethernet application
Miscellaneous	Contains log files
Report Generator	Contains style sheets for report generation
Tools	Contains instrument and TekExpress Ethernet application-specific files

See also

View test-related files File name extensions

File name extensions

The TekExpress Ethernet application uses the following file name extensions:

File name extension	Description
.TekX	Application session files (the extensions may not be displayed)
.ру	Python sequence files
.xml	Test-specific configuration information (encrypted) files
	Application log files
.CSV	Test result reports
	Plot data
.mht	Test result reports (default)
	Test reports can also be saved in HTML format
.pdf	Test result reports
	Application help documents
.xslt	Style sheet used to generate reports

See also

View test-related files Application directories

View software version

Use the following instructions to view version information for the application and for the application modules such as the Programmatic Interface and the Programmatic Interface Client.

To view version information for Ethernet, click **v** button in the TekExpress application and select About TekExpress.





Note: This example shows a typical Version Details dialog box, and may not reflect the actual values as shown when you open this item in the application.

Operating basics

Launch the application

To launch the TekExpress Ethernet solution, select Applications > TekExpress Ethernet from the TekScope menu.



When you launch the application for the first time, the file C:\Users\<username>\My Documents\My TekExpress\Ethernet\Resources.xml is mapped to drive x:. This file contains information about available network-connected instruments. The session files are stored in X:\Ethernet\. If this file is not found, then the application runs Instrument Discovery Program to detect the network-connected instruments before launching Ethernet solution.

If the application is behind the oscilloscope application, click **Applications > TekExpress Ethernet** to bring it to the front. To keep the Ethernet application window on top, select **Keep On Top** from the Ethernet **Options menu**.



Note: After installing the application, wait until the instruments gets discovered in the TEKVISA before launching the application.

See also

Application controls Application panel overview

Application panels overview

TekExpress Ethernet solution uses panels to group Configuration, Results, and Reports settings. Click any button to open the associated panel. A panel may have one or more tabs that list the selections available in that panel. Controls in a tab can change depending on settings made in the same tab or another tab.



Table 5: Application panels overview

Panel Name	Purpose
Setup panel	The Setup panel shows the test setup controls. Click the Setup button to open this panel.
	Use this panel to:
	Set DUT tab parameters
	Select tests
	Set acquisition tab parameters
	Set configuration tab parameters
	Set preferences tab parameters
Status panel	View the progress and analysis status of the selected tests, and view test logs.
Results panel	View the summary of test results and select result viewing preferences.
Plots panel	View the plot for Return Loss measurement. Plot is displayed as a two dimensional plot for additional measurement analysis.
Reports panel	Browse for reports, save reports as specific file types, specify report naming conventions, select report content to include (summary information, detailed information, user comments, setup configuration, application configuration), and select report viewing options.

See also

Application controls

Global application controls

Application controls

This section describes the application controls.

Table 6: Application controls description

Item	Description
Options menu	To select global application controls.
Options 💌	
Test Panel buttons	Controls that open tabs for configuring test settings and options.
Setup Status Results	
Plots Reports	
Start / Stop button	Use the Start button to start the test run of the measurements in the selected order. If prior acquired measurements are not cleared, then new measurements are added to the existing set.
	The button toggles to the Stop mode while tests are running. Use the Stop button to abort the test.
Pause / Continue button	Use the Pause button to pause the acquisition. When a test is paused, this button toggles to Continue .
Clear button	Use the Clear button to clear all existing measurement results. Adding or deleting a measurement, or changing a configuration parameter of an existing measurement, also clears measurements. This is to prevent the accumulation of measurement statistics or sets of statistics that are not coherent. This button is available only on <i>Results panel</i> .
Application window move icon	Place the cursor over the three-dot pattern in the upper left corner of the application window. When the cursor changes to a hand, drag the window to the desired location.

Item	Description
Minimize icon	Click to minimize the application.
Close icon	Click to close the application.
Mini view / Normal view	Toggles the application between mini view and normal view. Mini view displays the run messages with the time stamp, progress bar, Start / Stop button, and Pause / Continue button. The application moves to mini view when you click the Start button. $\frac{\sqrt{16kExpress Ethernet - (Untitled)^*}{\frac{100}{1771225342} \cdot Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 \cdot Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 \cdot Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 \cdot Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 \cdot Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 \cdot Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 · Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 · Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 · Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 · Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 · Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 · Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 · Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 · Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 · Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 · Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 · Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 · Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 · Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 · Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 · Acquiring Vaveforms of DATA signal at CH1 Stop 0507718225342 · Acquiring Vaveforms of DATA signal at CH1 Stop 050771822534 · Acquiring Vaveforms of DATA signal at CH1 Stop 050771825545 · Acquiring Vaveforms of DATA signal at CH1 Stop 050771825545 · Acquiring Vaveforms of DATA sig$

See also

Application panel overview

Options menu overview

To access *Options menu*, click **v** in the upper-right corner of the application.

	Default Test Setup	
	Open Test Setup	
	Save Test Setup	
	Save Test Setup As	
	Open Recent	>
	Instrument Control Settings	
	Keep On Top	
	Email Settings	
	Help	
	About TekExpress	
-		

Figure 1: Options menu

Menu	Function
Default Test Setup	Opens an untitled test setup with defaults selected. Acquire Live Waveforms. Data rate: 1000BASE-T.
Open Test Setup	Opens a saved test setup.
Save Test Setup	Saves the current test setup.
Save Test Setup As	Saves the current test setup with a different file name or file type.
Open Recent	Displays the recently opened test setups to open.
Instrument Control Settings	Detects, lists, and refreshes the connected instruments found on specified connections (LAN, GPIB, USB, and so on).
Keep On Top	Keeps the TekExpress Ethernet application on top of all applications.
Email Settings	Use to configure email options for test run and result notification.
Help	Displays the TekExpress Ethernet help.
About TekExpress	 Displays application details such as software name, version number, and copyright. Provides a link to the end-user license agreement. Provides a link to the Tektronix Web site.

See also

Application controls

TekExpress instrument control settings

Use TekExpress Instrument Control Settings dialog box to search the instruments (resources) connected to the application. You can use the Search Criteria to search the connected instruments depending on the connection type. The details of the connected instrument is displayed in the Retrieved Instruments window.

You can access this dialog box from the **Options** menu.

LAN 🗹 GI	PIB 🔲 Serial	Non - VISA Res	sources	
TekLink U	SB 🔲 VXI		Refres	TekVISA 300 s Timeout
Retrieved Instrume	ents (1) Resource	Serial No	Options	Resource Addr
VISA-GPIB	DP077002SX	PQ100011	50XL,VET,SR-CU.	GPIB8::1::INSTR

The connected instruments displayed here can be selected for use under Global Settings in the test configuration section.

 \triangle

Note: Select GPIB (Default) when using TekExpress Ethernet application.

See also

Options menu overview

View connected instruments

Use TekExpress Instrument Control Settings dialog box to search the instruments (resources) connected to the application. The application uses TekVISA to discover the connected instruments.



Note: The instruments required for the test setup must be connected and it must be recognized by the application before running the test.

To refresh the list of connected instruments:

- 1. From the Options menu, select Instrument Control Settings.
- 2. In the Search Criteria section of the Instrument Control Settings dialog box, select the connection types of the instruments to search.

Instrument search is based on the VISA layer, but different connections determine the resource type, such as LAN, GPIB, and USB. For example, if you choose LAN, the search will include all the instruments supported by TekExpress that are communicating over the LAN.

3. Click Refresh. TekExpress searches for connected instruments.



4. After searching, the *dialog box lists the instrument-related details* based on the search criteria. For example, For the Search Criteria as LAN and GPIB, the application displays all LAN and GPIB instruments connected to the application.

Search Criteria			_	
LAN GPI	IB Serial B VXI	Non - VISA Res	ources	TekVISA 300 s Timeout
Connection	Resource	Serial No	Options	Resource Addr
VISA-GPIB	DPO77002SX	PQ100011	50XL,VET,SR-CU	GPIB8::1::INSTR
Last Updated Aug	ust 10, 2016 04:54:2	20		Close

The details of the instruments are displayed in the Retrieved Instruments table. The time and date of instrument refresh is displayed in the Last Updated field.

See also

1000BASE-T-Multi Pair connection diagram 1000BASE-T connection setup 100BASE-T connection setup 10BASE-T connection setup

Configure email settings

Use the Email Settings utility to get notified by email when a measurement completes, or produces any error condition. Follow the steps to configure email settings:

- 1. Select **Options > Email Settings** to open the *Email Settings* dialog box.
- 2. (Required) For Recipient email Address(es), enter one or more recipient email addresses. To include multiple addresses, separate the addresses with commas.
- 3. (Required) For Sender's Address, enter the email address used by the instrument. This address consists of the instrument name, followed by an underscore, followed by the instrument serial number, then the @ symbol, and the email server ID. For example: user@yourcompany.com.
- 4. (Required) In the Server Configuration section, type the SMTP Server address of the Mail server configured at the client location, and the SMTP Port number, in the corresponding fields.

If this server requires password authentication, enter a valid login name, password, and host name in the corresponding fields.



Note: If any of the above required fields are left blank, the settings will not be saved and email notifications will not be sent.

In the Email Attachments section, select from the following options:

• Reports: Select to receive the test report with the notification email.

5.

- Status Log: Select to receive the test status log with the notification email. If you select this option, then also select whether you want to receive the full log or just the last 20 lines.
- 6. In the Email Configuration section:
 - Enter a maximum file size for the email message. Messages with attachments larger than this limit will not be sent. The default is 5 MB.
 - Enter the number in the Number of Attempts to Send field, to limit the number of attempts that the system makes to send a notification. The default is 1. You can also specify a timeout period.
- 7. Select the **Email Test Results When complete or on error** check box. Use this check box to quickly enable or disable email notifications.
- 8. To test your email settings, click **Test Email**.
- 9. To apply your settings, click **Apply**.
- 10. Click Close when finished.

Email Settings

Email Settings					
Recipient e-mail Address(es)					
	Note: Separate Email addresses (with a comma			
Sender's Address					
Email Attachments		Server Configuration	n		
Reports		SMTP Server		SMTP Port	
🔽 Status Log 📀 Last 20 Li	nes 🔵 Full Log	Login			
		Password			
		Host Name			
Entell Configuration					
Email Conliguration			_		
Max Email Size (MB) 5		Number of Attempts to	to Send 1		
Timeout (Sec) 0					
Email Test Results When c	omplete or on error	(Email App	ly Close	

Setup panel

Setup panel overview

The Setup panel contains sequentially ordered tabs that help you guide through the test setup and execution process.



Set DUT parameters

Use the DUT tab to select parameters for the device under test. These settings are global and apply to all tests of current session. The DUT settings also affect the list of available tests in the Test Selection tab.

Click **Setp > DUT** to access the DUT parameters:

Table 7: DUT tab settings

Setting	Description
DUT ID	Adds an optional text label for the DUT to reports. The default value is DUT001. The maximum number of characters is 32. You cannot use the following characters in an ID name: (.,,,/:?"<> *)
Comments icon (to the right of the DUT ID field)	Opens Comments dialog box to enter text to add to the report. Maximum size is 256 characters. To enable or disable comments appearing on the test report, see <i>Select report options</i> .
Acquire live waveforms	Perform analysis on live waveforms.
Use pre-recorded waveform files	Perform analysis on pre-recorded waveforms.
Data Rate	
1000BASE-T	IEEE 802.3, Section 40
100BASE-T	ANSIX 3.263-1995
10BASE-T	IEEE 802.3, Section 14
1000BASE-T Multi Pair	IEEE 802.3, Section 40

See also

Select tests

Select tests

Use the Test Selection tab to select the tests. The test measurements available depends on the standard selected in the DUT tab.

Setup	titled) Ethernet : 1000BASE-T : IEEE 802.3, Section	Options 40 Select All Select All	Start
Status 2 Test Selection Results 3 Acquisitions Plots 4 Configuration 5 Preferences	1000BASE-T Measurements Without Disturber Template Point A Template Point B Template Point D Pare Point P Peak Point B Peak Point B Peak Point C Peak Point C Peak Point C Peak Point G Droop Point J Transmitter Distortion Transmitter Distortion		Pause
Ready	Test Description Please select a test name to view its description	Schematic and View Waveform Preview	

Table 8: Test Selection tab settings

Setting	Description
Deselect All	Click to clear all tests.
Select Required	Click to select all the tests required for compliance.
Select All	Click to select all tests. All tests are selected by default.
Tests	Click on a test to select or unselect. Highlight a test to show details in the Test Description pane.
Test Description	Shows brief description of the highlighted test in the Test field.
Preview	Click to preview the schematic and the expected waveform example for the selected test.

See also

Set acquisition tab parameters

Set acquisition tab parameters

Use Acquisitions tab to view the test acquisition parameters. The contents displayed on this tab depends on the DUT type, Suite selected, and the tests selected.

Note: TekExpress Ethernet application acquires all waveforms needed by each test group before performing analysis.

Table 9: Acquisitions tab settings

Setting	Description
View Probes	Click to view the detected probe configuration. Use the View Probes dialog box to enable or disable probe signal source access in the application.
	If probe connection is changed, user has to click on Refresh button to view updated probe information.
Source	Select the signal source for Data, Master Clock and/or Slave Clock for the measurement. Ensure that no two sources have the same channel selected.
	Same set of channels can be used for Return Loss with a Data as positive input and Master Clock as negative input and Slave Clock for sync input.
Aux	Select to use oscilloscope's Aux channel.
Acquisition and Save	Saves all the waveforms after the analysis.
Options	Deletes all the waveforms after the analysis.
Save All Waveforms	
Delete All Waveforms After Analysis	
Show Acquire Parameters	Select to view the acquisition parameters.
Connection Setup	Allows to configure multiple pairs and map with channels.

TekExpress Ethernet saves all acquisition waveforms to files by default. Waveforms are saved in a unique folder for each session (a session is started when you click the Start button). The folder path is X:\Ethernet\Untitled Session\<dutid>\<date>_<time>. Images created for each analysis, CSV files with result values, reports, and other information specific to that particular execution are also saved in this folder.

Saving a session moves the session file contents from the Untitled Session folder to the specified folder name, and changes the session name to the specified name.

Set configuration tab parameters

Use Configuration tab to view and configure the Global Settings and the measurement configurations. The Global Settings and the measurements with configurations available in this tab depends on the Standards selected in the DUT tab.

Figure 3: Configuration tab: Global Settings

V TekExpress Ethernet - (Un	titled)* Options	
TekExpress Ethernet - (Un Setup UT Status Test Selection Results Acquisitions Plots 4 Configuration S Preferences	Compliance Mode User Defined Mode Global Settings Measurements Image: Template Point A Image: Template Point C Image: Template Point D Image: Template Point H Image: Template Point A Image: Template Point C Image: Template Point B Image: Template Point B Image: Template Point B Image: Template Point A Image: Peak Point B Image: Template Point B Image: Peak Point B Image: Peak Point C Image: Peak Point C Image: Peak Point C	Pause
Ready.		

Figure 4: Configuration tab: Measurements Settings

Table 10: Configuration tab settings

Setting	Description
Compliance Mode	Select to run test(s) in compliance mode. By default Compliance Mode is selected.
User Defined Mode	Select to run test(s) in user defined mode.
Global Settings	
Instruments Detected	Displays the instruments connected to this application. Click on the instrument name to open a list of available (detected) instruments.
	Select Options > Instrument Control Settings and click Refresh to update the instrument list.
	Note: Verify that the GPIB search criteria (default setting) in the Instrument Control Settings is selected when using TekExpress Ethernet application.
JigMatch Calibration	Measures the Amplitude and the Frequency of the disturbing signals. The default values can be set. The application measures and displays the values in the Measured Value fields. You can validate the disturbing signal by comparing the Measured Value with the Expected Value.
Return Loss Calibration	Displays the schematics for Return Loss Calibration. The Transmitter and Receiver Return Loss calibration for OPEN, SHORT, and LOAD terminations can be performed.
Bandwidth Limiting	Bandwidth limit can be set from the drop down for the measurements to be run. The Effective Bandwidth will be lesser of the Oscilloscope and the probe connected.

Table 11: Return Loss test method configuration and bandwidt	h limiting
--	------------

Method	Description
Oscilloscope Based	Calibration for the given setup and Return Loss Measurement are made using the connected signal generator and the oscilloscope.
VNA Data Import	Perform Return Loss measurement using VNA and the data is imported here.

Table 12: Measurements configuration for Analyze 1000BASE-T and 1000BASE-T-Multi Pair

Measurements	Configuration	Configuration	
Template Point A	Analyze	External Filter	Include or Exclude
Template Point B			
Template Point C			
Template Point D			
Template Point F			
Template Point H			
Template Point A (D)			
Template Point B (D)			
Template Point C (D)			
Template Point D (D)			
Template Point F (D)			
Template Point H (D)			
Peak Point A			
Peak Point B			
Peak Point C			
Peak Point D			
Peak Point A (D)			
Peak Point B (D)			
Peak Point C (D)			
Peak Point D (D)			
Transmitter Distortion Without TX_TCLK	Analyze	LP Filter	Include or Exclude
Transmitter Distortion With TX_TCLK		Hi Resolution	16 to 64
Transmitter Distortion Without TX_TCLK (D)			
Transmitter Distortion With TX_TCLK (D)			
Master Filtered Without TX_TCLK	Analyze	Clock Edge	RISE, FALL
Master UnFiltered Without TX_TCLK			
Table continued		1	1

Operating basics

Measurements	Configuration		Value
Slave Filtered Without TX_TCLK Slave UnFiltered Without TX_TCLK Master Filtered With TX_TCLK Master UnFiltered With TX_TCLK Slave Filtered With TX_TCLK Slave UnFiltered With TX_TCLK		Hysteresis	0% - 10 %
Transmitter Return Loss	Analyze	Smoothing Averages Loads (Ohm)	1 to 10 • 85, 100, 115 • 100
CM Voltage	Analyze	Filter Type	 None 1 MHZ (High Pass) 100 MHz (Low Pass) (1-100) MHz(Baseband)

Table 13: Measurements configuration for Analyze 100BASE-T

Measurements	Configuration		Value
AOI Template	Analyze	Fail Threshold	1 to 5000
Fall Time (Pos)	Analyze		
Fall Time (Neg)			
Rise Time (Pos)			
Rise Time (Neg)			
RF Symmetry (Pos)			
RF Symmetry (Neg)			
RF Symmetry (Max-Min)			
Overshoot (Pos)			
Overshoot (Neg)			
Differential Output Voltage (Pos)			
Differential Output Voltage (Neg)			
Amplitude Symmetry			
RF Symmetry (Max-Min)			
Jitter		Measurement Type	TieHistogram
Table continued	1	1	1

Table continued...

Measurements	Configuration		Value
Transmit Clock Frequency			
Duty Cycle Distortion			
Receiver Return Loss Transmitter Return Loss	Analyze	Smoothing Averages Loads (Ohm)	1 to 10 • 85, 100, 115 • 100

Table 14: Measurements configuration for Analyze 10BASE-T

Measurements	Configuration		Value
Link Pulse Load With TPM	Analyze	Mask Selection	Head, Tail, Both
Link Pulse Load Without TPM	-	Fail Threshold	1
Link Pulse Timing With TPM	Analyze		
Link Pulse Timing Without TPM			
Differential Voltage	Analyze	Peak	• Min • Min Max
TP_IDL Load Without TPM	Analyze	Mask Selection	Head, Tail, Both
TP_IDL Load With TPM		Fail Threshold	1
Jitter Normal with TPM	Analyze	МАШ Туре	• Internal
Jitter Normal without TPM			External
Jitter 8.0 with TPM			
Jitter 8.0 without TPM			
Jitter 8.5 with TPM			
Jitter 8.5 without TPM			
MAU Internal		Fail Threshold	1
MAU External			
MAU Internal (Inverted)			
MAU External (Inverted)		Mask Scale	Normal, 2. 0.9 and 3. 1.1
Transmitter Return Loss	Analyze	Smoothing Averages	1 to 100
Table continued			

Measurements	Configuration		Value	
Receiver Return Loss		Loads (Ohm)	85, 100, 115100	
CM Voltage	Analyze	Filter Type	 None 1 MHz (High Pass) 100 MHz (Low Pass) 1-100 MHz (Band pass) 	

Table 15: Measurements configuration for Acquire 1000BASE-T

Measurements	Configuration		Value
Template Point A	Acquire	Acquisition Average	16 to 256
Template Point B		TriggerLevel (A)	-5 V to 5 V
Template Point C			
Template Point D		TriggerLevel (B)	-5 V to 5 V
Template Point F			
Template Point H			
Template Point A (D)			
Template Point B (D)			
Template Point C (D)			
Template Point D (D)			
Template Point F (D)			
Template Point H (D)			
Transmitter Distortion Without TX_TCLK	Acquire	Acquisition Average	16 to 256
Transmitter Distortion With TX_TCLK	Acquire		-1000 mV to 1000
Transmitter Distortion Without TX_TCLK (D)			mV
Transmitter Distortion With TX_TCLK (D)			10 ns to 200 ns
Peak Point A			
Peak Point B			
Peak Point C			
Peak Point D			
Droop Point G			
Droop Point J			
Peak Point A (D)			
Peak Point B (D)			
Peak Point C (D)			
Table continued	1	I	1
Measurements	Configuration		Value
--	---------------	--------------------------	--
Peak Point D (D) Droop Point G (D) Droop Point J (D)			
Master Filtered Without TX_TCLK Master UnFiltered Without TX_TCLK Slave Filtered Without TX_TCLK Slave UnFiltered Without TX_TCLK	Acquire	Measurement Duration	 1 ms 10 ms 100 ms 1000 ms
Master Filtered With TX_TCLK Master UnFiltered With TX_TCLK Slave Filtered With TX_TCLK Slave UnFiltered With TX_TCLK		Number Of Clock Edges	 100000 1000000 10000000
Transmitter Return Loss	Acquire	Acquisition Average	100 to 10000
CM Voltage	-		

Table 16: Measurements configuration for Acquire 100BASE-T

Measurements	Configuration		Value
AOI Template	Acquire	Number of samples	5000 to 2147400000
Fall Time (Pos)	Acquire	Acquisition Type	Sample, Average
Fall Time (Neg)		Number of	2 to 10000
Rise Time (Pos)		Waveforms	
Rise Time (Neg)			
RF Symmetry (Pos)			
RF Symmetry (Neg)			
RF Symmetry (Max-Min)			
Overshoot (Pos)			
Overshoot (Neg)			
Differential Output Voltage (Pos)			
Differential Output Voltage (Neg)			
Amplitude Symmetry			
RF Symmetry (Max-Min)			
Jitter	-		
Transmit Clock Frequency	-		
Table continued			

Measurements	Configuration		Value
Duty Cycle Distortion	Acquire	Acquisition Type	Sample, Average
Receiver Return Loss Transmitter Return Loss	Acquire	Acquisition Average	100 to 10000

Table 17: Measurements configuration for Acquire for 10BASE-T

Measurement	Configuration		Value
Link Pulse Timing Without TPM	Acquire	Number of Acquisitions	2 to 10000
Link Pulse Timing With TPM		Number of Waveforms	1 to 10000
Link Pulse Load Without TPM			
Link Pulse Load With TPM			
Differential Voltage	Acquire	Acquisition Average	2 to 1000
		Acquisition Delay	1 to 10000 (Micro-seconds)
		Acquisition Type	Sample
			Average
TP_IDL Load With TPM	Acquire	Number of Acquisitions	2 to 10000
TP_IDL Load Without TPM		Number of Waveforms	1 to 10000
Jitter Normal with TPM	Acquire	Number of Acquisitions	2 to 10000
Jitter Normal without TPM			
Jitter 8.0 with TPM			
Jitter 8.0 without TPM			
Jitter 8.5 with TPM			
Jitter 8.5 without TPM			
MAU Internal			1000 to 10000
MAU External			
MAU Internal (Inverted)			
MAU External (Inverted)			
Harmonic	Acquire	Acquisition Delay	1 to 10000 (Micro-seconds)
		Math Average	2 to 10000
Transmitter Return Loss	Acquire	Acquisition Average	100 to 10000
Receiver Return Loss			
CM Voltage	-		

Return Loss Calibration steps

You can configure a DUT (Device Under Test) by adjusting it to conform to a dependable measure before running the Return Loss measurement.

Complete OPEN, SHORT, and LOAD calibrations before running the Return Loss measurement.

To run the Return Loss calibration, follow the steps given below:

1. Use **TC1** in the test fixture.

Make the connections as shown in the following figure.



Figure 6: Connection diagram for SHORT Calibration

- 2. Connect a BNC Cable between channel 1 of AWG/channel 1 of AFG and J290.
- 3. Connect a BNC Cable between Ch1/ AWG/channel 2 of AFG and J291.
- 4. Connect Differential probes from configured channels of the oscilloscope to P1 and P2 for Transmitter Return Loss, P3 and P4 for Receiver Return Loss.

Pair / Return Loss Type	Pair to be used
Transmitter return loss	P1 and P2
Receiver return loss	P3 and P4
Pair BI-DA	P1 and P2
Table continued	

TekExpress® Ethernet Electrical Testing Application Help

Pair / Return Loss Type	Pair to be used
Pair BI-DB	P3 and P4
Pair BI-DC	P5 and P6
Pair BI-DD	P7 and P8



Note: All 4 pairs can be calibrated simultaneously for 1000Base-T-Multi Pair, by connecting all the pairs to Oscilloscope.

- 5. Connect the termination SHORT, LOAD, and OPEN to J200 one by one, for calibration.
- 6. In the TekExpress Ethernet application click the DUT panel and select the Suite of interest.
- 7. For 1000Base-T-Multi Pair: Click the Acquisitions panel and select the channels for calibration.
- 8. If Aux is selected as Source3 (Trigger Sync Input), select the checkbox.



Note: Aux channel is present only in "6 Series MSO" oscilloscopes.

- 9. In the Options > Instrument Control settings, refresh to view the connected AWG/AFG.
- 10. In the Configuration Panel, select the Signal source model (For Return Loss test: AWG/AFG).
- 11. Click Return Loss.



Figure 7: Configuration Panel to select Signal Source and to perform Return Loss Calibration

- 12. In the Calibration dialog, select Tx for Transmission or Rx for Receiver Return Loss Calibration.
- **13.** For 1000Base-T-Multi Pair, make the connections for all the pairs selected in Acquisition panel. All the pairs will be calibrated simultaneously.
- 14. Perform SHORT, OPEN, and LOAD Calibration one by one with connection changes (detailed below) and click **Apply**. This completes the Return Loss Calibration.

	Loop Collibration		
100BASE-1 Return	Loss Calibration		
⊙ Тх	O Rx	Signal Source: AWG5202	Schematic
Probe1: CH1	Probe2: CH2	Sync Input: CH3	
Calibration Type	Calibration Status	Calibration Time	
Short	Pending		Calibration
Open	Pending		Calibration
open.	renang		
Load	Pending		Calibration
		LastApplied:	Apply

Figure 8: Calibration panel before performing calibration

The corresponding date and time for the latest successful Calibration and Apply are displayed.

1000BASE-T Retur	n Loss Calibration		×
О Тх	O Rx	Signal Source: AFG31052	Schematic
Probe1: CH1	Probe2: CH2	Sync Input: CH3	
Calibration Type	Calibration Status	Calibration Time	
Short	Completed	05/12/2019 19:52:17	Calibration
Open	Completed	05/12/2019 19:53:12	Calibration
Load	Completed	05/12/2019 19:55:51	Calibration
		LastApplied: 05/12/2019 19:55	558 Apply

Figure 9: Calibration panel after calibration is performed for OPEN, SHORT, and LOAD and then Apply

SHORT calibration:

Perform the above-mentioned steps with SHORT termination connected to J200 as shown below:



Figure 10: Connection diagram for SHORT Calibration

The following figure displays a typical waveform for Return Loss SHORT Calibration.



Figure 11: Calibration output for SHORT calibration

OPEN Calibration:



Figure 12: Connection diagram for OPEN Calibration

The following figure shows a typical waveform for Return Loss OPEN Calibration.



Figure 13: Calibration output for OPEN calibration

LOAD Calibration:

Perform the above mentioned steps with LOAD termination connected to J200 as shown below:



Figure 14: Calibration output for LOAD calibration

The following figure shows a typical waveform for Return Loss LOAD Calibration.

Ref 1 - FFT				
-				
	ж.			

Figure 15: Calibration output for LOAD calibration

After OPEN, SHORT, and LOAD calibration, click **Apply** in Return Loss Calibration window which generates the Return Loss measurements pre-requisite data by using calibration values.



Note: Clicking Apply will not apply any setting on the oscilloscope nor does any acquisition.

Note: If you change any of the following configurations, calibration for Open, Short, and Load must be performed again before running the return loss measurement:



- Channels and Trigger Sync input
 - Signal Source selected

• Return Loss type (Transmitter or Receiver)

Method to set up the Signal Source for Do not use configuration:

In Configuration Panel if the **Signal source** is selected as *For Return Loss test: AWG/AFG* is *Do not use*, then the waveform need to be manually loaded in the Signal Source before running the Calibration or Return Loss measurement.

Global Settings	Measurements	
Instruments Detect	ed	
Real Time Scope		MSO64 (GPIB8::1::INSTR)
For JigMatch test :	AWG/AFG/Scop	Do not use
For Return Loss te	st : AWG/AFG	Do not use 💟

Figure 16: Return Loss Signal Source selection, with Do not use configuration

Method for loading the waveform on the supported AWG:

 Copy the waveform available at Oscilloscope at C:\Program Files\Tektronix\TekExpress\TekExpress Ethernet\AWG Waveforms\10BaseT Return Loss\AWG Format\RL10_AWG.wfm, to the AWG using LAN or USB.

Example mentioned above is for 10BaseT, select the folder accordingly for 1000BaseT or 100BaseT. The above path is applicable for all supported AWG models.

- Open the waveform for the corresponding speed and AWG series from Open File option, and when prompted, select option Max & Preserve Offset settings.
- Set Amplitude to 1.5 Vpp. (Maximum supported Amplitude)
- Click Setup > Clock > set the Sample Rate to 250 MS/s.
- Click Setup > Channel > set the Resolution(bits) to (15 + 1 Mkr).
- Switch ON the channel and click Play.

A0#05282															
88					Playing							0			
Home Setup Waveform Plug-ins Sequence E	ditor Capture/Pli	ayback Preco	mpensation Ut	tilities											
								Force Trig A	A] Force 1	Trig B	All Output	s Off	AWG	Function	s
Channel 1 RL1000_5000													plitude 1	.500 Vpp	
🔗 Run Continuous 🔫													Offset 0		
^{750 mv} ······	ulululu	hhhhh	n n n n n n n n	ububuh	ulululululul	n ha ha ha ha ha	deteletele	ulululu	uuun	mm	ddddd	qqqq	10100	n n n n n n	
	հետես	ւննեն	de de de de de de de	hhhhh	Indeka ka k	ւհեռեւն	հեհեն	An	hahahah	dalah	հեհեհ	հետե	ululululu	An de de de de de	lu I
M1															
Click to assign waveform/seque													olitude S	00.0 mVpp	h
													Offset 0	v	ή
250 mV															Ĩ
-250 mV															
	Sample Rate: 2	50 MS/s													

Figure 17: AWG with Return Loss waveform loaded

Method for loading the waveforms on the supported AFG:

For AFG3000 series:

 Copy the waveform available at Oscilloscope at C:\Program Files\Tektronix\TekExpress\TekExpress\TekExpress Ethernet\AWG Waveforms\10BaseT Return Loss\AFG Format\RL10_AFG.tfw, to AFG using USB. Example mentioned above is for 10BaseT, select the folder accordingly for 1000BaseT or 100BaseT. The above path is applicable for all supported AFG 3000 series models.

- 2. Click Arb > Arb Waveform menu > USB > select the waveforms (.tfw) on both the channels.
- 3. Set the Frequency to 6.052682549 kHz for 100BaseT and 1000BaseT and 6.097560976 kHz for 10BaseT, for both the channels.
- 4. Set the Amplitude to 2.0 Vpp, for both the channels.
- 5. Invert the waveforms on channel 2.
- 6. Switch ON both the channels.



Figure 18: AFG with Return Loss waveforms loaded

For AFG31000 series:

- 1. Copy the waveform available at Oscilloscope at C:\Program Files\Tektronix\TekExpress\TekExpress Ethernet\AWG Waveforms\10BaseT Return Loss\AFG Format\RL10_AFG.tfw, to AFG using USB. Example mentioned above is for 10BaseT, select the folder accordingly for 1000BaseT or 100BaseT. The above path is applicable for all the supported AFG models.
- 2. Click Home > ArbBuilder > Open > USB, select corresponding folder and file (.tfw) and click OK.
- 3. Click Save As and save the waveform on the Memory (.tfwx). Click OK.
- 4. Click Home > Basic > select Arb from drop down menu for the channel 1.
- 5. From Shape > File > USB > select the waveform file for the corresponding speeds from Memory(.tfwx).
- 6. Repeat steps 4 and 5 for channel 2.
- 7. Set the Frequency to 6.052682549 kHz for 100BaseT and 1000BaseT and 6.097560976 kHz for 10BaseT, for both the channels.
- 8. Set the Amplitude to 2.0 Vpp, for both the channels.
- 9. Invert the waveforms on channel 2.
- 10. Switch ON both the channels.

JigMatch calibration steps

You can measure the Amplitude and Frequency of the disturbing signal and set the default values. The application measures and displays the values in the Measured Value fields. You can validate the disturbing signal by comparing the measured value with the expected value.

• Test Mode 1	🔵 Test Mod	ie 4	Schemati
Disturber Con	npensation		
Connect Tektro	nix AWG/AFG to tes	st fixture TC5	Set &
	Compliance Value	e Last Measured Value	incusure
Amplitude (V)	1.4	1.4	Measure
Frequency	31.25MHz	31.25MHz	Default
Click Default to	set IEEE standar	d values	\square
Test Fixture C	ompensation —		
Step 1: Connect DUT to	o test fixture TC2		
	Expected Value	Last Measured Value	
DUTAmp	750mV	750mV	Measure
			Default
Step 2:			
Connect DUT to	o test fixture TC5		
	Expected Value	Last Measured Value	
Probe Point Am	1p 500mV	500mV	Measure
	1.5	15	Default
Attenuation	1.0	1.0	

Figure 19: JigMatch calibration configuration panel

To do the JigMatch calibration in the TekExpress application follow the steps below:

- 1. In the DUT panel and select the Suite of interest.
- 2. In the Acquisitions panel and select the channel for measurement.
- 3. In the Instrument Control settings, refresh to view the connected AWG/AFG.
- 4. From the Configuration panel, select the Signal source model in For JigMatch test: AWG/AFG/Scope AFG.
- 5. Click JigMatch.



Figure 20: Configuration Panel for selecting Signal Source and to perform JigMatch Calibration

JigMatch calibration includes the following:

- Disturber Compensation
- Test Fixture Compensation Step 1
- Test Fixture Compensation Step 2

To measure the Disturbing Signal using JigMatch, follow the steps given below:

- **1.** Use TC5 of the test fixture.
- 2. Make the connections as shown in the following figure:



Figure 21: Connection diagram to measure Disturbing Signal using JigMatch

Note: Do not connect the Ethernet cable to J700 and the test port of the DUT.

- 3. Connect a BNC cable between Channel 1 of AFG/AWG+ and J650.
- 4. Connect a BNC cable between Channel 2 of AFG/AWG- and J790.
- 5. Short the jumpers J621, J630, J620, J623, J721, J723, J680, and J781.
- 6. Connect the Differential probe to P19 and configured channel of the oscilloscope.
- 7. In the Jig Match dialog box, click Set&Measure/Measure in the Disturber Compensation group box.



Figure 22: Disturber Compensation in JigMatch

- 8. Click Default to set the IEEE standard values as Compliance values.
- 9. If Set & Measure is clicked, AFG/AWG will be configured to the Compliance Value and then value will be measured.
- 10. If Measure is clicked, value will be measured.
- 11. Compare the **Compliance value** and last **measured value**.
- 12. If the **Measured Value** is not approximately equal to the Expected Value, modify the amplitude and clock frequency settings of the Arbitrary Waveform Generator/Arbitrary Function Generator. Then click **Measure** to compare the values to be approximately equal.

To compensate the linearities of Test Fixture (TC2) using JigMatch, follow the steps given below:

Test Fixture Compensation, Step 1:

- 1. Use TC2 of the test fixture.
 - a. Make the connections as shown in the following figure.



Figure 23: Connection diagram to measure linearities of Test Fixture using JigMatch

- 2. For Template, Droop, and Peak Voltage tests, set the DUT to generate Test Mode 1 signal. For Distortion test, set the DUT to generate Test Mode 4 signal.
- 3. Connect the Ethernet cable to J490 and the test port of the DUT.
- 4. In the JigMatch dialog box >Test Fixture Compensation group box, selectMeasure.



Figure 24: Test Fixture Compensation in JigMatch

To compensate the linearities of Test Fixture (TC5) using JigMatch, follow the steps given below:

Test Fixture Compensation, Step 2:

- 1. Use TC5 of the test fixture.
- 2. Make the connections as shown in the following figure.



Figure 25: Connection diagram to measure linearities of the Test Fixture using JigMatch

- 3. For Template, Droop, and Peak Voltage tests, set the DUT to generate Test Mode 1 signal. For Distortion test, set the DUT to generate Test Mode 4 signal.
- 4. Connect the Ethernet cable to J700 and test port of the DUT.
- 5. Switch OFF the Arbitrary Waveform Generator/Arbitrary Function Generator.

Note: Short the jumpers J621, J630, J623, J721, J723, J680, and J781.

- 6. Connect the differential probe to P18 and configured channel of the oscilloscope.
- 7. In the Jig Match dialog box >under step 2 of Test Fixture Compensation group box, select Measure.

Step 2: Connect DUT to te	st fixture TC5		
E	xpected Value	Last Measured Value	
Probe PointAmp	500mV	500mV	Measure
Attenuation	1.5	1.5	Default

Figure 26: Test Fixture Compensation in JigMatch

Method to set up the Signal Source for Do not use configuration:

In Configuration Panel if the Signal source is selected as For JigMatch test: AWG/AFG/Scope AFG is Do not use, then the waveform need to be manually loaded in the Signal Source before running the JigMatch Calibration.

Global Settings	Measurements			
Instruments Detect	ed			
Real Time Scope		MSO64 (GPIB8::1::INSTR)		
For JigMatch test	: AWG/AFG/Scop	Do not use 💟		
For Return Loss te	est : AWG/AFG	AWG5202 (TCPIP::134.64.246.111		

Figure 27: JigMatch Signal Source selection, with "Do not use" configuration

To load the waveform follow the steps below:

Method to setup the supported AWG For Test Mode 1:

1. Copy the waveform available in Oscilloscope located at C:\Program Files\Tektronix\TekExpress\TekExpress Ethernet\AWG Waveforms\AWG_Automation_Files\Template5K.wfm, to the AWG using LAN or USB.

The above mentioned path is applicable for all supported AWG models.

- 2. Set Amplitude on the AWG to 700 mVpp.
- 3. Switch ON the channel and click Play.



Figure 28: AWG with Test Mode 1 waveform loaded

Method to setup the supported AWG For Test Mode 4:

1. Copy the waveform available in Oscilloscope located at C:\Program Files\Tektronix\TekExpress\TekExpress Ethernet\AWG Waveforms\AWG_Automation_Files\Distortion5K.wfm, to the AWG using LAN or USB.

The above mentioned path is applicable for all supported AWG models.

- 2. Set Amplitude on AWG to 1.35 Vpp.
- 3. Switch ON the channel and click Play.

	Pi	lying .		
Home Setup Waveform Plug-ins Sequence Editor Capture/Playback F	Precompensation Utilities			
		Foro	e Trig A Force Trig B All Outputs	Off AWG Functions
Ogannel 1 Distortion5K 🗸 💥 ≚				Amplitude 1 350 Voo
				Official D.Y.
o Run Continuous V				Unset UV
675 mV				
-675 mV				
0 4k 8k 12k	16 k 20 k 24	k 28 k 32 k	36 k 40 k	44 k 48 k
🛈 Channel 2 Click to assign waveform/sequence 🔻 🔆				Amplitude 500.0 mVpp
8 Run Continuous 👻				Offset 0 V
250 mV				
20				
223 IN				

Figure 29: AWG with Test Mode 4 waveform loaded

Method to setup the supported AFG For Test Mode 1:

- 1. Set signal source on both the channels as Sine.
- 2. Set the Frequency on both the channels to 31.25 MHz.
- 3. Set the Amplitude on both the channels to 700 mVpp.
- 4. Set Phase of Channel 2 to 180 degrees
- 5. Switch ON both the channels.



Figure 30: AFG with Test Mode 1 waveform loaded

Method to setup the supported AWG For Test Mode 4:

- 1. Set signal source on both the channels as Sine.
- 2. Set the Frequency on both the channels to 20.833 MHz.
- 3. Set the Amplitude on both the channels to 1.35 mVpp.
- 4. Set Phase of channel 2 to 180 degrees.
- 5. Switch ON both the channels.

CH1	Sine 🔻	Continuous 🔻	СН2	Sine	•]	Continuo	us 🔻
Fre	eq 20	.833 000 000 0 MHz		Freq	20.83	3 000 000	0 MHz
Pha	ise 0.0	90 °		Phase	180.0	0 °	
Am	planet 1.3	350 Vpp		Ampl	1.350	Vpp	
Offs	set 0 r	mV		Offset	0 mV		
Uni	its Vp	p 🔻]	Units	Vpp		•
675 mV		\frown	6/5 mV				
0 mV			675 mV	J.			
-675 mv 0 ns	24.0 ns 48.0 ns	72.0 ns 96.0 ns	0 ns	24.0 ns	48.0 ns	72.0 ns	96.0 ns

Figure 31: AFG with Test Mode 4 waveform loaded

Set preferences tab parameters

Use Preferences tab to set the application action on completion of a measurement.



Table 18: Preferences tab settings

Setting	Description
Number of Runs	
Table continued	

Setting	Description
Acquire/Analyze each test <no> times (not applicable to Custom Tests)</no>	Select to repeat the test run by setting the number of times. By default, it is selected with 1 run.
Actions on Test Measurement F	ailure
On Test Failure, stop and notify	Select to stop the test run on Test Failure, and to get notified via email. By default, it is unselected.
me of the failure	Click Email Settings to configure.
Pop-up Settings	
Auto close Warnings and Informations during Sequencing	Select to auto close warnings/informations during sequencing. Set the Auto close time. By default it is unselected.
Auto close after <no> Seconds</no>	
Auto close Error Messages during Sequencing. Show in Reports	Select to auto close Error Messages during Sequencing. Set the Auto close time. By default it is unselected.
Auto close after <no> Seconds</no>	

Status panel

Status panel overview

The Status panel accesses the Test Status and Log View tabs, which provide status on test acquisition and analysis (Test Status) and a listing of test tasks performed (Log View tab). The application opens the Test Status tab when you start a test run. You can select the Test Status or the Log View tab to view these items while tests are running.

stName	Acquisition	Acquire Status	Analysis Status
Template Point A	TemplateA Without Disturber	Completed	Completed
Template Point B	TemplateB_Without Disturber	Completed	Completed
Template Point C	TemplateC_Without_Disturber	Completed	Completed
Template Point D	TemplateD_Without_Disturber	Completed	Completed
Template Point F	TemplateF_Without_Disturber	Completed	Completed
Template Point H	TemplateH_Without_Disturber	In Progress	To be started
Peak Point A	PeakvoltageA_Without_Disturber	To be started	To be started
Peak Point B	PeakvoltageB_Without_Disturber	To be started	To be started
Peak Point C	PeakvoltageC_Without_Disturber	To be started	To be started
Peak Point D	PeakvoltageD_Without_Disturber	To be started	To be started
Droop Point G	DroopG_Without_Disturber	To be started	To be started
Droop Point J	DroopJ_Without_Disturber	To be started	To be started
Transmitter Distortion Without TX_TCLK	Distortion_Without_Disturber_Wit hout_TX_TCLK	To be started	To be started
Transmitter Distortion With TX_TCLK	Distortion_Without_Disturber_Wit h_TX_TCLK	To be started	To be started
Template Point A (D)	TemplateA_With_Disturber	To be started	To be started
Template Point B (D)	TemplateB_With_Disturber	To be started	To be started
Template Point C (D)	TemplateC_With_Disturber	To be started	To be started
Template Point D (D)	TemplateD_With_Disturber	To be started	To be started
Template Point F (D)	TemplateF_With_Disturber	To be started	To be started
Template Point H (D)	TemplateH_With_Disturber	To be started	To be started
Deale Parlas A (P)	Particular A 1156 Participar	*********	

Figure 32: Test status view

Operating basics



Figure 33: Log view

Table 19: Status panel Log View controls

Control	Description
Message History	Lists all executed test operations and timestamp information.
Auto Scroll	Enables automatic scrolling of the log view as information is added to the log during the test.
Clear Log	Clears all messages from the log view.
Save	Saves the log file to a text file. Use the standard Save File window to navigate to and specify the folder and file name to which to save the log text.

See also

Application panel overview

Results panel

Results panel overview

When a test execution is complete, the application automatically opens the Results panel to display a summary of test results.

iverall Test Result 🛛 🥑 Pas	S				Preferences
Test Name	Details	Pass/Fail	Value	Margin	Units
Receiver Return Loss ≢	ReturnLoss_R eceiver 850hm_Run1	🥑 Pass	3.0990	L:3.0990	dB
Receiver Return Loss +	ReturnLoss_R eceiver 1000hm_Run	🕜 Pass	11.7726	L:11.7726	dB
Receiver Return Loss +	ReturnLoss_R eceiver 1150hm_Run	🕜 Pass	2.7588	L:2.7588	dB
Receiver Return Loss ±	ReturnLoss_R eceiver 850hm_Run2	🕑 Pass	3.1226	L:3.1226	dB
Receiver Return Loss +	ReturnLoss_R eceiver 1000hm_Run	🕜 Pass	10.1108	L:10.1108	dB
Receiver Return Loss	ReturnLoss_R eceiver 1150hm_Run	🕜 Pass	3.5099	L:3.5099	dB
Receiver Return Loss +	ReturnLoss_R eceiver 850hm_Run3	🕜 Pass	2.1059	L:2.1059	dB
Receiver Return Loss	ReturnLoss_R eceiver 1000hm_Run	🕜 Pass	8.6606	L:8.6606	dB
Receiver Return Loss ⊕	ReturnLoss_R eceiver 1150hm_Run	🕜 Pass	4.0344	L:4.0344	dB
Receiver Return Loss	ReturnLoss_R	_	3.5779	L:3.5779	dB

See also

View a report Application panel overview

View test-related files

Files related to tests are stored in My TekExpress\Ethernet\. Each test setup in this folder has both a test setup file and a test setup folder, both with the test setup name.

The test setup file is preceded by the TekExpress icon and usually has no visible file name extension.

Inside the test setup folder is another folder named for the DUT ID used in the test sessions. The default is DUT001.

Inside the DUT001 folder are the session folders and files. Each session also has a folder and file pair, both named for the test session using the naming convention (date)_(time). Each session file is stored outside its matching session folder:

20110520_154553
 20110520_154713
 20110520_155111
 20110520_155920
 20110520_160103
 20110520_154553
 20110520_154713
 20110520_155111
 20110520_155920
 20110520_155920
 20110520_160103

Each session folder contains image files of any plots generated from running the test session. If you selected to save all waveforms or ran tests using prerecorded waveform files, these are included here.

The first time you run a new, unsaved session, the session files are stored in the Untitled Session folder located at $..\My$ TekExpress\Ethernet\. When you name and save the session, the files are placed in a folder with the name that you specify. A copy of the test files stay in the Untitled Session folder until you run a new test or until you close the Ethernet application.

See also

File name extensions

Plots panel

Plots panel overview

The Plots panel displays the result as a two-dimensional plot for additional measurement analysis. The plots are displayed only for Return Loss measurements.



Toolbar functions in plot windows

The Plot Toolbar window includes the following functions:

lcon	Functions
	Saves the plot.
Save	
₽	Expands the selected plot area. Left-click and drag the mouse to mark the region on the plot to zoom.
Select & Zoom	
•	Expands part of the plot (Horizontal and Vertical); the data appears in more detail.
Zoom In	
Table continued	•

Icon	Functions
0	Contracts part of the plot (Horizontal and Vertical); the data appears in less detail.
Zoom Out	
87	Moves the plot anywhere within the scale.
Pan	
+	Hides the gridlines.
Hide Gridlines	
	Resets the zoom to 100%.
Reset	
	Sets the plot color. Click and select the color in the Color window and click OK. Click in the plot area to
Choose Waveform Colors	apply the color.
₿	Displays or hides the markers
Show/Hide Markers	
	Click to undock/dock the plot window.
UnDock/Dock	
Select Test	Select the measurement.

Reports panel

Reports panel overview

Use Reports panel to browse for reports, name and save reports, select test content to include in reports, and select report viewing options.



For information on setting up reports, see Select report options. For information on viewing reports, see View a report.

See also

Application panel overview

Select report options

Click Reports panel and use the Reports panel controls to select which test result information to include in the report, and the naming conventions to use for the report. For example, always give the report a unique name or select to have the same name increment each time you run a particular test.

Select report options before running a test or when creating and saving test setups. Report settings are included in saved test setups.

In the Reports panel, select from the following report options:

Table 20: Report options

Setting	Description		
Report Update Mode			
Generate new report	Creates a new report. The report can be in either .mht or .pdf file formats.		
Append with previous run session	Appends the latest test results to the end of the current test results report.		
Include header in appended reports	Select to include header in the appended reports.		
Replace current test in previous run session	Replaces the previous test results with the latest test results. Results from newly added tests are appended to the end of the report.		
Report Creation Settings			
Report name	Displays the name and location from which to open an Ethernet report. The default location is at \My TekExpress\Ethernet\Untitled Session. The report file in this folder gets overwritten each time you run a test unless you specify a unique name or select to auto increment the report name.		
	Do one of the following:		
	 In the Report Path field, type over the current folder path and name. 		
	 Double-click in the Report Path field and then make selections from the pop-up keyboard and click the Enter button. 		
	Be sure to include the entire folder path, the file name, and the file extension. For example: C:\Documents and Settings\your user name\My Documents\My TekExpress\Ethernet\DUT001.mht.		
	Note: You cannot set the file location using the Browse button.		
	Open an existing report.		
	Click Browse , locate and select the report file and then click View at the bottom of the panel.		
Save as type	Saves a report in the specified file type, selected from the drop-down list.		
	Note: If you select a file type different from the default, be sure to change the report file name extension in the Report Name field to match.		
Table continued			

Setting	Description					
Auto increment report name if duplicate	Sets the application to automatically increment the name of the report file if the application finds a file with the same name as the one being generated. For example: DUT001, DUT002, DUT003. This option is enabled by default.					
Create report automatically at the end of the run	Creates report at the end of the run.					
Contents To Save						
Include pass/fail info in details table	Includes pass/fail info in the details table of the report.					
Include detailed results	Includes detailed results in the report.					
Include plot images	Includes plot images in the report.					
Include setup configuration	Sets the application to include hardware and software information in the summary box at the top of the report. Information includes: the oscilloscope model and serial number, the oscilloscope firmware version, and software versions for applications used in the measurements.					
Margin value in percentage	Select to include the margin value in percentage in the report.					
Include user comments	Select to include any comments about the test that you or another user added in the DUT tab of the Setup panel. Comments appear in the Comments section, under the summary box at the beginning of each report.					
View report after generating	Automatically opens the report in a Web browser when the test completes. This option is selected by default.					
View	Click to view the most current report.					
Generate Report	Generates a new report based on the current analysis results.					
Save As	Specify a name for the report.					

View a report

The application automatically generates a report when test execution is complete and displays the report in your default Web browser (unless you cleared the **View Report After Generating** check box in the Reports panel before running the test). If you cleared this check box, or to view a different test report, do the following:

- 1. Click the **Reports** button.
- 2. Click the Browse button and locate and select the report file to view.
- 3. In the Reports panel, click View.

For information on changing the file type, file name, and other report options, see Select report options.

Report contents

A report shows detailed results and plots, as set in the Reports panel.

-19.77dB

-20.74dB

Tektronix ®				Tel 10	TekExpress Ethernet 1000BASE-T Test Report						
Setup Information											
DUT ID		DUT001			Scope Information			MSO54, C012701			
Date/Time 2		2019-	2019-05-03 06:37:23			Scope F/W Version			1.15.48.6297		
Device Type E		Ethern	Ethernet			Return Loss Signal Generator			AWG5202		
TekExpress Ethernet Version 1		1.0.1.0	1.0.1.616			Jigmatch Signal Generator			AWG5202		
TekExpress Framework Version 4.10		4.10.0	.10.0.35		DATA Probe Model			TDP3500			
Execution Mode Live		Live	Live		DATA Prol	DATA Probe Serial Number			B012249		
Compliance Mode Tru		True	l'rue		MCLK Probe Model			TDP3500			
Overall Test Result Pa		Pass	55		MCLK Probe Serial Number			Q100110			
Overall Execution Time 0		0:09:0	0:09:08								
DUT COMMENT:	General comment										
Test News Commence	T-1-1-										
Test Name Summary Table											
Receiver Return Loss Pass											
Receiver Return Loss	Margin Table Run	1									
Erequency	Spec Value		850hm	1000hm		1150hm	Result		Comments		
1MHz	=16dB	_	_21_38dB	-48 68dB		-23 53dB	Pass		connents		
10MHz	-16dB		-23 53dB -28 66dI			-21 23dB	Pass				
20MHz	-16dB		-20.5dB	-30.81dB		-21.59dB	Pass				
30MHz	-16dB		-21.89dB	-32.83dB		-22 78dB	Pass				
40MHz	=16dB		-19.4dB	= 30 48dB		-24 37dB	Pass				
500.01	TOUD			00.1000		2					

-30.48dB -33.54dB

-36.89dB

Setup configuration information

-14.08dB

-12.5dB

The summary box at the beginning of the report lists setup configuration information. This information includes the oscilloscope model and serial number, optical module model and serial number, and software version numbers of all associated applications.

Pass

Pass

To exclude this information from a report, clear the Include Setup Configuration check box in the Reports panel before running the test.

User comments

50MHz 60MHz

If you selected to include comments in the test report, any comments you added in the DUT tab are shown at the top of the report.

-25.56dB

-24.98dB

See also

Results panel overview

View test-related files

Running tests

1000BASE-T connection diagram

Click Setup > Test Selection > Preview to view the equipment setup diagram(s).



Figure 34: 1000BASE-T Template, Peak Volt, and Droop (Without Disturber)

1504-023



Figure 35: 1000BASE-T Template, Peak Volt, and Droop (With Disturber)

Running tests



Figure 36: Distortion with Disturber with Clock



Figure 37: Distortion with Disturber without Clock





Figure 38: Distortion without Disturber with Clock



Figure 39: Distortion without Disturber without Clock





Figure 40: Master and Slave Jitter without Clock



Figure 41: Master Filtered Jitter with Clock - Connection 1





Figure 42: Master Filtered Jitter with Clock - Connection 2


Figure 43: Master Unfiltered Jitter with Clock





Figure 44: Slave Filtered Jitter with Clock - Connection 1



Figure 45: Slave Filtered Jitter with Clock - Connection 2



Figure 46: Slave Unfiltered Jitter with Clock

Tektronix Oscilloscope



Figure 47: 1000BASE-T CM Voltage



Figure 48: 1000BASE-T Transmitter Return Loss



Figure 49: 1000BASE-T Receiver Return Loss

1000BASE-T-Multi Pair connection diagram

Click Setup > Test Selection > Preview to view the equipment setup diagram(s).





Figure 50: 1000BASE-T-Multi Pair Template, Peak Volt, and Droop (Without Disturber)



Figure 51: 1000BASE-T-Multi Pair Template, Peak Volt, and Droop (With Disturber)



Figure 52: Distortion with Disturber with Clock

Running tests



Figure 53: Distortion with Disturber without Clock



Figure 54: Distortion without Disturber with Clock



Figure 55: Distortion without Disturber without Clock





Figure 56: Master and Slave Jitter without Clock



Figure 57: Master Filtered Jitter with Clock - Connection 1



Figure 58: Master Filtered Jitter with Clock - Connection 2



Figure 59: Master Unfiltered Jitter with Clock



Figure 60: Slave Filtered Jitter with Clock - Connection 1



Figure 61: Slave Filtered Jitter with Clock - Connection 2



Note: During this test execution, dynamic pop-up contains information about data channel mapping but it will be acquire clock channels only.



Figure 62: Slave Unfiltered Jitter with Clock

Tektronix Oscilloscope



Figure 63: 1000BASE-T-Multi Pair CM Voltage



Figure 64: 1000BASE-T-Multi Pair Transmitter Return Loss

100BASE-T connection diagram

Click Setup > Test Selection > Preview to view the equipment setup diagram(s).





Figure 65: 100BASE-T connection diagram for all tests except Return Loss



Figure 66: 100BASE-T Transmitter Return Loss



Figure 67: 100BASE-T Receiver Return Loss

10BASE-T connection diagram



Figure 68: 10BASE-T MAU, Jitter, TP_IDL Load With TPM, Link Pulse Timing With TPM, and Link Pulse Load With TPM

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Figure 69: 10BASE-T TP_IDL Load Without TPM, Jitter, Link Pulse Load Without TPM, Harmonic, and Link Pulse Timing Without TPM, and Differential Voltage



Figure 70: 10BASE-T Transmitter Return Loss



Figure 71: 10BASE-T Receiver Return Loss

Refer Return Loss Calibration steps on page 39

Prerequisite

Compensate the signal path

Use the following procedure to compensate the internal signal acquisition path. Perform this procedure if the ambient temperature has changed more than 5 °C (9 °F) since you performed the last signal path compensation. Perform the signal path compensation once a week. Failure to do so may result in the instrument not meeting warranted performance levels.

- 1. Power on and wait for the instrument to complete its warm up period before continuing with this procedure.
- 2. Disconnect any probes you have connected to the input channels.
- 3. Set the instrument to Menu mode.
- 4. Select Instrument Calibration from the Utilities menu.
- 5. Note any instructions that appear in the resulting control window.
- 6. Click Run SPC to begin the procedure. The procedure may take several minutes to complete.
- 7. Verify that the Status changes to Pass after the procedure is complete. If the Calibration Status field indicates anything other than Compensated, see Signal Path Compensation Status for information on the readout and recommended action.



Note: When making measurements at vertical scale settings less than or equal to 5 mV, you should perform the signal path compensation at least once a week. Failure to do so may result in the instrument not meeting warranted performance levels at those volts/div settings.

Running tests

Select tests, set acquisition parameters, set configuration parameters, set preferences parameters, and click **Start** to run the tests. While tests are running, you cannot access the Setup or Reports panels. To monitor the test progress, switch between the Status panel and the Results panel.

While the tests are running, other applications may display windows in the background. The TekScope application takes precedence over other applications, but you can switch to other applications by using **Alt + Tab** key combination. To keep the TekExpress Ethernet application on top, select **Keep On Top** from the TekExpress Options menu.

The application displays report when the tests execution is complete.

Prerun checklist

- 1. Make sure that the instruments are warmed up (approximately 20 minutes) and stabilized.
- 2. Perform compensation: In the oscilloscope main menu, select Utilities > Instrument Compensation. Click Help in the compensation window for steps to perform instrument compensation.

View test results

When a test completes, the application switches to the Results panel, which shows a summary of test results.

Each test result occupies a row in the Results table. By default, results are displayed in summary format, with the measurement details collapsed. You can change the view in the following ways:

- To view the results grouped by pair or test, select the corresponding item from the Preferences menu.
- To expand all tests listed, select View Results Details from the Preferences menu.
- To expand and collapse tests, use the plus and minus buttons to the left of the test rows.
- To collapse all expanded tests, select Preferences > View Results Summary.
- To enable or disable the wordwrap feature, select Preferences > Enable Wordwrap.
- To expand the width of a column, place the cursor over the vertical line that separates the column from the one to the right. When the cursor changes to a double-ended arrow, hold down the mouse button and drag the column to the desired width.
- To sort the test information by column, click the column head. When sorted in ascending order, a small up arrow is displayed. When sorted in descending order, a small down arrow is displayed.

• To clear all test results displayed, click Clear (

See Also

View a report

Saving and recalling test setup

Test setup files overview

Saved test setup information (such as the selected oscilloscope, general parameters, acquisition parameters, measurement limits, waveforms (if applicable), and other configuration settings) are saved under the setup name at X:\Ethernet.

Use test setups to:

- · Run a new session, acquiring live waveforms, using a saved test configuration.
- · Create a new test setup using an existing one.
- View all the information associated with a saved test, including the log file, the history of the test status as it executed, and the results summary.
- Run a saved test using saved waveforms.

See also

Save a test setup Open (load) a saved test setup

Save a test setup

You can save a test setup before or after running a test. You can create a test setup from *already created test setup*, or using *default test setup*. When you select the default test setup, the parameters are set to the application's default value.

Select Options > Save Test Setup to save the opened setup.

Select Options > Save Test Setup As to save the setup with different name.

Open (load) a saved test setup

To Open (load) a saved test setup, do the following:

- 1. Select Options > Open Test Setup.
- 2. Select the setup from the list and click Open. Setup files are located at X:\Ethernet\.

See also

About test setups Create a test setup using an existing one Create a test setup from default settings

Create a test setup from default settings

To create a test setup using default settings, follow the steps:

- 1. Select Options > Default Test Setup. For default test setup, the parameters are set to the application's default value.
- 2. Click application Setup and set the parameters.

- 3. Click application *Reports* and set the report options.
- 4. Optional: Click Start to run the test and verify that it runs correctly and captures the specified test information and reports. If it does not, then edit the parameters and repeat this step until the test runs to your satisfaction.
- 5. Select Options > Save Test Setup. Enter the file name and click Save. The application saves the file to X:\Ethernet\<session_name>.

Create a test setup using an existing one

To create a test setup using an existing one, follow the steps:

- 1. Select Options > Open Test Setup.
- 2. Select a setup from the list and then click **Open**.
- **3.** Click application *Setup* and modify the parameters.
- 4. Click application *Reports* and modify the report options.
- 5. Select Options > Save Test Setup As.
- 6. Enter test setup name, and click Save.

SCPI Commands

About SCPI command

You can use Standard Commands for Programmable Instruments (SCPI) to communicate with the TekExpress application.

Socket configuration for SCPI commands

This section describes the steps for TCP/IP socket configuration and TekVISA configuration to execute the SCPI commands.

TCP/IP socket configuration

1. Click Start > Control Panel > System and Security > Windows Firewall > Advanced settings.



 In Windows Firewall with Advanced Security menu, select Windows Firewall with Advanced Security on Local Computer > Inbound Rules and click New Rule...

Prindows Firewall with Advanced	I Security				- 0 X
Eile Action View Help					
	L				
Windows Firewall with Advance	Inbound Rules				Actions
Cutbound Rules	Name	Group	Profile Enabled	Action ^	Inbound Rules 🔺
💺 Connection Security Rules				=	New Rule
Monitoring					🕎 Filter by Profile 🕨 🕨
					Filter by State
					Filter by Group
					View
					Refresh
					Export List
					Help
					Tektronix VISA Call Monitor 🔺
					Disable Rule
					🖌 Cut
					Copy
					🗙 Delete
					Properties
					🛛 🛛 Help
				-	
< III >				•	1

3. In New Inbound Rule Wizard menu

a. Select Port and click Next.

Prew Inbound Rule Wizard	
Rule Type Select the type of firewall rule to c	create.
Steps: Protocol and Ports Action Profile Name	What type of rule would you like to create? Program Rule that controls connections for a program. Prgdefined: BranchCache - Content Retrieval (Uses HTTP) Rule that controls connections for a Windows experience. Qustom rule. Leam more about rule types

b. Select TCP as rule apply and enter 5000 for Specific local ports and click Next.

Prew Inbound Rule Wizard		×
Protocol and Ports Specify the protocols and ports to v	which this rule applies.	
Steps:		
Rule Type	Does this rule apply to TCP or UDF	?
Protocol and Ports	<u>Т</u> СР	
 Action 	© <u>U</u> DP	
 Profile 		
Name	Does this rule apply to all local port	s or specific local ports?
	All local ports	
	Opecific local ports:	5000
		Example: 80, 443, 5000-5010
	Learn more about protocol and por	<u>is</u>
		< Back Next > Cancel

c. Select Allow the connection and click Next.

Prev Inbound Rule Wizar	d	×
Action		
Specify the action to be taken v	vhen a connection matches the conditions specified in the rule.	
Steps:	What action should be taken when a connection matches the specified conditions?	
 Rule Type Protocol and Ports 	Allow the connection	
ActionProfile	This includes connections that are protected with IPsec as well as those are not.	
 Name 	 Allow the connection if it is secure This includes only connections that have been authenticated by using IPsec. Connections will be secured using the settings in IPsec properties and rules in the Connection Security Rule node. Customize Block the connection 	
	Leam more about actions < Back Next > Cance	9

d. Select Domain, Private, Public and click Next.

Prew Inbound Rule Wiza	rd X
Profile Specify the profiles for which the	ris rule applies.
Steps: Protocol and Ports Action Profile Name	 When does this rule apply? Domain Applies when a computer is connected to its corporate domain. Private Applies when a computer is connected to a private network location. Public Applies when a computer is connected to a public network location.
	Leam more about profiles < Back Next > Cancel

e. Enter Name, Description (optional), and click Finish.

Prev Inbound Rule Wizard	
Name	
Specify the name and description of this r	ule.
Steps:	
Rule Type	
Protocol and Ports	
Action	
Profile	Name:
Name	TOKEQUESS
	Description (optional):
	< <u>B</u> ack Finish Cancel

4. Check whether the Rule name is displayed in Windows Firewall with Advanced Security menu > Inbound Rules.

Windows Firewall with Advanced	Security							- 0	X
File Action View Help	(second)								
Windows Eisswall with Advance	Telescond Dates			_	_	_			
Inbound Rules	Indound Kules							Actions	
Cutbound Rules	Name	Group	P	Profile	Enabled	Action		Inbound Kules	-
Connection Security Rules	Texexpress		, A	411	Yes	Allow		New Rule	
								Y Filter by Profile	
								Filter by State	
								Y Filter by Group	•
								View	•
								Q Refresh	
								Export List	
								Help	
								TekExpress	-
								Disable Rule	
								🔏 Cut	
								🕒 Сору	
								🗙 Delete	
								Properties	
								Help	
							Ε		
<	•					•	*		
							_		

TekVISA configuration

1. Click Start > All Programs > TekVISA > OpenChoice Instrument Manager.



2. Click Search Criteria. In Search Criteria menu, click LAN to Turn-on. Select Socket from the drop-down list, enter the IP address of the TekExpress device in Hostname and type Port as 5000. Click to configure the IP address with Port.

Enter the Hostname as 127.0.0.1 if the TekVISA and TekExpress application are in the same system, else enter the IP address of the TekExpress application system.

VISA W	Search Criteria	- 0 💌
	GPIB	O On
	LAN	O On
	Search LAN	
	Auto Discovery	Parameters
	Hostname	e Port
	Socket	4000
)
	Socket 127.0.0.1 5000 Socket 134.64.244.227 50	00
	Delete	Search
	Serial	Off
	VXI	O On
	USB	Off
	TekLink	Off
	Done	Help

3. Click Search to setup the TCPIP connection with the host. Check whether the TCPIP host name is displayed in OpenChoice Instrument Manager > Instruments.

🐯 OpenChoice Instrument Manager		😨 Search Criteria	
File Edit Help		GPIB	O On
Instruments	Applications and Utilities	LAN	On
IGPE: CPIP::127.0.0.1::5000::SOCKET Socket TCPIP::127.0.0.1::5000::SOCKET	OpenChoice Call Monitor OpenChoice Talker Liste	Search LAN Auto Discovery Hostn Socket Delete	Parameters ame Port 5000
Instrument List Update Search Criteria.	Start Application or Utility	Serial VXI USB TekLink Done	O orr O orr O orr O orr Help

4. Double-click **OpenChoice Talker Listener** and enter the Command *IDN? in command entry field and click **Query**. Check that the Operation is successful and Talker Listener Readout displays the Command / Data.

OpenChoice Talker List	ener						
<u>File E</u> dit <u>T</u> ools <u>H</u> elp							
Instruments			Enter Command or	Script			
GPIB GPIB8::1::INSTR			*IDN?				
EXAMPLE TOPIP::127.0.0.1	::5000::SOC	KET	Write Read		Query	Hex Entry Enabled	
			Command / Script I	History			
			*IDN?				
Last Updated 12/17/20	15 10:36 PM	1	AutoQuery - False ; Term Char - LF ;				
Update Reset Co	ommunicatio	ons	Run Single St	tep			
Talker Listener Reado	ut:		Display As:	 AS(Cll Only	Hex and ASCII	
Date / Time Dur	ration So	ource	Command / Data			Command Type	
12/17/2015 10: 0.0	170s VI	ISA	TCPIP::127.0.0.1::50	00::SO(CKET	Open Session	
12/17/2015 10: 0.0	775s TC	CPIP:	TekExpress			Read	
Operation Success	ful						

TEKEXP:*IDN?

This command queries the active TekExpress application name running on the oscilloscope.

Syntax

TEKEXP:*IDN?\n

Inputs

NA

Outputs

Returns active TekExpress application name running on the oscilloscope.

TEKEXP:*0PC?

This command queries the execution status of the last executed command.

Syntax

TEKEXP:*OPC?\n

Inputs

NA

Outputs

0 - last command execution is not complete

1 - last command execution is complete

TEKEXP:ACQUIRE_MODE

This command sets the acquire mode as live or pre-recorded.

Syntax

TEKEXP:ACQUIRE_MODE {LIVE | PRE-RECORDED}\n

Inputs

{LIVE | PRE-RECORDED}

Outputs

NA

TEKEXP:ACQUIRE_MODE?

This command queries the acquire mode type.

Syntax

TEKEXP:ACQUIRE_MODE?\n

Inputs

NA

Outputs

{LIVE | PRE-RECORDED}

TEKEXP:EXPORT

This command returns all the bytes of data to the specified file.

Syntax	Outputs
TEKEXP:EXPORT REPORT\n	Returns the report file in bytes
TEKEXP:EXPORT WFM, " <filename>"\n</filename>	Returns the specified waveform file in bytes
TEKEXP:EXPORT IMAGE," <filename>"\n</filename>	Returns the specified image file in bytes

Inputs

FileName - Specifies the file name

TEKEXP:INF0?

This command queries the information about the file(s).

Syntax	Outputs
TEKEXP:INFO? REPORT\n	<reportfilesize>,"<reportfilename.mht>"</reportfilename.mht></reportfilesize>
TEKEXP:INFO? WFM\n	<wfmfile1size>,"<wfmfilename1.wfm>";<wfmfile2size>,"<wfmfilename2.wfm>";</wfmfilename2.wfm></wfmfile2size></wfmfilename1.wfm></wfmfile1size>
TEKEXP:INFO? IMAGE\n	<image1filesize>,"<image1filename>";<image2filesize>,"<image2filename>";</image2filename></image2filesize></image1filename></image1filesize>

TEKEXP:INSTRUMENT

This command sets the value for the selected instrument type.

Syntax

```
TEKEXP:INSTRUMENT "<InstrumentType>",<Value>"\n
```

Inputs

InstrumentType

Value



Tip: Check Command parameters list section for InstrumentType and Value parameters.
NA

TEKEXP:INSTRUMENT?

This command queries the instrument selected for the specified instrument type.

Syntax

TEKEXP:INSTRUMENT? "<InstrumentType>"\n

Inputs

InstrumentType



Tip: Check Command parameters list section for InstrumentType parameters.

Outputs

Returns the instrument selected for the specified instrument type

TEKEXP:LASTERROR?

This command queries the last error string occurred for the current TCP session. If there are no errors since startup, or since the last call to TEKEXP:LASTERROR?\n, this command returns an empty string.

Syntax

TEKEXP:LASTERROR?\n

Inputs

NA

Outputs

<string>

TEKEXP:LIST?

This command queries the list of available device, suite, test, version or instrument.

Syntax	Outputs
TEKEXP:LIST? DEVICE\n	Returns the list of available device(s) as comma separated values.
TEKEXP:LIST? SUITE\n	Returns the list of available suite(s) as comma separated values.
TEKEXP:LIST? TEST\n	Returns the list of available test(s) as comma separated values.
TEKEXP:LIST? VERSION\n	Returns the list of available version(s) as comma separated values.
TEKEXP:LIST? INSTRUMENT," <instrumenttype>"\n</instrumenttype>	Returns the list of available instruments' for the given Instrument type as comma separated values.



Note: This command returns the list of items within double quotes (""). Iterate the receive procedure until the list ends with double quotes otherwise the next query commands won't work as expected.

Inputs





Tip: Check Command parameters list section for Instrument Type parameters.

TEKEXP:MODE

This command sets the execution mode as compliance or user defined.

Syntax

TEKEXP:MODE {COMPLIANCE | USER-DEFINED}\n

Inputs

{COMPLIANCE | USER-DEFINED}

Outputs

NA

TEKEXP:MODE?

This command queries the execution mode type.

Syntax

TEKEXP:MODE?\n

Inputs

NA

Outputs

```
{COMPLIANCE | USER-DEFINED}
```

TEKEXP:POPUP

This command sets the response to the active popup shown in the application.

Syntax

TEKEXP:POPUP "<PopupResponse>"\n

Inputs

PopupResponse

NA

TEKEXP:POPUP?

This command queries the active popup information shown in the application.

Syntax

TEKEXP:POPUP?\n

Inputs

NA

Outputs

Returns the active popup information in the application.

TEKEXP:REPORT

This command generates the report for the current session.

Syntax

TEKEXP:REPORT GENERATE\n

Inputs

GENERATE

Outputs

NA

TEKEXP:REPORT?

This command queries the queried header field value in the report.

Syntax

TEKEXP:REPORT? "<HeaderField>"\n

Inputs

 ${\tt HeaderField} \text{-} {\tt Specifies to return the measured value for the indicated test}.$



Tip: Check Report for HeaderField parameters.

Returns the queried header field value in the report

TEKEXP:RESULT?

This command queries the result available in report summary/details table.

Syntax	Outputs
TEKEXP:RESULT? " <testname>"\n</testname>	Return Pass/Fail status of the test.
<pre>TEKEXP:RESULT? "<testname>","<columnname>"\n</columnname></testname></pre>	Returns all the row values of the specified column for the test.
<pre>TEKEXP:RESULT? "<testname>","<columnname>",<rownumber>\n</rownumber></columnname></testname></pre>	Returns the column value for the specified row number ¹

Inputs

 ${\tt TestName}$ - Specifies the name of the test for which to obtain the test result value.

ColumnName - Specifies the column name for the measurement

 ${\tt RowNumber}$ - Specifies the row number of the measurement

Tip: Check Results panel for TestName, ColumnName, and RowNumber parameters.

TEKEXP:SELECT

This command selects the device, suite, version, or test.

Syntax

```
TEKEXP:SELECT <string1>,<string2>,<string4>\n
TEKEXP:SELECT TEST,<string3>,<string4>\n
```

Inputs

```
<string1> = {DEVICE | SUITE | VERSION}
<string2> = {DeviceName | SuiteName | VersionName}
<string3> = {"<TestName>"| ALL| REQUIRED }
<string4> = {TRUE | FALSE}
```

Tip: Check Command parameters list section for DeviceName, SuiteName, VersionName, and TestName parameters.

¹ Row number starts from zero.

NA

TEKEXP:SELECT?

This command queries the name of the selected device, suite, version, or test.

Syntax

TEKEXP:SELECT? {DEVICE | SUITE | TEST | VERSION}\n

Inputs

{DEVICE | SUITE | TEST | VERSION}

Outputs

Returns the name of the selected device, suite, version, or test.

TEKEXP:SETUP

This command sets the value of the current setup.

Syntax	Outputs
TEKEXP:SETUP DEFAULT\n	Restore to default Setup
TEKEXP:SETUP OPEN," <sessionname>"\n</sessionname>	Open the session
TEKEXP:SETUP SAVE\n	Saves the already existing modified session
TEKEXP:SETUP SAVE," <sessionname>"\n</sessionname>	Save the session

Inputs

SessionName - The name of the session

TEKEXP:STATE

This command sets the execution state of the application.

Syntax

TEKEXP:STATE {RUN | STOP | PAUSE | RESUME}\n

Inputs

{RUN | STOP | PAUSE | RESUME}

NA

TEKEXP:STATE?

This command queries the current setup state.

Syntax	Outputs
TEKEXP:STATE?	RUNNING PAUSED WAIT ERROR READY
TEKEXP:STATE? SETUP	SAVED NOT_SAVED

TEKEXP:VALUE

This command sets the value of parameters of type General, Acquire, Analyze, or DUTID.

Syntax

```
TEKEXP:VALUE GENERAL,"<ParameterName>","<Value>"\n
TEKEXP:VALUE ACQUIRE,"<TestName>","<AcquireType>", "<ParameterName>","<Value>"\n
TEKEXP:VALUE ANALYZE,"<TestName>","<ParameterName>"."<Value>"\n
TEKEXP:VALUE DUTID,"<Value>"\n
TEKEXP:VALUE VERBOSE,{TRUE | FALSE}\n
TEKEXP:VALUE WFMFILE,<Test Name>,<Aquire Type>,<FilesName1$FileName2>\n
```

Inputs

ParameterName - Specifies the parameter name TestName - Specifies the test name AcquireType - Specifies the acquire type Value - Specifes the value to set FilesName1\$FileName2 - Specifies the waveform file name TRUE - Pop-ups are enabled FALSE - Pop-ups are disabled



Tip: Check Command parameters list section for ParameterName, AcquireType, and Value parameters.

Outputs

NA

TEKEXP:VALUE?

This command queries the value of the parameter for type General, Acquire, Analyze, or DUTID.

Syntax	Outputs
TEKEXP:VALUE? GENERAL, " <parametername>"\n</parametername>	Returns the value of Parameter for type GENERAL
<pre>TEKEXP:VALUE? ACQUIRE, "<testname>", "<acquiretype>", "<parametername>"\n</parametername></acquiretype></testname></pre>	Returns the value of Parameter for type ACQUIRE
TEKEXP:VALUE? ANALYZE, " <testname>","<parametername>"\n</parametername></testname>	Returns the value of Parameter for type ANALYZE
TEKEXP:VALUE? DUTID\n	Returns the DUTID value
TEKEXP:VALUE? WFMFILE, <test_name>,<aquire_type>\n</aquire_type></test_name>	Returns the waveform file name
TEKEXP:VALUE? VERBOSE	Returns the verbose mode type

Inputs

ParameterName - Specifies the parameter name

TestName - Specifies the test name

AcquireType - Specifies the acquire type

TRUE - Pop-ups are enabled

FALSE - Pop-ups are disabled

Tip: Check Command parameters list section for ParameterName and AcquireType parameters.

Outputs

Returns the value of Parameter for type GENERAL | ACQUIRE | ANALYZE | DUTID.

Command parameters

This section provides the parameters list for the SCPI commands.

Table 21: Parameter Name and Value for DUT tab

Parameters	Description
DUT ID	Specifies the value parameters
	For DUT ID, valid value is: Comment
Acquire mode	Specifies the acquire mode parameters
	Acquire live waveforms
	Use pre-recorded waveform files
Table continued	

Table continued...

Parameters	Description
Suite	 1000BASE-T 100BASE-T 10BASE-T
	• 1000BASE-T-Multi Pair

Table 22: Parameter Name and Value for Test Selection tab

Parameters	Description
Test Measurements for 1000BASE-T	Specifies the test measurement name.
	Without Disturber
	 TemplateA_Without_Disturber TemplateB_Without_Disturber TemplateC_Without_Disturber TemplateD_Without_Disturber TemplateF_Without_Disturber TemplateH_Without_Disturber PeakvoltageA_Without_Disturber PeakvoltageB_Without_Disturber PeakvoltageC_Without_Disturber PeakvoltageD_Without_Disturber DroopG_Without_Disturber Transmitter Distortion
	 Distortion_Without_Disturber_With_TX_TCLK Distortion_Without_Disturber_Without_TX_TCLK
	With Disturber
	 TemplateA_With_Disturber TemplateB_With_Disturber TemplateC_With_Disturber TemplateD_With_Disturber TemplateF_With_Disturber TemplateH_With_Disturber PeakvoltageA_With_Disturber PeakvoltageB_With_Disturber PeakvoltageC_With_Disturber PeakvoltageD_With_Disturber DroopG_With_Disturber
Table continued	

Parameters	Description
	 Transmitter Distrortion Distortion_With_Disturber_With_TX_TCLK Distortion_With_Disturber_Without_TX_TCLK
	Transmitter Jitter MasterFiltered_Jitter_Without_TX_TCLK MasterUnfiltered_Jitter_Without_TX_TCLK SlaveFiltered_Jitter_Without_TX_TCLK MasterFiltered_Jitter_With_TX_TCLK MasterUnfiltered_Jitter_With_TX_TCLK SlaveFiltered_Jitter_With_TX_TCLK SlaveFiltered_Jitter_With_TX_TCLK CM Voltage
Test Measurements for 100BASE-T	Specifies the test measurement name. • AOI_Template • Fall_Time_Pos • Fall_Time_Neg • Rise_Time_Pos • Rise_Time_Neg • RF_Symmetry_Pos • RF_Symmetry_Neg • RF Symmetry (Max-Min) • Overshoot_Pos • Overshoot_Pos • Overshoot_Neg • Differential_Output_Voltage_Pos • Differential_Output_Voltage_Neg • Amplitude_Symmetry • Jitter • Transmit_Clock_Frequency • Duty Cycle Distortion • ReturnLoss_Transmitter • ReturnLoss_Receiver

Parameters	Description
Test Measurements for 10BASE-T	Specifies the test measurement name.
	Link Pulse
	 Link Pulse Link Pulse Load1 With Twisted Pair cable Link Pulse Load2 With Twisted Pair cable Link Pulse Load3 With Twisted Pair cable Link Pulse Load2 Without Twisted Pair cable Link Pulse Load3 Without Twisted Pair cable Link Pulse Timing Link Pulse Timing Load1 With Twisted Pair cable Link Pulse Timing Load2 With Twisted Pair cable Link Pulse Timing Load2 With Twisted Pair cable Link Pulse Timing Load2 Without Twisted Pair cable Link Pulse Timing Load3 Without Twisted Pair cable Differential Voltage TP_IDL TP_IDL Load1 With Twisted Pair cable TP_IDL Load3 With Twisted Pair cable TP_IDL Load2 Without Twisted Pair cable TP_IDL Load3 Without Twisted Pair cable Jitter Normal With Twisted Pair cable Jitter 8.0 With Twisted Pair cable Jitter Normal With Twisted Pair cable Jitter Normal Without Twisted Pair cable Jitter Normal Without Twisted Pair cable Jitter 8.5 Without Twisted Pair cable
	MAU Internal
	MAU External
	MAU Internal Inverted
	MAU External Inverted Hormonia
	Transmitter Return Loss
	Receiver Return Loss
	CM Voltage
	, , , , , , , , , , , , , , , , , , ,

Table 23: Parameter Name and Value of Acquisitions

Parameter Name	Value
Source 1	Specifies the test mode source channel for each listed signal. Valid values are CH1 to CH14.
Source 2	Specifies the test mode source channel for each listed signal. Valid values are CH1 to CH14.
Source 3	Specifies the test mode source channel for each listed signal. Valid values are CH1 to CH14.
Aux	TRUE or FALSE
Show Acquire Parameters	TRUE or FALSE

Table 24: Parameter Name and Value for Preferences tab

Parameters	Description
Number of Runs	1 to 250
Acquire /Analyze each test	TRUE or FALSE
Action on Test measurement Failure	ON or OFF
Pop-up Settings	Auto Close Warnings and Information during Sequencing. Auto Close after (1 to 60) seconds.
	• Auto Close Error Message during Sequencing Show in Reports. Auto Close after (1 to 60) seconds.

Table 25: Parameter Name and Value for Acquire (1000BASE-T)

Test Name	Acquire Type	Parameter Name	Values
TemplateA_Without_Disturber	TemplateA_Without_Disturber	AcquisitionAverage	16 to 256
TemplateB_Without_Disturber	TemplateB_Without_Disturber	TriggerLevel (A)	-5 V to 5 V
TemplateC_Without_Disturber	TemplateC_Without_Disturber		
TemplateD_Without_Disturber	TemplateD_Without_Disturber	TriggerLevel (B)	-5 V to 5 V
TemplateF_Without_Disturber	TemplateF_Without_Disturber		
TemplateH_Without_Disturber	TemplateH_Without_Disturber		
TemplateA_With_Disturber	TemplateA_With_Disturber		
TemplateB_With_Disturber	TemplateB_With_Disturber		
TemplateC_With_Disturber	TemplateC_With_Disturber		
TemplateD_With_Disturber	TemplateD_With_Disturber		
TemplateF_With_Disturber	TemplateF_With_Disturber		
Table continued	1	1	1

Test Name	Acquire Type	Parameter Name	Values
TemplateH_With_Disturber	TemplateH_With_Disturber		
PeakVoltageA_Without_Disturber	PeakVoltageA_Without_Disturber	Acquisition Average	16 to 256
PeakVoltageB_Without_Disturber	PeakVoltageB_Without_Disturber		
PeakVoltageC_Without_Disturber	PeakVoltageC_Without_Disturber		
PeakVoltageD_Without_Disturber	PeakVoltageD_Without_Disturber		
DroopG_Without_Disturber	DroopG_Without_Disturber		
DroopJ_Without_Disturber	DroopJ_Without_Disturber		
PeakVoltageA_With_Disturber	PeakVoltageA_With_Disturber		
PeakVoltageB_With_Disturber	PeakVoltageB_With_Disturber		
PeakVoltageC_With_Disturber	PeakVoltageC_With_Disturber		
PeakVoltageD_With_Disturber	PeakVoltageD_With_Disturber		
DroopG_With_Disturber	DroopG_With_Disturber		
DroopJ_With_Disturber	DroopJ_With_Disturber		
Distortion_Without_Disturber_Without_TX_T CLK	Distortion_Without_Disturber_Without_TX_T CLK		
Distortion_Without_Disturber_With_TX_TCL K	Distortion_Without_Disturber_With_TX_TCL K		
MasterFilter_Jitter_Without_TX_TCLK	MasterFilter_Jitter_Without_TX_TCLK	Measurement	1 ms, 10 ms, 100 ms,
MasterUnfilter_Jitter_Without_TX_TCLK	MasterUnfilter_Jitter_Without_TX_TCLK	Duration	1000 ms
SlaveFilter_Jitter_Without_TX_TCLK	SlaveFilter_Jitter_Without_TX_TCLK	Number Of Clock	100000, 1000000,
SlaveUnfilter_Jitter_Without_TX_TCLK	SlaveUnfilter_Jitter_Without_TX_TCLK	Edges	1000000
MasterFilter_Jitter_With_TX_TCLK	MasterFilter_Jitter_With_TX_TCLK		
MasterUnfilter_Jitter_With_TX_TCLK	MasterUnfilter_Jitter_With_TX_TCLK		
SlaveFilter_Jitter_With_TX_TCLK	SlaveFilter_Jitter_With_TX_TCLK		
SlaveUnfilter_Jitter_With_TX_TCLK	SlaveUnfilter_Jitter_With_TX_TCLK		
Transmitter Return Loss	ReturnLoss_Transmitter	Acquisition Average	100 to 10000
CM Voltage	CM Voltage		

Table 26: Parameter Name and Value for Acquire (100BASE-T)

Test Name	Acquire Type	Parameter Name	Values
AOI_Template	AOI_Template	Number of samples	5000 to 2147400000
Fall_Time_Pos	Fall_Time_Pos	Acquisition Type	Sample, Average
Fall_Time_Neg	Fall_Time_Neg	Number of Waveforms	2 to 10000
Table continued	I	I	I

Test Name	Acquire Type	Parameter Name	Values
Rise_Time_Pos	Rise_Time_Pos		
Rise_Time_Neg	Rise_Time_Neg		
RF_Symmetry_Pos	RF_Symmetry_Pos		
RF Symmetry_Neg	RF Symmetry_Neg		
RF Symmetry (Max-Min)	RF Symmetry (Max-Min)		
Overshoot_Pos	Overshoot_Pos		
Overshoot_Neg	Overshoot_Neg		
Differential_Output Voltage_Pos	Differential_Output Voltage_Pos		
Difftrerential_Output_Voltage_Neg	Difftrerential_Output_Voltage_Neg		
Amplitude_Symmetry	Amplitude_Symmetry		
Transmit Clock Frequency	Transmit Clock Frequency		
Duty Cycle Distortion	Duty Cycle Distortion	Acquisition Type	Sample, Average
		Number of Waveforms	2 to 10000
Transmitter Return Loss	ReturnLoss_Transmitter	Acquisition Average	100 to 10000
Receiver Return Loss	ReturnLoss_Receiver]	

Table 27: Parameter Name and Value for Acquire (10BASE-T)

Test Name	Acquire Type	Parameter Name	Values
Link Pulse Load1 With Twisted Pair cable	Link Pulse Load1 With Twisted Pair cable	Number of Acquisitions	2 to 10000 Normal (NLP)
Link Pulse Load2 With Twisted Pair cable	Link Pulse Load2 With Twisted Pair cable		Fast (FLP)
Link Pulse Load3 With Twisted Pair cable	Link Pulse Load3 With Twisted Pair cable		
Link Pulse Load1 Without Twisted Pair cable	Link Pulse Load1 Without Twisted Pair cable		
Link Pulse Load2 Without Twisted Pair cable	Link Pulse Load2 Without Twisted Pair cable		
Link Pulse Load3 Without Twisted Pair cable	Link Pulse Load3 Without Twisted Pair cable		
Differential Voltage	Differential Voltage	Acquisition Delay	1 us to 10000 us
		Acquisition Type	SampleAverage
		Acquisition Average	2 to 1000
Table continued			

Table continued...

Test Name	Acquire Type	Parameter Name	Values
TP_IDL Load1 With Twisted Pair	TP_IDL Load1 With Twisted Pair	Number of Acquisitions	2 to 10000
TP_IDL Load2 With Twisted Pair cable	TP_IDL Load2 With Twisted Pair cable	Last Bit	CD0, CD1
TP_IDL Load3 With Twisted Pair cable	TP_IDL Load3 With Twisted Pair cable		
TP_IDL Load1 Without Twisted Pair cable	TP_IDL Load1 Without Twisted Pair cable		
TP_IDL Load2 Without Twisted Pair cable	TP_IDL Load2 Without Twisted Pair cable		
TP_IDL Load3 Without Twisted Pair cable	TP_IDL Load3 Without Twisted Pair cable		
Jitter Normal With Twisted Pair Cable	Jitter Normal With Twisted Pair Cable	Number of Acquisitions	2 to 10000
Jitter 8.0 With Twisted Pair Cable	Jitter 8.0 With Twisted Pair Cable	Trigger Hold Off	0.25 us tp 1000 us
Jitter 8.5 With Twisted Pair Cable	Jitter 8.5 With Twisted Pair Cable		
Jitter Normal Without Twisted Pair Cable	Jitter Normal Without Twisted Pair Cable		
Jitter 8.0 Without Twisted Pair Cable	Jitter 8.0 Without Twisted Pair Cable		
Jitter 8.5 Without Twisted Pair Cable	Jitter 8.5 Without Twisted Pair Cable		
MAU Internal	MAU Internal		1000 to 10000
MAU External	MAU External		
MAU Internal Inverted	MAU Internal Inverted		
MAU External Inverted	MAU External Inverted		
Harmonic	Harmonic	Acquisition Delay	1 us to 10000 us
		Math Average	2 to 10000
		Signal Type	 Normal All Ones No IPG
Transmitter Return Loss	Transmitter Return Loss	Acquisition Average	100 to 10000
Receiver Return Loss	Receiver Return Loss		
CM Voltage	CM Voltage		

Table 28: Parameter Name and V	Value for Analyze (1000BASE-T)
--------------------------------	--------------------------------

Test Name	Acquisition Type	Parameter Name	Values
TemplateA_Without_Disturber	TemplateA_Without_Disturber	External Filter	Include
TemplateB_Without_Disturber	TemplateB_Without_Disturber		Exclude
TemplateC_Without_Disturber	TemplateC_Without_Disturber		
TemplateD_Without_Disturber	TemplateD_Without_Disturber		
TemplateF_Without_Disturber	TemplateF_Without_Disturber		
TemplateH_Without_Disturber	TemplateH_Without_Disturber		
TemplateA_With_Disturber	TemplateA_With_Disturber		
TemplateB_With_Disturber	TemplateB_With_Disturber		
TemplateC_With_Disturber	TemplateC_With_Disturber		
TemplateD_With_Disturber	TemplateD_With_Disturber		
TemplateF_With_Disturber	TemplateF_With_Disturber		
TemplateH_With_Disturber	TemplateH_With_Disturber		
PeakVoltageA_Without_Disturber	PeakVoltageA_Without_Disturber		
PeakVoltageB_Without_Disturber	PeakVoltageB_Without_Disturber		
PeakVoltageC_Without_Disturber	PeakVoltageC_Without_Disturber		
PeakVoltageD_Without_Disturber	PeakVoltageD_Without_Disturber		
PeakVoltageA_With_Disturber	PeakVoltageA_With_Disturber		
PeakVoltageB_With_Disturber	PeakVoltageB_With_Disturber		
PeakVoltageC_With_Disturber	PeakVoltageC_With_Disturber		
PeakVoltageD_With_Disturber	PeakVoltageD_With_Disturber		
Distortion_Without_Disturber_Without_TX_T CLK	Distortion_Without_Disturber_Without_TX_T CLK	LP Filter	Include Exclude
Distortion_With_Disturber_Without_TX_TCL K	Distortion_With_Disturber_Without_TX_TCL K	Hi Resolution	16 to 64
MasterFilter_Jitter_Without_TX_TCLK	MasterFilter_Jitter_Without_TX_TCLK	Clock Edge	• RISE
MasterUnfilter_Jitter_Without_TX_TCLK	MasterUnfilter_Jitter_Without_TX_TCLK		• FALL
SlaveFilter_Jitter_Without_TX_TCLK	SlaveFilter_Jitter_Without_TX_TCLK	Hysteresis	0% to 10%
SlaveUnfilter_Jitter_Without_TX_TCLK	SlaveUnfilter_Jitter_Without_TX_TCLK		
MasterFilter_Jitter_With_TX_TCLK	MasterFilter_Jitter_With_TX_TCLK		
MasterUnfilter_Jitter_With_TX_TCLK	MasterUnfilter_Jitter_With_TX_TCLK		
SlaveFilter_Jitter_With_TX_TCLK	SlaveFilter_Jitter_With_TX_TCLK		
SlaveUnfilter_Jitter_With_TX_TCLK	SlaveUnfilter_Jitter_With_TX_TCLK		
Table continued	1		I

Test Name	Acquisition Type	Parameter Name	Values
Transmitter Return Loss	ReturnLoss_Transmitter	Smoothing Averages 1 to 10	
		Load (Ohm)	85, 100, 115100
CM Voltage	CM Voltage	Filter Type	 None 1 MHZ (High Pass) 100 MHZ (Low Pass) 1-100 MHZ (Base band)

Table 29: Parameter Name and Value for Analyze (100BASE-T)

Test Name	Acquisition Type	Parameter Name	Values
Transmitter Return Loss	Transmitter Return Loss	Smoothing Averages	1 to 10
Receiver Return Loss	Receiver Return Loss	Load(Ohm)	85, 100, 115100
AOI_Template	AOI_Template	Fail Threshold	1 to 5000
Transmit Clock Frequency	Transmit Clock Frequency		
Jitter Pos Jitter Neg	Jitter Pos Jitter Neg	Measurement Type	TieHistogram

Table 30: Parameter Name and Value for Analyze (10BASE-T)

Test Name	Acquire Type	Parameter Name	Values
Link Pulse Load1 With Twisted Pair cable	Link Pulse Load1 With Twisted Pair cable	Fail Threshold	1 to 5000
Link Pulse Load2 With Twisted Pair cable	Link Pulse Load2 With Twisted Pair cable		
Link Pulse Load3 With Twisted Pair cable	Link Pulse Load3 With Twisted Pair cable		
Link Pulse Load1 Without Twisted Pair cable	Link Pulse Load1 Without Twisted Pair cable		
Link Pulse Load2 Without Twisted Pair cable	Link Pulse Load2 Without Twisted Pair cable		
Link Pulse Load3 Without Twisted Pair cable	Link Pulse Load3 Without Twisted Pair cable		
TP_IDL Load1 With Twisted Pair cable	TP_IDL Load1 With Twisted Pair cable		
Table continued	1	1	1

Test Name	Acquire Type	Parameter Name	Values
TP_IDL Load2 With Twisted Pair cable	TP_IDL Load2 With Twisted Pair cable		
TP_IDL Load3 With Twisted Pair cable	TP_IDL Load3 With Twisted Pair cable		
TP_IDL Load1 Without Twisted Pair cable	TP_IDL Load1 Without Twisted Pair cable		
TP_IDL Load2 Without Twisted Pair cable	TP_IDL Load2 Without Twisted Pair cable		
TP_IDL Load3 Without Twisted Pair cable	TP_IDL Load3 Without Twisted Pair cable		
Link Pulse Timing Load1 With Twisted Pair cable	Link Pulse Timing Load1 With Twisted Pair cable		
Link Pulse Timing Load2 With Twisted Pair cable	Link Pulse Timing Load2 With Twisted Pair cable		
Link Pulse Timing Load3 With Twisted Pair cable	Link Pulse Timing Load3 With Twisted Pair cable		
Link Pulse Timing Load1 Without Twisted Pair cable	Link Pulse Timing Load1 Without Twisted Pair cable		
Link Pulse Timing Load2 Without Twisted Pair cable	Link Pulse Timing Load2 Without Twisted Pair cable		
Link Pulse Timing Load3 Without Twisted Pair cable	Link Pulse Timing Load3 Without Twisted Pair cable		
Jitter Normal with Twisted Pair cable	Jitter Normal with Twisted Pair cable	MAU Type	InternalExternal
Jitter 8.0 with Twisted Pair cable	Jitter 8.0 with Twisted Pair cable		
Jitter 8.5 with Twisted Pair cable	Jitter 8.5 with Twisted Pair cable		
Jitter Normal without Twisted Pair cable	Jitter Normal without Twisted Pair cable		
Jitter 8.0 without Twisted Pair cable	Jitter 8.0 without Twisted Pair cable		
Jitter 8.5 without Twisted Pair cable	Jitter 8.5 without Twisted Pair cable		
MAU Internal	MAU Internal	Fail Threshold	1
MAU External	MAU External	MAU Mask Scale	Normal, 0.9, 1.1
MAU Internal Inverted	MAU Internal Inverted		
MAU External Inverted	MAU External Inverted		
Differential Voltage	Differential Voltage	Peak	• Min • MinMax
Table continued			

Table continued...

Test Name	Acquire Type	Parameter Name	Values
Transmitter Return Loss	Transmitter Return Loss	Smoothing Average	1 to 10
Receiver Return Loss	Receiver Return Loss	Load (Ohm)	• 85, 100, 111
			• 100

Parameter Name and Value for General, Acquire and Analyze: Specifies the Parameter Name and Value for General, Acquire, and Analyze.

Parameter Name	Value
Report Update Mode	 New Append Replace in previous run, current session in any run, any session
Report name	X:\Ethernet\Reports\DUT001.mht
Auto increment report name if duplicate	IncludedExcluded
Create report automatically at the end of the run	IncludedExcluded
Include pass/fail results Summary	 Included Excluded Mote: Include Statistic Table is only for Distortion Measurement, when Number of Runs is more than 1.
Include detailed results	IncludedExcluded
Include plot images	IncludedExcluded
Include setup configuration	IncludedExcluded
Include complete configuration	IncludedExcluded
Include user comments	Included Excluded
Table continued	

Parameter Name	Value
View report after generating	IncludedExcluded
Save As type	 Web Archive (*.mht;*.mhtml) PDF (*.pdf) CSV (*.csv;)
Include Statistics Table	 Included Excluded Mote: Include statistic table is only for Distortion Measurement, when Number of Runs is more than 1.

Examples

This section provides the examples for the SCPI commands.

Example	Description
TEKEXP:*IDN?	It returns the active TekExpress application name running on the scope.
TEKEXP:*OPC?	It returns the last command execution status.
TEKEXP:ACQUIRE_MODE PRE-RECORDED	It sets the acquire mode as pre-recorded.
TEKEXP:ACQUIRE_MODE?	It returns LIVE when acquire mode is set to live.
TEKEXP:EXPORT REPORT	It returns the report file in bytes. This can be written into another file for further analysis.
TEKEXP:INFO? REPORT	It returns "100,"ReportFileName.mht"", when 100 is the filesize in bytes for the filename ReportFileName.
TEKEXP:INFO? WFM	It returns "100,"WfmFileName1.wfm"";"200,"WfmFileName2.wfm"" when 100 is the filesize in bytes for the filename WfmFileName1.wfm and 200 is the filesize in bytes for the filename WfmFileName2.wfm.
TEKEXP:INSTRUMENT "Real Time Scope",MSO58 (GPIB8::1::INSTR)	It sets the instrument value as MSO58 (GPIB8::1::INSTR) for the selected instrument type Real Time Scope.
TEKEXP:INSTRUMENT? "Real Time Scope"	It returns "MSO58 (GPIB8::1::INSTR), when MSO58 (GPIB8::1::INSTR)" is the selected instrument for the instrument type Real Time Scope.
TEKEXP:LASTERROR?	It returns ERROR: INSTRUMENT_NOT_FOUND, when no instrument is found.
TEKEXP:LIST? DEVICE	It returns "Ethernet Tx" when Ethernet Tx application is the available device.
Table continued	

Example	Description
TEKEXP:LIST? INSTRUMENT, "Real Time Scope"	It returns "MSO58 (GPIB8::1::INSTR),MSO64 (TCPIP::134.64.248.91::INSTR)" when MSO58 (GPIB8::1::INSTR), MSO64 (TCPIP::134.64.248.91::INSTR) are the list of available instruments.
TEKEXP:MODE COMPLIANCE	It sets the execution mode as compliance.
TEKEXP:MODE?	It returns COMPLIANCE when the execution mode is compliance.
TEKEXP:POPUP "OK"	It sets OK as the response to active popup in the application.
TEKEXP: POPUP?	It returns "OK", when OK is the active popup information shown in the application.
TEKEXP:REPORT GENERATE	It generates report for the current session.
TEKEXP:REPORT? "Scope Model"	It returns "MSO58" when MSO58 is the scope model.
TEKEXP:REPORT? "DUT ID"	It returns "DUT001" when DNI_DUT001 is the DUT ID.
TEKEXP:RESULT? "PeakVoltageD_Without_Disturber"	It returns Pass, then the test result is Pass.
TEKEXP:RESULT? "PeakVoltageD_Without_Disturber", "Margin"	It returns list of values then that is 'Margin' column data.
TEKEXP:RESULT? "PeakVoltageD_Without_Disturber", "Units",0	It returns the unit of the first row of result.
TEKEXP:SELECT DEVICE, "TekExpress Ethernet"	It selects device "TekExpress Ethernet".
TEKEXP:SELECT TEST,"TemplateA_Without_Disturber", TRUE	It selects "TemplateA_Without_Disturber" measurement.
TEKEXP:SETUP DEFAULT	It restores the application to default setup.

References

1000BASE-T and 1000BASE-T-Multi Pair

1000BASE-T template

This measurement verifies that the transmitter output fits the time domains transmit templates.

Reference:

Subclause 40.6.1.2.3 of IEEE standard 802.3-2015

Description

According to standard, the Test Mode 1 signal from the DUT needs to be normalized. This should be compared to the differential output templates shown in Figure 40-26 of the standard. The normalization factors to be applied to various points:

For Point A: Normalization with the peak voltage at point A.

For Point B: Normalization with the negative of peak voltage at point A.

For Point C: Normalization with 0.5 times the peak voltage at point A.

For Point D: Normalization with the negative of 0.5 times the peak voltage at point A.

For Point F and H: The waveform around points F and H are compared to time domain transmit template 2 after the following normalization factors are applied:

Normalization with the peak voltage at point F.

Normalization with the peak voltage at point H.

According to standard, the waveform can be shifted in time to fit the template.

1000BASE-T peak voltage

This measurement verifies the transmitter output levels.

Reference:

Subclause 40.6.1.2.1 of IEEE standard 802.3-2015

Description

According to standard, magnitude of peak differential output voltage measure at points A and B should be between 670 and 820 mV. Also, these conditions should be met:

$$abs\left(\frac{|PeakVoltageB| - \left(\frac{|PeakVoltageB| + |PeakVoltageA|}{2}\right)}{|PeakVoltageB| + |PeakVoltageA|}\right) < 1\%$$

 $\frac{|\text{PeakVoltageC}|}{|\text{PeakVoltaageD}|} < 2\% \text{ of } 0.5 \text{ times } \frac{|\text{PeakVoltageA}| + |\text{PeakVoltageB}|}{2}$

1000BASE-T droop

This measurement verifies that the transmitter output level does not decay faster than the maximum specified rate.

Reference:

Subclause 40.6.1.2.2 of IEEE standard 802.3-2015

Description

According to standard, the Point G and J are exactly 500 ns from Points F and H respectively. The magnitude of voltage at Point G should be greater than 73.1% magnitude of voltage at Point F and magnitude of voltage at Point J should be greater than 73.1% magnitude of voltage at Point H.

1000BASE-T jitter (with TX_TCLK)

This measurement verifies that the transmitter output level does not reduce faster than the maximum specified rate.

Reference:

Subclause 40.6.1.2.5 of IEEE standard 802.3-2015

Description

Jitter Master Unfiltered — According to the standard, the peak-to-peak value of jitter waveform on MASTER TX_TCLK relative to unfiltered reference should be less than 1.4 ns.

Jitter Master Filtered — According to the standard, the peak-to-peak value of jitter waveform on MASTER TX_TCLK when filtered by a high pass filter,

with the transfer function below + JTx out of Data related to the corresponding edge of MASTER TX_TCLK should be less than 0.3 ns.

$$H_{jf1}(f) = \frac{jf}{jf + 5000} f \text{ in Hz}$$

Jitter Slave Unfiltered — According to the standard, the peak-to-peak value of jitter waveform on SLAVE TX_TCLK relative to unfiltered reference should be less than 1.4 ns.

Jitter Slave Filtered —According to the standard, the peak-to-peak value of jitter waveform on SLAVE TX_TCLK when filtered by a high pass filter, $H_{jf2}(f)$ with the transfer function below + JTx out of data related to the corresponding edge of SLAVE TX_TCLK should be less than 0.4 ns + peak-to-peak value of jitter waveform on MASTER TX_TCLK when filtered by a high pass filter, $H_{jf1}(f)$.

$$H_{jF2}(f) = \frac{jf}{jf + 32000} f \text{ in Hz}$$



Note: J denotes the square root of -1.

1000BASE-T jitter (without TX_TCLK)

To provide an analysis of the Transmitter Timing Jitter test method defined in Clause 40.6.1.2.5 of IEEE 802.3-2002, and to propose an alternative method that may be used in cases where a device does not provide access to the TX_TCLK signal.

Reference:

- 1. IEEE standard 802.3-2015, subclause 40.6.1.1.1 Test channel
- 2. Ibid., subclause 40.6.1.1.2, figure 40-20 Test modes
- 3. Ibid., subclause 40.6.1.1.3, figure 40-25 Test fixtures

- 4. Ibid., subclause 40.6.1.2.5 Transmitter Timing Jitter
- 5. Test suite appendix 40.6.A 1000BASE-T transmitter test fixtures



Note: The references mentioned here are proposed, and not part of a standard. This is an alternate test method for jitter measurement being proposed, when TX_TCLK is not accessible. This is an informal test method.

Transmitting Timing Jitter (Alternate Method):

Jitter Master Unfiltered — The peak-to-peak value of jitter waveform on data in Test Mode 2 relative to unjittered reference should be less than 1.4 ns (pass).

The peak-to-peak value of jitter waveform on data in Test Mode 2 relative to unjittered reference should be more than 1.4 ns (inconclusive).

Jitter Master Filtered — The peak-to-peak value of jitter waveform on data in Test Mode 2 relative to unjittered reference, when filtered by a high pass filter, H_{if1}(f) with the transfer function below should be less than 0.3 ns (pass).

The peak-to-peak value of jitter waveform on data in Test Mode 2 relative to unjittered reference, when filtered by a high pass filter, $H_{if1}(f)$ with the transfer function below should be more than 0.3 ns (inconclusive).

$$H_{jf1}(f) = \frac{jf}{jf + 5000} f \text{ in Hz}$$

Jitter Slave Unfiltered — The difference between the peak-to-peak value of jitter waveform on data in Test Mode 3 relative to unjittered reference and the peak-to-peak value of jitter waveform on data in Test Mode 2 relative to unjittered reference should be less than 1.4 ns (pass).

The difference between the peak-to-peak value of jitter waveform on data in Test Mode 3 relative to unjittered reference and the peak-to-peak value of jitter waveform on data in Test Mode 2 relative to unjittered reference should be more than 1.4 ns (fail).

Jitter Slave Filtered — The difference between the peak-to-peak value of jitter waveform on data in Test Mode 3 relative to unjittered reference, when filtered by a high pass filter,

H_{jf1}(f) with the transfer function below, and the peak-to-peak value of jitter waveform on data in Test Mode 2 relative to unjittered reference, when filtered by a high pass filter,

H_{if1}(f) with the transfer function below, should be less than 0.4 ns (pass).

The difference between the peak-to-peak value of jitter waveform on data in Test Mode 3 relative to unjittered reference, when filtered by a high pass filter,

H_{jf1}(f) with the transfer function below, and the peak-to-peak value of jitter waveform on data in Test Mode 2 relative to unjittered reference, when filtered by a high pass filter,

H_{if1}(f) with the transfer function below, should be more than 0.4 ns (fail).

$$H_{jf1}(f) = \frac{jf}{jf + 5000} f \text{ in Hz}$$

$$H_{jF2}(f) = \frac{jf}{jf + 32000} f \text{ in Hz}$$

1000BASE-T distortion

This measurement verifies that the peak transmitter distortion of the DUT is less than 10 mV for at least 60% of the UI within the eye-opening.

Reference:

IEEE standard 802.3-2015, sub clause 40.6.1.2.4

PMA Test suite, version 2.5, Test 40.1.6

Description

The peak distortion of the Test Mode 4 differential signal, when sampled with the symbol rate TX_TCLK at an arbitrary phase and processing this block of any 2047 consecutive samples, should be less than 10 mV.

1000BASE-T return loss

This measurement verifies that the Return Loss of the Device Under Test (DUT) is above the conformance limit.

Reference:

Subclause 40.8.3.1 of IEEE standard 802.3-2015

Description

At least 16 dB over the frequency range of 1.0 MHz to 40 MHz and at least 10 -20log 10 (f /80) dB over the frequency range 40 MHz to 100 MHz (f in MHz).

1000BASE-T CM voltage

This measurement verifies that the common-mode voltage of the DUT is within the conformance limits.

Reference:

Subclause 40.8.3.3 of IEEE standard 802.3-2015

Description

The magnitude of the total common-mode output voltage, Ecm_out, on any transmit circuit, shall be less than 50 mV peak-to-peak when transmitting data at frequencies above 1 MHz.

100BASE-T

100BASE-T template

This measurement verifies that the transmitter output fits the time domain transmit template.

Reference:

Annex J of ANSIX3.263-1995

Description

According to standard, Active Output Interface (AOI) transmitting scrambled Halt Line State should fit in the template.

100BASE-T differential output voltage

This measurement verifies that the differential output voltage of the device under test (DUT) is within the conformance limits.

Reference:

Subclause 9.1.2.2 of ANSI X3.263-1995

Description

According to standard, differential output voltage (V_{out}) should lie in the range of 950 mV to 1050 mV in both positive and negative excursion.

100BASE-T signal amplitude symmetry

This measurement verifies that the signal amplitude symmetry of the device under test (DUT) is within the conformance limits.

Reference:

Subclause 9.1.4 of ANSI X3.263-1995

Description

The ratio of the + V_{out} magnitude to – V_{out} magnitude shall be between the limits:

 $0.98 \le |+V_{out}| / |-V_{out}| \le 1.02$

100BASE-T rise and fall time

This measurement verifies that the response times of the DUT are within the conformance limits.

Reference:

Subclause 9.1.6 of ANSI X3.263-1995

Description

Active Output Interface (AOI) rise and fall time shall be in the range of 3.0 ns and 5.0 ns. Rise and fall times are defined as time difference between 10% and 90% voltage levels. Both positive and negative rise/fall times should be validated.

The difference between the maximum and the minimum of all measured rise and fall times should be less than 0.5 ns.

100BASE-T waveform overshoot

This measurement verifies that the waveform overshoot of the DUT is below the conformance limit.

Reference:

Subclause 9.1.3 of ANSI X3.263-1995

Description

According to standard, Overshoot is the percentage excursion of the differential signal transition beyond Vout. Differential signal overshoot should not exceed 5%. Both positive and negative overshoot are to be measured.

100BASE-T Jitter

This measurement verifies the jitter of the DUT is within the conformance limits.

Reference:

Subclause 9.1.9 of ANSI X3.263-1995

Description

The transmitter output jitter when measured at the output of the twisted-pair model should lie within ±5.5 ns. As per B.4.3.3 Note for 14.3.1.2.3 of IEEE standard 802.3-2015, failure of this test does not demonstrate noncompliance.

The transmitter output jitter when measured without the twisted-pair model should lie within ±8.0 ns.

100BASE-T return loss

This measurement verifies the return loss at the transmitter or receiver of the device under test (DUT) is above the conformance limit.

Reference:

Subclause 9.1.5 and 9.2.2 of ANSI X3.263-1995

Description

Greater than 16 dB from 2 MHz to 30 MHz.

Greater than (16-20log(f/30 MHz)) dB from 30 MHz to 60 MHz.

Greater than 10 dB from 60 MHz to 80 MHz.

100BASE-T duty cycle distortion

This measurement verifies that the duty cycle distortion of the DUT is below the conformance limit.

Reference:

Subclause 9.1.3 of ANSI X3.263-1995

Description

According to standard, duty cycle distortion should be measured at the 50% voltage points on rise and fall transitions of the differential output waveform and should not exceed ±0.25 ns.

100BASE-T Transmit clock frequency

This measurement verifies that the transmit clock generated by the DUT is below the conformance limit.

Reference:

IEEE Std 802.3-2005, subclause 24.2.3.4

Description

According to standard, frequency of clock signal recovered from the DUT signal, should be 125 MHz ± 6.25 kHz.

10BASE-T

10BASE-T MAU External

This measurement verifies that the transmitter output equalization meets standard specifications.

Reference:

Subclause 14.3.1.2.1 of IEEE standard 802.3-2015

Description

According to standard, the transmitter waveform should lie within the template (Normal and Inverted) for all data sequences at the twisted-pair model's output with 100 Ohm termination.

10BASE-T MAU Internal

This measurement verifies that the transmitter output equalization meets standard specifications.

Reference:

Subclause 14.3.1.2.1 of IEEE standard 802.3-2015

Description

According to standard, the transmitter waveform should lie within the template (Normal and Inverted) for all data sequences at the twisted-pair model's output with 100 Ohm termination.

10BASE-T TP_IDL

This measurement verifies that the transmitter functions properly after a transition to the idle state.

Reference:

Subclause 14.3.1.2.1 of IEEE standard 802.3-2015

Description

According to standard, the TP_IDL pulse should lie within the template. This test shall be done across each of the specified test loading Load 1, Load 2, and Load 3 with and without twisted-pair model.

10BASE-T link pulse

This measurement verifies that the link test pulse waveforms meet specification.

Reference:

Subclause 14.3.1.2.1 of IEEE standard 802.3-2015

Description

According to standard, the link test pulse should lie within the template. This test shall be done across each of the specified test loading Load 1, Load 2, and Load 3 with and without twisted-pair model.

10BASE-T differential voltage

This measurement verifies that the differential voltage of the DUT is within the conformance limits.

Reference:

Subclause 14.3.1.2.1 of IEEE standard 802.3-2015

Description

Peak differential voltage of transmitter waveform when terminated with a 100 Ohm resistor should lie between 2.2 V and 2.8 V for all data sequences.

10BASE-T harmonic

This measurement verifies that the harmonic content of the DUT is within the conformance limits.

Reference:

Subclause 14.3.1.2.1 of IEEE standard 802.3-2015

Description

Harmonic test is done when the DO circuit is driven by all ones. Each harmonic measured at the output of the transmitter shall be at least 27 dB below the fundamental.

10BASE-T return loss

This measurement verifies the return loss at the transmitter or receiver of the device under test (DUT) is above the conformance limit.

Reference

Subclause 14.3.1.2.2 of IEEE standard 802.3-2015 ab

Description

At least 15 dB over the frequency range of 5.0 to 10 MHz.

10BASE-T jitter

This measurement verifies the jitter of the DUT is within the conformance limits.

Reference:

Subclause 14.3.1.2.3 of IEEE standard 802.3-2015

Annexure B.4.3.2 Note for 14.3.1.2.3 of IEEE standard 802.3-2015

Description

The transmitter output jitter when measured at the output of the twisted-pair model should lie within ±5.5 ns. As per B.4.3.3 Note for 14.3.1.2.3 of IEEE standard 802.3-2015, failure of this test does not demonstrate noncompliance.

The transmitter output jitter when measured without the twisted-pair model should lie within ±8.0 ns.

10BASE-T CM Voltage

This measurement verifies that the common-mode voltage at the transmitter or receiver of the device under test (DUT) is above the conformance limit.

Reference:

Subclause 14.3.1.2.5 of IEEE standard 802.3-2015

Description

At least 15 dB over the frequency range of 5.0 to 10 MHz.

Index

A

Acquire parameters including in test reports 61 viewing in reports 62 Acquisition tab 28 Analysis options 54 Application directories 16 Application panels overview 18 Application version (show) 17

В

Button calibration 28 clear log 55 save 55 view optical modules 28

С

Calibration button 28 Clearing test results 97 Compensate the signal path 96 Configuration tab 25 Configuration tab parameter instruments detected 30 Configuration tab parameters global settings 30 Connected instruments searching for 22, 23 Connection requirements 64, 79 Create a test setup from default settings 98 Create a test setup using an existing one 99

D

DUT ID 26 DUT parameter device 26 device profile 26 optical module settings 26 optical power 26 DUT type device 26 DUT-instrument setup 64, 79

E

Email notification and setup 24 Equipment setup 64, 79 Extensions, file names 17

F

File name extensions 17

G

GPIB 22

I

Installing the software switch matrix application 15 Instrument-DUT setup 64, 79 Instruments discovering connected 22 viewing connected 23 Instruments and accessories required 14 Instruments detected 30

Κ

Keep on top 18

L

LAN 22 License agreement (show) 17 Live waveforms 26 Loading a test setup 98 Log view save file 55

М

```
Menus
Options 21
Preferences 97
Minimum system requirements 14
My TekExpress folder
files stored in 58
```

Ν

Names, file extensions 17 Non-VISA 22

0

Opening a saved test setup 98 Options menu Instrument control settings 22 keep on top 18 Oscilloscope compensation 96

Ρ

Panels 18 Pattern 26 Pattern type 26 Preferences menu 56 Preferences tab send an Email 54 setup panel 54

R

Recalling a test setup 98 Report contents 63 Report name 61 Report options 61 Report sections 62 Reports receiving in email notifications 24 Reports panel 18, 59 Resource file 18 Results panel summary of test results 56 test name 56 Results Panel 97 Running tests 97

S

Save log file 55 Saving tests 58 Schematic button (DUT-instrument setup) 64, 79 SCPI commands TEKEXP:*IDN? 106 TEKEXP:*OPC? 107 TEKEXP:ACQUIRE_MODE 107 TEKEXP:ACQUIRE_MODE? 107 **TEKEXP:EXPORT** 108 TEKEXP:INFO? 108 **TEKEXP:INSTRUMENT** 109 **TEKEXP:INSTRUMENT? 108 TEKEXP:LASTERROR?** 109 TEKEXP:LIST? 109 TEKEXP:MODE 110 TEKEXP:MODE? 110 **TEKEXP:POPUP** 110 TEKEXP:POPUP? 111 **TEKEXP:REPORT** 111 TEKEXP:REPORT? 111 TEKEXP:RESULT? 112 TEKEXP:SELECT 112 TEKEXP:SELECT? 113 TEKEXP:SETUP 113 TEKEXP:STATE 113 TEKEXP:STATE? 114 TEKEXP:VALUE 114 TEKEXP:VALUE? 115 Search for connected instruments 23 Selecting test report contents 61

Selecting tests 27 Serial 22 Session folders and files 58 Setting up equipment 64, 79 Setup acquisition tab 28 Setup files 98 Setup panel DUT parameter 25 preferences tab 25 test selection 25 Show acquire parameters 28 Signal conditioning bandwidth 26 filter 26 Software installation switch matrix application 15 Source 26 Status panel log view 55 message history 55 test status tab 55 System requirements 14

Т

```
Tek Link 22
Test Name 28
Test reports 62
Test results
     send by email 24
Test Results
     clearing displayed 97
Test selection
     Ethernet 27
     optical tests 27
     test description 27
Test selection controls 27
Test setup files 58, 98
Test setups
     load 98
     open 98
     recalling 98
Test status
     acquire status 55
     analysis status 55
     auto scroll 55
Test-related files 58
Tests
     running 97
     selecting 27
```

U

USB 22 User Comments including in reports 62

۷

View a report 62 View application license agreement 17 View application software version 17 View optical modules button 28 VXI 22

W

Waveform files locating and storing 58 Wavelength 26