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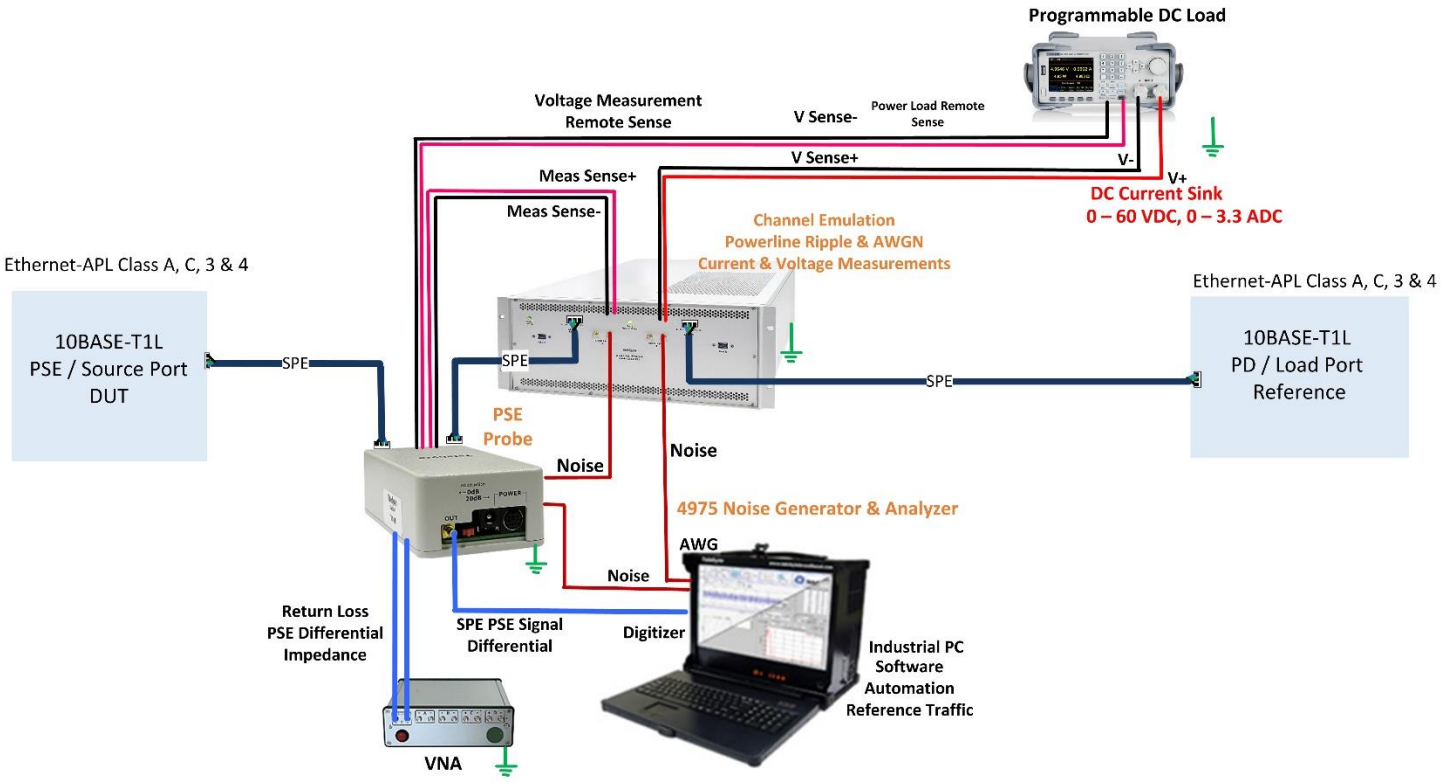
Application Note

Ethernet-APL Universal Test Setup for PSE / Source Data and Power Conformance Tests (Fast Streaming Version)



Telebyte's Ethernet-APL Universal Test Setup (Fast Streaming version) supports PSE Source with one setup for Ethernet-APL Conformance and Interoperability Data and Power testing. The PD may be emulated as a golden reference link partner device. The small footprint saves valuable laboratory test space while the fully automated approach saves time and money and provides repeatable test results. The solution is easy to use, allowing tests to be performed by technicians with minimal training. There is no need to plug/unplug different instruments and fixtures in the test setup. Additional features include automated software for controlling DUTs and all test equipment. The software generates Pass / Fail Reports for Ethernet-APL Conformance Power and Data tests. The fast streaming version uses Telebyte's high-end Industrial PC with an 8-lane PCIe backplane to stream data to disk for post processing the captured Ethernet signal.

Customers may purchase all integrated test setup instruments from Telebyte.

An optional Switch Matrix is also available to automate the switching in of multiple DUTs in a test bed to the Telebyte Universal Test Setup.

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Required Equipment

- Telebyte 4950 10BASE-T1L Channel Emulator
- Telebyte 4975 Noise Generator (AWG) and Analyzer (Digitizer)
- Telebyte SPE Test Automation Software
- Telebyte 4975-P01 Probe
- AEM MMVNA-200 8-Channel Vector Network Analyzer
- Siglent SDL1020X Programmable DC Load

Ethernet Conformance Data and Power Test List

Ethernet-APL Data Test Specification v1.4
Group 1: Transmitter Electrical Measurements
Test APL.146.1.1 - Transmitter Output Voltage (Test Mode 1)
Test APL.146.1.2 - Transmitter Output Droop (Test Mode 2)
Test APL.146.1.3 - Transmitter Timing Jitter (Test Mode 1)
Test APL.146.1.4 - Transmitter Power Spectral Density (PSD) and Power Level (Test Mode 3)
Test APL.146.1.5 - Transmit Clock Frequency (Test Mode 1)
Test APL.146.1.6 - MDI Return Loss (Part A: Tx disabled: DUT in Slave, high Z state)
Test APL.146.1.6 - MDI Return Loss (Part B: Test Mode 3 VNA with narrowband IF of 100Hz)
Test APL.146.1.7 - Transmitter Distortion (Test Mode 2) with 1MHz Sinusoidal Disturber at 1.0Vpp and/or 2.4Vpp
Group 2: Receiver Electrical Measurements
Test APL.146.2.1 - Receiver Packet Error Rate Stress Test
Noise includes
AWGN @ -106dBm/Hz
Power-line Ripple Noise components
100mV at 1kHz and 10kHz, 10mV at 100kHz and 1MHz, and
100mV at 10kHz falling 20dB per decade to 10mV at 100kHz swept
Ethernet-APL Appendix F – 1.0Vpp Spur & 2.4Vpp Trunk Worst-Case Whole Communication Channel
Traffic Testing - Link Quality SNR better than 20dB, DUT Passing BER < 10^{-9}
Group 3: PCS Transmit
Test APL.146.3.1 – PCS Transmit Signaling
Group 4: PCS Receive – 10BASE-T1L valid Decoding of code groups
Test APL.146.4.1 – Automatic Polarity Detection and Correction
Test APL.146.4.2 – Handling of Received ESD_ERR4
Test APL.146.4.3 – Handling of Received disparity_error
Test APL.146.4.4 – Handling of Receipt of rem_rcvr_status = NOT_OK while link up
Section 98: Ethernet-APL Clause 98 Auto-Negotiation Validation
Group 1: Auto –Negotiation Basic Tests for Ethernet-APL
Test APL.98.1.1 – Advertisement and Auto-Negotiation Verification
Part A: DUT advertises valid capabilities
Part B: DUT links with compatible link partner
Part C: DUT spur port when LP advertises but does not request increased transmit level
Part D: DUT behavior with incompatible link partner (spur to trunk, trunk to spur)
Part E: DUT behaves properly with incompatible link partner (spur to trunk, trunk to spur)

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Part F: DUT behavior when link partner prefers master or slave port role (M/S is always 0).
Part G: DUT behavior when link partner forces master or slave port role (M/S is always 1).
Test APL.98.1.2 – Management Restart of Auto-Negotiation
Test APL.98.1.3 – Link Status Fail
Test APL.98.1.4 – DME Voltage Envelope Test
Ethernet-APL Power Test Specification v1.1
TP: Trunk Power Source Ports – Segment 'T'; Port 'P
TP.1: Power Tests
TP.1.1 Power Class Currents Minimum Supply Voltage 46
TP.1.1 Power Class Currents Maximum Supply Voltage 50V
TP.1.2 Powering Class Voltages Minimum Supply Voltage 46
TP.1.2 Powering Class Voltages Maximum Supply Voltage 50V
TP.2 Electrical Characteristics
TP.2.1 Differential In-Band Ripple and Noise
TP.2.1 Differential In-Band Ripple and Noise Load draws 0 A
TP.2.2 Differential Out-Band Ripple and Noise Maximum Supply Voltage 50V Load draw IPS
TP.2.2 Differential Out-Band Ripple and Noise Minimum Supply Voltage 46 Load draw IPS
TP.2.2 Differential Out-Band Ripple and Noise Maximum Supply Voltage 50V Load 0 A
TP.2.2 Differential Out-Band Ripple and Noise Minimum Supply Voltage 46 Load 0 A
TP.2.3 Voltage Derivatives
TP.2.4 Over Current Capability
TP.2.5 Over Current Limiting
TP.3 General Port Requirements
TP.3.1 Terminal and Connectors
TP.3.2 Shielding Options*
TP.3.3 Short Circuit Behavior
SP: Spur Power Source Ports – Segment 'S'; Port 'P'
SP.1 Power Tests
SP.1.1 Powering Class Currents Minimum Supply Voltage (A=9.6 C=11.61)
SP.1.1 Powering Class Currents Maximum Supply Voltage V=15
SP.1.2 Powering Class Voltages Minimum Supply Voltage (A=9.6 C=11.61)
SP.1.2 Powering Class Voltages Maximum Supply Voltage V=15
SP.2 Electrical Characteristics
SP.2.1 Differential In-Band Ripple and Noise Maximum Supply Voltage V=15 Load draws IPSmin
SP.2.1 Differential In-Band Ripple and Noise Minimum Supply Voltage (A=9.6 C=11.61) Load draws IPSmin
SP.2.1 Differential In-Band Ripple and Noise Maximum Supply Voltage V=15 Load draws 20mA
SP.2.1 Differential In-Band Ripple and Noise Minimum Supply Voltage (A=9.6 C=11.61) Load draws 20mA
SP.2.2 Differential Out-Band Ripple and Noise Maximum Supply Voltage V=15 Load draws IPSmin
SP.2.2 Differential Out-Band Ripple and Noise Minimum Supply Voltage (A=9.6 C=11.61) Load draws IPSmin
SP.2.2 Differential Out-Band Ripple and Noise Maximum Supply Voltage V=15 Load draws 20mA

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SP.2.2 Differential Out-Band Ripple and Noise Minimum Supply Voltage (A=9.6 C=11.61) Load draws 20mA
SP.2.3 Voltage Derivatives
SP.3 General Port Requirements
SP.3.1 Terminal and Connectors
SP.3.2 Shielding Options*
SP.3.3 Short Circuit Behavior
TL: Trunk Power Load Ports – Segment 'T; Port 'L'
TL.1 Power Tests
TL.1.1 Minimum Current Draw Minimum Supply Voltage 28.8 V
TL.1.1 Minimum Current Draw Maximum Supply Voltage 50V
TL.1.2 Inrush
TL.2 Electrical Characteristics
TL.2.1 Differential In-Band Ripple and Noise Maximum Supply Voltage 50V
TL.2.1 Differential In-Band Ripple and Noise Minimum Supply Voltage 28.8 V
TL.2.2 Differential Out-Band Ripple and Noise Maximum Supply Voltage 50V
TL.2.2 Differential Out-Band Ripple and Noise Minimum Supply Voltage 28.8 V
TL.2.3 Current Derivatives Minimum Supply Voltage 28.8 V
TL.2.3 Current Derivatives Maximum Supply Voltage 50V
TL.2.4 Current Events Minimum Supply Voltage 28.8 V
TL.2.4 Current Events Maximum Supply Voltage 50V
TL.2.5 Under Voltage Current
TL.3 General Port Requirements
TL.3.1 Terminal and Connectors
TL.3.2 Shielding Options*
TL.3.3 Polarity Sensitivity Mode A + / -
TL.3.3 Polarity Sensitivity Mode B - / +
SL: Spur Power Load Ports – Segment 'S'; Port 'L'
SL.1 Power Tests
SL.1.1 Minimum Current Draw Minimum Supply Voltage UPL(min) Class A=9V ClassC =10.6V
SL.1.1 Minimum Current Draw Maximum Supply Voltage UPL(min) Class A and C = 15V
SL.1.2 Inrush Current
SL.2 Electrical Characteristics
SL.2.1 Differential In-Band Ripple and Noise Maximum Supply Voltage UPS(max) Class A and C = 15V
SL.2.1 Differential In-Band Ripple and Noise Minimum Load Voltage UPL(min) Class A=9V ClassC =10.6V
SL.2.2 Differential Out-Band Ripple and Noise Maximum Supply Voltage UPS(max) Class A and C = 15V
SL.2.2 Differential Out-Band Ripple and Noise Minimum Load Voltage UPL(min) Class A=9V ClassC =10.6V
SL.2.3 Current Derivatives Maximum Supply Voltage UPS(max) Class A and C = 15V
SL.2.3 Current Derivatives Minimum Load Voltage UPL(min) Class A=9V ClassC =10.6V
SL.2.4 Current Events Minimum Load Voltage UPL(min) Class A=9V ClassC =10.6V
SL.2.4 Current Events Maximum Supply Voltage UPS(max) Class A and C = 15V

SL.2.5 Under Voltage Current
SL.3 General Port Requirements
SL.3.1 Terminal and Connectors
SL.3.2 Shielding Options*
SL.3.3 Polarity Sensitivity Mode A + / -
SL.3.3 Polarity Sensitivity Mode B - / +

* External DMM required (not included)