

Ethernet-APL Test Guide

Test Type (Data or Power): Data

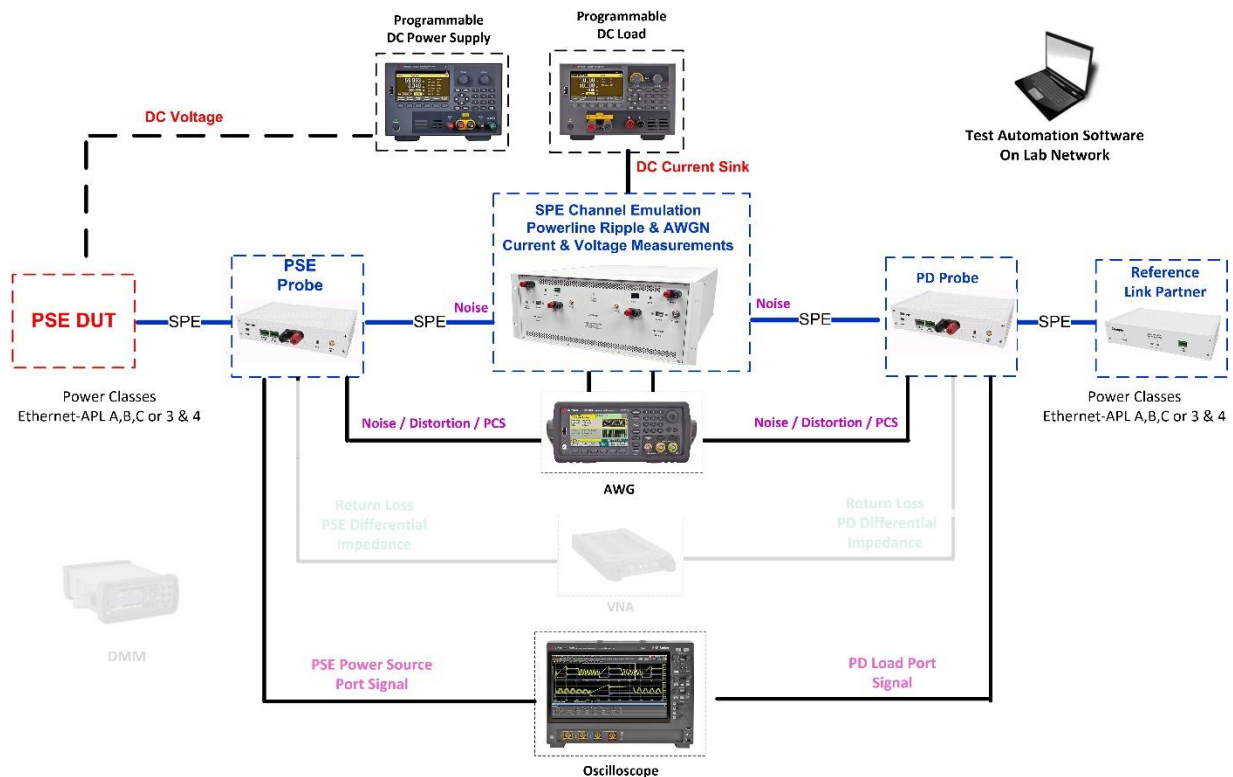
Test Name: 146.3.1 Transmit Packet Formation

Purpose/Description: To verify that the PCS properly performs the side-stream scrambling and code-group generation (4B3T) and can receive three packets at line-rate.

Required Test Equipment for PSE:

1. PD Probe
2. 4950 Channel Emulator (for current measurements)
3. PSE Probe
4. Programmable DC Power Supply (to power the PSE DUT)
5. Programmable DC Load (to draw current from PSE DUT)
6. AWG
7. Oscilloscope
8. Test Automation Software
9. Model 4925 Telebyte Link Partner

Test Setup / Connection Diagram (PSE):

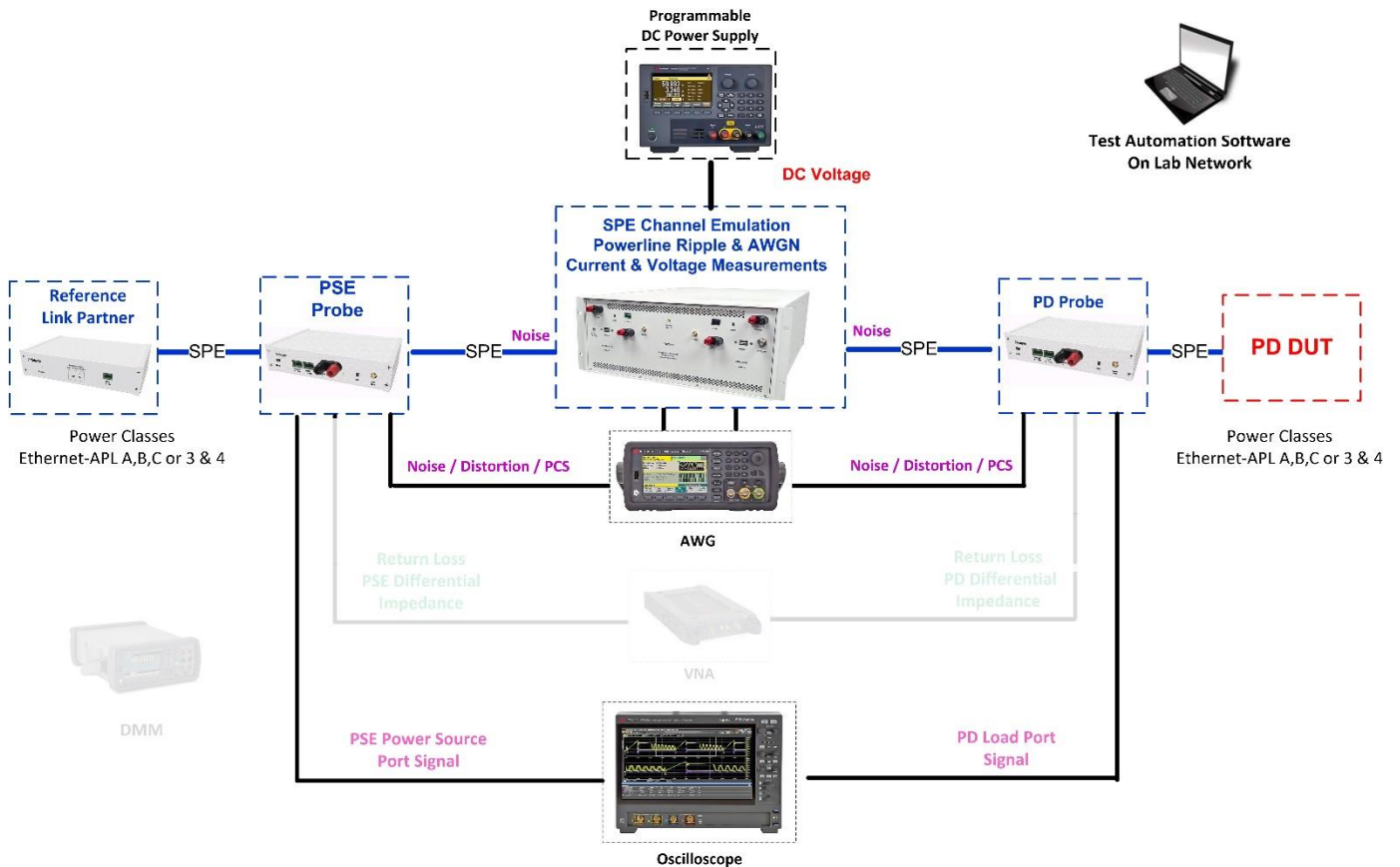


Ethernet-APL Test Guide

Required Test Equipment for PD:

1. PD Probe
2. 4950 Channel Emulator (for current measurements)
3. PSE Probe
4. Programmable DC Power Supply (to power the PD Load DUT)
5. Oscilloscope
6. AWG
7. Test Automation Software
8. Model 4925 Telebyte Link Partner

Test Setup / Connection Diagram (PD):



Ethernet-APL Test Guide

Device Under Test Setup:

- Part A: DUT as 10BASE-T1L SLAVE, Tx Enabled, Auto-Negotiation Disabled, Forced Slave
- Enter the Power Class for the Device Under Test (Trunk: Class 3 or 4, Spur: Class A, B or C) into the test automation software.
- The Device Under Test (DUT) must have the ability to send and receive Test Packets
- A test station capable of Auto-Negotiation, 10BASE-T1L link signaling, arbitrary packet generation and capturing; OR A test station capable of transmitting arbitrary ternary symbols (allowing explicit control of tx_disparity) and receiving valid ethernet packets. Note that if an Option 1A test station is in use, Auto-negotiation must be disabled. If an Option 2 test station is in use, the test station will be capable of DME page exchange as well.

Expected Results (Pass/Fail Criteria):

Step	Status	Description
A:3	PASS	The DUT, as SLAVE, is observed to establish a link and properly encode idle and data packets.
A:1	FAIL	The DUT does not link.
A:2	FAIL	The transmissions did not follow: the side-stream scrambler polynomial specified in [1] for SLAVE; the generation of Sdn[3:0] specified in [3] for idle transmissions; or, mapping of Sdn[3:0] to any column of the respective Sdn[3:0] row of [5] during idle transmissions.
A:3	FAIL	Three response packets are not captured from the DUT.
A:3	FAIL	Coding Check: The data transmissions did not follow: the side-stream scrambler polynomial specified in [1] for SLAVE; the generation of Sdn[3:0] specified in [3] for data transmissions; or, the 4B3T symbol mapping as defined in [5] during data transmissions. During data transmissions any incorrect disparity events that would cause a receiver to set RX_ER = TRUE, as shown in [8], were observed.
A:3	FAIL	SSD Check: The DUT did not transmit {0, 0, 0}, {0, 0, 0}, {-1, TBx, TCx}, {TAz, TBz, TCz} or {0, 0, 0}, {0, 0, 0}, {1, TBy, TCy}, {TAz, TBz, TCz} at the beginning of the packet. Where TBx, TCx can take on the values {0, 1}, {0, 0}, {0, -1}, or {-1, -1}; TBy, TCy can take on the values {0, 1}, {0, 0}, {0, -1}, or {1, 1}; and TAz, TBz, TCz can take on the values {1, 1, -1} or {-1, -1, 1}.
A:3	FAIL	ESD Check: The DUT did not transmit {0, 0, 0}, {0, 0, 0}, {-1, TBx, TCx}, {TAz, TBz, TCz} or {0, 0, 0}, {0, 0, 0}, {1, TBy, TBy}, {TAz, TBz, TCz} at the end of the packet. Where TBx, TCx can take on the values {0, 1}, {0, 0}, {0, -1}, or {-1, -1}; TBy, TCy can take on the values {0, 1}, {0, 0}, {0, -1}, or {1, 1}; and TAz, TBz, TCz can take on the values {1, -1, 1} or {-1, 1, -1}.
A:3	FAIL	Preamble Check: The DUT transmitted less than seven (7) bytes of Preamble, accounting for the two SSD bytes as part of Preamble.
A:3	WARNING	Preamble Warn: The DUT transmitted more than seven (7) bytes of Preamble, accounting for the two SSD bytes as part of Preamble. [Only 7 bytes are necessary, but excess preamble is unlikely to cause an interoperability issue.]
A:3	FAIL	SFD Check: The DUT did not transmit one (1) byte of start of frame delimiter (SFD) immediately after the Preamble.
A:3	WARNING	Disparity Check: At any time the transmissions did not follow the 4B3T symbol mapping defined in [5]. (This includes following the tx_disparity encoding rules).

Ethernet-APL Test Guide

Notes:

References:

- [1] IEEE Std. 802.3-2022 subclause 146.3.3.4.1 – Side-stream scrambler polynomial
- [2] IEEE Std. 802.3-2022 subclause 146.3.3.4.2 – Generation of Syn[3:0]
- [3] IEEE Std. 802.3-2022 subclause 146.3.3.4.3 – Generation of scrambled bits Sdn[3:0]
- [4] IEEE Std. 802.3-2022 subclause 146.3.3.5 – Generation of code-groups
- [5] IEEE Std. 802.3-2022 Table 146-1 – 4B3T encoding
- [6] IEEE Std. 802.3-2022 Table 146-2 – Disparity reset
- [7] IEEE Std. 802.3-2022 Table 146-3 – Delimiters
- [8] IEEE Std. 802.3-2022 Figure 146-9 – PCS receive state diagram (part a)