

Voyager M310P SuperSpeed Calibration

This application note outlines calibration procedures for resolving unexpected Inter-Packet Symbols (IPS) in traces with the Voyager M310P USB 3.1 analyzer.

1. Voyager M310P Probe Design

The Voyager M310P features a fully passive Analog-Front-End (AFE). This new probe design utilizes no active components specifically to avoid interfering with USB Type-C Alt-Mode adapters (AMA) that support DisplayPort 4K video. These AMA devices that transmit main line video out (uni-directionally) using all four (4) SS pairs do not work consistently when active components are present in the probe AFE. When testing USB 3.1 Gen 2 signaling with the M310P's fully passive AFE, users may see higher occurrence of IPS packets in the trace file. These events occur when the SERDES on the analyzer FPGA momentarily loses "lock" on the bit stream and shows intermittent "garbage" packets in the trace. Calibrating the analyzer SERDES dynamic feedback equalization (DFE) settings usually resolves this issue.

2. Voyager M310P calibration process

Figure 1) To improve compatibility with Alt-mode adapters, the Voyager M310P utilizes a high-impedance probe design which can result in lower amplitude signaling reaching the analyzer FPGA (receiver). Intermittent IPS events in the Trace file are the primary side-effect of the lower amplitude signal passing through the analyzer (USS packets can be ignored as they are considered normal when DUTs exit low power states).

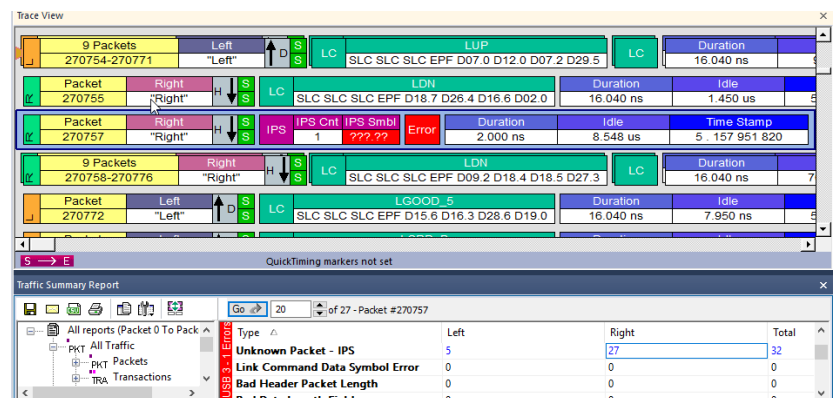
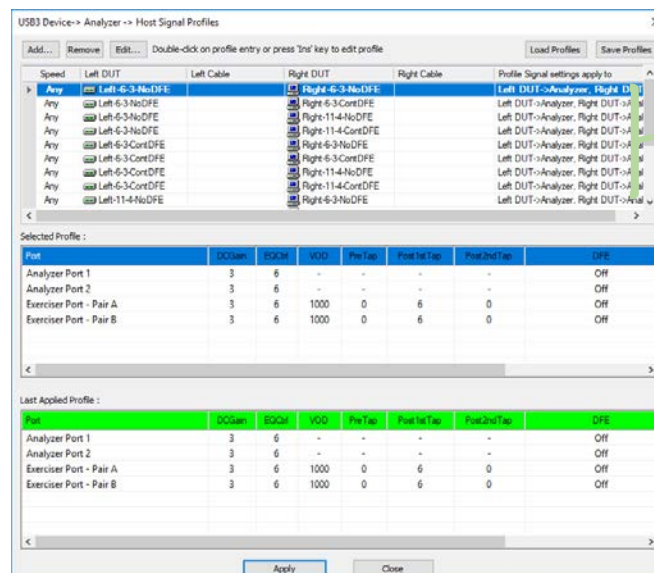
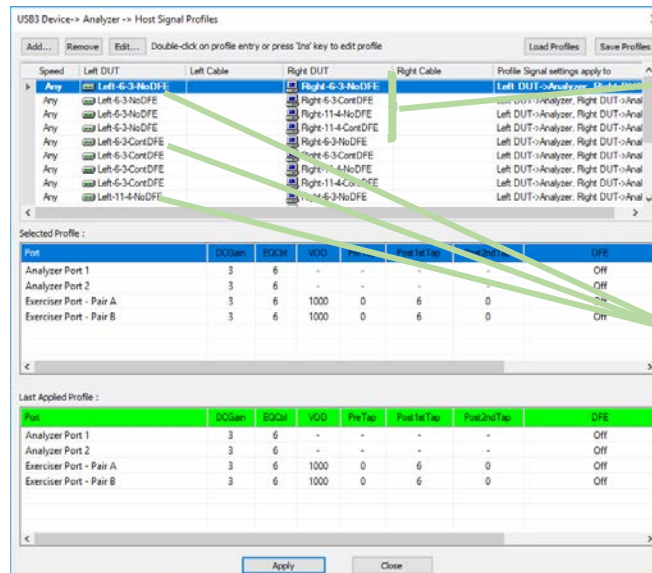


Figure 2) To minimize the appearance of IPS packets in the trace, open the Calibration window under Setup>USB 3.1 Device / Host Signal Properties. This window is only available when physically connected to a Voyager M310P system. The upper portion of this window displays 16 "pre-defined" AFE settings; the middle portion displays the actual DFE parameters for the selected pre-set. The lowest window displays the DFE settings that are currently applied for the attached M310P system.



16 pre-defined AFE settings

Figure 3) The recommended calibration procedure is to experiment by trying the different “pre-defined” DFE Settings in the upper window. It is suggested to start with the channel that is showing IPS events. This can be determined by identifying if the IPS packets are from the DUT attached to the “left” or “right” channel on the analyzer. There are only 4 different pre-sets for the left and right channels. Which means only four (4) iterations would be required to try all settings for a single problematic channel.



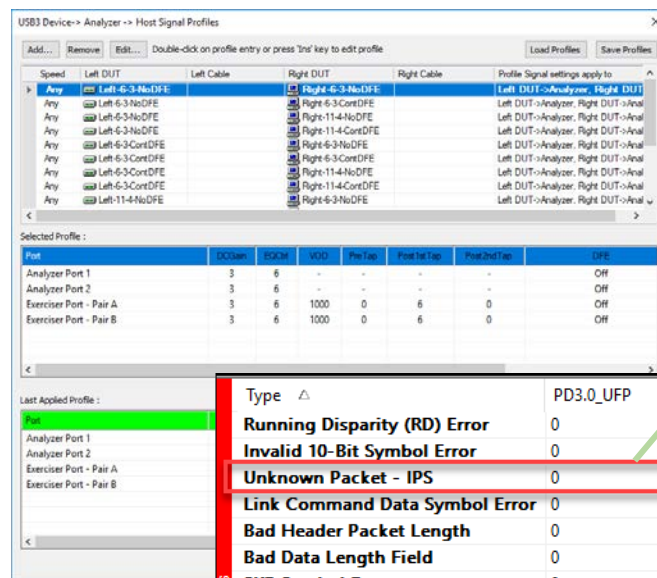
4 options
for Right
DUT

4 options
for Left
DUT

Sequence:

- 1) After applying setting, record “link-up” event & check Error Report for IPS (below)
- 2) Repeat with all 4 “left” settings and check for IPS
- 3) When “IPS = 0” on “left” side; Repeat with all 4 “right” channel settings until “IPS = 0”

Figure 4) Only make changes to one channel at a time. View the results by capturing USB 3.1 link-up event. Review the error report for any improvement in the number of IPS. Note: parameters may only need adjustment on one of the two channels (E.G. the DUT with lower signal integrity). This calibration process is a one-time event but may need to be repeated if the channel under test is changed (e.g.: device or cable...). The last applied signal parameters will be re-used automatically until changed in this window. If the pre-defined signal parameters do not resolve the occurrence of IPS, it is possible to add additional DFE presets using the “ADD” button. Contact Teledyne LeCroy support for assistance with this advanced feature.



Goal: IPS
Packets=0