

This application note outlines troubleshooting steps for resolving connection/capture issues with the Voyager-based USB 3.0 analyzer. This document addresses the following topics:

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1. Voyager RX Detect Overview

There are two modes of operation available in the Voyager M3i analyzer. The *Auto* termination/RX detect mode and the *manual* termination/RX detect mode. When using the *Auto* termination/RX detect mode, the Voyager intelligently controls termination signals to the DUTs. With devices powered on, the Voyager uses a proxy system that waits for both DUTs to be attached and then presents termination to both link partners simultaneously.

1.1. Auto Termination / RX.detect Mode

Termination/RxDetect
 (Applies to M3i USB Connectors only.)

Analyzer Ports

☒ Auto

☐ Manual

* Note: the original Voyager M3 does not offer the Auto Rx.detect mode and provides the manual mode only

1. Terminations A: Off B: Off   Auto Mode	2. Terminations A: Off B: Off   Auto Mode	3. Terminations A: ON B: ON   Auto Mode
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Voyager M3i analyzer in Auto Rx.detect mode waits until both link partners are powered and connected and then automatically presents termination to both sides simultaneously. (see page 5)

In some cases, it may be necessary to change the Termination settings in recording options to *Manual* if the DUT RX Detect window is very short and one of the link partners times-out or fails to detect the Polling.LFPS handshake. (see [Manual Termination / RX.detect Mode](#)).

1.2. Manual Termination / RX.detect Mode

The manual RX.detect mode provides a manual control button which can turn the termination on the Voyager On or Off interactively. This control allows users to prevent each side from entering RX.detect state until after the DUTs are connected.

Termination/RxDetect

[Applies to M3i USB Connectors only.]

Analyzer Ports

☐ Auto
 ☒ Manual

* Note: the original Voyager M3 does not offer the Auto Rx.detect mode and provides the manual mode only

1. Terminations A: Off B: Off



Status: Off

2. Terminations A: Off B: Off



Status: Off

3. Terminations A: ON B: ON

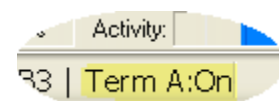


Click Button Status:On after both attached

Status: On

Voyager M3i analyzer in Manual Rx.detect mode* provides a manual control button which should be used to enable Status: ON after both DUTs are attached to the analyzer. This presents termination to both sides simultaneously. The USB Protocol Suite shows the current termination status in the application tray: (see 2.

[Manual RX.detect Connection method: Voyager M3 & Voyager M3i](#)).

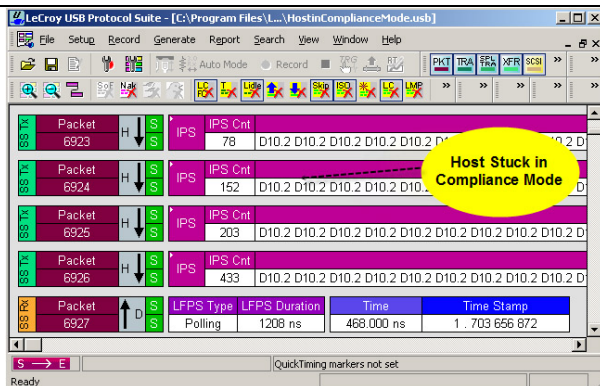


Tip: tray shows current status

2. Diagnosing Connection Problems

Identifying the root cause of these connection issues is the first step. The conditions below summarize symptoms and possible causes.

Issue / Symptom	Possible Cause
2.1. RXDetect timeout – (Compliance mode) DUTs are powered up and attached through the analyzer; the host and device fail to establish a link.	Root Cause - After attaching host or device to the Voyager system, the termination on the analyzer causes the device to falsely detect the presence of the far-end link partner. The device prematurely enters first time

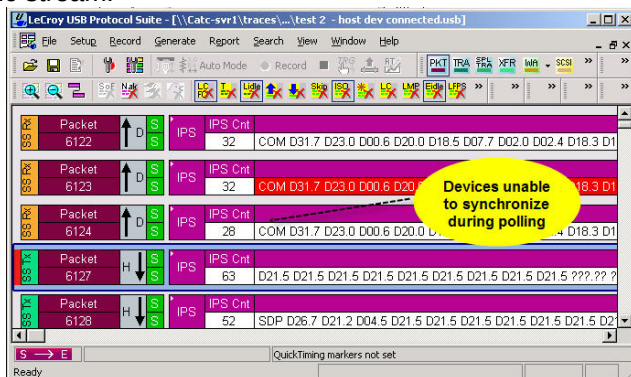


LFPS.polling state before the far-end link partner is ready or connected. The far-end link partner cannot complete the LFPS handshake within the required 360 ms time-out. As result the first DUT connected exits LFPS.polling and goes to “compliance” mode. Once in compliance mode, the DUT can only exit when directed by the host or by resetting the link.

The Voyager M3i system Auto RX.detect is designed to overcome this problem. Use the steps outlined in 3.1 [Auto Termination / RX.detect Connection method: For Voyager M3i](#) below.

2.2. Signal Lock (at Power on)

Symptom – DUTs fail to link up; analyzer records invalid traffic stream.

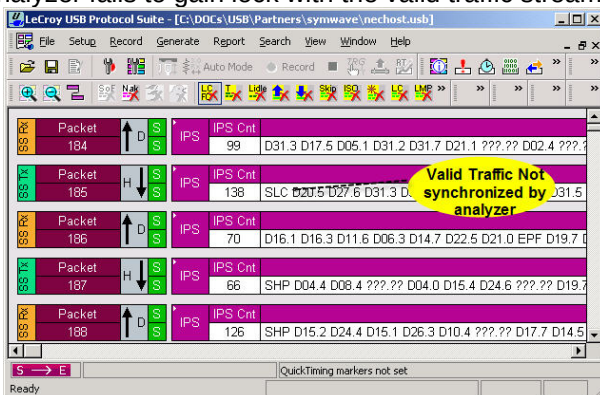


Root Cause – In some cases, after DUTs start link synchronization, signal integrity issues can prevent successful link up. The DUTs would normally achieve bit lock after the link exits electrical idle and begins transmitting TSEQ ordered sets. If devices cycle between Polling.Active and Polling.LFPS yet fail to connect it's also possible that one or both sides are unable to lock due to problems at the physical layer.

Use the steps outlined in 3.1 [Auto Termination / RX.detect Connection method: For Voyager M3i](#) below.

2.3. Signal Lock (at U1 Exit to U0)

Symptom – DUTs appear to exit U1 state and reach U0 but the analyzer fails to gain lock with the valid traffic stream.

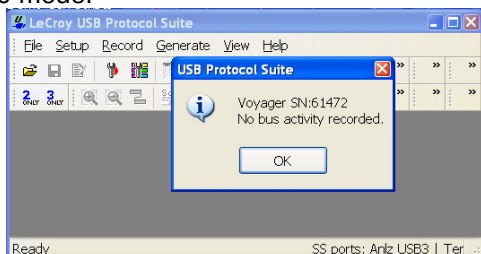


Root Cause – In rare cases, during the exit U1 to U0 state, the analyzer does not detect a COM character. The COM character detection normally occurs just after the link exits electrical idle and begins transmitting TSEQ ordered sets. If the devices are able to establish a link before the analyzer is synchronized, the DUTs will enter U0 state. In U0 they will no longer send K-Chars that the analyzer needs to symbol alignment with the data stream.

Use the steps outlined in [Manual RX.detect Connection method: Voyager M3 & Voyager M3i](#) below.

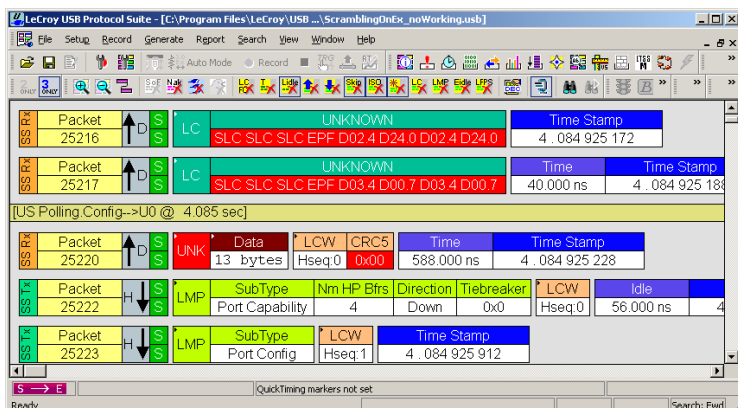
2.4. USB 2.0 mode

DUTs are powered up and then attached through the analyzer, but no 3.0 traffic is seen because the devices have entered 2.0 mode.



Root Cause - After first power-on reset of the DUTs, USB 3.0 devices will detect the presence of vBus and then look for SuperSpeed termination on their receiver. If the device does not see termination it will assume it's connected to USB 2.0 port and begin the high-speed enumeration sequence. The USB link will stay in 2.0 mode until power-on / reset condition places the devices back in RX.detect.

2.5. Scrambling settings



Applying de-scrambling to non-scrambled traffic (or vice-versa) will show valid packets from one side or both sides but payload data is filled with errors.

Root Cause - In some cases, users may incorrectly configure scrambling settings on the Voyager analyzer. The analyzer scrambling settings are applied to captured data stream as a post-process. By incorrectly applying de-scrambling - traffic will appear filled with errors – although the link will operate normally. The presence of 3.0 packets with large numbers of errors is the tell tale sign of scrambling issues. The link is operating because DUTs detected the correct scrambling settings but the Voyager analyzer is set incorrectly.

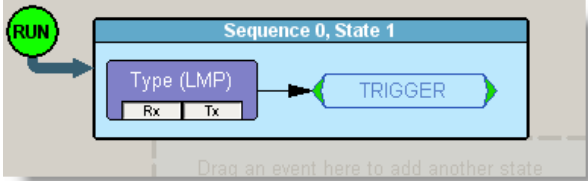
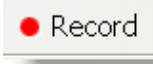
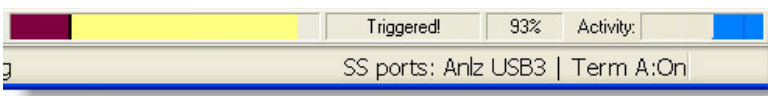
Use the Auto-descrambling setting which is designed to follow the DUTs advertised scrambling settings.

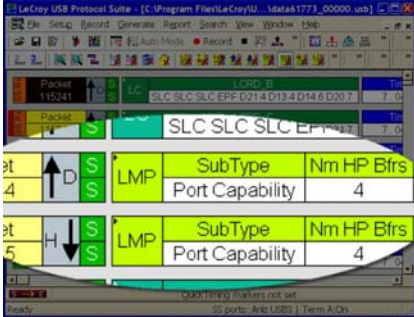
3. Step-by-Step Connection Methods

This section outlines three approaches to bringing-up SuperSpeed links with the Voyager analyzer inline. If encountering problems using 3.1 *Auto Termination*, try using the sequence outlined in 3.2 and then 3.3.

3.1. Auto Termination / RX.detect Connection method: *For Voyager M3i only*

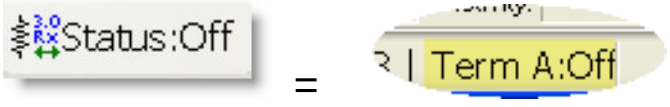
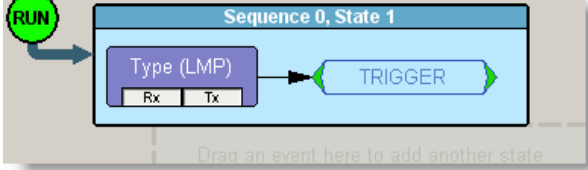
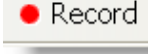
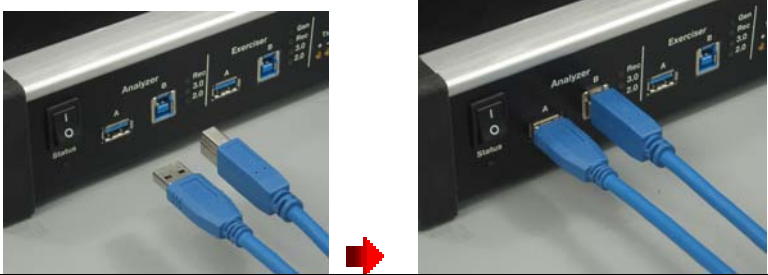
The Auto Termination / RX.detect method below is the recommended connection sequence for Voyager M3i Systems. Auto RX.detect mode will work using DUTs in either hot plug (powered on) or cold-boot (reset) mode.

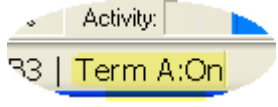
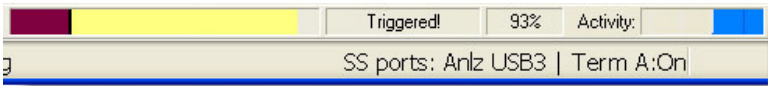
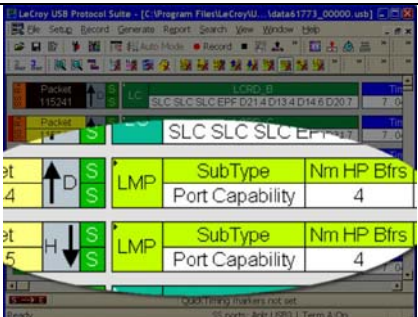
Set Termination RX/Detect to Auto	
Set Trigger on Packet Type: LMP to ensure capture of enumeration sequence	
Click Record	
Connect both devices in any order (devices are already powered on)	
Analyzer should trigger on first LMP packet. If no trigger is seen, try plug-unplug the B port connector.	

After trace finishes uploading, use Search>Go to Trigger to navigate to LMP indicating transition to U0.	
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3.2. Manual RX.detect Connection method: Voyager M3 & Voyager M3i

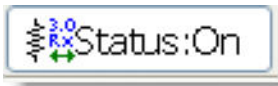
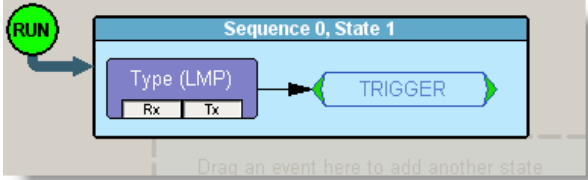
If the Auto RX.detect mode above fails to establish a link, it may be necessary to change the Termination settings in recording options to Manual. This has been observed when the DUT RX.detect window is very short and the device continually enters Compliance Mode. In other cases, DUT may fail to detect Voyager Terminations. Below is the recommended step-by-step connection method for Voyager Systems using Manual RX.detect mode.

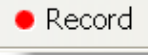
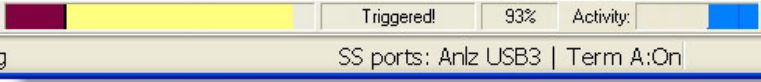
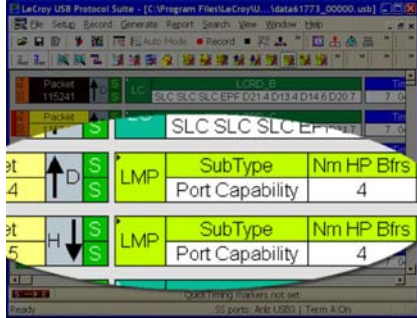
Set Termination RX/Detect to Manual	
After Setting Manual mode the Rx.detect button should indicate Status: Off	 Tray shows current status
Set Trigger on Packet Type: LMP to ensure capture of enumeration sequence	
Click Record	
Connect both devices in any order (devices are already powered on)	

Click the 3.0 Termination button to indicate: <i>Status: On</i> Enables Termination simultaneously on both A & B connectors	  Tray shows current status
Analyzer should trigger on first LMP packet	
After trace finishes uploading, use Search>Go to Trigger to navigate to LMP indicating transition to U0.	

3.3. Alternate Manual RX.detect Connection methods: Voyager M3 & Voyager M3i

If the Auto Rx.detect mode (3.1) and the Manual Rx.detect (3.2) above fail to establish a clean enumeration recording, it may be necessary to experiment with alternate methods that place the devices in RX.detect mode after connecting them to the analyzer ports. This is accomplished by either powering on the DUTs after attaching to the analyzer or by initiating a warm reset from the xHCI host.

Set Termination RX/Detect to Manual	
After Setting Manual mode the Rx.detect button should indicate Status: Off; Change to Status: ON	
Set Trigger on Packet Type: LMP to ensure capture of enumeration sequence	

Connect both devices in any order (devices are not powered on)	
Click Record	
Then a) Power on the devices Or b) Perform Warm Reset by choosing Disable then Enable xHCI driver within Device Manager	
Analyzer should trigger on first LMP packet	
After trace finishes uploading, use Search>Go to Trigger to navigate to LMP indicating transition to U0.	

Teledyne LeCroy will continue to release updated firmware that will improve handling of the RX.Detect states. Always update to the latest USB Protocol Suite software.