Technical Brief

Voyager M310e

PD 3.2 Source & Sink Compliance Tests

Introduction

The Power Delivery Compliance program defines several *power sink* and *power source* tests that verify PD devices consume and source power at levels consistent with the PD specification. The *power sink* tests verify the DUT does not consume more current than advertised. The *power source* tests verify the DUT can source power at the required voltages. These specific tests require use of external programmable load or power supply.

Voyager M310e can emulate an EPR "Sink" for testing PD 3.2 power sources using an external programmable load. Voyager M310e can also emulate an EPR "Source" for performing PD 3.2 Sink tests (i.e.: TEST.PD.EPR.SNK3.1) using an external programmable power source. See the Table 1.1 for all tests that require external load generators. See the Table 1.2 for all EPR tests that require an external power source.

Tests that require external load generator∆

The Voyager M310P / M310C / M4x Test Platforms are capable of performing "Load" tests for SPR devices. Only the Voyager M310e Test Platform is capable of performing "Load" tests for both SPR and EPR devices. Only PD "end-products" and "reference designs" that can operate as "*source"* must pass the load tests ("*PD Silicon only"* designs are not required to pass the load tests). The table below outlines the specific Power Delivery Compliance tests (CTS rev 1.4) that require the external load generator.

Table 1.1

PD Test	Description	DRP	Provider Consumer	Consumer Provider	Provider	Consumer
TEST.PD.PS.SRC.1∆	Multiple Request Load Test	✓	✓		✓	
TEST.PD.PS.SNK.3∆	Multiple Request Load Test Post PR Swap	✓		✓		
TEST.PD.PS.EPR.SRC3.1∆	Multiple EPR Request Load Test	✓	✓	✓	✓	

Note: As part of the "Load Test Post PR Swap" test above, the vendor-provided VIF defines the source PDOs advertised while in source mode. For DRPs, P/Cs, and C/Ps, these devices are required to accept a Power Role Swap request under the test conditions.

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Tests that require external power supply*

Voyager M310e Test Platform is also capable of performing “EPR” sink tests for devices that act as a sink supporting “EPR” voltages. The table below outlines the specific Power Delivery EPR Compliance tests (CTS rev 1.4) that require an external power supply (denoted: *).

Table 1.2

PD Test	Description	DRP	Provider Consumer	Consumer Provider	Provider	Consumer
TEST.PD.EPR.SNK3.1*	EPR Entry Process - Success	✓	✓	✓		✓
TEST.PD.EPR.SNK3.4*	EPR Entry FAIL due to tFirstSourceCap timeout	✓	✓	✓		✓
TEST.PD.EPR.SNK3.5*	EPR Exit due to incorrect EPR Source Cap	✓	✓	✓		✓
TEST.PD.EPR.SNK3.6*	EPR Exit due to EPR_Mode Exit Message	✓	✓	✓		✓
TEST.PD.EPR.SNK3.7*	EPR Fail by WAIT message	✓	✓	✓		✓
TEST.PD.EPR.SNK3.8*	EPR mode - Request message response	✓	✓	✓		✓
TEST.PD.EPR.SNK3.9*	EPR mode - EPR_Get_Source_Cap message	✓	✓	✓		✓

Test Setup Overview

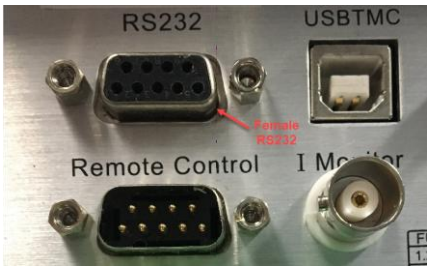
Load Tests for SOURCES	Power Supply tests for SINKS
To perform the **external load generator**Δ tests requires the use of a programmable load generator that can sink current from the PD source under test. The load box tests require connecting both the “Control cable” and the “PD Load cable” on the rear panel of the Voyager M310e. The fork clips attach to the positive and negative terminals on the load box (inset). The internal circuitry in the load box measures the actual power and current supplied by the DUT. The tester configures the load box over RS-232 and routes power from the DUT (over USB Type-C port) to the load box.	To perform the **external power supply*** tests for devices that support EPR PDOs above 20v requires the use of an external power supply that can generate precise voltages. The power supply tests require connecting both the “Control cable” and the “PD source cable” on the rear panel of the Voyager M310e. The banana clips attach to the positive and negative terminals on the power source box (inset). The tester configures the external power supply and routes voltage over the Exerciser USB Type-C port. This allows the tester to source the extended power range RDOs.
Required Cables **Control Cable RS-232/DB9 (42488504001)** **External PD Load Cable (933534-00)**	**Required Cables** **Control Cable RS-232/DB9 (42488504001)** **External PD Source Cable (933535-00)**

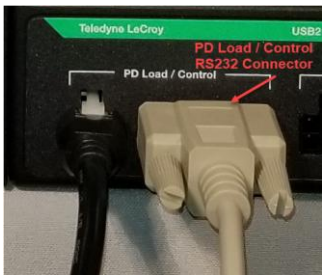
See Appendix A: Supported Equipment for approved programmable load and source. Note: the external power supply is only required during EPR tests.

External Load Box Detailed Setup

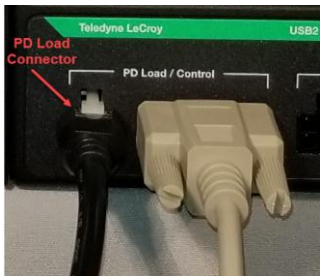
1. Note: It may be necessary to switch operating modes on the load box itself based on regional wall-power standard: (110v and 220v)

2. On the back of the Load Box there is a connector labeled RS232. Connect the RS-232 cable (42488504001) from the connector on the Load Box (female RS232) to the PD Load / Control connector on the rear panel of the Voyager M310e (male RS232).





3. On the front of the load box, loosen both the + and – knobs (two knobs with a + and – above each one). Using the External PD Load Cable (933534-00), connect the fork clamps Red lead to the + Load Input terminal and the Black lead to - Load Input terminal and tighten the knobs. Connect the other end to the PD Load connector on the rear panel of the Voyager M310e.



4. If an error message is received at the start of testing indicating "load box resource not found", it's possible the Load box is configured to use the ***USB*** port for control or specifies an incorrect Baud rate. This must be changed on the Load Box itself using the buttons Shift-SYSTEM -> Communication -> RS232. The table below summarizes the required settings for the Load box:

• Communication = RS232	• Baud Rate: 115200 bps
• Parity: None	• Data bits: 8
• Flow Control: None	• Stop bits: 1

5. The Voyager M310e will communicate directly with the load box over RS232 and does not require any additional drivers on the host PC.

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Initiating Load Tests

1. Once the Load Box and Voyager M310e are setup using the above instructions, the DUT (Device Under Test) can be directly connected to the Exerciser port. It is required to use the Vconn Thru cable (USB17CAB-X or USB25CAB-X) for all PD Compliance tests.

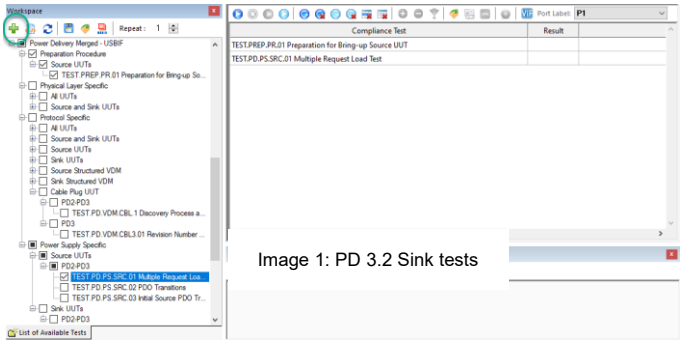
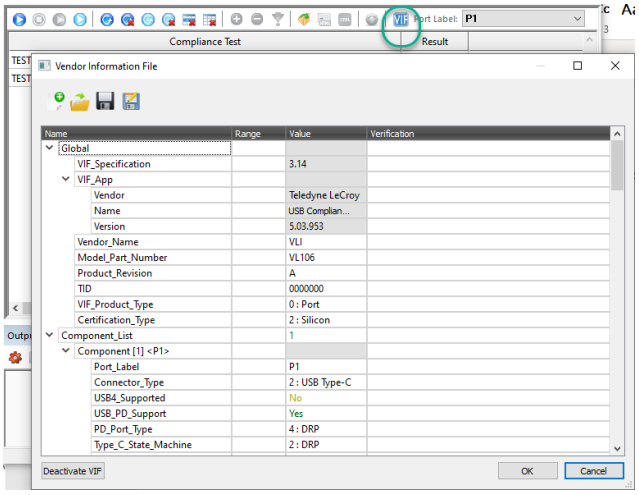


Image 1: PD 3.2 Sink tests

2. In the USB Compliance Suite, choose the PD 2.0 Compliance Tests that require the Load Box (TEST.PD.PS.SRC.1 or Legacy TDA 2.3.1.1 & TDA 2.3.1.2) by clicking the checkbox next to each test in the Workspace area. Then add them to the Test Monitoring area using the Green + button in the upper left corner of the Workspace window.

3. Add a VIF specific to the DUT by clicking the Open icon and navigate to the saved .xml file location. It is recommended to always use the official USB-IF VIF Generator utility to create VIF files. Minor edits can be performed in the USB Compliance>VIF window. Any fields marked in "red" must be corrected before starting the test run.

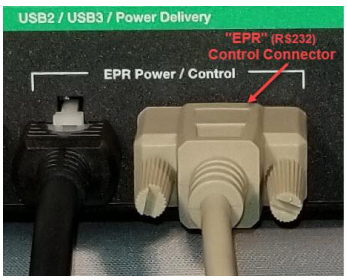
4. In the Test Monitoring area, click the blue Run button (F5) to start testing. Follow any prompts on screen.



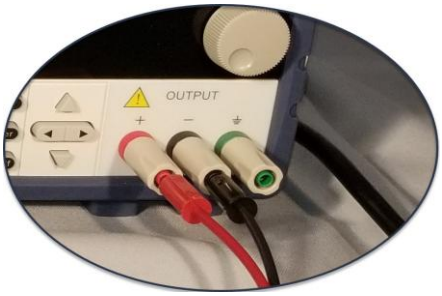
External Power Supply Detailed Setup - Needed for EPR specific tests only

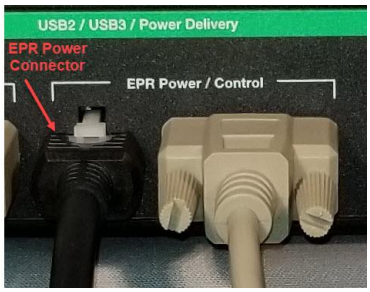
The Voyager M310e can perform all "SPR" Compliance tests using the provided 24V power brick. Only the "EPR" specific compliance tests require the additional step of connecting a general-purpose power supply (B&K Precision 9202 360W).

1. On the back panel of the B&K Precision Power Supply there is a connector labeled RS232. Connect the RS-232 cable (42488504001) from the connector on the EPR Power / Control port to the connector (female RS232) on the External Power Supply.



2. On the front of the External Power Supply, connect the External PD Load Cable (933535-00) the Red “banana jack” lead to the + Load Input terminal and the Black lead to - Load Input terminal. Connect the other end to the EPR Power connector on the rear panel of the Voyager M310e.





3. The Voyager M310e will communicate directly with the power supply over RS232 and does not require any additional drivers on the host PC.

4. If an error message is received at the start of testing indicating “External power resource not found”, it’s possible the power supply is configured to use the ***USB*** port for control or specifies an incorrect Baud rate. This must be changed on the Load Box itself using the buttons Shift-SYSTEM -> Communication -> RS232. The table below summarizes the required settings for the external power supply:

• Communication = RS232	• Baud Rate: 115200 bps
• Parity: None	• Data bits: 8
• Flow Control: None	• Stop bits: 1

Initiating EPR Power Tests

1. After Voyager M310e is setup using the above instructions, the DUT (Device Under Test) can be directly connected to the Exerciser port. It is required to use the VConn through cable (USB25CAB-X) to perform the EPR Power tests.

2. In the USB Compliance Suite choose the PD 3.2 EPR Tests that require the external power supply (image 2) by clicking the checkbox next to each test in the Workspace area. Then add them to the Test Monitoring area using the Green + button in the upper left corner of the Workspace window.

3. Add a VIF specific to the DUT by clicking the Open icon and navigate to the saved .xml file location. Minor edits can be performed in the USB Compliance>VIF window. Any fields marked in “red” must be corrected before starting the test run.

4. In the Test Monitoring area, click the blue Run button (F5) to start testing. Follow any prompts on screen.

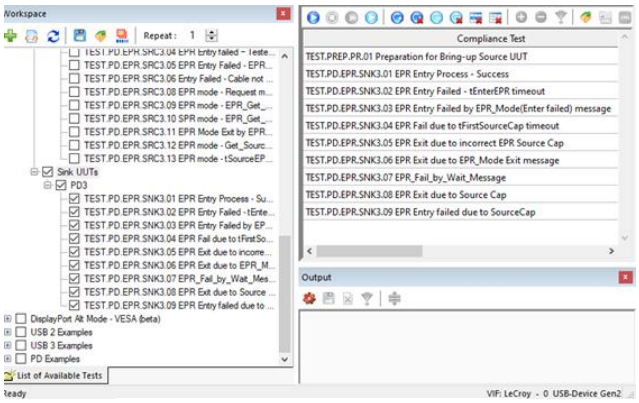


Image 2: PD 3.1 “EPR” Sink tests

Appendix A: Supported Equipment

Programmable Load Supported Hardware

The programmable load must have RS-232 serial interfaces for remote communication. USBTMC control is not supported on Voyager M310e. Only the equipment below is currently supported:

- B&K Precision Programmable DC Electronic Load:
  - B&K Precision 8600/B (if PDP is 140 W or less)
  - B&K Precision 8601/B
  - B&K Precision 8602/B (if PDP is 140 W or less)
  - B&K Precision 8610/B
  - B&K Precision 8612/B
  - B&K Precision 8614/B
  - B&K Precision 8616/B
- ITECH Programmable DC Electronic Load:
  - ITECH IT8811 (if PDP is 140W or less)
  - ITECH IT8812
  - ITECH IT8812B (if PDP is 180W or less)
  - ITECH IT8812C

B&K Precision 8601 series

Programmable DC Electronic Load

ITECH series IT8800 Programmable

Electronic Load (for SPR tests)

Programmable Power Supply Supported Hardware

The programmable power supply must have RS-232 serial interfaces for remote communication. Only the equipment below is currently supported.

- B&K Precision Programmable Power Supply:
  - B&K Precision 9202/B
  - B&K Precision 9205/B
  - B&K Precision 9206/B
  - ITECH IT6722A

B&K Precision 9202 360W power supply

iTECH IT6722A