

PD 3.1 "Fast Role Swap" Compliance Tests

TECHNICAL BRIEF

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Summary

Overview of the PD 3.1 Fast Role Swap test implementation for the Voyager M310e system.

Introduction

PD 3.1 Fast Role Swap (FRS) was designed to lower the risk of data loss for USB peripherals in the event of unexpected removal of a hub or dock power cable. It's intended to keep the devices in a USB ecosystem powered when the hub they're attached to loses power. The FRS sequence requires the precise exchange of messages during the power role swap. Teledyne LeCroy supports all the required FRS compliance tests with the Voyager M310P & M310e test platforms. Power Delivery 3.1 chipsets and end products that support Fast-Role-Swap (FRS) are required to pass the compliance tests listed in table 1.

FRS Test Setup

PD 3.0 Fast Role Swap tests are only performed on PD DRPs that support FRS (including Try.Src & Try.Snk DRPs). The setup below is required for the "initial source" test mode only. The figure 1 below details the physical connections for Voyager M310P system (CVS) operating as PD FRS "sink". The FRS Compliance fixture is used to initiate the fast role swap sequence by simulating a "power-loss event" for the DUT. The DUT must perform the role swap while meeting the timing and power requirements. The CVS system is continuously monitoring the flow of VBUS throughout the FRS process.

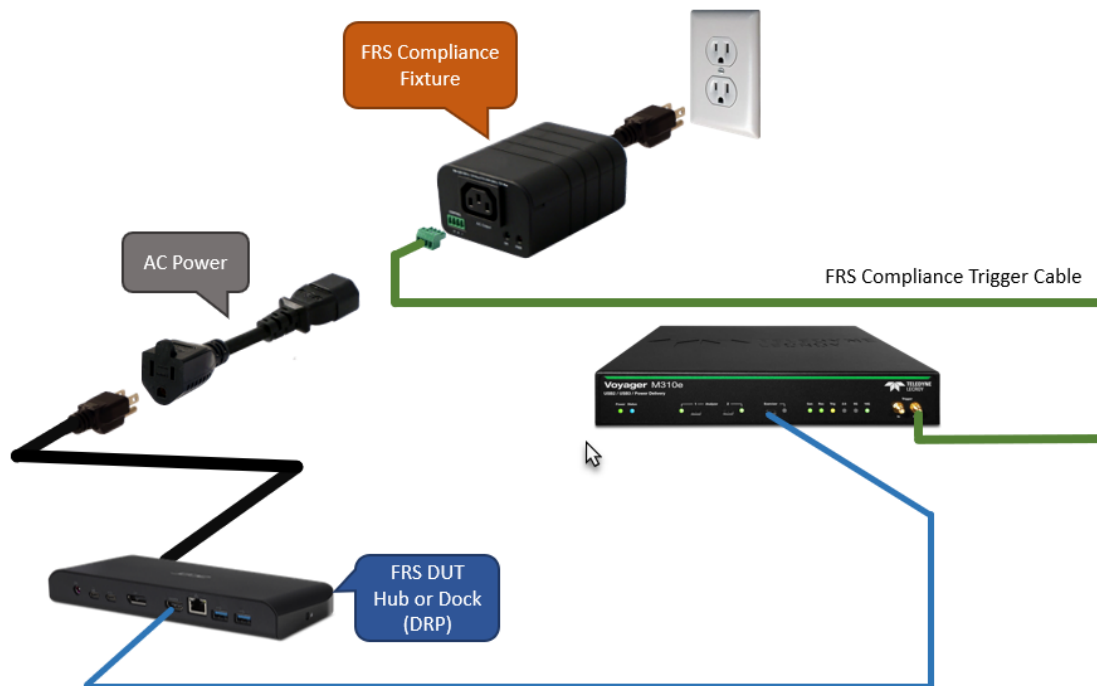


Figure 1: Fast Role Swap Test Setup

FRS Test Overview

Testing DRPs capable of operating as an “Initial Source” requires the use of the FRS AC switch fixture for AC tests and the FRS DC switch for DC configurations. The DC switch fixture is available from the USB-IF [web site](#).

The key test steps for “normal condition” fast role swap are outlined below. Several additional tests that verify the DUT handles FRS error and timeout conditions (see table 1):

- 1) The CVS system runs bring-up procedure with the UUT as a Source (COMMON.PROC.BU.1 or COMMON.PROC.BU.7)
- 2) The CVS system operating as a sink will establish an initial contract with the Source.
- 3) The CVS system will initiate the “power-loss” event for the DUT (Test is performed four times: twice with the DC switch (figure 2) @ 5V and @ highest PDO; and twice with AC switch fixture (figure 3) @ 5V and @ highest PDO)
- 4) After receiving Fast Role Swap signal and VBUS has dropped below vSafe5V min, the Tester verifies that the UUT does not draw more current than allowed.
- 5) Separately, the appropriate PD messaging is checked (FR-Swap – Accept – PS-RDY)
- 6) The CVS checks that the UUT does not draw more than pSnkStdby



Figure 2: PD Fast Role Swap DC switch Fixture
(Note: Available directly from the USB-IF; users must provide their own AC/DC adapter in which the DC side power line is spliced and connected to the +/- power jacks)



Figure 3: PD Fast Role Swap AC switch Fixture
(Note: Available directly from Teldeyne LeCroy; Fixture includes 110V power cords only)

Initial Source Tests (DRP & TRY.SRC DRP)	
TEST.PD.FRS.SRC3.1	Normal Conditions
TEST.PD.FRS.SRC3.2	Provider Only Checks
TEST.PD.FRS.SRC3.3	GoodCRC Not Sent In Response To Accept
TEST.PD.FRS.SRC3.4	GoodCRC Not Sent In Response To PS_RDY
TEST.PD.FRS.SRC3.5	PSSourceOnTimer Deadline
TEST.PD.FRS.SRC3.6	PSSourceOnTimer Timeout
Initial Sink Tests (DRP & TRY.SNK DRP)	
TEST.PD.FRS.SNK3.1	Normal Conditions
TEST.PD.FRS.SNK3.2	Normal Conditions, Consumer Only
TEST.PD.FRS.SNK3.3	FR_Swap Not Sent
TEST.PD.FRS.SNK3.4	SendResponseTimer Timeout
TEST.PD.FRS.SNK3.5	PSSourceOffTimer Deadline
TEST.PD.FRS.SNK3.6	PSSourceOffTimer Timeout
TEST.PD.FRS.SNK3.7	PS_RDY Not Sent

Table 1: Fast Role Swap Compliance Tests

Ordering Information

Part Number	Description
USB-AC55-V07-X	PD Fast Role Swap Compliance Fixture (Includes Custom SMA Trigger Assy)