

# PD 3.0 ‘Fast Role Swap’ Compliance Tests

TECHNICAL BRIEF

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## Summary

Overview of the PD 3.0 Fast Role Swap test implementation for the Voyager M310P system.

## Introduction

PD 3.0 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 now supports all the required FRS compliance tests with the Voyager M310P Compliance Suite. Power Delivery 3.0 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.

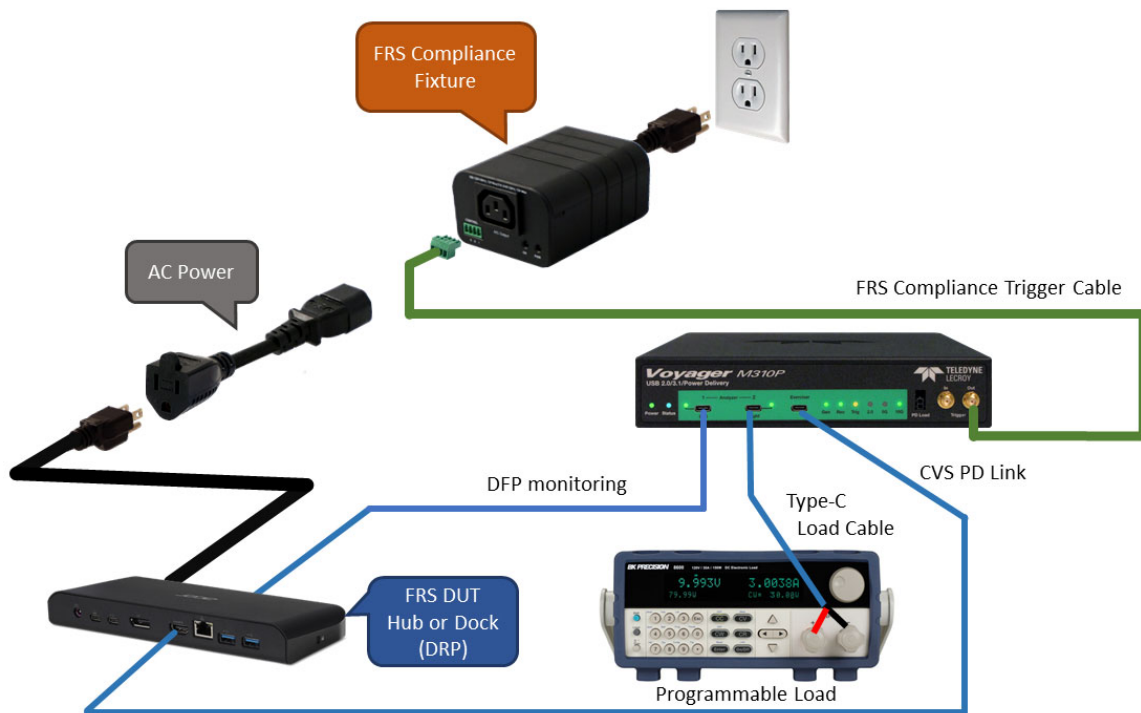


Figure 1: Fast Role Swap Test Setup

## FRS Test Overview

Testing DRPs capable of operating as an “Initial Source” requires the use of the PD Fast Role Swap Compliance Fixture (below). The key steps for “normal condition” fast role swap are outlined below:

- 1) The CVS system operating as a sink will establish an initial contract with the Source.
- 2) The CVS system will initiate the “power-loss” event for the DUT (using the compliance fixture: figure 1)
- 3) The CVS stops sinking current and applies vSafe5V on VBUS
- 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) For DUTs that have more than one Type-C connector (eg:hub/dock); a 2<sup>nd</sup> Type-C connection is established between the tester.
- 7) A programmable load is connected directly to this port as a second sink (using custom Type-C load cable).
- 8) The programmable load is used to maintain a constant current draw by emulating a simple Type-C bus powered sink.
- 9) The CVS monitors current draw from the DUT (which is directly connected to the load box using the custom Type-C Load cable) to verify that current drawn on this Type-C port does not exceed 80% of the value of FR\_Swap\_Reqd\_Type\_C\_Current current.

There are several additional tests that verify the DUT handles FRS error and timeout conditions (see table 1):

Initial Source Tests (DRP & TRY.SRC DRP)_
TD.PD.FRSISRC3.E1 Normal Conditions
TD.PD.FRSISRC3.E2 Fast Role Swap FR_Swap Without Signaling
TD.PD.FRSISRC3.E3 Fast Role Swap Accept Not Sent
TD.PD.FRSISRC3.E4 Fast Role Swap PS_RDY Not Sent
TD.PD.FRSISRC3.E5 Fast Role Swap PSSourceOnTimer Deadline
TD.PD.FRSISRC3.E6 Fast Role Swap PSSourceOnTimer Timeout
Initial Sink Tests (DRP & TRY.SNK DRP)_
TD.PD.FRSISNK3.E1. Normal Conditions
TD.PD.FRSISNK3.E2. Fast Role Swap FR_Swap Not Sent
TD.PD.FRSISNK3.E3. Fast Role Swap SenderResponse TimeOut
TD.PD.FRSISNK3.E4. Fast Role Swap PSSourceOffTimer Deadline
TD.PD.FRSISNK3.E5. Fast Role Swap PSSourceOffTimer Timeout
TD.PD.FRSISNK3.E6. Fast Role Swap PS_RDY Not Sent



Figure 2: PD Fast Role Swap Compliance Fixture  
(Note: Fixture includes 110V power cords only)

Table 1: Fast Role Swap Compliance Tests

## Ordering Information

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

