# Technical Guide

# USB 3.1 xHCI-based Certification Platform

March 13, 2018

Revision 2.1

## About this Document

| Content Owner | SuperSpeed USB Compliance (ssusbcompliance@usb.org) |
|---|---|
| Author | Martin Franke, Sydney Fernandes |
| Approval Body | Abdul Ismail |

## Revision History

| Revision 1.0 | Release |
|---|---|
| Revision 1.1 | Added information about USB30CV and Drivers |
| Revision 1.2 | Added information about UAC with USB30CV |
| Revision 1.3 | Added information about USB30CV installation, equipment setup with the NEC (Renesas)  xHCI |
| Revision 1.4 | Updated information about USB30CV documentation and updated contact information for the USB-IF Technical Support |
| Revision 1.5 | Updated information about USB30CV directory structure |
| Revision 1.6 | Updated information about USB30CV driver names, updated installation settings required for 64-bit operating systems and updated Renesas PDK jumper settings |
| Revision 1.7 | Updated information about PDK Jumper Settings |
| Revision 1.8 | Updated to xHCI spec version 1.0 based PDK boards. Added information based on use of Stack Switcher |
| Revision 1.9 | Removed Renesas PDK. Added Dell XPS8700 certification testing platform. Modifications to Dell XPS8700 system for certification testing. |
| Revision 2.0 | Added Dell XPS8920 Special Edition and Modification to Dell XPS 8920 Special Edition Removed Fresco PDK and Added info on Point Grey Card Removed Windows 8.1 and added Windows 10 |
| Revision 2.1 | Added Dell XPS8930 and Modification to Dell XPS 8930 |

**Table of Contents**

**Acronyms**

| | |
|---|---|
| ESD | Electro Static Discharge |
| DUT | Device Under Test |
| FW | Firmware |
| HW | Hardware |
| I/O | Input / Output |
| MB | Motherboard |
| NC | No Connection |
| OS | Operating System |
| PC | Personal Computer |
| PCB | Printed Circuit Board |
| PCI | Peripheral Component Interconnect |
| PCIe | PCI Express. Refer to the PCIe specification |
| PCLK | PHY Clock Signal |
| PDK | Peripheral Development Kit |
| PHY | Physical Layer |
| UAC | User Account Control |
| USB | Universal Serial Bus |
| USB-IF | Universal Serial Bus Implementers Forum |
| xHCI | extensible Host Controller Interface |

## 1.  INTRODUCTION

The USB-IF uses the DELL XPS8700 (and XPS8920 Special Edition and XPS8930 replacement system as needed) for USB3.1 Certification.  Testing is performed using the on-board Intel xHCI host controller.  This document provides information and instructions to modify the DELL XPS8700, XPS8920 Special Edition and XPS8930 certification platform.  Furthermore the document also provides information and instructions to implement Point Grey xHCI Card used for LPM-L1 testing (Device Interop testing).  The system hardware specifications and software installation have been tested by qualified hardware technicians. Deviation from these instructions may result in unpredictable behavior in the certification platform. This document is not a substitution for any referenced documentation. The procedures should be performed by a qualified technician only.

## 2. REFERENCES

The references given here are mentioned throughout this documentation:

- Specification Revision 1.0: http://www.usb.org/developers/docs
- USB-IF Company List: http://www.usb.org/developers/tools/comp_dump
- USB-IF eStore: http://www.usb.org/developers/estoreinfo

## 3. WORKSTATION PREPARATION FOR POINT GREY CARD

### 3.1. Point Grey Card System Requirements
For best results when using a PDK the recommended minimum system requirements are:

- Dell XPS 8700 or XPS 8920 Special Edition or XPS8930
- Intel Core™ i7
- 8192MB of RAM or higher
- 120GB or Higher SSD
- Microsoft Windows 10

### 3.2. Hardware
Point Grey Add-in Card is available from Point Grey:

https://www.ptgrey.com/point-grey-usb-30-pcie-20-x1-host-adapter-card-2-port-w-internal-head-connector-support-3

- Point Grey (Fresco Logic xHCI-based) PCIe Card



**Figure 1: Point Grey (Fresco Logic FL1100 Silicon) add in card**

### 3.2.1. Point Grey PCIe Card Installation

Installing the Point Grey Card:

1.  Shutdown the PC. Use *caution* anytime hardware is removed or inserted into a computer system.

2.  Unplug the power cord from the PC system before attempting to remove or insert the Point Grey Card.

3.  Power on the PC.

4.  When the system has finished booting the OS should recognize new hardware is attached.

5.  Install the Fresco Logic Driver for the Fresco Logic Host Controller and Root Hub (Identify the controller in Device Manager). Run the batch file FrescoU1U2Enable- LPMEnable.reg and Restart the system. This step will replace the Microsoft XHCI Driver with the FrescoLogic Custom driver for the FrescoLogic Host Controller and also enable U1U2 and LPM.

## 4. USB 3.1 CERTIFICATION PLATFORM PREPARATION

### 4.1. DELL XPS8700 Configuration

For best results when purchasing the DELL XPS8700 the recommended minimum system requirements are:

- Intel Core™i7 (4th Generation), 3.40GHz or faster processor
- 8 GB of RAM
- 120GB or Higher SSD with 10GB of free space
- Microsoft Windows 10 Operating System

### 4.2. System Modification

DELL XPS8700 is shipped standard with an add-on Graphics Card, Wireless Mini-Card and Media-Card Reader. These items should be removed before using the system for testing.

**Modification Steps:**

**Step 1**

Enable Integrated Graphics by doing the following:

- Power on the system
- Press **F2** when you see **Dell** logo onscreen
- Highlight **Advanced** -> **Onboard Device Configuration** and press **Enter**
- Highlight **Intel Multi Display** option and **Enable** it if it is disabled

**Step 2**

Follow the DELL XPS8700 Owner's Manual for the modifications listed below:

- **Remove the Graphics Card and connect the Display Monitor to Integrated Graphics HDMI port**
- **Remove the Wireless Mini-Card**
- **Remove the Media-Card reader**
- **Ensure that system only has 8GB of RAM**

**Step 3**

Do a fresh install of Windows 10. Be sure to delete all partitions on the hard drive beforehand.

After Windows 10 is installed, complete the Windows Updates.
Drivers and BIOS for the system can be found at
http://www.dell.com/support/drivers/us/en/19/Product/xps-8700?~ck=mn
Install Intel Z87 Chipset Drivers.
Install Intel Graphics Driver.
Install Intel Rapid Storage Technology.
Install Intel Management Engine Components.
It is recommended to save a system image at this point.

The DELL XPS8700 is a "Legacy Free" system, all USB ports are controlled by the Intel xHCI controller. When USB-IF tools like CV are launched control of Mouse and Keyboard will be lost. To avoid this issue install a secondary PCIe USB card and connect the mouse and keyboard to the USB ports on it.

### 4.3. DELL XPS8920 Special Edition Configuration

For best results when purchasing the DELL XPS8920 Special Edition the recommended minimum system requirements are:

- Intel Core™i7 (7th Generation), 4.20GHz or faster processor
- 8 GB of RAM
- 120GB or Higher SSD with 10GB of free space
- Microsoft Windows 10 Operating System

### 4.4. System Modification

DELL XPS8920 Special Edition is shipped standard with:
add-on Graphics Card, Wireless Mini-Card, M2 SSD Disk, HDD hard drive
Media-Card Reader. These items should be removed before using the system for testing.

**Modification Steps:**
Step 1

Enable Legacy Boot List Option, Disable Secure Boot, and Enable USB Wake Support (S3) by doing the following:

- Power on the system
- Press **F2** when you see **Dell** logo onscreen
- Highlight **Boot** -> **Boot List Option** and select **Legacy**
- Highlight **Boot** -> **Secure Boot** and select **Disabled**
- Highlight **Advanced** -> **USB Wake Support (S3)** and select **Enabled**

Step 2

Follow the DELL XPS8920 Special Edition Owner's Manual for the modifications listed below:

- **Remove the Graphics Card and connect the Display Monitor to Integrated Graphics HDMI or DP Port**
- **Remove the WLAN Mini PCIe-Card**
- **Remove the Media-Card reader**
- **Remove the M2 SSD**
- **Remove the HDD Hard Drive**
- **Disconnect Audio jack connector from motherboard**
- **Ensure that system only has 8GB of RAM**
- **Unplug the Front Panel USB 3.0 Port Header on the motherboard**

### Step 3

Install a new SSD (128 GB or Higher). Do a fresh install of Windows 10.

After Windows 10 is installed, complete the Windows Updates.
Drivers and BIOS for the system can be found at:
http://www.dell.com/support/home/us/en/04/product-support/product/xps-8920-desktop/drivers/advanced

Install Intel Chipset Drivers.
Install Intel Graphics Driver.
Install Intel Rapid Storage Technology.
Install Intel Management Engine Components.
It is recommended to save a system image at this point.

### Step 4

The DELL XPS8920 is a "Legacy Free" system, all USB ports are controlled by the Intel xHCI controller. When USB-IF tools like CV are launched control of Mouse and Keyboard will be lost. To avoid this issue install a secondary PCIe USB card and connect the mouse and keyboard to the USB ports on it or you can connect the mouse and Keyboard to the ASMedia 3.1 Gen 2 onboard Controller ports (USB Type-C and A ports).

**Please note the Dell XPS8920 has 2 XHCI Onboard Controllers:**

ASMedia 3.1 Gen 2 Host Controller

**Intel USB 3.0 controller (7<sup>th</sup> Generation)**

For 3.1 Gen 1 and USB 2.0 portion of the certification testing (i.e. for all USB 3.1 Gen 1 and 2, USB 2.0 products) use SS port numbers 21 through 23 on the back panel.  There are 3 SS ports on the back panel and 4 SS ports on the front Panel.  Please see picture below (front and back panel).  These ports are routed to the onboard Intel XHCI Controller.  The front panel ports should be disabled by unplugging the header from the motherboard.
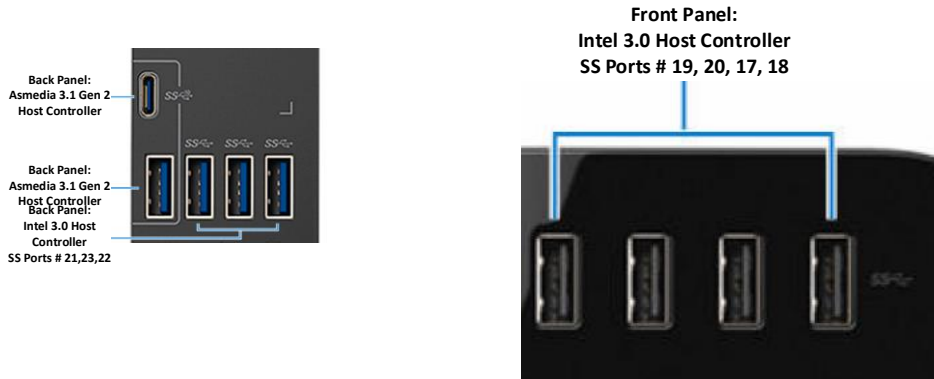


**Figure 2:**  Front and Back panel SS ports for Intel 3.0 Host Controller on XPS8920 Special Edition platform

**List of Known Issues with Dell XPS8920 Special Edition:**

1) If the Interop Tree is connected to the Intel 3.0 Host controller, during Hibernate/Resume (done right after Hybrid Sleep/ Resume), the monitor does not turn on to display during Resume.

   This issue is not seen when any USB3.1 Hubs or devices are connected at Root Port. This is seen when USB 2.0 Tree (consisting of HS Hubs, FS Hubs, HS Devices and FS/LS Devices) is connected to USB 3.1 Hub (as part of the full USB 3.1 Interop Tree).

   This issue is only seen if Hibernate/Resume is done right after Hybrid/Sleep (if the full USB 3.1 Interop Tree is connected to the Intel 3.0 Host Controller).

   To ensure complete testing is done with the Interop tree test the Hybrid Sleep independently i.e. Test Inactive Detach/Reattach, Hibernate, Warm Boot, Hybrid Boot, Cold Boot, and then Hybrid Sleep.

2) The Intel 3.0 Host Controller does not enter Compliance Mode with the shipped manufacturing BIOS

### 4.5. DELL XPS8930 Configuration

For best results when purchasing the DELL XPS8930 the recommended minimum system requirements are:

- Intel Core™i7 (8th Generation), 3.20GHz or faster processor
- 8 GB of RAM
- 120GB or Higher SSD with 10GB of free space
- Microsoft Windows 10 Operating System

### 4.6. System Modification

DELL XPS8930 is shipped standard with:
add-on Graphics Card, Wireless Mini-Card, M2 SSD Disk (maybe optional), HDD hard drive Media-Card Reader. These items should be removed before using the system for testing.

**Modification Steps:**
**Step 1**

Enable Legacy Boot List Option, Disable Secure Boot, and Enable USB Wake Support (S3) by doing the following:

- Power on the system
- Press **F2** when you see **Dell** logo onscreen
- Highlight **Boot** -> **Boot List Option** and select **Legacy**
- Highlight **Boot** -> **Secure Boot** and select **Disabled**

- Highlight **Boot** -> **Attempt Legacy Boot** and select **Enabled**
- Highlight **Boot** -> **Legacy Option ROMs** and select **Enabled**
- Highlight **Advanced** ->**Power Options** ->**USB Wake Support (S3)** and select **Enabled**

### Step 2

Follow the DELL XPS8930 Owner's Manual for the modifications listed below:

- **Remove the Graphics Card and connect the Display Monitor to Integrated Graphics HDMI or DP Port**
- **Remove the WLAN Mini PCIe-Card**
- **Disconnect the Media-Card reader**
- **Remove the M2 SSD**
- **Remove the HDD Hard Drive**
- **Disconnect Audio jack connector from motherboard**
- **Ensure that system only has 8GB of RAM**
- **Unplug the Front Panel USB 3.0 and 2.0 Port Header on the motherboard**

### Step 3

Install a new SSD (128 GB or Higher).  Do a fresh install of Windows 10.

After Windows 10 is installed, complete the Windows Updates.
Drivers and BIOS for the system can be found at:
http://www.dell.com/support/home/us/en/19/product-support/product/xps-8930-desktop/drivers

Install Intel Chipset Drivers.
Install Intel Graphics Driver.
Install Intel Rapid Storage Technology.
Install Intel Management Engine Components.
Install Intel Serial IO Driver
Install Realtek Audio Driver
It is recommended to save a system image at this point.

### Step 4

The DELL XPS8930 is a "Legacy Free" system, all USB ports are controlled by the Intel xHCI controller. When USB-IF tools like CV are launched control of Mouse and Keyboard will be lost. To avoid this issue install a secondary PCIe USB card and connect the mouse and keyboard to the USB ports on it or you can connect the mouse and Keyboard to the ASMedia 3.1 Gen 2 onboard Controller ports (USB Type-C and A ports).

**Please note the Dell XPS8930 has 2 XHCI Onboard Controllers:**

ASMedia 3.1 Gen 2 Host Controller

**Intel USB 3.0 controller (8th Generation)**

For 3.1 Gen 1 and USB 2.0 portion of the certification testing (i.e. for all USB 3.1 Gen 1 and 2, USB 2.0 products) use SS port numbers 21 through 23 on the back panel. There are 3 SS ports on the back panel and 4 SS ports on the front Panel. Please see picture below (back panel). These ports are routed to the onboard Intel XHCI Controller. The front panel ports should be disabled by unplugging the header from the motherboard.
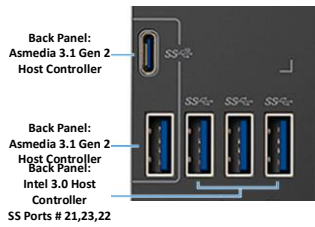


**Figure 3:** Back panel SS ports for Intel 3.0 Host Controller on XPS8930 platform

**List of Known Issues with Dell XPS8930:**

1) The Intel 3.0 Host Controller does not enter Compliance Mode with the shipped manufacturing BIOS

## 5. SOFTWARE SETUP

> The USB3CV software is proprietary software provided by the USB-IF or their representative. Find more information regarding proprietary software setup at the USB-IF website:
> www.usb.org/developers

.

### 5.1. Command Verifier Installation

If configuring system for use with the CV tool be sure that User Account Control (UAC) is disabled:

- In Control Panel window select **User Accounts**
- In the User Accounts menu select **User Accounts**
- In the User Accounts menu select **Change User Account Control Settings**
- Set notification status to **Never notify** and click **ok**
- Reboot the system

Install the USB30CV software available from the SuperSpeed USB Tools site (see "Software Tools and PDK Drivers" from chapter 2).

### 5.1.1. CV Stack Switcher

Under normal operation the CV software will automatically install the compliance driver in place of any other host controller driver when CV is opened. When CV is closed properly it will remove the compliance driver and allow Windows to automatically install whichever driver takes priority based on Windows internal driver installation algorithm. This process is accomplished using a tool called "Stack Switcher". When the compliance driver is correctly installed, it will be viewable from device manager as shown in Figure 3.
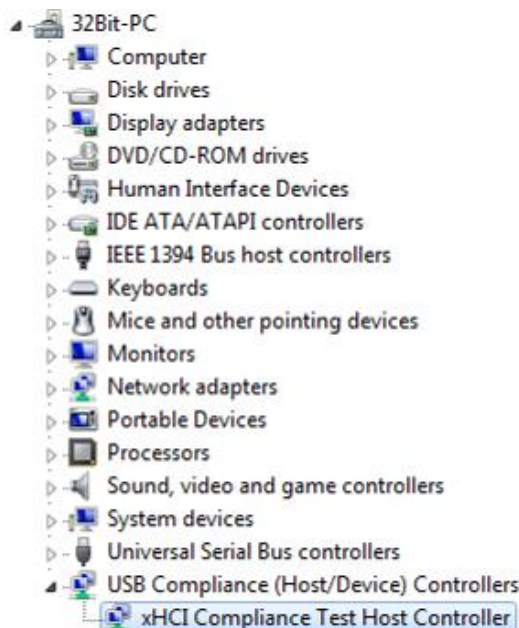


**Figure 3: Compliance Driver**

## 6.    TROUBLESHOOTING

| Issue | Possible Cause | Solution |
|-------|----------------|----------|
|       |                |          |

For technical support, contact the USB-IF at ssusbcompliance@usb.org