

Intel[®] USB 3.0 eXtensible Host Controller Driver

Bring Up Guide
For unified driver

April 2015

Revision 1.5

Intel Confidential



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Revision History

| Revision Number | Description | Revision Date |
|-----------------|--------------------------|----------------|
| 0.7 | Initial Release. | September 2013 |
| 0.8 | Alpha Release | October 2013 |
| 0.85 | Alpha2 Release | December 2013 |
| 0.86 | Beta Release | March 2014 |
| 0.90 | ENG 3.0.0.27 Release | May 2014 |
| 0.95 | ENG 3.0.0.31 Release | May 2014 |
| 1.0 | PC/PV Release – 3.0.0.34 | June 2014 |
| 1.1 | HF1 Release – 3.0.1.41 | August 2014 |
| 1.2 | MR2 Release – 3.0.2.54 | November 2014 |
| 1.3 | MR3 Release – 3.0.3.60 | December 2014 |
| 1.4 | MR4 Release – 3.0.4.65 | February 2015 |
| 1.5 | MR5 Release – 3.0.5.69 | April 2015 |

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1 Introduction

1.1 Purpose and Scope of Document

This document provides installation instructions and general usage of the Intel® USB 3.0 eXtensible Host Controller Driver. It is intended to help OEM and ODM customers setup their platform as they prepare for validation and debug of USB 3.0 devices.

The Intel® USB 3.0 eXtensible Host Controller Driver support the following operating system

Intel® 8 Series Chipset Family
4th Generation Intel® Core™ Processors
Intel® 9 Series Chipset Family
Intel® Pentium® Processor or Intel® Celeron® Processor N- & J- Series
5th Generation Intel® Core™ Processors
Intel® Core™ M Processor:

- Windows* 7 Operating System (both 32-bit and 64-bit versions).

Intel® C220 series chipset family
Intel® C610 series Chipset Family:

- Windows* 7 Operating System (both 32-bit and 64-bit versions).
- Windows* Server 2008 R2 Operating System.
- Windows* Small Business Server 2008 Operating System.

Note: The Intel® USB 3.0 eXtensible Host Controller Driver is not supported on Windows* XP and Windows Vista*. For these operating systems, ensure your BIOS settings have the xHCI Mode set to "Auto" or "Smart Auto". This will reconfigure the USB 3.0 ports to function as USB 2.0 ports using the native Windows* EHCI driver. For more information, see the Platform Controller Hub (PCH) BIOS Specification document.

1.2 Acronyms and Terminology

| Term | Description |
|------|---|
| ACPI | Advanced Configuration and Power Interface |
| BIOS | Basic Input/Output System |
| BKC | Best Known Configuration |
| CRB | Customer Reference Board |
| IBP | Intel Business Portal (https://businessportal.intel.com) |



| Term | Description |
|-------------|--------------------------------------|
| IHV | Independent Hardware Vendor |
| PCH | Platform Controller Hub |
| OS | Operating System |
| SS | Super Speed |
| USB | Universal Serial Bus |
| xHC | eXtensible Host Controller |
| xHCI | eXtensible Host Controller Interface |

1.3 Reference Documents

| Document | Document No./Location |
|---|---|
| USB 3.0 Specification | http://www.usb.org/developers/docs/ |
| Extensible Host Controller Interface (xHCI) Specification for USB 3.0 | http://www.intel.com/technology/usb/xhcispec.htm |

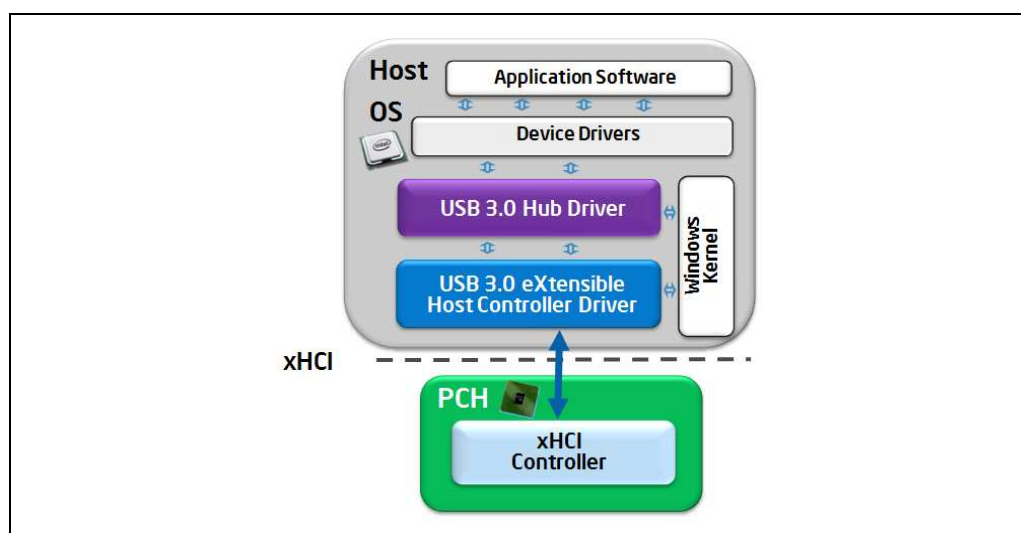
2 Platform Details

2.1 Driver Architecture Overview

As shown in Figure 1, the Intel® USB 3.0 eXtensible Host Controller Driver Stack consists of two main blocks,

- Intel® USB 3.0 eXtensible Host Controller Driver
- Intel® USB 3.0 Hub Driver

Figure 1. Intel® USB 3.0 eXtensible Host Controller Driver Stack



The Intel® USB 3.0 eXtensible Host Controller Driver implements the xHCI specification. Its main functions include:

- Direct control of the USB 3.0 Host Controller hardware by reading and writing memory mapped I/O registers
- Command, Event and Transfer Ring management
- Provide abstraction of HW Interface to other SW layers
- Handles power management of xHCI controller



The Intel® USB 3.0 Hub Driver implements the USB 3.0 specification. Its main functions include:

- Management and control of downstream ports, both USB 3.0 and USB 2.0 high/full/low-speed, on the root hub and external hubs
 - Servicing connection status change
 - Managing port power
- Association of USB 3.0 and USB 2.0 parts of external USB 3.0 hub
- USB bus enumeration (exposing USB devices to the OS)
- Exposing USB Driver Interface (USB DI) to class drivers
- I/O requests and USB Request Block (URB) processing
- Interfaces with 3rd party device drivers

Note that there are different kinds of device drivers. Most of them (for example, Microsoft* inbox class drivers) are running in kernel space. There are also some drivers operating in user space, usually provided by Independent Hardware Vendors (IHV).



3 Driver Installation

Note: A supported Operating System must be installed prior to the installation of the Intel® USB 3.0 eXtensible Host Controller Driver.

There are two different methods to install the Intel® USB 3.0 eXtensible Host Controller Driver for this release:

1. Driver Installation via Installer
2. Silent Driver Installation via Installer

There is only one method to uninstall the Intel® USB 3.0 eXtensible Host Controller Driver: Uninstalling the Driver via Control Panel

Note: Uninstallation of the Intel® USB 3.0 eXtensible Host Controller driver through the Device Manager is not a supported method and it's not validated. Do not uninstall the Intel® USB 3.0 eXtensible Host Controller driver through the Device Manager.

Please see the following subsections for more details.

Note: The current driver is signed with 2048 Bit Root certificate. Some Windows* 7 OS image might not contain the correct root certificate to authenticate it. If this is the case, it's required to install Microsoft* KB [931125](#).

For more detail of 2048 Bit root certificate, see Root Certification Guidance - customer communication #549032

3.1 Driver Installation via Installer

Follow the steps listed below for driver installation via installer:

1. Copy and unzip the Intel® USB 3.0 eXtensible Host Controller Driver onto the platform under test.

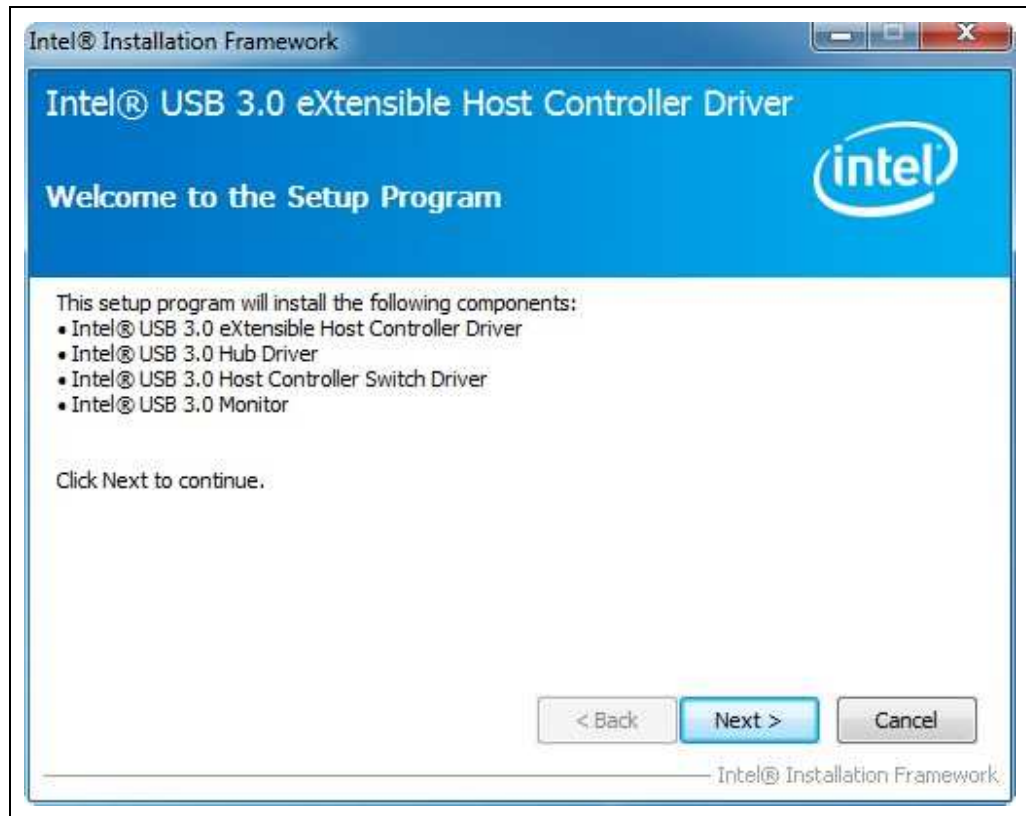
Note: **WARNING** – Do not run this driver's installer (Setup.exe) from a USB storage device (ie. external USB hard drive or USB thumb drive). For proper installation, please copy driver files to a local hard drive folder and run from there.

2. Locate the "Setup.exe" file.
3. Right click on the executable and select 'Run as administrator' option from the menu to start the installer and then click on 'Yes' button in User Account Control pop-up window.



4. You should see welcome screen with component details as shown in Figure 2. Click 'Next >' button to continue the installation.

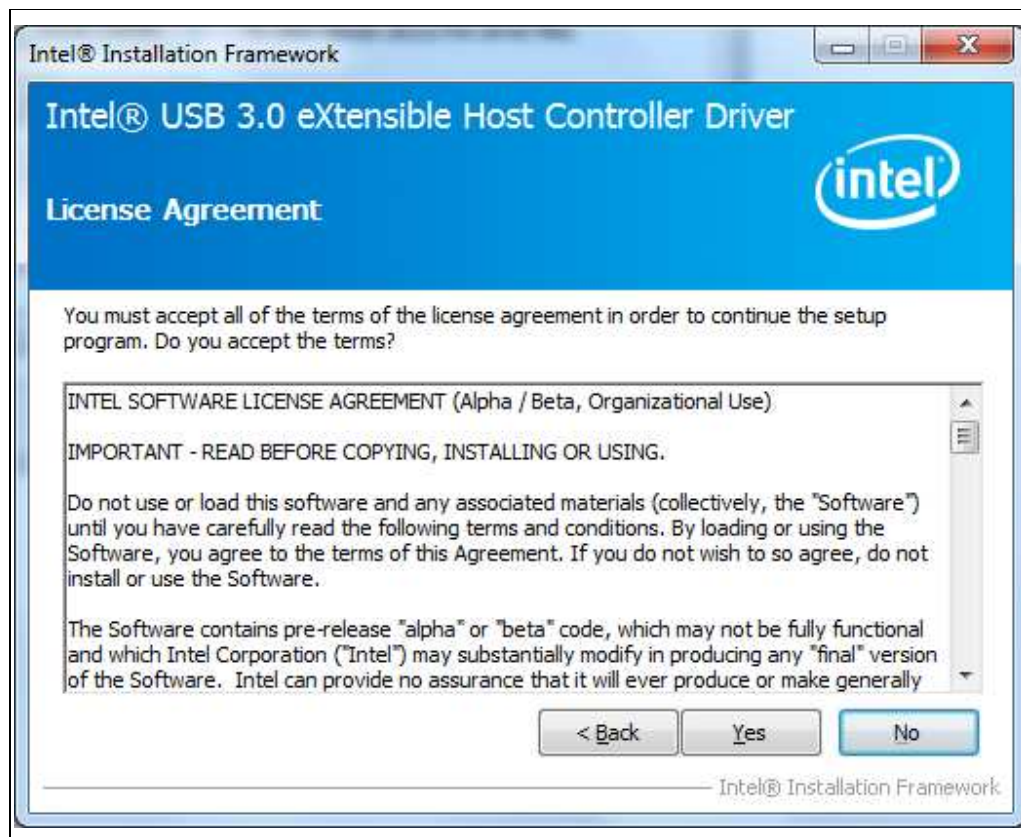
Figure 2. Welcome Screen





5. Next, you should see license agreement screen as shown in Figure 3. Please review the license agreement and if you accept the license terms then click on 'Yes' button to continue the installation.

Figure 3. License Agreement





- Next, you should see Readme File Information screen with details on system requirements and installer information as shown in Figure 4. Click on 'Next >' button to continue the installation.

Note: **WARNING** – Do not run this driver's installer (Setup.exe) from a USB storage device (ie. external USB hard drive or USB thumb drive). For proper installation, please copy driver files to a local hard drive folder and run from there.

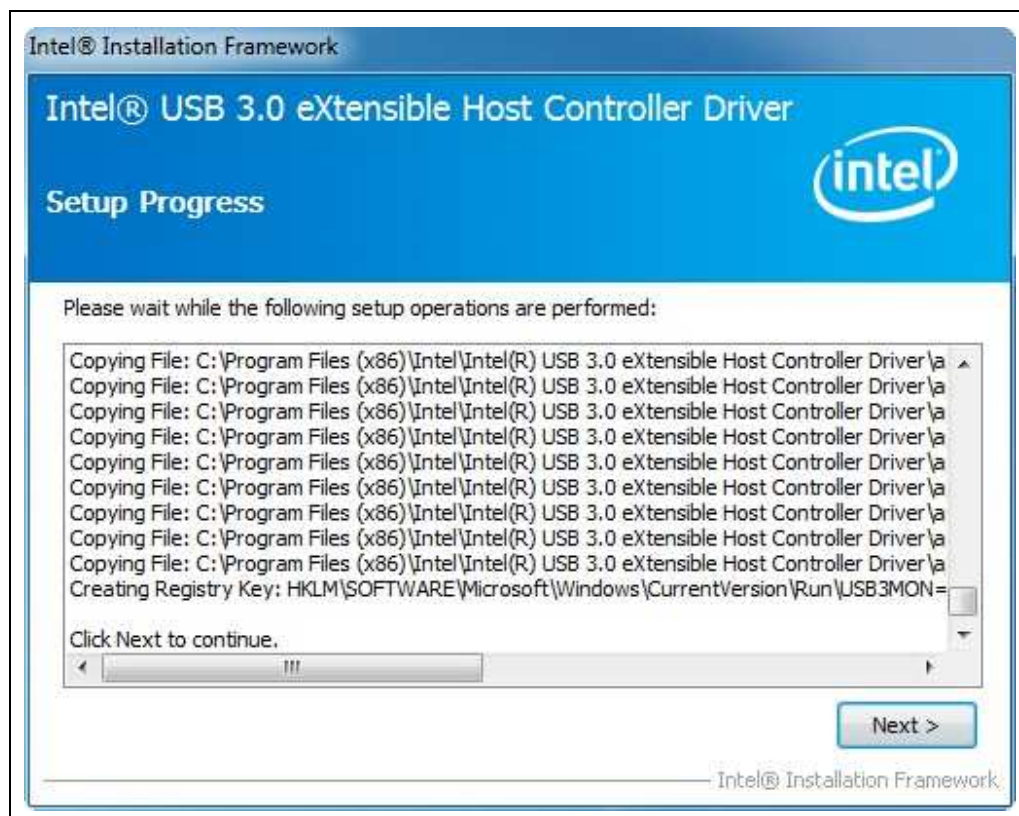
Figure 4. Readme File Information





7. Then, installer will perform various installation operations and show progress in Setup Progress screen. When installation is complete, you should see screen as shown in Figure 5. Click on 'Next >' button to continue.

Figure 5. Setup Progress





8. After successful installation, you should see setup completion screen as shown in Figure 6. Click on 'Finish' button to restart the system.

Figure 6. Setup Completion



9. After the system has booted, you can refer to section 3.3 to check the driver version.

3.2 Silent Driver Installation via Installer

Follow the steps listed below for silent driver installation via installer:

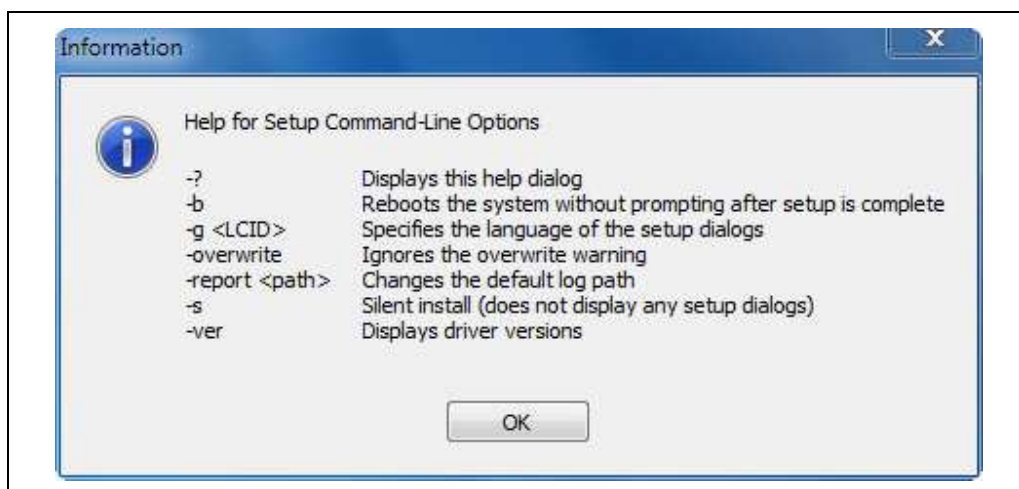
1. Copy and unzip the Intel® USB 3.0 eXtensible Host Controller Driver onto the platform under test.

Note: **WARNING** – Do not run this driver's installer (Setup.exe) from a USB storage device (ie. external USB hard drive or USB thumb drive). For proper installation, please copy driver files to a local hard drive folder and run from there.



2. Open a Command Prompt (cmd.exe) with administrator rights (ie. Run as administrator). Click on 'Yes' button in User Account Control pop-up window.
3. Change the directory to where you unzipped the driver in Step 1 and then change to the "Setup.exe" directory.
4. To see all available options for the Installer, run command "Setup.exe -?". You should see a window pop-up similar to Figure 7. For the "-g <LCID>" option which specifies the language of the setup dialogs, the LCID list is shown in below table. Click OK to continue.

Figure 7. Installer Help Information



Note: The "-report <path>" option allows users to change where the installation log file is saved. Otherwise, Intel driver installation log files are stored in the general location of 'C:\Intel\Logs'.



| LCID | Language |
|------|-----------------------|
| 0401 | Arabic |
| 0804 | Chinese (Simplified) |
| 0404 | Chinese (Traditional) |
| 0405 | Czech |
| 0406 | Danish |
| 0413 | Dutch |
| 0409 | English (USA) |
| 040B | Finnish |
| 040C | French |
| 0407 | German |
| 0408 | Greek |
| 040D | Hebrew |
| 040E | Hungarian |
| 0410 | Italian |

| LCID | Language |
|------|-----------------------|
| 0411 | Japanese |
| 0412 | Korean |
| 0414 | Norwegian |
| 0415 | Polish |
| 0416 | Portuguese (Brazil) |
| 0816 | Portuguese (Standard) |
| 0419 | Russian |
| 0C0A | Spanish |
| 041B | Slovak |
| 0424 | Slovenian |
| 041D | Swedish |
| 041E | Thai |
| 041F | Turkish |

5. Run command "Setup.exe -b -s" to start the silent installation. This process should take about 1 min to complete. When silent installation is complete, the system will automatically reboot.
6. After the system has booted, you can refer to section 3.3 to check the driver version.

Other silent installation examples are:

- > Setup.exe -s -overwrite -report C:\Temp
- > Setup.exe -s -g 0404
- > Setup.exe -s -s0: this will return a code "0" instead of "14" (0xA00D)



For the installation, a full listing of return values can be found in the following table. The 'ResultCode' value can be found at the end of the installation log file.

| ResultCode | Description |
|------------------|--|
| 0x0 | Success |
| 0xA001 | Bad command line |
| 0xA002 | User is not an administrator |
| 0xA003 | The OS is not supported for this product |
| 0xA005 | No devices were found that matched package INF files |
| 0xA007 | User refused a driver downgrade |
| 0xA009 | User canceled the installation |
| 0xA00A | Another install is already active |
| 0xA00B | Error while extracting files |
| 0xA00C | Nothing to do |
| 0xA00D | A system restart is needed before setup can continue |
| 0xA00E | Setup has completed successfully but a system restart is required |
| 0xA00F | Setup has completed successfully and a system restart has been initiated |
| 0xA010 | A bad file path was provided |
| 0xA011 | Fatal error occurred while installing a driver |
| Win32 error code | General install failure |

3.3 Checking the Driver Version

To check the Intel® USB 3.0 eXtensible Host Controller Driver version:

1. Open Device Manager.
2. Click the "Universal Serial Bus controllers" arrow to open the list of USB devices.
3. You can check either the "Intel(R) USB 3.0 eXtensible Host Controller" device or the "Intel(R) USB 3.0 Root Hub" device. Double click on the device you want.
4. Select the "Driver" tab and the Driver Version will be listed (see Figure 8 and Figure 9).



Figure 8. Intel® USB 3.0 eXtensible Host Controller Driver Version

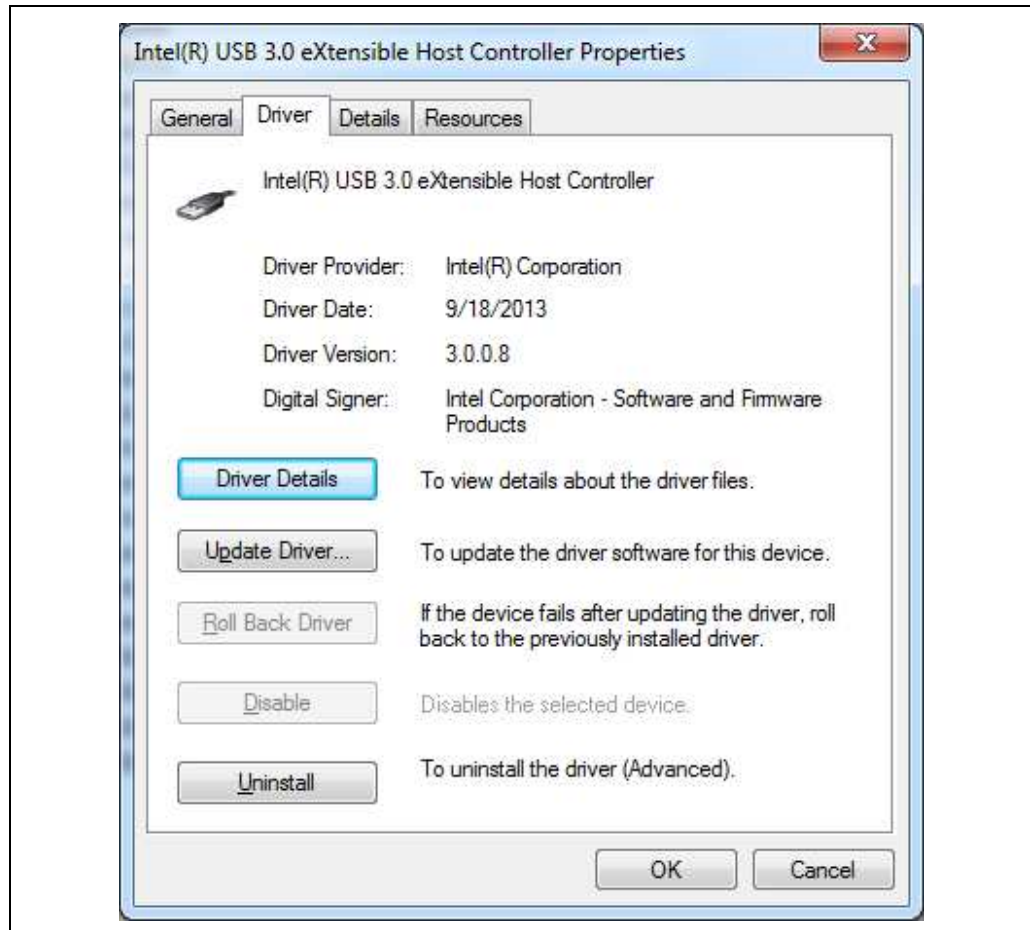
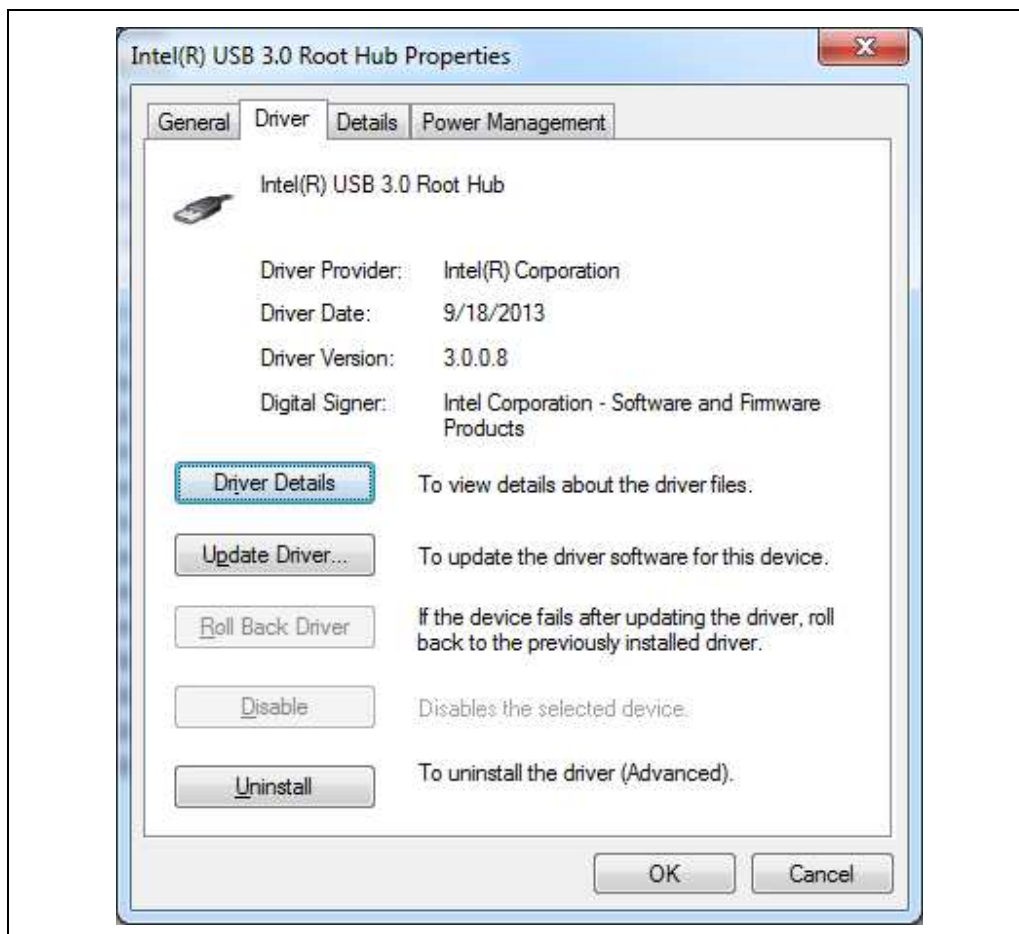


Figure 9. Intel® USB 3.0 Root Hub Driver Version

3.4 Uninstalling the Driver via Control Panel

Follow the steps listed below to uninstall the driver via the Control Panel:

1. Open the Control Panel window (Start -> Control Panel).
2. If the Control Panel window is shown in 'Category' view, then select "Uninstall a program" as shown in Figure 10. Otherwise if the Control Panel window is shown in 'icon' view, then select "Programs and Features".

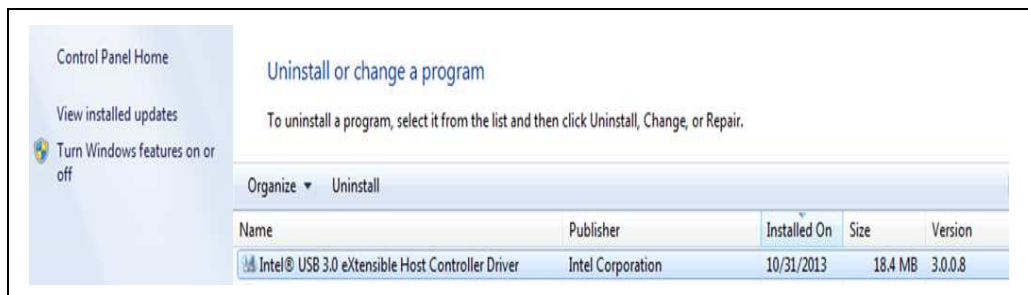


Figure 10. Control Panel – Uninstall a program



3. On the next window, select the “Intel® USB 3.0 eXtensible Host Controller Driver” (see Figure 11) from the list of programs. Then click the “Uninstall” button.

Figure 11. Control Panel – Programs List





4. You should see the Welcome to Uninstallation Program pop-up window with component details as shown in Figure 12. Click 'Next >' button to continue.

Figure 12. Welcome to the Uninstallation Program





- ### Figure 13. Uninstallation Progress





6. After successful uninstall, you should see setup completion screen as shown in Figure 14. Click on 'Finish' button to restart the system.

Figure 14. Uninstall Setup Completion

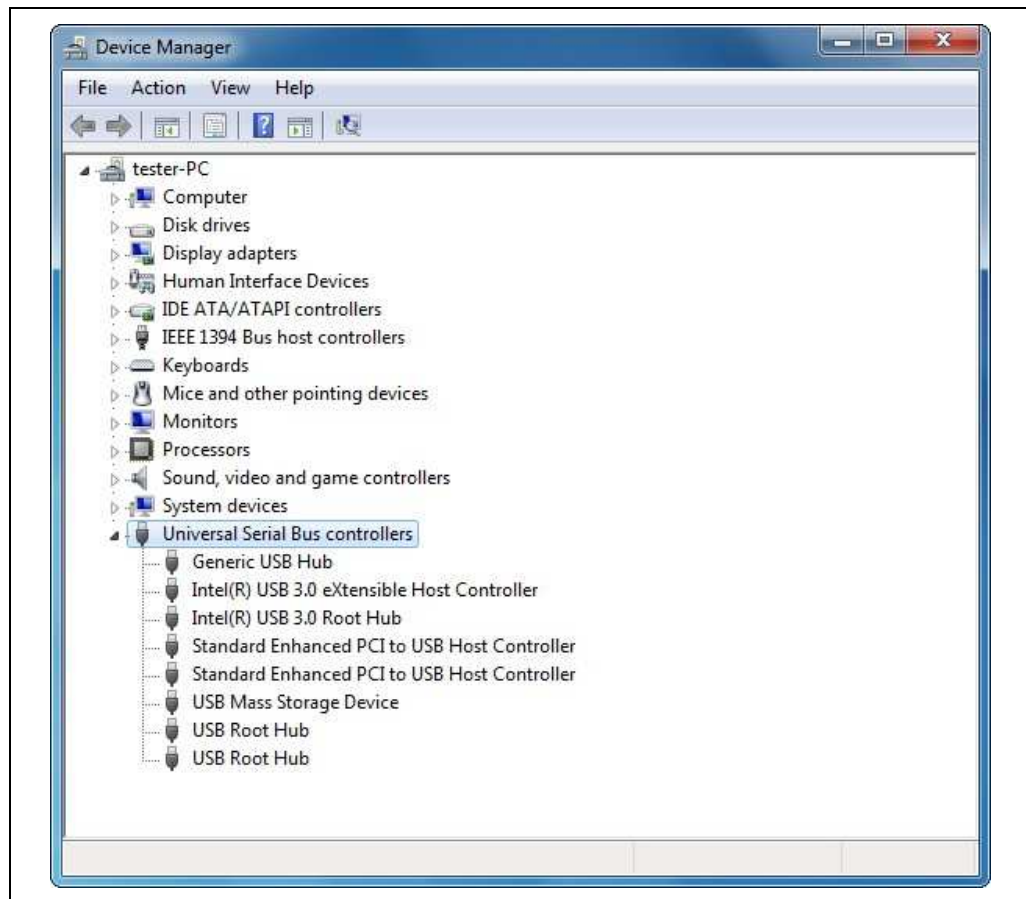


4 Using the USB 3.0 Driver

4.1 How to Check Connected USB devices

Since your platform may have other USB 2.0 and USB 3.0 controllers, it is often useful to check which controller a USB device is actually connected to. When you first open the Device Manager, the default view is "Devices by type" as shown in Figure 15.

Figure 15. Device Manager: Devices by type view



If you connected a USB 3.0 thumb drive (USB Mass Storage Device) to one of the Intel USB 3.0 ports, you'll see it listed under the "Universal Serial Bus controllers" category.



To check which USB controller this device is connected to, click "View" and select "Devices by connection" as shown in Figure 16.

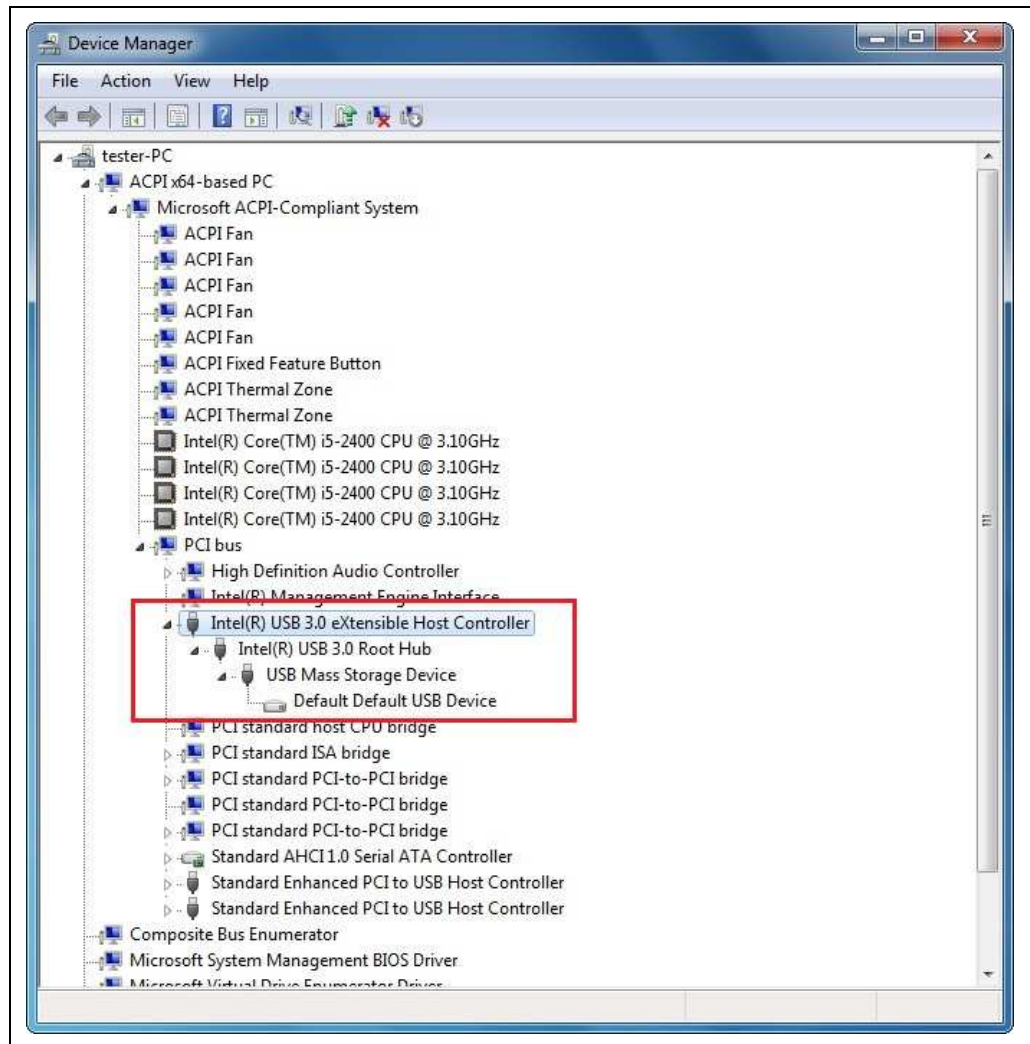
Figure 16. Device Manager: Devices by connection view





The Device Manager View will change to the connection view (Figure 17) which easily allows you to see which USB 3.0 controller is being used.

Figure 17. Device Manager: USB Device connection view





4.2 Intel® USB 3.0 Monitor Application

The Intel® USB 3.0 eXtensible Host Controller Driver release kit includes the Intel® USB 3.0 Monitor application. It will be installed by the Intel® USB 3.0 eXtensible Host Controller Driver Installer (see section 3.1 for more information about the Installer).

The main functions of this application are:

- Monitors plug and play status of all USB 3.0 Ports
- Generates pop-up message for event notification

The 6 pop-up messages are listed in the following table

| Pop-up Message | Description |
|------------------------------|---|
| Bandwidth allocation failure | The eXtensible Host Controller cannot assign sufficient bandwidth on the bus for the attached device. Click on pop-up message for possible workaround to adjust bandwidth settings. |
| Device can run faster | Super Speed capable device is attached to a USB 2.0 only port on the system. User should move the Super Speed device to a Super Speed capable port. |
| Enumeration failure | Enumeration failure occurred with USB device. |
| Hub too deep | As per the USB 3.0 specification, the maximum hub depth is 5. This pop-up notification will be displayed when users exceed the maximum hub depth. |
| Insufficient power | There is insufficient power for all USB device(s) and hub(s) connected to the USB port. Move some devices to another USB port. |
| Overcurrent | The USB device is drawing excessive current from the USB port. Check USB device to ensure it is operating normally and try on another USB port. |

4.3 Intel® USB 3.0 Host Controller Switch Driver

The Intel® USB 3.0 eXtensible Host Controller Driver release kit includes the Intel® USB 3.0 Host Controller Switch Driver. This driver uses BIOS ACPI method to control dynamic switching from EHCI to xHCI during OS boot. It will be installed by the Intel® USB 3.0 eXtensible Host Controller Driver Installer (see section 3.1 for more information about the Installer). For more information about the Switch Driver, see the Wildcat Point-LP Platform Controller Hub (PCH) BIOS Specification document.



4.4 Next Steps – USB 3.0 Validation and Debug

Please see the document "Intel® USB 3.0 eXtensible Host Controller Driver - Customer Validation and Debug Guide" for information on driver validation and debug methods. This document is available on IBP (Doc #477627), please contact your Intel FAE for access.

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