

Intel® USB 3.0 eXtensible Host Controller Driver

Bring Up Guide
For unified driver

April 2017

Revision 1.3

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Revision History

Revision Number	Description	Revision Date
0.7	Initial Release.	December 2015
0.71	WW02 BKC Release.	January 2016
0.72	WW16 BKC Release.	April 2016
1.0	PV Release for Alpine Ridge	September 2016
1.01	PV Release for Intel® 200 Series Chipset Family	November 2016
1.1	MR1 Release	November 2016
1.2	MR2 Release	March 2017
1.3	MR3 Release	April 2017

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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 based on the chipset:

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
6th Generation Intel® Core™ Processors
Intel® 100 Series Chipset Family
Alpine Ridge USB3.1 Host Controller
Alpine Ridge LP USB3.1 Host Controller
Intel® 200 Series Chipset Family + Skylake CPU platforms:

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

Intel® C220 series chipset family
Intel® C230 series chipset family
Intel® C610 series Chipset Family
Purley Platform (Lewisburg PCH):

- 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



Term	Description
BIOS	Basic Input/Output System
BKC	Best Known Configuration
CRB	Customer Reference Board
IBP	Intel Business Portal (https://businessportal.intel.com)
IHV	Independent Hardware Vendor
PCH	Platform Controller Hub
PV	Production Version
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
EHCI Removal from Skylake Platform Controller Hub (PCH) - Technical White Paper	541711

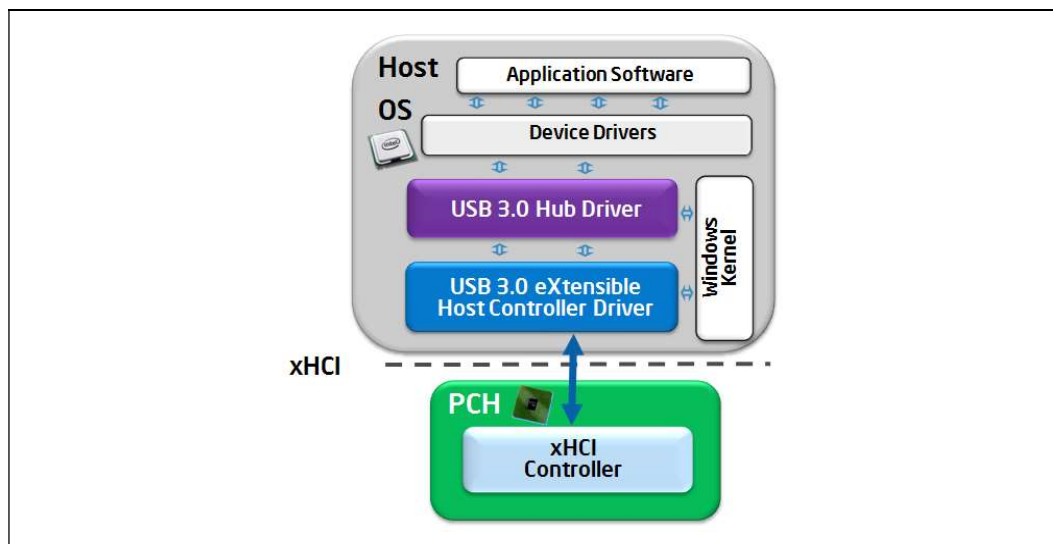
2 Platform Details

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).

2.2 EHCI controller removal from 6th Generation Intel® Core™ Processors / Intel® 100 Series Chipset Family.

For the 6th Generation Intel® Core™ Processors / Intel® 100 Series Chipset Family generation, the EHCI controllers along with their integrated rate matching hubs (RMH) have been removed from the PCH. Intel continue to provide USB functionality through the xHCI controller for USB 2.0 and USB 3.0 connectivity. The implication of this change is USB functionality will not work on the Windows* 7 based image, since the OS doesn't have native USB3.0 (xHCI) controller driver. To enable USB functionality in the Windows* 7 OS, it's required to manually install the USB3.0 (xHCI) driver.

For more detail of this implication and instructions how to manually add USB3.0 driver to the Windows* 7 based image, see EHCI Removal from Skylake Platform Controller Hub (PCH) - Technical White Paper document # 541711.



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 (not applicable for 6th Generation Intel® Core™ Processors / Intel® 100 Series Chipset Family platform, see section 3.5.1 for command line option to uninstall driver)

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.

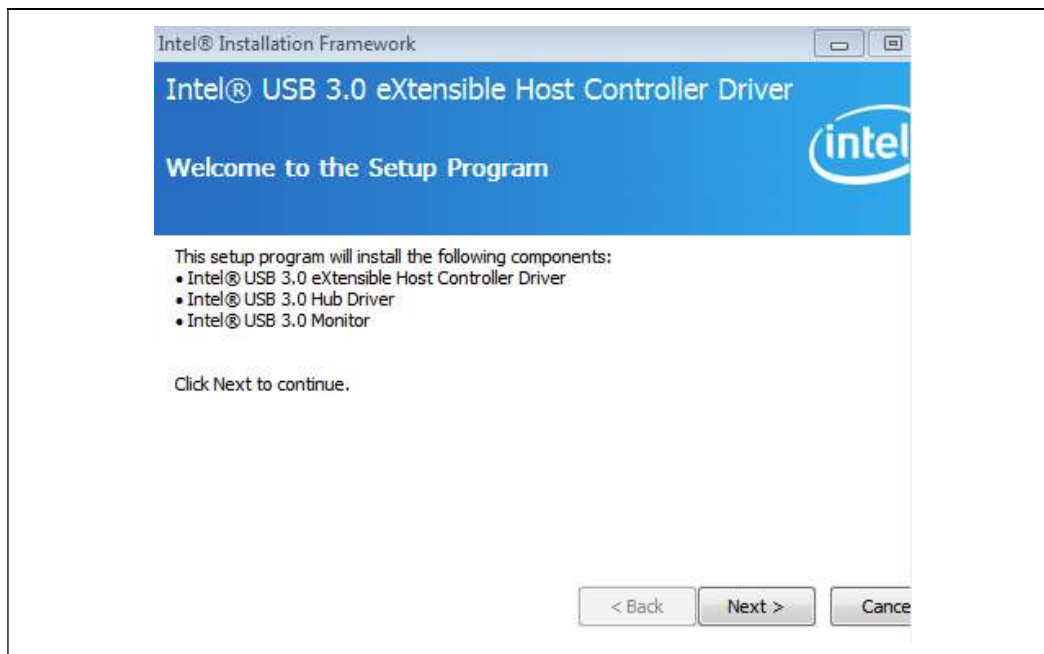
Note: **WARNING** – Do not run this driver's installer (Setup.exe) from a USB storage device (ie. external USB hard drive or USB thumb drive). For proper installation, please copy driver files to a local hard drive folder and run from there.

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.



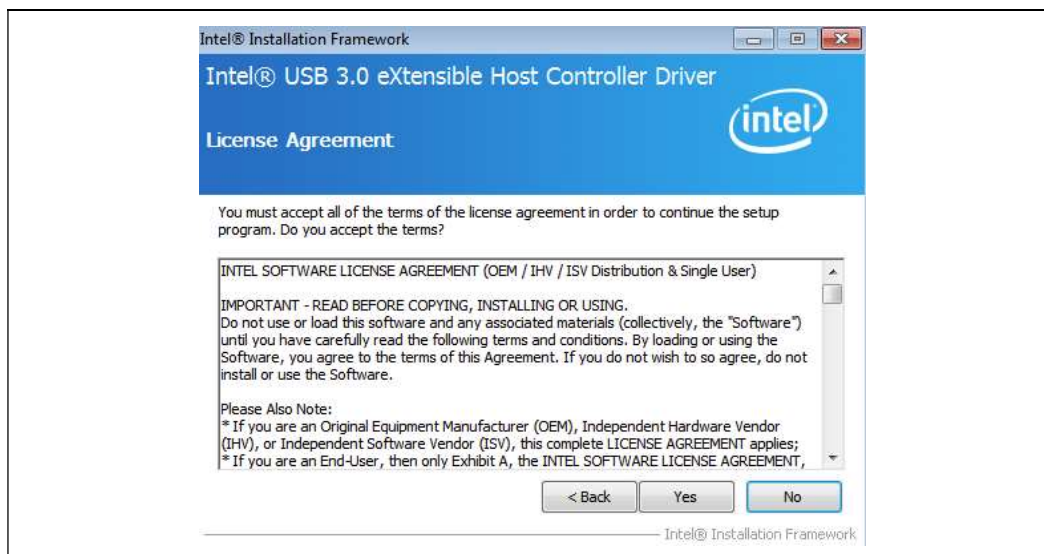
4. You should see welcome screen with component details as shown in Figure 2. Click 'Next >' button to continue the installation.

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

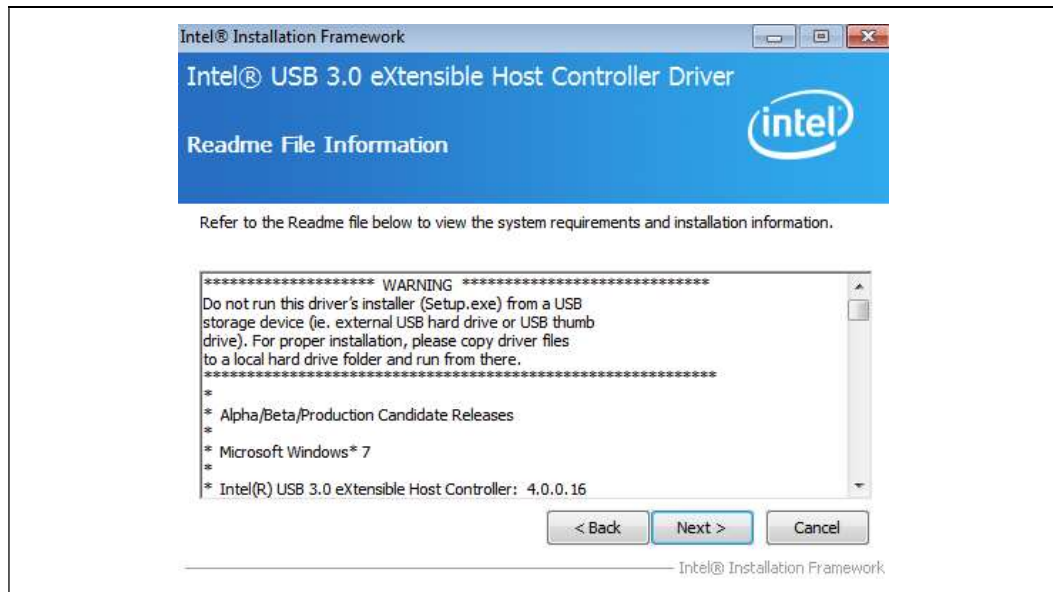




- Next, you should see Readme File Information screen with details on system requirements and installer information as shown in Figure 4. Click on 'Next >' button to continue the installation.

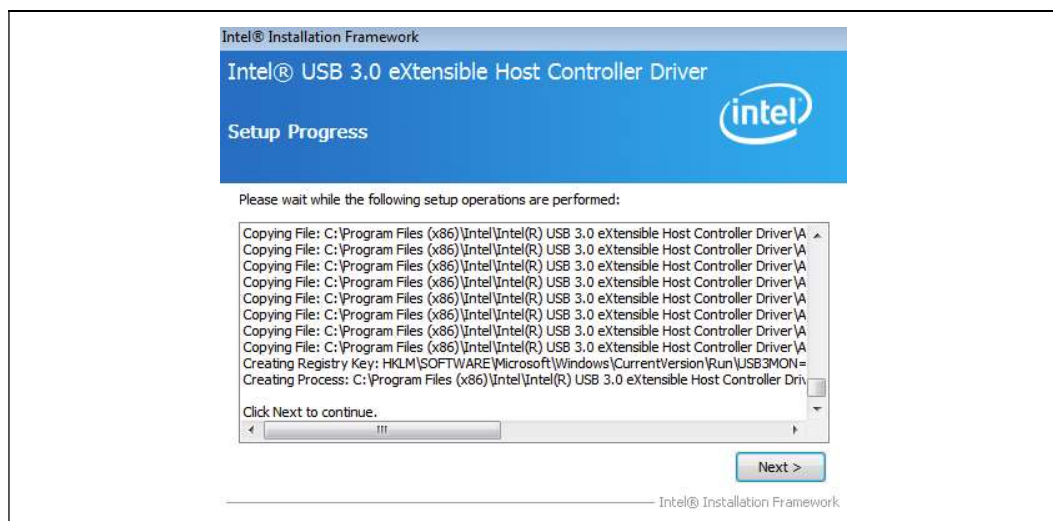
Note: **WARNING** – Do not run this driver's installer (Setup.exe) from a USB storage device (ie. external USB hard drive or USB thumb drive). For proper installation, please copy driver files to a local hard drive folder and run from there.

Figure 4. Readme File Information



- 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





Note: After successful installation, you should see setup completion screen as shown in After setup completion on the driver on 6th Generation Intel® Core™ Processors / Intel® 100 Series Chipset Family platform, there will be no request to reboot system to complete the driver installation.

8. Figure 6. Click on 'Finish' button to restart the system.

Note: After setup completion on the driver on 6th Generation Intel® Core™ Processors / Intel® 100 Series Chipset Family platform, there will be no request to reboot system to complete the driver installation.

Figure 6. Setup Completion



9. After the system has booted, you can refer to section 3.4 to check the driver version.

3.2 Upgrading/downgrading with a Non-PV (WHQL) Driver.

When doing an upgrade/downgrade of the USB3.0 driver to a Non-PV version of the USB3.0 driver, you may encounter a "Windows Security" pop up message (Figure 3) requesting approval to trust and allow the installation of the driver. During that moment of the install process, the previous driver is already uninstalled and all the USB ports in the platform will not function. This may cause the installation process to get stuck and cause the installation the USB3.0 driver to fail.

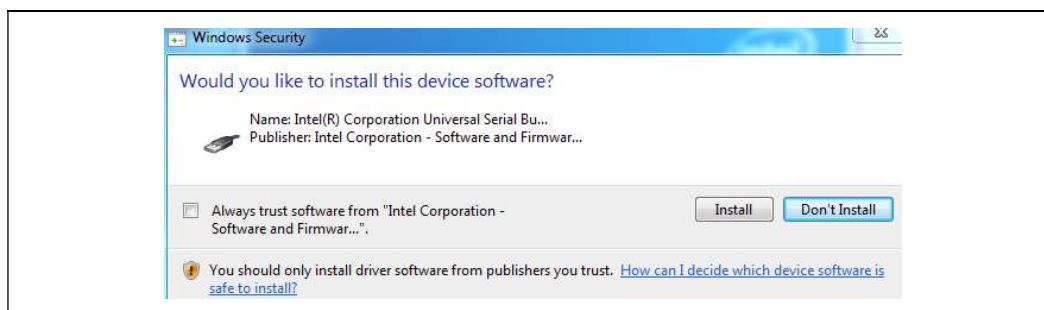
To avoid running into this situation, follow the steps below:

1. When installing the USB3.0 for the first time using setup.exe, select (check) the option "Always trust software from Intel Corporation Software and Firmware..." on the "Windows Security" pop up message (Figure 3) for all three USB3.0 driver components. The next time when doing an upgrade/downgrade of the Non-PV USB3.0 driver, the "Windows Security" message will not pop up requesting for approval.
2. Pre 6th Generation Intel® Core™ Processors / Intel® 100 Series Chipset Family platforms only: If you have already done installation for the first time using



setup.exe and have not checked the option "Always trust software from Intel Corporation Software and Firmware..." on the "Windows Security" pop up message, go to control panel to uninstall the driver and reboot the system. Install the driver again but this time check the option "Always trust software from Intel Corporation Software and Firmware..." on the "Windows Security" pop up message.

Figure 7. Windows Security



3.3 Silent Driver Installation via Installer

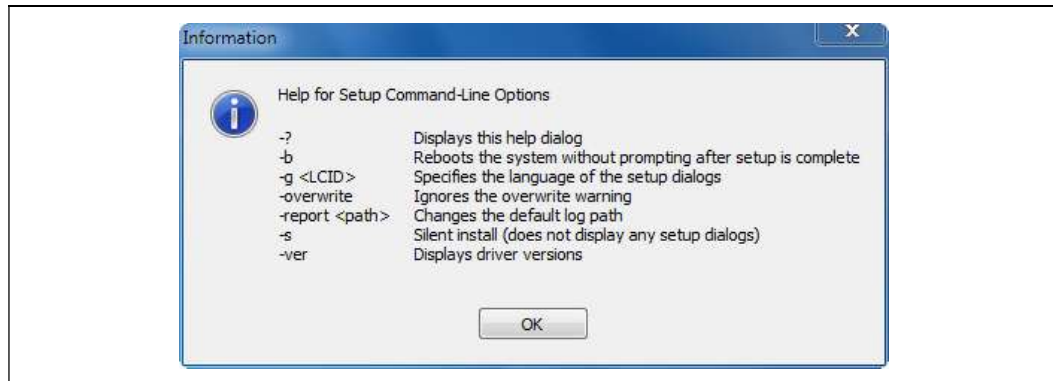
Follow the steps listed below for silent driver installation via installer:

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 8. 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 8. 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 3.4 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

3.4 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 9 and Figure 10).



Figure 9. Intel® USB 3.0 eXtensible Host Controller Driver Version

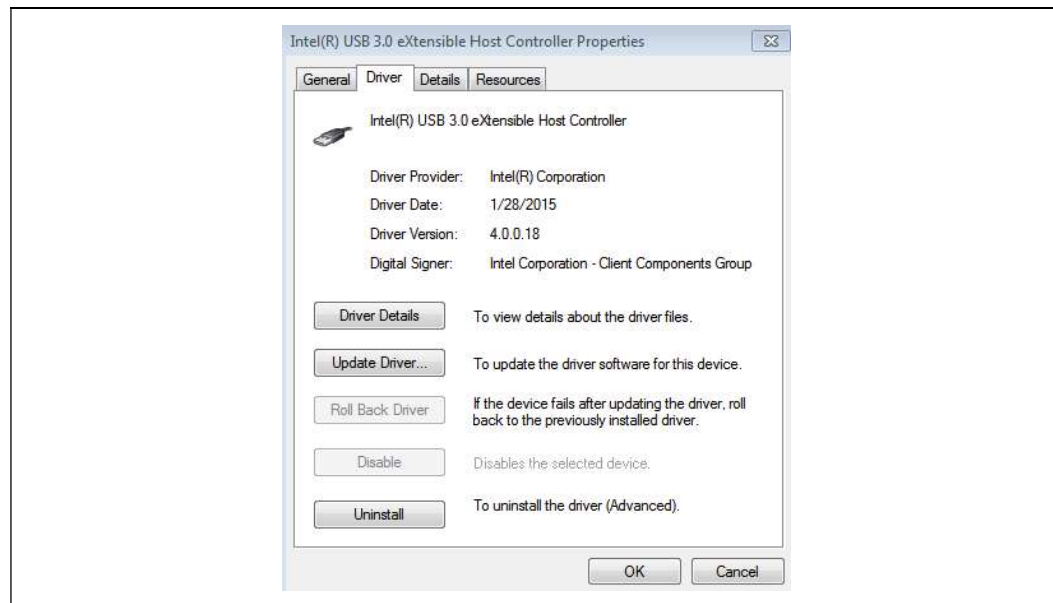
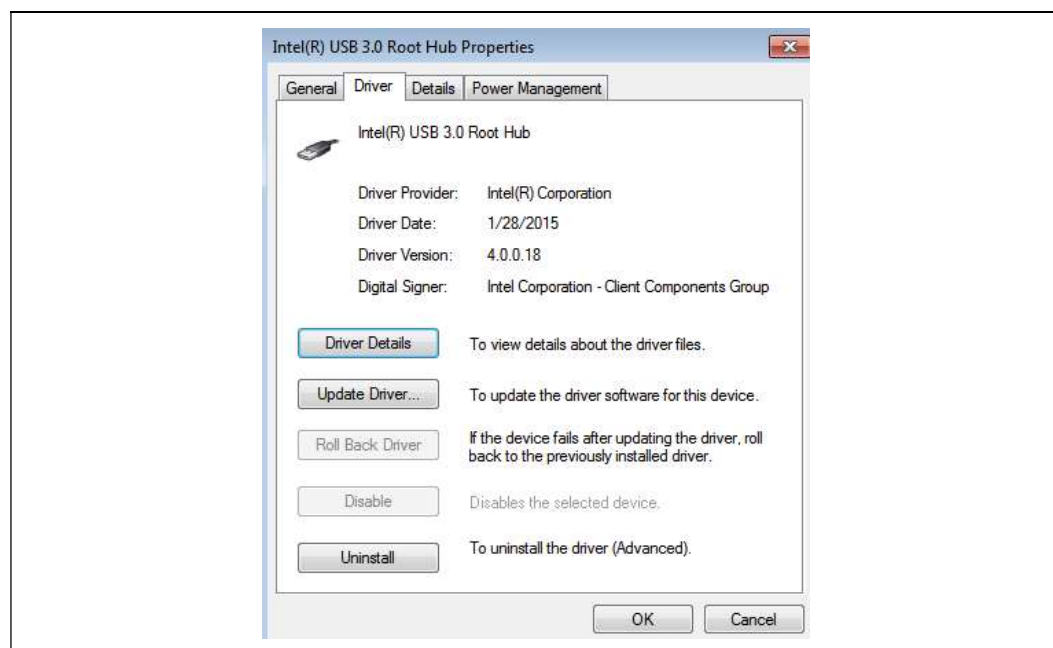


Figure 10. Intel® USB 3.0 Root Hub Driver Version



3.5 Uninstalling the Driver via Control Panel

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

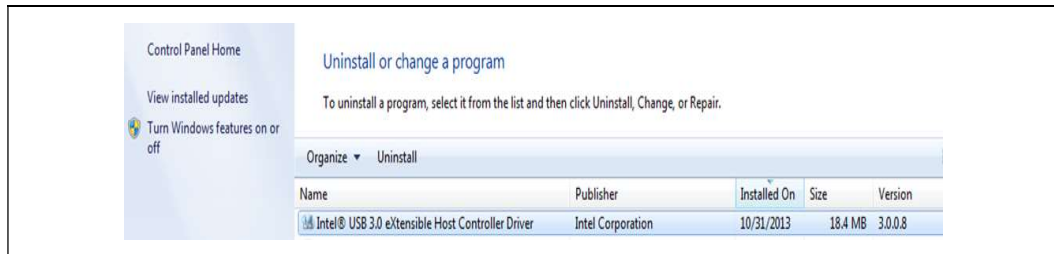
1. Open the Control Panel window (Start -> Control Panel).
2. If the Control Panel window is shown in 'Category' view, then select "Uninstall a program" as shown in Figure 11. Otherwise if the Control Panel window is shown in 'icon' view, then select "Programs and Features".

Figure 11. Control Panel – Uninstall a program



3. On the next window, select the "Intel® USB 3.0 eXtensible Host Controller Driver" (see Figure 12) from the list of programs. Then click the "Uninstall" button.

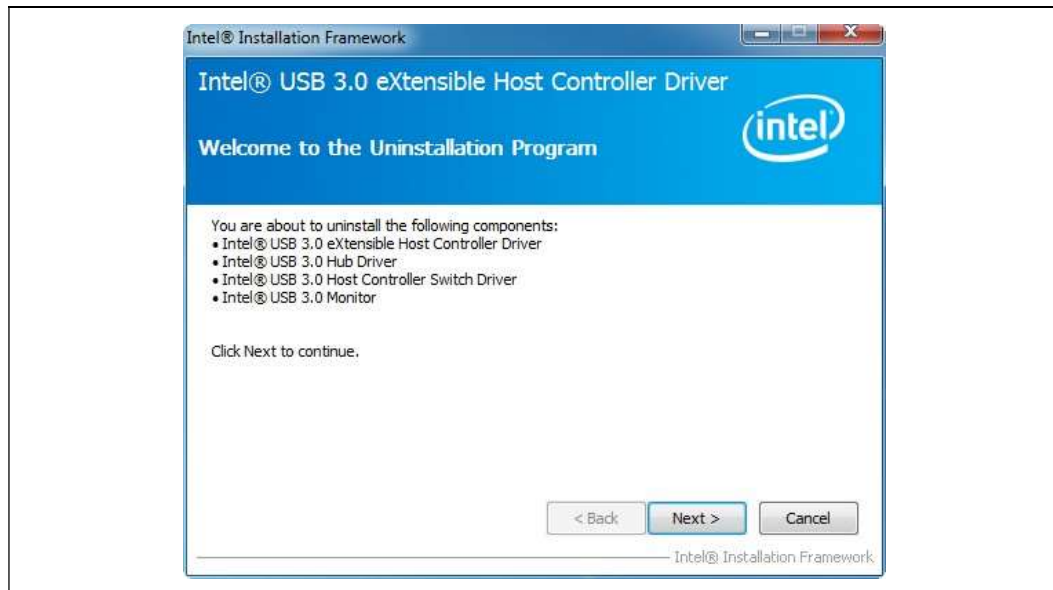
Figure 12. Control Panel – Programs List





4. You should see the Welcome to Uninstallation Program pop-up window with component details as shown in Figure 13. Click 'Next >' button to continue.

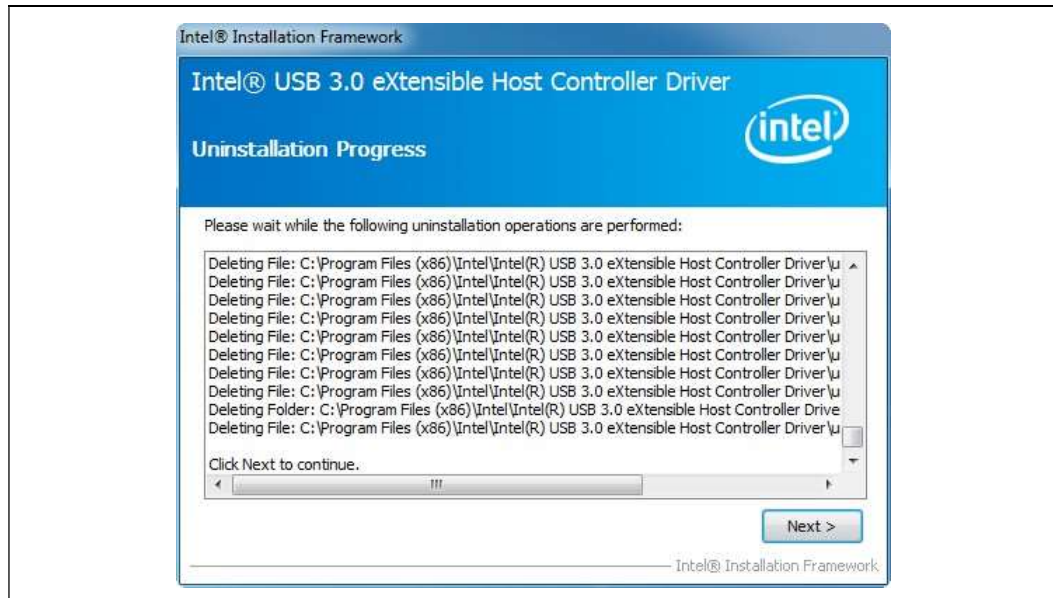
Figure 13. Welcome to the Uninstallation Program





5. Next, installer will perform various operations and show progress in Uninstallation Progress screen. When the uninstall is completed, you should see screen as shown in Figure 14. Click on 'Next >' button to continue.

Figure 14. Uninstallation Progress





6. After successful uninstall, you should see setup completion screen as shown in Figure 15. Click on 'Finish' button to restart the system.

Figure 15. Uninstall Setup Completion



3.5.1 Uninstalling the Driver on 6th Generation Intel® Core™ Processors / Intel® 100 Series Chipset Family platforms only platform.

The 6th Generation Intel® Core™ Processors / Intel® 100 Series Chipset Family platforms only provide USB functionality through the xHCI controller. Since the Windows* 7 OS doesn't have native USB3.0 (xHCI) support and most platform rely on the USB controller for mouse and keyboard functionality, the USB3.0 driver is blocked from being uninstalled from the control panel to avoid accidental removal of the USB3.0 driver and thus causing the platform to lose USB functionality.

In the event that the driver must be uninstalled from the system, it can be done by using command line option -uninstall.

1. Launch command prompt with administrator right
2. Navigate to C:\Program Files (x86)\Intel\Intel(R) USB 3.0 eXtensible Host Controller Driver\uninstall folder.
3. Run the following command: **Setup.exe -uninstall**
4. Click 'Yes' to continue with the process.
5. After the driver is uninstalled, the system will reboot automatically.



Note: After the driver is uninstalled, USB functionality will not work. Ensure that the system has an alternate input method (Keyboard/Mouse) before uninstalling the driver.

Note: This option is not applicable if the USB3.0 driver was not installed through the setup.exe installer.

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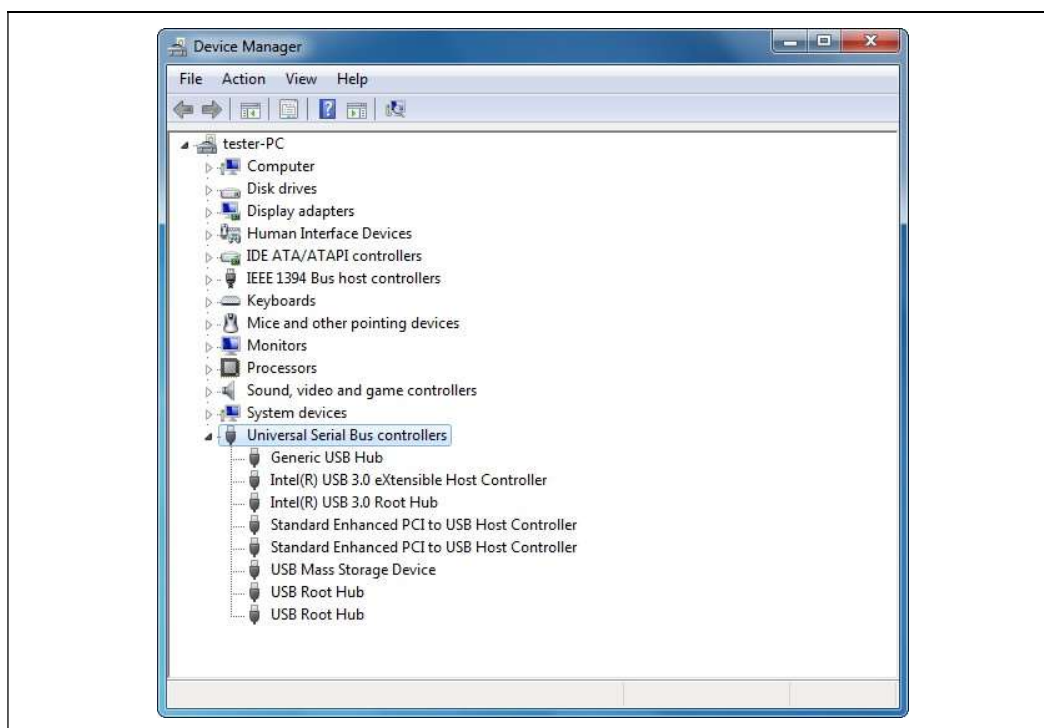


4 Using the USB 3.0 Driver

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 16.

Figure 16. 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 17.

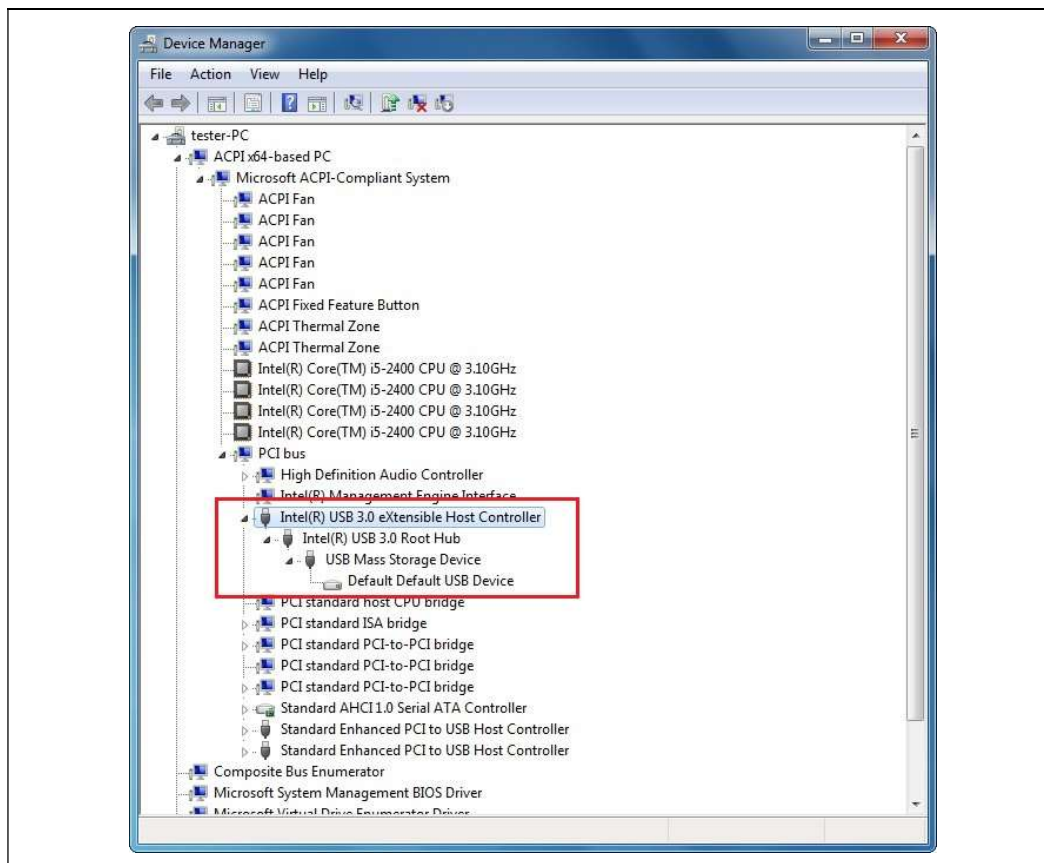
Figure 17. Device Manager: Devices by connection view





The Device Manager View will change to the connection view (Figure 18) which easily allows you to see which USB 3.0 controller is being used.

Figure 18. 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.

Note: This is not applicable for the 6th Generation Intel® Core™ Processors / Intel® 100 Series Chipset Family platform. The switch driver will not be installed/not necessary in



the 6th Generation Intel® Core™ Processors / Intel® 100 Series Chipset Family platform.

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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