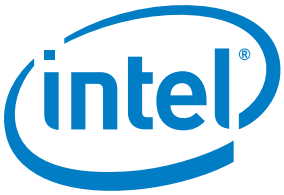

BSP for Microsoft* Windows* 7 (WIN7, WES7 & POSReady 7) 32-bit & 64-bit for Intel® Pentium® Processor N3700 and Intel® Celeron® Processor N3150, N3050 and N3000 Product Family

User Guide

September 2015

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Document Number: 557841-1.1

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Revision History

Date	Revision	Description
July 2015	1.1	Initial release.

§

1.0 Introduction

1.1 Scope of document

This document consists of a User Guide about the Intel developed GPIO*, I2C*, HS-UART, and USB3.0 XHCI driver for Windows* 7, Windows* Embedded Standard 7 and Windows Embedded POSReady 7. This document also includes steps to build the Windows BSP for the Intel® Pentium® Processor N3700 and Intel® Celeron® Processor N3150, N3050 and N3000 Product Family.

This document is intended for OEMs and ODMs that are enabling Win7 and WES7 drivers with the Intel® Pentium® Processor N3700 and Intel® Celeron® Processor N3150, N3050 and N3000 Product Family.

1.2 System Requirements

The following operating systems are supported:

- Windows 7 Operating System (32-bit and 64-bit versions)
- Windows Embedded Standard 7 Operating System (32-bit and 64-bit versions)
- Windows Embedded POSReady 7 Operating System (32-bit and 64-bit versions)

1.3 Acronyms and Terminology

Term	Description
API	Application Programming Interface
ATAPI	ATA Packet Interface
BSP	Board Support Package
CRB	Customer Reference Board
DMA	Direct Memory Access
eMMC	Embedded Multimedia Card
GPIO	General Purpose Input/Output
HSUART	High Speed Universal Asynchronous Receiver/Transmitter
I2C	Inter-Integrated Circuit
IO	Input Ouput
IOCTL	Input Output Control
KITL	Kernel Independent Transport Layer

Term	Description
LAN	Local Area Network
MSDN	Microsoft* Developer Network
OS	Operating System
PCI	Peripheral Component Interconnect
SATA	Serial ATA
SD*	Secured Digital
USB	Universal Serial Bus

§

2.0 User Guide

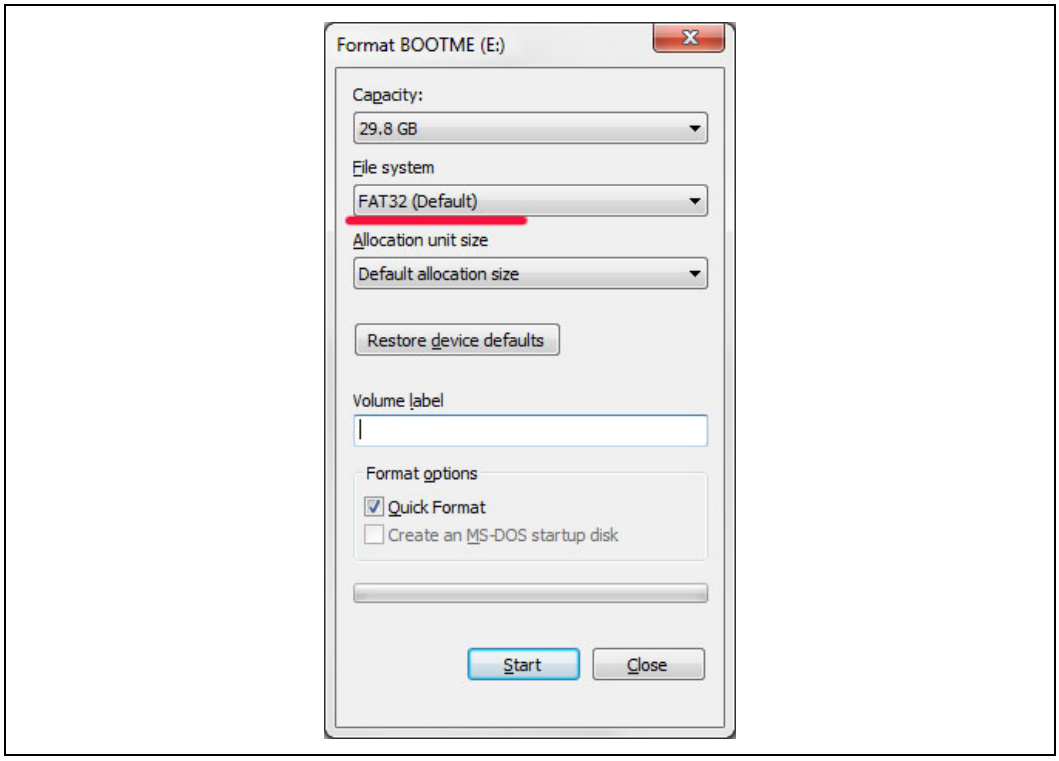
2.1 Building Windows BSP

The content of this section covers Windows 7, Windows Embedded Standard 7 and Windows Embedded POSReady 7.

1. Prepare the installation media.

   a. Get a thumb drive which the capacity is between 8GB - 32GB, and format it with FAT32.

Figure 1. File System FAT32



   b. Extract all files from an ISO* image of WIN7/WES7/POSReady 7 to the thumb drive.

2. BIOS Setup for installation.

   a. In BIOS setting, enter "Device Manager→System Setup, and follow with these settings:

      Boot→BOM Config: Legacy System

      Legacy USB Configuration→Legacy USB Support: Enabled

      Press "F4", commit changes and Exit.

Figure 2. BOM Config Legacy System

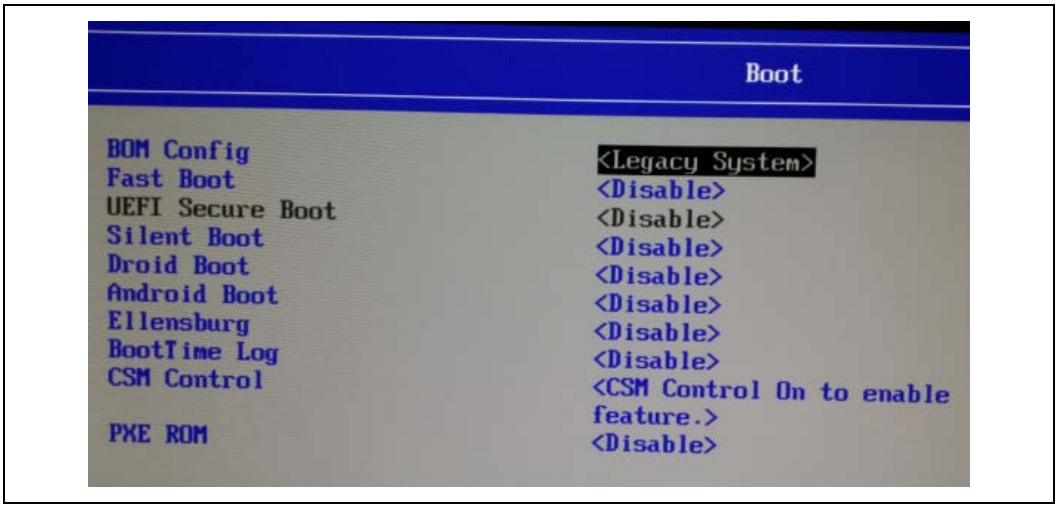


Figure 3. Legacy USB Configuration

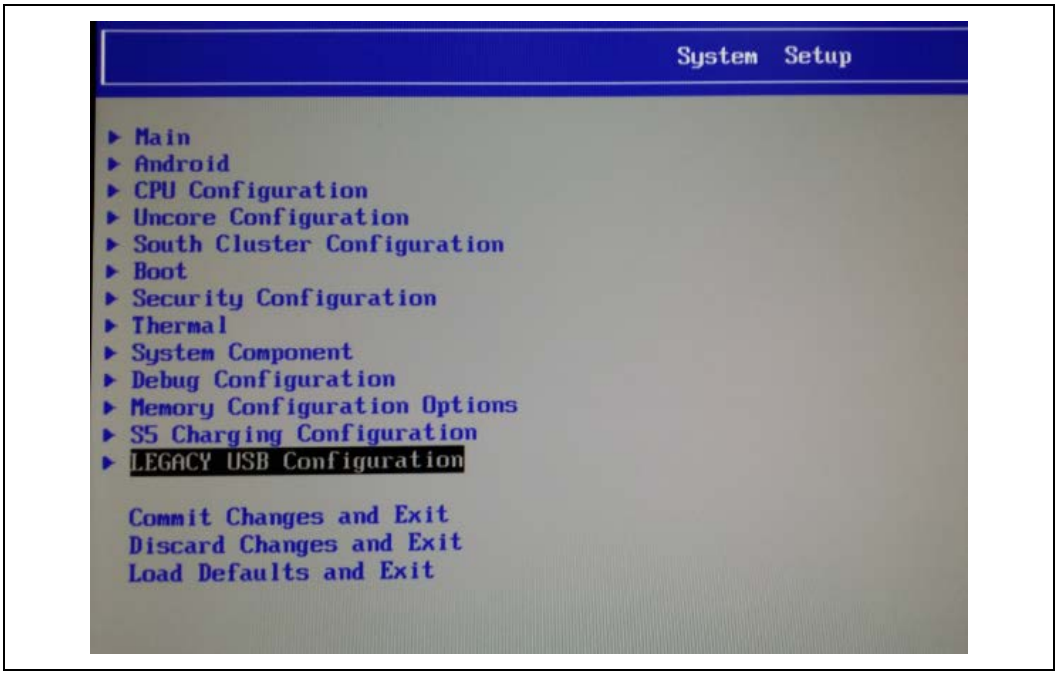
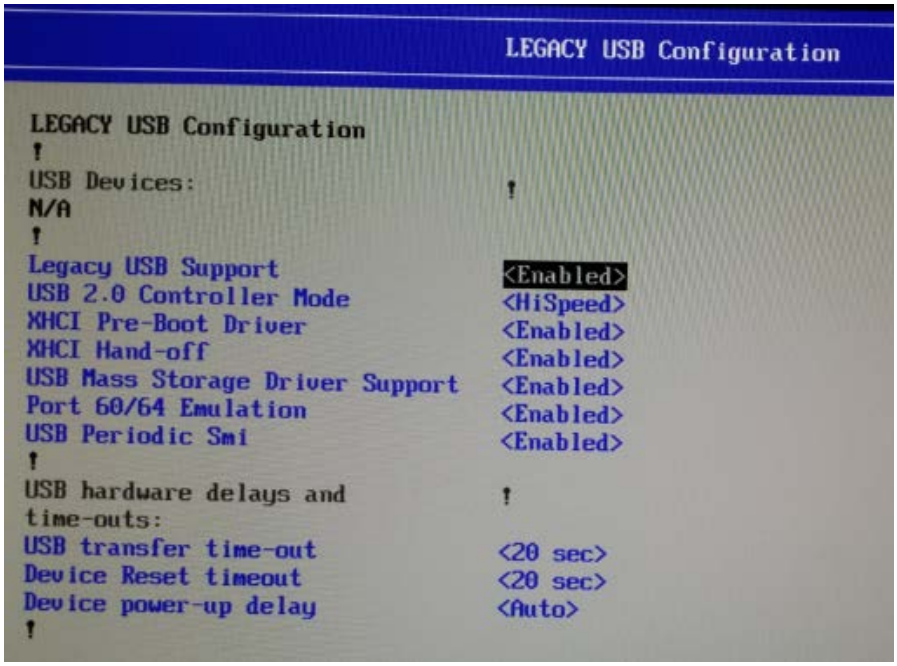


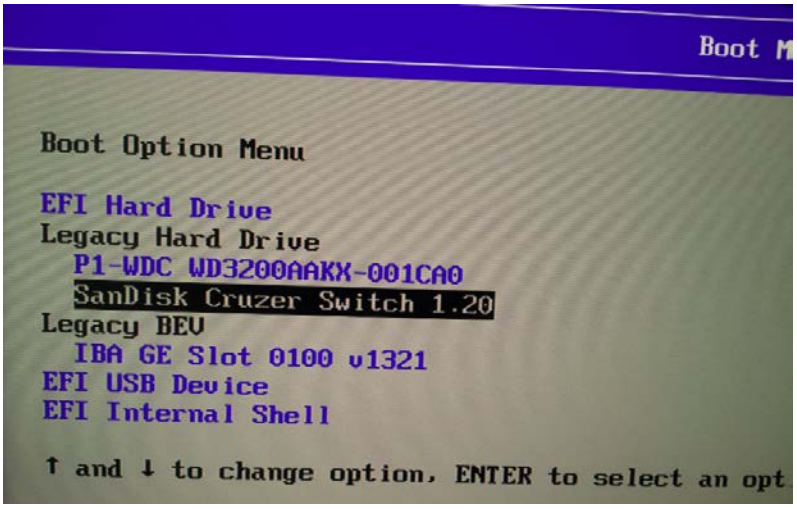
Figure 4. Legacy USB Support Enabled



b. Enter into "Boot Manager", then SELECT the option to boot from the drive or device which contains the OS image and press ENTER.

Note: Please DO NOT use EFI USB boot since Win 7 is using legacy mode.

Figure 5. Boot Option Menu



3. OS Installation.
   a. Install the OS with Windows OS default installation steps.
4. Intel IO drivers installation.
   a. For Windows7 64-bit or WES7 64-bit, install the Microsoft Hotfix KB2732471. (http://support.microsoft.com/kb/2732471)

Note: This hotfix is only required for the SD driver. It is not needed for Win7/WES7 (64-bit) if the SD driver is not used.

   b. Execute Intel Processor Win7 IO Drivers 32Bit.msi or Intel Processor Win7 IO Drivers 64-bit.msi.

Note: Run as administrator.

   c. Check the checkbox "Always trust software from Intel Technology Sdn.Bhd." and click **Install**.
5. Chipset INF installation.
   a. Execute the SetupChipset.exe installation package.

2.2 Software Driver BKMs

2.2.1 How to Enable Hibernation in WES7

By default, hibernation is disabled in WES7. To enable it, start the Windows Command Prompt and type "`powercfg /h on`".

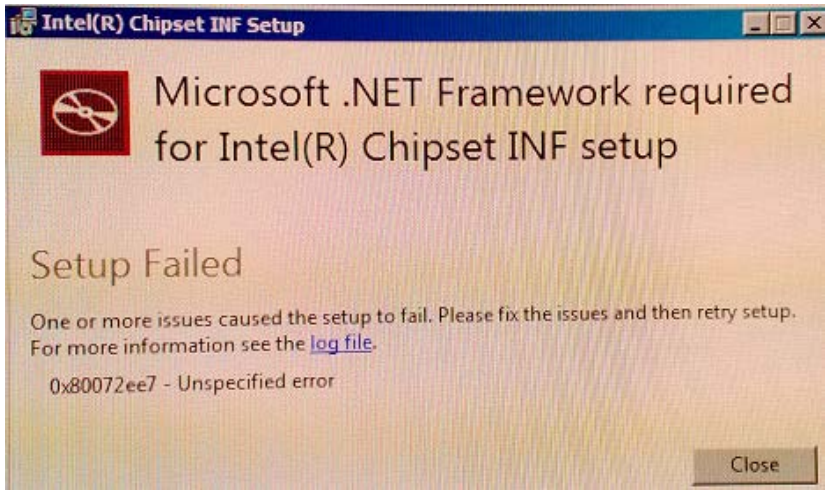
2.2.2 How to Create OS Boot from USB Device for WES 7

The following are generic steps for enabling OS boot on Windows. Refer to Microsoft's website for more instructions.

1. Prepare the setup environment: Connect a USB flash device to a USB port (which you want to deploy the WES7 image to). Connect another storage device (which contains the WES7 image).
2. Power up the system and boot into the WES 7 image.
3. Select **Build an Image**. After accepting the license (terms and conditions), select “Do not use a template”. Then choose a language, and click “Next”.
4. In the select the packages window to include in your image page, click "**Feature Packages**" to expand the branch, then click "**Embedded Enabling Features**", and then select "**Bootable Windows USB Stack**".
5. Add any other additional drivers/packages that you may need.

To install chipset INF, .NET is requested when installing the WES , else there would be error as below:

Figure 6. Microsoft .NET Framework Setup Failed



6. Click on **Resolve Dependencies** and try to resolve all dependency issues.

Note: If you are asked to choose between the **Standard Windows USB Stack** and the **Bootable Windows USB Stack**, make sure only leave **Bootable Windows USB Stack** checked.

7. On the drive-selection screen, select the partition you wish to install to.
8. Click next and wait for installation to complete.

2.2.3 How to Disable the DMA Feature for I2C

There are 7 I2C controllers in the Intel® Processor N3000 and these controllers use the Windows registry to control the DMA feature.

```
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\iaioi2c\Parameters]
"ForceDma"="0,0,0,0,0,0,0"
```

ForceDma is a string type and there are 7 values mapped to the 7 I2C controllers which are device IDs are from 0F41 to 0F47h.

Value 0 will force DMA to disable, and I2C data will be read/write in PIO mode.

For a value other than 0: If the data length is more than the specified value, I2C data will be read/write in DMA mode; if data length is less than the specified value, I2C data will read/write in PIO mode.

By default, without any registry settings, I2C will use PIO mode.

2.2.4 How to Set the Baud Rates of HS-UART

1. The baud rate is calculated based on the following method:

```
Baud rate = (SourceClockFrequency) / (16 * divisor)
Source Clock Frequency = 50000000* PrescalerMValue /PrescalerNValue*2
For example, to set baud rate to 1M:
Set PrescalerMValue = 64
Set PrescalerNValue = 100
SourceClockFrequency = 64,000,000
```

You can customize the value of SourceClockFrequency, PrescalerMValue and PrescalerNValue from the Windows registry. You will need to reboot the system after setting these values.

2. To support baud rate between 230,400 and 3,686,400, create and change the following registry setting:

```
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\iaiouart\Parameters]
;High speed source clock, M and N prescalers
"HSUartSourceClockFrequency"=dword:01c1f8f8
"HSUartPrescalerMValue"=dword:00003fff
"HSUartPrescalerNValue"=dword:00006c80
```

3. To support baud rate between 300 and 115200, change the following registry setting.

For Low speed source clock, M and N prescalers:

```
"UartSourceClockFrequency"=dword:001c2000
"UartPrescalerMValue"=dword:0000025a
"UartPrescalerNValue"=dword:00007fff
```

See Section 27.2.3 Baud Rate Generator in the "Bay Trail-I SoC External Design Specification" document for details.

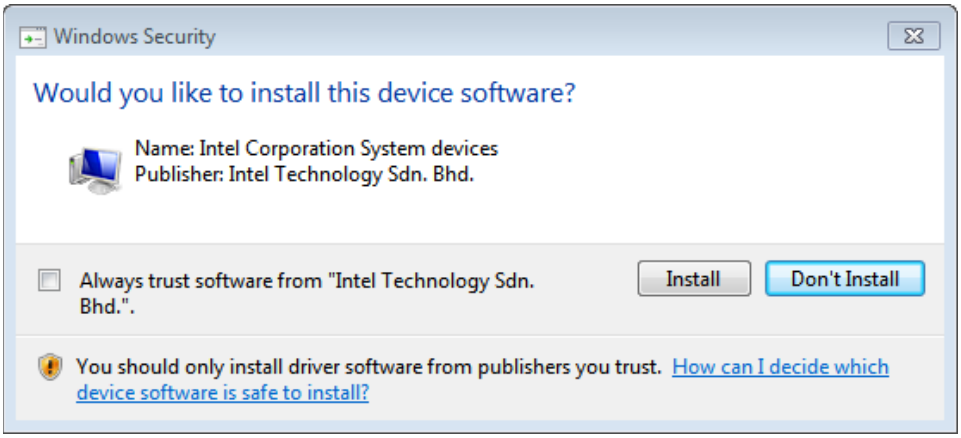
2.2.5 How to Install I/O Driver Unattended in Windows 7

All operations mentioned below require **administrator privileges** in Windows 7 and Windows Embedded Standard 7 (WES7). You will need to write a Windows batch file to complete these steps.

Suppress the Windows Security Prompt

1. This prompt will pop up every time during driver installation until user clicks the "Always trust software from..." click box.

Figure 7. Windows Security Prompt



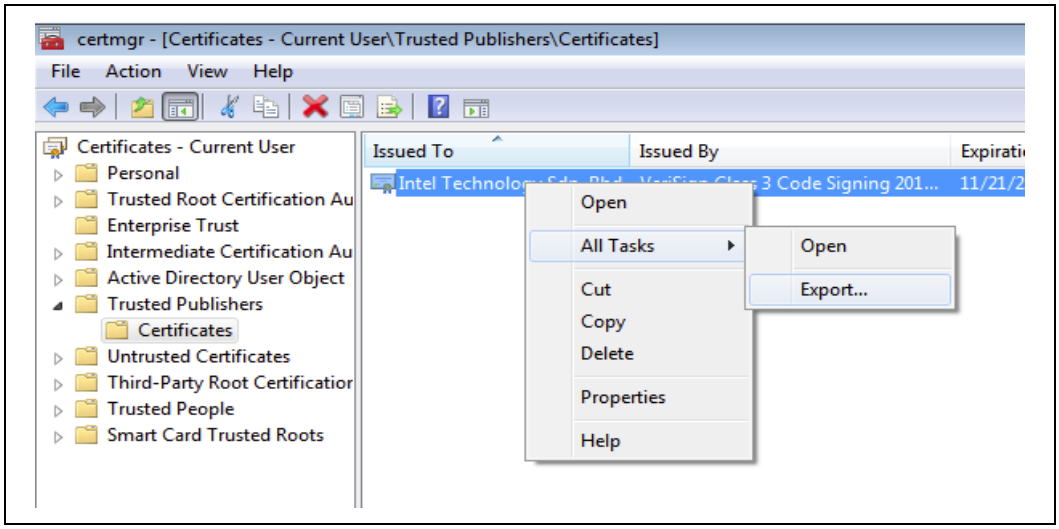
To suppress this prompt, first add the "Intel Technology Sdn. Bhd." as a trusted publisher.

a. Manually install Intel IO driver on Windows 7 and select the "Always trust software from Intel Technology Sdn. Bhd." click box.

b. After installation, run Windows tool **certmgr.msc** and navigate to **Trusted Publishers,** then **Certificates**.

c. Export the certificate with the name "Intel Technology Sdn. Bhd." to your local disk with DER encoded binary X.509(.CER) format. For example, "Intel.cer".

Figure 8. Export the Certificate



d. On your other Windows platform where you intend to install the driver unattended, add the exported certificate to the Windows Trusted Publisher. Run the following command with administrator privileges:

   certmgr.exe -add intel.cer -c -s -r localMachine TrustedPublisher
   User can obtain *certmgr.exe* from Windows SDK. Refer to MSDN Certificate Manager Tool .

Suppress the Windows Installer Prompt

The Intel IO driver package is in Windows Installer (MSI) format so you can use the *msiexec.exe* to install it in unattended mode. For example, run this command in administrator privileges:

```
msiexec /i " Intel Processor Win7 IO Drivers 32Bit" /passive
```

To uninstall it:

```
msiexec /x " Intel Processor Win7 IO Drivers 32Bit" /passive
```

Unattended uninstallation when .msi file is not present.

Create a bat file with the following command. Run the bat file as administrator.

```
wmic product where name="xxxxxx" call uninstall
```

Note: "xxxxxx" refers to the application name. For example: Intel Processor Win7 IO Drivers 32Bit.

2.2.6 How to Install I/O Driver Using INF or SYS File

By default, you can run the Intel driver .msi installer package to install the I/O drivers. Alternatively, you can also install by retrieving the raw driver package (the inf and sys file) in the following folder after the driver installation is done on another identical system. Install the retrieved driver (inf and sys file) using PnPUtil or Windows DP Installer.

For 64 bit driver: [Program Files]\Intel\ Intel Processor Win7 IO Drivers 64Bit.

For 32 bit driver: [Program Files]\Intel\ Intel Processor Win7 IO Drivers 32Bit.

Then the user also can customize their own installation directly based on driver package files, for example:

- Use PnPUtil tool to install driver by inf file http://msdn.microsoft.com/en-us/library/windows/hardware/ff550423(v=vs.85).aspx
- Use Driver Package Installer (DPInst) http://msdn.microsoft.com/en-us/library/windows/hardware/ff544842(v=vs.85).aspx

2.2.7 How to Inject USB3.0 Driver into Windows 7 Installer

The SoC on Cherry Hill CRB is only equipped with a single xHCI (USB 3.0) controller; AHCI (legacy USB) is not supported. The following steps are necessary so that USB 3.0 input devices work to complete Windows 7 OS installation.

Note: For more details about USB 3.0, Please refer to the USB 3.0 "Bring up Guide.pdf" which is available for download in VIP.

1. Extract Windows 7 image from ISO file to USB pendrive (recommend to use Windows USB/DVD Download Tool).
2. Keep the USB pendrive in the workstation after finished extracting the ISO file.
3. Create a folder for storing USB3.0 driver (C:\USB).
4. Copy USB3.0 driver into the folder.
5. Download and place the Inject.bat* file from email attachment to workstation (recommend C:\).
6. Open a command prompt with administrator rights.
7. Navigate to directory where Inject.bat is located.
8. Enter the following command: **inject.bat <Path to Win7 installation Source> <Path to XHCI driver> <Index in Install.wim>**

For example:

C:\> **inject.bat E:\sources C:\USB 5**

E:\sources: directory of USB Pendrive where BOOT.WIM and INSTALL.WIM located

C:\USB: directory of USB3.0 driver located

5: index of different Windows edition in INSTALL.WIM

Proceed until the completion message is shown. Now the USB pendrive installer is ready with USB3.0 driver integrated.

*Inject.bat contain the following:

```
@echo off
if "%1%"=="" goto usage
if "%3%"=="" goto list


echo ******** Embedding XHCI Drivers into Boot.wim (Index 1) *******

set ImgFile=%1\boot.wim
set DriverPath=%2
Dism /Get-WimInfo /WimFile:%ImgFile%
mkdir tmp
Dism /Mount-Wim /WimFile:%ImgFile% /Index:1 /MountDir:tmp
Dism /Image:tmp /Add-Driver /Driver:%DriverPath% /Recurse
Dism /Image:tmp /Get-Drivers
Dism /Unmount-Wim /MountDir:tmp /Commit

echo ******** Embedding XHCI Drivers into Boot.wim (Index 2) *******

set ImgFile=%1\boot.wim
set DriverPath=%2
Dism /Get-WimInfo /WimFile:%ImgFile%
mkdir tmp
Dism /Mount-Wim /WimFile:%ImgFile% /Index:2 /MountDir:tmp
Dism /Image:tmp /Add-Driver /Driver:%DriverPath% /Recurse
Dism /Image:tmp /Get-Drivers
Dism /Unmount-Wim /MountDir:tmp /Commit

echo ******** Embedding XHCI Drivers into Install.wim (Index %3) *******

set ImgFile=%1\install.wim
Dism /Get-WimInfo /WimFile:%ImgFile%
```

```
Dism /Mount-Wim /WimFile:%ImgFile%  /Index:%3 /MountDir:tmp
Dism /Image:tmp /Add-Driver /Driver:%DriverPath% /Recurse
Dism /Image:tmp /Get-Drivers
Dism /Unmount-Wim /MountDir:tmp /Commit

echo ********  Complete *******

rmdir tmp


set DriverPath=
set ImgFile=

goto end

:usage
echo Usage:
echo     %0 "Win7 installation Path" "XCHI drivers Path" "Index"

echo Examples:
echo List Indexes in Install.wim:
echo     %0 E:\source  C:\temp\XCHI\X64
echo Add XHCI to Win7 installation:
echo     %0 E:\source  C:\temp\XCHI\X64 4
goto end
:list
Dism /Get-WimInfo /WimFile:%1\install.wim
:end
```

§