



Microsoft* Windows* 7 (WIN*7, WES7* & POSReady 7) 32 & 64-bit IO Drivers for Intel® Atom™ Processor x5-E8000 and Intel® Pentium®/Celeron® Processor N3000 Family

User Guide

March 2016

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Revision History

Date	Revision	Description
March 2016	1.3	Maintenance Release 1.
September 2015	1.2	Gold release.
July 2015	1.1	Initial release.

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1.0 Introduction

1.1 Scope of document

This document consists of a User Guide about the Intel developed General Purpose Input/Output (GPIO*), Inter-Integrated Circuit (I²C*), High Speed Universal Asynchronous Receiver/Transmitter (HS-UART), and SD/ Embedded Multimedia Card (eMMC*) driver for Windows* 7, Windows* Embedded Standard 7 and Windows Embedded POSReady 7. This document also includes steps to build the Windows Board Support Package (BSP) for the Intel® Atom™ Processor x5-E8000, 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 Win*7, WES7*, and POSReady7 drivers with the Intel® Atom™ processor x5-E8000, 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

Table 1. 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



Term	Description
HSUART	High Speed Universal Asynchronous Receiver/Transmitter
I ² C*	Inter-Integrated Circuit
IO	Input Ouput
IOCTL	Input Output Control
KITL	Kernel Independent Transport Layer
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

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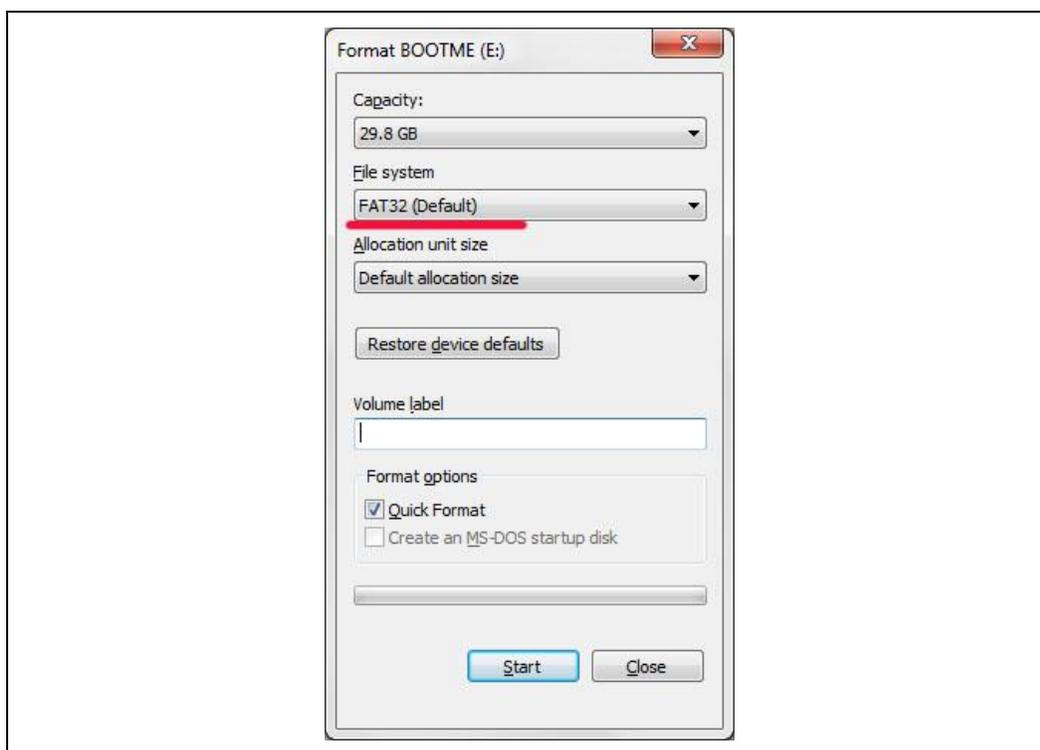
2.0 User Guide

2.1 Building Windows BSP

The content of this section covers Windows* 7, Windows Embedded Standard* 7 and Windows Embedded POSReady7.

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

Figure 1. File System FAT32



- b. Extract all files from an ISO* image of WIN7/WES7/POSReady7 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

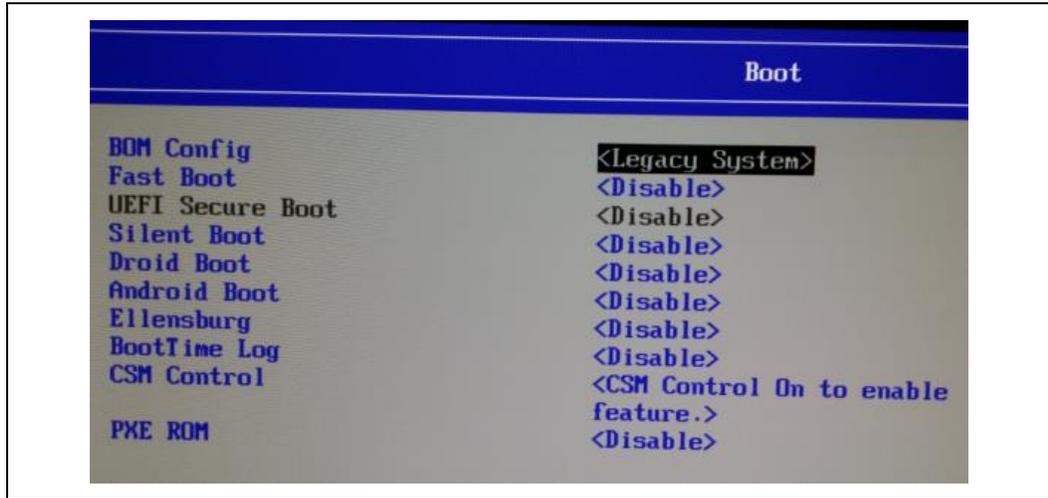


Figure 3. Legacy USB Configuration

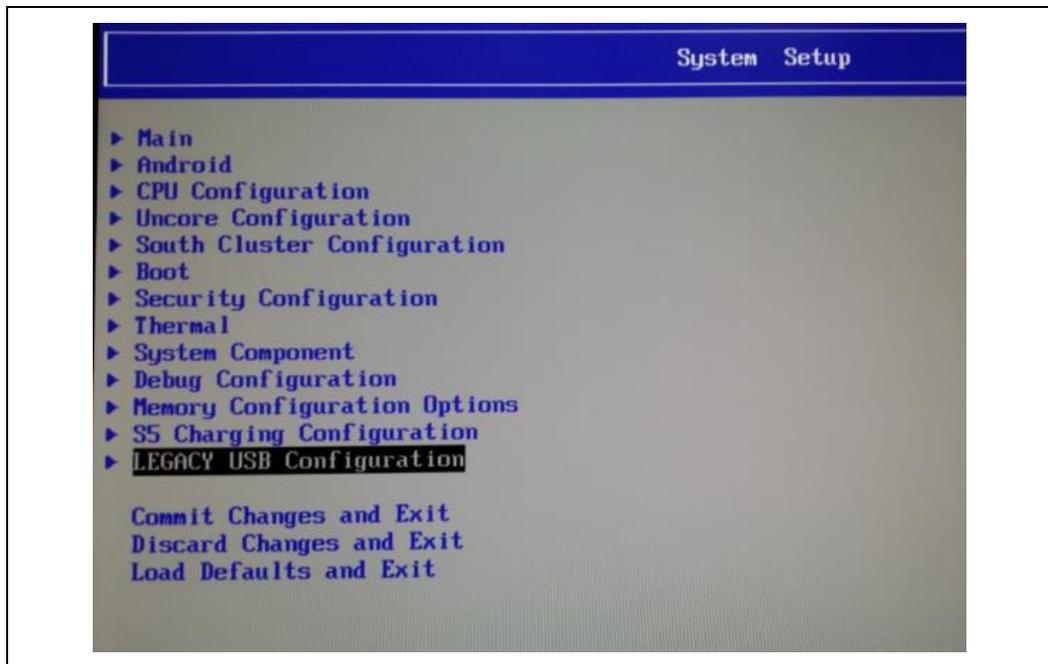
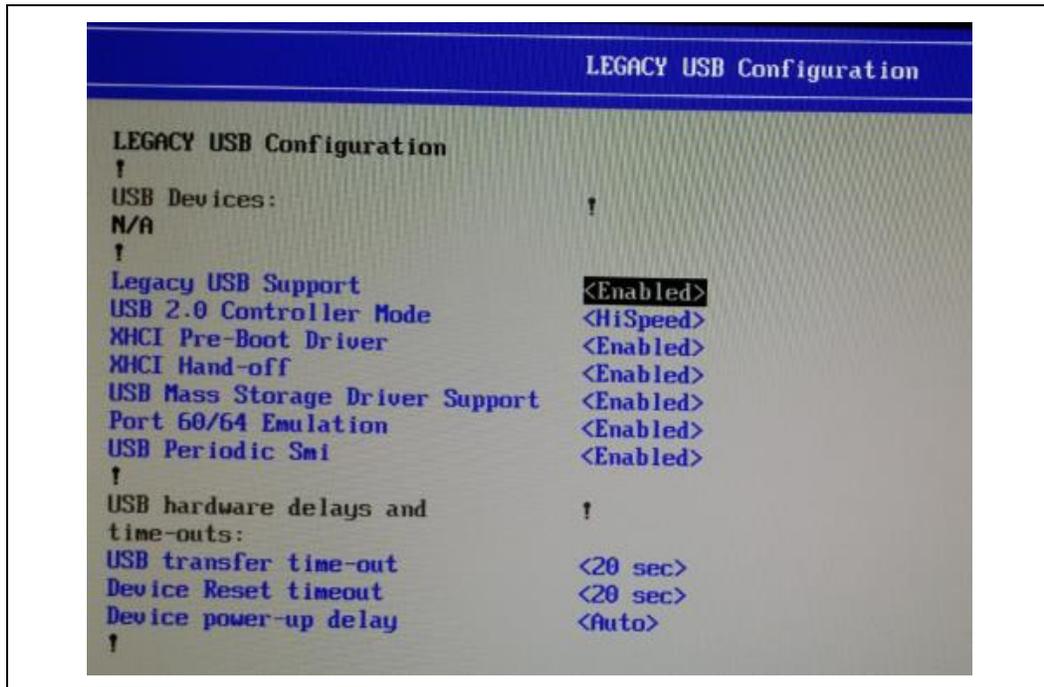




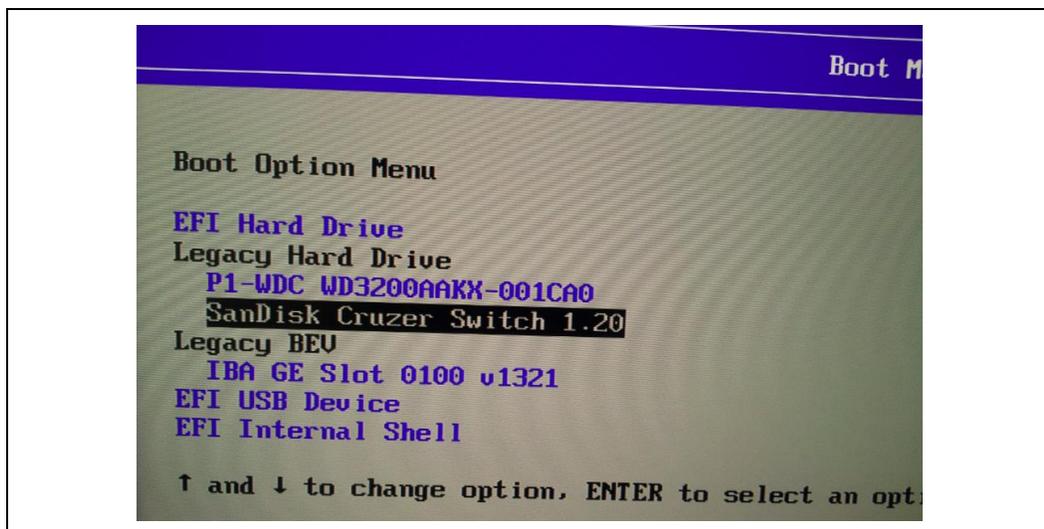
Figure 4. Legacy USB Support Enabled



- 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 driver's installation.
 - a. For Windows*7 64-bit or WES*7 64-bit and POSReady7 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 POSReady7 (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 BKM's

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.

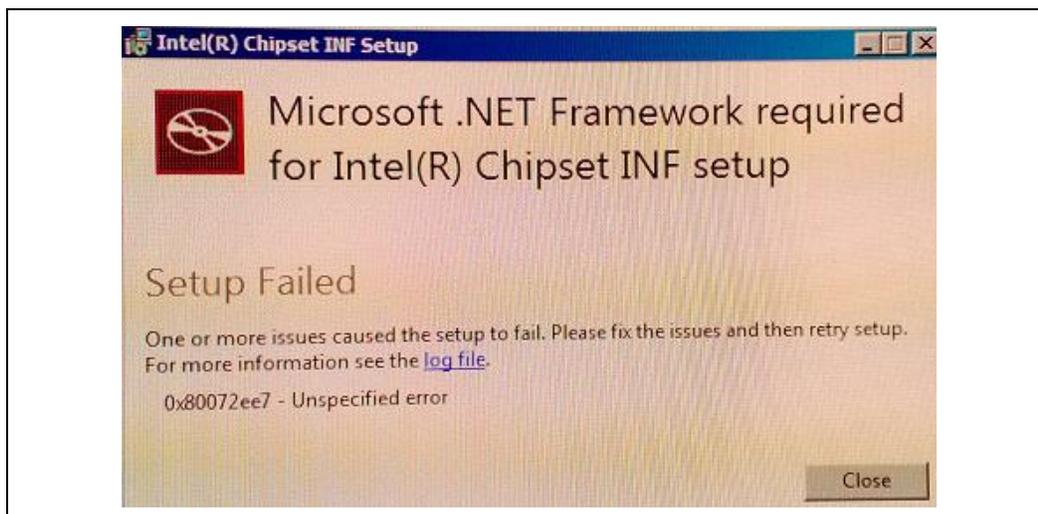
Prepare the setup environment:

1. 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 seven I²C* controllers in the Intel® Processor N3000, 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 seven values mapped to the seven 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

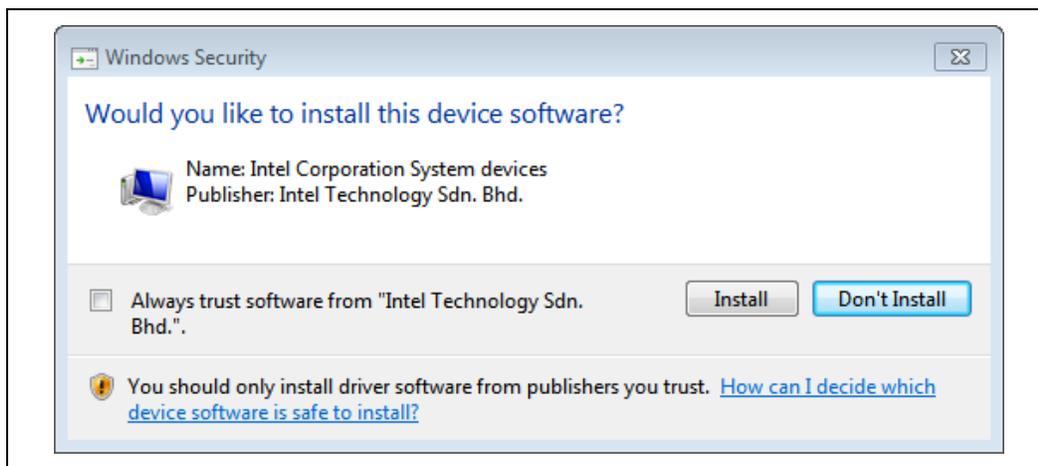
All operations mentioned below require **administrator privileges** in Win* 7 and WES*7. You will need to write a Windows batch file to complete these steps.

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.



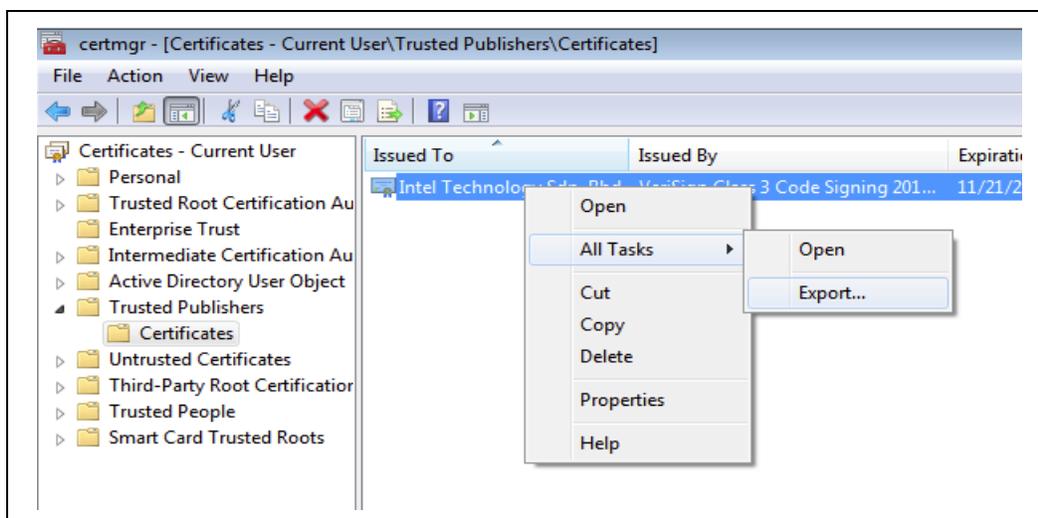
Figure 7. Windows Security Prompt



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="xxxxxxx" 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](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](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, 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 contains 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
```

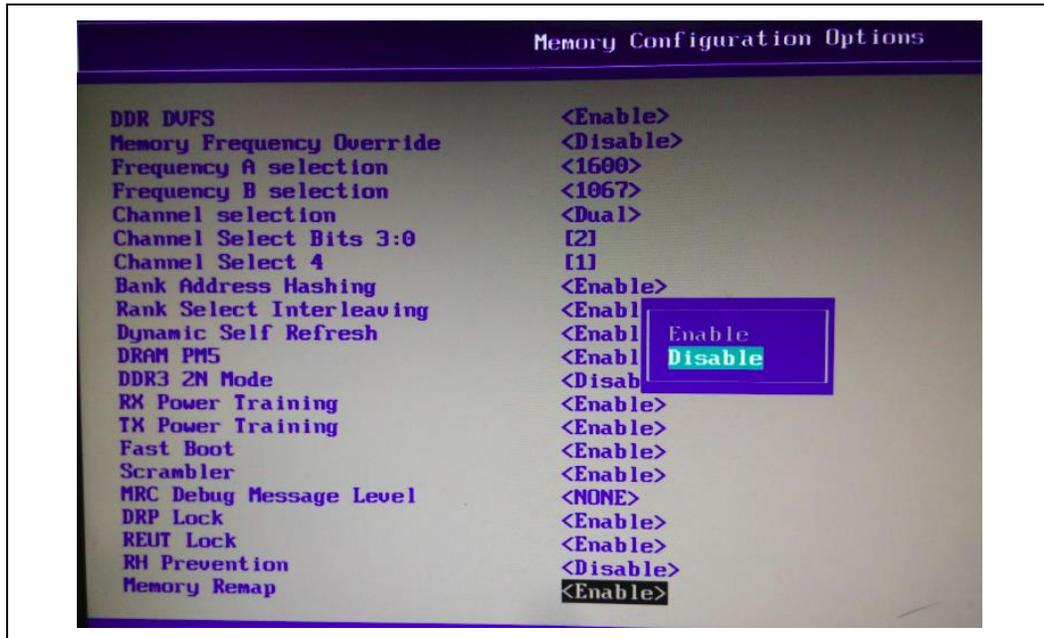
2.2.8 How to perform Win7 legacy OS installation into SD/eMMC

The following are generic steps for enabling SD/eMMC* boot on Windows.

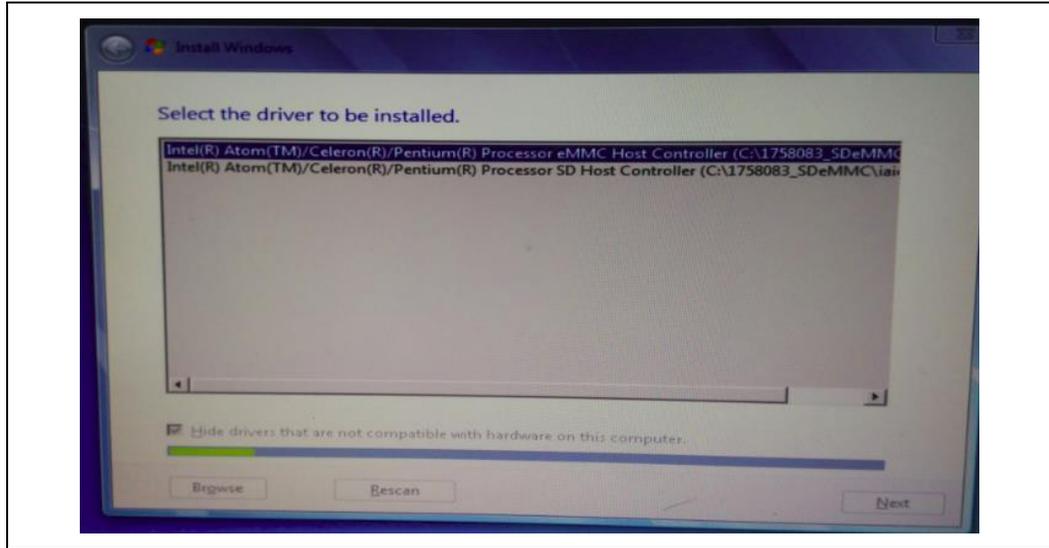
1. Refer to [Section 2.1 Building Windows BSP](#) of the guidelines to prepare the installation media and follow the BIOS setup configuration.
2. Follow the [Section 2.2.7](#) guidelines and inject the USB driver into the installation media.

Note: For Win7 64Bit OS: Follow [Section 2.2.7](#) guidelines and inject the Microsoft Hotfix KB2732471.

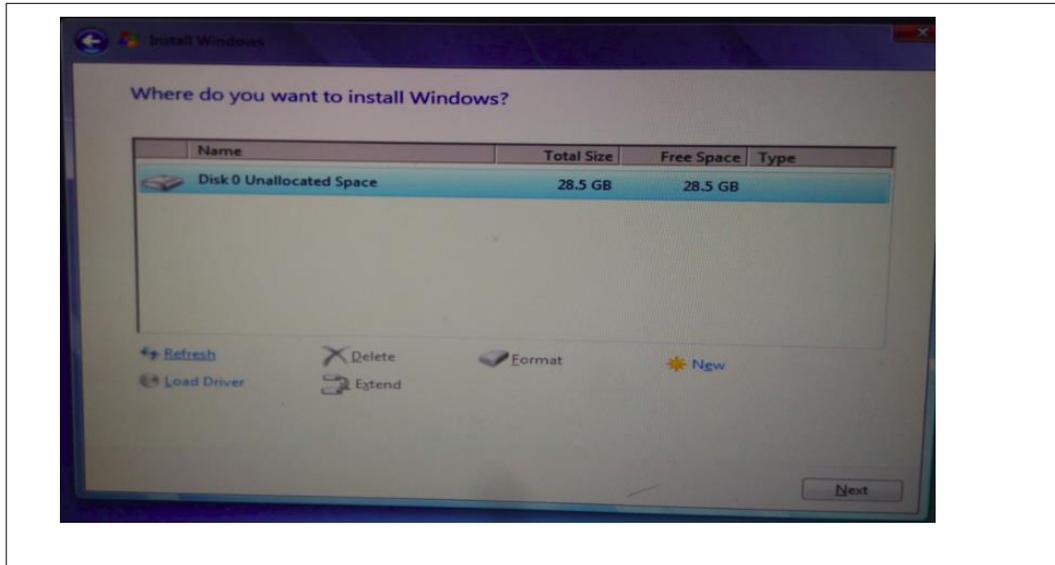
Note: For Win7 32Bit OS: In BIOS setting, enter into "Memory Configuration Options", then DISABLE the "Memory Remap" option.



3. Copy SD/eMMC driver into the installation media. (Get the SD/eMMC driver from Program Files\Intel\Intel Processor Win7 IO Drivers XXBit\SD and copy 3 file:iaiosd.inf, iaiosd.sys and iaiosd.cat)
4. Power on the board and enter into "Boot Manager", then SELECT the option to boot from the drive or device which contains the OS image (installation media) and press ENTER.
5. Press "Install Now" and "accept the license terms" then press "Next"
6. Install the OS with Windows OS default installation step, until the windows "Where do you want to install Windows" → Load driver → Browse to the SD/eMMC driver and then click "OK".
7. In "Select the driver to be installed", select SD/eMMC component and click "Next". Wait until SD/eMMC driver installation complete.



8. In “Where do you want to install Windows?” Select SD/eMMC disk and click “Next.”



9. Continue install until installation complete.

Note: For Win7 32-Bit OS: In BIOS setting, enter into "Memory Configuration Options", then ENABLE the “Memory Remap” option after complete the OS installation.

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