1. Product Information:

The AX88178 Controller is a single chip USB 2.0 to Gigabit Ethernet Controller. This is an AX88178 NDIS driver for WinCE 5.0 embedded system. It has been qualified under WinCE 5.0 CETK on an Intel Pentium II 300MHz system with a NEC D720100AGM USB 2.0 PCI Host adapter running WinCE 5.0 CEPC X86 Platform Image.

Note: The default USB 2.0 HCD driver (EHCI) of Windows CE 5.0 Platform Builder has a USB 2.0 device Hot-Swap BUG. The EHCI driver should be updated to fix this bug. Please refer to Section 6 "Update WinCE 5.0 USB 2.0 HCD Driver (EHCI.DLL)" for the detail information.

2. Files Descriptions:

The AX88178 WinCE driver package includes the files as described below,

RELEASE.PDF	This file
AX88178.DLL	Driver file
EHCI.DLL	Updated EHCI Driver file
PROJECT.REG	Sample REG file
PROJECT.BIB	Sample BIB file
CETK_LOG\ 1C_TEST.LOG	CETK One Card Test log file
CETK_LOG\ 2C_TEST.LOG	CETK Two Card Test log file
CETK_LOG\ 1C_TEST.TXT	CETK One Card Test readme file
CETK_LOG\ 2C_TEST.TXT	CETK Two Card Test readme file

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3. Revision History:

Revision	Author	Date	Description
v1.0.2.0	Francis Jaw	2010/07/29	1. Support Realtek RTL8211CL, RTL8211BN and RTL8251CL GigaPHYs. 2. Support Vitesse VSC8601 GigaPHY. 3. Add wakeup function: link up and magic packet.
v1.0.1.0	Johnny Huang	2009/12/18	1. Change the version numbering rule. 2. Modify TX, RX and Interrupt handling functions for performance improvement. 3. Change USB 2.0 interface's maximum RX bulk buffer size from 16K bytes to 8K bytes. 4. Fix the suspend device failure issue.
v1.0.0.5	Mark	2009/02/06	1. Fix the write EEPROM failure issue.
v1.0.0.4	Francis Jaw	2009/01/06	1. Fix SROM size error when program EEPROM.
v1.0.0.3	Francis Jaw	2008/12/01	1. Change interrupt in interval from 1s to 125ms. 2. Modify EEPROM write function, add a write delay time parameter, and add OID_SET_EEPROM_DELAY_TIME to let SROM tool to set this parameter. Default value is 5ms
v1.0.0.2	Francis Jaw	2008/08/13	1. Fix structure alignment problem for ARM platform.
v1.0.0.1	Francis Jaw	2008/03/27	1. Add the “OID_ACCESS_EEPROM” OID to support SROM Programming Tool.
v1.0.0.0	Allan Chou	2005/11/23	1. New release for WinCE 5.0.

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4. Driver Installation:

1. Add below AX88178 registry values into the $(_WINCEROOT)\PUBLIC\CEBASE \OAK\FILES\PROJECT.REG file.

```
; @CESYSGEN IF BSP_NIC_AX88178
;IF BSP_NIC_AX88178
[HKEY_LOCAL_MACHINE\Drivers\USB\LoadClients\2965_6016\Default\Default\AX88178]
        "DLL"="AX88178.DLL"
        "Prefix"="NDS"

[HKEY_LOCAL_MACHINE\Drivers\USB\ClientDrivers\AX88178]
        "DLL"="AX88178.DLL"
        "Prefix"="NDS"

[HKEY_LOCAL_MACHINE\Comm\AX88178]
        "DisplayName"="ASIX AX88178 USB 2.0 Gigabit Ethernet Driver"
        "Group"="NDIS"
        "ImagePath"="AX88178.dll"

[HKEY_LOCAL_MACHINE\Comm\AX88178\Linkage]
        "Route"=multi_sz:"AX881781"

[HKEY_LOCAL_MACHINE\Comm\AX881781]
        "DisplayName"="ASIX AX88178 USB 2.0 Gigabit Ethernet Driver"
        "Group"="NDIS"
        "ImagePath"="AX88178.dll"

[HKEY_LOCAL_MACHINE\Comm\AX881781\Parms]
        "BusNumber"=dword:0
        "BusType"=dword:1
;       "NetworkAddress"="02-12-34-56-78-9a"     ;Define an override MAC address 02-12-34-56-78-9a

;==============================================================================
; AX88178 Driver Parameters:
;   "ConnectionType" ==> 0 = "AutoSense"; 2 = "10BaseT Half_Duplex"; 3 = "10BaseT Full_Duplex"
;                        8 = "100BaseTx Half_Duplex"; 9 = "100BaseTx Full_Duplex"
;                       17 = "1000BaseT Full_Duplex"
;   "FlowControl"     ==> 0 = "Disable"; 1 = "TX PAUSE"; 2 = "RX PAUSE"; 3 = "Enable"
;   "WakeUp"          ==> 0 = "Disable"; 2 = "Link-up"; 4 = "Magic Packet";
;                        6 = "Link-up" & "Magic Packet";
;==============================================================================
        "ConnectionType"=dword:0
        "FlowControl"=dword:3
        "WakeUp"=dword:0

[HKEY_LOCAL_MACHINE\Comm\AX881781\Parms\TcpIp]
;       "EnableDHCP"=dword:0                     ;Disable DHCP function
;       "IpAddress"="xxx.xxx.xxx.aaa"            ;Define your IP address (xxx.xxx.xxx.aaa)
;       "Subnetmask"="255.255.255.0"             ;Define Submask IP address
;       "DefaultGateway"="xxx.xxx.xxx.bbb"       ;Define Gateway IP address
;       "DNS"="xxx.xxx.xxx.ccc"                  ;Define DNS server IP address

        "AutoCfg"=dword:1
        "EnableDHCP"=dword:1                     ;Enable DHCP function
        "UseZeroBroadcast"=dword:0               ;Use zero for broadcast address?
```

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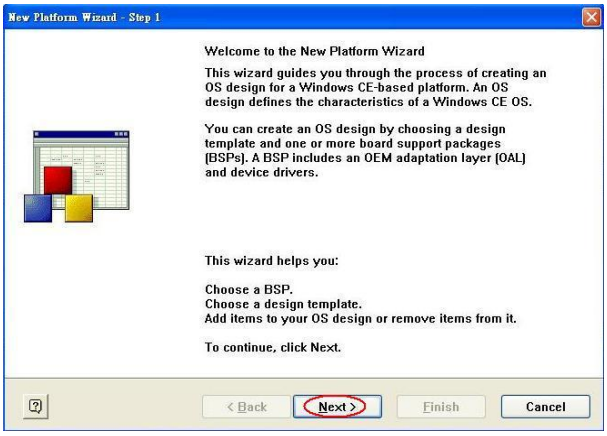
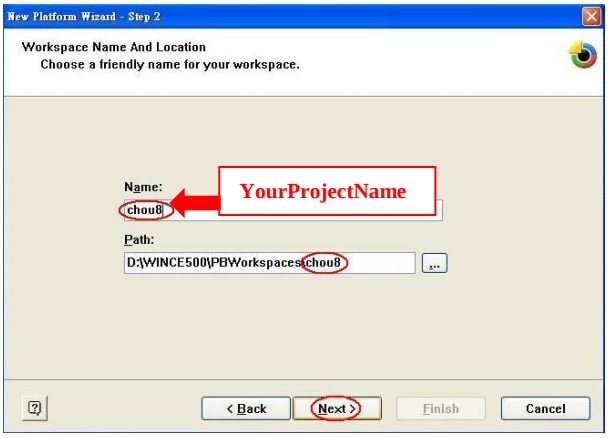
```
;ENDIF BSP_NIC_AX88178
; @CESYSGEN ENDIF BSP_NIC_AX88178
```

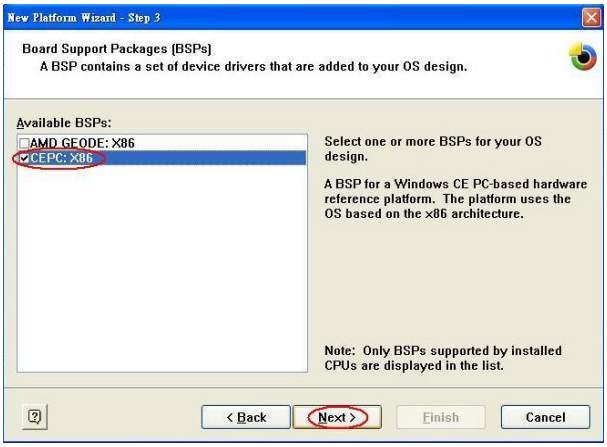
2. Add below AX88178 driver file path and attributes into the $(_WINCEROOT)\PUBLIC \CEBASE\OAK\FILES\PROJECT.BIB file.

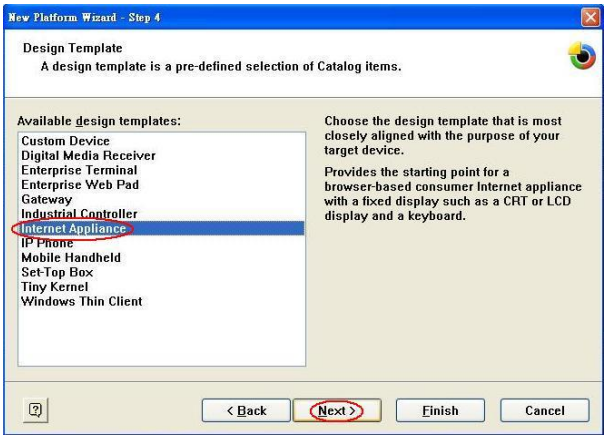
```
MODULES
;  Name          Path                                                    Memory Type
;  --------------  ---------------------------------------------------------  -----------
ax88178.dll       $(_FLATRELEASEDIR)\ax88178.dll                            NK   SH

FILES
;  Name          Path                                  Memory Type
;  --------------  ---------------------------------------------  -----------
```

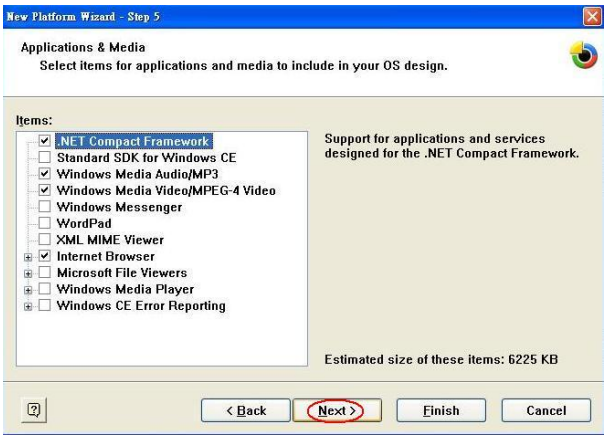
3. Install new platform for your project

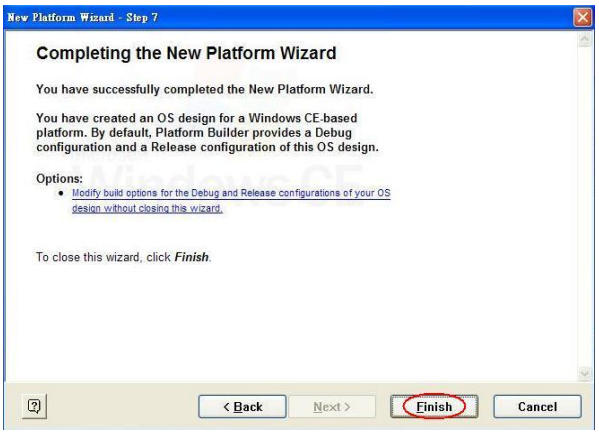












Note: Please check if the PROJECT.REG file in $(_WINCEROOT)\PBWorkspaces \<YourProjectName\>\WINCE500\CEPC_x86\OAK\files subdirectory is included all contents modified in Step 1.

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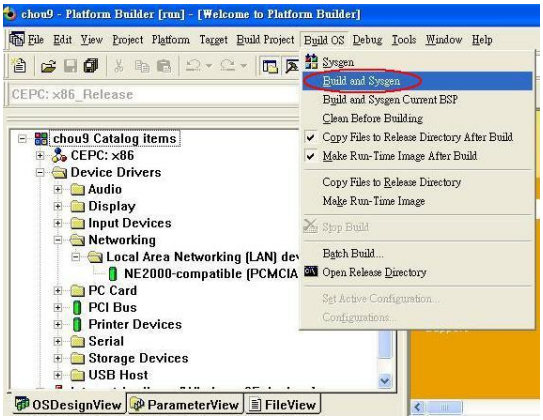
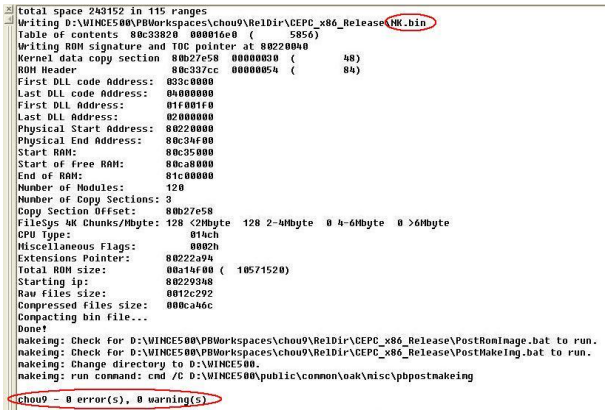
4. Copy AX88178.DLL and **EHCI.DLL** files into the $(_WINCEROOT)\PBWorkspaces \<YourProjectName>\WINCE500\CEPC_x86\OAK\files subdirectory.
5. Choose "Build and Sysgen" from the Build OS menu to build the platform image file (NK.BIN).





6. Startup your CE/PC to get the connection with the Platform Builder.
   6-1. Install a supported Ethernet adapter (like NE2000 ISA card or RTL8139 PCI card) for Ethernet Boot Loader (eboot.bin) and a ASIX AX88178 USB to Fast Ethernet adapter for tested WinCE driver.

> **Note 1: Please set a proper IRQ, IOBASE and IP address in the AUTOEXEC.BAT file of the CE/PC Boot Disk for the Ethernet Boot Loader adapter.**
> **(For PCI card: set to IRQ=0, IOBASE =0 for auto-detection.**
> **For ISA card: set to the same IRQ, IOBASE as the H/W setting.)**

   6-2. Insert the CE/PC Boot Disk into your CE/PC.
   6-3. Power ON the CE/PC.
   6-4. Select "Boot CE/PC (ether via eboot.bin with /L:800x600x16)" from the boot menu.

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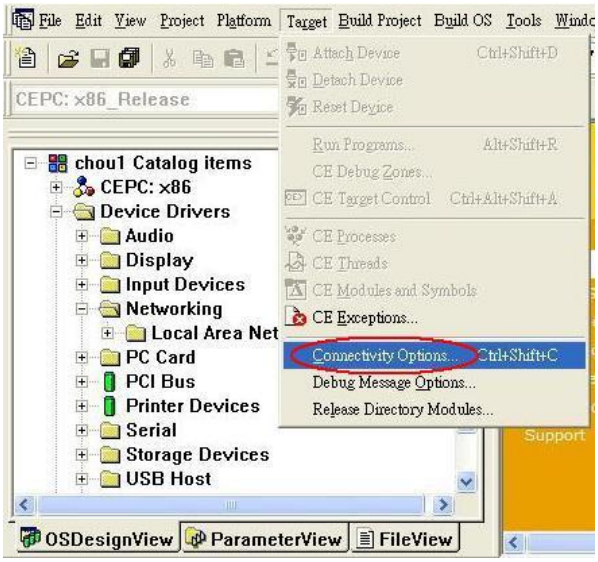
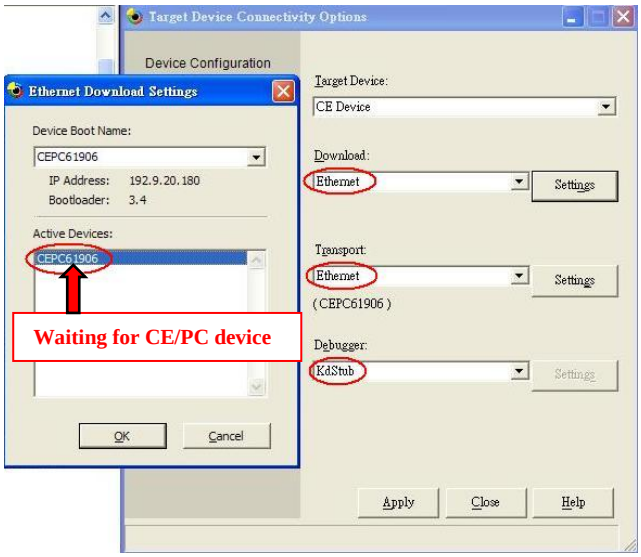
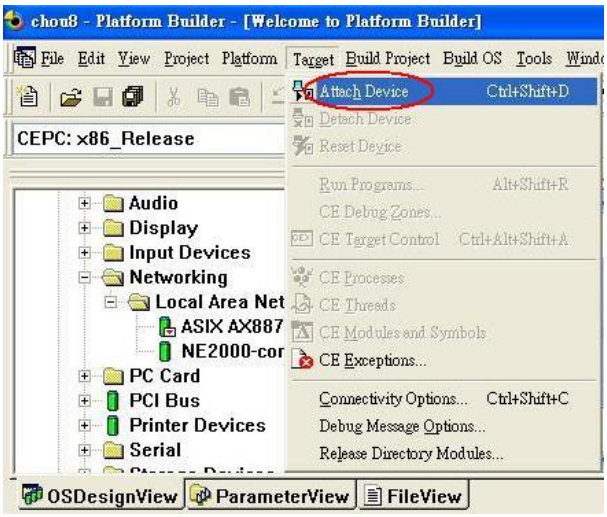
7. Choose “Connectivity Options” from the Target menu to configure an Ethernet connection for downloading and debugging the image file.
   7-1. Select “Ethernet” in the drop-down menu titled “Download”.
   7-2. Select “Ethernet” in the drop-down menu titled “Transport”.
   7-3. Click “Settings” button associated with the “Download” option.
   This will open a new dialog to wait for the available CEPC devices.
   7-4. Select “KbStub” in the drop-down menu titled “Debugger”.





8. Choose “Attach Device” from the Target menu to start downloading the Platform Image file onto the CE/PC.



9. After the image file is downloaded successfully, the CE/PC will be booted up to WinCE operation system by running the Platform Image file.
10. Run Ping command to verify the network connection function.

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5. Modify Driver Parameters:

1. Modify the AX88178 registry values from the $(_WINCEROOT)\PBWorkspaces \<YourProjectName>\RelDir\CEPC_x86_Release\PROJECT.REG file.

```
; @CESYSGEN IF BSP_NIC_AX88178
;IF BSP_NIC_AX88178
[HKEY_LOCAL_MACHINE\Drivers\USB\LoadClients\2965_6016\Default\Default\AX88178]
        "DLL"="AX88178.DLL"
        "Prefix"="NDS"

[HKEY_LOCAL_MACHINE\Drivers\USB\ClientDrivers\AX88178]
        "DLL"="AX88178.DLL"
        "Prefix"="NDS"

[HKEY_LOCAL_MACHINE\Comm\AX88178]
        "DisplayName"="ASIX AX88178 USB 2.0 Gigabit Ethernet Driver"
        "Group"="NDIS"
        "ImagePath"="AX88178.dll"

[HKEY_LOCAL_MACHINE\Comm\AX88178\Linkage]
        "Route"=multi_sz:"AX881781"

[HKEY_LOCAL_MACHINE\Comm\AX881781]
        "DisplayName"="ASIX AX88178 USB 2.0 Gigabit Ethernet Driver"
        "Group"="NDIS"
        "ImagePath"="AX88178.dll"

[HKEY_LOCAL_MACHINE\Comm\AX881781\Parms]
        "BusNumber"=dword:0
        "BusType"=dword:1
;       "NetworkAddress"="02-12-34-56-78-9a"     ;Define an override MAC address 02-12-34-56-78-9a

;==============================================================================
; AX88178 Driver Parameters:
;   "ConnectionType" ==> 0 = "AutoSense"; 2 = "10BaseT Half_Duplex"; 3 = "10BaseT Full_Duplex"
;                         8 = "100BaseTx Half_Duplex"; 9 = "100BaseTx Full_Duplex"
;                        17 = "1000BaseT Full_Duplex"
;   "FlowControl"     ==> 0 = "Disable"; 1 = "TX PAUSE"; 2 = "RX PAUSE"; 3 = "Enable"
;   "WakeUp"          ==> 0 = "Disable"; 2 = "Link-up"; 4 = "Magic Packet";
;                         6 = "Link-up" & "Magic Packet";
;==============================================================================
        "ConnectionType"=dword:0
        "FlowControl"=dword:3
        "WakeUp"=dword:0

[HKEY_LOCAL_MACHINE\Comm\AX881781\Parms\TcpIp]
;       "EnableDHCP"=dword:0                     ;Disable DHCP function
;       "IpAddress"="xxx.xxx.xxx.aaa"            ;Define your IP address (xxx.xxx.xxx.aaa)
;       "Subnetmask"="255.255.255.0"             ;Define Submask IP address
;       "DefaultGateway"="xxx.xxx.xxx.bbb"       ;Define Gateway IP address
;       "DNS"="xxx.xxx.xxx.ccc"                  ;Define DNS server IP address

        "AutoCfg"=dword:1
        "EnableDHCP"=dword:1                     ;Enable DHCP function
        "UseZeroBroadcast"=dword:0               ;Use zero for broadcast address?
```

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```
;ENDIF BSP_NIC_AX88178
; @CESYSGEN ENDIF BSP_NIC_AX88178
```

2. Choose “Make Run-Time Image” from the Build OS menu to build a new platform image (NK.BIN) to take effect the new settings.

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6. Update WinCE 5.0 USB 2.0 HCD Driver (EHCI.DLL)

The default USB 2.0 HCD driver (EHCI) of Windows CE 5.0 Platform Builder couldn't handle the USB 2.0 device Hot-Swap event well while there is a pending transfer. It will cause the USB 2.0 device driver couldn't be loaded successfully after hot-swapping the device for a couple of times because the physical memory (TD buffers) resources are not released by the USB 2.0 HCD driver when the USB 2.0 device is unplugged while there is a pending transfer. This bug has been confirmed by Microsoft and will be fixed in the future version of Windows CE 5.0.

Solution:

1. ASIX provides an updated EHCI.DLL file for standard X86 CE/PC platform.

   1-1. Copy the updated **EHCI.DLL** file into the $(_WINCEROOT)\PBWorkspaces \<YourProjectName>\RelDir\CEPC_x86_Release subdirectory.
   1-2. Run "Make Run-Time Image" to create the NK.BIN image file.

2. Customer manually modifies the **cpipe.cpp** file in the $(_WINCEROOT)\PUBLIC \COMMON\OAK\DRIVERS\USB\HCD\USB20\EHCI subdirectory and rebuild a new EHCI.DLL driver for their specific WinCE BSP platform.

   2-1. Modify the **cpipe.cpp** file in the $(_WINCEROOT)\PUBLIC\COMMON \OAK\DRIVERS\USB\HCD\USB20\EHCI subdirectory to remove below two statements.

<<< In the cpipe.cpp file >>>

```
void  CQueuedPipe::AbortQueue( void )
{
   ….
   ASSERT( m_pUnQueuedTransfer == NULL);
   if (m_pQueuedTransfer) {
      RemoveQHeadFromQueue();
//      m_pQueuedTransfer;                    //Remove this line
      m_pQueuedTransfer ->AbortTransfer();
      GetQHead()->InvalidNextTD();
      m_pCEhcd->AsyncBell();// Ask HC update internal structure.
      Sleep(2);// this sleep is for Interrupt Pipe;
      m_pQueuedTransfer->DoneTransfer();
//      m_pQueuedTransfer =  NULL;            //Remove this line
      delete m_pQueuedTransfer;
      m_pQueuedTransfer = NULL;
      InsertQHeadToQueue() ;
   }
   ASSERT(m_pQueuedTransfer == NULL);
   ….
}
```

   2-2. Rebuild EHCI driver by select "Build and Sysgen Current Project" from **usb20** project menu. (See below picture)

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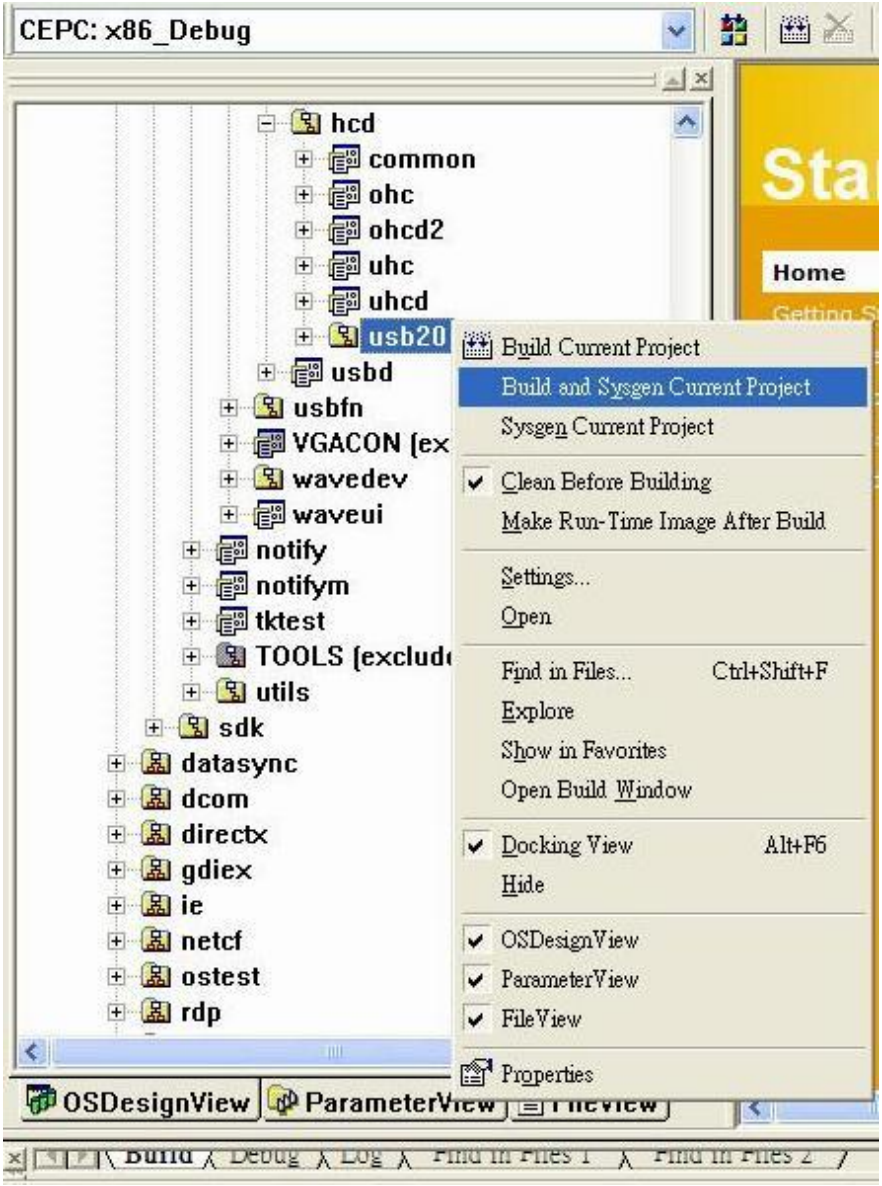

2-3. Check if the EHCI.DLL file in the $(_WINCEROOT)\PBWorkspaces \<YourProjectName>\RelDir\CEPC_x86_Release subdirectory is updated successfully or not.

2-4. Run "Make Run-Time Image" to create the NK.BIN image file.

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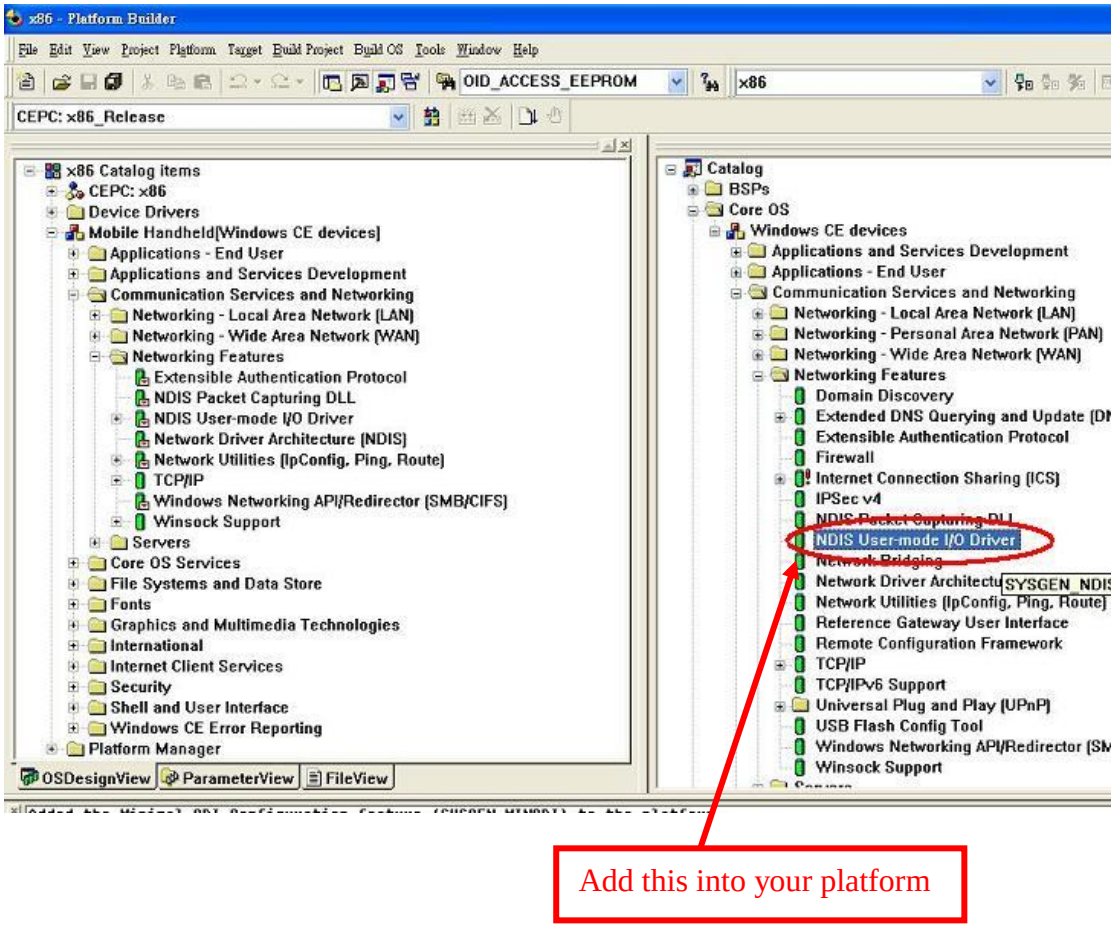
7. How to configure WinCE 5.0 to run the SROM Programming Tool?

Before running AX88178 SROM Programming Tool (eeprom.exe), users need to add the "NDIS user mode I/O driver" in the WinCE 5.0 platform and then select "Build and Sysgen" from "Build OS" menu to rebuild the boot image file.



8. How to support AX88178 board with different Vendor ID/Product ID?

The AX88178 WinCE 5.0 driver supports AX88178's default VID/PID (0B95h/1780h). If the VID/PID of your AX88178 board are different from AX88178's VID/PID, please follow below procedures to change the VID/PID registry setting of AX88178 WinCE 5.0 driver to support your AX88178 board.

8-1. Change the VID/PID setting from the Registry File

1. Add the following registry setting highlighted in below blue text in the $(_WINCEROOT)\PBWorkspaces\<YourProjectName>\RelDir\CEPC_x86_Release\PROJECT.REG file, and then change the VID/PID registry setting to meet the real VID/PID of your AX88178 board.

Note:

1. The VID/PID registry values in the PROJECT.REG file are demonstrated in **"decimal"** numbers. For example, the "2965" means 0B95h in a hexadecimal number; meanwhile, the "6016" means 1780h in a hexadecimal number. The VID/PID registry setting "2965_6016" is for AX88178's default VID/PID (0B95h/1780h).
2. Since the behavior of WinCE may not truncate the first zero "0"for decimal number in the registry, users MUST skip the first "0" digital number(s) when modify the "project.reg." For example, if your VID is C07Ah (49274) and PID is 0039h (0057), you have to fill in,
   [HKEY_LOCAL_MACHINE\Drivers\USB\LoadClients**49274_57**\Default\Default\AX88178] but not
   [HKEY_LOCAL_MACHINE\Drivers\USB\LoadClients**49274_0057**\Default\Default\AX88178].

```
; @CESYSGEN IF BSP_NIC_AX88178
;IF BSP_NIC_AX88178
[HKEY_LOCAL_MACHINE\Drivers\USB\LoadClients\49274_41591\Default\Default\AX88178]
        "DLL"="AX88178.DLL"
        "Prefix"="ASX"
```

Change to the VID/PID value of your AX88178 board.
(The VID is C07Ah and the PID is A277h in this example.)

```
[HKEY_LOCAL_MACHINE\Drivers\USB\LoadClients\2965_6016\Default\Default\AX88178]
        "DLL"="AX88178.DLL"
        "Prefix"="NDS"

[HKEY_LOCAL_MACHINE\Drivers\USB\ClientDrivers\AX88178]
        "DLL"="AX88178.DLL"
        "Prefix"="NDS"

[HKEY_LOCAL_MACHINE\Comm\AX88178]
        "DisplayName"="ASIX AX88178 USB 2.0 Gigabit Ethernet Driver"
        "Group"="NDIS"
        "ImagePath"="AX88178.dll"

[HKEY_LOCAL_MACHINE\Comm\AX88178\Linkage]
        "Route"=multi_sz:"AX881781"

[HKEY_LOCAL_MACHINE\Comm\AX881781]
```

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```
        "DisplayName"="ASIX AX88178 USB 2.0 Gigabit Ethernet Driver"
        "Group"="NDIS"
        "ImagePath"="AX88178.dll"

[HKEY_LOCAL_MACHINE\Comm\AX881781\Parms]
        "BusNumber"=dword:0
        "BusType"=dword:1
;       "NetworkAddress"="02-12-34-56-78-9a"     ;Define an override MAC address 02-12-34-56-78-9a

;==============================================================================
; AX88178 Driver Parameters:
;   "ConnectionType" ==> 0 = "AutoSense"; 2 = "10BaseT Half_Duplex"; 3 = "10BaseT Full_Duplex"
;                         8 = "100BaseTx Half_Duplex"; 9 = "100BaseTx Full_Duplex"
;                        17 = "1000BaseT Full_Duplex"
;   "FlowControl"      ==> 0 = "Disable"; 1 = "TX PAUSE"; 2 = "RX PAUSE"; 3 = "Enable"
;==============================================================================
        "ConnectionType"=dword:0
        "FlowControl"=dword:3


[HKEY_LOCAL_MACHINE\Comm\AX881781\Parms\TcpIp]
;       "EnableDHCP"=dword:0                     ;Disable DHCP function
;       "IpAddress"="xxx.xxx.xxx.aaa"            ;Define your IP address (xxx.xxx.xxx.aaa)
;       "Subnetmask"="255.255.255.0"             ;Define Submask IP address
;       "DefaultGateway"="xxx.xxx.xxx.bbb"       ;Define Gateway IP address
;       "DNS"="xxx.xxx.xxx.ccc"                  ;Define DNS server IP address

        "AutoCfg"=dword:1
        "EnableDHCP"=dword:1                     ;Enable DHCP function
        "UseZeroBroadcast"=dword:0               ;Use zero for broadcast address?

;ENDIF BSP_NIC_AX88178
; @CESYSGEN ENDIF BSP_NIC_AX88178
```

2. Choose **Build OS>Make Run-Time Image** to build a new platform image (NK.BIN) to take effect the new settings.

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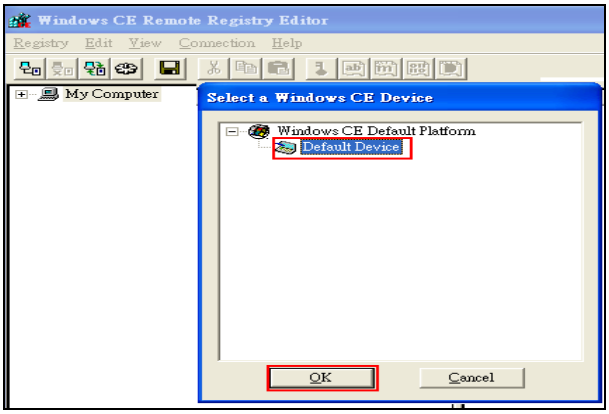
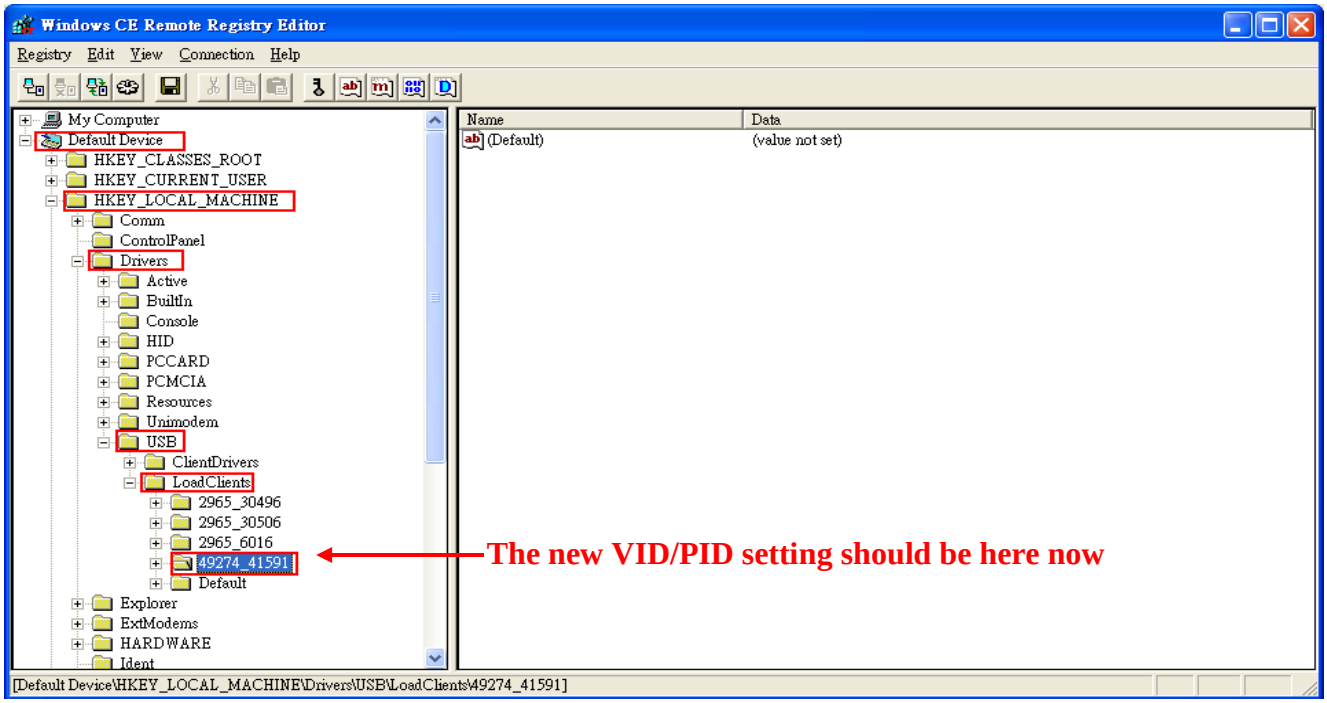
8-2. Check the modified VID/PID in WinCE Remote Registry Editor

After changed the VID/PID registry setting on your WinCE image file, you can follow the following procedures to double check if the new VID/PID setting was taken effect properly.

1. When the image has been built, click **Target>Attach Device** to download the Platform Image file onto the CE/PC.
2. After the image file is downloaded successfully, the CE/PC will be booted up to WinCE operation system by running the Platform Image file.
3. Establish the connection with CE/PC.
4. Click **Tools>Remote Registry** Editor. A pop-up window, **Select a Windows CE Device**, is shown on the screen. Select **Default Device** and click **OK**.



5. The **Default Device** icon will be shown up. Click **HKEY_LOCAL_MACHINE>Drivers>USB>LoadClients**. You will see your own VID/PID under **HKEY_LOCAL_MACHINE>Drivers>USB>LoadClients**.



8-3. Change the VID/PID setting from WinCE Remote Registry Editor manually

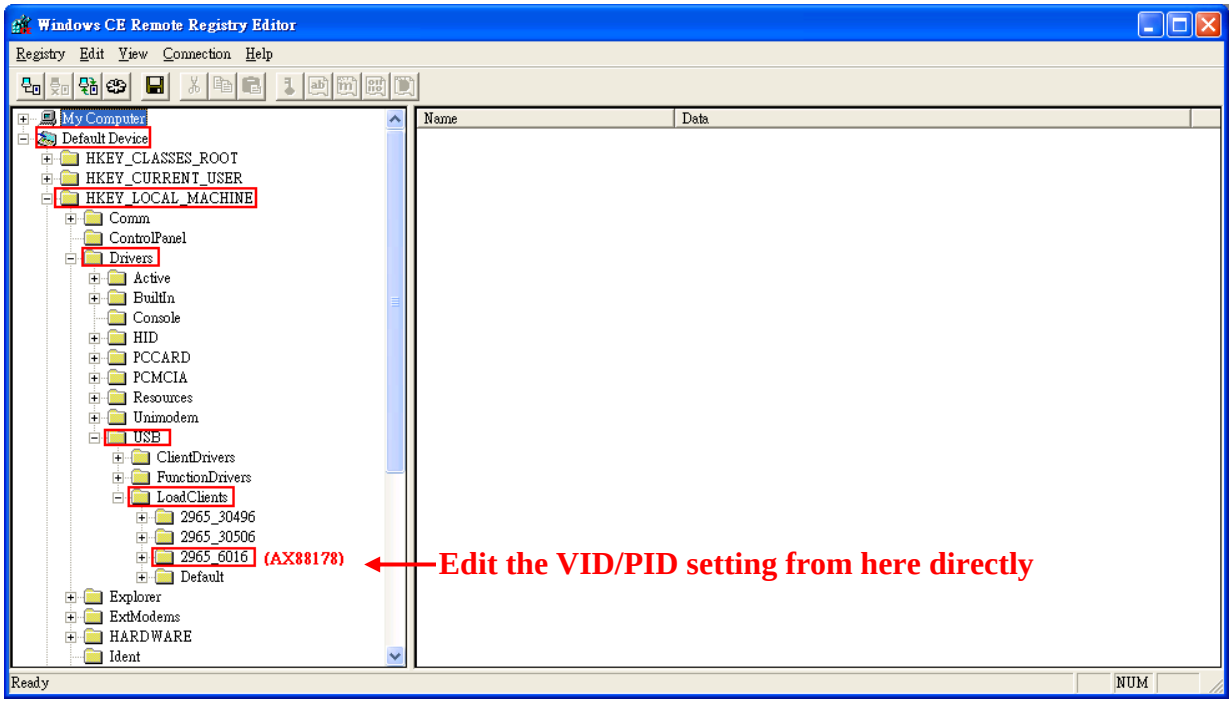
The following method illustrates how to change the VID/PID registry setting of AX88178 WinCE 5.0 driver from the WinCE Remote Registry Editor directly.

Note: This is a temporary configuration for testing purpose and will be reset to the default registry setting of WinCE 5.0 platform boot image file after rebooting the WinCE 5.0 platform. Please refer to Section 8-1 Change the VID/PID setting from the Registry File to modify the VID/PID registry setting of AX88178 WinCE 5.0 driver from the register file (PROJECT.REG) for official release purpose.

1. Follow Step #1 to Step #5 in Section 8-2 Check the modified VID/PID in WinCE Remote Registry Editor to establish the WinCE Remote Registry Editor connection with your WinCE 5.0 platform.

2. Modify the VID/PID registry under **HKEY_LOCAL_MACHINE>Drivers>USB>LoadClients** to meet the real VID/PID of your AX88178 board.

   Example: The VID/PID of your AX88178 board is **C07Ah/A277h** respectively.
   You should adjust the following "**2965_6016**" registry value to "**49274_41591**".
   (Please refer to the WinCE registry VID/PID setting note in Section 8-1 for more details.)



3. Un-plug/re-plug your AX88178 board with VID (C07Ah)/PID (A277h) in this example. The AX88178 WinCE 5.0 driver should work fine with your AX88178 board now.

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9. Known Errata:

None.

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