1. Product Information:

The AX88772A/AX88772 Controller is a single chip USB 2.0 to Fast Ethernet Controller. This is an AX88772A/AX88772 NDIS driver for WinCE 6.0 embedded system. It has been qualified under WinCE 6.0 CETK on an Intel Pentium 4 2.8GHz system with a NEC D720100AGM USB 2.0 PCI Host adapter running WinCE 6.0 CEPC X86 Platform Image.

2. Files Descriptions:

The AX88772A/AX88772 WinCE driver package includes the files as described below,

RELEASE.PDF	This file
AX88772.DLL	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

3. Revision History:

Revision	Author	Date	Description
v1.2.17.0	Alex	2011/12/08	1. Fix the plug/un-plug issue. 2. Fix the DHCP issue on the Mentor Ranger. 3. Fix an issue where the driver stays looping sometimes when putting the system into suspend mode.
v1.2.16.0	Kater	2011/08/18	1. Fix plug/unplug issue when device initialize.
v1.2.15.0	Kater	2011/05/28	1. Using the critical section to protect the usb detach and usb attach. 2. In addition to srom read/write, no longer use critical section to protect other vendor command operations. 3. Fix multi-adapter suspend/resume issue. 4. Fix issue of ping command with specific packet size.
v1.2.14.0	Francis	2010/10/18	1. Add wait events in the TX/RX bulk transfer complete routines and Interrupt transfer complete routine to wait for "lpIssueBulkTransfer" to return the transfer handler if the complete routine had been called before "lpIssueBulkTransfer" returned.
v1.2.13.0	Francis	2010/05/25	1. Change the PHY power up process delay time from 60ms to 600ms. 2. Fix the second adapter driver fail issue if multi adapters plug in multi host controllers.
v1.2.12.0	Francis	2010/02/25	1. In some platforms, send a bulk request in a bulk complete routine will cause some problems. Set a timer in the bulk complete routine to send a bulk request.
v1.2.11.0	Francis	2009/12/16	1. Adjust the Bulk request failed retry delay time from 0ms to 100ms to avoid taking up CPU resources and crash issue when shutdown and restart.
v1.2.10.0	Francis	2009/12/10	1. Fix the vendor command failed issue when the PHY ON/OFF procedure and the EEPROM read/write procedure run simultaneously. 2. Don't call any USB function in the halt routine.
v1.2.9.0	Francis	2009/11/09	1. Fix the AX88772 PHY ON/OFF procedure.
v1.2.8.0	Francis	2009/9/23	1. Improve the throughput. 2. Used EEPROM offset 0x17 to select the power saving mode.

v1.2.7.0	Mark	2009/8/06	1. Support multi-adapter
v1.2.6.0	Mark	2009/6/26	1. Cover the DriverInitialize is called twice issue on some platform.
v1.2.5.0	Mark	2009/5/21	1. Add the version string in DriverInitialize 2. Take out the QueryPerformanceFrequency function call on normal operation.
v1.2.4.0	Mark	2009/04/20	1. Add new algorithm for power saving. 2. Fix compatibility issue with some switch
v1.2.3.0	Mark	2009/03/20	1. Add new power down method to save more power
v1.2.2.0	Mark	2009/03/05	1. Add the PHY ON/OFF sequence. 2. Fix issue of ping command with big packet size
v1.2.1.0	Mark	2009/02/12	1. Improve the performance of USB1.1 interface
v1.2.0.9	Francis	2009/01/06	1. Fix SROM size error when program EEPROM.
v1.2.0.8	Francis	2008/12/02	1. Change interrupt in interval from 1s to 125ms. 2. Register VID/PID 0B95_7720 and 0B95_772A instead of only VID 0B95 in USBInstallDriver routine. 3. 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.
v1.2.0.7	Francis	2008/04/22	1. Tuen on AX88772A backpressure function when enable flow control.
v1.2.0.6	Francis	2007/12/24	1. New release for WinCE 6.0. Build from WinCE 5.0 source v1.0.0.6.

4. Driver Installation:

1. Add below AX88772A/AX88772 registry values into the $(_WINCEROOT)\PUBLIC\ CEBASE\OAK\FILES\PROJECT.REG file.

```
; @CESYSGEN IF BSP_NIC_AX88772
;IF BSP_NIC_AX88772
 [HKEY_LOCAL_MACHINE\Drivers\USB\LoadClients\2965_30496\Default\Default\AX88772]
        "DLL"="AX88772.DLL"
        "Prefix"="ASX"

 [HKEY_LOCAL_MACHINE\Drivers\USB\LoadClients\2965_30506\Default\Default\AX88772]
        "DLL"="AX88772.DLL"
        "Prefix"="ASX"

 [HKEY_LOCAL_MACHINE\Drivers\USB\ClientDrivers\AX88772]
        "DLL"="AX88772.DLL"
        "Prefix"="ASX"

 [HKEY_LOCAL_MACHINE\Comm\AX88772]
        "DisplayName"="ASIX AX88772 USB 2.0 Fast Ethernet Driver"
        "Group"="NDIS"
        "ImagePath"="AX88772.dll"

 [HKEY_LOCAL_MACHINE\Comm\AX88772\Linkage]
        "Route"=multi_sz:"AX887721"

 [HKEY_LOCAL_MACHINE\Comm\AX887721]
        "DisplayName"="ASIX AX88772 USB 2.0 Fast Ethernet Driver"
        "Group"="NDIS"
        "ImagePath"="AX88772.dll"

 [HKEY_LOCAL_MACHINE\Comm\AX887721\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


;======================================================================================
; AX88772 Driver Parameters:
;  "ConnectionType" ==> 0 = "AutoSense"; 2 = "10BaseT Half_Duplex"; 3 = "10BaseT Full_Duplex"
;                       8 = "100BaseTx Half_Duplex"; 9 = "100BaseTx Full_Duplex"
;  "FlowControl"   ==>  0 = "Disable"; 1 = "TX PAUSE"; 2 = "RX PAUSE"; 3 = "Enable"
;  "wakeup"        ==>  0 = "Disable"; 2 = "Link-up"; 4 = "Magic Packet"; 8 = "Wakeup Frame"
;                       6 = "Link-up" & "Magic Packet";
;                      10 = "Link-up" & "Wakeup Frame";
;                      12 = "Magic Packet" & "Wakeup Frame";
;                      14 = "All"
;                       ps: "Wakeup Frame" is only for AX88772A chip
;======================================================================================
        "ConnectionType"=dword:0
        "FlowControl"=dword:3
        "WakeUp"=dword:0
;=====================================================
;the follow only for AX88772A chip
;=====================================================
```

```
        "WakeUpFrameType"=dword:3               ; 1 = "Ping"; 2 = "ARP"; 3 = "All";
        "VlanEnable"=dword:0                    ; 0 = "Disable"; 1 = "Enable";
        "VlanId"=dword:0                        ; 0 - 4095

  [HKEY_LOCAL_MACHINE\Comm\AX887721\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_AX88772
  ; @CESYSGEN ENDIF BSP_NIC_AX88772
```
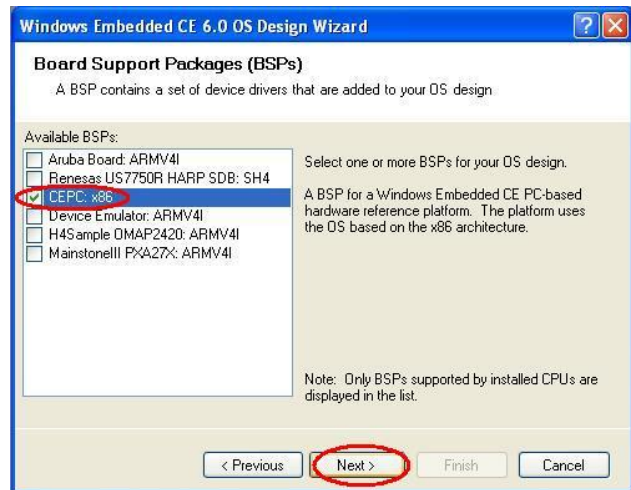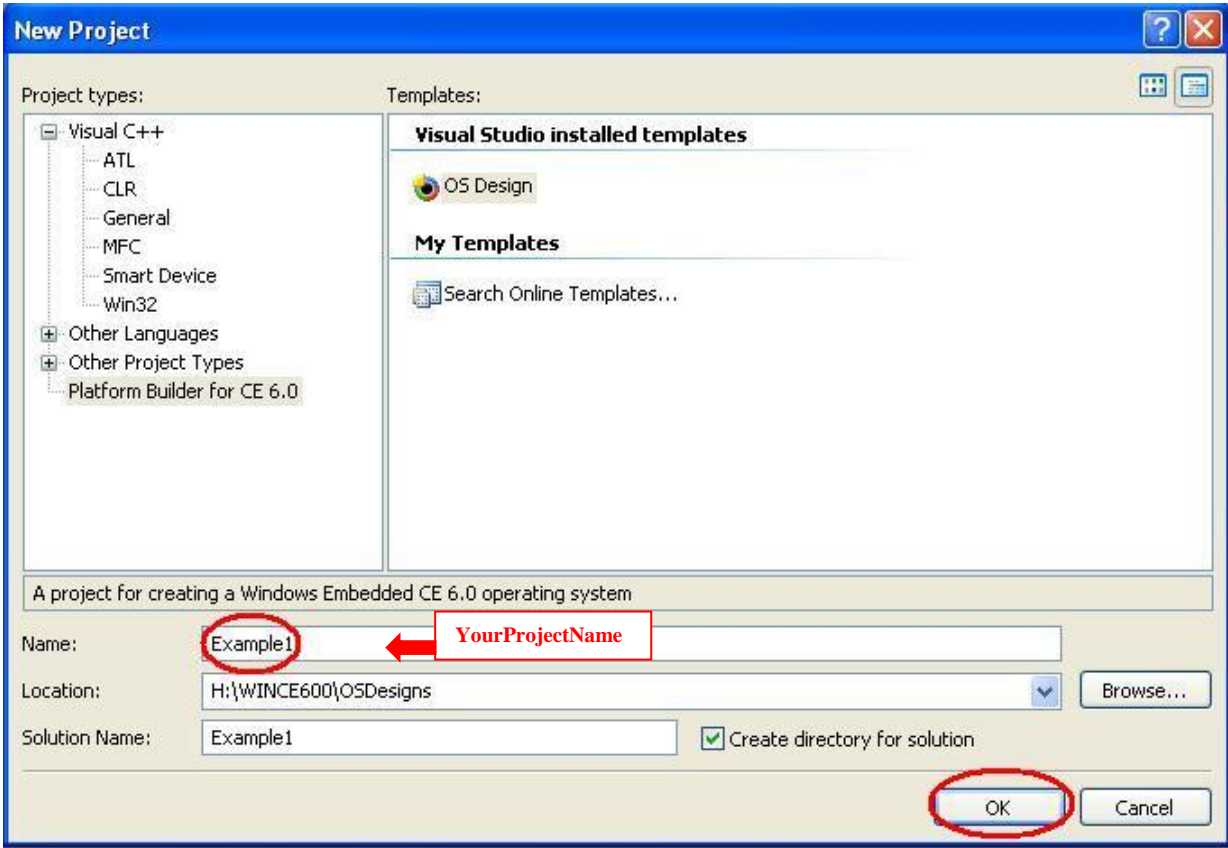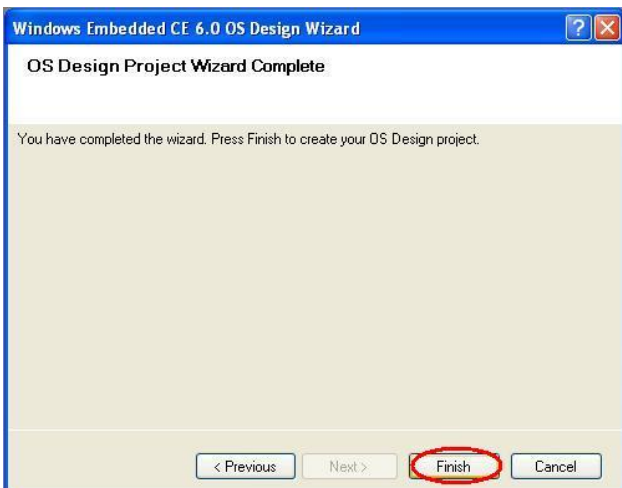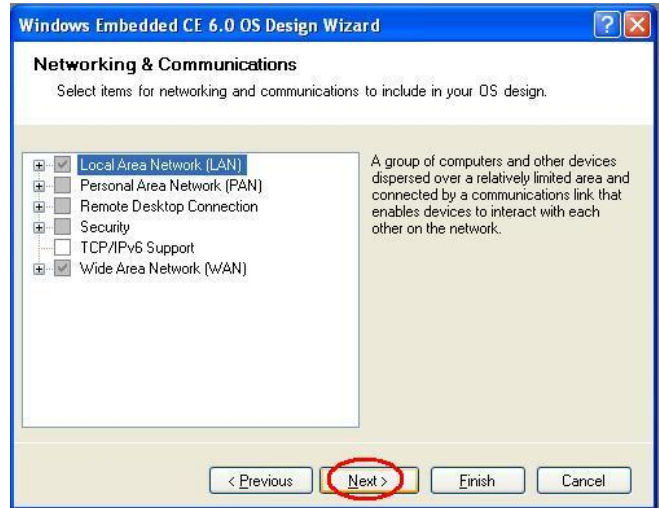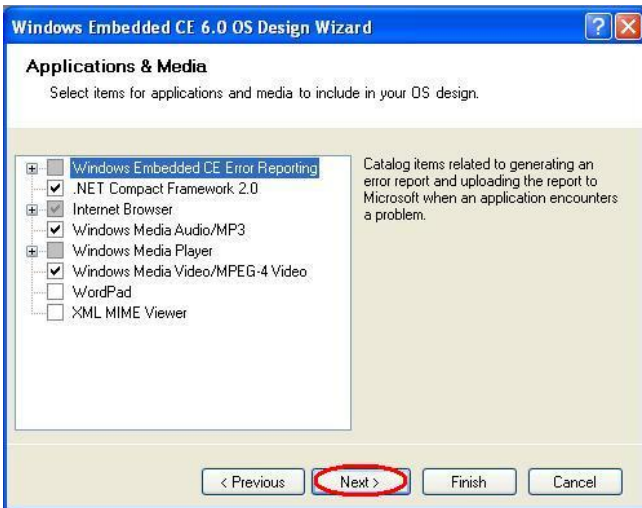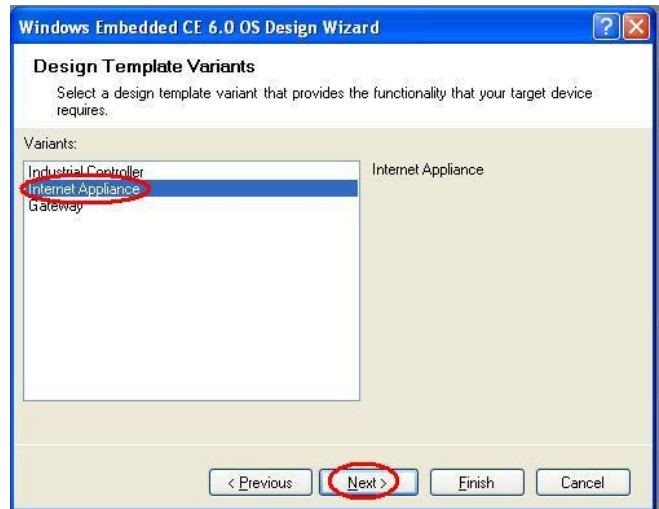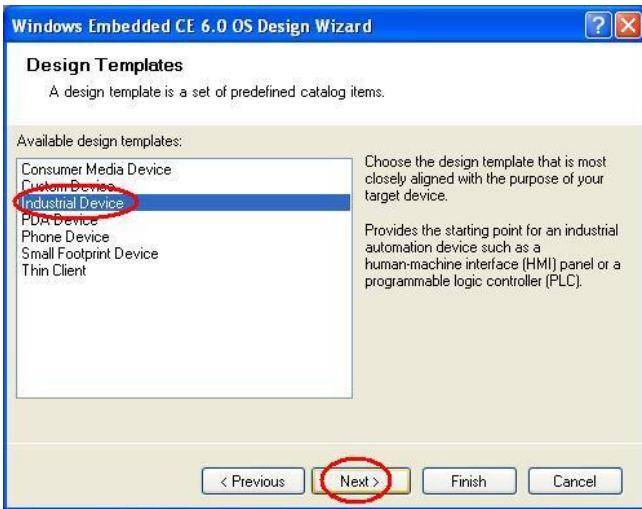
2. Add below AX88772A/AX88772 driver file path and attributes into the $(_WINCEROOT)
   \PUBLIC\CEBASE\OAK\FILES\PROJECT.BIB file.

```
  MODULES
  ; Name           Path                                                 Memory Type
  ; -------------- ------------------------------------------------ -----------
  ax88772.dll      $(_FLATRELEASEDIR)\ax88772.dll          NK   SHK

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

3. Install new platform for your project

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Note: Please check if the PROJECT.REG file in $(_WINCEROOT)\OSDesigns
\<YourProjectName>\<YourProjectName>\WINCE600\CEPC_x86\OAK\files
subdirectory is included all contents modified in Step 1.

4. Copy AX88772.DLL file into the $(_WINCEROOT)\OSDesigns\<YourProjectName>
   \<YourProjectName>\WINCE600\CEPC_x86\OAK\files subdirectory.

5. Choose "Build and Sysgen" from the Build OS menu to build the platform image file
   (NK.BIN).
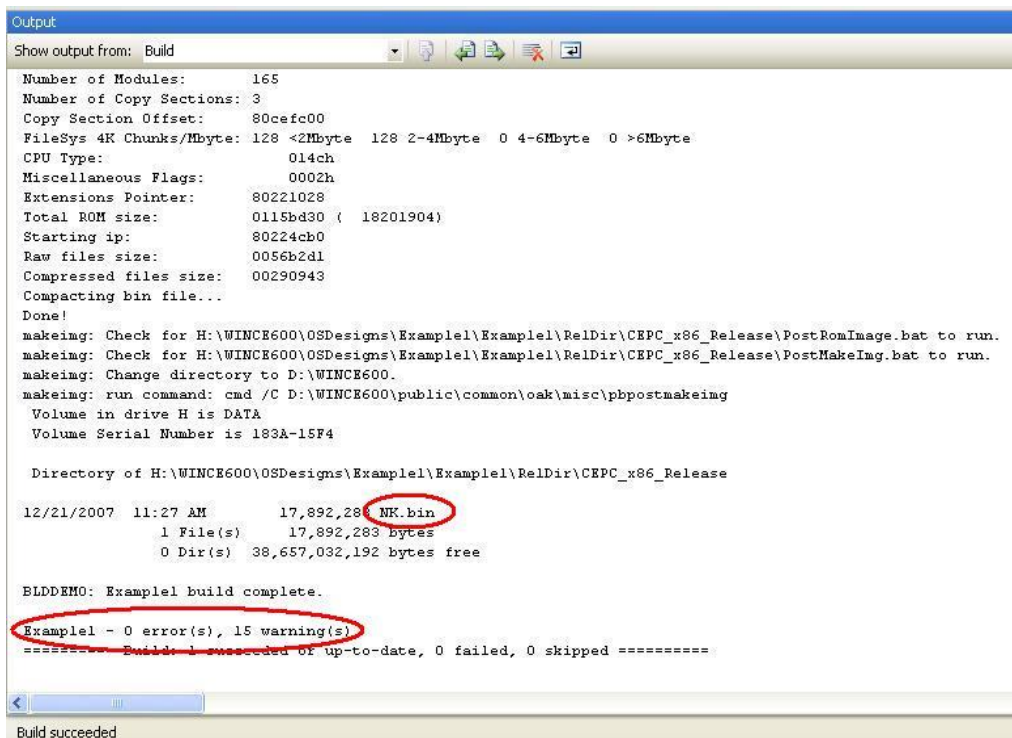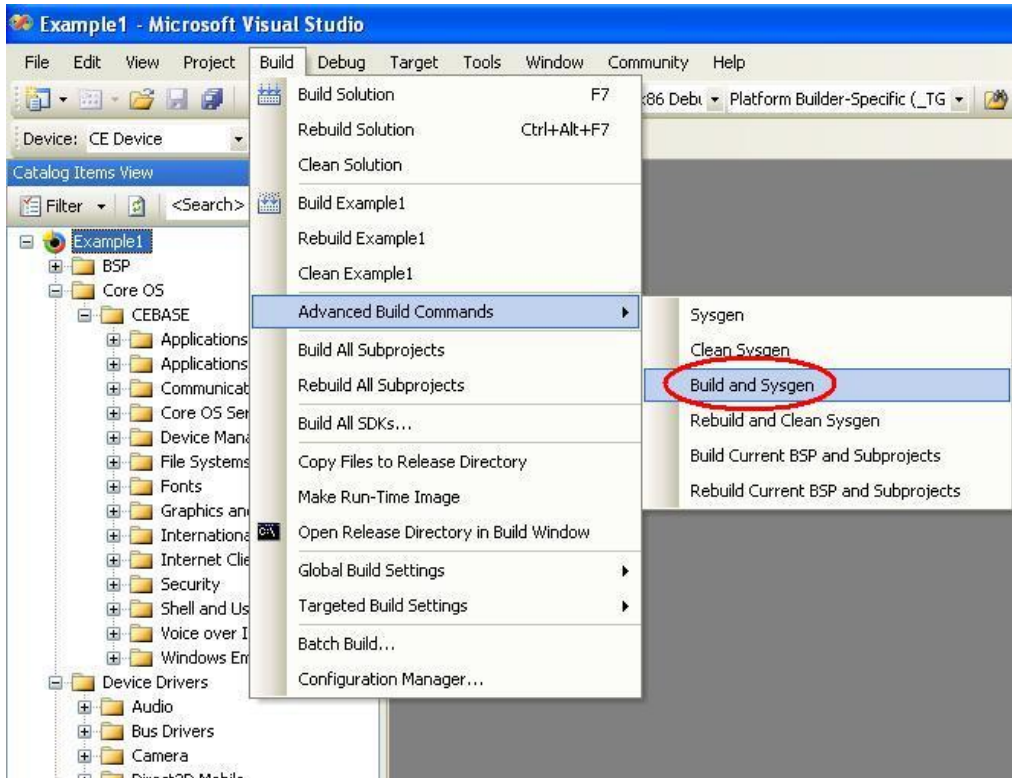
6. Startup your CE/PC to get the connection.
    6-1. Install a supported Ethernet adapter (like NE2000 ISA card or RTL8139 PCI card) for Ethernet Boot Loader (eboot.bin) and a ASIX AX88772A/AX88772 USB to Fast Ethernet adapter for tested WinCE driver.

> **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.

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 "None" in the drop-down menu titled "Debugger".
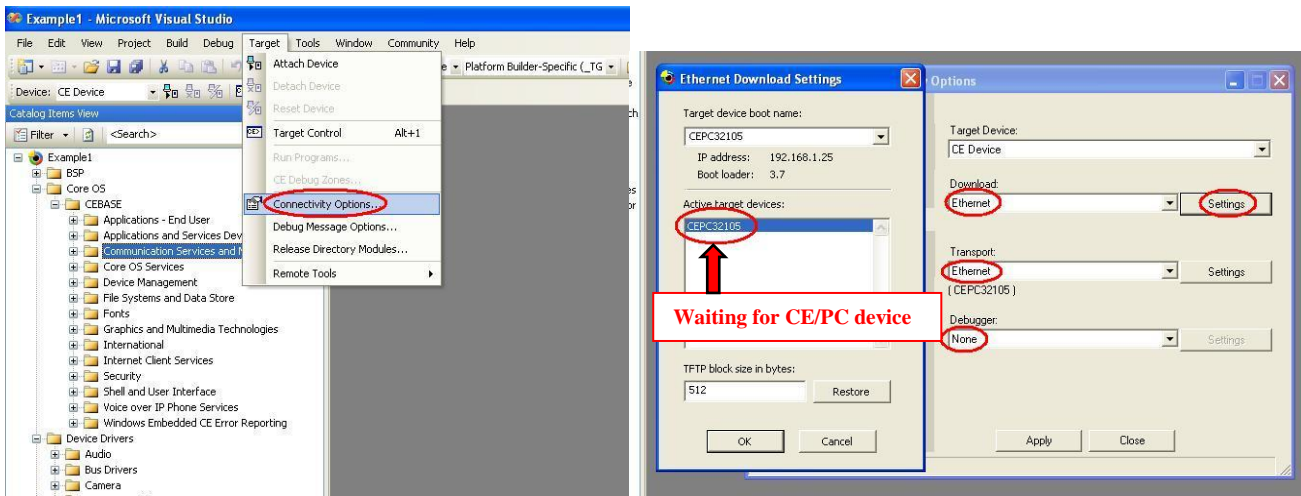
8. Choose "Attach Device" from the Target menu to start downloading the Platform Image file onto the CE/PC.
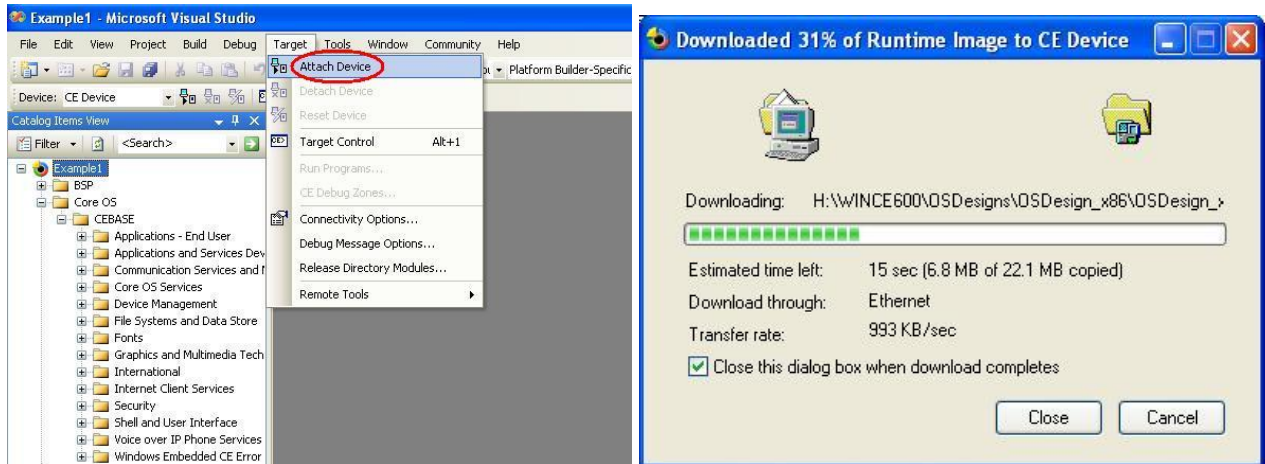
9. After the image file is downloaded successfully, the CE/PC will be booted up to WinCE operation system by running the Platform Image file.

10. Run Ping command to verify the network connection function.

5. Modify Driver Parameters:

1. Modify the AX88772A/AX88772 registry values from the $(_WINCEROOT)\OSDesigns \<YourProjectName>\<YourProjectName>\RelDir\CEPC_x86_Release\PROJECT.REG file.

```
; @CESYSGEN IF BSP_NIC_AX88772
;IF BSP_NIC_AX88772
[HKEY_LOCAL_MACHINE\Drivers\USB\LoadClients\2965_30496\Default\Default\AX88772]
      "DLL"="AX88772.DLL"
      "Prefix"="ASX"

[HKEY_LOCAL_MACHINE\Drivers\USB\LoadClients\2965_30506\Default\Default\AX88772]
      "DLL"="AX88772.DLL"
      "Prefix"="ASX"

[HKEY_LOCAL_MACHINE\Drivers\USB\ClientDrivers\AX88772]
      "DLL"="AX88772.DLL"
      "Prefix"="ASX"

[HKEY_LOCAL_MACHINE\Comm\AX88772]
      "DisplayName"="ASIX AX88772 USB 2.0 Fast Ethernet Driver"
      "Group"="NDIS"
      "ImagePath"="AX88772.dll"

[HKEY_LOCAL_MACHINE\Comm\AX88772\Linkage]
      "Route"=multi_sz:"AX887721"

[HKEY_LOCAL_MACHINE\Comm\AX887721]
      "DisplayName"="ASIX AX88772 USB 2.0 Fast Ethernet Driver"
      "Group"="NDIS"
      "ImagePath"="AX88772.dll"

[HKEY_LOCAL_MACHINE\Comm\AX887721\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


;===========================================================================
; AX88772 Driver Parameters:
;  "ConnectionType" ==> 0 = "AutoSense"; 2 = "10BaseT Half_Duplex"; 3 = "10BaseT Full_Duplex"
;                       8 = "100BaseTx Half_Duplex"; 9 = "100BaseTx Full_Duplex"
;  "FlowControl"   ==>  0 = "Disable"; 1 = "TX PAUSE"; 2 = "RX PAUSE"; 3 = "Enable"
;  "wakeup"        ==>  0 = "Disable"; 2 = "Link-up"; 4 = "Magic Packet"; 8 = "Wakeup Frame"
;                       6 = "Link-up" & "Magic Packet";
;                       10 = "Link-up" & "Wakeup Frame";
;                       12 = "Magic Packet" & "Wakeup Frame";
;                       14 = "All"
;                        ps: "Wakeup Frame" is only for AX88772A chip
;===========================================================================
      "ConnectionType"=dword:0
      "FlowControl"=dword:3
      "WakeUp"=dword:0
;=======================================================
;the follow only for AX88772A chip
;=======================================================
```

```
        "WakeUpFrameType"=dword:3              ; 1 = "Ping"; 2 = "ARP"; 3 = "All";
        "VlanEnable"=dword:0                   ; 0 = "Disable"; 1 = "Enable";
        "VlanId"=dword:0                       ; 0 - 4095

    [HKEY_LOCAL_MACHINE\Comm\AX887721\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_AX88772
    ; @CESYSGEN ENDIF BSP_NIC_AX88772
```

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.

6. How to configure WinCE 6.0 to run the SROM Programming Tool?

Before running AX88772A/AX88772 SROM Programming Tool (eeprom.exe), users need to add the "NDIS user mode I/O driver" in the WinCE 6.0 platform and then select "Build and Sysgen" from "Build OS" menu to rebuild the boot image file.
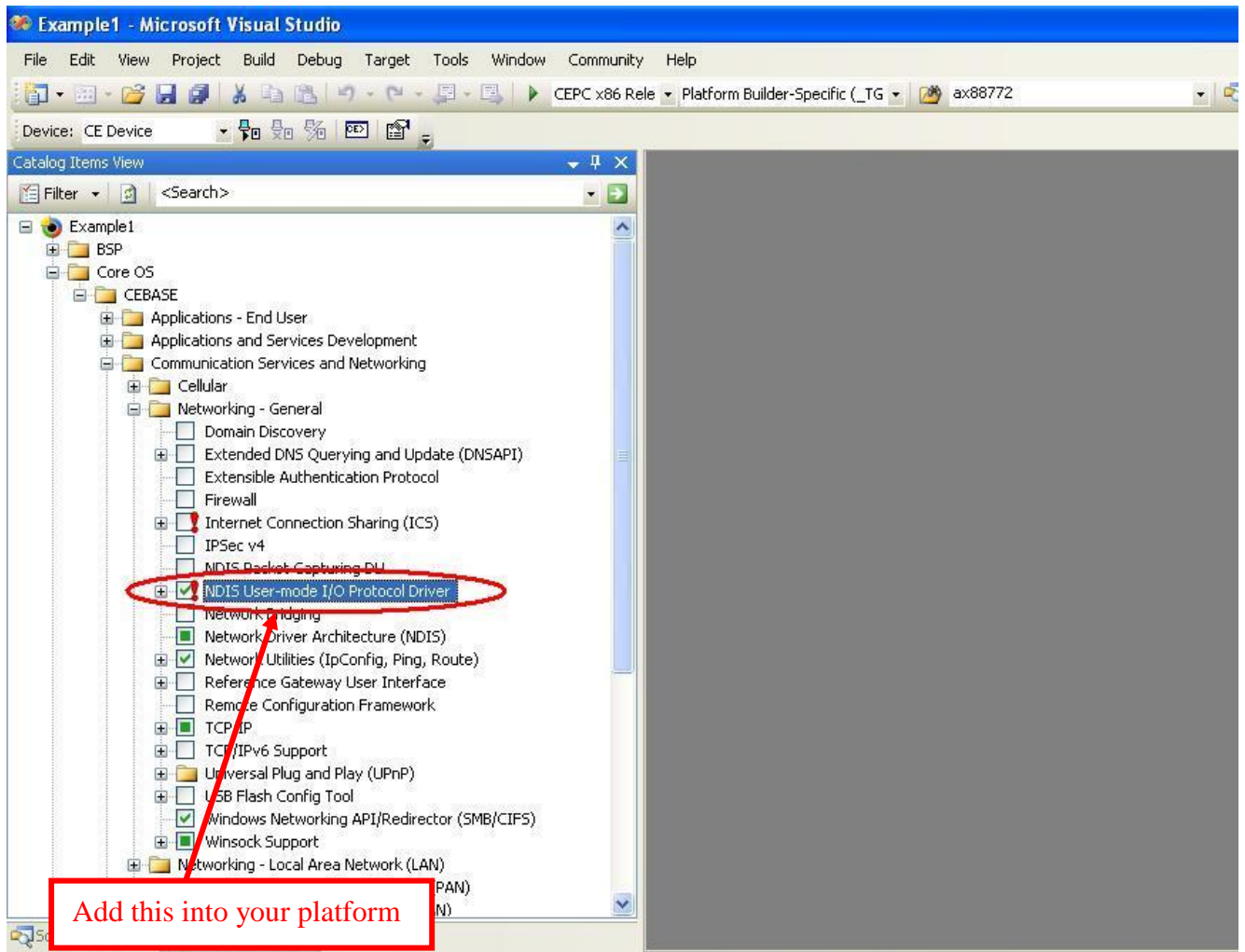
7. How to support AX88772A/AX88772 board with different Vendor ID/Product ID?

The AX88772A/AX88772 WinCE 6.0 driver supports AX88772A's default VID/PID (0B95h/772Ah) and AX88772's default VID/PID (0B95h/7720h). If the VID/PID of your AX88772A/AX88772 board are different from AX88772A's/AX88772's VID/PID, please follow below procedures to change the VID/PID registry setting of AX88772A/AX88772 WinCE 6.0 driver to support your AX88772A/AX88772 board.

7-1. Change the VID/PID setting from the Registry File

1. Add the following registry setting highlighted in below blue text in the $(_WINCEROOT)\ OSDesigns\<YourProjectName>\<YourProjectName>\RelDir\CEPC_x86_Release\PROJECT.REG file, and then change the VID/PID registry setting to meet the real VID/PID of your AX88772A/AX88772 board.

> **Note:** 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 "30496" means 7720h in a hexadecimal number. The VID/PID registry setting "2965_30496" is for AX88772's default VID/PID (0B95h/7720h), and the VID/PID registry setting "2965_30506" is for AX88772A's default VID/PID (0B95h/772Ah).

```
; @CESYSGEN IF BSP_NIC_AX88772
;IF BSP_NIC_AX88772
[HKEY_LOCAL_MACHINE\Drivers\USB\LoadClients\49274_41591\Default\Default\AX88772]
    "DLL"="AX88772.DLL"
    "Prefix"="ASX"
```

Change to the VID/PID value of your AX88772A/AX88772 board. (The VID is C07Ah and the PID is A277h in this example.)

```
[HKEY_LOCAL_MACHINE\Drivers\USB\LoadClients\2965_30496\Default\Default\AX88772]
    "DLL"="AX88772.DLL"
    "Prefix"="ASX"

[HKEY_LOCAL_MACHINE\Drivers\USB\LoadClients\2965_30506\Default\Default\AX88772]
    "DLL"="AX88772.DLL"
    "Prefix"="ASX"

[HKEY_LOCAL_MACHINE\Drivers\USB\ClientDrivers\AX88772]
    "DLL"="AX88772.DLL"
    "Prefix"="ASX"

[HKEY_LOCAL_MACHINE\Comm\AX88772]
    "DisplayName"="ASIX AX88772 USB 2.0 Fast Ethernet Driver"
    "Group"="NDIS"
    "ImagePath"="AX88772.dll"

[HKEY_LOCAL_MACHINE\Comm\AX88772\Linkage]
    "Route"=multi_sz:"AX887721"
```

```
[HKEY_LOCAL_MACHINE\Comm\AX887721]
        "DisplayName"="ASIX AX88772 USB 2.0 Fast Ethernet Driver"
        "Group"="NDIS"
        "ImagePath"="AX88772.dll"

[HKEY_LOCAL_MACHINE\Comm\AX887721\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


;==========================================================================
; AX88772 Driver Parameters:
;   "ConnectionType" ==> 0 = "AutoSense"; 2 = "10BaseT Half_Duplex"; 3 = "10BaseT Full_Duplex"
;                        8 = "100BaseTx Half_Duplex"; 9 = "100BaseTx Full_Duplex"
;   "FlowControl"   ==>  0 = "Disable"; 1 = "TX PAUSE"; 2 = "RX PAUSE"; 3 = "Enable"
;   "wakeup"        ==>  0 = "Disable"; 2 = "Link-up"; 4 = "Magic Packet"; 8 = "Wakeup Frame"
;                       6 = "Link-up" & "Magic Packet";
;                      10 = "Link-up" & "Wakeup Frame";
;                      12 = "Magic Packet" & "Wakeup Frame";
;                      14 = "All"
;                       ps: "Wakeup Frame" is only for AX88772A chip
;==========================================================================
        "ConnectionType"=dword:0
        "FlowControl"=dword:3
        "WakeUp"=dword:0
;=====================================================
;the follow only for AX88772A chip
;=====================================================
        "WakeUpFrameType"=dword:3              ; 1 = "Ping"; 2 = "ARP"; 3 = "All";
        "VlanEnable"=dword:0                   ; 0 = "Disable"; 1 = "Enable";
        "VlanId"=dword:0                       ; 0 - 4095

[HKEY_LOCAL_MACHINE\Comm\AX887721\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_AX88772
; @CESYSGEN ENDIF BSP_NIC_AX88772
```

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

7-2. 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**.
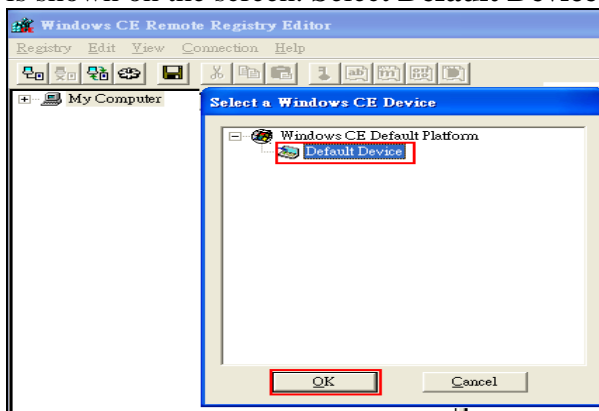
5. The **Default Device** icon will be shown up. Click **HKEY_LOCAL_MACHINE>Drivers>USB>LoadClients**. You will see your own VID/PID under **HKEY_LOCAL_MACHINE>Drivers>USB>LoadClients**.
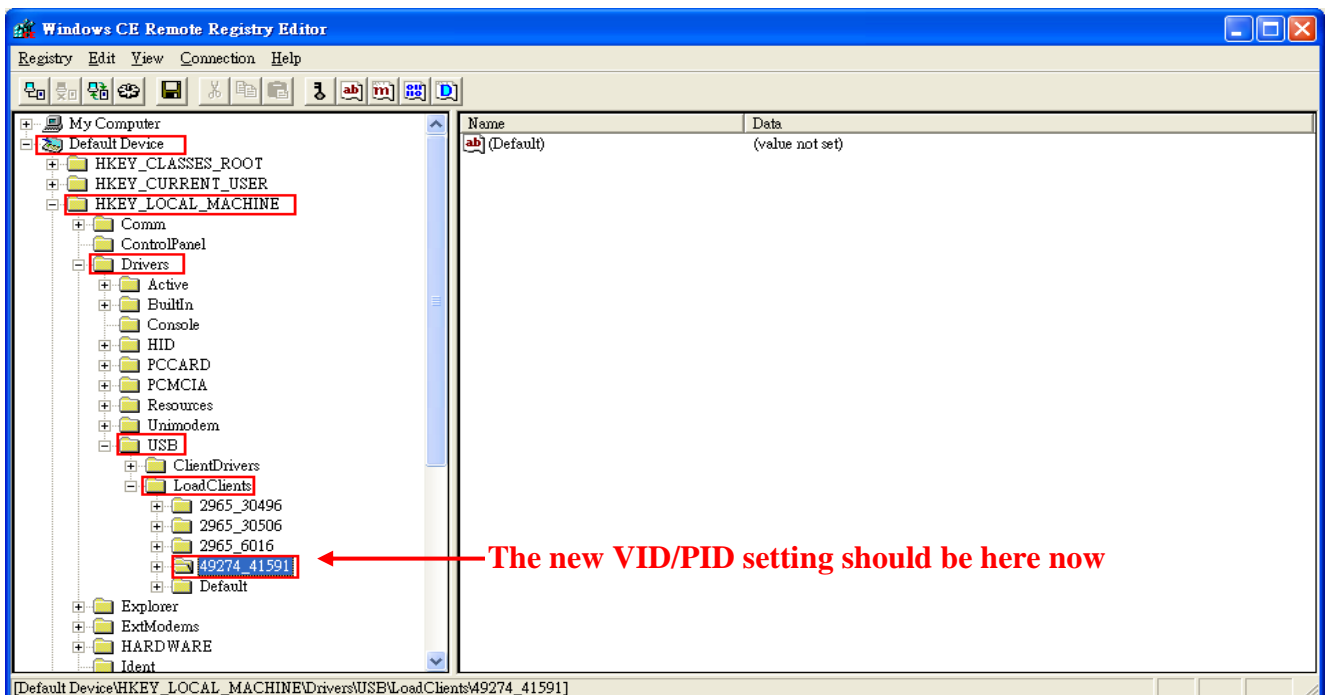
7-3. Change the VID/PID setting from WinCE Remote Registry Editor manually

The following method illustrates how to change the VID/PID registry setting of AX88772A/AX88772 WinCE 6.0 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 6.0 platform boot image file after rebooting the WinCE 6.0 platform. Please refer to Section 7-1 Change the VID/PID setting from the Registry File to modify the VID/PID registry setting of AX88772A/AX88772 WinCE 6.0 driver from the register file (PROJECT.REG) for official release purpose.

1. Follow Step #1 to Step #5 in Section 7-2 Check the modified VID/PID in WinCE Remote Registry Editor to establish the WinCE Remote Registry Editor connection with your WinCE 6.0 platform.

2. Modify the VID/PID registry under **HKEY_LOCAL_MACHINE>Drivers>USB>LoadClients** to meet the real VID/PID of your AX88772A/AX88772 board.

   Example: The VID/PID of your AX88772A board is **C07Ah/A277h** respectively.
   You should adjust the following "**2965_30506**" registry value to "**49274_41591**".
   (Please refer to the WinCE registry VID/PID setting note in Section 7-1 for more details.)
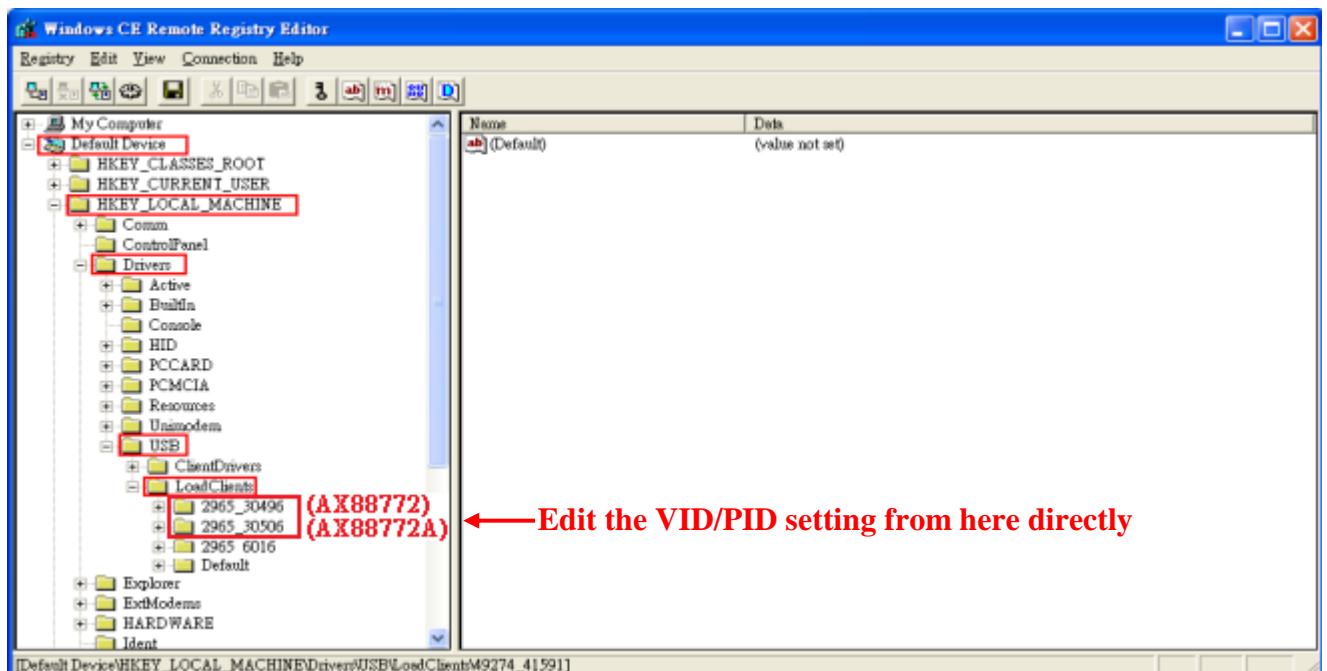
3. Un-plug/re-plug your AX88772A board with VID (C07Ah)/PID (A277h) in this example. The AX88772A/AX88772 WinCE 6.0 driver should work fine with your AX88772A/AX88772 board now.

8. Known Errata:

None.

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