Windows Embedded OS USB Driver Installation
For LISA-U / SARA-U / TOBY-L2 series
Application Note

Abstract
This document explains how to install the USB driver in a Windows Embedded OS.
## Document Information

<table>
<thead>
<tr>
<th>Title</th>
<th>Windows Embedded OS USB Driver Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subtitle</td>
<td>For LISA-U / SARA-U / TOBY-L2 series</td>
</tr>
<tr>
<td>Document type</td>
<td>Application Note</td>
</tr>
<tr>
<td>Document number</td>
<td>UBX-14003263</td>
</tr>
<tr>
<td>Revision, date</td>
<td>R01</td>
</tr>
<tr>
<td></td>
<td>24-Oct-2014</td>
</tr>
<tr>
<td>Document status</td>
<td>Objective Specification</td>
</tr>
</tbody>
</table>

### Document status explanation

<table>
<thead>
<tr>
<th>Document status</th>
<th>Description</th>
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<tr>
<td>Objective Specification</td>
<td>Document contains target values. Revised and supplementary data will be published later.</td>
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<tr>
<td>Advance Information</td>
<td>Document contains data based on early testing. Revised and supplementary data will be published later.</td>
</tr>
<tr>
<td>Early Production Information</td>
<td>Document contains data from product verification. Revised and supplementary data may be published later.</td>
</tr>
<tr>
<td>Production Information</td>
<td>Document contains the final product specification.</td>
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### This document applies to the following products:

- **LISA-U**
- **SARA-U**
- **TOBY-L2**

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Contents

Contents..................................................................................................................3

1 Introduction........................................................................................................4

2 Rights................................................................................................................4

3 Getting Started...................................................................................................5

4 Package Content...............................................................................................6
  4.1 LISA-U / SARA-U..........................................................................................6
  4.2 TOBY-L2........................................................................................................6

5 Installation...........................................................................................................7
  5.1 LISA-U / SARA-U..........................................................................................7
  5.2 TOBY-L2........................................................................................................8
    5.2.1 SW Requirements.......................................................................................8
    5.2.2 Integration steps .....................................................................................8
    5.2.3 Image built verification............................................................................9

6 Dial-up networking............................................................................................10

7 Debug................................................................................................................14
  7.1 Virtual COM ports and AT commands .........................................................14
  7.2 Networking.....................................................................................................15

Related documents ...............................................................................................16

Revision history.....................................................................................................16

Contact..................................................................................................................17
1 Introduction
This document describes the USB driver installation in a Windows Embedded OS.

This document applies to the USB driver version 1.55.0.0 for Windows Embedded OS.

This document provides all needed information about installation and usage of the provided software. The package contains the USB driver for CPU architecture ARMV4I. The following embedded operating systems are supported:

- Windows CE 5.0
- Windows CE 6.0
- Windows Embedded Compact 7
- Windows Embedded Automotive 7
- Windows Mobile 5.0
- Windows Mobile 6.0
- Windows Mobile 6.1
- Windows Mobile 6.5

This software was developed and tested on a BeagleBoard-xM platform based on ARM Cortex-A8’s core.

u-blox assumes no responsibility for the software functionality on other devices or MPUs.

2 Rights
The customer is granted a limited, non-exclusive license to use the driver without the right to sublicense, only to operate the u-blox hardware. It is, unless authorized by mandatory provisions of law, forbidden to decompile, to detect the source code, to change, reproduce or develop the firmware or software as well as to reproduce, change or reverse engineer the hardware. The customer is not allowed to modify the driver package to make his own developments.
3 Getting Started

This section describes the main connections and settings required to getting started with the EVK-U12, EVK-U13, EVK-U20, EVK-U23, EVK-U26, EVK-U27, EVK-L20, EVK-L21 and the BeagleBoard-xM platform.

To evaluate the u-blox cellular module with BeagleBoard-xM platform these devices are needed:

- BeagleBoard-xM platform
- Evaluation Kit and an adapter board where the u-blox cellular module is soldered
- Power supply for BeagleBoard-xM and the u-blox cellular evaluation kit
- PC
- Keyboard
- Mouse
- Monitor with HDMI or S-Video port
- 1 or 2 USB cable
- DVI-D cable or S-video cable
- Jack in/out
- SD card (if not provided with BeagleBoard-xM platform)
4 Package Content

4.1 LISA-U / SARA-U

The SW delivery for this platform is made up of several `<SDK build>` directories, each which corresponds to a specific embedded operating system and CPU architecture, and provide binary drivers; see Table 1.

<table>
<thead>
<tr>
<th>SDK build</th>
<th>Embedded operating system</th>
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<tr>
<td>BeagleBoard-xM SDK (ARMV4I)</td>
<td>BeagleBoard-xM SDK for Windows CE6</td>
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<td>BeagleBoard-xM WEC7 (ARMV4I)</td>
<td>BeagleBoard-xM SDK for Windows EC7</td>
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<td>Colibri600 (ARMV4I)</td>
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<td>Windows Mobile 5.0 Pocket PC SDK (ARMV4I)</td>
<td>Windows Mobile 5 and greater</td>
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<td>Windows Mobile 6 Professional SDK (ARMV4I)</td>
<td>Windows CE6</td>
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</tbody>
</table>

Table 1: SDK build and operating system list

Other architectures are available on request (x86, MIPS, SH).

Each `<SDK build>` delivery is provided with the following content:
- `<usb_ce_install.exe>`: Windows CE driver installer
- `<usbcdc.cfg>`: driver configuration file
- `<usbcdc.dll>`: dynamic library for COM driver
- `<usbcdc_ce_inst.CAB>`: compressed installation file (only for BeagleBoard-xM `<SDK build>`)  
- `<SimpleComTest.exe>`: program to send/receive string to/from COM port of Windows CE OS
- `<SimpleComTest_devname>`: program to send/receive string to/from `\$device\COM` port of Windows CE OS

4.2 TOBY-L2

The drivers for the TOBY-L2 product series are already present in the MS Platform Builder core OS. Section 5.2 explains how to enable the driver and integrate the required components and the correct registry keys in a new OS design.
5 Installation

5.1 LISA-U / SARA-U

Drivers are provided in binary format and can be integrated in the final Windows CE/EC image without building the OS image.

1) Extract the provided files from the delivery package: delivery_<version>.zip

2) Copy the files onto the SD card where the BeagleBoard-xM OS image will be loaded at module power on.

3) Insert the SD card into BeagleBoard-xM's SD slot.

4) Connect the keyboard and mouse to the other USB Host port.

5) Connect the monitor to the DVI-D connector or to the S-Video connector.

Do not plug the DVI-D connector into a display with the board powered on. Plug the cable into the display and then power on the BeagleBoard-xM.

6) Connect the power supply cable to the BeagleBoard and the USB cable to the USB OTG port, if MS ActiveSync is needed.

7) After the OS system start-up:
   a. For the default installation, execute usbcd_ce_inst.CAB (usbcdc.dll will be copied and the registry keys set)
   b. For the custom installation, copy the file usbcdc.dll to the \Windows directory on the Beagleboard platform and copy usb_ce_install.exe and usbcdc.cfg to a directory on the Beagleboard platform. Execute usb_ce_install.exe. Now the registry settings are made.

8) Power on the module. Connect the USB Host port of BeagleBoard-xM to the module.
5.2 TOBY-L2

The drivers (binary DLL) are not provided as an installer package, because they are already present in the Platform Builder Core OS sources, but they must be enabled before building the image of the targeted OS. The following explanations refer to Windows Embedded Compact 7 (EC7), but they can also be used for Windows CE 6.0 and Windows Embedded Compact 2013.

A complete explanation of the procedure to build a working Windows Embedded Compact OS Design is beyond the scope of this document.

5.2.1 SW Requirements

To build an OS design for BeagleBoard-xM (or equivalent embedded platform) the following parts are needed:

1) Visual Studio 2008 with Service Pack1
2) Platform Builder plugin for Windows EC7
3) Board Support Package (BSP) for BeagleBoard-xM
4) Make sure Monthly Update January 2013 is installed (http://support.microsoft.com/kb/2806587)

5.2.2 Integration steps

The following actions are needed to add the features which will enable RNDIS networking interface and virtual COM ports to the current OS design:

1) From the catalog, add RNDIS support:
   Core OS > Windows Embedded Compact > Device Drivers > USB > USB Host > USB Class Drivers > USB RNDIS Class Driver (which corresponds to SYSGEN_ETH_USB_HOST variable)

2) Inside OS design properties, add Environment variable to enable CDC-ACM virtual COM support:
   SYSGEN_USB_SER = 1

3) Insert the following registry keys to customize OS USB enumeration:
   
   [HKEY_LOCAL_MACHINE\Drivers\USB\LoadClients\Default\Default\224\usb8023]
   "dll"="usb8023.dll"

   [HKEY_LOCAL_MACHINE\Drivers\USB\LoadClients\Default\Default\10\usbser_class]
   "prefix"="COM"
   "dll"="usbser.dll"

   [HKEY_LOCAL_MACHINE\Drivers\USB\LoadClients\5446_4416\Default\Default\usbser_class]
   "dll"="usbser.dll"

   [HKEY_LOCAL_MACHINE\ExtModems\U-blox-Modem]
   "Port"="COM1:"
   "DeviceType"=dword:1
   "FriendlyName"="U-blox Cellular Modem"

   [HKEY_LOCAL_MACHINE\ExtModems\U-blox-Modem\Init]
   [HKEY_LOCAL_MACHINE\ExtModems\U-blox-Modem\Settings]
   "MdmLogFile"=dword:1
   "Blind_Off"=""
   "Blind_On"=""

   ; Removal of RNDIS association to Function Class 239 (0xf0)
   [HKEY_LOCAL_MACHINE\Drivers\USB\LoadClients\Default\239]
Figure 1 shows an example of OS design where the two features are enabled:

5.2.3 Image built verification
After the OS image has been built, follow steps 3) to 8) of section 5.1. With the OS booted, verify that the system recognizes the RNDIS Network interface as USB80231, as shown in the following picture:
6 Dial-up networking

To create a dial-up connection, perform these steps:

1) Open the “Settings > Network and Dial-up Connections” window and start the “Make New Connection wizard”.

![Figure 3: Dial up connection setup](image)

2) Select the Cellular Modem (the textual name can be changed by modifying the registry keys).

![Figure 4: Modem name insertion](image)
3) Configure the module, leaving “Port Settings” unchanged and setting “Calling Options”:
   a. Uncheck “Wait for dial tone before dialing”

![Figure 5: Modem properties setting](image)

4) Go through the next step, setting the phone number *99***1# and click the “Finish” button.

![Figure 6: Modem properties setup (phone number)](image)
5) Now the new connection can be opened.

![Image of dial-up connection](image1)

Figure 7: Opening the dial up connection


![Image of dial-up properties](image2)

Figure 8: Dial up properties
7) Establish the connection by clicking “Connect” and wait few seconds for the message box, which confirms the “Connected” status.

Figure 9: Dial up connection establishment

If the ActiveSync connection is in use, discover the TCP/IP default gateway associated with the PC and remove it with the commands “route print” and “route delete 0.0.0.0 192.168.55.100”:

Figure 10: ActiveSync connection removal
7 Debug

7.1 Virtual COM ports and AT commands

Use the sample application, SimpleComTest, to issue AT commands and test the USB modem connection. The preliminary configuration can be done using the “Settings” tab where the port name and speed can be specified. Then open the COM port and chose the “Communication” tab.

![Figure 11: SimpleComTest preliminary configuration](image1)

Click the “Send” button to transmit AT commands to the selected COM port (select radio button to append carriage return or line feed or both at the end of the string).

![Figure 12: AT commands transmission on SimpleComTest](image2)
7.2 Networking

MS Embedded OS provides a sample tool to trace the network traffic activity (http://msdn.microsoft.com/en-us/library/ee495089%28v=winembedded.70%29.aspx), which can be analyzed offline with Windows Network Monitor or similar products such as Wireshark. This tool is also very helpful to debug PPP issues. The utility is called “netlog” and can be inserted into the OS image through the catalog (with the activation of the environment variable SYSGEN_NETLOG):
Related documents

[2] EVK-U20 EVK-U23 Getting Started, Docu No UBX-13001794


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Revision history

<table>
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<th>Date</th>
<th>Name</th>
<th>Status / Comments</th>
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<td>R01</td>
<td>24-Oct-2014</td>
<td>mace</td>
<td>Initial release</td>
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</tbody>
</table>
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