
USB DRIVER INSTALLATION METHODS

1. Introduction

Users can install a driver for a Silicon Labs USB Device in three ways:

- Microsoft's Driver Package Installer (DPInst)
- Legacy Silicon Labs USB Driver Installer
- INF-only installation

DPInst is an installation utility available through Microsoft. Silicon Labs redistributes this installer with the CP210x and USBXpress drivers and provides a Driver Customization Utility (see application note, "AN220: USB Driver Customization") that will automatically customize a DPInst-based installation utility.

The Legacy Silicon Labs Driver installer is a utility included in the software accompanying this document. The executable and INI files included with the installer are intended to be used as a template for a custom driver installation utility. Running the executable alone will not install a driver, as the setup.ini file must be modified to work with the driver installation. Both the INI and EXE files need to be moved into the driver installation directory next to the INF file for the installation to be successful. See "4. Legacy Silicon Labs USB Driver Installer/Uninstaller" for more information on usage and customization.

The INF-only installation doesn't require any installer and simply relies on the INF file itself.

The following sections will describe each of these installation methods in more detail.

Note: The WHQL recertification process that Silicon Labs provides to customers does not rely on any of these installation methods, so they can be chosen, or changed, at any point in the process: during, before or after certification of a driver.

2. Relevant Documentation

Application notes can be found on the www.silabs.com/interface-appnotes and www.silabs.com/8bit-appnotes pages.

- **AN220: USB Driver Customization** – This document describes the options available for generating a customized DPInst utility with application-specific strings, VID, PID, and features. This application note also includes a software utility to generate the customized DPInst files.

3. DPInst

DPInst is Microsoft's utility that simplifies and customizes driver installations for Windows. Visit MSDN and read the Driver Package Installer (DPInst) article for full details and support information on the DPInst utility: [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).

3.1. Installation and Customization

The simplest method to install a driver with DPInst is to copy the **dpinst.exe** file to the same folder as the driver INF file. It will run out of the box and uses the INF file to determine what to show in the dialogs and how to install the driver. There are specific versions for DPInst, and Silicon Labs only uses x86 and x64. The **dpinst.exe** filename itself can be modified and customized.

By creating and modifying a file named **dpinst.xml**, customization settings can be defined for the installation. For more information on this, visit MSDN and read the Customizing Driver Installation article: [http://msdn.microsoft.com/en-us/library/windows/hardware/ff540241\(v=vs.85\).aspx](http://msdn.microsoft.com/en-us/library/windows/hardware/ff540241(v=vs.85).aspx).

3.1.1. Quiet Mode

It is common for manufacturers to launch an installer in quiet mode. To do this, create or modify an XML file as described on MSDN. Command-line arguments to **dpinst.exe** can be used instead of the XML file, if desired. The specific arguments to use are the suppressWizard (**/sw**), suppressEulaPage(**/se**) and quietInstall (**/q**) arguments.

The sample DPInst XML file would look like:

```
<dpinst>
...
<quietInstall/>
<suppressWizard/>
<suppressEulaPage/>
...
</dpinst>
```

The same functionality in command-line form is:

```
<dpinst install name>.exe /q /se /sw
```

3.1.2. Ignoring Serial Numbers

DPInst does not have a method to ignore serial numbers. This is a feature specific to the Legacy Silicon Labs Installation Utility. To continue to use this option, refer to “4. Legacy Silicon Labs USB Driver Installer/Uninstaller” .

3.1.3. Using DPInst in XP with Unsigned Drivers

When using the DPInst installer with unsigned drivers, it is necessary to specify the legacyMode (**/lm**) argument either in the **dpinst.xml** file or to **dpinst.exe** through the command line. This argument allows DPInst to install the unsigned driver to the machine. The 64-bit drivers still need a signature to be able to be installed, with or without this argument.

The sample DPInst XML file would look like:

```
<dpinst>
...
<legacyMode/>
...
</dpinst>
```

The equivalent operation on the command-line is:

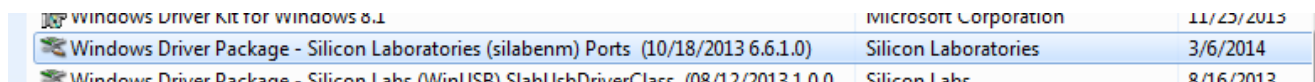
```
<dpinst install name>.exe /lm
```

3.1.4. Further Customization

For additional information on other DPInst customization options, visit MSDN and read the Customizing Driver Installation article: [http://msdn.microsoft.com/en-us/library/windows/hardware/ff540241\(v=vs.85\).aspx](http://msdn.microsoft.com/en-us/library/windows/hardware/ff540241(v=vs.85).aspx). Currently, Silicon Labs offers automated customization of a **dpinst.xml** file when using the AN220 utility to generate a driver installer. All the custom driver information is entered into this utility, and it will generate the **dpinst.xml** file in the newly created driver package.

3.2. Uninstallation

DPInst will create an uninstaller in Control Panel's Add/Remove Program Files on a successful installation. This entry will begin with **Windows Driver Package**. To uninstall a DPInst package, find the name of the driver in the list and double-click to begin the uninstallation process.



Windows Driver Kit for Windows 8.1	Microsoft Corporation	11/23/2013
Windows Driver Package - Silicon Laboratories (silabnm) Ports (10/18/2013 6.6.1.0)	Silicon Laboratories	3/6/2014
Windows Driver Package - Silicon Labs (WinUSB) USB to UART Bridge (08/12/2013 1.0.0)	Silicon Labs	8/16/2013

Figure 1. Uninstalling the DPInst Driver Package

4. Legacy Silicon Labs USB Driver Installer/Uninstaller

4.1. Description

The legacy driver installer and uninstaller combination is a template for a customizable installation utility for Silicon Laboratories USB drivers. These utilities are completely independent of the actual driver, and no referencing is done by the INF file to the installer or uninstaller. This is desirable because certification of the driver is not affected by changes in the installation utility, and the installation utility is not required by the driver if a customer does not want to use it. The utilities currently work under Windows 2000®, XP®, Server 2003®, Vista®, and Windows 7®.

4.2. Installation

The following sections explain how installation works using the Silicon Labs USB Driver Installer. This utility is no longer updated by Silicon Labs, but it is made available for specific features, such as the “Manufacturing Ignore Serial Numbers” option during install.

4.2.1. Install Package

The driver installer is built as a single executable that references a file called **setup.ini**. This INI file contains all of the settings used for driver installation and uninstallation. This **DriverInstaller.exe** and **setup.ini** combination should exist in a directory alongside the ***.sys** driver files, ***.inf** installation files, and (if the driver is certified) any ***.cat** catalog files. For example, the USBXpress Driver Package using this installer looks like this:

```
\USBXpressInstaller.exe (renamed DriverInstaller.exe)
\setup.ini (customized setup values)
\x64\SiUSBXp.sys (USBXpress driver 64 bit)
\x64\SiLib.sys (support library for USBXpress 64 bit)
\x86\SiUSBXp.sys (USBXpress driver 32 bit)
\x86\SiLib.sys (support library for USBXpress 32 bit)
\SiUSBXp.inf (INF file for the USBXpress driver)
\SiUSBXp.cat (catalog file for the USB driver)
```

When the **USBXpressInstaller.exe** executable runs, it starts by reading in all the values from the **setup.ini** file. From this, it can determine if setup should be performed quietly or if the windows and message boxes should be shown. If quiet mode is selected, then the installation routine begins immediately, and no status messages are shown to the user. If quiet mode is not selected, the main window is populated with the strings specified in the INI file (company name, product name, the driver version, etc.) and displayed to the user.

4.2.2. Installation Directory Selection

An option in the **setup.ini** file determines if drivers should be copied to the PC. If driver files are supposed to be copied to the hard drive, then a default installation directory specified in **setup.ini** is displayed in the DriverInstaller window. This directory can be changed by clicking the **Change Install Location** button. The installation directory is where the driver package is copied and where the installation originates. With this type of setup, the original install media, such as a CD or floppy, is not needed every time a device is installed.

The DriverInstaller can also take a default directory from the command line, which will override the default directory for installation and forces the driver files to be copied regardless of the copy files specification in **setup.ini**. The following is an example of how to pass in an installation directory:

```
USBXpressInstaller.exe "C:\Program Files\Silicon Labs\USBXpress"
```

If the **setup.ini** file specifies that driver files should not be copied to the PC, then no installation directory is shown in the window and nothing will happen if a directory is supplied at the command line. Because nothing is copied, the install media (such as a CD, floppy, or the source install directory on the PC) is where the installation originates and will be needed when devices are plugged in. If the installation media is not found when a device is plugged in, then the Add New Hardware Wizard will prompt for the disc or floppy. It is recommended to always copy the drivers to the PC under **root:\Program Files\Company Name\Product Name** to avoid this behavior.

4.2.3. Pre-Installation Routine

When the install button is clicked, the installer goes through a process to make sure that the driver is installed successfully and cleanly. The steps are as follows:

- Pre-installation check
 - Checks that a current version of the driver is not already installed.
 - Checks that an older version of the driver is not installed.
 - Checks that a version of this driver is not installed using an older version of Silicon Labs driver installation utilities.
 - Performs a system scan to ensure that other INF files do not exist with any VID and PID of the drivers that are about to be installed.

The first check determines whether the driver being installed is already installed. If it is installed, it prompts and exits. The next check determines if an older version of this driver was installed previously. If so, it will perform a proper removal before installing the new driver. There is also a check to determine if this type of driver was installed using one of Silicon Labs' older installation utilities by looking up the uninstall keys in the registry. If it finds an old version installed, it prompts the user to uninstall the old installation and runs the old uninstaller utility in quiet mode.

Finally, the INF directory is scanned to find any leftover INF files that contain a matching VID and PID to the ones being installed. If they are found, the user is prompted with the names of the driver sets and can choose to either uninstall them and continue or cancel the installation.

During any of these preinstall checks, it is possible that something may occur that requires a reboot. If this is the case, then the user is prompted to reboot at the end of the successful installation.

4.2.4. Driver Installation Routine Description

- Driver Installation (upon successful pre-installation check)
 - Driver files are copied to the installation directory (if specified in setup.ini).
 - The uninstaller is copied into the system directory.
 - INF files are installed from either the installation directory (if copied) or the install media.
 - Registry entries are created for Driver Uninstallation.
 - Registry entries are created containing information on the current installation, such as the version, VID, PID, DriverInstaller version, installation directory, and lists of files copied and installed. It also contains the options for uninstallation, such as quiet, removing the installed driver files, etc.

The driver installation process is very straightforward. If anything fails in the above routine list, the user is prompted and the application exits. If there are no errors, then the installation prompts with success and exits.

4.2.5. Driver Installation Completion

The driver installer records all device installation in a registry key. This key can be checked by calling the application to determine if an installation has been completed successfully and comes from the first item in the VID_PID List. See "4.4. Customization of the Driver Installer" for more information.

```
HKEY_LOCAL_MACHINE\SOFTWARE\Silicon Laboratories, Inc.\Silicon Laboratories Driver Installations\<Device Type>\<Device Specific Key>
```

<Device Type>—The devices are split into USBXpress or VCP device types with a corresponding registry key of "USBXpress" and "VCP CP210x Cardinal", respectively.

<Device Specific Key>—USBXpress devices consist of device string **SIUSBXP&VVVV&PPPP** and CP210x devices consist of device string **IIII&COMM&VVVV&PPPP** (where IIII is up to the first 4 characters in the INF file name, VVVV is the VID and PPPP is the PID). These device specific keys are also used in the Windows Uninstaller registry key which causes the driver installation to appear in the Add/Remove Programs listing.

The following registry entries are examples of the current USBXpress and VCP installations:

USBXpress—HKEY_LOCAL_MACHINE\SOFTWARE\Silicon Laboratories, Inc.\Silicon Laboratories Driver Installations\USBXpress\SIUSBXP&10C4&EA61

VCP—HKEY_LOCAL_MACHINE\SOFTWARE\Silicon Laboratories, Inc.\Silicon Laboratories Driver Installations\VCP CP210x Cardinal\SLABCOMM&10C4&EA60

There may be times when an installation completes and the system needs to be rebooted. The user will be prompted if the driver installer is not running in quiet mode. If the driver installer is being called from another application in quiet mode, it is recommended to reboot the computer at the end of a successful installation.

4.3. Uninstallation

This section explains the Legacy Silicon Labs Driver uninstallation process.

4.3.1. Calling the Uninstaller

An uninstaller is copied to a **Silabs** directory inside the Windows system directory (such as **C:\Windows\system32\Silabs**). This uninstaller is named **DriverUninstaller.exe** and is embedded within the **DriverInstaller.exe**. Because this is a universal installation utility, the same **DriverUninstaller.exe** is used by any Silicon Labs driver installations. During installation, the installer checks the version of the current uninstaller (if it already exists on the system) and then only replaces it if it is missing or an older version exists.

The uninstaller takes in the <Device Type>\<Device Specific Key> portion of the registry key entered at the completion of an installation via command line. For example, to uninstall the USBXpress device with VID 0x10C4 and PID 0xEA61, the command would look like:

```
DriverUninstaller.exe "USBXpress\SIUSBXP&10C4&EA61"
```

The uninstaller is then provided with all of the installation information that was provided in the **setup.ini** file. When the uninstaller first runs, it will look to see whether it should run in quiet mode. If so, the uninstallation is performed with no windows or messages. If it is not in quiet mode, it will populate the window with all of the strings that were specified in the **setup.ini** on installation and, if driver files were copied, will show their current existing location.

4.3.2. Driver Uninstallation Routine

First, the uninstaller removes the copied drivers if they are specified to be removed. If no drivers were copied on installation in the first place, this check is skipped.

Next, the INF files for the device are uninstalled; this happens differently depending on the operating system. The basic removal routine is to remove any INF/PNF combinations and then remove any catalog files (catalog files will only be pertinent on Windows XP®/Server 2003®/Vista/7®).

Finally, the computer is scanned for any device reference to the driver, and those devices are removed from the system. This causes any matching USB devices to be stopped, and they will not be recognized by the system until they are either unplugged and plugged back in or a **Scan for New Hardware** command is issued in Device Manager.

4.4. Customization of the Driver Installer

The setup.ini file contains a set of entries denoted by [<option>]. All of the bracketed entries are case-sensitive and must be exact or the **DriverInstaller.exe** will ignore it. The value of the entry is directly below the bracketed entry line. Each entry and selection must be separated by a blank line (see “4.4.1. Example Setup.ini”). Some of these bracketed entries are required and some are not. Also, some are case-sensitive (such as strings—what you type is what you will see) and some are not (“on, off, yes, no” options). Each entry is described in detail below.

[Driver Type]—REQUIRED—This is the type of driver that you are trying to install. Currently there is support for two driver types, which are both case-sensitive:

- USBXpress
- VCP CP210x Cardinal

USBXpress and VCP CP210x Cardinal specify a USBXpress driver installation and CP210x driver installation, respectively.

[Driver Version]—REQUIRED—This is the version of the driver you are trying to install. This is a string and will appear exactly as entered.

[Product Name]—REQUIRED—This is the product name for the device you are installing. This string will also appear in the Add/Remove Programs as “<product string> (Driver Removal)”. This is a string and will appear exactly as entered.

[Company Name]—REQUIRED—This is the name of the company that is distributing the driver set. This is a string and will appear exactly as entered.

[VID_PID List]—REQUIRED—This is the nine character hexadecimal VID and PID of the device that matches this driver (example: VVVV_PPPP where VVVV is the VID and PPPP is the PID). This is not case-sensitive.

[Relative Install]—OPTIONAL (required if not using a drive relative path in the [Install Directory] and [Copy Driver Files] = Yes)—This allows the driver to be installed relative to either the Windows Drive or the Program Files Directory. This is done by specifying one of the following, which is case-sensitive:

- Relative To Program Files
- Relative To Windows Drive

If you specify one of the above, you can simply specify the Install Directory as “Directory\SubDirectory\SubSubDirectory” and it will be placed directly under the relative path chosen.

[Install Directory]—OPTIONAL (required if [Copy Driver Files] = Yes)—This is the default driver installation directory that appears on the Installer window. This is a string and will appear exactly as entered. This directory does not need to exist, as the installer will create it for you.

[Install Subdirectories]—OPTIONAL (required if [Copy Driver Files] = Yes)—If any drivers to be copied contain a .*subdir\driver.sys, all *subdir* names should be listed here.

[Install Quiet Mode] and [Uninstall Quiet Mode]—REQUIRED—This has to be one of the following:

- On
- Off

If quiet mode is on, no windows, dialogs or message boxes are shown to the user, which is good for third-party installers that integrate the driver installation or do not want to display information or choices on its installation. This is not case-sensitive (on and ON will both work).

[Copy Driver Files]—REQUIRED—This has to be one of the following values:

- Yes
- No

This denotes whether the installer should copy the driver files to an installation directory. If they are not installed, the install media where the DriverInstaller.exe is run will be the installation location. If the install media is not available when a device is plugged in, you will be prompted to locate it. This is not case-sensitive (yes and YES will both work).

[Remove Copied Files On Uninstall]—OPTIONAL (required if [Copy Driver Files] = Yes)—This has to be one of the following values:

- Yes
- No

This denotes whether the copied installation files should be removed on uninstallation. This is not required if files are not copied on installation. This is not case-sensitive (yes and YES will both work).

[XP_2K_2K3_VISTA INF Files]—REQUIRED—This will denote the list of INF files that should be copied to the INF directory and installed. There should be one INF on each line with no blank lines between them. This is not case-sensitive.

[XP_2K_2K3_VISTA Driver Files]—REQUIRED—This will denote the list of driver files that exist in the installation. There should be one file name on each line with no blank lines in between them. This is not case-sensitive. If driver files should exist in subdirectories, list them as “.*subdir\driver.sys. If CopyFiles = Yes, then all subdirectories in any of these files must be listed in [Install Subdirectories] or they will not be successfully copied to the install directory.

[XP_2K_2K3_VISTA Catalog Files]—OPTIONAL—This will denote the list of catalog files that belong to a certified driver. This is optional because certification is not required. This is not case-sensitive.

[Manufacturing Ignore Serial Numbers]—OPTIONAL—This will allow a manufacturing version of the driver to be installed that will ignore the serial numbers and assign a unique serial number to each USB port. The value for this must be as follows:

Ignore Serial Numbers

If the value does not specifically match the above string, it will not work. This option should not be put on a driver package that is released for end users and should only be used in a manufacturing environment. For this reason, it is not supported by the AN220 customization utility and must be put in by hand.

This option is most commonly used in a manufacturing environment for the CP210x devices. If a large number of serialized devices are being tested, this entry will not fill up the registry by assigning a COM port to each individual device.

4.4.1. Example Setup.ini

Below is an example setup.ini listing, specifically for the USBXpress Driver Package:

```
[Driver Type]
USBXpress

[Driver Version]
3.1

[Product Name]
Silicon Laboratories USBXpress Device

[Company Name]
Silicon Laboratories

[VID_PID List]
10C4_EA61

[Relative Install]
Relative To Program Files

[Install Directory]
Silabs\MCU\USBXpress\

[Install Subdirectories]
x86
x64

[Install Quiet Mode]
Off

[Uninstall Quiet Mode]
Off

[Copy Driver Files]
Yes

[Remove Copied Files On Uninstall]
Yes

[XP_2K_2K3_VISTA INF Files]
SiUSBXp.inf

[XP_2K_2K3_VISTA Driver Files]
.\x64\SiUSBXp.sys
.\x64\SiLib.sys
.\x86\SiUSBXp.sys
.\x86\SiLib.sys

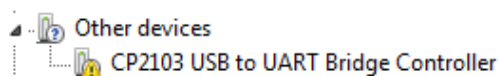
[XP_2K_2K3_VISTA Catalog Files]
siusbxp.cat
```


5. INF-Only Driver Management

5.1. Installation

In certain cases it is necessary, or desirable, to point directly to an INF file in a driver package to install the driver. The best way to do this is to perform the following steps:

1. Plug your device in to a USB port.
2. Open Device Manager and look for the device to appear:
 - a. If the device doesn't already have a driver installed, it will show up with a yellow exclamation point in the **Other devices** section. Here is an example of a CP2103 with no driver associated with the device:

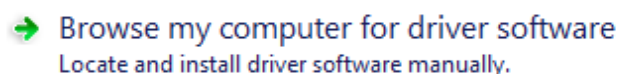


- b. If the device is associated with a driver, then it could show up in its proper device list. Here is an example of a CP2103 with a driver associated with the device:



Note: If the device is already associated with the driver, it may be preferable to uninstall the driver from Control Panel if the option is available. If there is not an entry in Control Panel to uninstall the device, then right-click on the device and select **Uninstall**. Then, check the box that says **Delete the driver software for this device** and click **OK**. When the device is connected again, it should no longer be associated with the driver.

3. Right-click on the device and select **Update driver software....**
4. A dialog box will appear with driver update options. Click **Browse my computer...** to point to a specific INF file:



5. In the next dialog box, click the **Browse...** button to locate folder that contains the INF to install:

Browse for driver software on your computer

Search for driver software in this location:

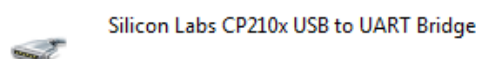
C:\

☒ Include subfolders

6. If the installation succeeds, a success dialog box will appear:

Windows has successfully updated your driver software

Windows has finished installing the driver software for this device:



5.2. Uninstallation

If an INF-only installation is performed, then there will be no entry in the Control Panel available to uninstall the driver. Instead, the driver can be uninstalled directly from Device Manager:

1. Connect the device to a USB port.
2. Open Device Manager and look for the device to appear:



3. Right-click on the device and select **Uninstall**. Then, check the box that says **Delete the driver software for this device** and click **OK**.
4. When the device is connected again, it should no longer be associated with the driver.

DOCUMENT CHANGE LIST

Revision 0.1 to Revision 0.2

- Relative Install added to sections “4.4. Customization of the Driver Installer” and “4.4.1. Example Setup.ini” .

Revision 0.2 to Revision 0.3

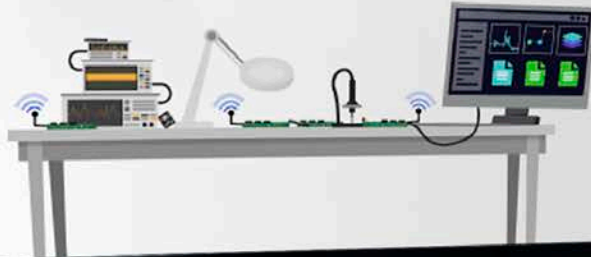
- Updated “4.4. Customization of the Driver Installer” to allow for multiple PID and VID combinations in one driver.
- Added support for Windows 7.

Revision 0.3 to Revision 0.4

- Added new information on the DPInst installer.
- Added “2. Relevant Documentation” .
- Updated “4. Legacy Silicon Labs USB Driver Installer/Uninstaller” to indicate that it’s now the legacy installer.
- Added “5. INF-Only Driver Management” .

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