

**Future Technology Devices  
International Ltd.**

## **AN232B-10 Advanced Driver Options**

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## 1 Introduction

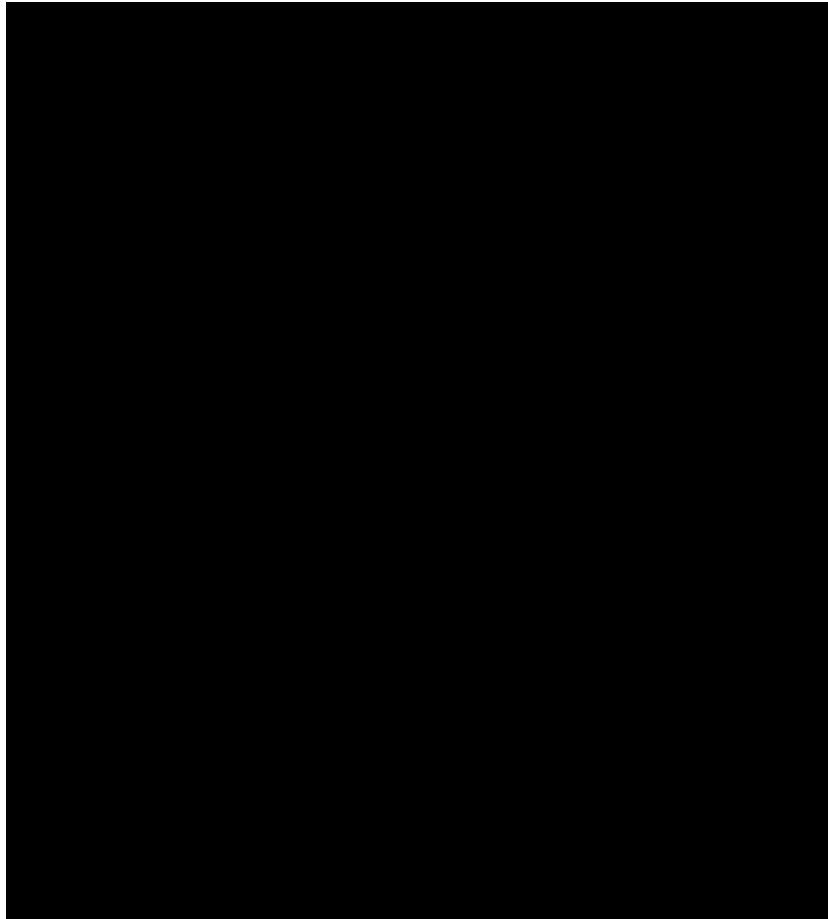
This application note describes advanced driver settings and operations for FTDI's CDM Windows driver. This is intended to be a reference for experienced engineers developing products incorporating FTDI devices and drivers who are experts with FTDI devices.

If you are unsure about any of the features described in this document, please do not change any of your driver files or registry settings and seek assistance from [FTDI's Support](#)<sup>[45]</sup>.

## 2 CDM USB Serial Converter Properties Page

With the CDM driver, a property page is now available for the USB Serial Converter driver. This is at the same level as the original D2XX driver.

In the case of FT232R, FT245R and FT2232 devices, the driver type is determined by a setting in the device EEPROM. The Advanced tab allows the user to override any EEPROM settings to select the driver type. The EEPROM settings can be overridden using the check box shown below:



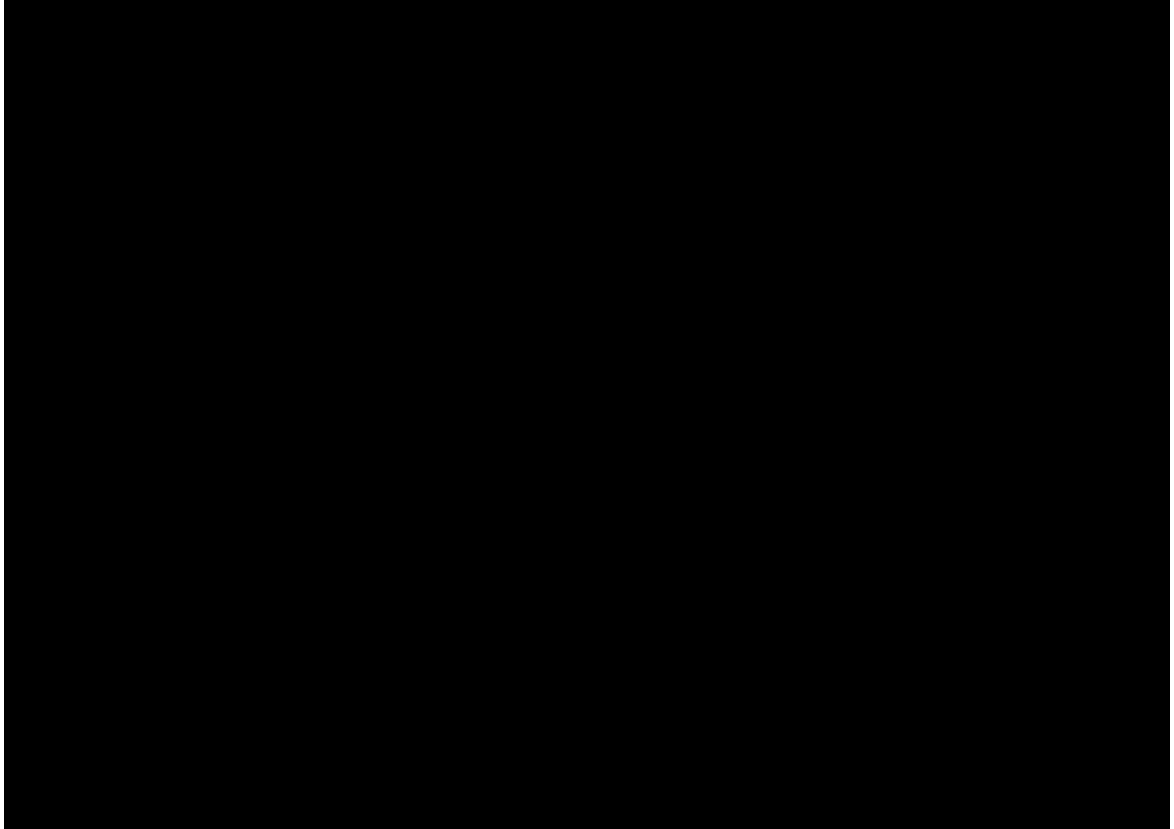
This option can also be configured as a default value via the FTDIBUS.INF file before installation as indicated in [FTDIBUS.INF, 1/2 Optic](#). If this is set, the EEPROM driver setting will be ignored.

### 3 CDM COM Port Advanced Properties Page

An advanced properties page is available for devices using VCP drivers. To access the advanced properties page in Windows 2000 or Windows XP, go to "Control Panel > System" then select the "Hardware" tab and click "Device Manager", or "Control Panel > Device Manager" in Vista. Find the USB serial port you want to change the properties of and right-click on it. Select "Properties" from the menu then select the "Port Settings" tab to get the window below.



This page allows configuration of the basic device parameters (i.e. Baud rate, data bits, parity, stop bits and flow control). To access more advanced settings, click on the "Advanced" button to display the advanced properties page (shown below).



This page will allow the following parameters to be altered:

- | COM port number
- | USB buffer sizes
- | Latency timer value
- | Read and write timeout values
- | Miscellaneous options

These options can also be configured as default values via the FTDIPORT.INF file before installation as indicated in [FTDIPORT.INF](#). The miscellaneous options are covered in [Miscellaneous](#).

## 4 **Modification of INF Files for Non-Default VID and PID Values**

In order to use FTDI drivers with devices that are identified by a VID and PID combination other than FTDI's VID and the device default PID, the driver INF files must be modified to match the desired VID and PID combination. The following sections indicate which references must be modified for the drivers to function correctly with alternative VIDs and PIDs.

There is also some useful information on the modification of INF files for custom VID and PID values in the MProg user manual which is available from the [FTDI's Knowledgebase](#).



## 4.1 FTDIBUS.INF

In order that Windows successfully match a device with the driver, the VID and PID programmed into the device must be listed in the driver INF file. The following sections of FTDIBUS.INF must be amended to match the desired VID and PID combination:

```
[FtdiHw]
%USB\VID_0403&PID_6001.DeviceDesc%=FtdiBus,USB\VID_0403&PID_6001

[FtdiHw.NTamd64]
%USB\VID_0403&PID_6001.DeviceDesc%=FtdiBus.NTamd64,USB\VID_0403&PID_6001
```

Also, in the case of the FTDIBUS.INF file FT2232 devices must have each interface listed as follows:

```
[FtdiHw]
%USB\VID_0403&PID_6010&MI_00.DeviceDesc%=FtdiBus,USB\VID_0403&PID_6010&MI_00
%USB\VID_0403&PID_6010&MI_01.DeviceDesc%=FtdiBus,USB\VID_0403&PID_6010&MI_01

[FtdiHw.NTamd64]
%USB\VID_0403&PID_6010&MI_00.DeviceDesc%=FtdiBus.NTamd64,USB\VID_0403&PID_6010
&MI_00
%USB\VID_0403&PID_6010&MI_01.DeviceDesc%=FtdiBus.NTamd64,USB\VID_0403&PID_6010
&MI_01
```

The device description string may be modified to display a custom device port name in the device manager if so desired in the section listed below:

```
[Strings]
USB\VID_0403&PID_6001.DeviceDesc="USB Serial Converter"
```

and for FT2232 devices:

```
[Strings]
USB\VID_0403&PID_6010&MI_00.DeviceDesc="USB Serial Converter A"
USB\VID_0403&PID_6010&MI_01.DeviceDesc="USB Serial Converter B"
```

A sample FTDIBUS.INF file is included in the [appendix](#) .

## 4.2 FTDIPOINT.INF

In addition to the modifications made to the FTDIBUS.INF file to accommodate driver matching, the following entries in the FTDIPOINT.INF file must be changed to match the VID and PID combination:

```
[FtdiHw]
%VID_0403&PID_6001.DeviceDesc%=FtdiPort232,FTDIBUS\COMPORT&VID_0403&PID_6001

[FtdiHw.NTamd64]
%VID_0403&PID_6001.DeviceDesc%=FtdiPort2232,FTDIBUS\COMPORT&VID_0403&PID_6001
```

In the case of the FTDIPOINT.INF file, separate entries are not needed for each interface of FT232 devices as each port of the FT232 is supported by the same entry:

```
[FtdiHw]
%VID_0403&PID_6010.DeviceDesc%=FtdiPort232,FTDIBUS\COMPORT&VID_0403&PID_6010

[FtdiHw.NTamd64]
%VID_0403&PID_6010.DeviceDesc%=FtdiPort2232,FTDIBUS\COMPORT&VID_0403&PID_6010
```

The device description string may be modified to display a custom device port name in the device manager if so desired in the section listed below:

```
[Strings]
VID_0403&PID_6001.DeviceDesc="USB Serial Port"
```

A sample FTDIPOINT.INF file is included in the [appendix](#) .

## 5 FTDIBUS.INF Options

Some default configuration options are configurable through FTDIBUS.INF. This section describes the options available and how to implement them.

## 5.1 Adjusting the Reset Pipe Retry Count

In some rare cases, it may be necessary to increase the number of times the driver tries to reset a USB pipe on which an error has occurred, for example in noisy environments where a lot of USB errors occur.

The default value for the reset pipe request retry count is 50. This default value may be changed in the FTDIBUS.INF file by editing or including the following fragment.

```
[FtdiBus.NT.AddService]
AddReg = FtdiBus.NT.AddService.AddReg

[FtdiBus.NT.AddService.AddReg]
HKR,Parameters,"RetryResetCount",0x00010001,100
```

In this example fragment, the reset pipe request is set to 100.

This value is held in the registry key located at

HKEY\_LOCAL\_MACHINE\SYSTEM\CurrentControlSet\Services\FTDIBUS\Parameters\RetryReset  
Count

## 5.2 Using Location IDs

In some application areas it may be desirable to install devices by physical location rather than serial number. In these instances, this may be accomplished by using the Loclds entry in the driver INF file.

The driver uses Loclds to define the set of USB ports supported. It can be used in systems that require only certain USB ports to be available, perhaps in conjunction with [MaxDevices](#)<sup>[14]</sup>. The default behaviour is that all USB ports are supported. The default can be overridden by including Loclds in the FTDIBUS.INF service key section.

```
[FtdiBus.NT.AddService]
AddReg = FtdiBus.NT.AddService.AddReg

[FtdiBus.NT.AddService.AddReg]
HKR,Parameters,"Loclds",1,21,00,00,00,32,00,00,00,11,00,00,00,00
```

In this example INF file fragment, three USB ports are supported. Location ID 0x00000021 represents host controller 1 port 1. Location ID 0x00000032 represents host controller 2 port 2. Location ID 0x00000011 represents host controller 0 port 1.

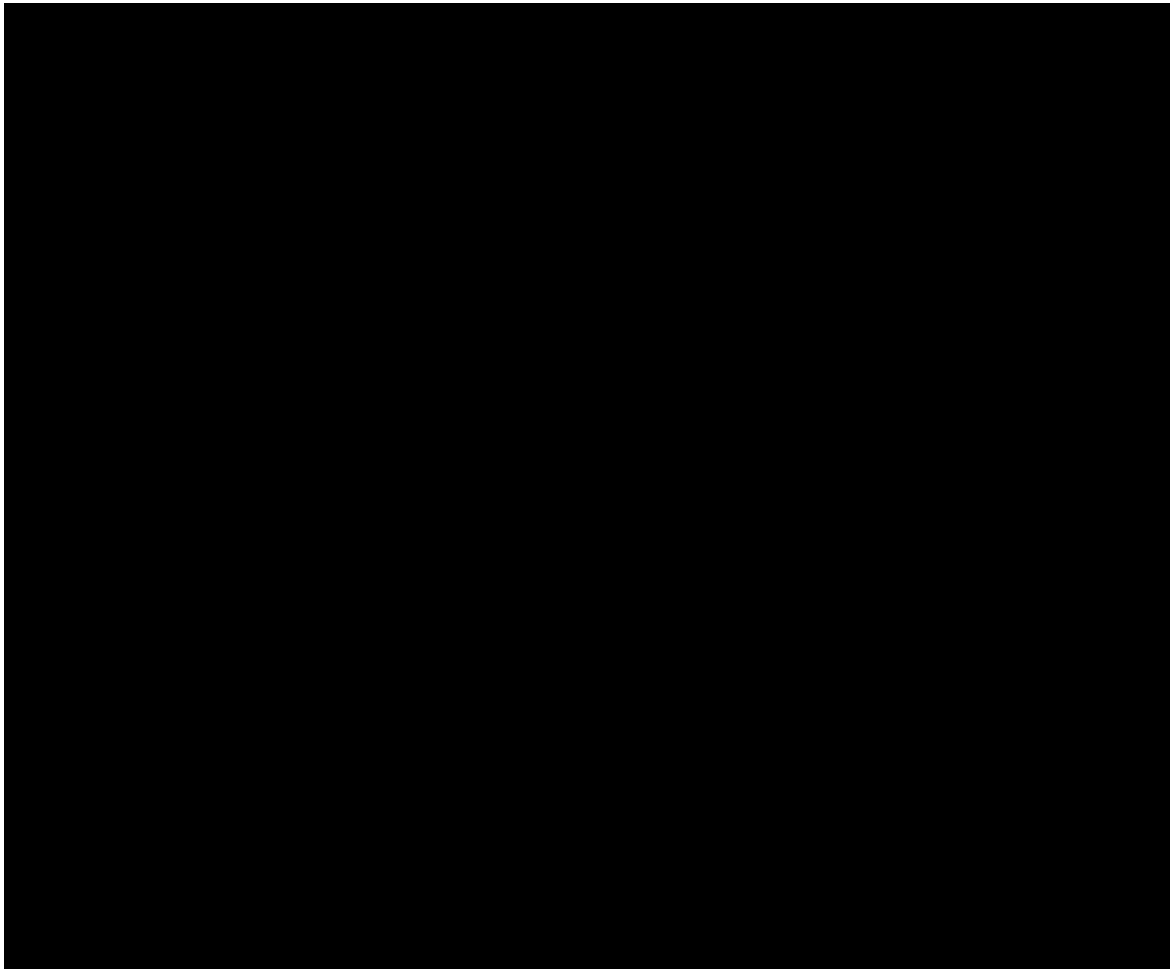
This value is held in the registry key located at

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\FTDIBUS\Parameters\Loclds
```

**Note that setting Loclds will radically alter the behaviour of the driver; please contact FTDI if you think you have to change Loclds.**

Location IDs can be obtained using the latest version of the USBView utility available from the [Utilities](#) section of the [FTDI's web](#). An application note on location IDs [AN232B-07](#) [Configuring FTDI's VCP Drivers](#) is also available.

USBView can be configured to show location IDs by selecting Options > Location IDs. The screen shot below shows a PC with a hub connected to location 0x0000002A and devices connected at locations 0x00000019 and 0x00002A3.



The INF entries for the devices connected to these ports would be

```
[FtdiBus.NT.AddService.AddReg]
HKR,Parameters,"LocIds",1,19,00,00,00,2A,03,00,00,00
```

Please note that the INF entry must end with an additional 00 entry to terminate the location ID list.

If an attempt is made to install a device at a location that is not supported, a Code 10 error ("This device cannot start") is generated for the new device.

### 5.3 Limiting the Number of COM Ports That Can Be Installed

The number of FTDI virtual COM ports that may be installed in a system can be limited by setting the MaxDevs parameter. MaxDevs defaults to 0, meaning that the feature is disabled and the driver will always attempt to create a COM port. The default can be overridden by including a non-zero MaxDevs value in the FTDIBUS.INF service key section.

```
[FtdiBus.NT.AddService]
AddReg = FtdiBus.NT.AddService.AddReg

[FtdiBus.NT.AddService.AddReg]
HKR,Parameters,"MaxDevs",0x00010001,3
```

In this example INF file fragment, the maximum number of devices is set to 3.

This value is held in the registry key located at

HKEY\_LOCAL\_MACHINE\SYSTEM\CurrentControlSet\Services\FTDIBUS\Parameters\MaxDevs

If an attempt is made to install more than MaxDevs devices, a Code 10 error ("This device cannot start") is generated for the new device.

**Note that setting MaxDevs to a value other than zero will radically alter the behaviour of the driver; please contact FTDI if you think you have to change MaxDevs.**

## 5.4 Override EEPROM Driver Setting

In the case of FT232R, FT245R and FT2232 devices, the driver will read the device EEPROM to determine whether to expose a COM port or not. The earlier B and AM series devices do not have an EEPROM setting for driver type, so will default to installing a COM port. This feature can be turned off and the choice of driver to load can be made through a setting in the installation file.

For a standard installation, the following sections can be added to FTDIBUS.INF to override the EEPROM configuration and load the VCP driver:

```
[FtdiBus.NT.HW]
AddReg=FtdiBus.NT.HW.AddReg

[FtdiBus.NTamd64.HW]
AddReg=FtdiBus.NT.HW.AddReg

[FtdiBus.NT.HW.AddReg]
HKR,, "ConfigData", 0x00010001, 4
```

Bit 2 of the ConfigData parameter determines the driver to be loaded: if it is set to 1, the VCP driver is loaded (as in the above example); otherwise, only the D2XX driver is loaded. Therefore, adding the above sections to the installation file, and in particular setting the value of ConfigData to 4, will cause the VCP driver to be loaded regardless of the EEPROM settings.

This method can be extended for the dual channel FT2232 device. In this case, new sections have to be created for each channel to allow the channels to be configured and installed separately. The following fragments show the additional changes that are necessary to configure channel A to load the D2XX driver only, and channel B to load the VCP driver.

```
[FtdiHw]
%USB\VID_0403&PID_6010&MI_00.DeviceDesc%=FtdiBusA,USB\VID_0403&PID_6010&MI_00
%USB\VID_0403&PID_6010&MI_01.DeviceDesc%=FtdiBusB,USB\VID_0403&PID_6010&MI_01

[FtdiHw.NTamd64]
%USB\VID_0403&PID_6010&MI_00.DeviceDesc%=FtdiBusA.NTamd64,USB\VID_0403&PID_6010
&MI_00
%USB\VID_0403&PID_6010&MI_01.DeviceDesc%=FtdiBusB.NTamd64,USB\VID_0403&PID_6010
&MI_01

[FtdiBusA.NT]
CopyFiles=FtdiBus.NT.Copy,FtdiBus.NT.Copy2
AddReg=FtdiBusA.NT.AddReg

[FtdiBusA.NTamd64]
CopyFiles=FtdiBus.NTamd64.Copy,FtdiBus.NTamd64.Copy2,FtdiBus.NTamd64.Copy3
AddReg=FtdiBusA.NT.AddReg

[FtdiBusA.NT.HW]
AddReg=FtdiBusA.NT.HW.AddReg

[FtdiBusA.NTamd64.HW]
AddReg=FtdiBusA.NT.HW.AddReg

[FtdiBusA.NT.HW.AddReg]
HKR,, "ConfigData", 0x00010001, 0

[FtdiBusA.NT.Services]
AddService = FTDIBUS, 0x00000002, FtdiBus.NT.AddService

[FtdiBusA.NTamd64.Services]
```



```
AddService = FTDIBUS, 0x00000002, FtdiBus.NT.AddService
```

```
[FtdiBusB.NT]
CopyFiles=FtdiBus.NT.Copy,FtdiBus.NT.Copy2
AddReg=FtdiBusB.NT.AddReg
```

```
[FtdiBusB.NTamd64]
CopyFiles=FtdiBus.NTamd64.Copy,FtdiBus.NTamd64.Copy2,FtdiBus.NTamd64.Copy3
AddReg=FtdiBusB.NT.AddReg
```

```
[FtdiBusB.NT.HW]
AddReg=FtdiBusA.NT.HW.AddReg
```

```
[FtdiBusB.NTamd64.HW]
AddReg=FtdiBusA.NT.HW.AddReg
```

```
[FtdiBusB.NT.HW.AddReg]
HKR,, "ConfigData", 0x00010001, 4
```

```
[FtdiBusB.NT.Services]
AddService = FTDIBUS, 0x00000002, FtdiBus.NT.AddService
```

```
[FtdiBusB.NTamd64.Services]
AddService = FTDIBUS, 0x00000002, FtdiBus.NT.AddService
```

Note that the value of ConfigData is set to 0 for channel A (D2XX) and the value of ConfigData is set to 4 for channel B (VCP) to achieve the required configuration. Of course, if ConfigData is not included in the installation file, the EEPROM settings will determine which driver is loaded.

The ConfigData parameter is held in the registry under the key

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Enum\USB\{Device VID, PID and
interface}\{Serial number}\DeviceParameters\ConfigData
```

The COM port can also be suppressed after installation through the Advanced tab of the [USB\VID\\_1209&PID\\_0001\Converter\propert](#) which is available through the device manager.

## 5.5 USB Timeout

The USB timeout is the maximum time in milliseconds that a USB request can remain outstanding. It is unlikely that this will ever need to be changed from the 5000ms default value.

This USB timeout (in milliseconds) is configurable through the FTDIBUS INF file in the INF fragments shown below:

```
[FtdiBus.NT.HW]
AddReg=FtdiBus.NT.HW.AddReg

[FtdiBus.NTamd64.HW]
AddReg=FtdiBus.NT.HW.AddReg

[FtdiBus.NT.HW.AddReg]
HKR,, "USBTimeout", 0x00010001, 5000
```

which corresponds to the registry entry

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Enum\USB\{Device VID, PID and
interface}\{Serial number}\DeviceParameters\USBTimeout
```

The default value for the USB Timeout is 5 seconds (5000ms).

## 5.6 Disable EEPROM Writes

In some cases, it may be desirable to disable the ability to write to the device EEPROM. This can be accomplished through a ConfigData bit in the FTDIBUS INF file.

The driver can be made to ignore any EEPROM write requests by setting bit 0 of the ConfigData field as shown in the INF fragment below:

```
[FtdiBus.NT.HW]
AddReg=FtdiBus.NT.HW.AddReg
```

```
[FtdiBus.NTamd64.HW]
AddReg=FtdiBus.NT.HW.AddReg
```

```
[FtdiBus.NT.HW.AddReg]
HKR,, "ConfigData", 0x00010001, 1
```

which corresponds to the registry key

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Enum\USB\{Device VID, PID and
interface}\{Serial number}\DeviceParameters\ConfigData
```

## 6 **FTDIPORT.INF Options**

There are many configuration options available through FTDIPORT.INF. This section describes these options and how to configure them.

## 6.1 Aliasing Baud Rates

FTDI devices can support non-standard Baud rates. It is not necessary to alias Baud rates to achieve this, but in cases where the application software tries to set a standard Baud rate and a non-standard Baud rate is desired, this can be achieved by aliasing non-standard baud rates.

Baud rates are calculated using a Baud rate divisor. The file FTDI PORT.INF contains entries that are used as the divisors for standard baud rates. By changing these it is possible to alias standard baud rates with non-standard values - for instance replacing 115k Baud with 512k Baud. Users would then set up the device to operate at 512k Baud by selecting 115k Baud for the USB serial port.

The procedure for calculating Baud rate divisors is described fully in application note [AN232B-05](#) *Configuring FT232R, FT2232 and FT2.*

The FT8U232AM device supports sub-integer divisors of 0, 0.5, 0.25 and 0.125 only. These values can be configured through a Baud rate divisor table with two elements to define a Baud rate. The extract below from FTDI PORT.INF gives an example of the Baud rate table for standard Baud rates for the FT8U232AM device. Note that the Baud rate table is one line in the INF.

```
[FtdiPort232.NT.HW.AddReg]
HKR,, "ConfigData", 1, 01, 00, 3F, 3F, 10, 27, 88, 13, C4, 09, E2, 04, 71, 02, 38, 41, 9C, 80, 4E, C0, 34, 00, 1A, 00, 0D, 00, 06, 40, 03, 80, 00, 00, D0, 80
```

In the case of the FT232R, FT2232 and FT232B devices, sub-integer divisors of 0, 0.5, 0.25, 0.125, 0.375, 0.625, 0.75 and 0.875 are supported. This requires that the Baud rate table be extended to four elements per Baud rate as indicated below. This example extract shows the four-element Baud rate table for standard Baud rates. As with the original divisors, note that the Baud rate table is one line in the INF.

```
[FtdiPort232.NT.HW.AddReg]
HKR,, "ConfigData", 1, 11, 00, 3F, 3F, 10, 27, 00, 00, 88, 13, 00, 00, C4, 09, 00, 00, E2, 04, 00, 00, 71, 02, 00, 00, 38, 41, 00, 00, 9C, 80, 00, 00, 4E, C0, 00, 00, 34, 00, 00, 00, 1A, 00, 00, 00, 0D, 00, 00, 00, 06, 40, 00, 00, 03, 80, 00, 00, 00, 00, 00, 00, 00, D0, 80, 00, 00
```

The Baud rate table used by each device is located in the registry under

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Enum\FTDIBUS\{Device VID, PID and serial number}\0000\Device Parameters\ConfigData
```

Please note that the four-element table will not allow the use of the additional sub-integer divisors with FT8U232AM devices. The two-element table will work with all devices.

For a full explanation of calculating non-standard Baud rate divisors and how to arrange them in the Baud rate table, see application note [AN232B-05](#) *Configuring FT232R, FT2232 and FT2.*

## 6.2 Changing the Default USB Transfer Size

The default USB transfer size may be set up at installation through the ConfigData entry in the FTDIPORT.INF file. This is the same entry that contains the Baud rate table.

The options can be set through the first DWORD of the table (shown in bold below)

```
[FtdiPort232.NT.HW.AddReg]
HKR,, "ConfigData", 1, 01,00,3F,3F, 10,27,88,13,C4,09,E2,04,71,02,38,41,9C,80,4E,C0,34,00,1A,00,
0D,00,06,40,03,80,00,00,D0,80
```

This entry is byte-reversed, so MSB the DWORD reads 3F 3F 00 01 and the least significant bit is Bit 0. The values are given as follows:

Bits 16 - 23:     Receive transfer size  
Bits 24 - 31:     Transmit transfer size

The maximum value permitted in each case is 3F this is the standard default value.

The transfer size in bytes may be calculated as

$$\text{Transfer size in bytes} = (\text{Transfer size entry} + 1) * 0x40$$

The USB transfer sizes used by a device are located in the registry under

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Enum\FTDIBUS\{Device VID, PID and serial
number}\0000\Device Parameters\ConfigData
```

### 6.3 Setting a Custom Default Latency Timer Value

The latency timer is a form of time-out mechanism for the read buffer of FTDI devices. When a FT\_Read instruction is sent to the device, data will not be sent back to the host PC until the requested number of bytes has been read. If the requested number of bytes never comes, the device would not send data back.

The latency timer counts from the last time data was sent back to the PC. If the latency timer expires, the device will send what data it has available to the PC regardless of how many bytes it is waiting on. The latency timer will then reset and begin counting again.

The default value for the latency timer is 16ms. This value may be customised by adding or changing the following entries in the FTDIPORT.INF file of the driver before installation.

```
[FtdiPort232.NT.HW.AddReg]
HKR,, "LatencyTimer", 0x00010001, 50
```

This example will set the default latency timer value to 50ms. The valid range for the latency timer is 1ms - 255ms, although 1ms is not recommended as this is the same as the USB frame length.

The latency timer value is held in the registry under

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Enum\FTDIBUS\{Device VID, PID and serial number}\0000\Device Parameters\LatencyTimer
```

Please see [AN232B-04 Data Throughput, Latency and](#) for additional information on the latency timer.

## 6.4 Enabling Modem Emulation Mode

Modem emulation mode allows binary data to be transmitted over a two (or more) wire interface with full handshaking and modem control signalling, thus allowing PPP connections to be made. Possible applications include mobile phone data cables, and radio links.

Including the following entries in the FTDIPORT.INF file for the VCP driver before installation enables modem emulation mode:

```
[FtdiPort232.NT.HW.AddReg]
HKR,, "EmulationMode", 0x00010001, 0x0000nnnn
```

This creates a registry entry under

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Enum\FTDIBUS\{Device VID, PID and serial
number}\0000\Device Parameters\EmulationMode
```

Please see [AN232B-09 Using the Modem Emulation Mode](#) for additional information on modem emulation mode.



## 6.5 Buffered Writes

In some cases, it is possible that the hardware developer does not have control over the application software. This can cause problems when migrating from RS232 to USB, as applications written for RS232 typically write bytes to the port one at a time and this will have a detrimental effect on the USB performance. Due to the packetised nature of USB, it is far more efficient to transfer data in large chunks. This can be achieved by buffering the data within the application.

If the developer does not have control over the application software to allow for buffering the data there, the FTDI driver provides an option to buffer the data from the application in the driver before sending the data out over USB to the device.

The Buffered Writes option is enabled through bit 10 of the first DWORD of the ConfigData entry in the FTDIPORT.INF file. This is the same entry that contains the Baud rate table.

The first DWORD is shown in bold in the INF fragment below.

```
[FtdiPort232.NT.HW.AddReg]
HKR,, "ConfigData", 1,01,00,3F,3F,10,27,88,13,C4,09,E2,04,71,02,38,41,9C,80,4E,C0,34,00,1A,00,
0D,00,06,40,03,80,00,00,D0,80
```

Please note that the ConfigData entry is byte-reversed, so MSB the DWORD reads **3F 3F 00 01** and the least significant bit is Bit 0. With Buffered Writes disabled, the DWORD would read **3F 3F 00 01**. With Buffered Writes enabled, the DWORD would read **3F 3F 04 01**.

In addition to enabling buffered writes in the Config Data entry, some parameters must be set up to control the behaviour. These parameters can also be set up in FTDIPORT.INF as follows:

```
[FtdiPort232.NT.HW.AddReg]
HKR,, "WriteBufferSize", 0x00010001, 4096
HKR,, "WriteBufferThreshold", 0x00010001, 20
HKR,, "WriteLatency", 0x00010001, 6
```

These values are held in the registry under this key:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Enum\FTDIBUS\{Device VID, PID and serial
number}\0000\Device Parameters
```

These parameters are specific to the application. As such, they will require to be "tuned" to provide best performance.

## 6.6 Miscellaneous Options

Miscellaneous options available on the [COMi;1;2port;1;2advanced;1;2prope](#)<sup>[5]</sup> may be set up at installation through the INF sections covered in this section.

- |↓| [Timeouts](#)<sup>[26]</sup>
- |↓| [Serial;1;2Enumer](#)<sup>[27]</sup>
- |↓| [Serial;1;2Prior](#)<sup>[28]</sup>
- |↓| [Cancel;1;2If;1;2Pov](#)<sup>[29]</sup>
- |↓| [Event;1;2On;1;2Surprise;1;2](#)<sup>[30]</sup>
- |↓| [Set;1;2RTS;1;2On](#)<sup>[31]</sup>
- |↓| [Disable;1;2Modem;1;2Ctrl;1;2](#)<sup>[32]</sup>

### 6.6.1 Timeouts

The read and write timeout values may be set through the FTDIPORT.INF file.

```
[FtdiPort232.NT.HW.AddReg]
HKR,, "MinReadTimeout", 0x00010001, 0
HKR,, "MinWriteTimeout", 0x00010001, 0
```

This INF file fragment shows the minimum read and minimum write timeout values set to 0ms.

These values are held in the registry under this key:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Enum\FTDIBUS\{Device VID, PID and serial
number}\0000\Device Parameters
```

### 6.6.2 Serial Enumerator

The function of the serial enumerator is to detect a Plug-and-Play enabled device (such as a serial mouse or serial modem) that is attached to the USB serial port.

The Serial Enumerator option is controlled through the following entries in FTDIPORT.INF:

```
[FtdiPort232.NT.HW.AddReg]  
HKR,, "UpperFilters", 0x00010000, "serenum"
```

### 6.6.3 Serial Printer

If enabled, serial printer will disable timeouts to allow for long delays associated with paper loading.

The Serial Printer option is controlled through bit 7 of byte 0 of the first DWORD of the ConfigData entry in the FTDI<sup>®</sup>PORT.INF file. This is the same entry that contains the Baud rate table.

The first DWORD is shown in bold in the INF fragment below.

```
[FtdiPort232.NT.HW.AddReg]
HKR,, "ConfigData", 1,01,00,3F,3F,10,27,88,13,C4,09,E2,04,71,02,38,41,9C,80,4E,C0,34,00,1A,00,
0D,00,06,40,03,80,00,00,D0,80
```

Please note that this entry is byte-reversed, so MSB the DWORD reads **3F 3F 00 01** and the least significant bit is Bit 0. When disabled (serial printer disabled), the DWORD would read **3F 3F 00 01**. When enabled (serial printer enabled), the DWORD would read **3F 3F 00 81**.

These values are held in the registry under this key:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Enum\FTDIBUS\{Device VID, PID and serial
number}\0000\Device Parameters\ConfigData
```

#### 6.6.4 Cancel If Power Off

The Cancel If Power Off option can be used to assist with problems encountered when going into a hibernate or suspend condition. This will cancel any requests received by the driver when going into hibernate or suspend.

The Cancel If Power Off option is controlled through bit 6 of byte 0 of the first DWORD of the ConfigData entry in the FTDIPORT.INF file. This is the same entry that contains the Baud rate table.

The first DWORD is shown in bold in the INF fragment below.

```
[FtdiPort232.NT.HW.AddReg]
HKR,, "ConfigData", 1,01,00,3F,3F,10,27,88,13,C4,09,E2,04,71,02,38,41,9C,80,4E,C0,34,00,1A,00,
0D,00,06,40,03,80,00,00,D0,80
```

Please note that this entry is byte-reversed, so MSB the DWORD reads **3F 3F 00 01** and the least significant bit is Bit 0. When disabled (no cancel on power off), the DWORD would read **3F 3F 00 01**. When enabled (cancel on power off), the DWORD would read **3F 3F 00 41**.

These values are held in the registry under this key:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Enum\FTDIBUS\{Device VID, PID and serial
number}\0000\Device Parameters\ConfigData
```

### 6.6.5 Event On Surprise Removal

The Event On Surprise Removal option is generally left unselected. If an application sets SERIAL\_EV\_EVENT2 (see NTDDSER.H) in its event bitmask and this feature is enabled, the driver will signal this event on surprise removal.

The Event On Surprise Removal option is controlled through bit 5 of byte 0 of the first DWORD of the ConfigData entry in the FTDI PORT.INF file. This is the same entry that contains the Baud rate table.

The first DWORD is shown in bold in the INF fragment below.

```
[FtdiPort232.NT.HW.AddReg]
HKR,, "ConfigData", 1,01,00,3F,3F,10,27,88,13,C4,09,E2,04,71,02,38,41,9C,80,4E,C0,34,00,1A,00,
0D,00,06,40,03,80,00,00,D0,80
```

Please note that this entry is byte-reversed, so MSB the DWORD reads **3F 3F 00 01** and the least significant bit is Bit 0. When disabled (no event on surprise removal), the DWORD would read **3F 3F 00 01**. When enabled (event on surprise removal), the DWORD would read **3F 3F 00 21**.

These values are held in the registry under this key:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Enum\FTDIBUS\{Device VID, PID and serial
number}\0000\Device Parameters\ConfigData
```

### 6.6.6 Set RTS On Close

Selecting the Set RTS On Close option will set the RTS signal on closing the port.

The Set RTS On Close option is controlled through bit 3 of byte 0 of the first DWORD of the ConfigData entry in the FTDIPORT.INF file. This is the same entry that contains the Baud rate table.

The first DWORD is shown in bold in the INF fragment below.

```
[FtdiPort232.NT.HW.AddReg]
HKR,, "ConfigData", 1,01,00,3F,3F,10,27,88,13,C4,09,E2,04,71,02,38,41,9C,80,4E,C0,34,00,1A,00,
0D,00,06,40,03,80,00,00,D0,80
```

Please note that this entry is byte-reversed, so MSB the DWORD reads **3F 3F 00 01** and the least significant bit is Bit 0. When disabled (RTS not set on close), the DWORD would read **3F 3F 00 01**. When enabled (RTS set on close), the DWORD would read **3F 3F 00 09**.

These values are held in the registry under this key:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Enum\FTDIBUS\{Device VID, PID and serial
number}\0000\Device Parameters\ConfigData
```



### 6.6.7 Disable Modem Ctrl At Startup

This option is used to control the modem control signals DTR and RTS at startup. In normal operation, the modem control signals at startup follow the behaviour of the legacy port. However, due to timing differences between a legacy COM port and a virtual COM port, a "spike" on one of these signals in the legacy port can appear as an assertion of the signal in the virtual COM port. Devices that monitor these signals can enter the wrong state after an unplug-replug cycle on USB.

Note that if the "Serial Enumerator" option in the property page is selected, then the enumeration sequence causes the modem control signals to change at startup. So if it is necessary to select "Disable Modem Ctrl At Startup", then it is likely that "Serial Enumerator" should be unchecked in the property page.

The Disable Modem Ctrl At Startup option is controlled through bit 1 of byte 1 of the first DWORD of the ConfigData entry in the FTDI<sup>®</sup>PORT.INF file. This is the same entry that contains the Baud rate table.

The first DWORD is shown in bold in the INF fragment below.

```
[FtdiPort232.NT.HW.AddReg]
HKR,, "ConfigData", 1,01,00,3F,3F,10,27,88,13,C4,09,E2,04,71,02,38,41,9C,80,4E,C0,34,00,1A,00,
0D,00,06,40,03,80,00,00,D0,80
```

Please note that this entry is byte-reversed, so MSB the DWORD reads **3F 3F 00 01** and the least significant bit is Bit 0. When disabled(modem control at startup enabled), the DWORD would read **3F 3F 00 01**. When enabled (modem control at startup disabled), the DWORD would read **3F 3F 02 01**.

Alternatively, the default can be overridden by directly editing the ConfigData parameter in the virtual COM port's registry entry.

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Enum\FTDIBUS\VID_0403+PID_6001+1234
5678\0000\DeviceParameters\ConfigData
```

Note that if DisableModemControlSignalsAtStartup is set TRUE by editing the installation file or the registry, the same considerations as above apply to "Serial<sup>®</sup> Enumerator<sup>™</sup>". So it may be necessary to remove references to "serenum" in "UpperFilters" in the AddReg sections of the installation file, and in the UpperFilters key in the virtual COM port's registry entry.

## 7 System Options

### 7.1 Ignore Hardware Serial Number

If devices have the same vendor ID and product ID but different serial numbers, the system will normally treat them as different devices. This causes the drivers to be installed for each device and create registry entries for each device.

It is possible to override this behaviour to make the system ignore a device's serial number and treat all devices with matching VID and PID connected to the same USB port as if they were the same device. This is achieved by adding a REG\_BINARY value called *IgnoreHWSerNum* to the registry and setting it to 01.

This value is held in the registry key located at:

HKEY\_LOCAL\_MACHINE\SYSTEM\CurrentControlSet\Control\UsbFlags\IgnoreHWSerNum{Device VID, PID and interface}

For a default FTDI device ID (VID 0x0403, PID 0x6001), add the following registry REG\_BINARY value set to 01:

HKEY\_LOCAL\_MACHINE\SYSTEM\CurrentControlSet\Control\UsbFlags\IgnoreHWSerNum04036001

For port A of an FT2232 device with default VID and PID, the IgnoreHWSerNum string would be:

HKEY\_LOCAL\_MACHINE\SYSTEM\CurrentControlSet\Control\UsbFlags\IgnoreHWSerNum0403601000

and for port B of an FT2232 device the IgnoreHWSerNum string would be:

HKEY\_LOCAL\_MACHINE\SYSTEM\CurrentControlSet\Control\UsbFlags\IgnoreHWSerNum0403601001

As the FT2232 device also uses the Windows composite device driver, an additional IgnoreHWSerNum entry is required to prevent Windows from creating additional composite driver registry entries:

HKEY\_LOCAL\_MACHINE\SYSTEM\CurrentControlSet\Control\UsbFlags\IgnoreHWSerNum04036010

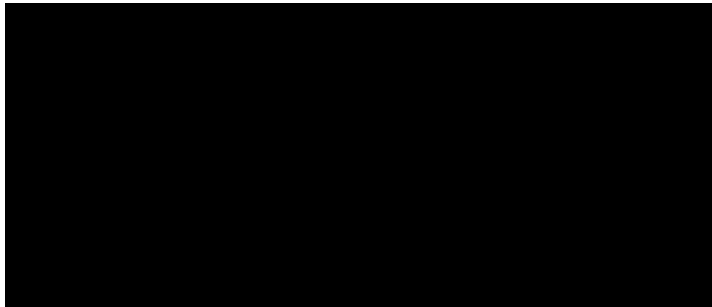
Now the system can treat devices with the same vendor ID and product ID but different serial numbers as the same device and drivers are installed for the first device only. As such, only one entry is created in the registry. If the device is connected to another USB port, the driver will have to be reinstalled for that port.

**Note that IgnoreHWSerNum cannot be setup in FTDIBUS.INF or FTDIPORT.INF, it must be setup by editing the registry manually or by an installation utility BEFORE installing the driver.**

## 7.2 Phantom Devices

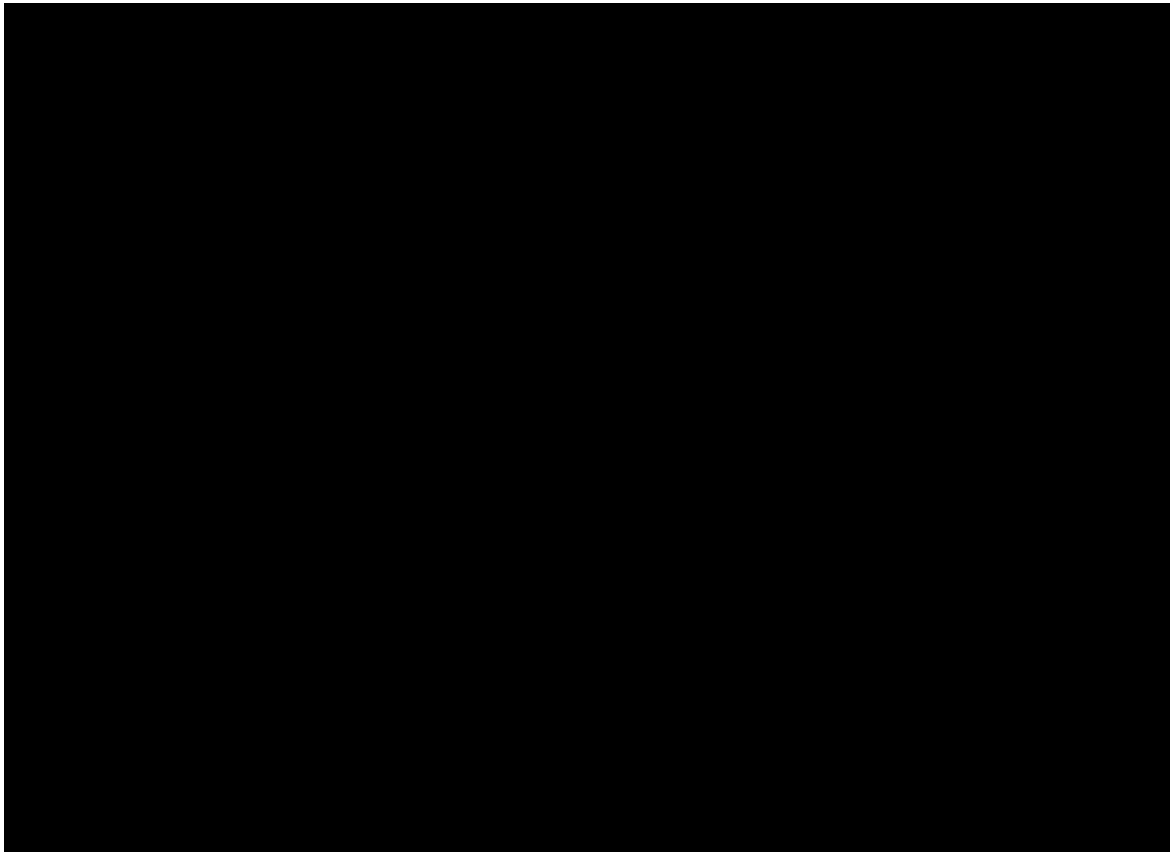
Devices that have been installed on a system but are not currently available are referred to as "phantom devices". These devices are not usually displayed in the device manager, but can be made to be displayed as though they are attached. This allows device properties to be changed or devices to be uninstalled via Device Manger even though the device is not physically connected to the PC.

To display phantom devices in Device Manager, a new system variable is required. Open "Control Panel > System" then select the "Advanced" tab and click "Environment Variables". In the System Variables section (**NOT THE USER VARIABLES SECTION**), click "New..." to display the following window:



Create a new System Variable called "DevMgr\_Show\_NonPresent\_Devices" and set the value to 1, then click OK.

Open the Device Manager ("Control Panel > System" then select the "Hardware" tab and click "Device Manager" <sup>1</sup>/<sub>2</sub>, or "Control Panel > Device Manger" in Vista and select "View > Show Hidden Devices". Device Manager will then show all hidden and phantom devices available on that PC as shaded.



## 8 Foreign Language Support

There is a DLL available to display the VCP COM port properties page in languages other than English. To request a new language be made available in the DLL, please contact [FTDI Support](#) who will provide the text from the properties page to be translated into the desired language. Once the translated text is returned to FTDI the new language can be implemented in the DLL.

## 9 Co-Installer

The FT2232 is a composite USB device which is capable of providing two COM ports to a system. To ensure that the ports of the FT2232 device are allocated COM port numbers in the correct order (i.e. port A is allocated before port B) under Windows 2000 and XP, a co-installer is used. The co-installer is specified in the following sections of the FTDIPORT.INF file:

```
[FtdiPort2232.NT.CoInstallers]
AddReg=FtdiPort2232.NT.CoInstallers.AddReg
CopyFiles=FtdiPort2232.NT.CopyColnst

[FtdiPort2232.NT.CoInstallers.AddReg]
HKR,,CoInstallers32,0x00010000,"ftcserco.Dll,FTCSERCoInstaller"

[FtdiPort2232.NT.CopyColnst]
ftcserco.dll
```

## 10 Renaming Driver Files

It is possible to rename the driver files to create a unique driver package, but this is not recommended. In order for the renamed driver package to work correctly, all references to file names in the INF files must be updated to use the new file names. FTDI does not currently support users who attempt to rename driver packages.

A WHQL certified driver package that has file names changed will invalidate the certification.

## 11 Driver Pre-Installation

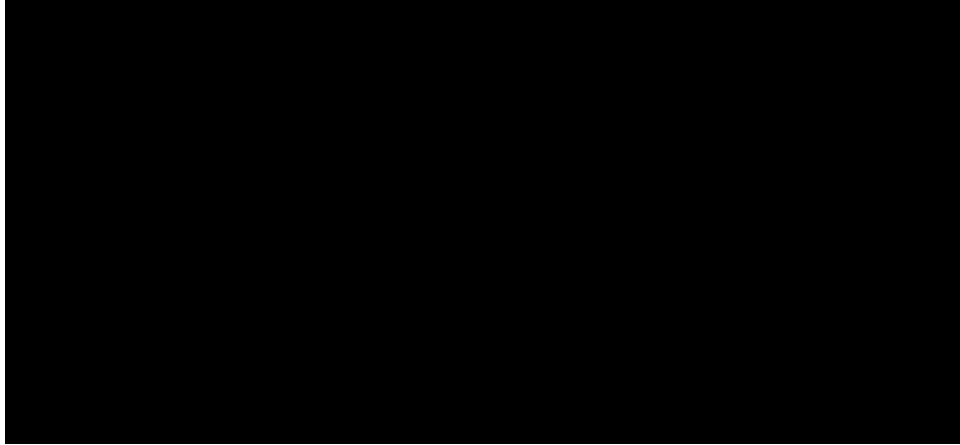
Traditionally, the Found New Hardware Wizard has been the regular method for installing new hardware on a Windows machine. Microsoft has recognised that this requires some input from the end-user who may know very little about driver installation. Additionally, many manufacturers would prefer to install the device drivers before the end-user connects the hardware to the PC.

Microsoft has addressed this problem by producing a set of driver installation tools called Driver Install Frameworks (DIFx). The simplest tool provided for driver installation is called the Driver Package Installer (DPInst). FTDI's driver packages from VCP 1.00.2176 onwards are compatible with DPInst.

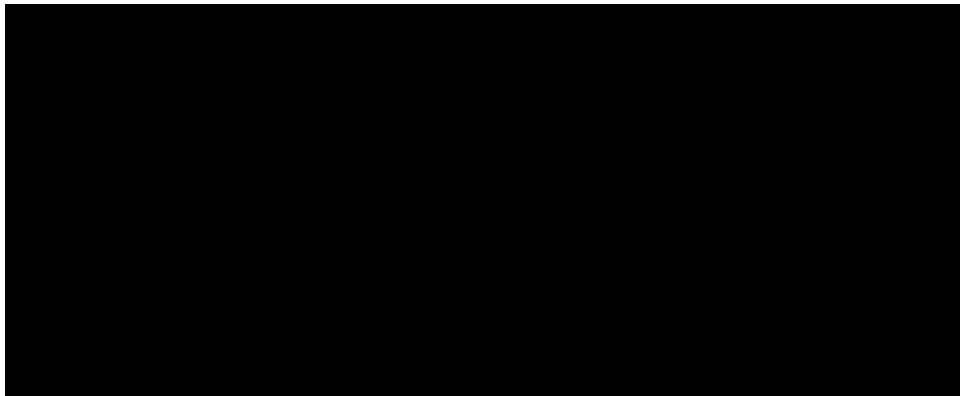


## 11.1 DPInst Packages

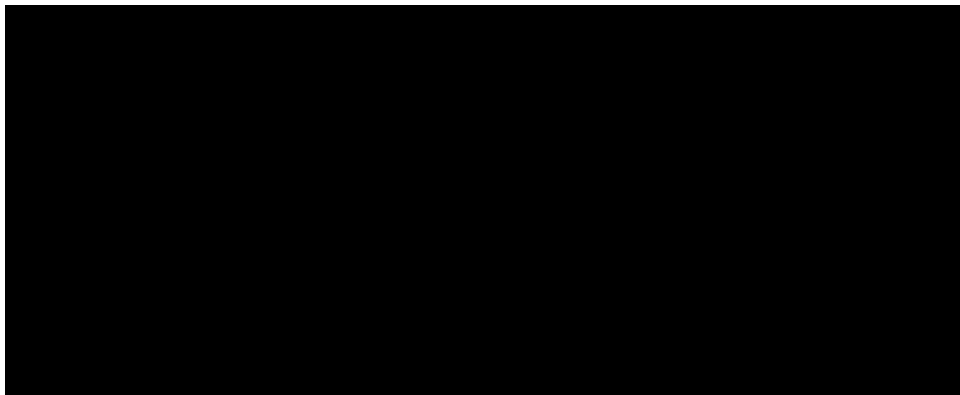
In order to be compatible with [DPInst](#), a driver package **must** be Microsoft WHQL certified and meet certain requirements as outlined in [Microsoft's ½ Documentat](#). The standard FTDI CDM driver package meets these requirements if certified, such as CDM 2.02.04. When bundled with DPInst, the driver package typically contains the files shown below:



where the i386 subdirectory contains the 32-bit driver files:



and the amd64 subdirectory contains the 64-bit driver files:



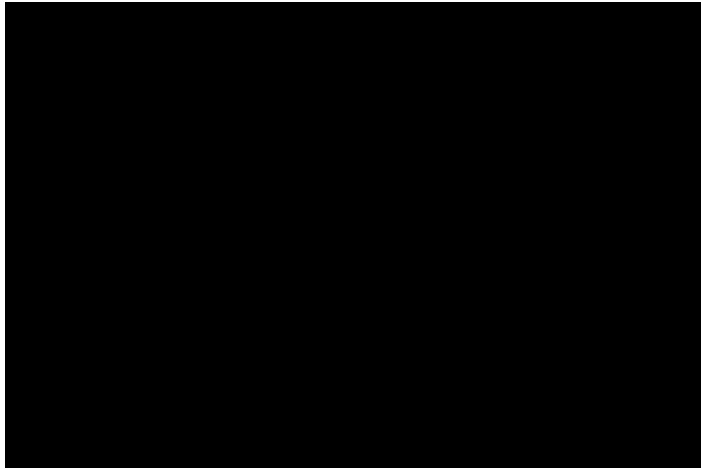
In order to use DPInst to install the driver, DPInst.exe must be run. There are two versions of DPInst, a 32-bit version to install the 32-bit driver package (DPInstx86.exe in above screen shot) and a 64-bit version to install the 64-bit driver package (DPInstx64.exe in above screen shot). An automated installer must detect which version of DPInst is required to successfully install the driver package using DPInst.

If a custom VID and PID combination is required, FTDI can grant reseller rights to customers with a WinQual account. This will allow them to modify the INF files and obtain new signature files for them without having to submit DTM test logs. Microsoft charge a small fee for this service. To learn more about using DPInst with FTDI drivers, please see application note [AN232R-03: FTDI Windows Driver Pr.](#)

## 12 Uninstalling Drivers

With the release of Microsoft Windows Vista, the FTDI uninstaller has been rendered unusable due to Windows Resource Protection preventing the executable from deleting driver files and associated registry values. Vista will only allow the system itself to modify files and registry values in these locations.

Consequently, a new method for uninstalling has to be used. Devices can be removed using the Device Manager by simply right-clicking and selecting "Uninstall". This will delete the associated registry entries for that device only. Vista provides an automatic method to delete driver files via a check box to "Delete the driver software for this device" on the uninstall dialog box.



Windows 2000, XP and Server 2003 do not have this check box, so driver files and OEM INF and PNF files must be removed manually or by using a custom application.

Some points to note about the new uninstallation method:

- | In the case of FT2232 devices, a composite device is also installed. This can also be removed by right-clicking and selecting "Uninstall". There is no option to delete the driver files when doing this as the driver for the composite device is a native Windows driver.
- | If the VCP driver has been installed, the COM port driver should be removed before the bus driver. If the bus is removed first, the COM port will no longer appear in the Device Manager.
- | If the files are deleted while other installed devices still require them those devices will not work correctly. This can be fixed by right clicking the device and selecting "Reinstall Driver" which will replace the missing files.
- | If a device to be uninstalled is not connected to the PC, the device can still be removed by [setting the device manager to show hidden devices](#)<sup>[34]</sup>. This can also allow a virtual COM port to be uninstalled if the bus layer has been removed first.

## 13 Revision History

Version	Release Date	Comments
1.0	January 2005	Initial release
2.0	June 2006	Modified to reflect new driver model Screen shots updated for XP themes DPIInst references included
2.1	August 2006	Amended Location IDs to include terminating 00 entry Added System Options section with IgnoreHWSerNum
2.2	July 2007	Added Phantom Devices section Modified appendix entries for INF and INI files to reflect new driver package for Vista (combined x86 and x64 package, no uninstaller executable) Removed references to uninstaller and FTClean (which uses the uninstaller) as no longer valid for Vista Removed references to power management tab and INF options - handled automatically as of CDM 2.02.04. Added a section on uninstalling via Device Manager as is required by Vista Updated USA office address

## 14 Disclaimer

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Please visit the [Sales & Netw](#) page of the [FTDI & Web](#) for the contact details of our distributor(s) in your country.

## 16 Appendix

### 16.1 FTDIBUS.INF

```
; FTDIBUS.INF
; Copyright (c) 2000-2007 FTDI Ltd.
;
; USB serial converter driver installation for Windows 2000, XP, Server 2003, Vista (x86 and x64).
;

[Version]
Signature="$Windows NT$"
DriverPackageType=PlugAndPlay
DriverPackageDisplayName=%DESC%
Class=USB
ClassGUID={36fc9e60-c465-11cf-8056-444553540000}
Provider=%FTDI%
CatalogFile=ftdibus.cat
DriverVer=06/27/2007,2.02.04

[SourceDisksNames]
1=%DriversDisk%,,,

[SourceDisksFiles]
ftdibus.sys = 1,i386
ftbusui.dll = 1,i386
ftd2xx.dll = 1,i386

[SourceDisksFiles.amd64]
ftdibus.sys = 1,amd64
ftbusui.dll = 1,amd64
ftd2xx64.dll = 1,amd64
ftd2xx.dll = 1,i386

[DestinationDirs]
FtdiBus.NT.Copy = 10,system32\drivers
FtdiBus.NT.Copy2 = 10,system32
FtdiBus.NTamd64.Copy = 10,system32\drivers
FtdiBus.NTamd64.Copy2 = 10,system32
FtdiBus.NTamd64.Copy3 = 10,syswow64

[Manufacturer]
%Ftdi%=FtdiHw,NTamd64

[FtdiHw]
%USB\VID_0403&PID_6001.DeviceDesc%=FtdiBus.NT,USB\VID_0403&PID_6001
%USB\VID_0403&PID_6010&MI_00.DeviceDesc%=FtdiBus.NT,USB\VID_0403&PID_6010&MI_00
%USB\VID_0403&PID_6010&MI_01.DeviceDesc%=FtdiBus.NT,USB\VID_0403&PID_6010&MI_01

[FtdiHw.NTamd64]
%USB\VID_0403&PID_6001.DeviceDesc%=FtdiBus.NTamd64,USB\VID_0403&PID_6001
%USB\VID_0403&PID_6010&MI_00.DeviceDesc%=FtdiBus.NTamd64,USB\VID_0403&PID_6010&MI_00
%USB\VID_0403&PID_6010&MI_01.DeviceDesc%=FtdiBus.NTamd64,USB\VID_0403&PID_6010
```

&MI\_01

[ControlFlags]  
ExcludeFromSelect=\*

[FtdiBus.NT]  
CopyFiles=FtdiBus.NT.Copy,FtdiBus.NT.Copy2  
AddReg=FtdiBus.NT.AddReg

[FtdiBus.NTamd64]  
CopyFiles=FtdiBus.NTamd64.Copy,FtdiBus.NTamd64.Copy2,FtdiBus.NTamd64.Copy3  
AddReg=FtdiBus.NT.AddReg

[FtdiBus.NT.Services]  
AddService = FTDIBUS, 0x00000002, FtdiBus.NT.AddService

[FtdiBus.NTamd64.Services]  
AddService = FTDIBUS, 0x00000002, FtdiBus.NT.AddService

[FtdiBus.NT.AddService]  
DisplayName = %SvcDesc%  
ServiceType = 1 ; SERVICE\_KERNEL\_DRIVER  
StartType = 3 ; SERVICE\_DEMAND\_START  
ErrorControl = 1 ; SERVICE\_ERROR\_NORMAL  
ServiceBinary = %10%\system32\drivers\ftdibus.sys  
LoadOrderGroup = Base  
AddReg = FtdiBus.NT.AddService.AddReg

[FtdiBus.NT.AddReg]  
HKR,,DevLoader,,\*ntkern  
HKR,,NTMPDriver,,ftdibus.sys  
HKR,,EnumPropPages32,, "ftbusui.dll,FTBUSUIPropPageProvider"

[FtdiBus.NT.AddService.AddReg]  
;HKR,Parameters,"LocIds",1,31,00,00,00,32,00,00,00,00  
;HKR,Parameters,"RetryResetCount",0x10001,50

[FtdiBus.NT.Copy]  
ftdibus.sys

[FtdiBus.NT.Copy2]  
ftbusui.dll  
ftd2xx.dll

[FtdiBus.NTamd64.Copy]  
ftdibus.sys

[FtdiBus.NTamd64.Copy2]  
ftbusui.dll  
ftd2xx.dll,ftd2xx64.dll

[FtdiBus.NTamd64.Copy3]  
ftd2xx.dll

[Strings]  
Ftdi="FTDI"  
DESC="CDM Driver Package"



```
DriversDisk="FTDI USB Drivers Disk"  
USB\VID_0403&PID_6001.DeviceDesc="USB Serial Converter"  
USB\VID_0403&PID_6010&MI_00.DeviceDesc="USB Serial Converter A"  
USB\VID_0403&PID_6010&MI_01.DeviceDesc="USB Serial Converter B"  
SvcDesc="USB Serial Converter Driver"  
ClassName="USB"
```

## 16.2 FTDIPOINT.INF

```
; FTDIPOINT.INF
; Copyright (c) 2000-2007 FTDI Ltd.
;
; USB serial port driver installation for Windows 2000, XP, Server 2003, Vista (x86 and x64).
;

[Version]
Signature="$Windows NT$"
DriverPackageType=PlugAndPlay
DriverPackageDisplayName=%DESC%
Class=Ports
ClassGUID={4d36e978-e325-11ce-bfc1-08002be10318}
Provider=%FTDI%
CatalogFile=ftdiport.cat
DriverVer=06/27/2007,2.02.04

[SourceDisksNames]
1=%DriversDisk%,,,

[SourceDisksFiles]
ftser2k.sys=1,i386
ftserui2.dll=1,i386
FTLang.Dll = 1,i386
ftcserco.dll = 1,i386

[SourceDisksFiles.amd64]
ftser2k.sys=1,amd64
ftserui2.dll=1,amd64
FTLang.Dll = 1,amd64
ftcserco.dll = 1,amd64

[DestinationDirs]
FtdiPort.NT.Copy=10,system32\drivers
FtdiPort.NT.CopyUI=10,system32
FtdiPort2232.NT.CopyColnst=10,system32

[ControlFlags]
ExcludeFromSelect=*

[Manufacturer]
%FTDI%=FtdiHw,NTamd64

[FtdiHw]
%VID_0403&PID_6001.DeviceDesc%=FtdiPort232.NT,FTDIBUS\COMPORT&VID_0403&PID_6001
%VID_0403&PID_6010.DeviceDesc%=FtdiPort2232.NT,FTDIBUS\COMPORT&VID_0403&PID_6010

[FtdiHw.NTamd64]
%VID_0403&PID_6001.DeviceDesc%=FtdiPort232.NTamd64,FTDIBUS\COMPORT&VID_0403&PID_6001
%VID_0403&PID_6010.DeviceDesc%=FtdiPort2232.NTamd64,FTDIBUS\COMPORT&VID_0403&PID_6010

[FtdiPort.NT.AddService]
```

```

DisplayName = %SvcDesc%
ServiceType = 1 ; SERVICE_KERNEL_DRIVER
StartType = 3 ; SERVICE_DEMAND_START
ErrorControl = 1 ; SERVICE_ERROR_NORMAL
ServiceBinary = %10%\system32\drivers\ftser2k.sys
LoadOrderGroup = Base

; ----- Serenum Driver install section
[SerEnum_AddService]
DisplayName = %SerEnum.SvcDesc%
ServiceType = 1 ; SERVICE_KERNEL_DRIVER
StartType = 3 ; SERVICE_DEMAND_START
ErrorControl = 1 ; SERVICE_ERROR_NORMAL
ServiceBinary = %12%\serenum.sys
LoadOrderGroup = PNP Filter

[FtdiPort.NT.AddReg]
HKR,,EnumPropPages32,, "ftserui2.dll,SerialPortPropPageProvider"

[FtdiPort.NT.Copy]
ftser2k.sys

[FtdiPort.NT.CopyUI]
ftserui2.dll
FTLang.dll

[FtdiPort232.NT]
CopyFiles=FtdiPort.NT.Copy,FtdiPort.NT.CopyUI
AddReg=FtdiPort.NT.AddReg

[FtdiPort232.NTamd64]
CopyFiles=FtdiPort.NT.Copy,FtdiPort.NT.CopyUI
AddReg=FtdiPort.NT.AddReg

[FtdiPort232.NT.HW]
AddReg=FtdiPort232.NT.HW.AddReg

[FtdiPort232.NTamd64.HW]
AddReg=FtdiPort232.NT.HW.AddReg

[FtdiPort232.NT.Services]
AddService = FTSER2K, 0x00000002, FtdiPort.NT.AddService
AddService = Serenum,,SerEnum_AddService
DelService = FTSERIAL

[FtdiPort232.NTamd64.Services]
AddService = FTSER2K, 0x00000002, FtdiPort.NT.AddService
AddService = Serenum,,SerEnum_AddService
DelService = FTSERIAL

[FtdiPort232.NT.HW.AddReg]
HKR,,"UpperFilters",0x00010000,"serenum"
;HKR,,"ConfigData",1,01,00,3F,3F,10,27,88,13,C4,09,E2,04,71,02,38,41,9c,80,4E,C0,34,00,1A,00,
0D,00,06,40,03,80,00,00,d0,80
HKR,,"ConfigData",1,11,00,3F,3F,10,27,00,00,88,13,00,00,C4,09,00,00,E2,04,00,00,71,02,00,00,3
8,41,00,00,9C,80,00,00,4E,C0,00,00,34,00,00,00,1A,00,00,00,0D,00,00,00,06,40,00,00,03,80,00,0
0,00,00,00,00,D0,80,00,00
HKR,,"MinReadTimeout",0x00010001,0

```

```
HKR,, "MinWriteTimeout", 0x00010001, 0
HKR,, "LatencyTimer", 0x00010001, 16

; -----
; FT232C
; -----

[FtdiPort2232.NT]
CopyFiles=FtdiPort.NT.Copy,FtdiPort.NT.CopyUI
AddReg=FtdiPort.NT.AddReg

[FtdiPort2232.NTamd64]
CopyFiles=FtdiPort.NT.Copy,FtdiPort.NT.CopyUI
AddReg=FtdiPort.NT.AddReg

[FtdiPort2232.NT.HW]
AddReg=FtdiPort232.NT.HW.AddReg

[FtdiPort2232.NTamd64.HW]
AddReg=FtdiPort232.NT.HW.AddReg

[FtdiPort2232.NT.CoInstallers]
AddReg=FtdiPort2232.NT.CoInstallers.AddReg
CopyFiles=FtdiPort2232.NT.CopyCoInst

[FtdiPort2232.NT.Services]
AddService = FTSER2K, 0x00000002, FtdiPort.NT.AddService
AddService = Serenum,,SerEnum_AddService
DelService = FTSERIAL

[FtdiPort2232.NTamd64.Services]
AddService = FTSER2K, 0x00000002, FtdiPort.NT.AddService
AddService = Serenum,,SerEnum_AddService
DelService = FTSERIAL

[FtdiPort2232.NT.CoInstallers.AddReg]
HKR,,CoInstallers32,0x00010000,"ftcserco.Dll,FTCSERCoInstaller"

[FtdiPort2232.NT.CopyCoInst]
ftcserco.dll

;-----;

[Strings]
FTDI="FTDI"
DESC="CDM Driver Package"
DriversDisk="FTDI USB Drivers Disk"
PortsClassName = "Ports (COM & LPT)"
VID_0403&PID_6001.DeviceDesc="USB Serial Port"
VID_0403&PID_6010.DeviceDesc="USB Serial Port"
SvcDesc="USB Serial Port Driver"
SerEnum.SvcDesc="Serenum Filter Driver"
```

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