Virtual COM Port Template Application Guide

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1. VCP (Virtual COM Port) Template Overview

The Holtek USB Code Library Generator provides a Virtual COM Port, the VCP template. This application type can support products that originally use a UART transmission interface. Modern day computers have gradually ceased supporting the UART interface. When the transmission interface is converted, the corresponding software must also be modified. If this device type is used for product development, the device will become a Virtual COM Port when it is connected to the computer therefore the software does not have to be modified.

2. VCP Template Architecture

In addition to MCU programs, the VCP template also provides a driver setup information file (INF). This allows users to manually setup a driver on the Windows operating system that cannot automatically setup the driver.

When the project has been generated, the device files will be located in the Device directory within the project directory and the computer files will be located in the Host directory.

This template demonstrates a simple data loopback function. When a computer COM port software actively transmits data with variable lengths, the USB device will return the received data to the computer. This means that the program only focuses on the development of the USB virtual serial port, and does not involve the UART timing. Users must complete this by themselves.

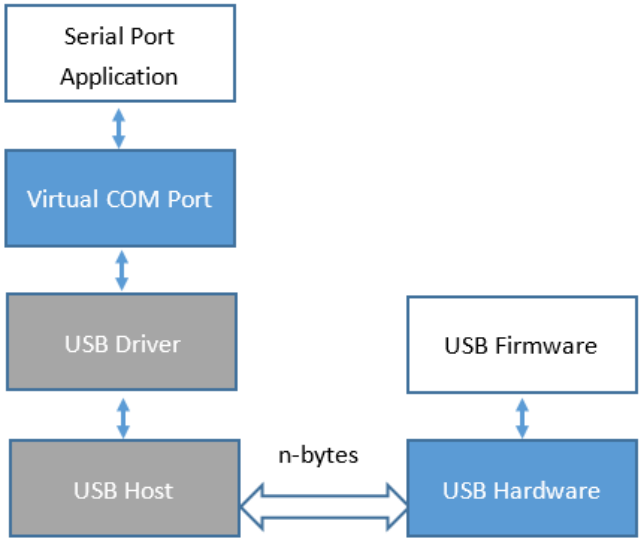


Fig 1. USB Stack

3. VCP Template File Description

[Project Dir]	
-- [Device]	
-- [Source]	
-- [application]	
-- main.c	Main program
-- define.h	User define variables
-- [hw]	
-- mcu.h	MCU related settings
-- [os]	
-- [usb]	
-- CLS	USB class command related functions
-- STD	USB enumeration and standard command related functions
-- USB_DESC.h	USB enumerate data
-- USB_INT	USB interrupt
-- USB_LIB	USB FIFO access related functions
-- USB_FIFO.h	USB related definition
-- xxxx.pjtx	HT-IDE3000 project files
-- [Host]	
-- ht_cdc_usb.inf	Driver setup information file

Fig 2. Directory Structure

4. MCU Program Description

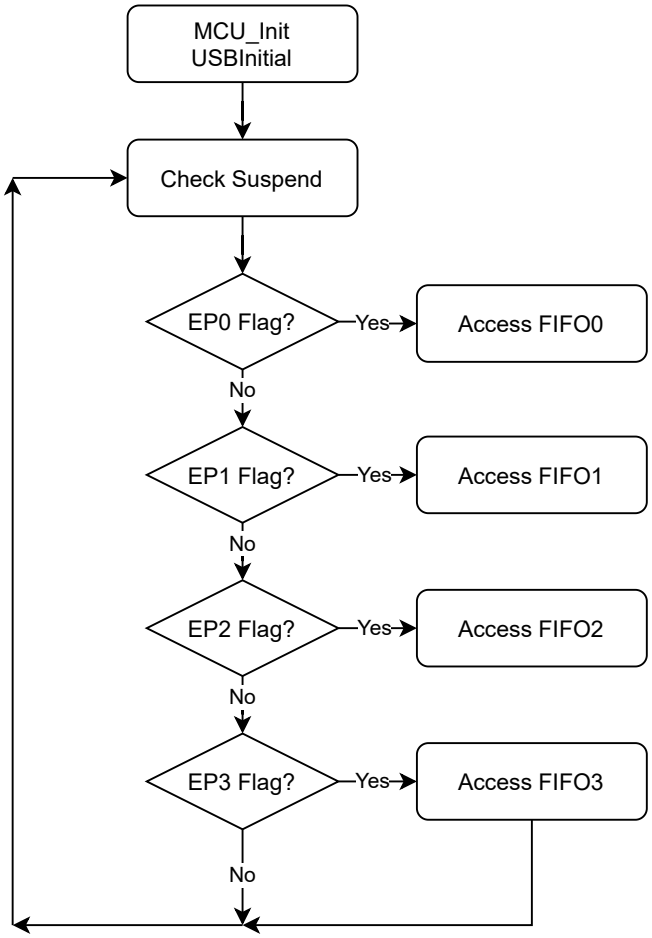


Fig 3. Program Main Flow

4.1 Program Main Flow

When the MCU has been powered-on, MCU_Init will be called to configure the system frequency and the output/input ports and USBInitial will be called to execute the USB related settings.

The program will then continuously determine whether any data needs to be accessed via the USB endpoints and then execute the following steps:

AccessFIFO0 USB enumeration will be completed using endpoint 0. This document does not describe the USB specifications. Refer to the usb.org website for the relevant files.

AccessFIFO1 When the RI/DSR/CD signal changes, its status will be returned to the host via endpoint 1.

AccessFIFO2 Data will be received from the host via endpoint 2.

AccessFIFO3 Data will be uploaded to the host via endpoint 3.

4.2 Data Transmission

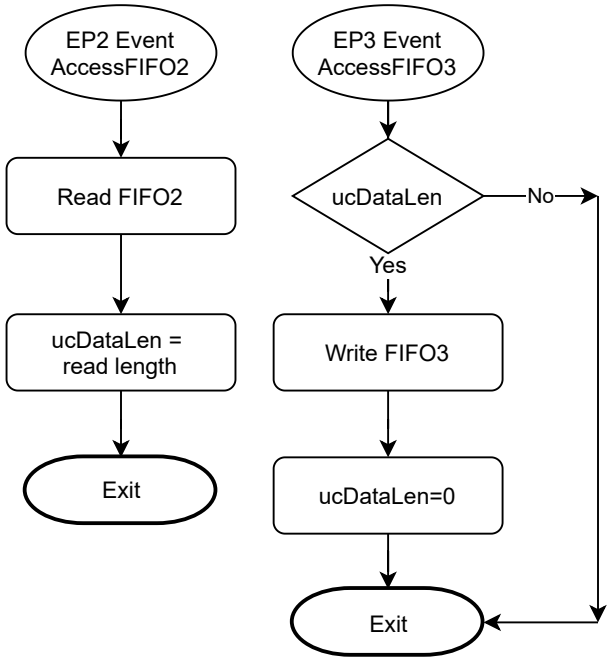


Fig 4. Endpoint 2/3 Access Flow

4.2.1 USB device passively waits for a host access event

When an endpoint 2 access event has been detected, the data will be read out and the data length will be recorded using ucDataLen. When an endpoint 3 access event has been detected, if ucDataLen is not 0, it indicates that the data has been received from the host. After the data has been returned to the host by calling WriteFIFO, ucDataLen should be cleared to 0.

This template only demonstrates the data loopback function. The user can modify AccessFIFO2 in the usb_int.c file to transmit data via the UART timing when receiving data from the host. Similarly, when the data has been received from the UART, it will be transmitted to the host via AccessFIFO3.

4.2.2 RI/DSR/CD Status

These three signals are modulator/demodulator related signals. The corresponding status will be returned to the host via AccessFIFO1 when the signal changes. These signals do not have to be processed when this device is used in transparent transmission bridge applications.

Refer to the PSTN subclass of the CDC class provided at the usb.org for the return formats.

4.2.3 VCP Control Command

If the user want to develop a simple transparent transmission device with a fixed transmission speed and number of data bits, the following three commands do not have to be modified.

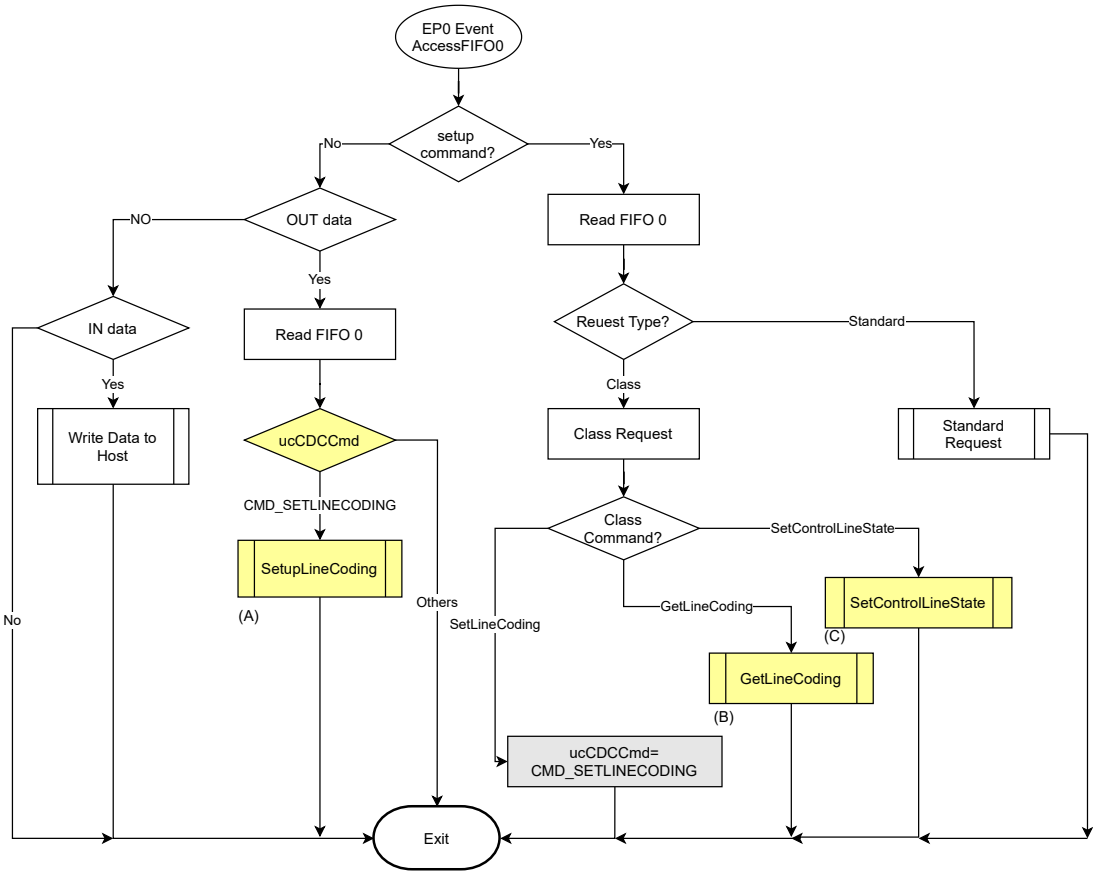


Fig 5. Endpoint 0 Access Flow

(A) SetLineCoding

The host can set the baudrate, stop bits, parity check code and number of data bits using the SetLineCoding command.

If necessary, add the UART control settings to SetupLineCoding in the usb_int.c file. The LineCoding consists of seven bytes, each of which are described in the following table:

Bytes	Description
0~3	Baudrate
4	Stop bits
5	Parity check code
6	Number of data bits

```
void SetupLineCoding()
{
    //LineCoding[0:3] : baudrate
    //LineCoding[4] : stop bits 0->1 stop
    //                          1->1.5 stops
    //                          2->2 stops
    //LineCoding[5] : parity    0->none
    //                          1->odd
    //                          2->even
    //                          3->mark
    //                          4->space
    //LineCoding[6] : databits  5,6,7,8

    //
    //add your code here
    //
}
```

(B) GetLineCoding

The host can obtain a UART setting value using the GetLineCoding command. The device only returns 7-byte LineCoding without modification.

(C) SetControlLineState

The host can control flows using the SetControlLineState in the cls.c file. If necessary, modify this function to set RTS/DTR signal according to the transmitted values.

Bits	Description	
D7 to D2	Reserved	
D1	DCE transmit function control	0 – RTS Off 1 – RTS On
D0	Notification of DTE ready state	0 – DTR Off 1 – DTR On

```
static void SetControlLineState()
{
    //Indicates to DCE if DTE is present or not
    if(FIFO_OUT[FIFO_wValL]&0x01)
        ;//_pin_DTR=0;
    else ;//_pin_DTR=1;

    //activate/deactivate Tx carrier
    if(FIFO_OUT[FIFO_wValL]&0x02)
        ;//_pin_RTS=0;
    else ;//_pin_RTS=1;
}
```

4.3 define.h

#define DESC_IDVENDOR (0x04D9)

#define DESC_IDPRODUCT (0x806C)

#define DESC_BCDDEVICE (0x0100)

The define.h file provides the following parameters for users to modify as required.

a. USB vendor ID - DESC_IDVENDOR

The identifier 0x04D9 is the Holtek dedicated USB ID. The user can use this or change it to their own applied for vendor ID.

b. USB product ID - DESC_IDPRODUCT

Different products can be configured with different product IDs to identify the pairing device using software.

c. Program version - DESC_BCDDEVICE

4.4 mcu.h

This template selects an internal oscillator as the system frequency by default. The external oscillators used by different ICs have different settings. The user can modify the parameters in the mcu.h file to change the settings.

```
#define _HXT_          0
    #define _HXTEN_       0
    #define _PLL_         0

#define _LXT_          0
    #define _LXTEN_       0
```

If _HXT_ has a value of 0, this indicates that this device does not support the programmable selection of an external high speed oscillator as the high frequency clock source or that it does not support an external oscillator.

Similarly, if _LXT_ has a value of 0, this indicates that this device does not support the programmable selection of an external low speed oscillator as the low frequency clock source or that it does not support an external oscillator.

Refer to the device datasheet for detailed usage.

```
#define _HXT_          1
    #define _HXTEN_       0
    #define _hxp0         _pds00
    #define _hxp1         _pds01
    #define _hxp2         _pds02
    #define _hxp3         _pds03

    #define _PLL_         0

#define _LXT_          1
    #define _LXTEN_       0
    #define _lxp0         _pes06
    #define _lxp1         _pes07
    #define _lxp2         _pes10
    #define _lxp3         _pes11
```

When _HXT_ has a value of 1, if the user wants to select an external oscillator as the high frequency clock source, then set _HXTEN_ to 1.

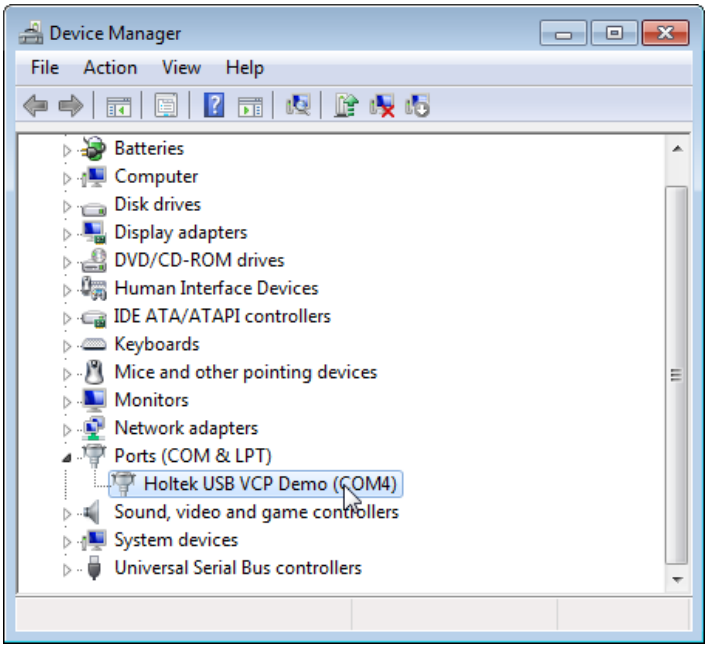
Similarly, if _LXTEN_ has been set high, the low frequency will be sourced from an external oscillator.

Other defined values in the mcu.h file are related to the device's own characteristics and should not be arbitrarily changed.

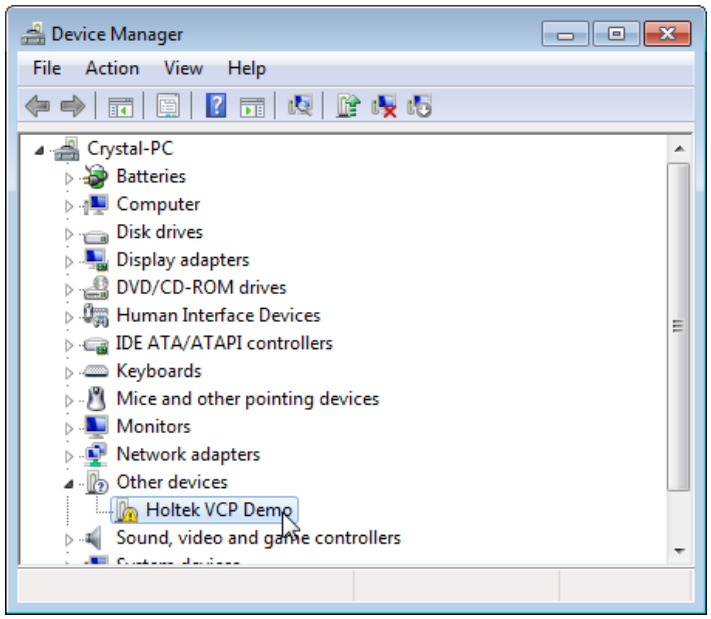
5. Software Instructions

5.1 Driver

On Windows 8 and higher operating systems, the virtual COM port drivers are usually installed automatically. When the driver setup has been completed, the COM port number will be displayed in the Device Manager as shown in the following figure.

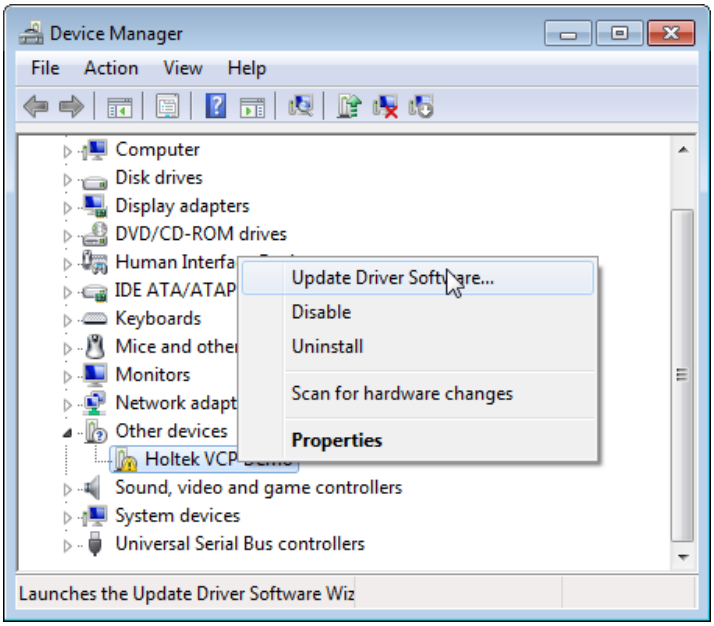


If the operating system does not support automatic COM port driver setup, this is displayed as shown in the following figure:

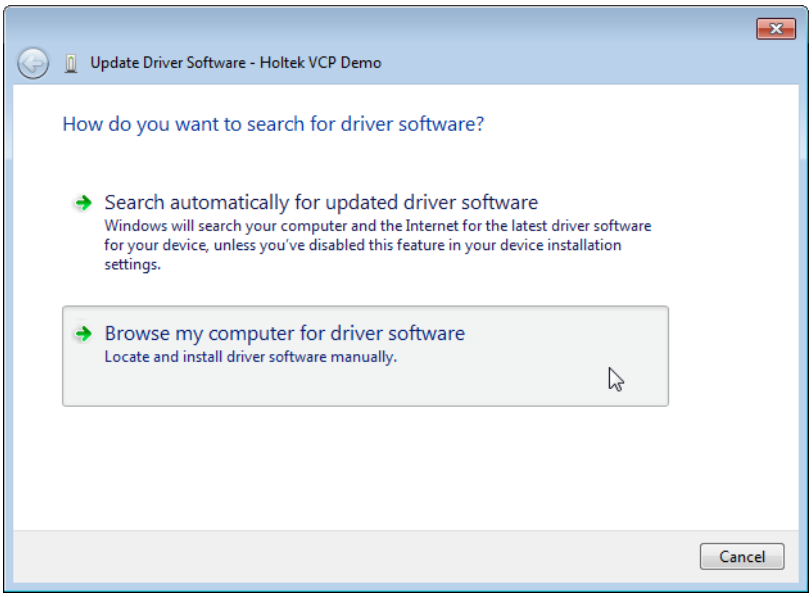


Now execute the following steps to install manually.

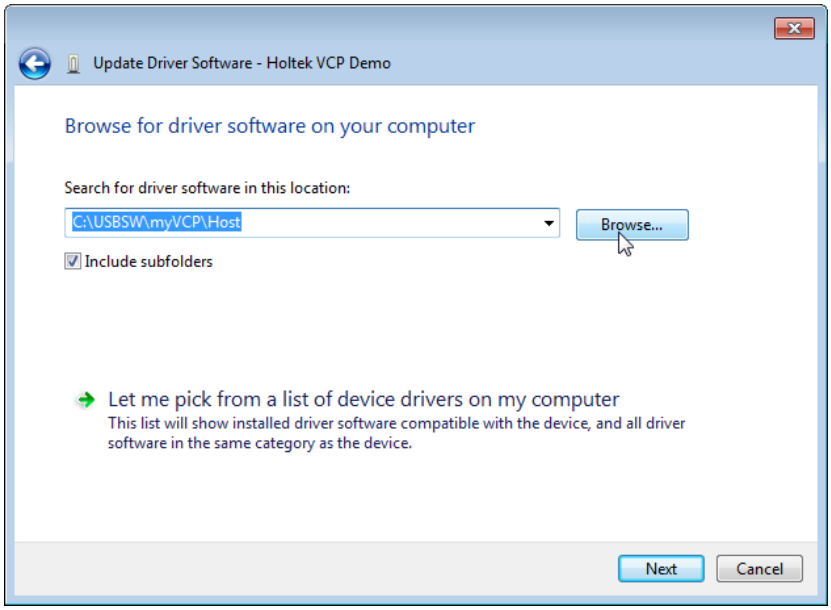
1. Right-click on “Holtek VCP Demo” and choose [Update Driver Software].



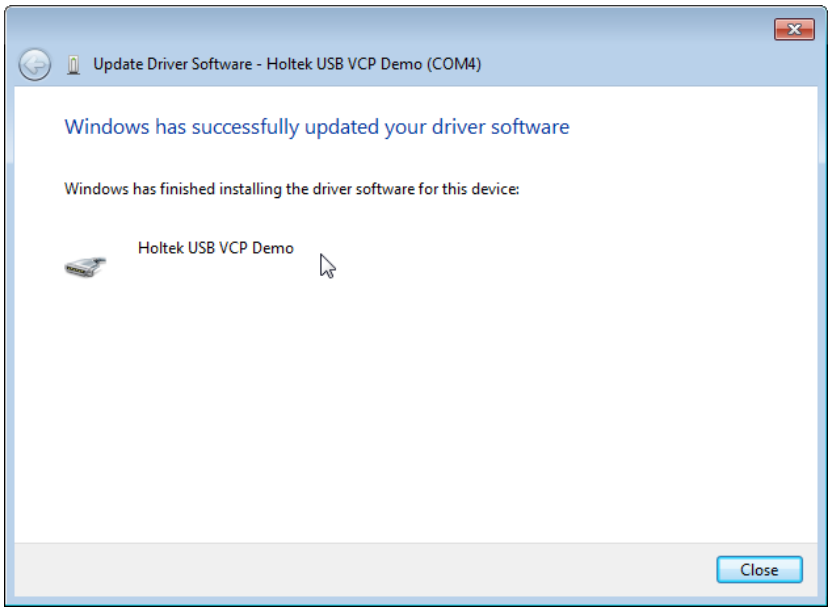
2. Select [Browse my computer for driver software] in the window that appears.



3. Select the Host directory in the project directory.



4. Finish installing.

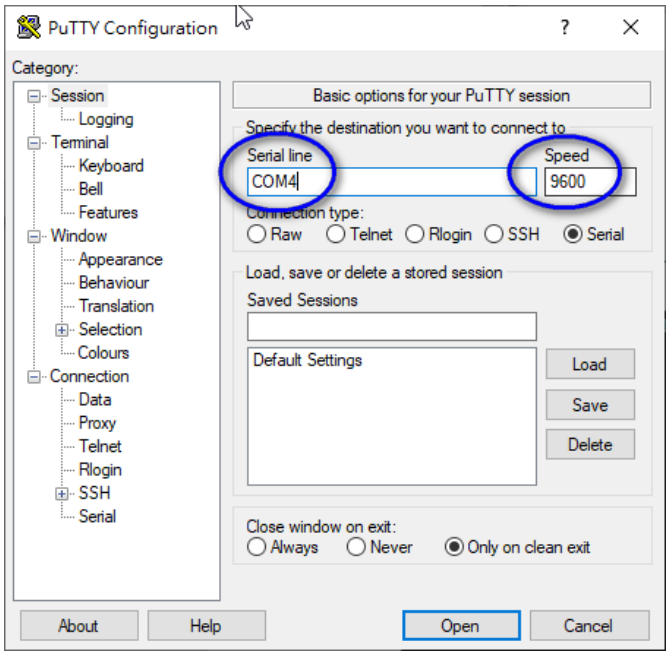


5.2 COM Port Software

The general COM port communication software can be used to test VCP devices. Take PuTTY as an example.

5.2.1 Enable COM Port

- Enter the number as shown in Device Manager in “Serial line”
- Enter any value in “Speed”, because this template is only used for a data loopback test and does not actually implement a UART timing.
- Click [Open].



5.2.2 Data Loopback Test

Enter any string in the window using the keyboard. If it displays what was entered, this indicates that the data has been correctly returned. If the data is not returned to the host, the entered string will not be displayed in the window.