UM0323
User manual

STEVAL-PCC001V1 - Getting started with the ST7 Full-speed USB/RS232 Evaluation Kit

1 Introduction

The ST7 Full-speed USB/RS232 Evaluation Kit (STEVAL-PCC001V1) has been created in order to provide a complete reference design for a serial port bridge as well as an evaluation board for ST72F651 devices. This application is used as an interface between devices with a serial port (RS-232 type) and a host computer USB port.

The USB interface is widespread and well known, but due to its complexity, the RS232 standard connection is still much used in some applications. In the past all PC's had two Serial communication ports RS232, but in the majority of PCs on the market today there is only one serial communication port RS232 and some notebooks don't include RS232 at all. In contrast the number of USB sockets are increasing.

This evaluation kit demonstrates the use of the USB Full Speed microcontroller ST72651 as a bridge between the USB and the RS232 interface, providing an additional Serial port on computers equipped with USB.

In addition, this evaluation kit demonstrates a simple method for connecting the USB microcontroller ST72651 to the PC without need of a proprietary driver.

Several general purpose input / output pins of ST72651 are provided on the external connector, thus providing a way to connect additional circuitry and allow customized USB application. The evaluation board can be reprogrammed easily with a user code through the In-Circuit Communication (ICC) connector.

1.1 Features and limitation of the RS232 communication

- Communication speeds implemented (Baud/s): 2400, 4800, 9600, 14400, 19200, 28800, 38400, 56000, 57600, 115200, 128000, 256000
- Half-duplex communication
- 8-bit or 7-bit data + 1-bit parity (even/odd)
- No hardware handshaking (can be implemented by user).

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2 Getting started

2.1 System requirements

For correct installation of the ST7 USB/RS232 Evaluation Kit on your PC you need:

- PC with a running operating system of Windows© 98SE, 2000 or XP
- 20 MBytes of free hard disk space (the driver itself consumes less than 1 MByte)
- One free USB socket
- CD-ROM drive.

2.2 Package content

The Full-speed USB/RS232 Evaluation Kit includes the following items:

- One evaluation board with ICC, USB and RS232 connectors
- One soldered ST72F651AR6 full-speed USB microcontroller device (TQFP64 package)

  ST72F651AR6 is a Flash device which allows up to 100 reprogramming cycles. The device is programmed with the evaluation firmware.
- CD-ROM
  - USB Driver for Windows 2000/XP/98SE
  - Documentation (Getting Started Manual, product datasheets)
  - Source code for the evaluation board firmware
  - PCB production data
  - Simple testing application USB_FS_test.exe.

2.3 Installation

The hardware setup process is different for each operating system, but for all of them you have to insert the installation CD-ROM included in the evaluation board package before installation.

2.3.1 Windows XP installation

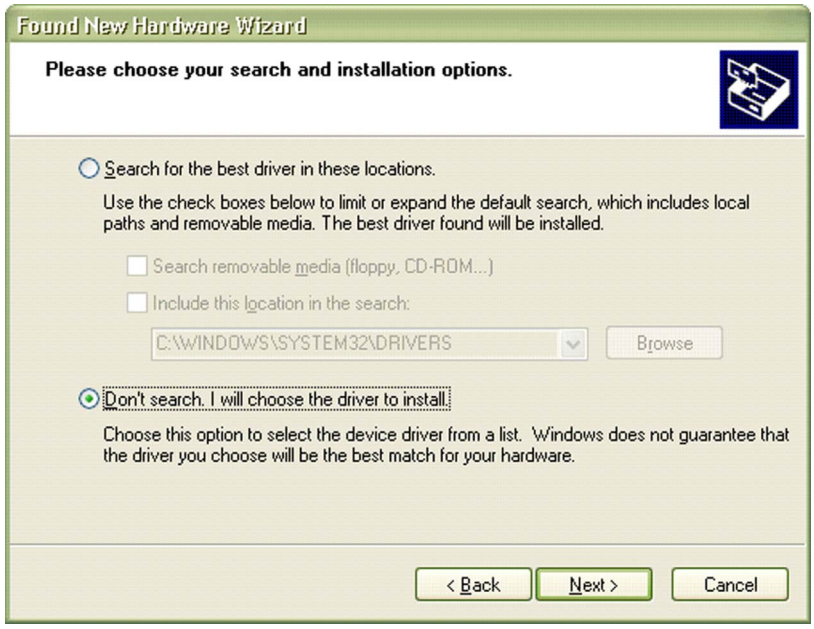
Log on with appropriate administration rights.

Plug the evaluation board into the free USB socket. A short while later Windows starts to enumerate the new USB device and opens the welcome dialog box.

Figure 1. Windows XP driver installation - welcome dialog box

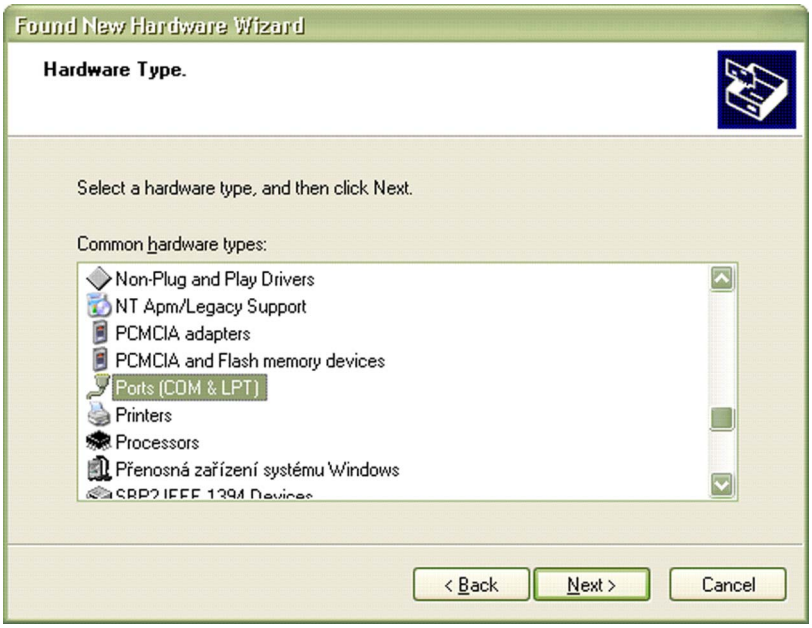
Select "**Install from a list or specific location**" and press the **Next** button.

Figure 2. Windows XP driver installation - search options dialog box



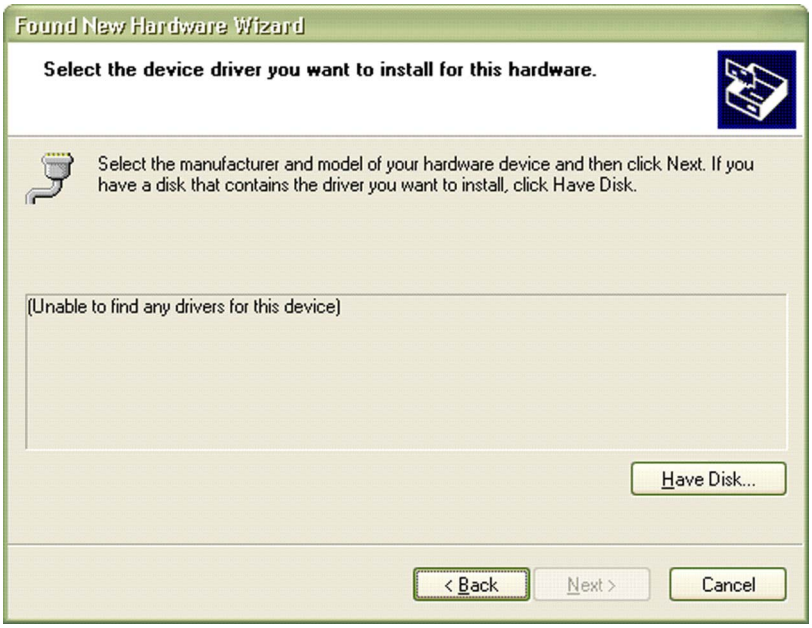
In the search options dialog box select "**Don't search ...**" and press **Next** button.

Figure 3. Windows XP driver installation - hardware type dialog box



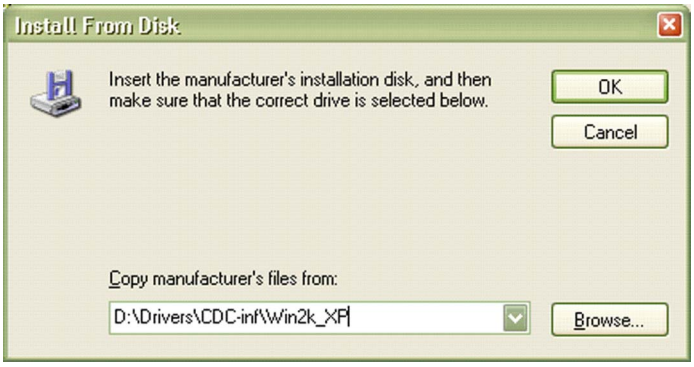
In the hardware type dialog box select "**Ports (COM & LPT)**" and press **Next** button.

Figure 4. Windows XP driver installation - have disk dialog box



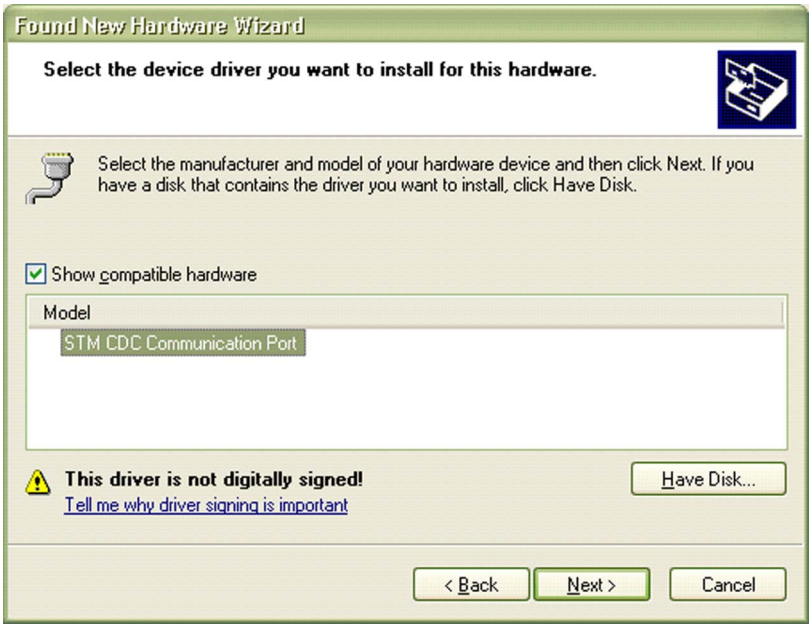
No available devices should be visible for first time installations. Press the "**Have Disk ...**" button.

Figure 5. Windows XP driver installation - path to driver dialog box



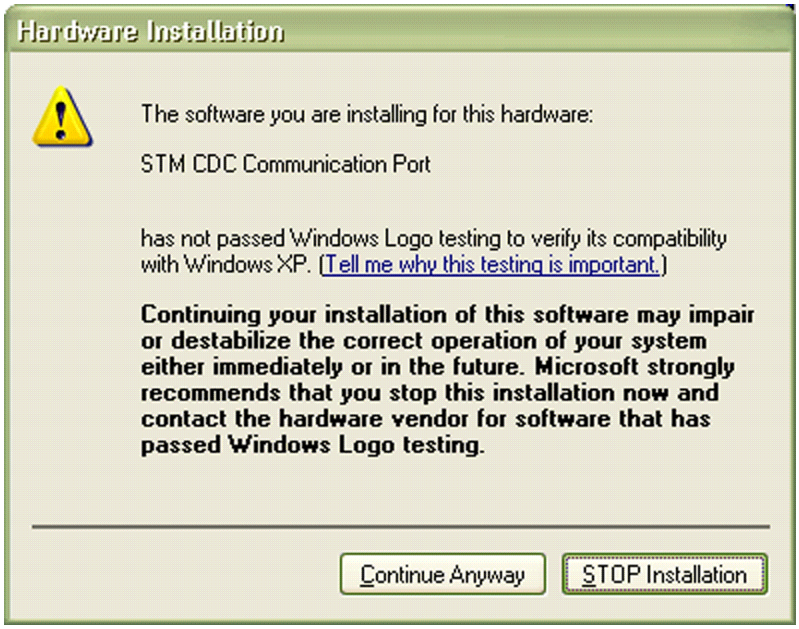
Select the correct path to the drivers located on the CD-ROM. For Windows XP the driver is located in the path **[CD-ROM letter]:\Drivers\CDC-inf\Win2k_XP**. When the directory is set, press **OK** button.

Figure 6. Windows XP driver installation - driver selection dialog box



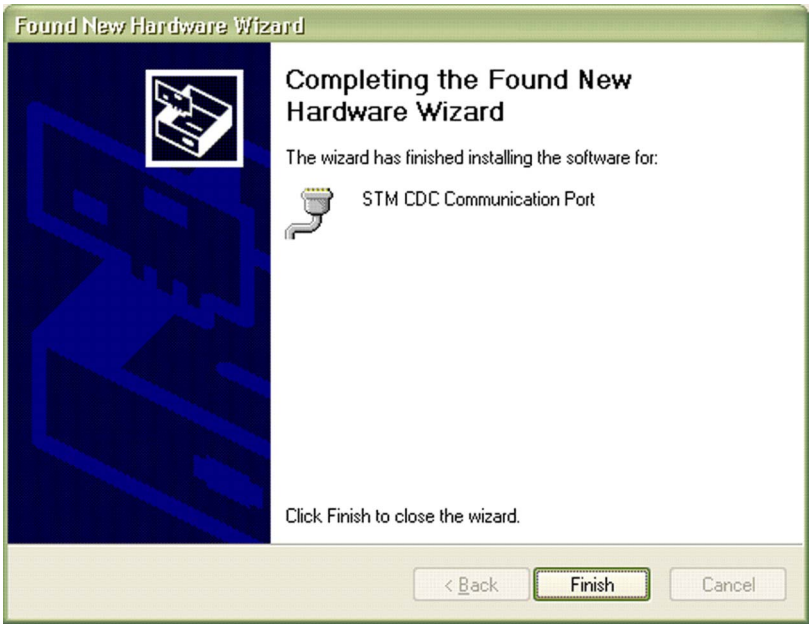
After correct selection of the pathway to the CD-ROM drivers, the evaluation board device will become visible. Select "**STM CDC Communication Port**" and press **Next**.

Figure 7. Windows XP driver installation - compatibility warning dialog box



During the final stage of installation Windows XP warns you that the driver is not certified. If you are using the original CD-ROM you can ignore this message but you need to press the **Continue Anyway** button otherwise the device will not work properly.

Figure 8. Windows XP driver installation - installation finished dialog box



Press the **Finish** button to complete the installation process.

2.3.2 Windows 2000 installation

Log on with appropriate administration rights.

Plug the evaluation board into the free USB socket. A short while later Windows starts to enumerate the new USB device and opens the welcome dialog box.

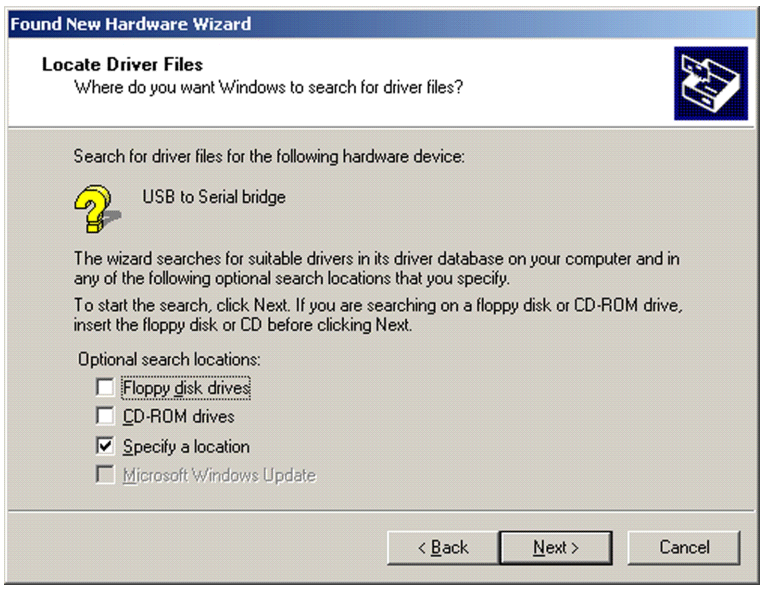
Figure 9. Windows 2000 driver installation - welcome dialog box

Press **Next** button to continue.

Figure 10. Windows 2000 driver installation - search options dialog box

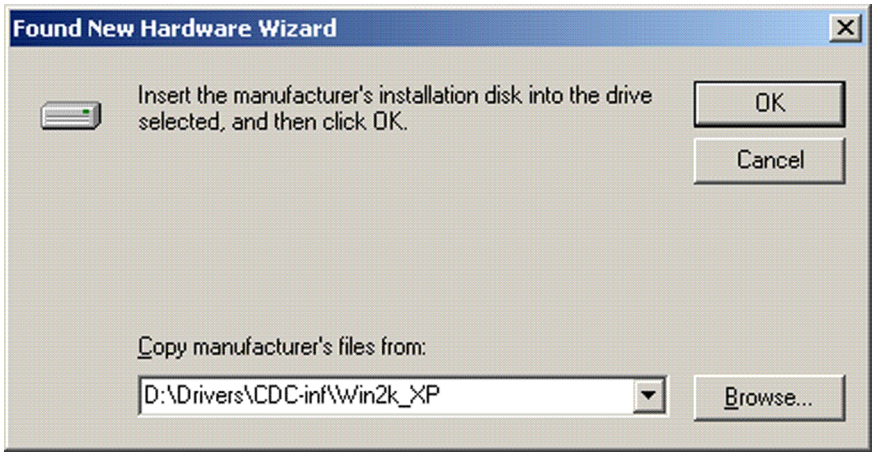
Select "**Search for a suitable driver for my device**" and press **Next** button.

Figure 11. Windows 2000 driver installation - locate driver files dialog box



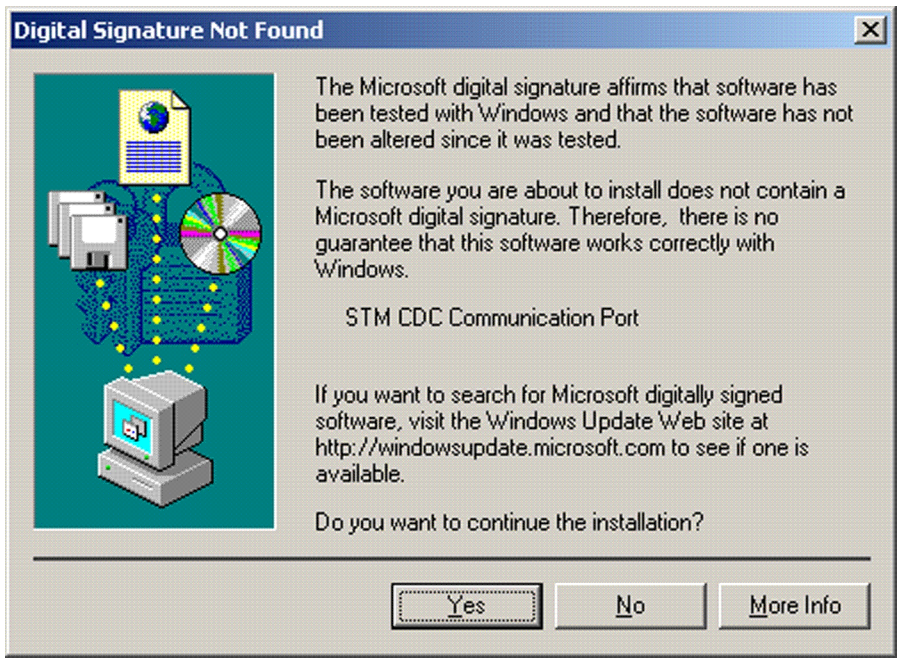
In the locate driver files dialog box select "**Specify a location**" and press **Next** button.

Figure 12. Windows 2000 driver installation - path to driver dialog box



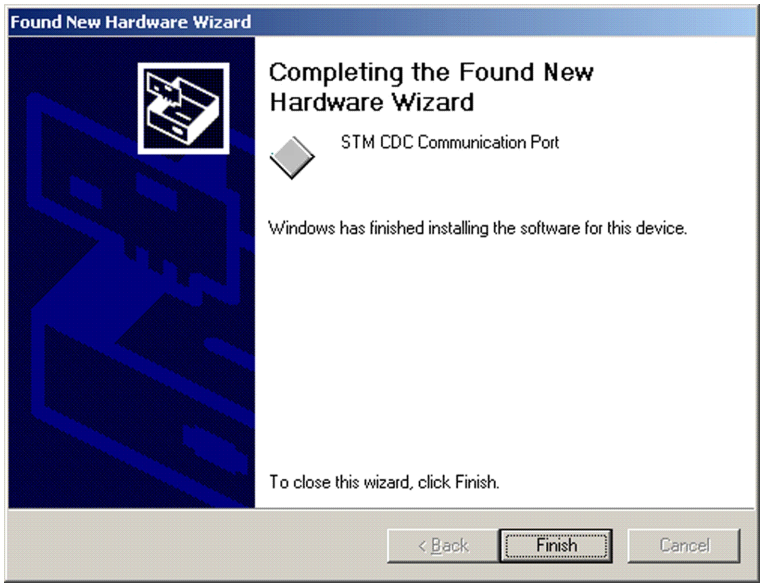
Select the correct path to the drivers located on the CD-ROM. For Windows 2000 the driver is located in the path **[CD-ROM letter]:\Drivers\CDC-inf\Win2k_XP**. When the directory is set press **OK** button.

Figure 13. Windows 2000 driver installation - digital signature dialog box



During the final stage of installation some versions of Windows 2000 warn you that the driver is not digitally signed, but if you are using the original CD-ROM you can ignore this message. You need to press the **Yes** button otherwise the device will not work properly.

Figure 14. Windows 2000 driver installation - installation finished dialog box

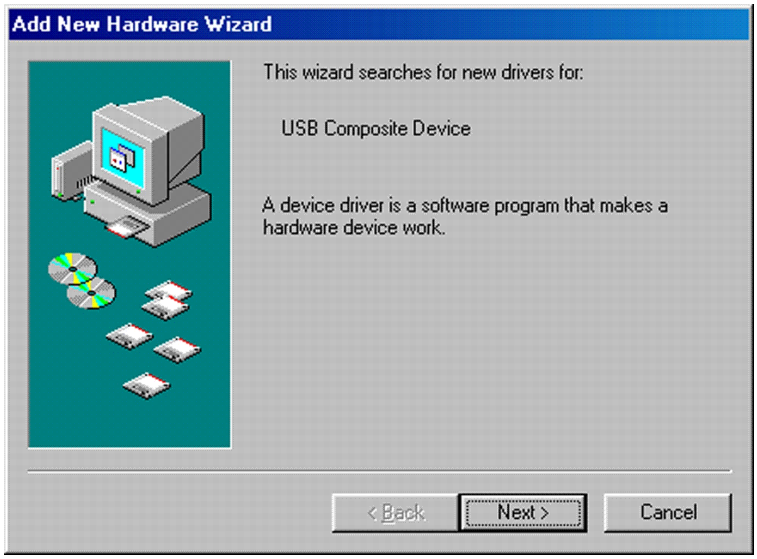


Press the **Finish** button to complete the installation process.

2.3.3 Windows 98SE installation

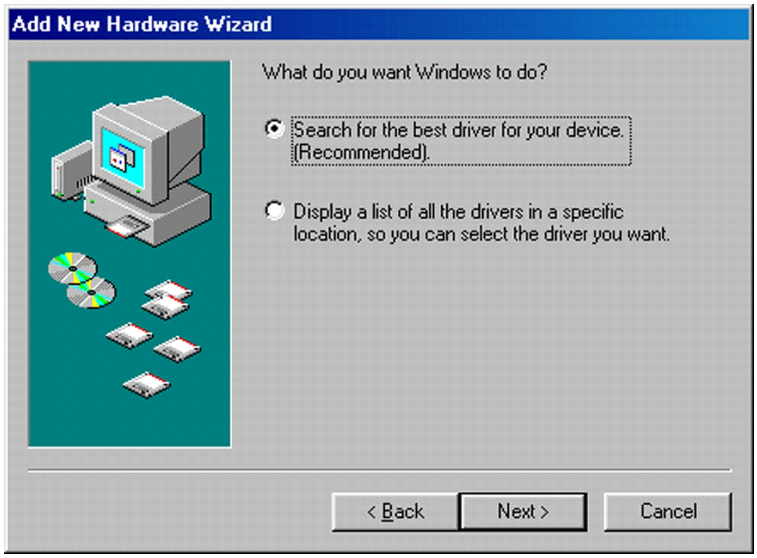
Ensure your Windows 98SE system is running. Plug the evaluation board into the free USB socket. In a short while Windows starts to enumerate the new USB device and opens the welcome dialog box.

Figure 15. Windows 98SE driver installation - welcome dialog box



Press **Next** button.

Figure 16. Windows 98SE driver installation - search options dialog box



Select "**Search for the best driver for your device**" and press **Next** button.

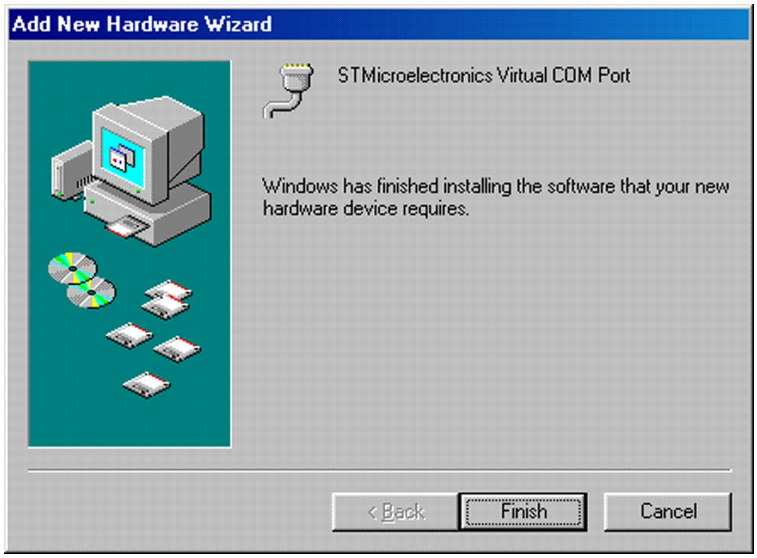
Figure 17. Windows 98SE driver installation - specify location dialog box

Select "**Specify a location**" option and enter the correct path to the driver. For Windows 98SE the driver is located in the path **[CD-ROM letter]:\Drivers\CDC-inf\Win98**. Then press **Next** button.

Figure 18. Windows 98SE driver installation - driver confirmation dialog box

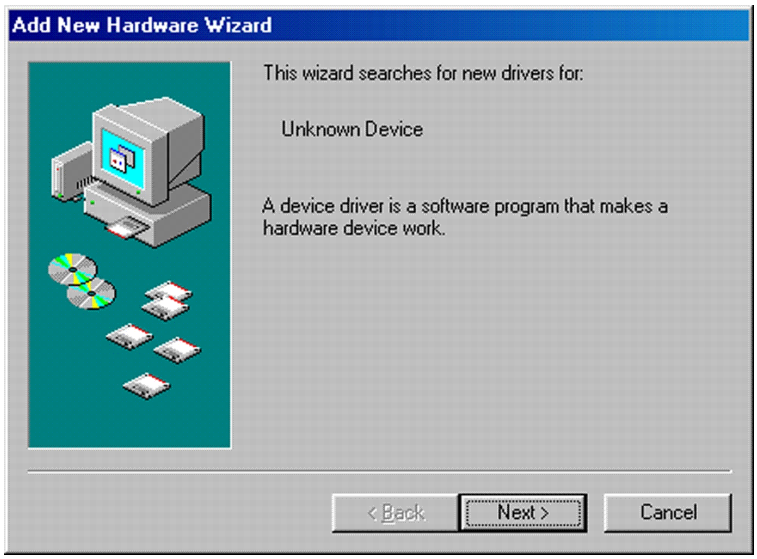
In the driver confirmation dialog box "STMicroelectronics Virtual COM Port" should be displayed. Press **Next** button to continue.

Figure 19. Windows 98SE driver installation - installation finished dialog box



Press the **Finish** button to complete the first stage and to continue to the second stage of driver installation for Windows 98SE.

Figure 20. Windows 98SE driver installation - the second welcome dialog box



When the first stage of driver installation has been successfully achieved, the wizard detects a new device. To continue with Windows 98SE device installation, press the **Next** button and **repeat all the above steps one more time**. Press the **Finish** button to complete the second round and final stage of driver installation for Windows 98SE.

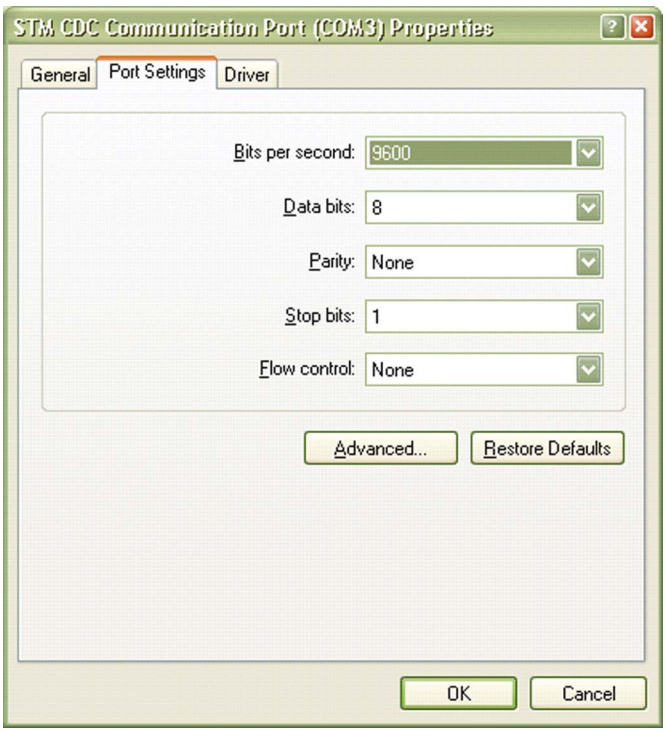
2.3.4 COM port number change

It is possible to change the COM port number assignment on Windows 2000 and Windows XP systems. To do this, you have to open the **Control Panel** and run choose **System Properties**. In the **System Properties** dialog box you have to switch to the **Hardware** tab and press the **Device Manager** button.

Figure 21. Device manager window

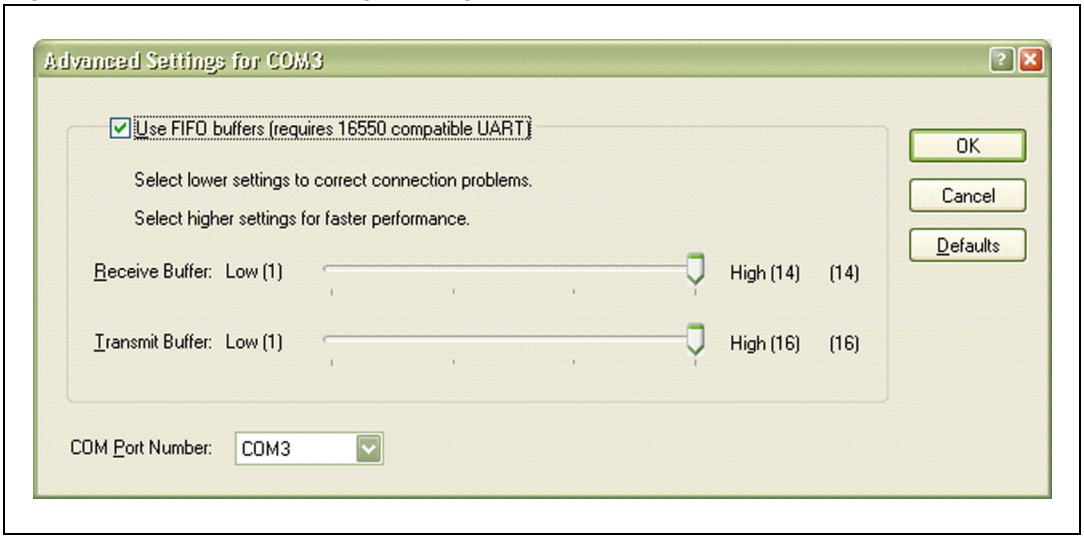
Under the **Ports (COM & LPT)** section you can find your newly installed **STM CDC Communication Port**. Select this item and select **Properties** from the **Action** menu.

Figure 22. Communication port properties dialog box



When the properties dialog box appears, press the **Advanced** button.

Figure 23. Advanced settings dialog box



In the advanced settings dialog box you can change the **COM Port Number** assignment. By pressing the **OK** button you can confirm the new selection. Click also on the **OK** button in the properties dialog box and close all previous dialog boxes. Selection is applied immediately.

3 Usage of the evaluation board

When the board is plugged into the PC and after the device driver is correctly installed, the evaluation board is ready to communicate. You can use it as a standard communication COM port. The device will become visible as a new COM port in all common serial communication programs like Windows Terminal application etc.

The COM port number assignment is based on the USB socket used. Therefore, if you plug the evaluation board into different USB sockets, the COM port number will change accordingly.

It is also possible to connect more than one evaluation board into one PC. Each of the boards is assigned to a different COM port number.

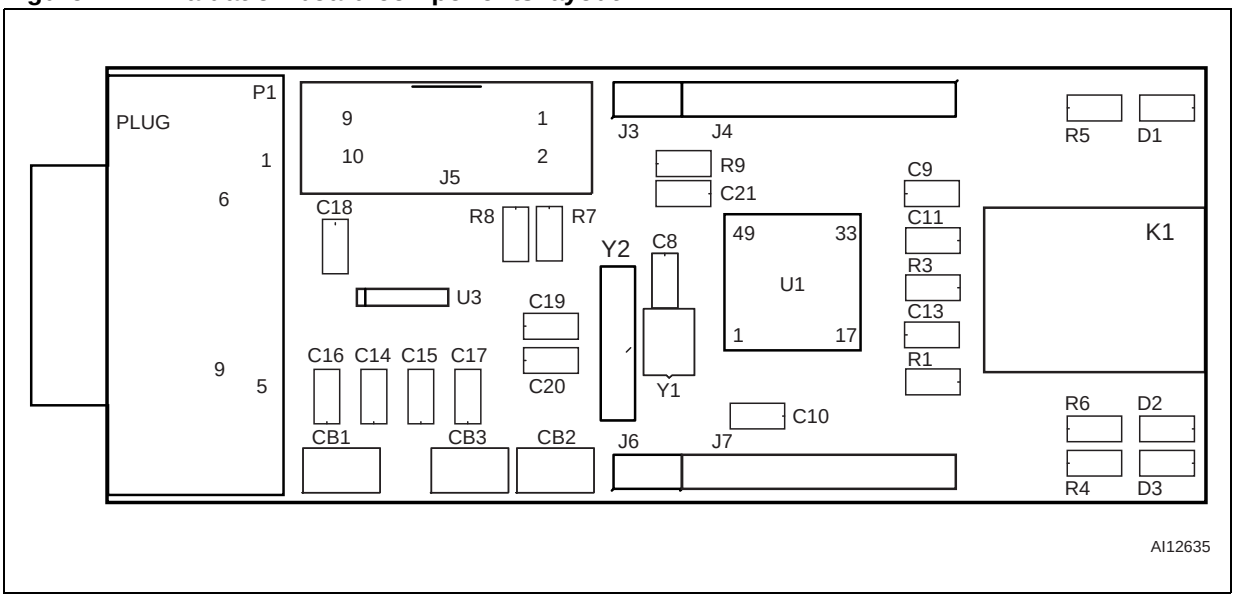
You can use the application USB_FS_test.exe to test the correct functionality of the evaluation board. The application is included on the supplied CD-ROM.

Warning: It is not possible to use the loop-back device to test the evaluation board due to half-duplex limitation.

4 Evaluation board hardware description

The evaluation board hardware layout was created in OrCAD 10.3 and all project files are included on the installation CD-ROM in the Hardware directory.

Figure 24. Evaluation board components layout



Connectors:

- K1 - USB B connector for connection to the PC
- P1 - CANON 9 pin male RS232 connector
- J3 - Power connector, pin1 (square pad) = +5V, pin2 = GND
- J4 - GPIO port D of ST72651. Can be used for connecting additional circuitry.
- J5 - ICC programming connector. Used for programming ST72651 with new firmware or for debugging.
- J6 - TTL level of RS232 RX (circle pad) and TX (square pad) signals. Some applications need only TTL signal levels for serial communication.
- J7 - GPIO port B of ST72651. Can be used for connecting additional circuitry.

Junctions (all connected by default):

- CB1 - Connect/Disconnect +10V to pin 4 of the RS232 connector (DTR signal). This connection can be used to power the application connected with RS232
- CB2 - Connect/Disconnect RX TTL signal from MCU to RS232 level shifter.
- CB3 - Connect/Disconnect TX TTL signal from MCU to RS232 level shifter.

LEDs:

- D1 - lights up when the board is connected to USB and enumerated
- D2 - lights up during transfers from USB to RS232
- D3 - lights up during transfers from RS232 to USB.

5 Evaluation board firmware

All source and project files for the microcontroller firmware are included in the Software directory of the installation CD-ROM.

The evaluation board firmware was developed in the ST Visual Develop rev. 3.3.2 IDE with 16k limited version of Cosmic C compiler 4.5c. Both software tools are available on the ST internet site http://www.st.com/mcu.

You can also contact your local ST sales office for obtaining this software.

Cosmic C compiler must be installed in the path without spaces in the name, i.e. "C:\COSMIC\CXST7_16K\". The default installation path cannot be used.

In order to compile the whole project correctly the user has to modify the file USB_FS_7265_32K.MAK and select the correct path to the project in the PRJ_PATH definition.

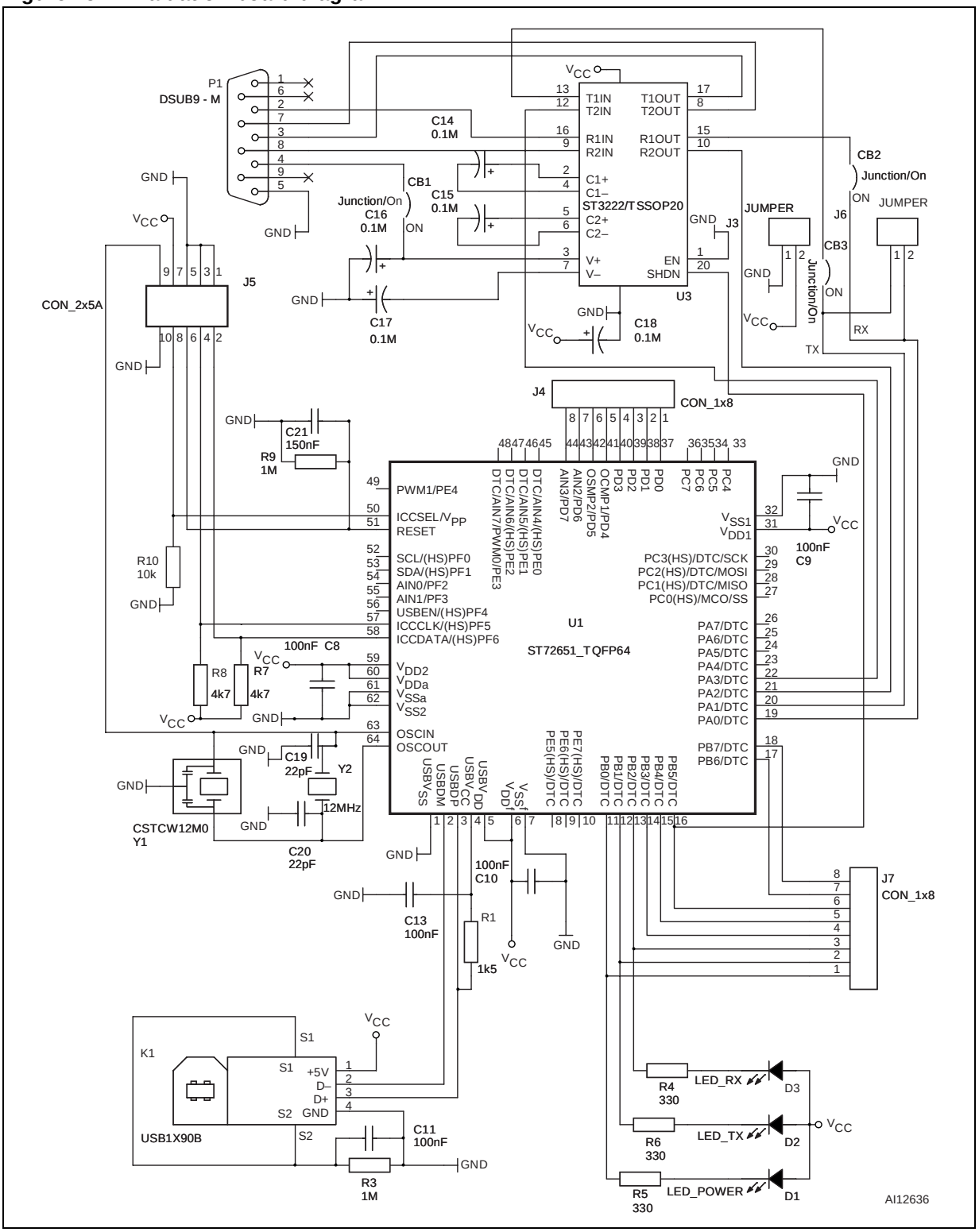
In case the recommended path for Cosmic C compiler is not used, the user has to also modify the file USB_FS_7265_32K.LKF and modify the pre-set path to correct the Cosmic C compiler location.

The firmware is based on the standard ST7 USB Full Speed library. This library can also be downloaded from ST internet site http://www.st.com/mcu.

One part of the source code is dedicated to Data Transfer Coprocessor, which is part of the ST72651 MCU. This code can be compiled using the tools included with the source code. In the "DTC Compiler\Fsm" part of the source code you can find the batch file **all.bat** which automatically compiles the source files for DTC and copies the result into the correct project directory. This batch file should be modified in order to change user paths to the project. The DTC implements the RS232 serial communication protocol.

6 Evaluation board diagram

Figure 25. Evaluation board diagram



7 Part list

Table 1. Bill of material

Quantity	Reference	Part
10	C8, C9, C10, C11, C13, C14, C15, C16, C17, C18	100nF SMD 0805
2	C19, C20	22pF SMD 0805
1	C21	150nF SMD 0805
1	D1	LED GREEN SMD 0805
2	D2,D3	LED RED SMD 0805
1	J5	CON 2x5 - HEADER PCB
1	K1	USB-B connector PCB
1	P1	DSUB9 Male - CANON 9V 90
1	R1 1	1.5kΩ SMD 0805
2	R3, R9	1MΩ SMD 0805
3	R4, R5, R6	330Ω SMD 0805
2	R7, R8	4.7kΩ SMD 0805
1	U1	ST72651AR6T1 TQFP64
1	U2	ST3222EBTR (replacement ST3222ECTR) TSSOP20
1	Y2	12MHz quartz resonator

Y2, C19, C20 resonator circuit can be replaced by Y1 - CSTCW12M0.

8 Revision history

Table 2. Document revision history

Date	Revision	Changes
08-Dec-2006	1	Initial release.

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