



**Future Technology Devices International Ltd.**

## **Application Note AN\_149**

# **Upgrading a passive DB9 RS232 Interface to an active USB Interface using an FTDI DB9-USB-RS232 Module**

**Document Reference No.: FT\_000296**

**Version Rev 1.1**

**Issue Date: 2010-10-12**

This application note illustrates how to upgrade a passive RS232 interface to an active USB interface by replacing the RS232 DB9 connector with an FTDI DB9-USB-RS232 module

DB9-USB-RS232 is a USB to RS232 converter that can be fitted into a legacy RS232 DB9 connector PCB footprint with no change to the PCB.

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## Table of Contents

<b>1</b>	<b>Introduction.....</b>	<b>2</b>
1.1	Overview .....	2
<b>2</b>	<b>RS232 DB9 Wiring Conventions .....</b>	<b>3</b>
<b>3</b>	<b>Upgrading an RS232 DB9 Connector with a DB9-USB-RS232 USB Connector.....</b>	<b>5</b>
<b>4</b>	<b>Acronyms and Abbreviations .....</b>	<b>6</b>
<b>5</b>	<b>Contact Information.....</b>	<b>7</b>
	<b>Appendix A - References .....</b>	<b>9</b>
	<b>Appendix B - Revision History.....</b>	<b>10</b>
	<b>Revision Record Sheet.....</b>	<b>11</b>

## 1 Introduction

The DB9-USB-RS232 connectors can be used to upgrade an RS232 port to an active USB port without the need to redesign the PCB. These active connectors contain all the USB to RS232 (and vice-versa) conversion electronics and are designed to fit directly into the same PCB footprint as a PC compatible RS232 DB9 connector.

The FTDI DB9-USB-RS232 connectors come in two types DB9-USB-RS232-M and DB9-USB-RS232-F.

A DB9-USB-RS232-M can be used to replace a male DB9 connector that is wired in a PC compatible RS232 manner.

A DB9-USB-RS232-F can be used to replace a female DB9 connector that is wired in a PC compatible RS232 manner.

Software drivers for the DB9-USB-RS232 connectors are available from the FTDI website.

### 1.1 Overview

This application note outlines the electrical wiring of a PC compatible male and female RS232 DB9 connector.

An example is also given showing how an RS232 DB9 connector can be replaced with an FTDI DB9-USB-RS232 module.

### 1.2 Background

In the long distant past, there was no standard defined for the connections on a DB9 connector when it was used as an RS232 interface. That changed when IBM introduced the PC-AT. This introduced a *generally accepted* DB9 RS232 standard and PC peripherals adopted the same pin-out using a 1-to-1 cable connection between the PC and the peripheral. The FTDI DB9-USB-RS232 have adopted this standard. The DB9 connector used is either male or female.

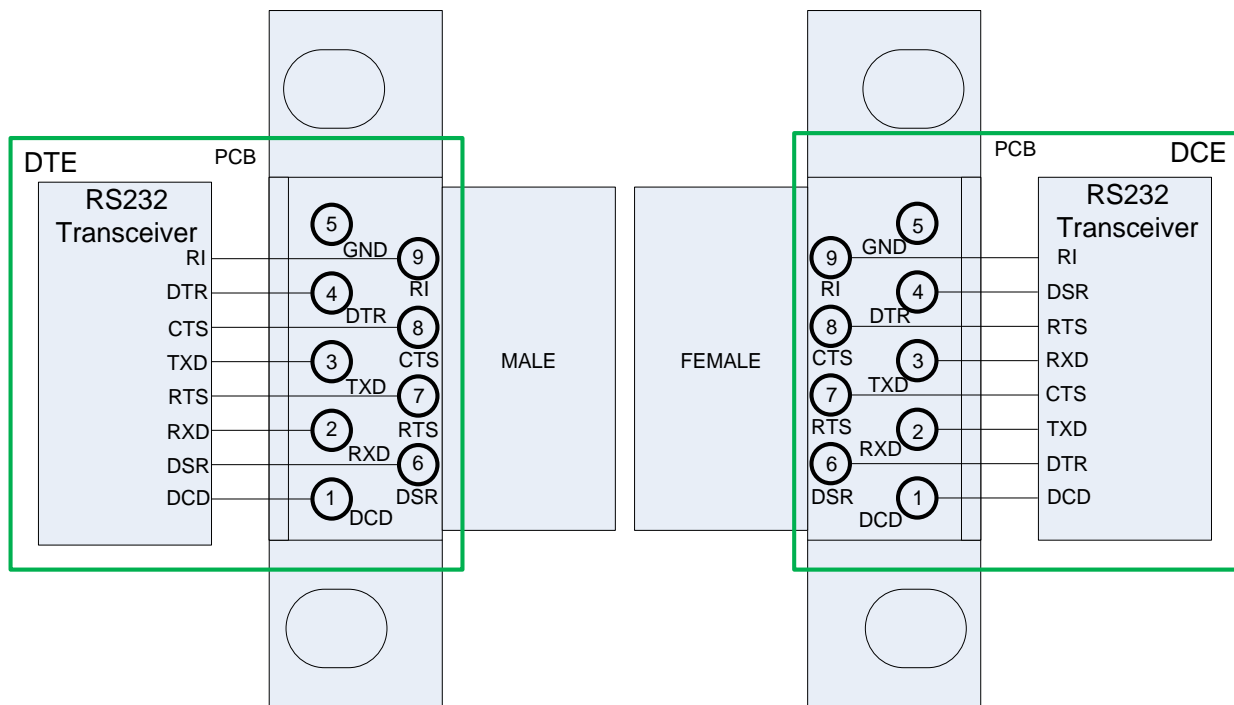
Note that **NOT ALL** peripheral adopted this standard so it is important for the user to check against the pin-out used for the male and female FTDI DB9-USB-RS232 connectors.

## 2 RS232 DB9 Wiring Conventions

DB9 connectors used for RS232 communication are either male or female type connectors.

The PC compatible accepted electrical connections for male and female RS232 DB9 connectors are illustrated in Figure 2.1 where the structure on the left is the top view of a male RS232 DB9 connector and the structure on the right is the top view of a Female RS232 DB9 connector.

Assuming a design follows these connection conventions, then an FTDI male or female DB9-RS232-USB connector can be used to replace this RS232 DB9 and turn the connection into an active USB interface.



**Figure 2.1 – Male and Female DB9-USB-RS232 PCB connections (top view looking through the module)**

Examples and signal directions are shown in Figure 2.2 and Figure 2.3

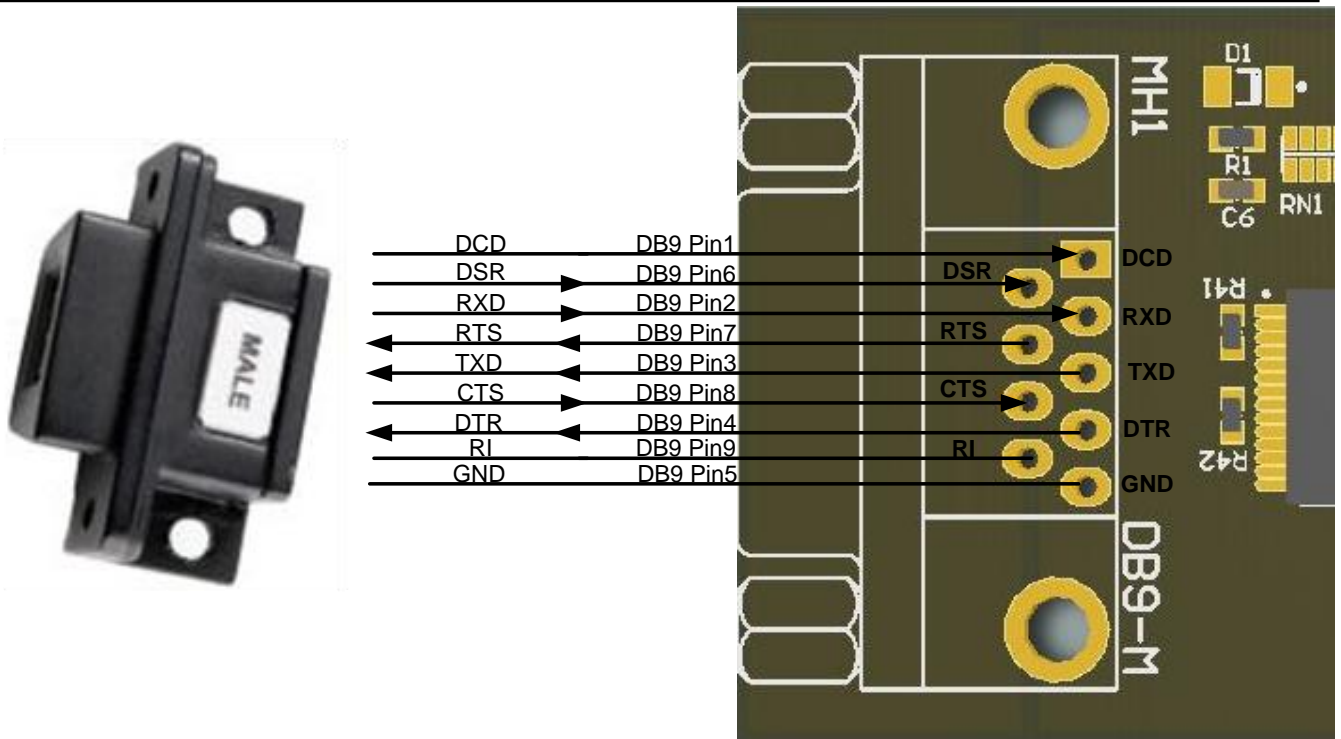


Figure 2.2 – DB9-USB-RS232-M Connection illustration

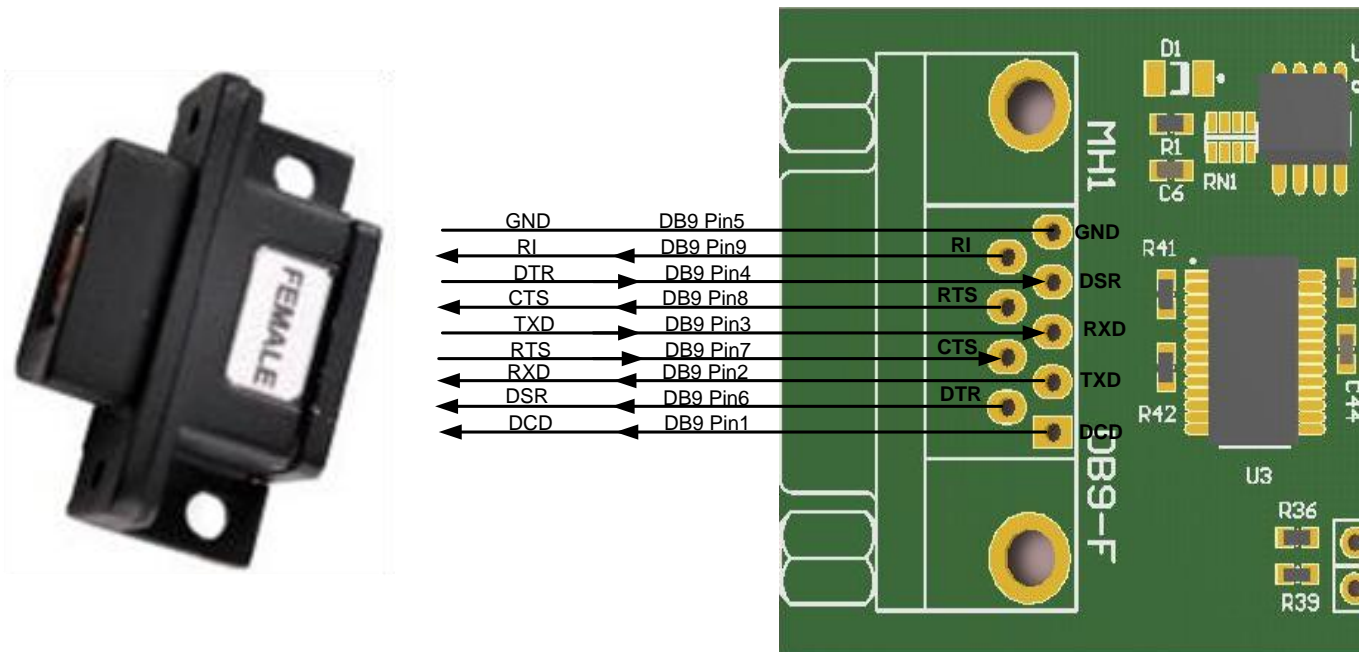


Figure 2.3 – DB9-USB-RS232-F Connection illustration

### 3 Upgrading an RS232 DB9 Connector with a DB9-USB-RS232 USB Connector

To replace a passive RS232 DB9 connector with an active USB DB9-RS232-USB-M/F connector:

- 1: Remove the DB9 connector from the existing board.
- 2: Place and solder a suitable DB9-USB-RS232 into the DB9 footprint on the PCB.

To allow the new DB9-USB-RS232 connector to communicate with a PC, suitable USB FTDI drivers are required to be installed on the PC. These can be downloaded from the FTDI website. At <http://ftdichip.com/>

To verify that the DB9-USB-RS232 is communicating with the PC, an enumeration check can be carried out using a utility programme called "USB View". This is also available from the FTDI website.

An example of a DB9 RS232 connector being replaced by a DB9-USB-RS232 is shown in Fig. 1 and Fig. 2. Here the male DB9 of an FTDI EVAL232R shown in Fig. 1 is replaced by a DB9-USB-RS232-M Fig. 2.

This then allows the module to communicate with a PC through a USB interface without any PCB modification or any additional electronics. All the "intelligence" and electronics are contained within the DB9-USB-RS232-M

The example is not a practical example and is only provided as an illustration.



Fig. 1 – EVAL232R with a Male DB9



Fig. 2 – EVAL232R with a DB9-RS232-USB-M

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## 4 Acronyms and Abbreviations

Terms	Description
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus
TXD	Transmit Data (The transmit data line of RS232)
RXD	Receive Data (The receive data line of RS232)
GND	Ground

**Table 4.1 Acronyms and Abbreviations**



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## **Distributor and Sales Representatives**

Please visit the Sales Network page of the FTDI Web site for the contact details of our distributor(s) and sales representative(s) in your country.

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## Appendix A – References

[TIA Standard DB9 Connector Reference](#)

[http://www.interfacebus.com/RS232\\_Pinout.html](http://www.interfacebus.com/RS232_Pinout.html)

[http://ftdichip.com/Support/Documents/DataSheets/Modules/DS\\_DB9-USB-RS232.pdf](http://ftdichip.com/Support/Documents/DataSheets/Modules/DS_DB9-USB-RS232.pdf)



## Appendix B - Revision History

### Revision History

Version 1.0	Initial Release	13 <sup>th</sup> August 2010
Version 1.1	Simplified note.	12 <sup>th</sup> October 2010