



USB-RS232

USB to RS232 Serial Converter Cable



**CE FC UK
CA**

Datasheet

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1 Description

The Connective Peripherals USB-RS232 cables are a family of USB to RS232-level serial converter cables. They incorporate the FT232R USB to UART interface IC device which handles all the USB signalling and protocols. The cables provide a fast, simple way to connect devices with an RS232 serial interface to USB.

Each USB-RS232 cable contains a small internal electronic circuit board, utilising the FT232R, which is encapsulated into the USB connector end of the cable. Refer to the [FT232R datasheet](#) for details. The integrated electronics also include the RS232 level shifter plus Tx and Rx LEDs which give a visual indication of traffic on the cable (on models with transparent USB connector).

The other end of the cable has bare, tinned wire ended connections by default, allowing a variety of connectors to be attached. The cables can be customised using different connectors to support various applications. Please contact Connective Peripherals Sales (sales@connectiveperipherals.com) for more information.

The cables are FCC, CE, UKCA and RoHS compliant.

The USB side of the cable is USB powered. It is USB 2.0 full speed compatible and can also be used with USB3 hosts. Each cable is 1.8m long and supports a data transfer rate up to 1 M Baud. Each cable supports the FTDIChip-ID™, with a unique USB serial number programmed into the FT232R. This feature can be used to create a security or password protected file transfer access using the cable.

The USB-RS232 cables require USB drivers, available free from Windows Update or from <https://connectiveperipherals.com>, which are used to make the FT232R in the cable appear as a virtual COM port (VCP). This then allows the user to communicate with the USB interface via a standard PC serial emulation port (for example TTY). The driver also supports using D2xx commands, which can be used with application software to directly access the FT232R on the cable through a DLL. This is illustrated in Figure 1.1.

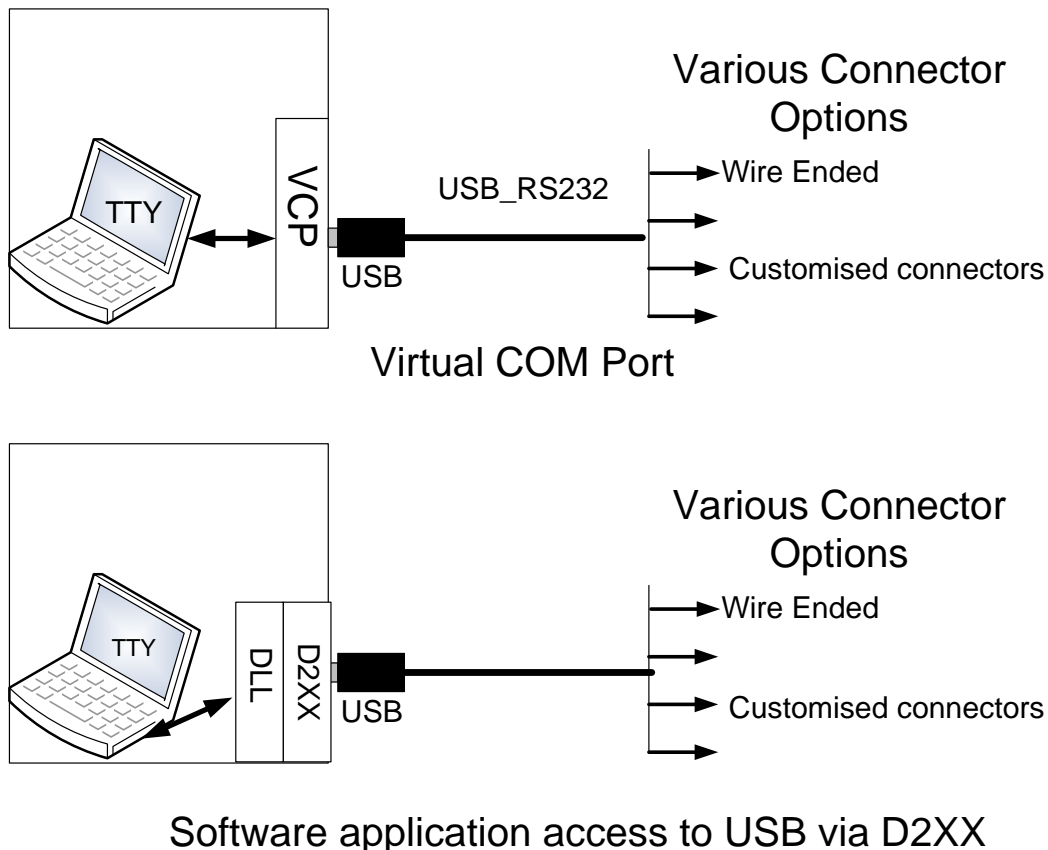


Figure 1.1 Using the USB-RS232 Cable

2 Cable Part Numbers

Table 2.1 gives details of the available USB-RS232 cables.

Part Number	Description	End Connector*	Cable details
USB-RS232-WE-1800-BT-0.0	USB to UART cable with RS232 level UART signals. B Black cable, T Transparent USB connector 0.0 = RED wire is 0V	Wire Ended (no connector)	1.8m cable, 6 core, UL2464 24 AWG, diam=5mm
* USB-RS232-CC-LLLL-CU-PWR	USB to UART cable with RS232 level UART signals. C = cable colour (B black or T transparent), U = USB connector colour (B black or T transparent) PWR = power supply output on red wire. 0.0 = 0V, 3.3=3.3V, 5.0=5V)	CU = Connector description.	LLLL = Length of cable.

Table 2.1 USB-RS232 Cables Descriptions and Part Numbers

* CP supports customised end connector designs. For more information, please contact sales@connectiveperipherals.com

2.1 Certifications

USB-RS232 range of cables are fully RoHs compliant as well as CE, UKCA and FCC certified.



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3 Typical Applications

- USB to serial RS232 level converter.
- Upgrading legacy peripherals to USB.
- Interface Microcontroller UART or I/O to USB*
- USB Instrumentation PC interface.
- USB industrial control.
- Interface FPGA or PLD to USB*

* Note that most MCUs and FPGAs use logic level UART signals and so an RS232 transceiver would be needed between the USB-RS232 cable and the MCU/FPGA to convert the signals from the USB-RS232 cable back to logic levels.

3.1 Driver Support

Royalty free VIRTUAL COM PORT (VCP) DRIVERS for...

- Windows 11, 10, 8.x, 7
- Windows XP (legacy)
- Windows CE 4.2, 5.0 and 6.0 (Legacy)
- macOS 10.9 and above
- Linux 2.4 and greater

Royalty free D2XX Direct Drivers (USB Drivers + DLL S/W Interface)

- Windows 11, 10, 8.x, 7
- Windows XP (legacy)
- Windows CE 4.2, 5.0 and 6.0 (Legacy)
- macOS 10.9 and above
- Linux 2.4 and greater

The drivers listed above are all available to download for free from <https://connectiveperipherals.com> Various legacy and 3rd Party Drivers are also available for other operating systems. Refer to <https://connectiveperipherals.com> and www.ftdichip.com for details.

3.2 Driver Installation

For driver installation, please refer to the **Connective Peripherals USB to Serial Converters Driver Installation Guide (CP_000084)** which is available from www.connectiveperipherals.com.

3.3 Features

- USB-RS232 converter cable provides a USB to RS232 serial interface with wire ended connections
- Entire USB protocol handled by the electronics in the cable USB.
- EIA/TIA-232 and V.28/V.24 communication interface with low power requirements.
- RS232 level UART interface with support for 7 or 8 data bits, 1 or 2 stop bits and odd / even / mark / space / no parity.
- Internal EEPROM with user writeable area.
- FTDI's royalty-free VCP drivers allow for communication as a standard emulated COM port and D2XX 'direct' drivers provide DLL application programming interface.
- Visual indication of Tx and Rx traffic via LEDs in the transparent USB connector.
- Fully assisted hardware (RTS#/CTS#) or X-On / X-Off software handshaking.
- Data transfer rates from 300 baud to 1 M Baud.
- Support for FT232R FTDIChip-ID™ feature for improved security.
- Low USB bandwidth consumption.
- UHCI / OHCI / EHCI host controller compatible.
- USB 2.0 Full Speed compatible, compatible with USB3 host ports
- -40°C to +85°C operating temperature range.
- Cable length is 1.80m (6 feet).
- ESD Protection for RS-232 I/O's
 - ±15kV Human Body Model (HBM)
 - ±15kV EN61000-4-2 Air Gap Discharge
 - ±8kV EN61000-4-2 Contact Discharge
- FCC, UKCA and CE compliant.
- Custom versions available on request (subject to MOQ).
- RoHS Compliant

4 Features of FT232R applicable to USB-RS232 Cables

The USB-RS232 cables use FT232R USB to serial UART IC device. This section summarises the key features of the FT232R which apply to the USB-RS232 USB to serial RS232 converter cables. For further details, and a full features and enhancements description refer to the [FT232R datasheet](#).

Internal EEPROM. The internal EEPROM in each cable is used to store USB Vendor ID (VID), Product ID (PID), device serial number, product description string and various other USB configuration descriptors. Each cable is supplied with the internal EEPROM pre-programmed as described in **Appendix A – Cable EEPROM Configuration**.

EEPROM Configuration. The internal EEPROM descriptors can be programmed in circuit, over USB without any additional voltage requirement. It can be programmed using the utility software called [FT_Prog](#). Additionally, there is a user area of the internal EEPROM available to system designers to allow storing of data (note that this is not modified by FT_Prog).

Lower Operating and Suspend Current. The FT232R has a low 15mA operating supply current and a very low USB suspend current of approximately 70µA. (Note that during suspend mode, the current drawn by any customised cable application which uses the USB supply, should not exceed 2.5mA to remain USB compliant)

Low USB Bandwidth Consumption. The USB interface of the FT232R, and therefore the USB-RS232 cables has been designed to use as little as possible of the total USB bandwidth available from the USB host controller.

UART Pin Signal Inversion. The sense of each of the UART signals can be individually inverted by configuring options in the internal EEPROM. For example CTS# (active low) can be changed to CTS (active high), or TXD can be changed to TXD#.

FTDChip-ID™. The FT232R includes the new FTDChip-ID™ security dongle feature. This FTDChip-ID™ feature allows a unique number to be burnt into each cable during manufacture. This number cannot be reprogrammed. This number is only readable over USB can be used to form the basis of a security dongle which can be used to protect any customer application software being copied. This allows the possibility of using the USB-RS232 cables as a dongle for software licensing. Further to this, a renewable license scheme can be implemented based on the FTDChip-ID™ number when encrypted with other information. This encrypted number can be stored in the user area of the FT232R internal EEPROM, and can be decrypted, then compared with the protected FTDChip-ID™ to verify that a license is valid.

Improved EMI Performance. The USB-RS232 cables are FCC, UKCA and CE certified.

Extended Operating Temperature Range - The USB-RS232 cables are capable of operating over an extended temperature range of -40° to +85° C thus allowing them to be used in automotive or industrial applications.

5 USB-RS232-WE-LLLL-CU-PWR

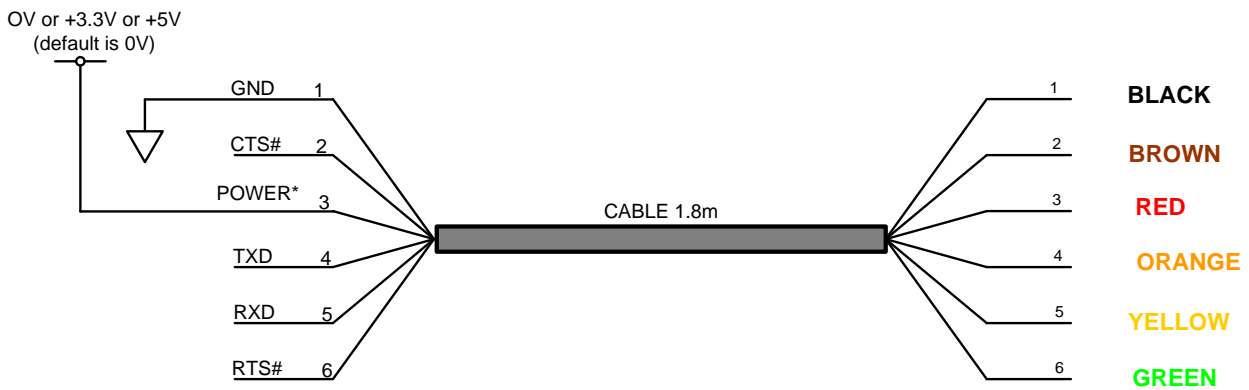
The USB-RS232-WE cable is un-terminated; it has bare and tinned wires.

The LLLL specifies the length of the cable in cm. The CU specifies the colour of the cable and the colour of the USB connector. The cable can be either Black or transparent. The USB connector can either be black or transparent. The USB connector comes by default as transparent because of the LEDs implemented inside the plug. For simplicity, the LLLL and CU have been dropped from the following descriptions.

Note that the product is supplied with black cable and transparent connector by default and other combinations require a custom cable request.

5.1 USB-RS232-WE-PWR Connections and Mechanical Details

Figure 5.1 shows the cable signals and the wire colours for the signals on the USB-RS232-WE cable.



POWER* - default is GND, but can be manufactured to provide +3.3V or +5V

Figure 5.1 USB-RS232-WE Connections

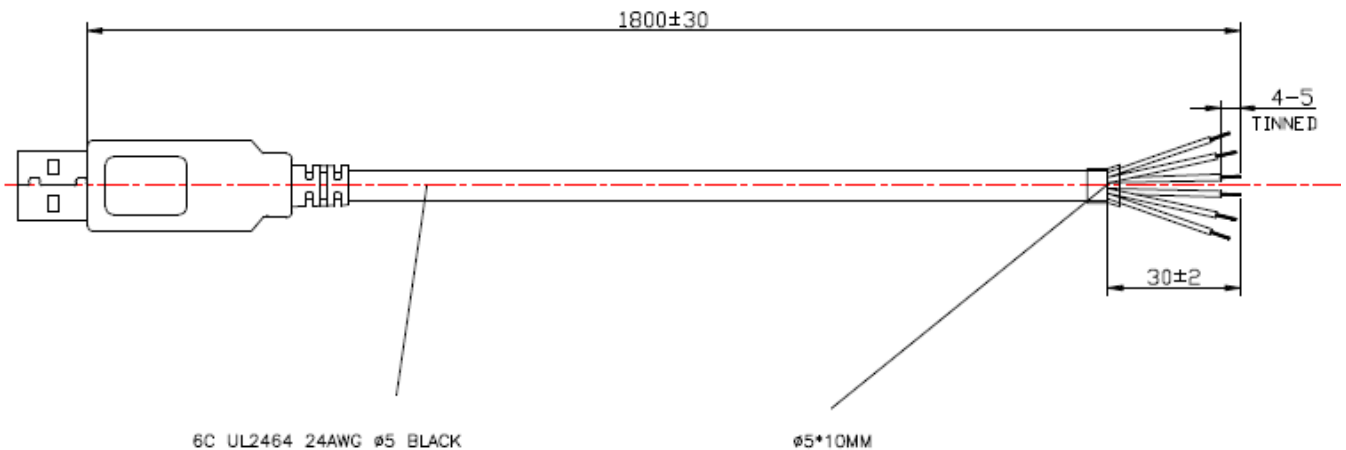


Figure 5.2 USB-RS232-WE-1800-BT-0.0 Mechanical Details (dimensions in mm)

5.2 USB-RS232-WE Cable Signal Descriptions

Colour	Name	Type	Description
Black	GND	GND	Device ground supply pin.
Brown	CTS#	Input	Clear to Send Control input / Handshake signal.
Red	POWER	Output	Power output. Default is GND, but can be customised to output +3.3V or +5V. If required, contact CP Sales Team
Orange	TXD	Output	Transmit Asynchronous Data output.
Yellow	RXD	Input	Receive Asynchronous Data input.
Green	RTS#	Output	Request To Send Control Output / Handshake signal.

Table 5.1 USB-RS232-WE Cable Signal Descriptions

Note that the selection of the voltage for the red wire is set using a solder jumper on the PCB inside the USB connector and so is not designed for selection by the user.

5.3 USB-RS232-WE Electrical Parameters

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
VCC_5V	Output Power Voltage*	4.25	5.0*	5.25	V	*Default is GND. This figure only applies when cable has been customised to output +5V. The range is dependent on the USB port that the USB-RS232-WE is connected to
VCC_3.3V	Output Power Voltage**	3.2	3.3**	3.4	V	**Default is GND. This figure only applies when cable has been customised to output +3.3V.
I _o	Output Power Current***	-		75	mA	***Only applies when POWER output is customised to +5V or +3.3V. Must be less than 2.5mA during suspend.
T	Operating Temperature Range	-40		+85	°C	

Table 5.2 USB-RS232-WE I/O Operating Parameters

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
V _{trans}	Transmitter output voltage swing	+/- 5	+/- 6.5	+/- 15	V	
V _{rec}	Receiver input voltage range	-25		+25	V	

Table 5.3 USB-RS232-WE I/O Pin Characteristics

Description	Conditions	Minimum	Typical	Maximum
ESD HBM	RS-232 Inputs and Outputs		±15 kV	
EN61000-4-2ContactDischarge	RS-232 Inputs and Outputs		±8 kV	
EN61000-4-2AirGapDischarge	RS-232 Inputs and Outputs		±15 kV	

Table 5.4 USB-RS232-WE ESD Tolerance

6 Cable PCB Circuit Schematic

The circuit schematic for the small internal electronic circuit board, utilising the FT232R, which is encapsulated into the USB connector end of the cable, is shown in **Figure 6.1**.

Customised versions of these cables are also available. Users interested in customised versions of these cables should contact CP Sales (sales@connectiveperipherals.com).

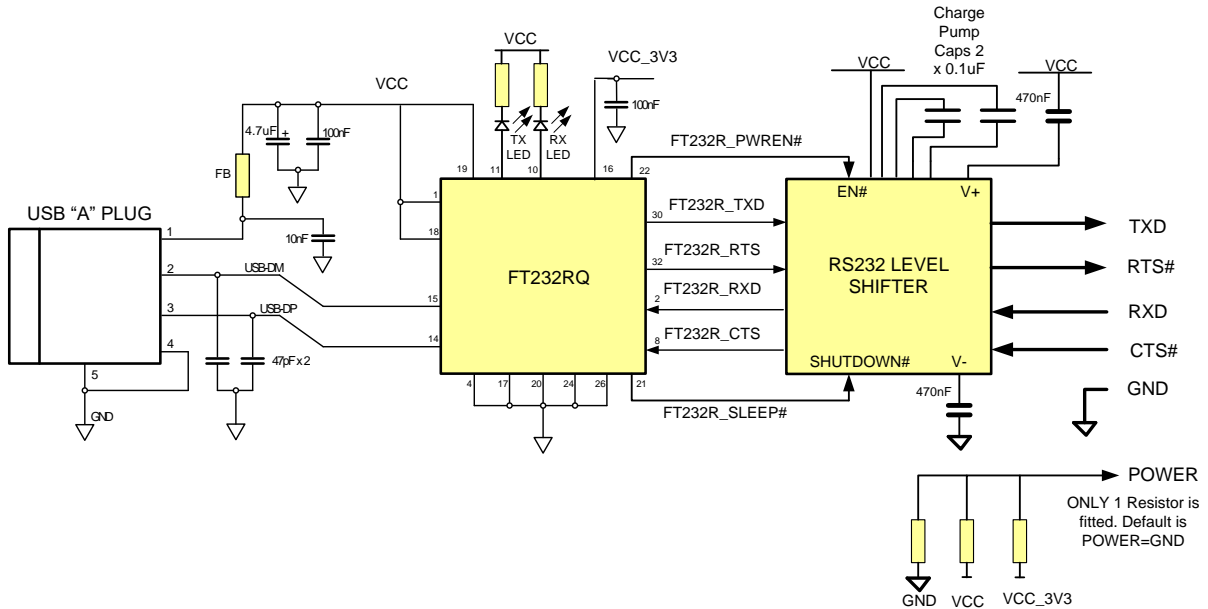


Figure 6.1 Circuit Schematic of PCB used in the USB to RS232 Serial Converter Cable

7 Contact Information

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Appendix A – Cable EEPROM Configuration

Each USB-RS232 cable is controlled by the FT232R IC. This FT232R device contains an EEPROM which contains the USB configuration descriptors for that device. When the cable is plugged into a PC or a USB reset is performed, the PC will read these descriptors. The default values stored into the internal EEPROM are defined in **Table 0.1**.

Parameter	Value	Notes
USB Vendor ID (VID)	0403h	FTDI default VID (hex)
USB Product ID (PID)	6001h	FTDI default PID (hex)
Serial Number Enabled?	Yes	
Serial Number	See Note	A unique serial number is generated and programmed into the EEPROM during device final test.
Pull down I/O Pins in USB Suspend	Disabled	Enabling this option will make the device pull down on the UART interface lines when the power is shut off (PWREN# is high). Note that these are the lines between the FT232R and the RS232 line driver and not the RS232 outputs accessible on the wire ends.
Manufacturer Name	FTDI	
Product Description	See note	USB-RS232-WE
Max Bus Power Current	90mA	
Power Source	Bus Powered	
Device Type	FT232R	
USB Version	0200	Returns USB 2.0 device description to the host. Note: The device is a USB 2.0 Full Speed device (12Mb/s) as opposed to a USB 2.0 High Speed device (480Mb/s).
Remote Wake Up	Disabled	
High Current I/Os	Enabled	Enables the high drive level on the UART and CBUS I/O pins. Note that these are the lines between the FT232R and the RS232 line driver and not the RS232 outputs accessible on the wire ends.
Load VCP Driver	Enabled	Makes the device load the VCP driver interface for the device.
Invert TXD	Disabled	Signal on this pin becomes TXD# if enable.
Invert RXD	Disabled	Signal on this pin becomes RXD# if enable.
Invert RTS#	Disabled	Signal on this pin becomes RTS if enable.
Invert CTS#	Disabled	Signal on this pin becomes CTS if enable.

Table 0.1 Default Internal EEPROM Configuration

The internal EEPROM in the cable can be re-programmed over USB using the utility program [FT Prog](#). Users who do not have their own USB Vendor ID but who would like to use a unique Product ID in their design can apply to CP for a free block of unique PIDs. Contact CP support for this service - support@connectiveperipherals.com.

Note that the EEPROM is supplied programmed ready to use for most applications. Changing the EEPROM settings is for advanced users only. Changing the settings can cause incorrect operation of the device. Before editing the VID or PID, note that this requires the user to have a driver with matching VID/PID in order to install the device before it can be used again. It is recommended to contact technical support if in doubt before making any changes.

Appendix B – References

Document References

[FT232R USB UART IC Datasheet](#)

Acronyms and Abbreviations

Terms	Description
DLL	Dynamic Link Library
EHCI	Enhanced Host Controller Interface
EEPROM	Electrically Erasable Programmable Read Only Memory
FPGA	Field Programmable Gate Array
IC	Integrated Circuit
MCU	Microcontroller Unit
RoHS	Restriction of Hazardous Substance
SIL	Single In Line
OHCI	Open Host Controller Interface
PLD	Programmable Logic Device
TTL	Transistor-Transistor Logic
USB	Universal Serial Bus
UART	Universal Asynchronous Receiver/Transmitter
UHCI	Universal Host Controller Interface

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Appendix D - Revision History

Revision	Changes	Date
Version 1.0	Document transferred from FTDI to CP	29-12-2020
Version 1.1	Updated to reflect UKCA compliance. Added driver install section and other minor updates.	30-1-2023