



USB-RS485

USB to RS485 Serial Converter Cable



Datasheet

Connective Peripherals Pte Ltd
178 Paya Lebar Road, #07-03 Singapore 409030
Tel.: +65 67430980 Fax: +65 68416071

E-Mail (Support): support@connectiveperipherals.com Web: www.connectiveperipherals.com/products

Neither the whole nor any part of the information contained in, or the product described in this manual, may be adapted or reproduced in any material or electronic form without the prior written consent of the copyright holder. This product and its documentation are supplied on an as-is basis and no warranty as to their suitability for any particular purpose is either made or implied. Connective Peripherals Pte Ltd will not accept any claim for damages howsoever arising as a result of use or failure of this product. Your statutory rights are not affected. This product or any variant of it is not intended for use in any medical appliance, device or system in which the failure of the product might reasonably be expected to result in personal injury. This document provides preliminary information that may be subject to change without notice. No freedom to use patents or other intellectual property rights is implied by the publication of this document. Connective Peripherals Pte Ltd, 178 Paya Lebar Road, #07-03 Singapore 409030. Registered Number: 201617872E

1 Description

The Connective Peripherals USB-RS485 cables are a family of USB to RS485-level serial converter cables. They incorporate the FT232R USB to UART interface IC device which handles all the USB signalling and protocols. The cable provides a fast, simple way to connect devices with an RS485 serial interface to USB.

Each USB-RS485 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 RS485 transceiver 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 USB-RS485 cable is designed for use at the end of an RS485 network up to approximately 10m. For longer networks or placement of the USB-RS485 cable in the middle of an RS485 network it may be necessary to reduce the cable length to 20cm or less to ensure signal integrity. For longer networks this allows the attachment of RS485 cabling and for connecting in the middle of a network this shortens the length of the resulting stub.

Note that cutting the cable will invalidate the warranty. It may therefore be preferred to use one of the USB-RS485 converters which have D-type connectors or terminal blocks and to attach the RS485 cabling to these. Please refer to the cables and adapters sections at <https://connectiveperipherals.com>

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 3 Mbaud. 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-RS485 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.

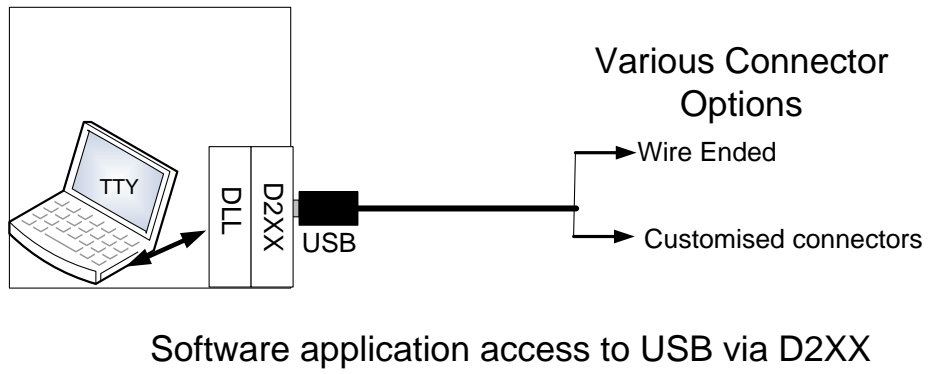
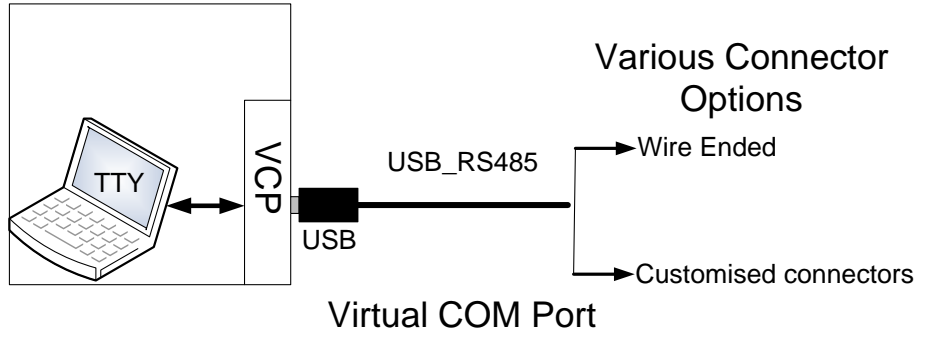


Figure 1.1 Using the USB-RS485 Cable

2 Cable Part Numbers

Table 2.1 gives details of the available USB-RS485 cables.

Part Number	Description	End Connector*	Cable details
USB-RS485-WE-1800-BT	USB to UART cable with RS485 level UART signals. B black cable, T transparent USB connector	Wire Ended (no connector)	1.8m cable, 6 core, UL2464 24 AWG, diam=5mm
* USB-RS485-CC-LLLL-CU-X	USB to UART cable with RS485 level UART signals. C = cable colour (B black or T transparent), U = USB connector colour (T transparent or B black) X = voltage (P is 5V, G is 0V (open))	CC = Connector description.	LLLL = Length of cable.

Table 2.1 USB-RS485 Cables Descriptions and Part Numbers

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

2.1 Certifications

USB-RS485 cable is fully RoHS compliant as well as CE, UKCA and FCC certified.

FCC Part 15, Subpart B, Class B. CISPR 22: 1997+A1: 2000, Class B. ICES-003: 2004, Class B.

ANSI C63.4-2003.



2.2 USB Compliant

The USB-R485 cables are fully compliant with the USB 2.0 specification.



Table of Contents

1	Description.....	1
2	Cable Part Numbers	3
2.1	Certifications	3
2.2	USB Compliant	3
3	Typical Applications	5
3.1	Driver Support	5
3.2	Driver Installation.....	5
3.3	Features.....	6
4	Features of FT232R applicable to USB-RS485 Cable	7
5	USB-RS485-WE-LLLL-CU-X.....	8
5.1	USB-RS485-WE Connections and Mechanical Details	8
5.2	USB-RS485-WE Cable Signal Descriptions.....	10
5.3	USB-RS485-WE Electrical Parameters.....	10
5.4	Local Echo.....	11
6	Cable PCB Block Diagram	12
7	USB-RS485 – Schematic.....	13
8	Contact Information.....	14
	Appendix A - Cable EEPROM Configuration.....	15
	Appendix B - References	16
	Document References	16
	Acronyms and Abbreviations	16
	Appendix C - List of Figures and Tables	17
	List of Figures	17
	List of Tables.....	17
	Appendix C - Revision History	18

3 Typical Applications

- USB to serial RS485 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 RS485 transceiver would be needed between the USB-RS485 cable and the MCU/FPGA to convert the signals from the USB-RS485 cable back to logic levels. RS485 is also half-duplex and so the MCU/FPGA would need to support direction control.

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 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-RS485 converter cable provides a USB to RS485 serial interface with wire ended connections
- Entire USB protocol handled by the electronics in the cable.
- EIA/TIA-485 communication interface with low power requirements.
- UART interface 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.
- X-On / X-Off software handshaking.
- Automatic direction control for the RS485 transceiver
- Data transfer rates from 300 baud to 3 Mbaud.
- 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-485 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-RS485 Cable

The USB-RS485 cable uses 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-RS485 cables has been designed to use as little as possible of the total USB bandwidth available from the USB host controller.

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-RS485 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-RS485 cables are FCC, UKCA and CE certified.

Extended Operating Temperature Range - The USB-RS485 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-RS485-WE-LLLL-CU-X

The USB-RS485-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.

The cable outputs 5V power on the wire by default. This can be modified to output 0V (open) power. The letter X in the part number indicates the output power selection.

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-RS485-WE Connections and Mechanical Details

Figure 5.1 shows the cable signals and the wire colours for the signals on the USB-RS485-WE cable.

Note that some manufacturers use different designations for RS485 signals A and B and so please consult the documentation for the RS485 product to be attached to the cable to confirm which of its terminals is the Data + and Data -

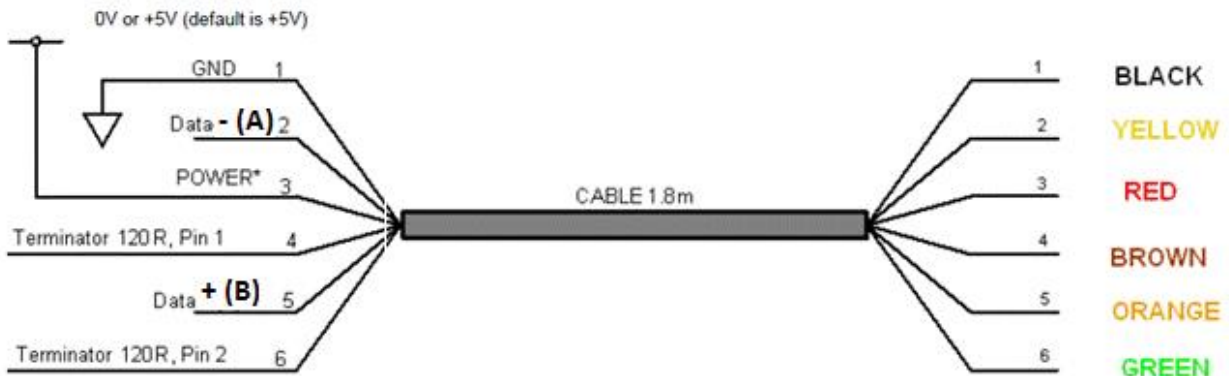


Figure 5.1 USB-RS485-WE Connections

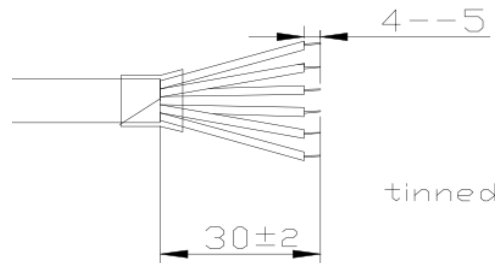


Figure 5.2 USB-RS485-WE Mechanical Details (dimensions in mm)



Figure 5.3 USB-RS485-WE Cable images

5.2 USB-RS485-WE Cable Signal Descriptions

Colour	Name	Type	Description
Black	GND	GND	Device ground supply pin.
Brown	Terminator 1	Input	Pin 1 of 120R Terminating Resistor. Only Required if the USB-RS485-WE cable is the first or last device in a multi-drop RS485 System, to meet RS485 Termination Requirements.
Red	POWER	Output	Default output is +5V when active, off during suspend. Power output can be customized to 0V (open) as a custom cable request, contact CP Sales team for more information. Switchable power to external device, 250mA max. OFF during suspend
Orange	Data+(B)	Bi-Direction	Data + RS-485 'B' Signal
Yellow	Data-(A)	Bi-Direction	Data - RS-485 'A' Signal
Green	Terminator 2	Input	Pin 2 of 120R Terminating Resistor. Only Required if the USB-RS485-WE cable is the first or last device in a multi-drop RS485 System, to meet RS485 Termination Requirements.

Table 5.1 USB-RS485-WE Cable Signal Descriptions

5.3 USB-RS485-WE Electrical Parameters

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
VCC_5V	Output Power Voltage*	4.25	5.0*	5.25	V	This only applies when cable has been configured to output 5V. The range is dependent on the USB port that the USB-RS485-WE is connected to
I _o	Output Power Current***	-		250	mA	Must be less than 2.5mA during suspend.
T	Operating Temperature Range	-40		+85	°C	

Table 5.2 USB-RS485-WE I/O Operating Parameters

*Default is 5V.

***Only applies when POWER output is 5V.

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
Receiver Input						
VCM	Common-mode input voltage range	-7		+12	V	
IN	Input Current			1.0	mA	VIN = +12V
				-0.8		VIN = -7V
VTH	Differential Threshold Voltage, VTH	-0.2		+0.2	V	
VIHYST	Input Hysteresis		20		mV	
RIN	Input Resistance, RIN	12	15		kΩ	
Transmitter Output						
VOD	Differential Output Voltage, dVOD	1.5		5	V	With RL = 54Ω. CL = 50pF *

Table 5.3 USB-RS485-WE I/O Pin Characteristics

* - The 54 ohms is the equivalent of two 120 ohm termination resistors placed on each side of the transmission line and the input impedance of 32 receivers on the line.

Description	Conditions	Minimum	Typical	Maximum
ESD HBM	RS-485 Inputs and Outputs		±15 kV	
EN61000-4-2ContactDischarge	RS-485 Inputs and Outputs		±8 kV	
EN61000-4-2AirGapDischarge	RS-485 Inputs and Outputs		±15 kV	

Table 5.4 USB-RS485-WE ESD Tolerance

5.4 Local Echo

RS485 systems often have local echo enabled. This means any data transmitted by a device is echoed back to itself.

The USB-RS485-WE cable allows for local echo to be enabled/disabled by changing a bit in the FT232R EEPROM. If CBUS4 in the EEPROM is set for "PWREN#" local echo is enabled. If CBUS4 in the EEPROM is set for "TXDEN" local echo is disabled.

Users can set this with [FT Prog.](#)

The default for the local echo is disabled (CBUS4 set for "TXDEN").

6 Cable PCB Block Diagram

The block diagram 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 the cable are also available. Users interested in customised versions of these cables should contact CP_Sales (sales@connectiveperipherals.com).

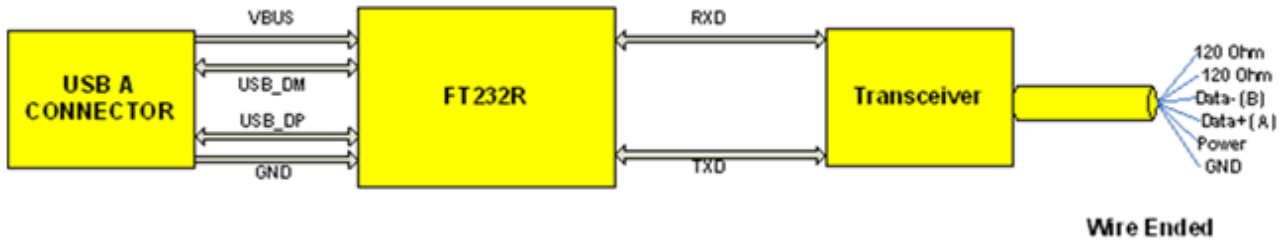


Figure 6.1 Block diagram of PCB Used in the USB to RS485 Serial Converter Cable

7 USB-RS485 – Schematic

Schematic for converter cable, USB-RS485 is shown in **Figure 7.1**.

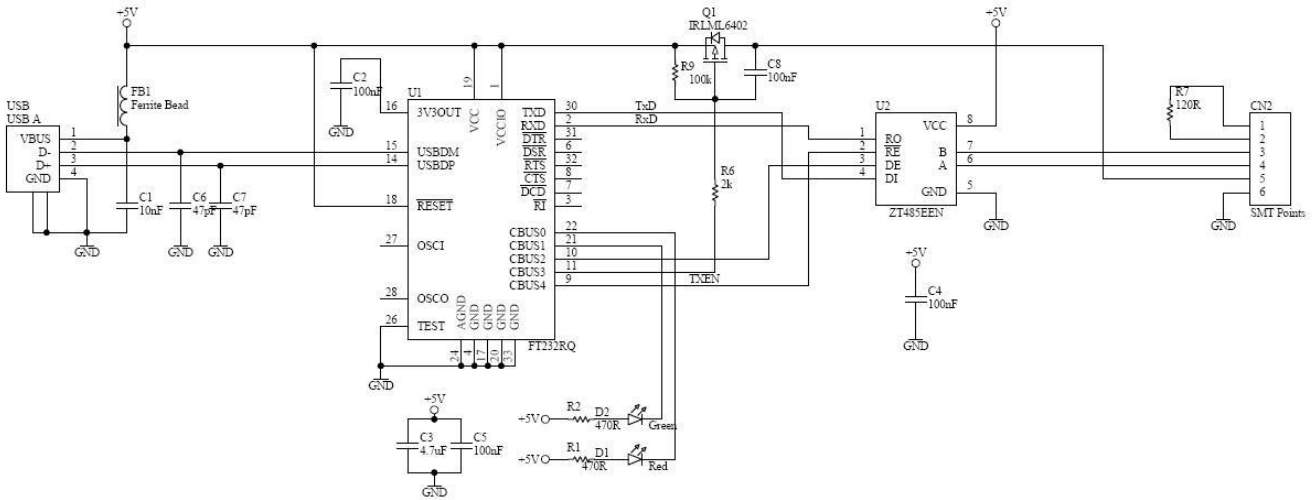


Figure 7.1 Schematic of USB-RS485 Converter Cable

8 Contact Information

Global Headquarters – Singapore

Connective Peripherals Pte Ltd
178 Paya Lebar Road
#07-03
Singapore 409030

Tel: +65 67430980
Fax: +65 68416071

E-Mail (Sales)	sales@connectiveperipherals.com
E-Mail (Support)	support@connectiveperipherals.com
Web Site URL	http://www.connectiveperipherals.com
Web Shop URL	http://www.connectiveperipherals.com

Appendix A - Cable EEPROM Configuration

Each USB-RS485 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-RS485-WE
Max Bus Power Current	250mA	
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
COM	General Purpose Input/output
DLL	Dynamic Link Library
EEPROM	Serial Peripheral Interconnect
EHCI	Enhanced Host Controller Interface
FPGA	Field Programmable Gate Array
HBM	Human Body Model
LED	Light Emitting Diode
OHCI	Open Host Controller Interface
RoHS	Restriction of Hazardous Substance Directive
USB	Universal Serial Bus
UART	Universal Asynchronous Receiver Transmitter
UHCI	Universal Host Controller Interface
VCP	Virtual COM Port

Appendix C - List of Figures and Tables

List of Figures

Figure 1.1 Using the USB-RS485 Cable	2
Figure 5.1 USB-RS485-WE Connections.....	8
Figure 5.2 USB-RS485-WE Mechanical Details (dimensions in mm).....	8
Figure 5.3 USB-RS485-WE Cable images	9
Figure 6.1 Block diagram of PCB Used in the USB to RS485 Serial Converter Cable.....	12
Figure 7.1 Schematic of USB-RS485 Converter Cable.....	13

List of Tables

Table 2.1 USB-RS485 Cables Descriptions and Part Numbers	3
Table 5.1 USB-RS485-WE Cable Signal Descriptions	10
Table 5.2 USB-RS485-WE I/O Operating Parameters.....	10
Table 5.3 USB-RS485-WE I/O Pin Characteristics	10
Table 5.4 USB-RS485-WE ESD Tolerance.....	11
Table 0.1 Default Internal EEPROM Configuration	15

Appendix C - 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.	30-01-2023