

# EPT 232R-US-R1

## 1 Meter USB to Serial Cable

### User Manual



## **1 EPT 232R-US-R1 1 Meter USB to Serial Cable**

The EPT 232R-US-R1, provides a simple method of adapting legacy serial devices with RS232 interfaces to modern USB ports.

Each EPT 232R-US-R1 adapter contains a small internal electronic circuit board which utilises the FTDI FT232R, mounted inside a rugged plastic enclosure capable of withstanding industrial temperature ranges. The integrated electronics also include RS232 level shifters and TXD/RXD LEDs to provide a visual indication of data traffic through the adapter.

The Cable incorporates a standard USB-A device connector for connection to an upstream host or hub port. RS232-level signals, including modem handshake signals, are available on an industry-standard DB9 Male connector. The maximum RS232-level data rate is 1MBaud.

The EPT 232R-US-R1 adapter cable requires USB device drivers, available from [www.earthpeopletechnology.com/resources/driver](http://www.earthpeopletechnology.com/resources/driver), which are used to make the EPT 232R-US-R1 appear as a Virtual COM Port (VCP). This allows existing serial communications software, such as HyperSerialPort, to exchange data through the US232R to a legacy RS232 peripheral device.

## 1.1 Block Diagram



### USB A Connector

This connector provides the interface for connection to a USB Host or Hub port

### Cable

The EPT 232R-US-R1 cable is available in length 1 meter.

### FTDI FT232R

The FTDI FT232R chip provides the USB-to-Serial conversion. Operating system device drivers are required in order to work with the FT232R to provide the Virtual COM Port serial functionality.

### RS232 Level Shifter

The RS232 level shifter converts the signals provided by the FT232R into the voltage levels required by RS232 devices.

### DB9 Connector (Male)

The DB9 Male connector is configured in an industry standard (TIA/EIA-574) pin-out to provide connection to RS232 peripherals through standard cables.

## 1.2 Cable Features

- Adds one RS-232 serial port by connecting to USB
- Special high gloss white finish enclosure design
- Side-lit blue RXD and TXD traffic indicators
- Enhanced RS232 transceiver gives serial port speed of up to 1MBaud.
- Gold plated USB and DB9 connectors for enhanced connection reliability
- Integral 100cm USB cable with moulded strain relief
- Quality 4-layer PCB design
- Easy plug & play installation and RS-232 device connection
- Works with USB 1.1 & 2.0 Host and Hub ports
- Industry Standard FTDI chip set & device drivers for maximum compatibility
- Microsoft Windows® WHQL-certified, Mac OS X, Linux and Windows CE device drivers
- Installs as a standard Windows COM port
- COM port number can be changed to any available COM port number, including COM1 to COM4, to support HyperSerialPort, or any other serial communications software application running in Windows
- FIFO: 128 byte transmit buffer, 256 byte receive buffer
- RS-232 data signals: TxD, RxD, RTS, CTS, DSR, DTR, DCD, RI, GND
- Powered by USB port. No external power adapter required.
- Serial Communication Parameters
  - Parity: None, Even, Odd
  - Data bits: 7, 8
  - Flow control: RTS/CTS , DSR/DTR, X-ON/X-OFF, None
  - Stop bits 1,2
- Operating temperature of -20°C to +80°C

### 1.3 Performance Figures

Parameter	Performance
USB Interface	12Mbps USB 2.0 Full-Speed
RS232 Interface	Standard Windows baud rates (300bps to 921.6Kbps) Custom baud rates (300bps to 1Mbps) through baud rate aliasing.

## 2 EPT 232R-US-R1 Key Features

This section summarises the key features and enhancements of the FT232R IC device which is used on the EPT 232R-US-R1 USB to RS232 converter cable. For further details, consult the FT232R datasheet, which is available from the FTDI website.

### 2.1 Pre-programmed EEPROM

The FT232R is supplied with its internal EEPROM pre-programmed with a serial number which is unique to each individual device. This, in most cases, will remove the need to program the device EEPROM.

### 2.2 Lower Operating and Suspend Current

The device operating supply current has been further reduced to 15mA, and the suspend current has been reduced to around 70µA. This allows greater margin for peripheral designs to meet the USB suspend current limit of 500µA.

### 2.3 Low USB Bandwidth Consumption

The operation of the USB interface to the FT232R has been designed to use as little as possible of the total USB bandwidth available from the USB host controller.

### 2.4 Improved EMI Performance

The reduced operating current and improved on-chip VCC decoupling significantly improves the ease of PCB design requirements in order to meet FCC, CE and other EMI related specifications.

### 2.5 Programmable Receive Buffer Timeout

The receive buffer timeout is used to flush remaining data from the receive buffer. This time defaults to 16ms, but is programmable over USB in 1ms increments from 1ms to 255ms, thus allowing the device to be optimised for protocols that require fast response times from short data packets.

### 2.6 Baud Rates

The FT232R supports all standard baud rates and non-standard baud rates from 300 Baud up to 3 Mbaud. Achievable non-standard baud rates are calculated as follows –

$$\text{Baud Rate} = 3000000 / (n + x)$$

where n can be any integer between 2 and 16,384 (= 2<sup>14</sup>) and x can be a sub-integer of the value 0, 0.125, 0.25, 0.375, 0.5, 0.625, 0.75, or 0.875. When n = 1, x = 0, i.e. baud rate divisors with values between 1 and 2 are not possible.

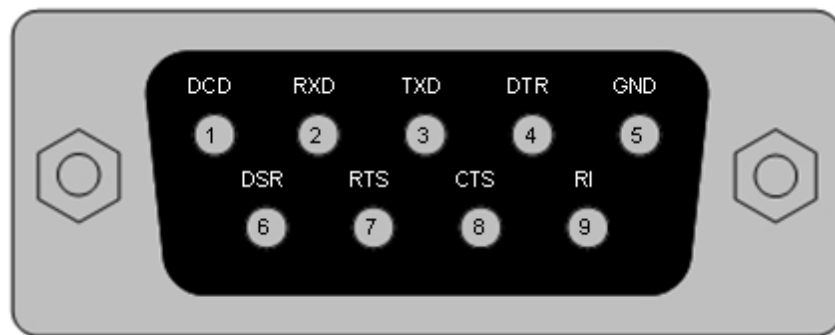
This gives achievable baud rates in the range 183.1 baud to 3,000,000 baud. When a non-standard baud rate is required simply pass the required baud rate value to the driver as normal,

and the FTDI driver will calculate the required divisor, and set the baud rate. See FTDI application note AN232B-05 for more details

The EPT 232R-US-R1 cable is limited to a maximum of 1 Mbaud because of the line driver within the circuit.

### 3 Installation

#### 3.1 RS232 Connection Pin Out



**Figure 3-1 RS232 DB9 Pin Out**

DB9 Pin No.	Name	Type	Description
1	DCD	Input	Data Carrier Detect control input
2	RXDATA	Input	Receive Asynchronous Data input.
3	TXDATA	Output	Transmit Asynchronous Data output.
4	DTR	Output	Data Terminal Ready control output / Handshake signal
5	GND	GND	Device ground supply pin.
6	DSR	Input	Data Set Ready control input / Handshake signal
7	RTS	Output	Request To Send Control Output / Handshake signal
8	CTS	Input	Clear to Send Control input / Handshake signal.
9	RI	Input	Ring Indicator control input. When remote wakeup is enabled in the FT232RL's internal EEPROM taking RI# low can be used to resume the PC USB host controller from suspend.

## 4 Electrical Details

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
USB_VCC	Input Power Voltage	4.25	5.0*	5.25	V	*Present when USB cable is attached and USB Host or Hub powered.
Icc	USB Current		30	50	mA	

Table 4.1 USB Electrical Details

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
Vtrans	Transmitter output voltage swing	$\pm 5$			V	RL = 3K $\Omega$
Vrec	Receiver input voltage range	$\pm 2.4$		$\pm 25$	V	Input resistance = 3K $\Omega$ to 7K $\Omega$
	ESD HBM		$\pm 15$		kV	RS-232 Inputs and Outputs

Table 4.2 RS232

## 5 Physical Environment Details

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
T	Operating Temperature Range	-20		+80	$^{\circ}\text{C}$	5% to 95% RH, non condensing

## 6 Environmental Approvals & Declarations

### 6.1 EMI Compatibility

#### FCC and CE

The EPT 232R-US-R1 has been tested to be compliant with both FCC Part 15 Subpart B and European EMC Directive.



NOTE: This is a Class B product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.



NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

## 6.2 Safety

The EPT 232R-US-R1 is defined as Limited Power Supply (LPS) device, with operating voltages under 60VDC.

## 6.3 Environmental

The EPT 232R-US-R1 is a lead-free device that complies with the following environmental directives: RoHS, WEEE, REACH, PFOS and DecaBDE.

## 6.4 Reliability

The EPT 232R-US-R1 is designed as a robust USB-Serial adapter for use in many environments. There are no user-serviceable parts. Any failure will require a replacement of the unit.

## 7 Troubleshooting

### 7.1 Hardware

Cables are the most common sources of trouble with external devices.

Check the following:

- USB cable is properly inserted
- Computer power is ON
- Computer is not in Sleep or Standby
- If a USB Hub is used, be sure it is set for “Self-Powered” operation
- If a USB Hub is used, be sure all cables are properly inserted

RS232 cables – check the following:

- Output signals (TXD, RTS, DTR) are connected to the respective inputs (RXD, CTS, DSR) in each direction.
- Check for specific handshake requirements of your RS232 peripheral.
- If handshake signals are not used, ensure the application is set to “No Hardware Handshake”, or equivalent.
- Test the port with a loop-back connector. Connect TXD to RXD, RTS to CTS and DTR to DSR. Use HyperSerialPort to check that data is transmitted and received.

### 7.2 Device Driver

Ensure the latest device driver is in use. See [www.earthpeopletechnology.com/resources/drivers](http://www.earthpeopletechnology.com/resources/drivers)

If other devices with FTDI chips are installed in the system, check with all manufacturers of these devices for the latest device drivers.

See the FTDI installation guides for additional details:

<http://ftdichip.com/Documents/InstallGuides.htm>

Common Windows Device Driver Troubles:

- **DEVICE TIMES OUT:** The default settings of the device driver assume typical data transfers of hundred to thousands or more bytes at a given time. Some applications, such as a GPS device, only send data in short packets, often only a few bytes. If this is the case, it may be necessary to adjust the drivers buffer size and/or latency timer to smaller values. These values can be adjusted through the Advanced driver options as noted in Figure 2.13. The buffer size can be reduced to 64 bytes. The latency timer can be set as low as 2ms. A setting of 1ms will cause unnecessary USB traffic and could adversely affect data transmission.



- **ERRATIC MOUSE POINTER:** The device driver defaults to query an attached device to find out whether it is a mouse or modem, consistent with native COM port operation. Some RS232 peripherals constantly send short packets of data, causing the host system to “think” a mouse or modem has been attached. These short packets will interfere with normal mouse operation causing the pointer to jump around the screen. If this happens, disconnect the RS232 device and *uncheck the Serial Enumerator* option, also found on the Advanced driver options screen in Figure 2.13.
- **COM PORT IN USE:** Windows keeps track of all COM port assignments. If multiple FTDI products have been connected to a single system, the COM port number will increase, even if the other devices are not attached. If the higher COM port assignments are not acceptable for the application, known unused COM port numbers should be uninstalled according to the FTDI installation guide: <http://ftdichip.com/Documents/InstallGuides.htm>.