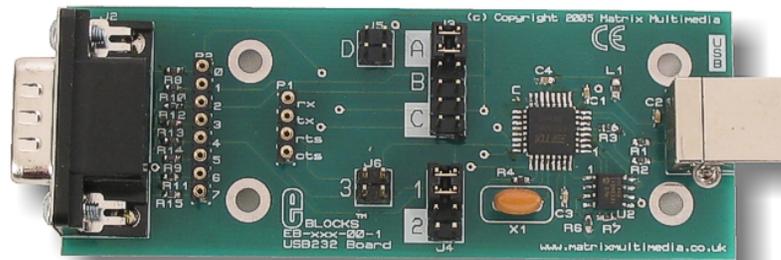


# USB232 board EB039-00-1 Technical datasheet



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Appendix 1      Circuit Diagram

## **1. About this document**

This document concerns the E-blocks USB232 board version 1.

The order code for this product is EB039.

### **1. Trademarks and copyright**

PIC and PICmicro are registered trademarks of Arizona Microchip Inc.  
E-blocks is a trademark of Matrix Multimedia Limited.

### **2. Other sources of information**

There are various other documents and sources that you may find useful:

#### **Getting started with E-Blocks.pdf**

This describes the E-blocks system and how it can be used to develop complete systems for learning electronics and for PICmicro programming.

#### **PPP Help file**

This describes the PPP software and its functionality. PPP software is used for transferring hex code to a PICmicro microcontroller.

#### **C and assembly strategies**

Not provided for this product.

### **3. Disclaimer**

The information in this document is correct at the time of going to press. Matrix Multimedia reserves the right to change specifications from time to time. This product is for development purposes only and should not be used for any life-critical application.

### **4. Technical support**

If you have any problems operating this product then please refer to the troubleshooting section of this document first. You will find the latest software updates, FAQs and other information on our web site: [www.matrixmultimedia.com](http://www.matrixmultimedia.com) . If you still have problems please email us at: [support@matrixmultimedia.co.uk](mailto:support@matrixmultimedia.co.uk).

## 2. **General information**

### ***Description***

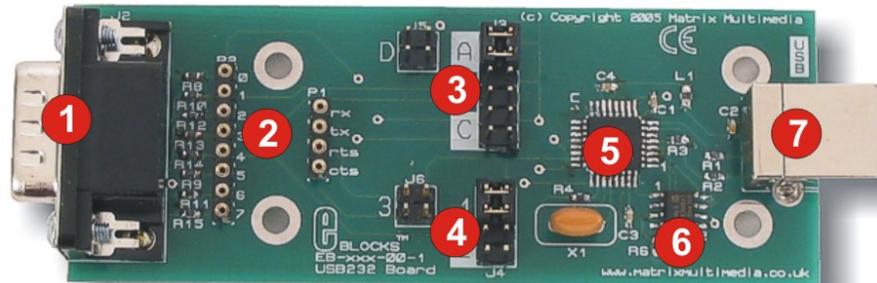
This interface board allows you to easily add a USB communications interface to your project. The board contains a FTDI FT232BL interface chip which provides an interface between a USB interface and a microcontroller UART using RS232 protocols. A virtual COM port driver is available which allows you to interface the board to Windows, MAC and Linux based applications including Visual Basic and Visual C++ etc. The FTDI device is able to communicate with data transfer speeds of up to 3M baud.

### ***Features***

- E-blocks compatible
- Low cost
- Provides a USB interface for all your projects
- Data transfer rates of up to 3M baud
- USB 1.0 and USB 2.0 compatible

For more details of the FTDI device's capabilities please refer to [www.ftdichip.com](http://www.ftdichip.com).

### 3. Board layout



EB039-74-1.cdr

1. D-type E-blocks connector
2. Patch system
3. Rx / tx jumper selection
4. RTS/CTS jumper system
5. FT232BL chip
6. EEPROM with USB ID
7. USB socket

## 4. Testing this product

The following program will test the circuit. The test files can be downloaded from [www.matrixmultimedia.com](http://www.matrixmultimedia.com).

The following instructions explain the steps to test your USB232 board. The instructions assume that PPP is installed and functional. It also assumes that you are confident in sending a program to the PIC via the Multiprogrammer.

These programs require a PICmicro Multiprogrammer board (EB-006) with a 40-pin PIC16F877A device. They require a PC with FTDI drivers installed, MProg 2.3 software, a spare USB port and Hyperterminal.

The program will enable you to fully test the functionality of the board.

### System Setup

Multi-programmer board (EB006) with:

EB006 Options	Setting
Power supply	External, 14V
PICmicro device	16F877A
SW1 (Fast/Slow)	Don't care
SW2 (RC/Xtal)	Xtal
Xtal frequency	19.6608MHz
Port A	Switch board EB007
Port B	LCD display EB005
Port C	USB232 board EB039
Port D	
Port E	
Test program	power.hex

EB005 Options	Setting
	DEFAULT

EB039 Options	Setting
J5, J3	A
J6, J4	1

Connect "+V" from the Screw terminal of the Switch board, and LCD board to "+V" of the Multiprogrammer

### PC software setup for the test routine

1. Plug the EB039 USB232 E-Block into the PC using a USB cable. If this is the first time the device is being plugged in, the "Add new hardware" wizard may appear. If it does, you will need to install the appropriate drivers - see the separate "Driver Installation" document for guidance.
2. The first step is to determine which virtual COM port has been allocated to the device. Do this by clicking on the "Start" button and selecting "Run..." In the "Open:" box, type "devmgmt.msc" (without the quotes) and press "OK" - this will open the "Device Manager" window.
3. Locate the "Ports (COM & LPT)" section and expand it by clicking the "+" symbol. The allocated COM port number will be shown in brackets after the "USB232 E-Block" entry.
4. Close down the "Device Manager" window.
5. Open "HyperTerminal". Enter a name in "Connection Description" window if this appears - it does not matter what you enter here.
6. In the "Connect to..." window, select the appropriate COM port number from the "Connect using:" drop-down box.
7. Set the properties for this connection to the following:
  - Bits per second = 9600
  - Data bits = 8
  - Parity = None

- Stop bits = 1
  - Flow control = Hardware
8. The connection should now be active. Press  (disconnect) button.

### ***Test Procedure***

1. Press “reset” on the Multiprogrammer – the LCD display should read “EB039 test” and “Press A0”.
2. Plug the USB32 board into the PC using the USB cable (if it is not already connected).
3. Click the  (connect) button in HyperTerminal.
4. If you get the “Unable to connect to COMx...” message, click the properties button () and in the “Connect using” drop-down, select the appropriate COM port. This will probably increment after each unit has been tested, so it is likely that you need to select the highest COM port number. Click “OK” and then click the connect button again – this time there should be no error message.
5. Press A0 on the Switches E-Block – HyperTerminal should display the message “EB039 Test” and the LCD display should display “Waiting for PC..”
6. Type a few characters into the HyperTerminal window – whatever you typed should be displayed on the lower part of the LCD display (and not on the PC window).
7. Press <return> on the PC keyboard and the LCD display (and HyperTerminal) should read “\*\*\*Unit Passed\*\*\*”. After a couple of seconds, the LCD display will revert to the original message.

## 5. Circuit description

The circuit on the EB039 is made up of a FTDI FT232BL device and associated EEPROM, and a patch system linking the FT232BL to the upstream board.

### **FT232BL**

The FT232BL is a single chip device that allows asynchronous data transfer between a computer with a USB port and your hardware project. The device supports a range of data transfer protocols based on RS232 like signals (TTL voltage levels) which allows data transfer at rates up to 3M baud.

The device connects to the USART of a microcontroller using the TX, RX, CTS and RTS lines via a patch system (see below).

On the PC (Windows, Linux or MAC), there are 2 types of drivers available. The first provide a “virtual” COM port functionality, which will allow legacy serial port applications to access the USB232 E-Block as if it was connected to a standard serial COM port. These are known as Virtual COM Port (of VCP) drivers.

The second set of drivers (known as D2XX drivers) provide direct access to the i/o lines of the FT232BL device. These provide a faster communication speed and allow for more flexibility in your design.

### **EEPROM**

There is an EEPROM on the EB-039 E-Block, which is used to store information that identifies the board as a USB device. This EEPROM also contains a unique serial number.

### **Patch system**

The D type plug, J2 is used to connect the USB232 board to your E-blocks system. As with most E-blocks downstream boards the patch system allows you to pre-select the connections between the key signals on the board and the upstream board. Many E-blocks systems are optimized for the PICmicro range of devices but the key signals, TX and RX, are on different pins for different PICmicro devices. The following table shows you the TX and RX connections for several PICmicro devices:

Table of pin outs of various chip families

Chip	signal	port bit	D-type pin
16F88	RX	RB2	pin 3
	TX	RB5	pin 6
16F627a	RX	RB1	pin 2
	TX	RB2	pin 3
16F877a	RX	RC7	pin 8
	TX	RC6	pin 7

The jumpers A, B, C allow you to quickly configure RX and TX for several ranges of PICmicro device. If you are not using one of the devices in the table then you will need to select jumper D to make your own configuration. This is achieved by identifying the USART pins on the PICmicro, then by selecting the corresponding links between the USB232 board and the upstream device.

Jumper Setting A	Jumper Setting B	Jumper Setting C		Jumper Setting D
		PIC16F devices	PIC16C devices	
PIC16F87	PIC16F627/A	PIC16F73	PIC16C63	PATCH SYSTEM
PIC16F88	PIC16F628/B	PIC16F737	PIC16CR63	
	PIC16F648A	PIC16F74	PIC16C65/A/B	
		PIC16F746	PIC16RC65	
		PIC16F76	PIC16C66	
		PIC16F767	PIC16C73/A/B	
		PIC16F77	PIC16C74/A/B	
		PIC16F777	PIC16C745	
		PIC16F870/1	PIC16C765	
		PIC16F873/A	PIC16C77	
		PIC16F874/A	PIC16C773	
		PIC16F876/A	PIC16C774	
		PIC16F877/A	PIC16C774	

**Table 1. Jumper settings for TX and RX selection.**

Jumper settings 1, 2, and 3 are used to set the correct pins for CTS and RTS. The following tables illustrate the correct jumper settings.

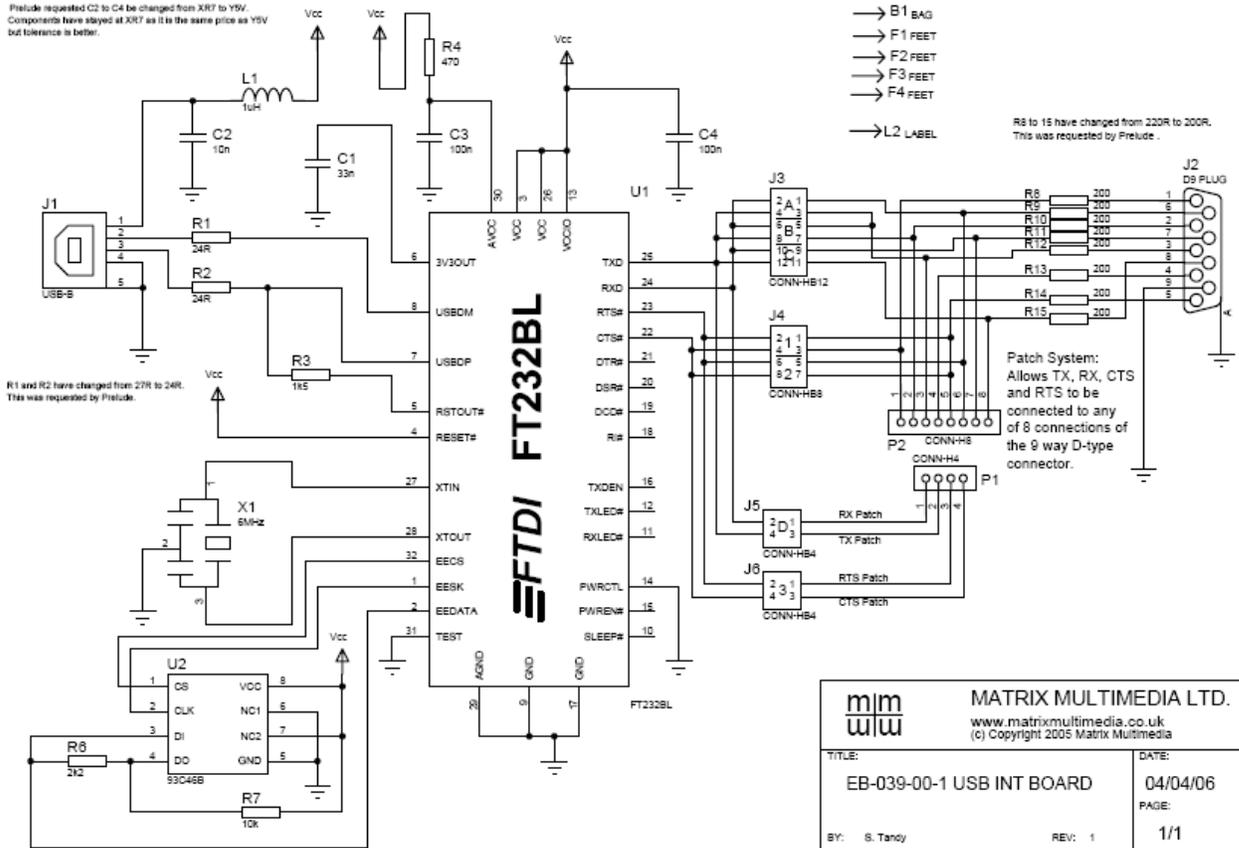
Jumper Setting 1		Jumper Setting 2		Jumper Setting 3	
CTS	RTS	CTS	RTS	CTS	RTS
Bit 4	Bit 0	Bit 5	Bit 4	Patch	Patch

**Table 2. Jumper settings for RTS and CTS selection**

(NOTE: Jumper setting 2 is used in conjunction with our Bluetooth module and should not be used when the USB232 E-Block is connected to a microcontroller).

Appendix 1

Prelude requested C2 to C4 be changed from XRT7 to Y5V.  
Components have stayed at XRT7 as it is the same price as Y5V but tolerance is better.



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