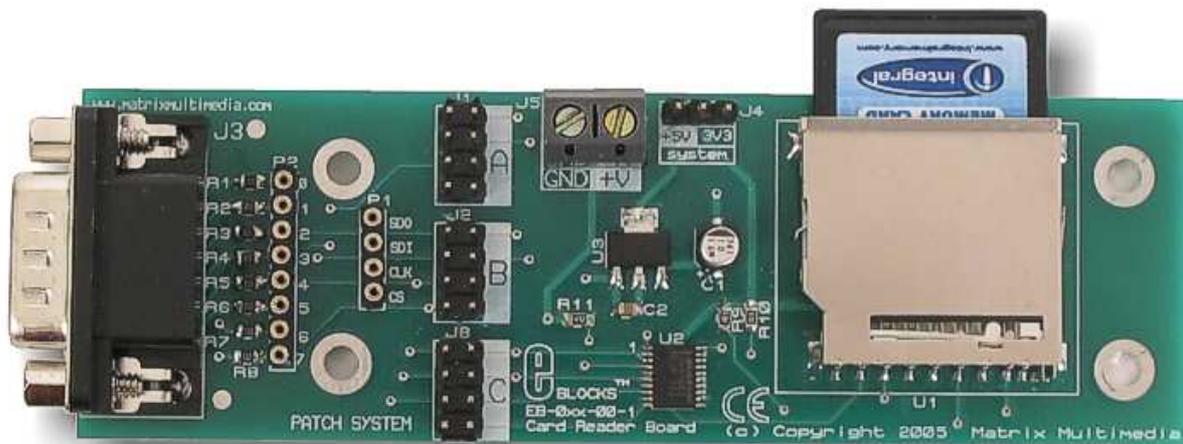


Card Reader Board EB037-00-1



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Appendix 1 Circuit diagram

1. About this document

This document concerns the E-blocks Card Reader board code EB037 version 1.

The order code for this product is EB037.

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

This is available as a free download from our web site.

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 . If you still have problems please email us at: support@matrixmultimedia.co.uk.

2. General information

1. *Description*

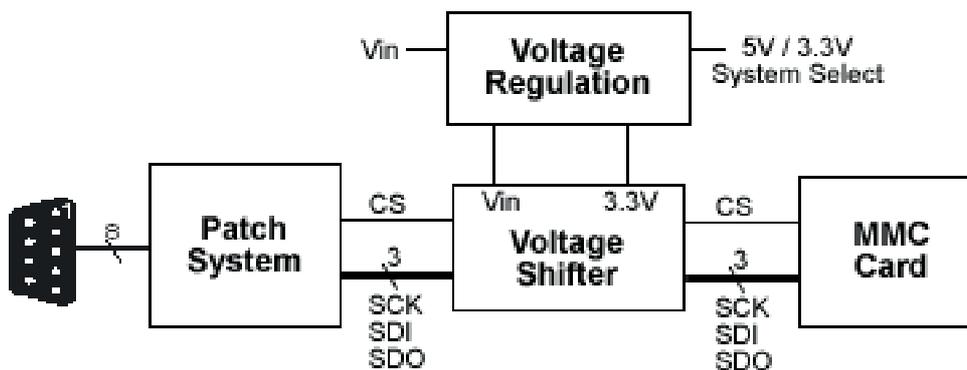
This E-block allows investigation of flash multimedia memory cards by implementing serial communication protocols, specifically the SPI interface. The main function of this E-block is to add the capabilities of storing and retrieving large amounts of data for use elsewhere in the system.

A set of jumper links are available which allow the Card Reader E-block to easily be set for all PICmicro® microcontroller SPI compatible devices. With the patch system available on board makes this board compatible with numerous other devices.

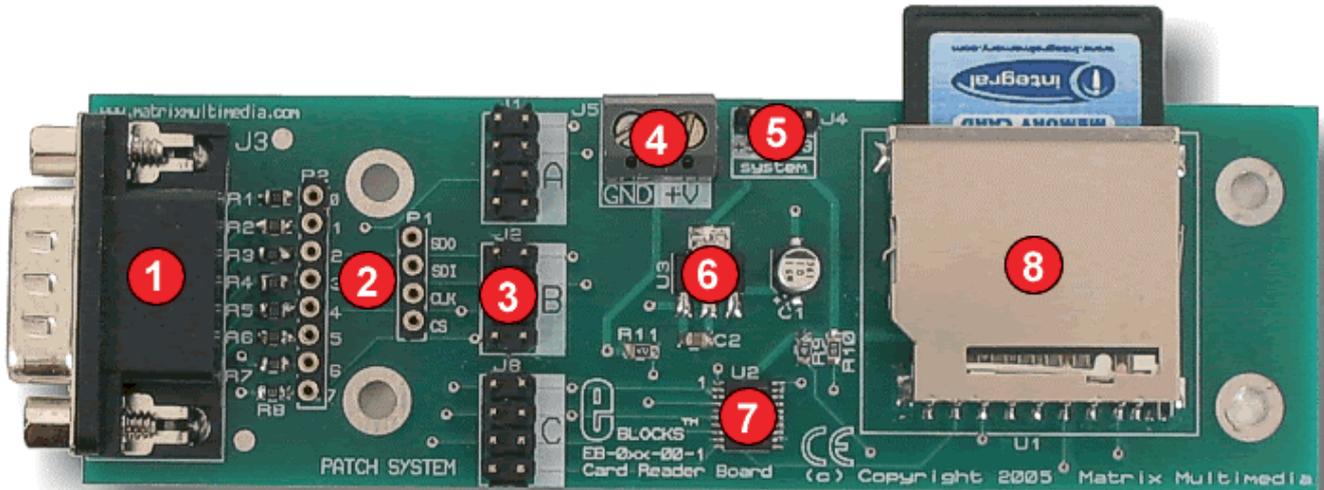
2. *Features*

- SPI serial MMC/SD card interface
- Bi-directional voltage level shifter
- Storage compatible with IBM based computers using the Flowcode FAT driver.

3. *Block schematic*



3. Board layout



EB037-74-1.jpg

- 1) 9-way downstream D-type connector
- 2) Patch system
- 3) SDO, SDI, SCK and CS mode selection jumper pins
- 4) Power screw terminals
- 5) VCC power selection jumper
- 6) 3.3V regulator
- 7) 5V to 3.3V Voltage shifter
- 8) MMC card socket

General Guide for SDO, SDI & SCK settings:

Jumper at A		Jumper at B	Jumper at C
PIC16F7x	PIC16C6x	PIC16F88	Patch System
PIC16F7x7	PIC16CC7x	PIC16F87	
PIC16F87x		PIC16F818	
PIC16F87xA		PIC16F819	
Connect to Port C		Connect to Port B	

General Guide for SS settings

Jumper at A	Jumper at B	Jumper at C
CS – Bit 2	CS – Bit 7	Patch System

4. Testing this product

The following program will test the circuit. The test file can be downloaded from www.matrixmultimedia.com.

1. *System Setup*

MMC/SD Flash Card

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	
Port B	LCD board EB005
Port C	Card Reader board EB037
Port D	
Port E	
Test program	MMC.hex

EB013 Options	Setting
Patch system	A
VCC jumper	Left 5V
MMC flash card	In

2. *Test Procedure*

Warning the following procedure may erase or corrupt data already on your MMC/SD card. Please make sure you have any information contained on the card backed up and you also may want to format the card after it has been tested to remove the test data.

- 1) Wire power to the LCD and Card Reader boards.
- 2) Configure system and board options as above.
- 3) Download the test program to the Multiprogrammer
- 4) Press RESET on EB006 Multiprogrammer
- 5) The program will now test the Card Reader by
 - a. Initializing the MMC/SD card into SPI mode
 - b. Writing 512 bytes of ASCII characters into the MMC/SD memory
 - c. Reading and Verifying the ASCII characters in memory
- 6) The progress of the program will be displayed on the LCD
- 7) If the test was successful then the message "successful" will be output on the LCD

This program tests the complete functionality of the board

5. Circuit description

The circuit as can be seen in the circuit diagram below (See Appendix 1 – Circuit diagram), made up of four sections: Connectors, voltage shifter, SPI bus and MMC/SD card socket.

1. Connectors

The design of this product is to enable you to use it with many standard PICmicro® microcontroller devices. This is achieved by identifying the PICmicro® that you are using. Then selecting the corresponding jumper setting on the SPI board. This will configure the board to the correct pin-out for that PICmicro® microcontroller. Jumper setting A, B, and C are used for selecting the appropriate pins for SDO, SDI and SCK, the dedicated SPI lines and CS the Card enable line.

The PICmicro® that is being used determines which port and which jumper. For example, if a PIC16F877A is being used, the Card Reader Board must be connected to Port C, with the jumper settings to A.

The following tables illustrate the correct jumper settings.

Jumper Setting A		Jumper Setting B	Jumper Setting C	
PIC16F devices	PIC16C devices		PATCH SYSTEM	
PIC16F72	PIC16C62B	PIC16F87		
PIC16F73	PIC16C63A	PIC16F88		
PIC16F737	PIC16C65	PIC16F818		
PIC16F74	PIC16C66	PIC16F819		
PIC16F747	PIC16C67			
PIC16F76	PIC16C72A			
PIC16F767	PIC16C73B			
PIC16F77	PIC16C74B			
PIC16F777	PIC16C76			
PIC16F872	PIC16C77			
PIC16F873/A	PIC16C773			
PIC16F874/A	PIC16C774			
PIC16F876/A				
PIC16F877/A				
CONNECT BOARD TO PORT C		CONNECT BOARD TO PORT B		

Table 1. Jumper settings for SDO, SDI & SCK selection.

The following table (Table 2) shows the chip select pin for the different jumper settings.

Jumper at A	Jumper at B	Jumper at C
CS – Bit 2	CS – Bit 7	Patch System

Table 2. CS pin based on jumper selection

The Patch System allows the user to route SDO, SDI, SCK, CS to any 8 of the bits that they require. This allows great flexibility, as the user can then use a different device other than specified in Table 1.

2. Voltage Shifter

The Voltage Shifter that is used on this board is a bi-directional 5V to 3.3V converter. The device is a MAX3002 chip, which has 8 bi-directional lines although only 4 are being implemented. The Chip is used to convert the voltages sent from the PICmicro® or microcontroller into a level that will not damage the MMC. The chip is powered via Vin and takes its 3.3V supply from the voltage regulation circuitry. If the Card Reader Board is operating at 3.3V then the voltage regulation circuitry is essentially bypassed via the system selection jumper.

3. SPI bus

The SPI protocol allows for multiple devices to be connected to the same data (SDI, SDO) and clock lines (SCK). Therefore each device has a device enable input. When a device is reading or writing data via the SPI lines that device's enable line must be activated. Setting the enable signal low for that device does this. The card readers enable line is referred to as (CS) in this datasheet and a table of its various pin configurations can be found on pages four and six.

4. MMC / SD Card Socket

The card socket allows a MMC/SD type memory card (sold separately) to be interfaced via the SPI bus. MMC/SD cards are easy to implement with simple read and write functions. However to store or read data on an MMC/SD card that will be compatible with a PC requires following the file allocation table (FAT) present on the card.

SD cards work fine with the E-block as long as they have an embedded SPI interface and have a sector size of 512 bytes. All new SD cards have to stick to this specification but older cards may vary a bit.

SD Association - <http://www.sdcard.org/home/>

MMC Association - <http://www.mmca.org/>

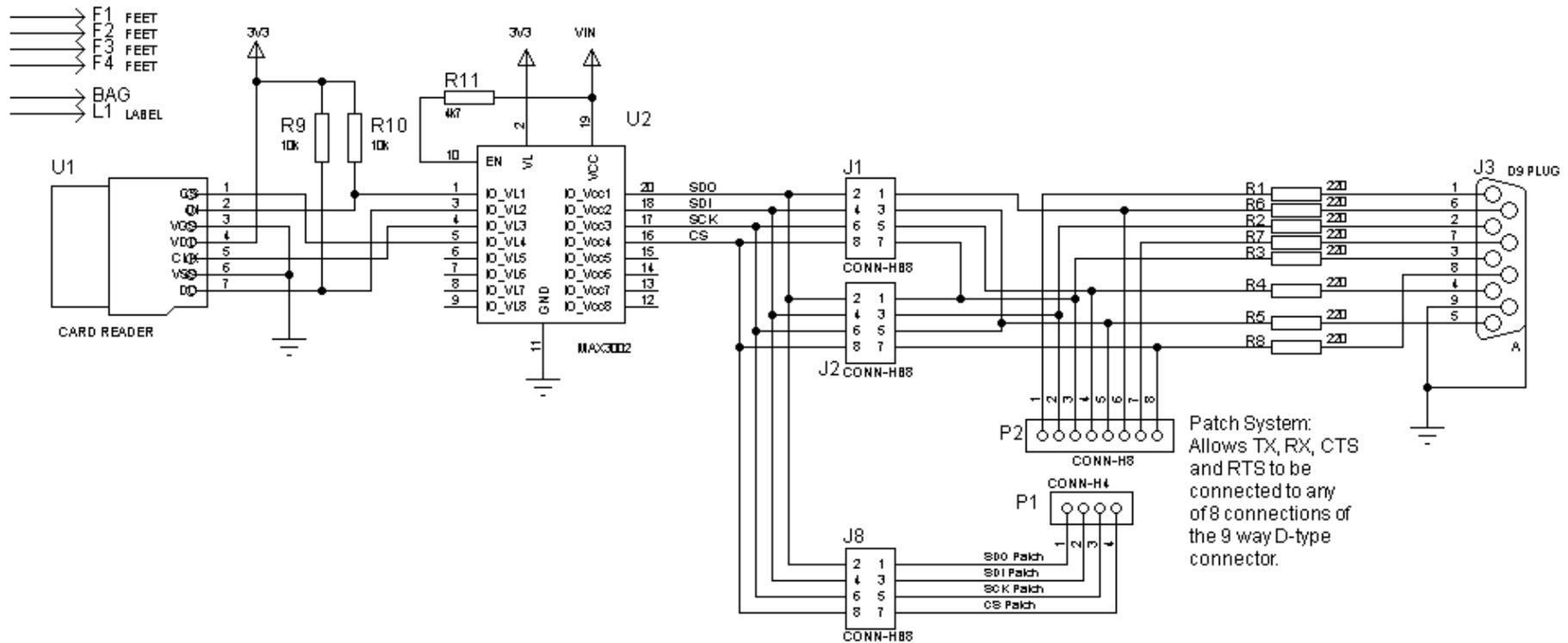
Introduction to the FAT file system - http://www.compuphase.com/mbr_fat.htm

Official FAT specification - <http://www.microsoft.com/whdc/system/platform/firmware/fatgen.msp>

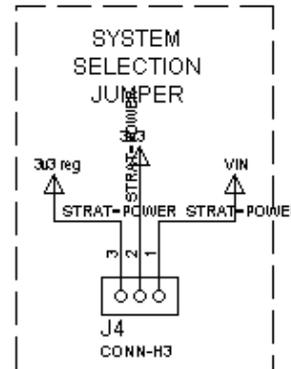
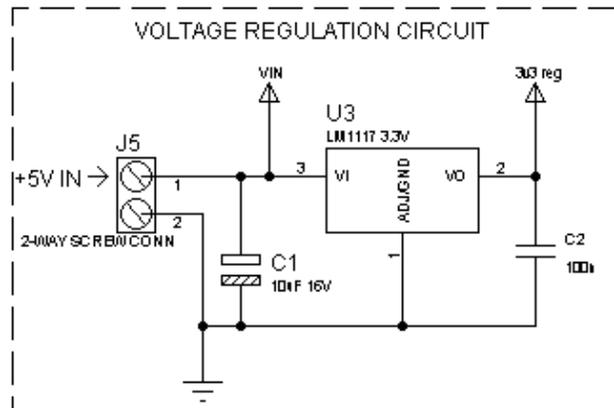
Embedded MMC/SD card explanation - http://www.freelabs.com/~whitis/sd_card/

Appendix 1 – Circuit diagram

THIS SYSTEM INCLUDES:-



Patch System:
Allows TX, RX, CTS
and RTS to be
connected to any
of 8 connections of
the 9 way D-type
connector.



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BY: Color Carr		REV: 1/1	