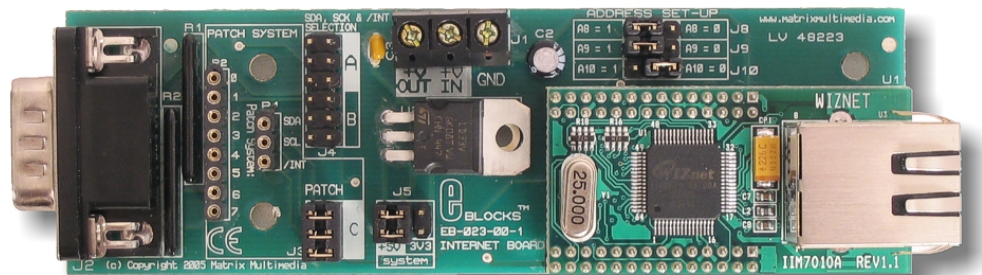


# Internet board datasheet

## EB023-00-1



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Appendix 1      Circuit diagram

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## 1. About this document

This document concerns the E-blocks internet board code EB023 version 1.

The order code for this product is EB023.

### 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](http://www.matrixmultimedia.com) .

## 2. General information

### 1. Description

The Internet E-Block allows Internet and Ethernet capabilities to be easily added to your microprocessor and FPGA designs. It consists of a TCP/IP stack, a physical-layer chip and an Ethernet socket.

Communication between this E-Block and a microcontroller is achieved using an I<sup>2</sup>C interface.

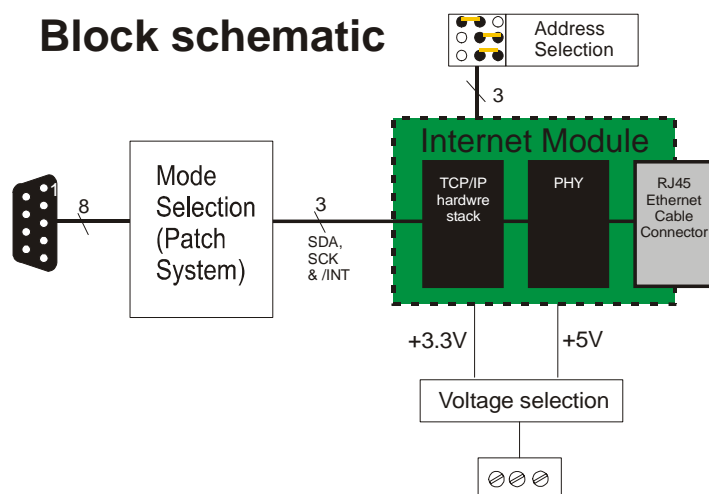
Two Flowcode components are available that simplify the use of this E-Block. The first is a "WebServer" component that facilitates the creation of an embedded web server with no knowledge of TCP/IP protocols needed. The second Flowcode component, the "TCP/IP" component, allows users to create a custom application using various protocols (TCP, UDP, IP or Ethernet), such as ARP scanners, SMTP email clients, hardware firewalls, etc, etc.

'C' and Assembly users can access all the features of this device without the need to embed an extensive TCP/IP stack into their own firmware.

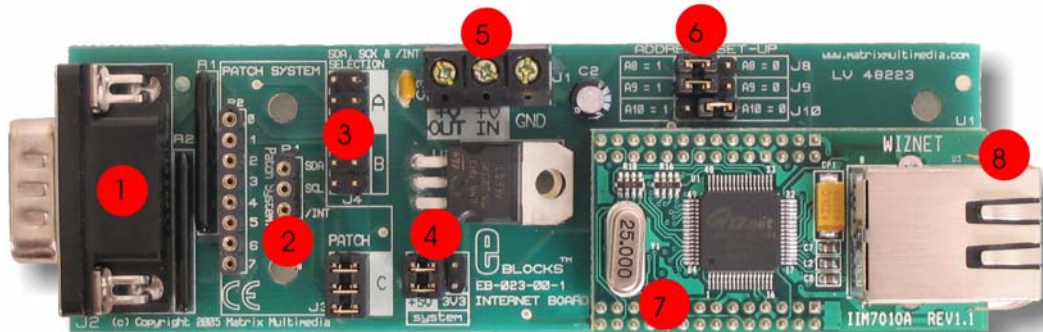
### 2. Features

- E-blocks compatible
- Supports 10/100 Base TX
- Supports half/full duplex operation
- Supports Auto-negotiation
- IEEE 802.3/802.3u Compliant
- Operates with 3.3V or 5V systems
- Supports network status indicator LED's
- Includes hardware Internet protocols: TCP, IP Ver.4, UDP, ARP
- Includes hardware Ethernet protocols: DLC, MAC
- Supports 4 independent connections simultaneously
- Supports I<sup>2</sup>C bus interface with 8 available addresses
- Two Flowcode Components are available
  - WebServer to allow simple creation of embedded web content
  - TCP\_IP to allow custom communications using various protocols (TCP, UDP, IP or Ethernet layers)

### 3. Block schematic



### 3. Board layout



EB023-74-1.cdr

- 1) 9-way downstream D-type connector
- 2) Patch system
- 3) SDA, SCK & /INT selection jumper pins
- 4) Voltage Selection jumper
- 5) Power screw terminals
- 6) Address set-up jumpers
- 7) Hardware TCP/IP stack IC
- 8) RJ45 connector

General Guide for SDA, SCL & /INT settings:

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

Note: The TCP\_IP Flowcode component requires MI2C (Master I<sup>2</sup>C). If you wish to use standard I<sup>2</sup>C devices, such as the PIC16F88 you may need to create your own C/ASM code.

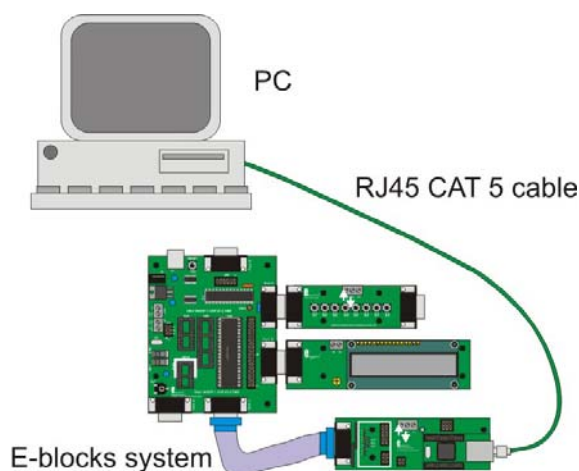
If you are using PICmicros then select +5V systems (J5) as PICmicros operate from +5V.

## 4. Testing this product

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

### 1. System Setup

The Internet board is connected direct to a PC using a standard RJ45 CAT 5 cross-over cable, as shown in the example below: -



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 board EB005
Port C	Internet board EB023
Port D	
Port E	
Test program	EB023_test.hex

EB005 Options	Setting
Patch jumper setting	DEFAULT

EB023 Options	Setting
Patch jumper setting	A
Voltage selector J 5	5V
Address jumper J8	1
Address jumper J9	1
Address jumper J10	1

The cable between the PC Ethernet connector and the internet board is a crossover cable.

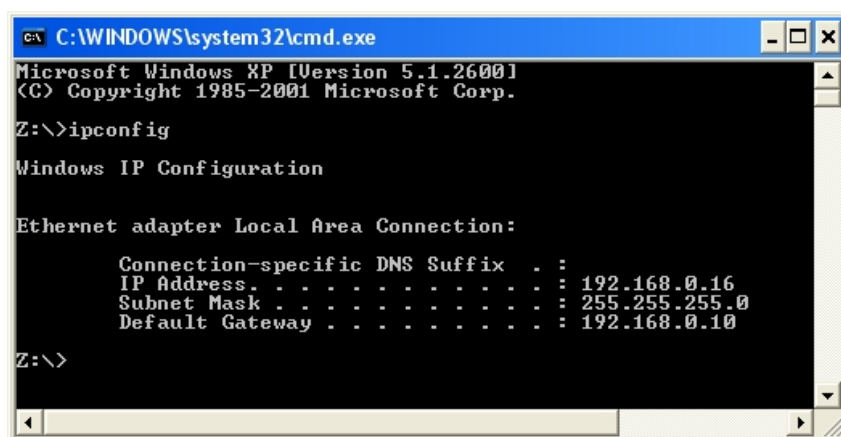
### 2. PC System Set-up

Note that the details here may vary from Operating System to Operating System.

If the PC has been configured for use on a Local Area Network you may need to configure the PC to have a set IP address, and to not use Proxy servers.

To find the IP address of a PC do the following:

- 1) Go to START -> RUN and type in 'CMD' and click on OK.
- 2) A black DOS prompt window will appear.
- 3) Type in 'ipconfig' and press Enter.
- 4) The IP address will be listed in the data provided.
- 5) Type in Exit and press enter to close the window.



```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

Z:\>ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . : 
    IP Address . . . . . : 192.168.0.16
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.0.10

Z:\>
```

The IP address can be set up in the Network Connections dialogue.

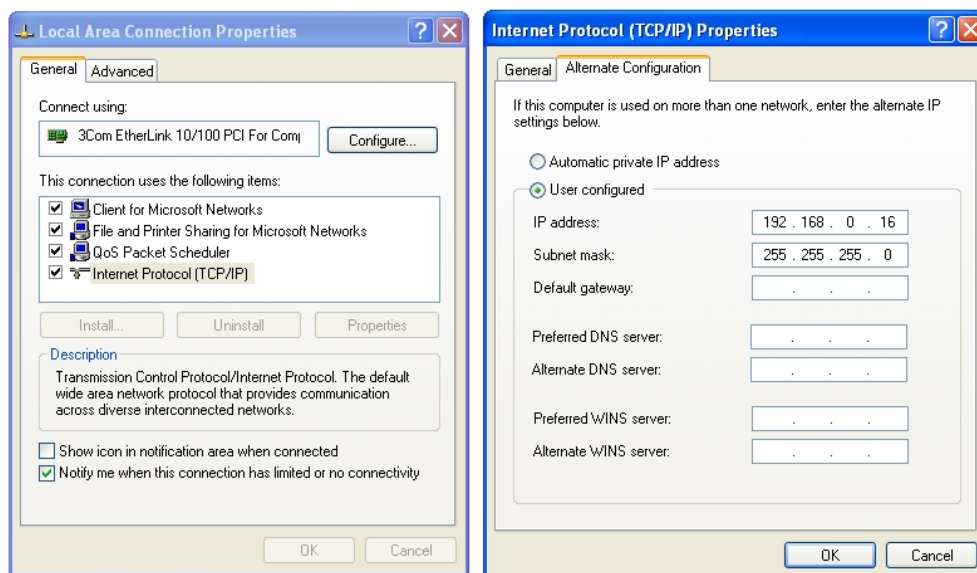
Open the Network Connections icon in the Control Panel.

Select the Local Area Connection item and right click and view its properties.

Select the TCP/IP entry in the list and click on the Properties button.

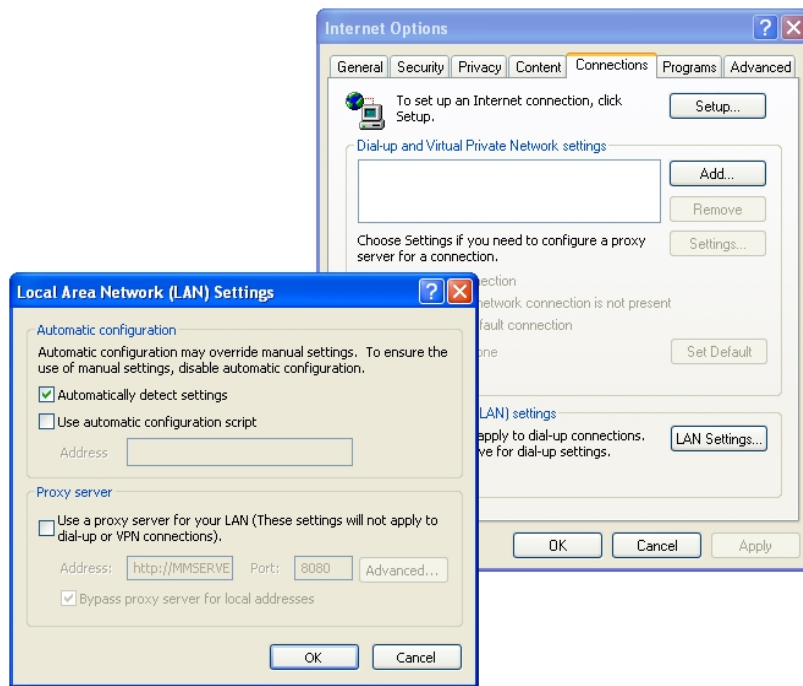
Go to the Alternative Configuration tab, select 'User configured' and enter the IP address obtained from the ipconfig program into the IP address. Click on the Subnet mask and the default 255.255.255.0 setting should appear. If not you can add it manually.

Here we have set the IP address for this PC to 192.168.0.16.



The LAN proxy server setting can be found in the Internet options control panel.

Ensure that Use a proxy server is not ticked.



### 3. Test Procedure

This test routine will test the functionality of the three main protocol layers (MAC, IP, TCP).

The program will send an HTML webpage from the PICmicro® to the computer via the Internet board and the connecting cable.

Visual clues will appear on the LCD display to ensure that the program is running.

- 1) Set up the Internet system as outline above
- 2) Apply power to Multiprogrammer board.
- 3) Download the test program ensuring that the PPP configuration is set to HS.
- 4) Press Reset button on Multiprogrammer
  1. LCD display will display “Starting up...” and then “Complete” once the TCP/IP connection is established.
- 5) Open up your Web browser
  1. Note: Your home page may not open properly as it is not connected to your network
- 6) Type the following IP address in to your web browser: http://192.168.0.2
  1. The LCD display will show “Sending HTML” during transmission.
- 7) To ensure that the page is valid and current (i.e. not stored in your computers memory) you need to refresh the page. Press the “Refresh” button in your Web browser
- 8) The “page request” number will increment when the page is refreshed (with a rollover back to 1 upon reaching 9)

This will confirm that the Internet Board is fully functional.

If you have problems with the refresh sequence repeat from step three above.

#### Troubleshooting

- 1) LCD fails to display “Starting up...”
  1. Check power, connections, chip and check that the correct program has been downloaded to the device.
- 2) Displays “Starting up...” but not “Complete.”
  1. TCP/IP connection not established
  2. Check Internet board has power.
  3. Check cross-over cable.
- 3) Are the Internet board and Ethernet connection LED’s flashing at all?
  1. If they are then there is an IP Address or socket issue.

2. Check if PC has IP Address 192.168.0.2 and this may cause a conflict with the one assigned to the Internet board.
- 4) Can you Ping the Internet board?
  1. Use the Command prompt and enter "Ping 192.168.0.2".
  2. Check the onboard jumpers are set correctly
  3. If using the patch system verify that the patch connections have been set up correctly.
- 5) Nothing happening
  1. Check that the PPP configuration settings are set to HS mode.



## 5. Circuit description

The circuit as can be seen in the circuit diagram below (See Appendix 1 – Circuit diagram), made up of three main components: the Hardware TCP/IP stack IC, the voltage regulation and selection system, and the Patch system.

### 1. **Hardware TCP/IP stack IC**

The Hardware TCP/IP stack IC used is the Wiznet Internet Module NM7010A (formally IIM7010A) IC. The TCP/IP stack IC is an all-in-one network module, ideal component to develop Internet enabled systems. The module communicates via a standard I<sup>2</sup>C compatible bus. This means that most processors can easily and rapidly communicate with the module, enabling a quick development time.

The I<sup>2</sup>C connection uses a 7-bit address to identify each specific target. The three Least Significant Bits of the address for the Internet module are set using the three jumpers J8, J9 and j10. This allows the use of up to 8 individual Internet boards on the same network system. For further information on the TCP/IP stack IC please see the datasheet provided on the CD.

### 2. **Voltage regulation / selection system**

The TCP/IP stack IC requires a core voltage of +3.3Volts. However the I/O lines are +5V tolerant allowing the board to run from either a +5V system or from a +3.3V system. The board can be used with a +5V system (i.e. E-Blocks PICmicro Multiprogrammer) or a +3.3V system (i.e. E-Blocks FPGA Board). An on-board voltage regulator is used to generate the +3.3V required by the TCP/IP stack IC.

The board is supplied with a jumper link (J5) which allows the user to select which voltage system they are using. The user must position the jumper link in either the “+5V” or the “3.3V” position as labelled on the PCB.

### 3. **Patch system**

The Internet Board, like all E-Blocks, is designed with flexibility in mind. Therefore the Internet Board can be used with any ‘upstream’ processor board. To facilitate this a patch system has been provided on this board. This patch system allows the use to either select the default setting of the board (generally used for PICmicro® microcontrollers) or to wire the connectors to any pins of the D-Type connector that they require.

The communication between the Internet board and the ‘Up-stream’ processor board is via an I<sup>2</sup>C compatible bus (SDA and SCK signals).

### 4. **Default settings (A or B)**

To use the default setting of the Internet board, the jumper links should be placed on header pins J6. Jumper setting A and B are used for selecting the appropriate pins for SDA and SCK, the dedicated I<sup>2</sup>C compatible lines. Both these jumper settings route the interrupt line from the Internet board to bit 0 of the ‘Up-stream’ device.

Headers pins J3 are provided to allow the use the patch settings.

The microcontroller that is being used determines which port and which jumpers are used. For example, if a PIC16F877A is being used, the Internet 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
PIC16F72 PIC16F73 PIC16F737 PIC16F74 PIC16F747 PIC16F76 PIC16F767 PIC16F77 PIC16F777 PIC16F82 PIC16F873/A PIC16F874/A PIC16F876/A PIC16F877/A	PIC16F87 PIC16F88 PIC16F818 PIC16F819	PATCH SYSTEM
CONNECT BOARD TO PORT C	CONNECT BOARD TO PORT B	
SDA = C4 SCK = C3 INT = C0	SDA = B1 SCK = B4 INT = B0	All connections are as set by the user.

Table 1: Jumper settings for SDA, SCK &amp; /INT selection.

Note: The TCP\_IP Flowcode component requires MI2C (Master I<sup>2</sup>C). If you wish to use standard I<sup>2</sup>C devices, such as the PIC16F88 you may need to create your own C/ASM code.

## 5. Using splitter cables

Splitter cables can be used to connect more than one Internet board to a single programmer.

The SDA and SCK lines need to be the same for each board connected to the splitter cable. However each board requires a separate interrupt line. Due to this constraint you will need to use the patch system when using more than one Internet board on a splitter cable.

- SDA – patch to same Pin (C4 or B1 etc.)
- SCK – patch to same Pin (C3 or B4 etc.)
- INT – patch to different Pins

Connection	Jumper A (First board)	Patch system (Second board)
SDA	C4	C4
SCK	C3	C3
INT	C0	C1 (or any other unused Port C pin but C0)

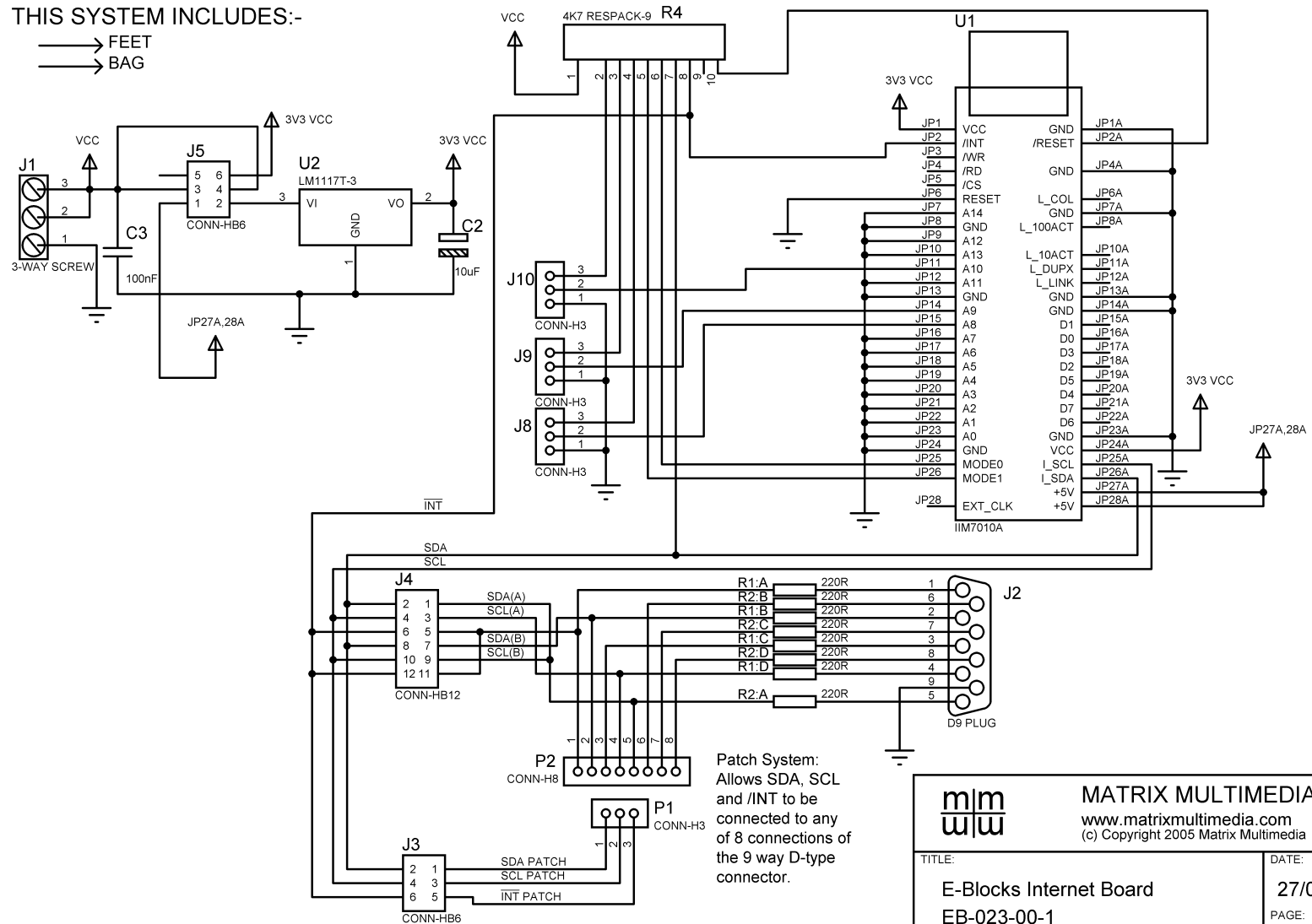
## 6. 3.3V operation

This board is compatible with upstream boards operating off 3.3V.


Appendix 1 – Circuit diagram

THIS SYSTEM INCLUDES:-

→ FEET  
→ BAG



Patch System:  
Allows SDA, SCL  
and /INT to be  
connected to any  
of 8 connections  
of the 9 way D-type  
connector.

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TITLE:		DATE:	
<b>E-Blocks Internet Board</b> <b>EB-023-00-1</b>		<b>27/04/05</b>	
BY: Conor Carr		PAGE:	
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