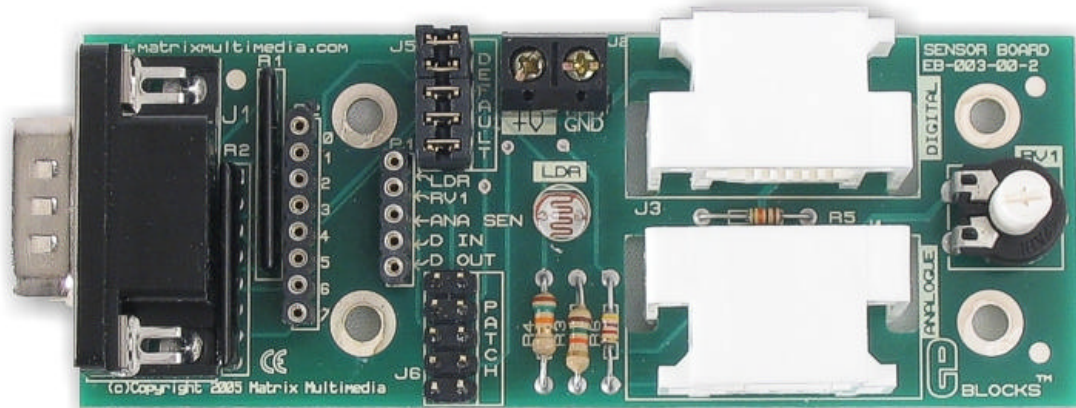




Sensor Board datasheet



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1 About this document

This document concerns the Matrix Sensor Board code EB-003-00-2.

Trademarks and Copyright

PIC, PICmicro are registered trademarks of Arizona Microchip Inc.

E-blocks is a trademark of Matrix Multimedia Limited.

EB-003-00-2 and associated software and documentation are Copyright ©2005 Matrix Multimedia Limited.

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.

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.

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.co.uk. If you still have problems please email us at: support@matrixmultimedia.co.uk. When emailing please state the operating system, the version of PPP you are using.

2 General information

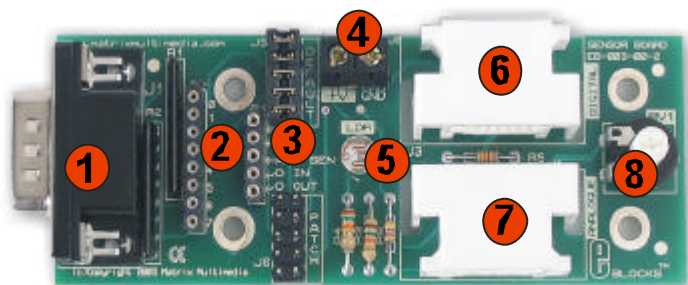
Description

This new Sensor Board is part of the new product range called E-Blocks. The board allows you to connect a range of digital or analogue sensors to any of the I/O ports on the E-Block 'up-stream' boards. It also allows you to use the on-board light sensor. The standard 9-way D-type connector associated with E-Blocks makes connection.

Features

- E-blocks compatible
- Low cost
- Full range of external sensor to enable plenty of different and interesting experiments
- On-board light sensor
- Downstream D-type connector
- Compatible with most I/O ports in the E-Block range
- Ease to develop programming code using Flowcode icons.

3 Sensor Board Layout



1. 9 Way D-type Plug
2. Patch system
3. Link blocks
4. Screw Terminals
5. Light sensor
6. External digital sensor
7. External analogue sensor
8. Potentiometer – for simulating varying analogue voltage

Potentiometer - part of the sensors system - simulates a varying analogue voltage on port A1 for testing code during program development.

4 Getting Started

As can be seen the circuit diagram (Appendix 1) consists of up to 4 sensors, an LDR, a variable resistor to simulate varying analogue signal, an Analogue sensor port and a Digital sensor port. The following shows a procedure to test the functionality of this board. It requires the Vernier motion detector and a Vernier Analogue sensor.

Testing the Sensor Board – sensor.hex

The following instructions explain the steps to test and use your Sensor 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.

The sensor.hex program will take readings from the four sensors connected and display them on the LCD board.

- 1) Ensure power is supplied to all the necessary boards.
- 2) Insert the LCD board (EB-005) into Port B of the Multiprogrammer
- 3) Insert the Sensor board (EB-003) into Port A of the Multiprogrammer
 - Ensure that the jumper links are placed on header pins J5 labelled "DEFAULT"
- 4) Ensure that both boards are connected to "+V" via the screw terminals
- 5) Ensure that the Multiprogrammer is in correct configuration
 - Fast mode (SW1 towards the centre of the board)
 - Ensure that a 19.6608MHz crystal is inserted in the Multiprogrammer boardSW2 is not used when in Xtal mode so it doesn't matter it's position
- 6) Program the a PIC16F88 with the test program sensor.hex
- 7) Check the LCD display. Altering the conditions, for example block light to the LDR, should change the values on the LCD display.

This should satisfy that the Sensor Board is fully functional!

5 Circuit description

5.1 Circuit overview

The circuit consists of four main devices. The board has a Light Dependant Resistor (LDR) to enable quick analogue light measurements. RV1 is a potentiometer that can provide a varying analogue voltage. This can be used to simulate an analogue voltage. There are also two connectors, J3 and J4, which are used to connect a wide range of analogue and digital sensors. J3 is the connector used for digital sensors. J4 is used to connect all analogue sensors.

There is also a screw terminal that is included on all E-Blocks that allows you connect +V and GND to the system.

5.2 Patch System

The Sensor Board, like all E-Blocks, is designed with flexibility in mind. Therefore the Sensor Board can be used with any 'Up-stream' processor board. To facilitate this a patch system has been used on this board. This patch system allows the user to either select the default setting of the board (generally used for PICmicro[®] microcontrollers) or to wire the connector to any pin of the D-Type connector that they require.

5.2.1 Default settings

To use the default setting of the Sensor board, the jumper links should be placed on header pins J5. This is labelled "DEFAULT" on the actual PCB. The following table shows the connections for the default setting.

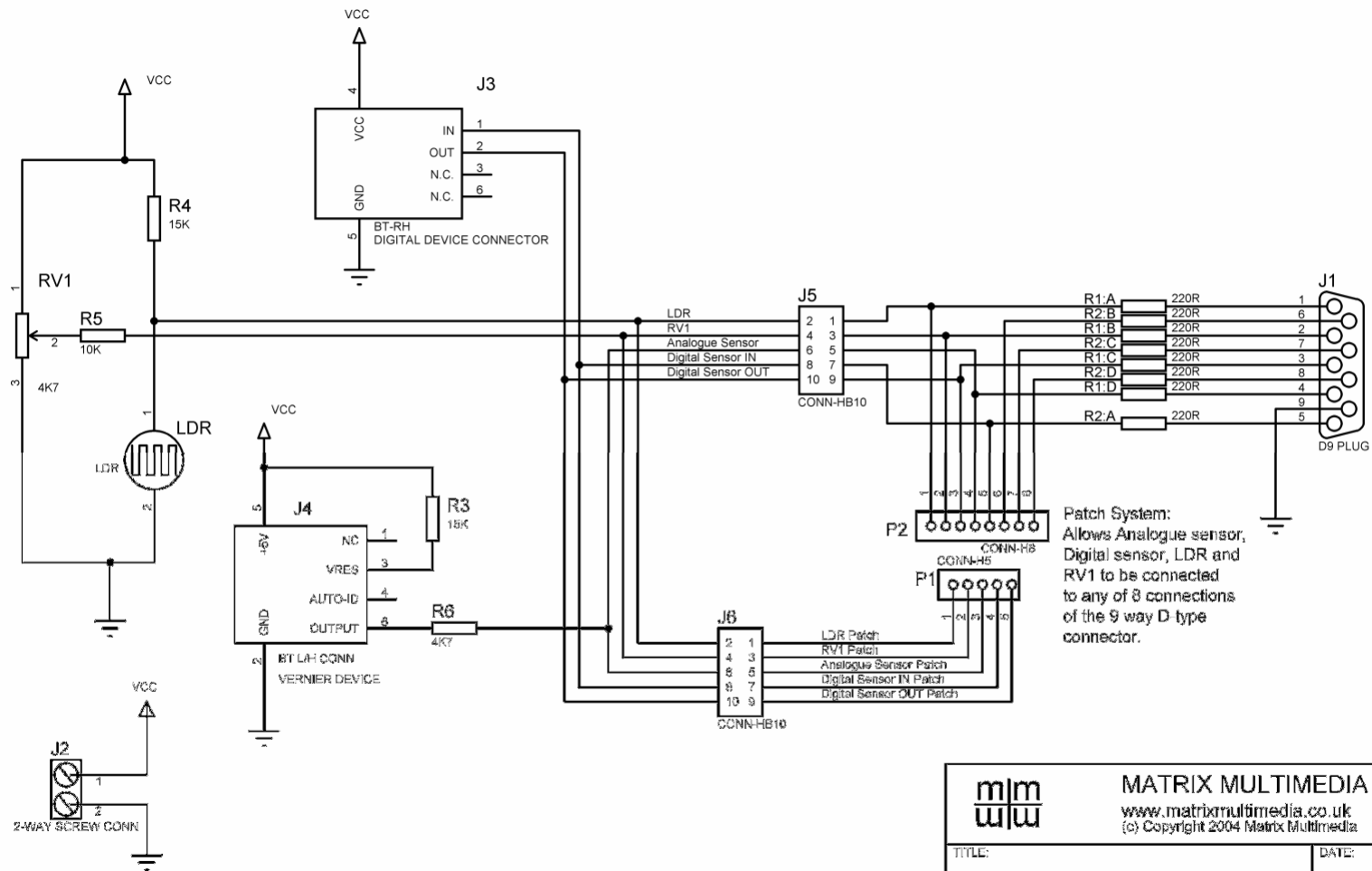
Function	Mapping to bit of D-Type
LDR	Bit 0
RV1 (Variable analogue voltage)	Bit 1
Analogue Sensor	Bit 3
Digital Sensor IN	Bit 4
Digital Sensor OUT	Bit 2

5.2.2 Patch settings

To allow for flexibility the "PATCH" settings on this board can be used. The patch settings allow the user to determine which bit any particular function should be connected to. To do this, firstly connect the jumper links to the header pin J6 labelled "PATCH". This allows routes the signals to the socket P1. All five signals are now available from these sockets and are appropriately labelled on the PCB. Now the user can attach wire connecting a particular signal to the sockets P2, which are connected to the appropriate bits of the D-type port. Therefore any signal can be connected to any bit of the port. For example, connecting LDR to bit 5 of the port. Simply connect the jumper links to J6 "PATCH". Then connect a wire from pin 1 of P1 labelled 'LDR' to pin labelled '5' on P2. Now there is a direct connection from the LDR signal to bit 5 on the port.

This patch system is very useful when using various 'Up-stream' processor board other than a PICmicro[®] board.

Appendix 1 – Circuit Diagram



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Appendix 2 - Sensors

A complete range of sensors for real world interaction

The following is a list of sensor that are available to use with the Sensor Board.

A complete list of sensors and their specifications are listed on our web site.

A separate datasheet gives further details on all sensors.



Barometer



Current probe



Dual range force sensor



Differential voltage probe



ECG sensor



Heart rate monitor



Gas pressure sensor

Product	Code
Bar Tape	HSTAPE
Barometer	HSBAR
Colourimeter	HSCOL
Conductivity probe	HSCON
Current probe	HSDCP
Differential voltage probe	HSDVP
Dissolved oxygen probe	HSDO
Dual-range force sensor	HSDFS
ECG electrodes	HPELEC
ECG sensor	HPEKG
Extra long temperature probe	HSTPL
Fast response photogate	HSVPG
Flow rate sensor	HSFLO
Gas pressure sensor	HSGPS
Heart Rate Monitor	HSEHR
Instrumentation amplifier	HSINA
Low-g accelerometer	HSACC
magnetic field sensor	HSMG
Microphone	HSMCA
Motion Detector	HSMD
O2 gas sensor	HSO2
pH sensor and amplifier	HSPH
Picket Fence	HSPF
Radiation Monitor	HSRM
Relative humidity sensor	HSRH
Respiration monitor belt (requires gas pressure sensor)	HSRMB
Rotary Motion sensor	HSRMS
Smart Pulley Attachment	HSSPA
Thermocouple	HSTCA
Three range light sensor	HSLS
Turbidity sensor	HSTRB
Wide range stainless steel temperature probe	HSTMP



Instrumentation amplifier



Low g accelerometer



Motion detector



O₂ sensor



Magnetic field sensor



pH sensor



Temperature probe