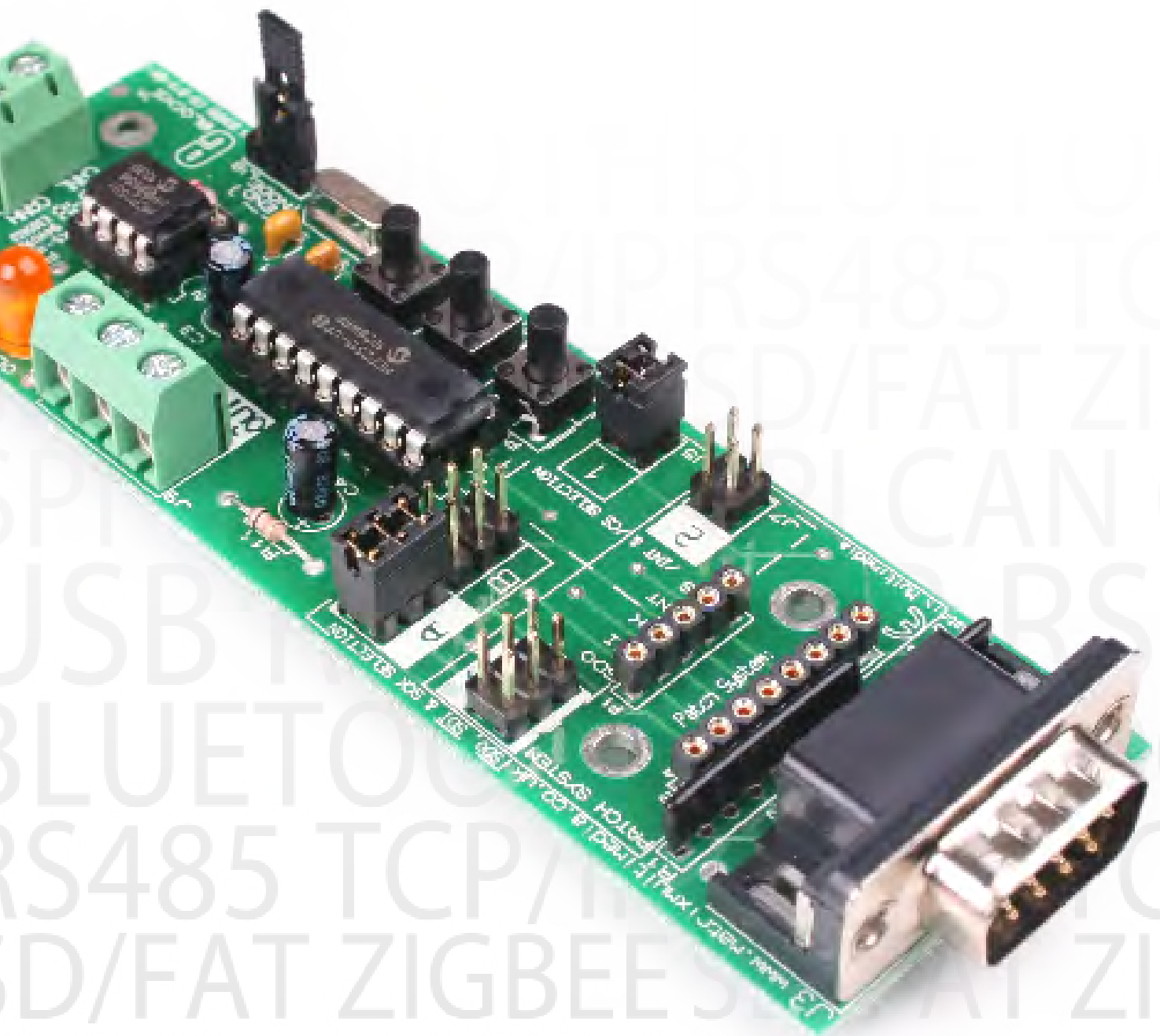


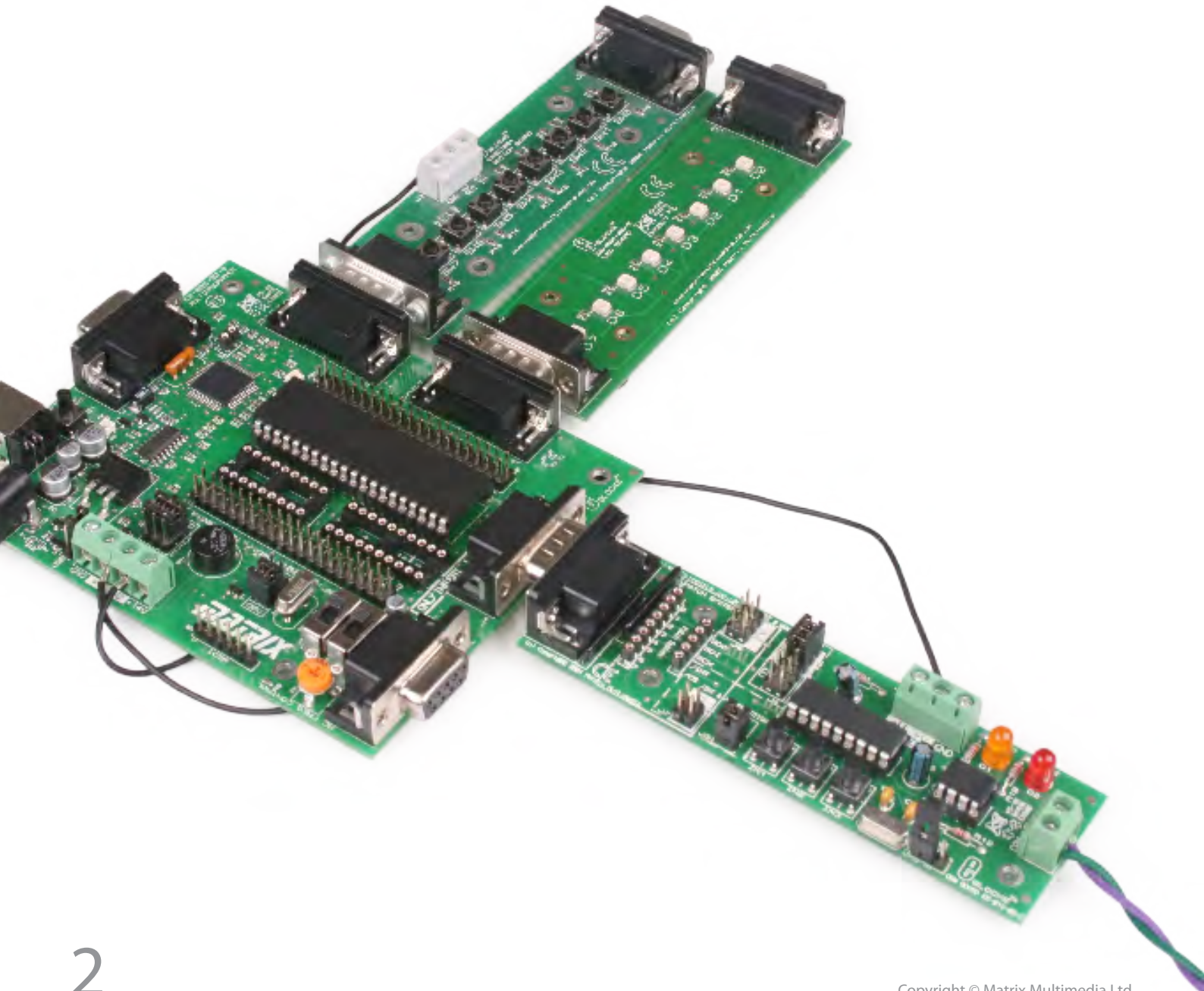
# **E**BLOCKS<sup>®</sup>

CAN bus board



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# About this document

This document concerns the EB018 E-blocks CAN bus board.

## 1. Trademarks and copyright

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

## 2. Disclaimer

The information provided within this document is correct at the time of going to press. Matrix Multimedia reserves the right to change specifications from time to time.

## 3. Testing this product

It is advisable to test the product upon receiving it to ensure it works correctly. Matrix provides test procedures

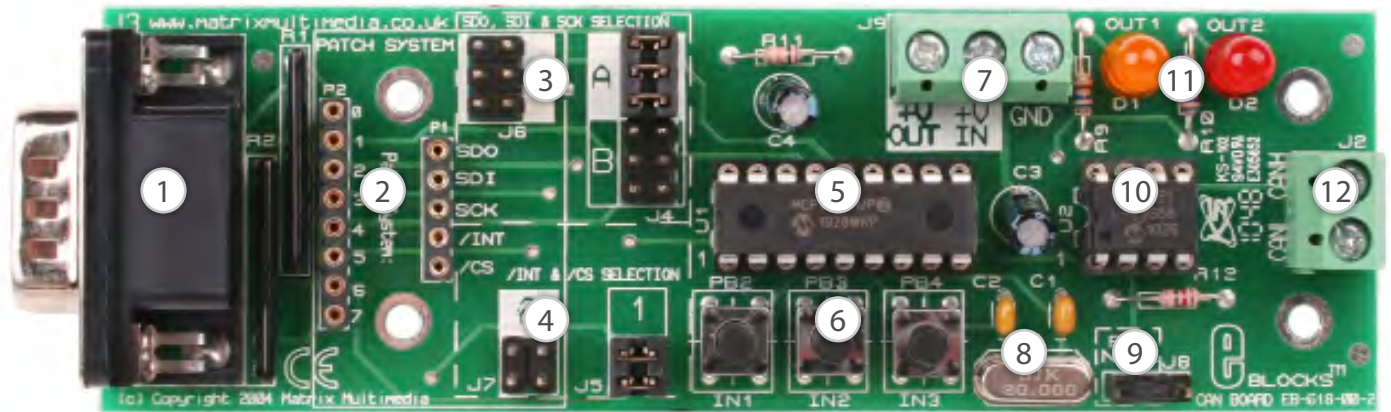
for all E-blocks, which can be found in the Support section of the website.

## 4. Product support

If you require support for this product then please visit the Matrix website, which contains many learning resources for the E-blocks series. On our website you will find:

- How to get started with E-blocks - if you are new to E-blocks and wish to learn how to use them from the beginning there are resources available to help.
- Relevant software and hardware that allow you to use your E-blocks product better.
- Example files and programs.
- Ways to get technical support for your product, either via the forums or by contacting us directly.

# Board layout



1. 9-way downstream D-type connector
2. Patch system
3. SDO, SDI & SCK selection jumper pins
4. /CS and /INT enable selection jumper pins
5. MCP2515 chip
6. 3 x dedicated input switches
7. Power screw terminals
8. 20MHz crystal
9. End note selection jumper
10. MCP2551 chip
11. 2 x dedicated output LEDs
12. CAN bus screw terminal

# General information

This E-block allows investigation of the CAN bus communication protocol. The board allows CAN to be added to circuits with PICmicro® microcontrollers or other processors that do not have a CAN peripherals embedded. The board uses both a CAN controller (MCP2525) and a CAN transceiver (MCP2551). The CAN controller uses high speed SPI™ to configure the CAN controller for transmitter and receiving CAN information. The CAN transeiver converts the CAN controller signals into a differential signal level used by the CAN bus, and vice versa.

In addition the CAN controller has 3 general-purpose input switches and 2 general-purpose output LEDs. These enable the user to have access to more I/O lines.

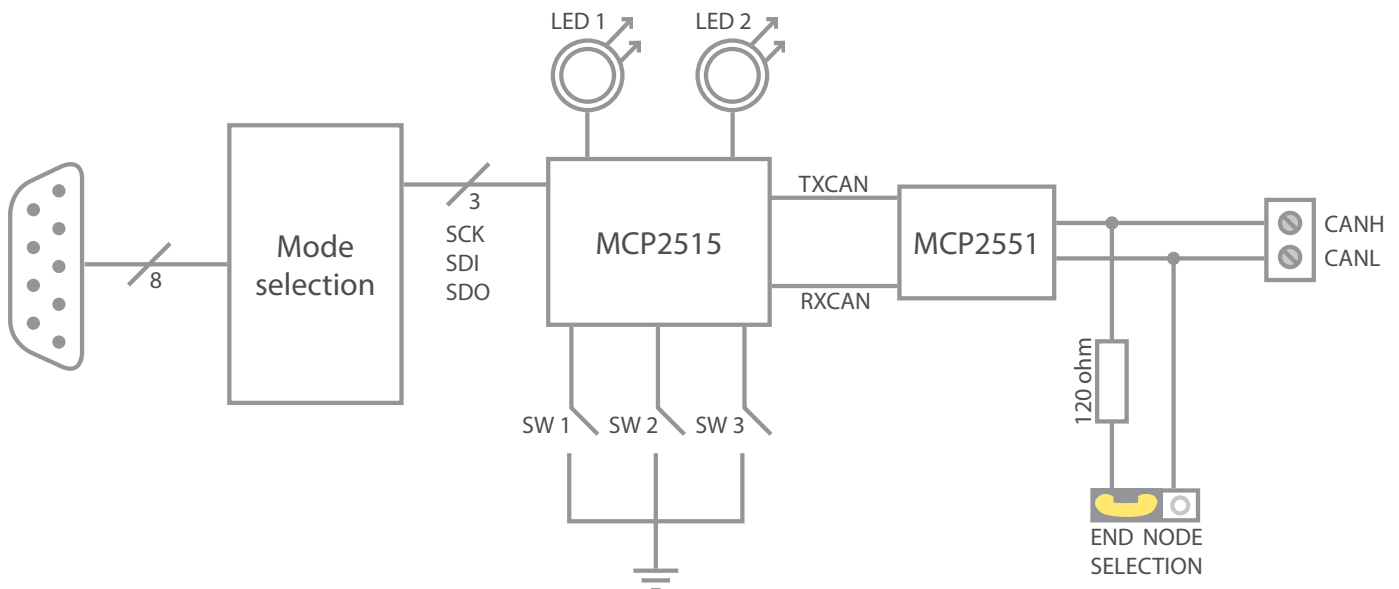
Users will need to consult the MCP2515 datasheet for information on programming and using this device. The datasheet for this and the MCP2551 can be found on the Microchip website.

A set of jumper links are available which allows the CAN E-block to easily be set for most PICmicro® microcontroller devices. The patch system available on board makes this board compatible with numerous other devices.

The upstream device (i.e. multiprogrammer) connected to this board must have an integrated SPI module available, or the firmware must be able to send SPI master-mode compatible waveforms.

## 1. Features

- Transmit and receive via CAN bus
- Enable non CAN embedded processors access to CAN protocol
- Configure CAN controller using high speed SPI™ protocol
- Access to dedicated input and output lines of the CAN controller



# Circuit description

The EB018 CAN bus board circuit can be observed on page 7. It is made up of two main components: the CAN controller (MCP2515) and the CAN transceiver (MCP2551)

## 1. CAN controller - MCP2515

The MCP2515 CAN controller enables the user to add a CAN bus system where CAN is not already embedded into the processor. The device uses the high speed SPI protocol to configure the CAN controller to allow the system to transmit and receiver CAN messages.

The MCP2515 provides masks and filters that can filter away messages that are not wanted. Both standard and extended frames are implemented, including remote frames, as is data byte filtering of the first two data bytes.

The devices has three dedicated outputs. These are connected to LEDs D1 and D2. The pins connected to the LEDs can be configured as buffer-full indicators indicating that message has been successfully received.

Users will need to consult the MCP2515 datasheet for information on programming and using the device. The datasheet for this can be found on the Microchip website.

## 2. CAN transceiver - MCP2551

The MCP2551 CAN transceiver is an interface between the CAN controller and the CAN bus. It converts the logic levels of the CAN controller and the differential signals levels of the CAN bus. it will also convert from the CAN bus signals to TTL logic level for the CAN controller.

The CAN\_H and CAN\_L outputs are connected to the screw terminal J2. Also there is a link block (J8) that allows the user to determine if this CAN node is the end

terminal, by adding a termination resistor. As can be seen in the diagram below, the two outer CAN boards have the link block for J8 in the "END NODE" position. The middle CAN board has the link in the other position that is not an end node.

## 3. Jumper settings

The design of this product enables you to use this board with many standard PICmicro devices. This is achieved by identifying the upstream device, then selecting the corresponding jumper setting on the CAN board. This will configure the board with the correct pins for SDO, SDI and SCK: the dedicated SPI lines. Jumper settings 1 and 2 are used to set the correct pins for /CS and /INT.

The microcontroller that is being used determines which port and which jumper. For example, if a PIC16F877A is being used, the CAN board must be connected to port A, with the jumper settings to A & 1.

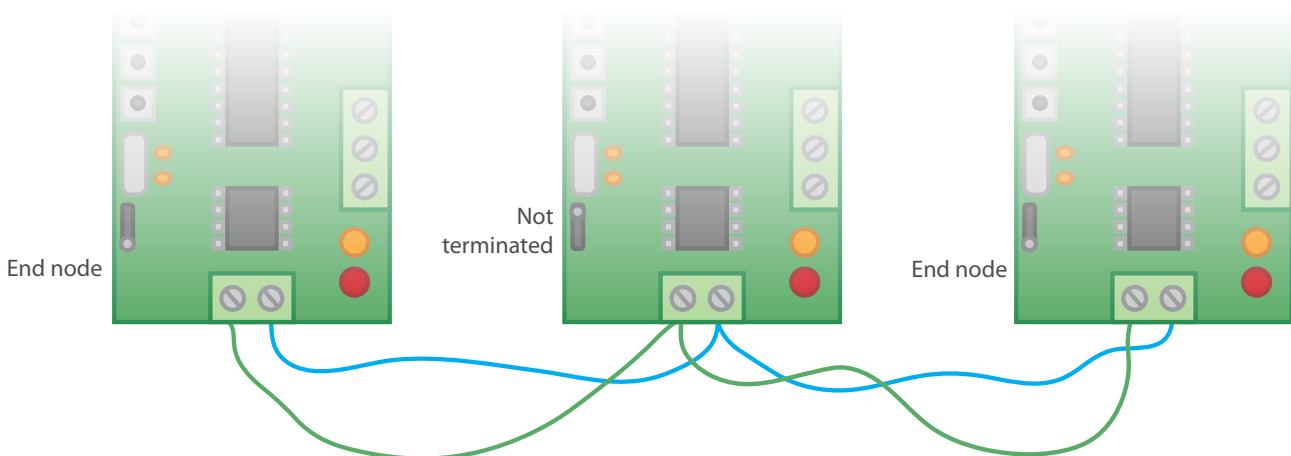
The table of the following page illustrates the correct jumper settings.

## 4. Using microcontrollers with embedded CAN

Some microcontrollers have an inbuilt CAN module, but these still need to be interfaced to the CAN bus using a transceiver chip such as the MCP2551 on this E-block. Such microcontrollers can use the transceiver chip on this E-block by removing the MCP2515 controller chip and using the patch system to link the appropriate TXCAN and RXCAN pins of the microcontroller to pins 1 and 2 of the vacated MCP2515 socket.

## 5. 3.3V operation

This board is not compatible with 3.3V systems.



CAN bus diagram showing "End nodes" in use.

Jumper setting A		Jumper setting B	Jumper setting C
PIC16F devices	PIC16C devices		
PIC16F72	PIC16C62B	PIC16F87	PATCH SYSTEM
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 settings that can be used for /CS and /INT:

Jumper setting 1		Jumper setting 2	
/CS	/INT	/CS	/INT
Bit 6	Bit 0	Patch	Patch

Table 2. Jumper settings for /INT and /CS selection

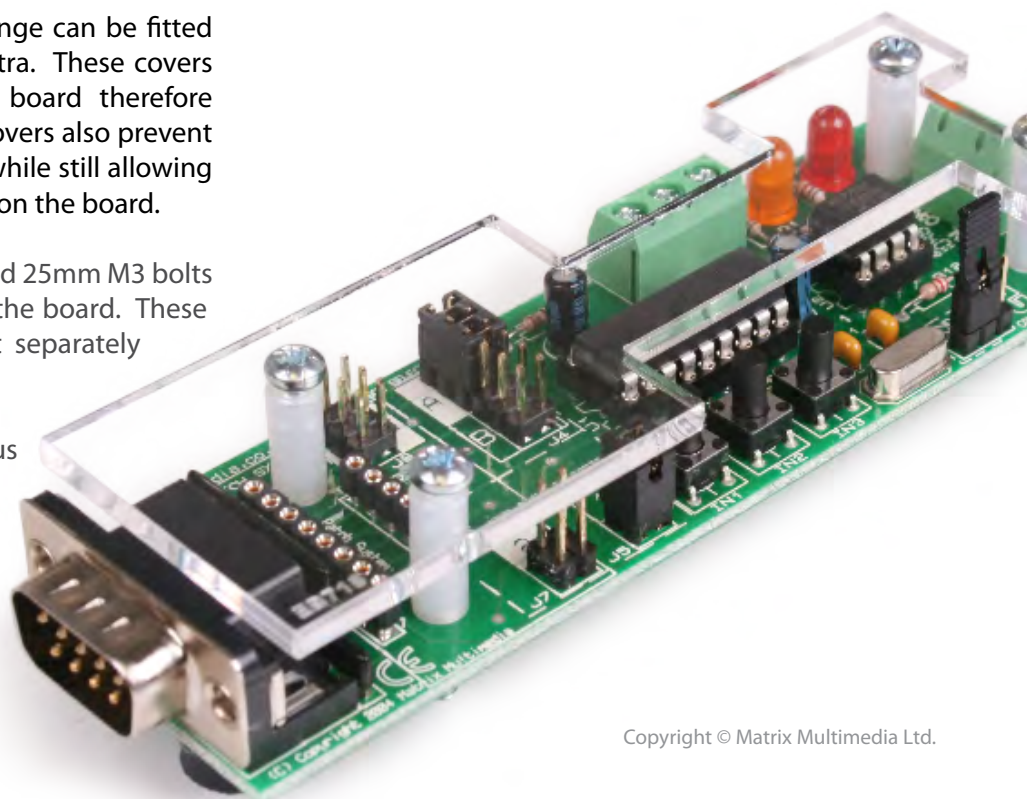
The patch system allows the user to route SDO, SDI, SCK, /CS and /INT to any of the 8 input bits required. This allows great flexibility, as the user can then use a different device other than those specified in table 1. When using the CAN board with upstream devices that are not mentioned in the above table, such as Atmel AVR® board or other processor boards, then the patch system will be required.

## Protective cover

Most of the boards in the E-blocks range can be fitted with a plastic cover as an optional extra. These covers are there to protect your E-blocks board therefore extending the life of the board. The covers also prevent the removal of external components while still allowing for the adjustment of applicable parts on the board.

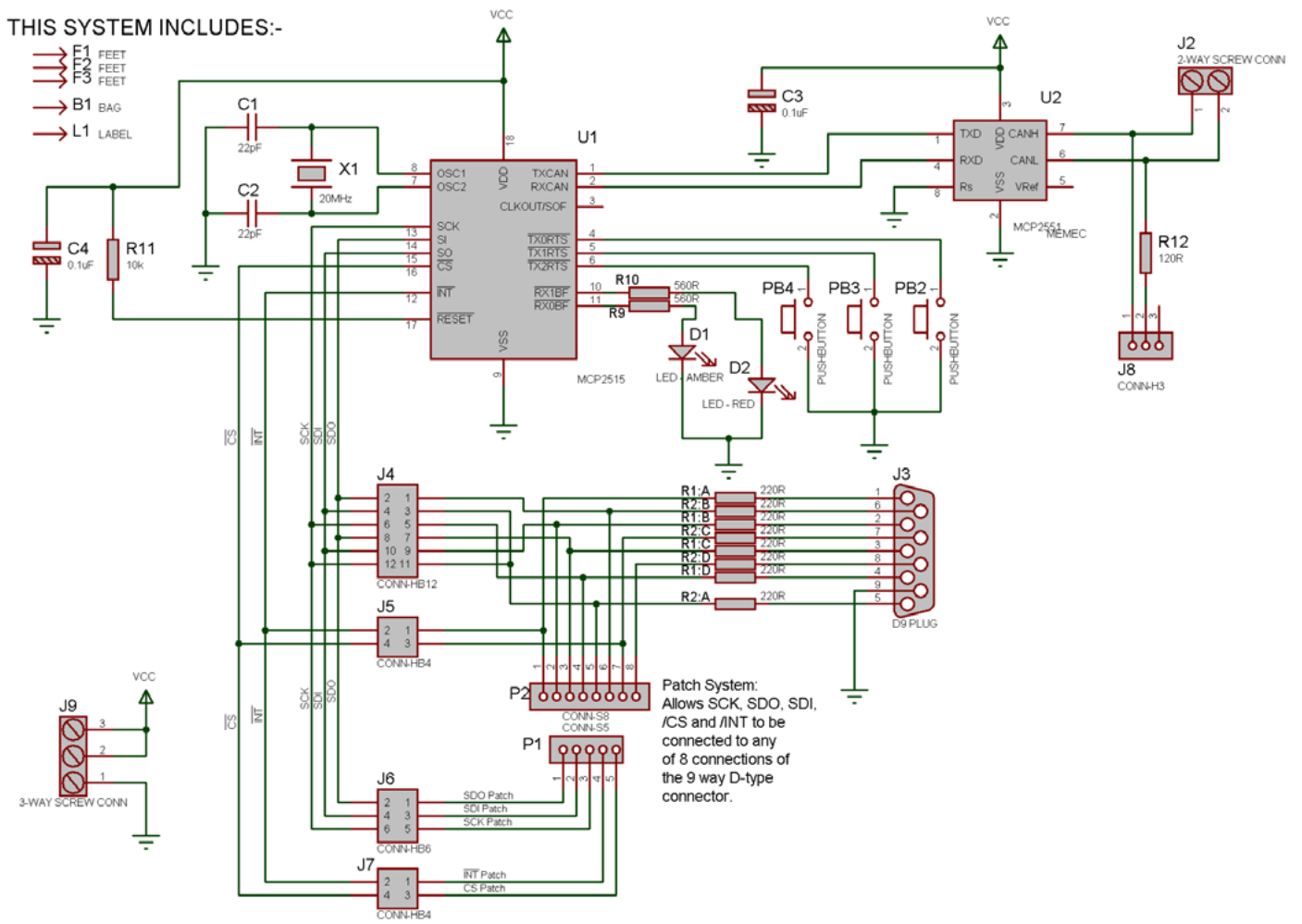
12mm M3 spacers, anti-slip M3 nuts and 25mm M3 bolts can be used to attached the cover to the board. These are not included but can be bought separately from our website.

The order code for the EB018 CAN bus board is EB718.



# Circuit diagram

THIS SYSTEM INCLUDES:-





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EB018-30-2