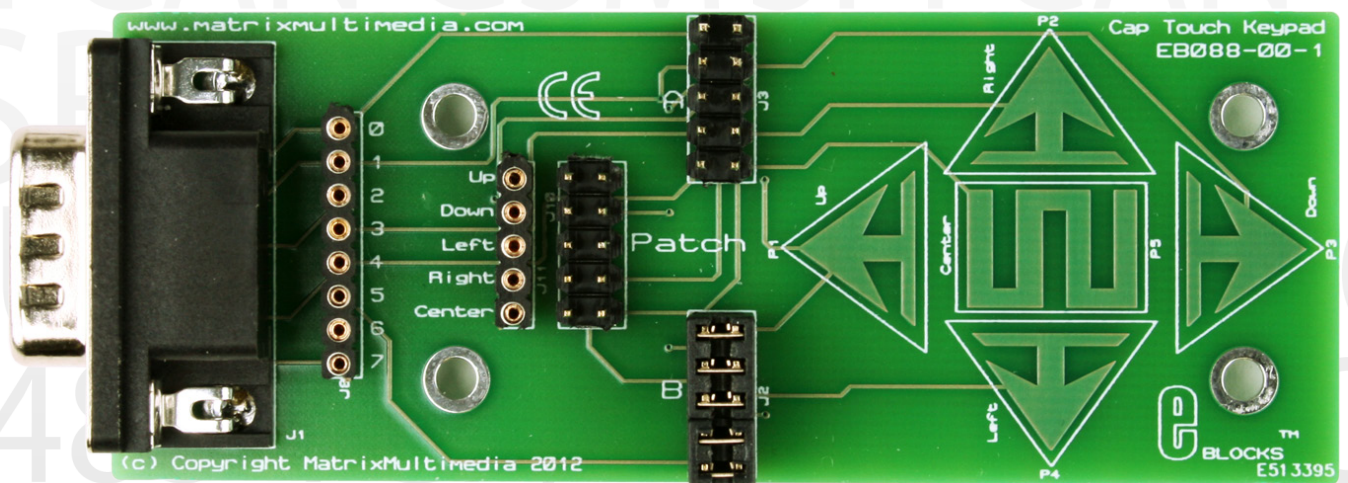


EBLOCKS[®]

Cap Touch Keypad Board



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About This Document

This document concerns the E-blocks Cap Touch Keypad board with code EB088 version 1.

The order code for the Cap Touch Keypad board product is EB088.

1. Trademarks and copyright

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

2. Disclaimer

The information provided within this document is correct at the time of going to press. Matrix TSL 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.

General Information

1. Description

The Cap Touch Keypad board allows the exploration of modern user interface techniques by providing five capacitive touch pads laid out in a keypad style configuration. The keypad allows for multi touch control making the board ideal for applications such as menu systems, games controllers and any other form of user based touch input. Most of the work in the Cap Touch sensing mechanism goes into the software to control the microcontroller's ADC channels. Each Cap Touch pad must be connected through to its own unique ADC channel and there also needs to be an extra free ADC channel to allow the internal ADC capacitor to be charged up.

2. Features

- 5 Cap Touch Pads
- Cursor Style Layout With Central Enter/Ok Button
- Minimal External Components
- Multi Touch Compatible

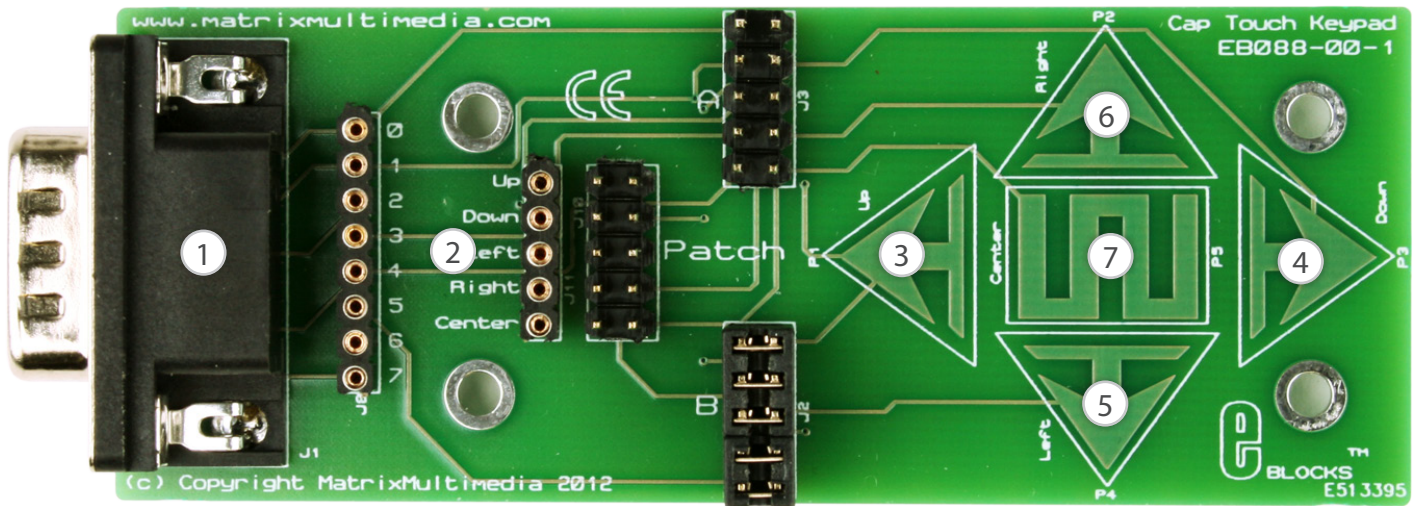
3. 3.3V system compatibility

The board is compatible with 3.3V and 5V systems.

4. Block Diagram

A block diagram has not been provided for this board.

Board Layout



- | | | | |
|----|----------------------------|----|------------------------------|
| 1) | 9 Way D-type Plug | 5) | Cap Touch Pad – Left – AN2 |
| 2) | Patch system | 6) | Cap Touch Pad – Right – AN3 |
| 3) | Cap Touch Pad – Up – AN0 | 7) | Cap Touch Pad – Center – AN4 |
| 4) | Cap Touch Pad – Down – AN1 | | |

Testing This Product

The following program will test the operation of the Cap Touch E-block.

The test file can be downloaded from www.matrixsl.com.

1. System Setup

1K Resistor

Terminal Board (EB002)

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	Cap Touch Board (EB088)
Port B	LCD Board (EB005)
Port C	
Port D	
Port E	Screw Terminal Board (EB002)
Test program	CAP_Touch.hex

- 1 Ensure that the Multiprogrammer is in correct configuration
 - Fast mode (SW1 towards the center of the board)
 - XTAL mode (SW2 towards the center of the board)
 - Ensure that a 19.6608MHz crystal is inserted in the Multiprogrammer board
- 2 Insert the LCD board (EB005) into Port B of the Multiprogrammer
- 3 Connect wire from "+V" of LCD board to "+V" of Multiprogrammer
- 4 Insert the Screw terminal board (EB002) into Port E of the Multiprogrammer
- 5 Insert 1K resistor in between pins 0 and 1 on the Screw terminal board (EB002)
- 6 Connect a 12V PSU to the EB006 and power up
- 7 Program the a PIC16F877A with the test program "CAP_Touch.hex"
- 8 Disconnect PSU
- 9 Connect Cap Touch Board EB088 under test to Port A of the Multiprogrammer with jumper setting B
- 10 Connect a 12V PSU to the EB006 and power up
- 11 Press each of the Cap Touch Pads in turn
- 12 The corresponding value on the LCD should change from 0 to 1.
- 13 Release the Cap Touch pad and the value should change from 1 back to 0.
- 14 If all five Cap touch pads are being read back correctly then the board has passed the test routine.

Circuit Description

1. Description

The circuit board consists of 5 Capacitive touch pads. Each pad is made by exposing a large area of copper which is parallel to a layer of copper which is connected to ground. The ground plane on the Cap touch board has a checked pattern which helps to minimise capacitance of the signal trace whilst maximising the capacitance of the larger Cap touch pads.

Individual pin jumper settings.

Pin Name	Function	Jumper Setting A	Jumper Setting B	Patch
Up	Cap Touch Pad 1	Bit-0	Bit-0	Patch
Down	Cap Touch Pad 2	Bit-1	Bit-1	Patch
Left	Cap Touch Pad 3	Bit-2	Bit-2	Patch
Right	Cap Touch Pad 4	Bit-3	Bit-3	Patch
Center	Cap Touch Pad 5	Bit-4	Bit-5	Patch

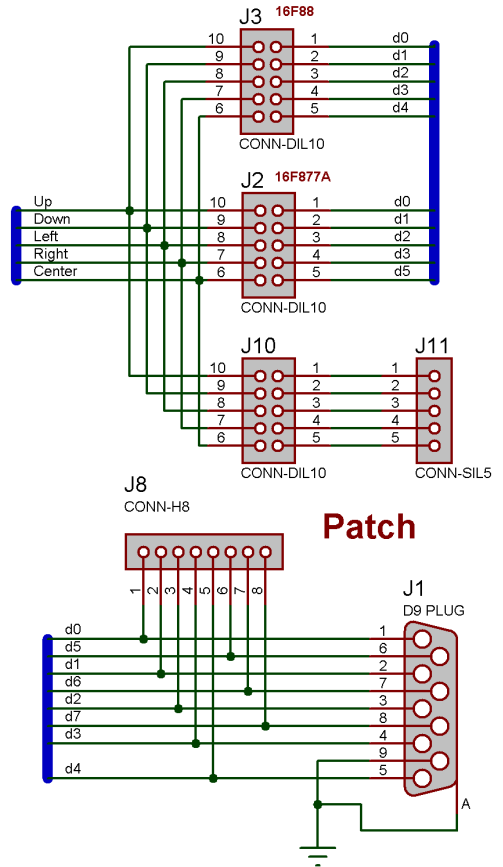
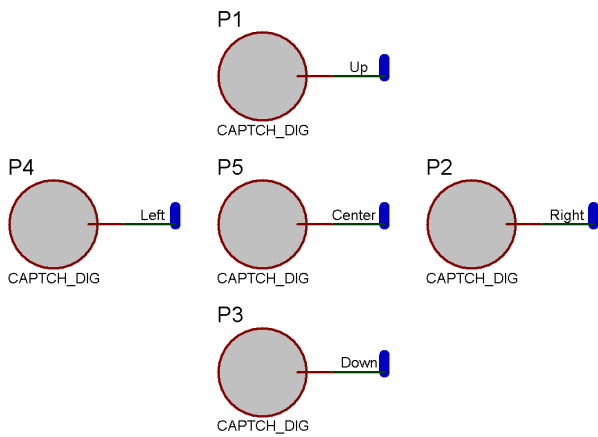
2. Sampling a Cap Touch Pad

The mechanism for sampling a capacitive touch pad is fairly complex so we will break it down into sections. Each cap touch pad must be sampled individually using the same basic mechanism.

- 1) The Cap Touch pad must first be grounded by outputting a logic 0 to the pin.
- 2) Next we enable the ADC module and connect it to the additional ADC pin which should be connected to VCC or a spare high output pin using a 1K resistor. This effectively charges the internal ADC capacitor up to VCC. In Flowcode this is done by calling the `ADC_RAW_Configure_Channel` hardware macro.
- 3) After a short delay the ADC capacitor will be fully charged.
- 4) Switch the cap touch pad to an input to allow the input voltage to float.
- 5) Switch the ADC peripheral to the correct ADC channel by using a line of C code.
- 6) Call the `ADC_RAW_Sample` hardware macro to collect the Cap touch reading.
- 7) Repeat this action several times in succession to get an average reading.
- 8) If no touch was present then the average reading will be high.
- 9) If a hard touch was present then the average reading will be lower.
- 10) Using the values as a guide set a value to use as your threshold. Any values above the threshold means there is no touch on the pad, any values below means that a touch is occurring.

Flowcode examples are available as part of the main Flowcode examples pack which can be downloaded from the Matrix Learning Centre.

Circuit Diagram



- | | |
|------------------|-----------------|
| L1
→
LABEL | F1
→
FEET |
| B1
→
BAG | F2
→
FEET |
| F4
→
FEET | F3
→
FEET |

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