

Fireloch™ Keypad Decoder / Encoder

Features:

- PIC 16F57
- Breadboard compatible.
- Debouncing of Keys.
- Compact design.
- ICSP for programming custom code.
- Socket for Microcontroller
- 8 Mhz Clock Frequency
- Operating Temperature -20C to +85C
- +5 V Supply Voltage

1.0 Device Overview

The Fireloch Keypad Decoder / Encoder is designed to work in conjunction with Velleman's 12 key common output keypad (model #12KEY) available from a number of suppliers. The Fireloch Decoder / Encoder converts the keys pressed on the keypad into a 4 bit binary code. This significantly reduces the time required to integrate the keypad into a project.

Module Pin Descriptions P1 – Output Port

Pin Number	Pin Name	Pin Type	Description
1	D0	I/O	Bit 0 of data output.
2	D1	I/O	Bit 1 of data output.
3	D2	I/O	Bit 2 of data output.
4	D3	I/O	Bit 3 of data output.
5	GND	GND	Ground
6	+5V	+V	Positive Voltage.

Preliminary

2.0 Decoder / Encoder Operation

After assembly, the decoder is ready for connection to the keypad. This can be accomplished by soldering the keypad directly to the decoder or soldering socket(s) into the keypad and then plugging the keypad into the decoder. You also have the option of using alternate connecting methods more suited to your application. How you ultimately connect the decoder to the keypad is up to you.

2.1 Data Out

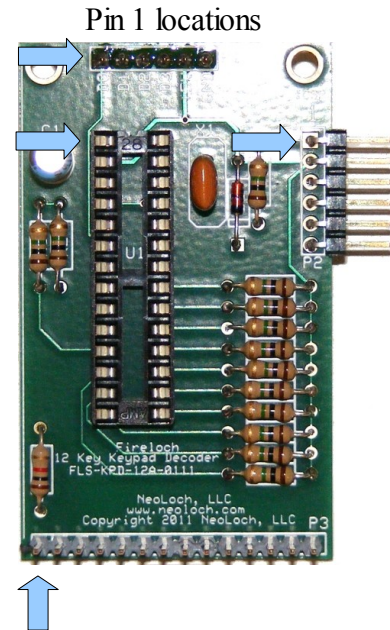
Once the keypad is connected and power is applied, the decoder will generate a 4 bit binary code on the output pins labeled D0-D3. To ease integration and coding, the binary value '0000' is considered a clock low while any other value is considered a clock high. For example: While the binary value '0000' is present on the data lines, no key is being pressed, once a key is pressed a value between '0001' and '1100' will be placed on the data out pins. As long as the key is pressed, the data will remain on the data out pins.

By using the binary value '0000' to represent a clock low and every other value a clock high, no additional data lines are required to transmit data from the decoder to outside circuitry.

This method also means that the binary value '0000' is not usable to represent the 0 key being pressed, so in it's placed the value '1010' (Ah) is used. Keep this in mind when integrating the decoder into your circuits as the value '1010' will need to be converted to '0000'.

2.1 Debouncing

When a key is pressed and when a key is released are both processed through debouncing code. The code used is optimized for the 8 Mhz clock signal, if you replace the resonator with a faster or slower clock rate, be sure to modify the code accordingly to optimize debouncing.



2.1 Key Codes

The following chart contains the binary codes that are generated on port 1 (P1) when a key is pressed.

Keyboard	Binary	Hex	Decimal
1	0001b	1	1
2	0010b	2	2
3	0011b	3	3
4	0100b	4	4
5	0101b	5	5
6	0110b	6	6
7	0111b	7	7
8	1000b	8	8
9	1001b	9	9
0	1010b	A	10
*	1011b	B	11
#	1100b	C	12

2.2 Keypad Connector Port (P3)

Pin one on the keypad must line up with pin 1 on the decoder / encoder. This can be accomplished with the included straight header pin with the decoder / encoder kit and the using a straight header socket (included with keypad option) on the keypad. This allows decoder /encoder to be inserted underneath the keypad and to have the data port (P1) inserted into a breadboard.

However, you are not limited to the supplied connection method. Feel free to utilize whatever connectors are best suited to your particular needs.

Note: Pin 2 on the keypad connector (P32) is not connected to anything and is available for customization.

3.0 In-Circuit Serial Programming (P2)

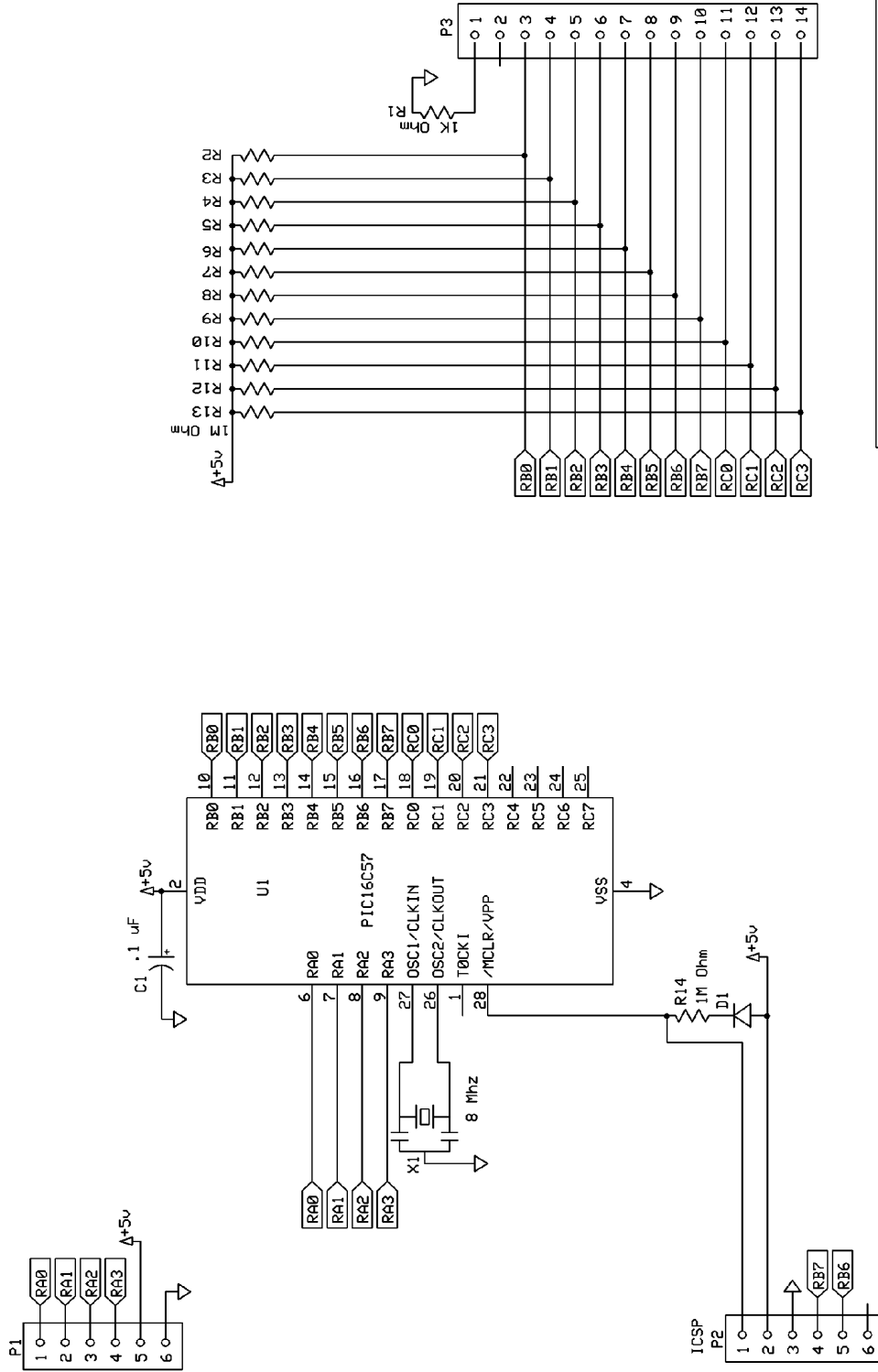
In-Circuit Serial Programming (ICSP) can be utilized to update the firmware or program your own code into the decoder / encoder. This permits customization of the devices operation as well as employing the unit in other circuit designs. It's also possible to customize the device to operate with other keypads.

Please note the location of pin one of the ICSP port, which is labeled on both sides of the board. It's important to connect the programmer correctly to prevent possible damage to the device.

To program the device use the following procedure:

- 1) Connect the programmer to port 2 on the device.
- 2) Make sure the programmer can read the device by performing a read
- 3) Program the device.
- 4) Remove the programmer (the device will not operate properly with the programmer connected. And may not operate properly with your custom code with the programmer connected.)
- 5) Test the decoder / encoder for proper operation.

This schematic is free for non-commercial use.
 See licensing file and contact NeoLoch, LLC for commercial use.



NeoLoch, LLC	
FLS-KPD-12A-0111	
David Hoffman	Rev 1.0 1/14/2011
1 of 1	

Notes