This is the Revision A version of the Emulate RoboBrick. The status of this project is work in progress.

Emulate Robobrick (Revision B)

Table of Contents

This document is also available as a PDF document.

1. Introduction

The Emulate board uses a 28–pin PIC16F876 with flash memory to emulate a PIC12C519, a PIC12C672, or a PIC16C505. When developing software for the PIC16F876, the flash memory is easier to erase than the other parts which require a UV light to erase them.

To improve readability, the part numbers are truncated down to the last three digits (i.e. PIC12C519 => '519, PIC16C505 => '505, etc.)

2. Programming

The relevant differences between '519, '672, '505, and '876 are summarized in the table:

	'519	'672	'505	'876
Package	8–pin DIP	8–pin DIP	14–pin DIP	28–pin (narrow) DIP
Program Memory	1K × 12	2K × 14	1K × 12	8K × 14
Data Memory	41	128	72	368
First Free Memory	7	7	0xC	0x20
A/D	None	4 Ch./8–bit	None	5 Ch./10–bit
I/O Pins	5 I/O, 1 Input Only	5 I/O, 1 Input Only	11 I/O, 1 Input Only	22 I/O

Since the RoboBricks are all being programmed in μCL, the differences between these microcontrollers can largely be ignored.

The pin outs for the '519, '672, and '505 are summarized in the table below:

Pin (DIP8)	'519	'672	Pin (DIP14)	'505

1	VDD	VDD	1	VDD
2	GP5/OSC1/CLKIN	GP5/OSC1/CLKIN	2	RB5/OSC1/CLKIN
3	GP4/OSC2	GP4/OSC2/AN3/CLKOUT	3	RB4/OSC2/CLKOUT
4	GP3/MCLR*/VPP	GP3/MCLR*/VPP	4	RB3/MCLR*/VPP
			5	RC5/T0CKI
			6	RC4
			7	RC3
			8	RC2
			9	RC1
			10	RC0
5	GP2/T0CKI	GP2/T0CKI/AN2/INT	11	RB2
6	GP1	GP1/AN1/VREF	12	RB1
7	GP0	GP0/AN0	13	RB0
8	VSS	VSS	14	VSS

Of particular importance to note is that 8−pin packages of the '519 and '672 map nicely onto the 14−pin package of the '505. The power, ground, and GP0−5 lines of the '519 and '672 line up with power, ground and RB0−5 lines of the '505. This means that a single 14−pin connector (N1) can be used to connect the Emulate RoboBrick to other RoboBricks that use the '519, '672, or '505. For the '519 and '672, a single 8 conductor ribbon cable is used, and for the '505, a 14 conductor ribbon cable is used.

In µCL, the first I/O port is always labeled A, the second B, the third C, etc. The binding between µCL ports and their corresponding microcontroller ports are summerized below:

µCL Port	'672	'519	'672	'505
A	RA0−5	GP0−5	GP0−5	RB0−5
B	RB0−7			RC0−5
C	RC0−7			

{Actually, I think this table is still a little screwed up and I do not feel like figuring it out right now.}

The '672 has for 4 analog inputs on pins GP0−GP2 and GP4. The '876 has 5 analog inputs on pins RA0−3 and RA5. Furthermore, the '876 has 10−bit A/D and the '672 has 8−bit A/D. The jumper block J1 can be used to swap RA3 and RA4 so that the analog input on GP4 of the '672 is routed to the analog input on RA3 of the '876. This swap must be dealt with in the µCL emulation software. The 8 vs. 10 bit A/D conversion resolution must be dealt with in software as well.
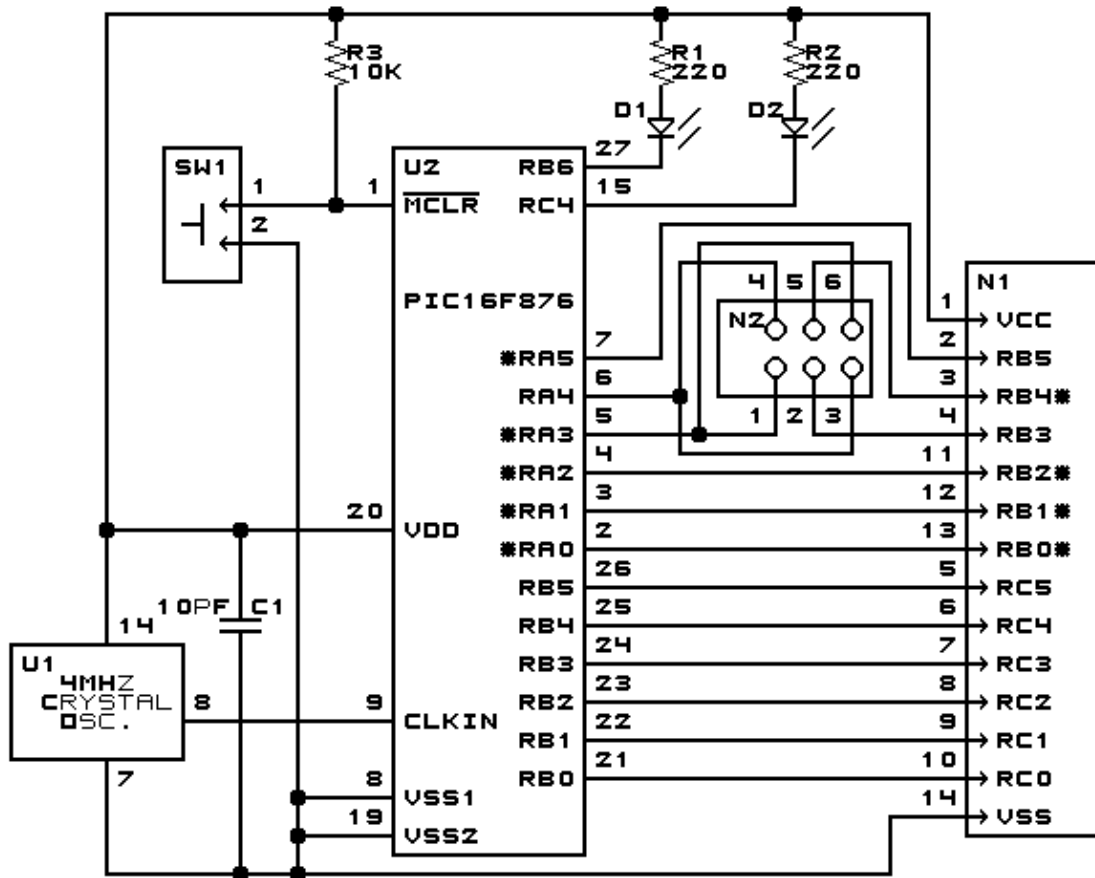
3. Hardware

The hardware consists of a circuit schematic and a printed circuit board.

3.1 Circuit Schematic

The schematic for the EMULATE RoboBrick is shown below:

```
EMULATE BOARD (REV. B)
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The parts list kept in a separate file –– emulate.ptl.

3.2 Printed Circuit Board

The printed circuit files are listed below:

emulate_back.png
> The solder side layer.

emulate_front.png
> The component side layer.

emulate_artwork.png
> The artwork layer.

emulate.gbl
> The RS–274X "Gerber" back (solder side) layer.

emulate.gtl
> The RS–274X "Gerber" top (component side) layer.

emulate.gal
> The RS–274X "Gerber" artwork layer.

emulate.drl
> The "Excellon" NC drill file.

emulate.tol

The "Excellon" drill tool rack.

4. Issues

The following issues came up with the revision B version of the Emulate RoboBrick:

- One of the pins (I forget which one) may still need a pull up resistor.

A. Appendix A: Parts List

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# Parts list for Emulate519 RoboBrick (Rev. B)
#
C1: Capacitor10pF - 10 pF Ceramic Capacitor [Jameco: 15333]
D1-2: LEDGreen - Small Green LED [Jameco: 34606]
N1: PIC16C505Socket - Socket for PIC16C505 [Jameco: 37196]
N2: Header2x3.Emulate - 2x3 Male Header [6/80 Jameco: 117196]
R1-2: Resistor220.Vertical - 220 Ohm 1/4 Watt Reisitor [Jameco: 30470]
R3: Resistor10K.Vertical - 10K Ohm 1/4 Watt Resistor [Jameco: 29911]
SW1: SwitchPlunger - Small Plunger Switch [Jameco: 172700]
U1: Oscillator4MHz - 4MHz Crystal Oscilator [Jameco: 27967]
U2: PIC16F876.EmulateB - Microchip PIC16F876 [Digikey: PIC16F876A-20/P-ND]
```

B. Appendix B: Artwork Layer
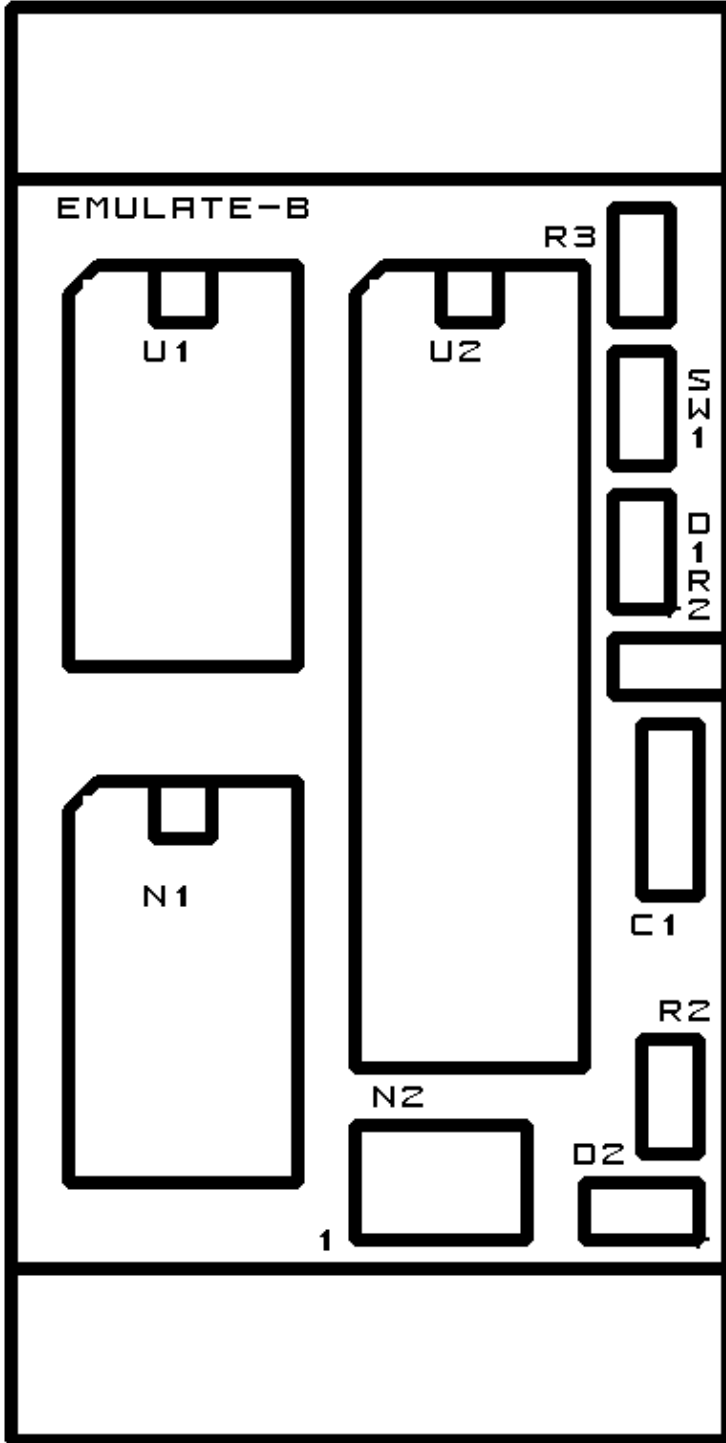
C. Appendix C: Back (Solder Side) Layer
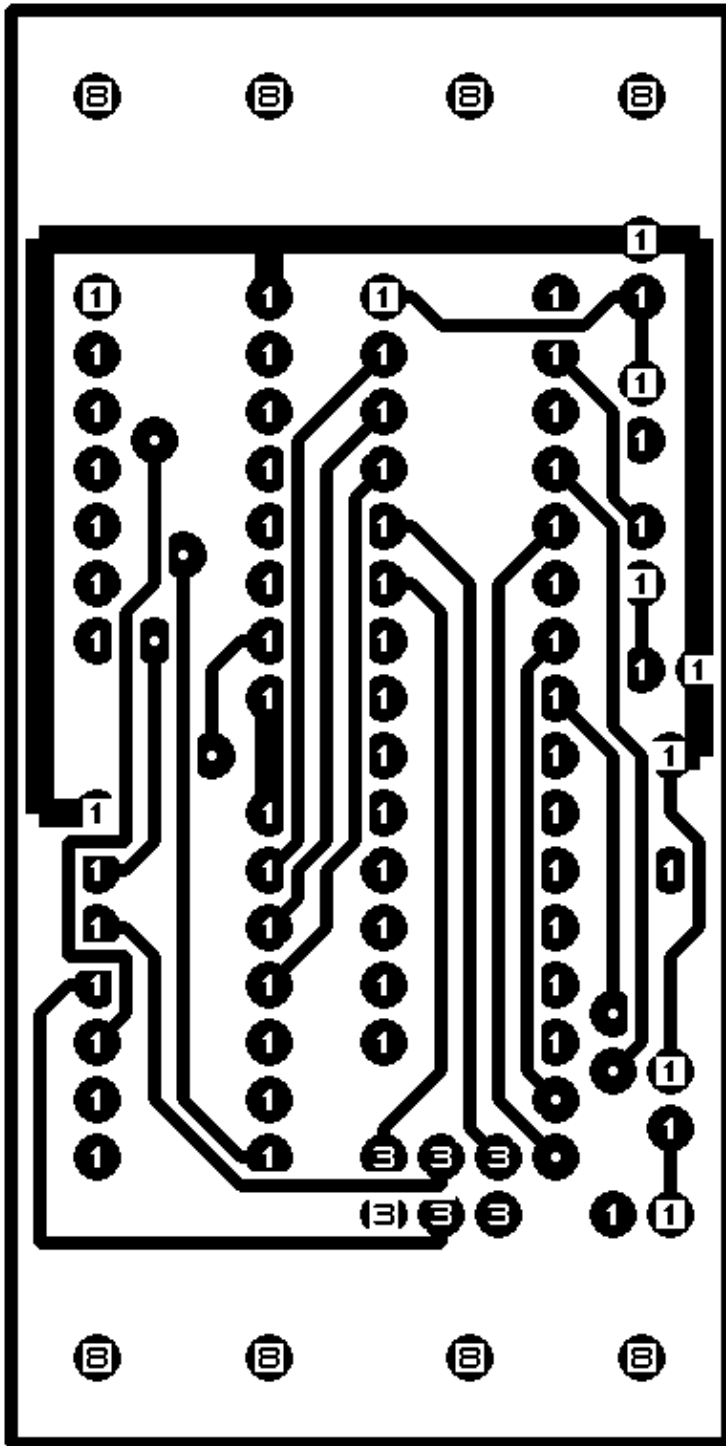
D. Appendix D: Front (Component Side) Layer

EMULATE-B