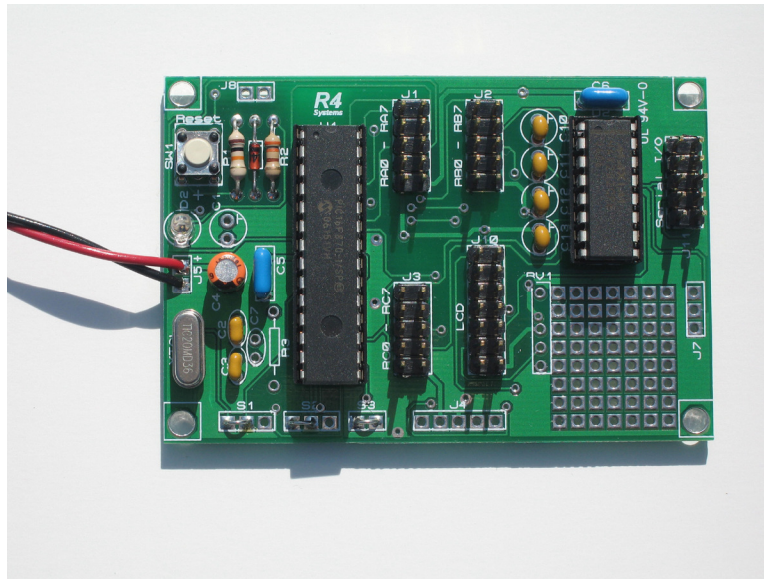


PIC 28 Pin Board Documentation

Update 2009.10

Version 5.0



R4 Systems Inc.

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Introduction

R4 Systems Inc. is pleased to provide you with our PIC 28 Pin board. This board can be populated with a 28 pin PIC microprocessor and some support components.

The board has been tested with many of the PIC 28 pin processor chips including the PIC 16F870, 16F876, 16F876A, 18F242, 18F252, etc.

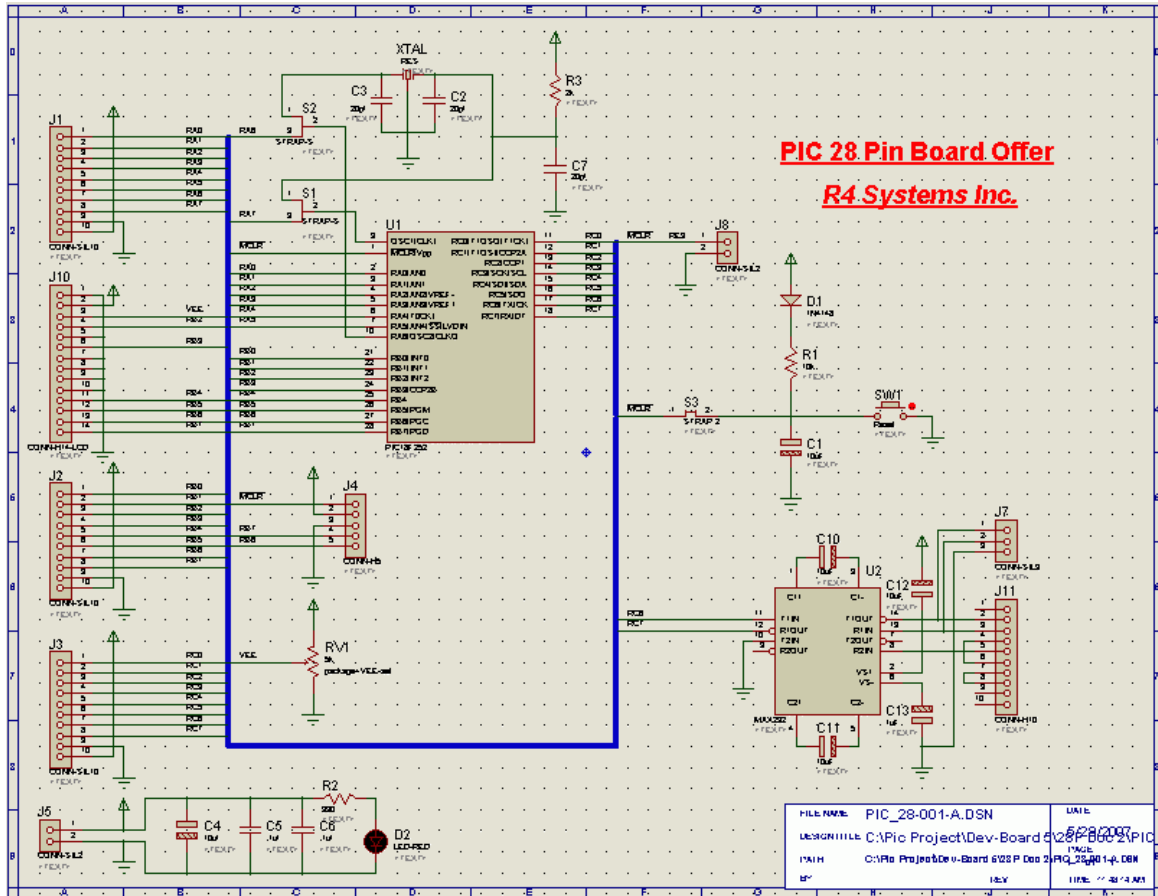
The Board has been designed and built to the highest standards, however R4 Systems Inc. offers no warranty or accepts any responsibility for problems arising from a user defined project.

This board is not intended to be used in any Life Support Device.

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Circuit Schematic

The following is the Circuit Schematic:



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View Schematic Using Proteus

The PIC Bare Board CD includes the following:

- Proteus Demo (You can use the Proteus Demo to view the schematic)
- PIC Bare Board Manual
- PIC 28Pin Board Schematic

To view the schematic you will need to load Proteus on your PC.

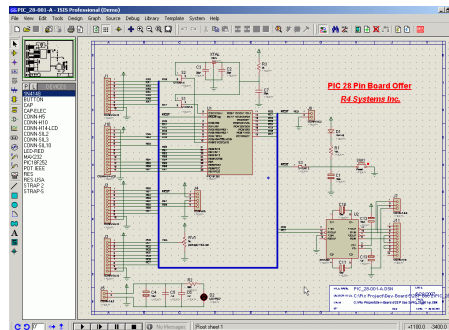
- To load Proteus place the CD in the CD drive and follow the prompts.

To Open the Schematic

- From the Windows Start menu start Proteus Demonstration ISIS.
- Proteus ISIS will start with the following screen.



- From the Proteus File menu select Open Design and navigate to the CD drive.
- On the CD select the file PIC_28-001-A
- The following is a screen capture of Proteus with the schematic open.



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The Following is the parts list

Bill Of Materials For PIC 28 Board

Design Title : PIC 28 Board
Author : R4 Systems Inc.
Revision : 10
Design Created : Saturday, May 05, 2007
Design Last Modified : Friday, May 25, 2007
Total Parts In Design : 33

3 Resistors

<u>Quantity</u>	<u>References</u>	<u>Value</u>	<u>Package</u>	<u>Tol</u>	<u>Cost</u>
1	R1	10k	RES40		
1	R2	330	RES40		
1	R3	2k	RES40		

11 Capacitors

<u>Quantity</u>	<u>References</u>	<u>Value</u>	<u>Package</u>	<u>Tol</u>	<u>Cost</u>
5	C1, C4, C10-C12	10uF	ELEC-RAD10		
3	C2, C3, C7	20pf	CAP10		
2	C5, C6	.1uf	CAP20-SQ		
1	C13	1uF	ELEC-RAD10		

2 Integrated Circuits

<u>Quantity</u>	<u>References</u>	<u>Value</u>	<u>Package</u>	<u>Tol</u>	<u>Cost</u>
1	U1	PIC18F252	DIL28NAR		
1	U2	MAX232	DIL16		

2 Diodes

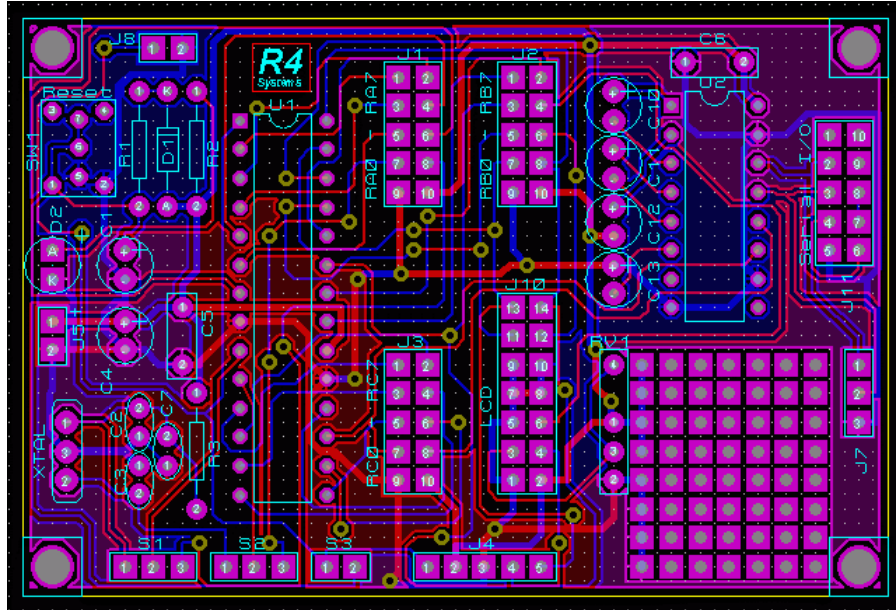
<u>Quantity</u>	<u>References</u>	<u>Value</u>	<u>Package</u>	<u>Tol</u>	<u>Cost</u>
1	D1	1N4148	DO35		
1	D2	LED-RED	LED		

15 Miscellaneous

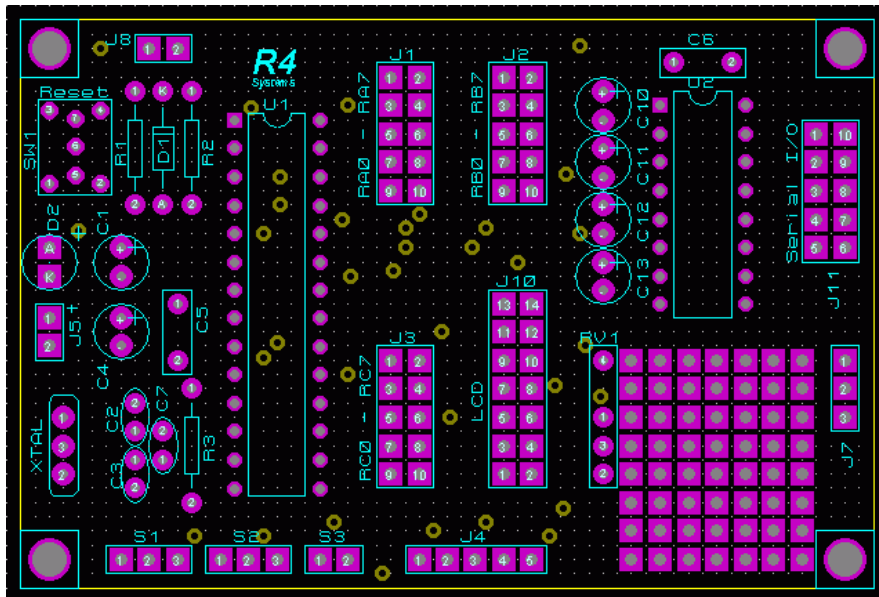
<u>Quantity</u>	<u>References</u>	<u>Value</u>	<u>Package</u>	<u>Tol</u>	<u>Cost</u>
3	J1-J3	CONN-SIL10	CONN-DIL10-2		
1	J4	CONN-H5	CONN-SIL5		
2	J5, J8	CONN-SIL2	CONN-SIL2		
1	J6	CONN-SIL3	NULL		
1	J7	CONN-DIL4	CONN-4		
1	J10	CONN-H14-LCD	CONN-H14-LCD		
1	J11	CONN-H10	CONN-DIL10		
2	S1, S2	STRAP-S	CONN-SIL3		
1	S3	STRAP 2	CONN-SIL2		
1	SW1	Reset	PCB-SW-SPST-2		
1	XTAL	RES	Resnator		

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Board Overview



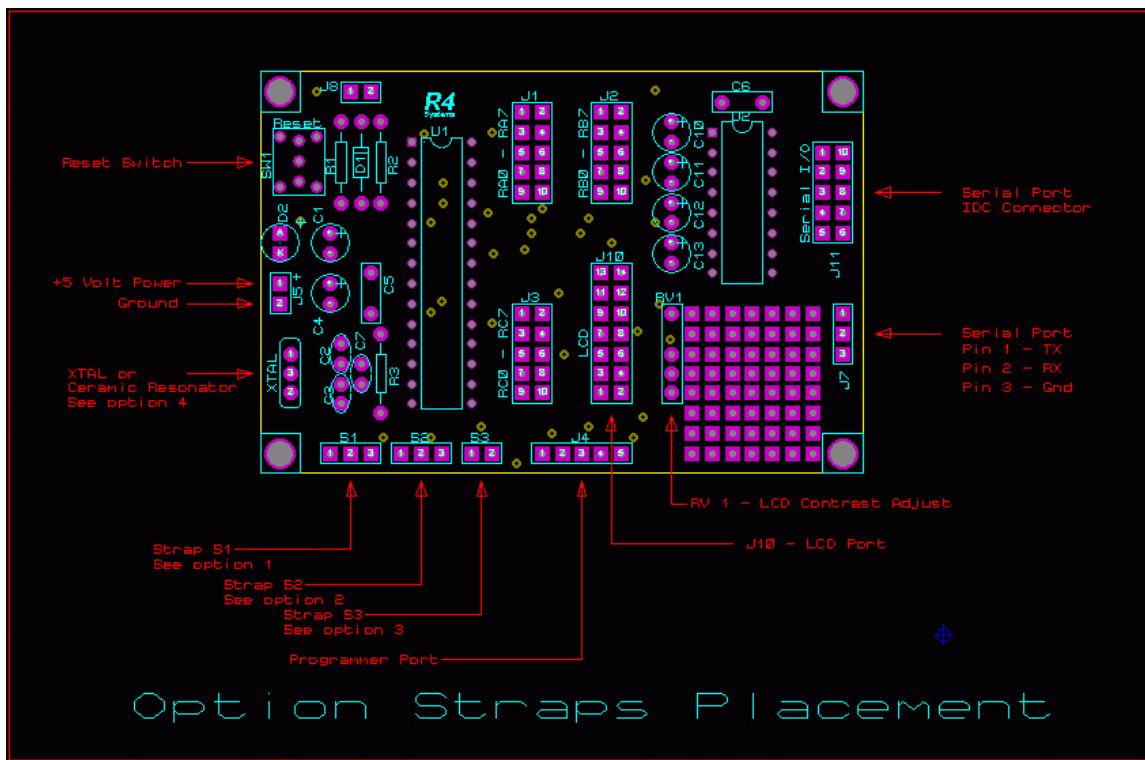
Board overview with Top & Bottom Copper and Silkscreen



Board overview Parts Placement

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Option Straps Overview



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Header Layout

The board has three 8 bit ports. Ports A, B & C. The port connector is a 10 pin header.

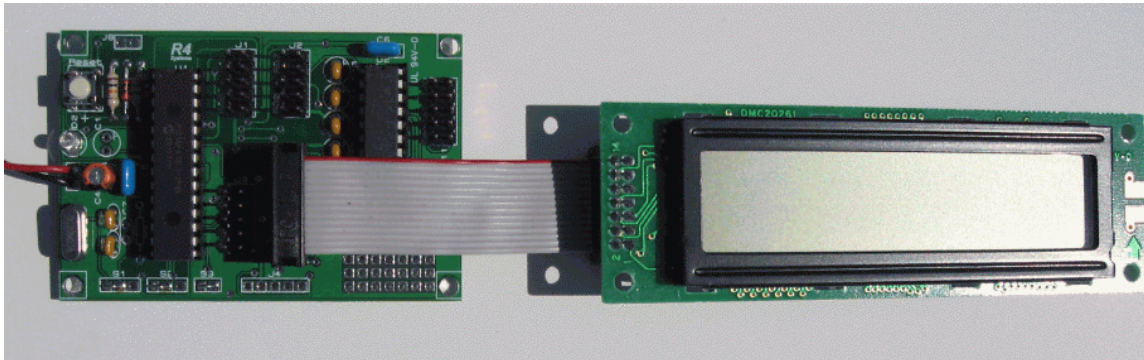
10 Pin Port Layout

Pin 1 - Bit 0	■	■	Pin 2 - Bit 1
Pin 3 - Bit 2	■	■	Pin 4 - Bit 3
Pin 5 - Bit 4	■	■	Pin 6 - Bit 5
Pin 7 - Bit 6	■	■	Pin 8 - Bit 7
Pin 9 - GND	■	■	Pin 10 - VCC

The board has 1 LCD connector. The connector is a 14 Pin header. The layout is as follows.

14 Pin LDC Port Layout

Pin 13	■	■	Pin 14
Pin 11	■	■	Pin 12
Pin 9	■	■	Pin 10
Pin 7	■	■	Pin 8
Pin 5	■	■	Pin 6
Pin 3	■	■	Pin 4
Pin 1	■	■	Pin 2

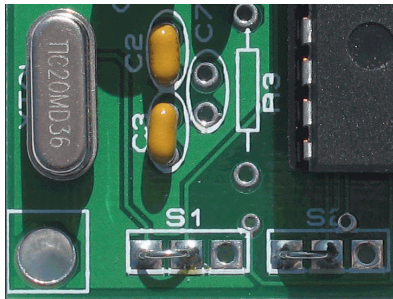


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Board Options

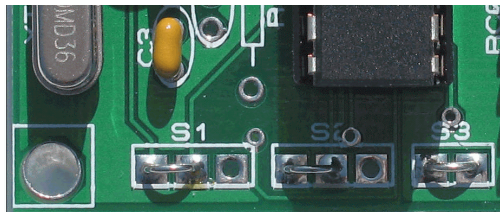
There are a number of option straps that must be set for the board to function.

- Strap S1 and S2
 - This selects the clock options.
 - Strap S1 Pin 1 to Pin 2 to select the XTAL or the Ceramic Resonator.
 - Strap S2 Pin 1 to Pin 2 to select the XTAL or the Ceramic Resonator.
 - See Picture below



- Strap S1 Pin 2 to Pin 3 to enable Port A Bit 7 on J1 Pin 8.
- Strap S2 Pin 2 to Pin 3 to enable Port A Bit 6 on J1 Pin 7.

- Strap S3
 - This selects the Reset
 - Strap S3 Pin 1 to Pin 2 to enable the Reset Switch, R1, D1 and C1.
 - See Picture below

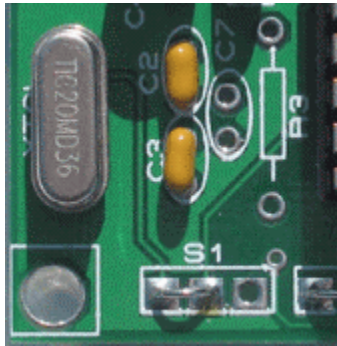


- On Some PIC processors such as the 16F886 the MCLR can be internal and no reset circuit is required. In this case S3 should be open. In this case J8 Pin 1 is RE3.

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Clock Options

- The board can be clocked with a crystal and two capacitors (check the datasheet for the processor your using). A good choice is a 20 Mhz XTAL and 20pf Caps (C2 & C3). See picture below.



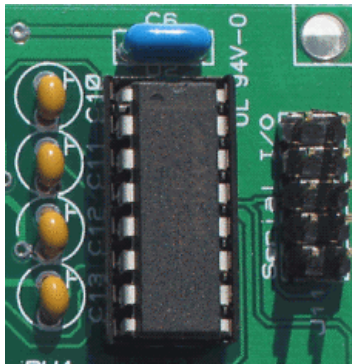
- The board can also be clocked with a 3 pin Ceramic Resonator (center pin is GND). In this case install S1 (Pin 1 to Pin 2), S2 (Pin 1 to Pin 2), Do Not install C2 or C3.
- Some PIC Processors can be clocked with a resistor and a capacitor (R3 & C7). In this case install S1 (Pin 1 to Pin 2) Install R3 and C7. Do not install XTAL or the Ceramic Resonator. Install S2 (Pin 2 to Pin 3) to enable the RA6 on the Port A header.

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Serial Port Options

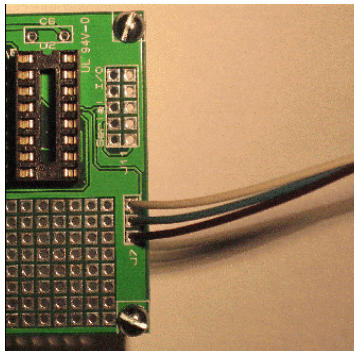
- The board can be fitted with a MAX232CPE in location U2.
 - In this case C10, C11, C12, and C13 should be 10uF 25V Caps.

- The board can be fitted with a MAX202CPE in location U2.
 - In this case C10, C11, C12, and C13 should be 0.1 uf Caps.



- The Serial connection can be a 10 pin IDC connector on J11. In this case a 10 Pin ribbon cable fitted with a 9 pin DB 9 connector is required.

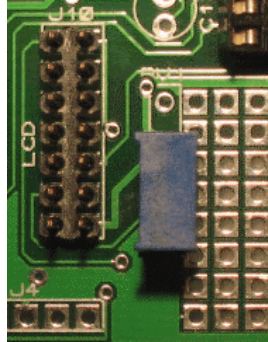
- There is also a 3 pin connector (J7) that can be used to connect a DB9 with 3 wires. The connections are as follows.
 - J7 - Pin 1 to BD9 Pin 2 (TX from Board)
 - J7 - Pin 2 to BD9 Pin 3 (RX from Board)
 - J7 - Pin 3 to BD9 Pin 5 (GND)



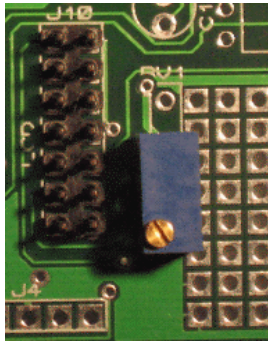
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LCD Set Contrast

- RV 1 is used to set the LCD contrast voltage (VEE).
- This can be a variable pot or a ¼ watt fixed resistor.
- To use a variable pot, install it in the 3 bottom holes on RV 1.
- See Picture below (Side adjust pot and a top adjust pot).

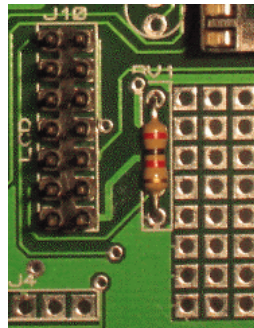


Side Adjust Pot



Top Adjust Pot

- In many cases it is OK to set the contrast using a fixed resistor. A 1K or 2K is a good value to start with. See Picture below



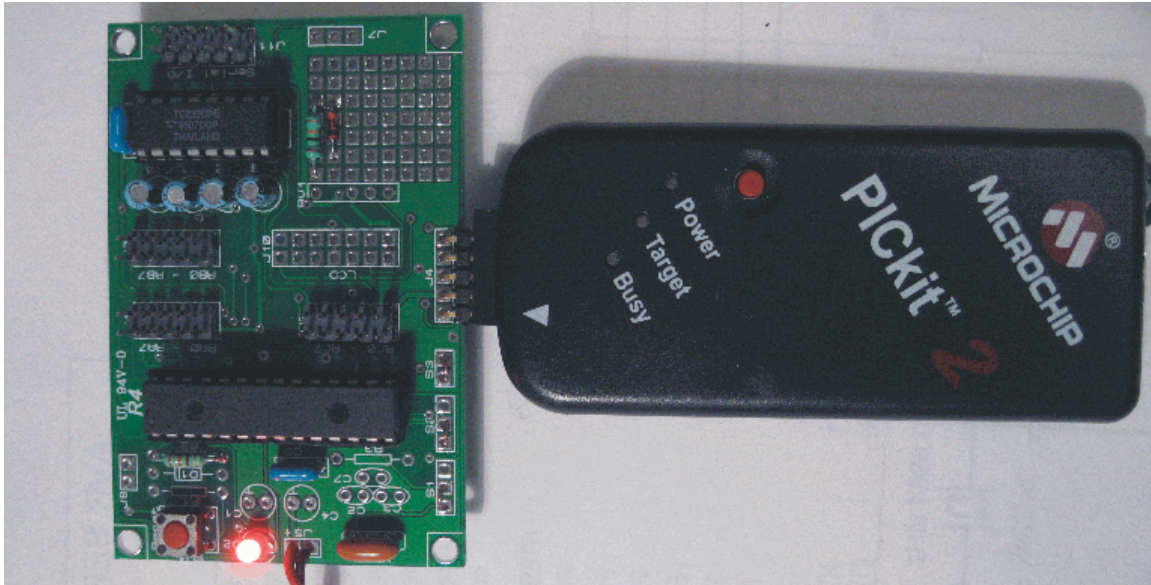
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PIC Programming Port

You can program the PIC chips with a external programmer such as a PICSTART® Plus or a Softlog programmer.

You can also program the PIC chip on the board using a programmer such as the PICKit 2. This is a low cost programmer from Microchip.

To program the PIC Chip on the board load and install the MicroChip MPLAB software and connect the PICKit 2 via a USB cable. To connect the PICKit 2 to the 28 PIN Board install the 5 pin header in the Programming port on the board. Connect the PICKit 2 as in the example below.



Note: the programming port only requires 5 pins. The PICKit 2 has a 6 pin connector. Connect pin 1 of the Programming port to Pin 1 (marked with the arrow). Pin 6 on the PICKit 2 is not used with this board.