

SPIRIT

Computer and Electronics Engineering

Microcontroller Based TekBot™ Counter and Display

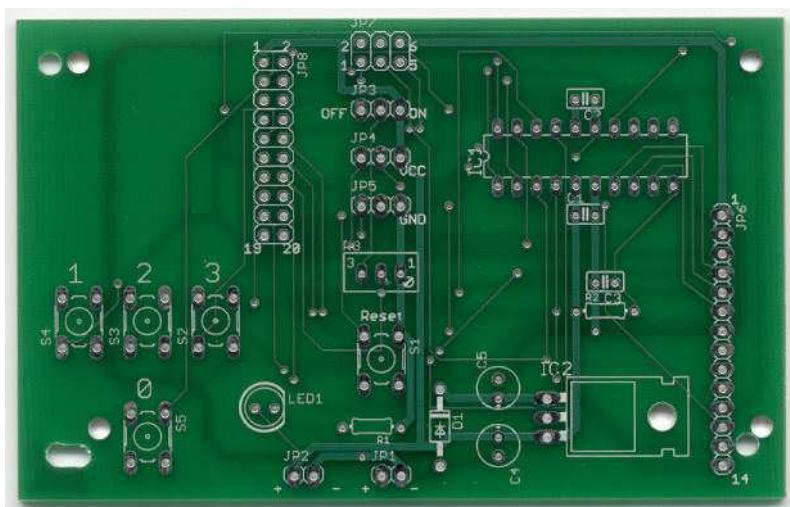
Introduction:

The counter and display unit will allow the TekBot user to perform many activities which involve counting events. The unit has three different modes of operation which can be selected using the switches. This board will be mounted in place of the analog board you have previously constructed and installed. One mode allows the unit to perform as it did with the analog board – the bump switches control the TekBot. The second mode allows the unit to function as a counter. The third mode, which has the most uses, will count the revolutions of the TekBot's wheel. The unit has a two line LCD (Liquid Crystal Display) and the count value can be displayed simultaneously in decimal and binary. Because the counter circuit is implemented by a programmable embedded controller (fancy words for a small, cheap computer), the device can be reprogrammed to perform a variety of functions. The programming is done using the C language and is downloaded into the ATtiny controller.

Assembly:

The printed circuit board has a silk screen which gives information on placement of the various components.

Place your parts on the Parts Inventory sheet to make sure have all the components and can identify them. As you have done before, start by soldering the lowest profile components first.



Install D2 and U1 last. Do not clip their leads until after you do a patch on the board.

The suggested order is:

R1	Resistor	330	1
R2	Resistor	1K	1

C1, C2, C3	Capacitor	0.1 uf	3
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Make sure the socket is oriented correctly

IC1	Socket	20 pin	1
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Orientation matters on the Regulator

Make sure 4.7 uf capacitors are oriented correctly

C4, C5	Capacitor, Electrolytic	4.7 uf	2
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The switches fit easily the correct way. Don't force them to fit the wrong way

S1, S2, S3, S4, S5	Switches		5
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JP3, JP4, JP5, JP7, JP7	3 PIN	Male Header	5
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JP1, JP2	2 PIN	Female Header	2
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JP6	14 Pin	Female Header	1
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JP8	Two 10 Pin	Female Header	2
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The potentiometer has its pin numbers printed on its side. They are faint. Match numbers with the ones printed on the board

R3	Potentiometer	10K	1
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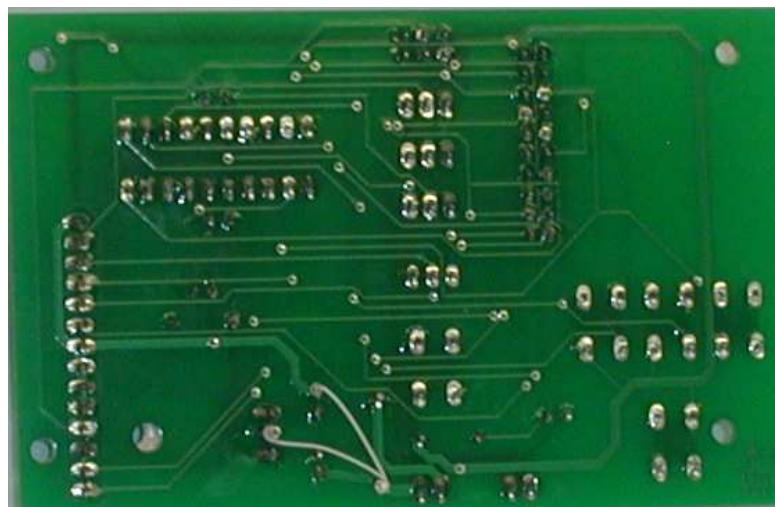
One side of the LED is flat. On these small LEDs it is hard to see. The short lead is on the flat side.

LED1	LED		1
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Do not clip the leads on D1 and U1 until after you do the patch.

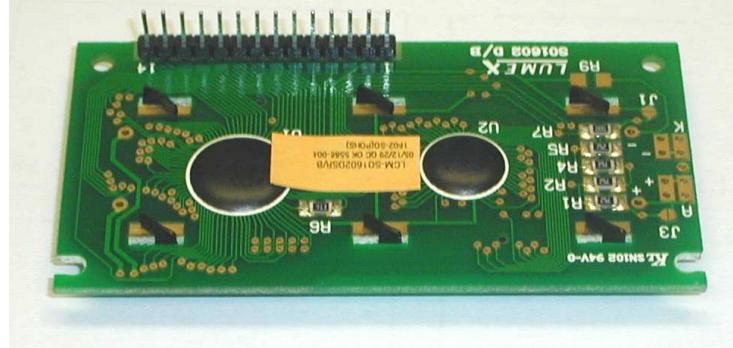
D1	Diode	1N4001	1
U1	5V Regulator	UA7805/TO	1

Two traces are missing on the board. You need to solder jumper wires from the middle pin of U1 to the anode (non-band) lead of D1. Also solder from the middle pin of U1 negative lead to lead of C5. After you have completed the jumpers you can clip the leads.



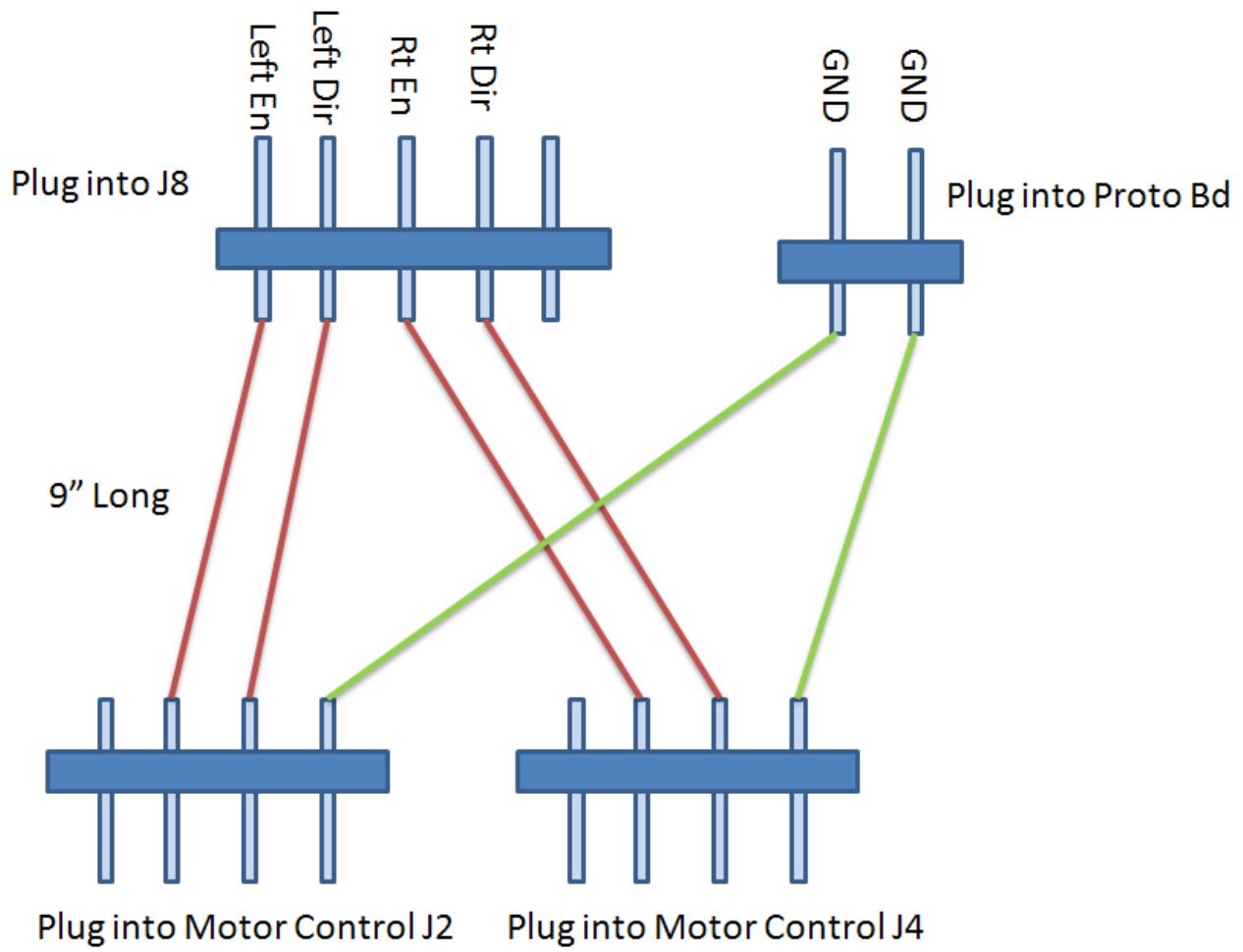
Solder a 14 pin male header into the holes of the LCD display. **Make sure you have it on the back side and the long leads stick out.** See the diagram.

When all components have been soldered, place the shorting covers on JP3, JP4, and JP5. They are placed over the two pins closest to IC1. Connect the LCD board to JP6. One of the assistants will test your board using one of our TekBots. Once it has been tested, you can remove the analog board and mount the new board in its place. Mount the optical sensor to the Plexiglas as shown. If you wish to leave your analog board on your TekBot, you can dangle the new board over the old just to try it.



Construct the unusual cable as shown in the following picture and on the following diagram. This will connect the counter board into the motor control board.





Connect the power cable that was connected to the analog board into JP1. **The two extra pins must be between JP1 and JP2.**

Connecting the bump switches:

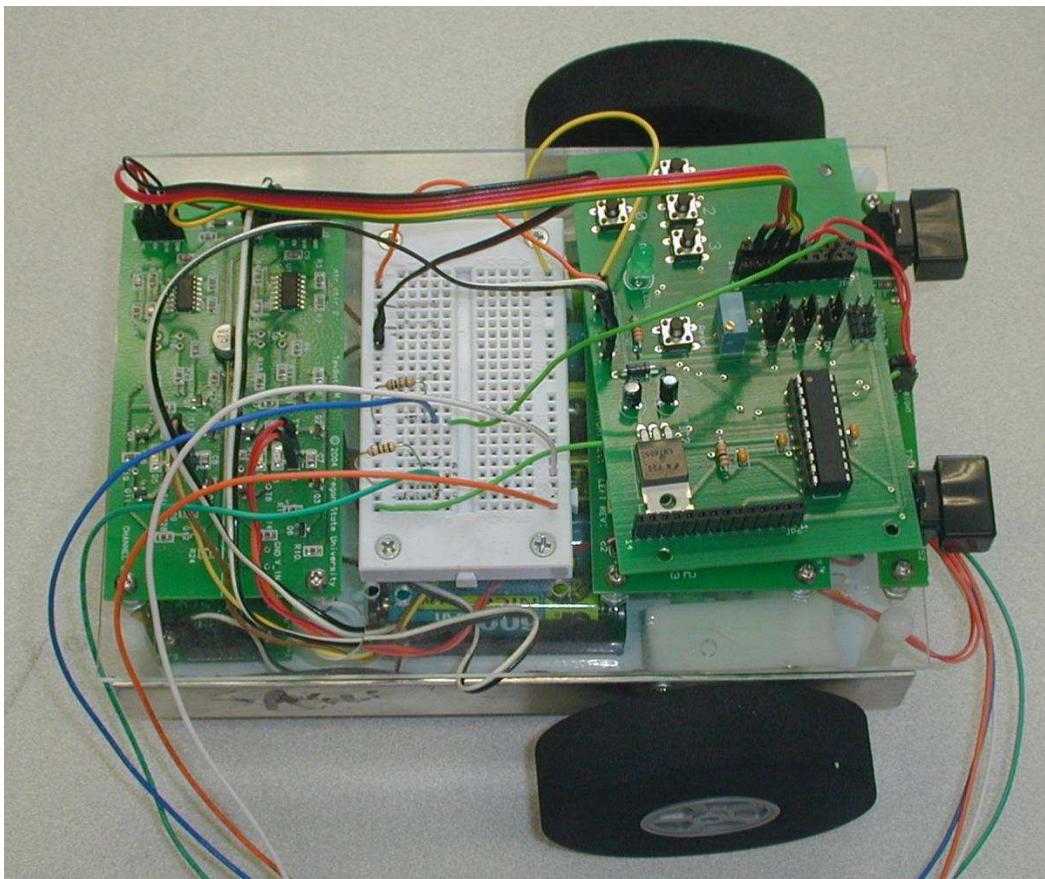
Connect a solid wire from the bump switch board J1 – Left to pin 7 of JP8. Note that the numbering is odd numbers on one side and even numbers on the other. Connect bump switch board J2 – Right to pin 9 of JP8. Connect wires from J1 GND and J2 GND to the ground bus of the proto board (the row of holes next to the motor control board).

Connecting the photo sensor to the proto board:

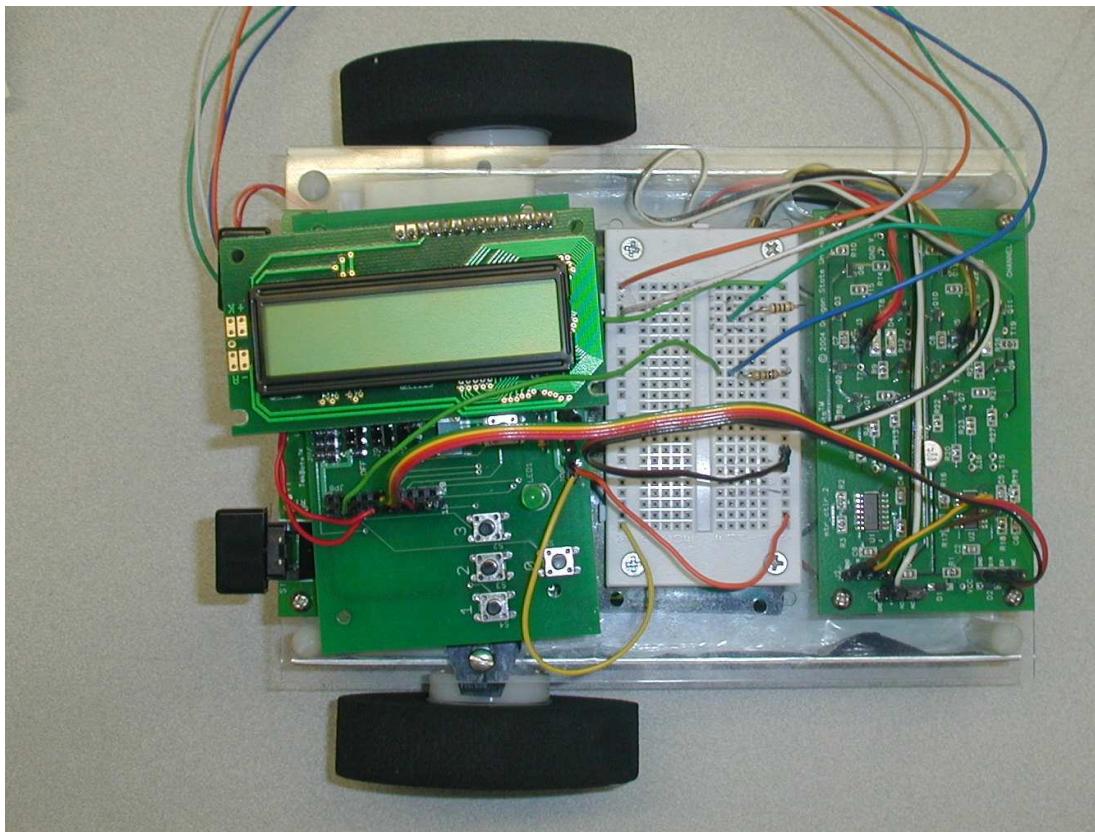
Connect a solid wire from the + of JP2 on the counter board to the power bus (the row of holes next to the counter board) of the proto board. Connect a solid wire from the – of JP2 to the ground bus of the proto board.

Place one end of the 150Ω resistor (Brown-Green-Brown) into the ground bus of the proto board and the other end into any nearby hole (node). Do the same with the 1 Meg ohm resistor. Place the Green wire from the sensor into the same node as the 150Ω resistor. Place the blue wire from the sensor into the node with the 1 Meg ohm resistor. Connect both the Orange and White wires to the power bus of the proto board.

Place a solid wire from the node with the 1 Meg ohm resistor to the counter board's JP8 pin 3.



Place the LCD unit into JP6. Make sure that it is oriented such that it is over the counter board, not hanging over the edge.



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