SPIRIT

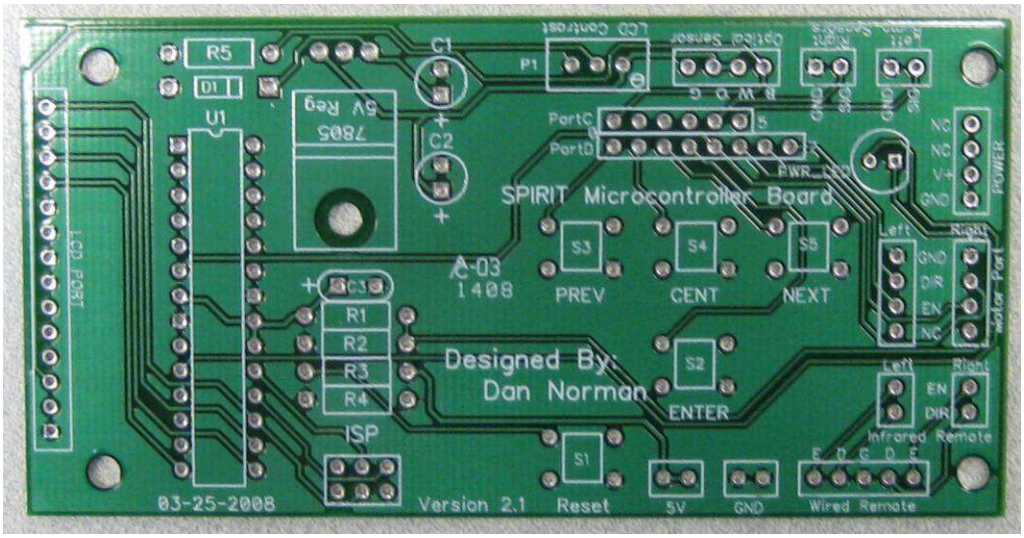
Computer and Electronics Engineering

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.

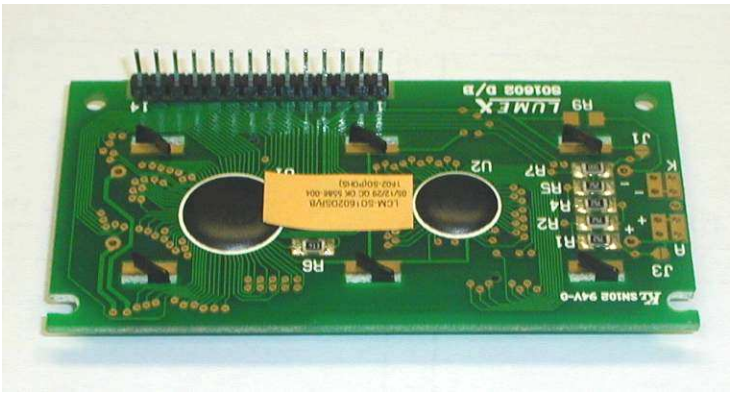
Place your parts on the Parts Inventory sheet to make sure

you have all the components and can identify them. As you have done before, start by soldering the lowest profile components first.

The suggested order is:

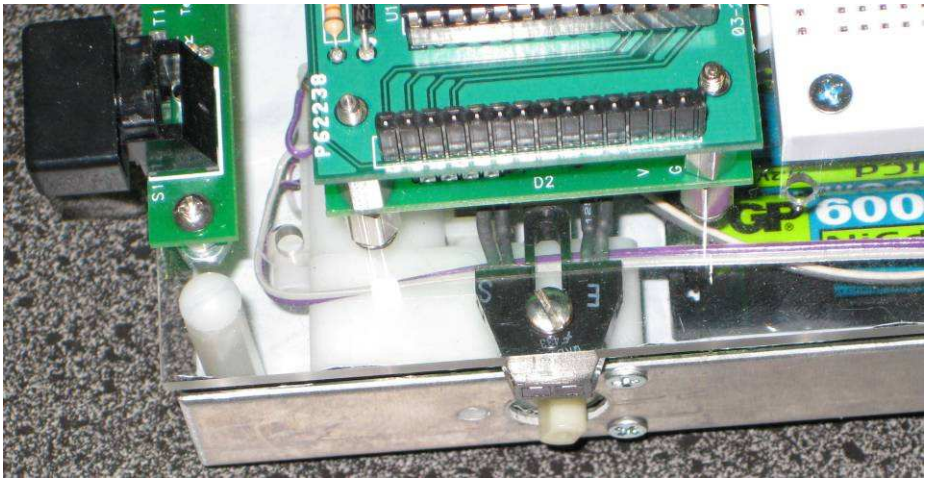
R1, R2	Resistor	330	2
R3, R5	Resistor	10K	2
R4	Resistor	150	1
D1 *Check Orientation*	Diode	1N4001	1
Make sure the socket is oriented correctly			
U1 *Do not solder the IC, just the socket*	Socket	28 pin	1
5V Regulator *Check Orientation*	Voltage Regulator	LM7805	1
C3	Capacitor	0.1 uf	1
Make sure 4.7 uf capacitors are oriented correctly			
C1, C2 *Check Orientation*	Capacitor, Electrolytic	4.7 uf	2
The switches fit easily the correct way. Don't force them to fit the wrong way			
S1, S2, S3, S4, S5	Switches		5
Female Headers	2 PIN	Female Header	6
Female Headers	4 PIN	Female Header	4
Female Headers	5 Pin	Female Header	1
Female Headers	14 PIN	Female Header	1
Male Headers	3 PIN	Male Header	2
The potentiometer has its pin numbers printed on its side. They are faint. Match numbers with the ones printed on the board			
P1 *Check Orientation*	Potentiometer	10K	1
One side of the LED is flat.			
PWR_LED *Check Orientation*	LED		1

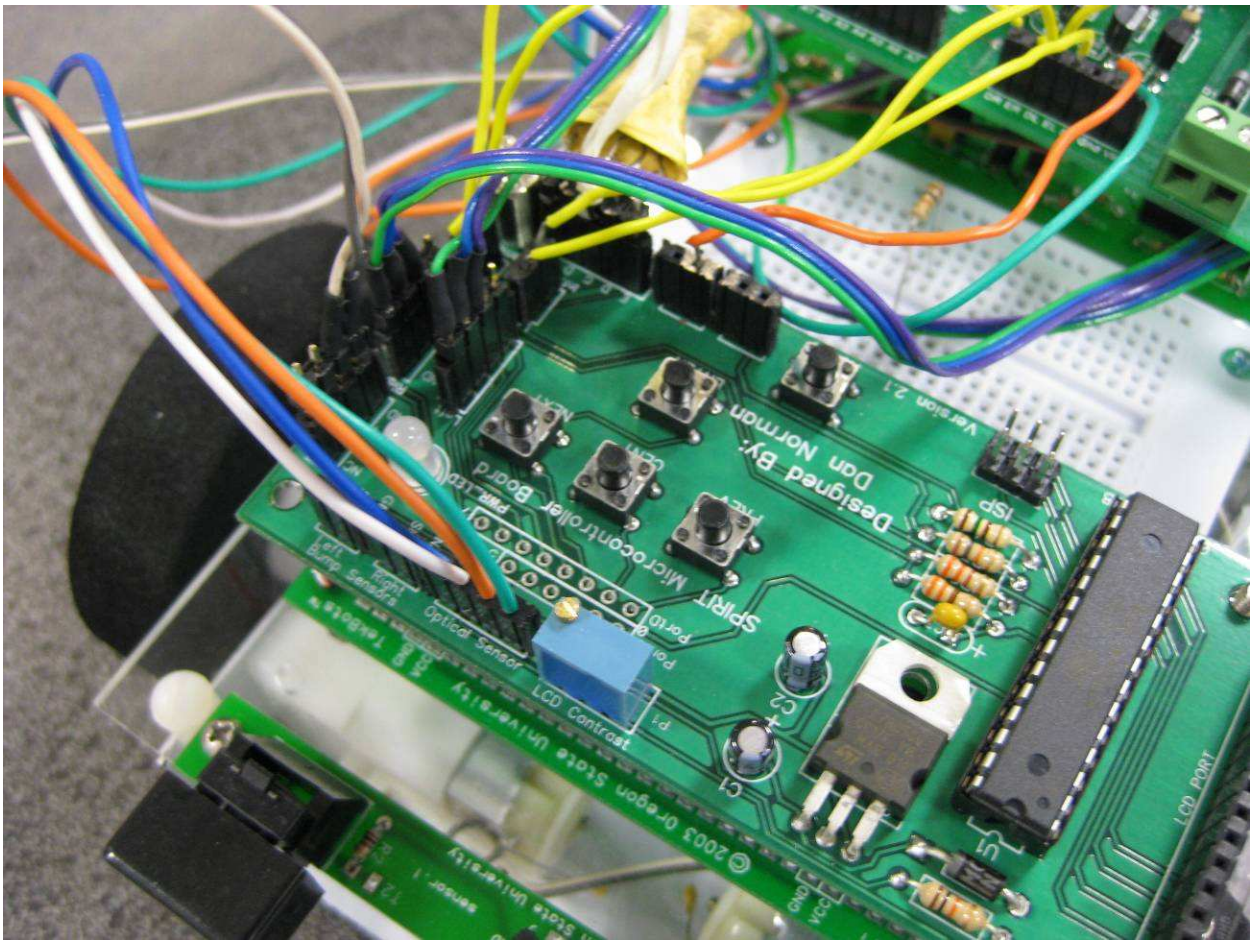
Your LCD display should have the 14 pin male header already attached. If it does not, solder a 14 pin male header into the holes of the LCD display. **Make sure you have it on the back side and the long leads stick out.** See the diagram.



Mount the optical sensor to the bottom side of the Plexiglas as shown.

Connect the LCD module to the LCD port. Place the LCD module such that it is over the board. 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 or you may want to use stand-offs to mount it over the analog board.





Board Mounted without the LCD

There are two ways to connect the optical sensor to the board. You can just insert the wire ends into the female jacks. The ends of the wires are already tinned so they won't fray. The wire colors are on the PCB silk screen to aid in the correct placement. You may note that the wires are way longer than necessary. If you wish, you can cut them to length and solder them to a four pin male header which will be inserted into the female header on the PCB. Make sure the placement of the wires on the male header corresponds to the colors printed on the PCB. Use the shrink tubing to prevent short circuits on the header.

Wiring the Counter Board

If you are not using the IR remote control, most of the wiring is accomplished by unplugging cables from the Analog Board and plugging them into the Counter Board. These cables are:

Power:	4 pin male, 2 wires
Motor Port Left:	4 pin male, 3 wires
Motor Port Right:	4 pin male, 3 wires

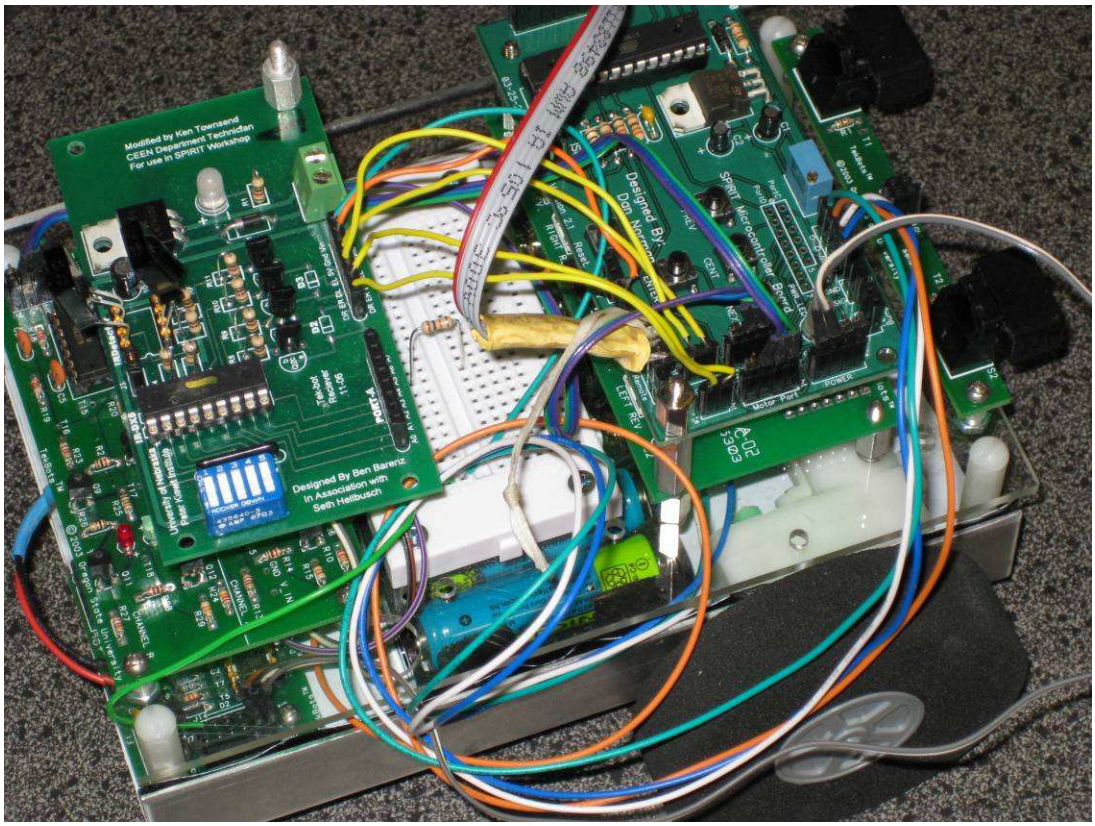
Bump Sensor Left: 2 pin male, 2 wires

Bump Sensor Right: 2 pin male, 2 wires

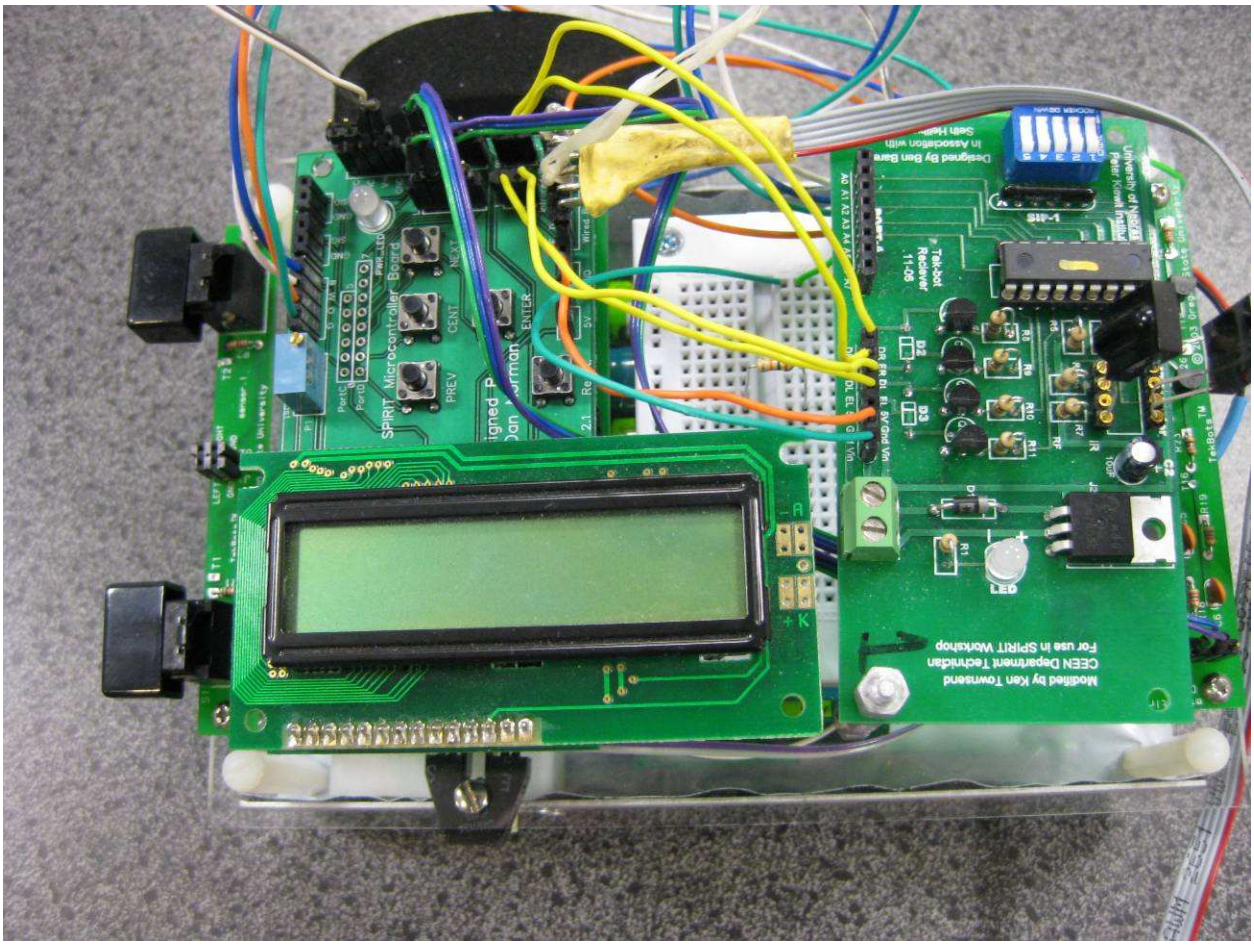
The hand-held remote control can be used without disconnecting the bump sensor cables. Place the 5 pin male connector from the remote in the Wired Remote female header.

The connection of the IR remote controller is accomplished with solid wire jumpers

Female Header on IR Remote	Female Header on Counter Board
DIR	INFARED REMOTE RIGHT: DIR
ER	INFARED REMOTE RIGHT: EN
DL	INFARED REMOTE LEFT: DIR
EL	INFARED REMOTE RIGHT: EN
5V	NO WIRE
GND	GND
VIN	V+ OF CHARGER BOARD



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.



IR Remote

DIR	RIGHT INFARED REMOTE DIR
ER	RIGHT INFARED REMOTE EN
DL	Left INFARED remote dir
EL	RIGHT INFARED REMOTE EN
5V	NO WIRE
GND	GND
VIN	TO V+ OF REGULATOR BOARD