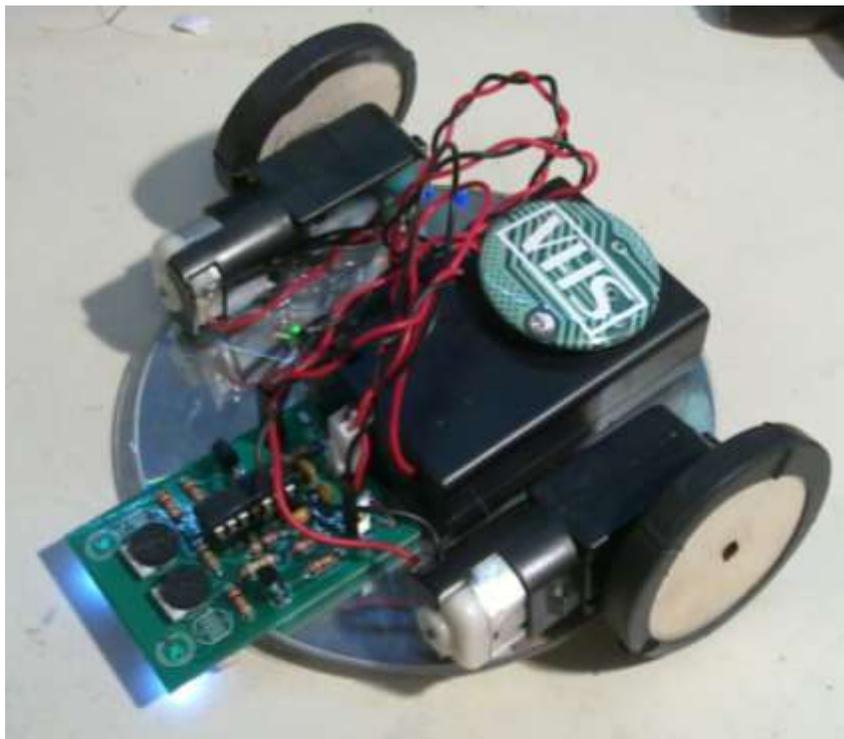


VANCOUVER HACK SPACE

LINE FOLLOWING ROBOT KIT INSTRUCTIONS

Vancouver Mini Maker Faire 2014



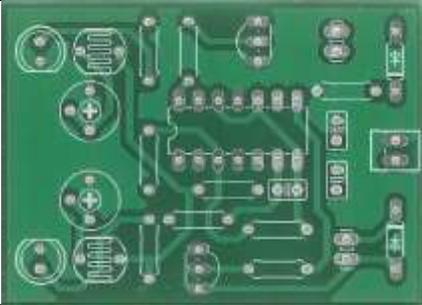
**This robot follows a line of black tape
without using any microcontrollers!**
Circuit design used with permission from:
<http://www.ermicro.com/blog/?p=1908>

PREPARATION:

1. This kit is recommended for people who have soldered before and can follow written instructions. This kit should take about 45 to 60 minutes to complete.
2. Check that you have all of the parts listed in the parts list on the next page. Once you have everything, you are ready to start building the kit!

PLEASE LEAVE THESE INSTRUCTIONS AT THE WORKSTATION. THANK YOU!

PARTS LIST

Quantity	Part # on board	Description	What it looks like
1		Printed Circuit Board	
4	R3, R9, R10, R11	1k resistor (Brown Black Red Gold)	
1	R5	15k resistor (Brown Green Orange Gold)	
1	R2	33k resistor (Orange Orange Orange Gold)	
2	R1, R7	47k resistor (Yellow Violet Orange Gold)	
1	R4	100k Resistor (Brown Black Yellow Gold)	
3	C1, C2, C3	0.1µF capacitors	
2	LDR1, LDR2	Light-Dependent Resistor (LDR)	
2	LED1, LED2	5mm White LED	
2	D1, D2	1N4148 Silicon Diode	
2	T1, T2	2N4401 NPN Transistors	
1	IC1	LM324 Quad Op-Amp IC	

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1	IC1	14-pin DIP IC Socket	
2	R6, R8	50k potentiometers	
2	JP1, JP2	Pin headers	
1	JP3	Pin headers (polarized)	
2		Motor	
1		3xAA Battery Holder	

Instructions continued on next page...

See the list below for the correct order to solder the components to the board. See the diagram on the next page for the correct locations for the parts. Solder in the parts one at a time and trim their leads.

Solder these parts in order to the top side of the board:

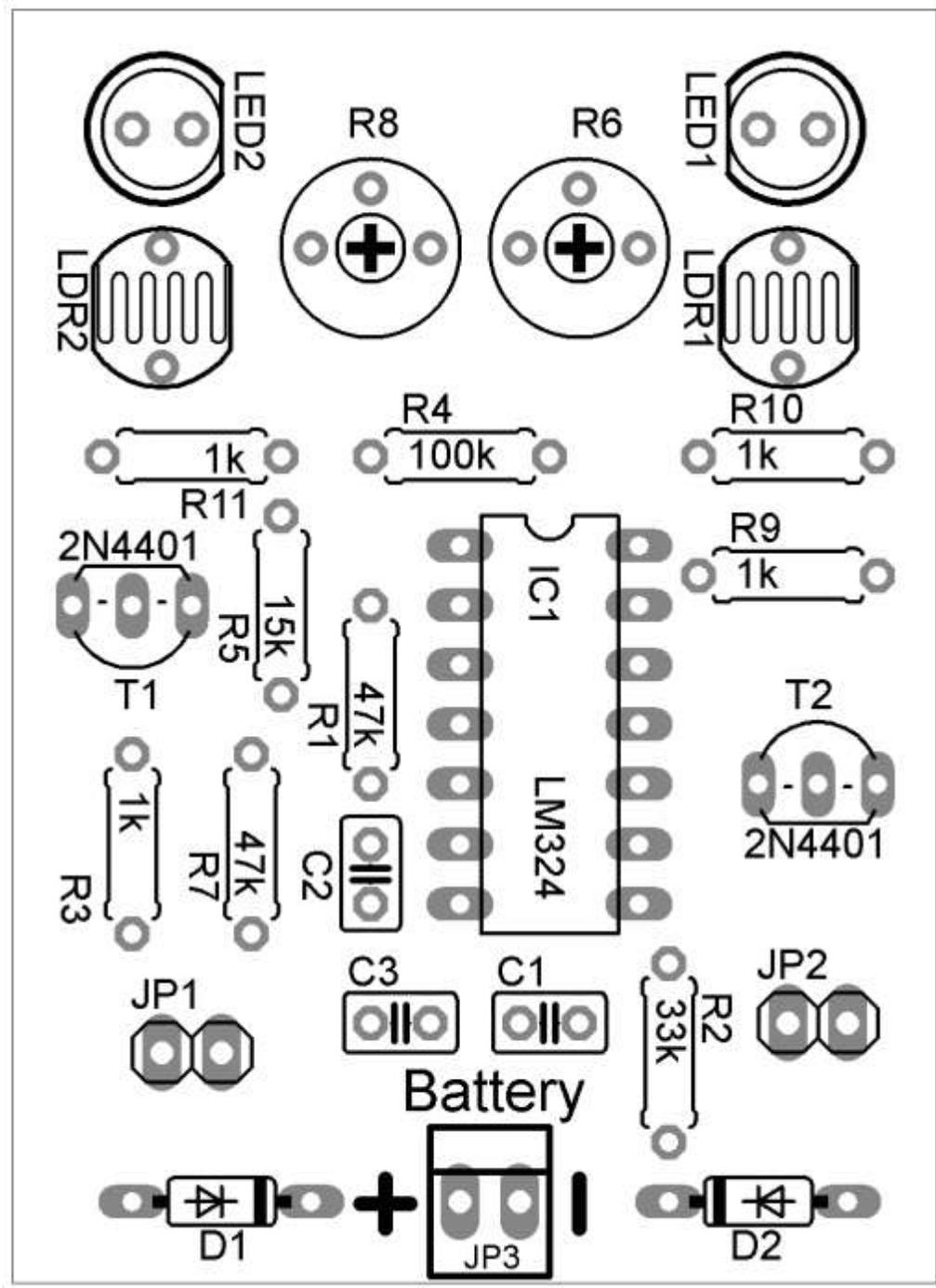
1. Diodes (note polarity; match up the stripe)
2. Resistors (see diagram on next page for correct locations)
3. Potentiometers
4. IC Socket (match up the notch)
5. Capacitors
6. Transistors
7. Pin headers; JP1, JP2 non-polarized, JP3 polarized (plastic tab faces inwards)

Solder these parts in order to the bottom side of the board:

1. LEDs (note polarity; match up the flat spot on the LED)
2. LDRs (should stick out slightly less than the LEDs)

CIRCUIT BOARD PARTS DIAGRAM

Hey, why isn't my circuit board labelled like this diagram?
This was a design mistake caused by rushing to get the board produced; take your time and you can avoid mistakes like ours.



Instructions continued on next page...

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Motors

Use wire strippers to remove about 1cm of insulation from the motor wires. Thread a wire through the hole on each tab of the motors and twist the wire around itself.

Solder the wire to the tab. There should be solder on both the wire and the tab. The motor tabs may be tarnished slightly, so the solder might not stick right away. If you're having trouble getting the solder to stick to the tab, try adding a bit of flux to the joint using the flux pen.

Wheels

Push a wheel firmly onto each motor shaft. If the wheel doesn't go on, flip it around and try the other side.

Test your circuit

Plug in both motors to the motor connectors on the board. Plug in the battery holder to the battery connector on the board and switch it on.

Both LEDs should turn on. If they don't, turn off the battery switch and ask for help.

If both LEDs are on, turn each potentiometer as far as it will let you go in either direction and see if that causes one of the motors to start and stop spinning. If this works for both motors, your whole circuit is working properly and you are ready to assemble your robot.

Instructions continued on next page...

Gluing together your robot

The glue gun is hot enough to burn you. Be careful not to touch the tip of the gun or any molten glue.

The hot glue sticks surprisingly well to the CD; a little goes a long way.

Attach the battery holder to the robot so that the switch is facing up and towards the inside of the CD.

Glue the motors to the CD so that the wheels near the rear of the CD and are parallel with each other. Make sure that the wheels aren't rubbing against the CD.

Glue the circuit board to the CD so that the LED and LDR are sticking out over the front edge of the CD.

Calibrating your robot:

Switch the power on. Check that the motors are spinning in the correct direction. The motor wires may be backwards. Try different combinations until the motors behave the way they're supposed to.

Put the robot on a white surface. Adjust each potentiometer until the point where the motor is barely turned off. Do this for both potentiometers and place your robot on the black line to try it out. It should start following the line. If not, adjust the potentiometers until you find a setting that works.

You're Done!

Congratulations! We hope you had fun making your kit and learning a useful new skill!

If you'd like to learn more about electronics, come visit the Vancouver Hack Space at 270 E 1st Avenue on one of our open-house evenings (check hackspace.ca for a calendar). The Vancouver Hack Space is a member-run non-profit organization that provides a place where people can meet and work on their projects. You can support us by becoming a member.

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