

# Line Sensor Robotic Development Kit Reference Manual

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## Overview

The Digilent Line Sensor Robotic Development Kit (RDK-Line) is an ideal platform for robotic applications. When used with any of several available Digilent embedded controllers and our extensive line of peripheral modules (Pmods), countless designs can be implemented, from basic experiments through more advanced systems.

Included parts:

- PmodLS1
- (2) PmodHB5 2A H-bridge motor amplifiers with attachment clips
- Cerebot MX4cK or Cerebot 32MX4
- (4) IRROSC
- rugged metal platform with holes on 1/2-inch center
- rugged metal motor mount
- (2) 1/19 ratio motor/gearbox drives with ABS plastic wheels (1/53 gear ratio motors are available)
- rugged plastic wheels and drag button
- bent bracket
- Velcro mounting strip
- AA battery holder (holds four AA batteries)
- all wiring and assembly hardware included

## Functional Description

The rugged steel components have holes on 1/2-inch centers allowing Digilent circuit boards and other vendors' products to be easily attached.

The following tools are recommended for robot assembly:

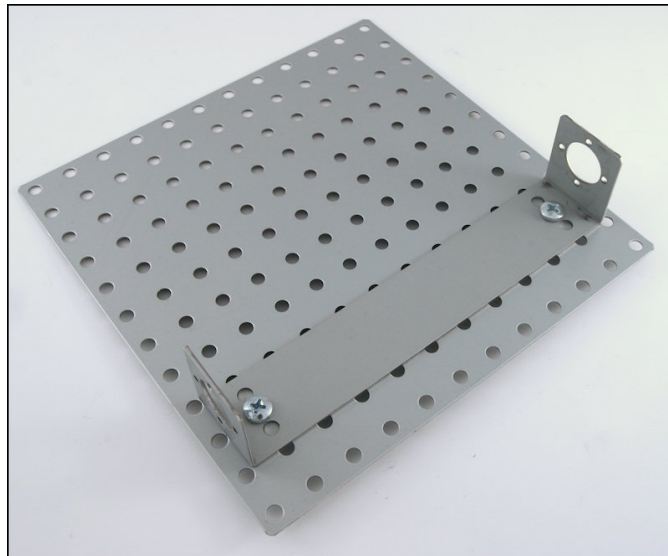
- regular and small Phillips head screwdrivers
- adjustable wrench
- pliers
- wire stripper
- scissors

*Note: The Cerebot MX4cK uses the same ports and jumper positions for this project as the Cerebot 32MX4. You may safely follow all of the pictures while assembling your kit.*

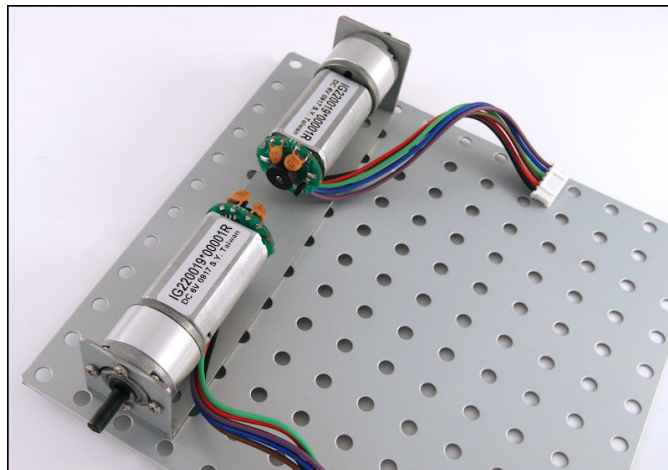
## Example Assembly

The following example uses the *RDK\_LineSensor* reference design, available at [www.digilentinc.com](http://www.digilentinc.com):

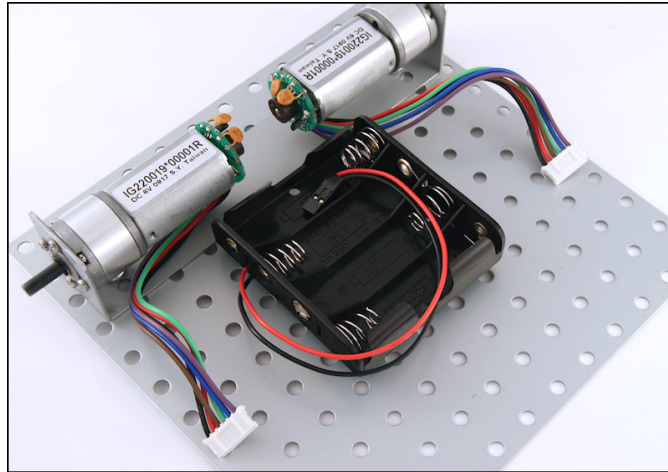
1. Take out the metal platform and place the metal motor mount on the top right side. Attach the screws accordingly.



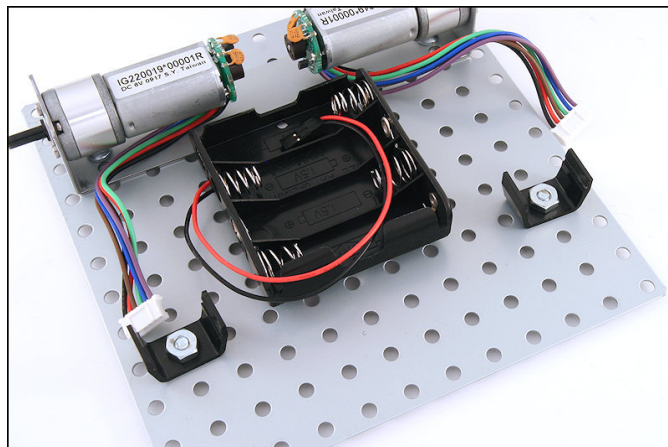
2. Attach the motors to the metal motor mount with miniature screws.



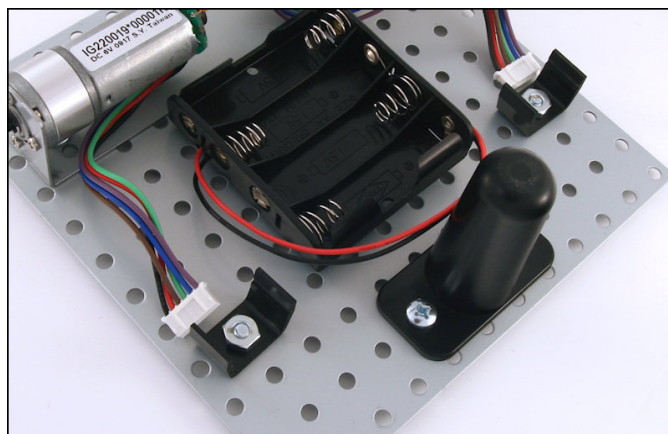
3. Attach the battery holder to the metal platform (below the motor mount) using the sticky Velcro.



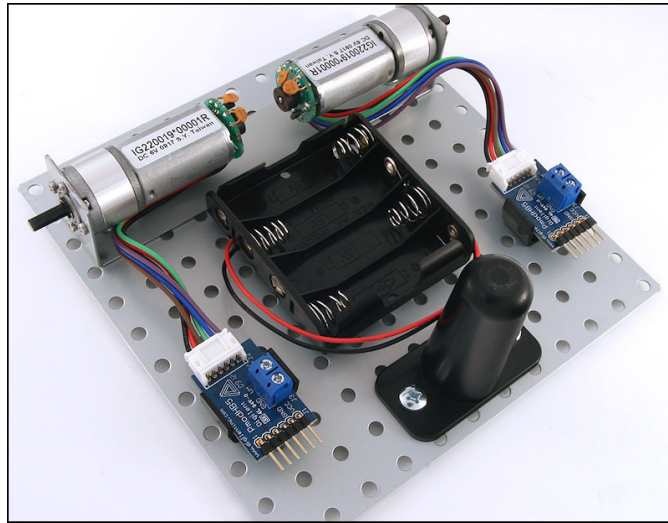
4. Attach the Pmod clips to the metal platform on either side of the battery holder.



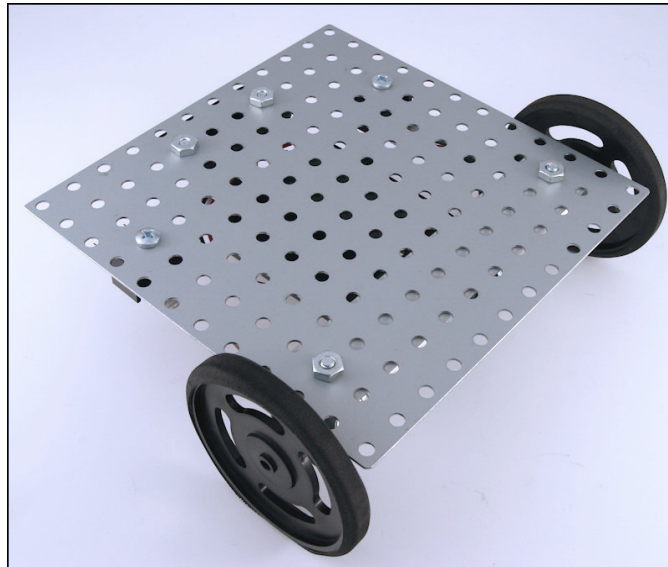
5. Attach the drag button to the metal platform, below the battery holder.



6. Attach the two PmodHB5 modules to the Pmod clips and connect them to the motors accordingly.



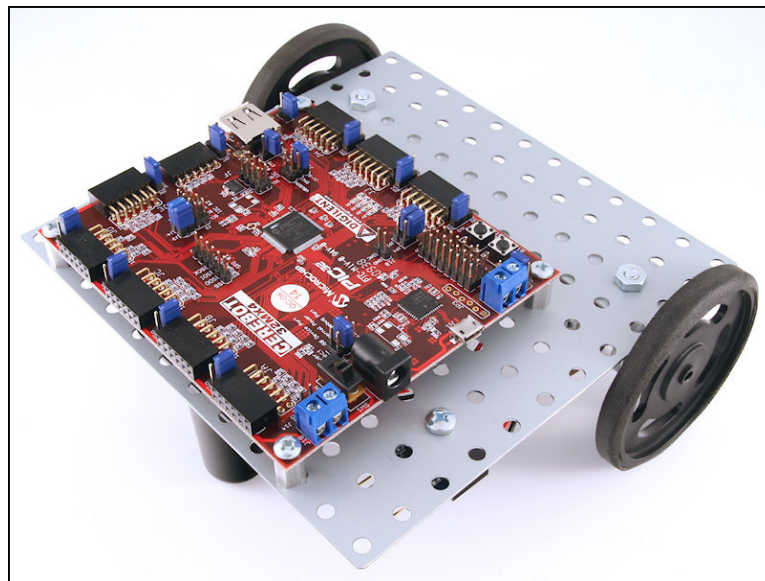
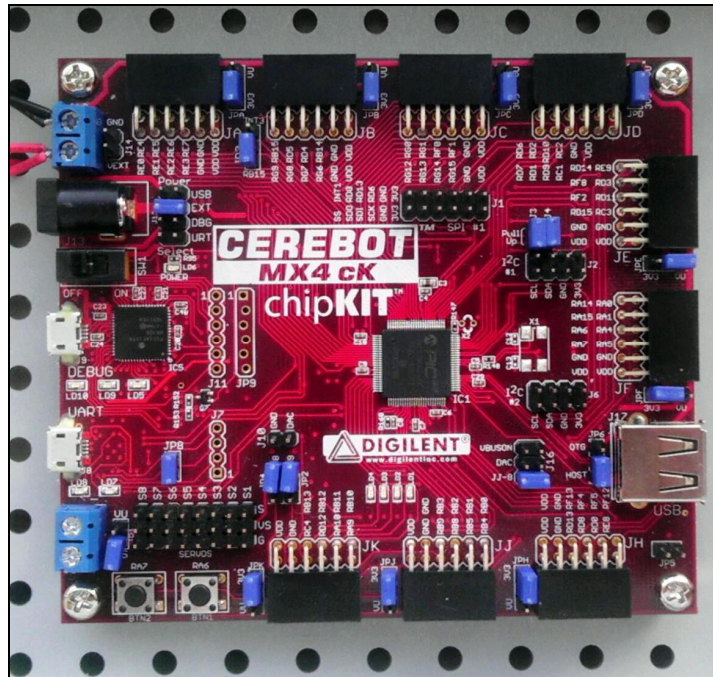
7. Attach the plastic wheels to the motors.



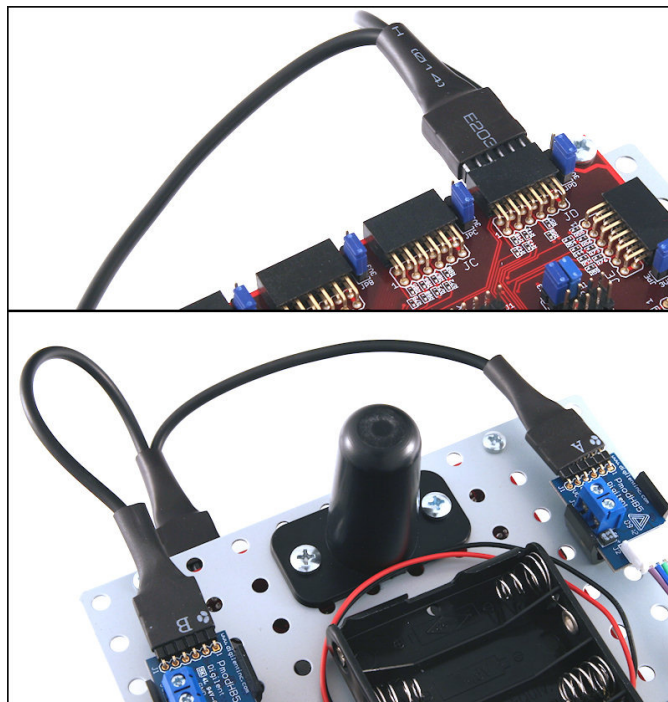


8. Compare the Cerebot MX4cK board to the picture below. Note that the blue shorts are attached to each jumper as depicted. Remove the rubber feet from the bottom of the corners of the Cerebot MX4cK. Attach the standoffs to the board using the corresponding mounting screws. Mount the Cerebot MX4cK board to the top side of the metal platform. Be careful not to cross thread screws while mounting the Cerebot MX4cK Board.

*Note: The Cerebot 32MX4 can also be used with this procedure.*



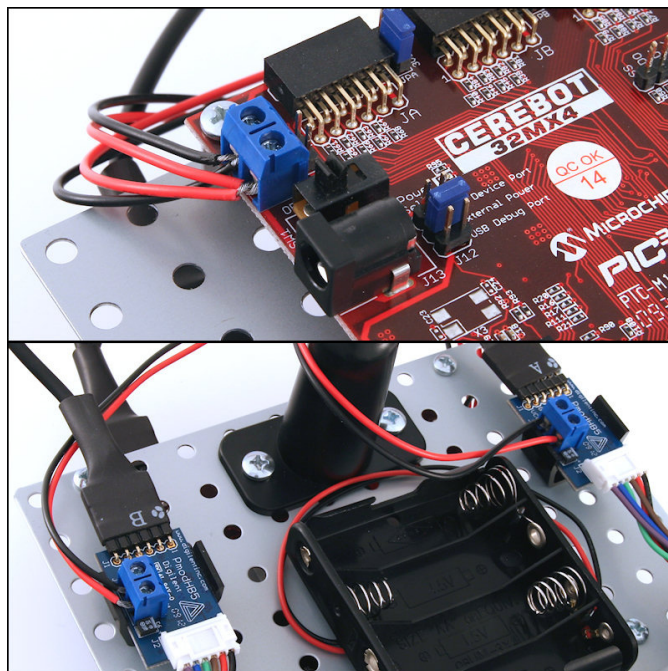
9. Connect the two PmodHB5 modules to port JD on the Cerebot MX4cK board using the 2x6 Pin to dual 6 pin cable. Use the marker on the cable connector to ensure that pin placements are in alignment when connecting the boards.



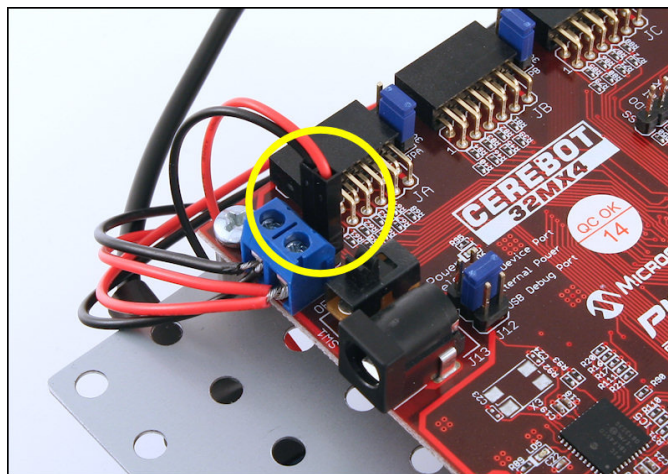
10. Strip 1/2-inch of insulation from both ends of all red and black 22 gauge power wires.



11. Route power wires from each PmodHB5 to the J18 power connector on the Cerebot MX4cK board, noting ground and voltage connections.

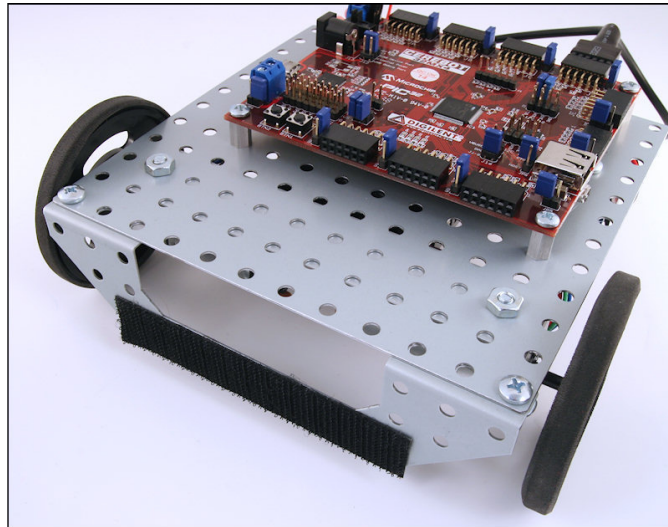


12. Attach the power cable from the battery pack to the J14 battery power connector on the Cerebot MX4cK board.

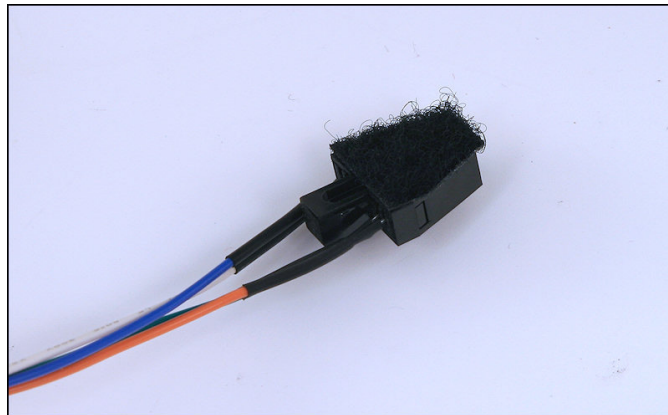




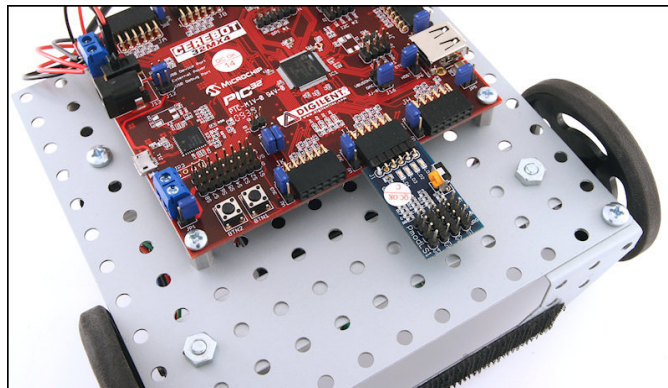
13. Attach the angled bracket to the front of the robot development kit along with the longer (4-inch) Velcro mounting strip.



14. Cut four ½-inch sections of Velcro from the other 4-inch strip. Attach these ½-inch strips to each of the four IROS sensors.

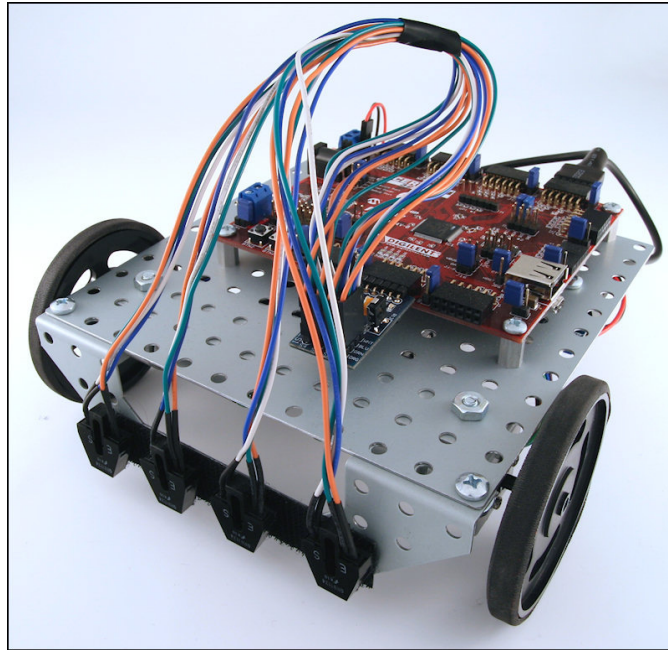


15. Connect the PmodLS1 to the top JJ Pmod header.





16. Attach the four IROS to the bent bracket from left to right using the attached Velcro, and connect the sensors in the same order, respectively, to each of the headers (S4-S1) on the PmodLS1.



MPLAB can now be used to program the *RDKit\_LineSensor* reference design to the board. For more information on how to program the Cerebot MX4cK using MPLAB, see the Cerebot MX4cK LED Demo project at [www.digilentinc.com](http://www.digilentinc.com). Note that running the reference design that turns the motors requires that the power select mode jumper J12 be shorted to External Power. Note that the recommend surface for running the reference design is a white surface with black tape.

Once the board has been programmed with the reference design, place the robot on the recommended surface with a black line between the two middle sensors. Turn the board on and press button 2 to cause the motors to turn and observe the robot follow the black line. Press button 1 to stop the robot.