Tutorial: Building BALANC3R

EV3, EV3 BUILDING

This tutorial provides step-by-step instructions to build BALANC3R, a self-balancing LEGO MINDSTORMS EV3 robot.

Requirements

- 1x LEGO MINDSTORMS EV3 #31313 Home Edition. (If you have the LEGO MINDSTORMS EV3 Education Core set #45544, you can build Gyro Boy instead.)

1x LEGO MINDSTORMS EV3 Home Edition

- 1x Gyroscopic Sensor. Use one of the following sensors:
  - EV3 Gyro by LEGO (pictured below)
  - NXT Gyroscope by HiTechnic

- Both sensors work great in this project, but here are some considerations before you buy:
  - The EV3 Gyro is cheaper. It can measure the angular

WEBSITE MAINTENANCE

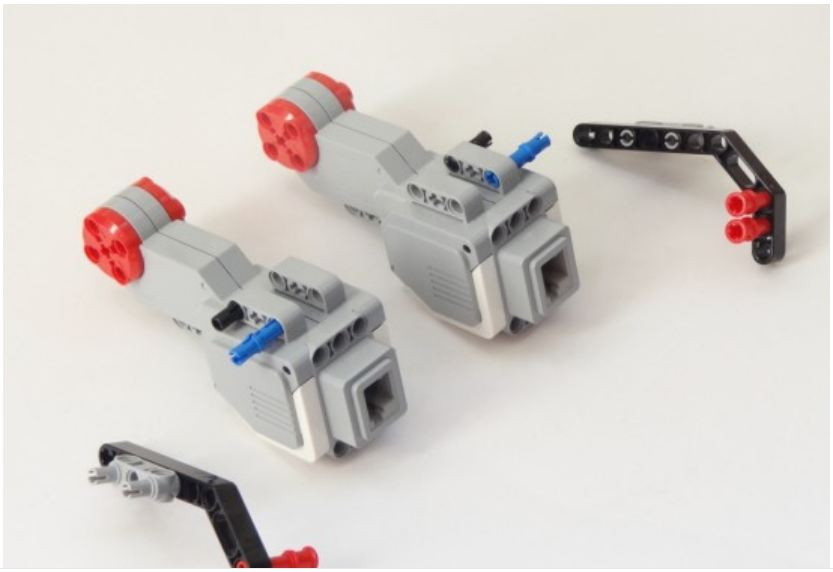
Robotsquare is currently being updated, which means that it may look a little different (and not very polished) for a while. All the content and pages should still be there, though. It should be back and fully operational soon. Thanks for your patience!

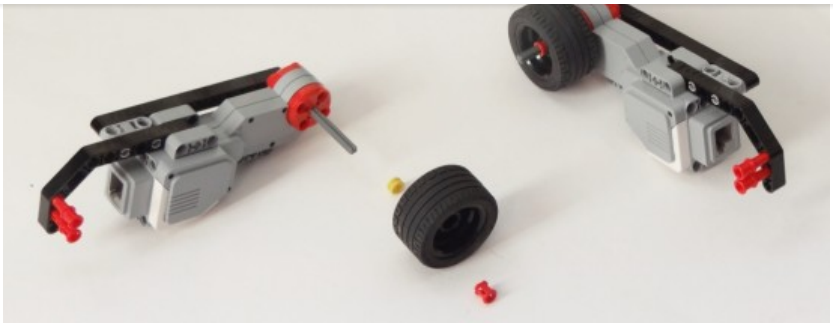
- The HiTechnic Gyro is more accurate for this application because of the increased resolution. It can only measure angular rate.

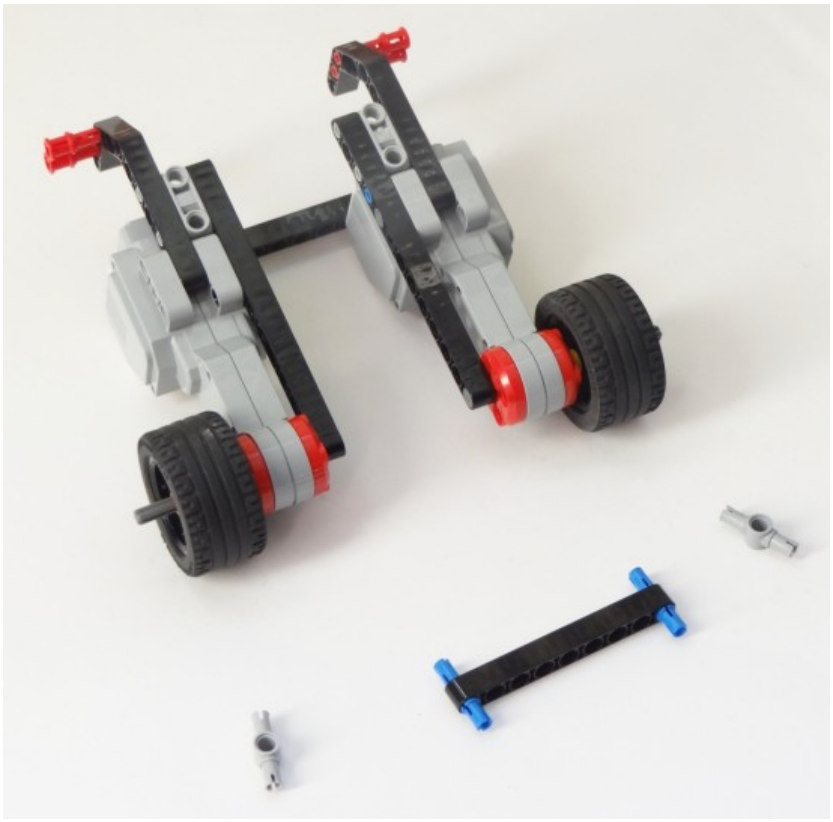
1x LEGO MINDSTORMS EV3 Gyroscope

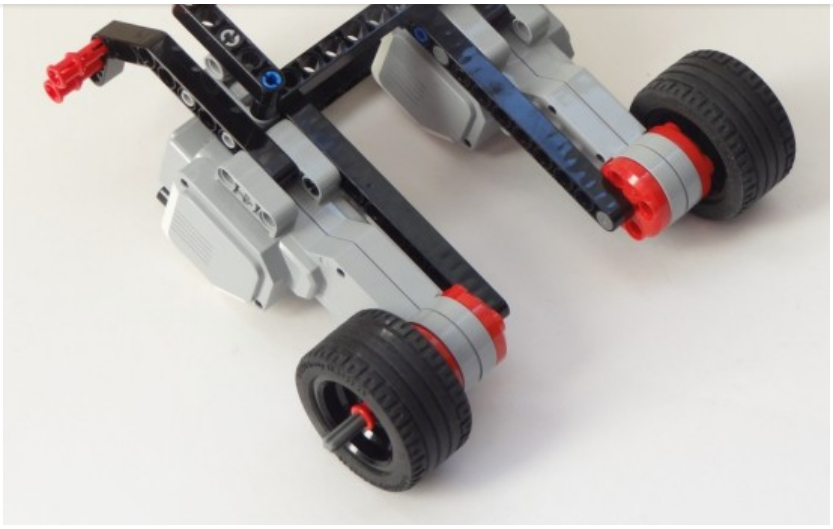
Building Steps

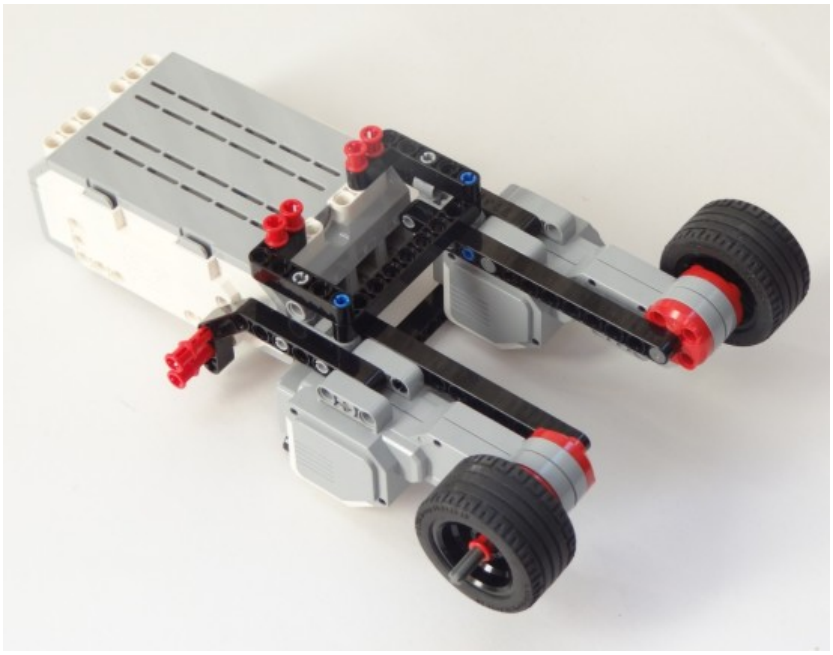
Build the robot by following the steps in order. Click on the pictures for a bigger image. Be sure to connect the motors and sensors to appropriate port on the EV3 brick as indicated by the port icons.



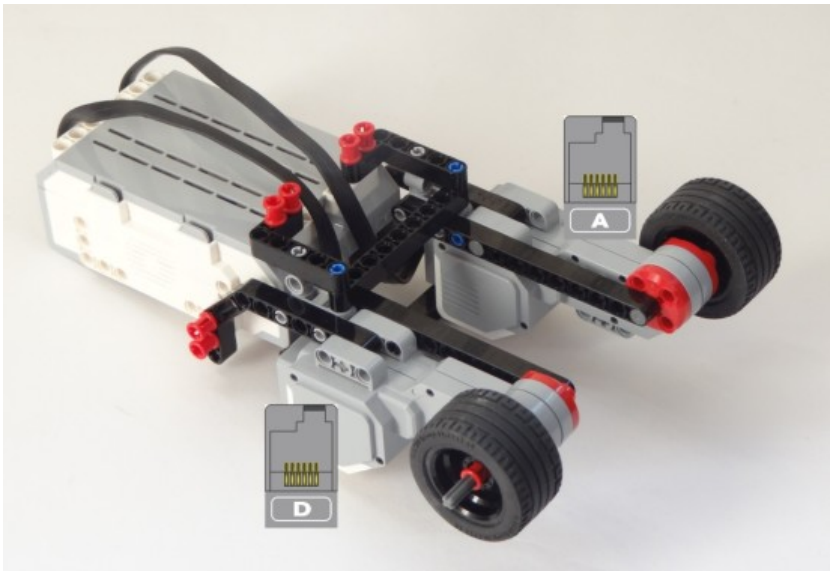


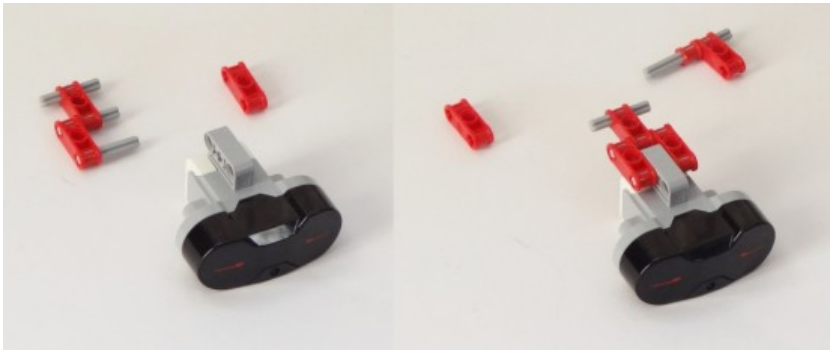


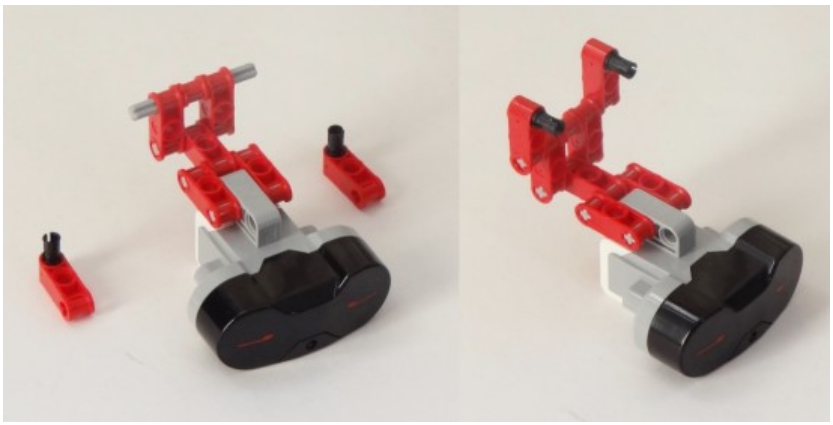


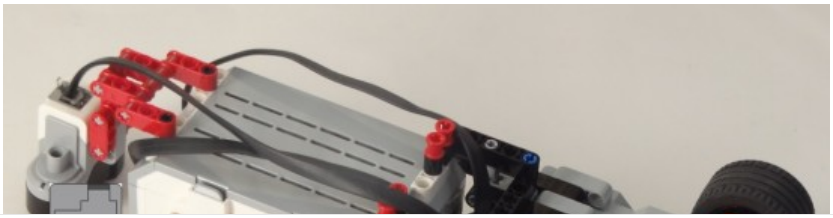



EV3

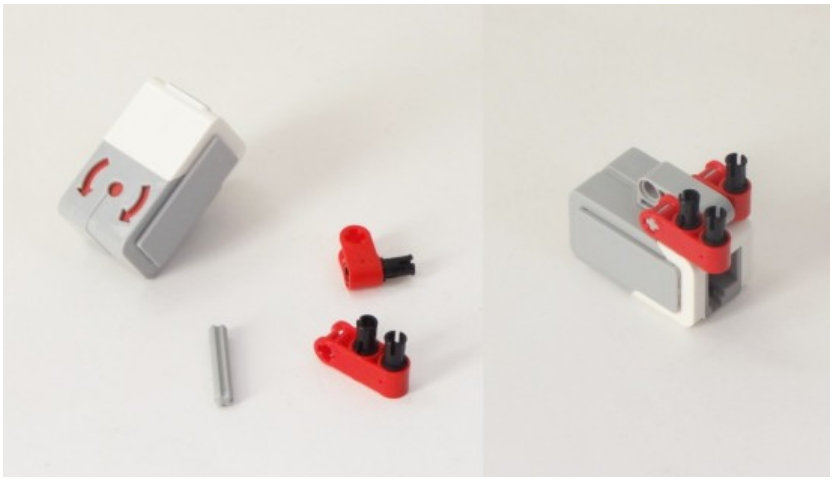

A
D





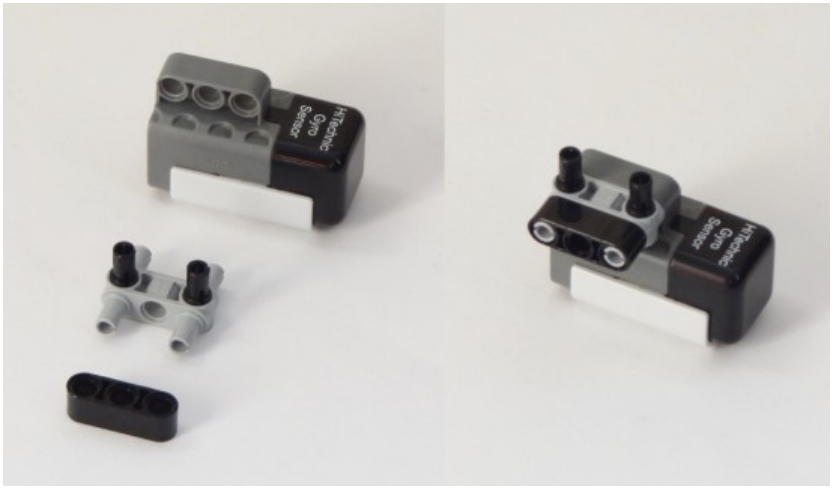


The following two steps are for the LEGO MINDSTORMS EV3 Gyroscopic sensor only. Skip these steps if you have another sensor.



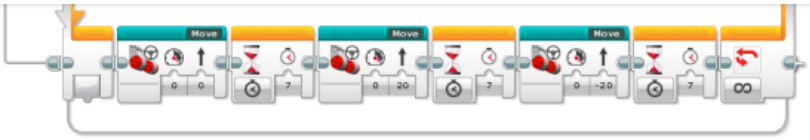
Attach the LEGO MINDSTORMS EV3 Gyro sensor as follows. Be sure to connect it to the side of the EV3 brick with the USB port.

The following two steps are for the HiTechnic Gyroscopic sensor only. Skip these steps if you have another sensor.



Attach the HiTechnic Gyro sensor as follows. Be sure to connect it to the side of the EV3 brick with the speaker.

Programming



Click to go to the programming tutorial.

← PREV NEXT →

45 RESPONSES

Robin Newman

REPLY

June 25, 2014 at 8:24 am

Great project Laurens. Looking forward to the code next week.

Tomas Naslund

REPLY

June 30, 2014 at 9:38 pm

Nice!Really looking forward to the program. I've been trying to wrap my head around the

to get it all explained to me! You are doning a great job! Thanx /Tomas

Ronald Ledford

REPLY

July 28, 2014 at 2:06 pm

Just finished building your Formula EV3 Race Car. Enjoyable project. I plan on having a programming joy using RobotC. But yet, the remote control program is keeping me busy driving the car.

In the meantime, I having been looking at your BalancE3 robot. I will have to use my NXT motors instead of the EV3 motors. It will be interesting to see if your program will work with no problem.

Laurens

REPLY

July 28, 2014 at 2:56 pm

Hi Ronald,

Great to hear that robot was fun to build. Maybe after you've tried the BALANC3R project, you can make the Formula EV3 Race car balance on its two rear wheels, and continue controlling it with the remote 😀 (It's one of the challenges at the end of the

seem to have less backlash, which is good for balancing.

When rotating in place, you'll notice that BALANC3R balances almost perfectly, while it moves back and forth while trying to stand still. That's because when standing still, it constantly moves back and forth across the backlash. While turning, it's always on one side of the backlash.

Laurens

C Ronaldo REPLY

November 23, 2018 at 6:32 am

I'm C Ronado!

ethan tran REPLY

July 28, 2014 at 5:41 pm

Can you use the dexter industries gyroscope sensor for the balanc3r?

Laurens REPLY

July 28, 2014 at 8:08 pm

leo

REPLY

May 16, 2016 at 5:47 am

Hello,guys! Valk,Can you add a sound sensor?

Ben

REPLY

September 3, 2014 at 4:32 pm

Hello Laurens,
I'm sorry that I posted this comment here but it wouldn't work on the other page. I bought your book on my kindle but I saw the BRICK SORT3R so I put in the password in figure 15-9 and it didn't do anything when I submitted it just looked liked it refreshed the page. Am I doing any thing wrong?

sorry for posting on this page it was one of the pages that didn't have passwords on it,

B-D

Javier

REPLY

February 14, 2016 at 1:16 pm

awesome!)

Arafat Qureshi

REPLY

October 2, 2014 at 2:07 pm

Hello Laurens,

Great site and book. I will order that. I am taking and advanced Robotics course this fall and we will be using EV3. But a lot of advanced programming will be in leJOS. Do you have a book recommendation for leJOS programming?

Thank you and keep up the great work.
Best wishes

Irvin Stafford

REPLY

October 15, 2014 at 7:38 pm

Laurens,

I have used and enjoyed your EV3 book very much.
The Balanc3r ‘bot is fantastic!

I added an Arduino UNO, Emic2 text to speech module, EasyVR voice recognition module, Bluetooth module, Pixy CMUcam5 video camera, and a FrSky RC receiver to my Balanc3r ‘bot that I call Wilber.

5) RC control
6) Video control

The basic idea is to convert all the control sources to 'speed' and 'steering' values.
I was able to get each control mode working on a breadboard but have not combined them.
The IR control and RC control are working now.
I used Dexter Industries I2C block to communicate between the EV3 and the Arduino.
Here is a short movie of Wilber under IR control.
https://www.youtube.com/watch?v=DiGyeV759JE

Again, thanks for creating such a great platform!

Irv Stafford

Laurens REPLY

January 11, 2015 at 3:28 pm

Hi Irv,

Thanks a lot for your comment. Sorry I didn't see it before—I have to manually review any comment with a URL in it to reduce spam.

Glad to hear you liked the book. The extended Segway project with sound is impressive, nice work!

mike

REPLY

October 18, 2014 at 11:11 pm

hi, i have the gyro from mindsensors
http://www.mindsensors.com/index.php?module=pagemaster&PAGE_user_op=view_page&PAGE_id=158
can you give me any pointers on how to use this sensor in your program please.?
thanks in advance.
mike

Jay

REPLY

October 23, 2014 at 9:06 pm

Can you post the programing using absolute-IMU?

Summer

REPLY

November 23, 2018 at 6:34 am

Of course!
I can’t!

Peter

REPLY

instructions and the ev3 programm, THATS REALY WORK!

Laurens REPLY

October 26, 2014 at 8:31 pm

Good job 🙂

Peter REPLY

October 31, 2014 at 10:01 pm

Hey laurens peter here!
I need a challange to build an robot, why an DUCKS3GWAY or a realy fast car
Or… Can jou reply and write it?ok. HAPPY HALLOWEEN!!!!

Peter REPLY

November 1, 2014 at 10:22 pm

Laurens hello do you reply??

Laurens REPLY

November 21, 2014 at 8:53 pm

Aubrey Johnson

REPLY

January 4, 2015 at 7:22 pm

Laurens,
Enjoying your excellent book received as Xmas gift.
Have you published any new build instructions as I've completed just about everything out there, but just not creative on my own at 78, ha.

Laurens

REPLY

January 4, 2015 at 7:49 pm

Hi Aubrey,

Thanks for your feedback!

You can also build all 12 bonus projects in the LEGO software under the "more robots" tab. I designed the RAC3 Truck.

And then there are the 150+ challenges in my book 🙂

Best,

Laurens

hanahwk

REPLY

February 10, 2015 at 7:44 pm

ha
ggggggggggggaaaaaaaaaaaaaaaaaaaaaaaa
ayyyyyyyyyyyyyyyyyyyyy

Catz

REPLY

April 1, 2015 at 11:14 pm

my robot doesn't move. any help?

Thanks

bluhhhhh

REPLY

April 2, 2015 at 9:56 pm

hcdbc xhzcchadwet
qyfehw4brsdncxfgwq7asufhbcewuysr you are
duhhhhhhhhhhh and bluuuuhhhhhhhhhh code
for……..

Ysiasia

REPLY

May 29, 2015 at 12:05 pm

Daniel Piquée

REPLY

October 29, 2015 at 9:04 am

really congratulations for this wonderful project
I would like to operate under Lejos
Is there a java version of this program?
Thank you for your response

Alfredo

REPLY

January 7, 2016 at 7:32 am

Hi Laurens! thanks for sharing your designs! We have a EV3 #31313 Home Edition and just got the Educational Core and Expansion sets! Do you have any ideas on how to combine the three of them to build a BIG robot?? Thanks!!

Victor Del Castillo

REPLY

March 11, 2016 at 11:51 pm

El mio funciono de maravilla!!! Gracias, muy buen aporte para estudiar el programa.
VBDCC

Pereira Aderito

REPLY

April 27, 2016 at 1:51 pm

Robert

REPLY

May 16, 2016 at 10:35 am

Hi Laurens can you please help me my balenc3r does not work. It keeps spinning the wheels randomly.

Cadan

REPLY

June 14, 2016 at 11:54 pm

I had same issue at fist. My son would start it and the robot would spin out and get ERROR. I found I needed to do a lot of trial and error finding the balance point before starting program. if it was slightly off balance, I would get the ERROR. Stick with it and really concentrate on keeping it balanced before pressing start. And hold the robot as lightly as possible. Sometimes having two people helps. One person lightly balances the robot using two hands, and when they find the balance point they tell the other person to press start. that often helped us. Also be sure the cables are all plugged into the proper ports. just a few things that worked for me.

hope that helps.

June 4, 2016 at 7:13 pm

como??????????????????????…
la gravedad?

Cadan

REPLY

June 14, 2016 at 11:31 pm

Ok, so far very cool program. I built the Balanc3r. I can get it to balance in place, however when I run Balanc3r Remote Control, it does not move. I have my remote selected to position 1, as in the program, and I click all the buttons but no response from the robot.
Any ideas, tips, suggestions??

Cadan

REPLY

June 14, 2016 at 11:47 pm

Nevermind…the instructions showed plugging infrared sensor into port 4, but the program showed port 3 for the remote control. I switched the cable into port 3 and it worked perfectly! Thanks!!

Also, as a tip, I found I needed to do a lot of trial and error finding the balance point before starting program. if it was slightly off balance, I would get the

Cadan

REPLY

June 14, 2016 at 11:53 pm

I had same issue at fist. My son would start it and the robot would spin out and get ERROR. I found I needed to do a lot of trial and error finding the balance point before starting program. if it was slightly off balance, I would get the ERROR. Stick with it and really concentrate on keeping it balanced before pressing start. And hold the robot as lightly as possible. Sometimes having two people helps. One person lightly balances the robot using two hands, and when they find the balance point they tell the other person to press start. that often helped us. Also be sure the cables are all plugged into the proper ports. just a few things that worked for me.

hope that helps.

Andrew

REPLY

May 3, 2017 at 2:21 am

Hey, guys. My BALANC3R is not working. I tried Cadan's troubleshooting tips, but it still did not work. I reset the gyro sensor and even checked that everything was done correctly. My robot is still not balancing. Whenever it tries to move it

Renos

REPLY

May 19, 2018 at 10:11 am

Hi Lauren,

Great project. Thank you for all instructions. Everything is working fine as long the robot is “balancing” before program starts.
I have a question: I replaced remote controlled part with one that follows the beacon. Tried a lot but always robot falls (Beacon following program alone works fine).
Any ideas what might be wrong?
Thank you for your time

Elle R.

REPLY

March 13, 2019 at 3:43 pm

Hello!

Great code! I have been spending a bit of time reverse-engineering it!
I am currently trying to code a version of the BALANC3R which is a spin-off from this one.
The point of my code is to be more compact and simpler, only saving the essential components that cause it to balance.
Near the end of the code, there is a “Wait” My Block, and without this My Block, your code

explaining what this My Block does, why you chose this particular dt, and where/what timer 8 is, along with any other relevant information?

Thank you so much!

Nikhil Ilango REPLY

April 30, 2019 at 1:03 pm

Thank you very very much. It was always my dream to build it 🙂

Maximus Marchi REPLY

August 21, 2019 at 4:15 pm

Every time I run the program, it says ERROR on the screen. Please help

Nick Lane REPLY

September 21, 2019 at 1:22 pm

Great job! it works awesome. Thanks.
Nick

daughter's to say the truth). The problem is that after some project of your book (line follower etc…) i'am trying with balance gyroboy. This one is a very hard work for me, although i have now a lot of free time to spend (for the COVID19) i can't understand the program so much. OK Laurens but what about a video tutorial for this program? (or a book :-). Thank u from Italy

LEAVE A REPLY

Comment*

Name*

Email*

Website

Save my name, email, and website in this browser for the next time I comment.