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# Embedded System Design

## Tracebot Introduction

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Hanyang University



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# Contents

1. Trace-bot Assembly
2. Setup Software Environment
3. Simple Test (optional)



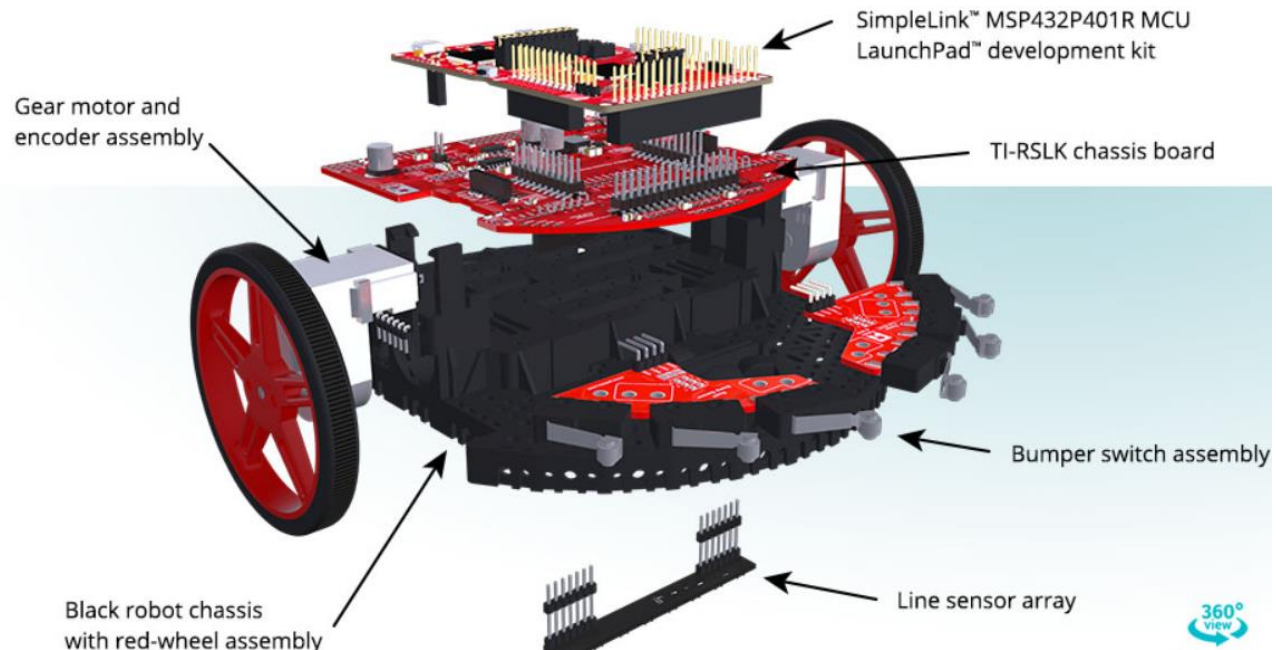
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# TRACE-BOT ASSEMBLY



# Introducing the TI-RSLK

- TI-RSLK MAX
  - Conduct a maze search project with tracing bot
  - Detailed information can be found at the following [link](#)



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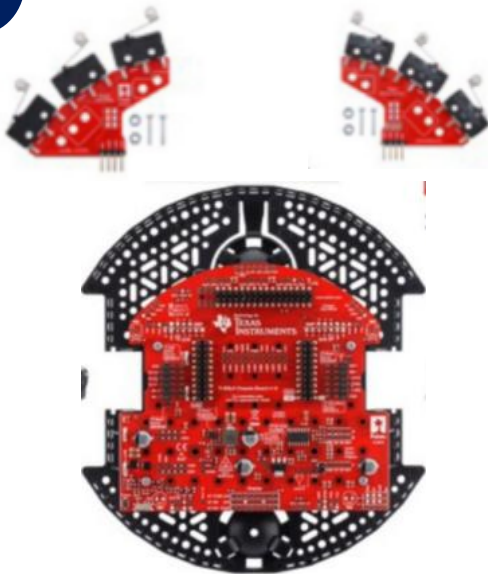
# Construction guide

- The following items will be needed to construct the TI-RSLK
- One Romi chassis plastic base plate (black) with the TI-RSLK chassis board and battery installed
  - One right and one left bumper assembly, along with four nuts and four 7/16th inch long bolts
  - One 8-channel QTR reflectance sensor array
  - Two Romi chassis motor clips
  - Two Romi gear motors with encoders
  - Two Romi wheels with tires
  - One Romi ball caster kit
  - One TI MSP432P401R LaunchPad development with the required headers (2x19 and 2x1) attached
  - You will need a Phillips head screwdriver(not included)

# Construction guide

- It is assembled in four steps

1



bumper switch boards

2



Motor clips & Tire wheel

3

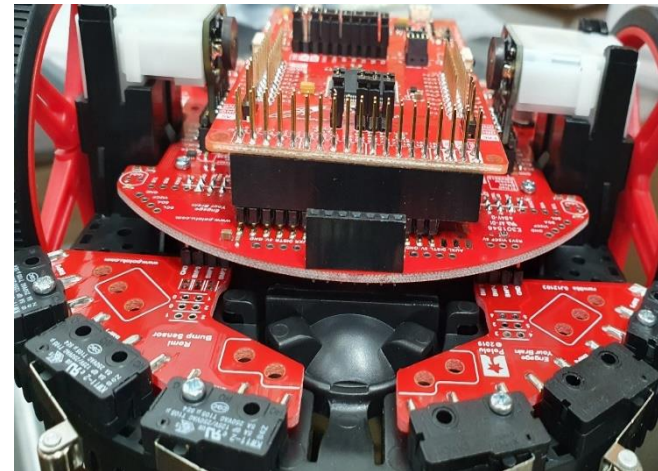
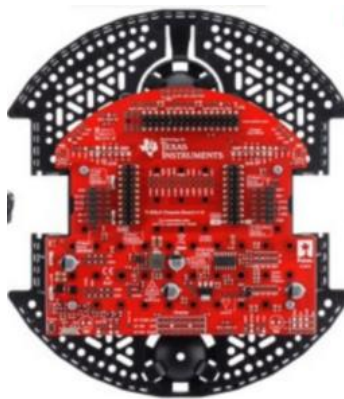


Ballcaster & sensor

# Construction guide

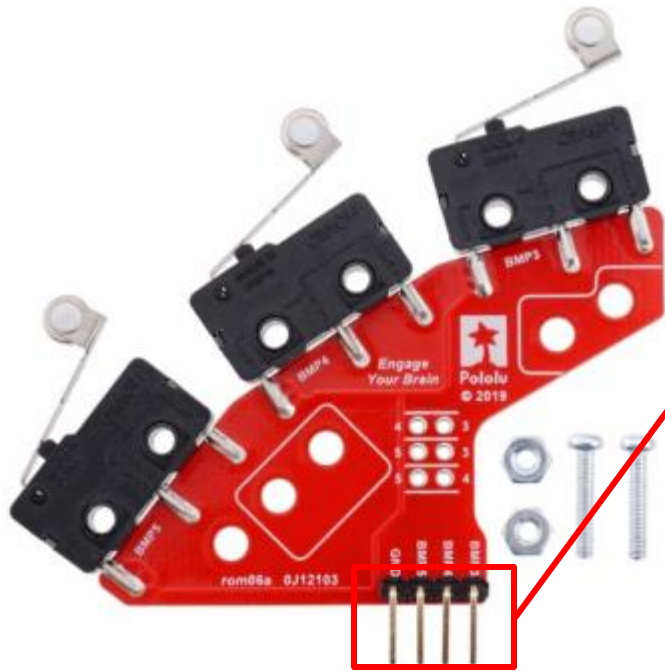
- It is assembled in four steps

4

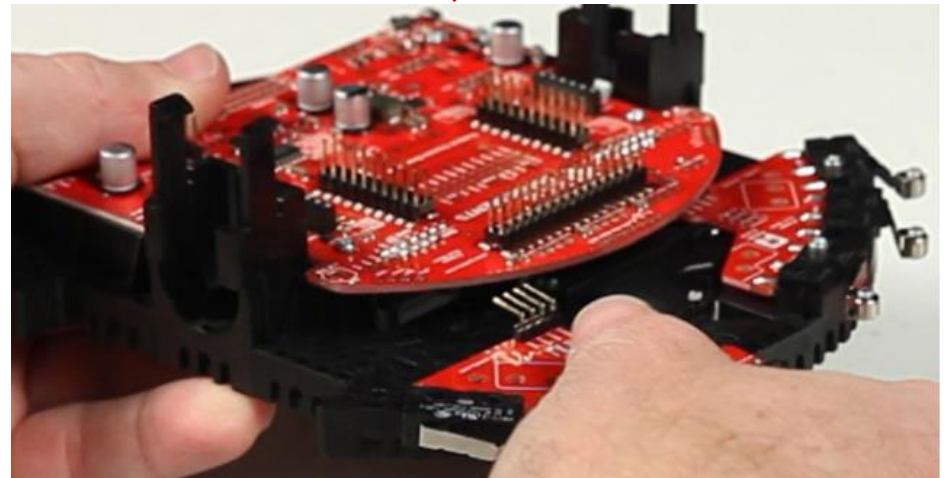


- Connect Launchboard

# 1. Two bumper & switch board



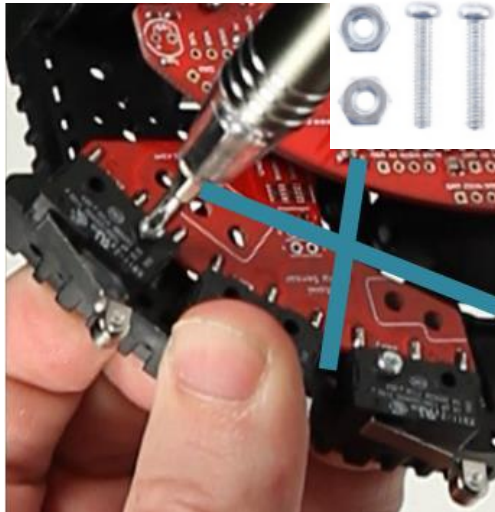
- Required parts to install the left and right bumper



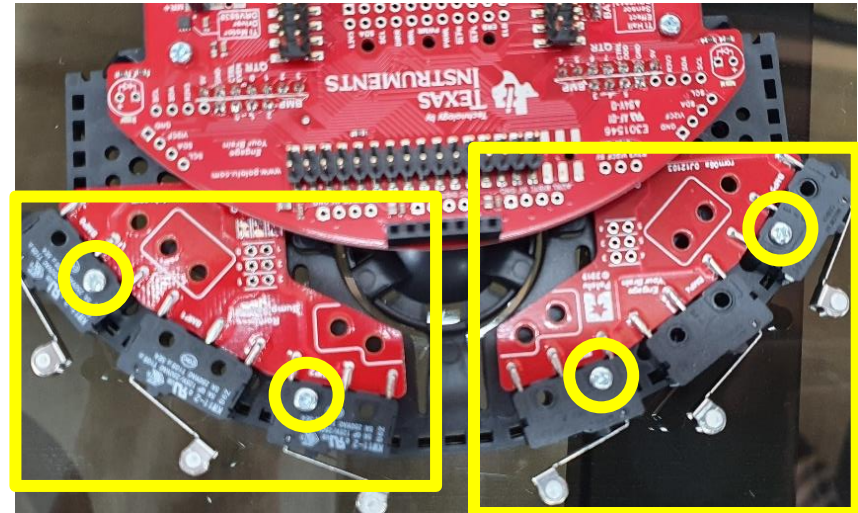
- Insertion of bumper switch board into female header



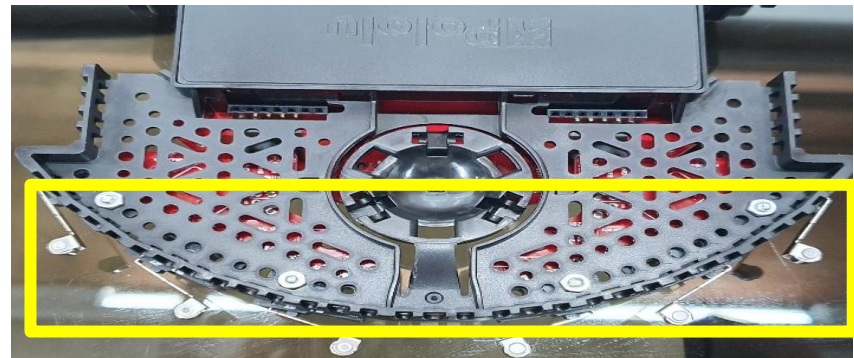
# 1. Two bumper & switch board



- Location of holes to secure the bumper switch boards

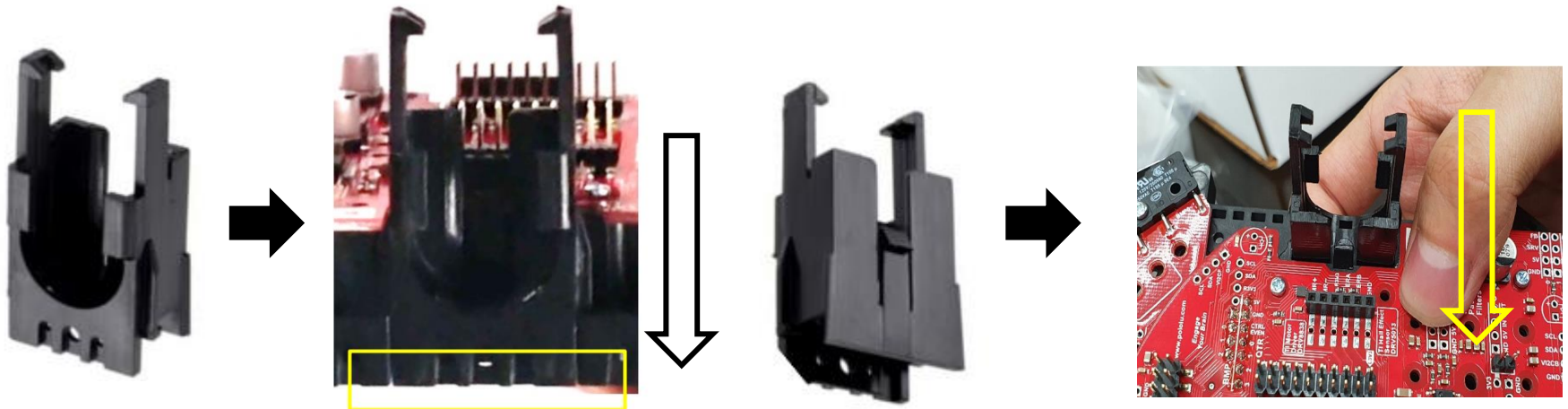


- Front with text
- Back with Blank



- Using the four bolts and nuts

## 2. Motor clips & Tire wheel

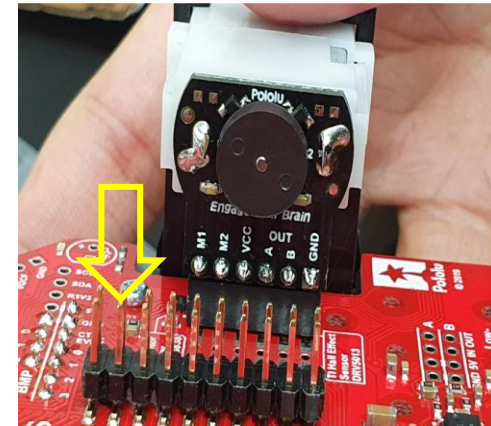
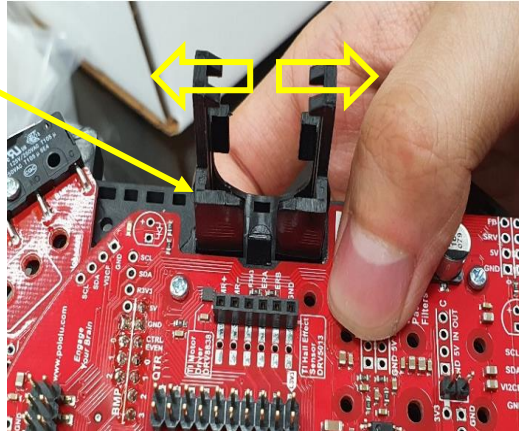


딸각!, click sound

- This step should be done **before inserting motors**
- With the motor clip aligned with the grooves as just instructed, push the motor clip all the way up into the plastic base plate
- **You may hear clicks** along the way, but it is not fully secured and correctly installed until the bottom of the motor clip is flush with the bottom of the plastic chassis plate
- Please **be careful risk breaking** this barb when you insert the motor.

## 2. Motor clips & Tire wheel

push it on both sides



- Ensure the motor is straight and pins are aligned before pressing down firmly



- Picture showing properly motor alignment and black plastic barbs holding the motors in place.

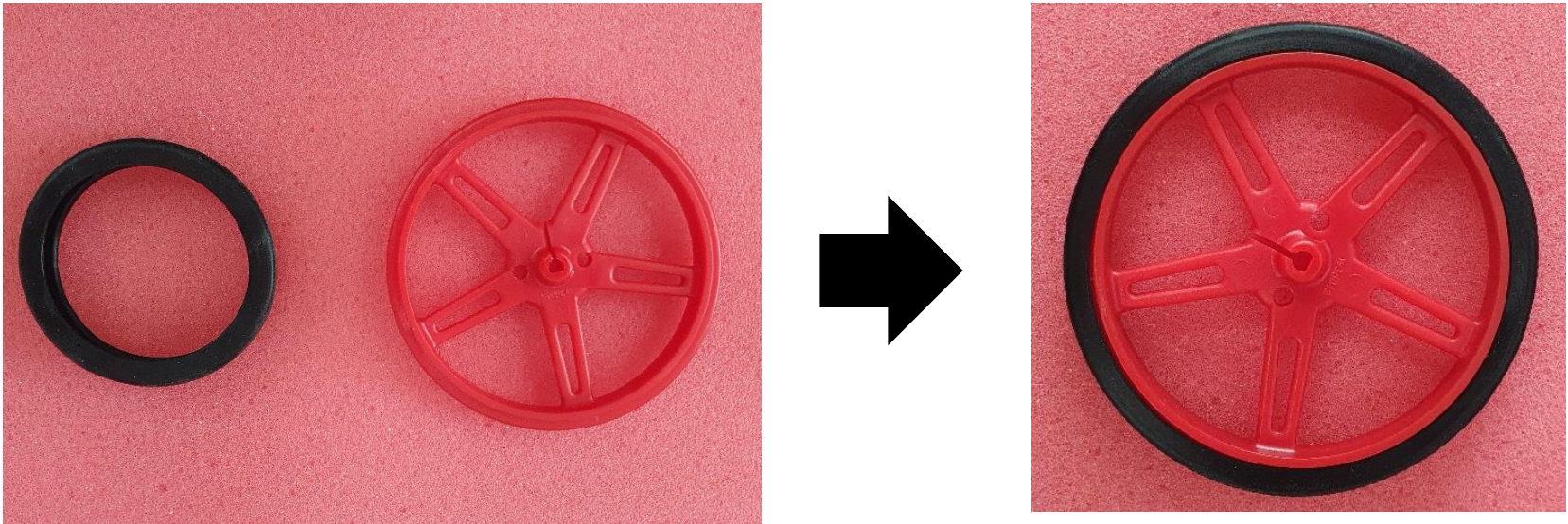
## 2. Motor clips & Tire wheel



- Picture showing properly motor alignment and black plastic barbs holding the motors in place.

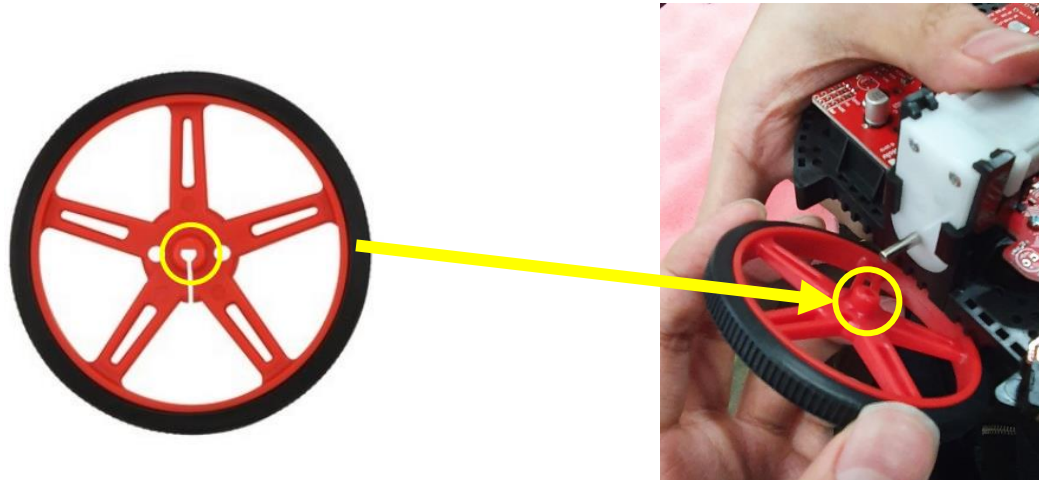


## 2. Motor clips & Tire wheel



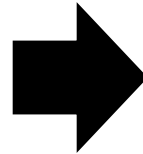
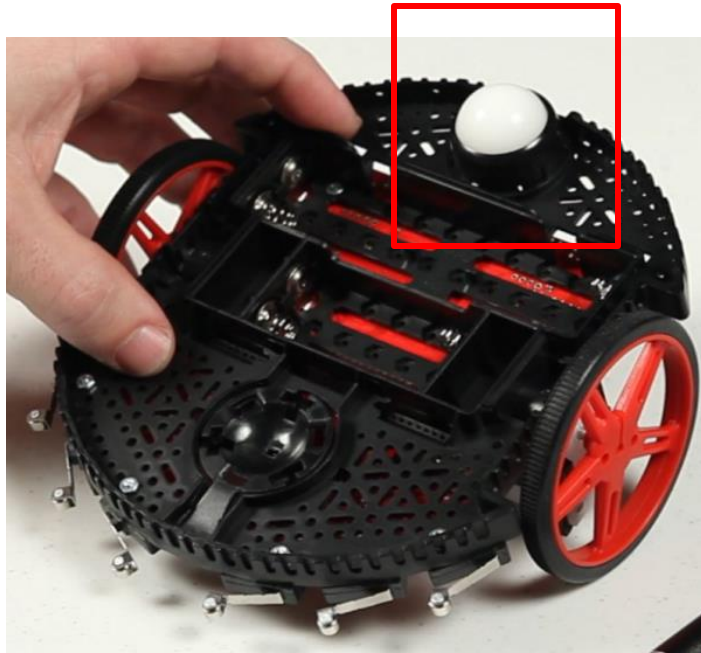
- Fit the round rubber to fit the Tire wheel

## 2. Motor clips & Tire wheel



- Tires properly installed onto the wheels. Notice the “D” shaped hole in the center of the wheel
- Applying force to insert the wheel onto the motor shaft

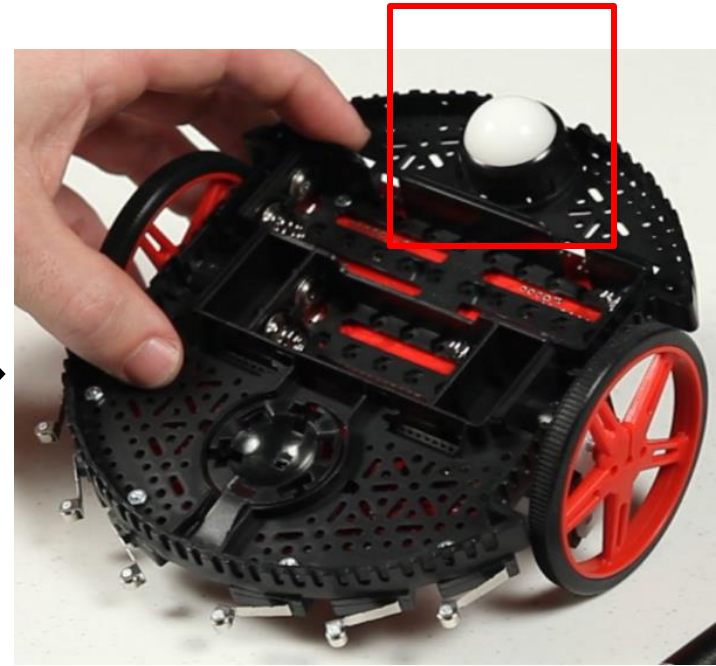
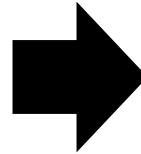
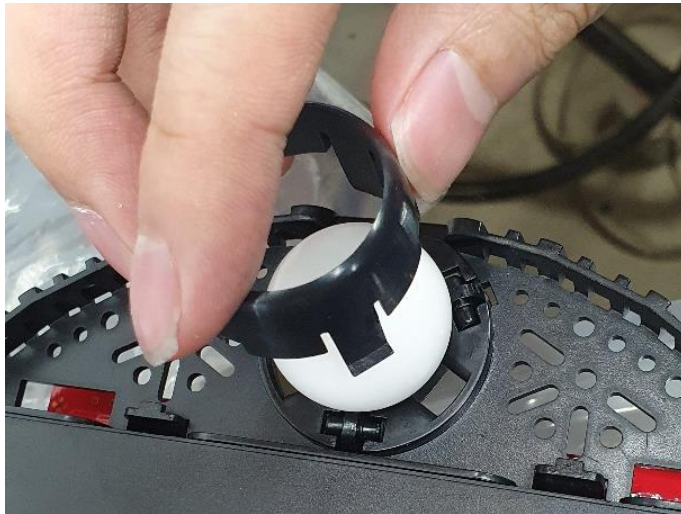
### 3. Ball caster & Sensor



- The three rollers will then be installed so that the shafts rest in the plastic grooves and the larger wheel portion of the rollers are free to spin



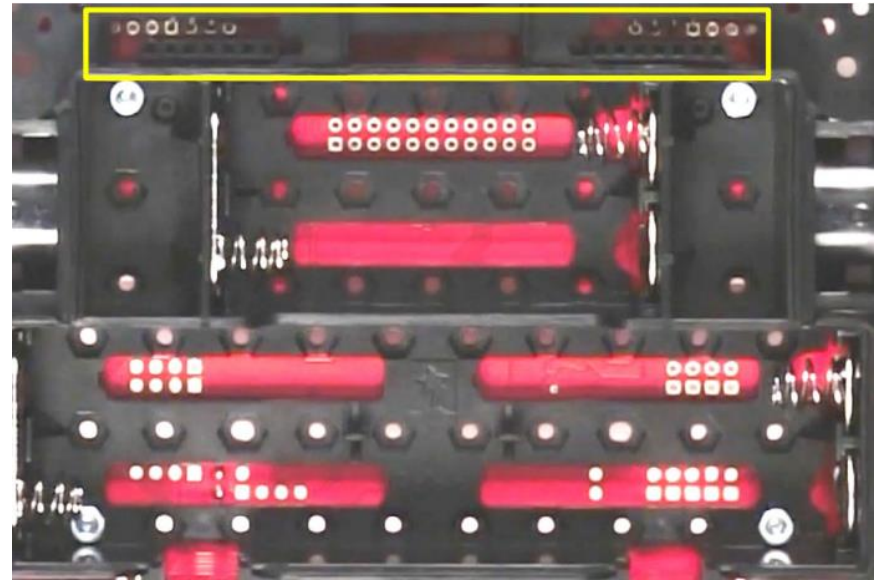
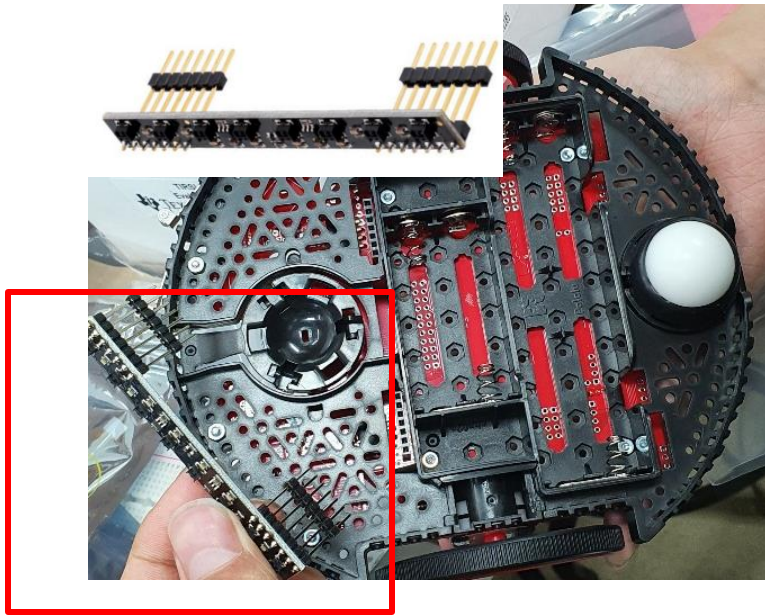
### 3. Ball caster & Sensor



- Proper location of ball caster

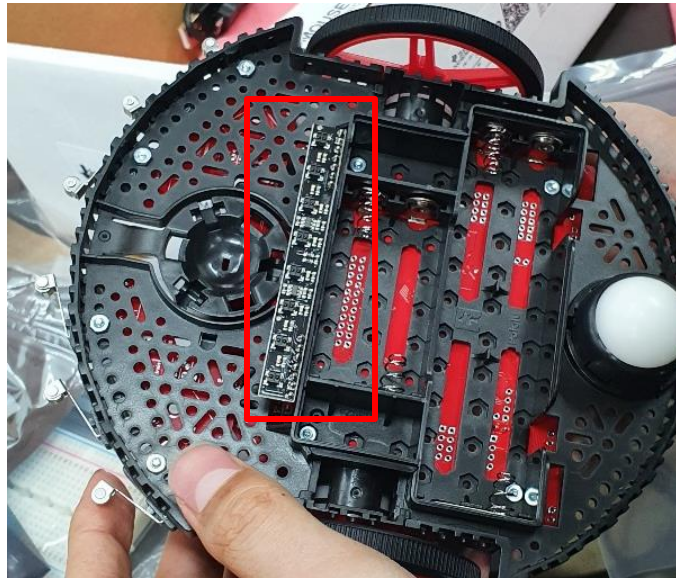


### 3. Ball caster & Sensor



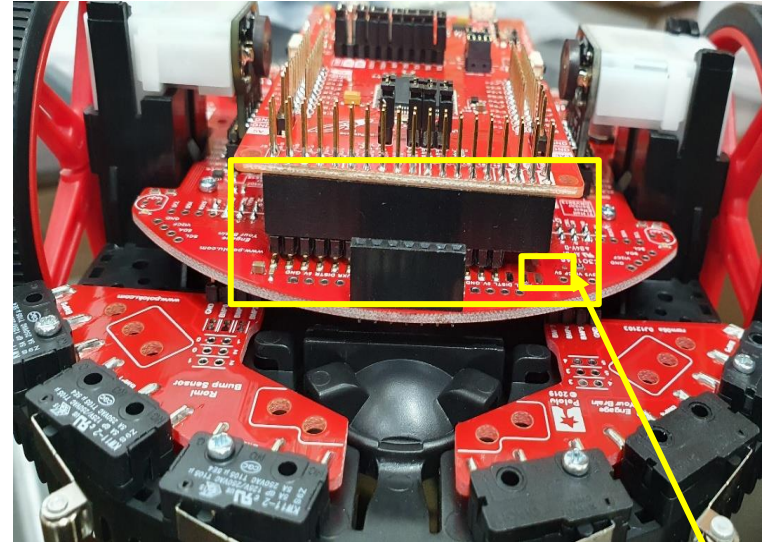
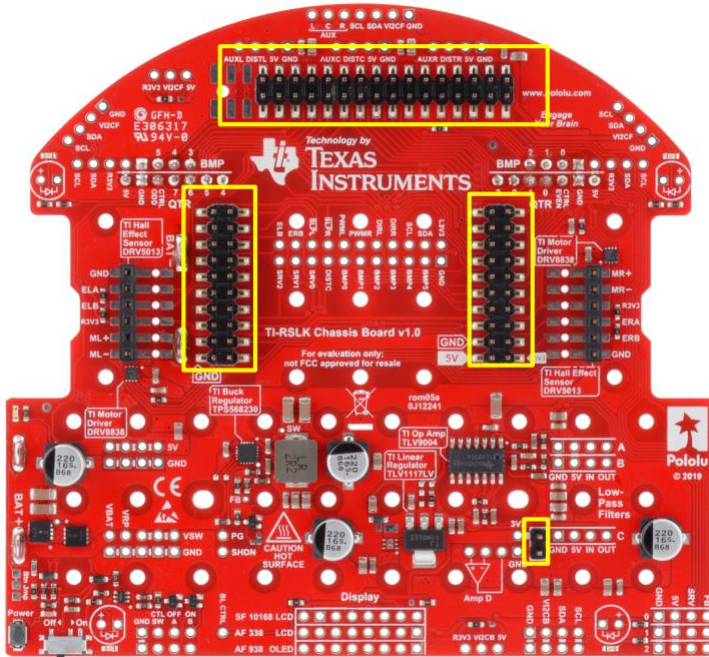
- To install the 8-channel QTRX line following sensor
- Location of two 1x7 female headers for the line following sensor

### 3. Ball caster & Sensor



- Insert the sensor with the largest part of the board facing the front of the robot

## 4. Connect LaunchPad



Empty!

- Carefully place and align the LaunchPad onto these header pins and press down evenly, being careful not to bend or break any of the header pins

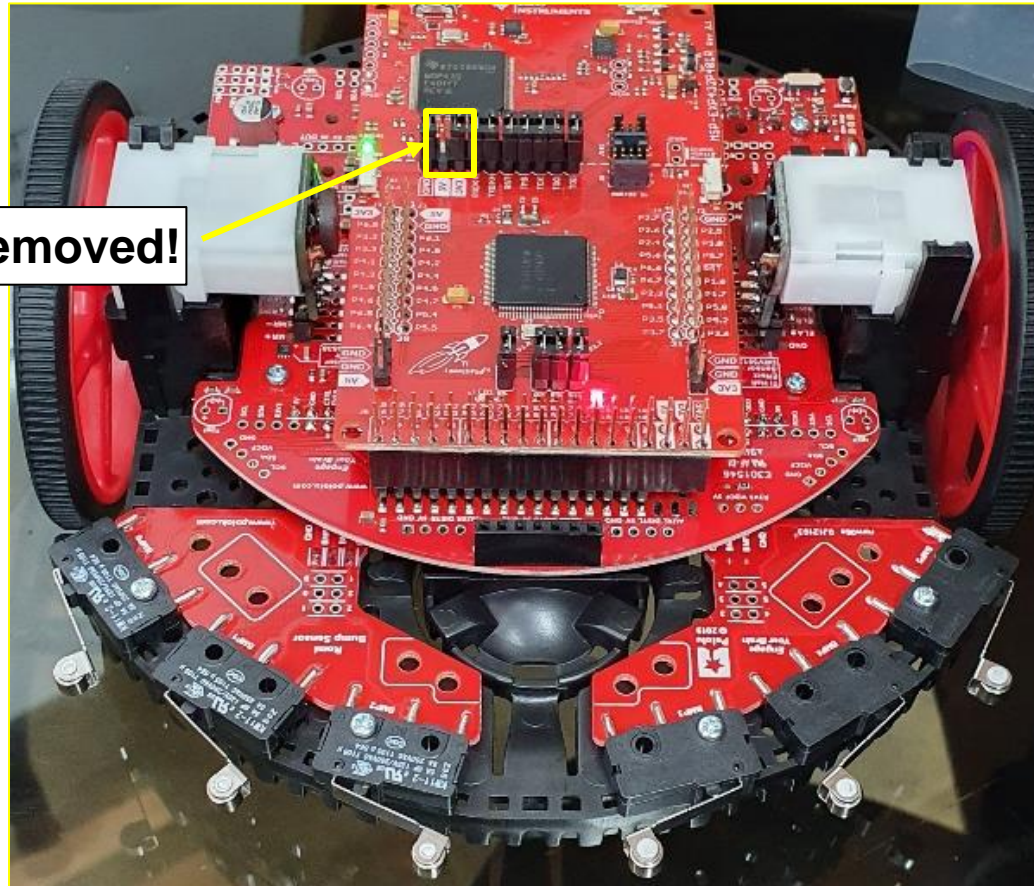


## 4. Connect LaunchPad



- The 5V jumper in the middle of the MSP432P401R LaunchPad must be removed before installing it onto the chassis board
- **You will damage the robot if this 5V jumper isn't removed**

## 4. Connect LaunchPad



5v jumper must removed!

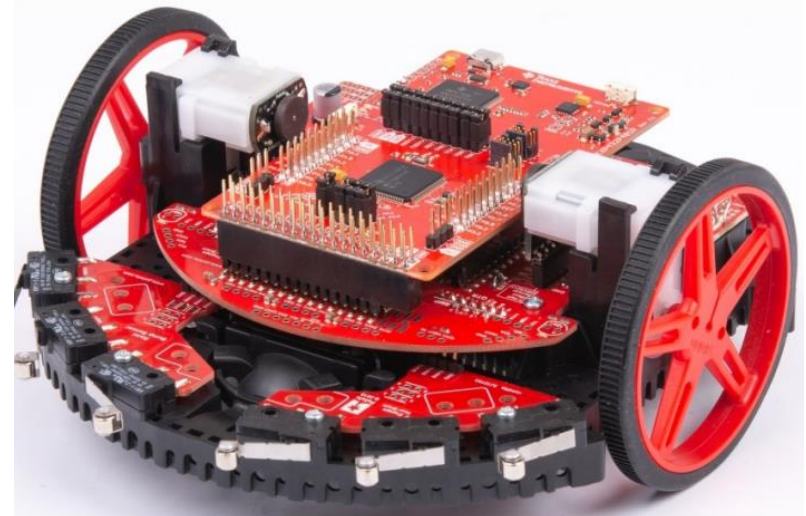
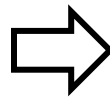
- The LaunchPad is now ready for use with the trace bot

## 4. LaunchPad installment

- If you want to disassembly guide, [Go to this TI-RSLK Instruction Link](#)
- When you're ready to power up the TI-RSLK Max for the first time, the last step will be to install six AA-sized batteries into the battery compartment



Install six AA-sized batteries



Finished assembling!

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# SETUP SOFTWARE ENVIRONMENT

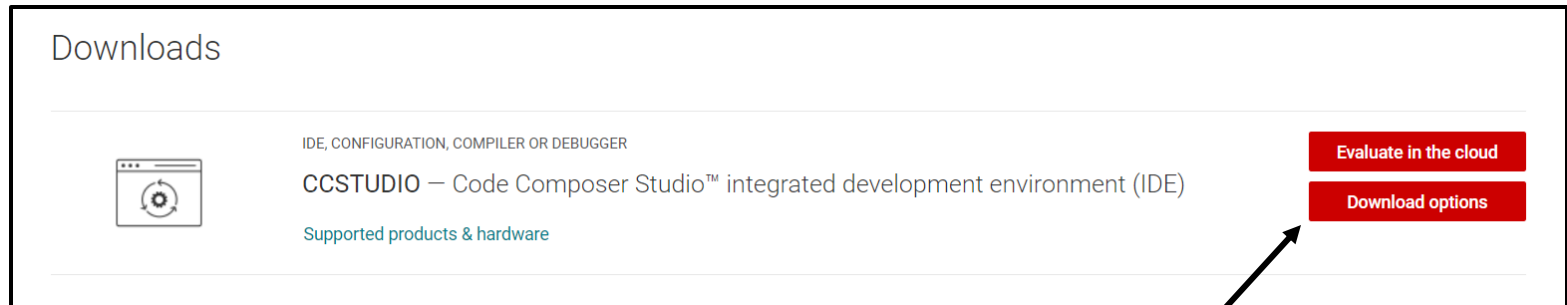


# Install CCSTUDIO

## 1. Download Installer

- Download CCSTUDIO Installer from the following link

[Download Installer](#)



Click "Download options"



# Install CCSTUDIO

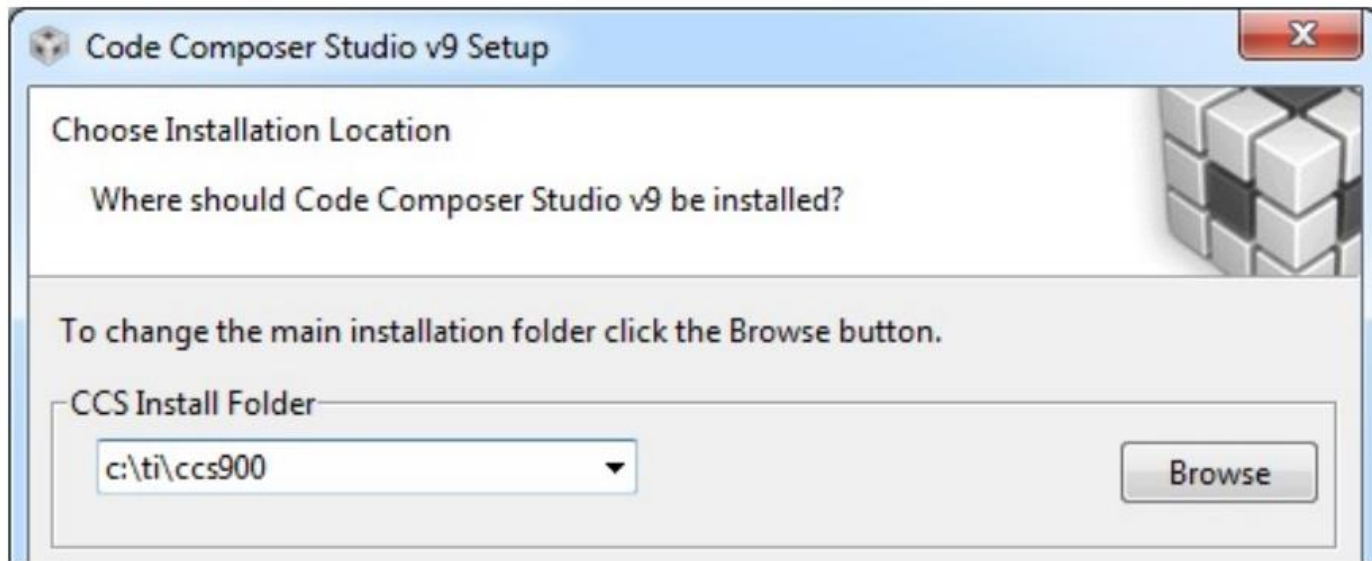
## 1. Download Installer

Downloads Supported products & hardware	
<a href="#">Windows single file installer for CCS IDE</a> — 1120166 K	Link to Windows single file (offline) installer for Code Composer Studio IDE (all features, devices) Checksum 6deb4932291be1f2c580cbb5806a0217
<a href="#">Linux single file installer for CCS IDE</a> — 1076114 K	Link to Linux single file (offline) installer for Code Composer Studio IDE (all features, devices) Checksum 3d0cc37fa0f96bccbb0ba6a182279a90
<a href="#">macOS single file installer for CCS IDE</a> — 1071622 K	Link to macOS single file (offline) installer for Code Composer Studio IDE (all features, devices) Checksum 4672847a34dee5e6a037fbae24320303
<a href="#">Windows on-demand installer for CCS IDE</a> — 39223 K	Link to Windows on-demand (web) installer for Code Composer Studio IDE (all features, devices) Checksum 3170911ae2c008cc601f2839616541c3
<a href="#">Linux on-demand installer for CCS IDE</a> — 24756 K	Link to Linux on-demand (web) installer for Code Composer Studio IDE (all features, devices) Checksum 7c9e92c5aa25e09e77eb2b2972db3edd
<a href="#">macOS on-demand installer for CCS IDE</a> — 34072 K	Link to macOS on-demand (web) installer for Code Composer Studio IDE (all features, devices) Checksum f2010685be1160a9c0fc5e7d47b97b82

both are fine

# Install CCSTUDIO

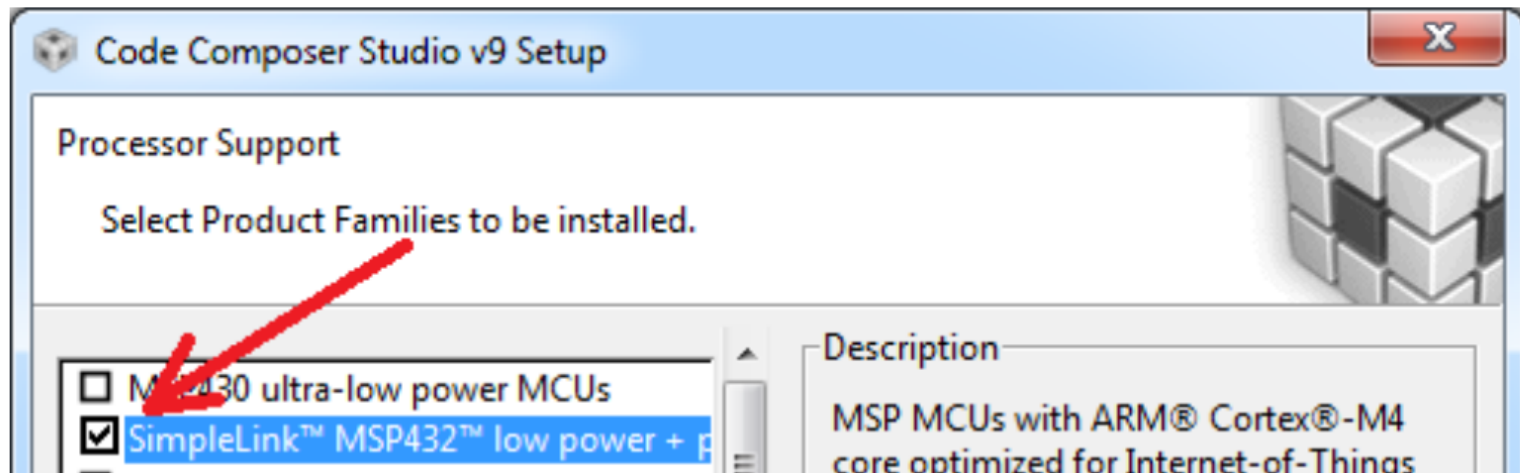
## 2. Run Installer



**Select CCSTUDIO Installation Path**

# Install CCSTUDIO

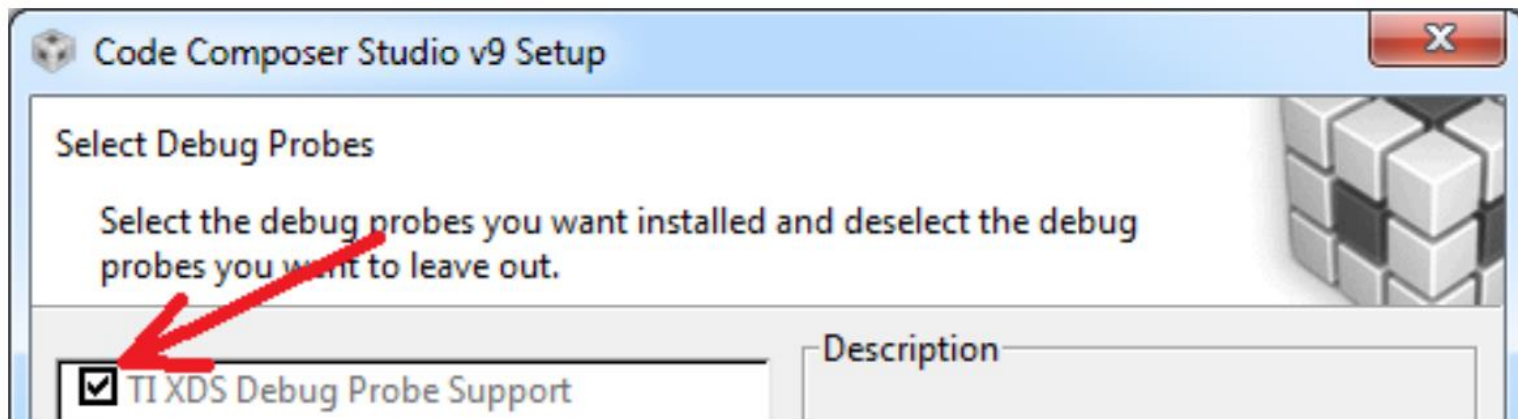
## 2. Run Installer



Select “SimpleLink™ MSP432™ ...”

# Install CCSTUDIO

## 2. Run Installer

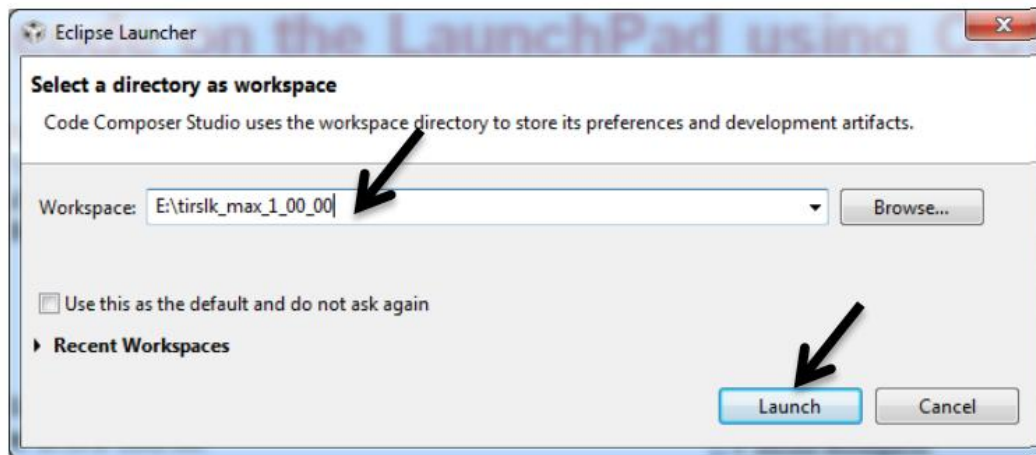


**Select “TI XDS Debug Probe Support”**

# Install CCSTUDIO

## 3. Import Workspace

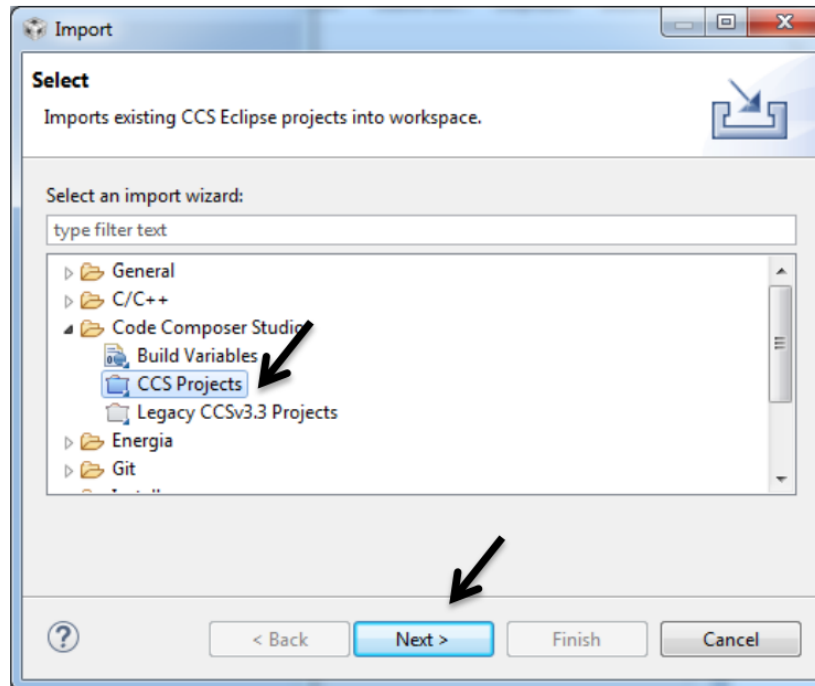
- Download tirlsk\_max workspace from the following link  
[Download Workspace](#)
- Start CCS. Select a previously unzipped workspace directory



# Install CCSTUDIO

## 3. Import Workspace

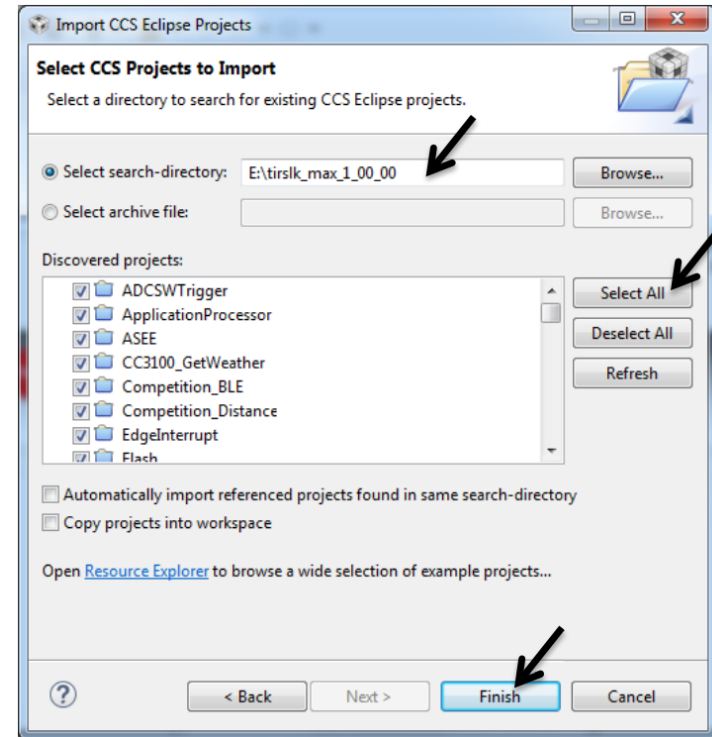
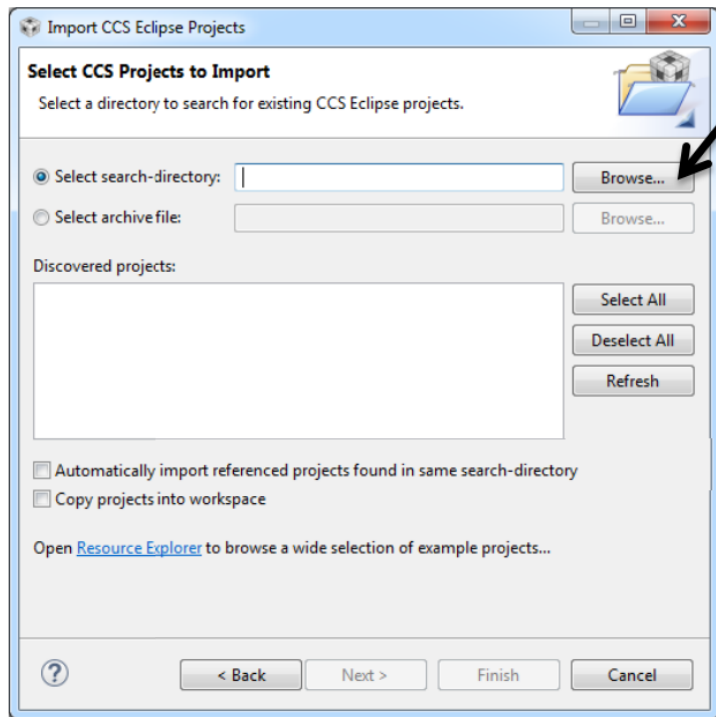
- Import all the projects into CCS  
From the Menu bar, click “File > Import ...”



# Install CCSTUDIO

## 3. Import Workspace

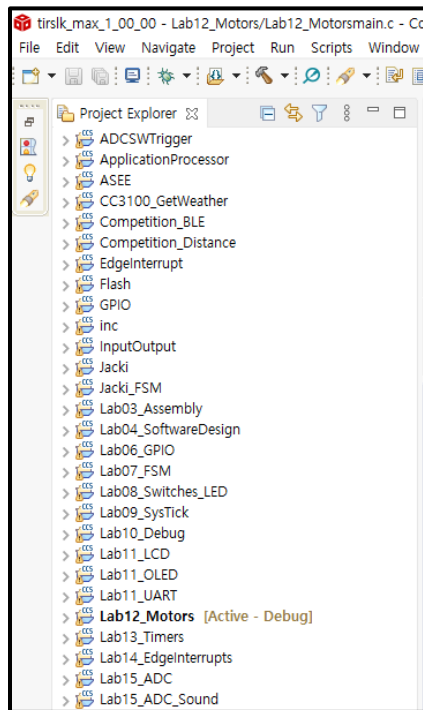
- Select search-directory and click the Browse... and find the unzipped “tirlsk\_max\_1\_00\_00” folder



# Install CCSTUDIO

## 3. Import Workspace

- You can see more than 40 projects are imported



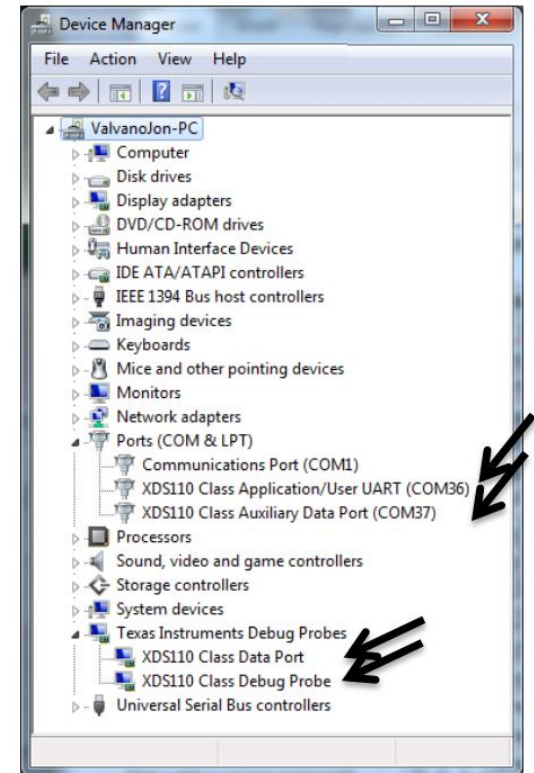


# Install CCSTUDIO

## 4. Installing OS drivers for the LaunchPad

- Plug the tirlsk into the PC using the USB cable  
OS will attempt to load drivers automatically

On Windows,  
there will be four drivers in the Device Manager



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# SIMPLE TEST



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# Simple Test (optional)

- You can check if the environment is correctly configured at the following [go to simple test](#)



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# Thank you

