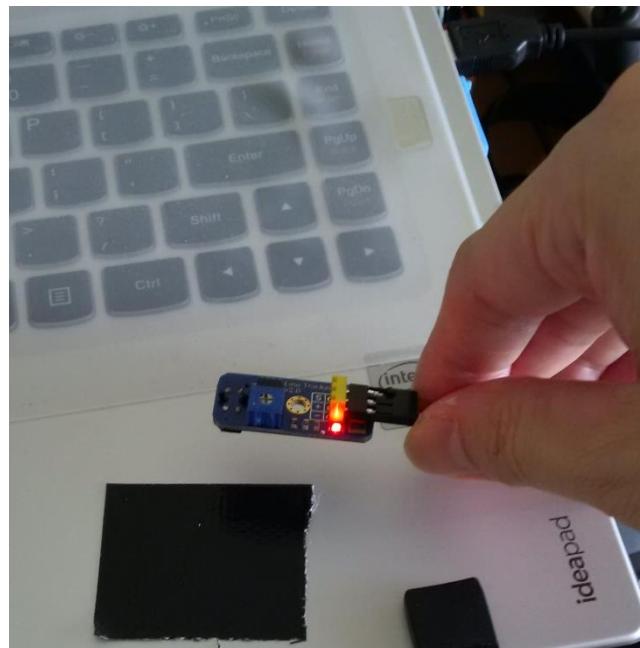


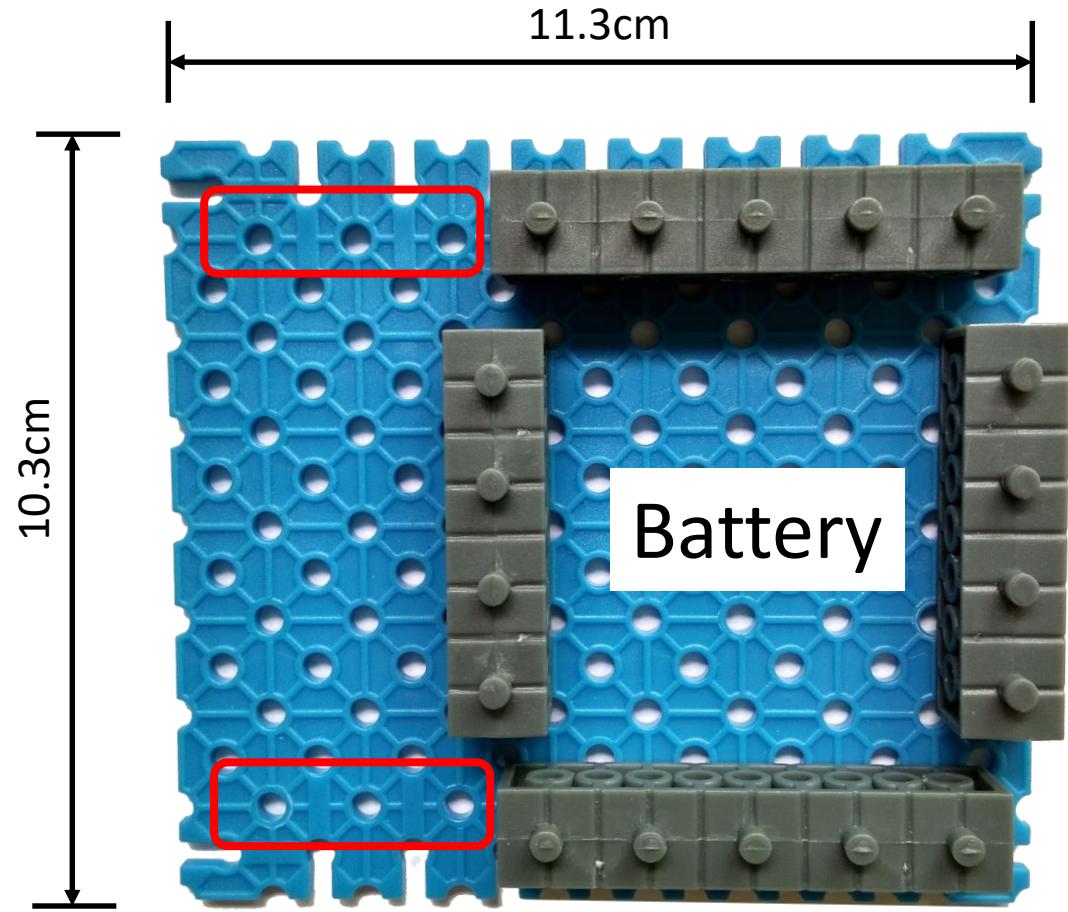
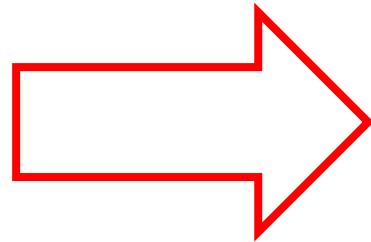
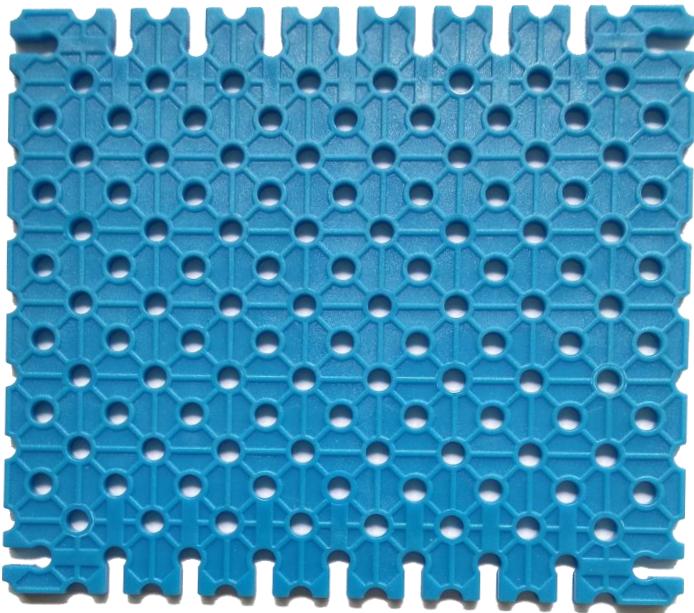
Line Tracing Sensor

- Must calibrate the Infrared Sensor
- When the IR is on the black surface (non reflective), the output is TRUE (1) - LED on IR sensor board is OFF
- When the IR is on a reflective surface, the output is FALSE (0) - LED on IR sensor board is ON

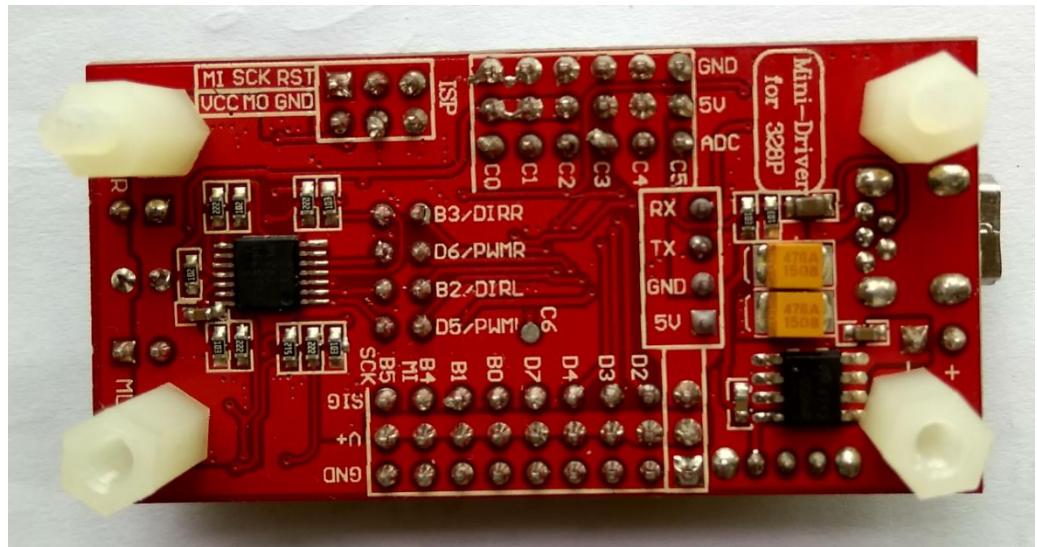
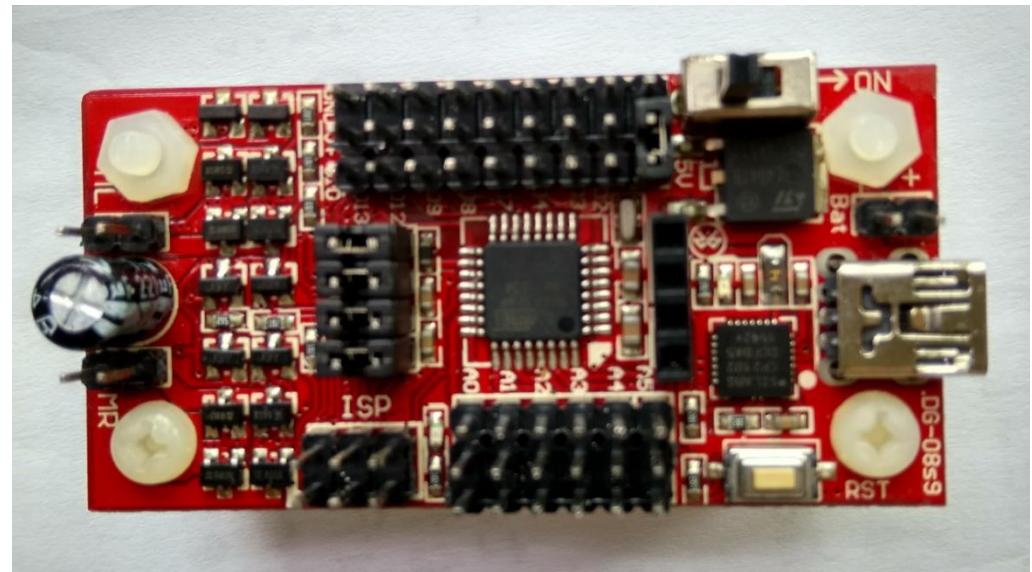
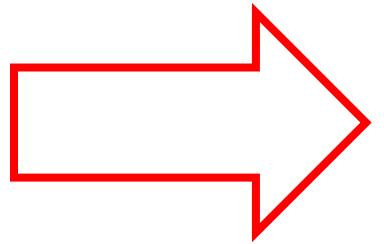
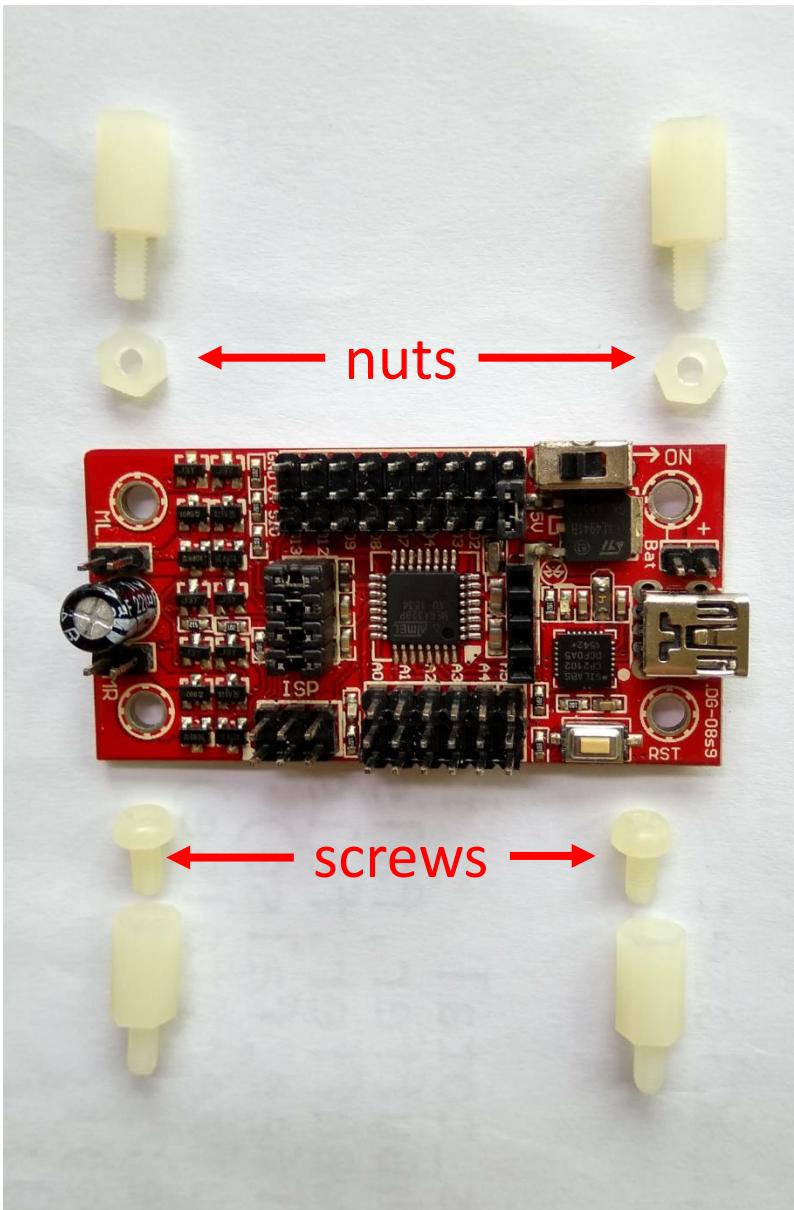
Black surface (non reflective)	LED (on board) OFF	1
White surface (reflective)	LED (on board) ON	0



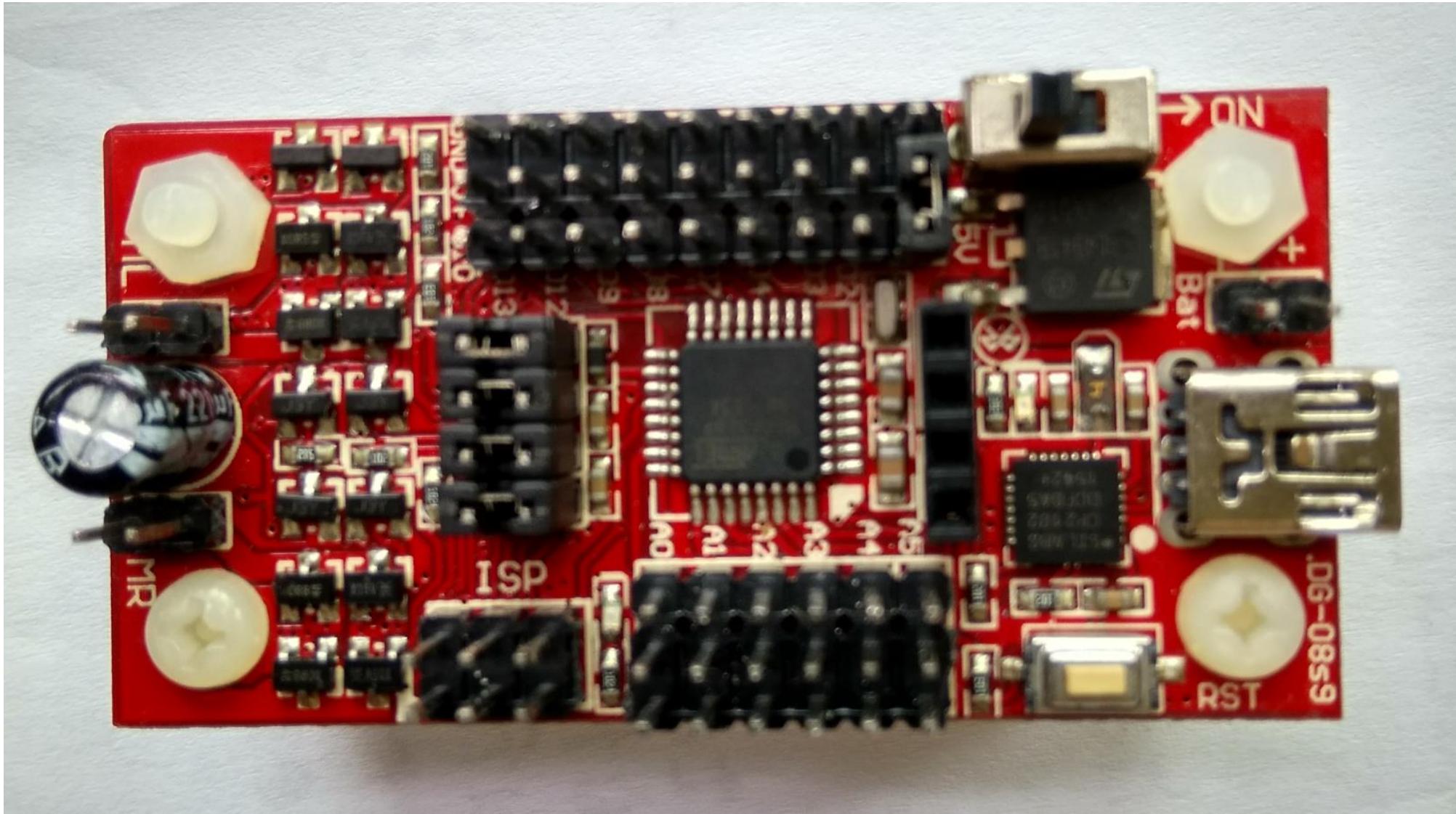
Smart Vehicle Construction – Base



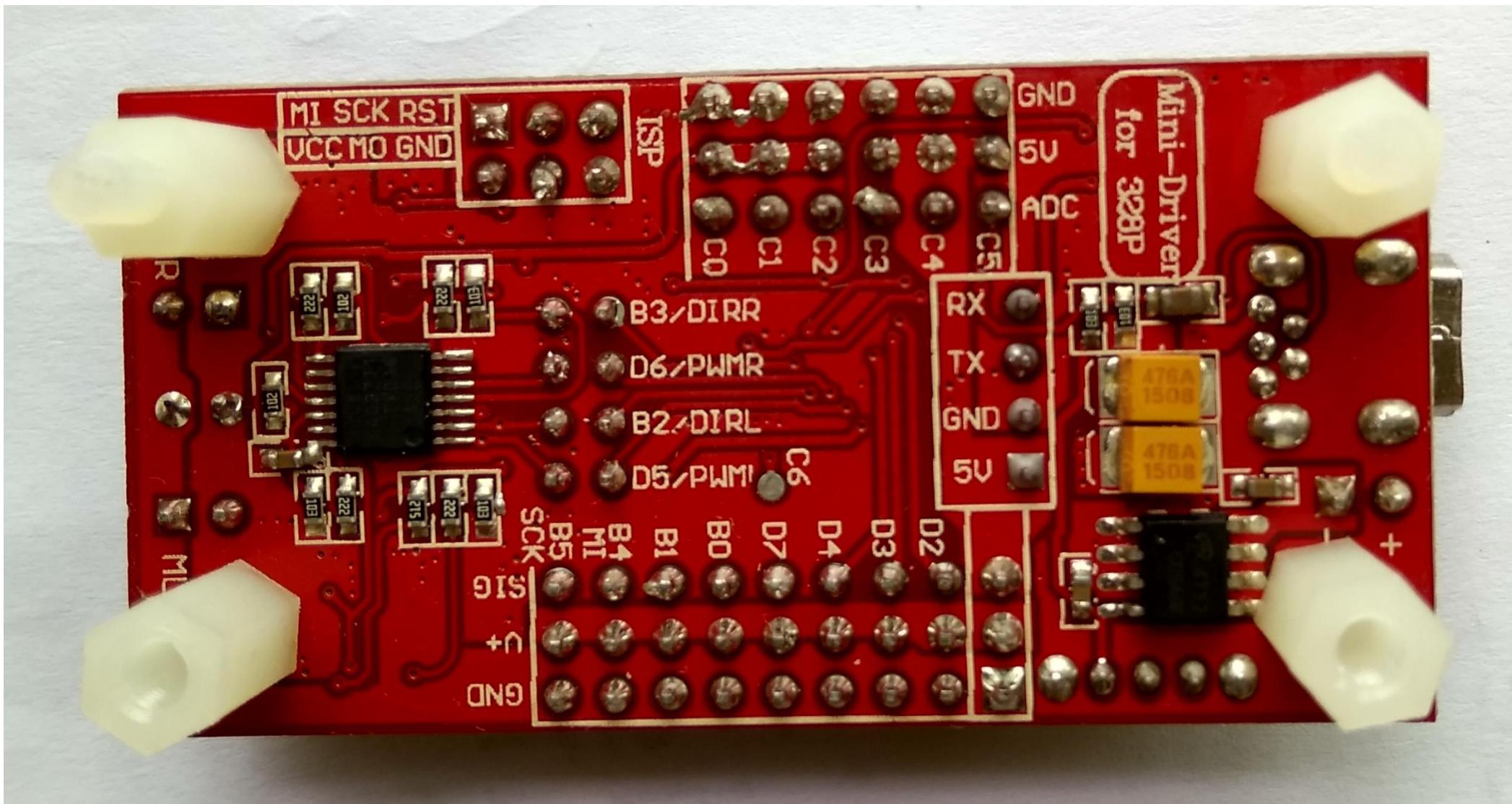
Vehicle Construction - Board



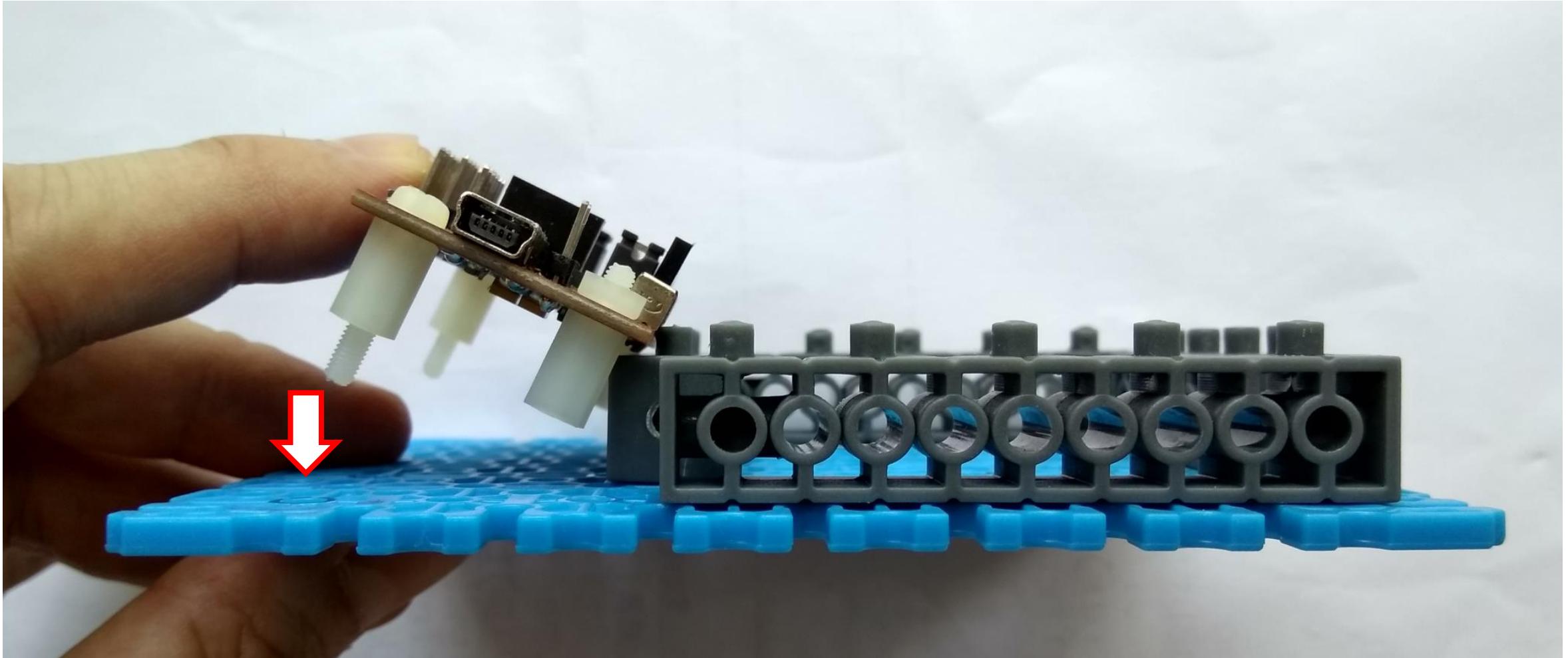
Vehicle Construction – Front of Arduino



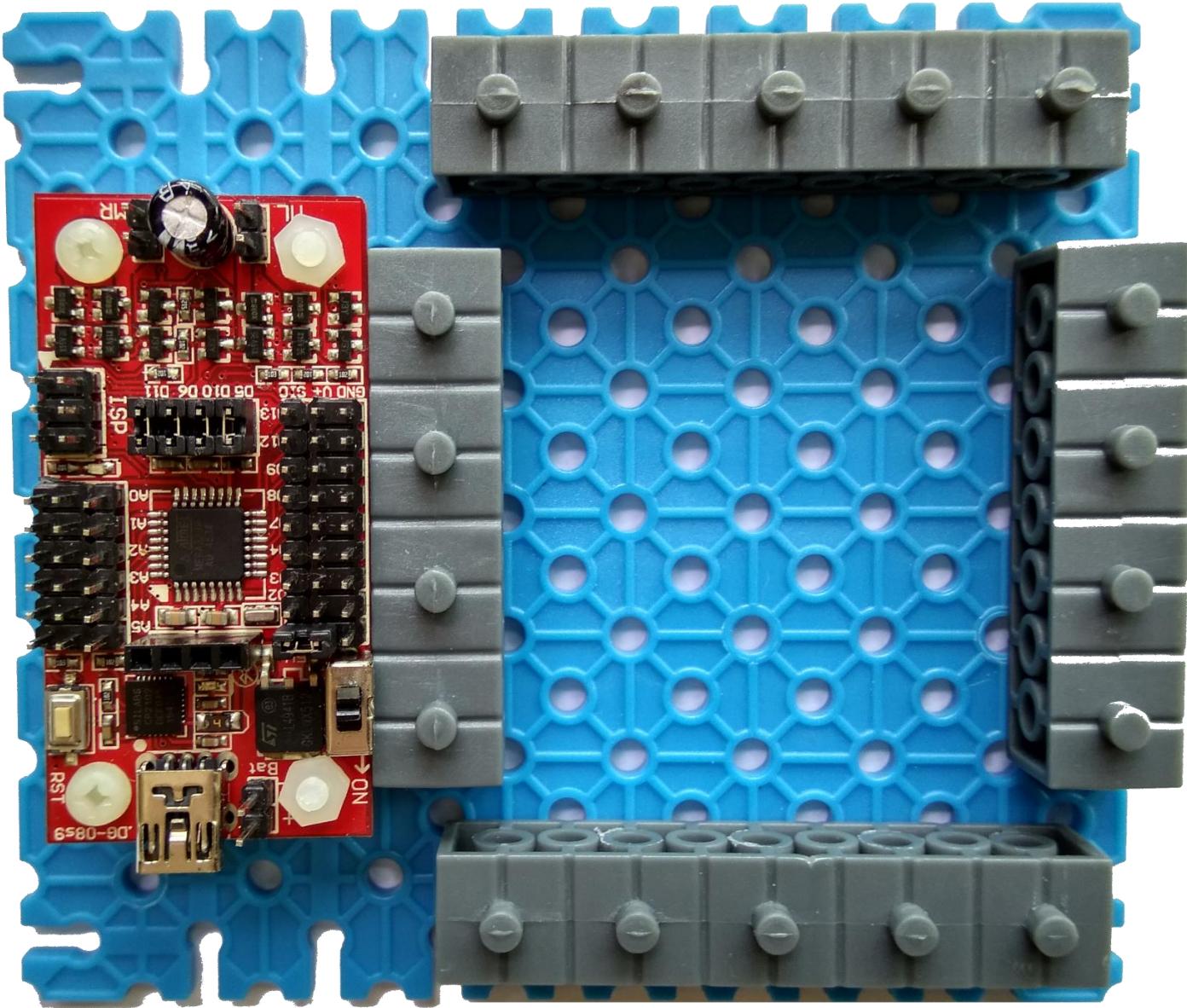
Vehicle Construction – Back of Arduino



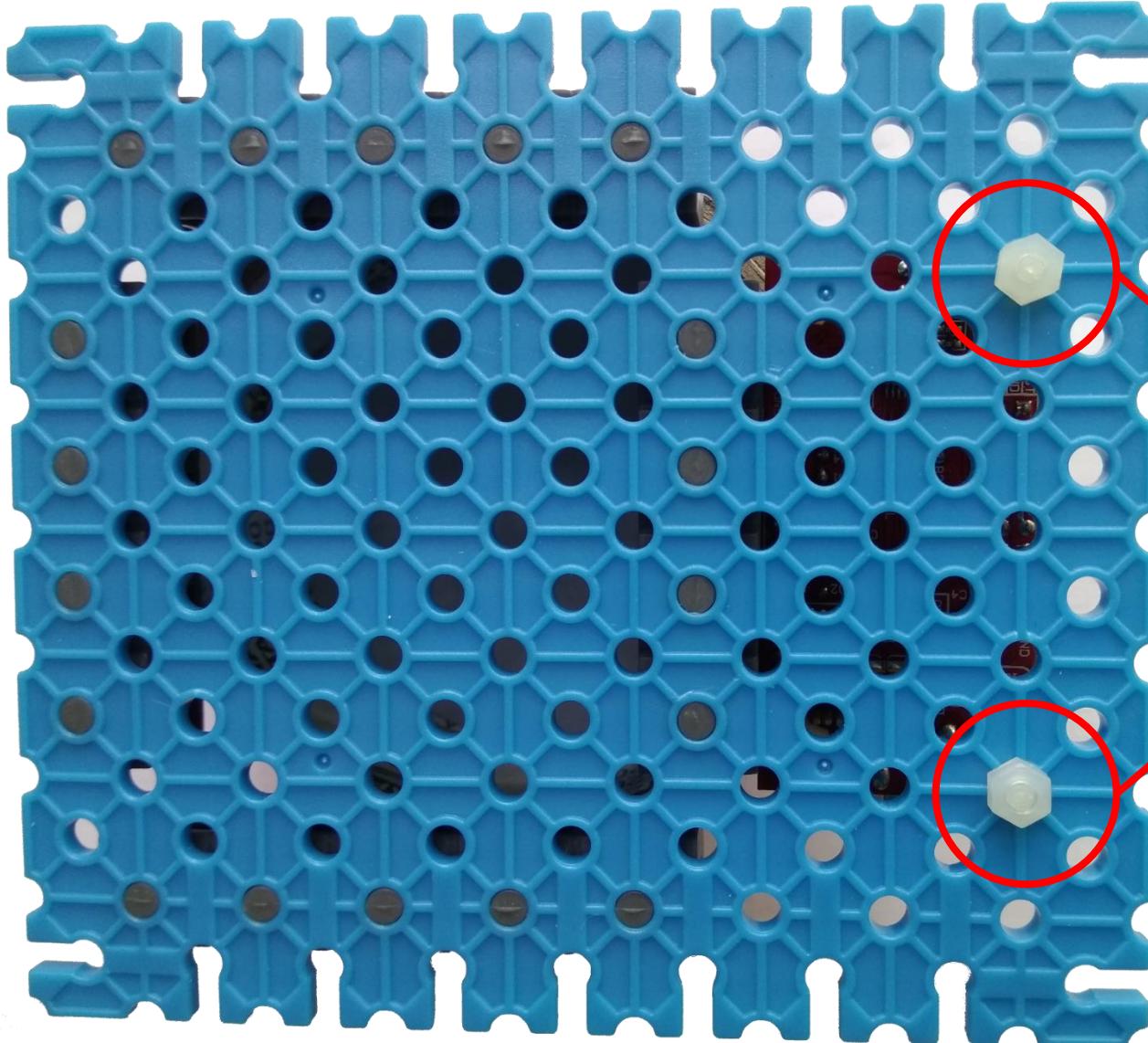
Vehicle Construction – Place Arduino to Base



Vehicle Construction – Front View



Vehicle Construction – Back View

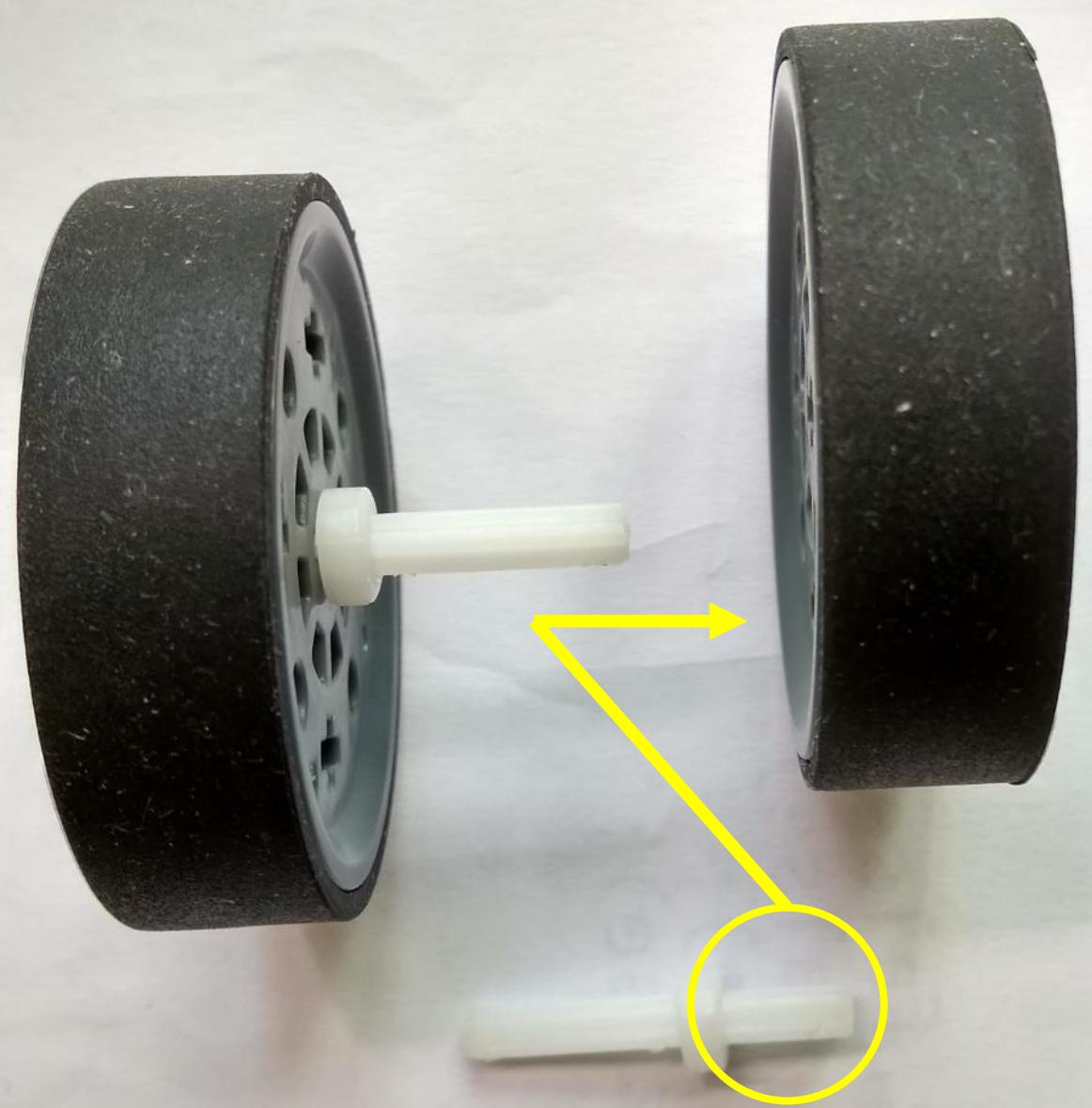


Use 2 plastic nuts to tighten the screws in order to secure the Arduino board

Vehicle Construction – Wheels & Motors

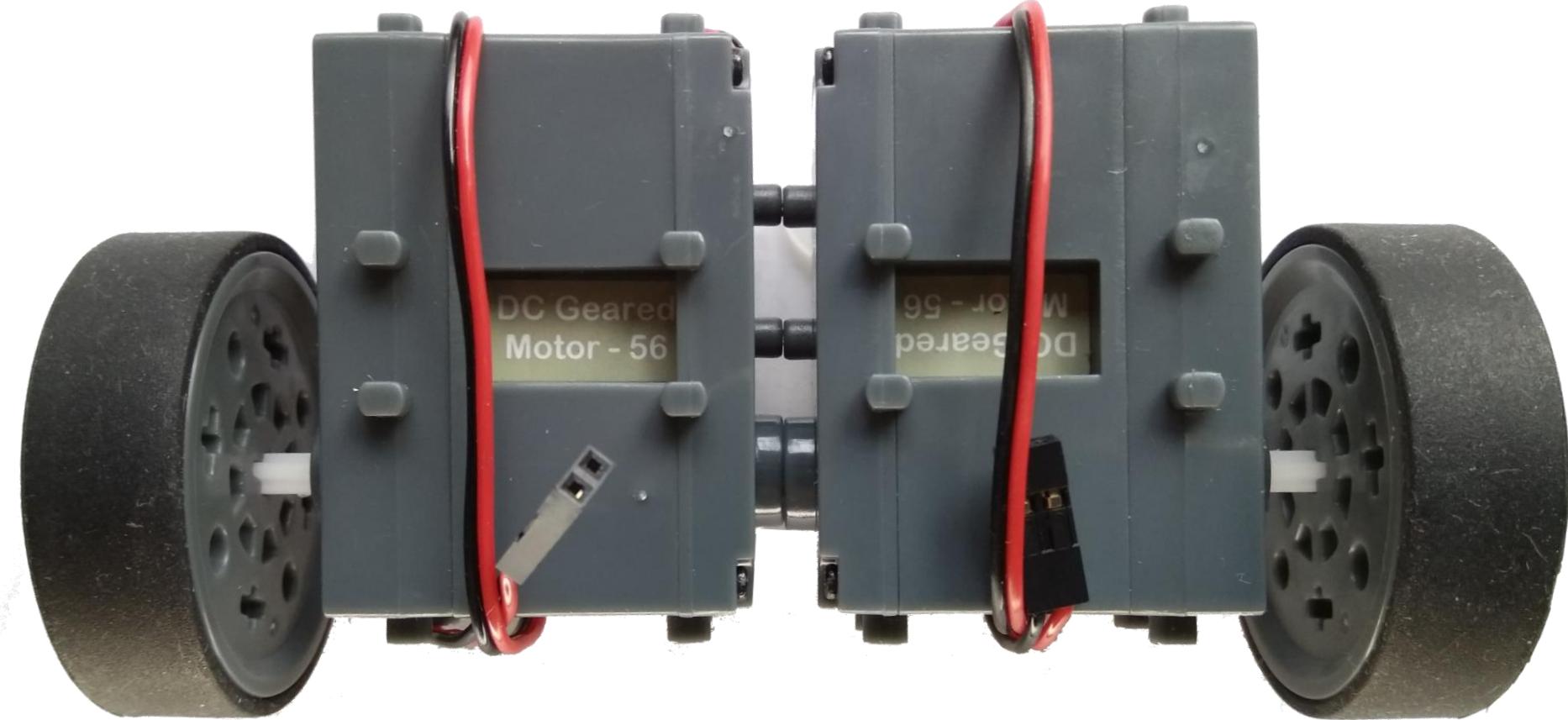


Vehicle Construction – Wheels & Motors



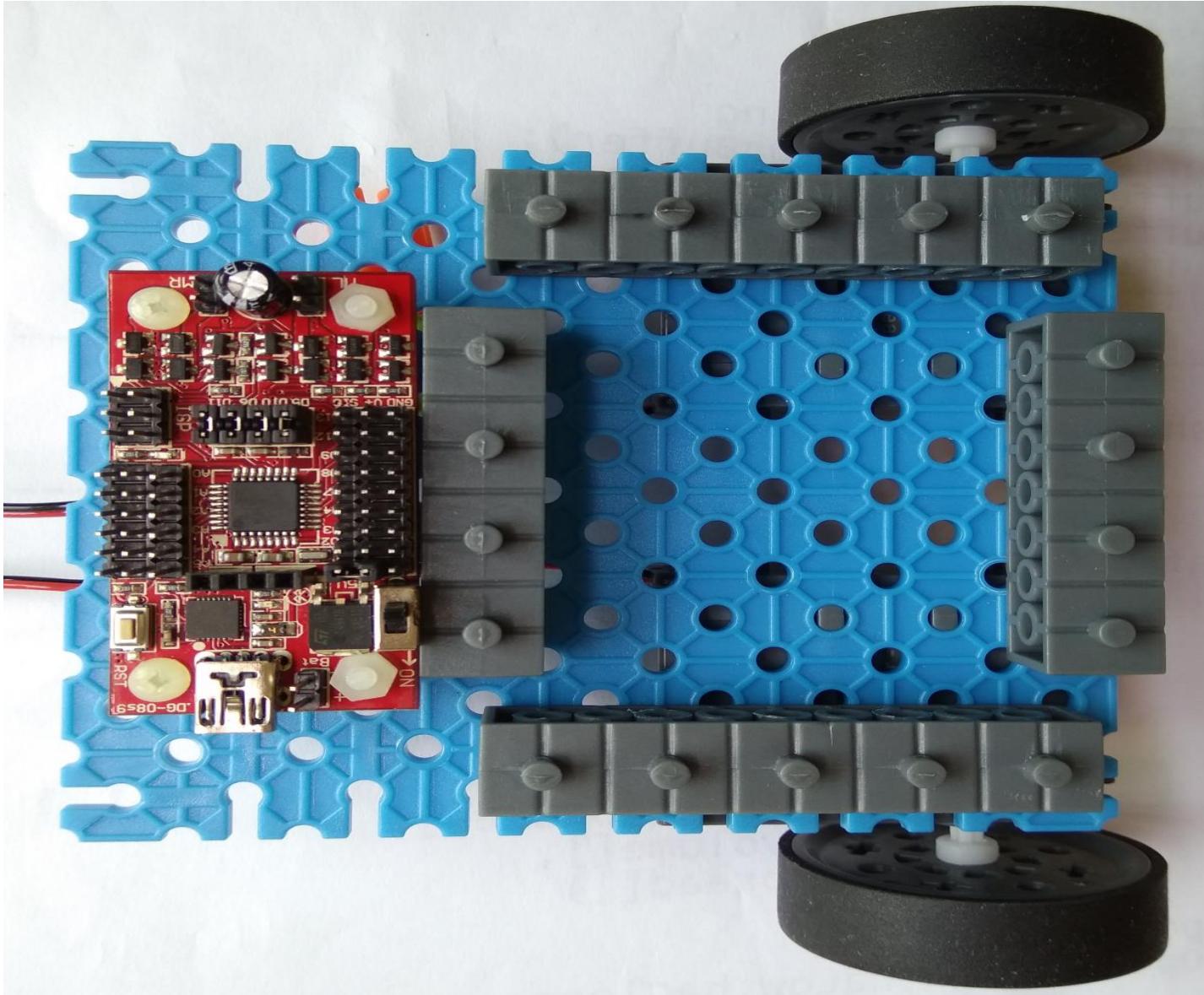
Insert the short side of the axle into the wheel

Vehicle Construction – Wheels & Motors

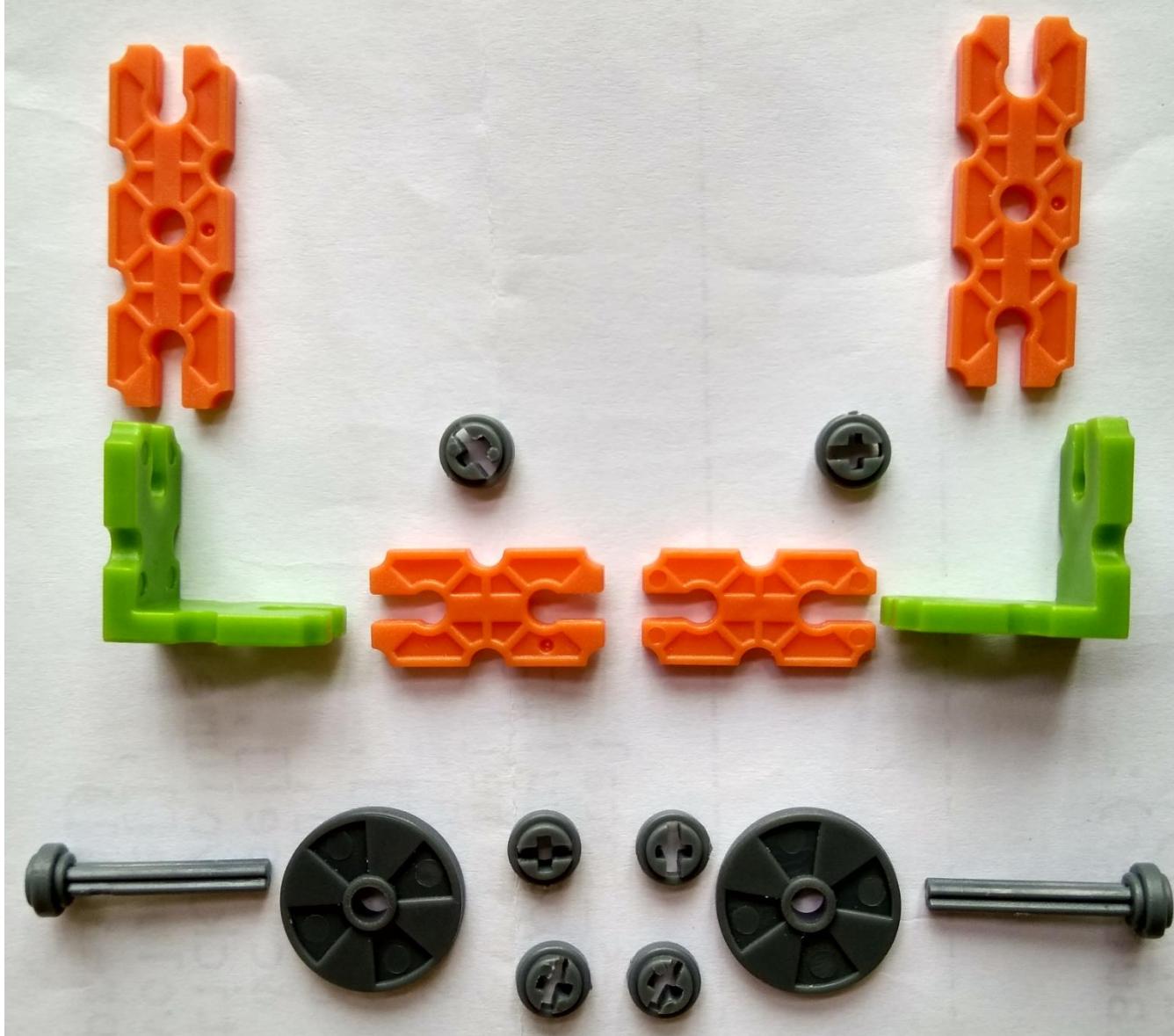


Insert the left and right wheels into the motors.

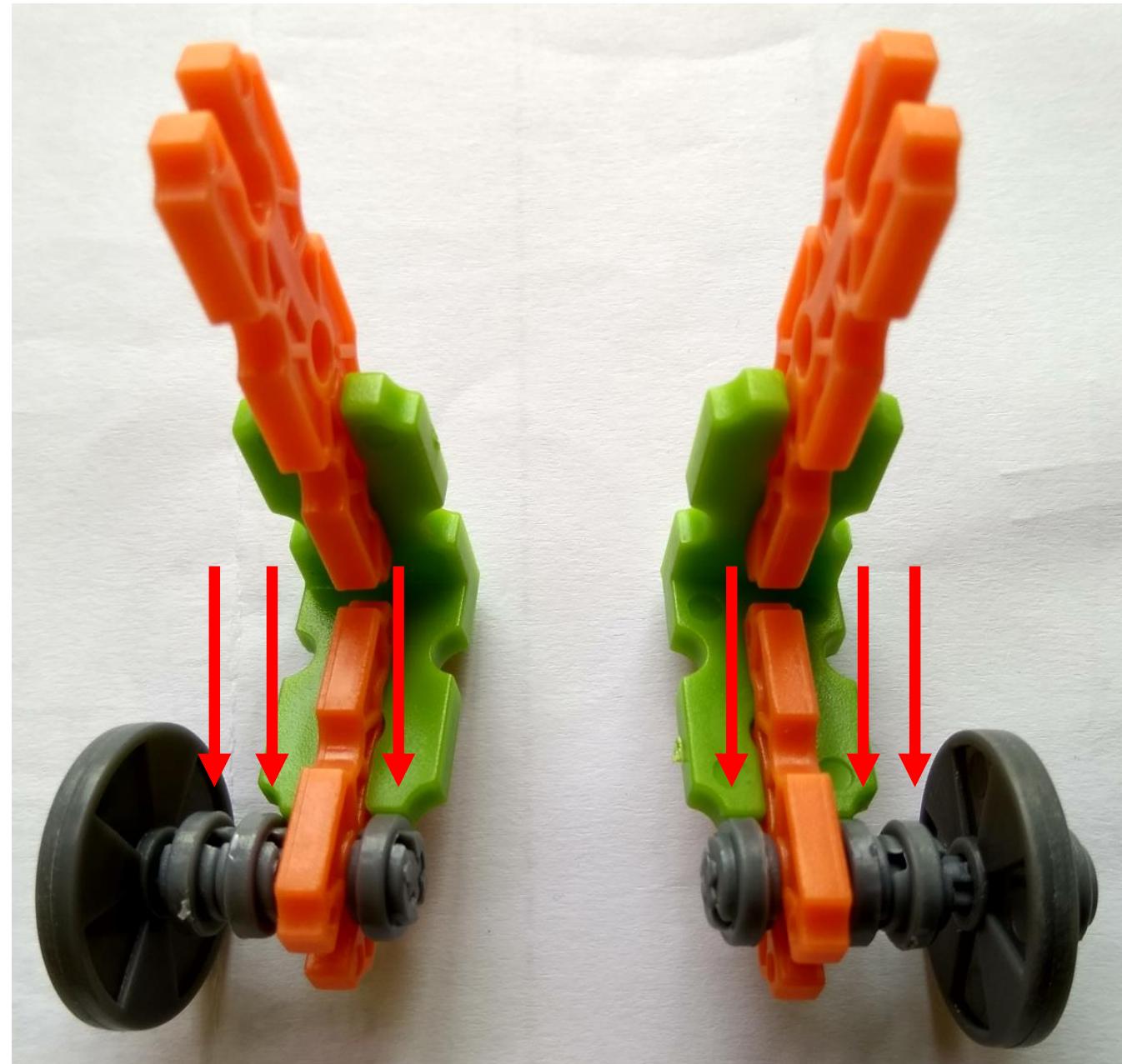
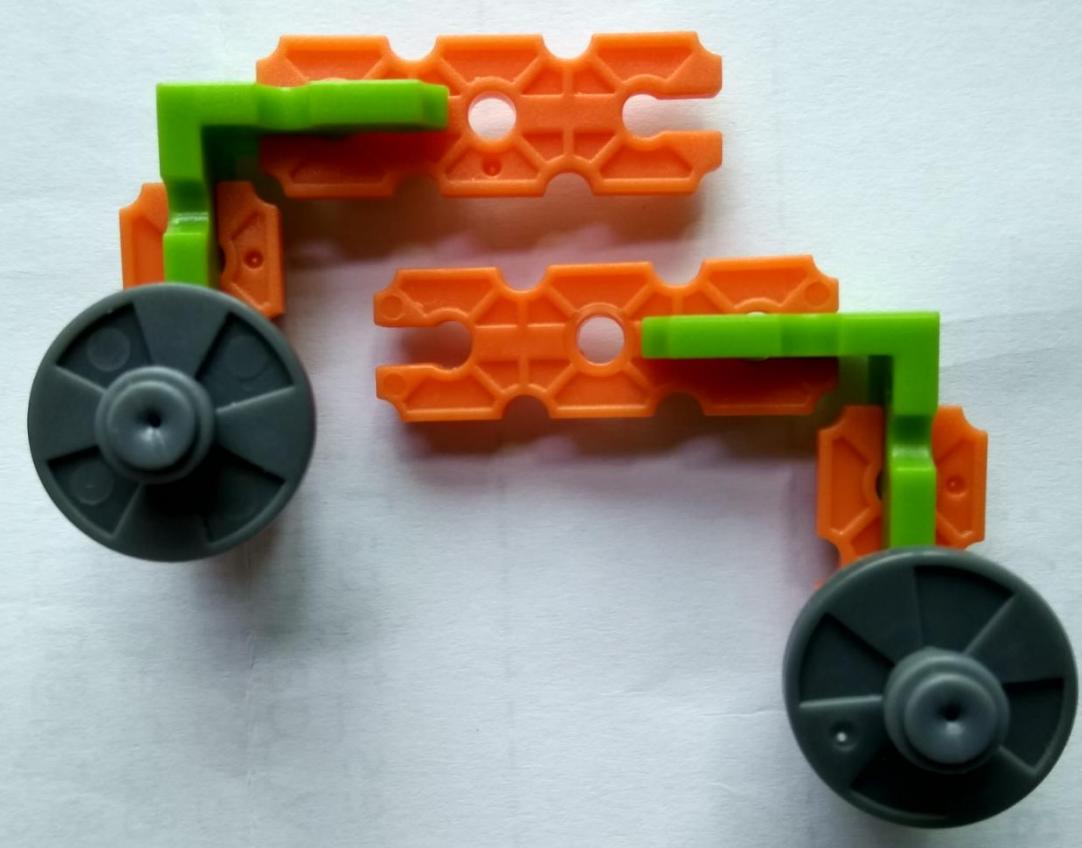
Vehicle Construction – Attach wheels to Base



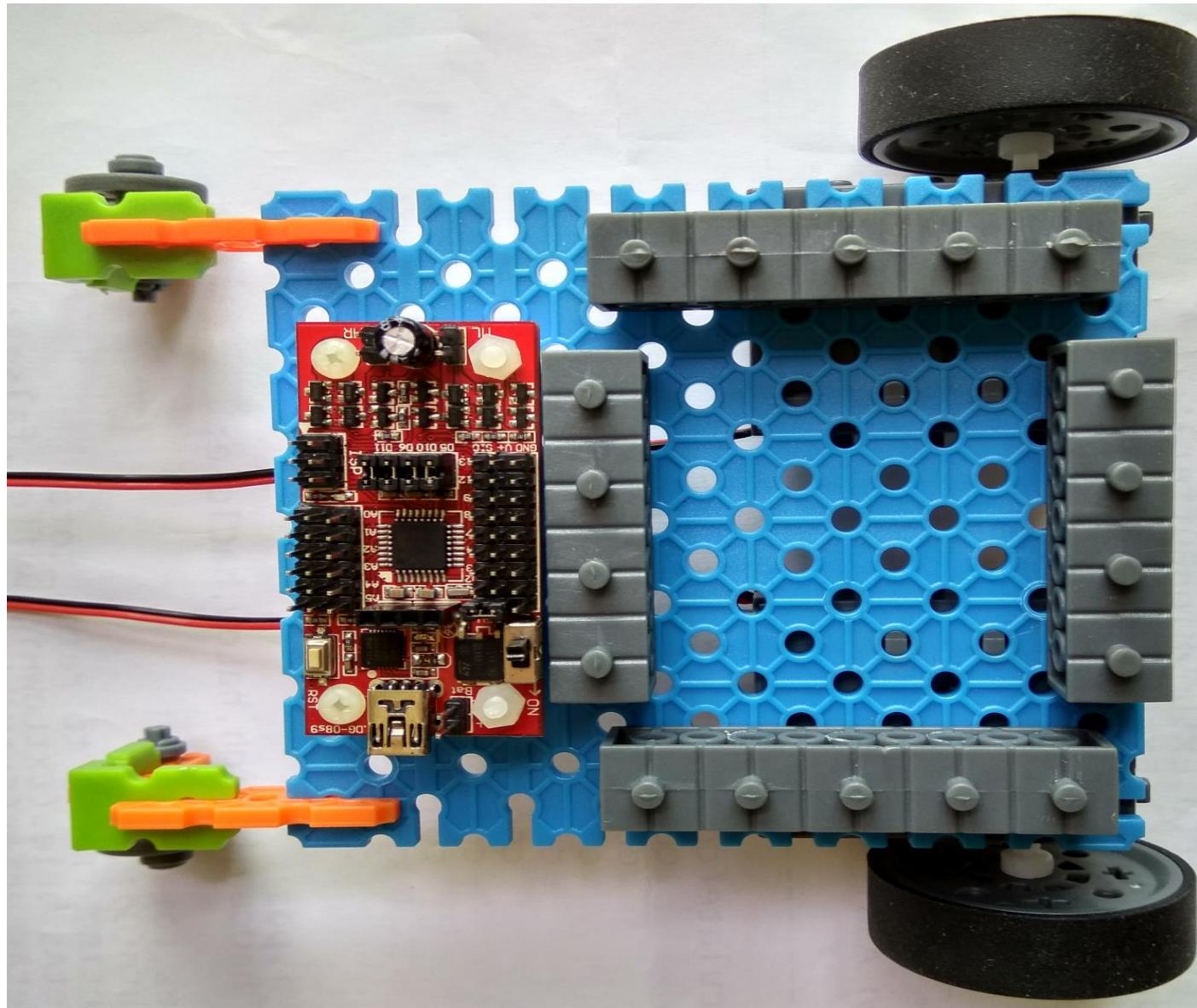
Vehicle Construction – Parts of Front Wheels



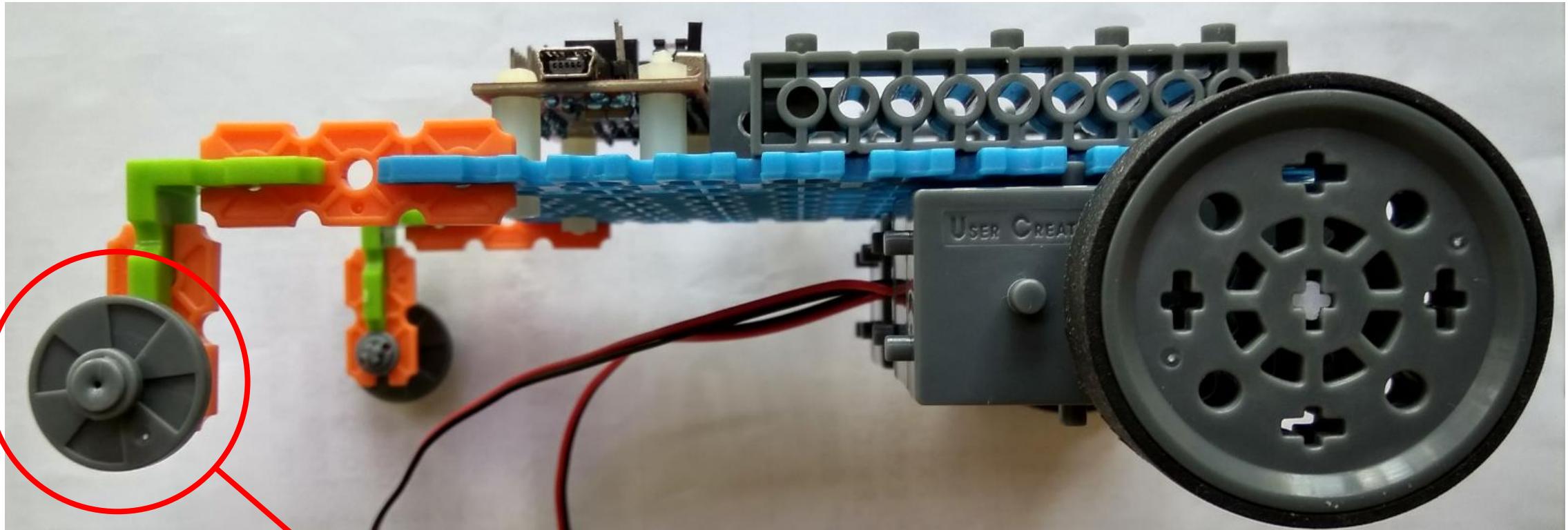
Vehicle Construction



Vehicle Construction – Attach Both Front Wheels

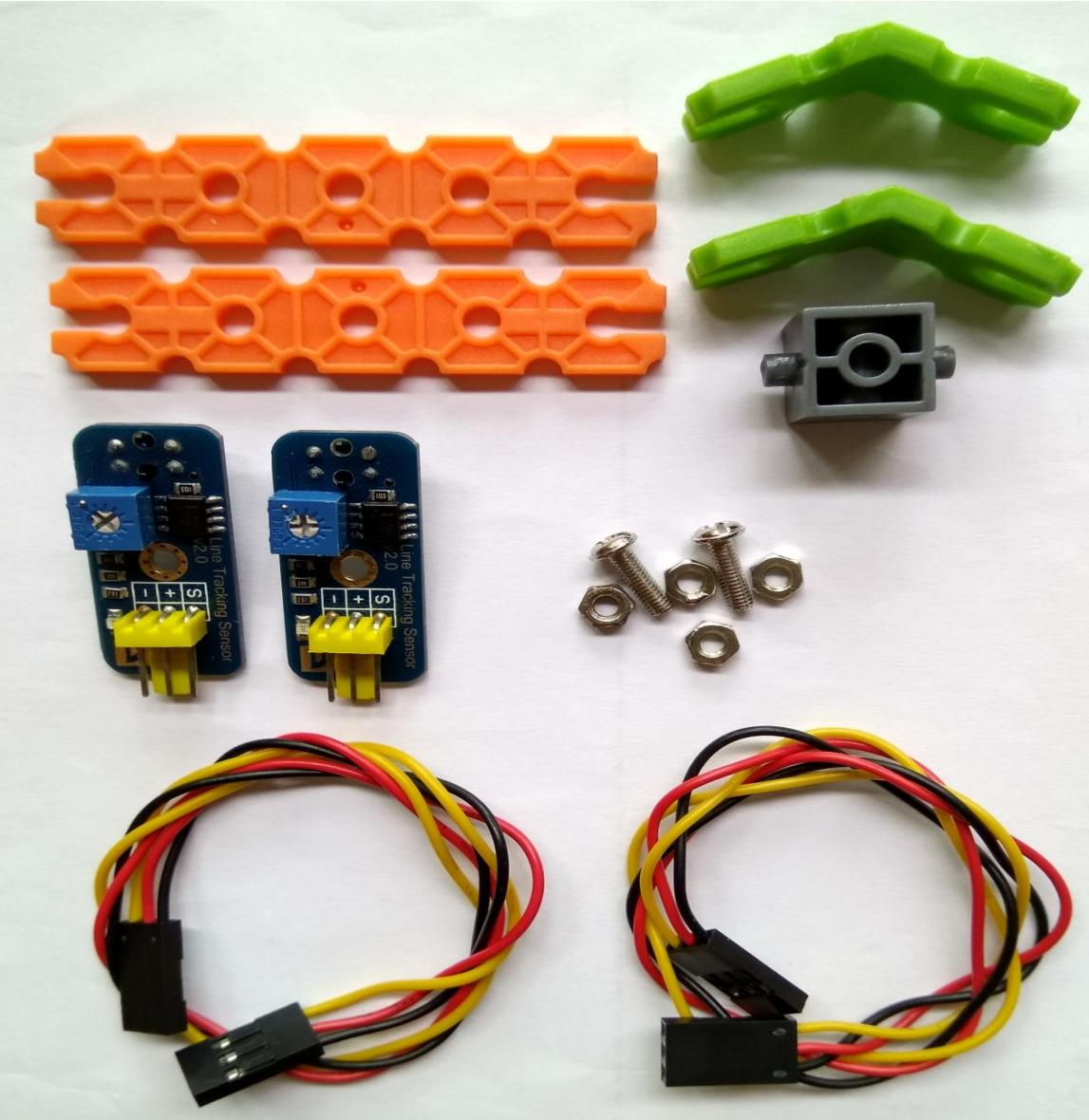


Vehicle Construction



The wheels are facing you.

Vehicle Construction – Line Tracing Sensor



Vehicle Construction – Setup Line Tracing Sensor

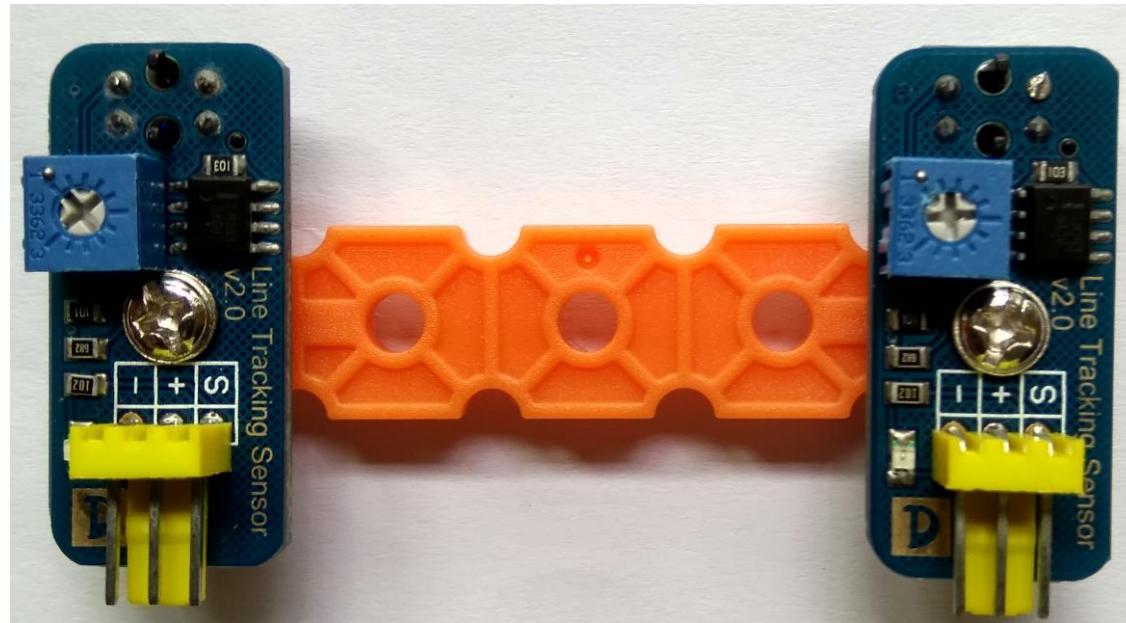


Front



Back

Vehicle Construction – Setup Line Tracing Sensor

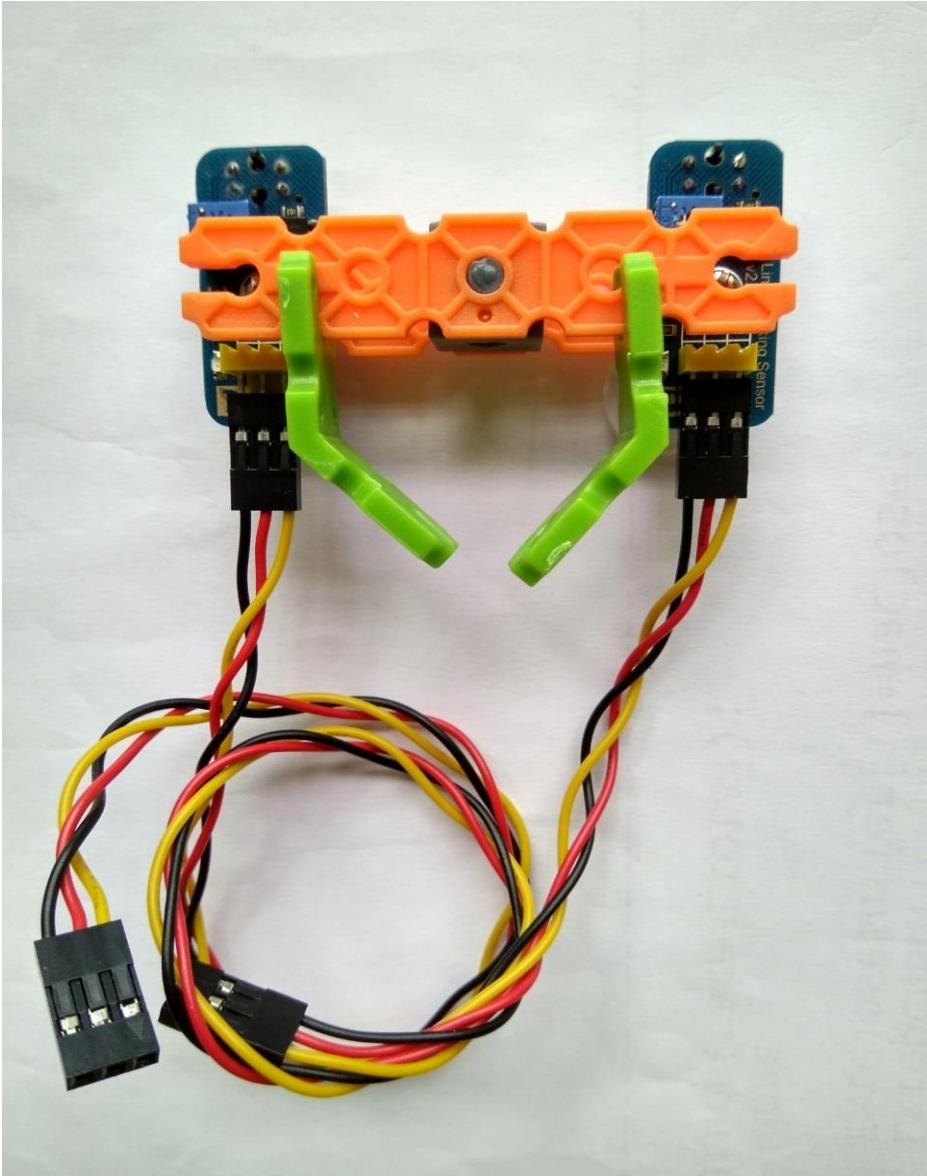


Front

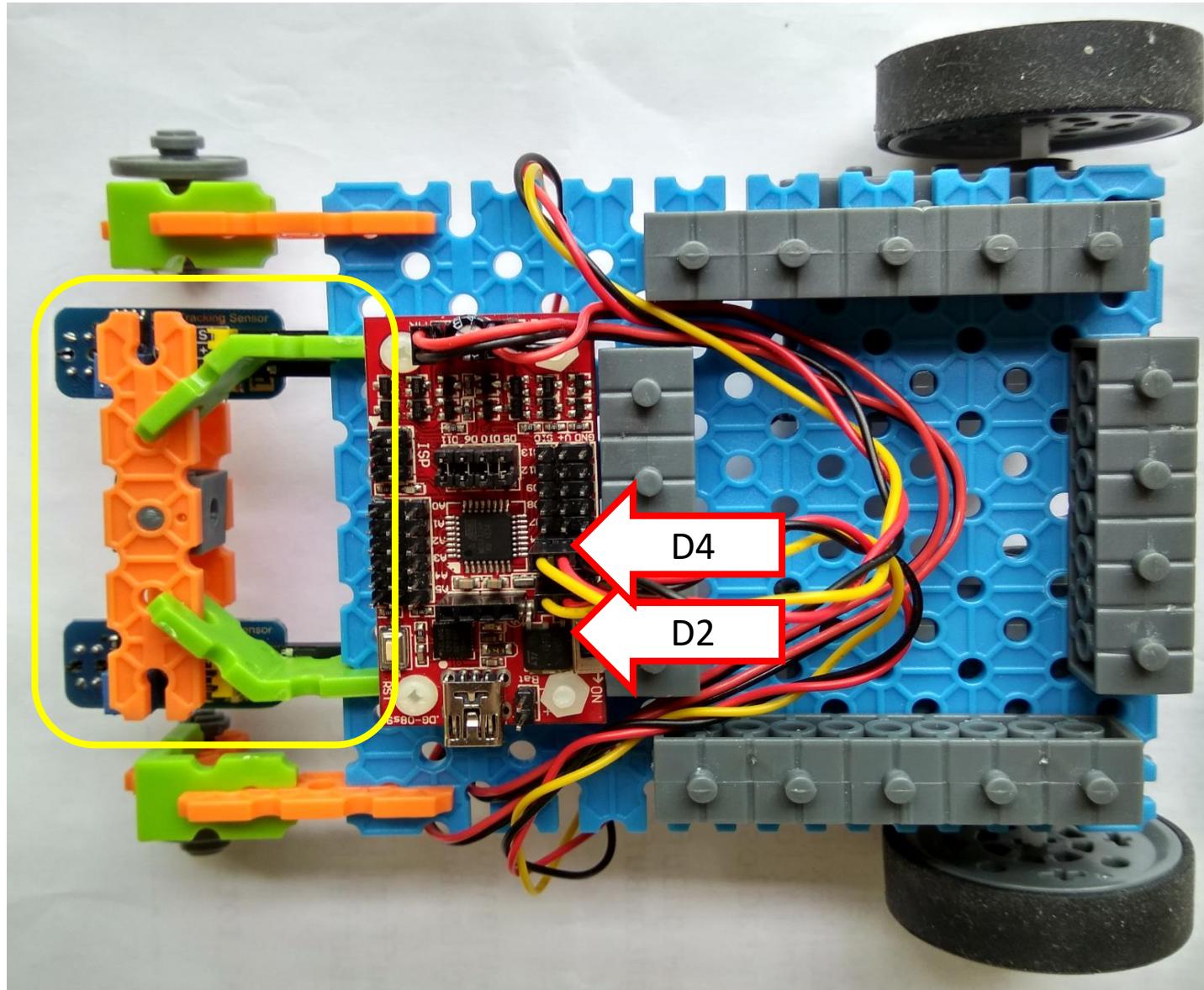


Back

Vehicle Construction – Setup Line Tracing Sensor

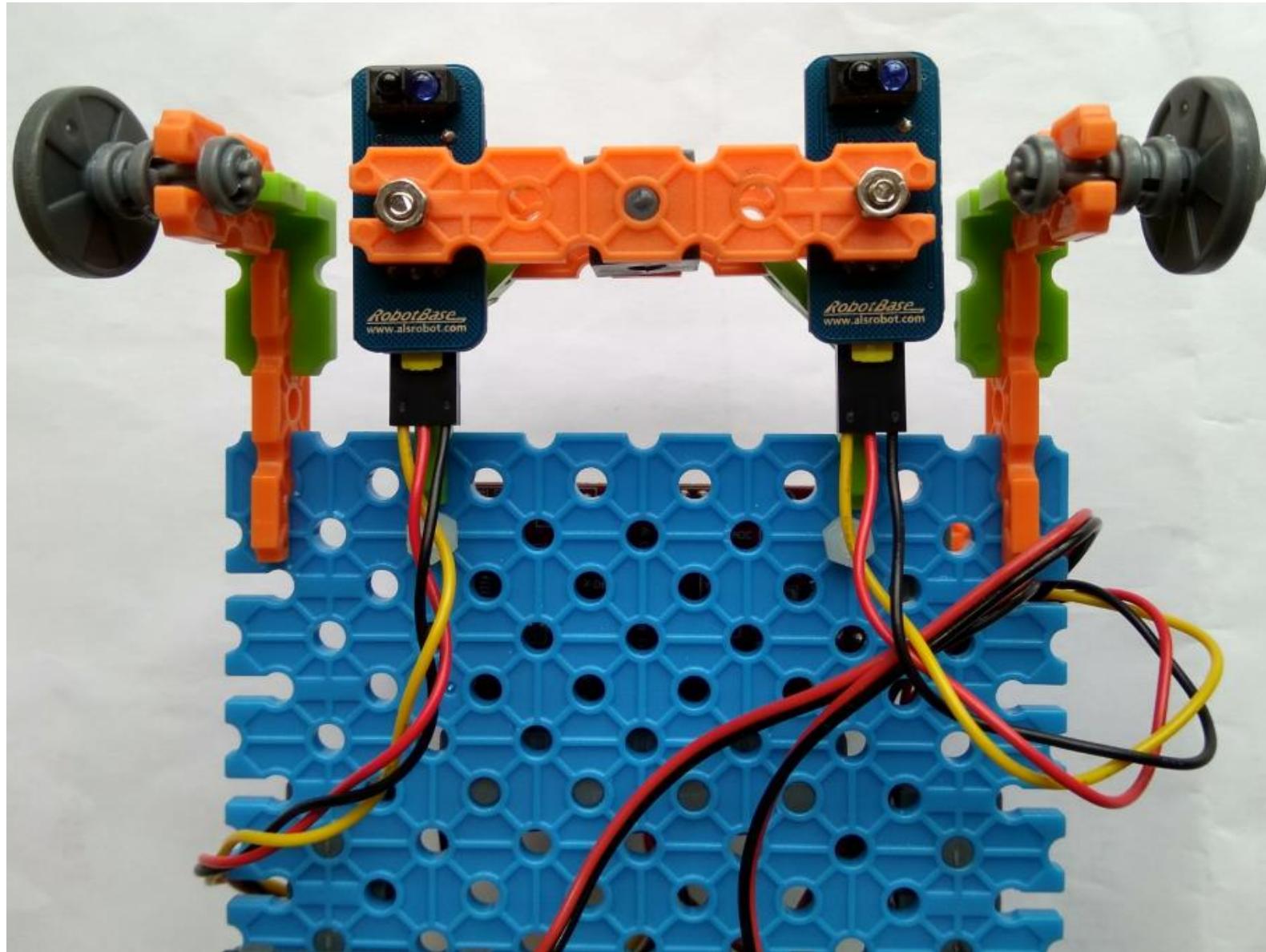


Vehicle Construction – Setup Line Tracing Sensor

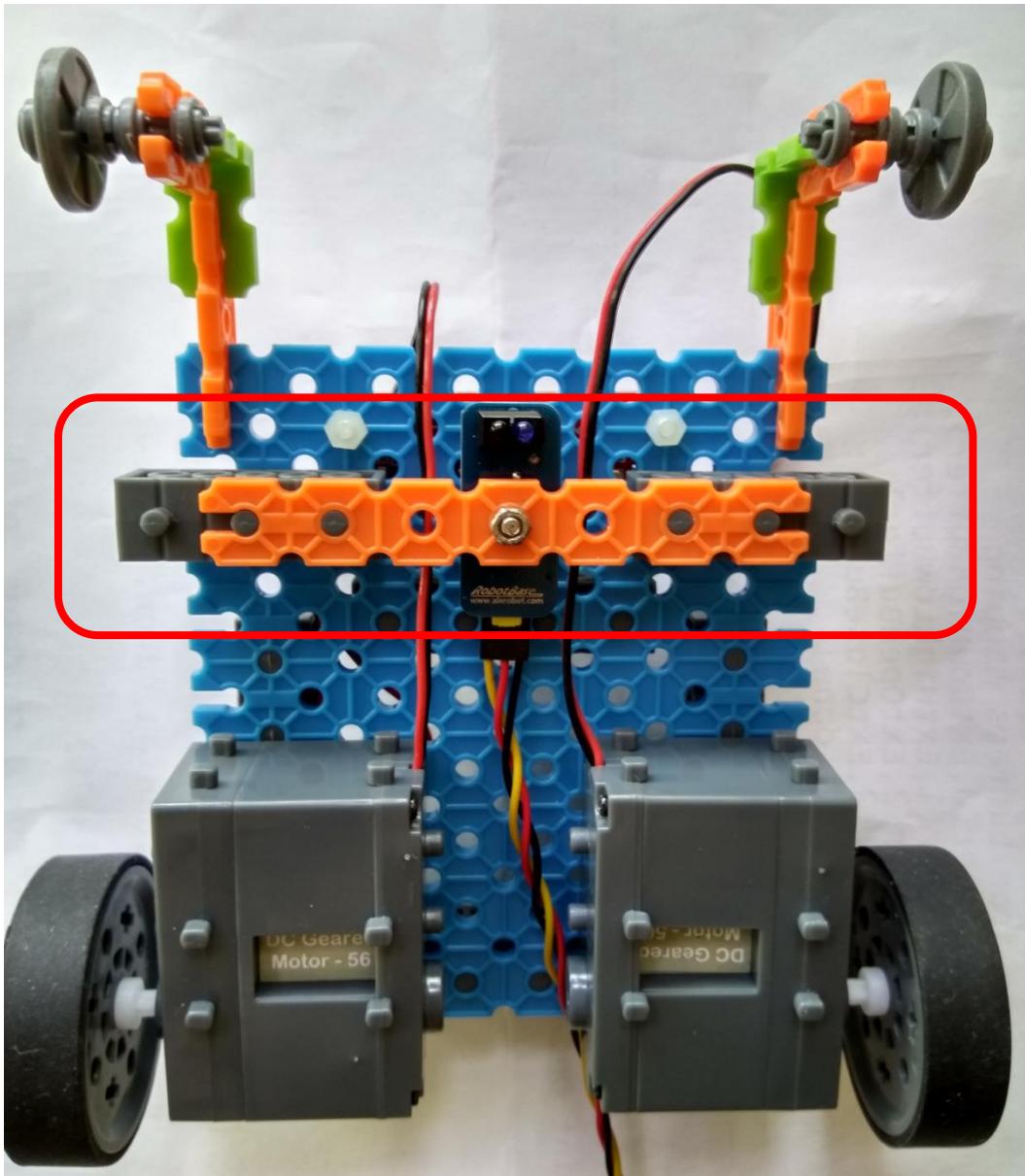


- Fix the 2 Line Tracing Sensors as shown
- Connect right line tracing sensor to D4
- Connect left line tracing sensor to D1

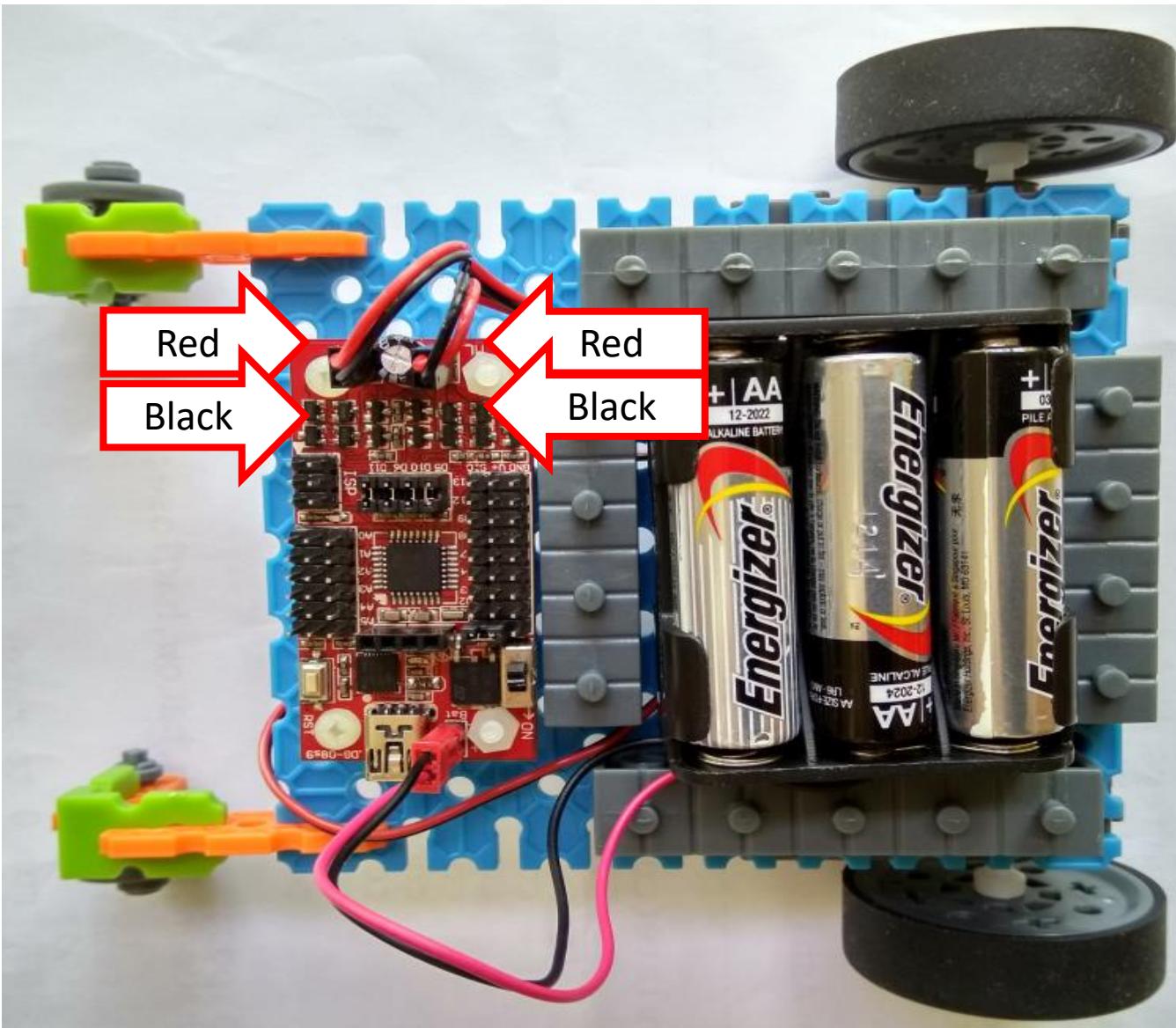
Vehicle Construction – Setup Line Tracing Sensor



Vehicle Construction – Attach Line Tracing Sensor

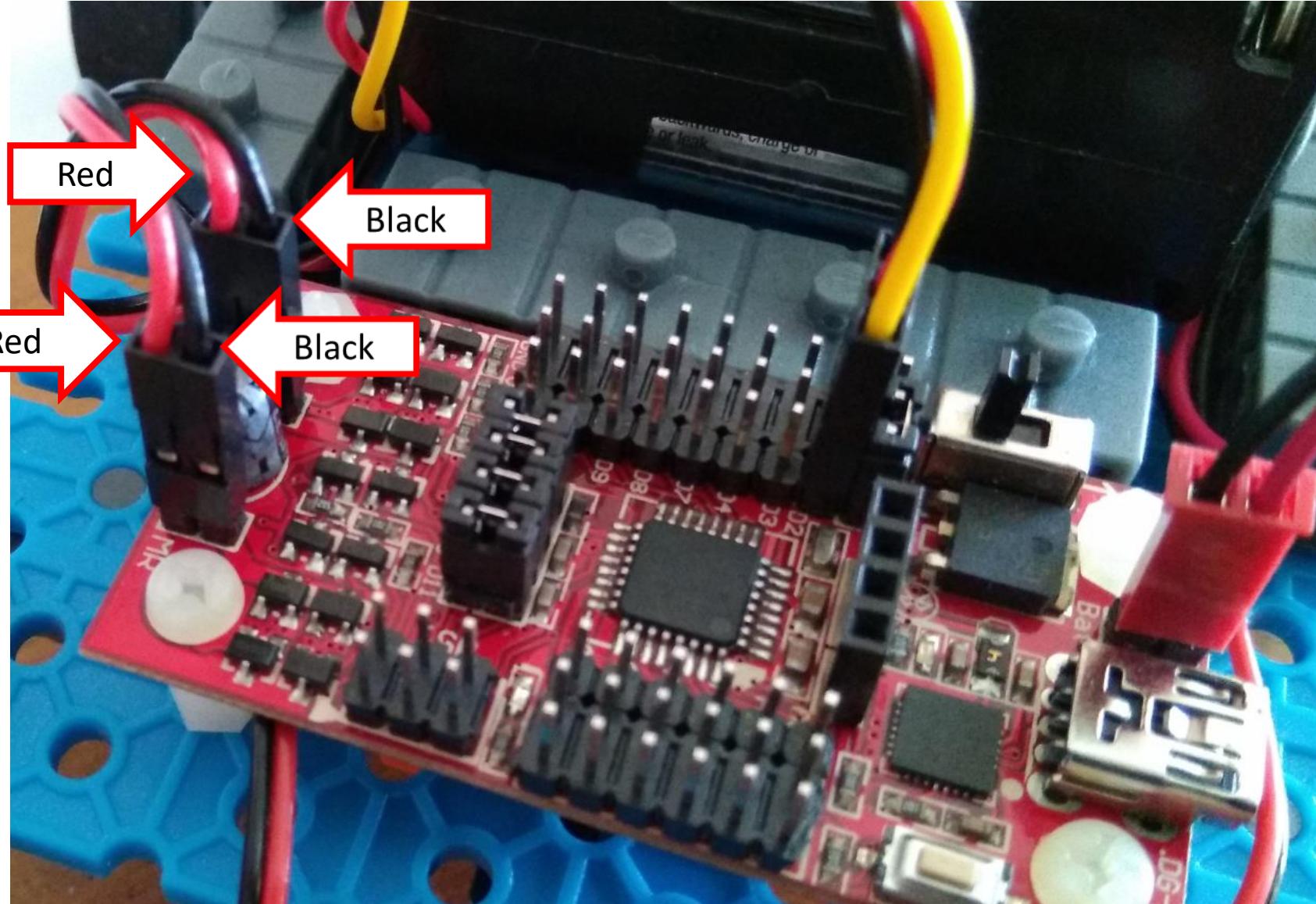


Vehicle Construction – Connect motors

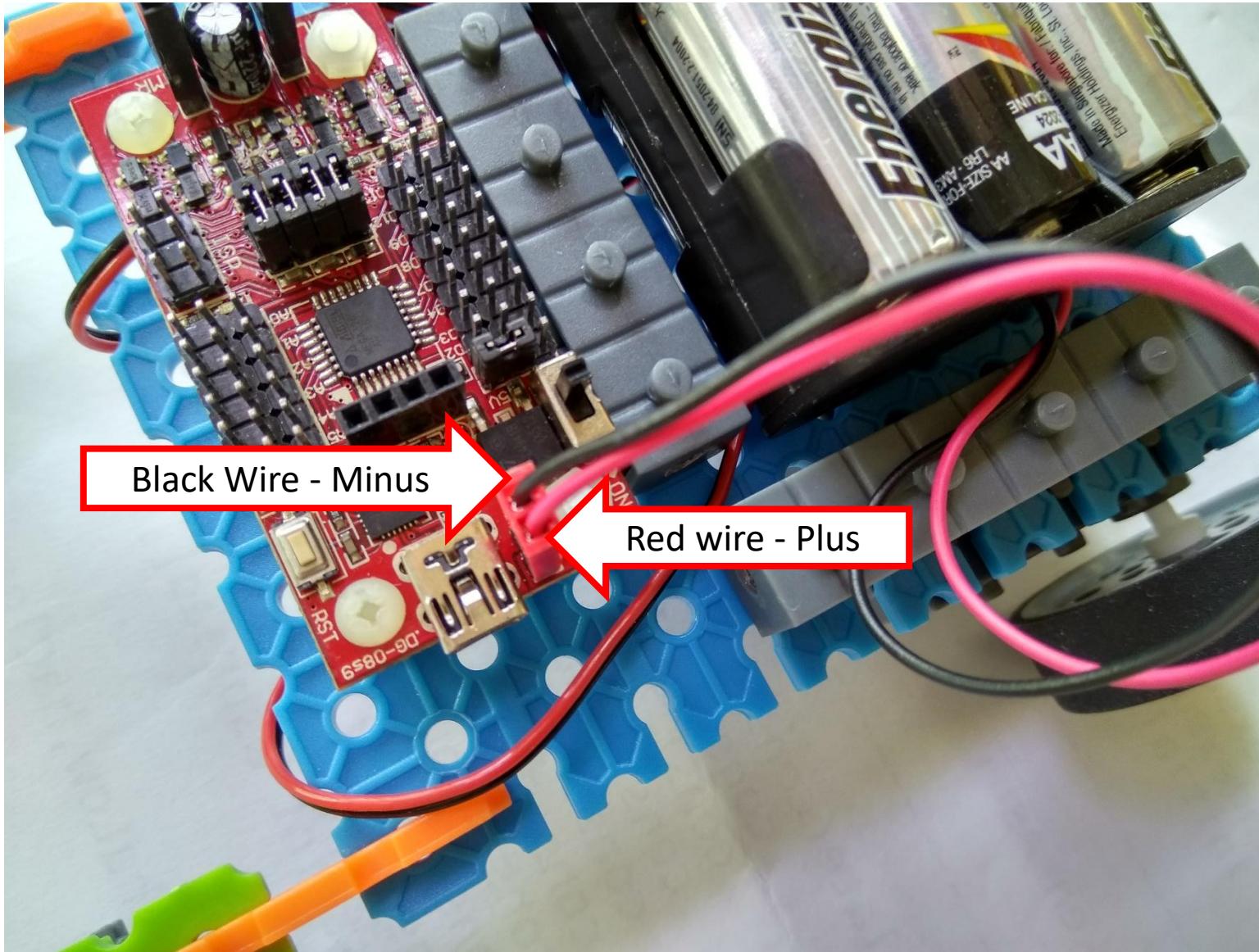


	Arduino ML	Arduino MR
Left Motor		X
Right Motor	X	

Vehicle Construction – Connect Motors

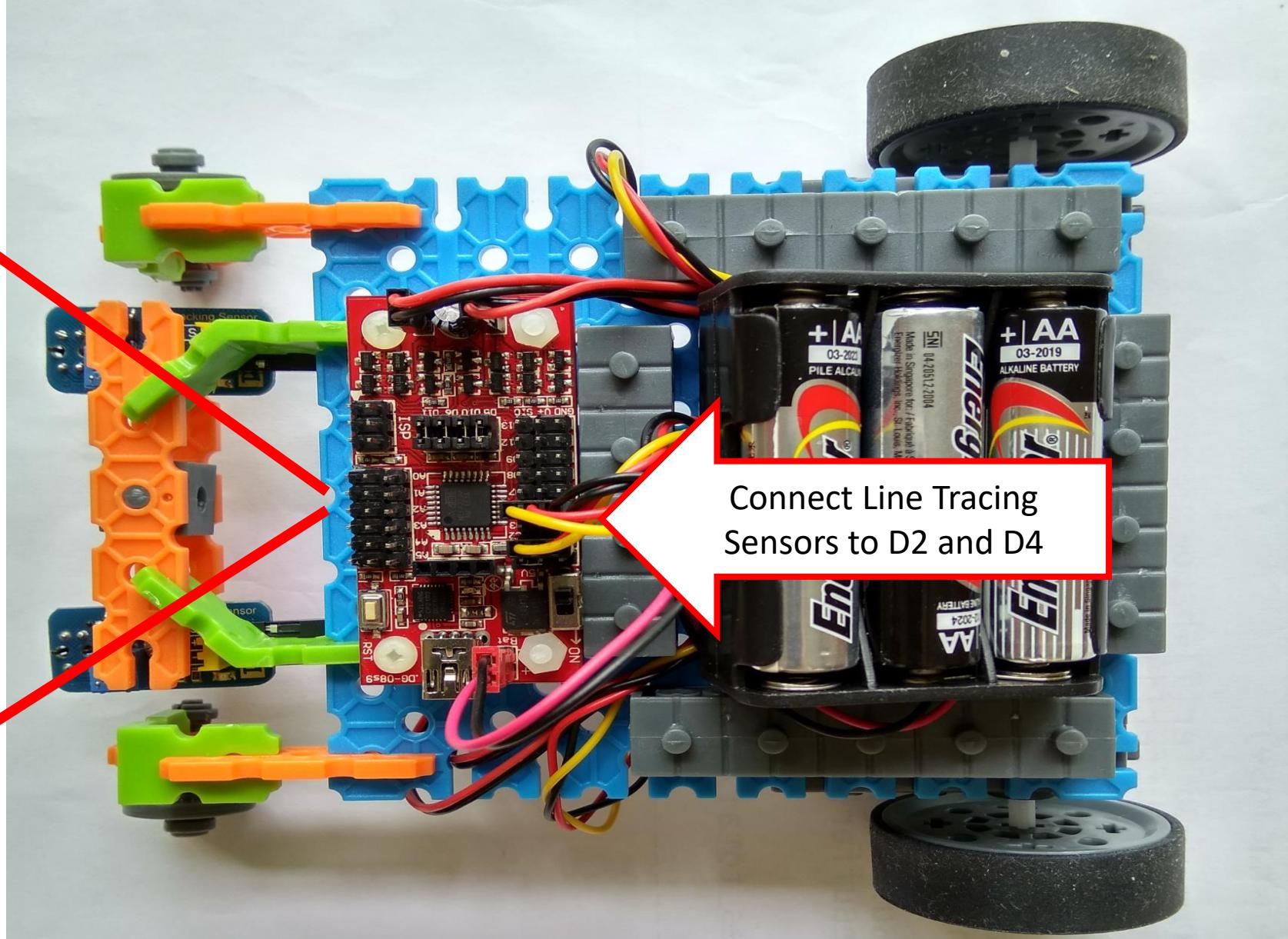


Vehicle Construction – Connect Battery Pack

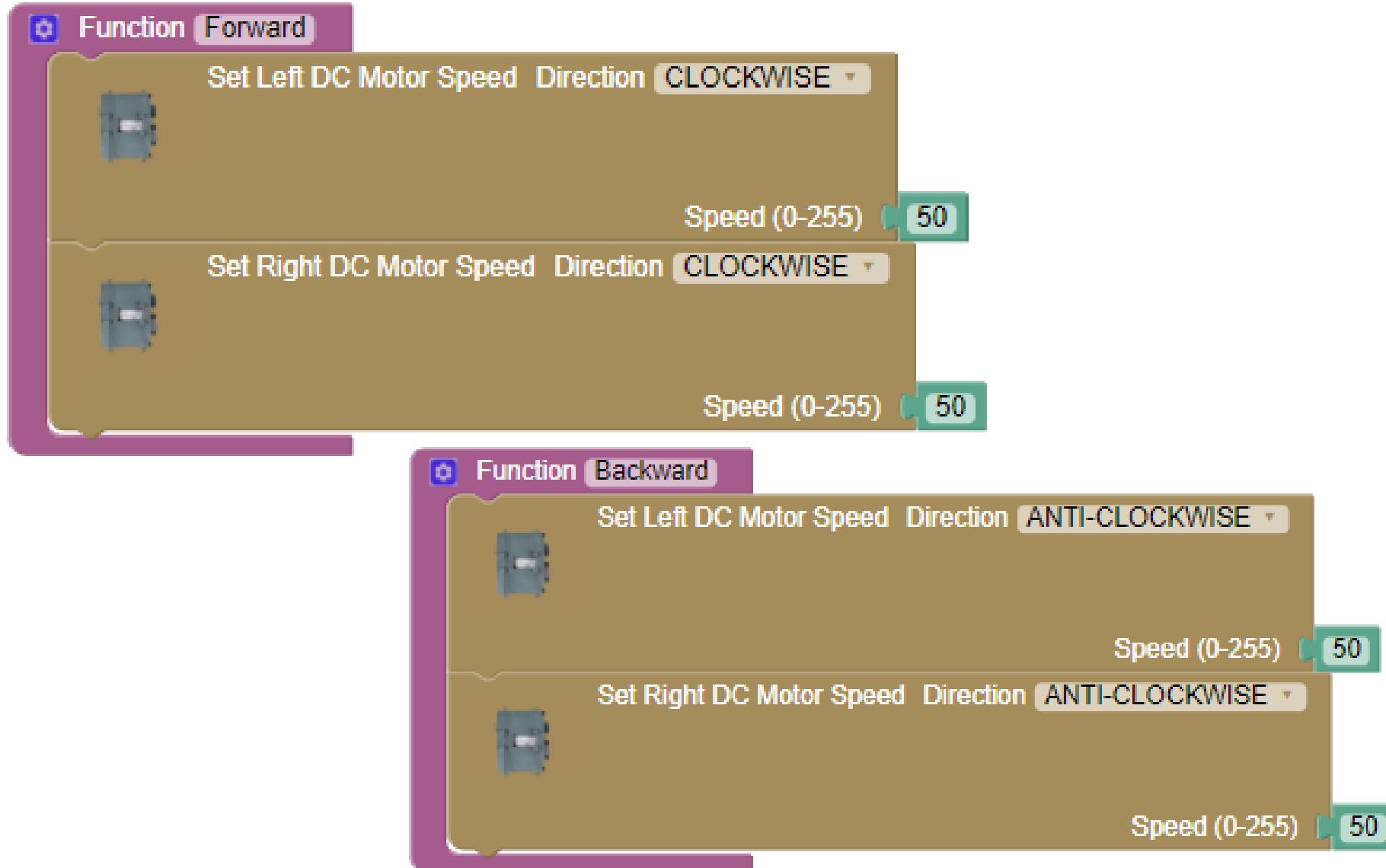


Vehicle Construction – Connect to D2 and D4

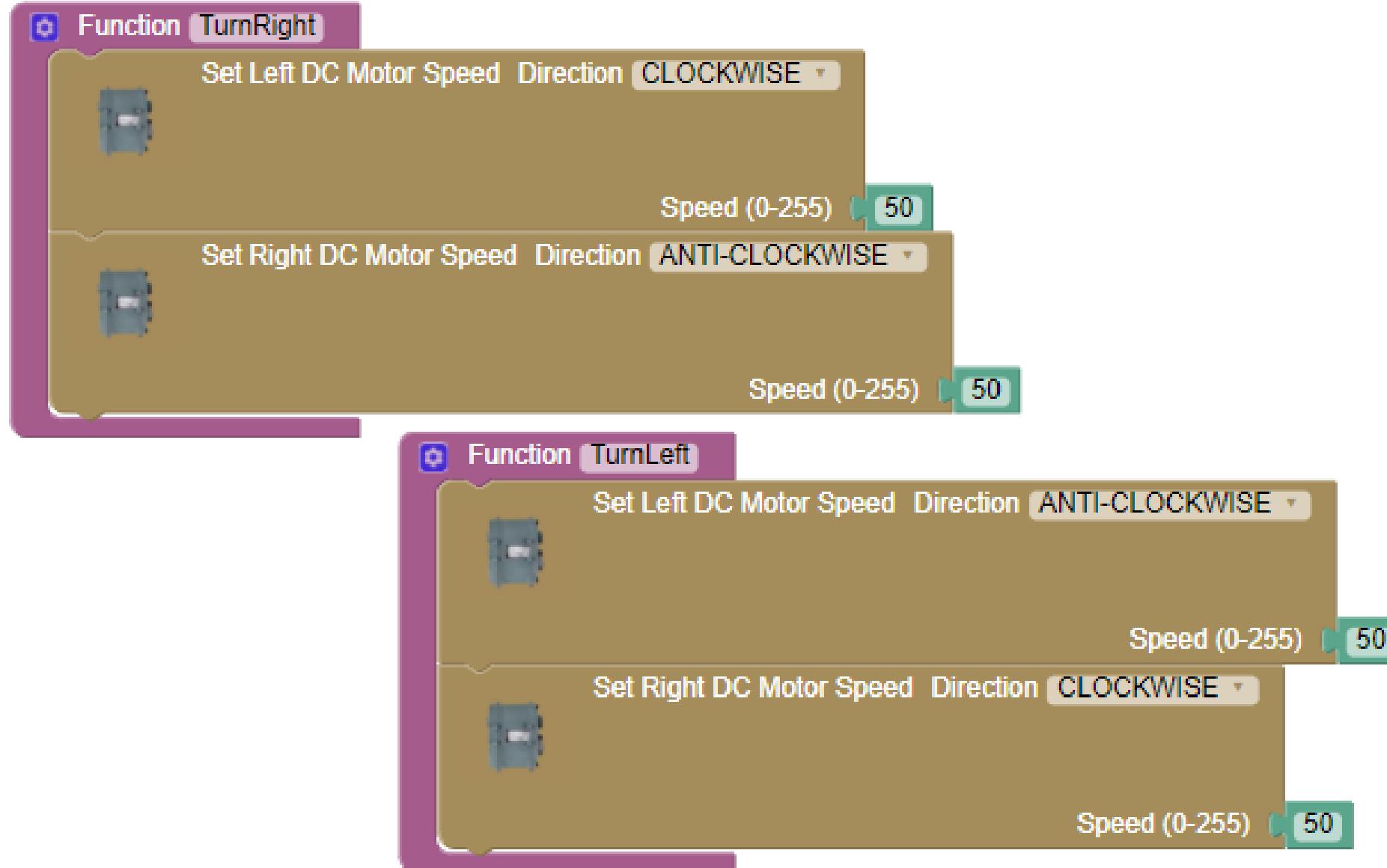
As big a angle as possible



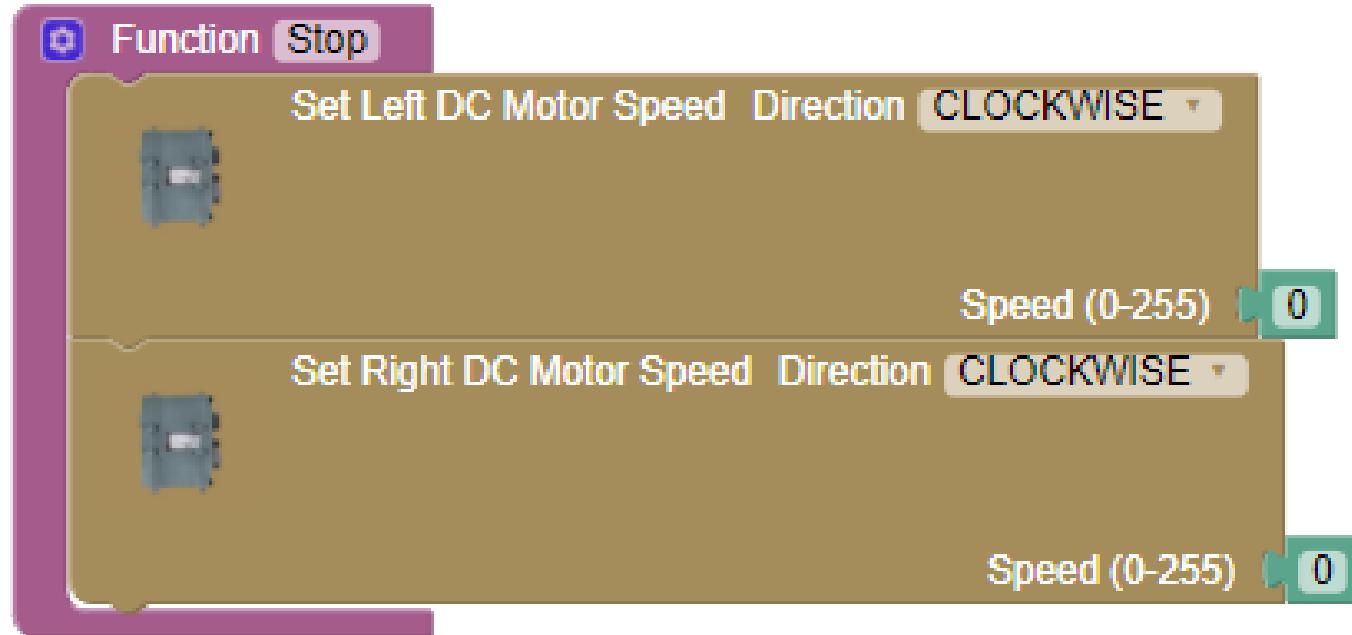
Vehicle Construction – Code for 2 Line Tracing Sensors



Vehicle Construction – Code for 2 Line Tracing Sensors



Vehicle Construction – Code for 2 Line Tracing Sensors



Vehicle Construction – Code for 2 Line Tracing Sensors

```
int LeftIR;  
  
int RightIR;  
  
void Forward() {  
    analogWrite(5, 50);  
    digitalWrite(10,HIGH);  
    analogWrite(6, 50);  
    digitalWrite(11,HIGH);  
}  
  
void Backward() {  
    analogWrite(5, 50);  
    digitalWrite(10,LOW);  
    analogWrite(6, 50);  
    digitalWrite(11,LOW);  
}
```

```
void TurnRight() {  
    analogWrite(5, 50);  
    digitalWrite(10,HIGH);  
    analogWrite(6, 50);  
    digitalWrite(11,LOW);  
}  
  
void TurnLeft() {  
    analogWrite(5, 50);  
    digitalWrite(10,LOW);  
    analogWrite(6, 50);  
    digitalWrite(11,HIGH);  
}  
  
void Stop() {  
    analogWrite(5, 0);  
    digitalWrite(10,HIGH);  
    analogWrite(6, 0);  
    digitalWrite(11,HIGH);  
}
```

```
void setup()  
{  
    pinMode(5, OUTPUT);  
    pinMode(10, OUTPUT);  
    pinMode(6, OUTPUT);  
    pinMode(11, OUTPUT);  
    pinMode(2, INPUT);  
    pinMode(4, INPUT);  
    Serial.begin(9600);  
}
```

Code for 2 Lines Tracing Sensors

```
void loop()
{
    LeftIR = digitalRead(2);
    RightIR = digitalRead(4);
    Serial.println(LeftIR);
    Serial.println(RightIR);
    Serial.println("----");
    if (LeftIR == true && RightIR == true) {
        Serial.println("STOP");
        Stop();
    }
}
```

```
if (LeftIR == false && RightIR == false) {
    Forward();
}

if (LeftIR == true && RightIR == false) {
    TurnLeft();
}

if (LeftIR == false && RightIR == true) {
    TurnRight();
}

//delay(200);
```

Video (2 Line Tracing Sensors)

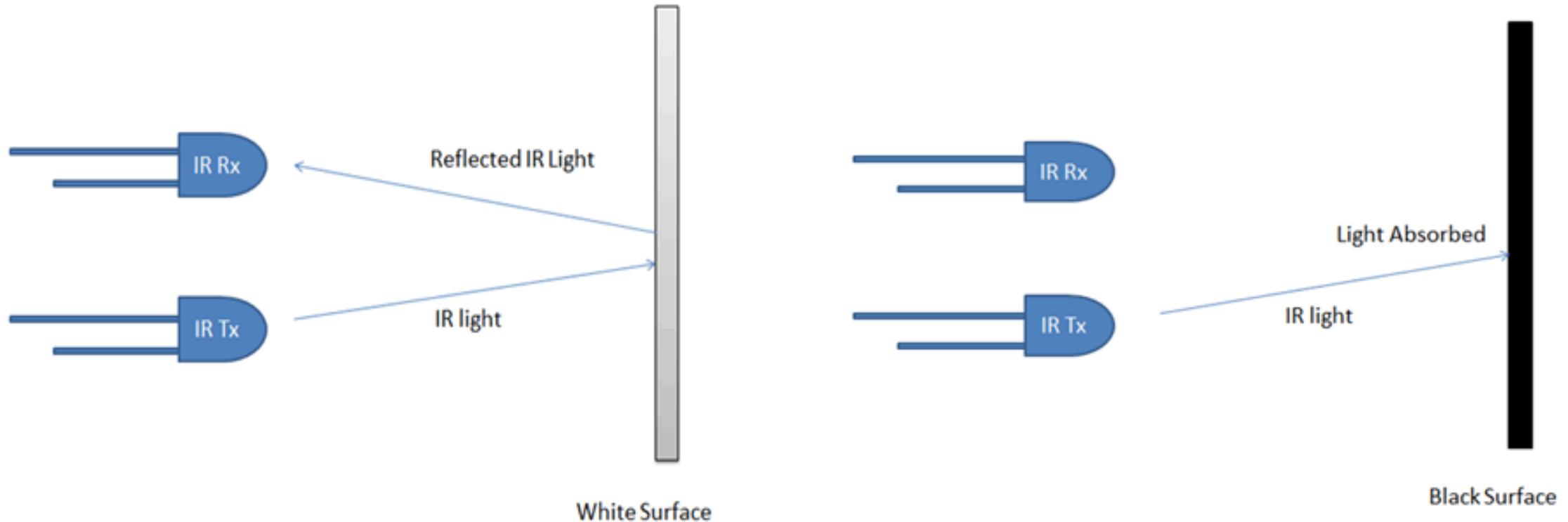
Motor Configuration

USB Connector	
(ML – On Arduino)	(MR – On Arduino)
Red	Black
Black	Red

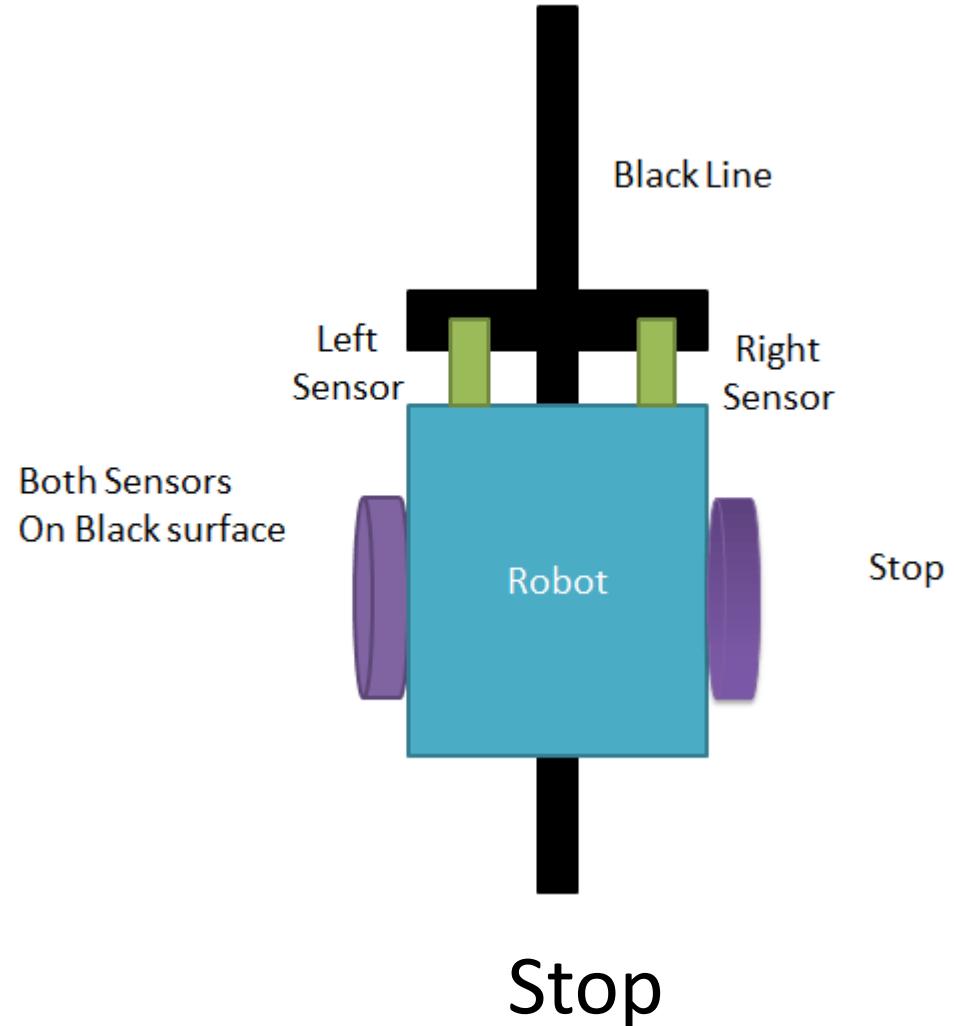
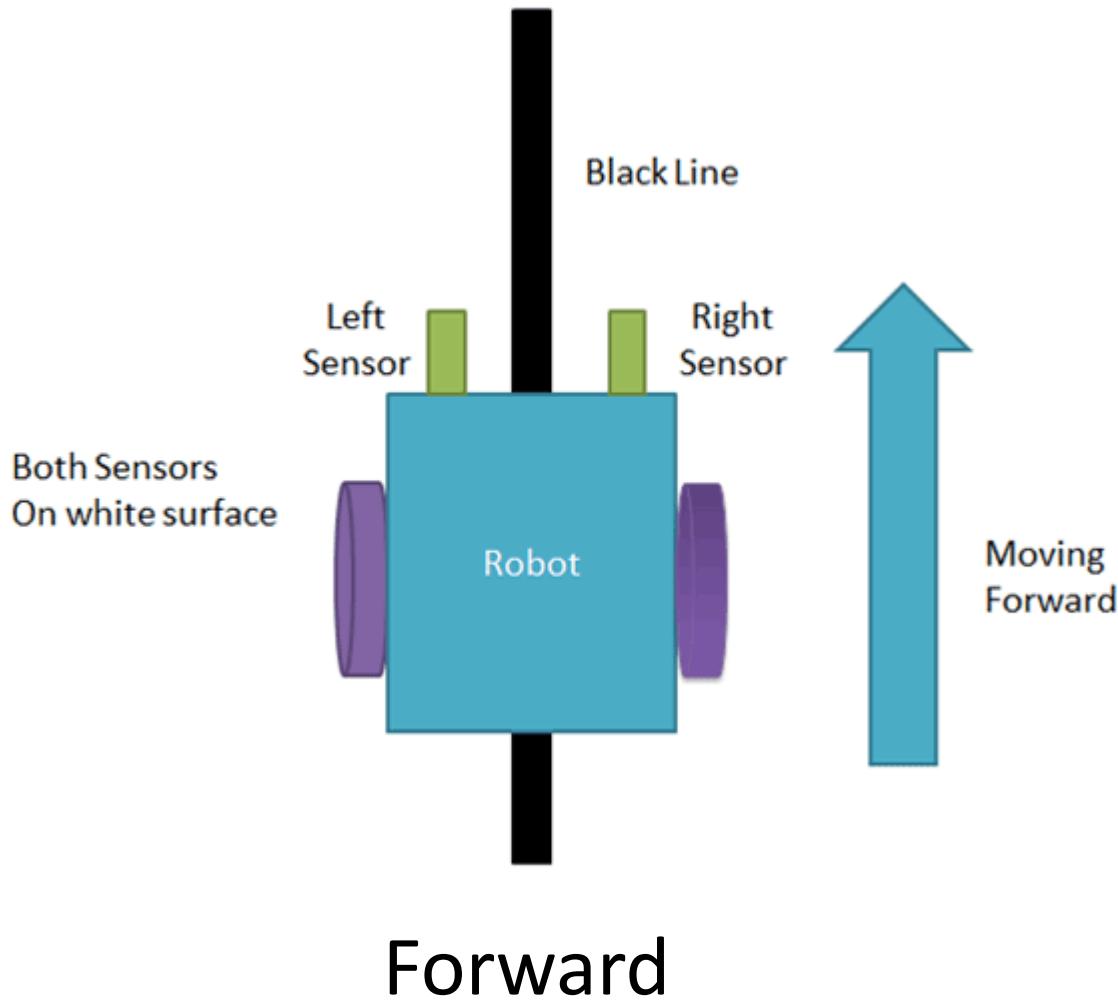
If the red and black cables are swapped, the turnings (left or right) will be swapped too

Left-Motor Code	Right-Motor Code	Direction
Clockwise	Clockwise	Forward
Anti Clockwise	Anti Clockwise	Backward
Clockwise	Anti Clockwise	Turn Right
Anti Clockwise	Clockwise	Turn Left

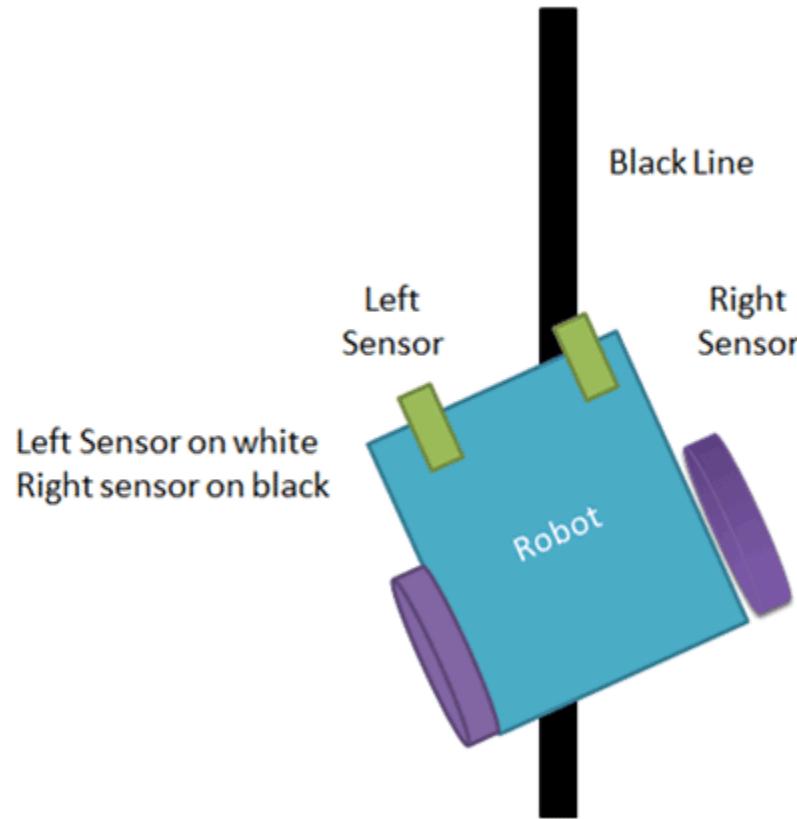
How does 2 Lines Tracing Sensors Trace a Line?



How does 2 Lines Tracing Sensors Trace a Line?



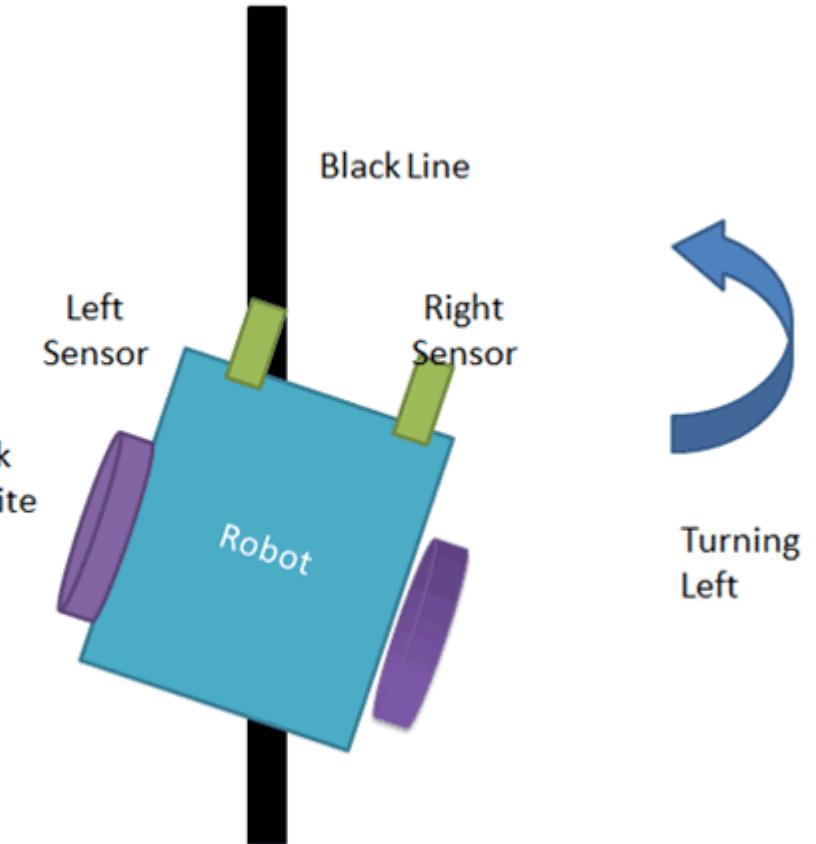
How does 2 Lines Tracing Sensors Trace a Line?



Right Turn



Left Sensor on black
Right sensor on white



Left Turn



Turning
Left