

STEM & Robotics ERP PRO Set

E30.1 ROBOTICS Lessons

The **STEM & Robotics ERP PRO education set** is specially designed for late Primary and Secondary school students of ages 9-12+. It combines the core subjects of STEM together with Robotics and includes high-level projects that lead to a deeper understanding of the underlying theory while also developing 21st century skills. The set comes in a convenient plastic storage tub that contains a large number of Engino structural and technical parts, together with advanced robotic devices such as ERP Pro controller, DC motors, LEDs, touch sensor and IR sensors. The set allows the construction of more than 30 STEM and Robotic models.



Lesson: Experimental robot

Manual Programming

The Engino® PRO 2.0 controller is a robotic system consisting of a main controller with different buttons, able to connect with various peripherals: motors, lights and sensors. Learn how to program the device manually and create a sequence of commands for traffic lights control.

Discover:

- What inputs and outputs are.
- What a command sequence is.
- How to program a robot manually.

Materials Needed:

- Engino® STEM & Robotics PRO.

Procedure:

1. Build the **experimental robot** model.

Make sure you connect each cable with the correct port. You can also twist the cables around other parts so they do not get in the way. Install 3 or 6 AA batteries on the back of the controller and power up the device by pressing the On-Off button.




2. Press the buttons (input) on the PRO controller in **exercise 1** and write the results you observe (output). On the motors, place the switch in position **I** and try both buttons on the controller. Note that in position **O** the motor does not work and in position **II** rotation direction is reversed.

3. A useful function of the PRO controller is the ability to record the commands sequence. To test this, press the "Program" button to record the sequence in **exercise 2**. To save recording press the "Program" button again and then "Play" to test it. You can make many trials until you find the corresponding buttons.

4. Have you noticed that there is no delay time between the execution of your commands? Read **exercise 3** to add this.

5. Use what you have learnt so far in order to create a program concerning traffic lights control. If you are unsure about the correct order you can review it in **exercise 4**.

Exercise 1. Push the buttons on the device (input) and write briefly the outcome you observe on the model (output).

Input		Output	
	Motor 1	→	motor switch in position I →
	Motor 2	→	motor switch in position I →
	Motor 3	→	
	LED 1	→	
	LED 2	→	
	Buzzer	→	

Exercise 2. Press "**Program**" (the red flashing light indicates that the program is being recorded) and then the necessary buttons in order to create the following sequence:

- *left fan rotates clockwise;*
- *both fans rotate at the same time in opposite direction;*
- *red LED turns on;*
- *orange and green LEDs turn on at the same time.*

Once finished, press the "**Program**" button again to save the program and then press the "**Play**" button. Check whether the sequence is correct. Keep the play button pressed for 3 seconds and the program will play in a loop (endless repeat).

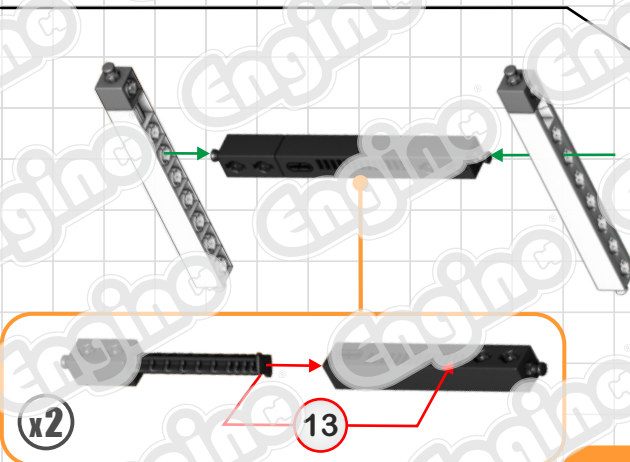
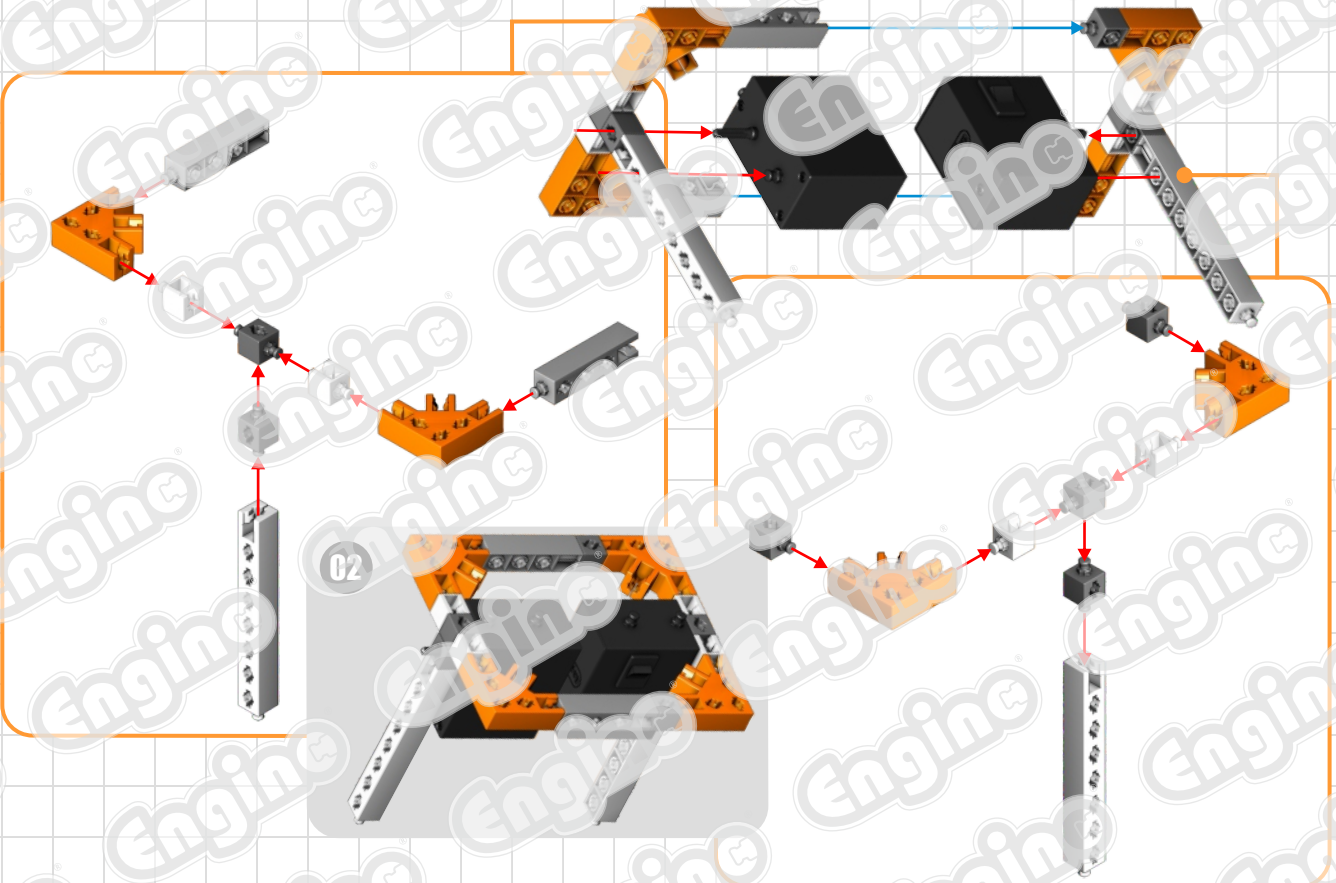
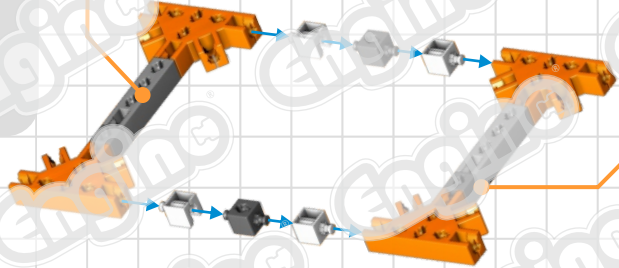
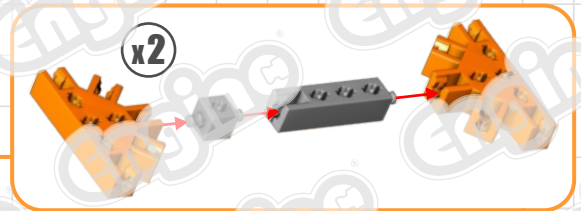
Exercise 3. Note that the controller does not record the elapsed time between pushing a button. It just plays all recorded commands straight away. Record the same program, with adding a delay time between each command. Push the "Idle time" button to achieve this and check the resulted outcome.

Exercise 4. Record the following sequence in order to simulate traffic lights control. Try to use proportional and realistic times:

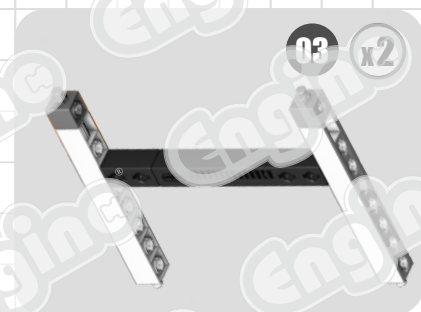
- *red light on (cars stop);*
- *red and amber light on simultaneously (cars ready to go);*
- *green light on (cars go);*
- *amber light on (cars ready to stop);*
- *red light on (cars stop).*

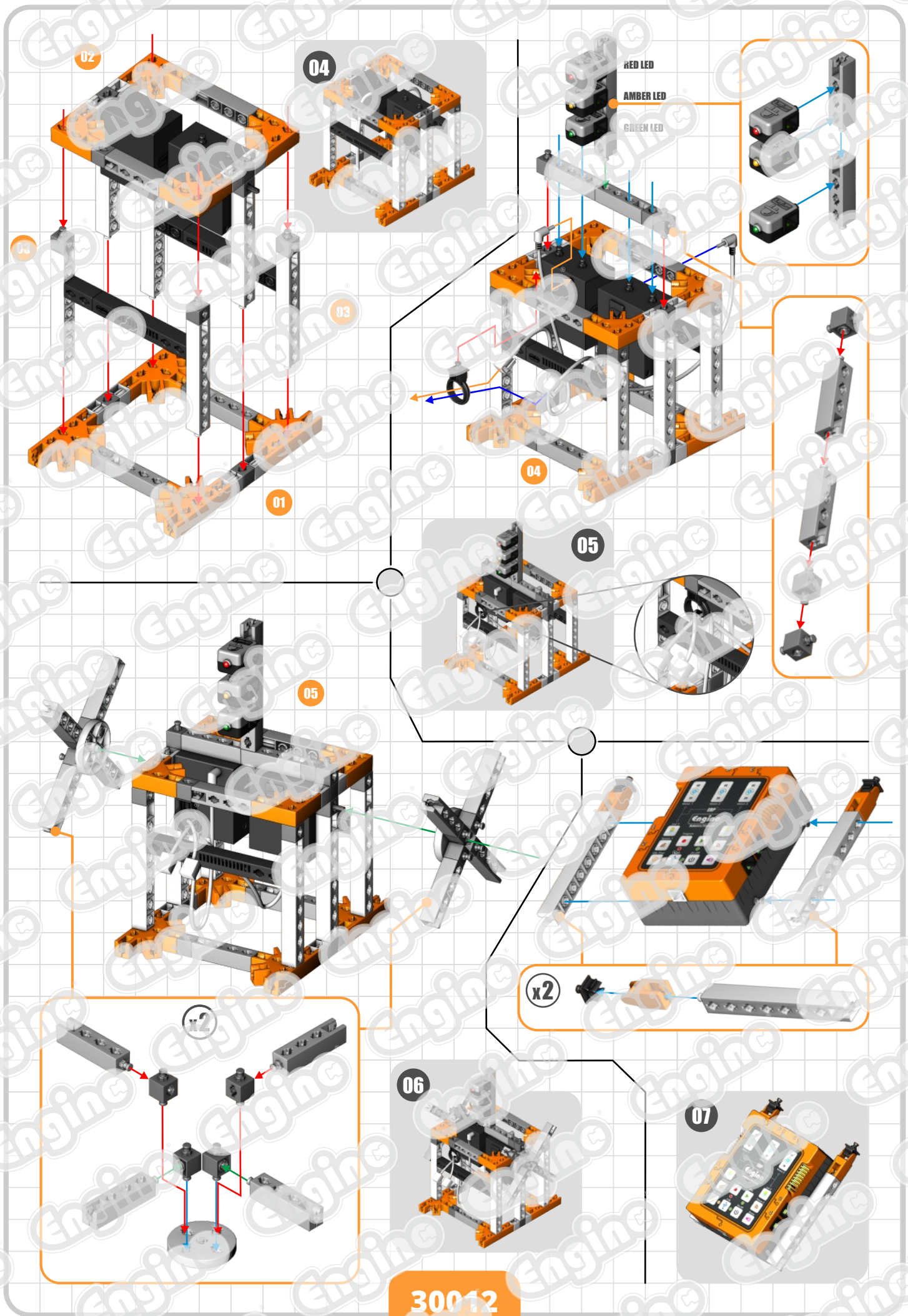


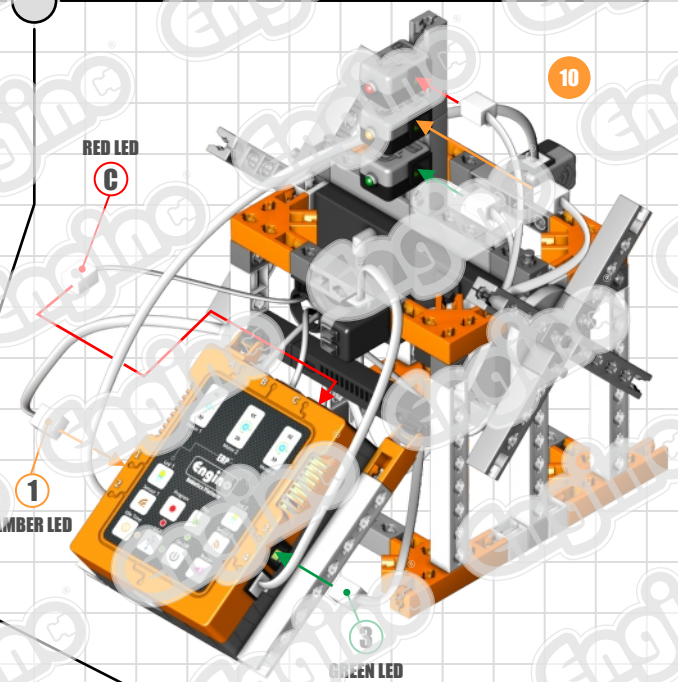
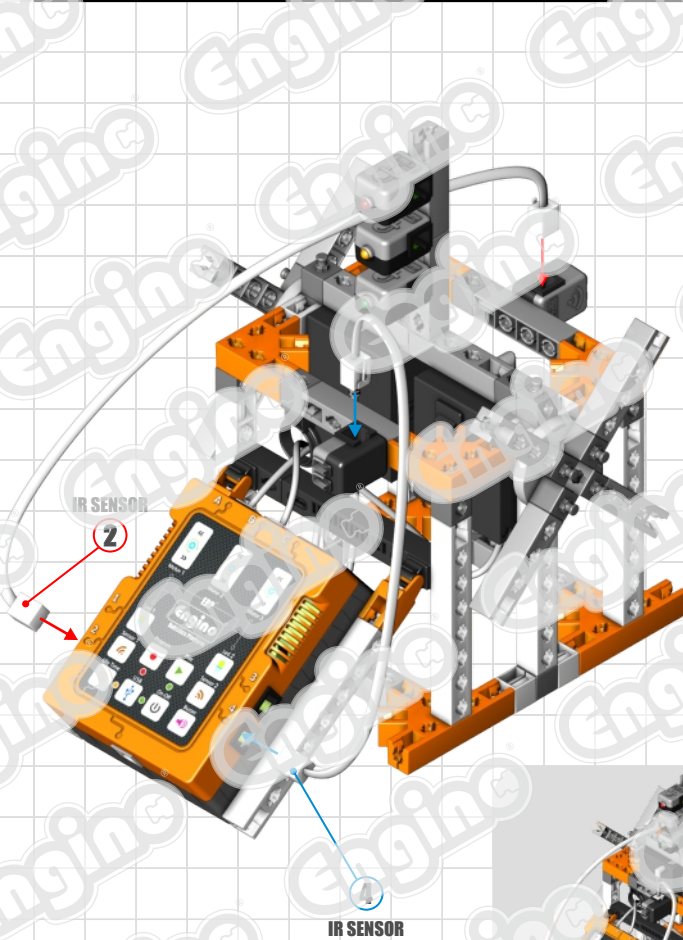
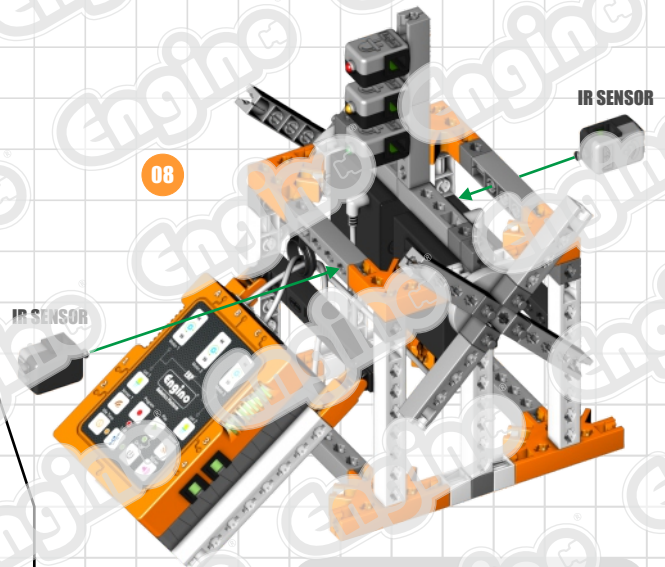
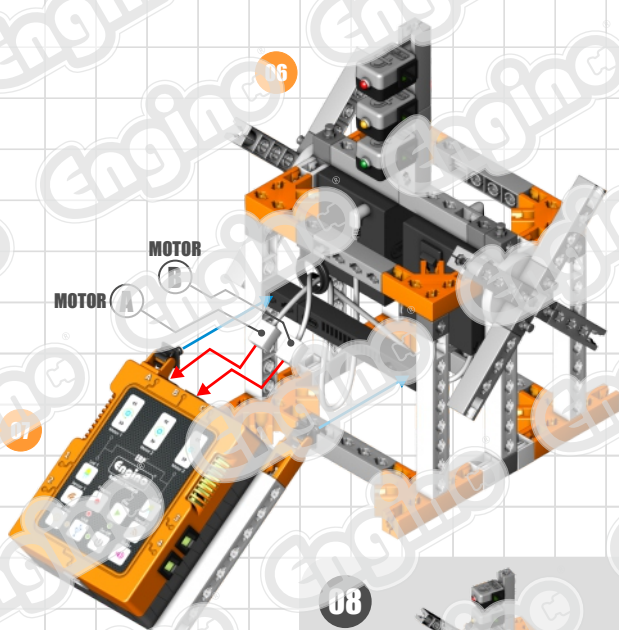
Engino® experimental robot



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