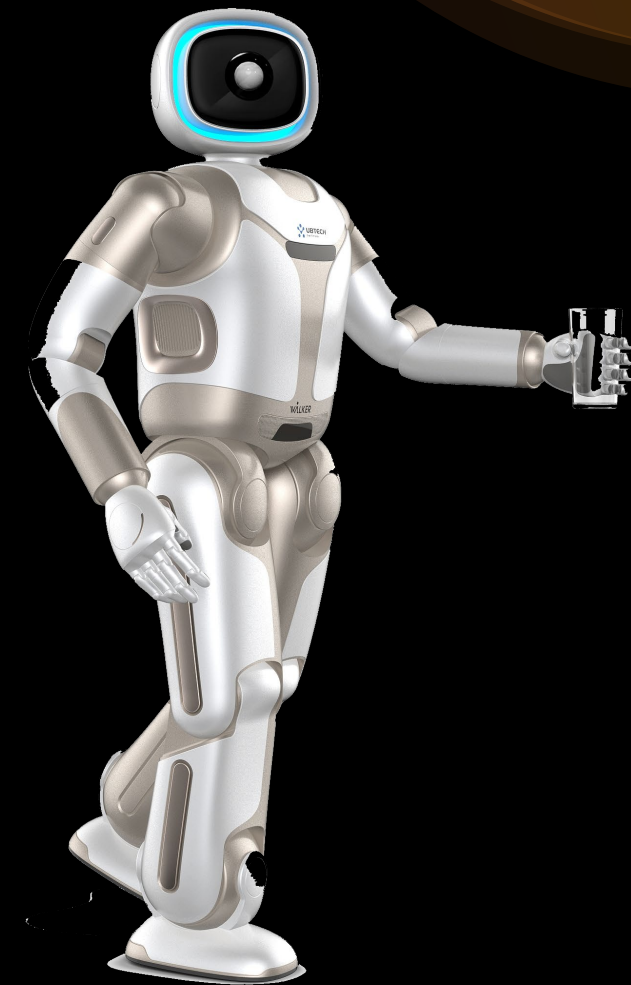


HUMANOID ROBOT FOR EDUCATION

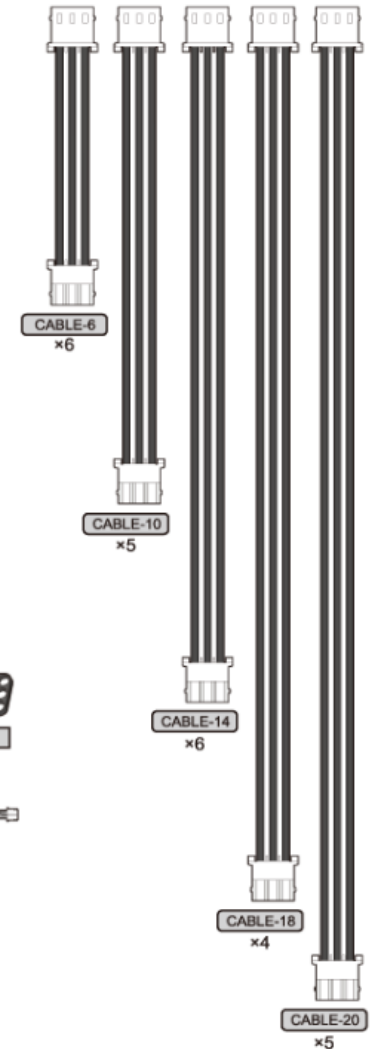
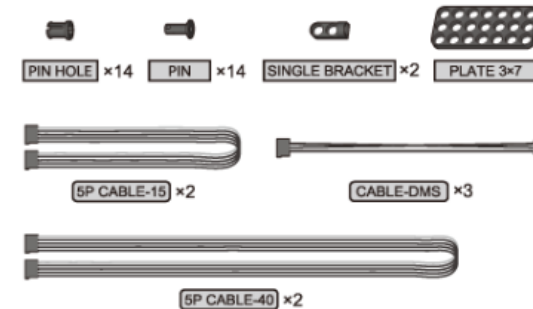
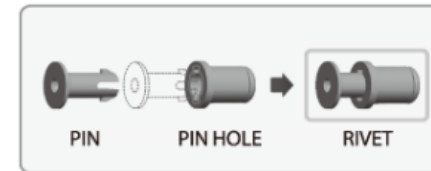
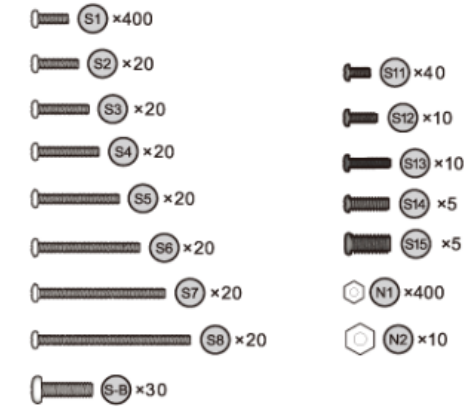
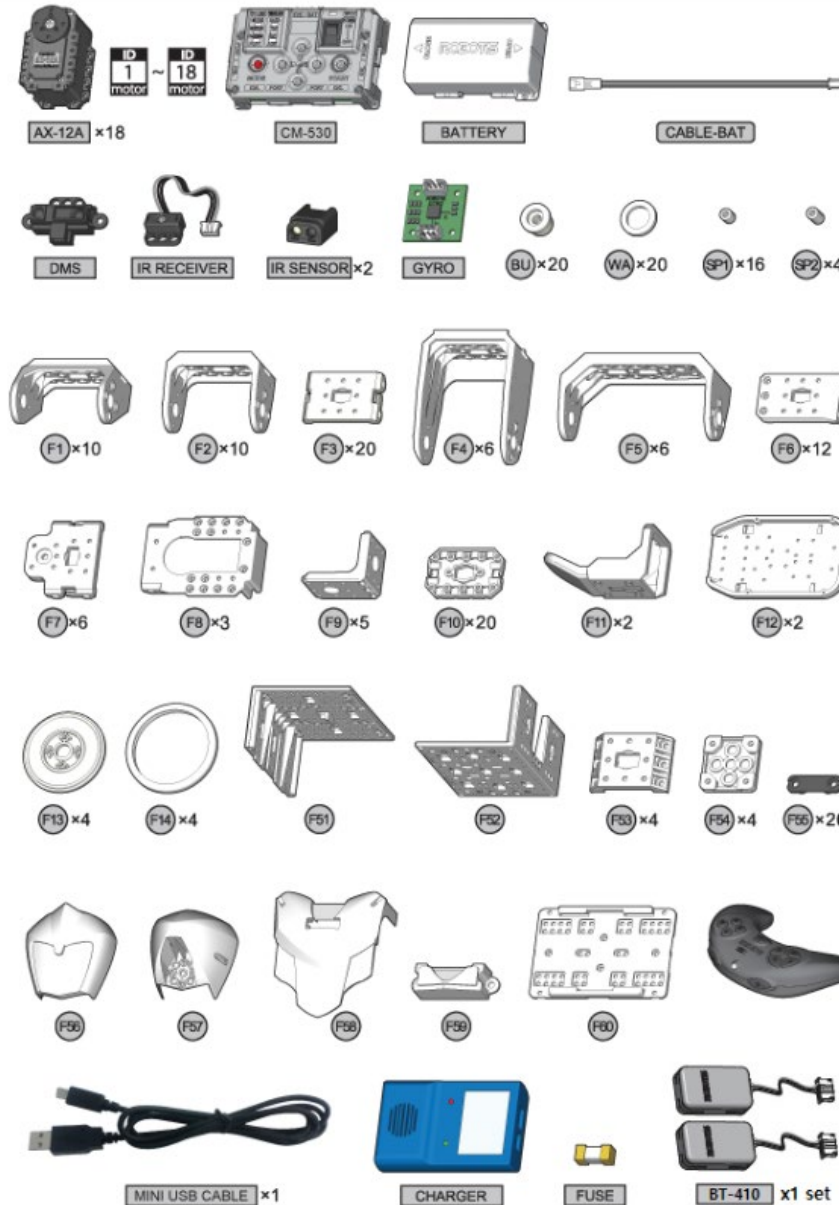


Humanoid robot for education

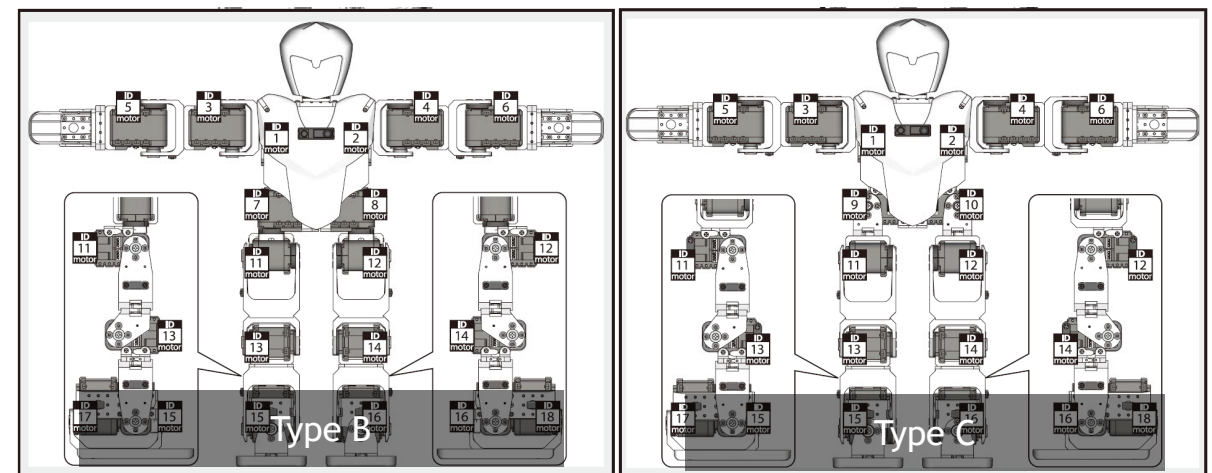
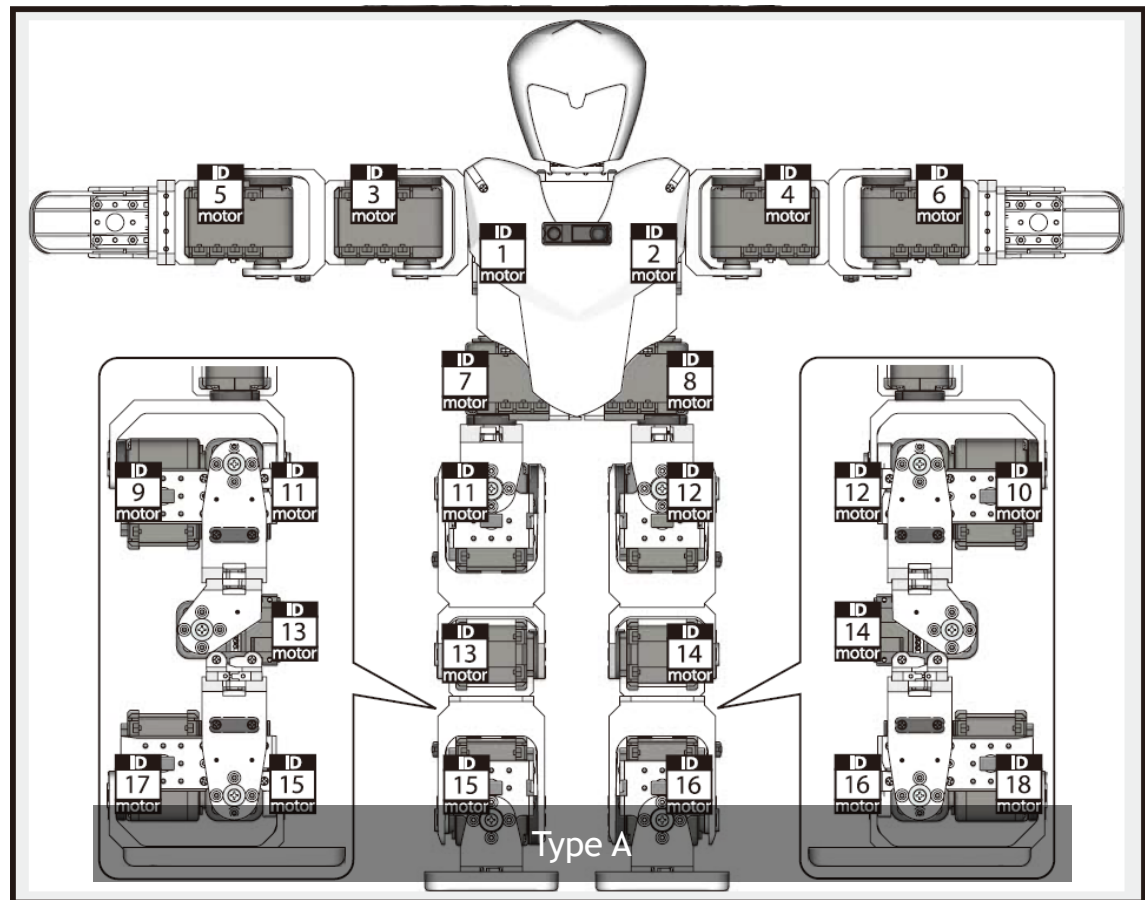


<https://emmanual.robotis.com/docs/en/edu/bioloid/premium/>

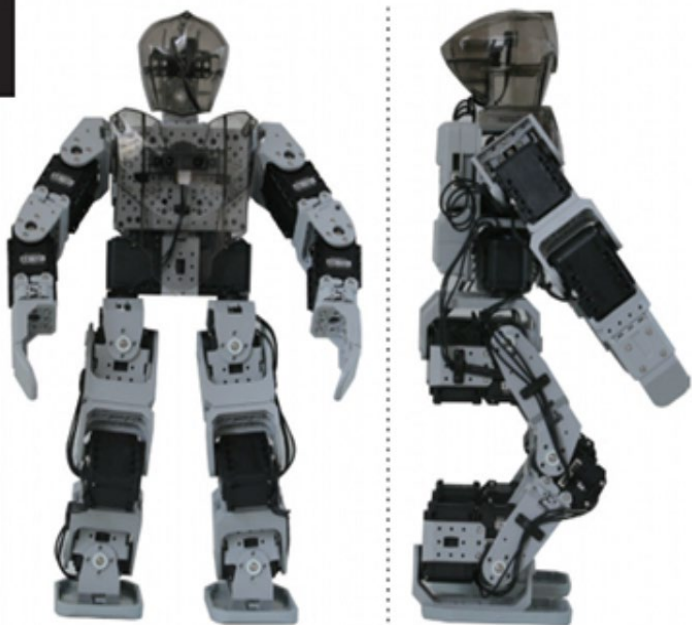
Part List



Humanoid Types

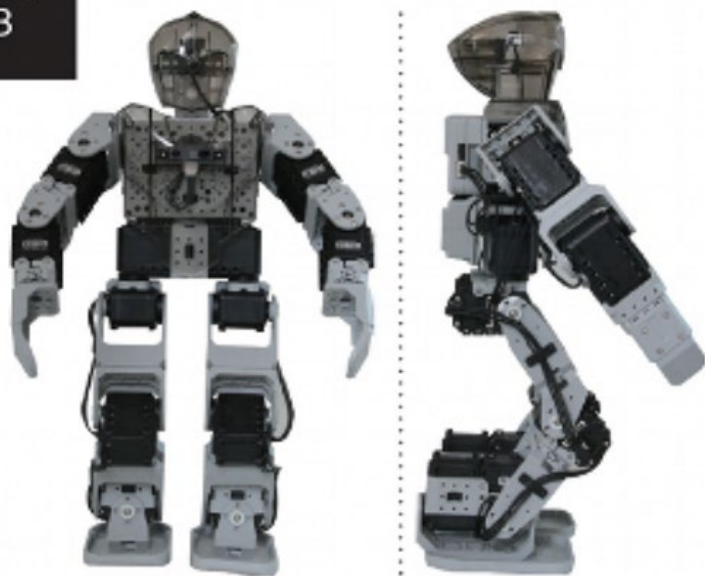


TYPE
A



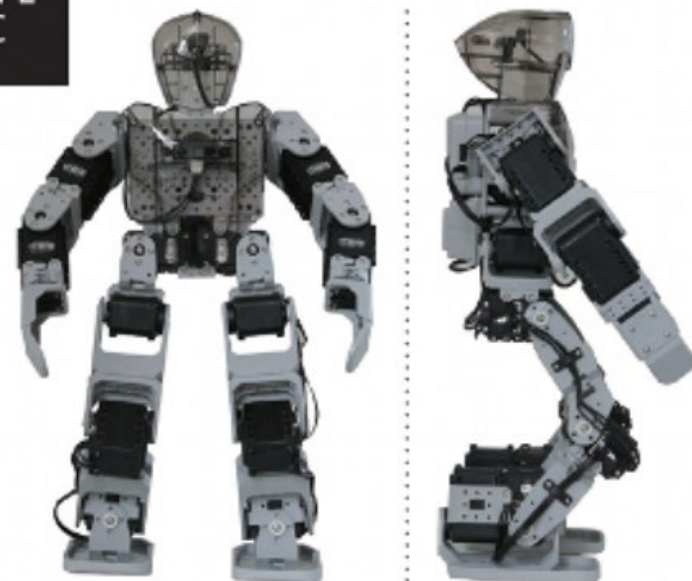
Type A will make a "Do" musical note melody

TYPE
B



Type B will make a "Do Re" musical note melody

TYPE
C



Type C will make a "Do Re Mi" musical note melody

•Point 2. CM-530, main controller for Dynamixel and external sensors



Communication Port

Remote control protocol
for IR, Zigbee

External Port

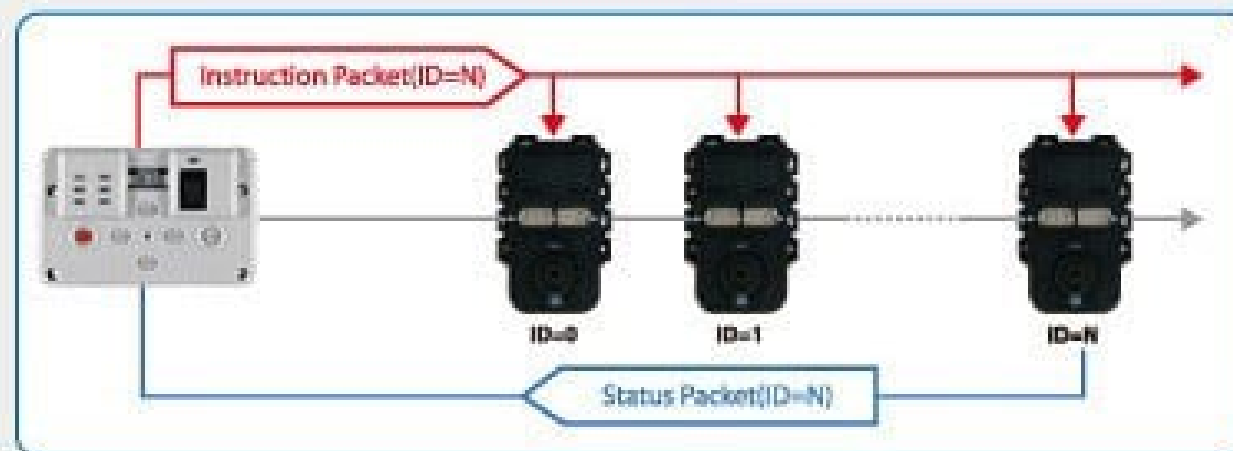
GP I / O + ADC support
for analog sensor

AX-12A BUS Port

Multi drop & packet control

CM-530

- ▶ AX-12A BUS port x 5
- ▶ External port x 6
- ▶ Communication port x 1
- ▶ Embedded MIC/Buzzer
- ▶ Works with Li-po battery / DC jack
- ▶ Self-battery check & warning



Main Controller
CM-530



DYNAMIXEL AX-12A
(Upper Body)



DYNAMIXEL AX-18A
(Lower Body)



Li-Po Battery
(11.1V 1000mA)



Cable Holders



Remote Controller
RC-100B



Wireless Comm
BT-410 Set



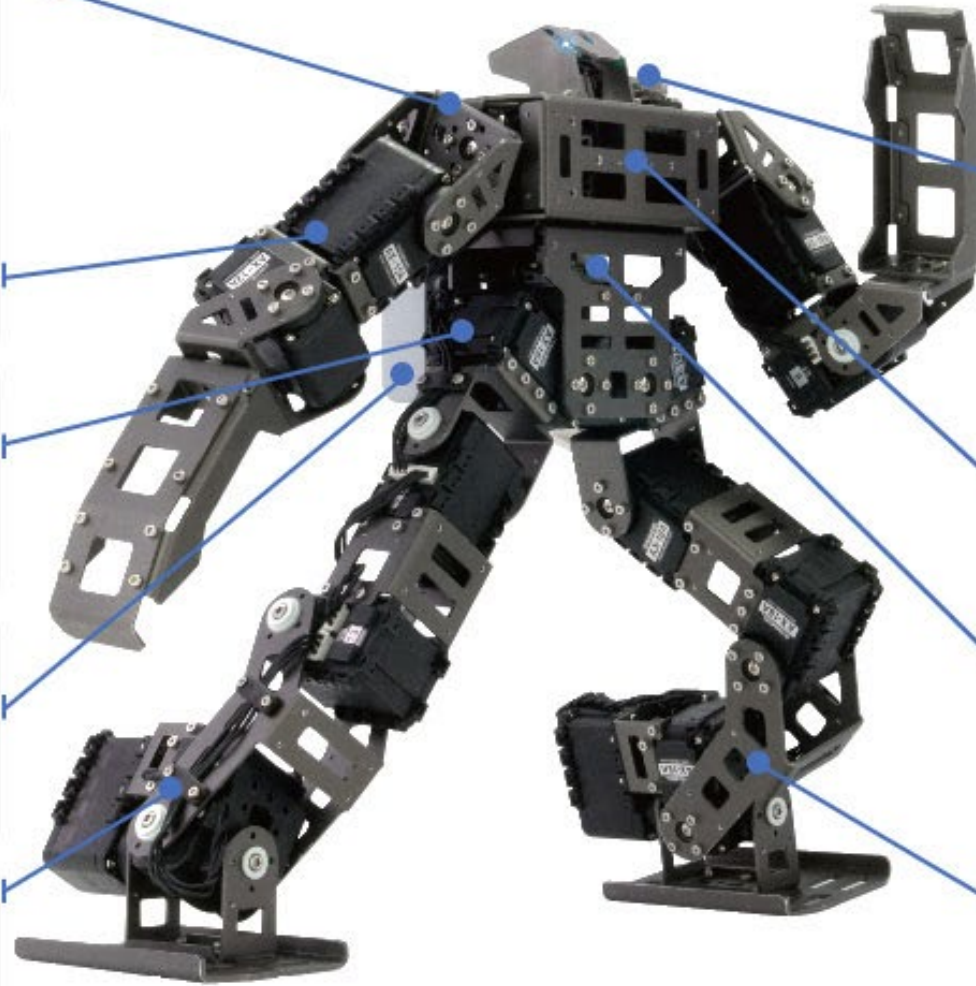
Distance Measurement
Sensor

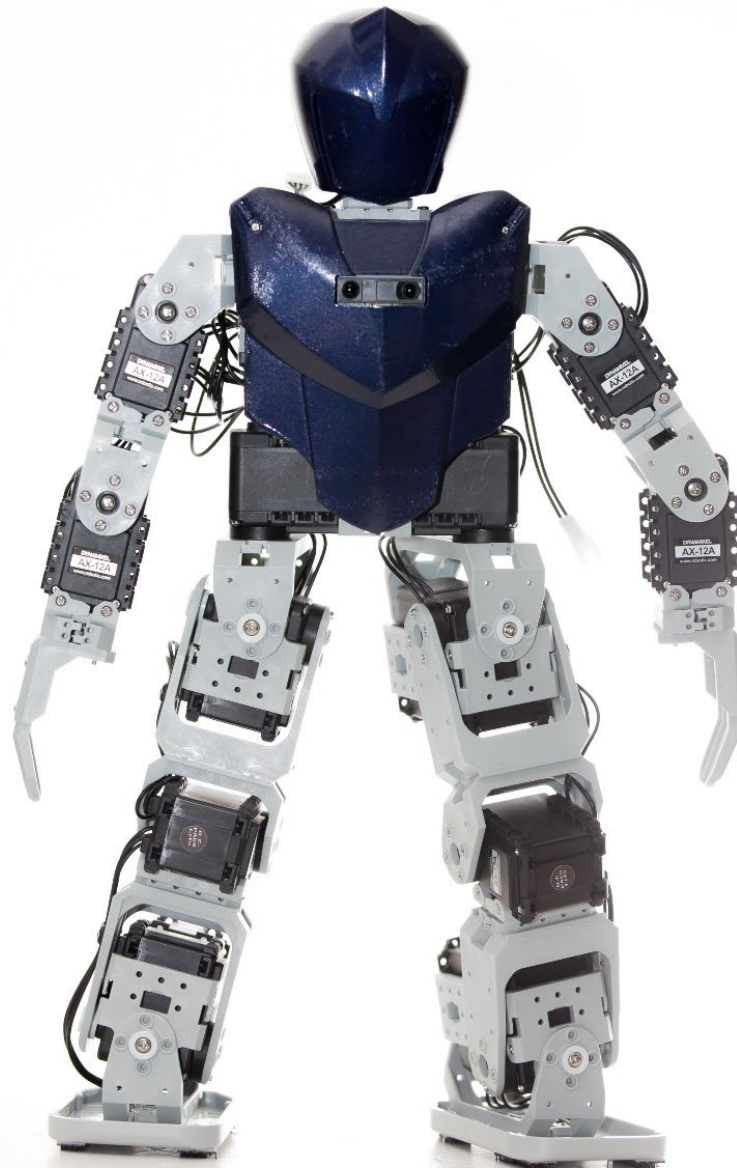


Gyro Sensor
(Walking Balance)

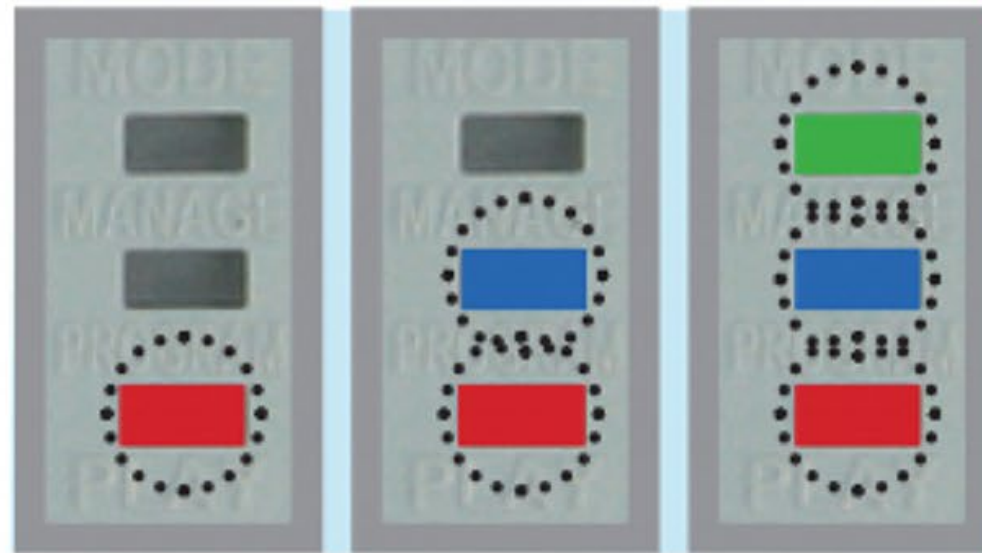


Aluminium Frame





Checking Battery

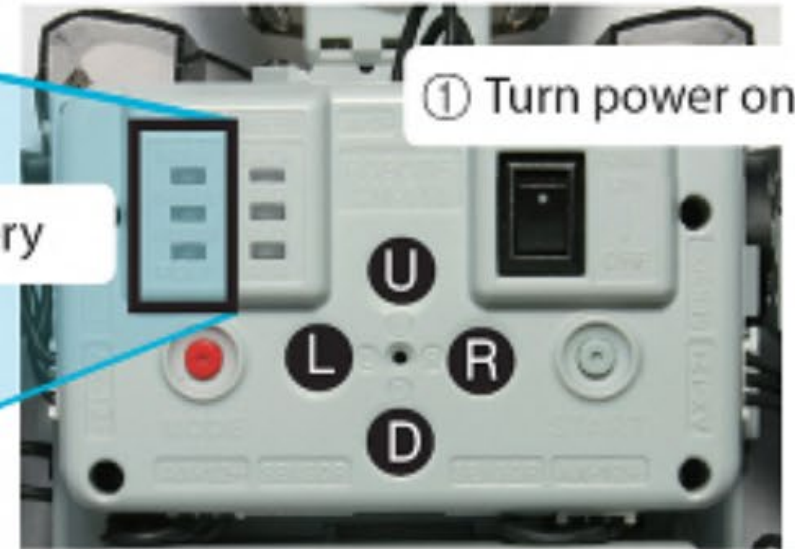


Weak

Normal

Full

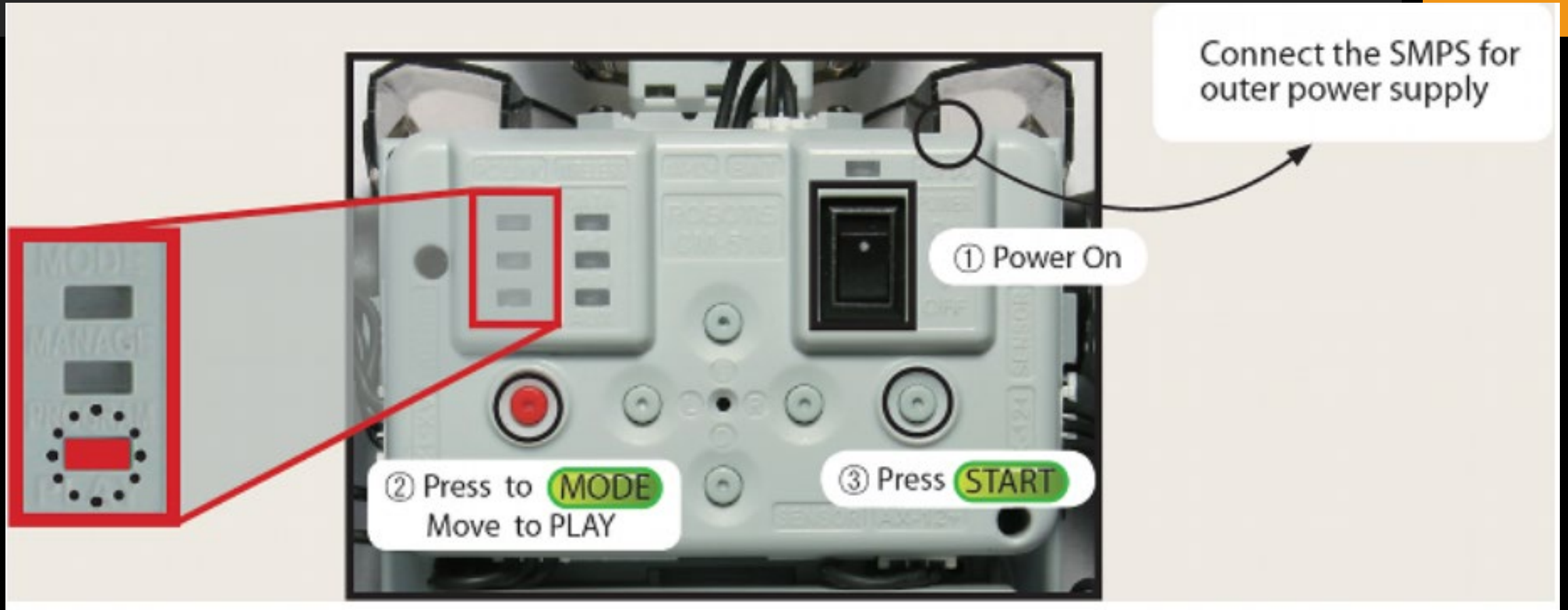
③ Check Battery



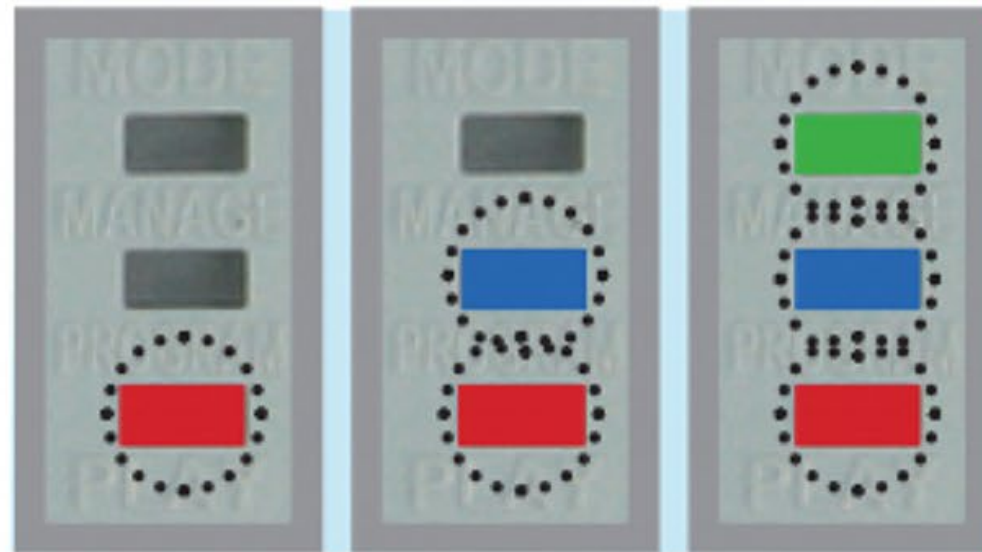
① Turn power on

② Press **U** button

Turning the Robot ON



Checking Battery

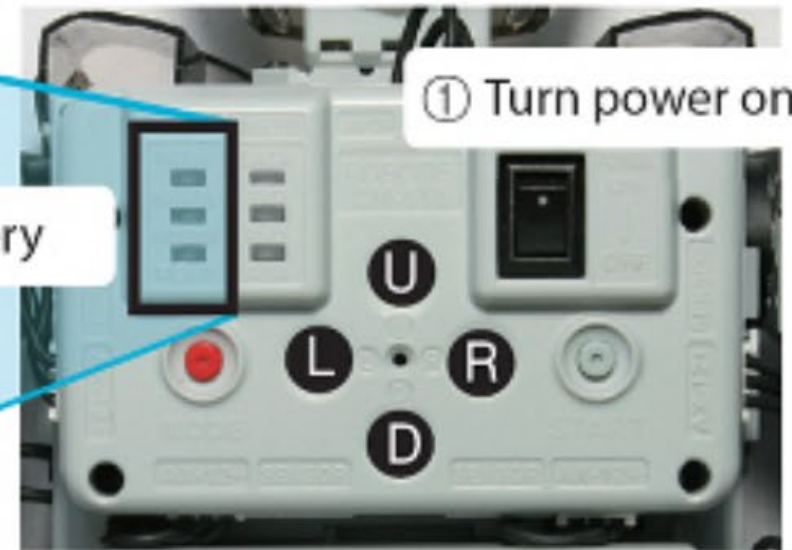


Weak

Normal

Full

③ Check Battery

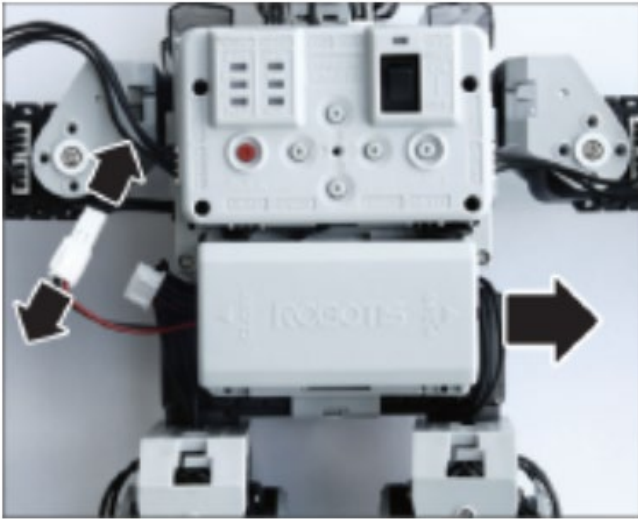


① Turn power on

② Press **U** button

Charging Battery

1. Take the battery out



2. Connect the charger



3. Charge

Charging(Red LED), Complete(Green LED)



Charging Battery

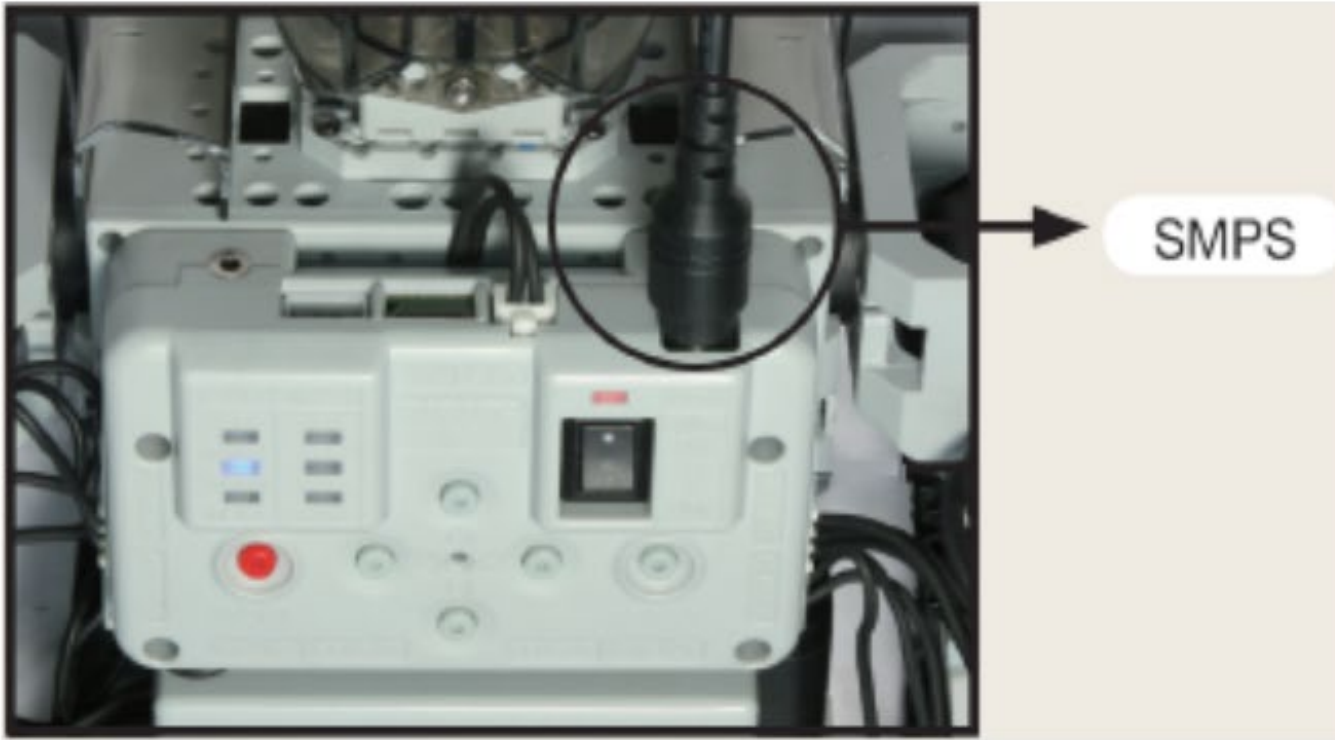
- When fully discharged : 1~1.5 hour
- Leaving the battery fully discharged for too long may reduce its lifespan drastically.
- Time to charge the battery depends on the status of the battery(If the charging time or battery life becomes too short, you may need to replace your battery).

Caution

1. Do NOT keep the battery connected with a robot or a charger.
2. If you will not use the battery for a long time from now on, please keep it HALF-CHARGED.
3. Do NOT put the battery with an environment with high temperature or humidity.

External Power to Robot

- You can connect the robot to an external power source through SMPS.

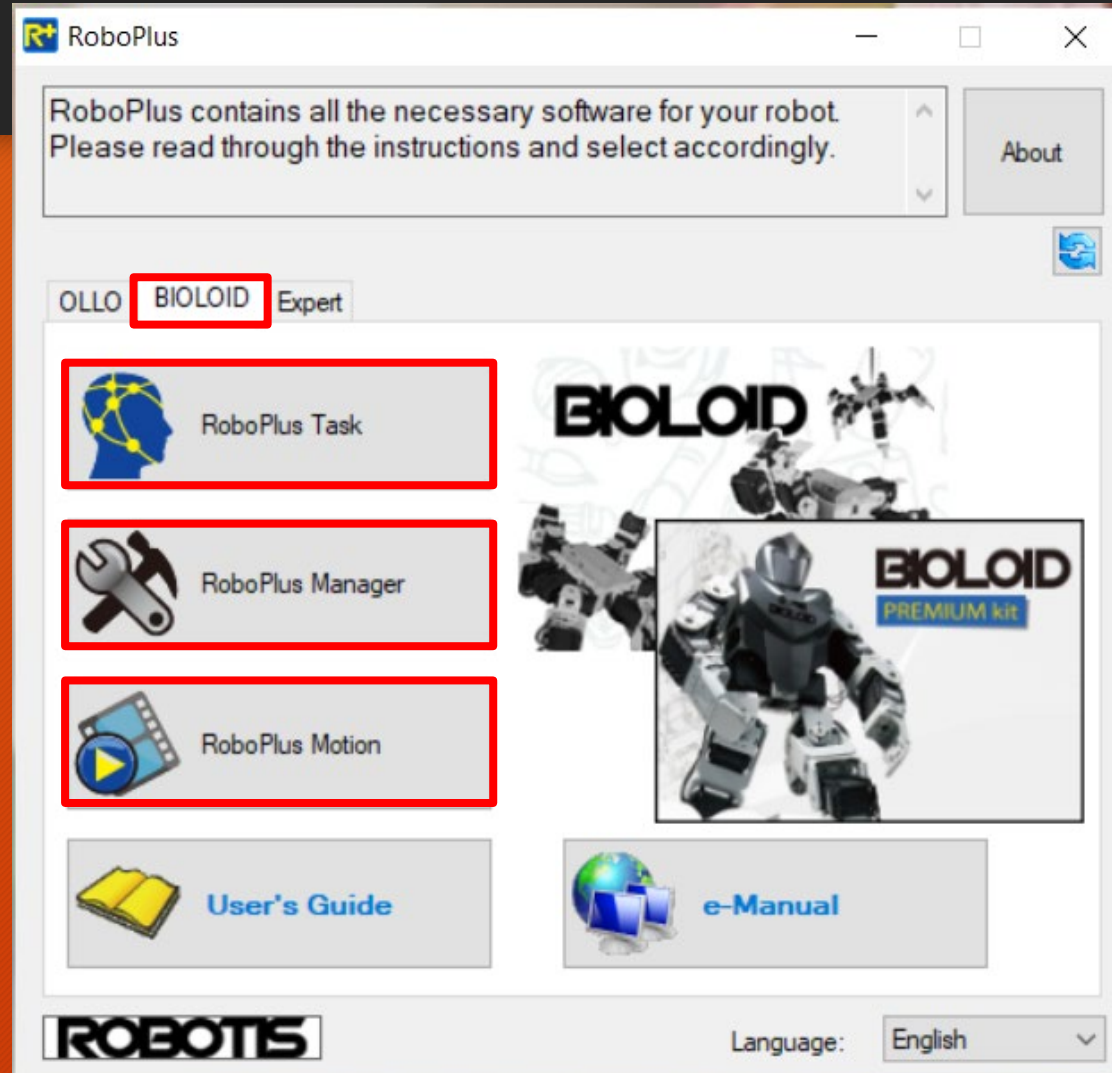




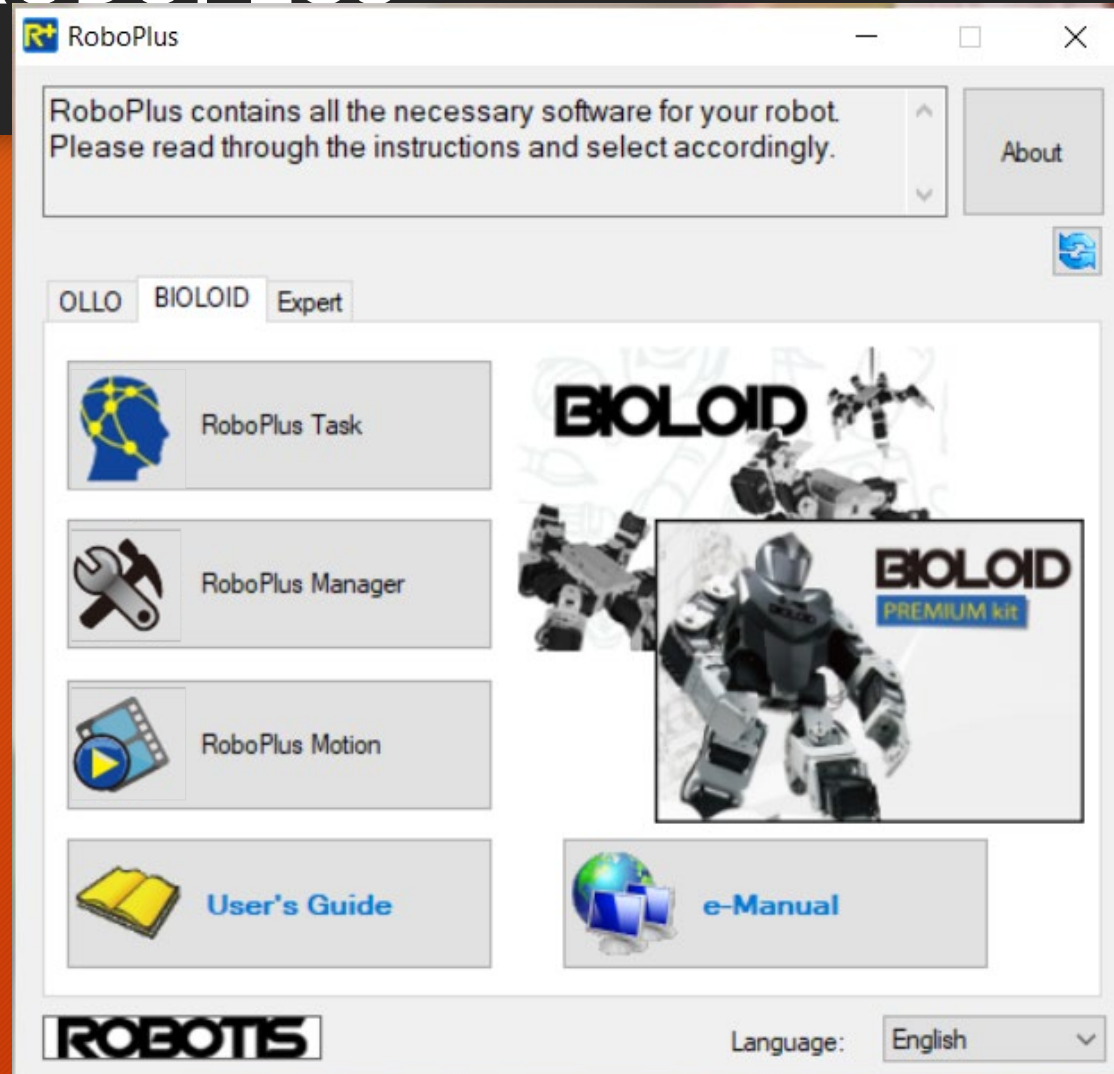
Introduction to ROBOPLUS



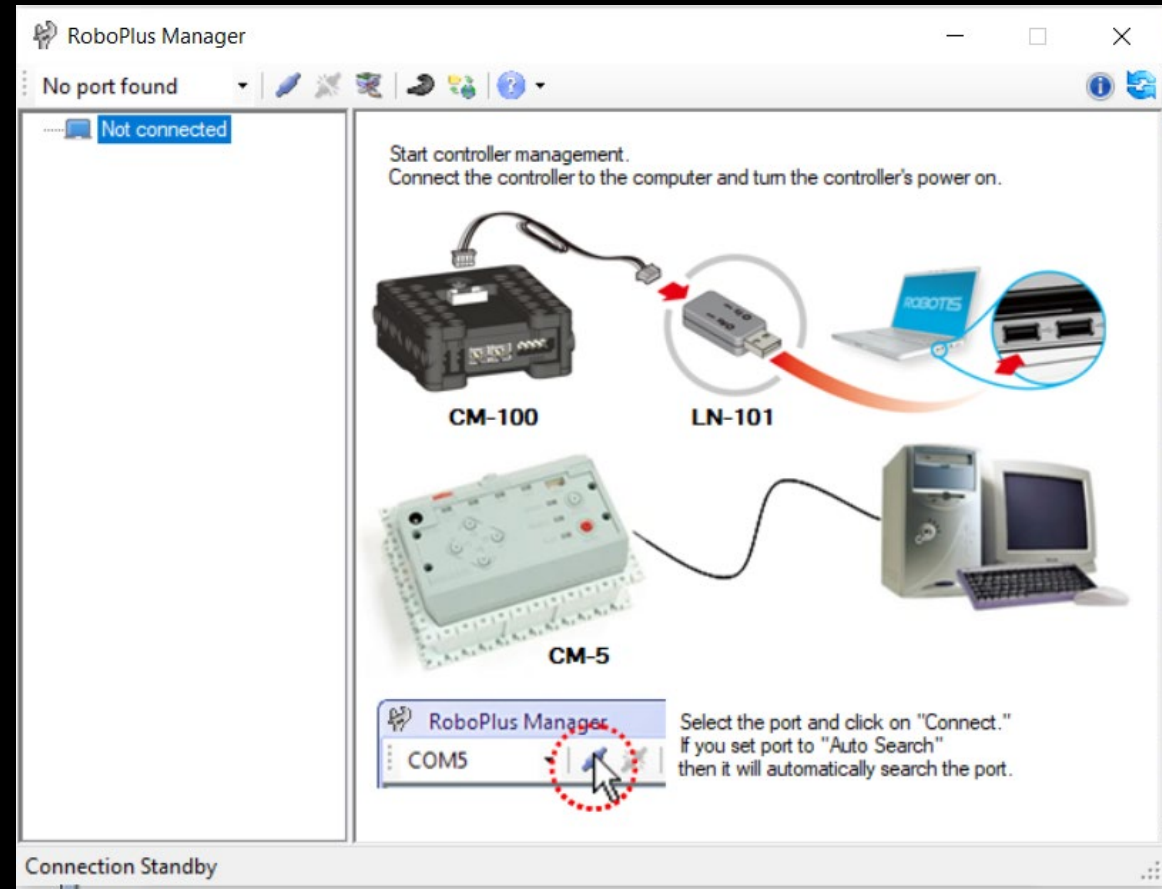
Introduction to ROBOPLUS



Introduction to ROBOPLUS



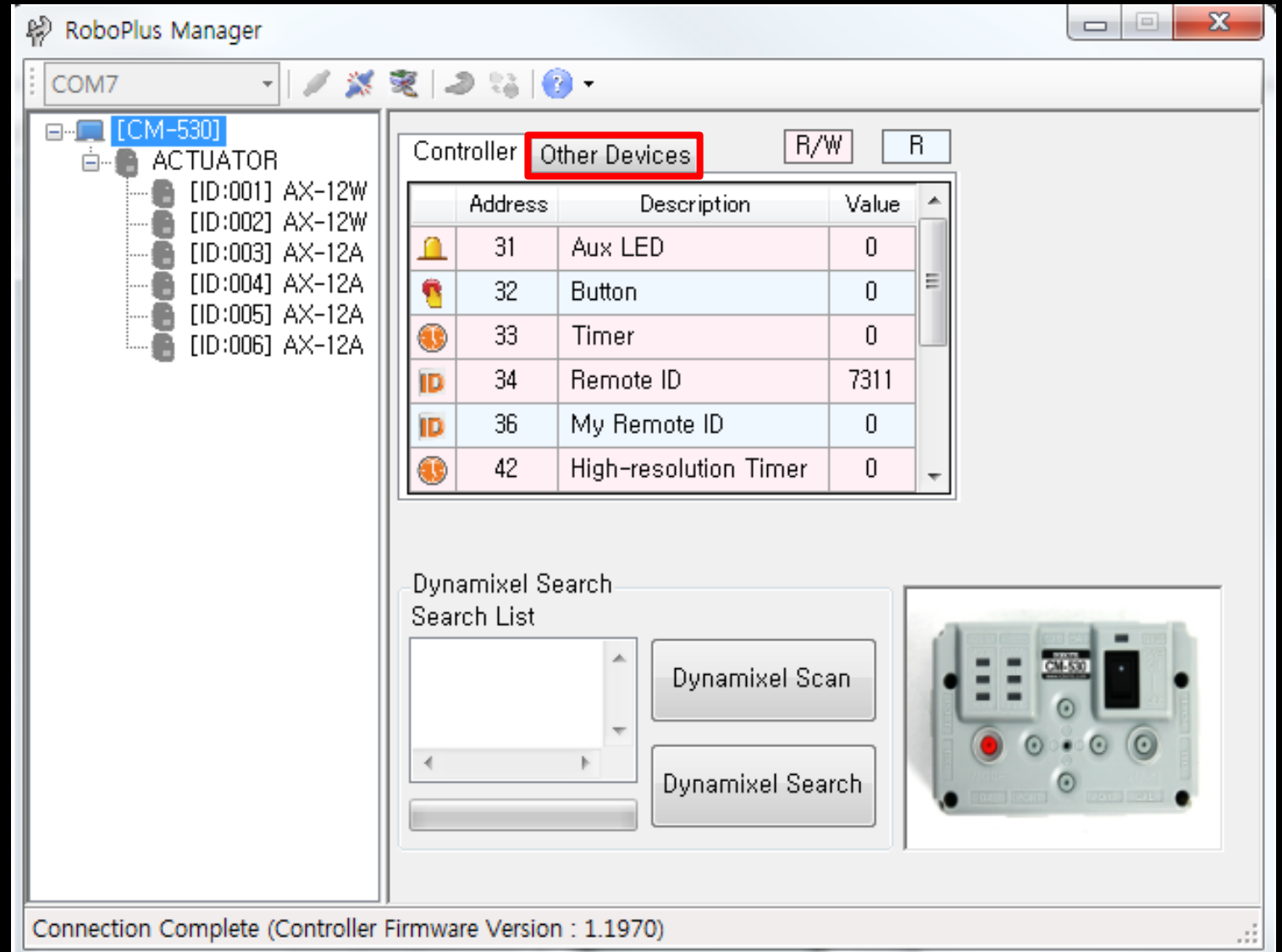
RoboPlus Manager



RoboPlus Manager is used to handle devices used by a robot. Major functions of this program are as follows.

- Manage controller firmware. (Update and Restore)
- Inspect the status of the controller and peripheral devices. (Test)
- Set the required modes. (Settings)

RoboPlus Manager



RoboPlus Motion

The screenshot shows the RoboPlus Motion software interface. Key components are highlighted as follows:

- Connect Robot(C) F4**: A button in the top toolbar.
- Play Motion(P) F7**: A button in the top toolbar.
- STEP 0**: A row in the 'STEP' table, highlighted with a red box.
- STEP 1**: A row in the 'STEP' table.
- STEP 2**: A row in the 'STEP' table.
- STEP 3**: A row in the 'STEP' table.
- STEP 4**: A row in the 'STEP' table.
- STEP 5**: A row in the 'STEP' table.
- Page Parameters**: A section containing:
 - Repeat time**: 1
 - Speed rate**: 1.0
 - Ctrl Inertial force**: 32
 - Real Play Time**: $(3.984\text{sec} / 1.0) \times 1 = 0\text{min } 3.984\text{sec}$
- Joint Softness**: A table with 15 rows (ID[1] to ID[15]) and a 'Level' column, all set to 5.
- Basic Pose Editor**: A section with two tables:
 - <Pose of Step>**: A table with 18 rows (ID[1] to ID[18]) and a 'Value' column. Values range from 335 to 515. Checkmarks are present in the third column.
 - <Pose of Robot>**: A table with 18 rows (ID[1] to ID[18]) and a 'Value' column. All values are 'OFF'.
- Navigation Buttons**: A set of buttons including a green right arrow, a circular arrow, and a green left arrow, all highlighted with red boxes.
- Actuator Control**: A section at the bottom with two light bulb icons. The first is highlighted with a red box and labeled 'Press the "On" button to turn on the selected actuator.' The second is highlighted with a red box and labeled 'Press the "Off" button to turn off the selected actuator.'

Robo Plus Motion

2. 1. Robot Motion

“Robot Motion” refers to the motion data in the controller.
These data can be seen and edited on the “Robot Motion” window.
This window is displayed only when the robot is connected.
(See how to [Connect to Robot](#))

[CM-510] X

	Name	Next	Exit
▶ 1	Bow	0	0
2	Bravo	3	0
3		4	0
4		0	0
5	Rap chest	6	0
6		0	0
7	Scratch head	0	0
8	Push up	9	0
9		10	0
10		0	0
11	Hand standing	12	0
12		13	0
13		0	0
14	R blocking	14	15
15		0	0
16	L blocking	16	17
17		0	0
18	L kick	0	0
19	R kick	0	0
20	R attack	0	0
21	L attack	0	0
22	F attack	0	0
23	Defence	23	24
24		0	0
25	Sit down	0	0
26	Stand up	0	0
27	F getup	0	0
28	B getup	0	0
29	Clap ready	0	0
30	Clapping	0	0

	Pause	Time
▶ STEP 0	0	0,296
STEP 1	0	0,496
STEP 2	0,496	1
STEP 3	0	1
STEP 4	0	0,296
STEP 5	0	0,4

Page Parameters

Repeat time: 1

Speed rate: 1,0

Ctrl Inertial force: 32

Real Play Time
(3,984sec / 1,0) × 1
= 0min 3,984sec

[Joint Softness]

ID	Level
ID [1]	5
ID [2]	5
ID [3]	5
ID [4]	5
ID [5]	5
ID [6]	5
ID [7]	5
ID [8]	5
ID [9]	5
ID [10]	5
ID [11]	5
ID [12]	5
ID [13]	5
ID [14]	5
ID [15]	5

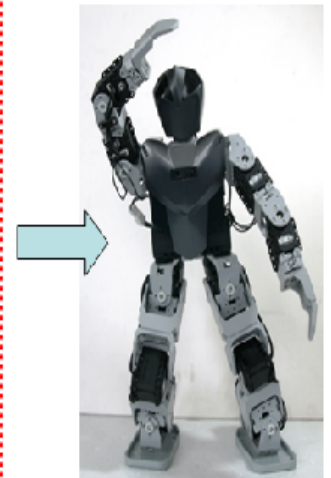
3. 4. 1. 4. Play Pose

To execute a pose, move “Pose of Step” to “Pose of Robot.”



<Pose of Step>		
ID	Value	
▶ ID [1]	233	✓
ID [2]	786	✓
ID [3]	299	✓
ID [4]	725	✓
ID [5]	462	✓
ID [6]	562	✓
ID [7]	353	✓
ID [8]	671	✓
ID [9]	497	✓
ID [10]	595	✓
ID [11]	317	✓
ID [12]	758	✓
ID [13]	284	✓
ID [14]	809	✓
ID [15]	628	✓
ID [16]	379	✓
ID [17]	529	✓
ID [18]	579	✓

<Pose of Robot>	
ID	Value
ID [1]	194
ID [2]	847
ID [3]	394
ID [4]	713
ID [5]	494
ID [6]	486
ID [7]	358
ID [8]	679
ID [11]	147
ID [12]	871
ID [13]	525
ID [14]	500
ID [15]	435
ID [16]	576
ID [17]	538
ID [18]	548



RoboPlus Motion

2. 1. Robot Motion

"Robot Motion" refers to the motion data in the controller.
These data can be seen and edited on the "Robot Motion" window.
This window is displayed only when the robot is connected.
(See how to [Connect to Robot](#))

[CM-510] x

	Name	Next	Exit
▶ 1	Bow	0	0
2	Bravo	3	0
3		4	0
4		0	0
5	Rap chest	6	0
6		0	0
7	Scratch head	0	0
8	Push up	9	0
9		10	0
10		0	0
11	Hand standing	12	0
12		13	0
13		0	0
14	R blocking	14	15
15		0	0
16	L blocking	16	17
17		0	0
18	L kick	0	0
19	R kick	0	0
20	R attack	0	0
21	L attack	0	0
22	F attack	0	0
23	Defence	23	24
24		0	0
25	Sit down	0	0
26	Stand up	0	0
27	F getup	0	0
28	B getup	0	0
29	Clap ready	0	0
30	Clapping	0	0

	Pause	Time
▶ STEP 0	0	0,296
STEP 1	0	0,496
STEP 2	0,496	1
STEP 3	0	1
STEP 4	0	0,296
STEP 5	0	0,4

Page Parameters

Repeat time: 1

Speed rate: 1,0

Ctrl Inertial force: 32

Real Play Time
(3,984sec / 1,0) × 1
= 0min 3,984sec

[Joint Softness]

ID	Level
ID [1]	5
ID [2]	5
ID [3]	5
ID [4]	5
ID [5]	5
ID [6]	5
ID [7]	5
ID [8]	5
ID [9]	5
ID [10]	5
ID [11]	5
ID [12]	5
ID [13]	5
ID [14]	5
ID [15]	5

3. 4. 1. 5. Capture Pose

To "Capture"(Store) a pose, move "Pose of Robot" to "Pose of Step."

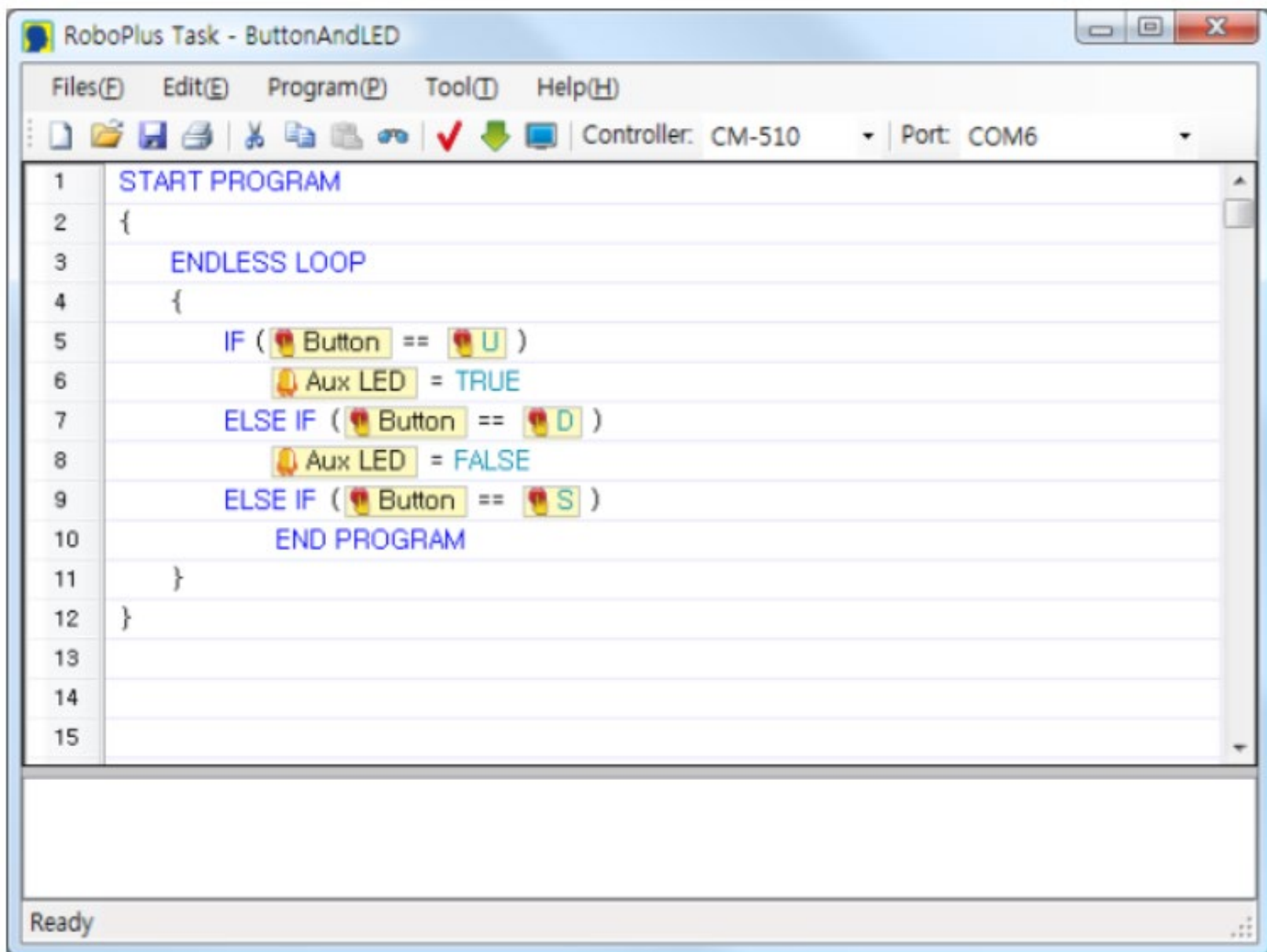


<Pose of Step>			<Pose of Robot>		
	Value			Value	
▶ ID[1]	233	✓	ID[1]	194	
ID[2]	786	✓	ID[2]	847	
ID[3]	299	✓	ID[3]	394	
ID[4]	725	✓	ID[4]	713	
ID[5]	462	✓	ID[5]	494	
ID[6]	562	✓	ID[6]	486	
ID[7]	353	✓	ID[7]	358	
ID[8]	671	✓	ID[8]	679	
ID[9]	497	✓	ID[11]	147	
ID[10]	595	✓	ID[12]	871	
ID[11]	317	✓	ID[13]	525	
ID[12]	758	✓	ID[14]	500	
ID[13]	284	✓	ID[15]	435	
ID[14]	809	✓	ID[16]	576	
ID[15]	628	✓	ID[17]	538	
ID[16]	379	✓	ID[18]	548	
ID[17]	529	✓			
ID[18]	579	✓			

Diagram illustrating the capture process: A green arrow points from the "Pose of Robot" table to the "Pose of Step" table, indicating the transfer of pose data. Below the tables, a green arrow points from the "Pose of Robot" table to a robot image, and another green arrow points from the robot image to the "Pose of Step" table, showing the sequence of actions.



RoboPlus Task



The screenshot shows the RoboPlus Task - ButtonAndLED software interface. The window title is "RoboPlus Task - ButtonAndLED". The menu bar includes "Files(F)", "Edit(E)", "Program(P)", "Tool(T)", and "Help(H)". The toolbar contains icons for file operations and a status bar at the bottom shows "Ready". The main text area displays a C++ program with line numbers 1 through 15. The program logic is as follows:

```
1  START PROGRAM
2  {
3      ENDLESS LOOP
4      {
5          IF ( Button == U )
6              Aux LED = TRUE
7          ELSE IF ( Button == D )
8              Aux LED = FALSE
9          ELSE IF ( Button == S )
10             END PROGRAM
11      }
12 }
13
14
15
```

The status bar at the bottom of the window indicates "Ready".

Example of task

- 
1. Sprint
 2. Weightlifting
 3. Lift & Carry
 4. Basketball
 5. Triple Jump
 6. Marathon
 7. Archery

