UXA-90 Light

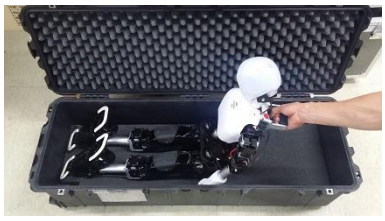
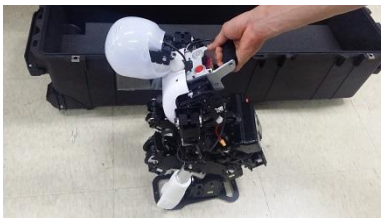
Multipurpose Humanoid Robot

Operation Manual

ROBOBUILDER

- Table of Contents -

CAUTION

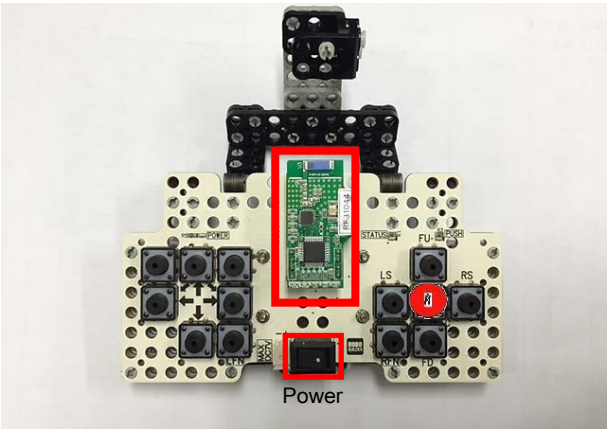




- When taking UXA-90 out from the carrier, lift by holding the handle on the back and have the robot sit on the floor.
- It is dangerous to put your hand into the servo motor area when UXA-90 robot is in action.
- Connect the regular power supply (power adapter) to check if the power works properly. (Do not use the battery at first.)
- Always check for damages in UXA-90 robot after use.
- Do not put UXA-90 robot on an elevated place such as on a table and work on the floor to prevent the robot from falling.
- In case of an emergency, press the red button on the SW board during operation for immediate stop.

- Do not put your hand into the fan on the knees.
- Be careful with motions and orders that require immoderate movements as they may damage the robot.
- Assure a safe distance from the robot when testing a new motion (movement).
- Connecting a safety cable is recommended in case of unexpected movements (falling, etc.) during the test.
- The manufacturer is not responsible for arbitrary remodeling/improvement or inappropriate management of the robot.

BASIC OPERATION

The following is based on <Chapter 6.2 RF Mini Controller>, and it explains the initial operation of the robot.

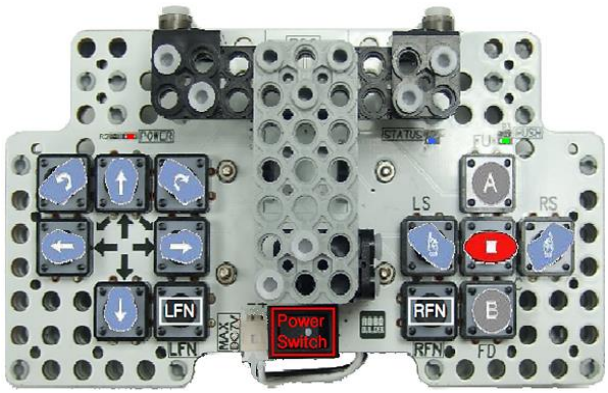


① Press the power switch on the SW board with the UXA-90 seated, and check the LED light on after the robot is turned on(*Press the power switch more than 3 seconds when you turn on the robot's computer together / You can control the robot's basic motions without turning on the computer).

② Press the power switch on the RF mini controller to turn on the power.

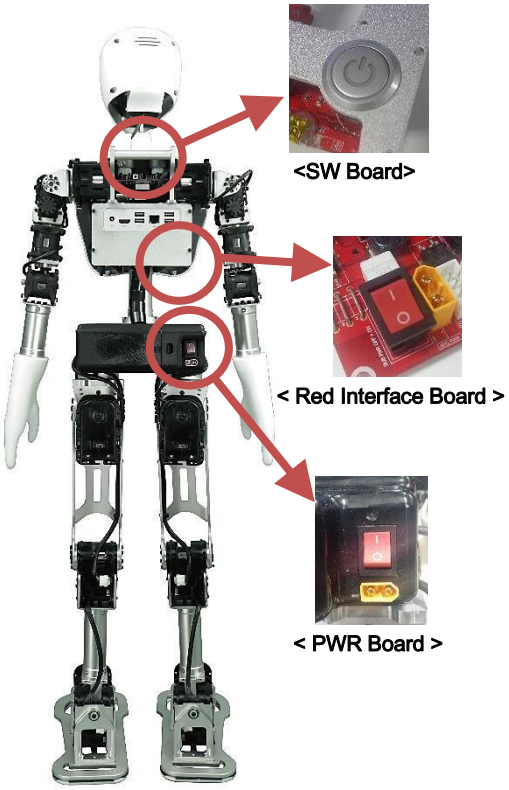
③ Press button on the RF controller to have the UXA-90 stand up in the initial position.

④ Press the button to have the robot move from the initial position. (Reference– Chapter 7.1 Remote Controller Key Map)



<RF controller key arrangement>

1. POWER



* The power for UXA-90 robot is 18.5V, and it operates with regular power (power adapter) or a battery.

* The power switch consists of SW board, red interface board, and PWR board. Among these three powers, red interface board and PWR board shall stay ‘on’ at all times, and turn on and off the robot with the SW board.

1.1 REGULAR POWER

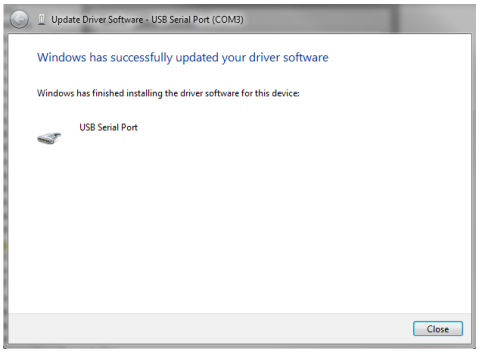
* When using the regular power, connect the power adapter provided with the package to the power supply part(PWR Board) of UXA-90.

1.2 BATTERY POWER

Check the specification of a battery first before use (Refer to Chapter 7.3 Battery specification). Connect the battery to the cable inside of the battery case. Remove the power adapter before use.

2. USB DRIVER

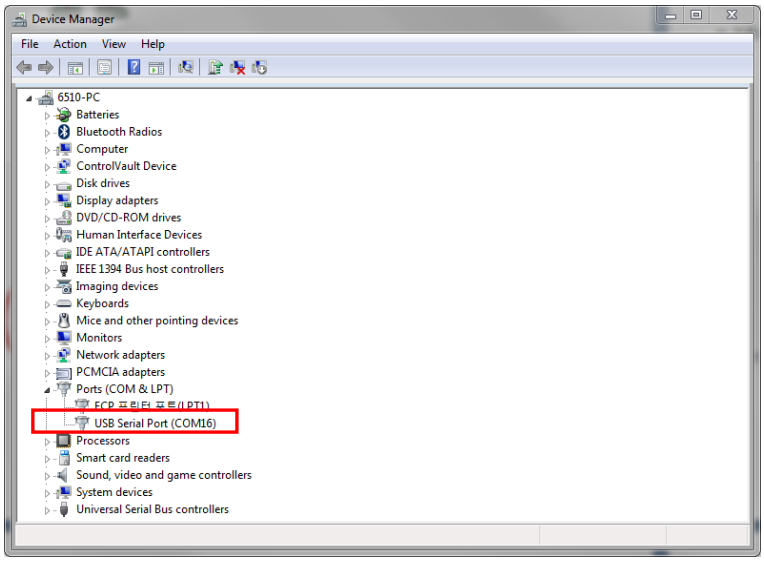
Use the Micro-USB cable to connect the PC and UXA-90. Here, the connecting part on the UXA-90 is the micro socket on the switch board (Refer to Chapter 3.2 Switch Board.). See below for driver installation guideline and a few setting methods.



<Figure 1>

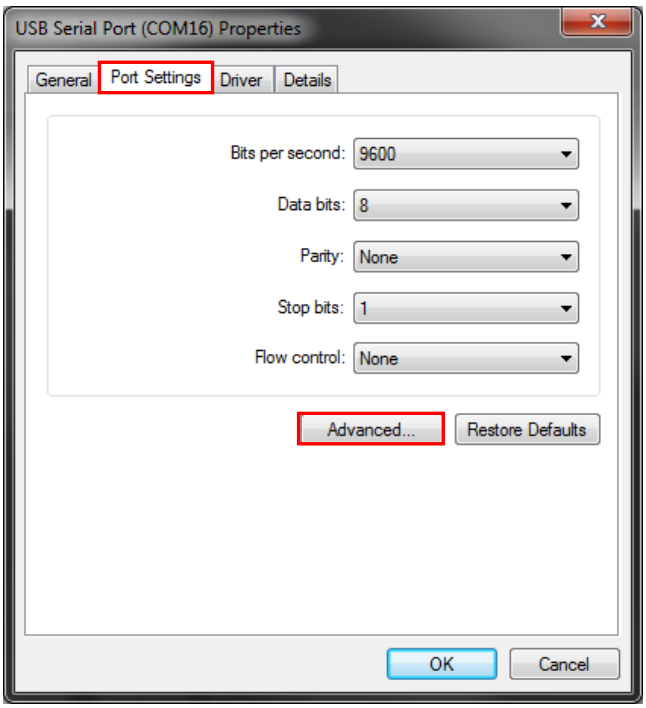
1) When the UXA-90 is connected to the PC with the Micro-USB cable, the automatic installation begins as shown in <Figure 1>.

※ If auto-installation does not begin, try connecting the USB again.



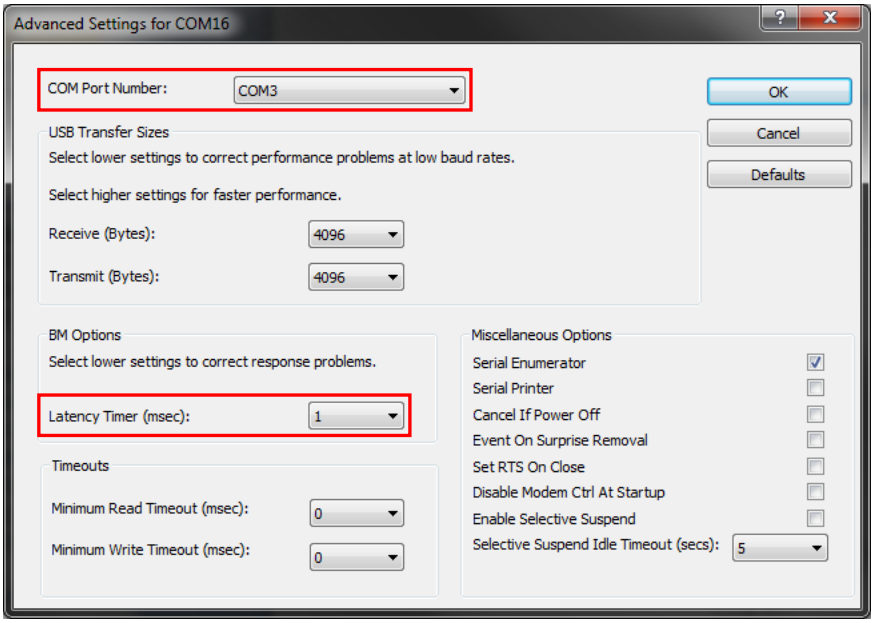
<Figure 2>

2) After completing the installation, check the port setting on Device Manager.



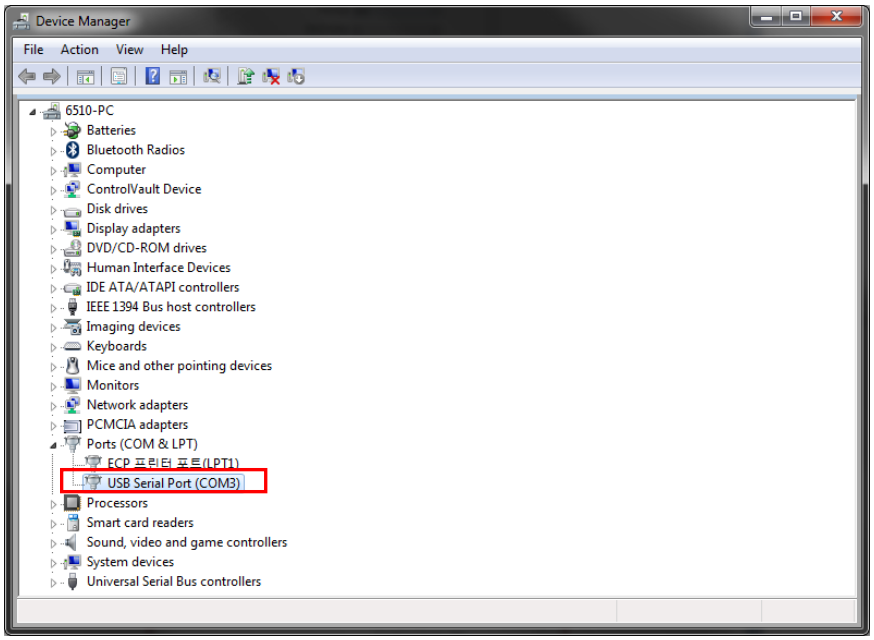
<Figure 3>

3) Click on the Advanced button in the port settings.



<Figure 5>

5) Change the COM Port Number to [COM3], and Latency Timer (msec) to [1].



<Figure 6>

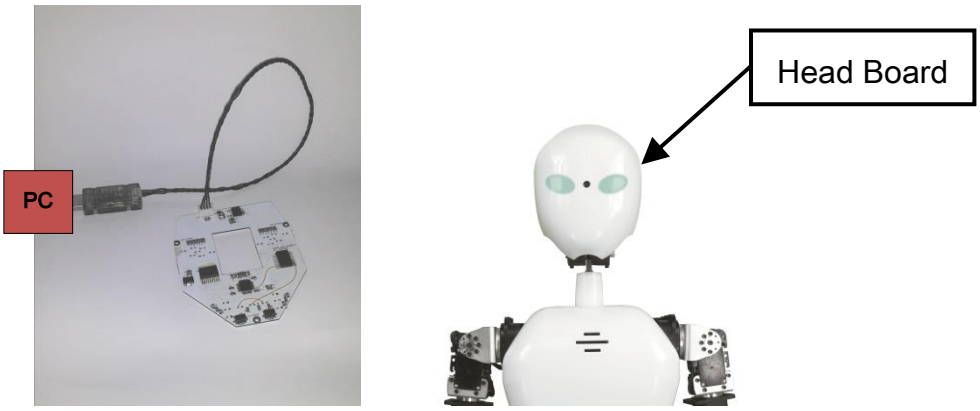
6) Check that the port number has been changed to [COM3].

3. FIRMWARE DOWNLOAD

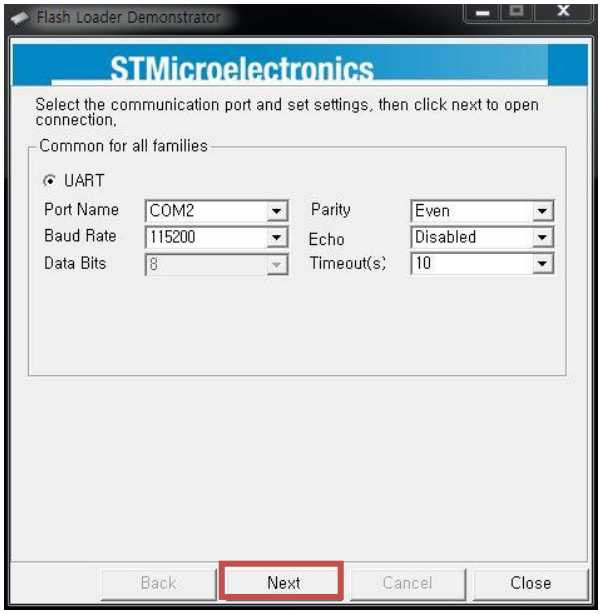
*Firmware download is not required unless update notice is released by Robobuilder (p9-p13).

The four boards to download the firmware are head board, switch board, and red interface board (main controller, sub controller). The program used to download the firmware is ‘Flash Loader Demo.exe’. Be careful as each board requires different switches to be pressed before downloading the firmware.

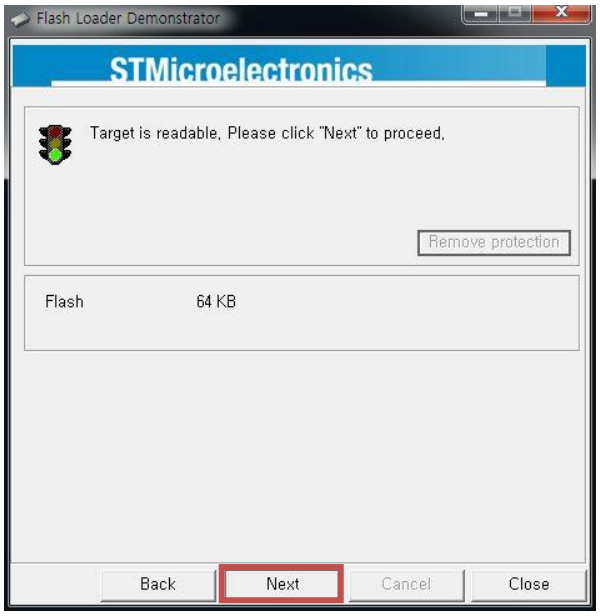
3.1 Head Board



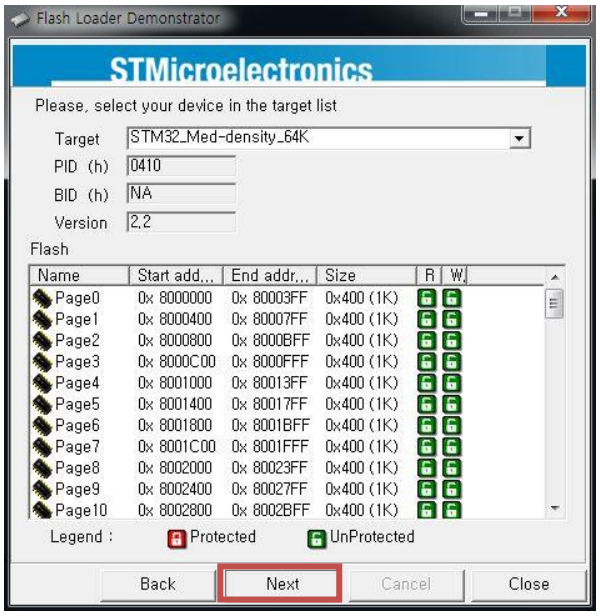
A. Connect USB to UART to the PC and the head board. The Boot switch is to be pressed when power is supplied, so press the Boot button while the Reset button is being pressed, and only keep the Boot button pressed.



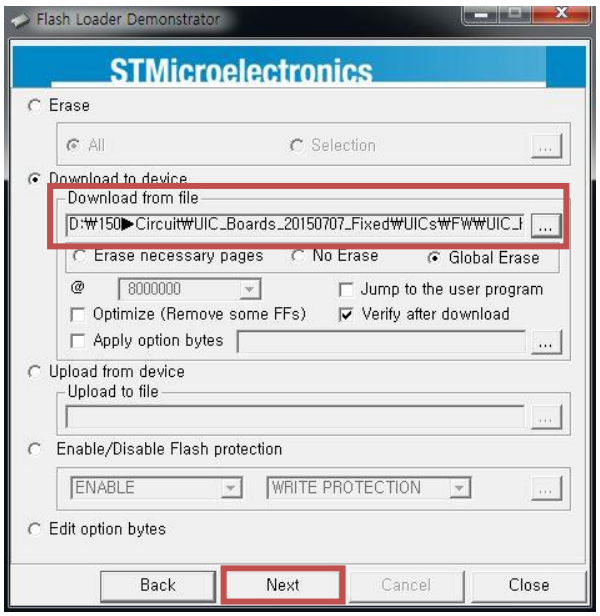
B. Open Flash Loader Demo.exe and set the USB to UART port name and the rate. Press <Next>.



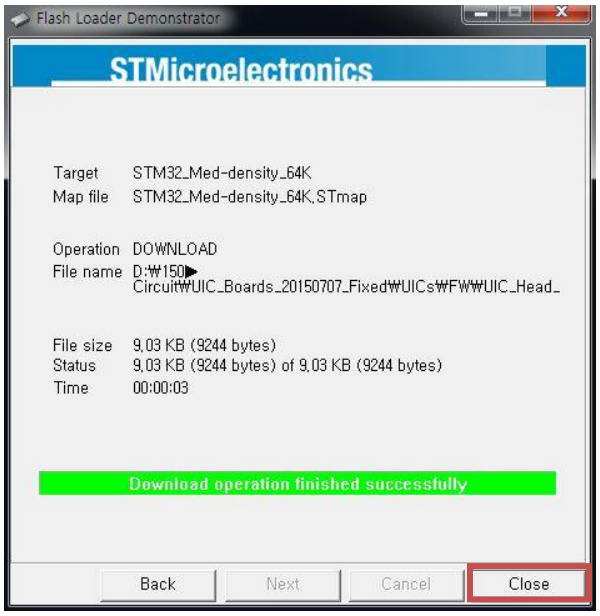
C. Click <Next>.



D. Check the list and click <Next>.

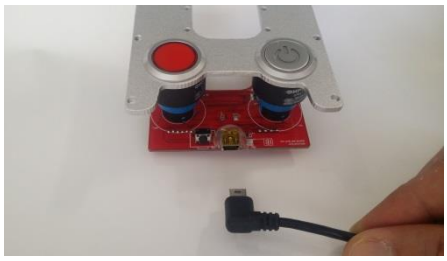


E. Refer to the ‘UXA-90_LIGHT_PARTLIST’ file and open the firmware file (.hex) of the head board. Check the information and click <Next>.

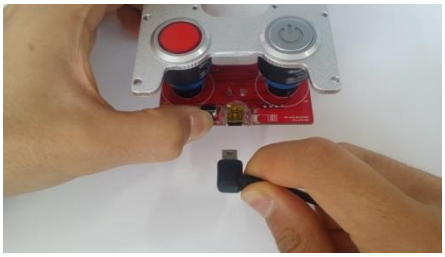


F. Once the download is completed, click <Close>.

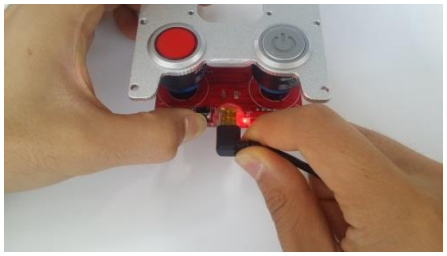
3.2 Switch Board



1) Have the Micro-USB on standby.



2) Press Boot button.



3) Connect the Micro-USB cable.

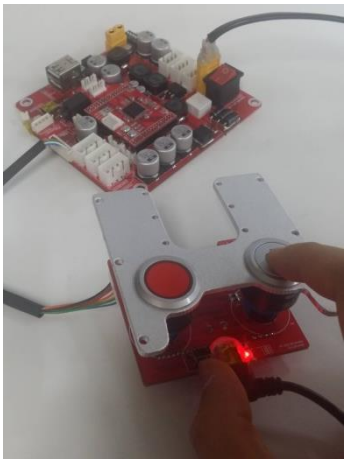
A. Since there is no Reset button on the switch board, connect the Micro-USB cable to the PC while the Boot button is pressed.

B. As explained earlier, download the firmware for the switch board.

※ When the firmware is downloaded properly on the switch board, connect with the red interface board and provide power to the red interface board. Check if the LED of the switch board power button is flickering.

3.3 Red Interface Board

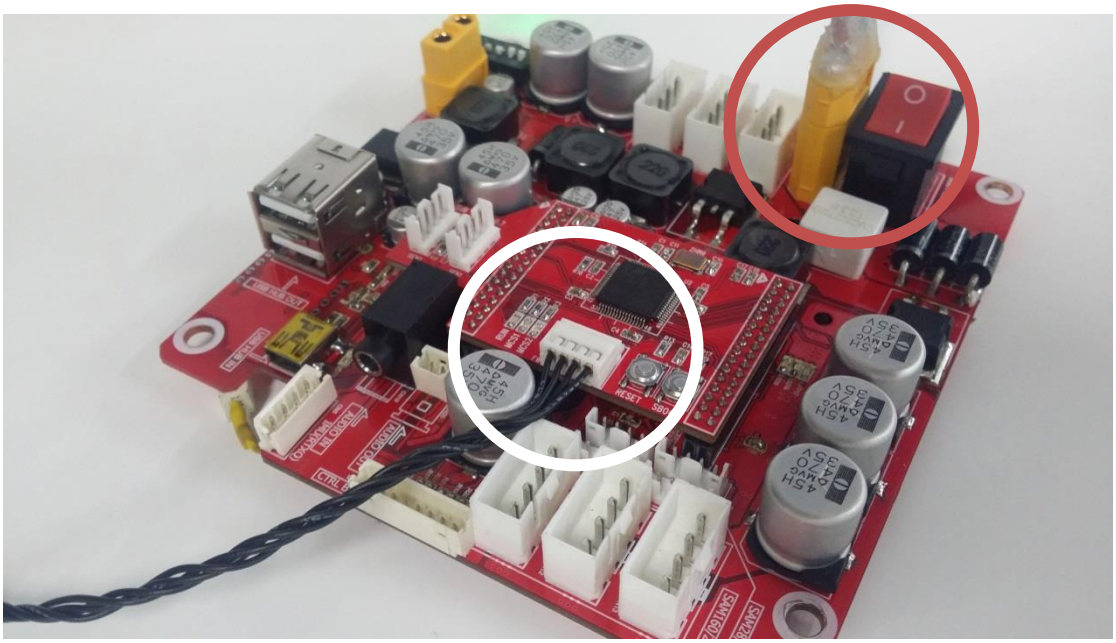
3.3.1 Main Controller



A. Connect in the order of PC – Switch Board – Red Interface Board – SMPS (power), and click the power button on the switch board while the Boot button is pressed to enter the firmware update mode.

B. Download the firmware for the main controller in the same way.

3.3.2 Sub Controller



A. As shown in the image, fix the UIC SUB CTRL board on the UIC MAIN CTRL board, and connect the power adapter and the USB to UART cable.

B. Press the two buttons (Boot, Reset) on the UIC SUB CTRL board as explained earlier, and down load the firmware with the Flash Loader Demo program.

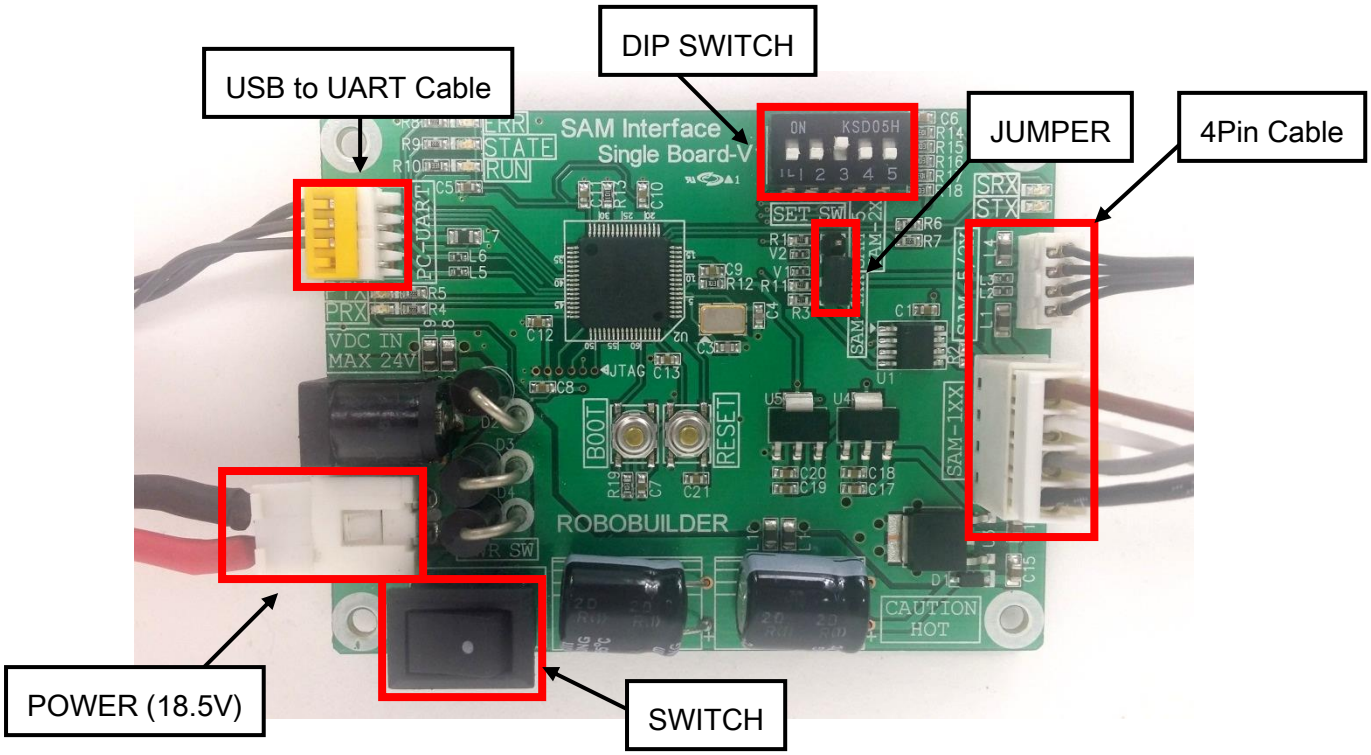
※ UIC SUB CTRL board cannot be downloaded individually without connecting the two CTRL boards.

※ The power is supplied only when the DIP S/W #3, 4, 5 are switched on. (SW Board part)

4. SAM ID SETTING

4.1 SAM ID SETTING

4.2 SAM Interface Single Board Explanation



① USB to UART Cable: Connect the USB to UART cable to the PC as shown in the image.

② POWER (18.5V): Use 18.5V for power.

③ SWITCH: Power switch

④ DIP SWITCH: Only keep the switch #3 on.

⑤ JUMPER, 4Pin Cable: JUMPER, 4Pin Cable part is divided into ‘SAM-1XX’ and ‘SAM-5/2X’. Connect the jumper and cable for SAM-160, 210 to ‘SAM-1XX’ and, SAM-3, 5, 30, 100 to ‘SAM-5/2X’.

4.3 SAM ID SETTING DIRECTION

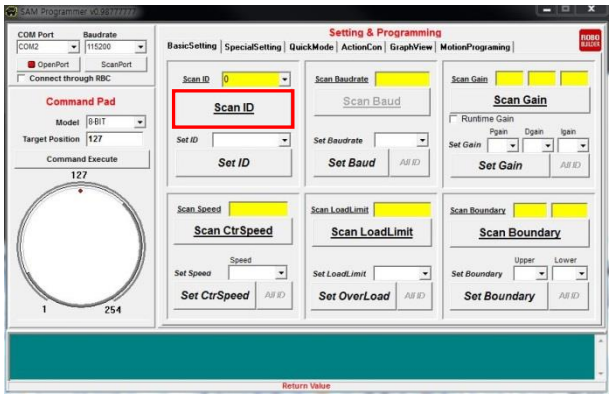
① Prepare SAM Interface Single Board, Power Supply (18.5V), SAM Motor(motor for ID setting), 4Pin Cable (cable that fits the motor), and SAM_Programmer.exe.

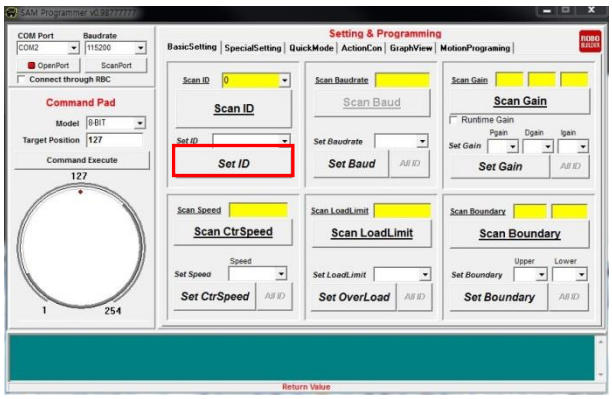
② First, connect the power line (18.5V) to the SAM Interface Single Board, and connect the jumper and 4Pin Cable that corresponds to the SAM Motor specification.

③ Turn on the power, run the SAM_Programmer.exe file, and connect the COM Port.

④ Press [Scan ID] button and check the motor ID, and click [Set ID] to set the motor ID.

⑤ Click [Scan ID] button three times to see if the motor ID has been set properly.



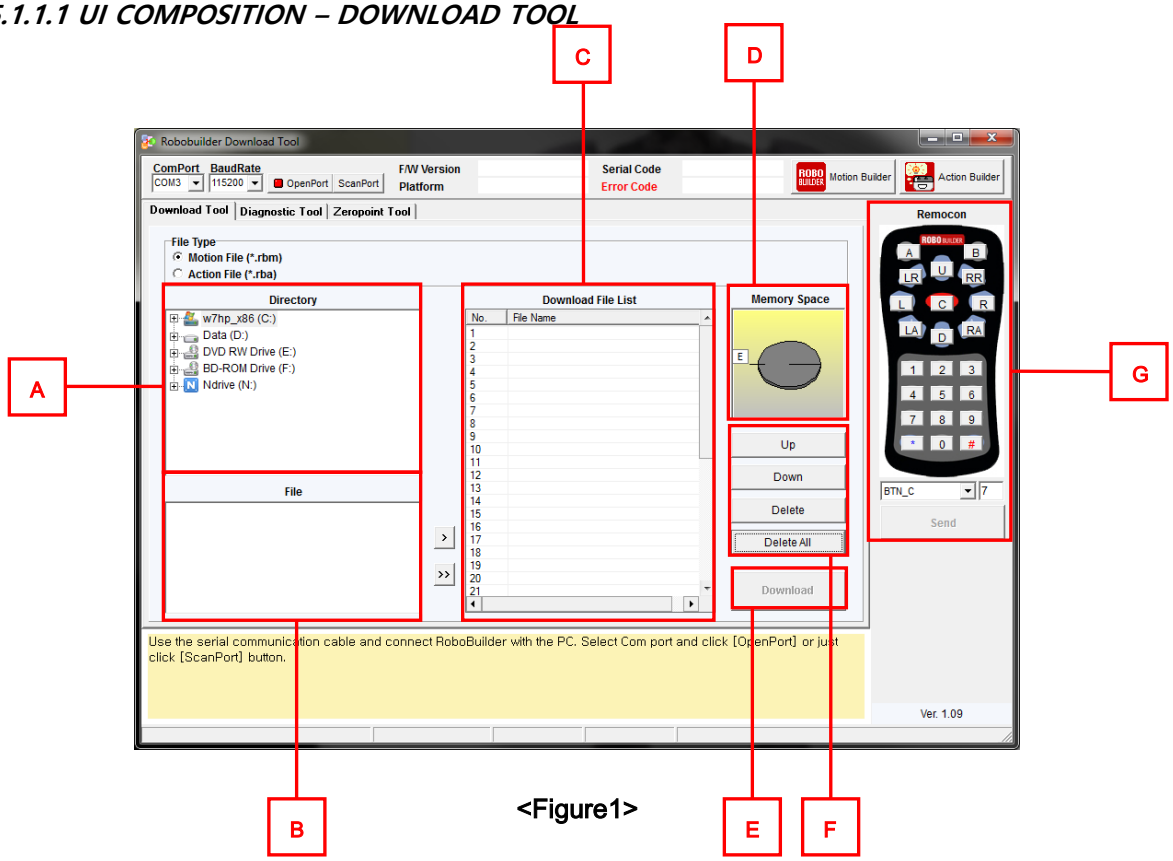


5. SOFTWARE

5.1 SOFTWARE DIRECTION

5.1.1 ROBOBUILDER DOWNLOAD TOOL

5.1.1.1 UI COMPOSITION – DOWNLOAD TOOL



<Figure1>

A. Directory: Explores the location in which the motion file is saved

B. File: Displays list of motion files in the location selected in A

C. Download File List: Adds the motion file to download on the UXA-90

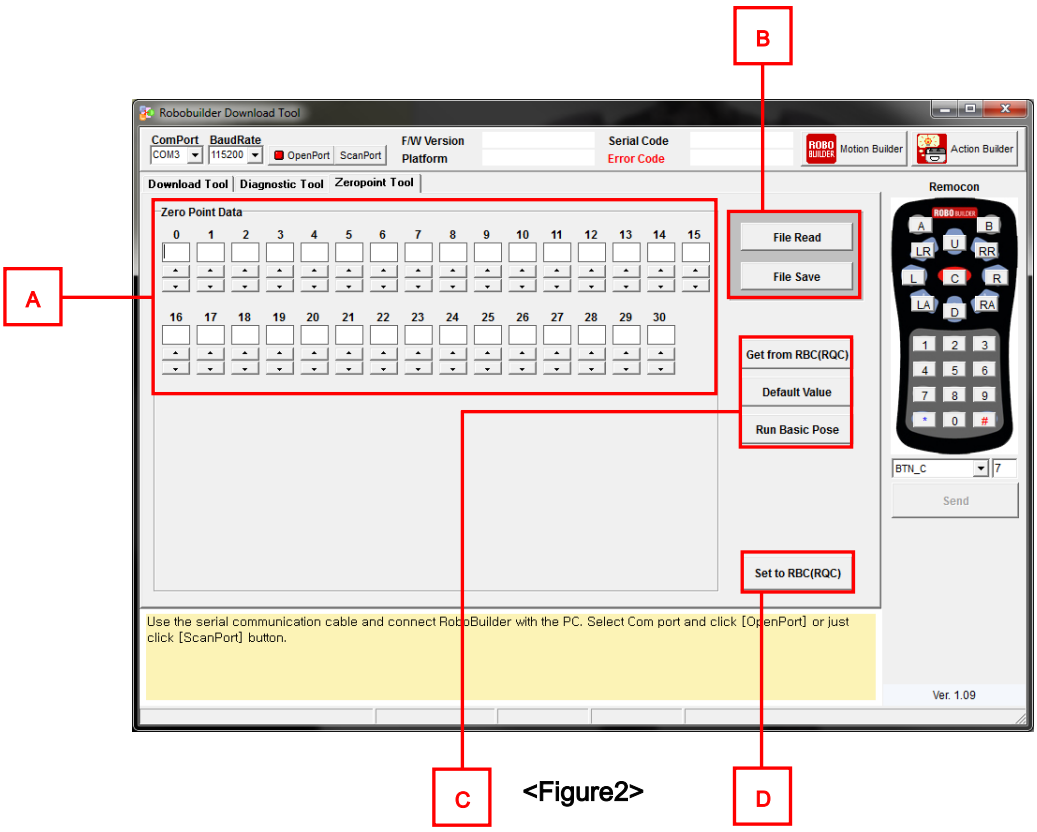
D. Memory Space: Shows the memory space in the UXA-90

E. Download: Downloads the files on C in the UXA-90 in order

F. Move & Delete All: Relocates or deletes the files on C

G. Remote controller: Performs the same function with the UI on the software instead of an actual remote controller

5.1.1.2 UI COMPOSITION – ZERO SETTING TOOL



<Figure2>

A. Zero Point Data: Shows and edits the zero data by ID

B. File Read: Opens the zero data saved on the file

File Save: Saves the modified data

C. Get(Zero) from RBC(RQC): Opens the current zero data of the UXA-90

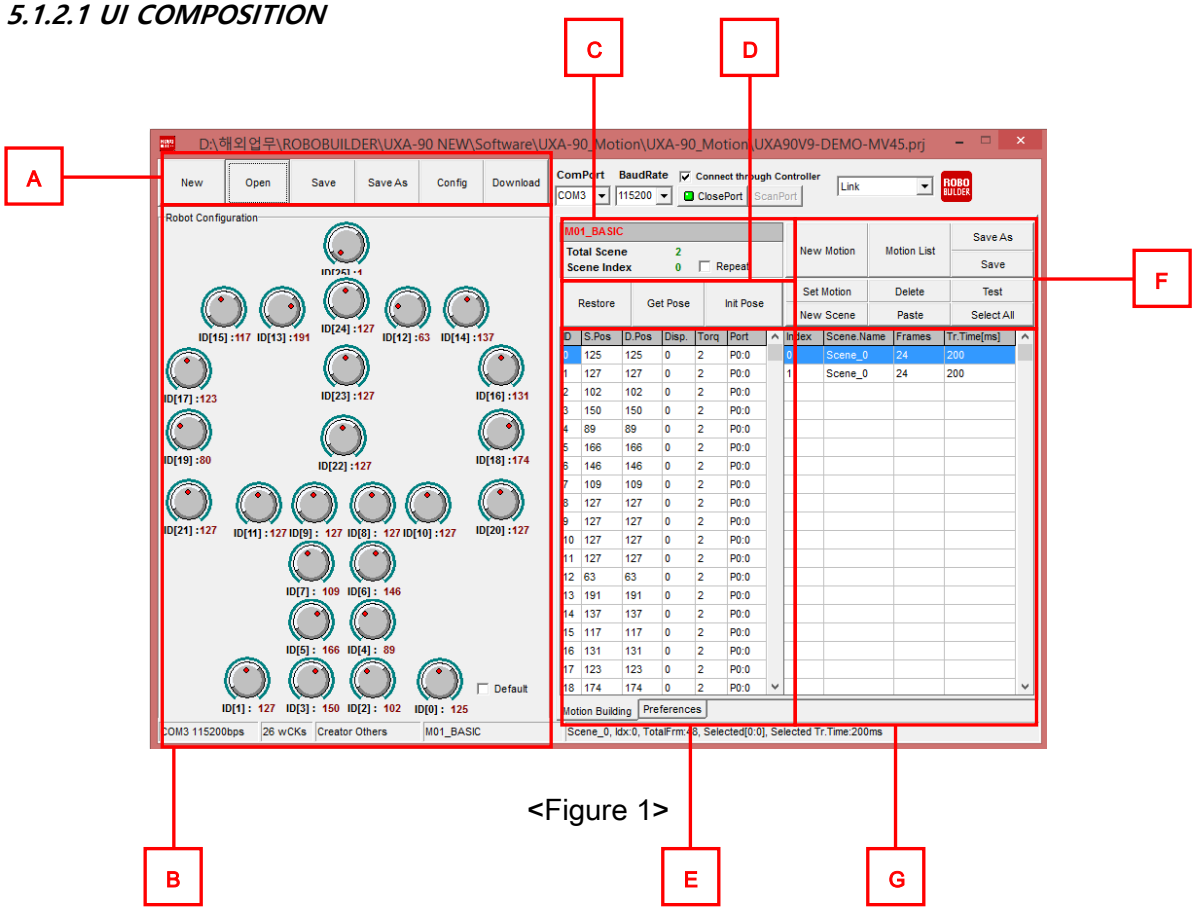
Default Value: Opens the base zero data

Run Basic pose: Orders the base zero data to the UXA-90

D. Set to RBC: Saves the modified data from A in the UXA-90

5.1.2 MOTION BUILDER

5.1.2.1 UI COMPOSITION



<Figure 1>

A. New : Generates a new project

Open: Opens an existing project

Save: Saves the current project

Save as: Changes the name for the current project

Config: Set details of individual servo motor

Download : Nonuse

B. Control panel: Checks and edits the parameter of the UXA-90 by ID

C. Motion data: Displays the information on the motion currently being edited

D. Displacement reset: Resets the edited displacement

E. Motion index: Edit the displacement and torque of the motion currently being edited

F. New motion: Generates a new motion

Motion list: Shows the list of motions in the project

Save As: Changes the name of the motion currently being edited

Save: Saves the current status of the motion currently being edited

Set Motion: Changes the setting (name, location, gain value) of the current motion

Delete: Deletes the selected scene

Test : Sends the current motion to the UXA-90 to perform

New scene: Adds a new scene to the motion

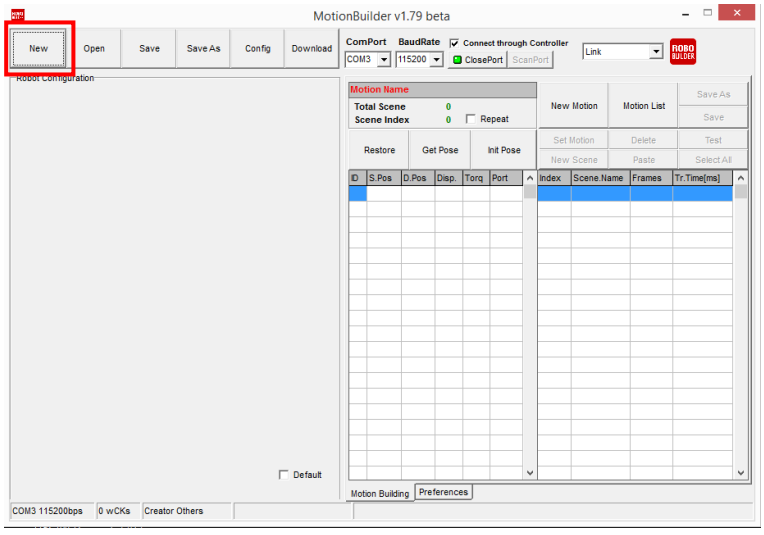
Paste: Pastes the copied motion

Select All: Select the entire scene of the motion

G. Scene index: Edits the number of frames in the scenes and the run time

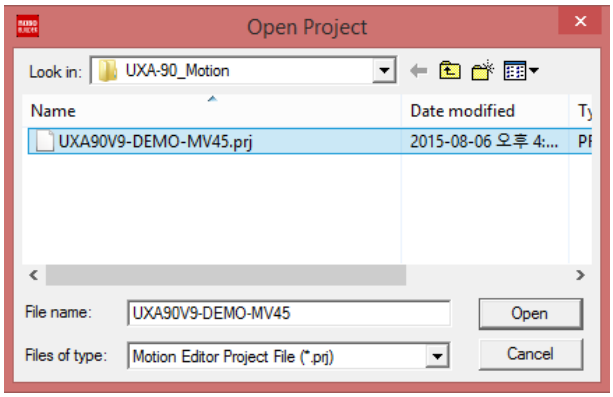
5.1.2.2 DIRECTION – OPEN A PROJECT

① Click New.

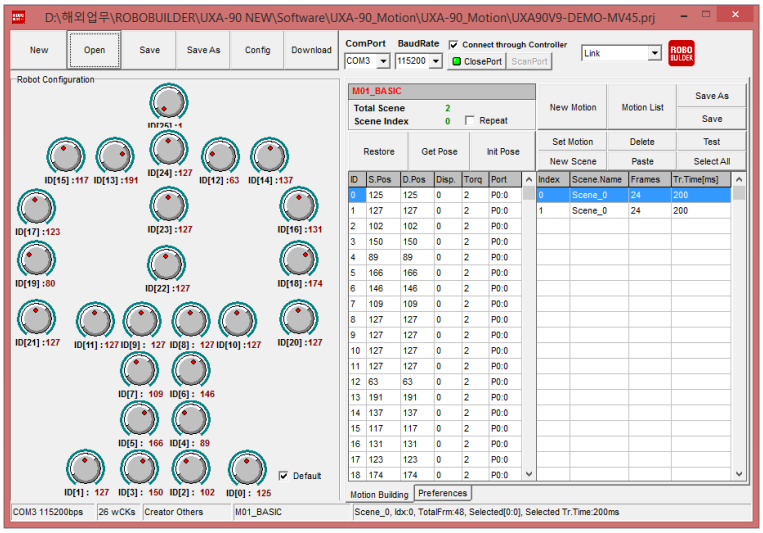


※ The control panel and motion list is blank in the beginning.

② Select the .prj(project) file in the location where the motion file is saved

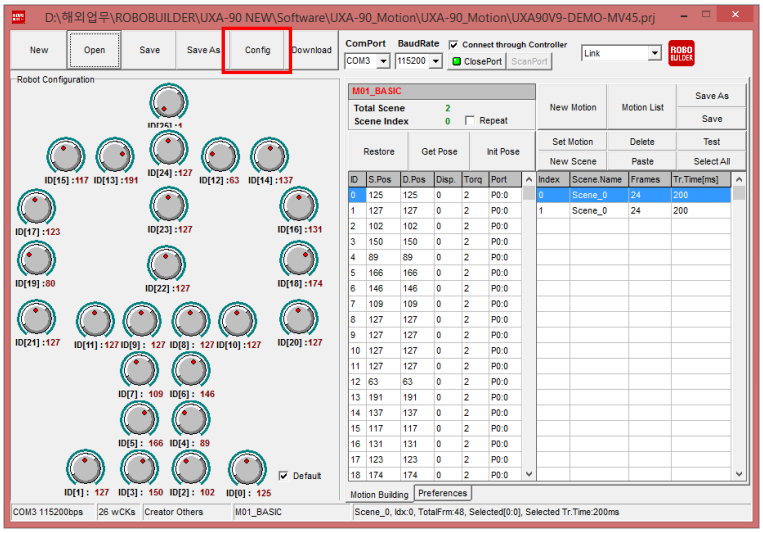


③ Open the project by selecting the .prj file, and the control panel and the motion list are shown as below.

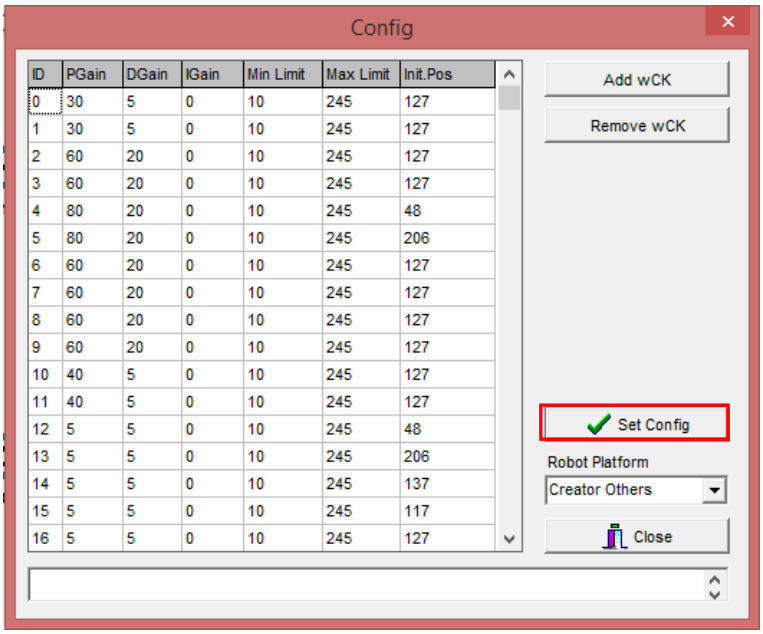


5.1.2.3 DIRECTION– SETTING PROJECT

① Click Config.



② Complete editing the project by with [Set Config].



※ Above screen appears.

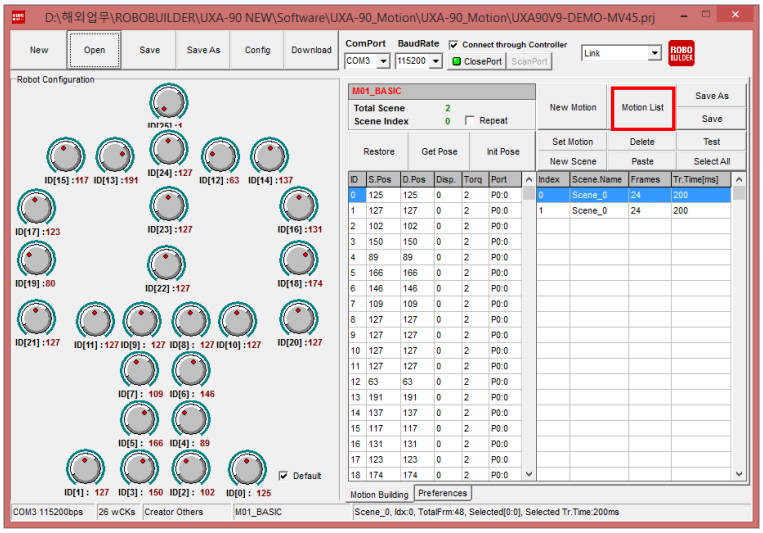
* Use the [Add SAM(WCK)] and [Delete SAM(WCK)] button to add or delete the number of SAM.

* Edit the P, D, I gain and parameter value by ID.

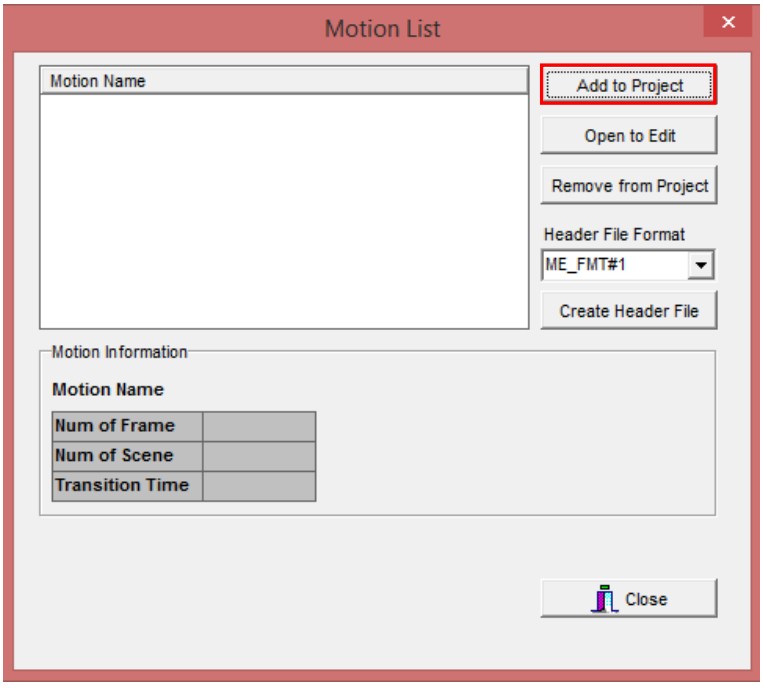
③ Complete editing the project by clicking [Apply Setting]..

5.1.2.4 DIRECTION – OPEN MOTION

① Click Motion List.



② Check Motion List.

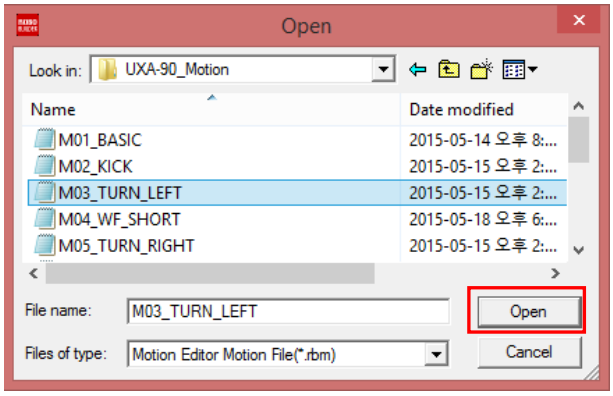


※ Above screen appears.

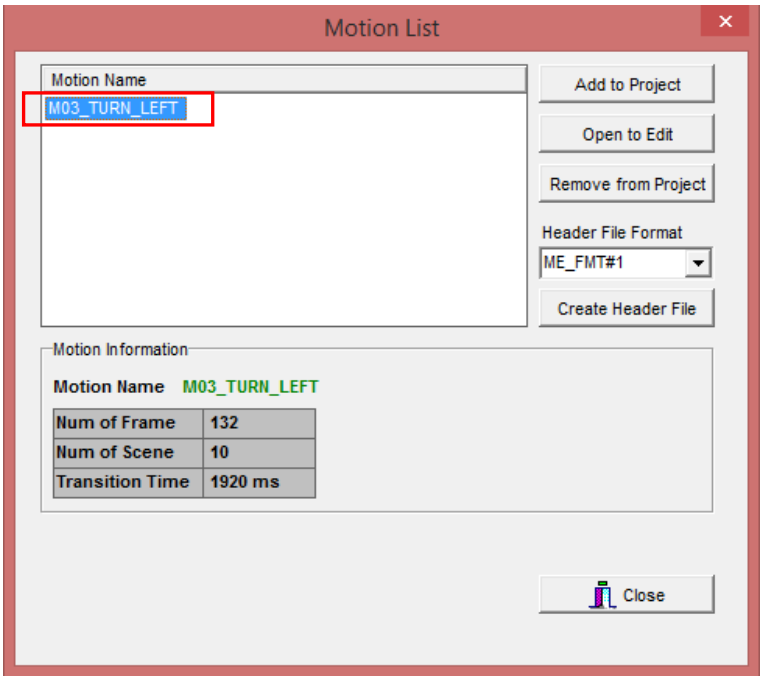
* Add a motion on the project if desired motion cannot be found on the list.

③ Click [Add to Project].

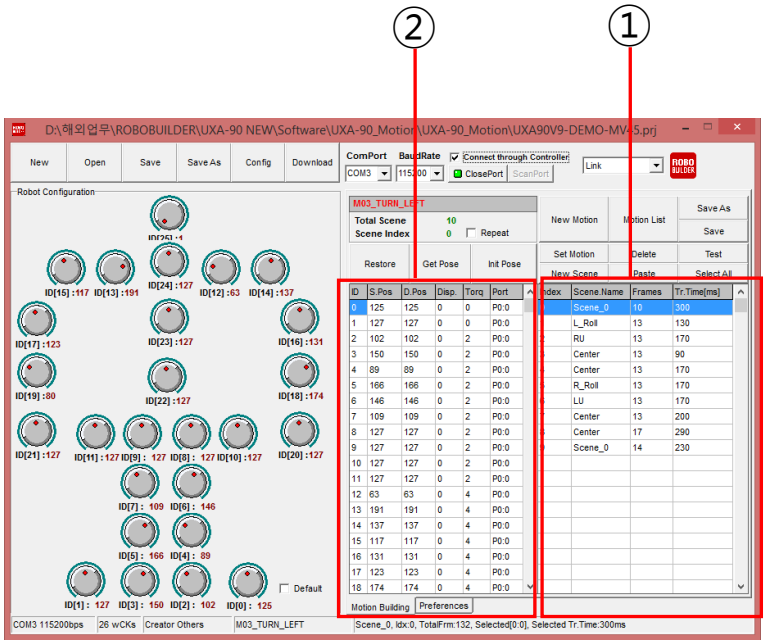
④ Select the motion file in .rbm format where the motion file is saved.



⑤ Double click the motion file on the list.



5.1.2.5 DIRECTION – OPEN A MOTION



* A motion file is composed of ‘scenes’.

* ‘Scene’ occurs from top to bottom in order, and the total run time is the run time for each scene added together.

① Select the scene to edit.

② Edit the displacement and torque for the scene.

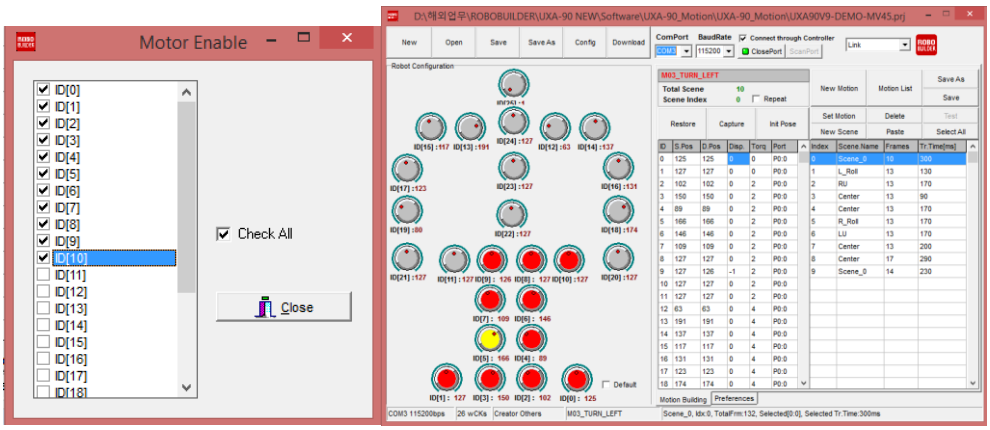
<Displacement and torque>

Method 1. Double click the value in ② and edit the number.

Method 2. Drag the wheel by ID on the control panel to edit.

Method 3. Edit with ‘Get Pose’.

Method 3.1. The screen below appears when you click [Get Pose].



Method 3.2. Select the ID to read the posture and click [Close].

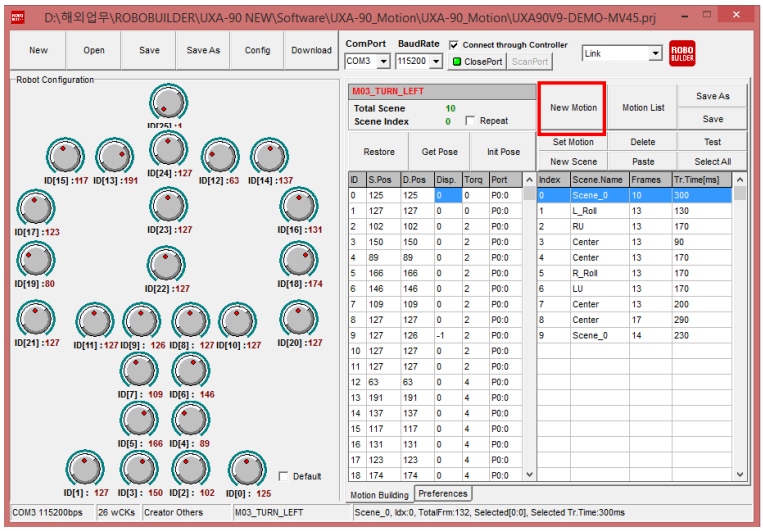
Method 3.3. Selected IDs are highlighted in red on the control panel.

Method 3.4. Have the UXA-90 pose in the desired posture and click [Get pose].

* The torque value should be between 0 and 4, and the torque is the highest when set at 0.

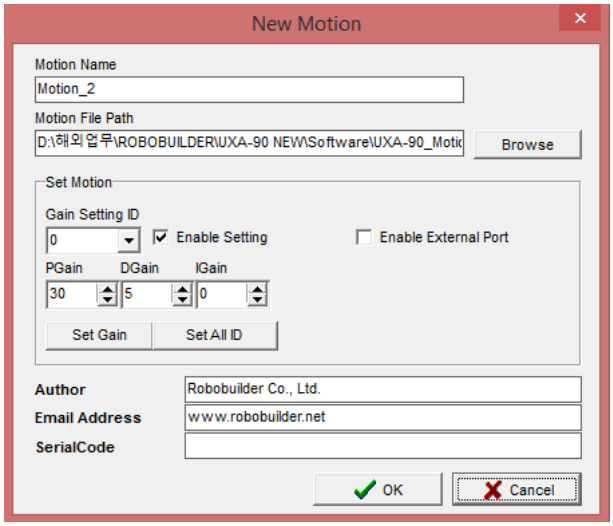
③ Click [Save] to save the edited file.

5.1.2.5 DIRECTION – GENERATE A MOTION

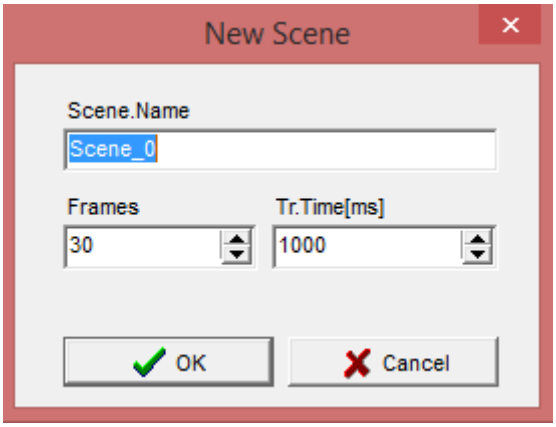


① Click [New Motion].

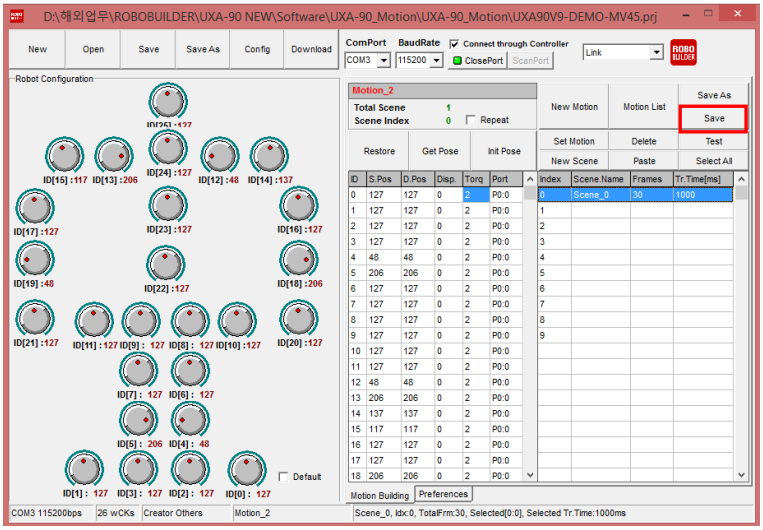
* Create a new motion if you would like to make a new motion other than the motions provided.



② Set the motion name, location, and P, D, I gain by ID, and click [OK].



③ Set the name for the new scene, number of frames, and run time, and click [OK].



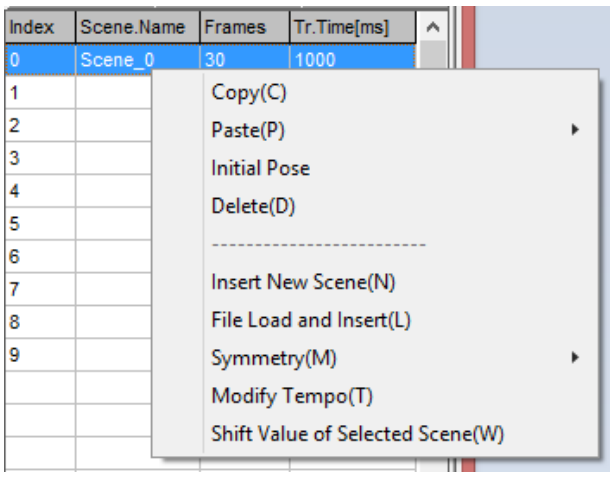
① Edit the displacement and torque for the generated scene. (Refer to '• DIRECTION – EDIT MOTION')

* Click [New Scene] to add a new scene.

* To operate the edited scene, select the scene, click [Test] to have the robot perform the scene. (Check [Repeat] for test operation to see the robot perform the scene repeatedly.)

② After the edit is completed, click [Save].

③ Additional function: Right click the scene for various additional functions.



⑥-① Copy: Copies the selected scene

⑥-② Paste: Pastes the copied scene onto the selected scene

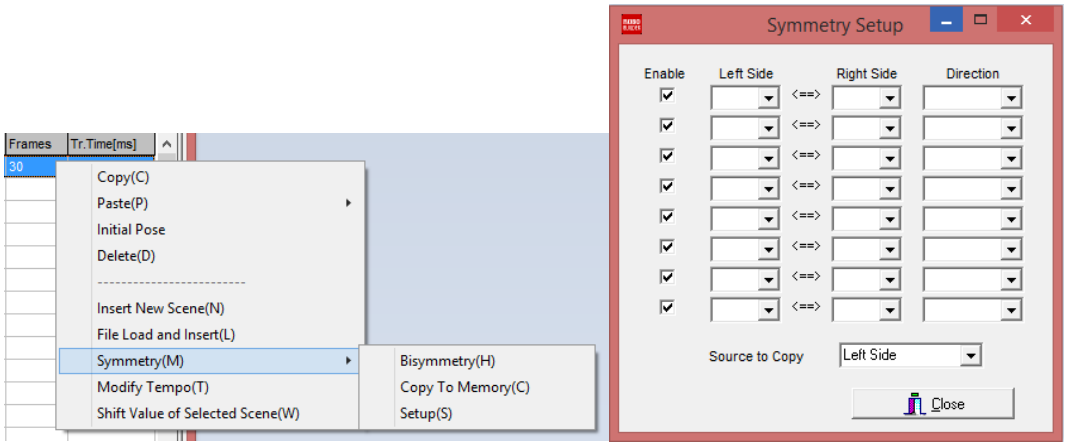
⑥-③ Initial Pose: Returns to the base posture

⑥-④ Delete: Deletes the selected scene

⑥-⑤ Insert New Scene: Creates a new scene where the selected scene is

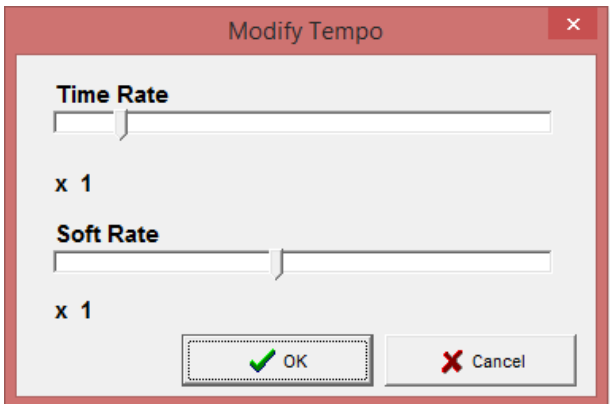
⑥-⑥ File Load and Insert: Inserts an existing motion where the selected scene is

⑥-⑦ Symmetry :



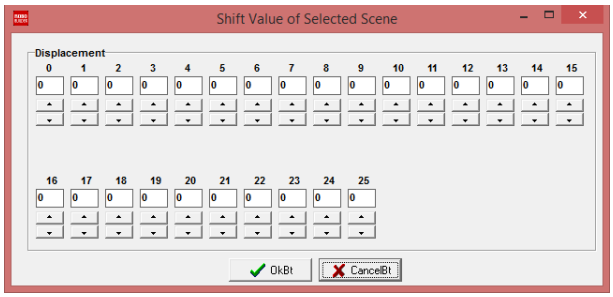
* Set the ID and direction in [Symmetry Setup] for symmetry, and click [Bi(lateral)symmetry] to apply the ID and direction.

⑥-⑧ Modify tempo



* Increase or decrease the run time at a specific rate.

⑥-⑨ Shift Value of Selected Scene



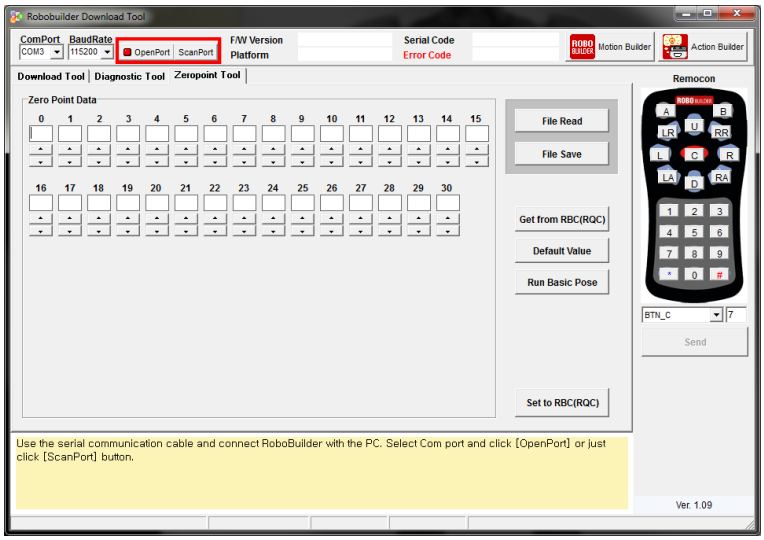
* Replace all position values by ID at once.

(Useful to edit several scenes at once)

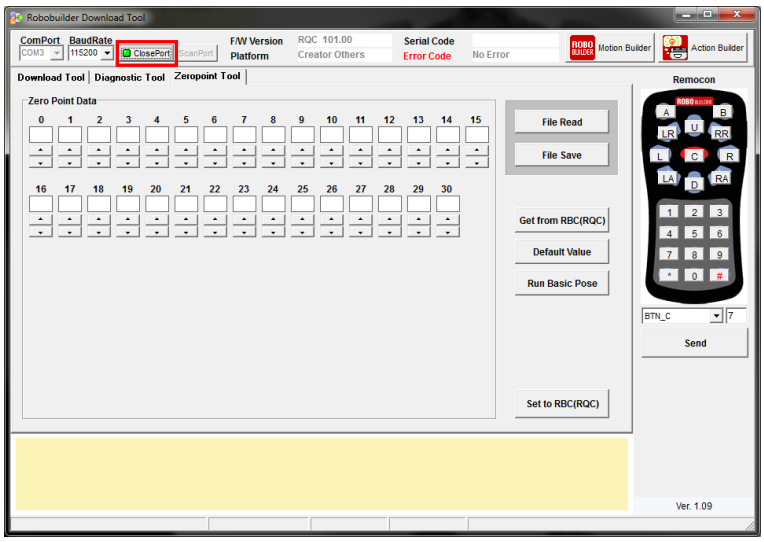
5.2 ZERO SETTING DIRECTION(Robobuilder Download Tool)

5.2.1 ZERO SETTING – 1 (PC NETWORK)

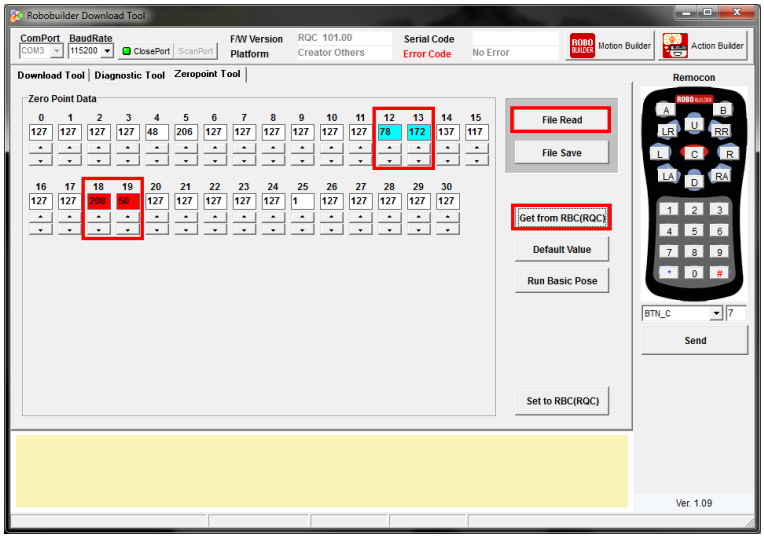
1) Have the UXA-90 sit down as in the image, and connect the UXA-90 to PC, and turn on the power(Refer to 3.2 Switch Board for the connection).



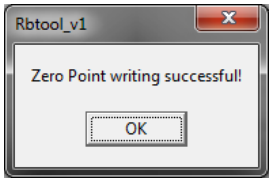
2) Open the program RBtool and select [Open Port] or [Search Port].



3) When the USB port is connected, the status changes to [Close Port] as shown in the image.



4) To use a new zero file, click [File Read], and to use a zero file saved in MC, click [Get from RBC(RQC)]. The zero value for the motors can be changed after opening the file. With the front horn of the motor in the center, clockwise direction is shown as (+, red), and counterclockwise direction is shown as (-, blue).



5) Click [Write Zero] after editing the zero point and check the pop-up message. Click [OK] and press [C] on the remote controller, and the robot will move to the base posture (standing up).

※ To save the file again after editing the zero point, click [File Save].

5.2.2 ZERO SETTING – 2 (Remote controller on Robobuilder Download Tool – Zero setting macro)

This function is the zero point setting macro for walking, so the first motion must be the basic walking. The main purpose of this function is to simply set the zero point and to do so only with the remote controller and without the use of computer.

The robot begins to move once # button on the remote is pressed. If the zero point is set using RBTool on PC, pressing # button will activate the # button combination function like a toggle key. To turn off the # button combination function, press # button once more. While the # button combination function is on, press C button and then B button to run the setting macro, and press the button for each macro function for setting. Lastly, to write the zero point, press C button.

To establish the setting for the robot in the beginning, press # button followed by C button and A button to read the current location value and set the zero point. Here, the basic walking position is not the basic posture, but the posture where the robot has the legs stretched fully. Be careful not to set the zero point when the robot is in its basic posture or basic walking posture – the robot must be laid flat on the floor.

See below for each key combination macro.

# + LR(stretch left leg) # + LA(fold left leg)	# + RR(stretch right leg) # + RA(fold right leg)	# + U(stretch both legs) # + D(fold both legs)
# + L(upper body to the left) # + R(upper body to the right)	# + 1(upper body lean forward) # + 3(upper body lean backward)	# + 4(both knees forward) # + 6(both knees backward)
# + 7(both ankles forward) # + 9(both ankles backward)	-	-

5.2.3 ZERO SETTNG– 3 (MOTION INPUT)

When the zero setting is missed and need to configure again, it is necessary to set an approximate zero point before setting the precise zero point to avoid any malfunction. Follow the direction below.

① Connect the power adapter and the USB cable to the UXA-90.

② Hold the waist of the robot, and turn on the power with all its joints straight

③ Open RBTool.exe and click <Connect Port >.

④ Press # button and C button on the remote controller.

⑤ Press A button while the robot is standing straight, and check the buzzer sound.

⑥ The robot is relaxed for 5 seconds, and torque is applied to all motors.

⑦ Press A button again, and repeated the direction above 5 times.

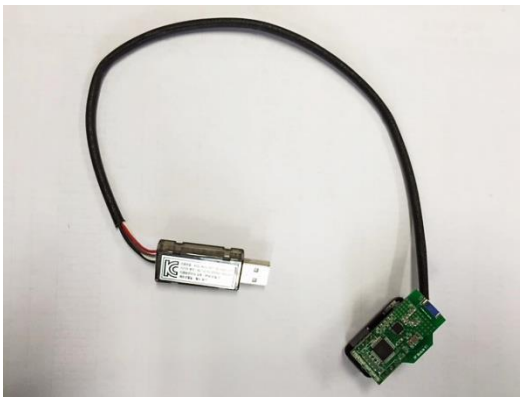
⑧ Press C button to save the memory.

After this, continue with 5.2.1 ZERO SETTING (PC) to set a precise zero point.

6. OPERATION METHOD

UXA-90 can be operated with two remote control methods: the remote controller in RBTool or RF mini controller.

6.1 RBTool



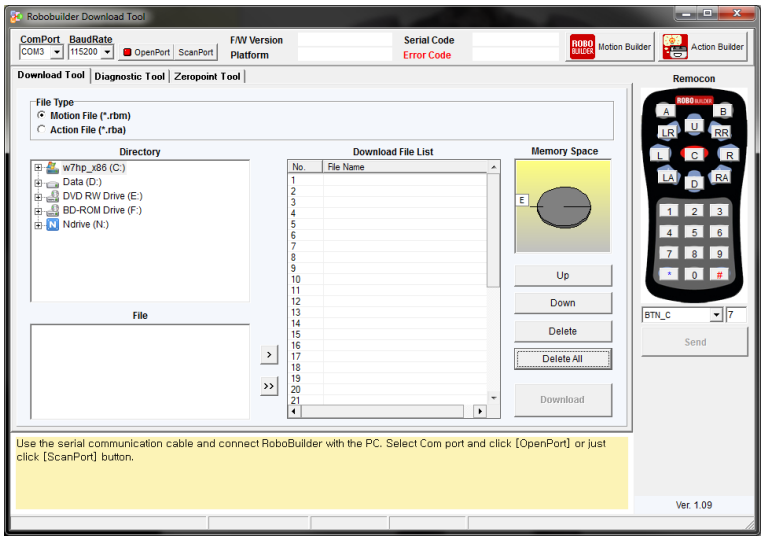
<RF-USB>

<RF-USB zoomed in>

A. Connect the RF module to the RF-USB in the direction shown in the image below. (Both RF and USB cable methods can be used. USB cable method was explained earlier.)

B. Connect the RF-USB to the PC.

C. Open Robobuilder Download Tool and connect the port.



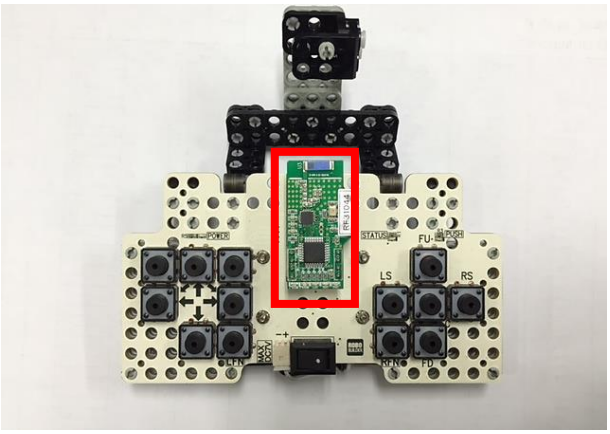
<Robobuilder Download Tool>

D. Turn on the power of UXA-90 while it is seated.

E. Press C button on the remote controller UI, and the UXA-90 stands to the initial position.

F. Run the motion with the buttons on the remote controller UI. (Reference– 7.1 REMOTE CONTROLLER KeyMap)

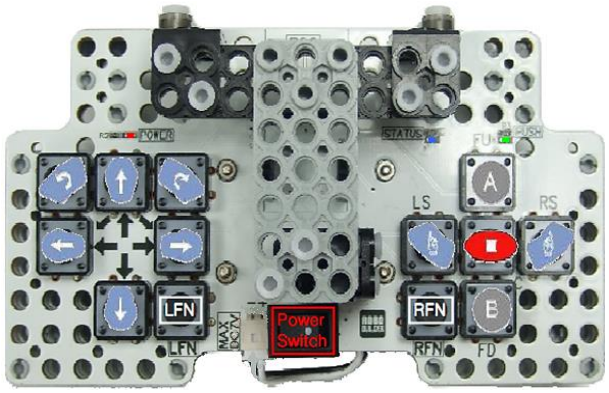
6.2 RF MINI CONTROLLER



A. Fix the RF module paired with UXA-90 onto the RF controller.

B. Turn on the power of UXA-90 while it is sitting down, and turn on the RF controller.

C. Press ■ button on the RF controller, and the UXA-90 stands up to the initial position.



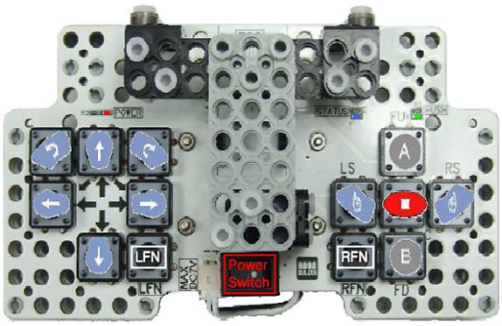
<RF Controller Key Arrangement >

D. Run the motion with the RF controller keys. (Reference– 7.1 REMOTE CONTROLLER KeyMap)

7. APPENDIX

7.1 REMOTE CONTROLLER KeyMap

※ The list on the file to be downloaded matches the number on the remote controller.



Button	mode	Motion No.	Motion list	Remark
■	■	7	INIT	Init Motion
A	A	1	BASIC	Basic Posture for walking
B	B	2	KICK	Right kick
↶	↶	3	TURN_LEFT	Turn Left
↑	↑	4	WF_SHORT	Walking forward 1step
↷	↷	5	TURN_RIGHT	Turn Right
←	←	6	SIDE_LEFT	Left Step
→	→	8	SIDE_RIGHT	Right Step
☝	☝	9	WF_4STEP	Walking forward 4step
↓	↓	10	BASIC	Basic Posture for walking
✌	✌	11	WF_6STEP1	※Walking forward 4step
RFN + ↶	1	12	INTRODUCTION	Introduction
RFN + ↑	2	13	GANGNAM	GangnamStyle dance
RFN + ↷	3	14	DEMO1	Demo motion
RFN + ←	4	15		
RFN + →	5	16		
RFN + ↓	6	17		
RFN + LFN	7	18		
LFN A	8	19		
LFN ✌	9	20		
LFN ■	0	21	SITDOWN	Sitdown
LFN ✌	* 1	33	PWR_OFF	System Shutdown(Built-in PC)
LFN B	* 2	34	MODE_CHANGE	Mode Change

7.2 ID MAP

ID	Actuator Type
0	SAM-210P
1	SAM-210P
2	SAM-210P
3	SAM-210P
4	SAM-210P
5	SAM-210P
6	SAM-210P
7	SAM-210P
8	SAM-210P
9	SAM-210P
10	SAM-160P
11	SAM-160P
12	SAM-100
13	SAM-100
14	SAM-100
15	SAM-100
16	SAM-30
17	SAM-30
18	SAM-30
19	SAM-30
20	SAM-30
21	SAM-30
22	SAM-160P
23	SAM-30
24	SAM-30

7.3 BATTERY SPECIFICATION

*The battery in the picture above is an example. Use a battery fulfilled the specification below.

*A charger for the battery is not inclusive in the package, and users can use a charger for lithium batteries which is the same type for R/C products.

Specification

Capacity: 2200mAh or higher.

Voltage: 5S1P / 5 Cell / 18.5V

Discharge: More than 10C (Constant)

Weight: Below 330g

Dimensions: Below 106 x 36 x 45mm

Discharge Plug: XT60

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