Safety Instructions



Warning : If user does not follow the instructions in this book properly, a serious injury, harm, or death may occur to user.



Caution : If user does not follow the instructions in this book properly, an injury to user or physical damage to the product may be occurred.

Electric Power



- Do not use any damaged power cord, plug, and loose outlet. It may cause an electric shock or fire.
- Make sure that the power plug is inserted firmly into the outlet so that the power cord does not

get loosed. A loose connection may cause a fire.

- Do not forcibly bend or pull the power cord or have it pressed under a heavy object.

It may cause an electric shock or fire.

- Do not handle the power cord with wet hands. It may cause an electric shock.
- Do not connect multiple electric devices to one outlet. It may cause an abnormal heat or fire.



- This product is not waterproof. Do not operate the product in a wet place in any case.
- Do not keep or operate the product in direct sunlight.

Usage



- Do not assemble the product when you are tired or physically in a bad condition particularly while intoxicated.
- Do not place your face too close to the robot.
- Do not use dangerous tools such as a knife or a drill but only recommended tool.
- Keep the remote control that contains batteries away from children's reach.
- When your kid swallowed a battery, consult with a doctor immediately.
- Do not keep or operate the robot in a place of high temperature or humidity.
- Keep small parts such as bolts, nuts, and joints away from children's reach.
- When your kid swallowed any product part, consult with a doctor immediately.



- Use the product only in an indoor environment.
- Do not disassemble, repair, and modify the product parts arbitrarily.
- Do not connect or disconnect cables while the robot product is in operation.

It may cause a damage or failure to the product.

- Make sure that only designated devices be connected to connectors or connection ports of the product.
 It may cause a damage or failure to the product.
- When cleaning the product, do not use water or solvent such as benzene, and alcohol but use a soft and dry cloth only. It may cause a failure to the product.
- Keep the robot well, or parts away from kid's access.

- Do not leave the product with power on. Battery damage may cause a product failure.
- Do not give excessive force while a torque is applied to the robot.

This could cause the gear damage of robot module and product failure.

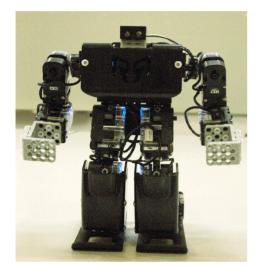
- When robot gets twisted by running wrong motions while programming, turn the power off quickly to prevent excessive torque from being transmitted to the robot.
- If your finger is put and pressed in between robot modules, turn the power off quickly and remove force applied to robot to prevent any physical injury.
- Do not operate near in baby or animal. It may cause injury to the life or product failure.

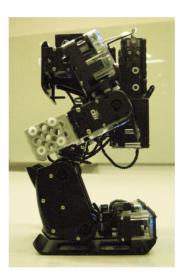
[Notice for Assembly and Operation]

 \cdot All users should follow the instructions in this user manual.

The basic posture of standard platform (HUNO) robot is as shown in the below.
If robot does not take the posture as the below after you press the center (•) button of IR remote controller, it means that robot was assembled in wrong way.

Do not operate robot by force when robot was assembled in wrong way Otherwise, robot could be damaged and it gets out of order.





Sometimes, smart servo does not rotate well when you assemble it by hand.
 This happens when internal gears are stiff, not a defective problem.
 This kind of problem will be solved when robot took the basic posture after you power-on smart controller.

Generally, it takes about one hour to assemble it by using '+' screw driver.
 But this is the average assembly time. so it can take longer or less depends on users' working environment.

· Robot will walk well in the flat place. It can be fallen down when you put a robot in carpet or rugged place

· Basic motions (11 motions) are already pre-programmed.

These motions are played by IR remote controller as soon as receiving robot.

. Make sure that nuts are not dropped into smart servo or smart controller during assembling robot.

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1. Basic Instruction

1.1 Product Introduction

RQ HUNO Kit is a new robotic DIY kit designed to provide robot enthusiasts with the value of Education and Entertainment. Design and build various robots simply by plugging together block-type robotic actuator modules. Without programming, users can download robotic motion files from the internet and play them on the RoboBuilder RQ platforms.

FEATURES

Quick & Simple Assembly : It can be assembled within one hour.

Robot File Sharing : Robot file can be shared via Internet. World First File Sharing by Precise Motion Control Technology.

Joint-Insert Style Assembly : Easily connected between modules by using provided various Joint.

Elaborate Motion : The angle of smart servo module can be adjusted freely, therefore, motion is smooth and natural. - Wheel Mode (360°) , Position Control Mode $(0 \sim 332^{\circ})$

Individual Controller : RQ HUNO Smart Controller and Smart Servo module controller are separated, therefore, it is easy to upgrade and easy to find failure.

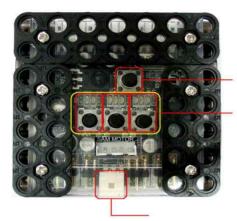
Built-in Connector : Signal line and power line can be connected directly onto Smart Servo module.

Unbounded Free Assembly Style : It can be built into various robot style, besides standard platform.

1.2 Product Usage

Operating Smart Controller

By manipulating the smart controller, you can select proper robot platform, and play motions. Also, you can change into various mode (such as PC direct control mode or firmware upgrade mode).



Button P : Power (ON/OFF) button / Run button

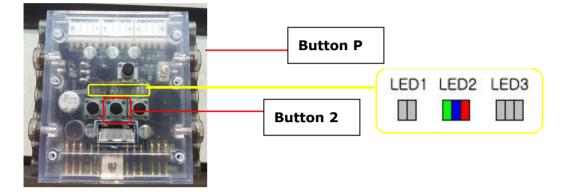
In smart controller, '1', '2', '3' numbers are written. Below in each number, there are "button 1, button 2 and button 3". Above in each number, there are "LED 1, LED 2, LED 3".

Power Connector

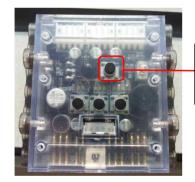
Function	Manipulation	Descriptions			
Power On	Connect battery line to Power	- It sets the latest platform.			
	Connector and press				
	Button P.	- It sets Standard platform,			
	LED indicates "STOP" state.	Non-standard platform, Zero position			
	("STOP" state means LED lights	setting.			
	but is NOT blinking.)				
Platform	Press button 3 in order to set	Standard platform			
Selection	"Standard platform" and "Non-	RED RED			
	standard platform"	Non-standard platform			
	in "STOP" state. (RQ-HUNO is	RED Green, Blue			
	standard platform.)				
Power Off	Press button P more than	All LEDs are off.			
	5 seconds.				
For more information, see the next page.					

IR remote controller registration

- 1 Power-off the smart controller.
- 2 Press button 2 then, press button P concurrently.
- \rightarrow You can see LED2 Green, Blue and Red lights together.



- ③ Make the IR remote controller close to smart controller towards <IR remote controller receiver>.
- ④ Press "stop" button in IR remote controller, then LED 2 "Green, Blue and Red" light will be blinking three times. Now IR remote controller is registered.



IR remote controller receiver



*** NOTE**

- Unregistered remote controller can not control the smart controller.
- Each smart controller can memorize 5 remote controller in maximum. If you try to

register 6th remote controller, then 1st registered remote controller is deleted.

• For the next remote controller registration, you can repeat the above procedures.

IR Remote Controller

The best way to use the remote control is to have remote controller point to the center of smart controller. Press STOP () button whenever power on RQ smart controller first to take the basic posture. Otherwise, IR remote controller button would not work on robot.

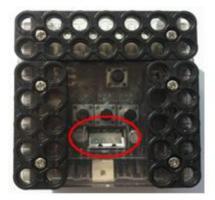


Button	Motion	Button	Motion	Button	Melody
1	Run Motion 1.	# + 1	Run Action 1.	* + 1	Ten little Indians
2	Run Motion 2.	# + 2	Run Action 2.	* + 2	Greeting
3	Run Motion 3.	# + 3	Run Action 3.	* + 3	Twinkle twinkle Little star
4	Run Motion 4.	# + 4	Run Action 4.	* + 4	Head and shoulder knees and toes
5	Run Motion 5.	# + 5	Run Action 5.	* + 5	Fur Elise
6	Run Motion 6.	# + 6	Run Action 6.	* + 6	Minuet(Mach)
7	Run Motion 7.	# + 7	Run Action 7.	* + 7	Congratulation
8	Run Motion 8.	# + 8	Run Action 8.	* + 8	Happy Birthday
9	Run Motion 9.	# + 9	Run Action 9.	* + 9	Arirang
0	Run Motion 10	# + 0	Run Action 10.	* + 0	Stop melody

* Motions and Actions are downloaded by users

W Cable and Smart Controller connection

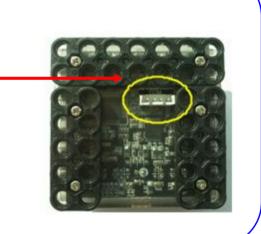
Smart controller has four port to connect for smart servo by using "W cable". You can connect any port regardless smart servo IDs.



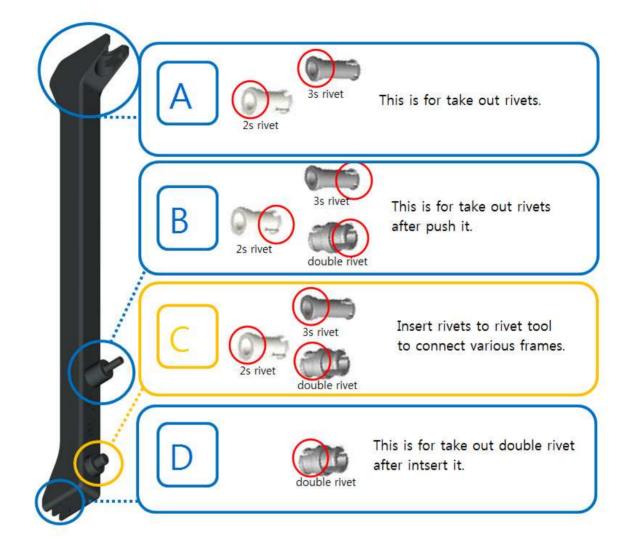


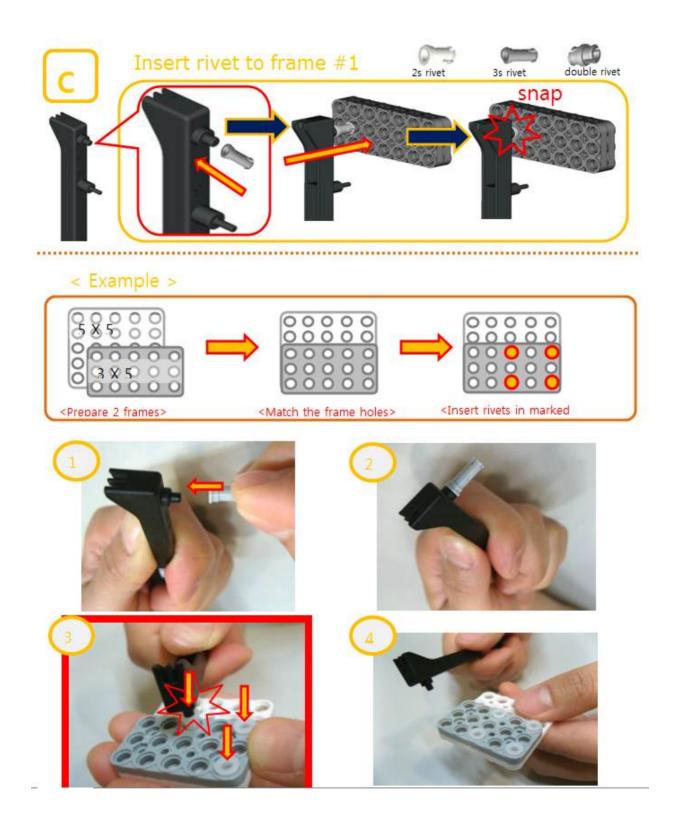
* NOTE

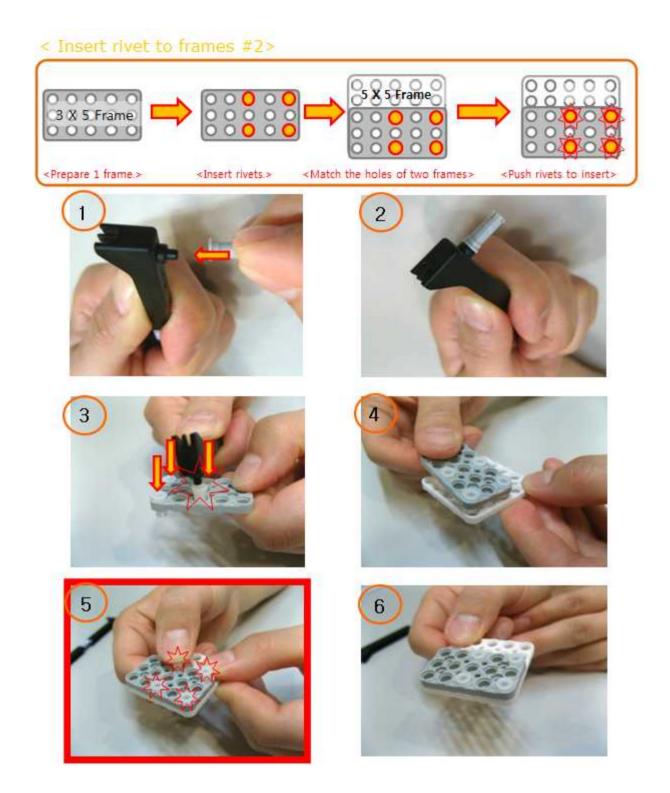
Rear side of COM port is for connection with <u>PC</u> or <u>Bluetooth chip</u>.

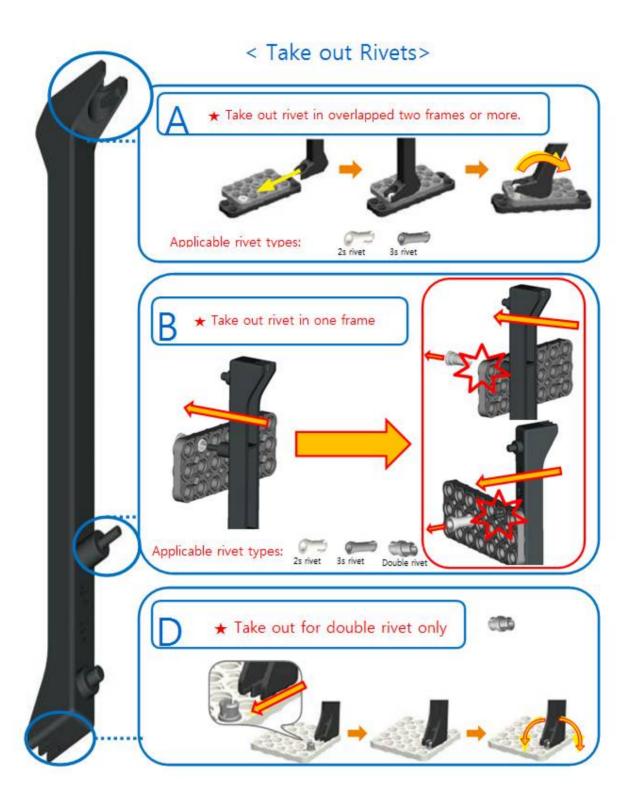


* Rivet Tool Usage









2. RQ-HUNO Assembly Guide

2.1 Check Part List

Place all the parts as the below for RQ-HUNO assembly.



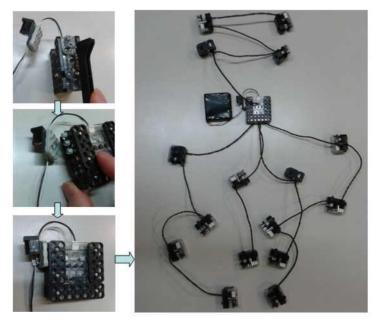
2.2 Smart servo connection and set basic posture position

Set up the RQ-HUNO initial position value in advance before you assembly. This prevents confusion of smart servo position when you connect joint frame with smart servo.

1. Place all smart servos and other parts as the below.



2. Connect smart servo with the other smart servo by using "w Cable", then also connect to smart controller at the end as the below.



 After power-on smart controller (it is "stop" state), press STOP button of IR remote controller. If IR remote controller is not working, check whether IR remote controller is registered. (See the page 8 - IR remote controller registration)



4. Press button 1 in IR remote controller.



Each smart servo set initial position after the above procedures.

Now, disconnect all the "w Cables" from the smart servos and smart controller in order to assemble RQ HUNO robot from the "RIGHT LEG ASSEMBLY".

2.3 Right LEG Assembly



STEP1. Insert front horn to smart servo ID09, then fix it with screw (P6).

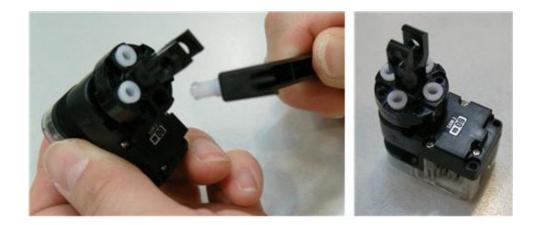
Before insert front horn to smart servo, check the chase mark as the below.



Front horn chase mark should be in center position (12 o'clock direction)



Be careful that smart servo initial position should not be rotated when you put screw into front STEP2. Insert "2s rivet" to the "Joint Frame" to connect with "Front Horn".



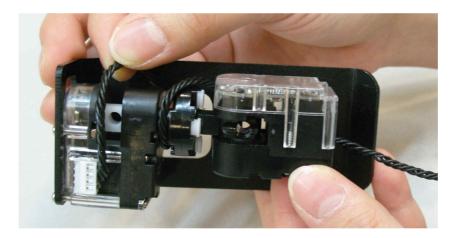
STEP3. Connect W Cable into smart servo "ID09" first, then connect foot frame by using Bolt and Nut. (Left) Foot Frame and (Right) Foot Frame is same.



STEP4. Connect W Cable (that is already connected with ID09) with smart servo ID08 and ID07.

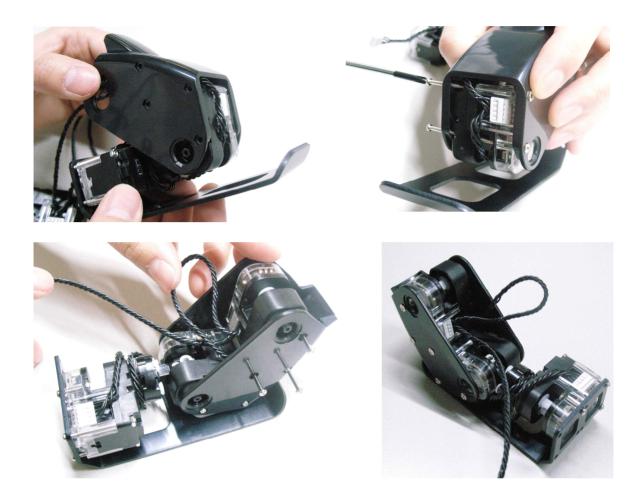


STEP5. Connect ID09 and ID08 by using "3s rivet". Rotate W Cable one time and fix it.

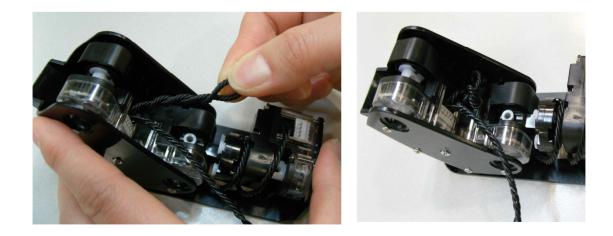




STEP6. Use the Bolt (B35) and Nut to connect "ID08" and "ID07" with "Knee Frame".



STEP7. Twist cable 3~4 times between "ID08" and "ID07" and put into empty space.



STEP8. Connect ID06 and `U' frame by using Bolt (B27) and Nut. Then use the "2s rivet" to fix with "Joint Frame".



Be careful JOINT frame direction

STEP9. Connect ID07 with "Joint Frame" by using "3s rivet". Rotate W cable two times and connect to ID06.





2.4 LEFT LEG Assembly

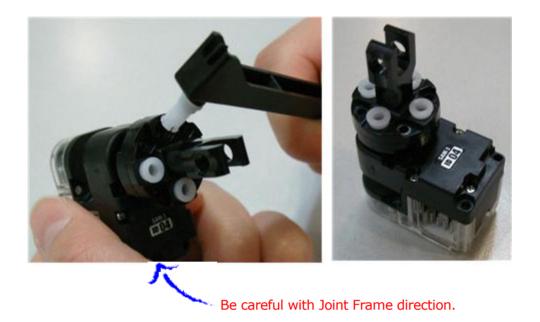


STEP1. Connect Front Horn to smart servo "ID04" by using screw (P6).

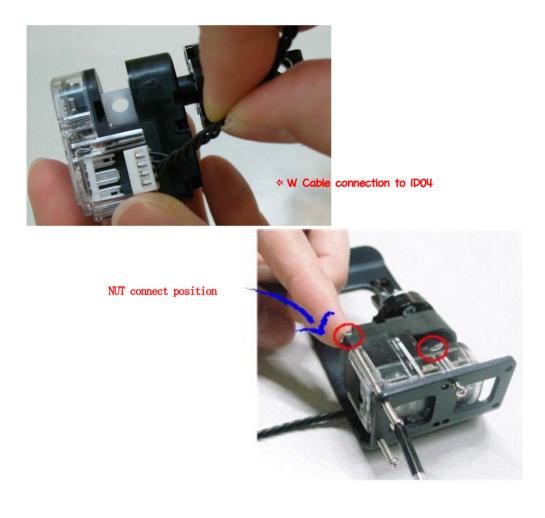


should be in center position (12 o'clock direction)

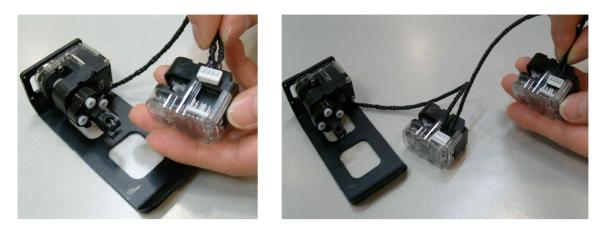
STEP2. Connect Front Horn and Joint Frame by using 2s rivets.



STEP3. Insert "W Cable" with ID04, then connect Foot Frame by using Bolt(B12, B27) and Nut.



STEP4. Connect W Cable with ID03 and ID02.



STEP5. Connect "Joint Frame" with ID03 by using 3s rivet. Then, rotate W Cable1~2 times and fix it.

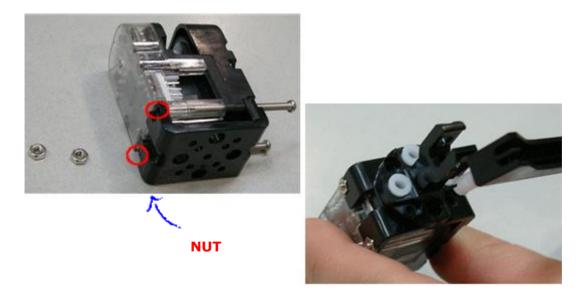




STEP6. Connect ID03 and ID02 with "Knee Frame" by using Bolt (B35) and Nut. Then, rotate the W Cable 3~4 times and put into empty space.



STEP7. Connect ID01 and 'U' frame by using Bolt (B27). Then use the 2s rivet to fix with "Joint Frame".



Be careful JOINT frame direction

STEP8. Connect ID02 and "Joint Frame" by using "3s rivet".

Then, rotate "W Cable" two times and connect with ID01.

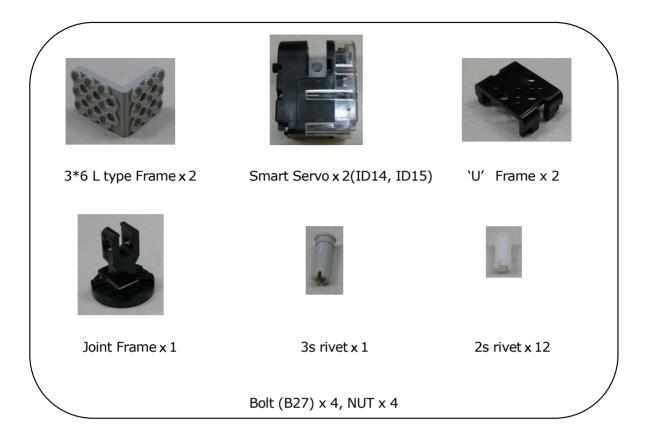




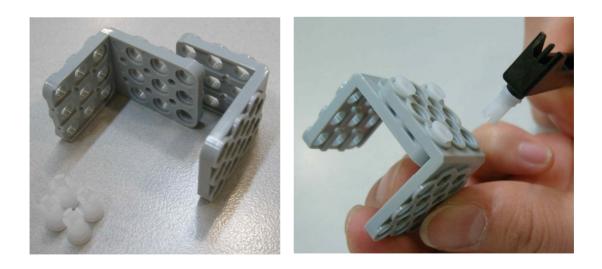




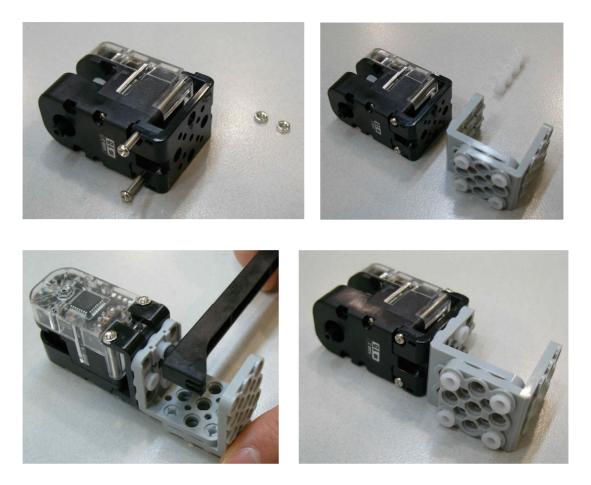
2.5 RIGHT ARM Assembly



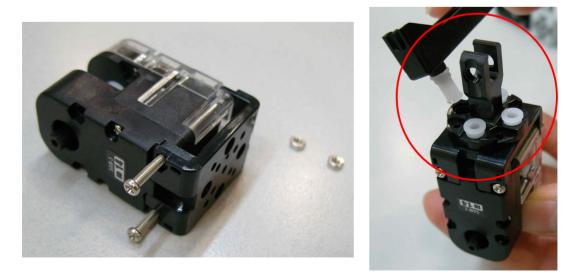
STEP1. Make "Hand" part by using the two "3*6 L type Frame" and "2s rivets" as shown in the below. Becareful with "3*6 L type Frame" part direction because the both sides are not same.



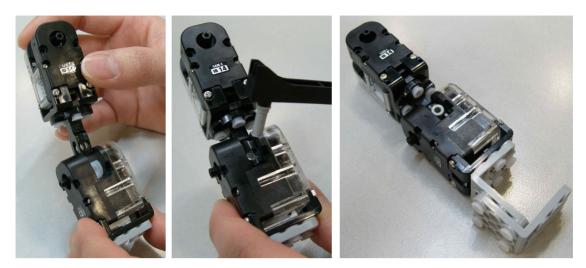
STEP2. Connect ID15 and `U' Frame by using Bolt (B27) and Nut, then connect with "Hand" part by using 2s rivets.



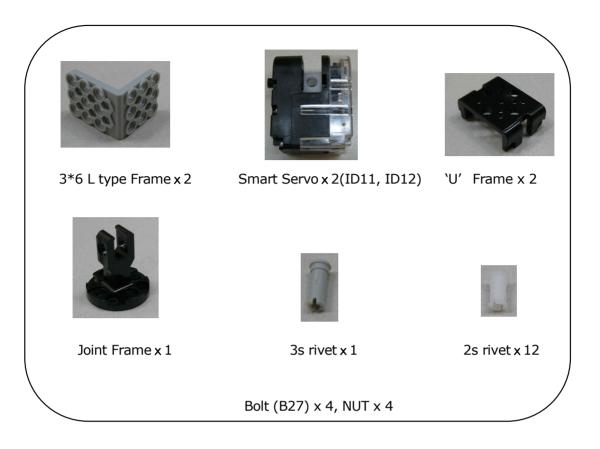
STEP3. Connect ID14 and 'U' Frame by using Bolt (B27) and Nut, then, connect with Joint Frame. Be careful of Joint Frame direction when you connect with smart servo.



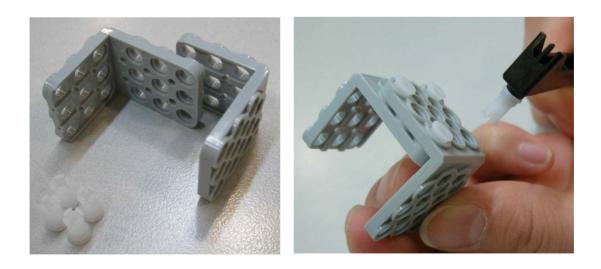
STEP4. Connect "Joint Frame" that connected with ID14 and ID15 by using 3s rivet.



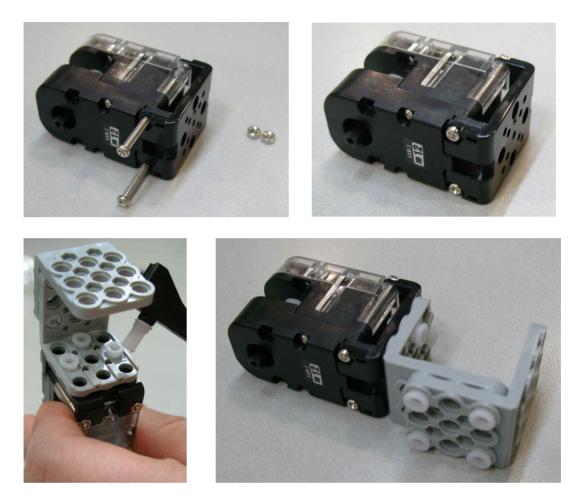
2.6 LEFT ARM Assembly



STEP1. Make "Hand" part by using the two 3*6 L type Frame and "2s rivets" as shown in the below. Becareful with 3*6 L type Frame part direction because the both sides are not same.



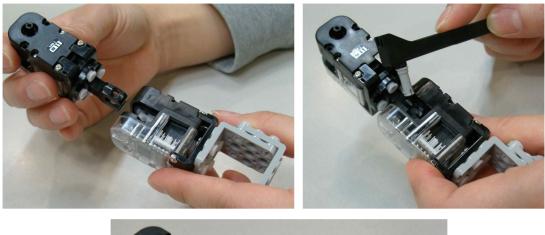
STEP2. Connect ID12 and `U' Frame by using Bolt (B27) and Nut, then connect with "Hand" part by using 2s rivets.



STEP3. Connect ID11 and 'U' Frame by using Bolt (B27) and Nut, then, connect with Joint Frame. Be careful of Joint Frame direction when you connect with smart servo.



STEP4. Connect Joint Frame that connected with ID14 and ID15 by using 3s rivet.





2.7 BODY Assembly



STEP1. Connect Front Horn to ID05 by using screw (P6). Front horn chase mark should be in center position (12 o'clock direction)



STEP2. Connect "Front Horn" and "Joint Frame" by using "2s rivet" as the below.



STEP3. Connect Front Horn and Joint Frame with ID00 same as the ID05 connection. Front horn chase mark should be in center position (12 o'clock direction)



STEP4. Connect ID00 and ID05 with Body Frame by using Bolt (B27) and Nut. Check the ID05 and ID00 connect position well as shown in the below.



STEP5. Connect "Front Horn" with ID10. Check the "Front Horn" and ID00 mark position.

- Smart servo mark position is 11 o'clock while Front Horn mark position is 12 o'clock as shown in the below.



STEP6. Connect "Joint Frame" with "Front Horn" by using "2s rivets" as shown in the below.





STEP7. Connect Front Horn with ID13. Check the Front Horn and ID00 mark position.

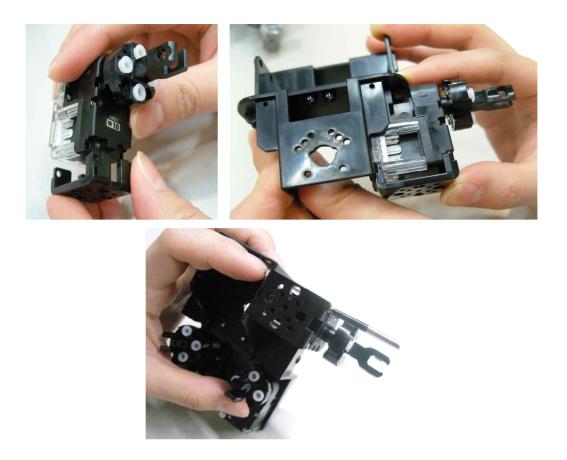
- Smart servo mark position is 1 o'clock while Front Horn mark position is 12 o'clock as shown in the below.



STEP8. Connect Joint Frame with Front Horn by using 2s rivets as shown in the below.



STEP9. Connect 'U' Frame with ID10 as shown in the below and connect with Body Frame by using Bolt (B30).

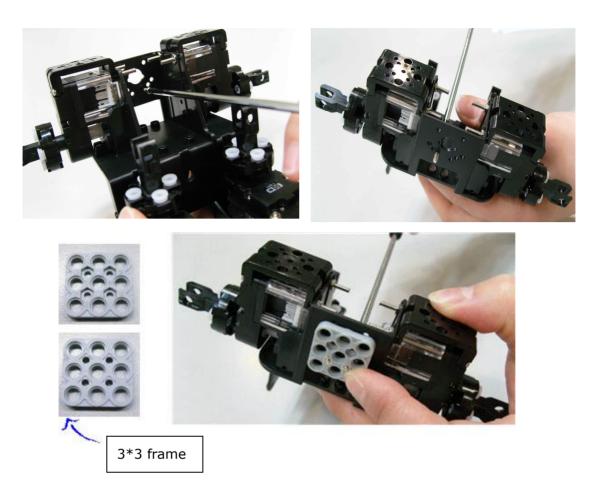


STEP10. Connect 'U' Frame with ID13 as shown in the above and finish the RQ HUNO shoulder.





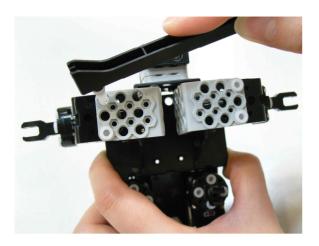
STEP11. Assemble Head part. Connect 3*3 frame with Body Frame by using Bolt (B6) and Nut.



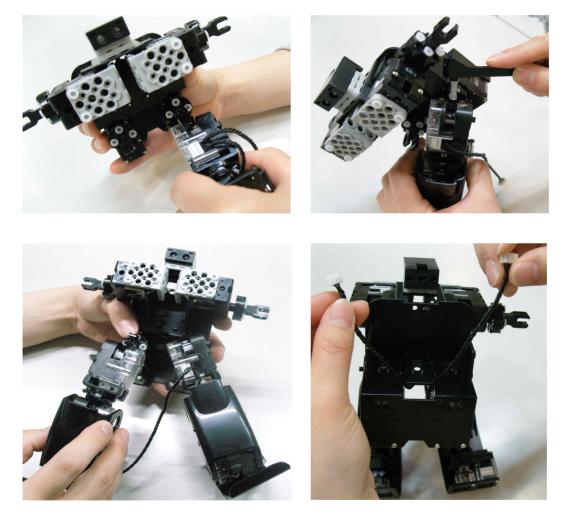
STEP12. Connect IR (Infrared Sensor) into 3*3 frame by using double rivets. .



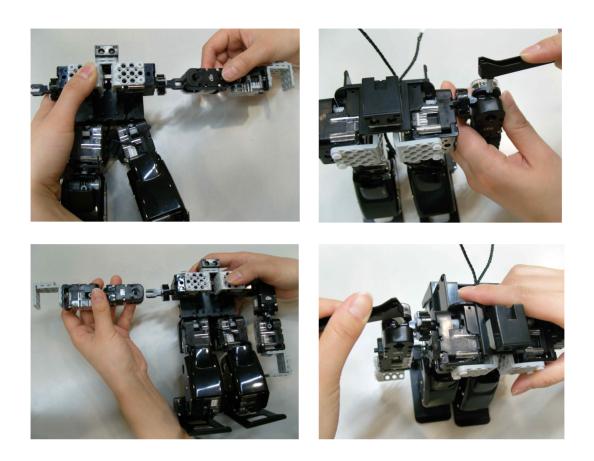
STEP13. Connect 3*6 L type frame onto chest part.



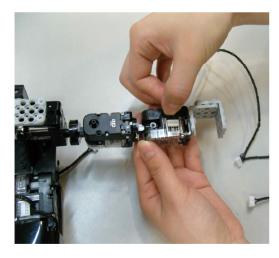
STEP14. Connect "ID00 with ID01" and "ID05 with ID06" by using "3s rivet", respectively . Then, pull the Cable outside from inside as shown in the below.

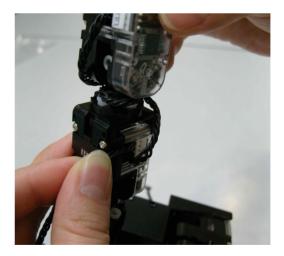


STEP15. Connect "ID10 with ID11", and "ID13 with ID14" by using "3s rivet", respectively.

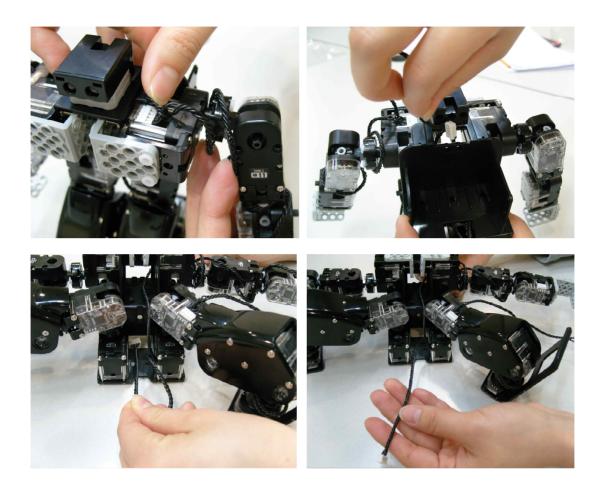


STEP16. Put the first connector of W Cable into ID12, and rotate W Cable 1~2 times then put the second connector of W Cable into ID 11 as shown in the below.

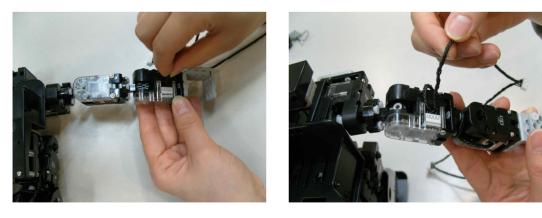




STEP17. Then, put the third connector of W Cable into ID 10. Put the fourth connector of W Cable Inside, then connect with ID00.



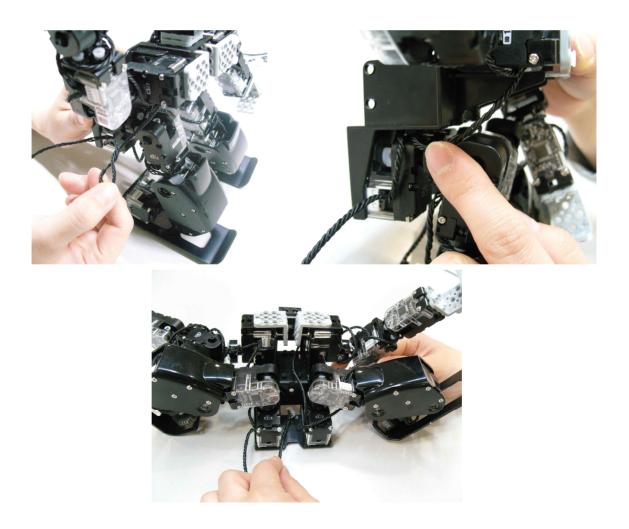
STEP18. Put the first connector of W Cable into ID15, and rotate W Cable 1~2 times then put the second connector of W Cable into ID 14 as shown in the below.



STEP19. Put the third connector of W Cable into ID13, and put the fourth connector of W Cable into ID05.



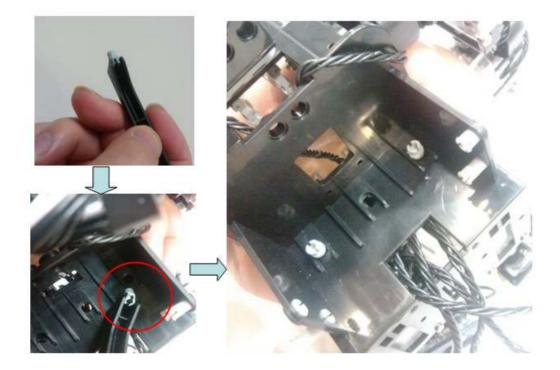
STEP20. Arrange the "W Cabe" as shown in the below, and pull out the "W Cable" from the bottom side of "Body Frame" to upside.



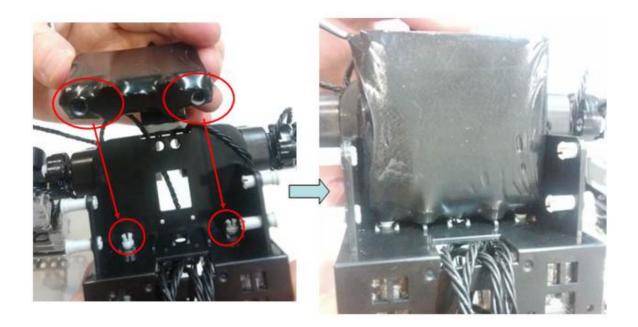
STEP21. Insert four "3s rivets" to "Body frame" to fix Smart Controller as shown in the below.



STEP22. Insert two "double rivets" to "Body frame" to fix "Battery" as shown in the below.



STEP23. Put "Battery" to "Body Frame" as shown in the below.



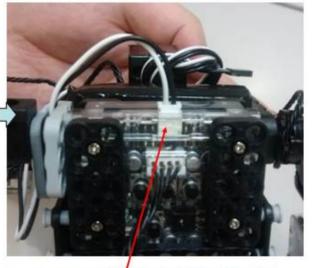
STEP24. Connect "W Cable" and fix Smart Controller with "Body Frame" as shown in the below.



STEP25. Connect battery connector, then also connect "power cable of charing board" to the "Smart Controller power connector" as shown in the below.







power cable of charging board

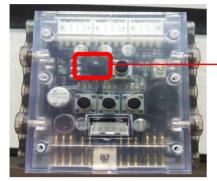
STEP26. Assembly completed.



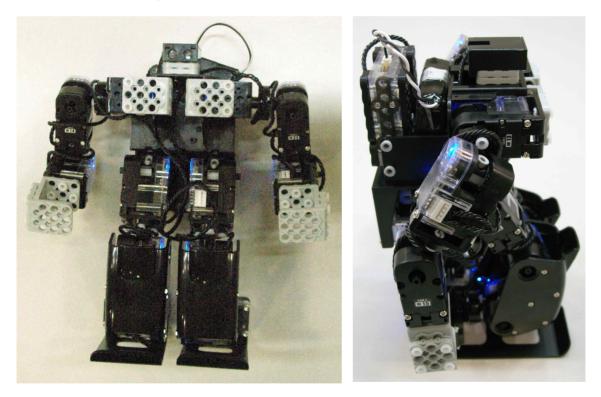
2.8 Check Assembled Robot

<Basic Posture>

Let's find out how Robot works after assembly. Firstly, power on (press button 'P') in smart controller. Then, press 'stop' button of IR remote controller towards IR remote controller receiver.

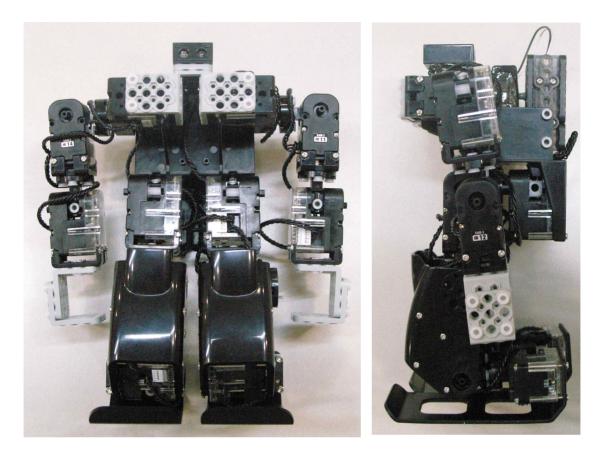


Then Robot will take the basic posture as shown in the below.



<Attention Posture>

Robot will take the "Attention!" posture if you press "button 1" in IR remote controller.



• Please check the assembly guide from the STEP1 again if robot posture is not the same as shown in

the above.

3. Zero Position Adjustment

Zero position is robot standard posture information in order to know the difference of each robot basic posture.

Every robot basic posture would be different a little because every smart servo has own tolerance. For instance, 'A' robot motion would play a little bit different in 'B' robot because of smart servo tolerance. This difference can be reduced as you ajdust "zero position adjustment".

<RQ-HUNO zero position adjustment?

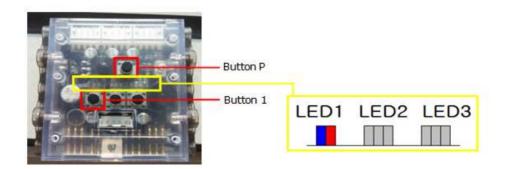
- i) Prepare "zero position tool".
- ii) Fix Front Horn with zero position tool by using 2s rivets.
- FrontHorn mark
- iii) Put FrontHorn into smart servo to be adjusted. Stand line and FrontHorn mark should be matched as the below.

standard line

'L' mark zero position tool is to adjust robot "left arm" and "left leg".

'R' mark zero position tool is to adjust robot "right arm" and "right leg".

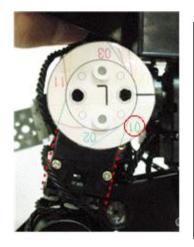
- iv) Make power-off the smart controller.
- v) Press button P while button 1 pressed.
 - ⇒ LED 1 blue and red LED lights, also, smart servo ID00 blue LED lights.
 (Zero position adjustment starts from smart servo ID00.)





vi) Press button 1 for selecting smart servo ID, then press button 2 or button 3 for smart servo rotating direction.

Button 1	Button 2	Button 3				
Every time you press button 1, smart servo is selected in order. "ID01, ID02, ID03 ID15, ID00".	Smart servo moves counter clockwise direction.	Smart servo moves clockwise direction.				



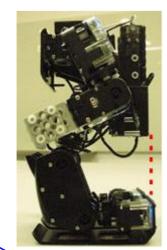
For example, smart servo ID01 blue LED lighs when
ID01 zero position adjustment is started.
⇒ Make sure that 01 adjustment line is matched
with smart servo ID01.
01 means smart servo ID01.
Adjust smart servo ID01 to fit with 01 number.

vii) Press button P to save the "zero position".

TIP.

=> Each smart servo is to be adjusted to conform with zero position adjustment line.
But for ID02, ID03, ID07, ID08 is to conform with Knee Frame, not a smart servo.



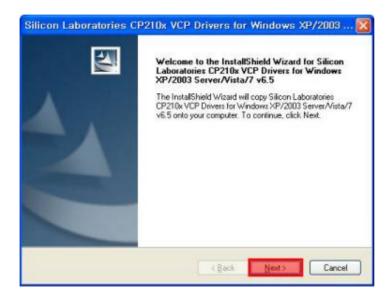


=> RQ-HUNO Body Frame should be conform with the rear side of Foot after zero position.

4. Download Cable (UART) driver Installation

You need to install the download cable driver in order to use robot programming software, such as MotionBuilder, ActionBuilder, Diagnostic Tool and Firmware Upgrade Tool.

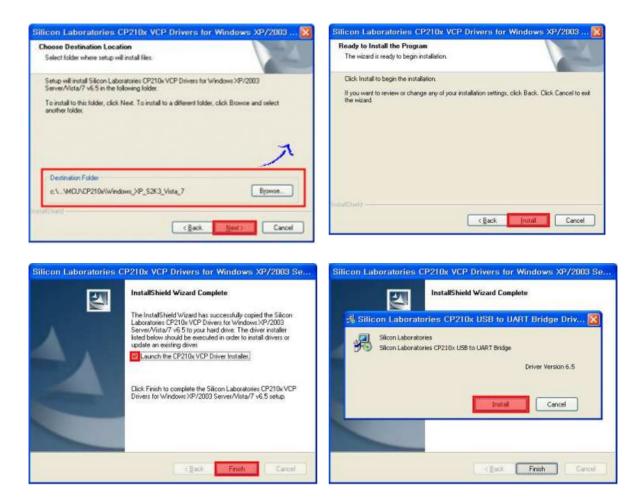
1) Download "USB Download Cable Driver" from <u>www.RQWORLD.com</u> and click to start installation.



2) Click "I accept the terms of license agreement", then click "Next".



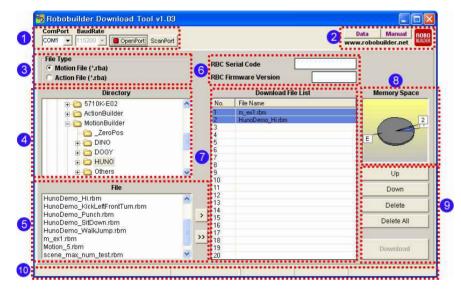
3) Click "Next" and finish the installation as shown in the below..



5. Download Tool

5.1 Introduction

Download Tool is used for downloading a number of Motion files (*.rbm) or Action files (*.rba) at one time. Users can designate the download positions in remote controller.



Layout description

PC Port Connection Part

- . COM Port : Designate available COM port for connection of RoboBuilder.
- . BaudRate : It shows data transferring speed.
- . OpenPort : Open PC COM port in order to connect a RoboBuilder.
- . ScanPort : Find available COM port and opens it automatically.

5.2 Download File

In RoboBuilder Download Tool, it shows the folders and downloaded (made) motion files. Click "Delete All" in order to delete the previous downloaded files in the list.

ComPort BaudRate COM1 ★ 115200 ★ OpenPort ScanPor	t			Data Manual ROBO www.robobuilder.net			
File Type Motion File (*.rba) C Action File (*.rba)			erial Code				
Directory			Download File List	Memory Space			
		No. 1 2 3 4 5 6 7 8 9	File Name	E			
File		10 11		Down			
CongratSong.rbm		12 13 14 15 16 17 18 19 20		Delete Delete Delete All Download			

In order to insert into Download File List section, select the file then, click `>' button.

RBC Serial Code RBC Firmware Version Download F		
Download F		
	ile List Memory Space	e
No. File Name 1 2 2 4 5 5 6 5 7 8 9 10 12 13 14 14 15 5 16 5 17 18 19 20	E Up Down Delete Delete All Download	
	4 5 6 7 8 9 10 11 12 3 3 14 5 5 7 8 9 10 11 12 12 13 14 15 5 7 8 9 10 10 11 11 12 12 13 14 15 15 16 10 11 11 11 11 12 15 16 16 17 18 19 19 10 10 11 11 11 11 11 11 11 11 11 11 11	4 5 7 8 9 9 10 11 12 12 10 10 10 11 12 10 10 10 10 10 10 10 10 10 10 10 10 10

% Users can use Drag & Drop function.

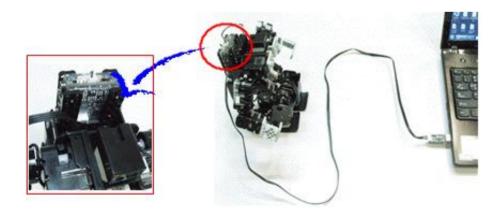
If you click a file in the Download File List, it shows file name, file size, robot platform, scene number, performance time.

DM1 v 115200 v Connection Scanp	ort			Data Manual Rewww.robobuilder.net
ile Type © Motion File (*.rba) © Action File (*.rba)		1000000	erial Code	
Directory			Download File List	Memory Space
data motion motion MSOCache My Document Com RECYCLER RobBuilder RobBuilder System Volume Information temp		No. 2 3 4 5 6 7 8 9	File Name	
File		10 11 12		Down
ongratSong.rbm	-	13 14 15 16 17		Delete Delete All
	2	> 18 19 20		Download

- ※ If registered files are more than one in the 'Download File List', users can change the downloading sequence by clicking "Up" or "Down" button.
- % Users can do this function by using Keyboard.

`Up' button = `+' Key
`Down' button = `-` Key
`Delete' button = `Delete' Key

Connect RQ-HUNO and Download (UART) Cable as shown in the below.



Click 'ScanPort' button in order to find available COM Port.

Robabuilder Dowr ComPort BaudRate COM1 👻 115200 💌 🔮	ClosePort Scargor	Data Manual Bug www.robobuilder.net
	COMI Try to connect Checking Version	Memory Space
	>>> 17 18 19	Delete All

RBC serial code and Firmware Version will be shown if connected properly.

🙀 Robobuilder Download Tool v1.03 Data Manual www.robobuilder.ext ComPort BaudRate ROBO ClosePort File Type Motion File (*.rba) **RBC Serial Code** TTO ISSUED IN 2.15 RBC Firmware Version Action File (*.rba) Directory Download File List Memory Space File Name No. 😑 🛅 data ^ → motion → → MSOCache 1 My Document
 Generation 8 9 10 11 12 13 14 15 16 17 18 19 20 主 🫅 temp Up File Down CongratSong.rbm Delete > >> Delete All Download

And "ClosePort" button will be shown as well.

Click 'Download" button, in order to all files in the "Download File List".

Then it starts downloading into RBC Box. Following message box will shown after downloaded completely.

ile Type ● Motion File (*.rba) ● Action File (*.rba)		RBC Serial Code ELI Code RBC Firmware Version 2.15	
Directory		Download File List	Memory Space
🖻 🧰 data	^	No. File Name	
- Commotion	Bholt		1
🗐 🦳 My Document	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
	Motion Availabl	File Download Success : 1files e Mernory : 18,193 KBytes	
🗉 🫅 RoboBuilder		2 2	E
🛅 System Volume Information ++ 🦳 temp			1
Temp	-	10	Up
File		11 12	Down
ongratSong.rbm		13	Delete
		> 14	
			Delete All
		16	
		16 17 18	

6. MotionBuilder

6.1 Introduction

This document explains how to use MotionBuilder the motion building tool for RQ-HUNO. What are project file, motion file, scene, frame, transition time?

Aotion File1	Motion File2	Motion File3
Scene 1 Scene 2 Scene 3	Scene 1 Scene 2 Scene 3	Scene 1 Scene 2 Scene 3
Scene 4 Scene 5	Scene 4 Scene 5	Scene 4 Scene 5

Project file(*.prj)

: A project file contains the information such as the robot's type and more. It is used to manage multiple motion files of a robot efficiently. Therefore, one project file includes one or more motion files.

Motion file(*.rbm)

: A motion file contains the complete data to execute its movement. One motion file consists of multiple scenes.

Scene

: A scene is a smaller motion unit that constitutes a complete motion file. A scene consists of start position and destination position. Except the first scene, the start position of a scene is the destination position of its previous scene. When a scene is executed, the frame data is generated automatically according to the predefiend number of frames and delivered to each actuator modules.

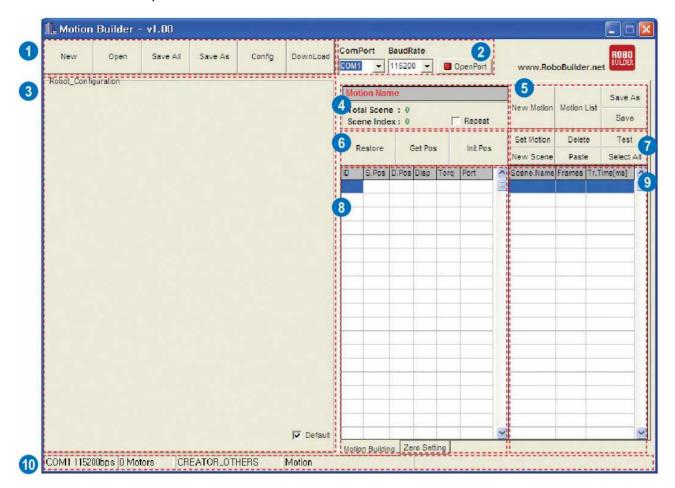
Frame

: A frame is the smallest motion unit that constitutes a scene. Each frame can be considered as the still image that is actually sent to robot actuators. The more frames you define, the smoother the motion becomes. One scene can have from 1 up to 100 frames.

Transition Time

- : Transition time is the time duration that is taken to execute a scene. Transition time is closely related with the number of frames. It can have value from 20msec up to 6000msec. The minimum transition time that can be allocated for a frame is 20msec.
 - e.g) If scene A has 10 frames, the transition time can be selected from 200 up to 60000.

Screen Layout



This is the screen layout of the MotionBuilder.

No.	Area Name	Functions & Descriptions
1	Menu Bar	 New: creates a new project by defining project name, file path, robot type etc. Open: opens an existing project file. (*.prj) Save All: stores the running project file and all data related to the project. Save As: saves the running project file as a different name. Config: configures and sets the wCK module. Download: transfers robot files to control box.
2	PC Port connection	 ComPort: sets the port on PC to connect RoboBuilder with. BaudRate: sets the data communication speed. (default: 115,200kbps) OpenPort: opens the set PC port to connect RoboBuilder with.
3	Robot Configuration	This area illustrates the mechanical construction of the wCK modules. Using the jog dial pad, you can control the movement of each wCK module. <i>If the [Default] button is not checked, you can freely relocate the jog dial pads of the wCK modules by dragging them with your mouse(right-click). When [Default] is selected, they return to their original default position.</i>
4	Motion File Information	 Motion Name: displays the name of the motion file running. Total Scene: displays the total number of scenes that constitutes the motion file running. Scene Index: displays the number of the selected scene in the running motion file. Repeat: is used to repeat and test the selected one or more scenes.
5	Motion File Management	 New Motion: creates a new motion file. Motion List: add, open, modify, or remove motion files. Save As: saves the running motion file as a different name. Save: saves the running motion file.
6	Position Control	 Restore: sets all modules' displacement angles of the selected scene to "0". Get Pos: captures the desired posture of a robot after adjusting the posture manually with user's hands. Captured posture is saved as in a scene. Init Pos: sets the initial torque and angle of the selected wCK module.
Ø	Scene Management	 Set Motion: sets the name and saved path of the motion file, configures PID gains of wCK modules. Delete: deletes the selected scene. Test: run the selected scene.(multiple scene selection available) New Scene: adds a new scene. Paste: pastes the copied scene in the selected position. Select All: selects all scenes in a motion file.
8	wCK module Control Detail	 ID: displays the ID number of the wCK module. S.Pos: stands for Start Position and it displays the start position of the wCK module in unit of control angle. D.Pos: stands for Destination Position and it displays the destination position of the wCK module in unit of control angle. Disp: stands for Displacement and it displays the control angle difference between S.Pos and D.Pos. Torq: It displays the speed of the wCK module.(0: Very fast, -4: Very slow) Port: displays the status of the LED installed on the I/O port of the wCK module.
9	Scene Editing	 Scene Name: displays the scene name. Frames: displays the number of frames, into which a scene is divided. Tr.Time[ms]: displays the transition time that is used for operating the corresponding scene.
10	Task Info	 displays the task related information such as the PC port connected, communication speed, number of wCK modules connected, robot type, etc.

6.2 Motion Programming #1

Let's try one simple motion programming for RQ-HUNO.

1) Run "MotionBuilder" and click "New".

Input "greeting" in Project Name, then select Robot Platform "RQ-HUNO".

tiew	Open	Save	Save As	Config	Download	ComPort Bi			nect throu nPart S		ink .	
Robot Config	uration					Motion Name				1		Save As
						Total Scene Scene Index	0 0	E)	Repeat	New Motion	Motion List	Savr:
						Restore	Get Pose		Init Pos	Set Wotan	Deate	TERM
1			New		_	-ISSNOTS	Get Pose	×	1	New Scene Scene Nam	Paster	Select Al
	(eting.prj Platform	Pro	er Level Messional	Browse					
		4										

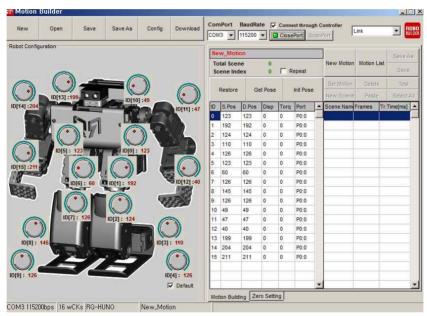
2) Click "OK", then it shows as below.

New	Open	Save	Save As	Config	Download			BaudRa 115200		Conn Oper	ect throu NPort S	gh C canf		Link			
Robot Config	uration					Ne	w_Moti	OR.					P	1	ſ		
				~		To	tal Scer	ne	0	FF	Repeat		New Motion	Motion L	ist	Save A	
0								1		1			Set Motion	Delete	2	Test	
	ID[13] :1	99		<i>)</i>	(.)		Restore	G	et Pose		Init Pose	•	New Scene			Select	All
ID[14] :204	Infinit.		ID[10	0] :49	ID[11] :47	D	S.Pos	D.Pos	Disp	Torg	Port	-	Scene Nam	Frames	TrT	ime[ms]	
	1	P2	1		10[11]:4/	0	123	123	0	0	P0:0						
1.40	1º	50	(hills	ALLA DE		1	192	192	0	0	P0:0						1
1.0		3 57 1	(*	111		2	124	124	0	0	P0:0						
0		1	K	11 12	Y TA	3	110	110	0	0	P0:0						
	ID[5] :	123	[0]CI	123		4	126	126	0	0	P0:0				-		
	3 (\frown	0			5	123	123	0	0	P0:0		-		-		
ID[15] :211						6	60	60	0	0	P0:0						
: KR	U.	D[6]: 60	ID[1] : 192	1	DID[12] :40	7	126	126	0	0	P0:0						
125.50			- P		1020	8	145	145	0	0	P0:0						
		•		49	100	9	126	126	0	0	P0:0						
				16		10	49	49	0	0	P0:0						
6	T]DI]: 126	ID[2]: 124	C	5	11	47	47	0	0	P0:0						
(•			1.00	 ('		12	40	40	0	0	P0:0				1		
P	/			199 🕓	1	13	199	199	0	0	P0:0						
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	9.7	A WAY	: NE			15	211	211	0	0	P0:0						
U.		- //	-														
ID[9]: 126	Sector Sector			10	[4]: 126				1								
				F	Default												-
						Mo	tion Build		ro Setti	ng							
Not Connec	. I lin	CKs RQ-HL		New_Moti		-	17. A. F. (2010)	-				_				_	-

3) Connect RQ-HUNO with PC by using "Down Cable (UART)" then, power on smart controller (Button P)



4) Click "Scan Port" to search correct COM Port, or you can click "Open Port" if you know the COM Port No.

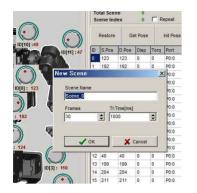


Click "New Motion". Then input "hi" in Motion Name.
 If you want to use smart servo LED, check the "Enable External Port", then, click "OK".

New	Open	Save	Save As	Config	Download	ComPort Baud	and the second second	nnect through osePort	Constanting of the second s	Link	
bot Confi	guration					New Motion			-	1	
			_			Total Scene Scene Index	0	Repeat	New Motion	n Moton Li	st Save
2	0		New Motio					×	Set Motion	Getere	-
I)	ID[13] :1	99	Motion Name	~					New Scene	Páste	Q.
14] :204			HI).	-				Scene Nam	Frames	Tr.Tme[ma]
= dI	100	ha	Motion File F	ath	2	ŭ		Browse	1		
100		1.71	u. Present		19			Slowse			
and the second second	521 1	11									
5	10[5] ;	123 000	Set Motion					-			
0	10[6] :	122 744	Set Motion Gain Settin	ng ID	nable Setting	Enable	e External Port	5			
5):211			Gain Settin 0 PGain	ng ID ▼ I⊽ Er DGain	IGain	Enable	e External Port	S			
15] :211	7	123 0[6] : 60	Gain Settin 0 PGain	ng ID ➡ I⊽ Er DGain		Enable	e External Port	2			
15] : 211	7	\bigcirc	Gain Settin 0 PGain	ng ID ▼ I⊽ E DGain	IGain	Enable	e External Port	2	3		
151:211			Gain Settin 0 PGain 20	ng ID DGain 30	IGain 0 🔹 Set All ID	1	e External Port	2	3		
		\bigcirc	Gain Settin 0 PGsin 20 Set Gr Author	ng ID DGain 30 🔮	iGain	0. Ltd.	e External Port	2	3		
			Gain Settin 0 PGain 20	ng ID DGain 30 •	IGain 0 💽 Set All D	0. Ltd.	e External Port	2	3		
C			Gain Settin 0 PGSin 20 Set Go Author Email Addr	ng ID DGain 30 •	IGain 0 💽 Set All D	0. Ltd.		Cancel	3		
			Gain Settin 0 PGSin 20 Set Go Author Email Addr	ng D DGan DGan 30 (\$ an	IGan 0 • Set All D Robobuilder Co www.robobuil	o., Ltd. idernet		\leq	3		
C			Gain Settin 0 PGSin 20 Set Go Author Email Addr	ng D DGan DGan an	IGam	o., Ltd. idernet		Cancel	3		

6) If you see the New Scene window, click "OK".

You can adjust "Frames", and "Motion Run Time (ms)".

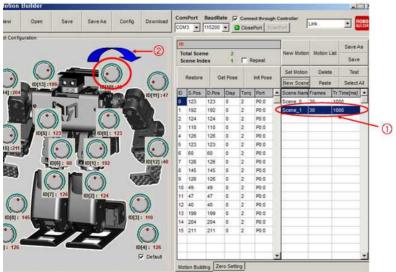


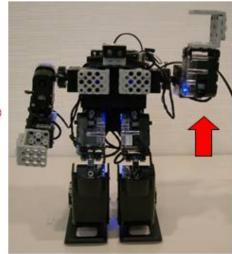
Frames : If you increase the Frames, robot moves smoothly.
Motion Run Time : Each frame run time range is 20~1000msec.
TIP. It is recommended that first scene and last scene is for robot basic posture for stable motion movement
Therefore, do not revise the Frames and Run Time value of Scene0

7) In order to move up and shake the arm, add the second scene. For adding new scene, you should select next empty scene before click "New Scene".

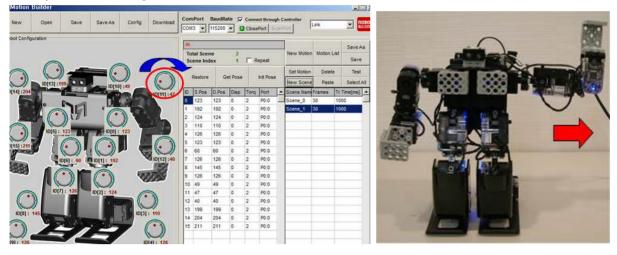


8) In order to move up and shake the arm, add the second scene. For adding new scene, you should select next empty scene before click "New Scene". Move the Jog Dial of "ID10".

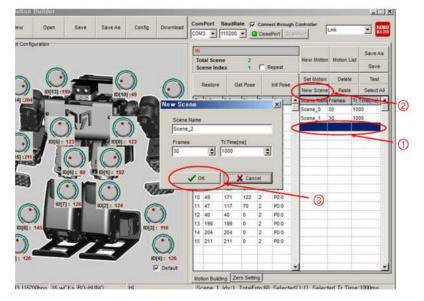




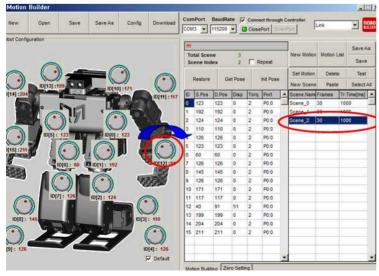
9) Move the Jog Dial of "ID11".

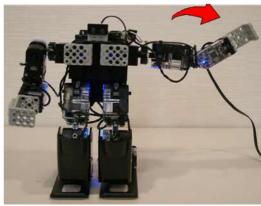


10)For the next movement, add the third scene.

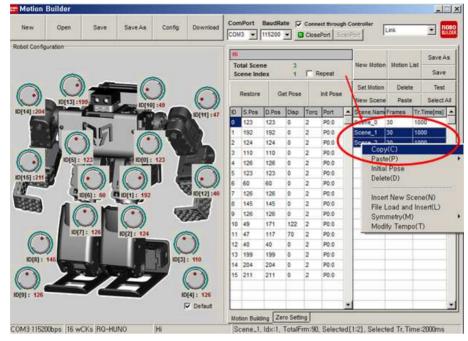


11) Move the Jog Dial of ID12.





12) Then, let's make the arm shaking motion like "saying Hi". Copy the Scene 1 and Scene 2.

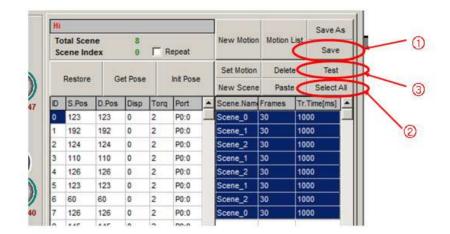


13) Paste the Scene 1 and Scene 2 to the next empty scene space, and do the paste again. Lastly, copy the "Scene 0" and paste to the last scene.

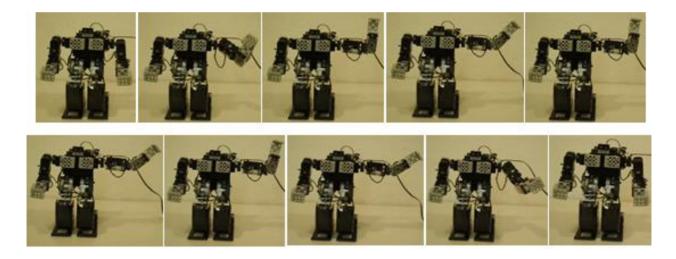
	Hi									Save As		
		tal Scer		3	∏ R	epeat		New Motio	n Motion L	List		
		Restore		et Pose		Init Pose	ľ	Set Motion	Delet	e Test		
ID[13] :199		Restore	G	el Puse		ing Pose		New Scen	e Paste	e Select All		
04 ID[11] : 117	D	S.Pos	D.Pos	Disp	Torq	Port	-	Scene.Narr	Frames	Tr.Time[ms]		
	0	123	123	0	2	P0:0		Scene_0	30	1000		
	1	192	192	0	2	P0:0		Scene_1	30	1000		
	2	124	124	0	2	P0:0		Scene_2	30	1000		
ID[5]: 123 ID[0]: 123	3	110	110	0	2	P0:0		Co	py(C)			
	4	126	126	0	2	P0:0			ste(P)		Insert	t(1)
	5	123	123	0	2	P0:0		Ini	tial Pose		Overv	Ari
	6	60	60	0	2	P0:0		De	lete(D)		T	NOTES.
ID[6]: 60 ID[1]: 192 ID[12]:40	7	126	126	0	2	P0:0						
	8	145 126	145	0	2	P0:0				Scene(N)		
	9	120	126	0	2	P0:0 P0:0				nd Insert(L)		
ID[7]: 126 ID[2]: 124	11	117	117	0	2	P0:0			mmetry(f odify Tem			
	12		91	51	2	P0:0		DATE	oany rem	1po(1)	in the second	
	13	199	199	0	2	P0:0						
145 ID[3]: 110	11	-	204	0	2	P0:0						
		211	211	0	2	P0:0						
	12	26.0	2010	55	1770	0.00017.0			-			
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					an Maria	3	Set Motion	Delete	e Test	
	Restore	9	et Pose		Init Pose	5	New Scene	e Paste	select	AI
D	S.Pos	D.Pos	Disp	Torq	Port		Scene Nam	Frames	Tr Time[ms]	
0	123	123	0	2	P0:0		C.ene_0	30	1000	19 No. 19
1	192	192	0	2	P0:0	/	Scene_1	30	1900	1
2	124	124	0	2	P0:0		Scene_2	30	1000	
3	110	110	0	2	P0 0		Scene_1	30	1000	4
4	126	126	0	2	P0.		Scene_2	30	1000	
5	123	123	0	2	P0:0		Scene_1	30	1000	
6	60	60	0	2	P0:0		Scene_2	30	1000	
7	126	126	0	2	P0:0	1	Scene_0	30	1000	
8	145	145	0	2	P0:0					

14) Save the Motion file, Click "select All" and then click "Test" button.



15)Completed "Hi.rbm" motion movement is as follows.

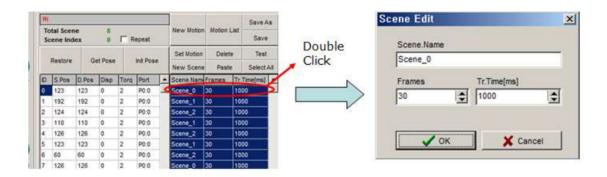


6.3 Change Motion Speed

Let's find out about frame and motion run time.

We have applied basic frame and motion run time (30 frames, 1000 msec) in the previous motion

1) If you look at the scene part, you can see all the frame value is 30 and time value is 1000. you can change the frames and time as you double-click related scene.



- 2) Minimum motion run time is 20msec for each frame. Therefore, time value should be at least 600 msec if frames are 30. Change the frame value first, then input proper time value.
- 3) Try to change the frame value to 15, and time value is 300msec then click "Test" as shown below.

	Restore	G	et Pose	2	Init Pos	e	Set Motion	Dele	te Test	
	restore			0		Ĭ	New Scene	Past	e Select	All
ID	S.Pos	D.Pos	Disp	Torq	Port	-	Scene.Nam	Frames	Tr.Time[ms]	-
0	123	123	0	2	P0:0		Scene_0	30	1000	-
1	192	192	0	2	P0:0		Scene_1	30	1000	
2	124	124	0	2	P0:0		Scene_2	15	300	
3	110	110	0	2	P0:0		Sceng_1	15	300	
4	126	126	0	2	P0:0		Scene_2	15	300	
5	123	123	0	2	P0:0		Scene 1	15	300	
6	60	60	0	2	P0:0		Scene_2	15	300	
-				1.		18 4			1	

4) You can see that motion speed is faster than before.

6.4 Motion Programming #2

In this section, we will make a deep bow HUNO motion.

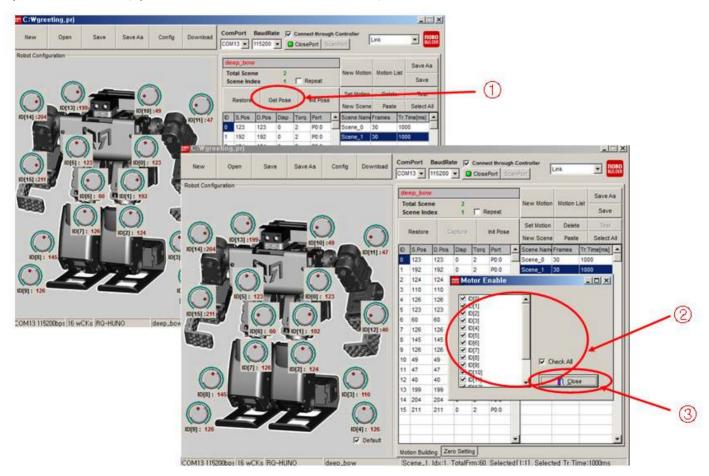
- 🚾 C:Wgreeting, pri -DX ComPort BaudRate 1 New Ope Save Save As Config Do ROBO Link COM13 - 115200 - ClosePort ScanPort Robot Configuration Save As Total Scene tion List T Repeat Save Scene Index Set Motion Test Dele × cene New Matin Paste Select A IDI14 Nam Frames Tr.Time[ms] 🔺 1 deep_bow 1000 30 1000 30 otion File Patt 300 15 Browse 300 15 Set Motio 15 300 2 Gain Setting ID 1 15 300 F Enable Setting ternal Port Enabl ٠ 2 15 300 PGain DGain IGain \$ 30 1 20 \$ 0 Set Gain Set All ID 0 IDI71 Robobuilder Co., Ltd. Author www.robobuilder.net Email Address SerialCode 🗸 ок X Cancel ID[9] m(a) : Defaut . Motion Building Zero Setting COM13 115200bps 16 wCKs RQ-HUNO Motion_0 Scene_0, Idx:0, TotalFrm:135, Selected[0:0], Selected Tr, Time:1000ms
- 1) Click "New Motion", then input motion name as a "deep_bow".

Scene_Name Scene_0	
Frames	Tr.Time[ms]
30	1000

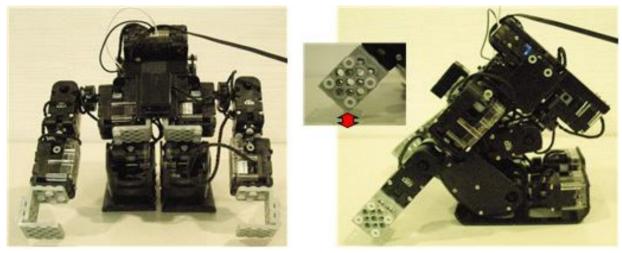
2) Click "New Scene" to add new scene.

Configu						Hi							Save As
							al Scene ne Index	1	E	Repeat	New Motion	Motion List	
		-		3	~	300	IIC IIIGEA		1	(ispasi	Set Motion	Delete	Test
•)) _		E.C.		J	0		estore	Get Pos	e	Init Pose	New Scene	×	Select All
:204	ID[13] :19		ID[10	0] :49	New Sce	ene				×			Time[ms]
204			-1								Scene, nam	Franica 1	a moclosi
				A CONTRACTOR .							Scene 0	30 1	000
412	0	20	s here		Scene	-111-11-11-11-11-11-11-11-11-11-11-11-1				- E;	Scene_0	30 1	000
	1°C	79	1.1		Scene Scene	and the second second			_		Scene_0	30 1	
	A.C	79	Č		Scene	_1	Tr.Tim	ne[ms]			Scene_0	30 1	
2	() () () () ()	123		123	Scene	_1	Tr.Tim	215-214-1-5-5-			Scene_0	30 1	
)		123		123	Scene	_1		215-214-1-5-5-			Scene_0	30 1	
211		77		123	Scene	_1		215-214-1-5-5-			Scene_0	30 1	
211			\odot		Scene Frames 30	_1	1000)			Scene_0	30 1	
211					Scene Frames 30	s	1000	215-214-1-5-5-			Scene_0	30 1	
211			\odot		Scene Frames 30	s V OK		X Ca	ncel			30 1	
211			\odot		Scene Frames 30	▲1 s ✓ OK 9	1000	X Ca	ncel 2	P0:0 P0:0	Scene_0	30 1	
211					Scene Frames 30	✓ OK	1000	X Car	ncel 2 2	P0:0 P0:0		30 1	
211			\odot		Scene Frames 30	►1 s OK	1000 126 126 49 49 47 47	Car	2 2 2 2	P0:0 P0:0 P0:0 P0:0		30 11	
					Scene Frames	с_1 s У ОК	1000 126 126 49 49 47 47 40 40	Car Car 0 0	2 2 2 2 2	P0:0 P0:0 P0:0 P0:0 P0:0		30 1	
2211 2211					Scene Frames 30	OK	1000 126 126 49 49 47 47 40 40 199 199	Car Car 0 0 0 0	2 2 2 2 2 2 2	P0:0 P0:0 P0:0 P0:0 P0:0 P0:0		30 11	
2211 2211					Scene Frames	OK	1000 126 126 49 49 47 47 40 40 199 199 204 204	Car Car 0 0 0 0 0 0 0 0 0 0 0 0	2 2 2 2 2 2 2 2 2	P0:0 P0:0 P0:0 P0:0 P0:0 P0:0 P0:0 P0:0		30 11	
2211 2211 8] : 1					Scene Frames	OK	1000 126 126 49 49 47 47 40 40 199 199	Car Car 0 0 0 0 0 0 0 0 0 0 0 0	2 2 2 2 2 2 2	P0:0 P0:0 P0:0 P0:0 P0:0 P0:0		30 11	

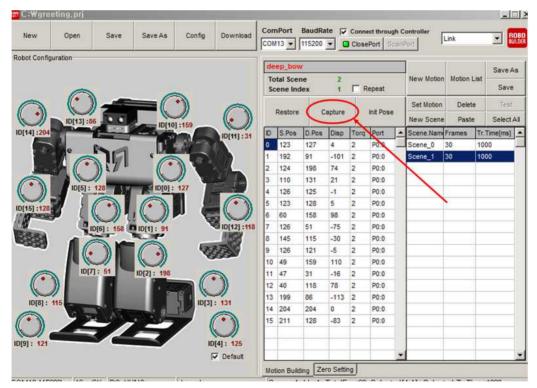
3) Click "Get Pose", you can see "Motor Enable" window, then check "Check All".



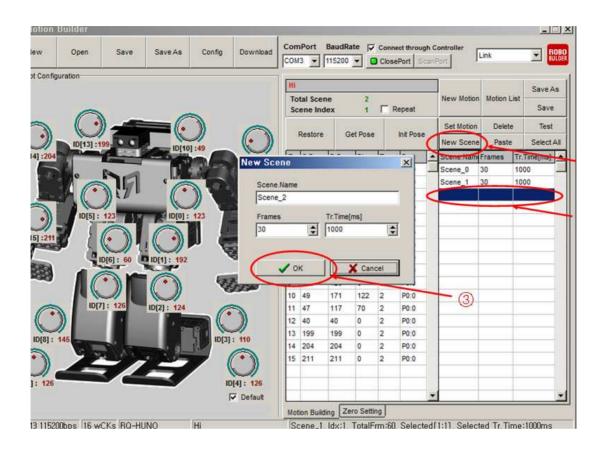
4) Then, you can make the RQ-HUNO posture by using your hand (Not by Jog Dial) as shown in the below.



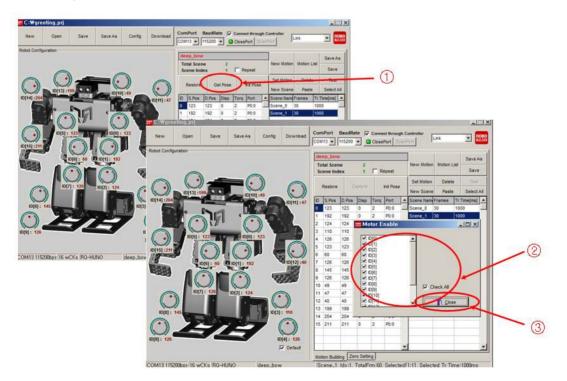
5) Then, click "Capture" to complete the above scene.



6) Click "New Scene" to add new scene.

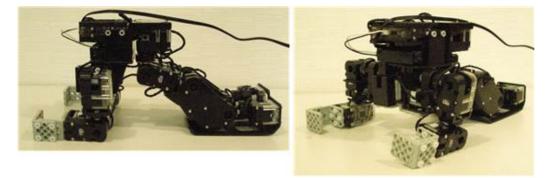


7) Click "Get Pose", you can see "Motor Enable" window, then check "Check All".

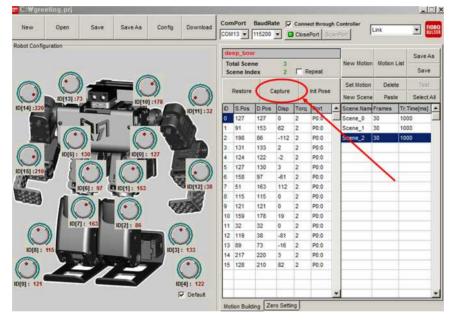


8) Then, you can make the RQ-HUNO posture by using your hand (Not by Jog Dial) as shown in the

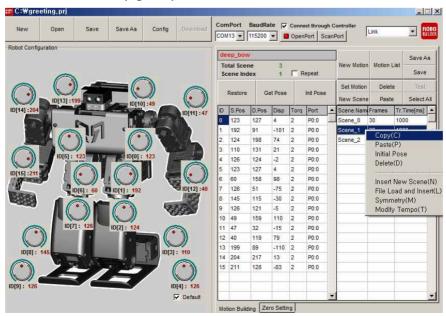
below.



9) Then, click "Capture" to complete the above scene.



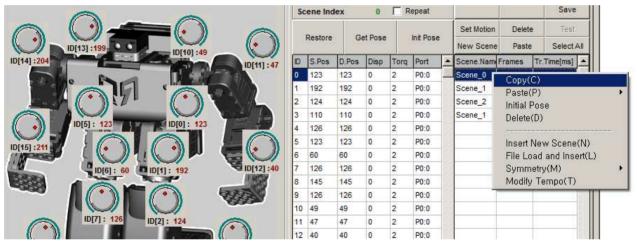
10)Now, Copy the "Scene_1" to ready get up.



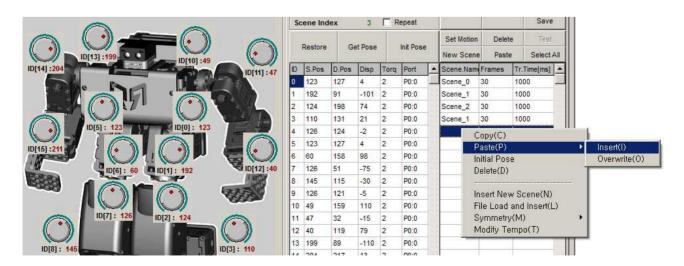
11)Mouse right click, then paste-insert to the next empty scene space after Scene_2.

	de	ep_bow								Save As			
		tal Scen ene Ind		3 2	∏ R	epeat		New Motion	Motion I	List Save			
		-						Set Motion	Delet	e Test			
D[13]:89 DD D[10]:159		Restore	G	et Pose	1	Init Pose	2	New Scene	Paste	Select Al			
4] :217 ID[11] : 32	ID	S.Pos	D.Pos	Disp	Torq	Port	-	Scene.Nam	Frames	Tr.Time[ms]			
	0	127	127	0	2	P0:0		Scene_0	30	1000			
	1	91	153	62	2	P0:0		Scene_1	30	1000			
	2	198	86 /	-112	2	P0:0		Scene_2	30	1000			
	3	131	133	2	2	P0:0				Copy(C)			
) ID[5]: 127 ID[0]: 127	4	124	123	-1	2	P0:0				Paste(P)		Þ	Insert(I)
	5	127	131	4	2	P0:0		1		Initial Pose			Overwrite(0)
	6	158	97	-61	2	P0:0				Delete(D)			
ID[6]: 158 ID[1]: 91 ID[12]:119	7	51	163	112	2	P0:0		1		*********	011001100	0111111	
	8	115	115	0	2	P0:0				Insert New S			
	9	121	121	0	2	P0:0				File Load an	Samaaaaaa)	
ID[7]: 51 ID[7]: 198	10		178	19	2	P0:0				Symmetry(M		*	
ID[7]: 51 ID[2]: 198	11	32	32	0	2	P0:0				Modify Temp	0(1)		1
		119	38	-81	2	P0:0							
: 115 ID[3]: 131		89	73	-16	2	P0:0							
	- ini-	217	220	3	2	P0:0							

12)Copy the "Scene_0" to take a basic posture.



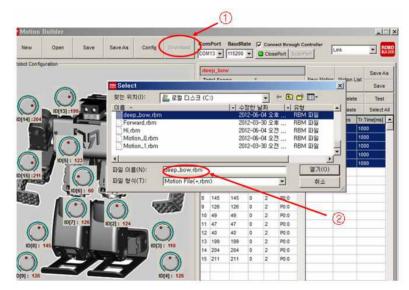
13) Mouse right click, then paste-insert to the next empty scene space after Scene_1



14)Now, click "Select All" and then click "Test".

New	Open	Save	Save As	Config	Download		nPort	BaudRa		Conne	et throug		ontroller	Link	
obot Config	uration					To	ep_bow otal Scen	e	4	∏ R	epeat		New Motion	Motion	List Save As
0.	ID[13] :1)	\bigcirc	-	Restore	G	it Pose		Init Pose		Set Motion New Scene	a second	Test Select All
D[14] :204	-	F 200	IDEAD		ID[11] :47	D	S.Pos	D.Pos	Disp	Torq	Port		Scene.Nam	Frames	Tr.Time[ms]
		-	1.0			0	123	123	0	2	P0:0	_	Scene_0	30	1000
	10	าต	500			1	192	192	0	2	P0:0		Scene_1	30	1000
1.00	3 C C	M22 .	(*	3		2	124	124	0	2	P0:0		Scene_2	30	1000
3		/	-		11	3	110	110	0	2	P0:0		Scene_1	30	1000
•))	ID[5] :	123	ID[0] :	123		4	126	126	0	2	P0:0				
5] :211				1 / /		5	123	123	0	2	P0:0				
A REAL				1		6	60	60	0	2	P0:0				
	Q.	0[6]: 60	ID[1]: 192		ID[12] :40	7	126	126	0	2	P0:0				
833			A AM		158	8	145	145	0	2	P0:0				
		• \\		100	1.5	9	128	126	0	2	P0:0				1

15)Click "Save" to save a "deep_bow.rbm" file.



16)"deep_bow.rbm" motion is downloaded successfully.

	\bigcirc		Restore		et Pose	8 8	Init Pose	-	Set Motion	Delete	e Test	
ID[13] :199 ID[10] :49	(•))		Restore	G	et Pose		Init Pose		New Scene	Paste	Select	All
D[14]:204	ID[111:47	D	S.Pos	D.Pos	Disp	Torq	Port	-	Scene.Nam	Frames	Tr.Time[ms]	-
	Motionbuild	er				×	P0:0		Scene_0	30	1000	
	DownLoad						P0:0		Scene_1	30	1000	
	Available N	Suc lema	cess. prv Size	: 28,40	5 KBvt	es	P0:0		Scene_2	30	1000	
		1					P0:0		Scene_1	30	1000	
(•) ID[5]: 123 ID[0]: 123		[ОK				P0:0		Scene_0	30	1000	
							P0:0					
		6	60	60	0	2	P0:0					
ID[6] : 60 ID[1] : 192	ID[12] :40	7	126	126	0	2	P0:0					
		8	145	145	0	2	P0:0					
	Messes	0	126	126	0	2	D0.0					

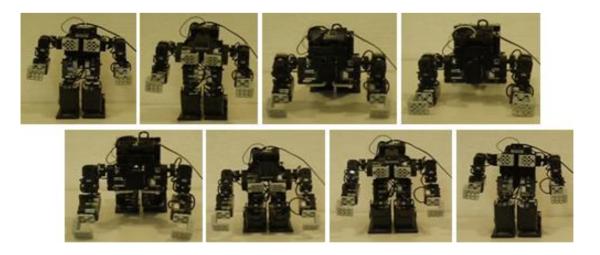
17)Click "Close Port" to control RQ-HUNO by IR remote controller

Save As	Config	Download	Com	1000	BaudRate	and the second	onnect thr	*	-	H [Link						
			dee	p_bow	,												
			100000	al Scer		6 0 Г	Repeat	í.	New	Motion	Motic	n					
									4	~	~						
									4	<	2	7					
			Motion B New	Older	Save	Save As	Config	Dramos			audRate				uller [Link	ile. B
				Open	Save	Save As	Config	Devintor	COM dei To	13 🔹 [t ep_bow tal Scene	15200 👱	6 Op	enPort 3	ScenPort	1 1	Link	Save A
			New	open ration) 🕳	-(Desimon	COM dee To So	13 💽 [t ep_bow	15200 👱	<mark>е ор</mark>		Ne e	rw Mation et Mation	Motion I Delet	Save A Save e Test
		Rot	New	Open) 🕳	Save As				13 • 1 tal Scene ene Inde Restore S Pos	15200 <u>•</u> F X Get I	<mark>е ор</mark>	Repeat Int Pos	e Ne	rw Mation et Mation w Scene ene Nam	Delet	Save A Save e Test

18) Press button 1 of IR remote controller, "deep_bow.rbm" motion is played.



19)Completed "Hi.rbm" motion movement is as follows.



7. ActionBuilder

7.1 Introduction

ActionBuilder is the robot action programming software that uses various sensors of robot.

Layout

Action	Builder	v1,54											
New	Open	Save	DeveAs	Conto Do	COM4 V 115200 B OpenPor Link (B) V								
Action Na Robot Pl	atform :	None	3		Statement Name : 6 Add (Deine Updat								
Total Sta	tements : Name	Condition	Execution	Description	CONDITIONS (II)								
					Remocon Accel (6)								
					None Motion Out UI Sound Out Wat Time Jump Index								
					Sound Play Sound[1]								

- ① Menu Bar
 - New File : Create new action file.
 - Open : Load existed action file.
 - Save : Save action file.
 - Save As : Save action file with new name.
 - Config : Revise action file information.
 - Download : Download action file to RQ smart controller
- ② PC COM Port
 - COM Port : Choose correct COM Port.
 - Baudrate : Display data communication speed.
 - OpenPort : Open COM Port connect PC with RQ HUNO.
 - ScanPort : Scan correct COM Port automatically.
 - Config : Revise action file information.
- ③ Action Information
 - Action Name : Display action file name.
 - Robot Platform : Display action file robot platform.
 - Total Statements : Display action file line numbers.

- ④ Action list
 - Index : Display action line index.
 - St. Name : Display statement name.
 - Condition : Display condition data.
 - Execution : Display execution data.
 - Description : Display description of statement.
- **5** Action Information
 - Statement Name : Display statement name and user can revise it.
 - Description : Display description of statement.
 - Add : Add action statement from list
 - Delete : Delete action statement from list.
 - Update : Update action statement from list.
- 6 CONDITIONS [If]
 - None : No condition
 - Distance : Distance condition (unit : cm, 10~50cm)
 - Sound : Sound condition (0~255, General clapping sound value is 10~15)
 - Touch, IR : Input from button
 - Remocon : Input from IR / Joystick remote controller
 - Accel : Input X,Y,Z acceleration value

⑦ EXECUTIONS [Then]

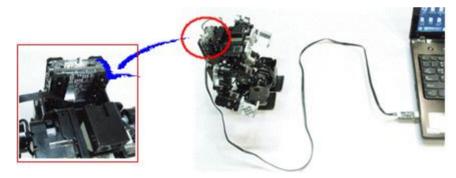
- None : No execution
- Motion Out : Run motion
- Sound Out : Run sound
- Wait Time : Wait for designated time.
- Jump Index : Jump to designated index.

7.2 Action Programming #1 (Continuous Motions)

- Robot Action : Basic Posture => Go => Back => Left => Right.
 - 1) Click "New" to create new action file, then input "Action Name, File Name" and select "RQ-HUNO" platform as the below.

New	Open	Save	SaveAs	Config. Downlos	ComPort BaudRate
Action	Name				Statement Name : Add Delete Up
	Platform : Statements	None : 0			Description :
Index	St.Name	Condition New Act	Execution	Description	
		* File Nat * Robot I Author E-mail/	Platform Phone	C:1go_back_left_right	Browse 2 2 2 2 4 4 4 4 4 4 4 4 4 4 4 4 4
		Descri	ption	(K Cancel

2) Connect RQ-HUNO with PC by using "Down Cable (UART)" then, power on smart controller.



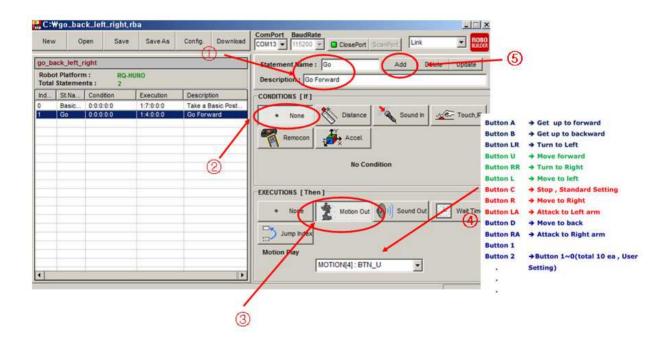
3) Click "Open Port".

New	Open	Save	Save As	Config.	Download	ComPort BaudRate	ScanPort L	ink	
go_back_	left_right					Statement Name : ST000	Add	Delete	Update
Robot Pla Total Stat	atform : ements :	RQ-HU 0	NO			Description :	1.		
Index St	Mama C	ondition	Execution	Descript	tion	CONDITIONS [If]			

4) Click as the below procedures (1,2,3,4,5) by number to add robot basic posture motion..

Nev	v. C	pen Save	Save As	Config.	Download	ComPort BaudRate	5)	
go_b	ack_left_	right				Statement Name : Basic Posture Add Delete Update	9	
	ot Platfor Stateme		HUNO			Description : Take a Basic Posturer		
Ind	St.Na.	Condition	Execution	Descriptio	in	CONDITIONS [H]		
0	Basic	0.0.0:0	1:7:0:0:0	Take s Ba	2	Remocon Accel No Condition EXECUTIONS [Then Moton Out Sound Out Warning Jump index	Atton A Atton B Atton LR Atton U Atton RR Atton L Atton C Atton R Atton D Atton D Atton A Atton 1 Atton 1 Atton 2	→ Get up to forward → Get up to backward → Turn to Left → Move forward → Turn to Right → Move to left → Stop, Standard Setting → Move to Right → Attack to Left arm + Button 1~0(total 10 ea, Us
•]	-			1	•	Motion Play		Setting)

5) Click as the below procedures (1,2,3,4,5) by number to add robot "go" motion.



6) Click as the below procedures (1,2,3,4,5) by number to add robot "back" motion.

New	0	pen Save	Save As	Config. Download	
go_ba	ck_left_i	right		- Q -	Statemenyflame : Back Add Belete update 5
	t Platforn Stateme		IUNO	549)	Description : Move Backwards
Ind 0 1 2	St.Na Basic Go Back	Condition 0.0.0.0.0 0.0.0.0.0 0.0.0.0.0 0.0.0.0.	Execution 1:7:0:00 1:4:0:00 1:4:0:00 1:10:0:0:00	Description Take a Basic Post. Go Forward Move Backwards	CONDITIONS [If] Nore Sound In Sec Touch, I Remocon Accel. No Condition EXECUTIONS [Then] Nore Motion Out Sound Out Wait Time Jump kreex Motion Tray MOTION[10]: BTN_D Sound Out Sound O

7) For "Left" and "Right" motion, it is same procedures except "Motion Play" section.

		Button A	→ Get up to forward
Motion Play		Button B	→ Get up to backward
		Button LR	→ Turn to Left
	MOTION[6] : BTN_L	Button U	→ Move forward
		Button RR	→ Turn to Right
		Button L	→ Move to left
		Button C	→ Stop , Standard Setting
		Button R	→ Move to Right
		Button LA	→ Attack to Left arm
Motion Play		Button D	→ Move to back
	MOTION[8] : BTN_R	Button RA	→ Attack to Right arm
		Button 1	
		Button 2	→Button 1~0(total 10 ea , User
			Setting)

8) Click below procedures (1,2,3) to save action file and download to RO smart controller.

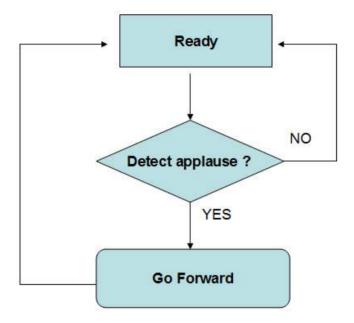
Nev	/ Oj		ComPort BaudRate
Robo	ack_left_r ot Platform Statemen	n: RQ-HUNO	Statement Name : Right Add Delete Update Description : Move Right
Ind 0 1 2 3 4	St.Na Basic Go Back Left Right	Condition Execution Description 찾는 위치(II): 올로 디스크 (C:) 이를 ~ Tmp Users Windows 한컴오피스2010 go_back_left_right,rba 치 파일 이름(N): go_back_left_right,rba 파일 형식(T): ActionBullifer File (-,	
•1			Motion Play MOTION[8] : BTN_R

9) Press "#" + "1" of IR remote controller, then robot moves "Basic Posture => Go
forward=> Backwards => Move Left => Move Right)

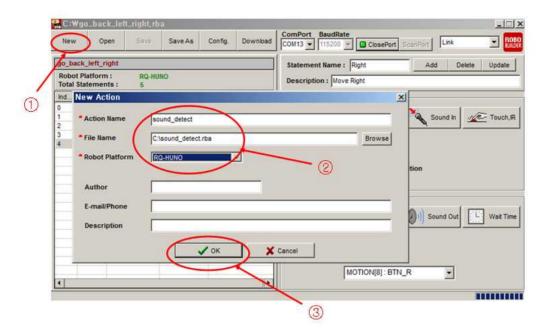


7.3 Action Programming #2 (Using Sound Sensor)

- Robot Action : Ready => If applause detected, move forward



1) Click "New" to create new action file, then input "Action Name, File Name" and select "RQ-HUNO" platform as the below.



2) Click as the below procedures (1,2,3,4,5) to add "basic posture" motion.

New	Op	oen Save	Save As	Config. Download	Colling 115200 ClosePort ScanPort Link	.(5)	
Robot	k_left_r Platforn tatemer	n: RQ-H	UNO		Statement Name : Basic Posture Add Delete Update Description : Take a Basic Posturer	9	
	St.Na	Condbon 0:0:0:0:0	Execution 17/0.0.0	Description Take a Basic Post.	Remocon Remocon Remocon Accel No Condition EXECUTIONS [Then] Note Moton Out Sound Out Washing (1)	Button A Button B Button LR Button U Button C Button C Button C Button C Button C Button T Button 1 Button 2	 → Get up to forward → Get up to backward → Turn to Left → Move forward > Turn to Right > Move to left > Stop , Standard Setting > Move to Right > Attack to Left arm > Move to back > Attack to Right arm → Button 1~0(total 10 ea , Use Setting)

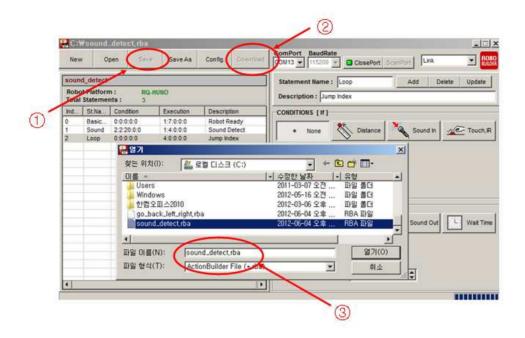
3) Click as the below procedures (1,2,3,4,5) to detect applause sound and add "go forward" motion.

						ComPort BaudRate
New	0	pen Save	Save As	Config.	Download	COM13 V 115200 V ClosePort ScanPort Link V ROBO
soun	d_detect]	Statement Name : Sound Add Add ADelete upgate 5
	t Platforn Statemen		HUNO		0 -	Description : Sound Detect
ind	St.Na	Condition	Execution	Descrip	tion	CONDITIONS [IF]
D	Basic	0:0:0:0:0	1:7:0:0:0	Robot R	leady	
1	Sound	2:2:10:0:0	1:4:0:0:0	Sound [Detect	* None Distances Co Sound In Touch ID
	_			_		Button A → Get up to forward
						Bemocon z Accel. Button B -> Get up to backward
					-	Button LR → Turn to Lert
					2	Sound Input Button R → Turn to Right
		1		_	100	10 Sound Level
				-		
				-		EXECUTIONS [Then]
			1.0		01	Button LA + Attack to Left arm
					3	 None Motion Out Motion Out Sound Out Button D → Move to back
		1				Button RA → Attack to Right arm
						Jump Index Button 1
						Button 2 →Button 1~0(total 10 ea,
						Motion Play . Setting)
			1.0			MOTION[4]: BTN_U ·

4) Click as the below procedures (1, 2, 3, 4, 5) to be in "infinite loop" state.

. C:₩	sound.	_detect	,rba				
New	0	pen	Save	Save As	Config.	Download	COMPort BaudRate
sound	_detect						Statement Name : Loop Add Delete Update
10000000	Platform	555.55	RQ-H	UNO		1 -	Description Jump Index
nd	St.Na	Conditio	n	Execution	Descript	tion	
)	Basic	0:0:0:0	:0	1:7:0:0:0	Robot R	eady	
1	Sound Loop	2:2:20:0		1;4:0:0:0	Sound D		None Distance Sound In Touch,IR
						3	Remocon No Condition EXECUTIONS [Then] None Motion Out Jump Index 0 (4)

5) Click below procedures (1, 2, 3) to save action file and download to RO smart controller.



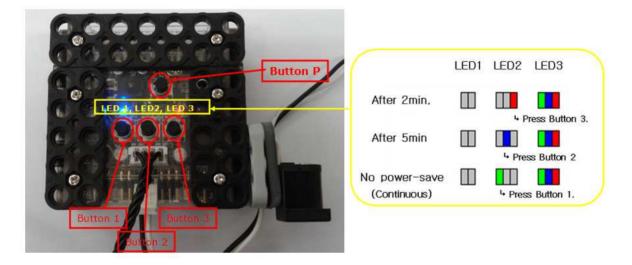
6) Press "#" + "2" of IR remote controller, then clap near RQ smart controller.

8. Appendix

8.1 Auto power-saving mode

If there is no input or movement during certain time, RQ-HUNO goes into power-saving mode automatically. You can set the entry time as below.

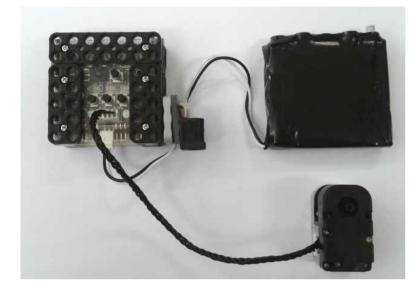
- 1) Power-off the smart controller.
- 2) Press button 3 and then, press button P concurrently.
 - \rightarrow LED3 "Green, Blue and Red" light up.
- 3) You can adjust the power-saving entry time as shown in the below.



4) Press "Button P" to save current setting after selecting power-saving entry time.

8.2 How to Change Smart Servo ID Number

1) Connect single smart servo cable as shown in the below.

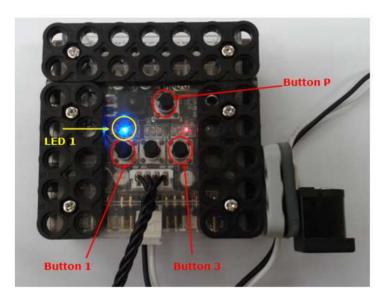


2) Make sure that Smart Controller power is "OFF" state.

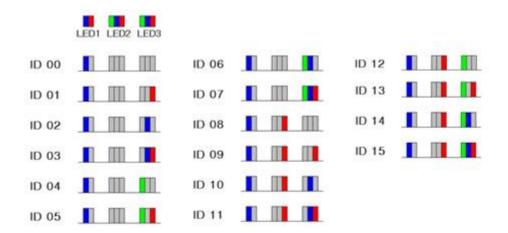


3) Press "Button P" as "Button 1" and "Button 3" are pressed together.

You can see "LED 1" is BLUE light. LED2 and LED3 indicates current Smart Servo ID. Yo You can change Smart Servo ID by pressing "Button 1" or "Button 3".

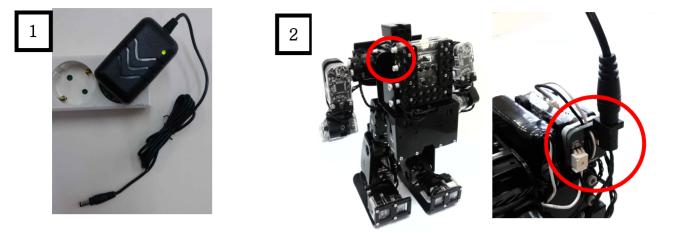


- Button 1 is to increase Smart Servo ID number.
- Button 2 is to cancel Smart Servo ID changes.
- Button 3 is to decrease Smart Servo ID number.



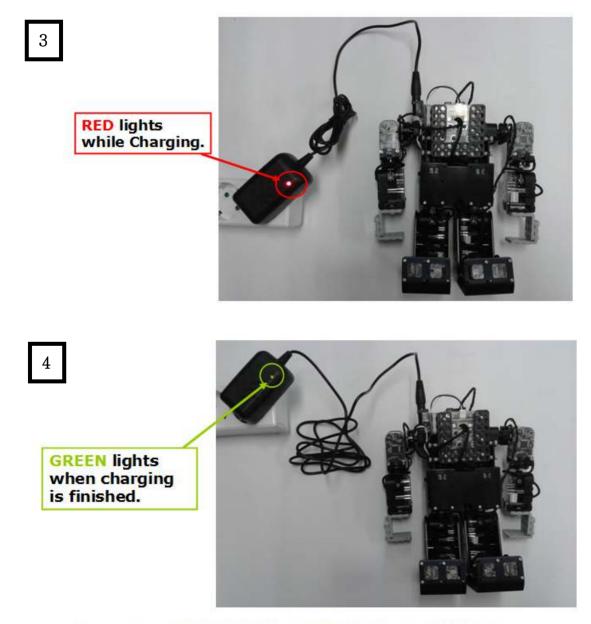
4) Press "Button P" to save current Smart Servo ID after change ID number.

8.3 How to charge



In first, You need to plug in Charger. Then Green light on and you can charge. (If Green light off, you need to check electricity.)

Please connect charging cable on charging board.



* Please disconnect charging adapter when green lights in order to prevent over-charging.

8.4 How to Upgrade Firmware

1. Run "RQC Firmware Upgrade Tool".

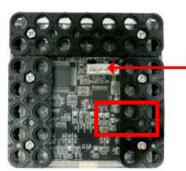
COM Port	COM2		
Firmware		Browse	START
	□ Keep RQC Internal Setting		

2. Click the **Scan** button, then you can search the **COM Port** as above.

COM Port	COM2 💽	Scan	
Firmware	[2012.04.20]RQC_0.31H_Motions.bin		START
Option	✓ Keep RQC Internal Setting		

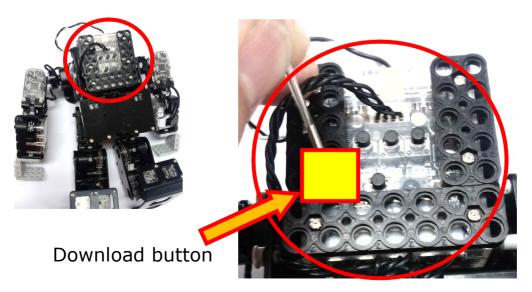
3. Click the **Browse** button and select the "Firmware File (*.bin)"

4. Connect the USB U-ART cable to "COM Port" of RQ Controller .





- 5. Take out "Power Connector" from RQ Controller first.
- 6. Connect "Power Connector" again after pressing <u>Download button</u> of RQ Controller by using "B35 bolt" as below



7. Click START button to start upgrading firmware.

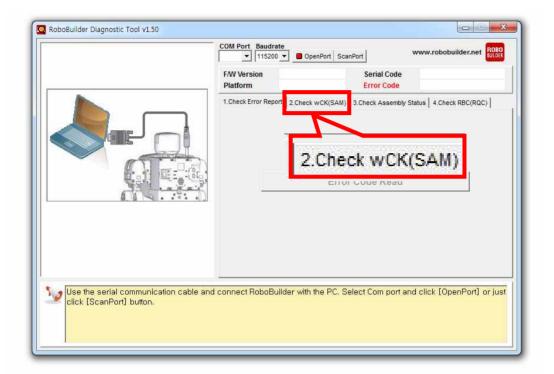
COM Port	COM2	Scan	
Firmware	[2012.04.20]RQC_0.31H_Motions.bin	Browse	
Option	☞ Keep RQC Internal Setting		

8. Please click the OK button when firmware upgrade completed as below.

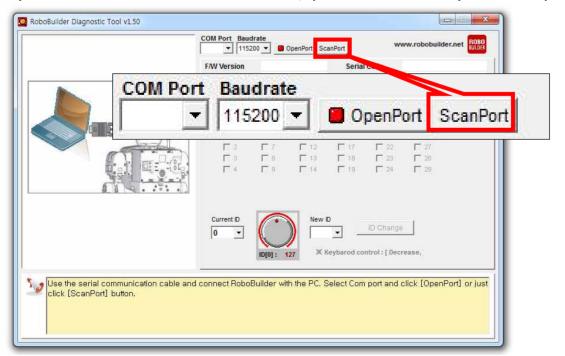
🕌 RQC Firmware U	ograde Tool v0.05		23
COM Port	COM2 -	ок	
Firmware	[2012.07.02]RQC	Firmware upgrade completed! se Comple	ete
Option	☞ Keep RQC Inte	확인	

8.5 How to Use Diagnostic Tool

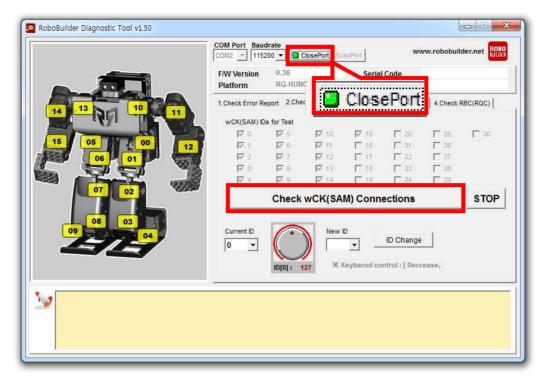
- 1. Please run the 🤦 "RoboBuilder Diagnostic Tool"
- 2. Click the " 2.Check wCk(SAM)" button an upper.



3. Click the ScanPort button, then you can search automatically your ComPort. If it don't work, please confirm your comport.



4. Please click the "Check wCK(SAM) Connections" after Green light on.



	F/W Version Platform	0.: R0	36 Q-HUNO		Serial Error			
	1.Check Error Re	port	2.Check w	CK(SAM)	3.Check A	ssembly Status	4.Check	RBC(RQC)
	wCK(SAM) D	s for T	est					
	이지	P		7 10	I₹ 15	F 20	25	T 30
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06 01	₩ 2	V	7	7 12	L 17	F 22	27	
	R 3	R	8 F	7 13	F 18	F 23	1 28	
	Ⅳ 4	V	9 F	7 14	LT 19	F 24	F 29	
	0	Che	k wCK	SAM)	commu	nication		STOP
09 08 03 04	Current ID	IDE); 127	New E	• -	ID Change ntrol : [Decrea	se,	
There are 16 wCK(SAM) modules w Please check if any of the wCK cables is								

15 05 00 12 1 1 1 1 16 12 1 2 12 12 17 12 11 16 12 12 1		F/W Version Platform	0.36 RQ-HUN	D	Serial Error		1	
14 11 15 10 15 10 15 12 <td< th=""><th></th><th>1.Check Error Re</th><th>port 2.Che</th><th>sk wCK(SAM)</th><th>3.Check A</th><th>ssembly Statu</th><th>s 4.Check I</th><th>RBC(RQC)</th></td<>		1.Check Error Re	port 2.Che	sk wCK(SAM)	3.Check A	ssembly Statu	s 4.Check I	RBC(RQC)
15 05 00 12 IF IF <td< td=""><td></td><td>wCK(SAM) ID</td><td>s for Test</td><td></td><td></td><td></td><td></td><td></td></td<>		wCK(SAM) ID	s for Test					
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Image: Contrast of the second secon	06 01	₩ 2	₩ 7	₩ 12	17	F 22	27	
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Check wCK(SAM) communication S		▼ 4	P 9	I√ 14	L 19	F 24	L 29	
09 Current ID New ID ID Change	07 02	(Check w	CK(SAM)	commu	nication		STOP
10[0]: 127		2202000)	-		ease,	