

# HOVIS Lite

## User GUIDE





## **Hovis Lite Guide**

### **DR–Visual Logic Robot Programming**

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**Published** : Apr 11th, 2012  
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# HOVIS Lite Introduction

※ Download Program/Manual : [www.hovis.co.kr/guide](http://www.hovis.co.kr/guide)

1. Caution & Warning
2. From Assembly to Test



### Choice of Colors

Use four different colored brackets to create your own unique humanoid robot. Hovis Lite is the first robot in the world that can be upgraded with external body case, omni wheel, and android terminal.



### DR-Visual Logic (Task Editor)

To program the robot based on the controller (DRC), Hovis Lite is supplied with 18 modules and a graphic programming language tool DR-Visual Logic that uses drag & drop method. Even the novice users without any prior knowledge of programming language would find DR-Visual Logic easy to use.



### DR-SIM (Motion Editor)

DR-SIM is a robot motion editor that incorporates 'time frame' feature found in the video editors. DR-SIM allows the user to create robot motions on screen, to capture motions from the robot, view user created motion simulations on screen, and to download and apply the created motion to the robot for execution.

## 01

Caution  
& Warning

Please read the following safety instructions carefully to avoid personal injury, damage to the property, and to protect your Robot from potential damage.

Safety instructions are divided into 'WARNING' and 'CAUTION' with following definitions.

- △ WARNING : Ignoring these instructions may lead to personal serious injury or death.
- △ CAUTION : Ignoring these instructions may lead to personal injury or property damage.



## Warning

- Do not connect the charger to the electric transformers, travel AC converters or adapters.  
Use of adapters may cause fire or damage from overheating.
- Do not connect multiple electronic devices to single wall outlet at the same time.  
Use of multiple devices may cause fire or damage from overheating.
- Do not touch the charger with wet hands. May cause electric shock or fire.
- Keep the power cords away from sharp edged objects, children and pets.  
Make sure power cord is not bent, pressed by a heavy object. Power cord should be placed so that it will not be stepped on or tripped over. May cause electric shock, fire or potential safety hazard.
- Charger should be used in well ventilated area. Make sure not to use the charger while it is in a carrying case and that it is not covered by materials such as paper or cloth when being used.
- Make sure the charger power cord is properly plugged into the wall socket.  
Loose connection may cause fire or electric shock.
- Do not touch the pins of the power plug when connecting or disconnecting the power cord from the wall socket. May cause electric shock or fire.
- Do not use the charger during the electric storm. Charger should be disconnected from both the wall socket and the robot during the electric storm. May cause serious personal injury or fire.
- Never assemble or disassemble DRC Controller and charger on your own. Servicing should only be done by qualified service personnel. (Refer to the customer support page at the back of the cover)  
Any damages caused by attempted modification or service by non qualified person will void the manufacturer's limited warranty.





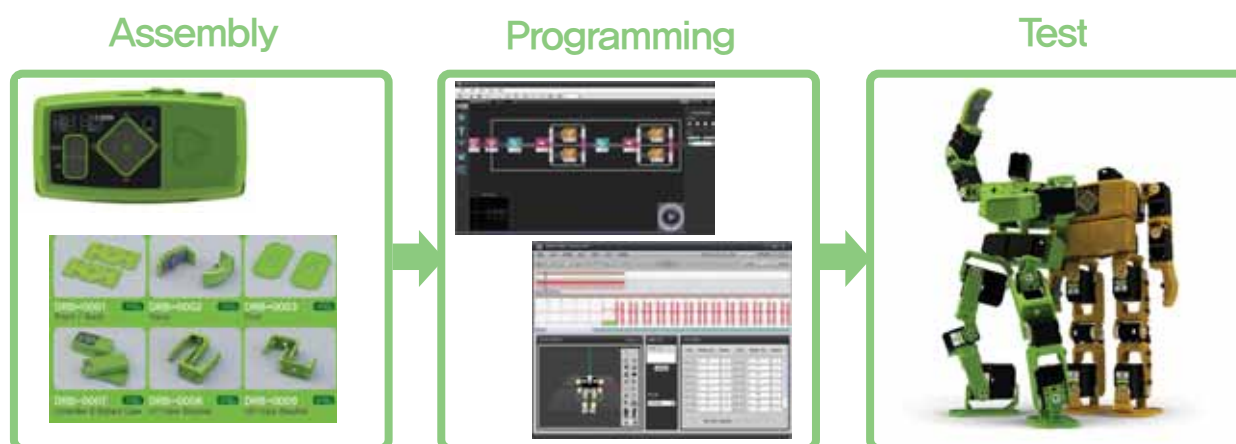
- Do not expose the battery, charger and Robot to temperatures above 49°C(120°F) or to heat sources such as the radiator, fireplace, stove, electric heater, direct sunlight, and closed car during the summer. May caused fire, explosion, or degraded battery performance.
- Do not insert of poke the charge connector with objects that conduct electricity. May cause electric shock, fire, or personal injury.
- Keep the battery away from the children.



## Caution

- Make sure not to jam your finger between the joints during robot movement. May cause serious injury.
- When lifting the robot out of the box, put your hand below the robot and lift by the body. (In case of assembled robot)
- Do not lift the robot by arm, leg, neck, or other part alone. Lift by holding the body. It may cause damage to the product.
- Battery will discharge naturally over period of time even when it was not in use. Charge the battery before using again.
- Do not drop or apply external shock to the robot. It may cause damage to the product.
- Robot may not respond to the remote control command while it is in motion. Do not force movement. Try the remote control after the robot has completed current motion.
- Robot may fall or not move if the surface is not flat, angled, slippery or filled with obstacles.
- Do not store the robot near a magnet or X-Ray. It may cause damage or produce malfunction in the product.
- Only use the robot indoors. Do not use the robot on rough surface such as concrete floors. It may cause damage to the product.
- Store the robot in the original box or in another appropriate box to prevent damage during transportation or long storage.
- Do not lubricate robot joints or other parts.
- After assembly, do not turn the shoulder in same direction continuously though there are stoppers to prevent over rotation. The wire harness may be cut or damaged.

# 02 From Assembly to Test



## ■ Assembly

Detailed assembly instructions are found in the assembly diagram. Dongbu robot provides assembly diagram for 20axis standard humanoid robot, 26 other types of robots can also be assembled using the robot kit. Refer to the web manuals in the website for assembly instructions.

## ■ Programming

DR-Visual Logic software is used to program the robot. DR-SIM software is used to create, edit, and capture robot motions. Created motions can be downloaded to the robot for execution or saved to the DRC and used in programming by the DR-Visual Logic.

## ■ Test

Compile and download the program created using the DR-Visual Logic to the robot. If the execution of the program did not result in the desired motion, adjust the property values of individual modules, download and execute to test.

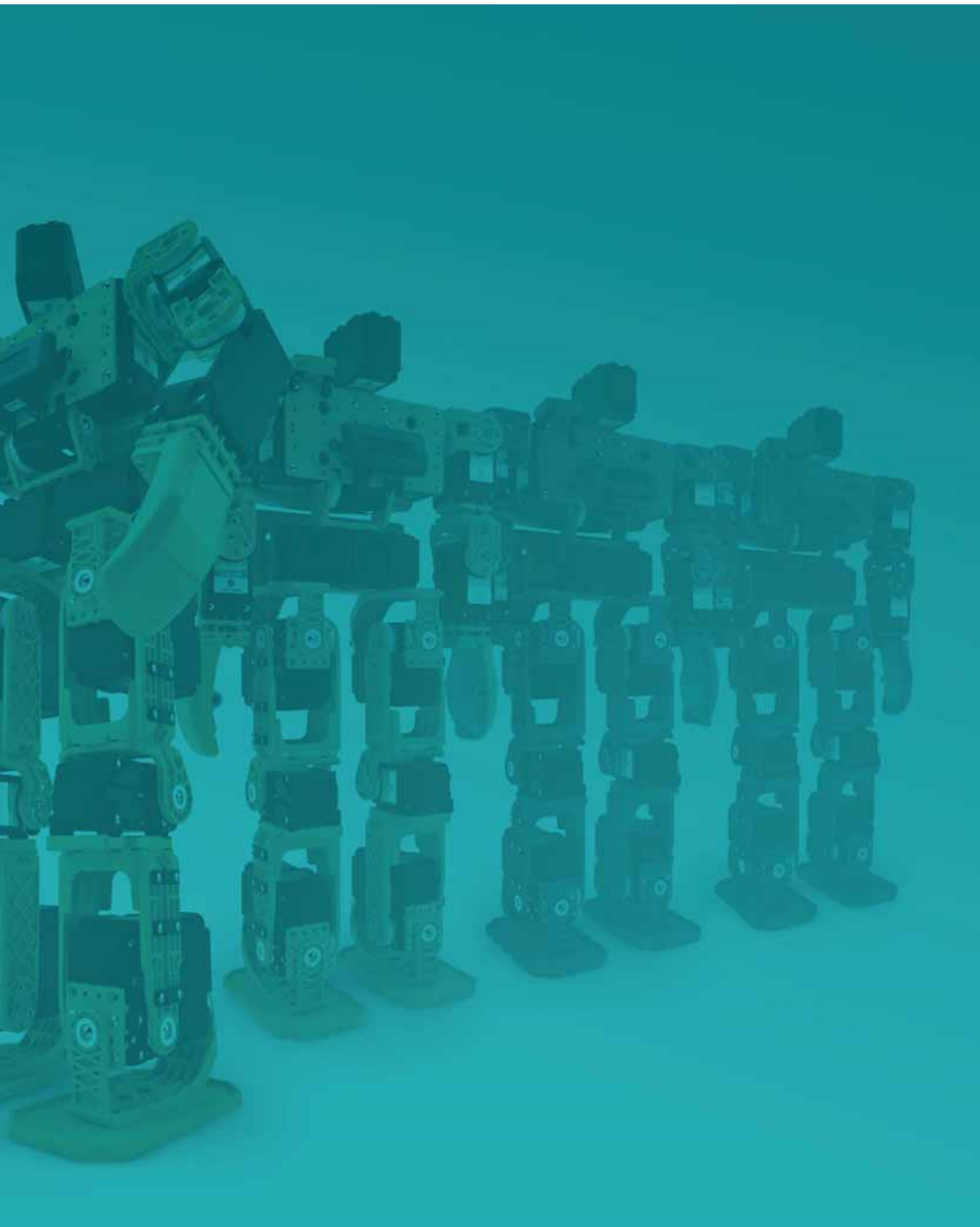
# Controller



1. Overview
2. DRC Battery Installation
3. DRC Connection
4. DRC Interface
5. DRC Register Map & Protocol
6. DRC Functions

## 7. DRC Basic Test

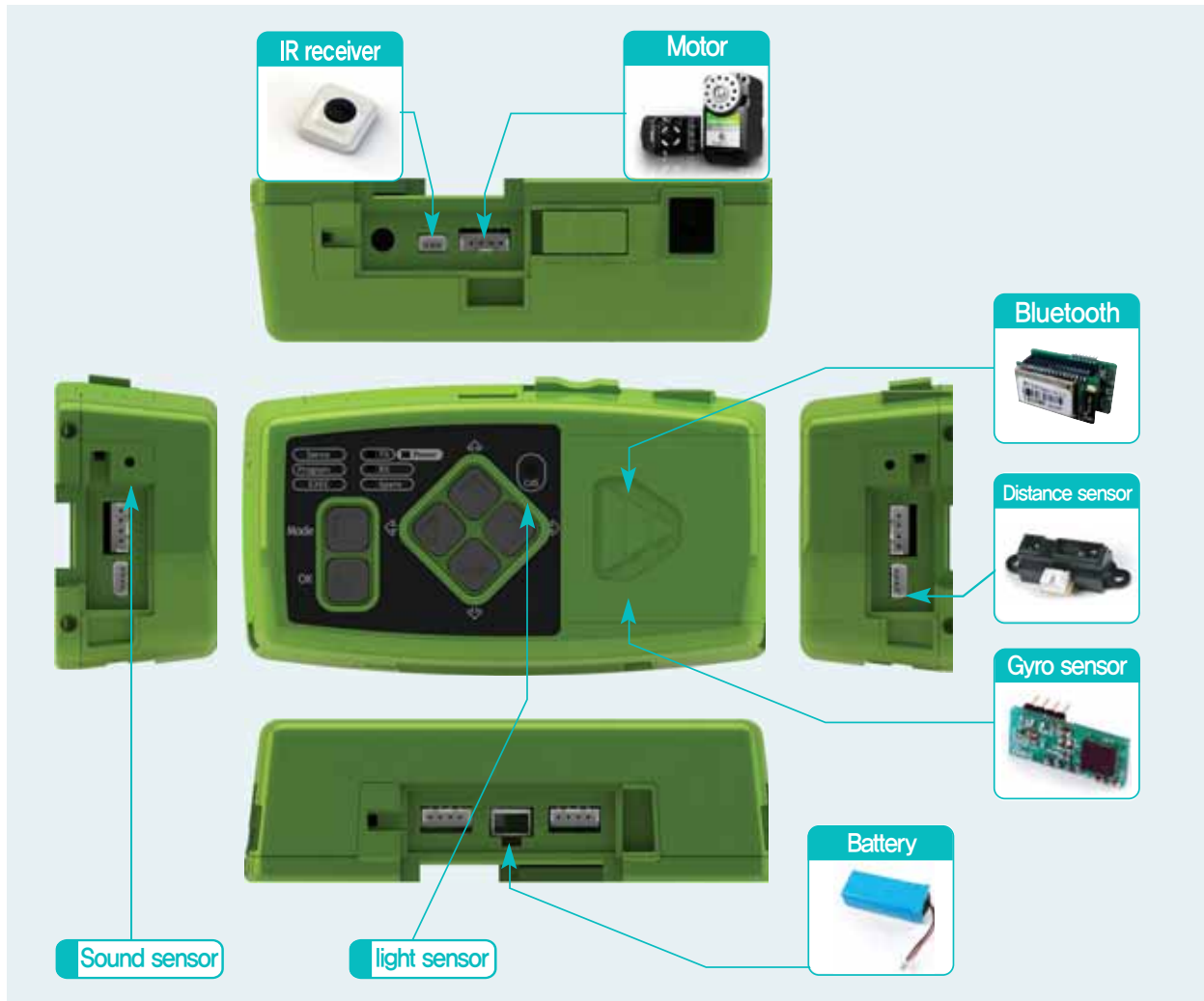
- Servo Motor
- Light Sensor
- Sound Sensor
- PSD Digital Distance Sensor
- PSD Analog Distance Sensor
- Acc/Gyro Sensor



# 01

## Controller

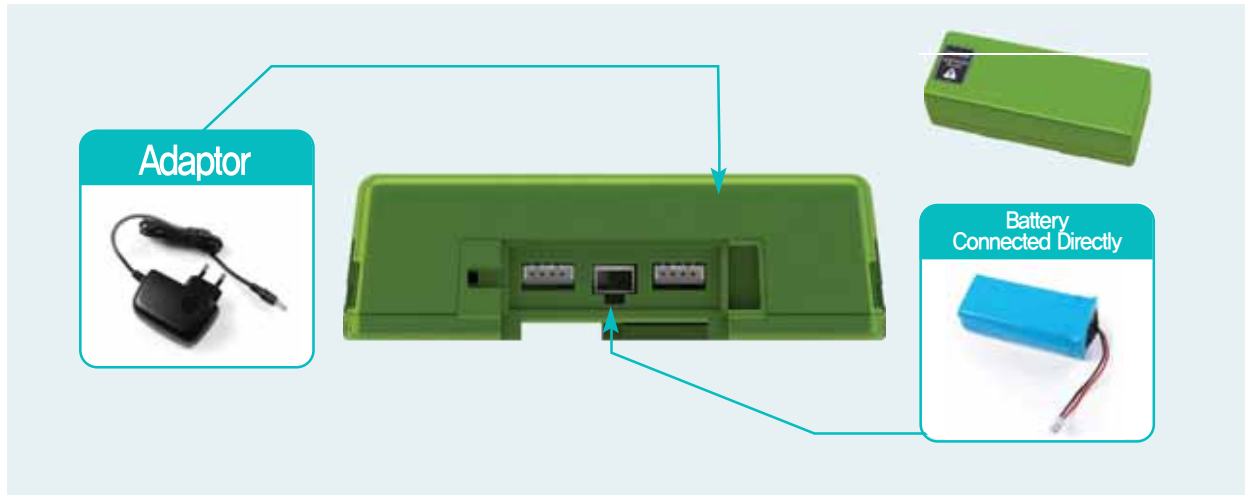
DRC Controller is the main component and brain of the Hovis Lite. Controller has variety of connectors and interfaces including 6 servo motor ports, 2 PSD sensor ports, Gyro sensor, and Bluetooth interface. Light sensor and the sound sensor in built-in to the controller. DR-Visual Logic program is a visual robot programming language that uses DRC functions to program the robot. Various sensors and 1~32 motors can be programmed and tested.



|                          |  |
|--------------------------|--|
| <b>CPU</b>               | ATMega 128   |
| <b>Size, Weight</b>      | 108 x 58.5 x 33 (mm), 82 g                               |
| <b>Operating Voltage</b> | Tolerance Range : 6.5V ~ 10V, Recommended Voltage : 7.4V |
| <b>Serial Speed</b>      | 115,200 bps ~ 666,667 bps                                |
| <b>Consumed Current</b>  | When IDLE : 50mA, Overall Max Current : 3A (PTC Fuse)    |
| <b>Interface</b>         | Button : 6ea, MIC : 2ea, LED : 7ea                       |
| <b>External I/O</b>      | Servo Motor : 5ea, PSD Sensor : 2ea                      |
| <b>Back Cover I/O</b>    | Bluetooth : 1ea, Gyro Sensor : 1ea                       |
| <b>Internal I/O</b>      | Sound Sensor : 2ea, Light Sensor : 1ea                   |

# DRC Battery Installation

# 02



### ■ Battery

To supply power to the DRC, connect the battery to controller by the power connector found at bottom.

### ■ Battery Charging

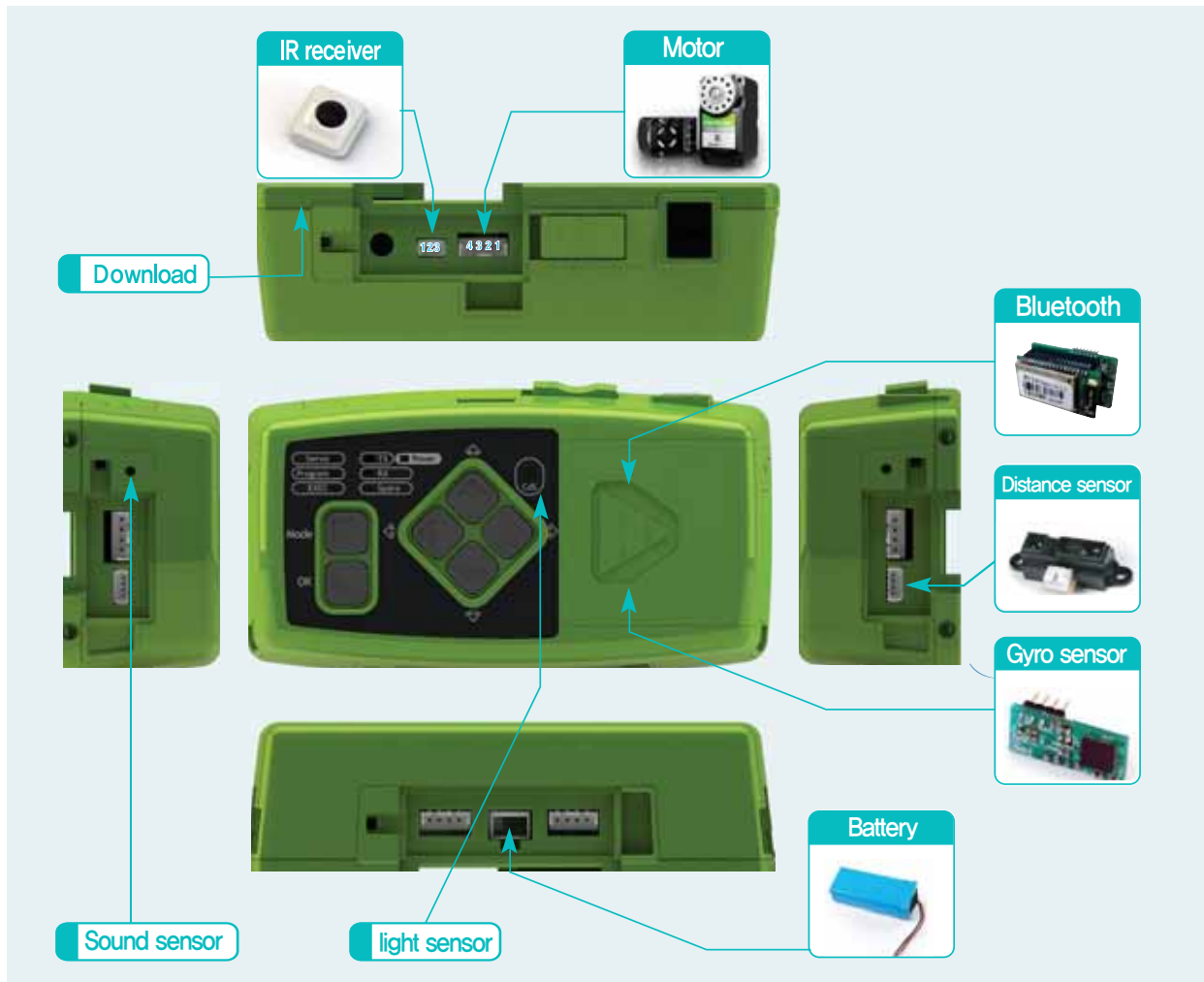
Battery can be charged directly using the battery cable and the adaptor. Another charging method is to connect the adaptor to the adaptor connector found at top of the controller. Battery installed on the controller will start to charge automatically when the adaptor is connected to the controller.



### ■ Low Battery

Power LED will start to blink when the battery level falls below 20%.

# 03 DRC Connection



### 1 Motor Connection

There are five ports around the controller

### 2 Distance Sensor Connection

There are two ports, one on each side.

### 3 Gyro Sensor Connection

Open the controller cover and install internally.

### 4 RF Connection(for Bluetooth)

Open the controller cover and install internally.

### 5 IR Receiver Connection

1 port, used for receiving remote control signal.

### 6 Download Connection

Ear phone Jack connection used to download program from PC to the robot.



# DRC Interface 04



DRC controller has Input/Output buttons and LEDs at the front and motor and sensor ports at the back. Interface buttons at the front are used to give input commands the LEDs are used to verify data output.

|                    | Name    | Short Cut                   | Standard Task Mode       |
|--------------------|---------|-----------------------------|--------------------------|
| <b>Main Button</b> | Mode    | Run Task                    |                          |
|                    | Ok      | Confirm                     |                          |
| <b>Navi Key</b>    | (Left)  | Battery Level               | Check Mode               |
|                    | (Up)    | DRC Self Test               | Autonomous Movement Mode |
|                    | (Right) | Switch wired/wireless com   | Remote Control Mode      |
|                    | (Down)  | Motor ID Scan               | Sound Demo Mode          |
| <b>LED</b>         | Servo   | HerkuleX Running            |                          |
|                    | Program | DR-SIM/Visual Logic Running |                          |
|                    | EXEC    | Task Running                |                          |
|                    | TX      | Data Transmit               |                          |
|                    | RX      | Data Receive                |                          |
|                    | Spare   | User Defined                |                          |
|                    | Power   | Power                       |                          |
| <b>Sensor</b>      | Cds     | Light Sensor                |                          |

# 05 DRC Register Map & Protocol

## ■ Register

DRC has a registers which contains current controller state, settings, and various sensor related data.

For example, number of motors connected to the robot and their ID, error status, and current error codes are all part of current controller state. Controller settings include such data as Min/Max input voltage, Ack Policy, and etc. Sensor readings such as luminosity detected by the light sensor and location of the detected sound are part of sensor data.

Controller register is divided into (Non-Volatile, EEPROM) register and (Volatile, RAM) register. Non-Volatile registers retain data even when the power has been turned off and contain basic setup values pertaining to the controller operation. Values in the Non-Volatile registers are copied to Volatile registers as soon as the power is turned on. Volatile registers contain controller settings, state, and sensor values. Data in the Volatile registers have direct effect on the operation of the controller.

Knowing the content of the the registers and how the content changes allow the user to write more refined robot motion program using DR-Visual program. Knowledge about registers also help the user to read the the controller status and to change the operational settings, making robot operation more convenient.

## ■ Protocol

Protocol is a predefined format or rules for commands that are given to read or write to registers. Protocol is defined not only for read/write commands but also for other commands such as run commands for running saved tasks or sounds, reboot command for rebooting the controller, and host of other commands.

Communication between the PC and the controller use such predefined protocols to send and receive packets. DR-SIM and DR-Visual programs provided by Dongbu Robot were also created using such protocols. User should become familiar with the protocols in order to control the DRC using their custom made programs.

## ■ Pin map

For the users who want to connect custom-made sensors or any other communication methods with DRC-005T, Dongbu provides pin map for DRC-005T ports.

Using this pin map, users may add custom-made sensors or custom-made board to DRC-005T which means that various functions can be added.

Please see the DRC register / protocol manual to get detailed register setting method & pin map information.

Refer to [DRC Regisers and Protocols manual for more information.](#)

## 1 Program Overview

**Firmware** : Internal program that cannot be modified by the user.

**Task** : User defined prgram that can be modified using the Task Editor (DR-Visual Logic).

At the time of release, basic humanoid Task Program is defined. Program can be modified by the user. Basic task is erased when the user downloads other tasks to DRC with DR-Visual Logic.

You can restore the basic task by first visiting our website <http://www.hovis.co.kr/guide>, downloading the basic task of corresponding model and degree of freedom, opening the file MainXX.dts (XX being the DoF), and then downloading the file to DRC.

## 2 Operating Method

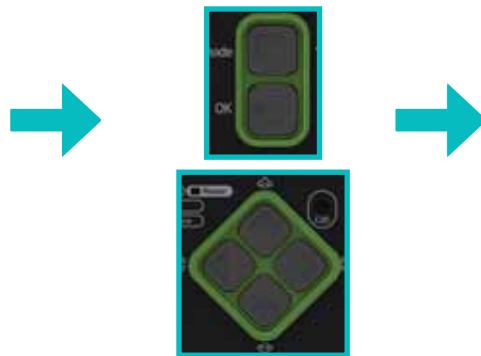
Basic functions in the firmware will start to operate when power is turned on and Navi key pressed. Pressing the Mode button will run the saved task. From running a basic task, press the Navi key and OK after the task to select which mode to go into

### Firmware (Cannot be changed by the user)

1 Navi button click



2 Mode or Navi click



3 Controller self test

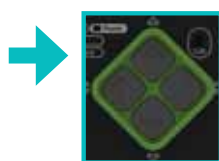


### Task Mode (Can be changed by the user)

1 Mode click



2 Navi click



3 Ok click



4 Robot control test



### 3 Operation & Functions

|                                    | Name      | Description                 | Operation & Functions  |
|------------------------------------|-----------|-----------------------------|--|
| Main Button                        | Mode      | Mode Change                 | Start Task<br>For standard Task, Mode → Navi key → Ok (to select operating mode)   |
|                                    | OK        | Confirm button              |  |
| Navi Key (Firmware)                | (L)       | Battery level check         | Battery level check → Shown by 3 left LED, low 1 LED, medium 2 LED, high 3 LED   |
|                                    | (Up)      | Test                        | Motor & sensor test using the controller<br>Method : (Up) → Button → Test according to motor response from sensor Test : Motor/Light/Sound/Distance/Accel/Gyro |
|                                    | (R)       | Wired/Wireless              | Wired using Ear phone jack / Wireless using ZigBee   |
|                                    | (Down)    | Motor ID Scan               | Rescan connected motor ID  |
| Navi Key (Basic Task for Humanoid) | (L)       | Check Mode                  | Mode → (L) → Ok : Check Mode : Individual motors, Arm/Leg module connection and assembly check.  |
|                                    | (Up)      | Autonomous Mode             | Mode → (Up) → Ok : Autonomous Mode : Robot operates by itself.   |
|                                    | (R)       | Remote Control Mode         | Mode → (R) → Ok : Remote Control Mode : Run predefined motion saved in the remote control.   |
|                                    | (Down)    | Sound Dem Mode              | Mode → (Down) → Ok : Sound Demo Mode : Run motions based on sound input.   |
| LED_mode                           | Servo     | HerkuleX running            | Blinks when HerkuleX Manager is in operation   |
|                                    | Program   | DR-SIM/Visual Logic running | Blinks when DR-SIM / Visual Logic is being used for editing. LED on when downloading data or firmware  |
|                                    | EXEC      | Task                        | On while the task is running when Task mode is entered using the mode button.  |
|                                    | TX        | Data Transmit               | Blinks when transmitting data, User spae when Task in operation.   |
|                                    | RX        | Data Receive                | Blinks when receiving data, user spae when Task in operation.  |
|                                    | Spare     | User Defined                |  |
|                                    | LED Blink | Error                       | 3 right side LEDs will blink when in error   |
| LED_Power                          | Power     | Power level                 | Blinks when battery level is below 20%   |
| Sensor                             | CdS       | Light Sensor                | Light sensor   |



# DRC

## DRC Basic Test

# 07

DRC is capable of running basic tests through the test mode even when the robot is not assembled. Proceed with the motor and sensor test by turning on the power and pressing the (up) button. Sensor test is performed by checking the motor response from the motors ID1 and 2 attached to left and right. Tests can be performed for motor, light sensor, sound sensor, distance sensor, and gyro sensor. Testing methods are as follows.

Light sensor and sound sensor tests are done by menu and OK as they are built in to the controller  
For PSD, Acc/Gyro, pressing the (down) button will check to see if only one of the sensor is connected. Test will proceed if only one sensor is connected and stop if more than one sensor is connected.

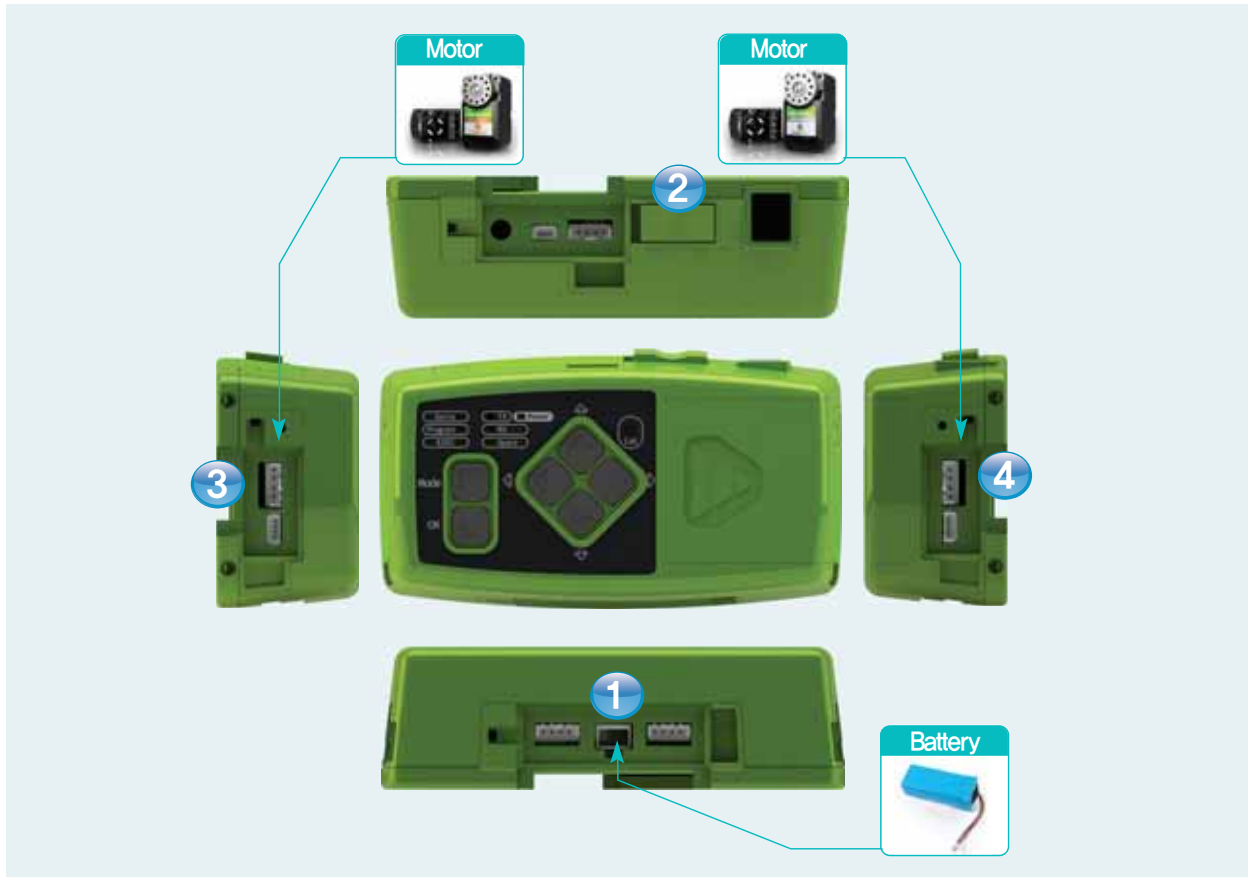
- 1** Motor : Connect motors to the left and right(No 1 on left, No 2 on right)  
(Up) → (L) : left motor will move, (R) right motor will move, (Up) both motors will move.
- 2** Light Sensor : (Up) → (Menu) : Light sensor in operation, Both motors will move when Cds blocked
- 3** Sound Sensor : (Up) → (OK) : Sound Sensor in operation  
Clapo fmr left, left motor will move,  
Clapo fmr right, right motor will move

Functions below will operate when (Down) button is pressed after connecting the sensor. Only the sensor to be tested should be connected as testing will not work if more than one sensor is connected.

- 4** PSD Digital : (Up) → Connect digital distance sensor → (Down) PSD in operation  
When object moves within 10cm → Both motors will move  
When object moves beyond 10cm (cliff detection) → Both motors will stop  
→ Cliff detection
- 5** PSD Analog : (Up) → Connect analog PSD sensor → (Down) PSD in operation  
Both motors will turn in a same direction. Farther the object, faster the motor movement  
Movement will slow when object comes closer → When object is <10 cm, motors will move in opposite direction → Collision avoidance after wall/object detection
- 6** Acc : (Up) → Connect Acc/Gyro → (Down) Acc in operation  
Motors stopped when the controller angle is same as when the robot is standing straight.  
Motor speed will vary depending on the angle. The greater the angle faster the movement.
- 7** Gyro : (Up) → Connect Acc/Gyro → (Down) Acc in operation → (Down) Gyro in operation  
No motor movement when the controller is not moving.  
Motor moves at approximately the same speed as the revolving controller.

Follow the detailed test instructions below.

# 07/1 DRC Basic Test : Servo Motor



- 1** Connect the battery
- 2** Turn on the power
- 3** Connect left motor : Make sure to connect Motor ID 1 (Other motors will not operate.)
- 4** Connect right motor : Make sure to connect Motor ID 2 (Other motors will not operate.)

Place the motor outward to test. Simulates wheels turning.

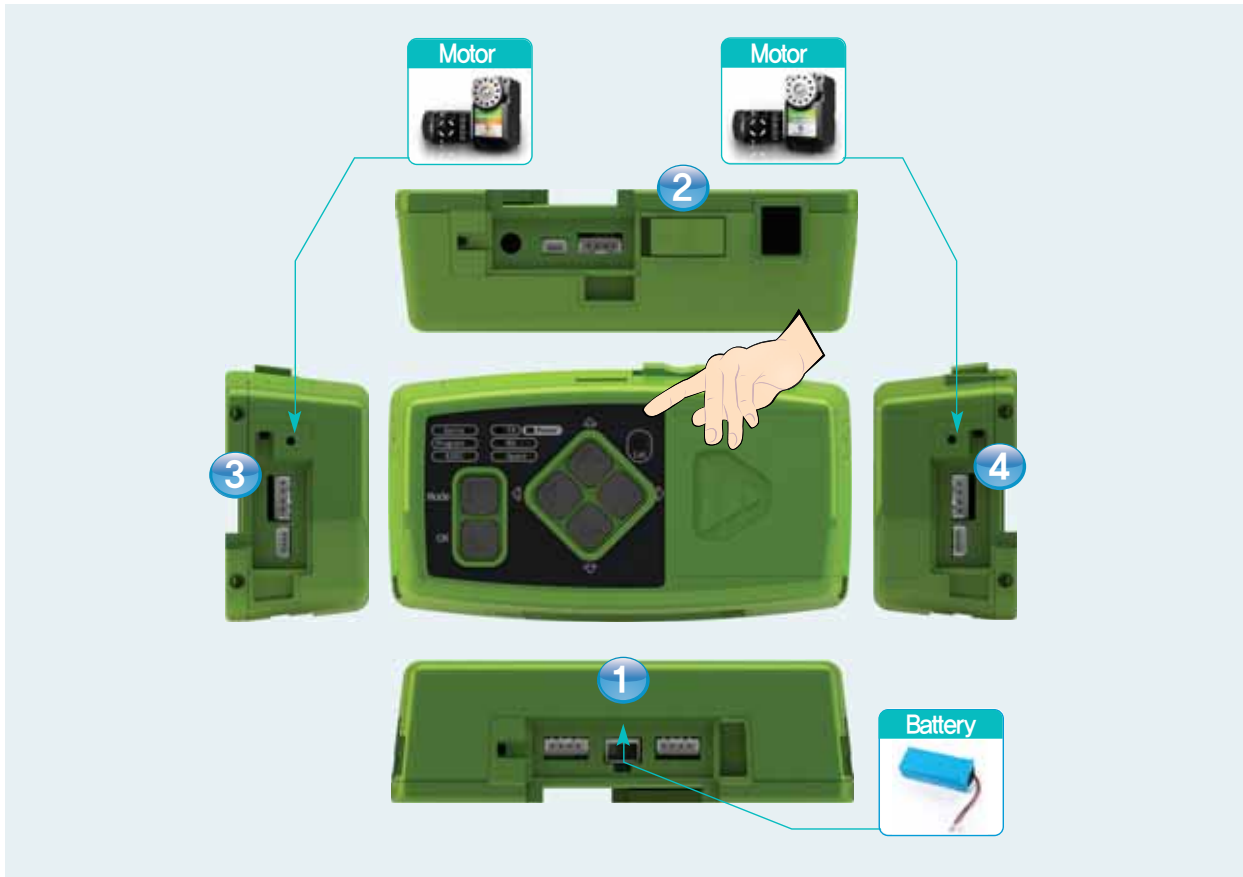
## → Test Process

- Turn on power, Press (Up) button to enter Test Mode
- Press Navi Key (L) button. → Left motor will turn.
- Press Navi Key (R) button. → Right motor will turn.
- Press Navi Key (Up) button. → Both motors will turn in forward direction.

Motors are operating without error if they worked according to the directions above, Results of all following tests will be shown by how the two motors behave. Do not disconnect the motors and continue on with sensor tests.

# DRC Basic Test : Light Sensor

# 07 / 2



**1** Connect Battery

**2** Turn on the power

**3** Connect left motor : Make sure to connect Motor ID 1 (Other motors will not operate.)

**4** Connect right motor : Make sure to connect Motor ID 2 (Other motors will not work.)

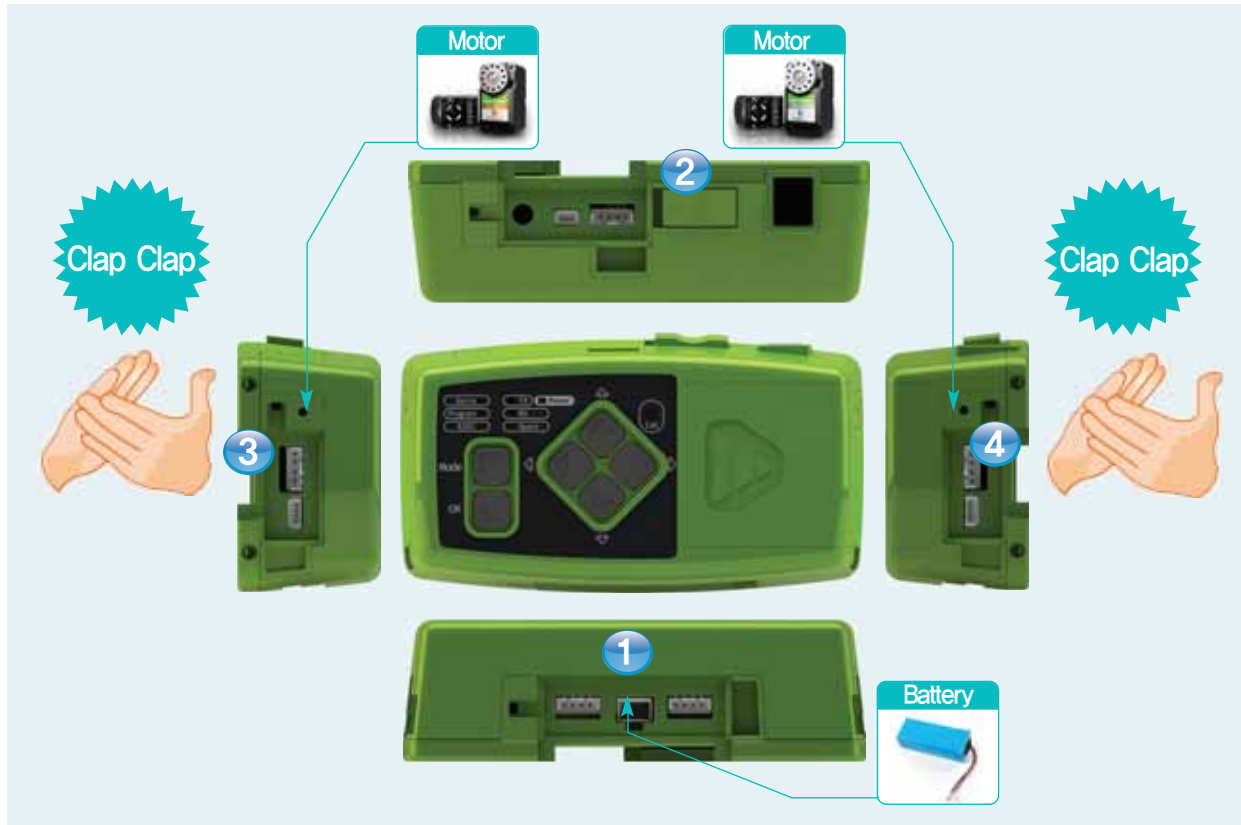
This test simulates robot arms grabbing the air when the light disappears.

### → Test Process

- Turn on power, Press (Up) button to enter Test Mode
- Cover the Cds window with hand. → both motors will turn at the same time.

Light sensor is operating without error if the motors turned accordingly. End light sensor test.

# 07 / 3 DRC Basic Test : Sound Sensor



- 1** Connect the battery
- 2** Turn on the power
- 3** Connect left motor : Make sure to connect Motor ID 1 (Other motors will not operate.)
- 4** Connect right motor : Make sure to connect Motor ID 2 (Other motors will not operate.)

Motor near the direction of the clapping sound will turn.

## → Test Process

- Turn on power, Press (Up) button to enter Test Mode
- Press (OK) button, → Sound Sensor in operation.
- Clap from left side, → Left motor will turn.
- Clap from right side, → Right motor will turn.

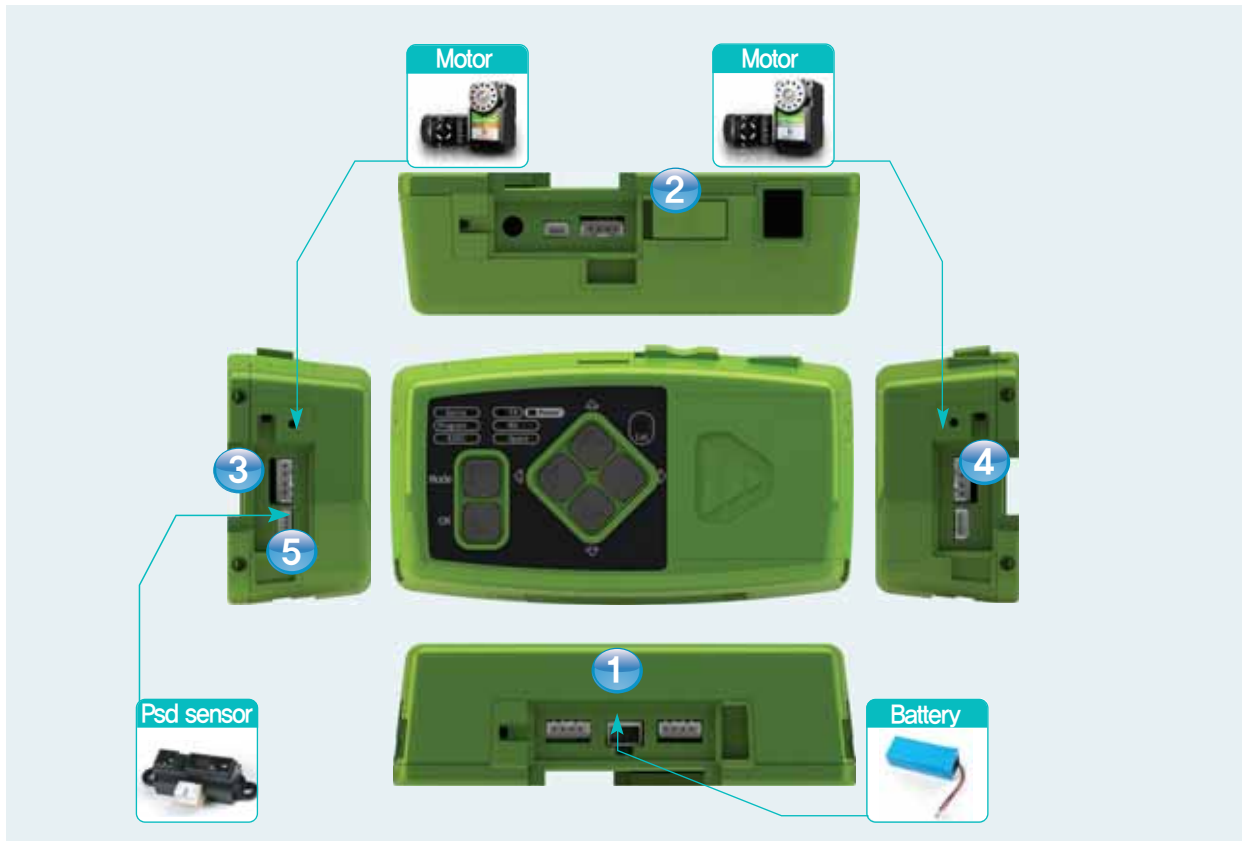
Sound sensor is operating without error if the motors turned accordingly. End sound sensor test.



# DRC Basic Test

## : PSD Digital Distance

# 07 / 4



### 1 Connect Battery

### 2 Turn on the power

### 3 Connect left motor : Make sure to connect Motor ID 1.(Other motors will not operate)

### 4 Connect right motor : Make sure to connect Motor ID 2.(Other motors will not operate)

### 5 Connect PSD Digital Sensor

PSD Digital sensor uses certain distance as a base of measure and checks to see how far or near it is. It is normally used to check the depth of the ground to detect steep drop (cliff) and stop the robot.

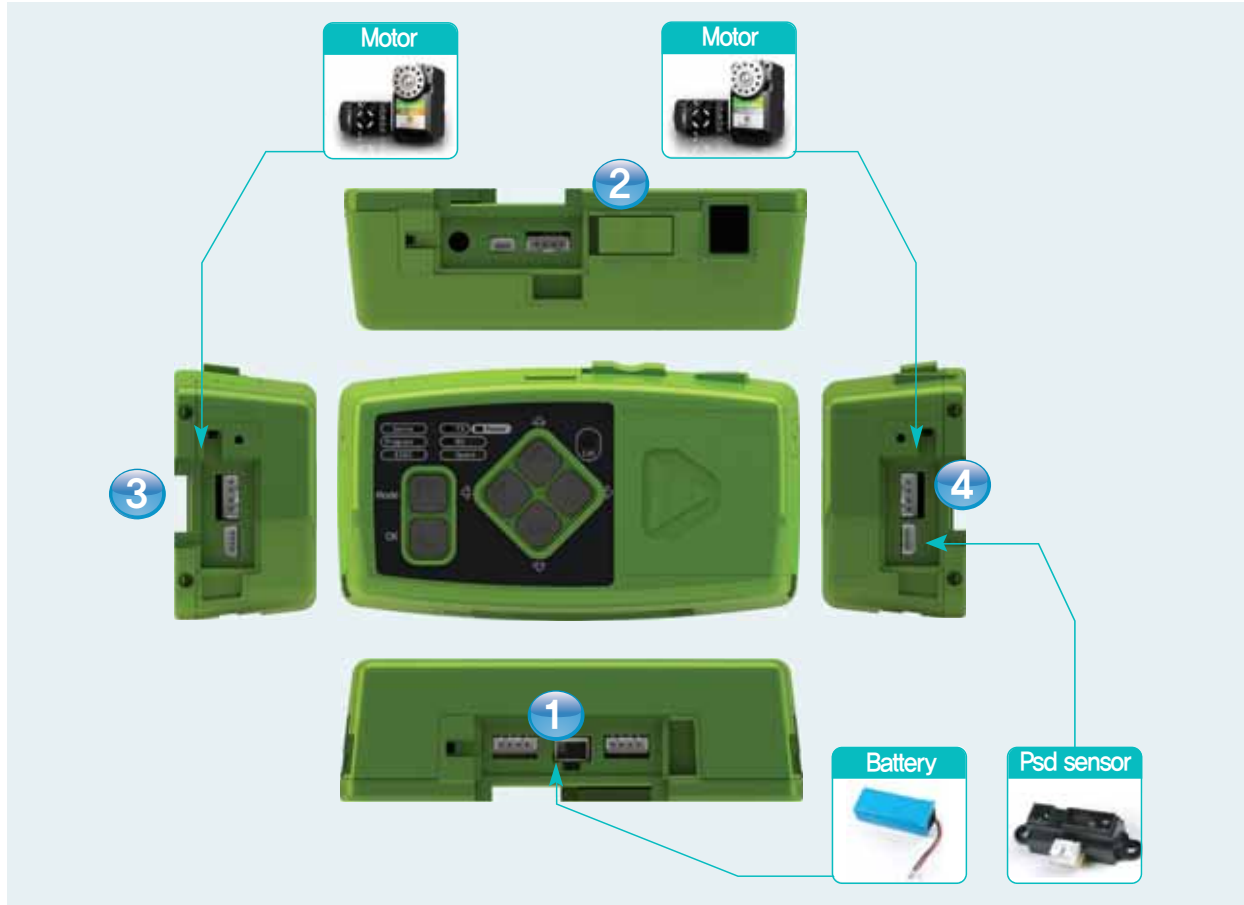
#### → Test Process

- Turn on power, Press (Up) button to enter Test Mode.
- Connect the PSD line and press (Down) button. → PSD Digital Sensor in operation.
- Move your hand or an object within 10cm from the sensor, → Both motors will turn.
- Move your had or an object away from the sensor to the distance > 10cm, → Both motors will stop.

※ PSD Digital has only On/Off mode with certain distance as a base of measure.

PSD Digital Sensor is operating without error if the motors turned accordingly. End PSD Digital Sensor test.

# 07 / 5 DRC Basic Test : PSD Analog Distance Sensor



## 1 Connect Battery

## 2 Turn on the power

## 3 Connect left motor : Make sure to connect Motor ID 1(Other motors will not operate)

## 4 Connect right motor : Make sure to connect Motor ID 2(Other motors will not operate)

## 5 Connect PSD Analog Sensor

PSD Analog Sensor is able to measure the distance in realtime and control the motor speed according to the distance from an object. Normally used to avoid obstacles by slowing down and changing direction.

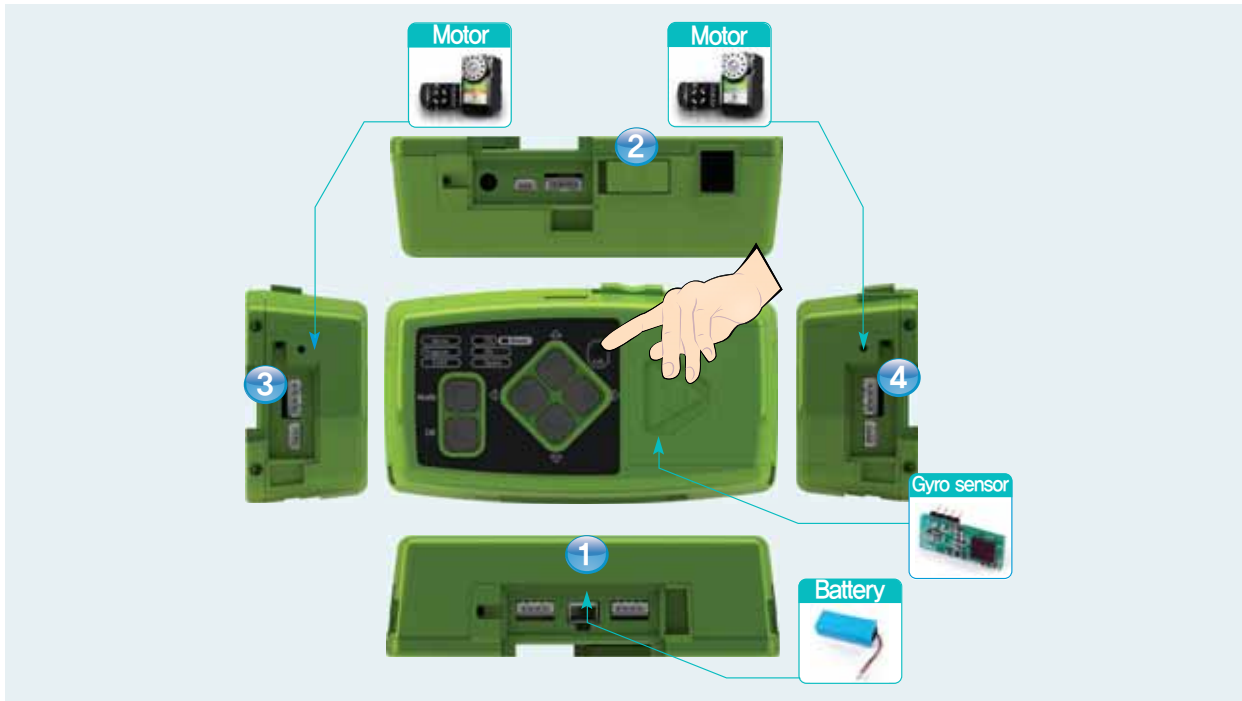
### → Test Process

- Turn on power, press (Up) button to enter Test Mode. Connect PSD line and press (Down)button, → PSD Digital Sensor in operation, → Both motors will turn in same direction,
- Place a hand or an object near the sensor and mover away, → Farther the object faster the motor movement, → Nearer the object the slower the motor movement,
- When the object is less than 5cm away from the sensor, motors will turn in opposite direction.

PSD Analog Sensor is operating without error if the motors turned accordingly, End PSD Analog Sensor.

# DRC Basic Test : Acc/Gyro Sensor

# 07 / 6



## 1 Connect Battery

## 2 Turn on power

## 3 Connect left motor : Make sure to connect Motor ID 1(Other motors will not operate)

## 4 Connect right motor : Make sure to connect Motor ID 2(Other motors will not operate)

Place the motors outward to simulate wheels turning

## 5 Connect Acc/Gyro Sensor : Open the controller cover and connect the Acc/Gyro Sensor.

### → Test Process : ACC

- Turn power on and press (Up) button to enter Test Mode, Connect Acc/Gyro and press (Down) button, → Acc sensor is in operation.
- Motors stopped when the controller angle is same as when it is attached to the robot standing up straight
- Tilt the controller slowly, → Speed of the motor will vary with the angle of the tilt, Greater the angle the faster the motor will turn.

Acc sensor is operating without error if the motors turned accordingly.



### Test Process : Gyro

- Press (Down) button one more time from the ACC test mode, → Gyro sensor is in operation.
- Motors stopped when the controller is not moving.
- Move the controller, → Motors will turn at approximately similar speed to the moving controller.

Acc/Gyro sensor is operating without error if the motors turned accordingly, End Acc/Gyro sensor test, Both the Acc and Gyro sensor is on a single chip board.

# Assemble

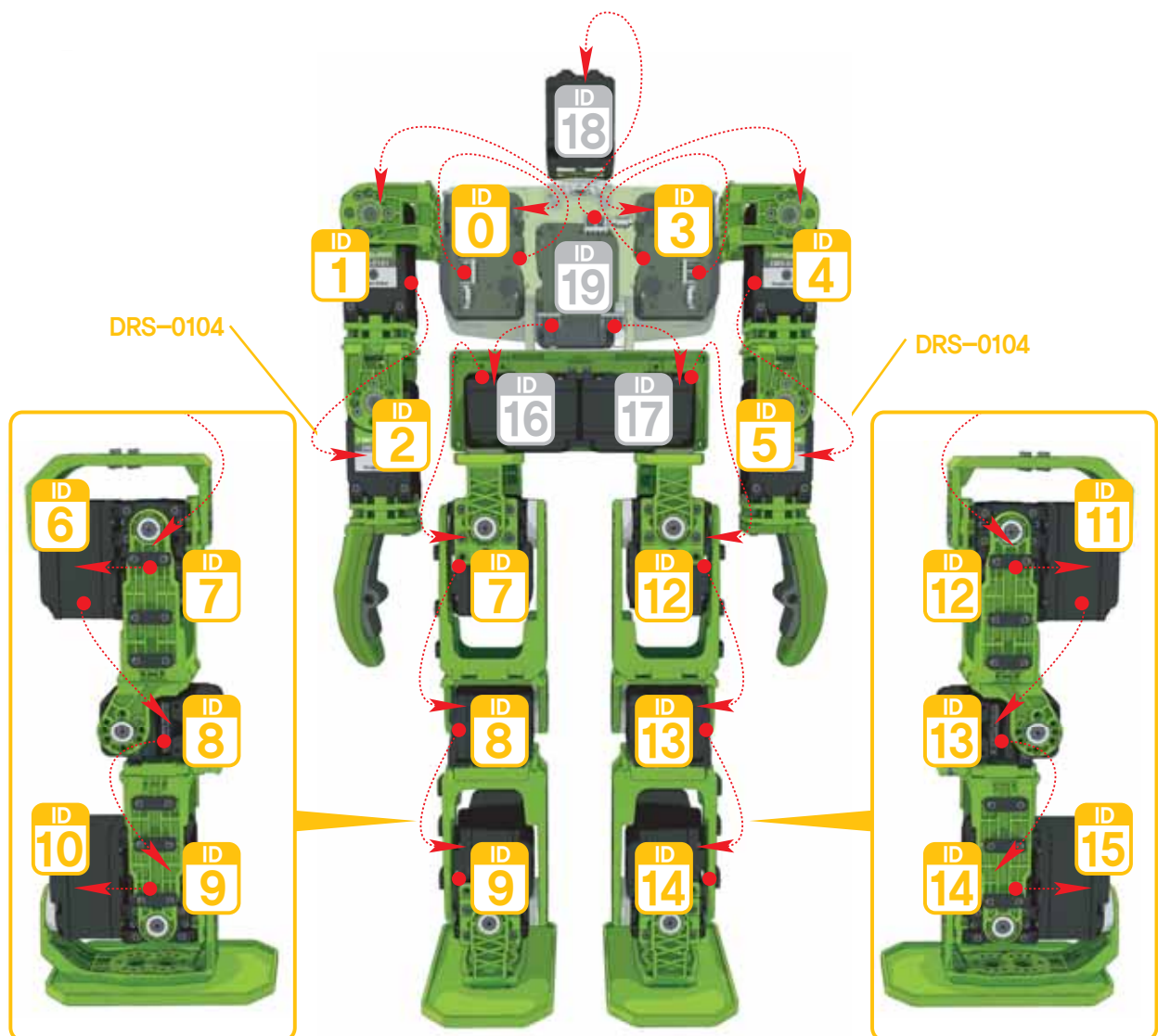
1. HOVIS Lite Assembly Diagram
2. HOVIS Lite DRC Function Instructions



# 01

## HOVIS Lite Assembly Diagram

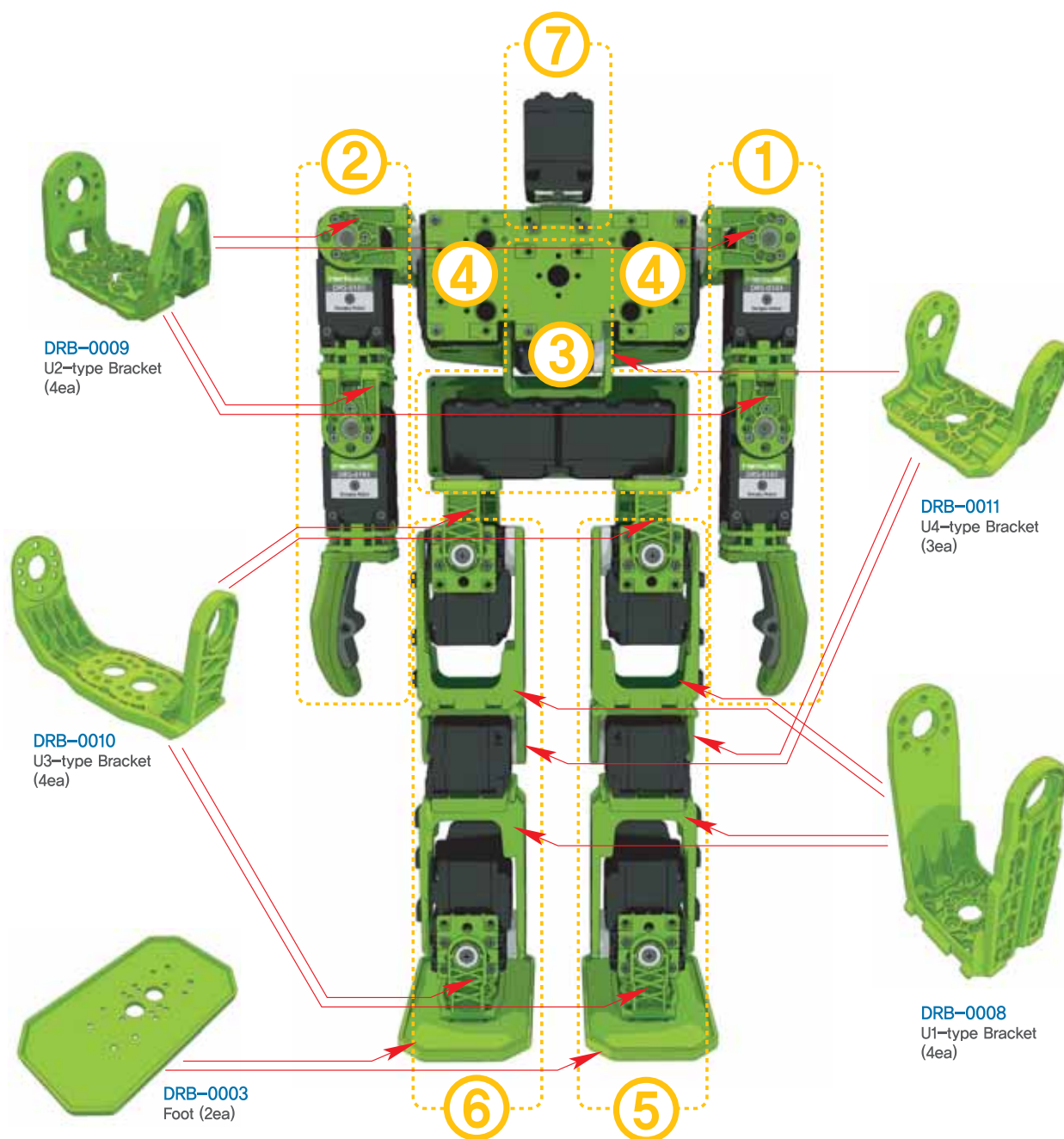
Humanoid robots are released with ID number attached to each servo motor. Robot must be assembled according to the ID number of each motor in order for the robot to operate properly. ID assignment is based on 20 axis robot. Wiring is the most difficult part in assembling the humanoid robot. User should become familiar with the wiring concept before attempting to wire the robot.



Brackets act as joints and as connection between the servos.

Brackets make up the shoulder, waist, hips, knees, and feet. Study the bracket assembly diagram before assembly.

Assembly sequence is as follows ①Left Arm, ②Right Arm, ③Waist, ④Right Leg, ⑤Left Leg, ⑥Head, ⑦Controller, ⑧Battery



# 02 Using HOVIS Lite DRC Functions

## Turning on the controller

|                     |   |
|---------------------|---|
| Power               | Blinks when battery level falls below 20%   |
| Battery Level Check | Turn on the power and press (L) button to check the battery<br>→ Shown by left 3 LEDs low 1 LED, medium 2 LED, high 3 LED |
| Entering Task       | Press mode button to enter basic task<br>Navi key → Ok button, select desired mode  |

## Program Download

|                                    | Motion of LED  | Declared LED    |
|------------------------------------|--|-----------------|
| HerkuleX connection                | Blinks when HerkuleX Manager is running  | Servo           |
| DR-SIM/<br>Visual Logic Connection | – Blinks when DR-SIM / Visual Logic is being used to edit<br>– Lit when downloading data or firmware | Program         |
| Apply Task to Robot                | LED will stay lit when the task is running   | EXEC            |
| Data Transmit                      | – Blinks when transmitting data when task is running<br>– User Spare area used                       | TX              |
| Data Receive                       | – Blinks when receiving data when task is running<br>– User Spare area used                          | RX              |
| User Defined                       |  | Spare           |
| Error                              | When error detected, all LEDs blink with alarm.  | All LED blinksc |





## Robot Motion

|                 |   |
|-----------------|---|
| Check Mode      | <p><b>Mode → (L) → OK Enter Check Mode</b></p> <p><b>When green RX LED comes on, press (L) or (R) button to select item to check.</b></p> <p><b>(L) : Motor check mode</b></p> <ul style="list-style-type: none"><li>– Selects each individual motor and checks connection status and assembly.</li><li>– Red TX LED comes on when motor check mode entered.</li><li>– When Green LED on selected motor comes on, motor turns to center position (512). Rest of the motors go into Torque Off state when LED goes off.</li><li>– Press (Up) &amp; (Down) to select the motor ID( 0~15). Check the connection status and location of the motors. First selected ID is 0 (Right Shoulder).</li><li>– Press (Up) button to increase ID by 1, (Down) button to decrease by 1.</li><li>– Warning buzzer will sound if selected motor ID does not exist.</li></ul> <p><b>(R) : Midpoint Check Mode.</b></p> <ul style="list-style-type: none"><li>– Checks assembly state of arms, legs, and other parts by testing individual modules.</li><li>– Spare LED comes on when Midpoint Check Mode is entered.</li><li>– Motors in the selected module makes slow repeated movements to simulate straight and bent posture.</li><li>– Press (Up) &amp; (Down) button to select the arm and the leg.</li><li>– Sequence: Left arm, Right arm, Left leg, right arm. Left arm is the first selected module.</li><li>– If motor ID is missing from the selected module, buzzer will make same number of sounds as the number of missing motor IDs.</li></ul> |
| Autonomous Mode | <p><b>Mode → (Up) → OK, enter autonomous mode.</b></p> <ul style="list-style-type: none"><li>– Robot makes autonomous movements without user intervention.</li><li>– Robot will select from the following movements in random; forward, front roll, left turn, right turn.</li><li>– In forward movement, robot will select from 10/20/30 steps in random.<br/>In left/right turn, random selection from 12/24/36 steps.</li><li>– Robot will pause for brief time after completing the randomly selected movement before starting next random movement.</li><li>– Robot will be able to avoid obstacles if PSD sensor is installed in the ADC port 1.</li><li>– If robot detects an obstacle, it will randomly select one of the following movements; backward &amp; left turn, left turn, back roll &amp; left turn,</li><li>– backward roll &amp; left turn is only possible if the robot detects an obstacle after moving at least 10 steps forward.</li><li>– If an obstacle cannot be avoided even after making number of left turns, robot will try backward &amp; left turn.</li><li>– If acceleration sensor is installed, robot will get back up after falling.</li><li>– If robot detects a fall, it will stop current motion and switch to getting up mode.</li></ul>   |

### Remote Control Mode

#### Mode → (R) → OK, enter remote control model

– Controls the robot by remote control. Remote control receiver must be installed for this mode to function.

– Up : Forward

– Down : Backward

– L : Left turn

– R : Right turn

– OK : Stop

– 1 : Roll forward

– 2 : Roll backward

– 3 : Push-up

– 4 : Boxing

– 5 : forward get up

(Acceleration sensor must be installed, Only possible from supine position)

– 6 : backward get up

(Acceleration sensor must be installed, Only possible from prone position)

### Sound Dem Mode

#### Mode → (Down) → OK, enter sound demo mode.

– Robot reacts to the number and direction of the sound

– Sound detection on, when controller TX, RX, Spare LED is on

– During sound detection,

– Single sound detected : Random motion from roll forward, roll backward, push-up, boxing.

– Sound detected twice : robot will lift the arm in the direction of the detected sound and wave. If the sound was detected once from the left and once from the right, robot will wave the left arm first and then the right arm.

– Three sounds detected : Robot will turn to the direction of the sound and walk 10 steps forward. If the sound was from the left, robot will turn left and then walk forward.

**※ Sound detection may not work 100% all the time due to background noise, echo from the wall, and other environmental factors. Robot will detect loud and short sounds like hand clapping more easily.**



# Infomation

**01.** Troubleshooting

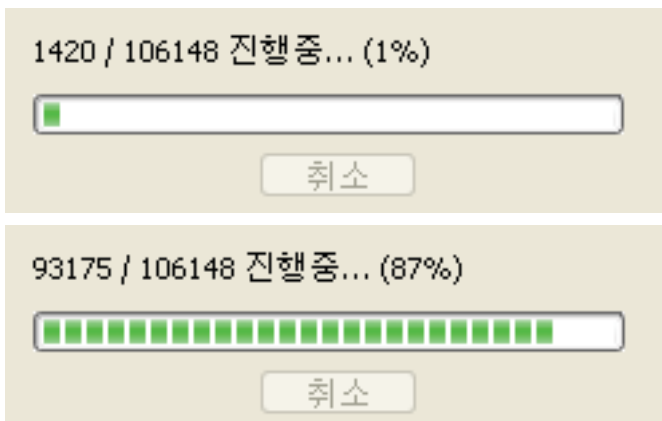
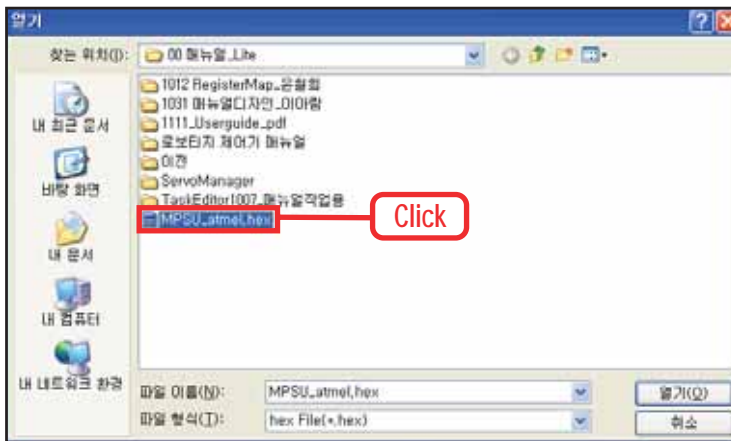
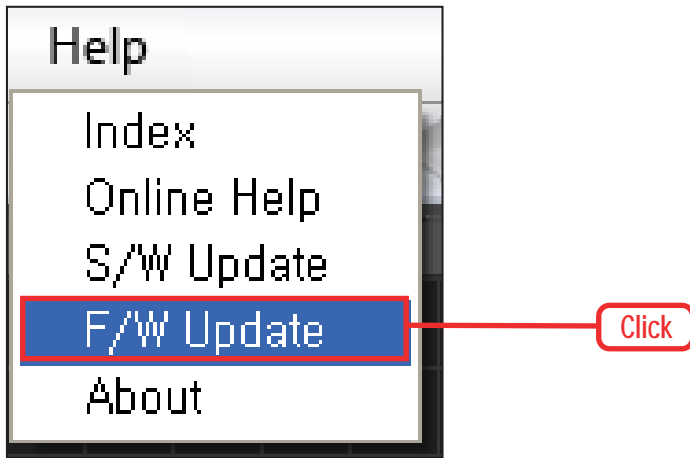
**02.** Calibration (0 Point Adjustment)

**03.** Changing the Motor ID



# 01 Troubleshooting

## Firmware Update



### 01 Help > Firmware Updae

Update controller firmware through DR-Visual Logic.

With the controller connected to the PC, Help > Click firmware update.

### 02 File Loading

Extension of firmware file is ".hex". Load downloaded (new) firmware.

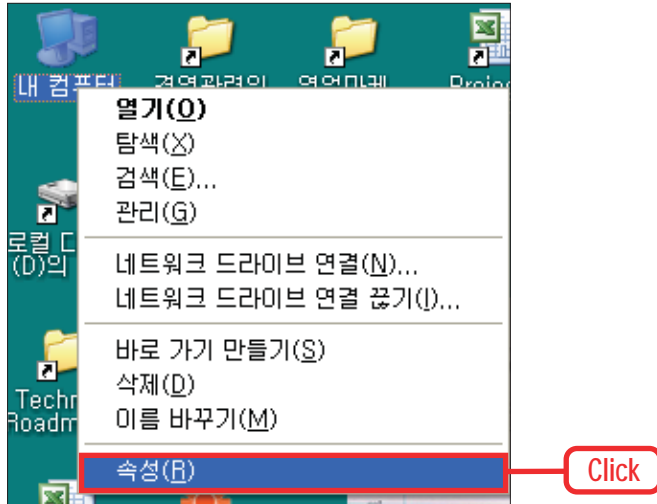
### 03 Firmware update

Please make sure not to interrupt update process while update is under processing. (Or make sure PC is not turned off.) It will bring some problem for DRC. If this happens, please restore firmware using DR-Visual Logic. In case problem still exists, please inquire service center at Dongburobot.

For firmware update, DRC power should be turned on.

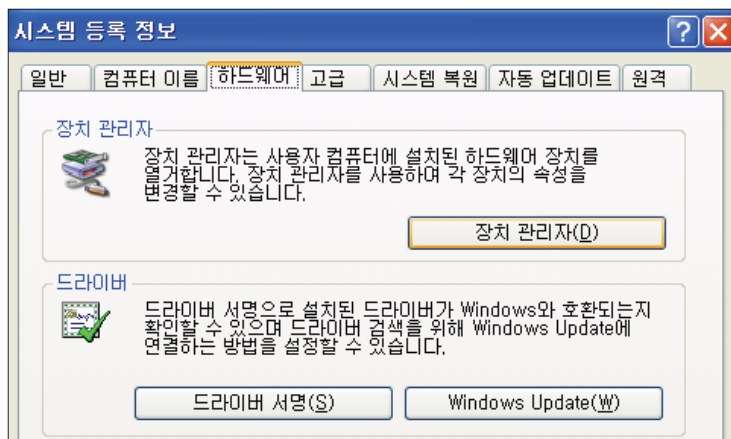
## COM Port Setting & Improving Download Speed

If you failed to connect the robot with PC, you are requested to set COM port so that your PC may recognize the robot. For faster & smoother download for firmware update, we would recommend to improve download speed according to instruction below.



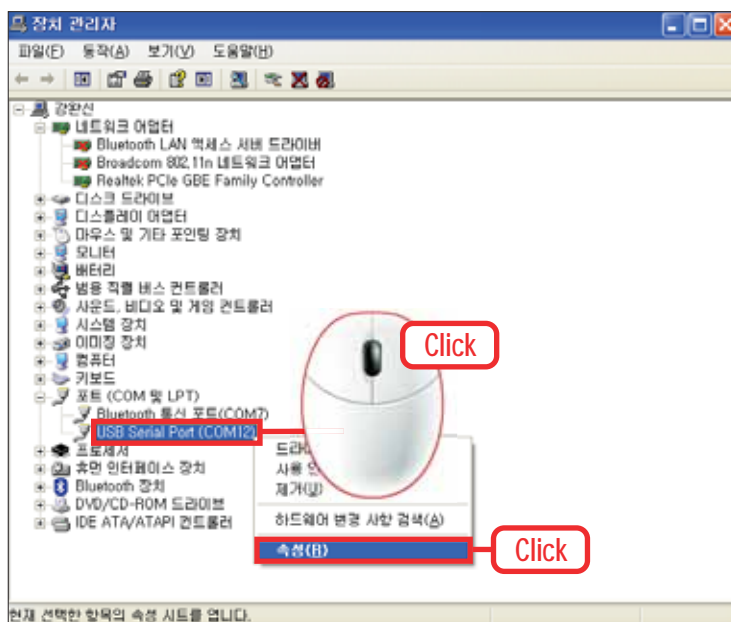
### O1 Property

Go to “My computer” and Click right button of the mouse to select “Property” menu.



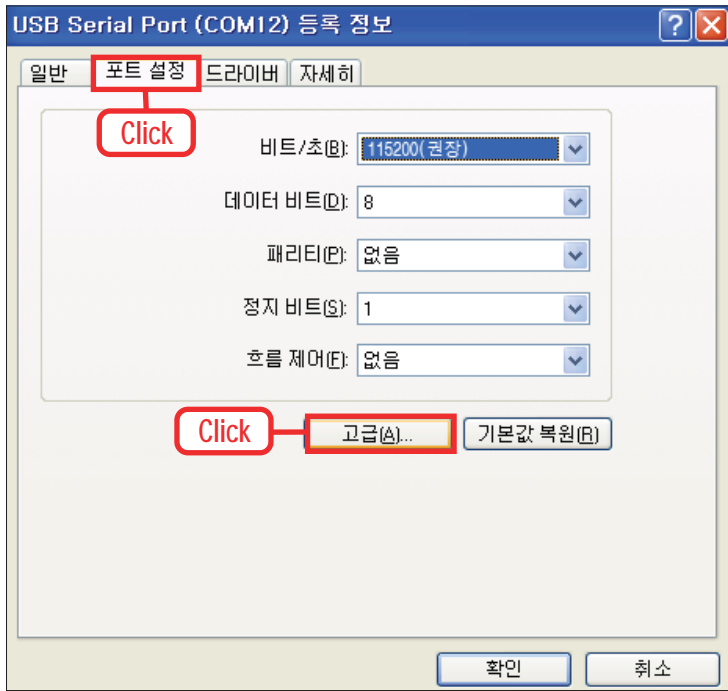
### O2 Hardware Device Manager

In “Property Menu”, go to “Hardware” tab and select “Device manager” button.



### O3 COM Port

Click “Port” item among listed devices. Select “USB Serial Port” and click right mouse button to select “Property”.



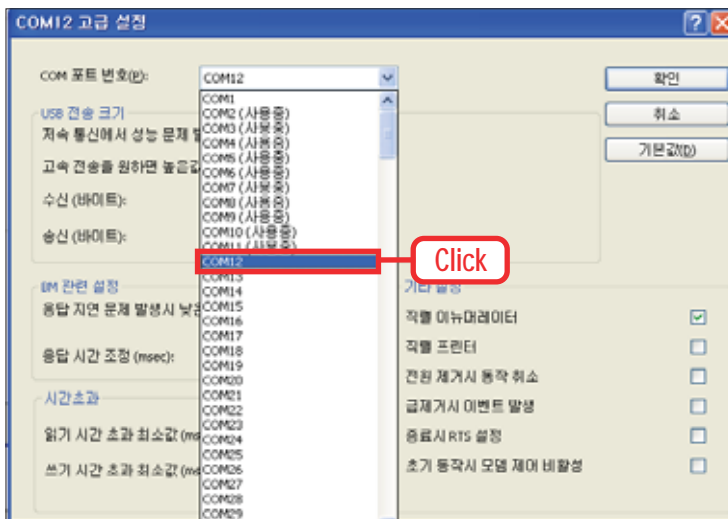
#### 04 Port Setting

Click "Port Setting" and set Baud rate at 115200.  
Then, click "Advanced" button



#### 05 Advanced Setting

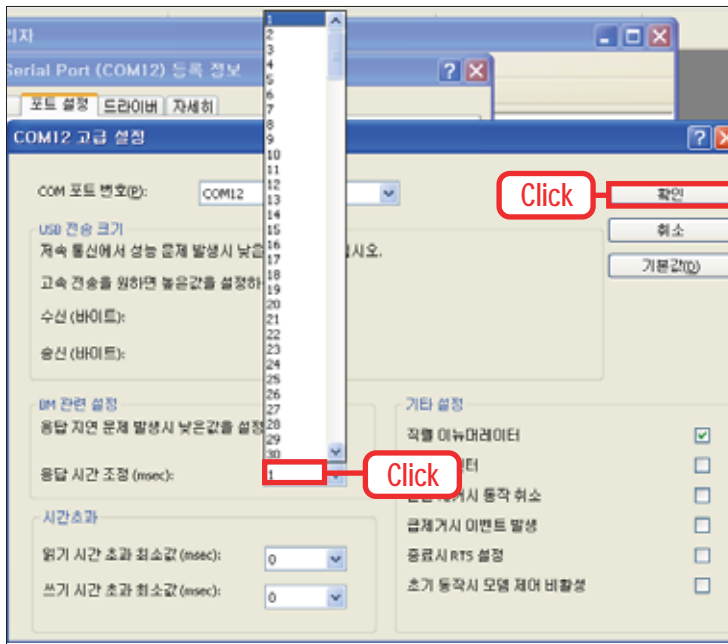
In Advance setting menu, you can change COM port(Currently COM 12 on the picture) or improve download speed.



#### 06 COM Port Change

If desired, click COM port and choose preferred port number among COM1~30.  
Then, assign concerned port number in setting menu of DRSIM or DR-Visual Logic so that robot can be connected with software.



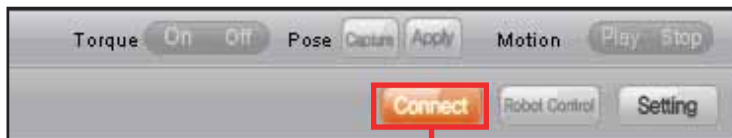


## 07 Improvement of download speed

If you feel download speed is too slow (or look like download process stops), adjust buffer rate to 1. (default setting is 14) Now, COM port speed will be faster by 14 times.

# 02 Calibration (0 Point Adjustment)

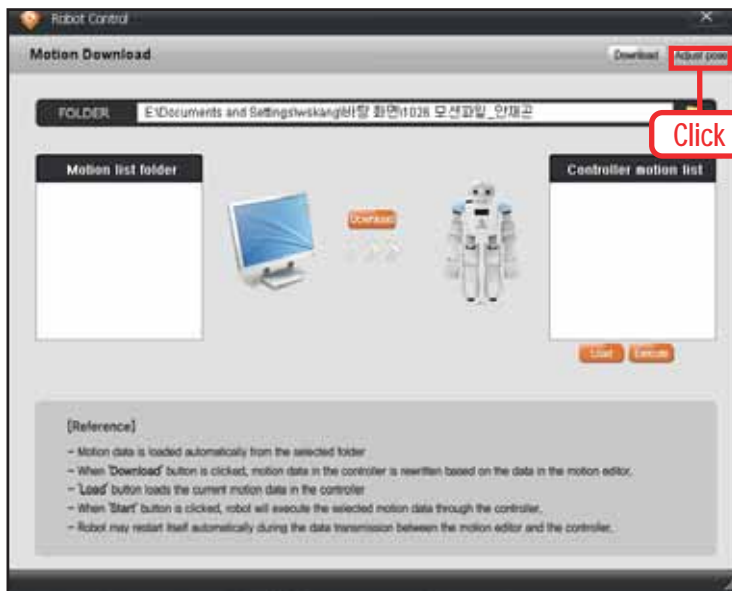
Checks robot to see if it was assembled correctly/exactly and makes adjustment if necessary. If the robot was not assembled correctly, it may cause error or unwanted movement.  
Click 'Robot Control' in DR-SIM to adjust the position of the robot motors.



Click



Click



Click

## 01 Connect

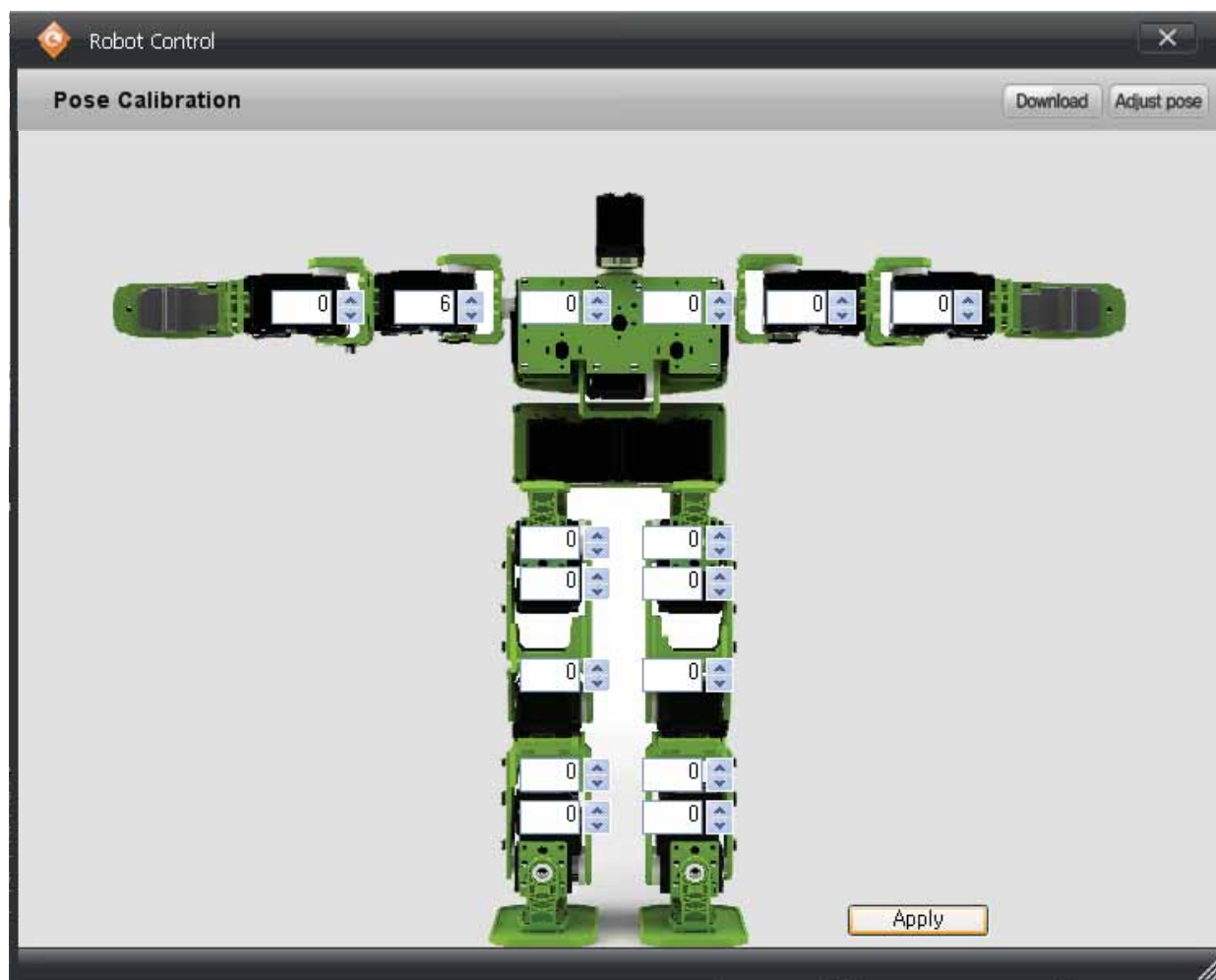
Connect to robot.  
Click Connect.

## 02 Robot Control

Turn on power.  
Click Torque On.  
Calibration is done in Robot Control.  
Click Robot Control.

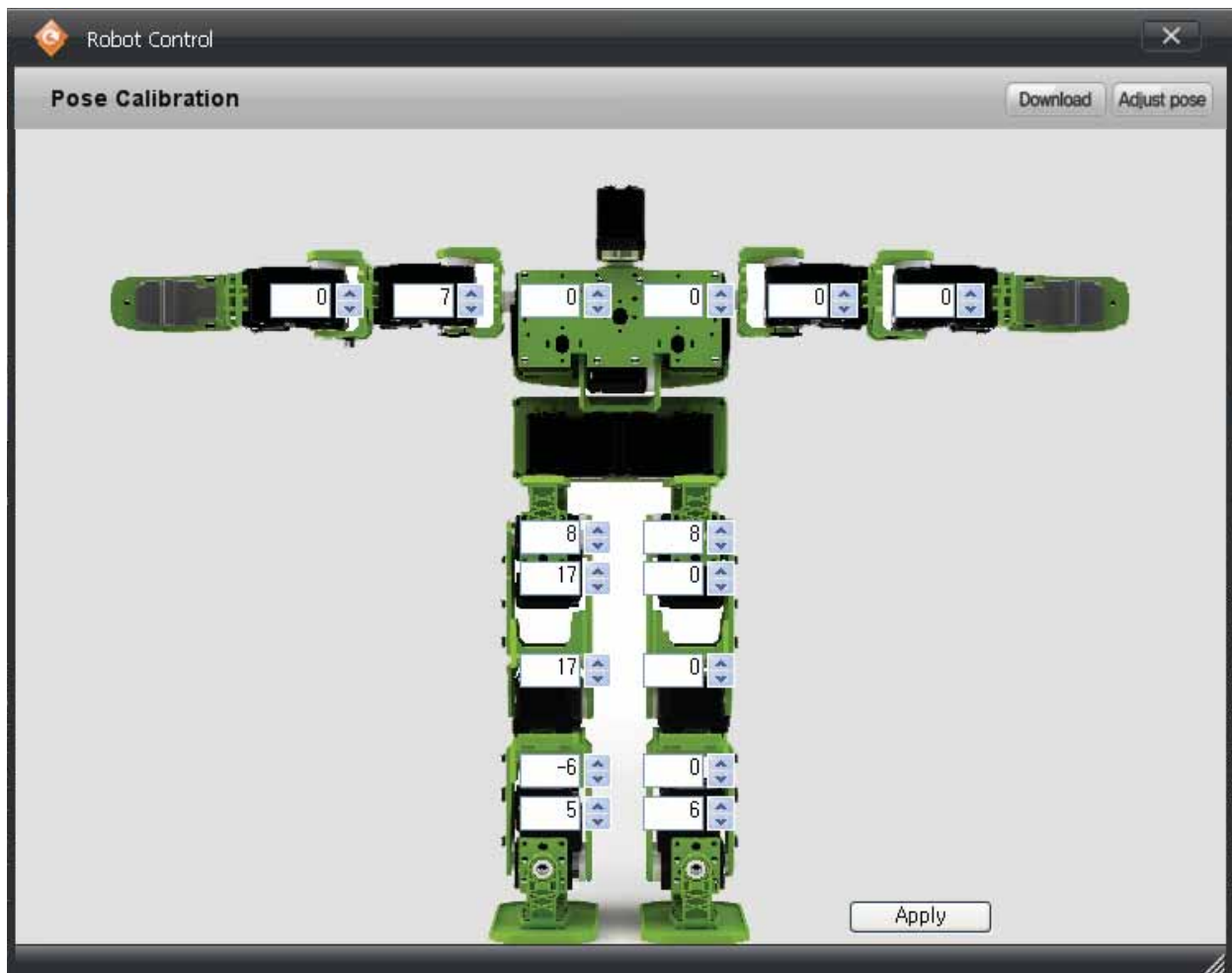
## 03 Posture Adjustment

Robot control window is divided into motion download and posture adjustment. Click Posture Adjustment



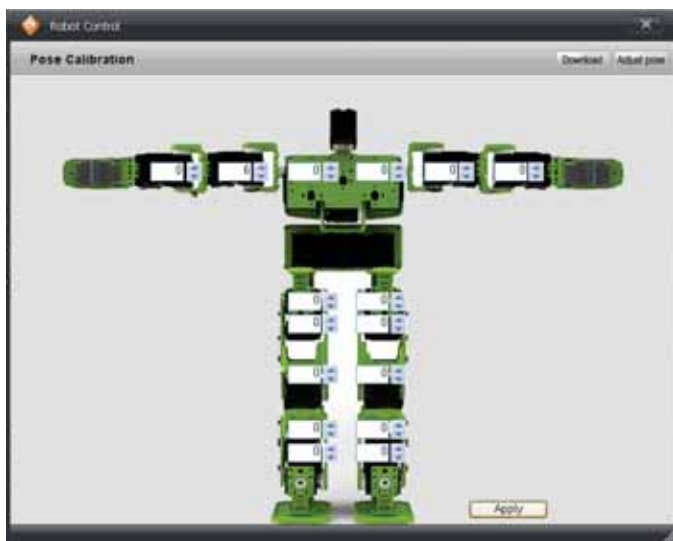
Clicking Posture Adjustment will show current calibration values.  
Compare with the actual robot and adjust the calibration values.

Calibration value range is from  $-128 \sim 127$ . Use the Up/Down button to change the values and notice the actual robot making slight movements.



Check the robot to view the adjustments being made and click Apply when the correct setting is achieved. Press Apply to save the adjustment to the robot. Robot will show adjusted values when connected.

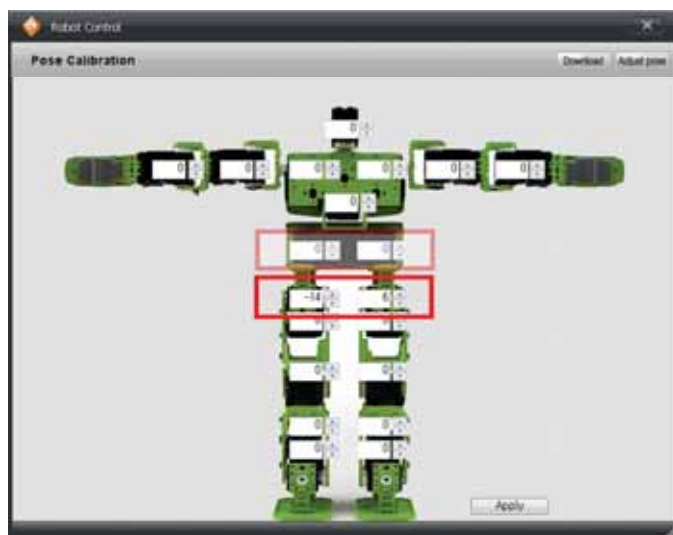
## Calibration TIP



01

Click Robot Control > Posture Adjustment button.

When the posture adjustment window opens up, lift up the robot and check the assembly



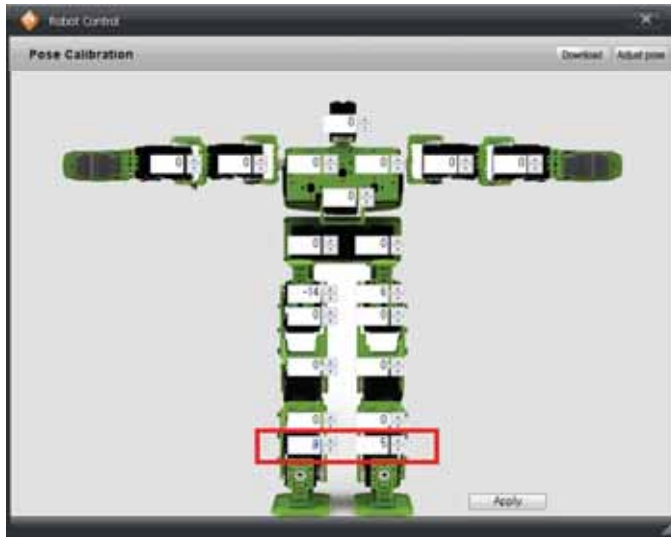
02

View the robot directly from the front and adjust the leg balance.



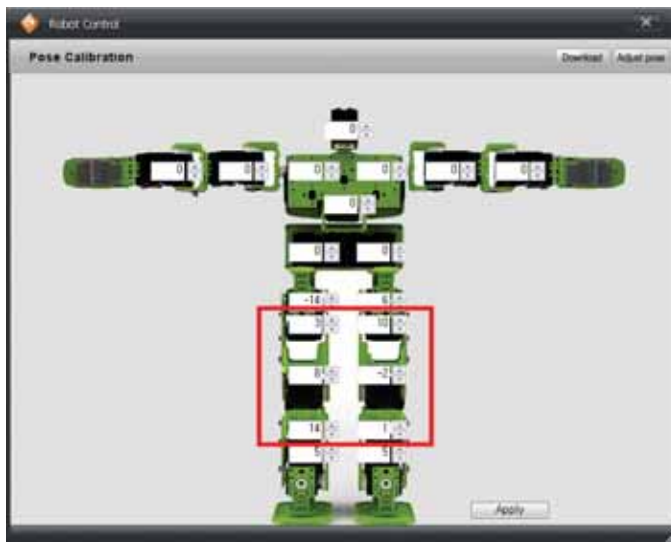
<Before>

<After>



03

Make adjustments so that both feet are flat on the ground.



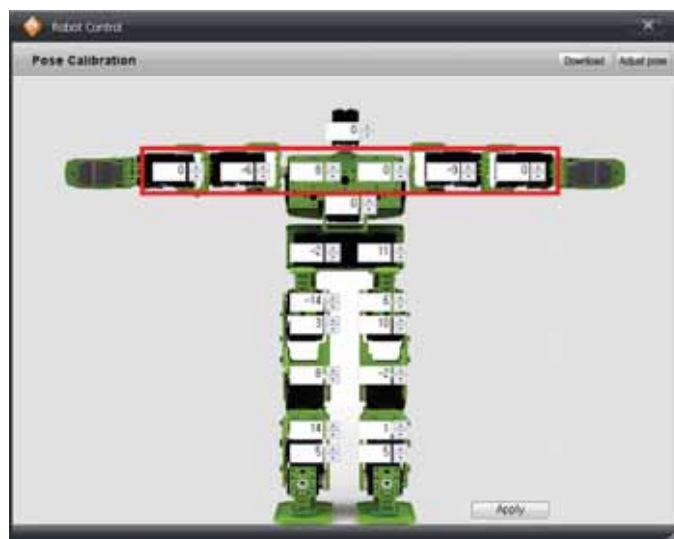
04

View the robot from the side and adjust the vertical angle.



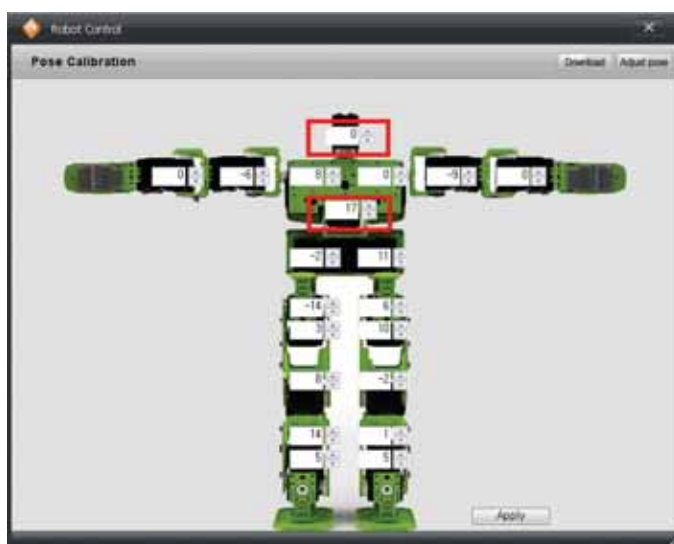
<Before>

<After>



## 05

View the robot from the top and adjust the arms to form straight line.



## 06

Adjust the waist and head for the robot.

## 07

Make further necessary adjustments and end the calibration.

## 03

## Changing the Motor ID

Since DRC identifies each motor by the motor ID number, it is important to place each motor in correct position according to the ID when assembling the robot. However, if the motor was incorrectly positioned or if the robot is being reassembled from 16 axis to 18 or 20 axis robot, motor ID change will be necessary.

- Make sure to change the motor ID prior to reassembling the robot from 16 axis to 18 or 20 axis.
- Follow the steps below to change the motor ID if the motors were positioned incorrectly during the assembly.

ex) Position of the motors ID 9 and 10 were switched.

ID 9 → ID100 (Motor ID 20 to 254 aer spare ID.)

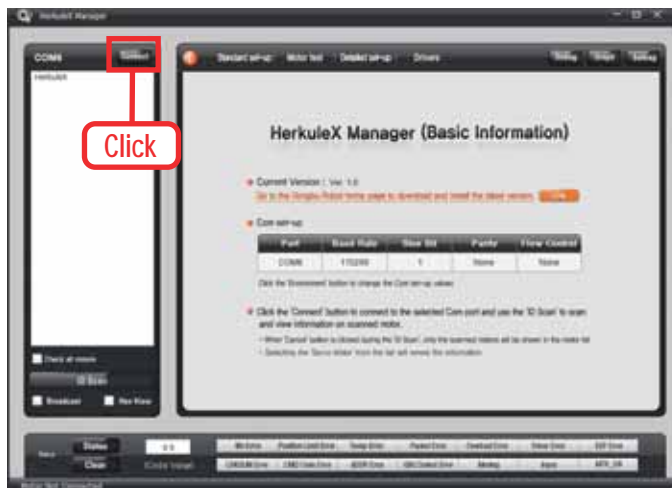
ID 10 → ID 9

ID 100 → ID 10

Example shown below uses HerkuleX Manager program to change the motor ID 253 to ID 15.

(HerkuleX Manager prgogram can be downloaded from Dongbu Robot website.)

<http://www.dongburobot.com/jsp/cms/view.jsp?code=100122>



## 01

Connect the motor to the controller (DRC) and run the HerkuleX Manager program. Setup the COM Port and click Connect button.





## 02

Motor connected to the controller (DRC) shows up in the left window when Connect button is clicked. Click [ID: 253] DRS-0101 to change the motor ID 253 to 15. Next, click on basic properties and then use the scroll bar to position the ID&Policy window so that it becomes visible.



## 03

Enter desired value in Servo ID (value is 15 in this example) and then click Setup. Motor ID scan will run automatically when Setup is clicked.



## 04

ID scan will show that Motor ID has changed from 253 to 15. As the last step, click [ID: 015]DRS-0101 and then click Save button to save the changed motor ID. (Changed motor ID shown by the ID Scan is from the changed RAM Register value which loses its data when power is turned off.

Clicking the Save button will save the changed Motor ID in EEPROM Register which retains data even when the power is turned off.)

## 05

Disconnect and reconnect power on motor. Then run ID SCAN through HerkuleX Manager to verify the ID of motor.

Consumers have the right to receive free-of-charge service during the 12 months(for battery, 6 months warranty) period starting from the date of the purchase in the case of product failure during use. However, in the event of failure arising from misuse on consumer’s part or failure due to natural disaster, any service related to such failures will be charged even during the period of free service.



### Product Warranty

|               |   |          |
|---------------|---|----------|
| Product Name  | : |          |
| Model Name    | : |          |
| Serial No.    | : |          |
| Purchase Date | : | YY MM DD |

### Consumer’s Contact Detail

|             |                      |
|-------------|----------------------|
| Name        | <input type="text"/> |
| Address     | <input type="text"/> |
| Contact.No. | <input type="text"/> |
| E-Mail      | <input type="text"/> |

※ Keep the warranty card in safe place as it will be required as a proof to show the purchase date when requesting for service.



1. Quality Assurance of this product is hereby stated and thus warranted.
2. Make sure to receive the purchase date as warranty period will begin from the date of the purchase.  
(If the purchase date cannot be confirmed, warranty period will begin 6 months after the manufacture date)
3. Keep this warranty card in safe place together with the manual. Warranty cards will not be replaced.



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[www.dongburobot.com](http://www.dongburobot.com)