This product is an assemble kit, therefore, all performance and results of a robot which you assemble belong with your responsibility. Please agree with it.

- **Danger**: This mark means that it might cause death and serious injure.
- **Warning**: This mark means that it has a possibility of death and serious...
- **Attention**: This mark means that it has a possibility of injure and damage.

- This mark means prohibition.
- This mark means compulsory execution.

---

**DANGER**

- **Prohibition**: Make enough space to work.

---

**WARNING**

- **Prohibition**: Keep children at a distance from robot parts
  - Children might get injured by edge of aluminium frame.
- **Prohibition**: Disconnect HV battery connector immediately when troubles have occurred.
- **Attention**: Such as break, fire, smoke, smell bad and heating.
- **Prohibition**: Do not dismantle a charger and cables.
Disconnect a charger plug when you don't use it.

⚠️ A charger always current electricity if a battery has not connected.

Do not dismantle and customize servos and a PCB.

🚫 Prohibition

Do not insert parts to water and fire.

🚫 Prohibition

Make sure your safety during assembling and operating.

⚠️

This component parts are mainly conductor one.

⚠️

⚠️ Attention

It should be authorized when you bring it to abroad. Please contact related ministry on your country.

⚠️

Handle with care when you plug off batteries and cables.

⚠️

Do not operate a robot on an unternain.

🚫 Prohibition

This HV battery is a nickel hydrometric battery, and it is a recycle battery. 🌍
HIGHT VOLTAGE BATTERY (Ni-MH) IS USED WITH THE KIT.
Ni-MH IS A BATTERY THAT CAN REUSE BY CHARGE.
BUT IT IS POSSIBLE TO OCCUR ACCIDENT IF THE HANDLING IS WRONG.
PLEASE READ THE INSTRUCTIONS.

How to charge the HV Battery

1. Connect the code to the charger.

2. Put the charger to the wall socket.

   Please be aware not to short-circuit.

3. Connect HV battery to the connector.

   The light will be on

Take the battery off immediately in case of too much heat, noise or bad smell.
HANDLING OF HV BATTERY

INSTRUCTIONS

⚠️ 危険

🚫 Please do not to do following things.

🚫 Don't modify connectors and don't short battery circuit.

Batteries will fire and burst when you short circuit. Please take care about battery treatment and operation.

🚫 Handle with care. Don't enclose other items.

If you enclose battery with other items, the battery connector will short. Don't enclosed batteries with other items.

⚠️ Warning

⚠️ Please give the appropriate treatment when following accidents has occured.

⚠️ When battery has short and the liquid has leak on your hand, wash your hand with pure water. If it were to enter in your eyes, wash your eyes immediately and go to hospital.

⚠️ When you don't use robot and you leave from robot long time, disconnect NiMH battery plug from PCB and charger.

⚠️ Warning

⚠️ If you throw away batteries, please follow your country low for recycle.

⚠️ Wrongful throw will cause environmental polution.

Characteristics of NiMH

NiMH has a extremely low impedance, therefore, the merit is that you can get huge electric current. Despite it cause a memory effect when you repeat charging from non-empty. In order to avoid a memory effect, it is recommended that you charge it from empty.
THANK YOU FOR PURCHASING THE HUMANOID ROBOT KIT "KHR-2HV"!
IT'S THE HUMANOID ROBOT ASSEMBLY'S KIT THAT HAS A LOT OF MOTIONS WITH REASONABLE PRICE.
PRINTED OUT THE MANUALS IS RECOMMENDED.

ATTENTION

This kit is an assemble kit, therefore, we only warrant parts not an assemble robot performance. If your robot does not perform well in spite of each parts don't break, please make sure your assemble at first.

This assemble robot kit is developed for hobbists from young to elder, however, this is not a toy product. A protector should be follow children's assembling it.

This assemble robot requires a personal computer which running Windows2000 or latter with USB interface. This instruction manual is written for persons who know fundamental operation for a personal computer. Please refer reference books for personal computer concerning this operation.

- Each company names, product names and logo marks written in this instruction belong each company trademark.
- This manual will be revised without any notices.

NESESARY ITEMS

COMPUTER
Windows 2000 or XP / Microsoft
More than one USB port : It will not work with USB-HUB.
CD-ROM drive (for installation of the software / instructions of manuals)

TOOLS
DRIVER (M size)
Thick grip and the magnet tip is good.

SCISSORS
Scissors for the models are recommended.

POLYCARBONATED PAINTING SPRAY
Good for the painting of the Front cover and the Board cover.

CONVENIENT TOOLS
* wood working drill
* bodkin
* drill
Good for the process of the cover's halls.
* cutter
* nipper
* file (sandpaper)
Good for the cutting of the parts or covers.
KRS-788HV SERVO MOTOR

KRS-788HV is a FET digital servo that have been improved former model KRS-786ICS. The powerful and saving-energy servos are durable to work with a High Voltage, and suitable for Robots.

- RedVersion の機能をそのまま搭載。キャラクタリスティックチェンジや、ポジショングキャプチャーなどが使用可能。
- ICS の使用により、外部からの設定が可能。
- ロボット専用サーボとして両軸支持による固定が可能。
- HV 対応。スペックは従来機種に比べアップなのに省エネルギー。

Spec

measure: 41 × 35 × 21 (mm)
weight: 47.5g
torque: 10.0kg/cm (Ni-cd 9)
speed: 0.14sec/60° (Ni-cd 9)
voltage: 9 ～ 12V

RCB-3J CONTROL BOARD

Spec

measure: 45 × 35 (mm)
weight: 12g
connectable servos: 24 units
voltage: DC 9 ～ 12V

REPAIR SERVICE

CONTACT

Please contact to the shop you purchased. Or contact to the Japanese distributor below.

REFERENCE: iXs Research Corporation
http://www.ixs.co.jp
info@ixs.co.jp

Manufactured by KONDO KAGAKU CO., LTD.

http://www.kondo-robot.com
INSTRUCTIONS

FOUR INSTRUCTIONS FOR ASSEMBLY

1. Kit Guidance

2. KHR-2HV ASSEMBLY’S MANUAL
   It explains process of the kit with PDF files.

3. RCB-3J instructions
   Explanation of making the motions and RCB-3J control board.

4. Serial USB Adapter

COMPOSITION AND RESUME

Explanations in order to the assembles.

- Charge the battery before assembling.
- Pull the case screws from servos.
- Fit the servos on the Brackets.
- Assemble the shoulder units.
- Assemble the leg units.
- Assemble the foot units.
- Assemble the front units.
- Assemble the body unit.
- Assemble the control unit.
- Set the starting point & fitting the arms
- Complete the assembly.
- Settle the home position.

You can assemble this robot kit only using screw.
Please charger your battery before procedure section 9.
In section 9 you will use a control board for adjusting a
center position each servos.

When you connect parts using several screws, you
should insert whole screws loosely at first. After that
you can tight whole screws.
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**BEFORE ASSEMBLING**

**DISTINCTION OF THE SERVOS & CH**

How to put the seals

It's convenience to have cut with scissors or cutter in advance.

Refer the process of the assembly or Channel's list regarding CH No.

**SEAL FOR THE SERVOS**

Put the seal on the side of each servo. The CH No should be equal to the connector.

**CHANNELS LIST**

**LAYOUT OF THE SERVOS**

RCB-3J has 24 channels for inserting the connectors. It can be connected servos or other option parts for 24 pcs at the max.

**FIGURE FROM BACK SIDE**

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</table>
REMOVE THE CASE SCREWS

**INSTRUCTION**

1. Remove the case screws which are in servo motors. 4 case screws are put in each servo.

Remove all case screws of 16 servos.

2. Confirm a quantity of servos and screws.

Servos: 12pcs (lead's length 300mm)
4pcs (lead's length 480mm)

Case screws: 64pcs
**ASSEMBLY OF BRACKET B UNIT**

**PREPARATION**
- SERVO MOTOR KRS-788HV 6pcs
  (LEADS LENGTH : 360mm)
- SERVO BRACKET B 6pcs
- SERVO ARM 700A BASE 6pcs
- 2.3-6 TAPPING SCREWS 24pcs
- CASE SCREWS 24pcs

**FINAL IMAGE**
- Shoulder, Arm, leg

---

1. **Tighten the screws to the right.**

   **2.3-6**

   Tapping screws (4pcs)

   *Servo Bracket B*

   Before putting the screws, have a look if the base faces correct direction as the illustration.

   **SERVO ARM 700A BASE**

2. **Fit the Bracket B into the servo with case screws.**

   Not tighten too much.

   It is possible to be deformed or gotten fire by physical resistance.

   "Confirm the base's direction."

   "Fix correctly the screws to not the parts be unstable."

---

Assemble 6 units
ASSEMBLY OF SHOULDER UNITS

PREPARATION
* SERVO MOTOR KRS-788HV 2pcs
  (LEAD'S LENGTH : 300mm)
* SHOULDER FLAME L 1 unit
* SHOULDER FLAME R 1 unit
* SERVO BRACKET A-L 1 unit
* SERVO BRACKET A-R 1 unit
* CASE SCREWS 8 pcs

FINAL IMAGE

Joint

SHOULDER UNIT L
SHOULDER UNIT R

1. **Important to distinguish L or R.**
   - Set Servo Bracket A-L & A-R into servos with case screws (4pcs each).
   - The combination is Unit L & Unit R.

2. **Have a look if L & R is correct.**
   - Fit Shoulder Flame L & R into Unit L & Unit R.
   - This bracket fits tightly because it does not use the screws.

3. **Put seal on servo's wire.**
   - CH2 : Shoulder unit L
   - CH6 : Shoulder unit R

Fit tightly without making a crack.
ASSEMBLY OF LEGS

PREPARATION
* SERVO MOTOR KRS-788HV 2pcs (LEAD'S LENGTH : 360mm)
* SERVO MOTOR KRS-788HV 2pcs (LEAD'S LENGTH : 480mm)
* LEG JOINT A-L unit
* LEG JOINT A-R unit
* LEG JOINT B-L unit
* LEG JOINT B-R unit

* M2-4 SCREWS 4pcs
* CASE SCREWS 16pcs

THIGH & NKEE

LEG UNIT L

FINAL IMAGE

LEG UNIT R

INSTRUCTIONS

1. Fit Tightly
   LEG JOINT B-L
   Cable's length 480mm

2. Fit Tightly
   LEG JOINT B-R
   M2-4 SCREWS 2pcs each

3. LEG UNIT L
   CASE SCREWS 8pcs

   CH13 : Leg unit L (upper)
   CH14 : Leg unit L (lower)
   CH19 : Leg unit R (upper)
   CH20 : Leg unit R (lower)

Fit the Leg joints as dents are getting outside.
**ASSEMBLY OF LEGS**

**PREPARATION**
- SERVO MOTOR KRS-788HV 2pcs (LEAD'S LENGTH : 480mm)
- SOLE 2 units
- FOOT ANGLE A 2 units
- FOOT ANGLE B-L 1 unit
- FOOT ANGLE B-R 1 unit
- M2-4 SCREWS 8pcs
- CASE SCREWS 8pcs

**FINAL IMAGE**

**INSTRUCTIONS**

1. **FIT TIGHTLY**
   - FOOT UNIT R
   - FOOT ANGLE B-R
   - FOOT UNIT L
   - FOOT ANGLE B-L

2. **CASE SCREWS**
   - 4pcs each
   - FOOT UNIT R
   - FOOT UNIT L
   - FOOT ANGLE A
   - **DO NOT TIGHTEN TOO MUCH!**

3. **FOOT UNIT R**
   - SOLE
   - M2-4 SCREWS (4pcs each)

4. **Put seal on Servo's wire**
   - CH15 : Foot unit L
   - CH21 : Foot unit R
1. The smooth surface would be front side.

3. Have a look if wires of the servos have been settled correctly as illustration.
ASSEMBLY OF BODY

PREPARATION
* SHOULDER UNIT L (ASSEMBLED) 1 unit
* SHOULDER UNIT R (ASSEMBLED) 1 unit
* FRONT UNIT (ASSEMBLED) 1 unit
* BODY FLAME B 1 unit
* M2-4 SCREWS 15 pcs
* CASE SCREWS 8 pcs

INSTRUCTIONS

1. Shoulder Flame have to be fronted outside.

2. A finger gets caught touching the back side. The front side will be put upper.

3. Pass the wire of CH11 and CH17 through the hall of Body Flame B.

4. Put seal on Servo's wire.
   CH2 : SHOULDER UNIT L
   CH6 : SHOULDER UNIT R
   CH11: FRONT FLAME L
   CH17: FRONT FLAME R
ASSEMBLY OF CONTROL UNIT

PREPARATION
* RCB-3J 1unit
* PCB BASE 1unit
* M2-4 SCREWS 4pcs
* POWER SWITCH 1unit

INSTRUCTIONS
1. Fix the RCB-3J on the PCB base with M2-4 screws.
2. Insert the power switch Harness to the power terminal on the RCB-3J.

Power switch Harness always should be turned off, except control the robot.
It is possible to be injured by sudden motion.

The connector will be broken if inserts with wrong.
CONNECTING THE PARTS TO THE SERVOS

Starting point should be equal.

 Settlement of the Starting point is important works that decide the standard angle of the servos. The motion will work with success if the settlement would correctly.

FITTING THE SERVO HONE

The axis is uneven. Fit the hone shifting the uneven part.

FITTING THE SERVO ARMS

Fit the servo arms correctly like the figure.

If there is a gap between the right and the left (Shoulders, Arms, Legs & etc...), the position of the body would not be matched.
SETTLEMENT OF SERVO'S STARTING POINT

The movable range of KRS-788HV servo motor is 180 degrees at the maximum. It should be considered the mechanical structures and the motions in practice, especially when you assemble robots to realize appropriate control.

The settlement of the starting point is an important element to work the servos correctly.

It should be settled in each assembly of the servo arms.

1 PREPARATION

RCB-3J
USB Serial Adapter
PC >>> Start up the software "Heart to Heart 3J"

Please refer the instruction's manuals of RCB-3J & USB Serial Adapter.
Computer's environment : Windows 2000 & Windows XP

2 CONNECTION

Connect the Serial USB Adapter to USB port of the computer.
Complete the set-up referring the instruction's manual.

* Connect the extra cable of the Serial USB Adapter to the terminal of the RCB-3J board.
* Connect the power Harnes to the RCB-3J, and charged HV battery to it.
* Turning the power Harnes on, the LED on the board will light on.
3 START UP THE SOFTWARE

Starting window of "HEART TO HEART3".

Indicate the COM port number first.

Please refer the Serial USB adaper's manual to confirm the number.

Check the switch "SYNC".

Settle one position on data sheet.
1. Click "POS" on tool bar.
2. Click on data sheet.

Double click the position settled on date sheet. The position window will be shown.

View the menu right clicking CH1, select "SERVO".
4. Inspection of motion (connecting the servos)

Connect the servo which settle the starting position to CH1.

Take a look if the servo works sliding the CH1's bar.

5. Settle the starting position

Slide each bar and settle each starting position.
The starting position of almost every servos is "0".
Some servos have to be settled at other point.

- This starting point is just for the beginning use of RCB-3J.
  It is possible to not work correctly if it has been settled again after assembly.

### STARTING POINT OF EACH CHANNEL

<table>
<thead>
<tr>
<th>CH1</th>
<th>0</th>
<th>CH8</th>
<th>0</th>
<th>CH17</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH2</td>
<td>0</td>
<td>CH11</td>
<td>0</td>
<td>CH18</td>
<td>0</td>
</tr>
<tr>
<td>CH3</td>
<td>0</td>
<td>CH12</td>
<td>0</td>
<td>CH19</td>
<td>90</td>
</tr>
<tr>
<td>CH4</td>
<td>0</td>
<td>CH13</td>
<td>-90</td>
<td>CH20</td>
<td>0</td>
</tr>
<tr>
<td>CH6</td>
<td>0</td>
<td>CH14</td>
<td>0</td>
<td>CH21</td>
<td>0</td>
</tr>
<tr>
<td>CH7</td>
<td>0</td>
<td>CH15</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The values do not mean the degrees.
It is the value that set at the "POS" window of the software.
FIT THE SERVO ARMS - ARMS & THIGH -

PREPARATION
* BRACKET B UNIT (ASSEMBLED) 6 units
* SERVO ARM 700A (UPPER) 6 units
* SERVO ARM 700A (LOWER) 6 units
* FLAT HEAD SCREWS 12pcs

CONNECT THE SERVOS

INSTRUCTIONS
1. Settle the starting point of servos.
   (Refer p.26 - 28)

2. Fit Servo Arm 700A (Upper) on Bracket B unit and take the Servo's connector of RCB-3J off.
   Tight both Servo Arm upper and lower with Flat Head screws.

3. MOVABLE RANGE
   (1) Starting point
   (2) Limit of movable range (Left side)
       Turn the Servo Arm to the left slowly, it will stopped like the figure.
   (3) Limit of movable range (Right side)
       Turn the Servo Arm to the right slowly, it will stopped like the figure.

Make 6 units.
1. Settle the starting point of the servo. Set the value on CH1’s slide bar. Connect the servo to RCB-3J.

   CH13: -90  CH14: 0
   CH19: 90   CH20: 0

2. Fit the Servo Arm (Upper) on the Leg unit, and take the connector of RCB-3J off.

   Tight the Servo arm (Upper and Lower) with flat head screws.
It is important to confirm the movable range of each servo. Servos will not work at correct position if there is any mistake regarding to settle the starting point or fitting of the Servo Arms.

3. Inspection of movable range

(1) Starting point
   Set like the figure with hand.

(2) Limit of movable range (Left side)
   Turn it to the left, and then it will be stopped at the point of the figure.

(3) Limit of movable range (Right side)
   Turn it to the right, and then it will be stopped at the point of the figure.

⚠️ While setting the servos, take the wire off from RCB-3J. Servo Arms will be broken if the power turned on.

⚠️ In case of turning the Servo Arms with force, some contents of the servo will be broken. Please turn it carefully.
**INSTRUCTIONS**

1. Settle the starting point of the servo.
   
   Set CH1’s slide bar "0", and connect the servo to RCB-3J.

2. Fit the Servo Arm (Upper) on the Foot units, and take off the connector of the servo from

3. MOVABLE RANGE
   
   (1) Starting point
   
   Set the servo arms as the figure by hand.

   (2) Limit of movable range (Left side)
   
   Turn it to the left, and then it will be stopped at the point of the figure.

   (3) Limit of movable range (Right side)
   
   Turn it to the right, and then it will be stopped at the point of the figure.

   **In case of turning the Servo Arms with force, some contents of the servo will be broken. Please turn it carefully.**
3. (1) Confirm the Arm Base's form.
(2) The joint should be connected such as left figures from (2) to (4).

Warm with the hair dryer if the piece is hard to fit.

4. Tight with the 2.6-8 Tapping screws Arm Base, Upper Arm and the Joint of Lower arm.

The joint part between a servo arm and a joint is tight because of higher stiffness. Please take care not to injure your finger and nails.
SETTLE THE SERVO ARM - BODY -

INSTRUCTIONS

1. Settle the starting position of the servo.
Set at neutral value, and connect to RCB-3J. Fit the Servo Arm (Upper) in it.

2. Pull the connector of RCB-3J, and fix the Body unit and Servo arms with Flat head screws.

3. Fit the Arm base into the Body unit, and fix it with 2.6-8 tapping screws.

4. MOVABLE RANGE
   (1) Starting point
       Set the servo arms as the figure by hand.

   (2) Limit of movable range (Left side)
       Turn it to the left, and then it will be stopped at the point of the figure.

   (3) Limit of movable range (Right side)
       Turn it to the right, and then it will be stopped at the point of the figure.

PREPARATION

* BODY UNIT (ASSEMBLED) 1 unit
* SERVO ARM 706A (UPPER) 2 units
* SERVO ARM 706A (LOWER) 2 units
* SERVO ARM 706A BASE 2 units
* FLAT HEAD SCREWS 4pcs
* 2.6-8 TAPPING SCREWS 8pcs
1. Cut out the cable guides.

It is better to cut with nipper and file sharp points.

2. Put the cable guide on the Servo Arms.
   Refer the photo below.

1, 2, 3, 4: Put it when the arms have been finished assembling.

7, 8, 9, 10, 11, 12: Put it when the legs have been finished assembling.

5, 6: Put it when the whole assembly finished.

* Five wires can be bundled at max.
LEGS' ASSEMBLY

PREPARATION

- BRACKET UNIT CH12 (ASSEMBLED) 1 unit
- BRACKET UNIT CH18 (ASSEMBLED) 1 unit
- LEG UNIT L (ASSEMBLED) 1 unit
- LEG UNIT R (ASSEMBLED) 1 unit
- FOOT UNIT L (ASSEMBLED) 1 unit
- FOOT UNIT R (ASSEMBLED) 1 unit
- 2.6-8 TAPPING SCREWS 8pcs

INSTRUCTIONS

1. Put the seal on each wire.

2. Bundle the wires with cable guides loosely. (three points)
ARMs' ASSEMBLY

PREPARATION
* BRACKET B UNIT (ASSEMBLED) 4 units
* HAND L 1 unit
* HAND R 1 unit
* 2.6-6 TAPPING SCREWS 4pcs
* 2.6-8 TAPPING SCREWS 4pcs

INSTRUCTIONS
1. Put the Bracket B unit on the Hands (L & R) with 2.6-6 tapping screws (2pcs).

2. Insert the Arm units into the Arm Base of Bracket B unit, and fix it with 2.6-8 tapping screws (2pcs). Put the seal on each wire.

3. Put the cable guides referring the photo below. Fix the wire loosely to not disturb the servo's movement.
1. Settle the starting point of the servos. Set point "0" on CH1's slide bar, and connect the servo to RCB-3J.

2. Fit the Arm supporter and Low height servo hone into the Body unit, and pull the connector out of RCB-3J. Fix the Low height servo hone with 2.6-6 tapping screw (1pc each).

3. Fit the Arm Base into the servo hone with M2-5 screws (4pc each). The front will surface the outside like figure.

4. MOVABLE RANGE
   (1) Starting point
       Set the servo arms as the figure by hand.

   (2) Limit of movable range (Left side)
       Turn it to the left, and then it will be stopped at the point of the figure.

   (3) Limit of movable range (Right side)
       Turn it to the right, and then it will be stopped at the point of the figure.
**PREPARATION**

- SERVO MOTOR KRS-788HV (WIRE'S LENGTH 300mm) 1unit
- TOP COVER 1unit
- CONTROL UNIT 1 unit
- LOW HEIGHT SERVO HONE 1unit
- FLAT HEAD SCREWS 1pc
- M2-4 SCREWS 4 pcs

**INSTRUCTIONS**

1. Put the seal on the servo's wire, CH1.

2. Settle the starting point of the servo.
   Set the CH1' slide bar "0", and connect the servo to RCB-3J, CH1.

3. Fit the Low height servo hone in the servo with flat head screw like figure.

4. Fix the Low height servo hone & top cover with M2-5 screws.

5. MOVABLE RANGE
   (1) Starting point
   Set the servo arms as the figure by hand.
   (2) Limit of movable range (Left side)
   Turn it to the left, and then it will be stopped at the point of the figure.
   (3) Limit of movable range (Right side)
   Turn it to the right, and then it will be stopped at the point of the figure.

6. Pull the power switch Harness of Control unit.

7. Fit the power switch into the top cover.
1. Fix each parts with 2.6-8 tapping screws like figure.
1. Fit the control unit with M2-5 screws like figure.
1. Fit the head sliding to the body like figure.

2. Insert the power switch's connector to RCB-3J.
WIRING TO THE CONTROL BOARD

Insert the connectors to each terminal on RCB-3J.
The channel number is written in seals put on the wires.

The black wire will be outside of the board.

Bundle the wires like orders of left picture.
Also arrange it in order like the picture below.

As each wire has been inserted to RCB-3J,
bundle the wires with nylon strap like picture above.

Fit the extra cable into the high speed Serial terminal.
It will be easy to connect the Serial USB adapter later.
1. Eliminate the oil on the back side of Front cover with neutral detergent or alcohol.

2. Dry the Front cover well, and paint the back side with the spray paint.

⚠️ Be aware with a ventilation of the room.
Do not use fire near.

3. Dry it well again, and cut the Front cover like figure.
Cut the dark color part.

⚠️ Filing the section to finish neatly.

4. Make four halls with tapping screws.
FITTING OF THE BOARD COVER

PREPARATION
* BODY (ASSEMBLED) 1 unit
* BOARD COVER 1 unit
* 2.6-6 TAPPING SCREWS 4pcs

INSTRUCTIONS

1. Fit the board cover onto the PCB base.
   Put the wires away in the board cover to not get caught like the picture below.
FITTING THE BATTERY

PREPARATION

* FRONT COVER 1 unit
* BODY PIN 3 pcs
* SPONGE 1 unit
* HV BATTERY 1 unit

INSTRUCTIONS

1. Cut the sponge in half, and peel it off a seal mount. Stick it on the Body Flame to cover the screws.

2. Connect the battery to the power switch.

3. Fit the Front cover on the Body Post.

4. Put body pins on the Body Post to fix the Front cover.

Be aware not to get caught the wires.
SETTING THE HOME POSITION

1. Start up the software as the same process of the starting point.
   Start up the RCB-3J.
   Make the icon "POS" on the data sheet.

   Double click the icon "POS", and open the window.

   Right click the channel you use, open the menu and select "SERVO".
   Once you move the scroll bar, it will be available.

   As moving the scroll bar, the servos will work. Please be aware not to touch during the settlement.

   Set the all channels you will use.
   Select the "SERVO", move the scroll bar and input "0".
SETTING THE HOME POSITION 2

The robot's style should be that like the figure with the settlement of the last page.

Right click on the data sheet, and select "To be a Home Position". Close the POS window.

(2) Adjust the Home Position as it is.

Click the yellow bird to adjust the position. Open the window for adjustment (HomeDlg).
SETTING THE HOME POSITION 3

Adjust each servo's position with HomeDlg. Home position means that stands up straight. It’s important essential to execute the motion. Especially the both legs have to march to walk correctly.

<table>
<thead>
<tr>
<th>CH1</th>
<th>CH2</th>
<th>CH3</th>
<th>CH4</th>
<th>CH5</th>
<th>CH6</th>
<th>CH7</th>
<th>CH8</th>
<th>CH9</th>
<th>CH10</th>
<th>CH11</th>
<th>CH12</th>
</tr>
</thead>
<tbody>
<tr>
<td>-60</td>
<td>-30</td>
<td>-15</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-15</td>
<td>-30</td>
<td>-60</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

It saves automatically in closing the window.

It’s just an example window. The number should be changed depend on the assembly’s condition. The both soles have to same position to the robot work with stable.

The axis of the legs’ servo should be lined up straight.

There is a hole called "Neutral gauge" in each flame. It can be found the aim the neutral position matching the gauge and the Arm’s projection.
EXECUTE THE SAMPLE MOTION

The settlement of the Home Position is completed now, however there is not any information to work the robot yet. Also it does not go to the Home Position just with the power because of the RCB-3J’s specifications. Here explains to register and execute the motions.

REGISTER THE START-UP MOTION

Set the start-up motion loading the Sample motion in a CD-ROM.

TO CONNECT

Connect the KHR-2HV to the PC, and also Serial USB Adapter to the PC.

1. Start up the software "Heart To Heart 3J".
2. Connect the battery to the KHR-2HV, and switch the power on.
3. Check "SYNC" at the window.

KHR-2HV looks like be power off. That is to say, every servos are free at initial condition.

LOAD THE START-UP MOTION FROM CD

Click the icon "Open the window" at main window of the software.
Choose the folder "SampleMotion".
Choose the file "2HV000 Start Up Motion RCB".
START-UP MOTION WILL BE SHOWN

Start-up Motion will be shown on the data sheet like the figure.

MODIFY THE START-UP MOTION

Replace the last position of the start-up motion to the Home Position.
In case you make the Home Position same to the manual, it does not need the modify.

"POS1" window like the right figure will be open with clicking "HomePos" icon.

Clicking the icon, the data will be changed to the Home Position you have set.

* If the process would be correct, all servo's value should be "0"(zero).
Close the window as confirm the value.

FILL OUT THE MOTIONS

The motion data should be filled out to the board to execute the motions.
Click the icon to fill out the data, and the dialog will be shown.

Here fills out into M80 as an example.

It explains to fill out into M80 just as example. You can choose whichever you would like.
**REVIEW THE DATA**

Click the data table icon, then the right window will be shown and you can find all the motion data of the board.

Click the play icon, and the dialog that designates the data No.
If you click OK, the motion will be executed.

Click the halt icon, the motion can be made to a halt.

Click the stop icon, the motion can be stopped.

* The contents should be used when switch the power on with the servos free.
  In case of the Home Position (working the servos), the motion will not be recognized.

**WORK AUTOMATICALLY WITH THE POWER**

RCB-3J CONTROL BOARD CAN WORK THE DESIGNATED MOTION AUTOMATICALLY WITH THE POWER ON.

Click the option icon, then the Option window will be opened.

At the subject "Play the Motion Scenario with the power", choose the start-up motion that has been registered.
Closing the Option window, the settlement will be fixed.

**PRACTICE THE START-UP MOTION**

As the registration has been completed, turn the power off. And turn it on again.
If the servos moves to the Home Position, the registration is success!
THE CONSTRUCTIONS OF START-UP & SAMPLE MOTION

Start-up motion's first designation is FREE to whole servos. KRS-788HV servo motors cancel the control, and, the other hand, it transfers the axis's position to the board. The board registers the first position as standard one.

Before moving to the last position (Home Position. (Refer p.51)), the standard position and the speed will be the one registered at first transfer to the board.

The start-up motion's registration is a basic process that you have to know to work other sample motions or make some motions by yourself.

Refer the processes below.

1. Right click on the data sheet.
2. Choose all the subjects.
3. Right click
4. Delete (or type the Del key)

Drag & drop the file shown from software, on the data sheet.
Open the file you made by yourself.

* If you read a motion data from a file during motion edit, the data will append to current motion, however if you read a motion data from a board, the current data will replace to read motion.
SETTING THE ICS

It occurs that the servos do not stop to the vibration in the setting of Home Position or Start-up motion. It can be resolved with changing the characteristic of the servos as connected the servos to the RCB-3J.

WHAT IS ICS?

ICS (Interactive Communication System) is a function that modifies or acquires the parameters with communicating the servo motors to the control boards.
This instruction’s ICS function is ; Make the servos be FREE, Make the pose you prefer, Make the position’s data getting from each servo.

To work the characteristic change, it has to register 3 types of motions in each servo, and make the change as the need.

SETTING

1. Turn the KHR-2HV on, and connect it to the PC.

2. Click icon “Option”, and open the window like the figure.

3. Check the actual channel that connected to the servo at subject “ICS function”.
ICS is available with the checked channel.
Close the Option window.

The setting will be available with the first setting.

4. Click the icon “ICS setting”.

As the window opened, turn the power off.
And turn the power on again.
If the red LED turns on, ICS is available with RCB-3J.
(The light will turn on just in the beginning.)
5. Click the icon “Load the window for ICS’s setting”, and loads the parameters of each servo.

In case the parameters cannot be read, please confirm the ICS’s settlement. The error message will be shown.

6. Click CH1, and open the window that settle the parameters. Change the pulse stretch SET1 to "3(MID)".
   Also change other channels settlement as same. (CH2, 3, 4 ... etc)

PULSE STRETCH’S VALUE

Pulse stretch settles the characteristic of stability. (Initial value: five). The stability gets stronger as the value gets higher, but same time hunching will be occurred when a load is low.

In case of stand-up straight KHR-2HV, reduce the pulse stretch the head and arms where the load is low.

7. As the settlement of the needed channels have been finished, close the ICS window.
   It needs to turn the power off and start up again.

Change the communication mode of the servos in case of using ICS when the power turns on. It needs to reboot the software to be ICS mode and in case of closing the ICS window to change to the normal working mode.