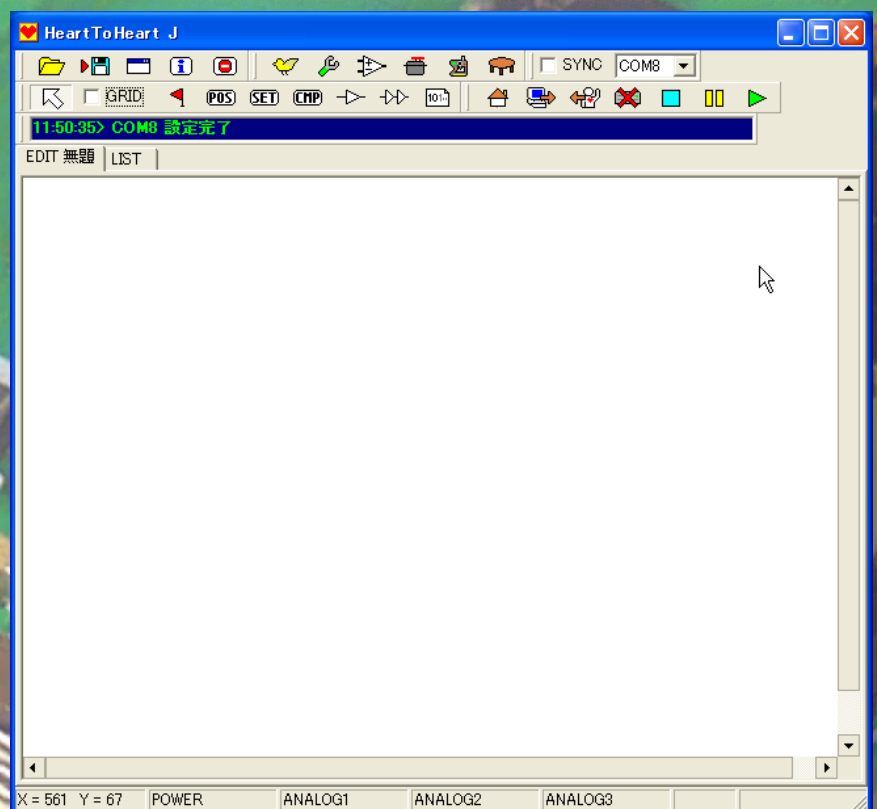


Control Board

RCB-3J Hardware Manual

for **RCB-3J** board management software

HeartToHeart3J Instruction manual



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INTRODUCTION

RCB-3J is the 3rd generation control board for robot.

Many functions are added as a standard board of KHR-2HV attachment, and it is more user-friendly than the type before.

This manual explains the way to use new control software “HeartToHeart3J” and how to connect RCB-3J. Please read carefully together with other manuals.

Furthermore, if you use with KHR-2HV, since the assembly instruction manual explains the procedure for KHR-2HV, Please read that first.

This instruction manual might not be the same procedure for KHR-2HV.

Orders of Manual

Explanation of RCB-3J Hardware

Here the things about hardware would be explained, such as connection method of RCB-3J. Options, or peripheral devices which you can connect, would be also explained.

When you use RCB-3J for the first time, please read from here correctly without failure.

Explanation of HeartToHeart3J software operation

Software

Each function of the software is explained in detail. Please read it when you search the name of parts and the basic way to handle the software.

Primer

Basic items are explained, such as basic operation of software or simple motion compilation.

HeartToHeart3J is the software for RCB-3J, but even the beginners who use it for the first time can operate it intuitively and GUI interface is adopted extensively, which is better than the procedure of making motions from enumeration of the data. Act that the enrollment compilation is read, please understand basic operation method.

With this primer, you can understand basic operations.

Guide for the intermediate

Book for middle class, in addition to the operations explained in the primer, we explain how to playback motions with the gyro sensor or the radio.

You can do almost all operations which were done with the former control board, when you understand this guide for the intermediate level.

Further high-level usage is introduced on our company web sight.

Sample motion and further high-level sample will be carried, and so please check it.

In addition, please read the support page concerning this manual and the update information.

<http://www.kondo-robot.com>

- We might update the contents of this book without any notice for revise of the goods. We might also update the software without an advance announcement.
- We put the software included in the product on view to public as free ware, provided the software is used with our products. However, Kondo Kagaku Corporation has copyright and all legal rights. The reverse engineering behavior like distribution, release and disassemble is prohibited.
- The company name and trade name inside this book are registered trademarks of the respective company.
- This product is designated to be used in Japan. To bring it abroad, the approval or the notification based on related laws might be necessary.
- The software included in this leaflet can be used with Windows2000 or XP of Microsoft corporations. This does not include the operation under the emulator environment by the hypothetical software.
- RCB-3J is to be used for KHR-2HV. Our servo-motor for the robot is also usable, but sometimes there is restriction on some functions.
 - * ICS2.0 is specified to KRS-4014HV and 4013H, but it has not yet corresponded to RCB-3J, you cannot set ICS on the board with RCB-3J.
- Company service section is in charge of the after-sales service of this product just as KHR-2HV. In addition, in the same way, we accept your inquires through telephone or E-mail.
(support@kondo-robot.com)
Notice: In case of inquiry through e-mail, it might take time to answer.

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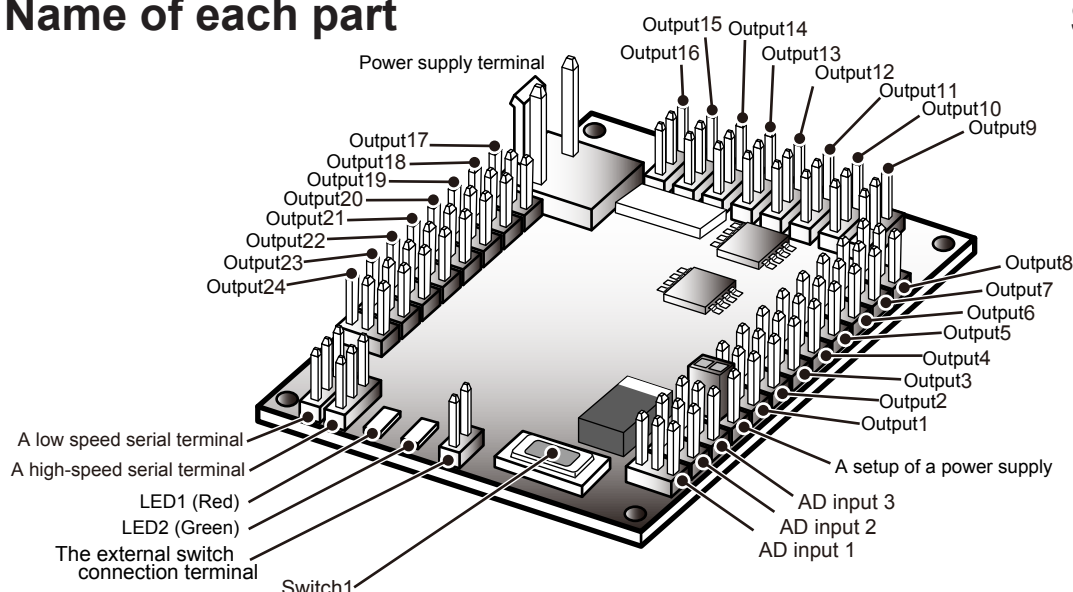
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Characteristics of RCB-3J

RCB-3J was developed as a control board for the third generation robot.

- M16C manufactured by Renesas Technology Corp. is adopted in the CPU. High-speed execution of order is realized.
- A 24 ports are equipped as output ports. It can be also set up as PMW signals or as IO ports which can output H/L. They cope with the various ways of using.
- It corresponds to the control by the communication form of these 2: the high-speed serial port which can communicate with 115200bps, and the low speed serial port which KONDO-made wireless control unit receiver can connect.
- 3 ports are equipped as analog input ports. It is possible to do mixing by analog input signal from outside, and to execute motions by the conditional branching.

Name of each part



Specifications

Dimension : 35 × 45 (mm)

Maximum height 14.5mm

Weight: 12g

Interface (input and output)

Output terminal 24

* PWM output, H/L output and ICS Control can be set up.

Input terminal

A high-speed serial terminal 1

A low-speed serial terminal 1

AD Input terminal1 3

Capacity

Maximum number of motions 80

Maximum motion base number 255(*)

*It may be different a little according to the contents to make.

The number of scenarios 5

Scenario capacity 200 (motion regenerated times)

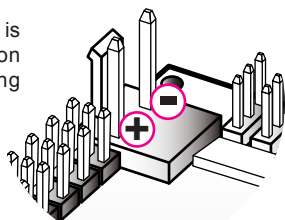
Operating voltage 9-12

It corresponds to a 6V power supply by using booster 3.

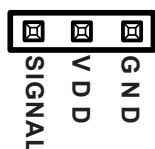
The specifications of the connection terminal

Power supply terminal

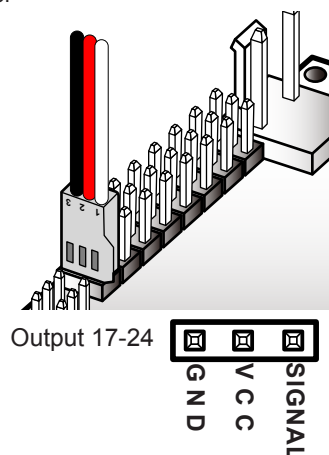
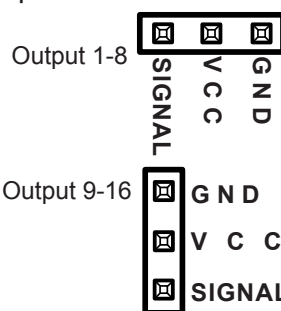
The polarity of the power supply terminal is shown in the figure. Please pay attention to the polarity when you use something additional connectors.



AD Input terminal



Output terminal



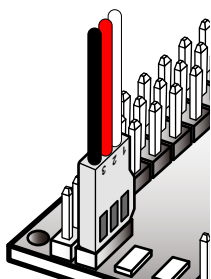
5V power supply stabilized on the board is being output to the VDD terminal of the AD input terminal. It is possible to supply about 50mA together with 3 terminals.

Output terminal is directed to be negative in outside of the board. VCC is connected the positive (+) terminal of the power.

Signals of CPU (PWM, serial, H/L etc.) are 0-5 V.

A high-speed serial terminal

The high-speed serial terminal is possible to connect the ICS-PC interface 2 attached to old model of RCB-1, in addition to attached Serial-USB adapter. Before using, please confirm the COM port number recognized by the personal computer. As for the high-speed serial terminal, the black line is connected to GND, and other two lines are signal lines.

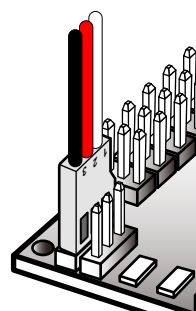


A low speed serial terminal

A low speed serial terminal is possible to be connected to KRT-1 and KRI-1.

(KRT-1 is a receiver of radio control units; KRI-1 is connected to KRR-2 attached to KRT-2)

The black code of the low speed serial terminal is GND, and the red one is The power supplying code from RCB-3J to the receiver connected, and the white one is signal lines.



How to turn on

RCB-3J does not have the power switch on the board or in the terminal.

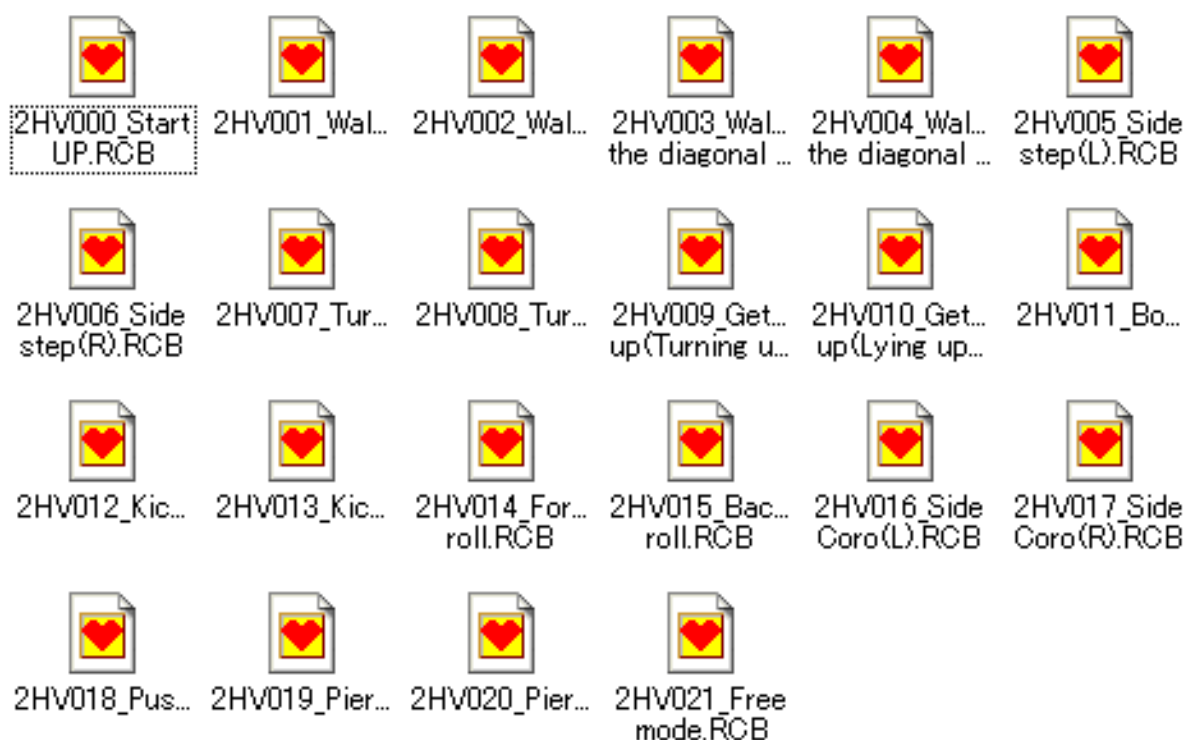
ON/OFF of the power supply could be done by setting and removing power source to the connector. The cable with the switch for the power supply connection is attached and it is used for KHR-2HV.

Please refer to a KHR-2HV assembling manual for this connection.

Sample motions

The CD-ROM of the HR-2HV accessory has the 22 sample motions.

Each motion is designed to conform when it is assembled under the state of standard of KHR-2HV. However, please keep in mind that you might need to modify some motions under some condition of assembling as it is an assembling kit.



Install

Installation of the serial USB adapter

Before installing software, you must make your PC recognize a serial USB adapter. Please see the manual of the serial USB adapter, and do installation.

The installation of software

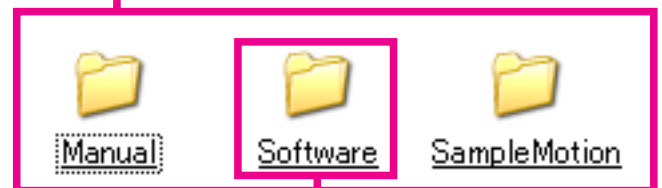
Install the software with the following process.

You just copy a required file as it does not have an installer.

- 1** When an attached CD-ROM folder is opened, you can see the folder as the figure to the right. Please open 'KHR-2HV' from this folder.



- 2** Then another 3 folders can be seen and please open the "Software" folder.

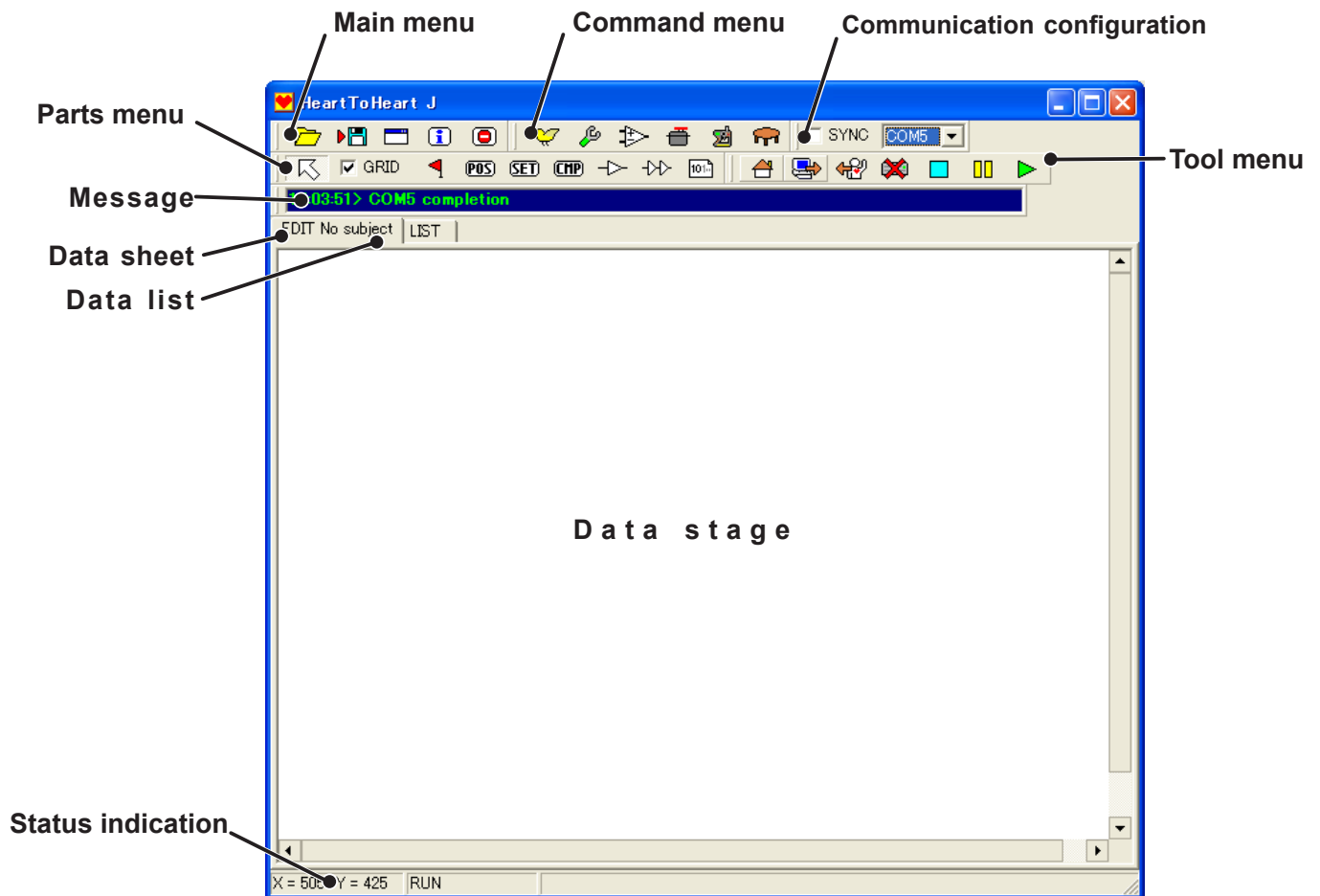


- 3** "HTHJ.EXE" in this folder is the file of software. Copy this file to the hard disk of the personal computer.

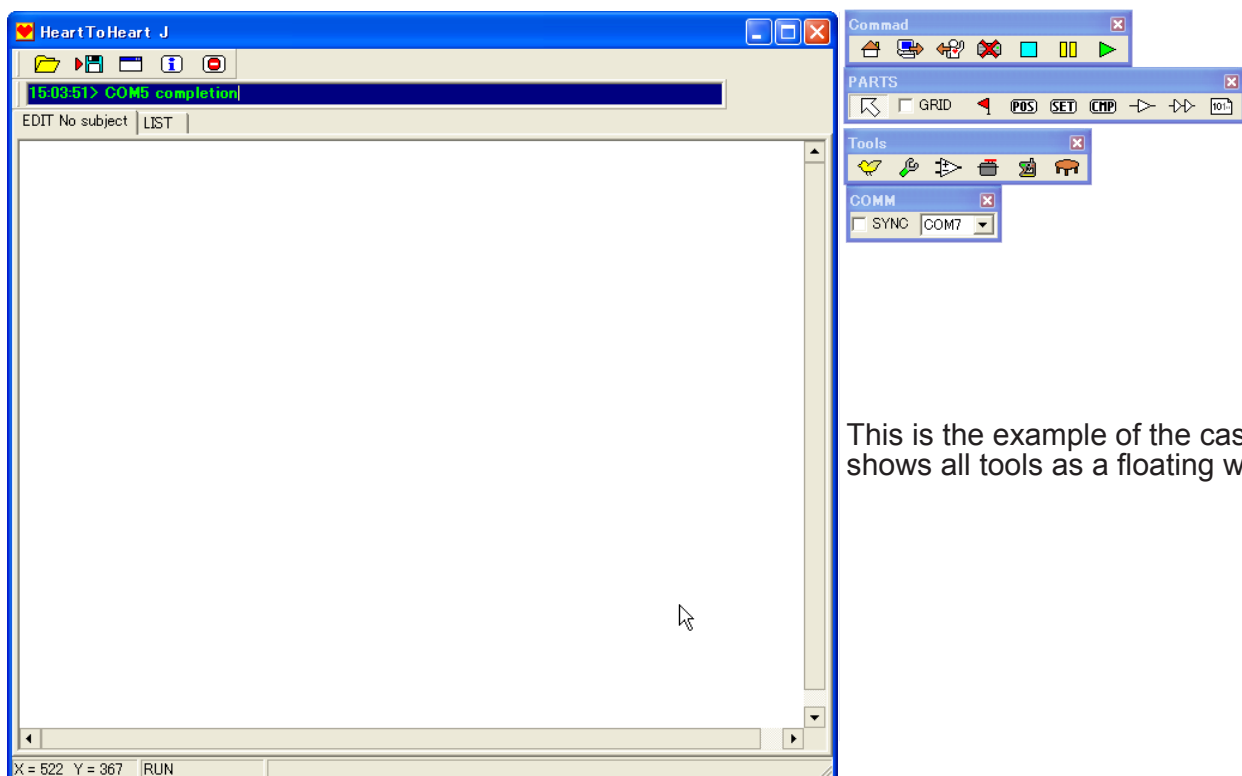


SOFTWARE

The start of software

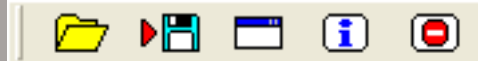


When you start software, the window like above is indicated. Please check the name of each part of software from the figure above. An icon to use for operation is divided into 4 groups, which are possible to use as a floating window by operating drag and drop, except for the main menu.



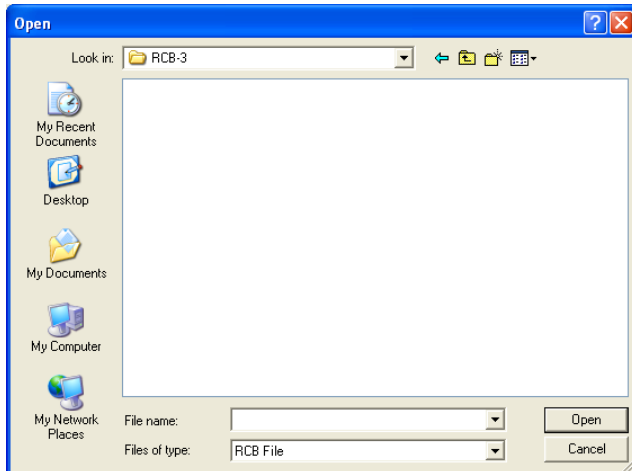
This is the example of the case which shows all tools as a floating window.

Main menu



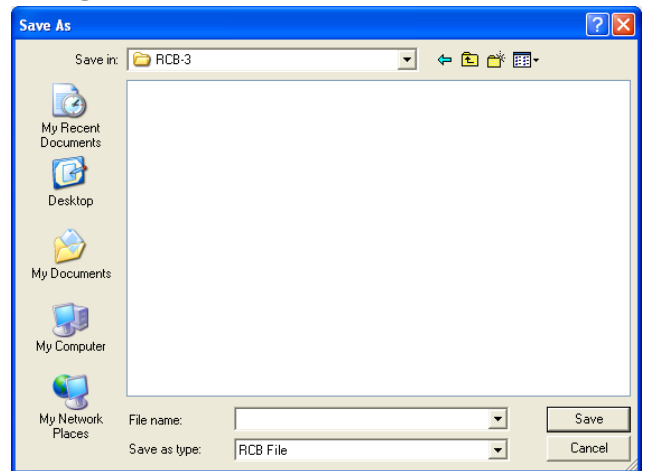
Loading

Please use this when saved data are loaded, clicking it, a dialog box opens, and you can select the files.

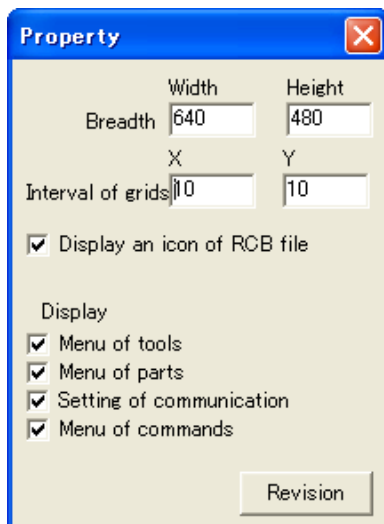


Saving

Save present data. You can give a file name to the data when you save.



Configuration



Set up moving environment

Area: The size of the data sheet can be changed by modifying this numerical value.

The interval of the grid : The minimum interval with which an object is arranged to the data is specified.

By putting a check in "Set up the file icon of RCB", a data file is indicated with a special icon for the preservation of the file and reading.

Indication: The checked menu icon group is indicated.

When you push a "renewal" button, the setup is effective.



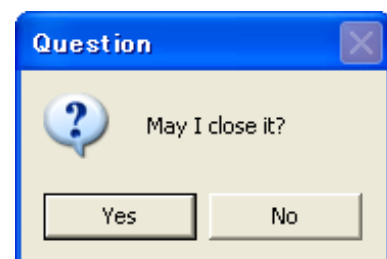
Information

It indicates the version information of software. It closes when you click on "x" button of the upper right, or click on the main window.



Ending button

Software is finished by clicking on this icon. When it is finished, the dialog box for confirmation would be indicated.



Tool menu

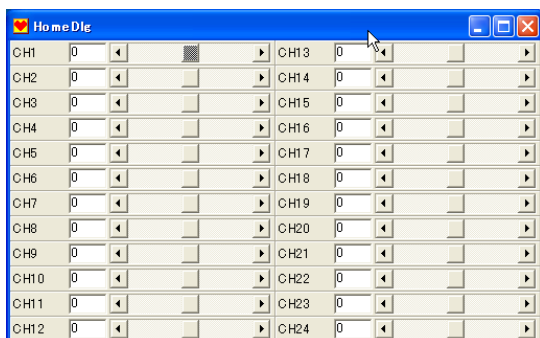


If RCB-3J isn't actually connected, a tool menu doesn't work. Please use this function after you connect RCB-3J first.



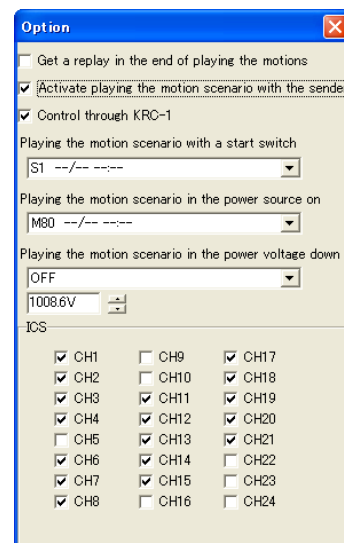
A setup of a trim adjustment option

It adjusts a home position of each servo correspond with the 24 output terminals.



Set up of options

It designs the various setups to use RCB-3J.



Analog configuration

There are 3 systems of analog input in RCB-3J. This program sets up a movement from the output of the sensor connected to this terminal.

There are 2 kinds of movements by analog input:

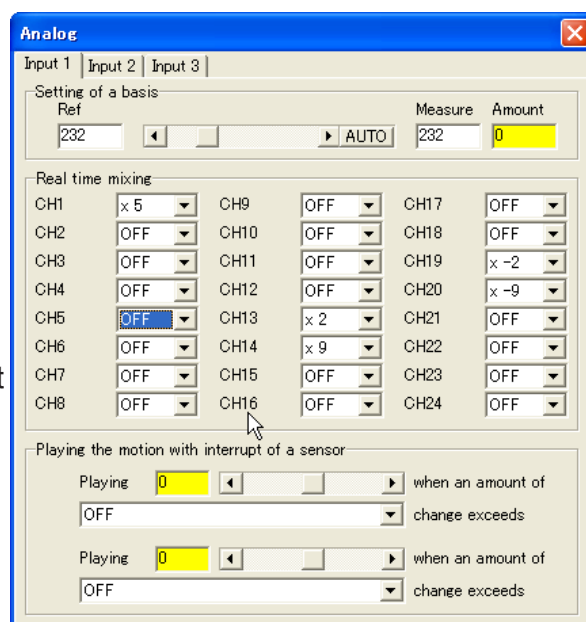
1. real time mixing
2. motion interruption

1. Real time mixing

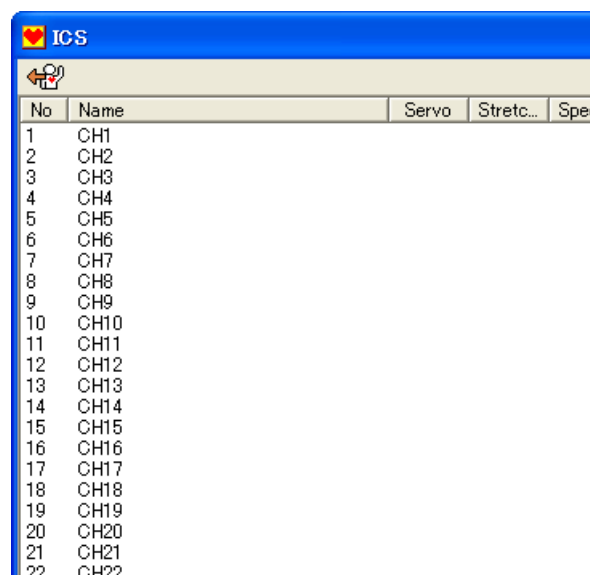
It is the way to add the specified magnification of the input signal to the output terminal. It is used, for example, when you use gyro sensor.

2. Motion interruption

It distinguishes the value of the signal and to execute the motions set up. For example, it could be used in the situation that automatic picking the body up is composed of using the acceleration sensor.



ICS setting



It is possible with RCB-3J to set up of characters by ICS all at once, while it was done directly one by one of the servo individually so far.

It is an ICS setup window that does this setup.

When you push ICS button and open the window, please do again after the power supply of RCB-3J is cut off once.

Each servo would be a communicate mode by ICS when the power is turned on.

Settings can be read with an upper reading button of the window. When you double-click on each channel, a setup window opens, and you can change the setup conditions of each servo.

You can return each servo to the initial setup conditions in bulk by pushing an initialization button.

If you finish setup, an ICS window will be closed and it returned to the usual mode by turning on RCB-3J again.

Take notice on that, though a servo is a servo for red version, the servo using ICS2.0 is an exception.



Receiver button

In this window you can monitor a signal from the receiver when a transmitter was used.

Though, in case of using a usual button-type (command) transmitter, the 2 byte signal was functioned as a command, in RCB-3J, it is expanded more, and all analog quantities can be allotted to 1 byte signal.



Data table indication

The list of the motion or the scenario in the internal memory of RCB-3J can be displayed by executing reading (using an icon in screen) the data table at present.

RCB-3J does not only have data but also the name of data, date of last update etc.

No	Name	Count	Date	Control
M1		0	--/------	65535
M2		0	--/------	65535
M3		0	--/------	65535
M4		0	--/------	65535
M5		0	--/------	65535
M6		0	--/------	65535
M7		0	--/------	65535
M8		0	--/------	65535
M9		0	--/------	65535
M10		0	--/------	65535
M11		0	--/------	65535
M12		0	--/------	65535
M13		0	--/------	65535
M14		0	--/------	65535
M15		0	--/------	65535
M16		0	--/------	65535
M17		0	--/------	65535
M18		0	--/------	65535
M19		0	--/------	65535
M20		0	--/------	65535
M21		0	--/------	65535
M22		0	--/------	65535
M23		0	--/------	65535
M24		0	--/------	65535
M25		0	--/------	65535
M26		0	--/------	65535
M27		0	--/------	65535
M28		0	--/------	65535
M29		0	--/------	65535
M30		0	--/------	65535
M31		0	--/------	65535
M32		0	--/------	65535
M33		0	--/------	65535

Communication configuration



SYNC Synchronization Switch

The position of the servo operated on software can effect on RCB-3J in real time. In case of the switch 'Off' (When a checkbox is empty), the change could be sent to RCB-3J if you push transmission button after the modification.

* It is the only information such as a position of the present active servo that is effective. The contents of the motion won't be changed.



COM8 A communication port choice

Then please choose the communication port.

A serial USB adapter is recognized as a virtual serial port on the personal computer. Please choose the serial port number of this case.

It can't communicate with RCB-3J if you choose wrong number.

Parts menu



The parts menu is used when you change the choice of the parts to arrange onto the data sheet.



Choice tool

It is the icon to use a choice of parts or moving tool.



Grid

This is the check box to use a grid.

When a check is in, a grid becomes effective, and each part would be arranged onto the grid.



Indication of a starting point

You can specify the start point (what is carried out as the first of all) in each part such as the position (POS) arranged onto the data sheet. When more than one motions exist on the data sheet, it is only the motions having "a starting point start" that is actually executed, which is mentioned this later.



Position

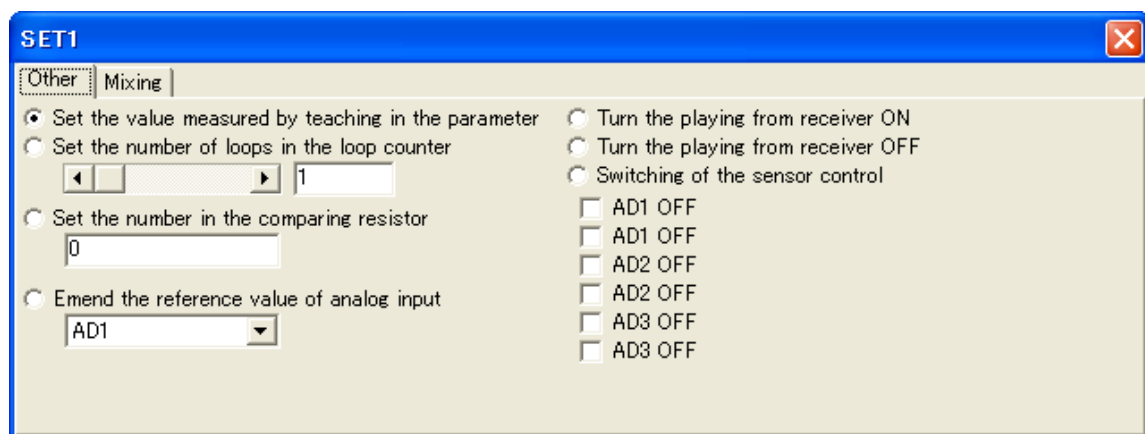
Please use this to arrange the position (the positional information of each servo) on the data sheet. The window for editing would open when you click these arranged parts. It is possible to arrange 30 positions individually onto one data sheet.



Setup value arrangement (SET object)

The following window opens when you double-click the arranged object.

It uses when settings values are arranged onto the data sheet. You can set up the change of the mixing setup, counter (the number of repetitions) of the case of the loop (the execution of the club).



What you have chosen, when it close, would be active in this window.

Set the value measured by teaching in the parameter

The setup possible to instruct in the former position Arrange (FREE and SET1, 2, 3), and it would be the setting values of the present servo. (It serves as a starting point to the next position.)

Set the number of loops in the loop counter

It is combined with CMP (compare), which I will mention later. This would set the initial value of counter to do a loop (repetition processing).

Set the number in the comparing resistor

CMP. This set the standard value for branching by using the value of the sensor.

This is also used by being combined with

Emend the reference value of analog input

When you use analog input, branching would be done according to the change of that input and the standard value of sensor would be proofread.

Turn the playing from receiver ON

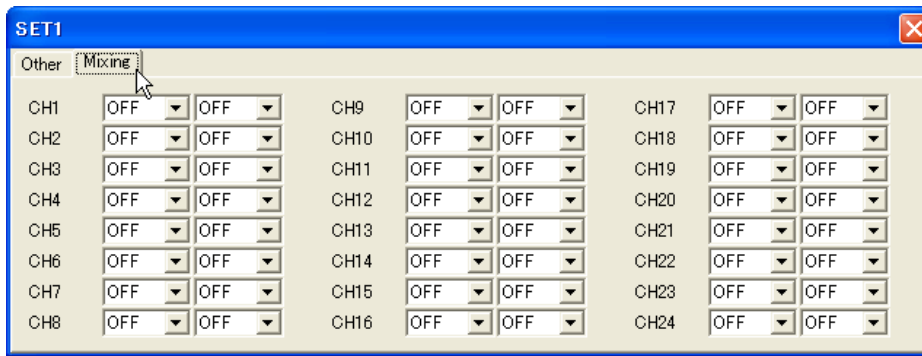
Turn the playing from receiver OFF

When wireless control is used, signal input from the receiver could be ignored temporarily (OFF), or could be returned to effective (on).

Switching of the sensor control

- ☐ AD1 OFF
- ☐ AD1 OFF
- ☐ AD2 OFF
- ☐ AD2 OFF
- ☐ AD3 OFF
- ☐ AD3 OFF

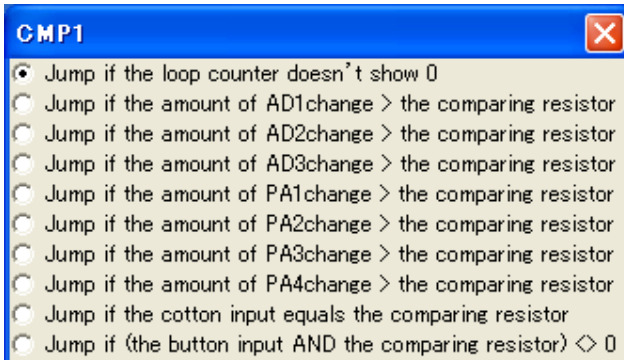
This would change the state of motion start by sensor value for analog input, to be effective or to be invalid. The first sentences of OFF changes depending on settings of an analog input.



In the tab of mixing in setup window, mixing motion by analog input within analog window could be re-defined or be made invalid. For example, the mode of gyro can be modified during the motion.



Compare tool



Please use this when you arrange a setup of branching. A setup of branching is the setup to choose a position to carry out next by the value of sensors (analog input).

The setup of branching is done.

All the setups are indicated as "if ***, jump".

Value is established with a SET object, and a loop counter is subtracted with CMP.

A comparative register is the value set up with a SET object, too.

Button input is command input value from a receiver to use with wireless control.

(It would be the same value as the input of control specified by every motion.)

It jumps if the setup condition is satisfied. Branching connection wiring below would be used for this jump.

* As for the use of CMP and SET, these settings are advanced one. For that reason, using examples will be provided as additional support on the web page of an advanced edition.



Connection wiring

It would be used to connect the position arranged onto the data sheet, a set point, and a setup of branching. You can make continuous motion by connecting the position arranged separately.



Branching connection wiring

Though this is a wiring tool, too, a starting point would always be a branching setup (CMP), which is different from the ordinary wiring.

When a condition is satisfied, the point united by branching connection wiring would be executed.



Compilation tool

The motion data would be sent as numerical value when it is sent to RCB-3J, though a motion is composed of each part arranged onto the data sheet.

When you click on the compilation tool, present data would be compiled, and would be indicated in the data list.

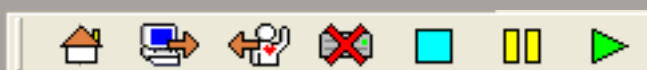
* Normally, it is done automatically when it is written in the board.

HeartToHeart3J makes a position to compose a motion (the movement of the robot) by putting POS on the data sheet.

SET and CMP are used to set conditions of branching and movement.

A motion is completed by connecting the object of these 3 with a wiring tool.

Command Menu



Home position

The condition of RCB-3J is returned in the home position set up at present.
The servo connected would work when you click this icon.

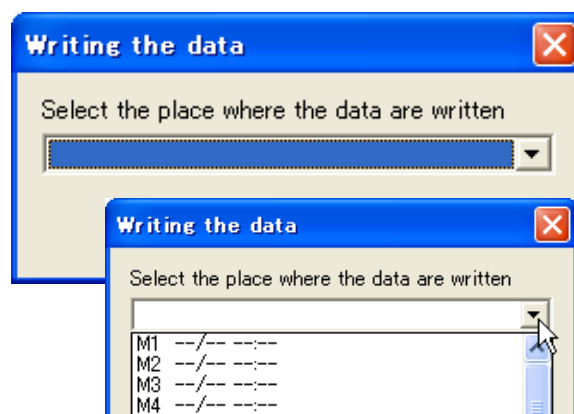


Writing

Write the contents of data to arrange to the present data sheet in RCB-3J.

Please specify the number of motion or scenario when the dialog box of "data writing" opens.

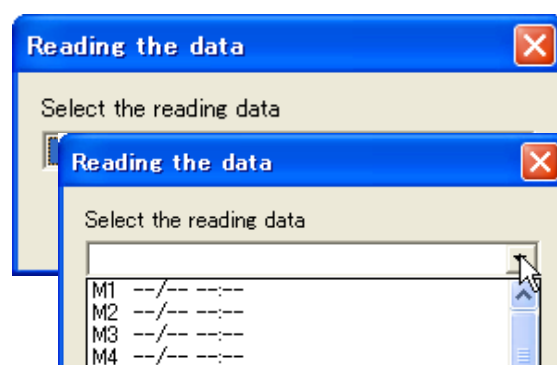
Writing would be done by clicking on OK button of the dialog box.



Reading

This reads and indicates the motion of RCB-3J or the contents of the scenario.

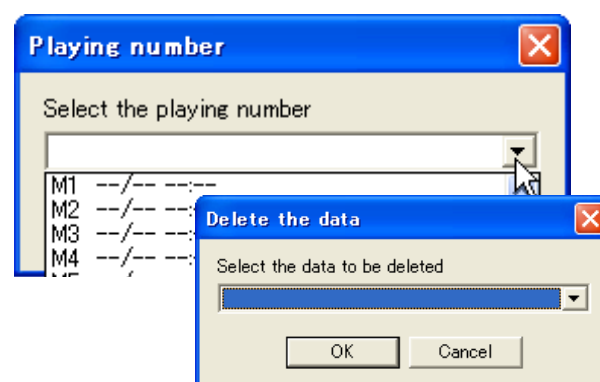
As the dialog box of "data reading" is indicated like the case of writing, specify the number of motion or scenario to be read and then push OK button, and reading is done.



Delete

This deletes (or eliminates) the motion or a scenario written in RCB-3J.

When a data deletion dialog is indicated, please select the motion or a scenario to be deleted and then push OK button, and deletion is done.



Stop

This stops a motion or a scenario being regenerated.



Pause

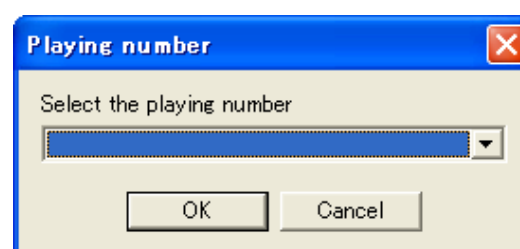
This stops a motion or a scenario being regenerated.
Push a start button again to stop the pausing.



Start

When you click, the dialog box of the regenerated number designation opens.

Specify the number and push OK button, and the motion of the number specified or a dialog box is play backed.



Message

A message for the operated contents is indicated with time.

15:03:51> COM5 completion

15:13:47> There are no data.

Data stage

For a motion and a scenario are made, a data stage has a function like canvas. Please edit actual data when an editing window opens by double-clicking on the arranged parts. The tab above the sheet is used to switch data sheet to list. It is the data (numerical value) of arranged parts which is compiled. The name of the item being edited is indicated in the tab of the data sheet.

Data dialog

A data dialog opens when you double-click on the data sheet.

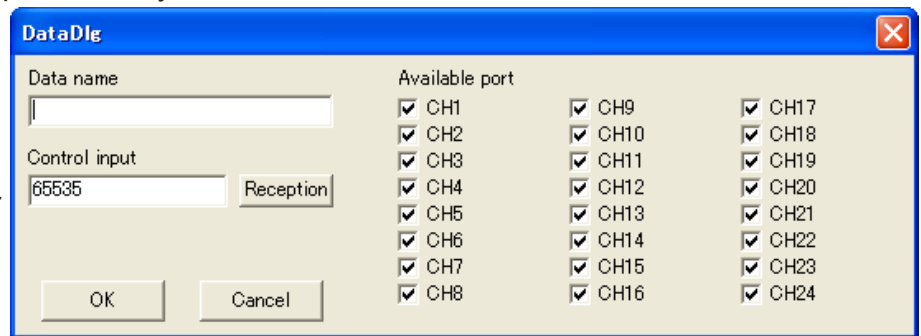
You can use data dialog for setting a data name or the control input (receiver input), and the designation of the using channel.

A data name is indicated in the tab of the data sheet, and this name is used for writing the data in the board.

Input of control shows a signal from a receiver to use wireless control.

Contents can be set up by operating a receiving button under the condition that a transmitter side is being operated.

Though the contents to set up with this dialog overlap with the dialog opening on the data table, there is different point: while the latter is memorized to a board at once, the setting on data sheet is the setup only on the software side.



Object on Data Sheet

Menu would be indicated when you right-click the each parts arranged on data sheet. You can set up the name or the color of item arranged by selecting property and so on.

Lifting selection: Lift the item selection at present

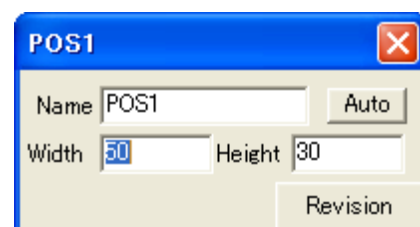
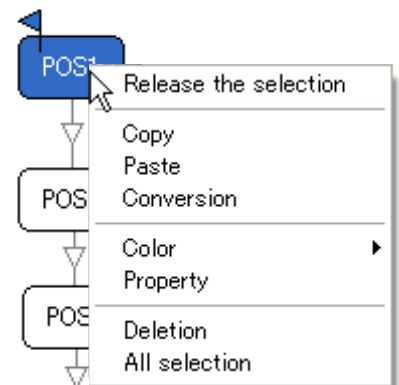
Copy: make a copy

Reproduction: paste the copy of item

Color: change the color of item

Property: the dialog as the right would be indicated and you can set the name etc. on this box.

Delete: delete the item selected



PRIMER

In the primer, we would explain how to make easy motions.

On one hand RCB-3J is multi-functional control board, and, on the other hand, you do not need any complicated setting to make simple motions.

Connect the servo, move it, and decide the initial position (setup of the starting point)

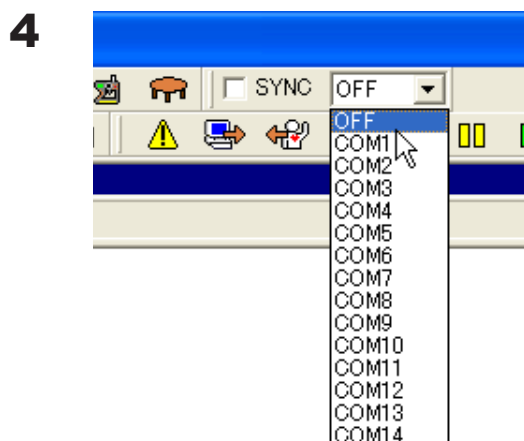
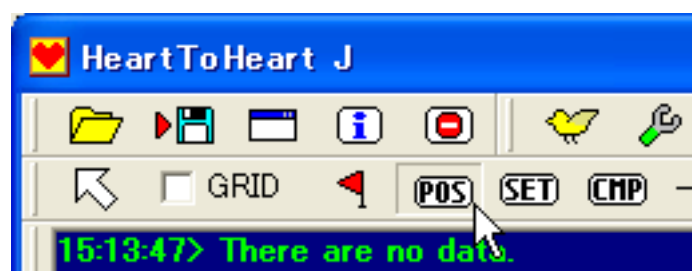
- 1 If you use this for the first time, please install serial USB adaptor and set up the software. Especially make sure the communication port number which you use after installation of serial USB adaptor, since if you use the wrong number, you cannot use the software.
- 2 Connect 1 servo to RCB-3J and connect the serial USB connector. Then turn on. When you turn it on, the green LED would be light for about 2 seconds.

3 Start the software.

If you use it for the first time, the specific message would be shown such as '19:31:35>COM8 set'

The first numbers show time, which reflects the time of your personal computer.

This message means COM8 on serials port is ready to be used now.



Select the number of using communication port.

For example, if you choose COM8, the message would indicate the completion of setup.

15:03:51> COM5 completion

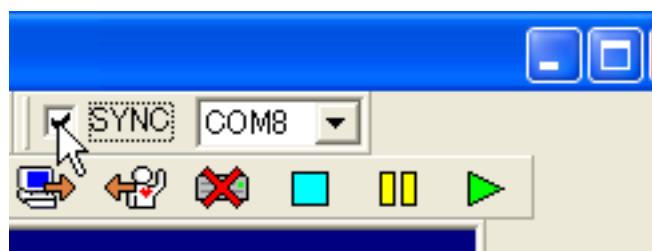
If you select the false communication port or the port which is really used in other applications, please select the right one again.

15:15:44> COM7 does not exist



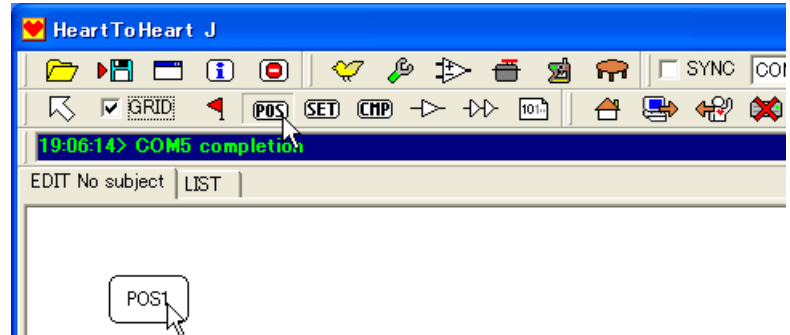
When you couldn't know the port number, please read the manual of the serial USB adaptor and confirm it.

5



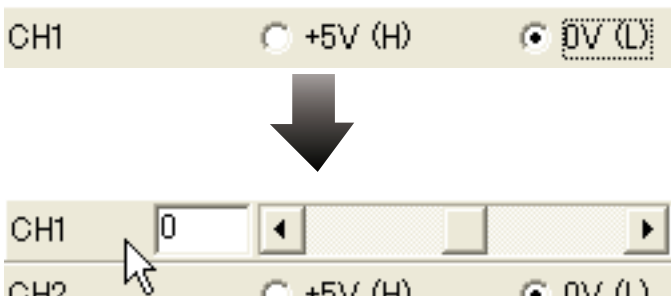
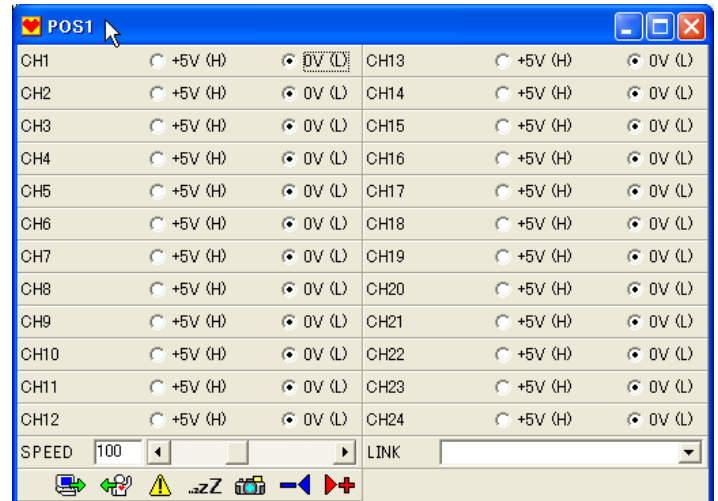
Please put a check on synchronized switch (SYNC) on communication setting, because the operations, such as setting of servo position proceeded on the software, would be effective directly.

- 6** To move servo, put temporary positions on the data sheet.
First, please select 'position' in parts menu and click on data sheet.
Then POS (position) would be made.



- 7** If you double-click the POS arranged, the POS window will open.
All port output of RCB-3J are 0V (L) on the initial conditions.
To activate them, show the menu by right-click on the port panel connected to servo, and change the output to SERVO.

* If you click the false place on application while using POS window, the POS window closes automatically.
When the POS window closes by mistake, please double-click POS and re-open the window, please.



When you set the output to 'SERVO' and move slide bar, the servo connected would be activated.
Be sure that the servo will move with the slide bar of the panel.
Lastly, put the part output axis to the initial place with slide bar and then take off the servo.



* Servo will be activating immediately when you change the output port to SERVO.
Pay attention in case that you attach horn or other parts to servo output axis.

- 8** Now the move of the servo is confirmed.
You can specify the movement confirmation of all the servos and the position of the output shaft of the servo under the initial state by changing a servo and repeating it the process above.
Here, please use only one output, re-connect a servo, and do work here.

What is mentioned here is explained as a method of initial setup point
by the assembling manual of KHR-2HV.
As for concrete contents of a setup, see an assembling manual in KHR-2HV.

Making home position

Home position means the basic posture for making motions. This would be erect posture for usual 2-legs robot.

In the case of putting parts to assemble body to servo's output axis, you need to fix the place of servo output axis as was mentioned before.

Its position depends on its body.

By putting the output place 0, the place can be the center of motion angle of servo. Then you can fix considering the total balance.

1 Before working

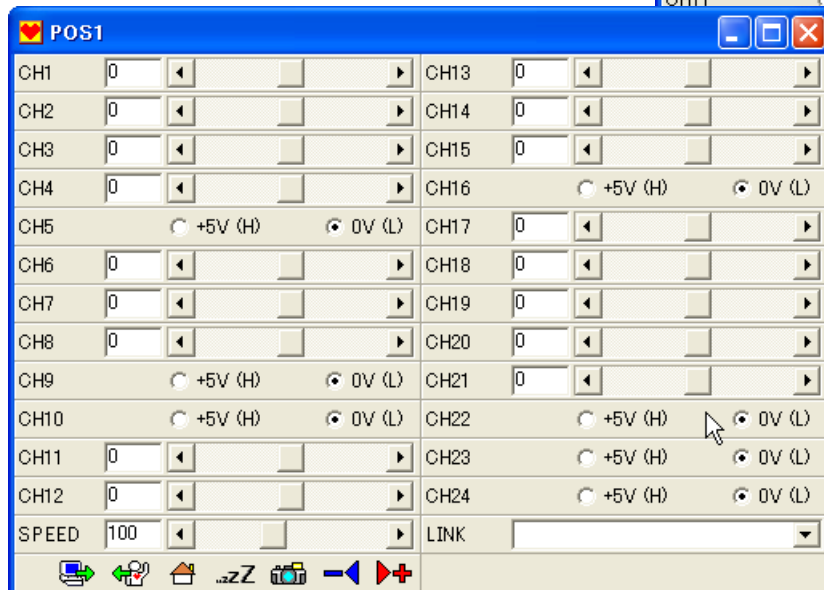
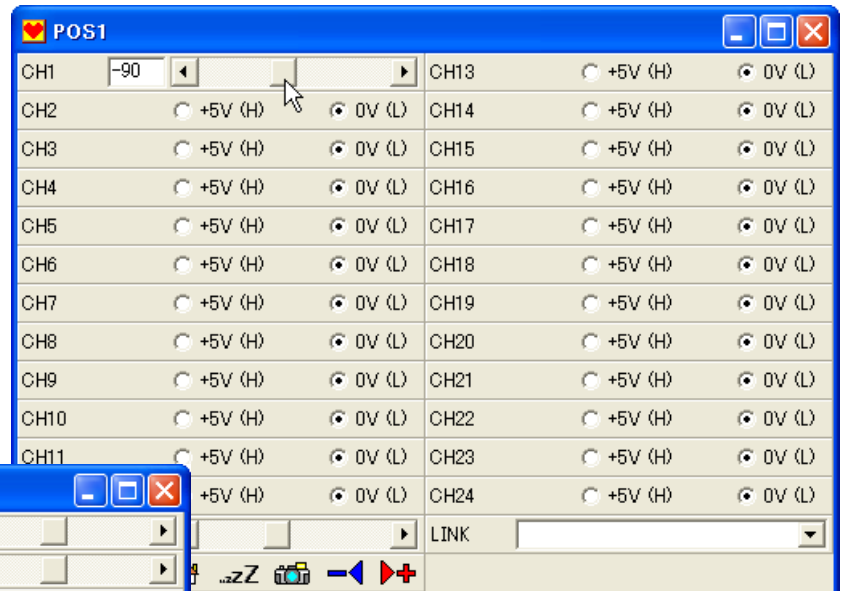
In the preceding clause, all initial conditions are explained. The following section presumes that all servos are connected to the board.

2 Change the output to SERVO

Please change to SERVO the panel of channel connected to the servo of the POS window, one by one.

Pay attention to the servo which is attached to the changed channel, as it began to move.

*the servo won't work if there is no check on the synchronization switch "SYNC" of the main window. Check it again when it doesn't work.



In the left figure, all the servos to use are established in 0. Please close this window when you finish setup.

3 Setting the home position



Click the trim modification button from the tool to open the window.

The home position of the robot is set up by adjusting the slide bar of the applicable servo in this window.

The number would be different depending on bodies.

There is a limit in the range that it can be set up in the setup window of the home position. And, even if it is within that numerical value, there may be a limitation of operating range to make an actual motion in the position window.

Servo display number

Servo actual work number

4 Registration of home position

Right-click on the mouse on POS window, opens a menu, and chooses "default position". Then the present position is registered in the default position.

The registered position can be used at once when you click the main window and default position button of POS window.

In addition, the position registered for the default position becomes a standard for all the motions.

PRIMER

Making start up motion

The startup motion is the setup that makes the body composed of RCB-3J to be in the home position when the power is turned on.

Though RCB-3J does not send a signal at the start, automatic regeneration is possible to make an easy motion and set it up.

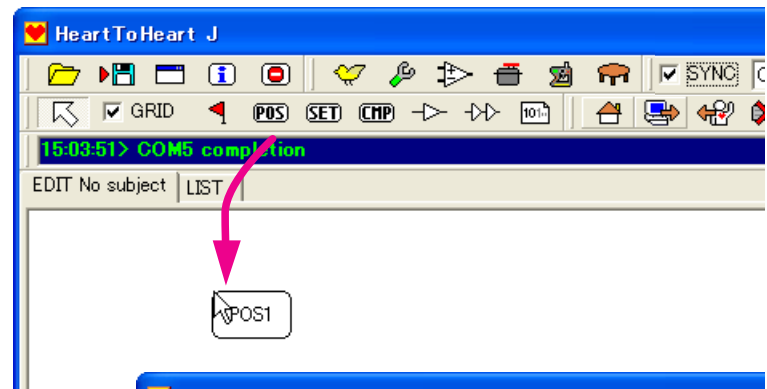
This making process of startup motion premise the completion of making the default position explained the former section. (Moreover, we presume that the servo of the specifications of the RED version manufactured by our company is being used.)

This motion is contained in the attached CD as sample motion. Assembling manual also explains by way of using sample motion.

1 Dispose POS1

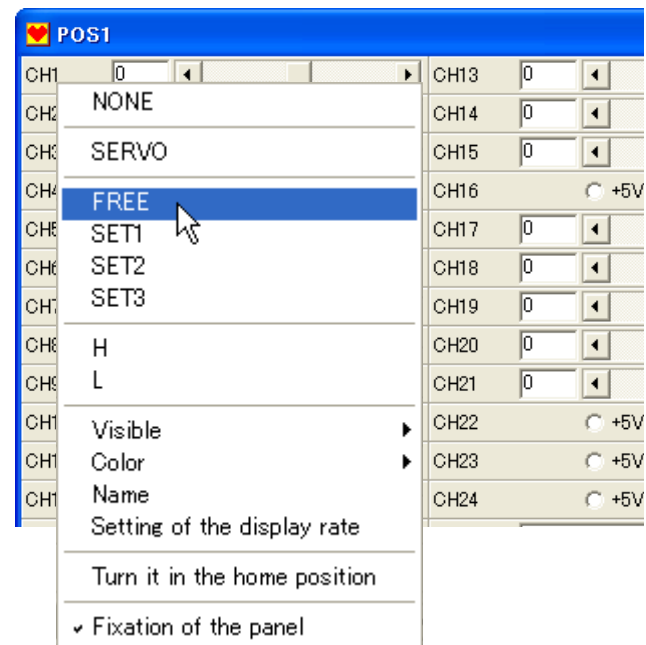
Select POS on the main window and click it on the data sheet to arrange 'POS1'.

*The choice of the tool is canceled when parts such as POS, SET and CMP are arranged.
You must choose a tool every time to arrange more than one part in succession.



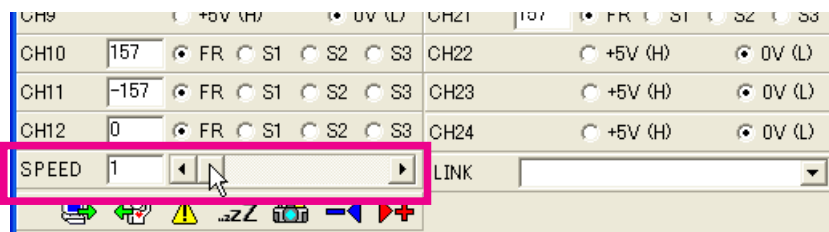
2 Edit POS1

Double-click on arranged POS1, and a POS window is opened. Make POS All servos free in the window.



3 Setting up Speed

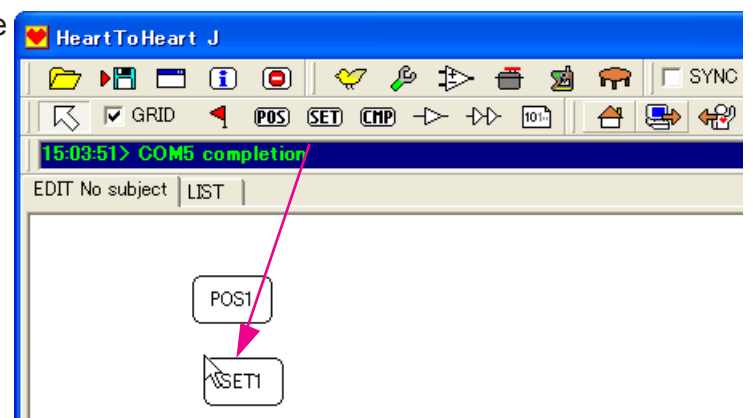
Set the speed 1 in the POS window.



Setup window is closed automatically when you proceed to next operation.

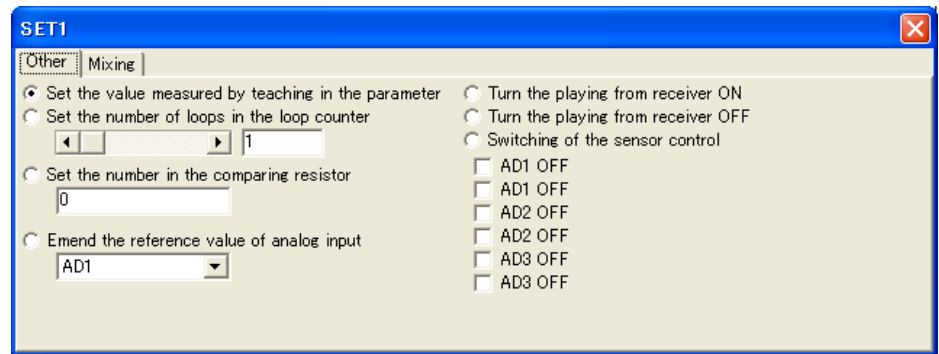
4 Dispose SET1

Choose SET1 in the main window, and clicks on the data sheet to arrange SET1.



5 Edit SET1

A setup window opens by double-clicking on arranged SET1. Select "The value measured in the instruction is set on the parameter." of the setup window.



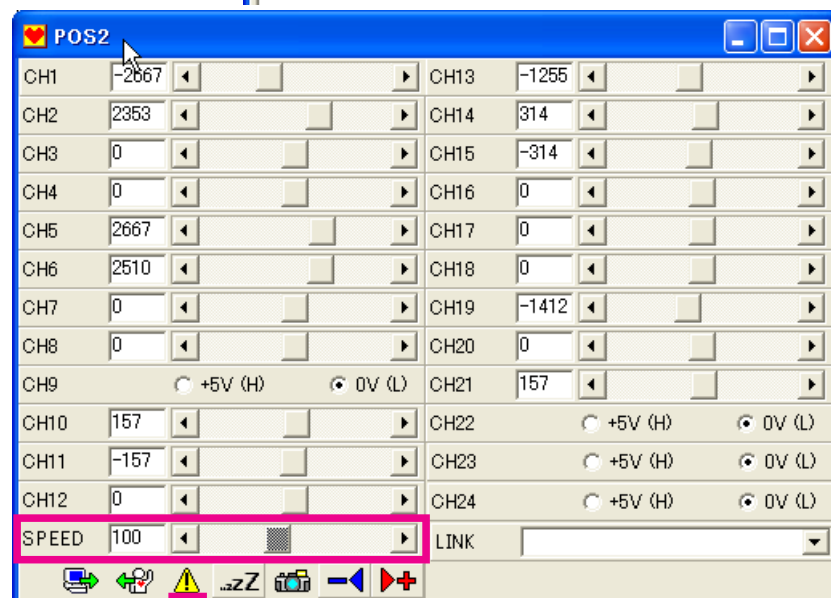
6 Dispose POS2

Choose POS in the main window, and clicks on the data sheet to arrange POS2.



7 Edit POS2

Double-click on arranged POS2 to edit it. Data to use would be the data on the default position set in advance. It can be set up with a default position button of the setup window. Though the speed setting is optional, we recommend you to start with slow speed (about 100), to avoid the danger.



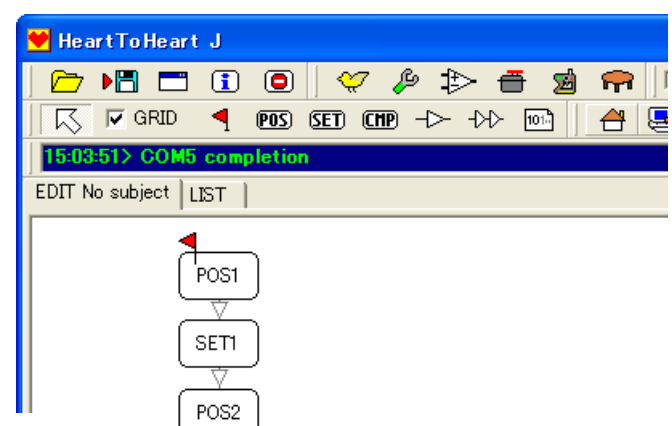
8 Wiring

The 2 position arranged by this and 1 SET are connected by using the wiring tool. A wiring tool will not be canceled until other tools are chosen with choosing it once. Please click on the first object of wiring first. As a red line is indicated when a mouse is moved, please click with the object which you want to connect next. Repeat this, and connect these 3 objects.



9 Specify the start position

The motion need to be specified its start position. A start flag tool is used to specify a position of a start. A start flag tool isn't canceled until other tools are chosen when choosing it once, either. A start flag can be put by clicking on the object on the data sheet. A start flag can be put only one in one motion.



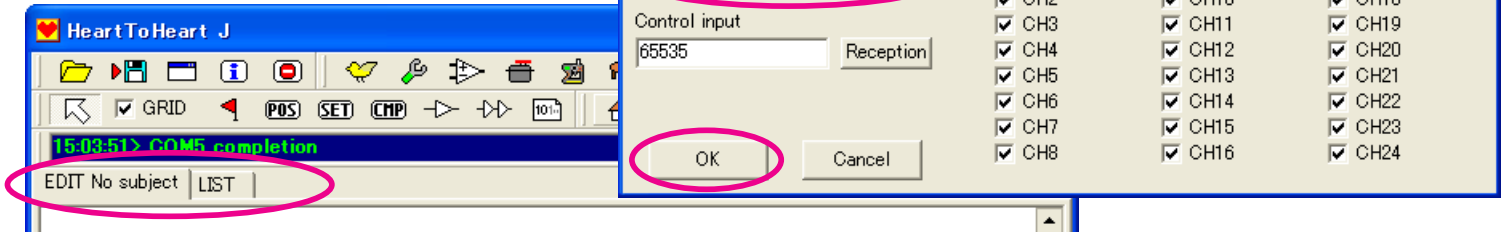
PRIMER

10 Name the data

If you double-click where there is nothing, the dialog designated to the right will open. Here you can name the data.

Let's see how to name the data 'start up motion'.

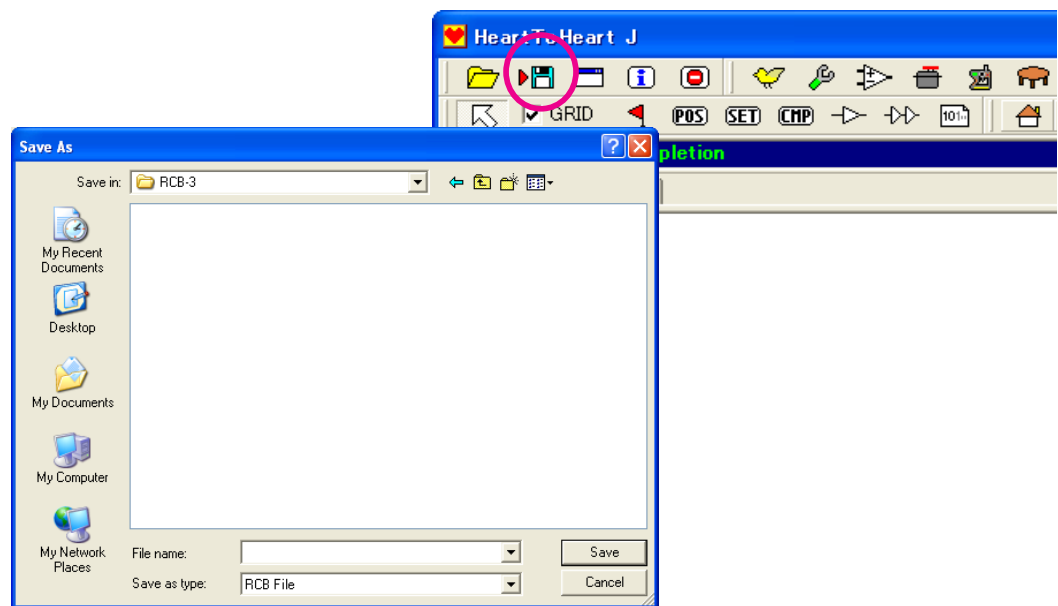
After naming the date, the name would be displayed on the tub over the data sheet.



11 Save the data

You can save the data as a file.

The saving dialog will appear and you can save the data.



12 Certify the forwarding address

Let's examine present data before writing the data.

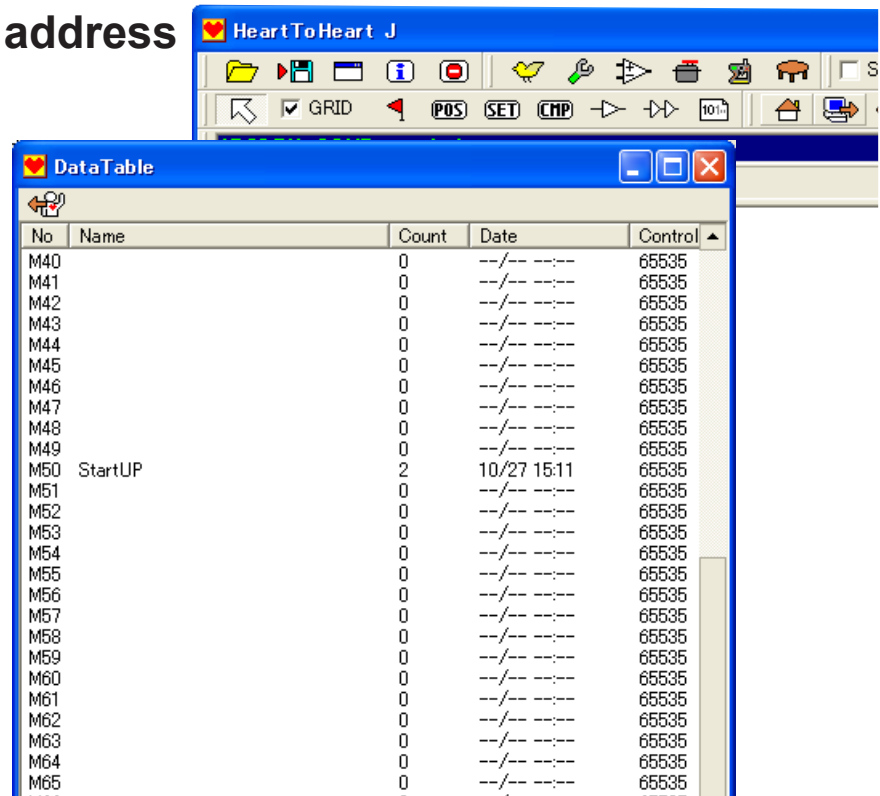
First, select "the data table" from the data table window of main window.

Click on the reading button when the data table opens.

Present contents of data would be indicated.

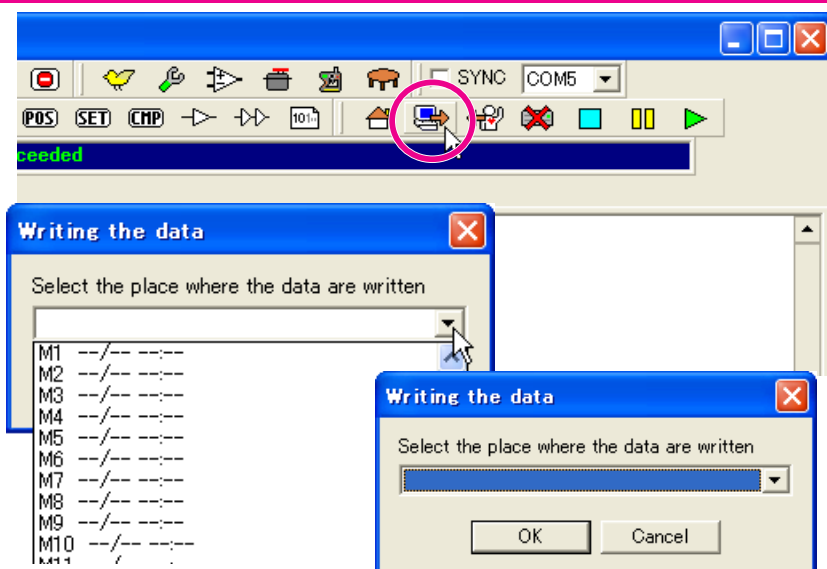
Once a data display on the data table is done, the name of data will be displayed automatically future, in reading or writing the data.

* Data table could be displayed at the same time with other windows.

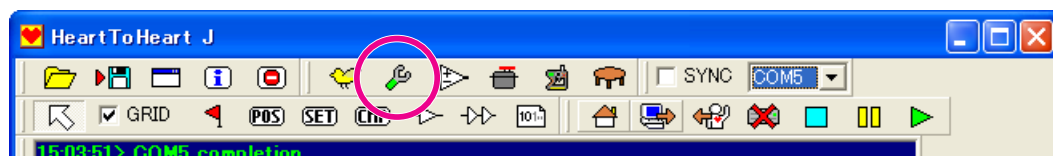


13 Forward the data

Data indicated at present can be transferred to RCB-3J by clicking on the writing button. When writing the data, the servo control of RCB-3J will be the temporary 'sleep' state.



14 Register the motion as 'a start-up motion'



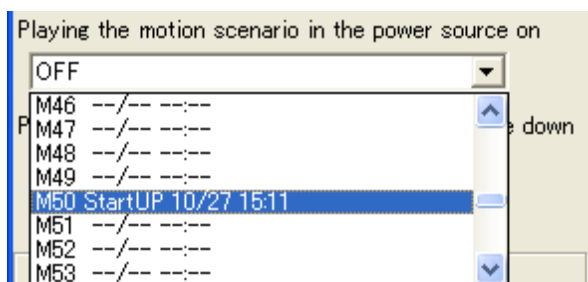
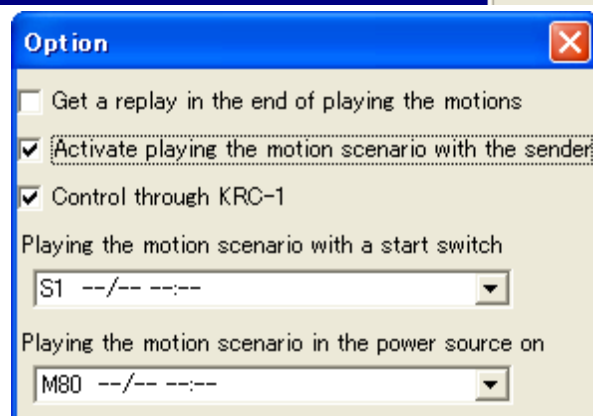
Then, register the motion so that the transferred motion can be executed automatically.

Open 'setup of an option' in the main window.

After opening the setup of an option, specify the startup motion registering before in the "A motion, scenario is play backed at the time of the power supply injection".

Close an optional setup window when you finish specifying it.

The contents set in RCB-3J will be written when an optional setup window was closed.



Please turn off the power supply on the board, and then try to turn on the power again when the setup is done.

If the RCB-3J works in the default position which was set up automatically, then the registration has completed.

The startup motion established here is effective only to RED version servo of our company.

Although it is an ideal to move each servo slowly on control board from the home position originally established in starting, there is no standard position where it should move slowly when you start up it, as the position of each servo isn't fixed at the that time.

The startup motion established here is effective to RED version servo manufactured by our company.

A control board doesn't have the standard position for moving slowly because the position of each servo isn't fixed on starting point, though ideally it is better to move each servo slowly.

The start-up motion we make this time is the one as follows: given that the connected servo is the servo of red version, firstly it executes position capture, and then moves slowly from the standard position to the home position.

Moreover, if you carry out this process when you turn on the machine, you can change the positions to home position easily.

Building the motion and execution

If you have already made start-up motion, then you can easily make other motions, too. Here, we briefly explain about the building and execution of motions.

1 Make connection and put in the power supply

Put the power supply while the RCB-3J and a servo are connected.

If the startup motion is set, each servo shall move slowly to the initial position.

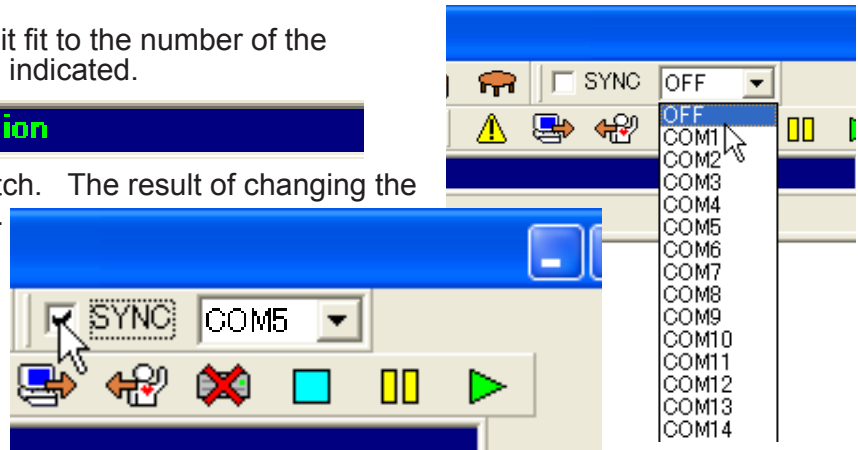
2 Start up the software

Start the software, HearToHeart3J. If it starts, please go to the following steps.

- Set up the communication port so that it fit to the number of the interface port. Confirm it by the message indicated.

15:03:51> COM5 completion


- Put a check in the synchronization switch. The result of changing the condition of each servo is reflected soon.




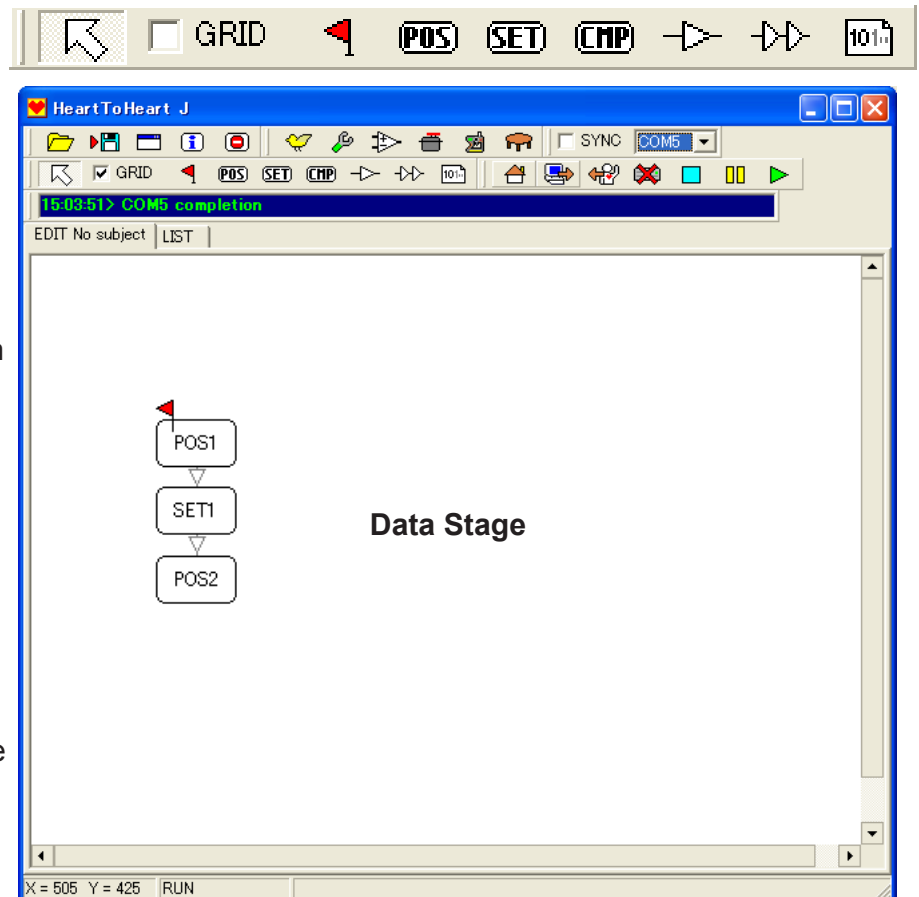
3 Making motion

With this software, you can make motions by arranging each object on the data stage.

POS As for basic movements, it would be arranged by clicking on POS (position), and then clicking again in the data sheet.

 The orders can be specified by connecting each position with connecting wire. The opening between positions of each data stage is complemented automatically on the software, and data will be made.

 Put the mark of the starting point which will be carried out firstly in the arranged position.



The Motion Capacity

You can set the position or SET for one motion up to 30. However, actually more than 30 motions could be put. Still, you need to take care when you write in the board the motion which has over 30 arrangements. Two memory domains are needed when more than 30 sets are arranged for one motion.

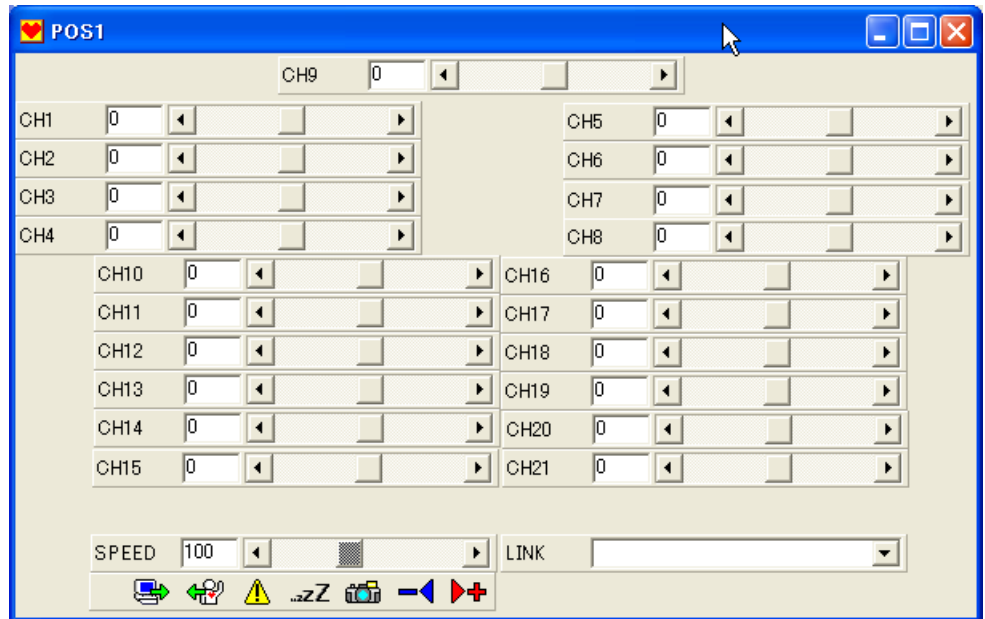
For example, you must leave M2 empty when you put more than 30 positions in M1.

4 Edit the motion

It is necessary to make data on the arranged position since the position arrangement is not enough to make it work.

A position window opens by double-clicking on the arranged position.

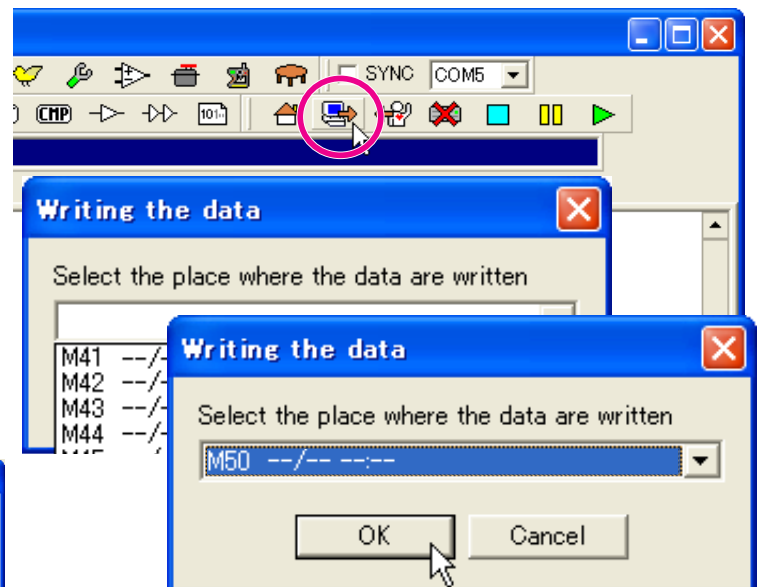
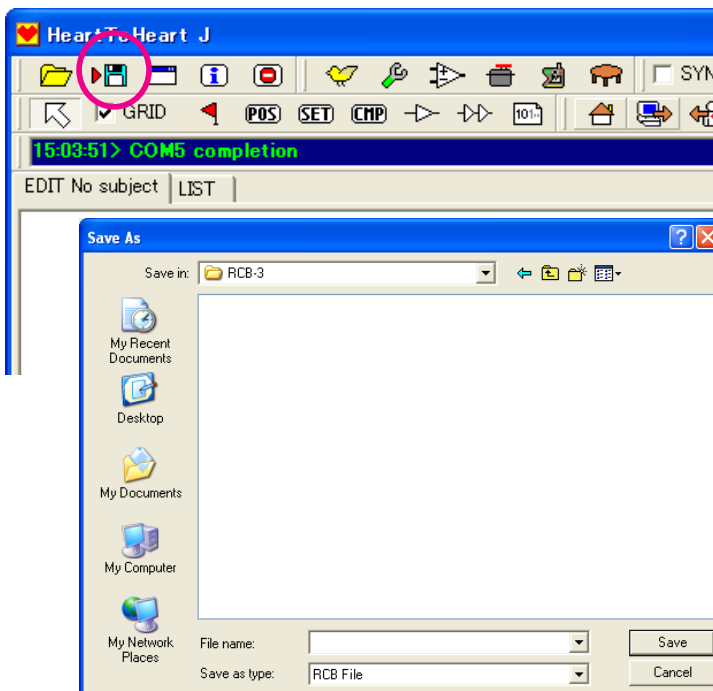
Then decide the position of movement of each servo in the position window.



5 Forward the data

The motion can be play backed by sending (writing) it to PCB-3.

Moreover, you can replace and use the motion beyond the capacity of RCB-3J by saving a motion as a file.



6 Play motions

Click the Play button to play the motion.

Specify the number of the motion to play.

You can stop by putting the stop button, if you want to.



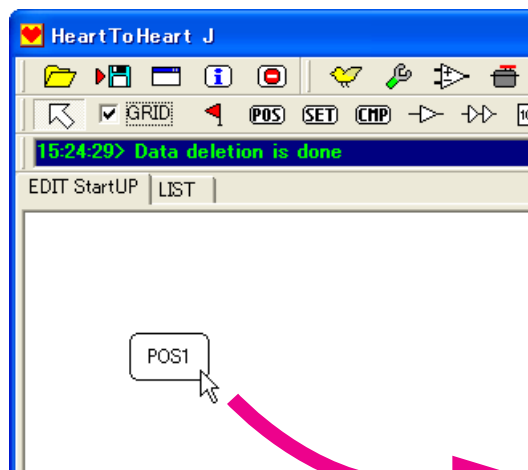
Customize the position window

The making process of the startup motion was explained in previous sections.

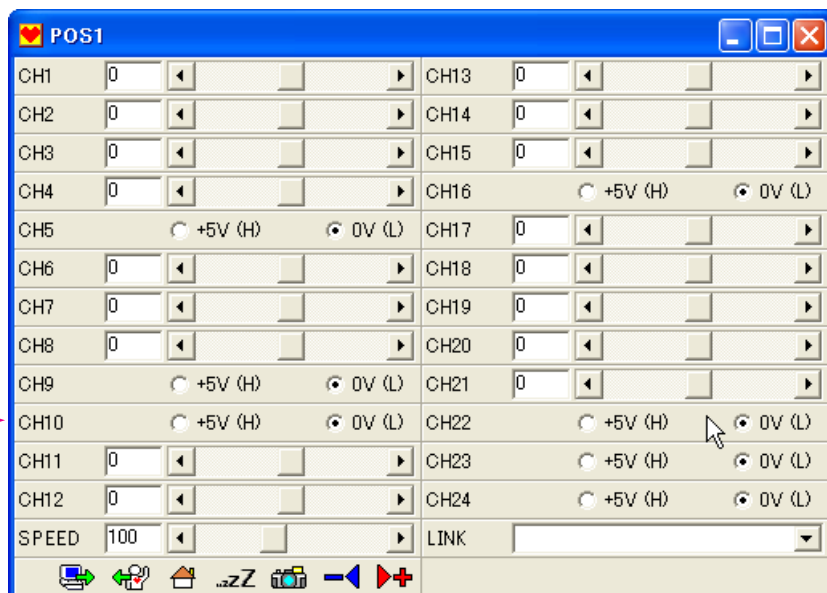
If you make start-up motion, then now you know the basic process to make a motion.

When you make motions, you need to use POS object and position window, which is opened by double-click of POS object, to make each servo work.

You can make it more useable by changing the various settings on position window.



A POS window opens by double-clicking on arranged POS.



A menu like the left one will open if you click the right button on the empty part of the POS window.

Operating the contents of the menu enables various customizations.

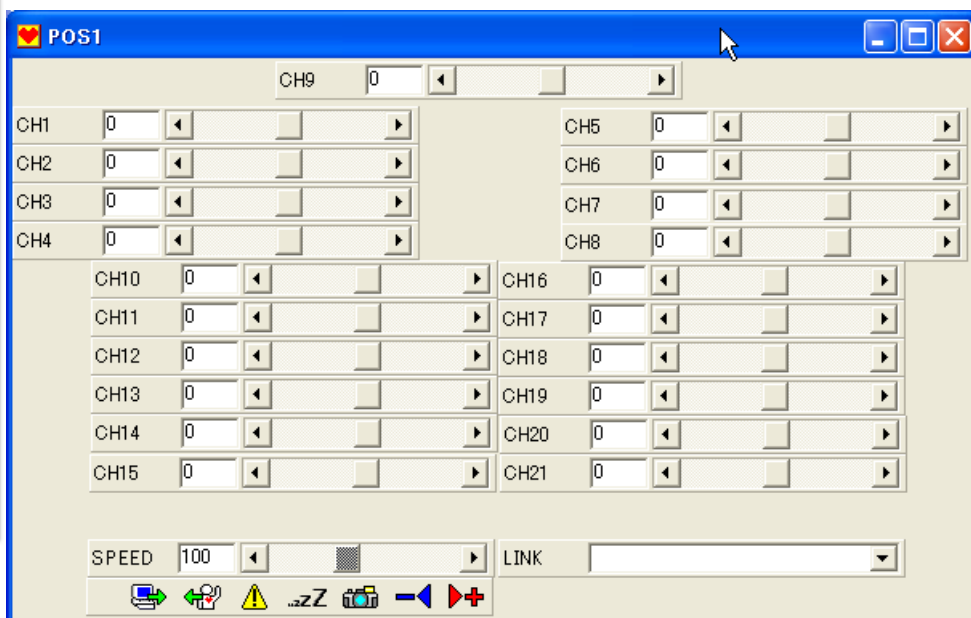
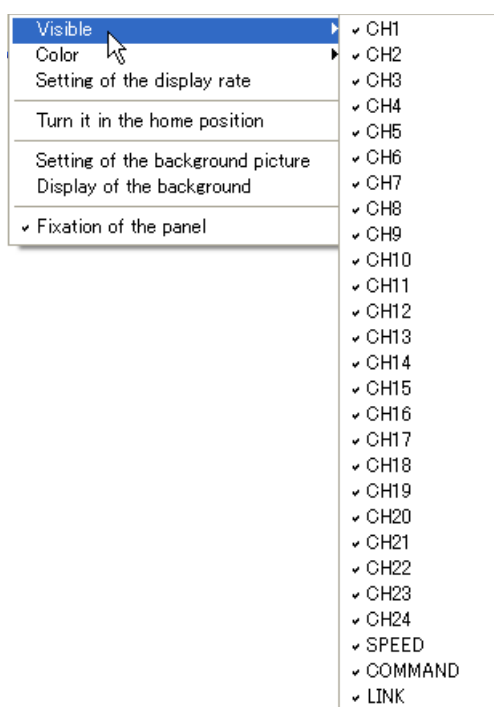
The ones with check mark in the indication menu are indicated.

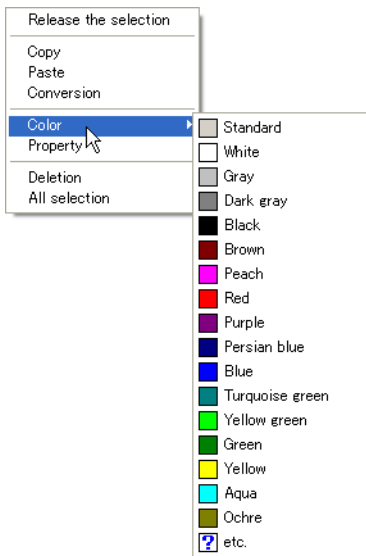
You can eliminate the one you do not want to indicate, by removing the check.

If you remove the check to 'the fixation of the panel' on the bottom of the menu, you can move a panel.

Please look below: this is one example in which only a necessary panel is indicated, and is moved to fit the body.

In this example, we use the 21 servo and make it shown in according to the servo position of arms and legs.





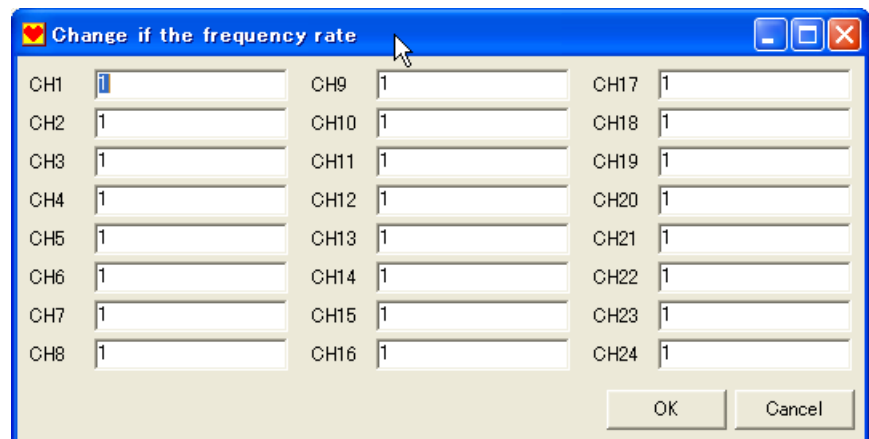
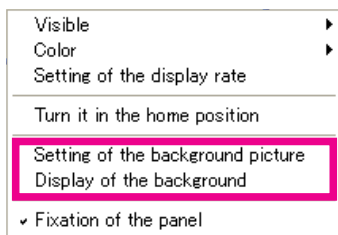
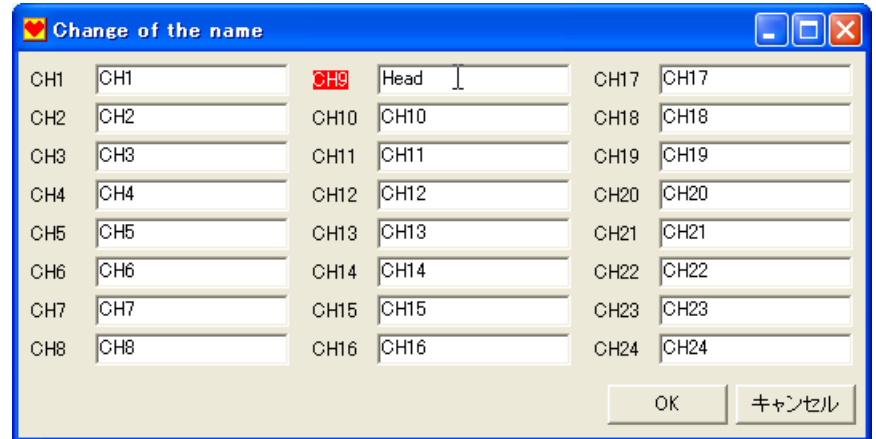
You can choose the color from the menu, and put it as a background color. You can also indicate background image by putting a check on background indication.

If you click the right button of a mouse, you can see the menu and you can change the indications of the control panel of each servo.

Example of changing panel color



Window for name changing



Settings of the indication rate

Though each moving position in the panel is indicated by numerical values, these numbers are not the ones which directly show a movement angle. It is difficult to know present position by this number since this numerical value just tell the inside setting point.

To solve this problem, it is possible to change the settings of indication so that numerical value will indicate the approximate value of the actual moving position (angle).

Ex) the servo of PWM 180 degrees movement, such as KRS-2350HV --- 0.346

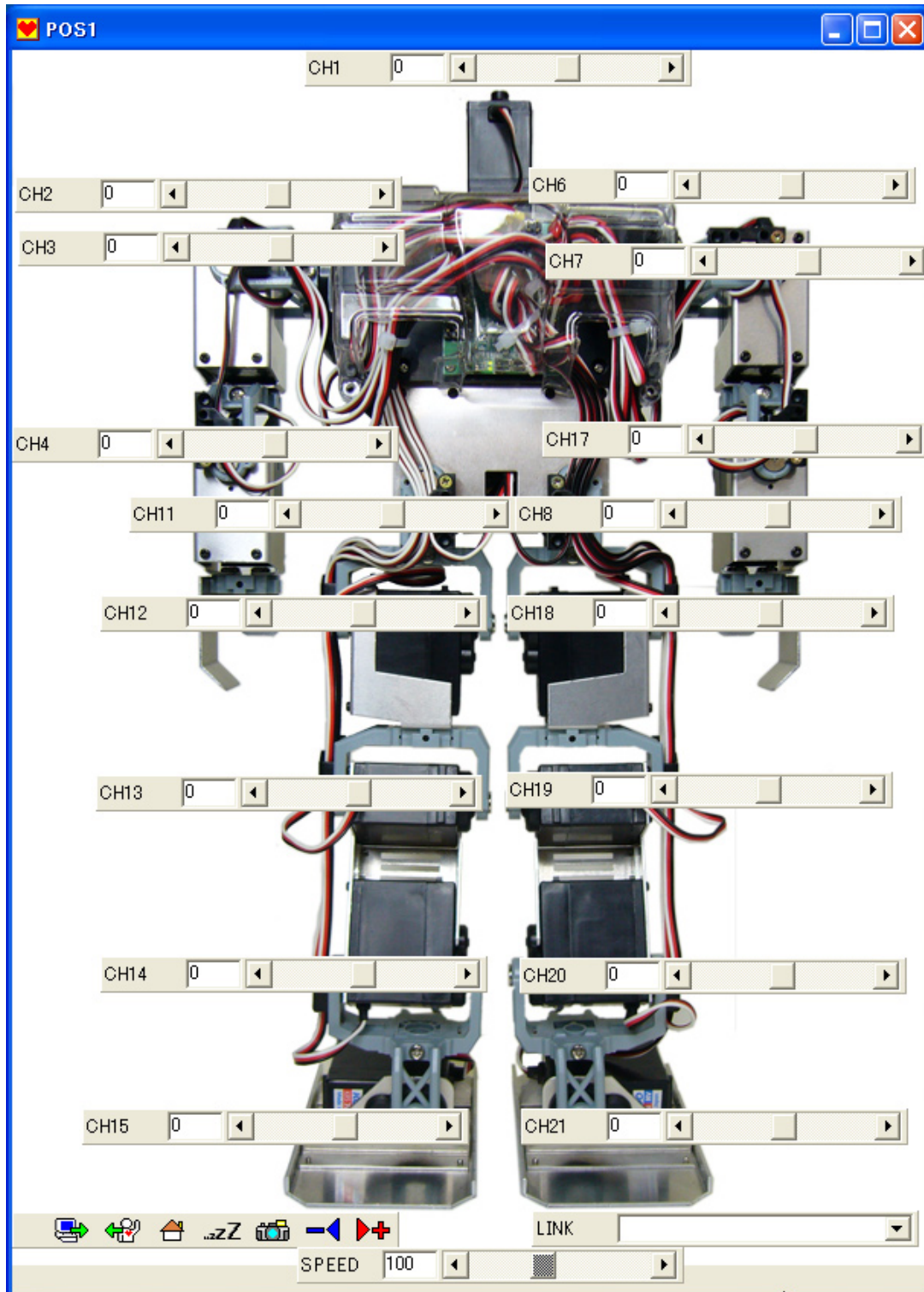
Ex) the servo of PWM 270 degrees movement, such as KRS-4014HV --- 0.52

Ex) the servo of PWM 260 degrees movement, such as KRS-4024HV --- 0.5

Example of customizing the position window (1)

The example below specified the picture taken as a background of the position window from the rear of KHR-2HV.

The panel of each servo is moved to the position where each channel shows.



The basic operation was explained in the primer. Even with the functions explained above, you can move KHR-2HV with the sample motion. Still it cannot be said that you make use of RCB-3J with these basic operations.

Let's learn how to use the more advanced operations such as wireless control in the next intermediate section.

INTERMEDIATE

Setting of wireless control

RCB-3J offers you 2 ways for wireless control.

One is using the KRC-1 wireless control set or conventional type of sender, which connects KRT-1, KRT-2 or personal computer to KRT-1 or KRT-3.

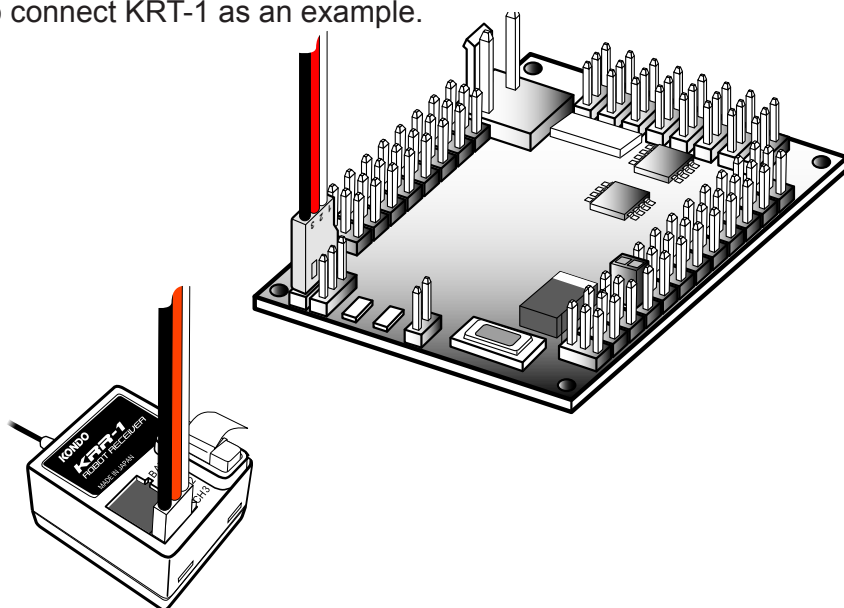
The other is expanding the command of conventional wireless control.

Here, the former way would be explained first.

1 Connect receiver to RCB-3J.

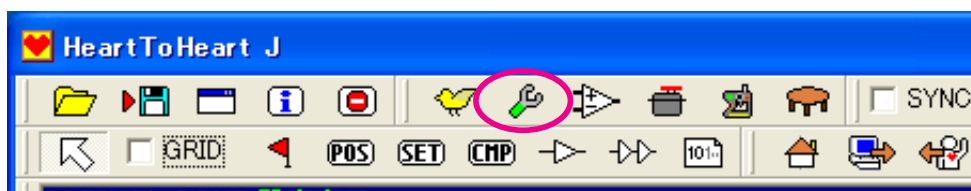
The figure below illustrates how to connect KRT-1 as an example.

Here KRC-1 is used as a sender.



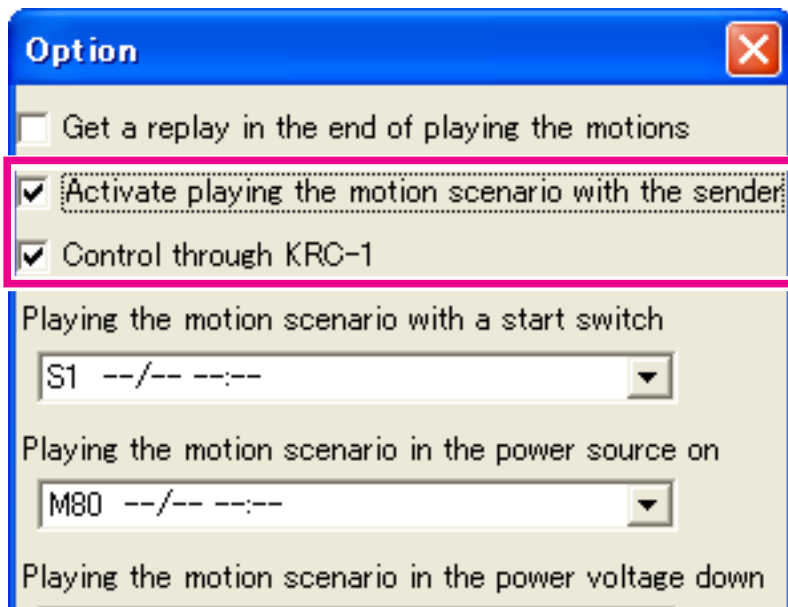
2 Data of receiver would be missed in the initial setting of RCB-3J, and you need to validate it, so let's set up for this.

First of all, please open the option window on software.



After opening the option window, put checks on 'Activate playing the motion scenario with the sender' 'Control through KRC-1'.

Then close the window.



*Here KRC-1 is used as sender but the procedure is the same even in the case of using RCB Commander (software) or KRT-2.

- 3** Then let's decide which motion to play when you push the button of sender.
Open the data table from the menu.



You need to read the data table beforehand; otherwise, your data will not be showed.
Click the input button so that all the data will be put in.

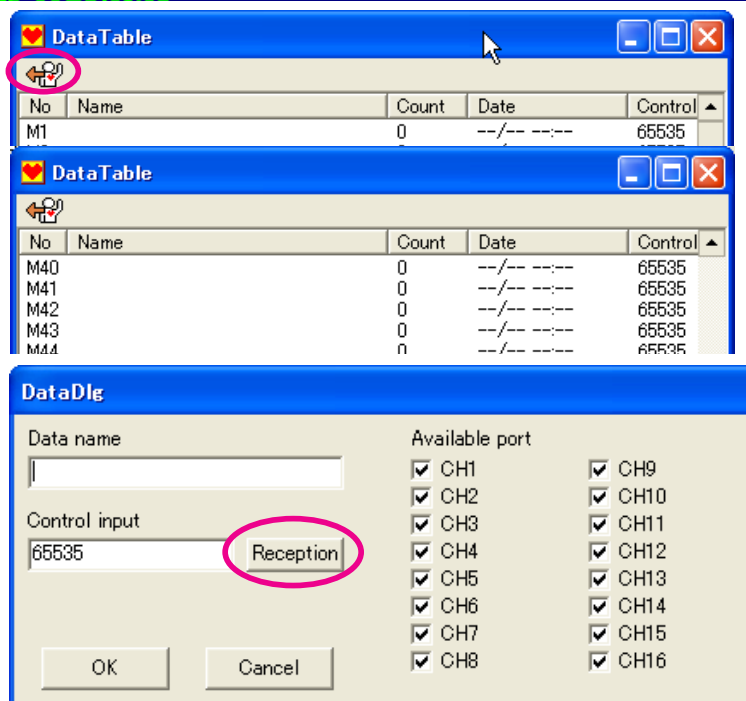
When the list appears, please double-click the motion which you want to control with KRC-1.
Then the data dialog will appear.

While data dialog is indicated, turn on the KRC-1 to keep discharging the radio wave and go on push the button to be allocated.

Under this state, click the 'receive' button of data dialog. If the number of control input changes, setting is completed.

Now you can release the button of sender.

Setting is written completely to RCB-3J when data dialogue is closed.



While the data is read in on the data sheet, it is possible to open the data dialog by double-clicking the empty part of the data sheet.

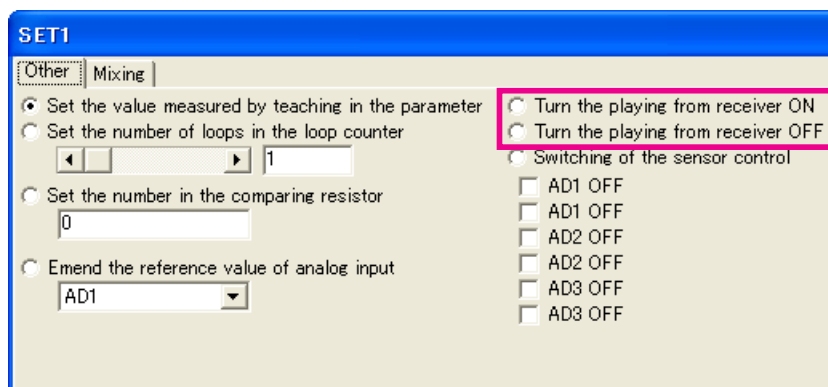
Still please take note that the data on data sheet will not become validated unless you write into RCB-3J after editing.

Receiver setting on the data table directly affects the operations of the internal data of RCB-3J. On the other hand, the dialogue setting on the data sheet manipulates the data on PC. That is why; the value set on data table will be overwritten when the motion data is written in. In order not to take different data by mistake, it would be better to save the data on the file in the PC after reading the motion in the board, when you set it on the data table.

You can do the same thing with RCB-1 and so forth, as is already explained in the previous sessions. Still, with RCB-3J, you can go for further advanced-level of use.

For example, you can temporarily invalidate or validate the signal from receiver, with setting of SET object which can be arranged in each motion.

Moreover, you can not only play motions using command, but also control at the more advanced level, by using the multi-bite analog control, which is another way of wireless control.



INTERMEDIATE

Use of gyro sensor

Gyro sensor is used to detect a change in posture of the body and to control the change.

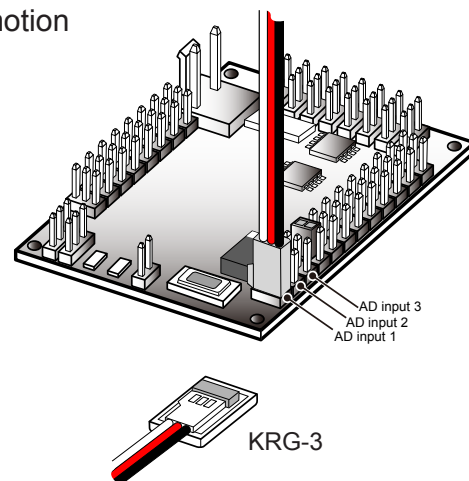
In using gyro unit, the common way has been putting it between the servomotors, which requires gyro effect, and control board, but in this way, the servo affects only on one servo, per one gyro or one system of gyro.

On the other hand, this RCB-3J can use as many as 3 analog outputs, and you can put the gyro effect at any gain on any servo control channel.

Furthermore, you can change the setup with SET object of the motion during the motion play.

Connection of KRG-3

When you connect gyro sensor KRG-3, be sure to connect it to analog input (AD1, 2, 3).



Confirmation of Basic gyro motions

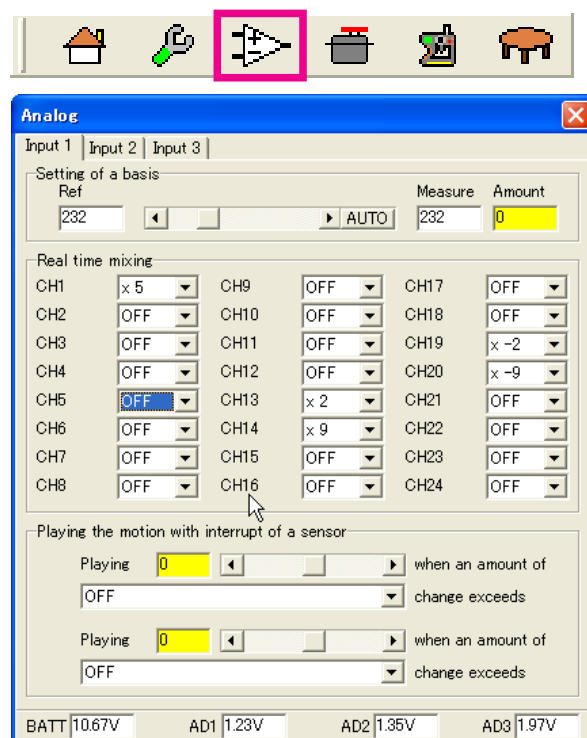
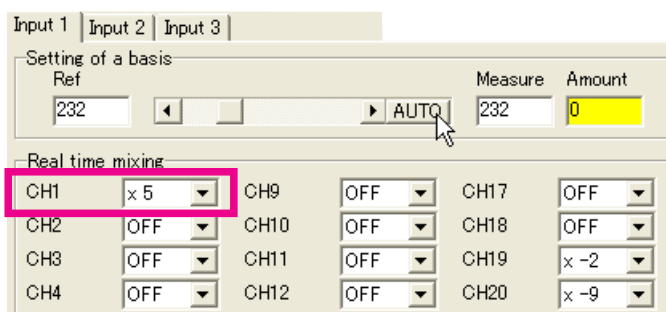
You can confirm the movement of gyro most easily by using an analog window of the command menu.

If the preparation of the startup motion has been completed, the body with RCB-3J would move slowly to the home position after putting power supply.

Click on the analog button, and open an analog window under this condition.

Then set the value of CH1 of Real time mixing to "x 5" on the tab of the input 1 [AD1].

If you have completed the former process and connection without any error, the servo connected to CH1 should begin to work.



Here we set up in CH1 as an example, and more than one servo can put to gyro.

Moreover, gain of the gyro can be changed by the set point, and if you set the minus numerical value, the gyro would move to reverse direction.

The contents set in this analog window will be saved in the memory of RCB-3J, and will be played when the power supply is injected.

If the servo position is different when you do not move gyro and under the condition that there is no gyro effect, please do basic setup again on the upper part of the window.



Standard value is set up by clicking the button of "AUTO" under the condition that gyro is fixed. Then the standard value of the gyro is overwritten properly.

More practical gyro movement

As for the gyro movement explained in the former page, the effect of gyro is at the same level from the moment of turning on to turning off. It can't cope with the drift of gyro caused by the change of time and temperature, neither.

Moreover, as the gyro effect is the same for all motions, there sometimes might be problems.

This is why RCB-3J has the option to use more dynamical way of manipulating gyro to the setup of analog window.

Settings of gyro with an SET object

You can do various setups by inserting the SET object used by the startup motion of the primer while playing the motion.

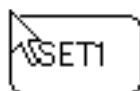
First, make a new motion.

If there is any motion which has not be saved in the data sheet, please save or send them to RCB-3J.

Be sure to erase all the objects in screen when you make a new motion.

First, click the right button on empty place of data sheet, and select 'choose all' from menu.

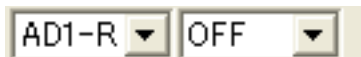
After all objects are chosen, then select 'delete' after click the right button or push DEL key on the key board, to complete the deletion.



When you delete all data, arrange the SET objects and double-click to open the window.

If the window opens, select the mixing tab. not the tab of 'others' which is used for start up motion.

The left side of each channel indicates kinds of the mixing, and the right side indicates gain.



Select the R of the AD channel connected to gyro in the left. R stands for Real-time mixing.

The set of gain can use with both plus and minus. The direction of gyro mixing will change according to the plus and the minus.

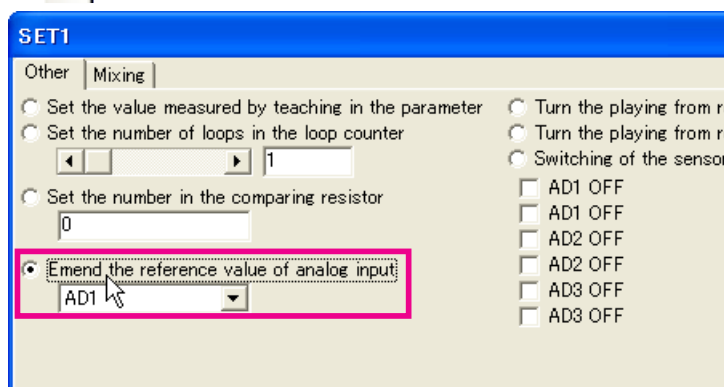
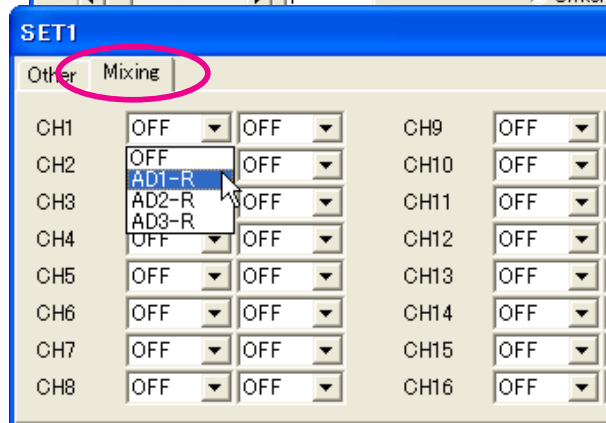
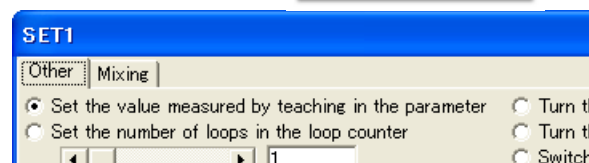
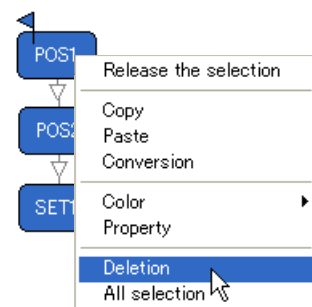
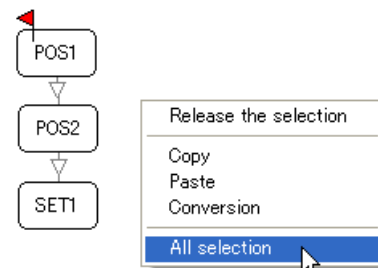
You can also put effects on several channels with different gains in setting of gyro on SET object, just as analog window. Moreover, you can change the gain freely during the motion, by injecting SET object to any place you want.

The way to use depends on the body and motion to use. It would be better to decide the way after trying several types.

In the case of using the gyro, please re-write the standard values of analog input with different SET object when the body posture is stable.

If standard value is not correct, the home position deviates every time turning on.

In addition, when you use it for a long time, it might be a good way to make revised motion and execute it if needed.



INTERMEDIATE

Managing the ICS setting

Though it was possible to change the setup of each servo(*) of RED Version by ICS, that setup has to be done with another software and it has to be removed from control board.

Our new RCB-3J can control the setting of RED Version servo connected.

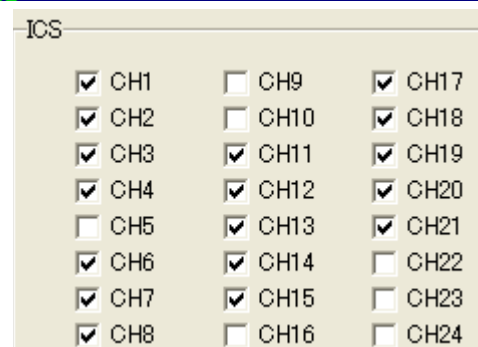
*KRS-4014 HV and 4013HV work with an ICS2.0 standard. Reading is impossible with this window.

- 1 Open the option to specify the channel for setup by ICS.



Put a check in the channel where setup by ICS is done.

Due to this process, there would cause no problem even if there is some models which is not for this type.

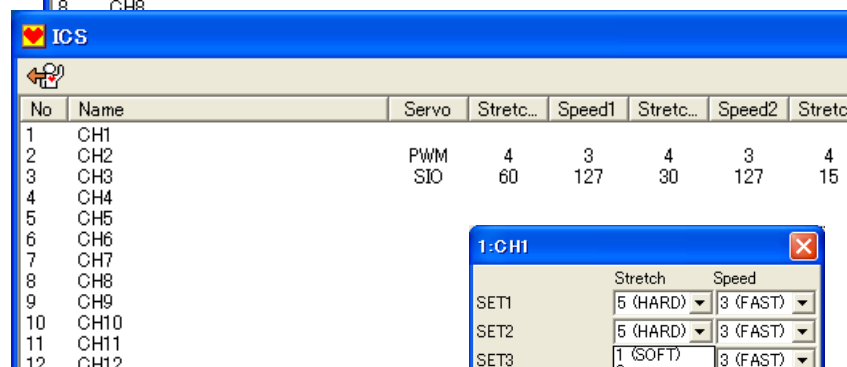
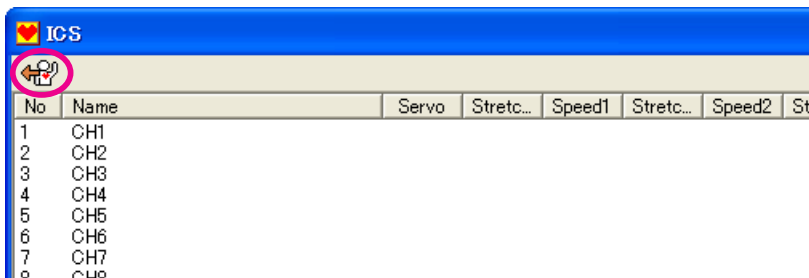


- 2 Open the ICS window to set it up.

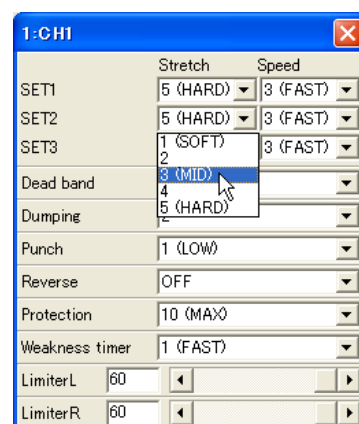
Turn on RCB-3J again first if the ICS window opens.

It starts in the ICS mode by turning on the power again.

Click the "reading" button to read data.



A setup can be changed here as a setup window opens by clicking each channel.



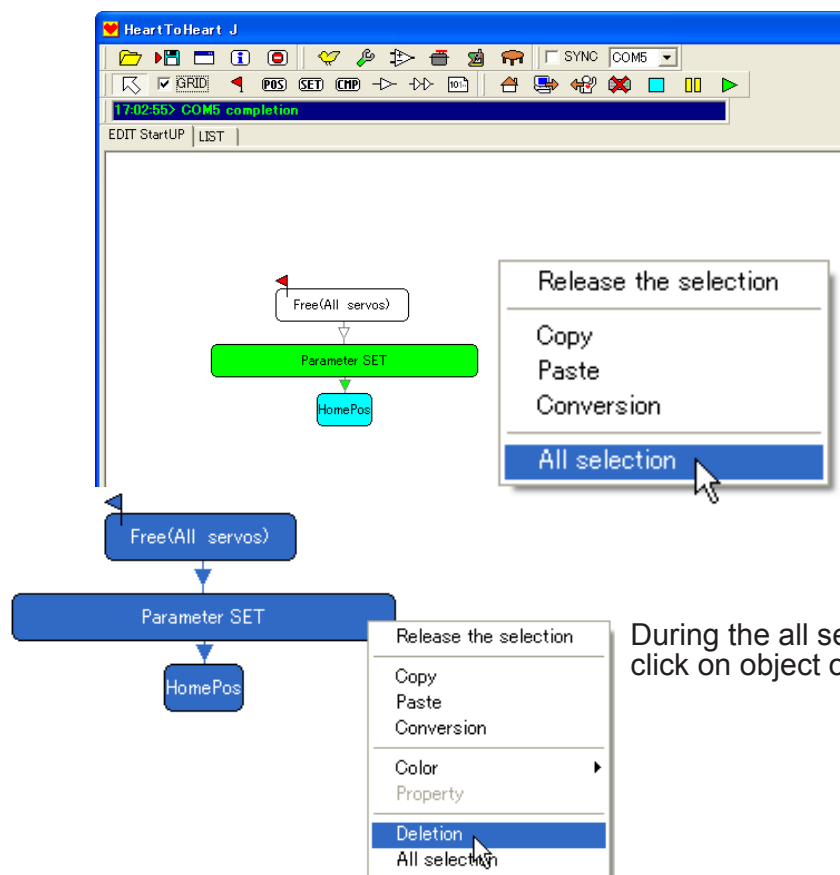
When you close ICS window, the power supply of RCB-3J should be put in again.

The ICS mode will change to usual servo control mode by the re-injection of the power supply.

Writing scenario

You can play motions continuously by making a scenario and to carry it out. Demonstration can be done in given time autonomously.

1 Clear the data sheet



Click the right button on the data sheet to open menu, and you can select all of what is on the data sheet.

During the all selecting, Choose the deletion by the right-button click on object or by pushing the DEL key on key boards.

When you make the scenario, you will arrange the motions on the data sheet.

This work can't be done to the condition (A motion is being made.) that a position and so on is arranged onto the data sheet though a motion is arranged to the data sheet when a scenario is made. So please erase the data sheet once.

2 Open the data table



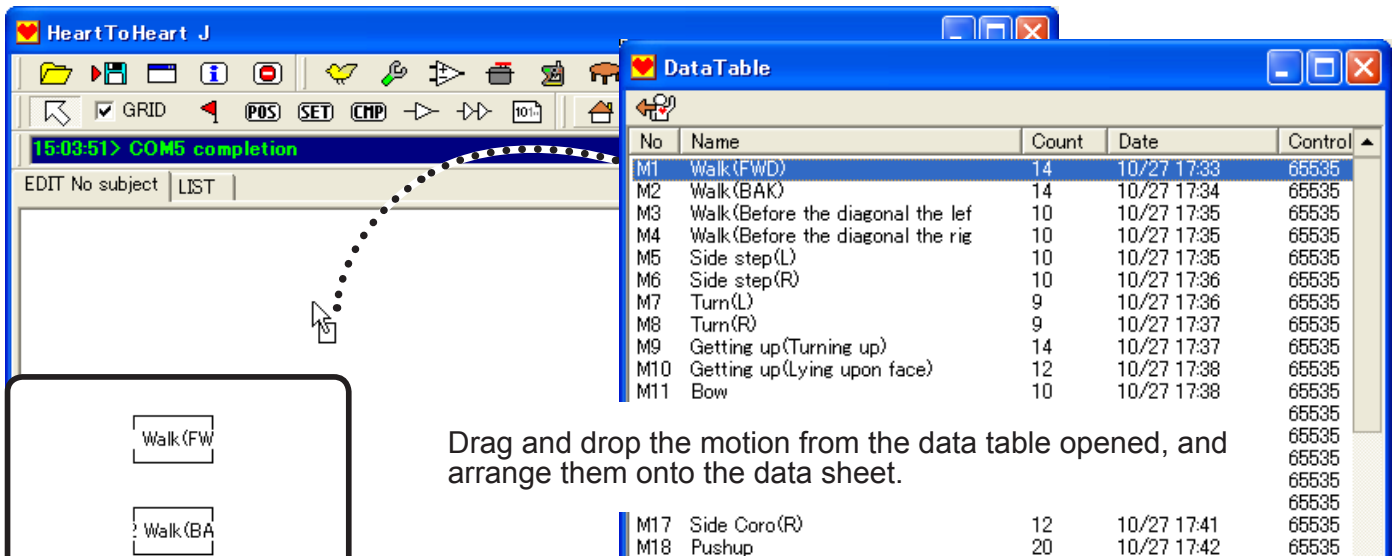
When you click on the data table icon, a data table window like the right figure opens.

When data aren't indicated, click the reading button of the upper left, and data will come to the computer.

No	Name	Count	Date	Control
M1	Walk(FWD)	14	10/27 17:33	65535
M2	Walk(BAK)	14	10/27 17:34	65535
M3	Walk(Before the diagonal the lef	10	10/27 17:35	65535
M4	Walk(Before the diagonal the rig	10	10/27 17:35	65535
M5	Side step(L)	10	10/27 17:35	65535
M6	Side step(R)	10	10/27 17:36	65535
M7	Turn(L)	9	10/27 17:36	65535
M8	Turn(R)	9	10/27 17:37	65535
M9	Getting up(Turning up)	14	10/27 17:37	65535
M10	Getting up(Lying upon face)	12	10/27 17:38	65535
M11	Bow	10	10/27 17:38	65535
M12	Kick(L)	10	10/27 17:39	65535
M13	Kick(R)	10	10/27 17:39	65535
M14	Forward roll	17	10/27 17:40	65535
M15	Backward roll	13	10/27 17:40	65535
M16	Side Coro(L)	12	10/27 17:41	65535
M17	Side Coro(R)	12	10/27 17:41	65535
M18	Pushup	20	10/27 17:42	65535
M19	Piercing(R)	12	10/27 17:42	65535
M20	Piercing(L)	12	10/27 17:43	65535
M21	Freemode	2	10/27 17:43	65535
M22		0	--/--	65535
M23		0	--/--	65535
M24		0	--/--	65535
M25		0	--/--	65535
M26		0	--/--	65535
M27		0	--/--	65535
M28		0	--/--	65535
M29		0	--/--	65535

INTERMEDIATE

3 Compose the motion

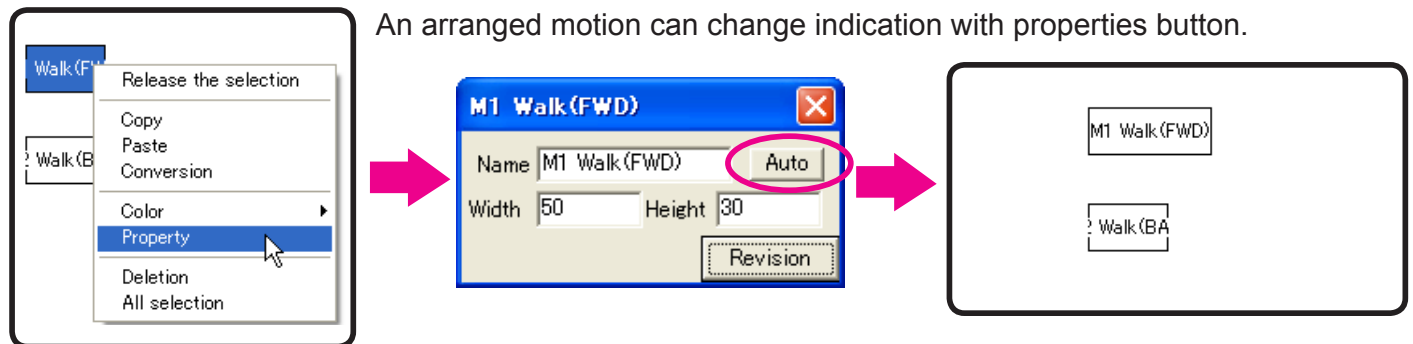


15-03-51> COM5 completion

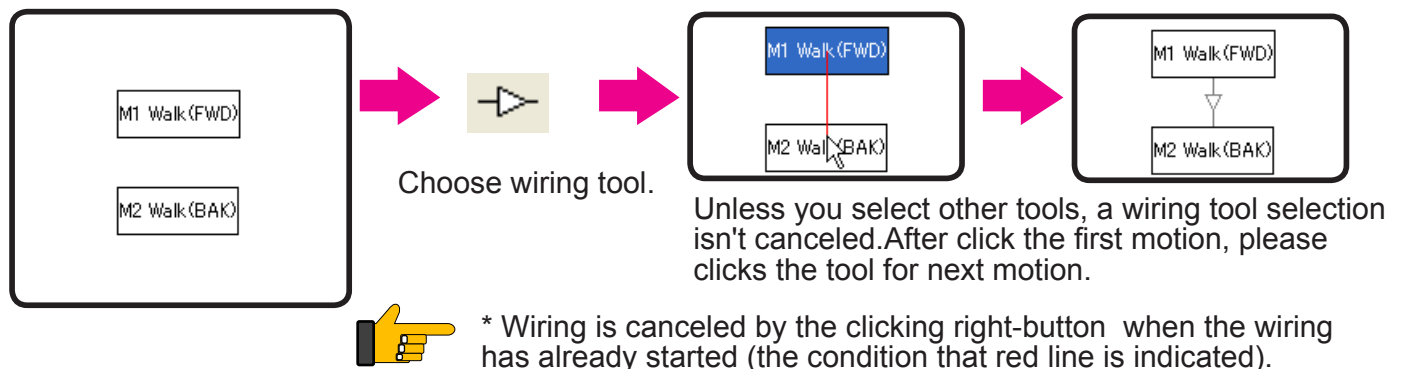
EDIT No subject LIST

Drag and drop the motion from the data table opened, and arrange them onto the data sheet.

No	Name	Count	Date	Control
M1	Walk(FWD)	14	10/27 17:33	65535
M2	Walk(BAK)	14	10/27 17:34	65535
M3	Walk(Before the diagonal the lef	10	10/27 17:35	65535
M4	Walk(Before the diagonal the rig	10	10/27 17:35	65535
M5	Side step(L)	10	10/27 17:35	65535
M6	Side step(R)	10	10/27 17:36	65535
M7	Turn(L)	9	10/27 17:36	65535
M8	Turn(R)	9	10/27 17:37	65535
M9	Getting up(Turning up)	14	10/27 17:37	65535
M10	Getting up(Lying upon face)	12	10/27 17:38	65535
M11	Bow	10	10/27 17:38	65535
M17	Side Coro(R)	12	10/27 17:41	65535
M18	Pushup	20	10/27 17:42	65535




An arranged motion can change indication with properties button.



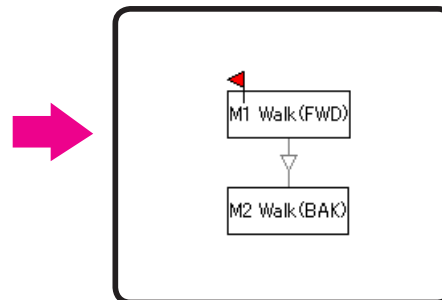
Choose wiring tool.

Unless you select other tools, a wiring tool selection isn't canceled. After click the first motion, please clicks the tool for next motion.

* Wiring is canceled by the clicking right-button when the wiring has already started (the condition that red line is indicated).

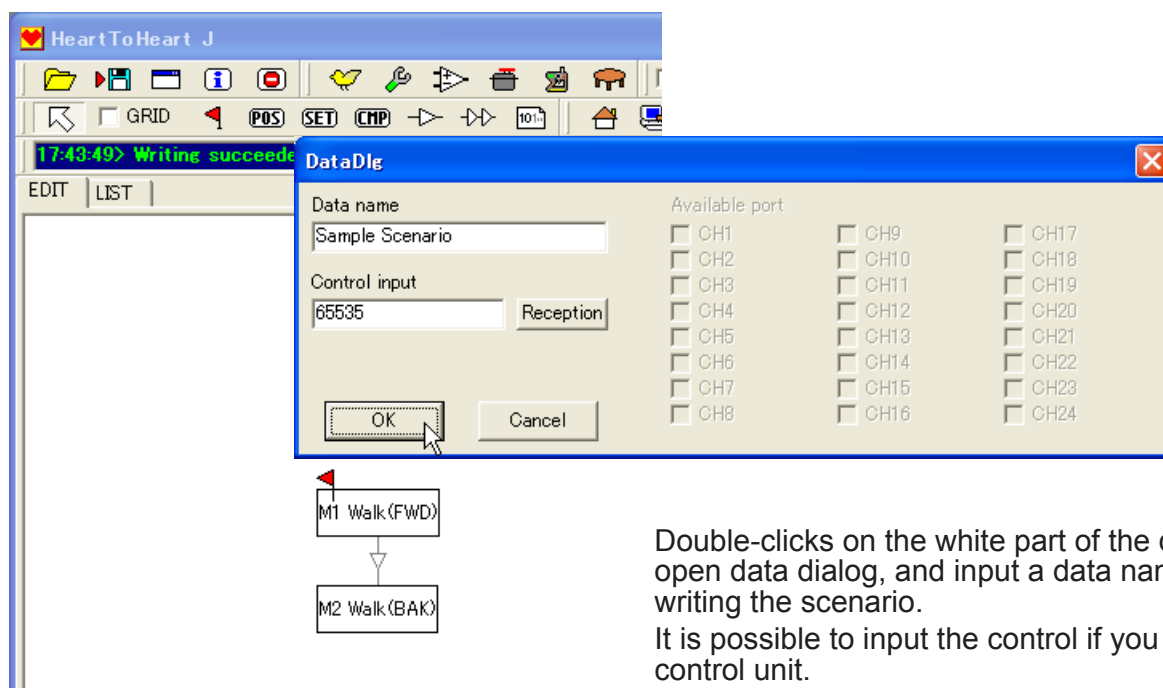
 Add start flag on the data sheet.
Put the flags on the objects which you want to play first from the tools.

* Until you choose other tools, a start flag tool isn't canceled, either.



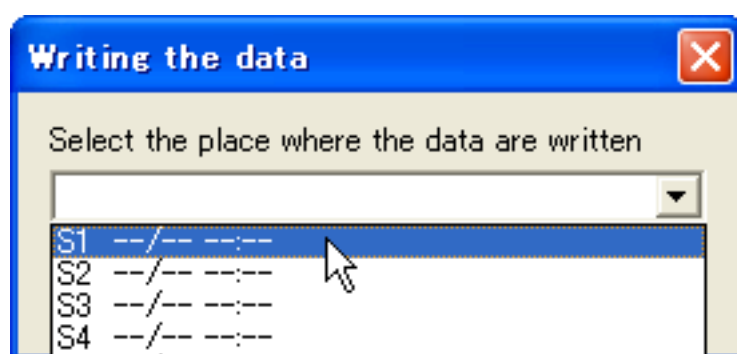
A data sheet could recognize it as a scenario when a motion was arranged to the data seat. There are only a wiring tool and a start flag except for the motion that you can use for the scenario. POS and SET and CMP can't be arranged.

4 Writing the scenario



You can write into the board by choosing a writing tool.

The written scenario can be also played, like the motions.



The contents and caution of scenario

The motions are for move the robot connected to RCB-3J, and the scenario has no information for actual movement, such as the position of the servo.

Scenario just contains the information of the order to play motions.

In other words, the movement should be changed when the contents of the motion specified by the scenario are changed.

So, you need to make sure that the motion and the content of it is correct, when you make scenario.

There might be some problem about the movement if there is a mistake in the motion.

And, when you made a mistake in repetition management (loop), which would be mentioned in the advanced edition, there is a case which the motion won't finish. Confirm the movement of each motion when you use the scenario.

INTERMEDIATE

Using instruction function

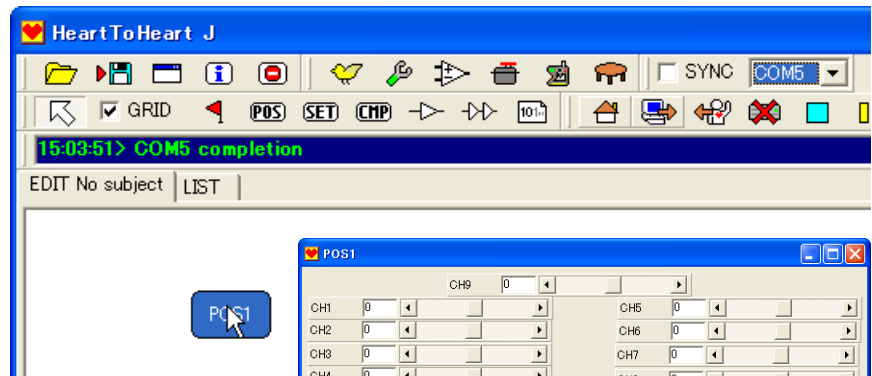
Usually when you make the motions of robot, you specify the moving place if each servo with numbers or with slide bars, and connect them to make one motion.

On the other hand, if you use the instruction function, you let the servos of the robot free and take in the posture of the robot into the servo.

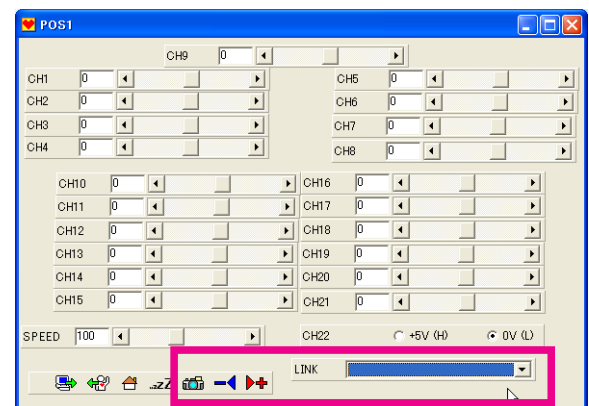
Using a Red Version servo of our company is required to use this function.

(This cannot be used if your servo does not have instruction function)

- 1 Arrange one position on the data sheet.

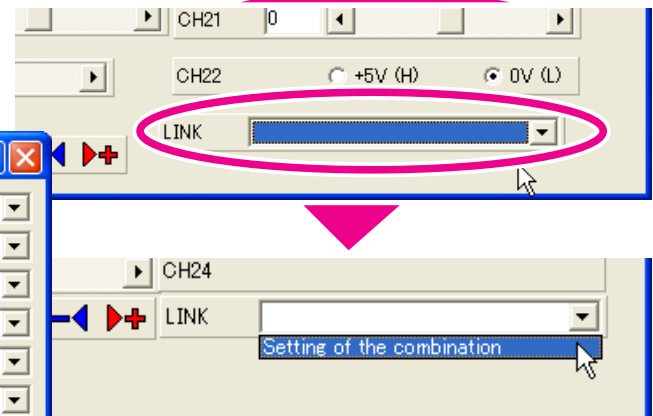
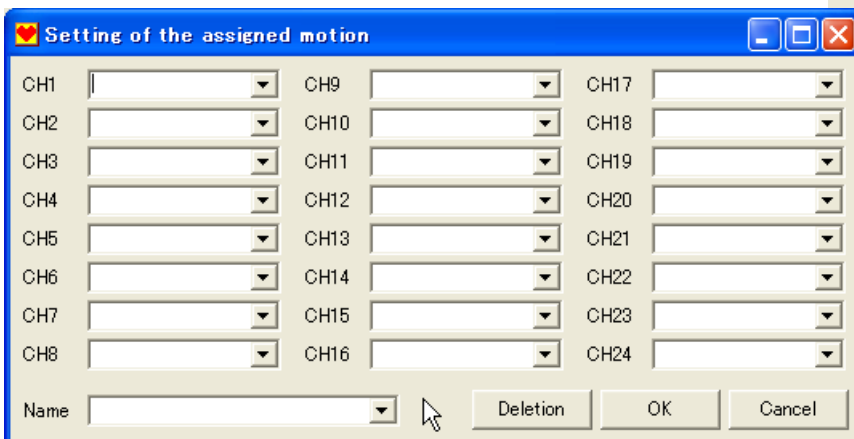


- 2 Double-click on the arranged position to open the position window.



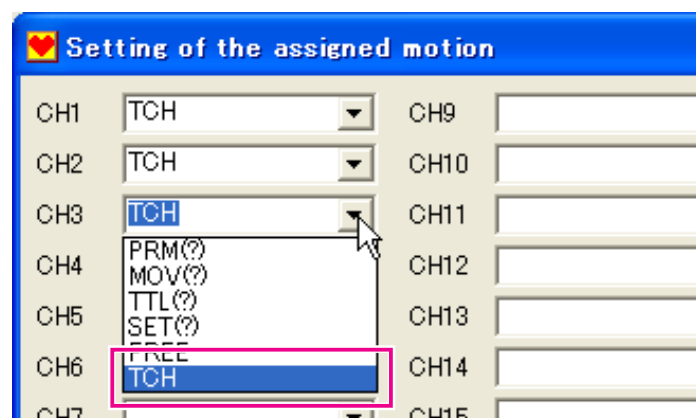
- 3 Select "The setup of the combination" from the LINK setup.

At the same time of the selection, "the setup of the designated movement" window opens.



- 4 Set 'TCH' on the channel to use instruction function, in the "the setup of the designated movement" window.

This TCH stands for teaching.

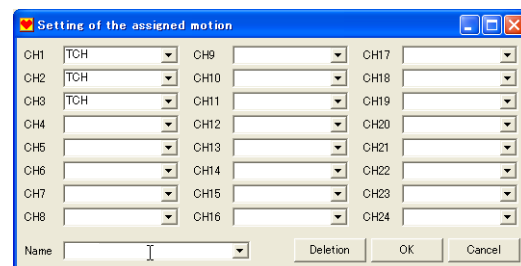


5 Change all the channels which you want to use the function to 'TCH'.

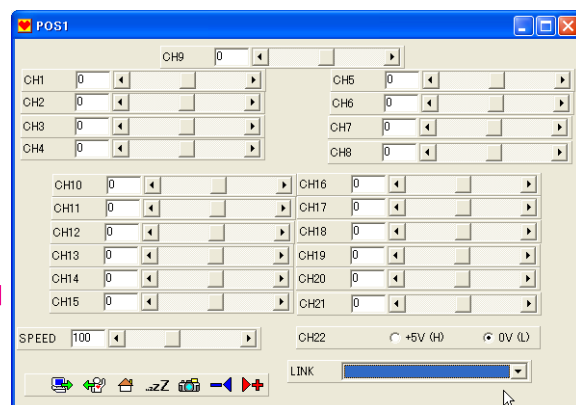
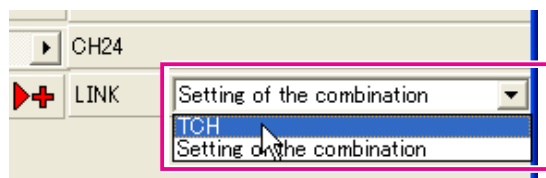
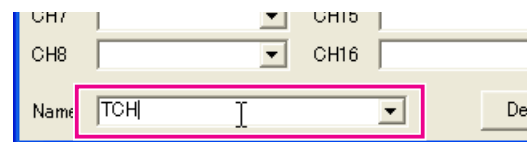
If the combination of the channel for specifying the instruction is completed, put the name of the combination in the column for the name.

(Here we use a name of 'instruction' as an example.)

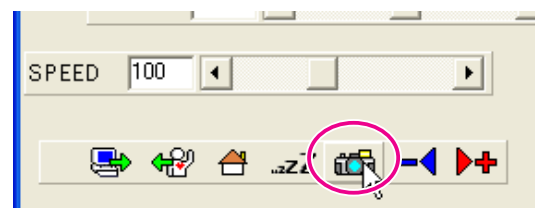
Then push OK, and close a window.





6 If you return to the position window, please select the name you specified ('instruction' in this example) in the LINK setting.



7 When instruction is chosen with LINK, instruction can be done with the following process.



 Once you click the shutter button, the servo specifying TCH on LINK window become free, and you can fix the posture.

 When you click on the shutter button again, a present position is taken in, and the channel of 'TCH' changes from FREE to SERVO.

- As even the newly opened position can be chosen if you tried the LINK selection once, the position using instruction function can be made quickly.
- If you make motions using instruction, you cannot teach more than the movable limitation of the servo.

RCB-3J

