

mitsubishi

Mitsubishi Industrial Robot

CRn-700 Series
R56TB Instruction Manual

MELFA
BFP-A8684

Safety Precautions

Always read the following precautions and the separate "Safety Manual" before starting use of the robot to learn the required measures to be taken.

CAUTION

All teaching work must be carried out by an operator who has received special training. (This also applies to maintenance work with the power source turned ON.)
Enforcement of safety training

CAUTION

For teaching work, prepare a work plan related to the methods and procedures of operating the robot, and to the measures to be taken when an error occurs or when restarting. Carry out work following this plan. (This also applies to maintenance work with the power source turned ON.)
Preparation of work plan

WARNING

Prepare a device that allows operation to be stopped immediately during teaching work. (This also applies to maintenance work with the power source turned ON.)
Setting of emergency stop switch

CAUTION

During teaching work, place a sign indicating that teaching work is in progress on the start switch, etc. (This also applies to maintenance work with the power source turned ON.)
Indication of teaching work in progress

WARNING

Provide a fence or enclosure during operation to prevent contact of the operator and robot.
Installation of safety fence

CAUTION

Establish a set signaling method to the related operators for starting work, and follow this method. Signaling of operation start

CAUTION

As a principle turn the power OFF during maintenance work. Place a sign indicating that maintenance work is in progress on the start switch, etc.
Indication of maintenance work in progress

CAUTION

Before starting work, inspect the robot, emergency stop switch and other related devices, etc., and confirm that there are no errors.
Inspection before starting work

- The points of the precautions given in the separate "Safety Manual" are given below. Refer to the actual "Safety Manual" for details.

⚠ CAUTION

Use the robot within the environment given in the specifications. Failure to do so could lead to a drop or reliability or faults. (Temperature, humidity, atmosphere, noise environment, etc.)

⚠ CAUTION

Transport the robot with the designated transportation posture. Transporting the robot in a non-designated posture could lead to personal injuries or faults from dropping.

⚠ CAUTION

Always use the robot installed on a secure table. Use in an instable posture could lead to positional deviation and vibration.

⚠ CAUTION

Wire the cable as far away from noise sources as possible. If placed near a noise source, positional deviation or malfunction could occur.

⚠ CAUTION

Do not apply excessive force on the connector or excessively bend the cable. Failure to observe this could lead to contact defects or wire breakage.

⚠ CAUTION

Make sure that the workpiece weight, including the hand, does not exceed the rated load or tolerable torque. Exceeding these values could lead to alarms or faults.

⚠ WARNING

Securely install the hand and tool, and securely grasp the workpiece. Failure to observe this could lead to personal injuries or damage if the object comes off or flies off during operation.

⚠ WARNING

Securely ground the robot and controller. Failure to observe this could lead to malfunctioning by noise or to electric shock accidents.

⚠ CAUTION

Indicate the operation state during robot operation. Failure to indicate the state could lead to operators approaching the robot or to incorrect operation.

⚠ WARNING

When carrying out teaching work in the robot's movement range, always secure the priority right for the robot control. Failure to observe this could lead to personal injuries or damage if the robot is started with external commands.

⚠ CAUTION

Keep the jog speed as low as possible, and always watch the robot. Failure to do so could lead to interference with the workpiece or peripheral devices.

⚠ CAUTION

After editing the program, always confirm the operation with step operation before starting automatic operation. Failure to do so could lead to interference with peripheral devices because of programming mistakes, etc.

⚠ CAUTION

Make sure that if the safety fence entrance door is opened during automatic operation, the door is locked or that the robot will automatically stop. Failure to do so could lead to personal injuries.

⚠ CAUTION

Never carry out modifications based on personal judgments, or use non-designated maintenance parts.

Failure to observe this could lead to faults or failures.

⚠ WARNING

When the robot arm has to be moved by hand from an external area, do not place hands or fingers in the openings. Failure to observe this could lead to hands or fingers catching depending on the posture.

⚠CAUTION

Do not stop the robot or apply emergency stop by turning the robot controller's main power OFF. If the robot controller main power is turned OFF during automatic operation, the robot accuracy could be adversely affected. Moreover, it may interfere with the peripheral device by drop or move by inertia of the arm.

⚠CAUTION

Do not turn off the main power to the robot controller while rewriting the internal information of the robot controller such as the program or parameters.

If the main power to the robot controller is turned off while in automatic operation or rewriting the program or parameters, the internal information of the robot controller may be damaged.

⚠WARNING

For using RH-5AH/10AH/15AH series or RH-6SH/12SH/18SH series.

While pressing the brake releasing switch on the robot arm, beware of the arm which may drop with its own weight.

Dropping of the hand could lead to a collision with the peripheral equipment or catch the hands or fingers.

Revision History

Date of print	Specifications No.	Revision details
2008-6-25	BFP-A8684-*	First release

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1. Before use

Since this teaching pendant R56TB (T/B) carries GUI, you can use it easily by operating the touch panel.
The operation method of T/B in the instructions manual of the separate volume is indicated based on R28TB.
Please refer to this book, when using R56TB.
To use this T/B, the software version of the controller needs to be K7 edition or later.

1.1. The check of the package

Please check if all items shown below are included in the package.

- Teaching-pendant body R56TB (With touch stylus and connection cable)
- INSTRUCTION MANUAL BFP-A8684

* Please contact the branch office or the agency if there is some shortage in the package.

2. Specification

2.1. Specifications

Items	Specifications	Remarks
Outline dimensions	252(W) x 240(H) x 114(D) (refer to outline drawing)	
Mass	Approx. 1,250g	The cable is not included.
Connection method	Connection with controller and round connector Cable length 7m	
	<i>RS-422</i> <i>Ethernet (10BASE-T)</i>	For connection with robot controller
Interface	<i>USB host (USB memory sticks)</i>	Note1)
	6.5" TFT (640x480 pixels) with backlighting. Resistive touch screen, to be operated with finger or stylus.	

Note1) The following list gives an overview about the tested USB memory sticks and their manufacturers.

- 1) Kingston Data Traveler: Manufacturer: Kingston
Type: USB 2.0 memory stick
Memory sizes: 128 MB - 1GB
- 2) Transcend Jet Flash: Manufacturer: Transcend
Type: USB 2.0 memory stick
Memory sizes: 128 MB - 1GB

Notice) USB memory sticks from other manufacturers is not guaranteed.



CAUTION

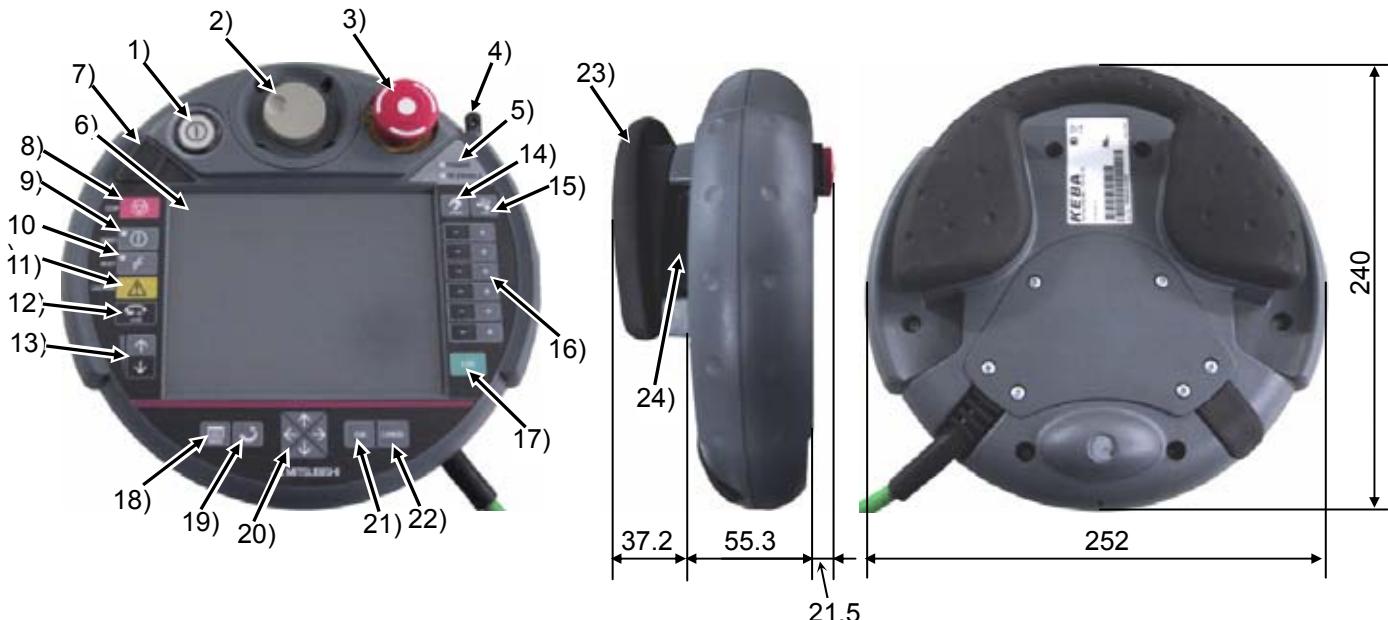
Use in the environment with a lot of dust and oil mists, etc. causes the trouble. Please do not use or keep in such a place.



CAUTION

The use of USB memory stick of larger capacity than 1G byte causes defective behavior. Please do not use it.

2.2. Construction



1) TEACH button

This changeover switch is used to enable or disable the T/B key operations. The lamp (white) lights up during enabling state.

2) Wheel

Move the cursor to select the menu and so on.

3) Emergency stop button

This stops the robot in an emergency state. The servo turns OFF. Turn to the right to cancel.

4) Touch stylus (Integrated in housing)

The pen which operates the touch panel.

5) Power supply LED, T/B enable LED

POWER LED lights up during supplying the power supply.

TB ENABLE LED lights up during enabling state.

6) Touch panel

Touch to operate with the stylus pen and the screen is displayed.

7) USB connector

Plug-in the USB memory stick.

8) STOP button

This stops the robot immediately. The servo does not turn OFF.

9) SERVO button

This turns ON the servo power simultaneously with the enable switch. The LED (green) lights during servo ON.

10) RESET button

This key resets an error state that has occurred.

11) CAUTION button

If this button is pushed in jog operation, the limit switch can be canceled.

Moreover, push this button, when releasing the brake.

12) HOME button

Not used.

13) OVRD button

This scrolls override up or down.

14) HAND button

Display the screen of hand operation.

15) JOG button

Display the screen of jog operation.

16) +/- button

This button operates corresponding to the selected operation.

17) EXE button

Move the robot, such as hand alignment.

18) MENU button

Display the menu screen.

19) RETURN button

Close each operation screen.

20) Arrow button

Move the cursor.

21) OK button

Fix each screen operation.

22) CANCEL button

Cancel each screen operation.

23) Multi grip handle

Holds the T/B.

24) Enable switch

When the TERACH button 2) is enabled, and this switch is released or pressed with force, the servo will turn OFF. Press this switch lightly when carrying out functions with the servo ON, such as jog operations. If emergency stop or servo OFF have been applied, and the servo is OFF, the servo will not turn ON even when this switch is pressed. In this case, carry out the servo ON operation again.

3. Connection with controller

Installing and removing the T/B ,with turning off the controller power.
If T/B is Installed and removed in the state of control source ON,emergency stop alarm will be occurred.
If you use the robot wherein T/B is removed ,install the dummy connector of attachment for the product instead of T/B.
Take out and insert the dummy connector with the connector itself.



CAUTION

Please do not pull the cable of T/B strongly or do not bend it too much.
It becomes the breaking of a wire of the cable and the cause of breakage of the connector.
Please installing and removing so that stress does not start the cable with the connector itself.

3.1. Installing The T/B

Explain the installation method of T/B below.

- 1) Check that the POWER (power supply) switch of the robot controller is OFF.
- 2) Connects T/B connector to the robot controller.

Use as the upper surface the lock lever shown in Fig. 3-1, and push in until there is sound.

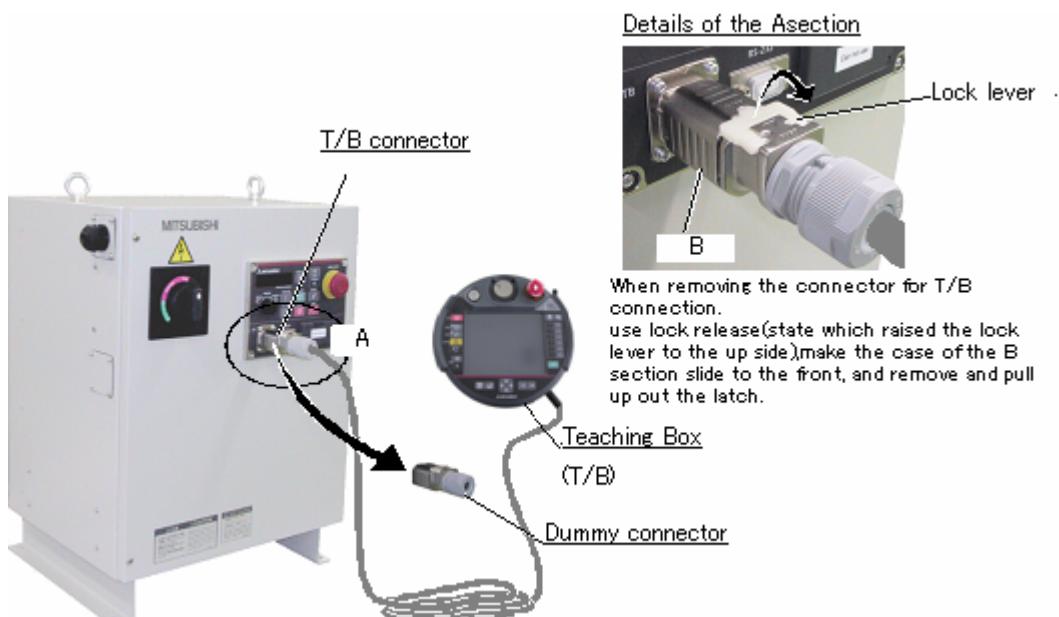


Fig. 3-1 : Installing and removing the T/B

The installation of T/B is finished.

3.2. Removing the T/B

Explain the removing method of T/B below.

Check that the POWER (power supply) switch of the robot controller is OFF.

Raise the lock lever up in the connector upper part, and pull up the connector.

Please install the dummy connector, if you use the robot, without connecting T/B.

The removing of T/B is finished



CAUTION

The content under the edit does not be preserved when you detach T/B while editing the program.
The edit of the user definition screen is also similar. (The user definition screen can be used since this software Ver.2.2.)

4. Basic operation method

The basic operating method of R56TB is shown.

As shown in the figure, holds with one hand and operate the enable switch by finger, and operate the screen and button by another hand. Since the screen is the touch panel, operate it with a touch stylus.



5. Language setting

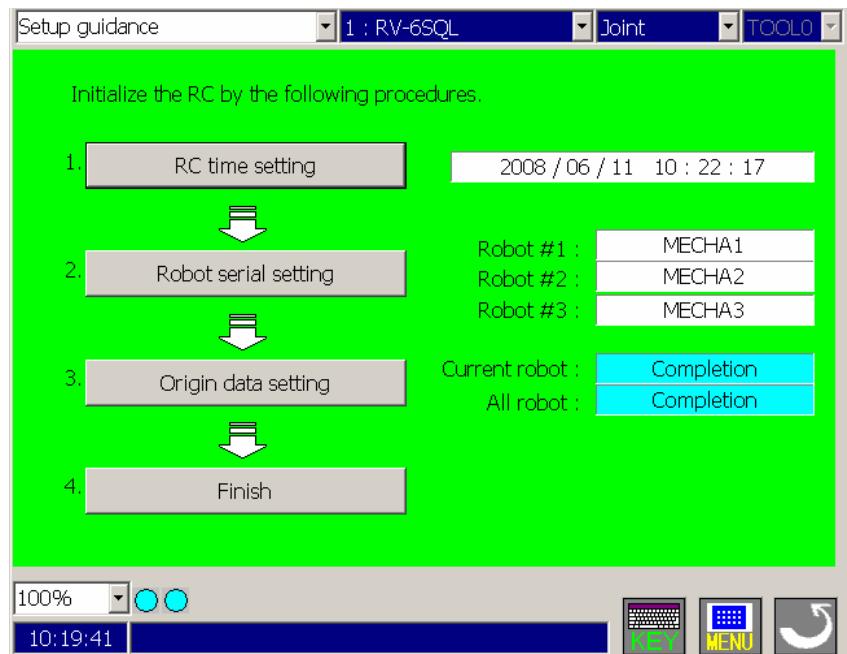
At the time of the first power supply on, the language setting screen is displayed.
Please select the language to make it display on the T/B screen. Please touch [OK] Key.
Japanese display: Japanese
English display: English

6. Guidance

Guidance screen is displayed for the basic setting such as the origin setting at the controller started for the first time.

There are three following functions in this screen.

- (1) Setting time of controller
- (2) Setting the management code of controller(Only when the CRn-500 controller is connected)
- (3) Setting the serial number of the robot arm (Only when The CRn-700 controller is connected)
- (4) Setting origin data



6.1. Setting time of controller

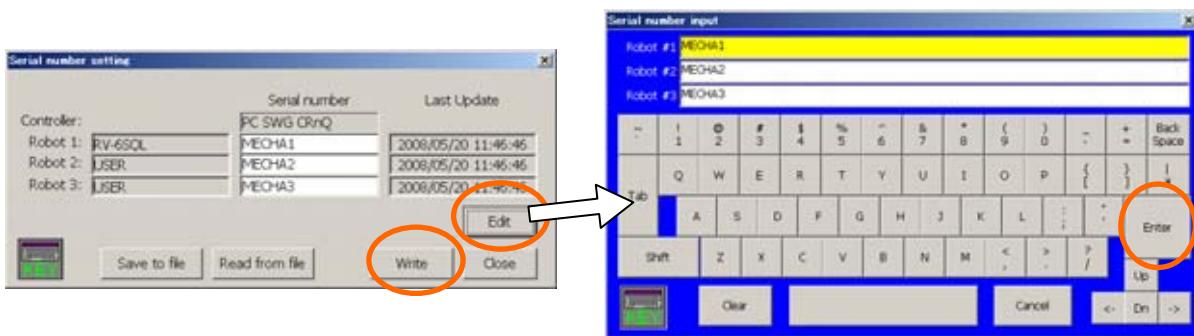
Set the time of controller.

The controller can be set time when the [RC time setting] button is clicked. The date that the controller is maintaining now is displayed in the right of the button.

6.2. Setting the serial number of the robot arm

Set the serial number of the robot arm.

Press [Robot serial setting] button and display the setting screen of serial number.



Press [Edit] button and display the setting screen.

Input the serial number which has been described to the plaque of the robot.

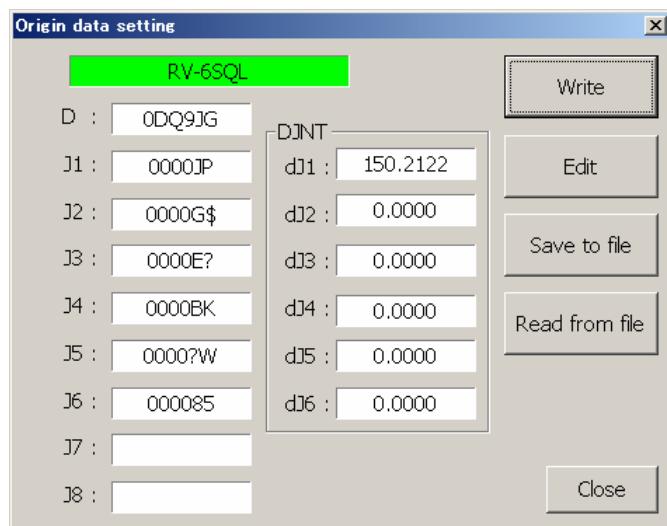
Press [Enter] button, then Press [Write] button.

After the confirmation dialog is displayed, the serial number of the robot arm is set.

6.3. Setting origin data

Set the robot origin by input the origin data.

Click the [Edit] button to input origin data. The origin data to be input is noted in the origin data sheet enclosed with the arm, or on the origin data history table attached to the back side of the shoulder cover.. Please refer to the separate manual "INSTRUCTION MANUAL / ROBOT ARM SETUP & MAINTENANCE" for details.



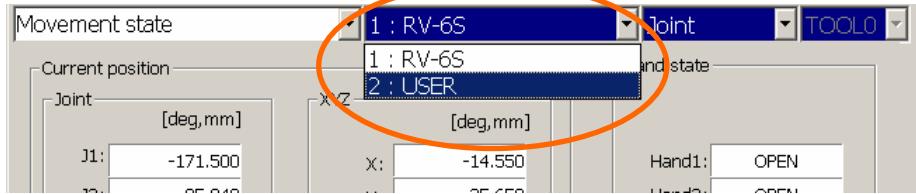
When the [Write] button is clicked, origin data is written in the controller. And setting the origin is completed.

Click the [Save to file] button, origin data can be saved in a specified file.

Click the [Read from file] button, origin data can be set from the file where the origin data is saved.

7. Setting a target robot for using multi-mechanism control

When using the multi-mechanism control, please select a target robot at the Select robot combo box.



The robot selected here becomes the object of the following operations and monitors.

- Servo ON/OFF
- JOG operation
- Hand operation
- Direct execution
- Position jump
- Releasing the brakes
- Setting the origin
- Various monitor functions



CAUTION

About the target robot of the step operation

The robot which moves when the step operation is executed is the same as the robot which moves when the program is executed by the automatic operating, regardless of the selection of robot at the combo box.

When the GETM command is executed, the robot selected by the GETM command moves in the execution of the robot operation commands after that.

- * Multi-mechanism control is the function to control up to two (excluding the standard robots) robots (user mechanism) driven by servo motors, besides the standard robots. For more information, please refer to the separate manual "ADDITIONAL AXIS INTERFACE".

8. JOG operation

8.1. Speed setting

Push [OVRD (Upper arrow)] or [OVRD (Lower arrow)] button (<a>) of T/B, and change operation speed.

LOW – HIGH – 3% - 5% - 10% - 30% - 50% - 70% - 100%

The changed speed is displayed on STATUS NUMBER of the controller, and on the combo box in the screen lower left of T/B. ()

Selection of this combo box can also do the setup of speed.

LOW and HIGH are fixed-dimension feed. (The STATUS NUMBER display of the controller is 3%). Even if it continues pressing the button at the time of the fixed-dimension feed, the robot moves only the fixed amount. The amount of movement depends on the individual robot.



Advice

Even set to the top speed, the speed of jog feeding is reduced for safety. (250mm/s max)

The highest movement speed and amount of fixed-dimension feed at teaching mode can be set by parameter: JOGJSP, JOGPSP, and JOGMAX.

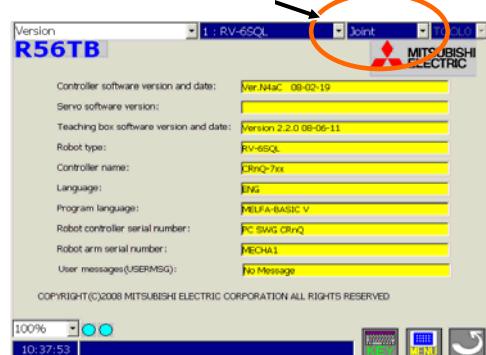
8.2. Jog mode

There are JOINT, XYZ, TOOL, 3-axis XYZ, and the Cylinder in jog mode.

Push the [JOG] button (<a>) of T/B, the JOG operation screen will be displayed. The jog mode is changed in order of JOINT->XYZ->TOOL->3-axis XYZ->Cylinder, each time the button is pushed. The current jog mode is displayed in the combo box. ()

Jog mode can be selected from this combo box.

Please refer to separate manual: "ROBOT ARM SETUP & MAINTENANCE," which provides more detailed explanations.



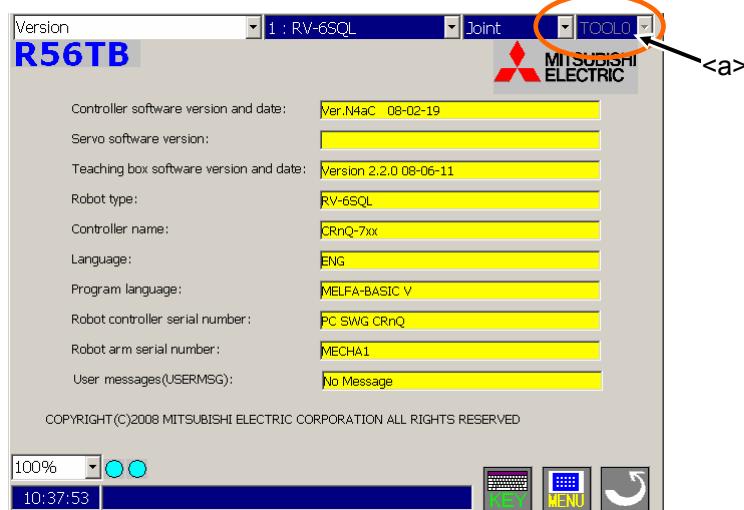
Joint jog mode		XYZ jog mode		TOOL jog mode	
J1:	-161.420	X:	-426.920	X:	-426.920
J2:	0.030	Y:	-143.470	Y:	-143.470
J3:	90.070	Z:	729.330	Z:	729.330
J4:	0.000	A:	180.000	A:	180.000
J5:	0.030	B:	89.870	B:	89.870
J6:	0.000	C:	18.580	C:	18.580
		FL1	R,A,N	FL1	R,A,N
		FL2	0	FL2	0
		Tool setting value		Tool setting value	
		X:	0	X:	0
		Y:	0	Y:	0
		Z:	0	Z:	0
		A:	0	A:	0
		B:	0	B:	0
		C:	0	C:	0
<input type="button" value="Close"/>		<input type="button" value="Close"/>		<input type="button" value="Close"/>	

3-axis XYZ jog mode		Cylinder XYZ jog mode	
3-axis XYZ		Cylinder XYZ	
X:	-426.920	R:	450.380
Y:	-143.470	T:	-161.420
Z:	729.330	Z:	729.330
J4:	0.000	A:	180.000
J5:	0.030	B:	89.870
J6:	0.000	C:	18.580
FL1	R,A,N	R	450.380
FL2	0	T	-161.420
Tool setting value		Z	729.330
X:	0	A	180.000
Y:	0	B	89.870
Z:	0	C	18.580
A:	0		
B:	0		
C:	0		
<input type="button" value="Close"/>	<input type="button" value="Close"/>		

8.3. Switching Tool Data

Beforehand the tool data setting as MEXTL1 - MEXTL4 can be selected.
If tool data not change, this operation is not necessary.

Tool data can be selected also from combo box. (<a>)



The value and the relation of the parameter to select are shown below.

TOOL0=MEXTL
TOOL1=MEXTL1
TOOL2=MEXTL2
TOOL3=MEXTL3
TOOL4=MEXTL4



CAUTION

When the robot moves with changing tool data, the tool data needs to be changed by setting tool number into the M_TOOL. To move the robot to the position where teaching was performed while switching tool data (MEXTL1 to 4 parameters) during the automatic operation of the program, substitute the M_TOOL variable by a tool number when needed, and operate the robot by switching tool data. Exercise caution as the robot moves to an unexpected direction if the tool data during teaching does not match the tool number during operation.

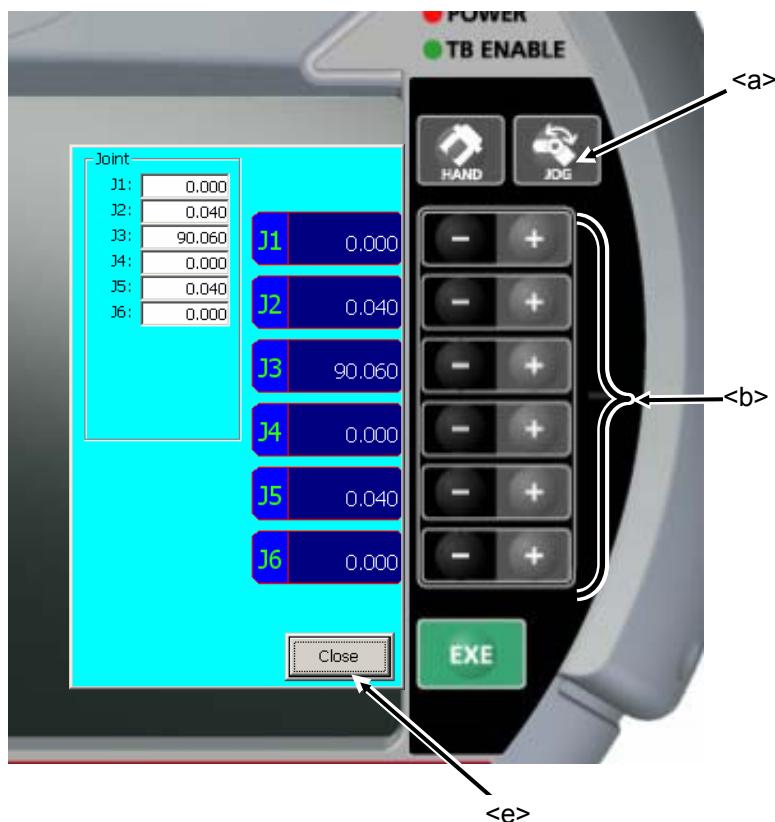


CAUTION

To move the robot while switching tool data during the step operation of the program, exercise caution as the robot moves to an unexpected direction if the tool data at the time of teaching does not match the tool number during step operation.

8.4. JOINT jog operation

Push the [TEACH] switch and enable the T/B. The LED (white) lights up.
Press the [JOG] button (<a>) of T/B and display the JOG operation screen.
Select joint jog mode (JOINT).

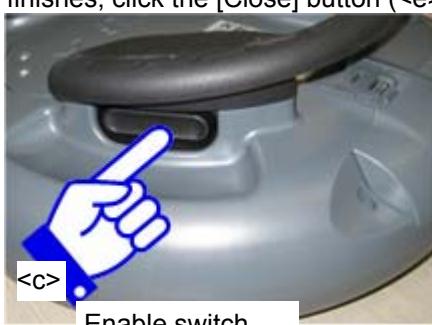


Jogging movement is in the servo power supply ON state, and execute jog feeding by pushing the button of each axis (), continuing pushing the enable switch of T/B. (<c>)

By pushing in the enable switch still more strongly during jog feeding, or detaching, the servo power supply can be turned off and can stop the robot.

The servo will turn ON when the [SERVO] button (<d>) pressed, in the condition that the enable switch is pushed. When the servo turns on, LED (green) of the [SERVO] button lights up.

If the button corresponding to the axis to move is pushed, only while pushing, the robot will move.
If it finishes, click the [Close] button (<e>) of the T/B screen and close the JOG operation screen.

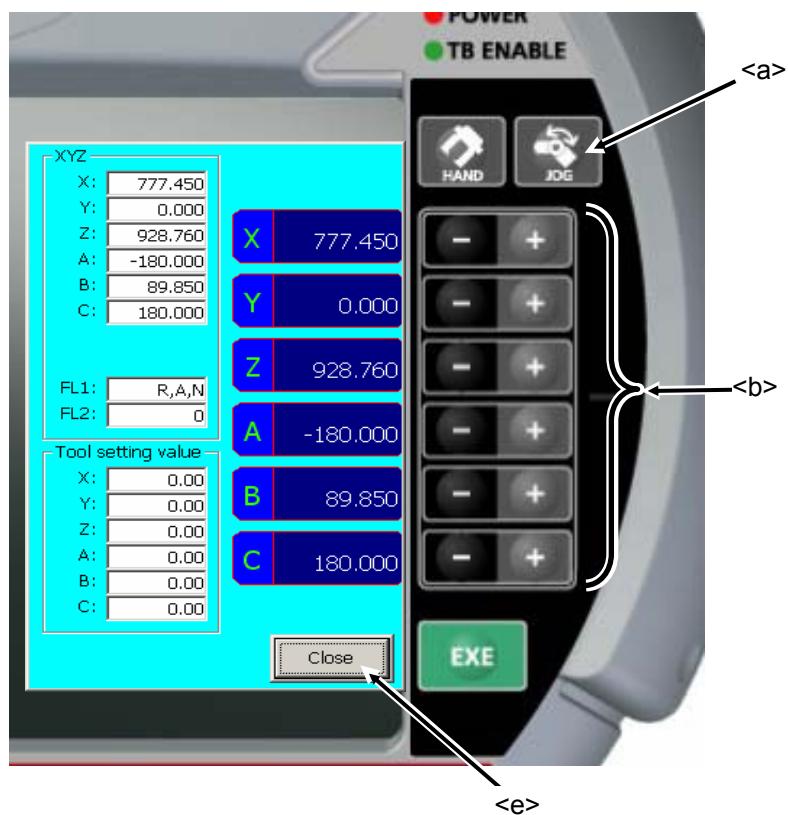


Advice

The enable switch is in two right and left on the back of T/B. e servo-on state will be maintained if keeping pushing one of the enable switches.

8.5. XYZ jog operation

Push the [TEACH] switch and enable the T/B. The LED (white) lights up.
 Push the [JOG] button (<a>) of T/B and display the JOG operation screen.
 Select joint jog mode (XYZ).



Jogging movement is in the servo power supply ON state, and execute jog feeding by pushing the button of each axis (), continuing pushing the enable switch of T/B. (<c>)

By pushing in the enable switch still more strongly during jog feeding, or detaching, the servo power supply can be turned off and can stop the robot.

The servo will turn ON when the [SERVO] button (<d>) pushed, in the condition that the enable switch is pushed. When the servo turns on, LED (green) of the [SERVO] button lights up.

If the button corresponding to the axis to move is pushed, only while pushing, the robot will move.
 If it finishes, click the [Close] button (<e>) of the T/B screen and close the JOG operation screen.



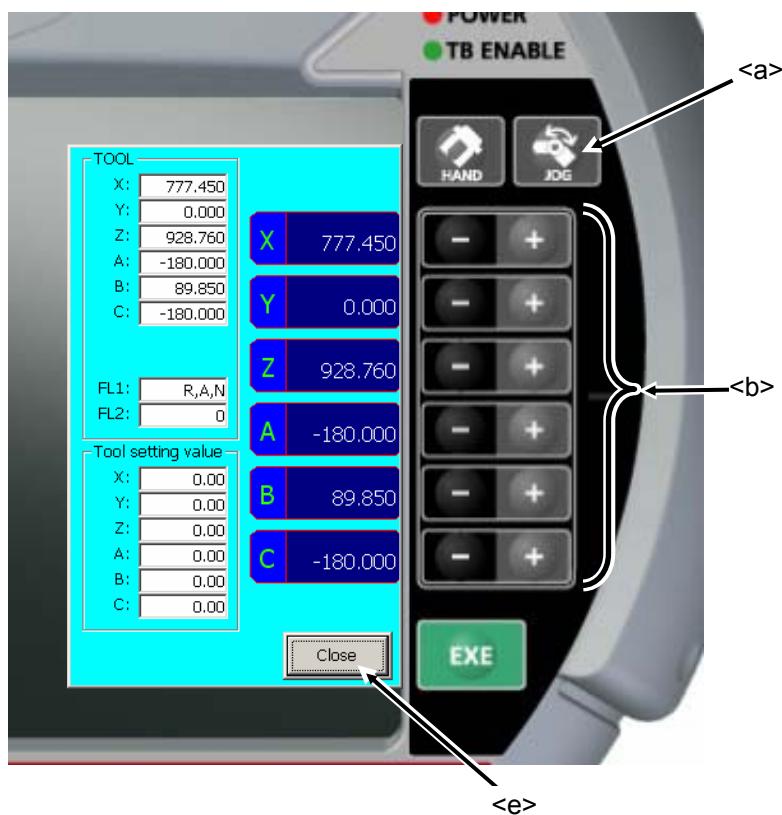
Advice

The enable switch is in two right and left on the back of T/B.

The servo-on state will be maintained if keeping pushing one of the enable switches.

8.6. TOOL jog operation

Push the [TEACH] switch and enable the T/B. The LED (white) lights up.
 Push the [JOG] button (<a>) of T/B and display the JOG operation screen.
 Select joint jog mode (TOOL).

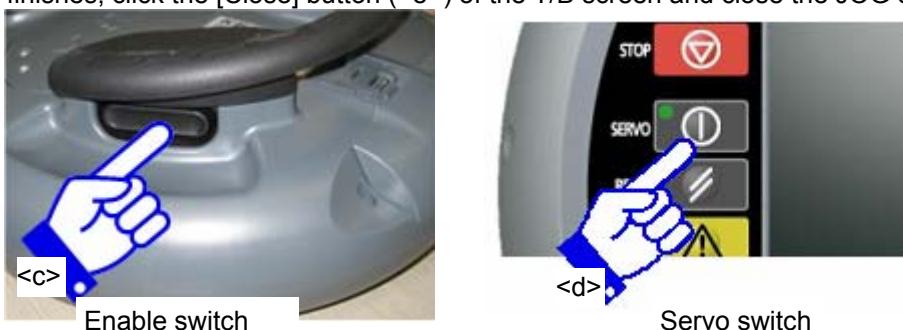


Jogging movement is in the servo power supply ON state, and execute jog feeding by pushing the button of each axis (), continuing pushing the enable switch of T/B. (<c>)

By pushing in the enable switch still more strongly during jog feeding, or detaching, the servo power supply can be turned off and can stop the robot.

The servo will turn ON when the [SERVO] button (<d>) pushed, in the condition that the enable switch is pushed. When the servo turns on, LED (green) of the [SERVO] button lights up.

If the button corresponding to the axis to move is pushed, only while pushing, the robot will move.
 If it finishes, click the [Close] button (<e>) of the T/B screen and close the JOG operation screen.

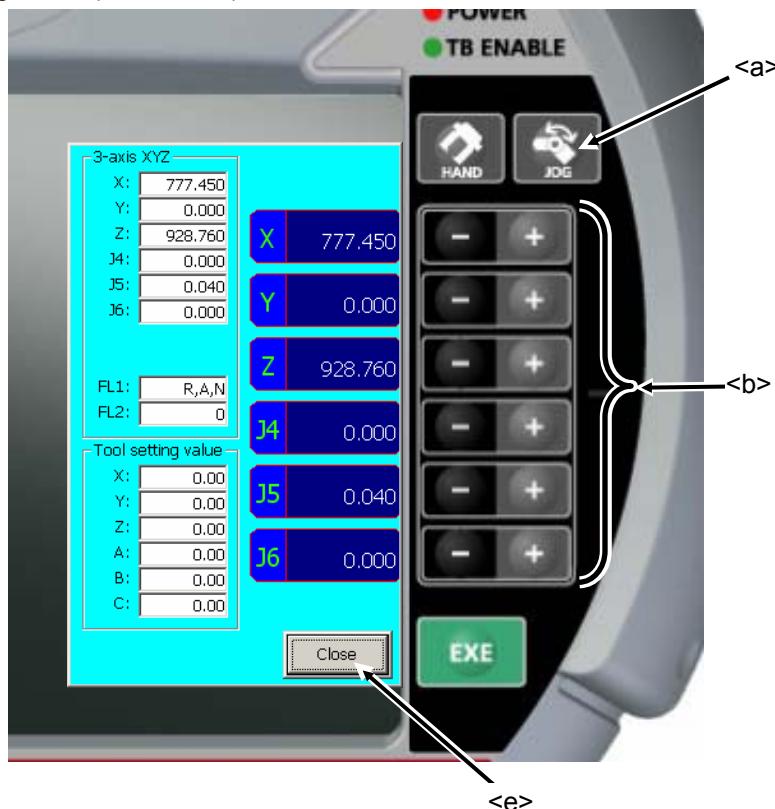


Advice

The enable switch is in two right and left on the back of T/B.
 The servo-on state will be maintained if keeping pushing one of the enable switches.

8.7. 3-axis XYZ jog operation

Push the [TEACH] switch and enable the T/B. The LED (white) lights up.
Push the [JOG] button (<a>) of T/B and display the JOG operation screen.
Select joint jog mode (3-axis XYZ).



Jogging movement is in the servo power supply ON state, and execute jog feeding by pushing the button of each axis (), continuing pushing the enable switch of T/B. (<c>)

By pushing in the enable switch still more strongly during jog feeding, or detaching, the servo power supply can be turned off and can stop the robot.

The servo will turn ON when the [SERVO] button (<d>) pushed, in the condition that the enable switch is pushed. When the servo turns on, LED (green) of the [SERVO] button lights up.

If the button corresponding to the axis to move is pushed, only while pushing, the robot will move.
If it finishes, click the [Close] button (<e>) of the T/B screen and close the JOG operation screen.



Advice

The enable switch is in two right and left on the back of T/B.

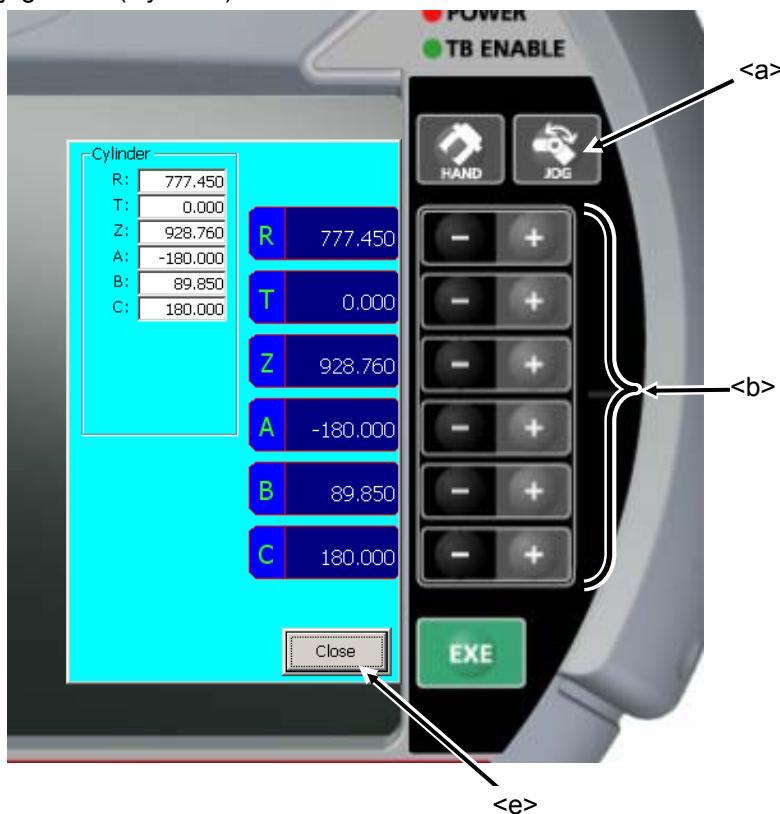
The servo-on state will be maintained if keeping pushing one of the enable switches.

8.8. Cylinder jog operation

Push the [TEACH] switch and enable the T/B. The LED (white) lights up.

Push the [JOG] button (<a>) of T/B and display the JOG operation screen.

Select joint jog mode (Cylinder).



Jogging movement is in the servo power supply ON state, and execute jog feeding by pushing the button of each axis (), continuing pushing the enable switch of T/B. (<c>)

By pushing in the enable switch still more strongly during jog feeding, or detaching, the servo power supply can be turned off and can stop the robot.

The servo will turn ON when the [SERVO] button (<d>) pushed, in the condition that the enable switch is pushed. When the servo turns on, LED (green) of the [SERVO] button lights up.

If the button corresponding to the axis to move is pushed, only while pushing, the robot will move.

If it finishes, click the [Close] button (<e>) of the T/B screen and close the JOG operation screen.



Advice

The enable switch is in two right and left on the back of T/B.

The servo-on state will be maintained if keeping pushing one of the enable switches.

8.9. Jog operation with wheel

While setting the operation speed to fixed-dimension feed High or Low, it is possible to operate by even rotating the wheel <a>, in addition to the usual jog operation done with [+] and the [-] key.
(This function is available with R56TB Ver.2.1 or later.)



Wheel-jog mode is released at the following time.

- Release the target axis for the operation.
- Change the jog mode.
- Change the operation speed to besides fixed-dimension feed High or Low.
- Disable the T/B.



WARNING

The operation speed of the robot might exceed 250mm/s.

In the jog operation with the wheel, the instruction in the jog is sent continuously when the wheel is rotated. Please note the movement of the robot enough.

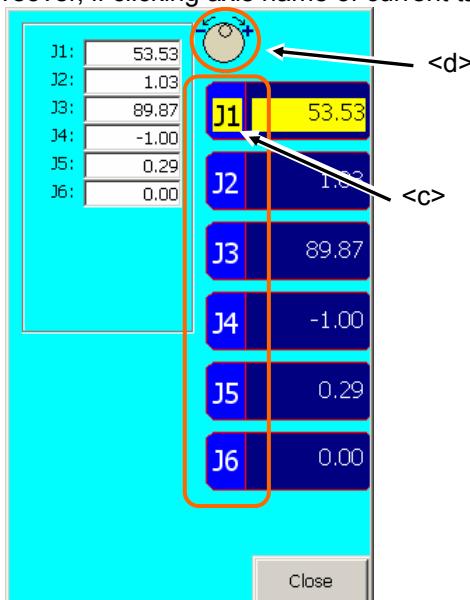
Especially, because the amount of operation of fixed-dimension feed is large in Jog mode which operates the joint axis, the speed in the flange plane of the robot might exceed 250mm/s. Feed amount when jog speed can be set by the first element of parameter JOGJSP (Inching H) and the second element (Inching L). Please set each below factory setting value and use it.

Operate according to the following procedures.

1. Push the [JOG] button () of T/B and display the JOG operation screen. Select the jog mode.
And Set the operation speed to High or Low.



2. Click a part of axis name <c> of axis to operate on the JOG operation screen, the axis becomes the target axis for the operation. If the target axis is set, it becomes Wheel-jog mode. And the Wheel-mark <d> is displayed.
 If clicking other axis name, the target axis changes into that axis.
 Moreover, if clicking axis name of current target again, it is released.



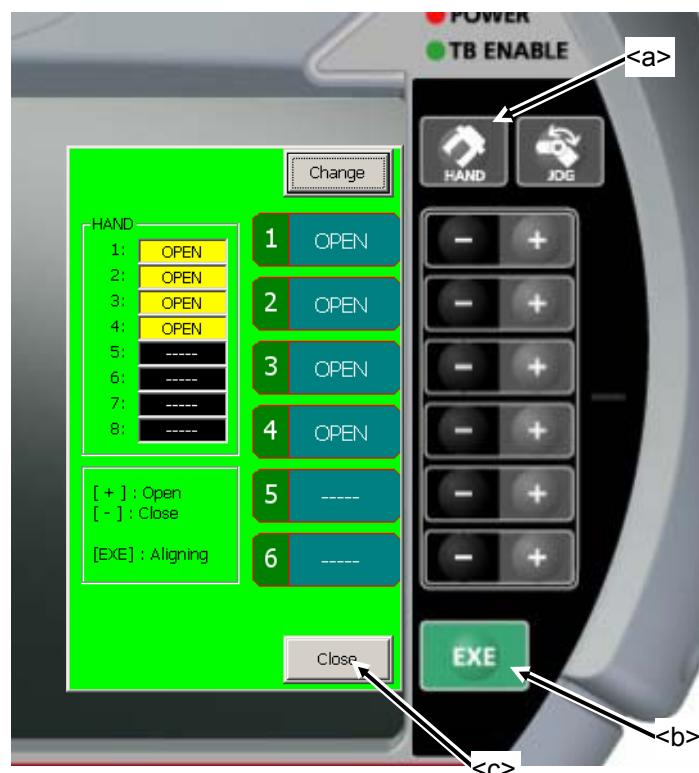
3. Turn the servo on, and rotate the wheel with pushing the enable switch of T/B. The target axis for the operation is moved in fixed-dimension feed.

Right rotation : Direction of +

Left rotation : Direction of -

8.10. Aligning the Hand

The posture of the hand attached to the robot can be aligned in units of 90 degrees. This feature moves the robot to the position where the A, B and C components of the current position are set at the closest values in units of 90 degrees. If the tool coordinates are specified by the TOOL instruction or parameters, the hand is aligned at the specified tool coordinates. If the tool coordinates are not specified, the hand is aligned at the center of the mechanical interface. Push the [HAND] button (<a>) of T/B and display the hand operation screen.



When aligning the hand, the servo power supply is in ON state, and in the condition that the enable switch of T/B continues being pushed. By pushing in the enable switch still more strongly during hand alignment, or detaching, the servo power supply can be turned off and can stop the robot. In the condition that the enable switch of T/B is pushed, if the [EXE] button () of T/B is pushed, only while pushing, the robot will move toward the alignment position. During movement, LED (green) of the [START] switch of the controller lights up, and if alignment is completed, the light will be put out. If it finishes, click the [Close] button (<c>) of the T/B screen and close the hand operation screen.

Advice

The enable switch is in two right and left on the back of T/B.

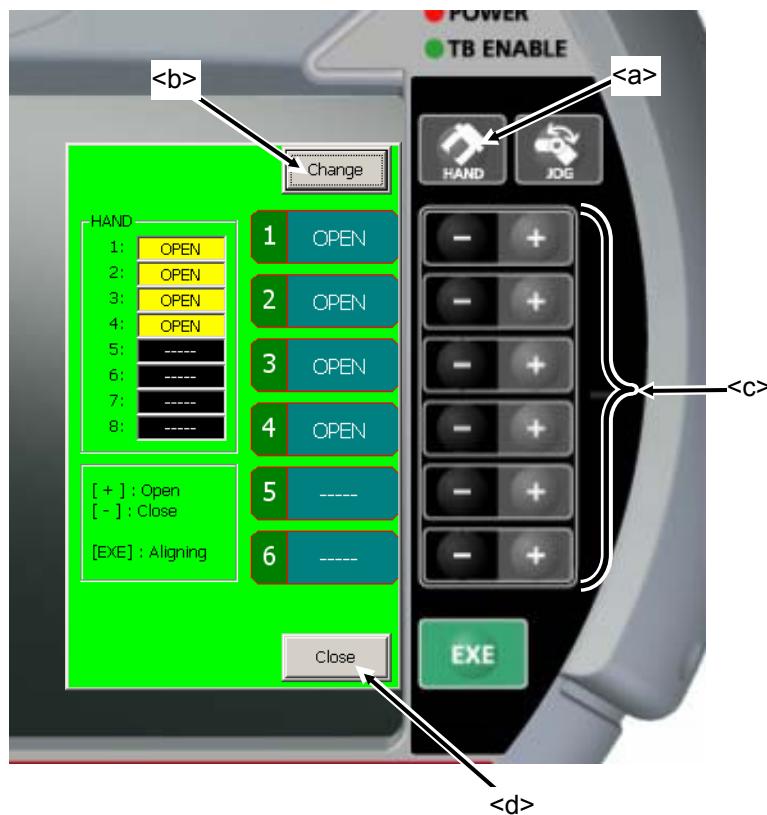
The servo-on state will be maintained if keeping pushing one of the enable switches.

8.11. Opening/Closing the Hands

Push the [HAND] button (<a>) of T/B and display the hand operation screen.

The current hand opening-and-closing state is displayed on the hand operation screen. Although the first screen displays even the hand numbers 1-6, if the [Change] button () of the screen is clicked, the hand numbers 7 and 8 will be displayed.

If the [+] button (<c>) corresponding to the hand number is pushed, the correspondence hand will open, and if the [-] button (<c>) is pushed, it will close.



If it finishes, click the [Close] button (<d>) of the T/B screen and close the hand operation screen.

9. USB memory stick



Note) The operation method is the same although the photograph shown below differs from the actual product slightly.

9.1. Plug-in the USB memory stick



CAUTION

Never unplug the USB memory stick during accessing (read / write operations). It causes the failure.

Please shut the cover surely after unplugging the USB memory stick. Otherwise the foreign body enters the connector, and it causes the malfunction.

<p>1. Open the protection cover:</p> 	<p>2. If the protection cover is open, you can see the USB connector:</p> 
<p>3. Plug-in the USB memory stick until it snaps in:</p> 	<p>4. Here you can see the plugged in USB memory stick.</p> 

*This picture is sample.

The USB memory stick will be detected immediately and will be shown as Hard Disk.

9.2. Unplug the USB memory stick

CAUTION

Never unplug the USB memory stick during accessing (read / write operations). It causes the failure.

Please shut the cover surely after unplugging the USB memory stick. Otherwise the foreign body enters the connector, and it causes the malfunction.

1. Unplug the USB memory stick:



2. Close the protection cover correctly:



3. The protection cover must be closed completely, otherwise IP65 won't be guaranteed:



*This picture is sample.

10. Operation of menu panel

If the control power of the controller is turned on, the splash window will be displayed on the screen of T/B and the initial screen will be displayed on it in about 15 seconds.

If the [MENU] button (<a>) at the right of the T/B screen is clicked, the menu panel (<d>) will be displayed, and you can operate easily by clicking each menu button.

At this time, there are the function which T/B can operate also in the invalid state, and the function which needs the enable state.

Finishing of operation clicks the button (Ex. [Exit] (<e>) etc.) corresponding to finishing in each operation screen, or clicks the [RETURN] button () at the lower right of the T/B screen.

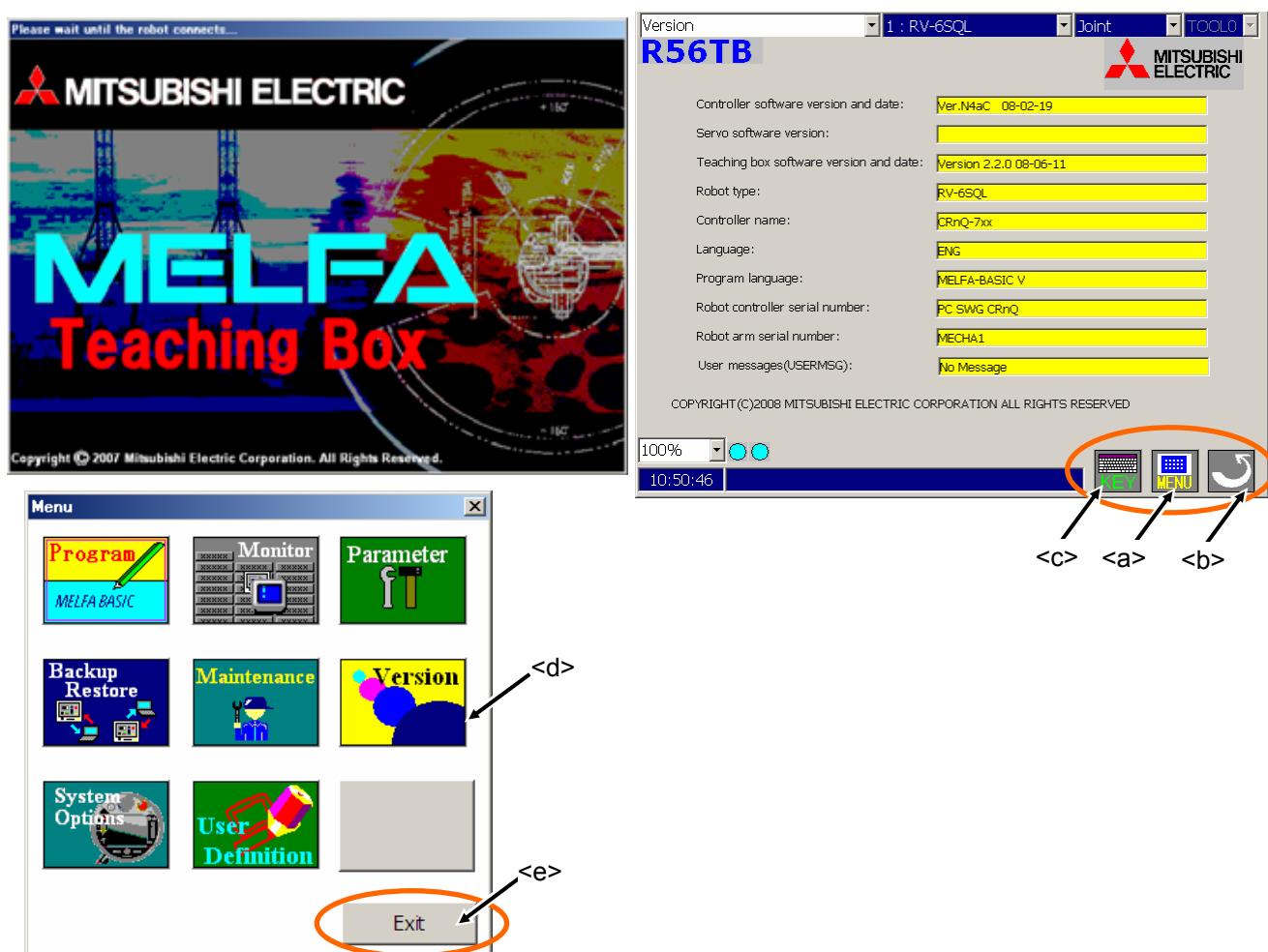
And the keyboard is displayed when the [KEY] (<c>) is clicked on each screen and the hoped character can be input.

Details are explained in the paragraph of the operation of each screen.

The operation for enabling T/B is shown below.

- (1) Set the controller [MODE] switch to "MANUAL".
- (2) Push in the [TEACH] switch of T/B and change into the enable state.

When the enable state, the lamp (white) of the [TEACH] switch and LED (green) of TB ENABLE light up.



Advice

The screen of T/B is the touch panel. Screen operation clicks and operates the icon currently displayed, the button, the radio button, etc. with the attached stylus pen.

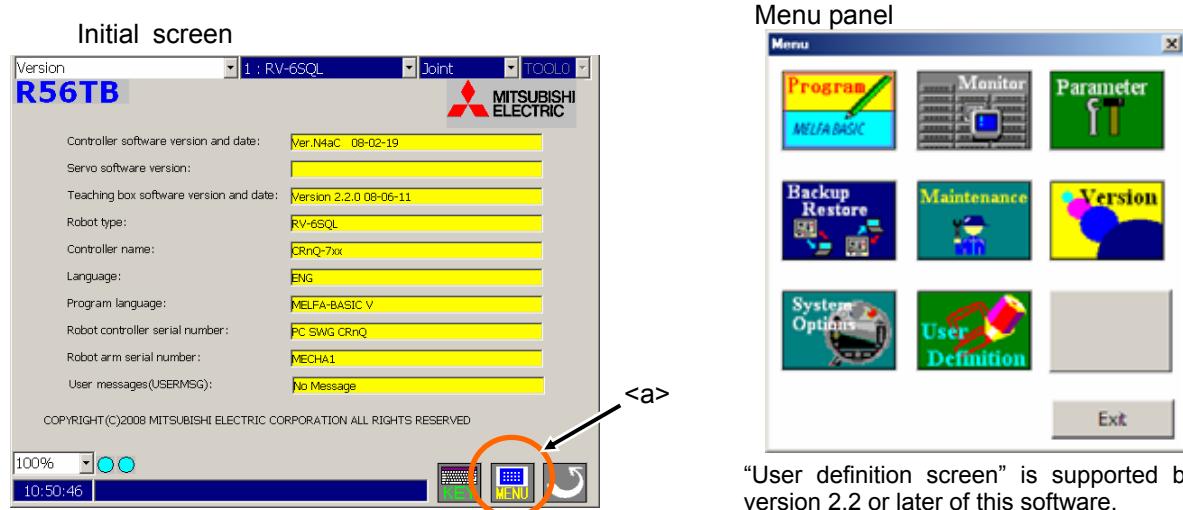
Moreover, there is also the function to push and operate the mechanical button.

11. Program edit

11.1. Edit of program

11.1.1. Open an edit display (new creation)

- 1) Click the [MENU] button (<a>) of a T/B screen and display menu panel.



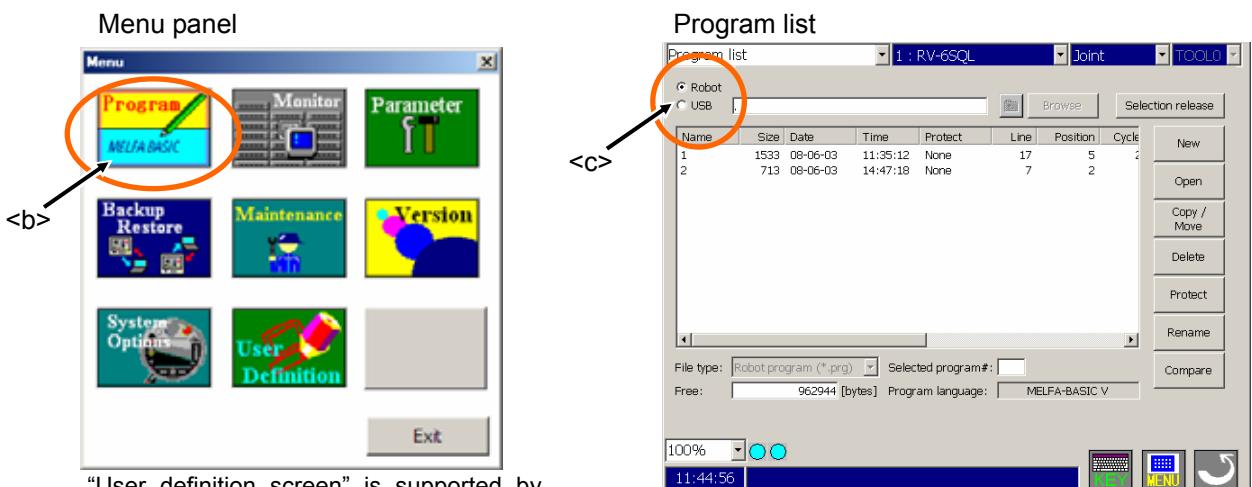
Menu panel



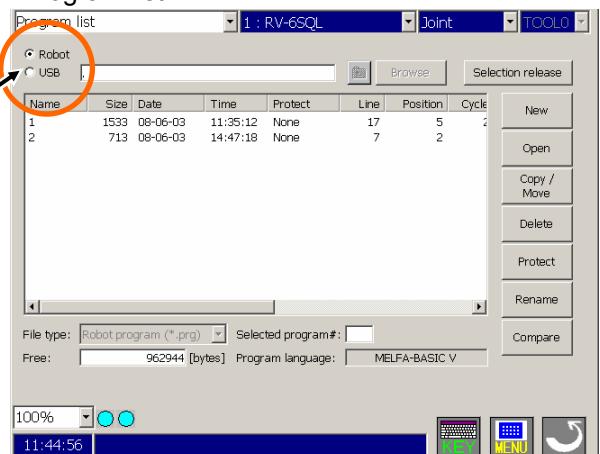
"User definition screen" is supported by version 2.2 or later of this software.

- 2) [Program] button () is clicked and a program list is displayed.

At this time, if it creates newly to a robot controller, the [Robot] radio button (<c>) is checked. If it creates newly to a USB memory, the [USB] radio button (<c>) is checked.



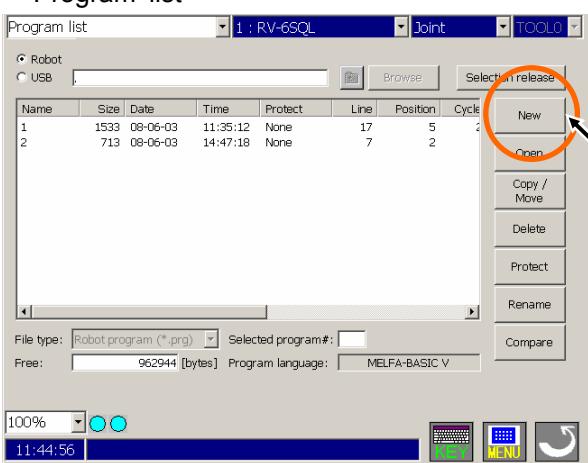
Program list



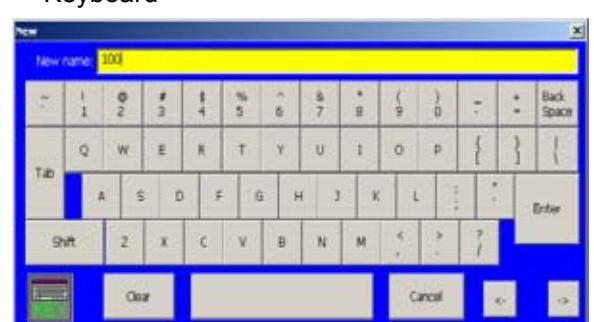
"User definition screen" is supported by version 2.2 or later of this software.

- 3) [New] button (<d>) is clicked and a keyboard is displayed.

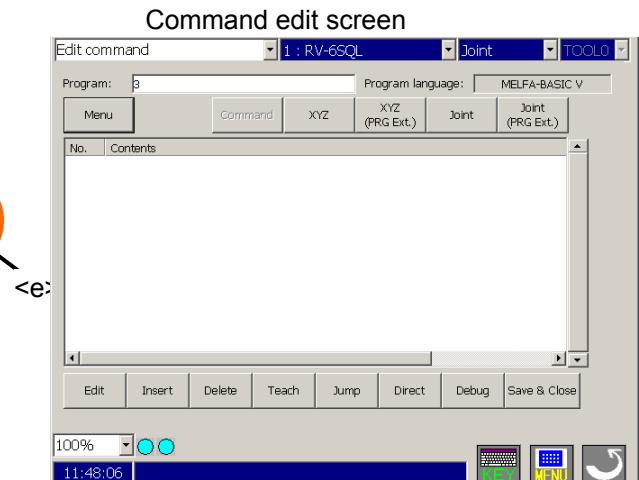
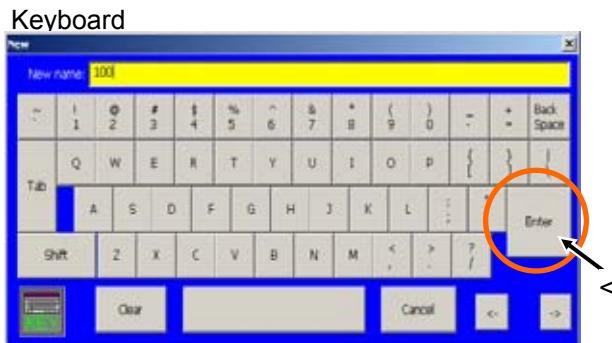
Program list



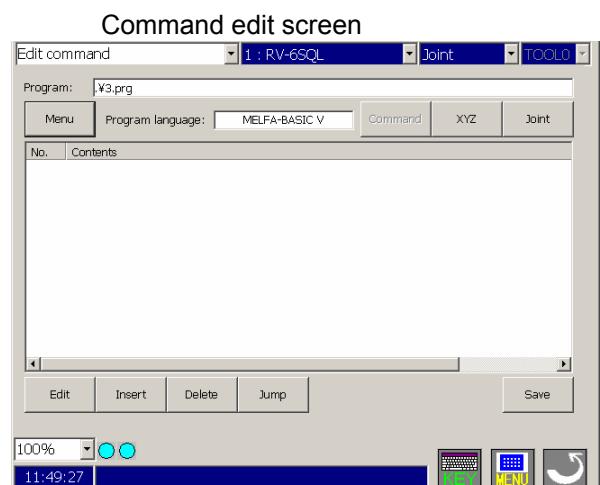
Keyboard



- 4) If a program name is inputted by the keyboard of a screen and the [Enter] key (<e>) is clicked, a command edit screen will be displayed.
 The inputted character is displayed on "Program"



(Creates to the robot controller)



(Creates to the USB memory)

Advice

The buttons displayed differ by the case where the edit screen targets the robot controller, and the case where the edit screen targets the USB memory. The functions, which can be executed also differ.

The edit screens include the command editing screen and the position editing screen.

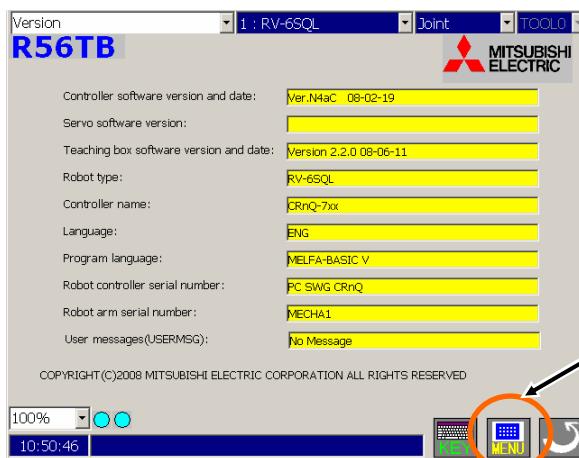
The command editing screen will be displayed first.

If the [XYZ], [XYZ(Global)], [Joint], or [Joint(Global)] button is clicked, the display will be changed to the position edit screen. And, if the [Command] button is clicked, the display will be changed to the command editing screen.

11.1.2. Open an edit display (read of the existing program).

- Click the [MENU] button (<a>) of a T/B screen and display menu panel.

Initial screen



Menu panel

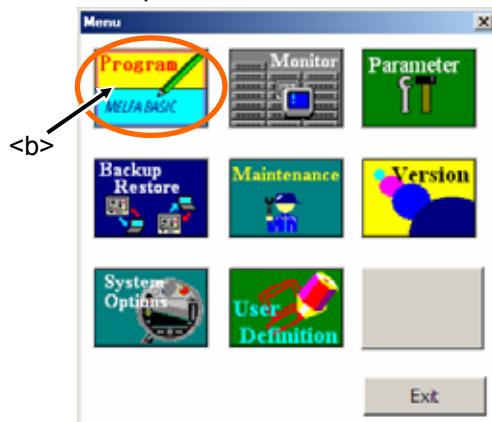


"User definition screen" is supported by version 2.2 or later of this software.

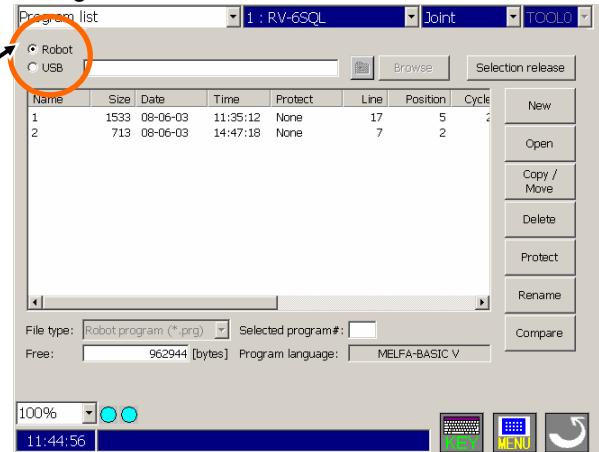
- [Program] button () is clicked and a program list is displayed.

At this time, if it creates newly to a robot controller, the [Robot] radio button (<c>) is checked. If it creates newly to a USB memory, the [USB] radio button (<c>) is checked.

Menu panel

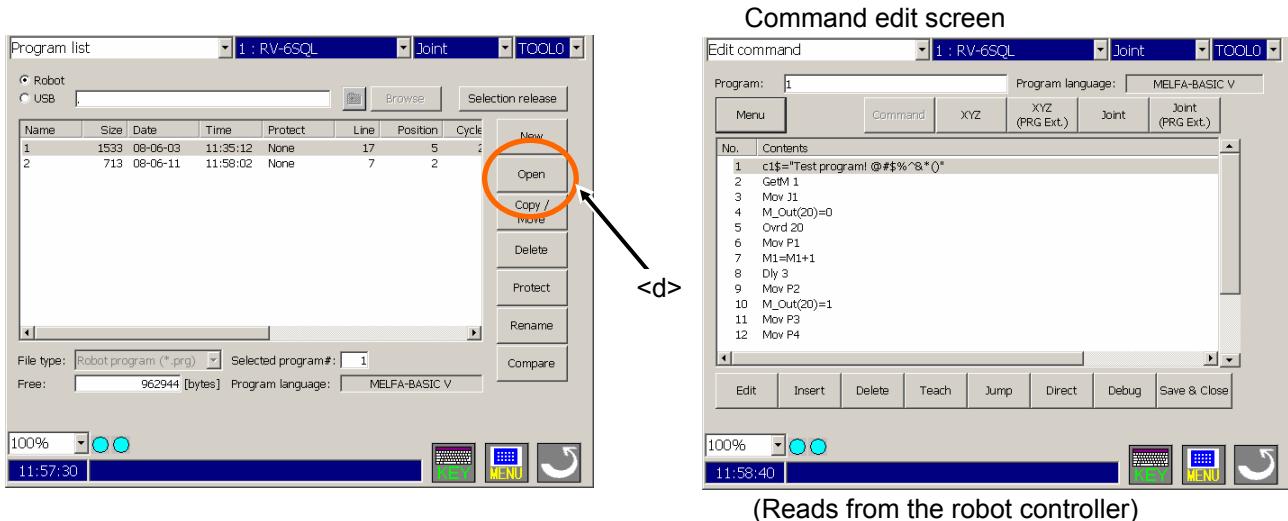


Program list

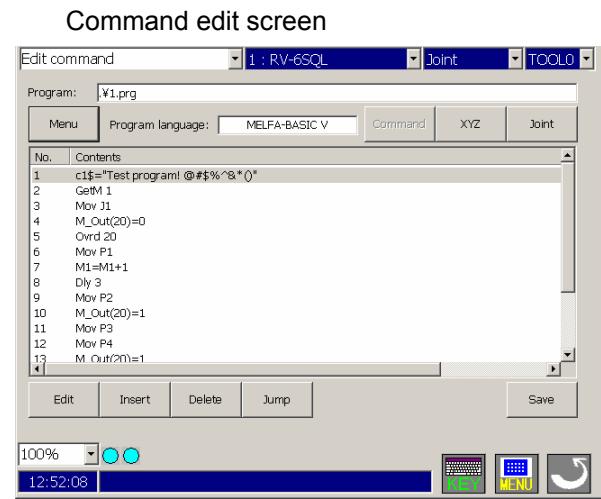


"User definition screen" is supported by version 2.2 or later of this software.

- 3) Select the program to read and click the [Open] button. (<d>) The command edit screen is displayed.
Even if it double-clicks the program to read, the command edit screen is displayed.



(Reads from the robot controller)



(Reads from the USB memory)

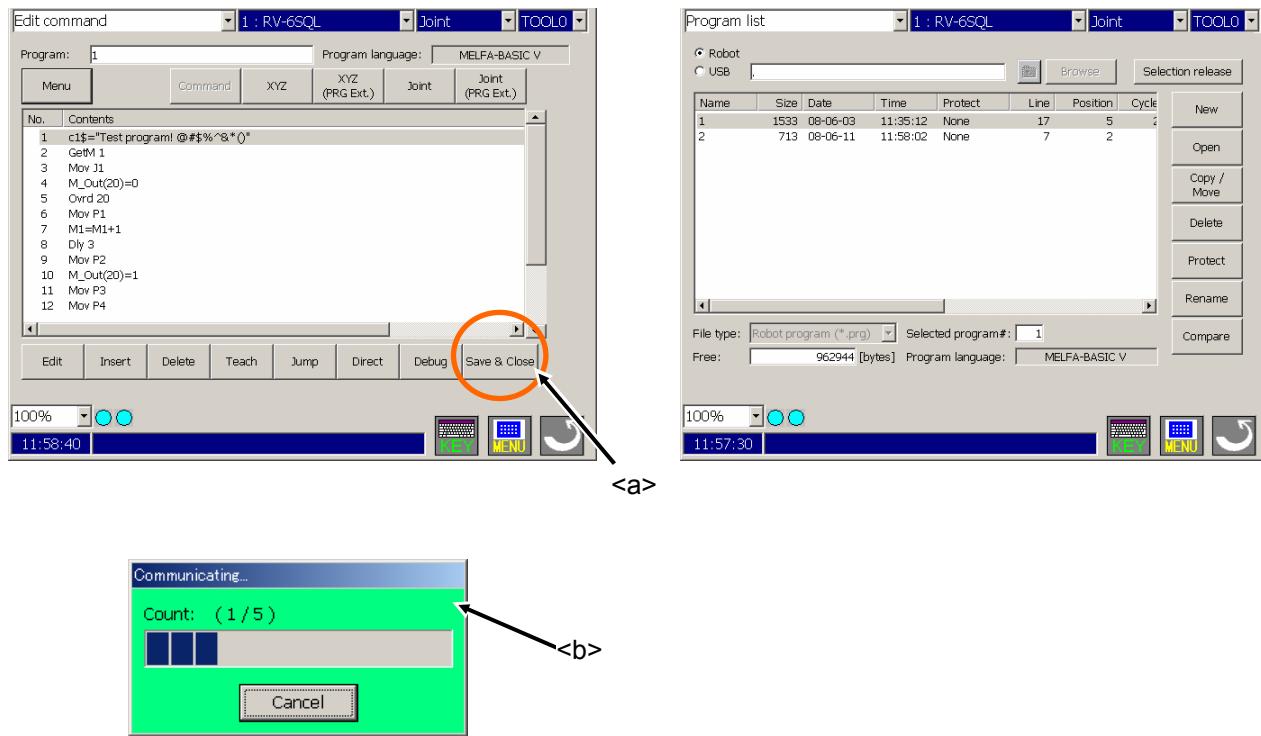
Advice

The buttons displayed differ by the case where the edit screen targets the robot controller and the case where the edit screen targets the USB memory. The functions, which can be executed, also differ.

11.1.3. Save (robot controller)

Click the [Save & Close] button (<a>) of the edit screen.

During the save, the screen is displayed during communication, () and if it completes, it will return to the program list.



Advice

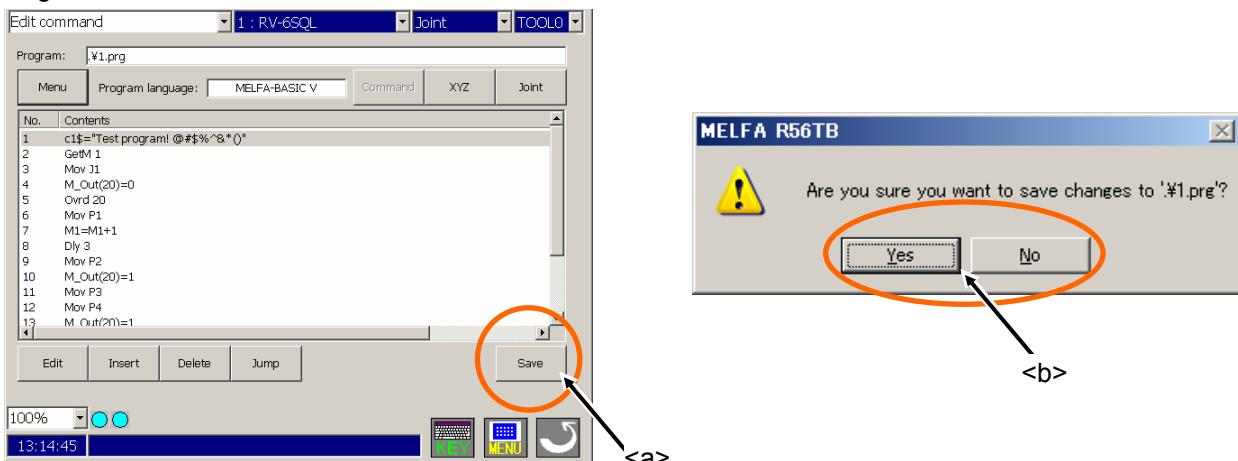
The buttons displayed differ by the case where the edit screen targets the robot controller, and the case where the edit screen targets the USB memory. The functions, which can be executed, also differ.

The save of the program can be executed even in the command editing screen or the position editing screen.

11.1.4. Save (USB memory)

Click the [Save] button (<a>) of the edit screen.

Since the confirmation screen is displayed, the [Yes] button () is clicked if it saves. The [No] button () is clicked if it does not save. During the save, if the sandglass is displayed and it completes, it will return to the original edit screen.



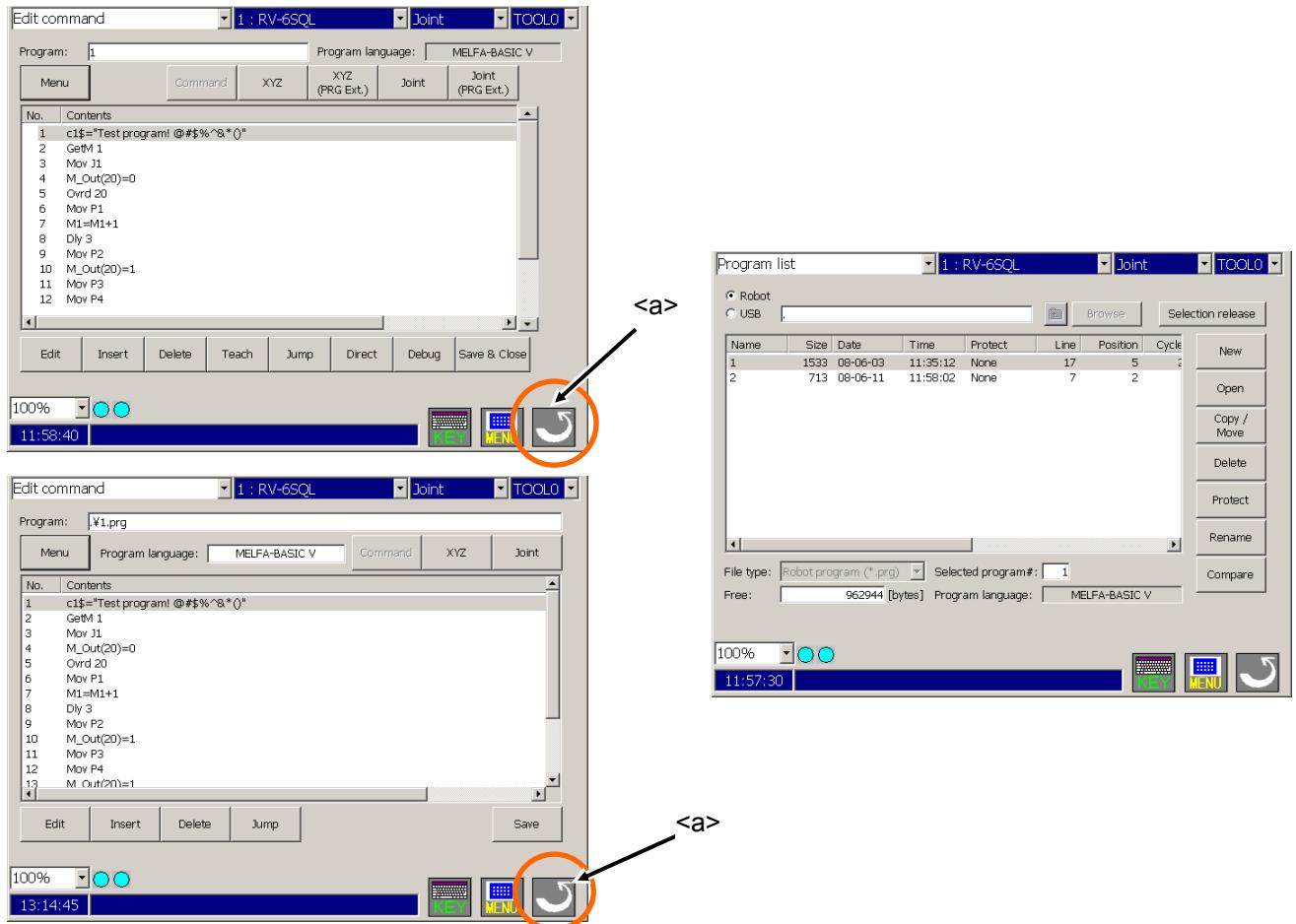
Advice

The buttons displayed differ by the case where the edit screen targets the robot controller, and the case where the edit screen targets the USB memory. The functions, which can be executed, also differ.

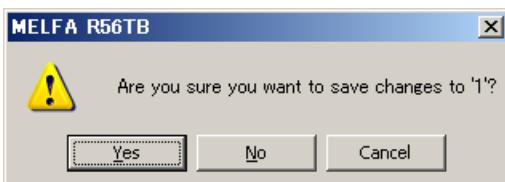
The save of the program can be executed even in the command editing screen or the position editing screen.

11.1.5. Close the edit screen

Click the [RETURN] button (<a>) at the lower right of the T/B screen. It returns to the program list display.



At this time, if the command and the position variable are edited and save operation is not performed, display the message of the confirmation.



If saved..... [Yes]

If not saved [No]

If it returns to the edit screen . [Cancel]

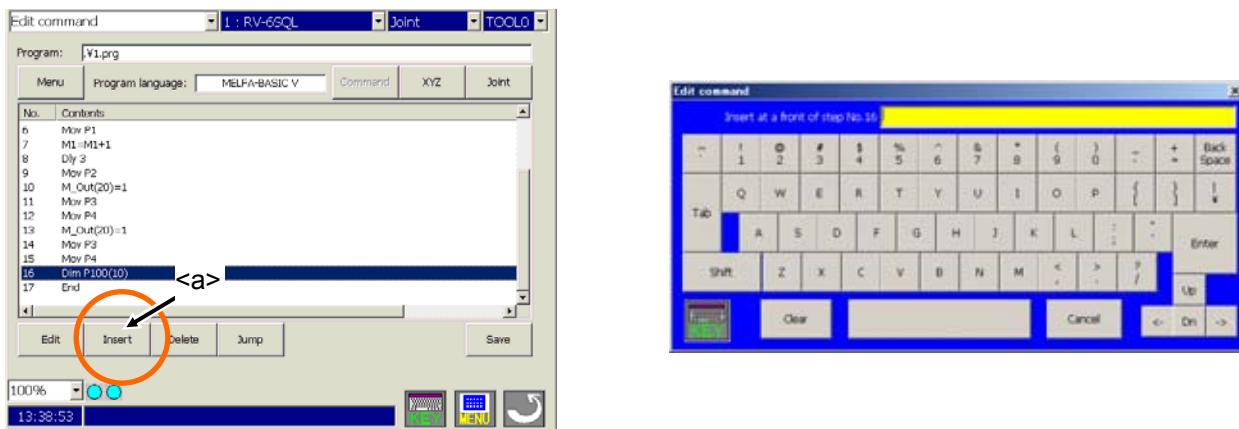
Click each button.

Advice

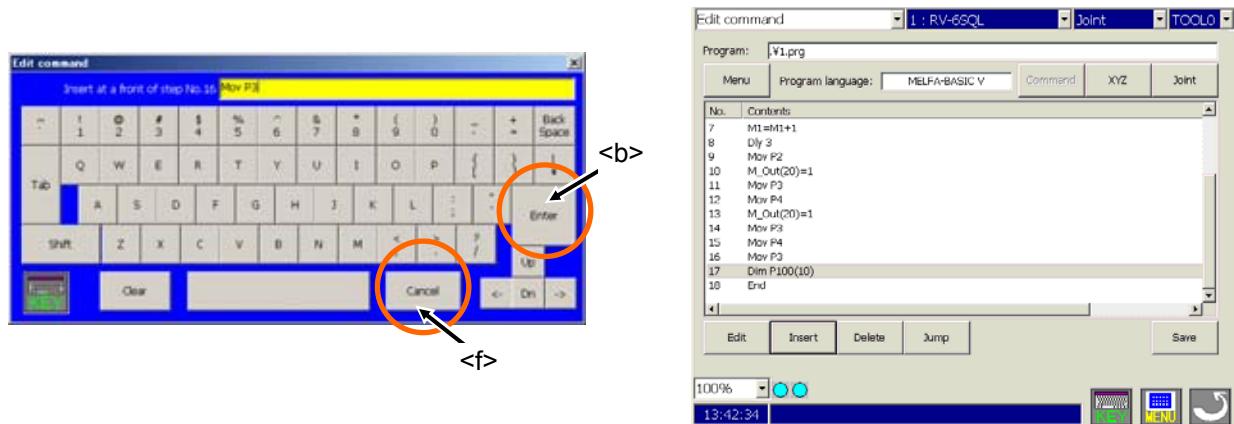
If the [MENU] button at the lower right of the T/B screen is clicked with the edit screen displayed, it can also progress to each menu directly.

11.1.6. Add the command line

Operation of adding the line of code to new or the existing program in the command edit screen is shown.
 1) Clicks of the [Add] button (<a>) of the command edit screen will display the keyboard.

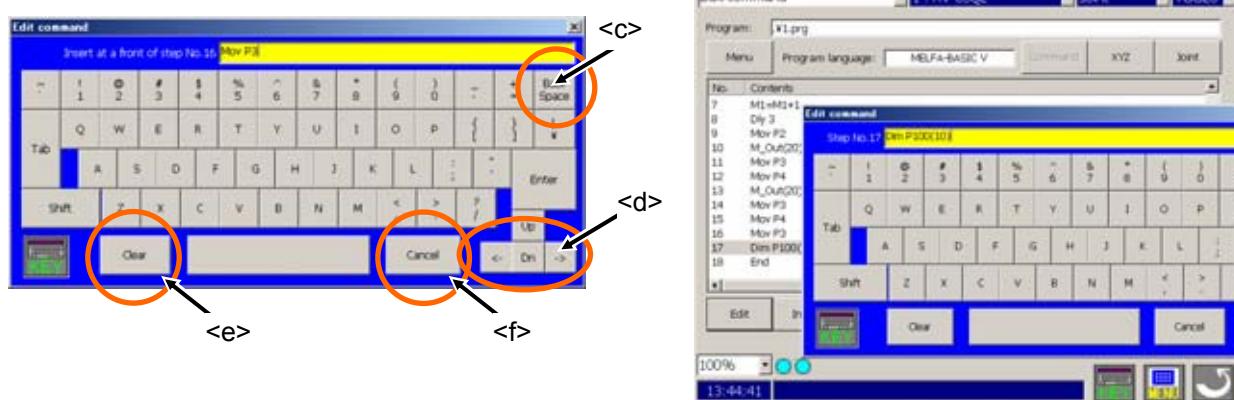


2) Input the line of code from the keyboard and click the [Enter] key. () The inputted line of code is added in order of the row number. When the [Cancel] key (<f>) is clicked, the keyboard is closed.



If it corrects the inputted character, delete by the [Back Space] key. (<c>)

Move the cursor to the right side of the character mistaken by the cursor key of [<-] and [>] (<d>), and click the [Back Space] key. If the [Clear] key (<e>) of the keyboard is clicked, package erasure can be carried out and the inputted character can be inputted again. Moreover, a click of the [Cancel] key (<f>) will stop input operation.



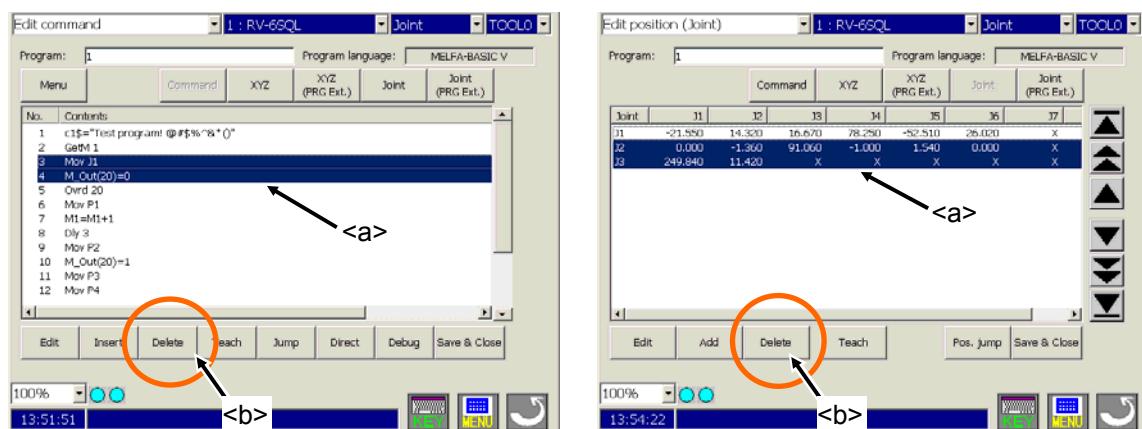
Advice

The keyboard is displayed even if it double-clicks the parts where the line is not selected, such as the right end on the program list. And, if the keyboard covers the program list and does not appear, the keyboard is shifted rightward, the program list is displayed and the [KEY] button is clicked, the small keyboard will be displayed and the input of the line of code can be done also from here.

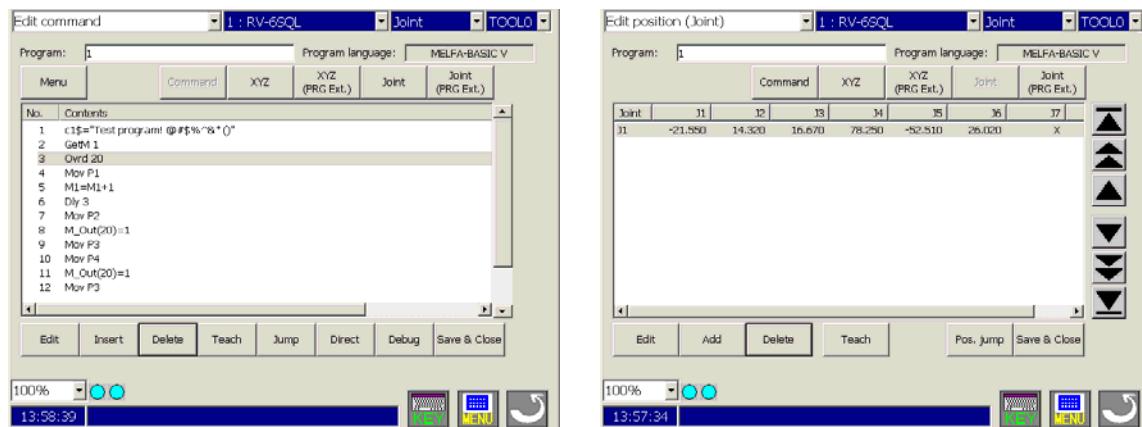
11.1.7. Delete the command line

Operation of deleting the line of code or the position variable is shown.

- Select the line to delete or the position variable. Two or more lines can be selected. (<a>)



- Click the [Delete] button (), the selected line of code or the position variable will be deleted.



It becomes the error when it is going to delete the position variable currently used by the line of code while editing the program of the robot controller. Push the [RESET] button of T/B. Since the message of confirmation is displayed, click the [OK] button. (<c>)



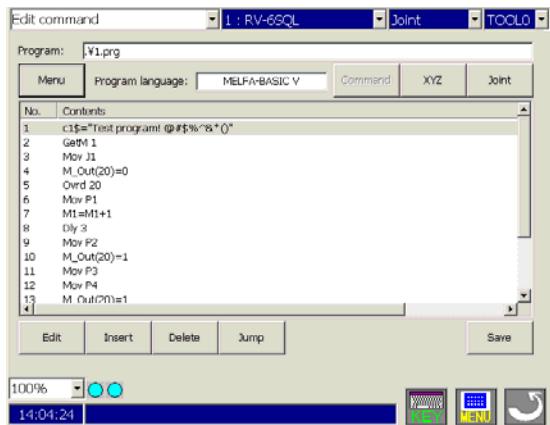
Advice

If deletes the line of code, click the [Menu] button after selecting the line to delete, and "Cut (Line)" is chosen, and it can execute also. In this case, the deleted line can be pasted, after.

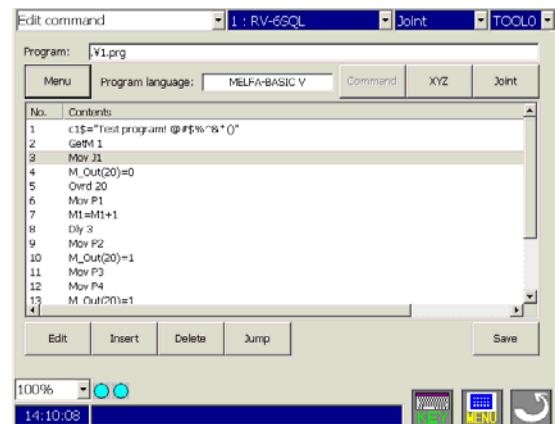
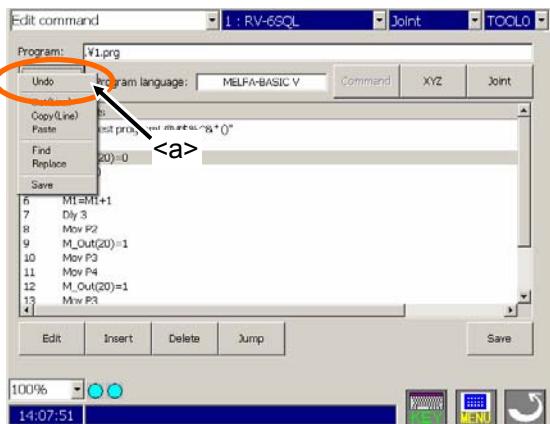
11.1.8. Undo the edited contents

When editing the command line of the program in the USB memory, the editing operation can be returned to the last state only once.

If the [Menu] button of the command edit screen is clicked and "Undo" (<a>) is clicked after the mistaken operation, the operation done last time will return.



If "3 Mov J1" has been deleted incorrectly.



"3 Mov J1" is return.

Advice

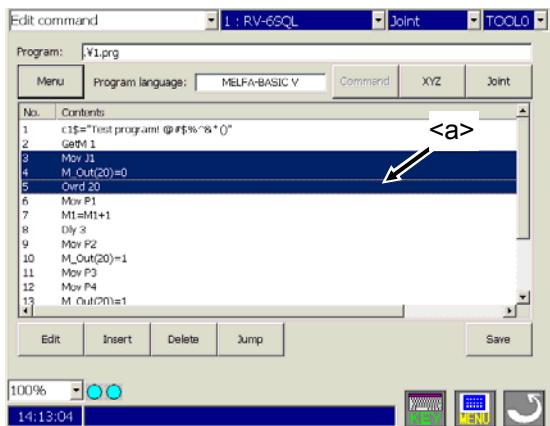
Only last one operation is valid to undo. All cannot be returned if two or more operations have been mistaken. In this case, it is necessary to finish program edit, without saving and to do over edit from the start.

To prevent such a situation, we recommend you to copy the program before edit beforehand and to reserve separately.

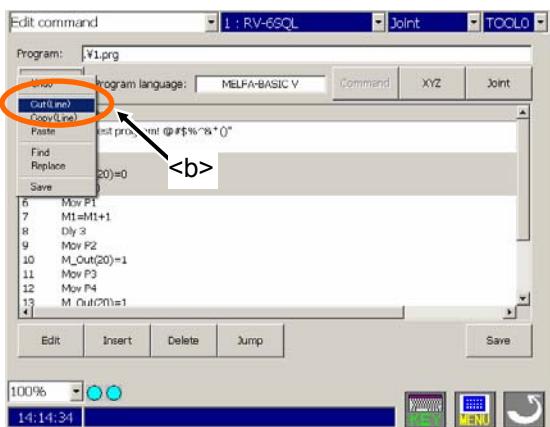
11.1.9. Cut, Copy and Paste

The specified line of code can be cut, pasted or copied.

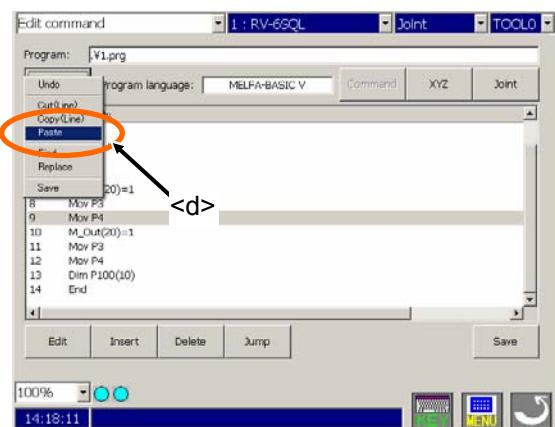
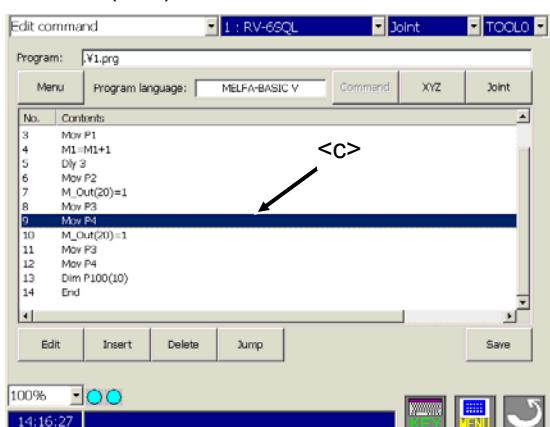
- Select the line to cut or copy. Two or more lines can be selected. (<a>)



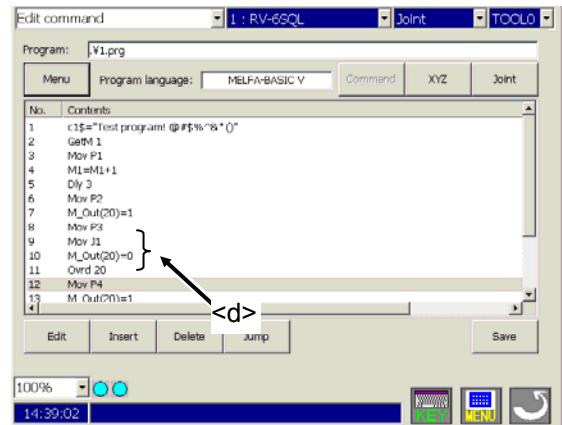
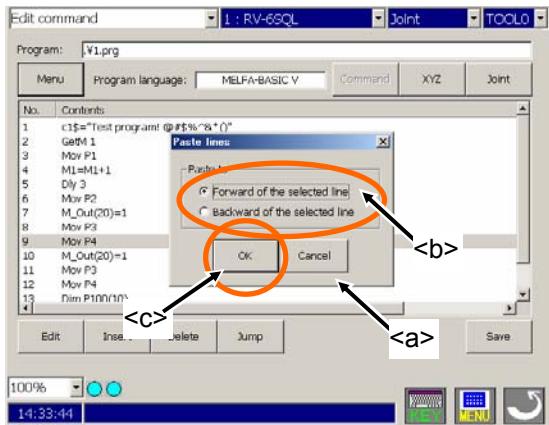
- Click the [Menu] button of the command edit screen, and if it moves, click the "Cut (Line)." () or if it copies, click the "Copy".



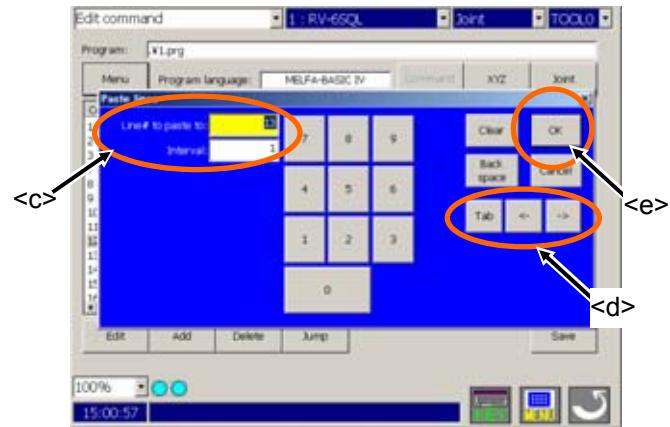
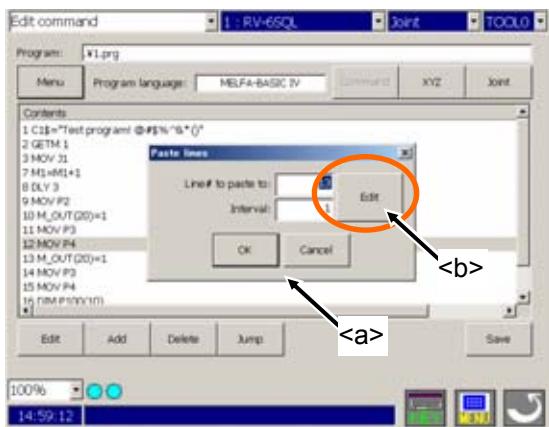
- Select just before the line of paste (<c>), click the [Menu] button of the command edit screen, and click "Paste". (<d>)



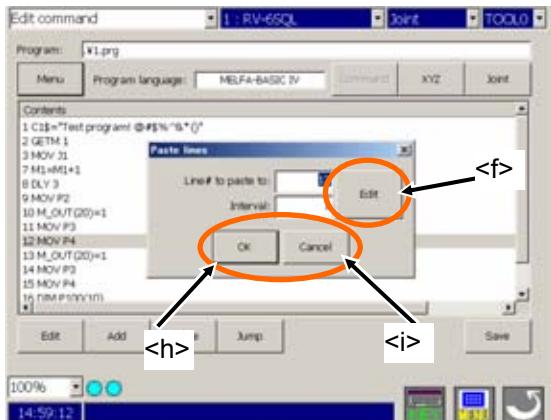
- 4) The screen <a> which confirms the putting part in the destination of the movement or the copy is displayed. Select ahead or after of the line for pasting, and click [OK] key <c>. And the command line is added to the selected part <d>



- 5) When MELFA-BASIC IV is used, the screen <a> which confirms the line number and the line interval at the copy destination is displayed. Please change the line number if necessary in the keyboard screen displayed by clicking [edit] key . Please set the first line number for the newly moved or copied to "Line# to paste to:". The line interval (at the movement or the copy of two or more lines) is set. <c> The cursor of both input boxes moves with [Tab], [<<], and the [>>] key. <d> When input ends, click the [OK] key<e> of the keyboard.

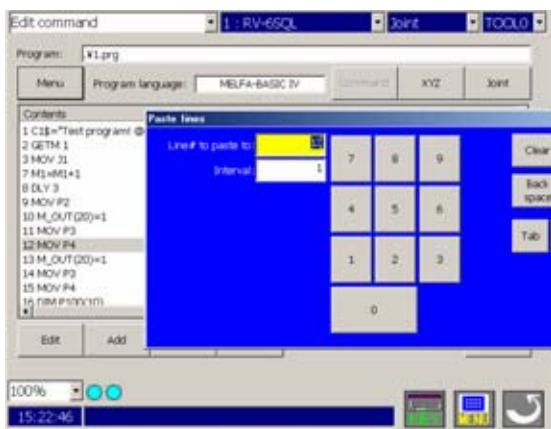


- 6) It returns to the Paste lines screen. Click [OK] button<h> if the setup is completed, [Edit] button<f> for setting up again, [Cancel] button<i> for stop pasting.



CAUTION

If the new line number of past replace (copy place) has already existed, the existing line of code is overwritten. Moreover, if the existing row number does not exist, the existing line of code and the new line of code will be mixed.



Please check securely the new row number when pasting, and the line pitch. Especially if pasting two or more lines, please be careful. The program list can be looked as shifting the keyboard (ten key).

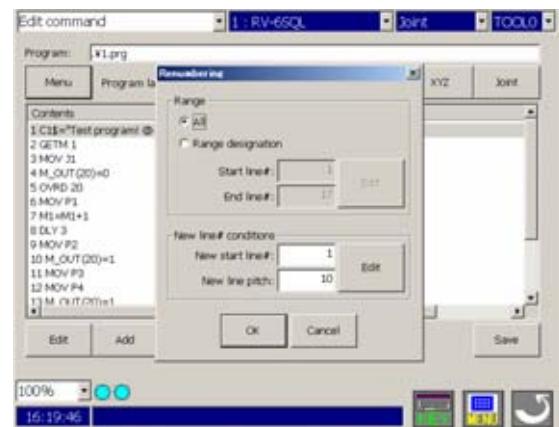
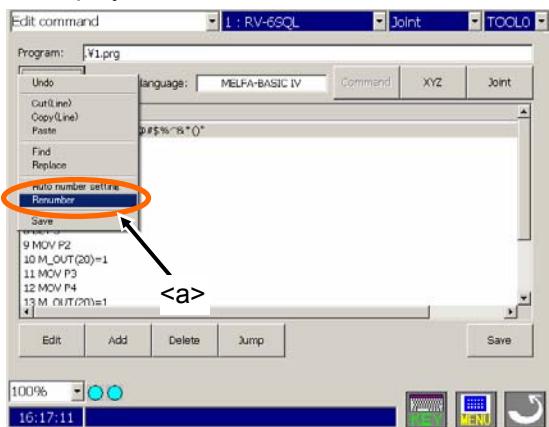
At the time of the mistaken place, if it is immediately after, it can return to the origin.

Moreover, we recommend you to copy the original program beforehand and to reserve separately.

11.1.10. Renumber

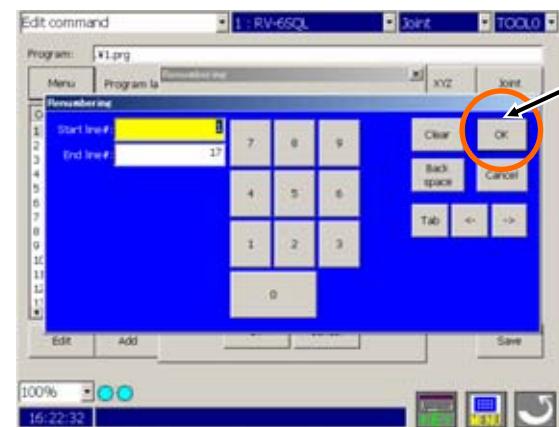
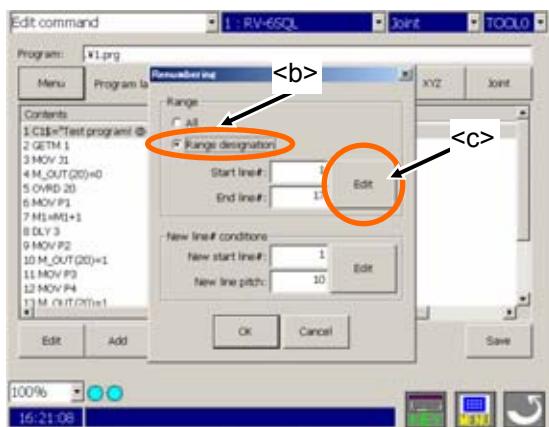
The renumbering function can only be used with MELFA-BASIC IV. The row number of the existing program can be reassigned. When the program is changed several times and the margin has been lost to the line pitch, it can utilize effectively. All lines of code and the range can be specified.

- Click the [Menu] button of the command edit screen and click the "Renumber". (<a>) The setting screen will be displayed.

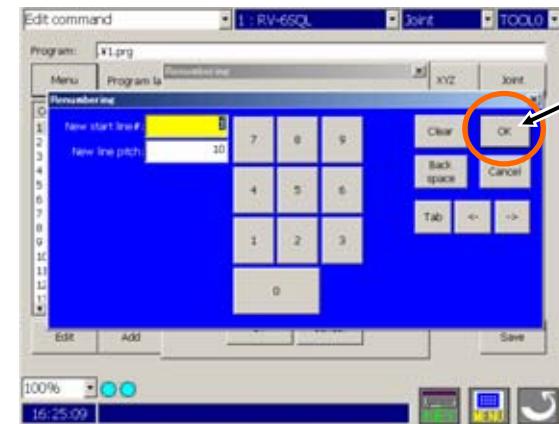
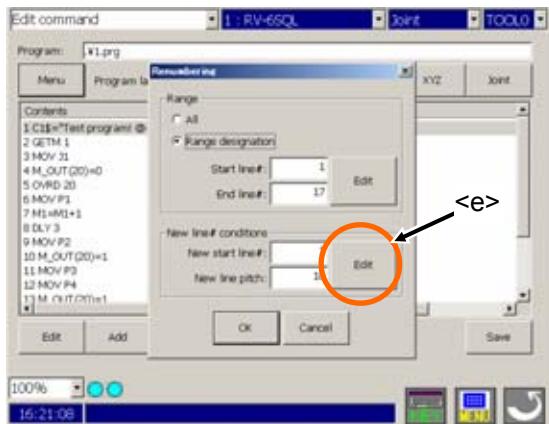


- Checks the radio button of "All" () if all lines are renumbered.

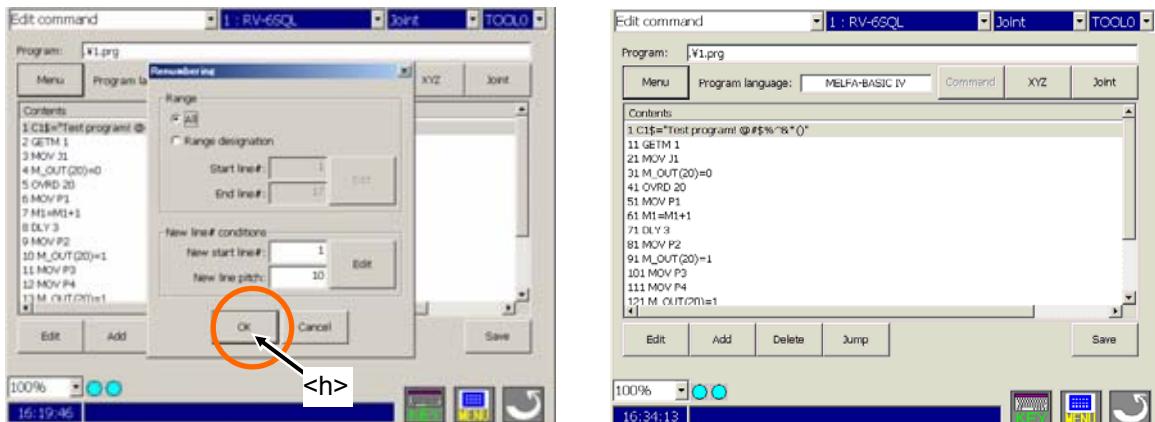
Checks the radio button of "Range designation" () if the line of the specification range is renumbered. And specify the target range by the start row number inputted into "Start line#", also the end row number inputted into "End line#". The input operates the keyboard (ten key) which clicks the [Edit] button (<c>) and is displayed. Clicks the [OK] key (<d>) of the keyboard (ten key) if input is completed.



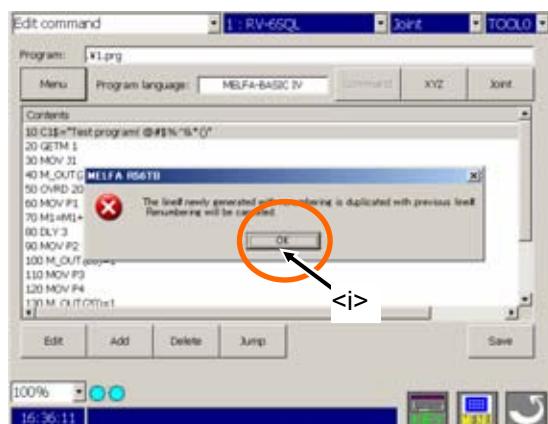
- Input the start row number after renumbering into "New start line#", and also input the line pitch into "New line pitch." The input operates the keyboard (ten key) which clicks the [Edit] button (<e>) and is displayed. Clicks the [OK] key (<f>) of the keyboard (ten key) if input is completed.



- 4) Renumber will be executed if you click the [OK] button (<h>) of setting screen.



If the object range is specified, display the message that the row number after the renumber has already existed. In this case, the renumber is not executed. Click the [OK] button. (<i>)



Advice

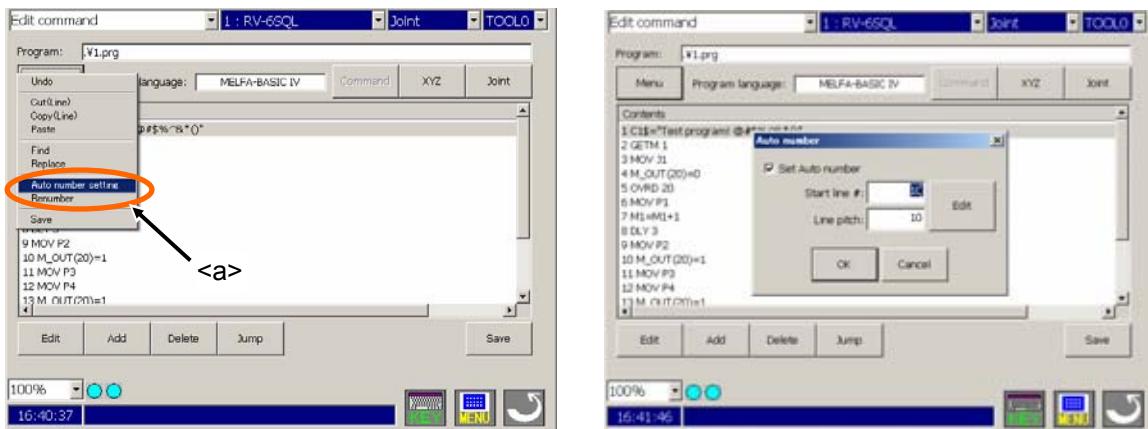
Even if row number not existing is specified to the range, it executes within the limits.
32767 can also be specified as "End line#" to execute to the last line of the program.

11.1.11. Automatic numbering

When MELFA-BASIC IV is used, the line number can be generated by the automatic operation in the command edit screen.

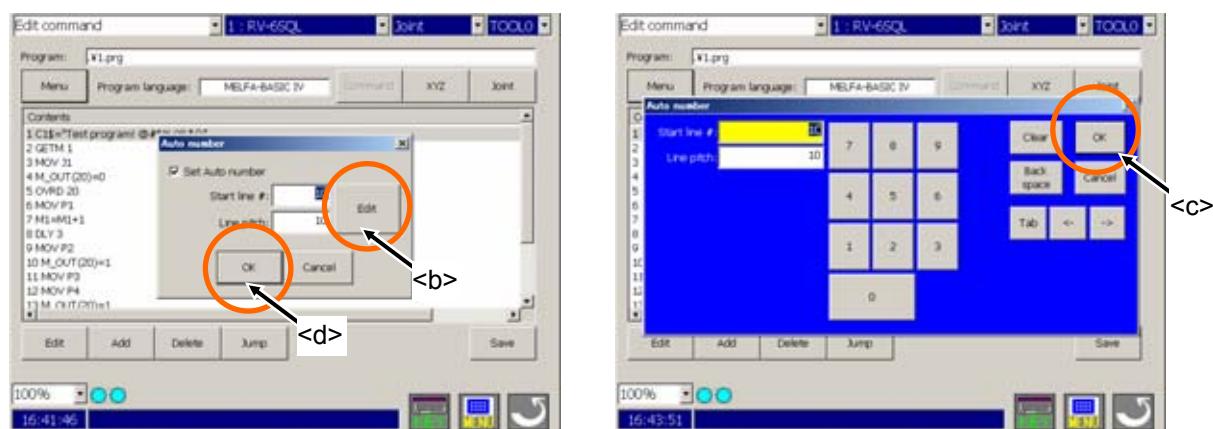
This function automatically displays the next line number each time the edit command dialog is displayed. The start line No. and line pitch can be designated with the setting dialog.

- The setting dialog will appear when "Auto Number setting" (<a>) is selected under the [Menu] button of the command edit screen.



- Input start Line number into "Start line#" and Line pitch into "Line pitch".

Inputs from the keyboard which clicks the [Edit] button () and is displayed.

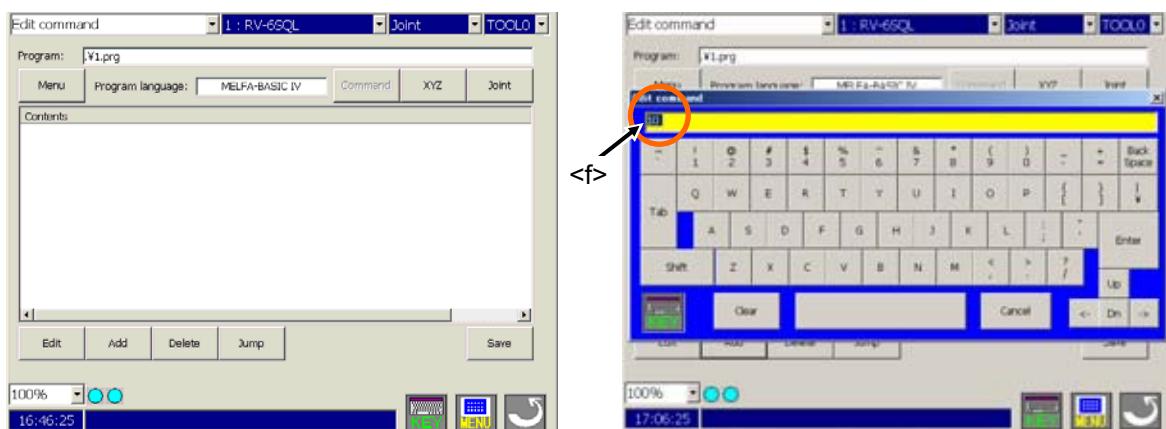


- Preparation will be completion, if the input is completed, the [OK] key (<c>) of the keyboard (ten key) will be clicked and the [OK] button (<d>) of the setting screen of the automatic row number will be clicked.

After this, the row number is set up automatically when [Add] button (<e>) is clicked. (<f>)

When creating the program newly, display the start row number set up by above-mentioned "2)."

Display the next of the last row number during the existing program edit.

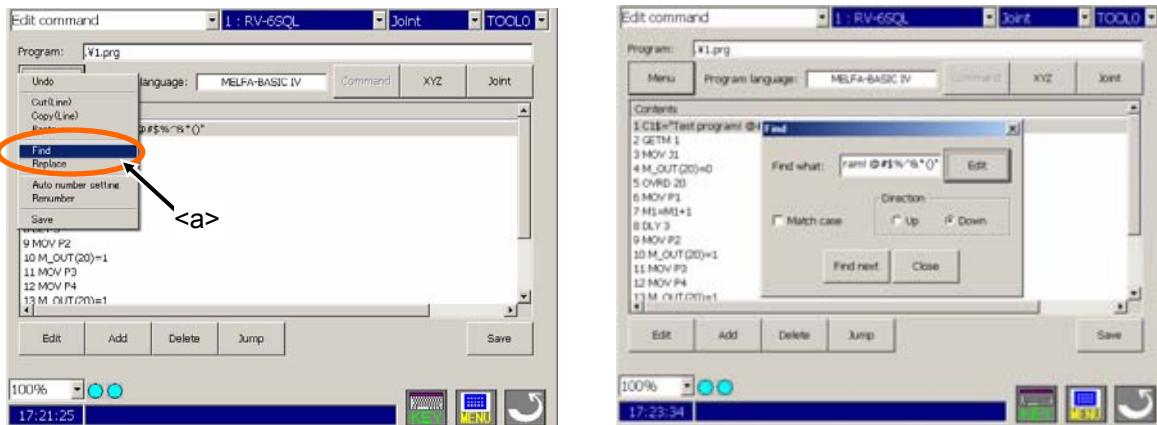


11.1.12. Search

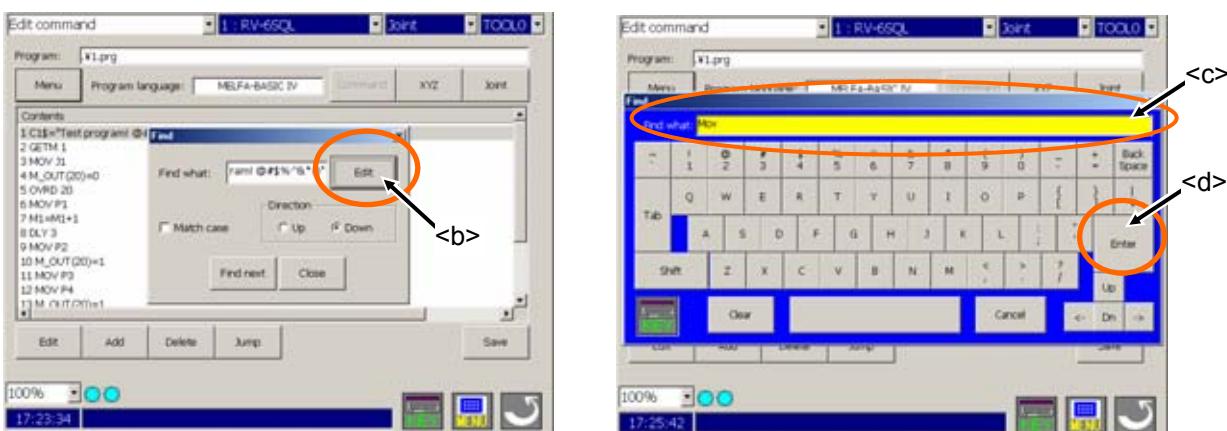
If the program of the USB memory is being edited, the specification character string can be searched with command edit. It can be specified whether the capital letter/small letter is differentiated or not.

- Clicks the [Menu] button and select the "Find" (<a>) of the command edit screen, the setting screen will be displayed.

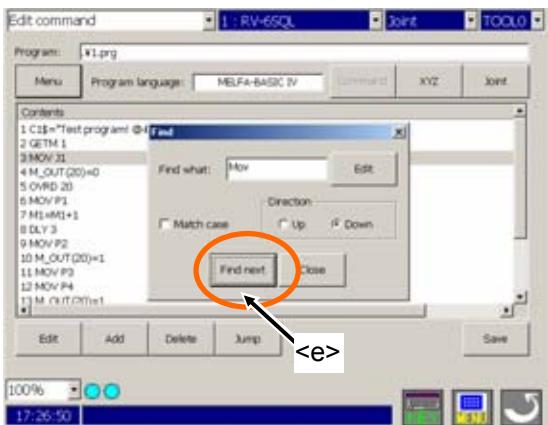
The line of code selected beforehand is inputted into "Find what" as a specification character string.



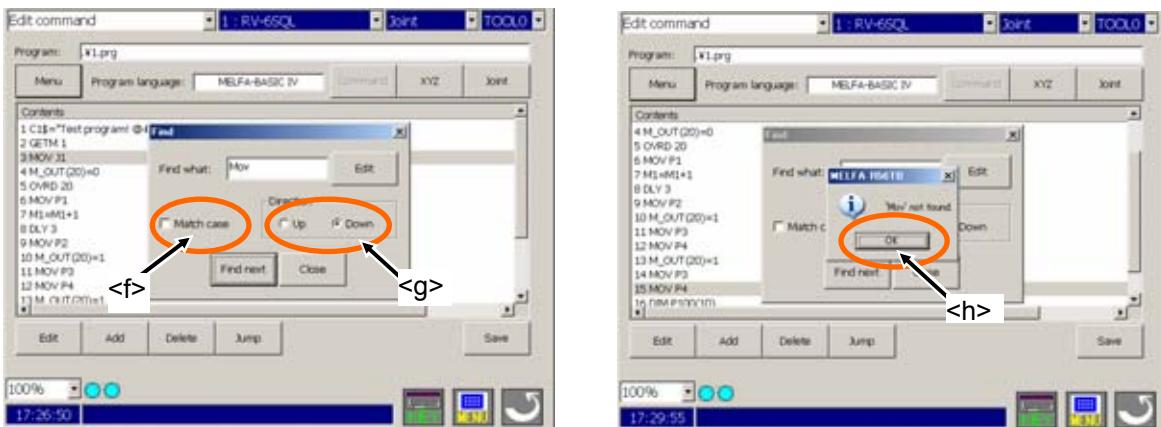
- The input of the character string to search, clicks the [Edit] button (), and keyboard displayed is used. The inputted character is displayed on "Find what". (<c>) Click the [Enter] key (<d>) of the keyboard to finish the input.



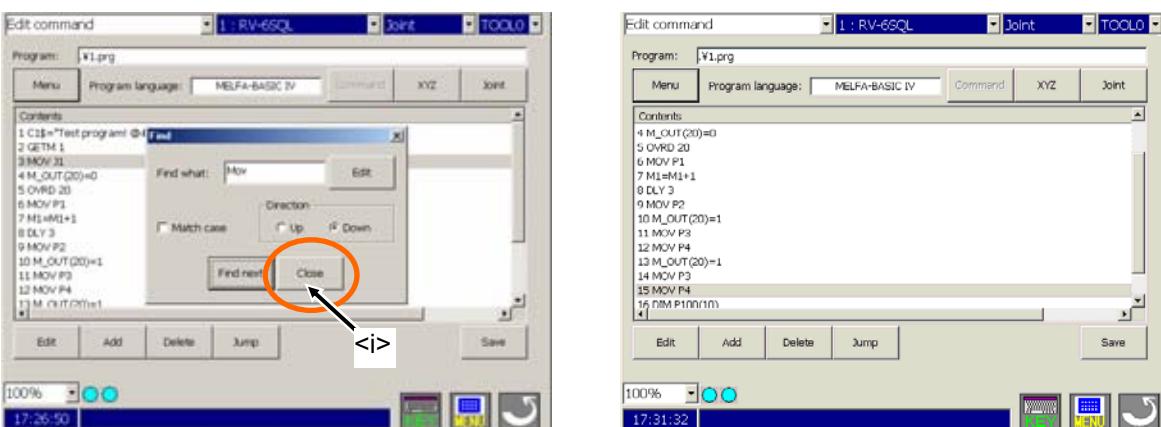
- Click the [Find next] button (<e>) to start search of the character string. If the specified character string is found, indicate the line by the highlight.



If the "Match case" (<f>) is checked at this time, the capital letter and the small letter will be differentiated. Moreover, the search direction can be specified with checking Up/Down. (<g>)
Display the message, if the character string is not found. Clicks the [OK] button. (<h>)



- 4) Click the [Close] button (<i>) to finish.



Advice

The row number is also the target of search.
If it edits the line of code, please close the specified screen of the search string.
The function to replace the character string is shown in "14) Replace."

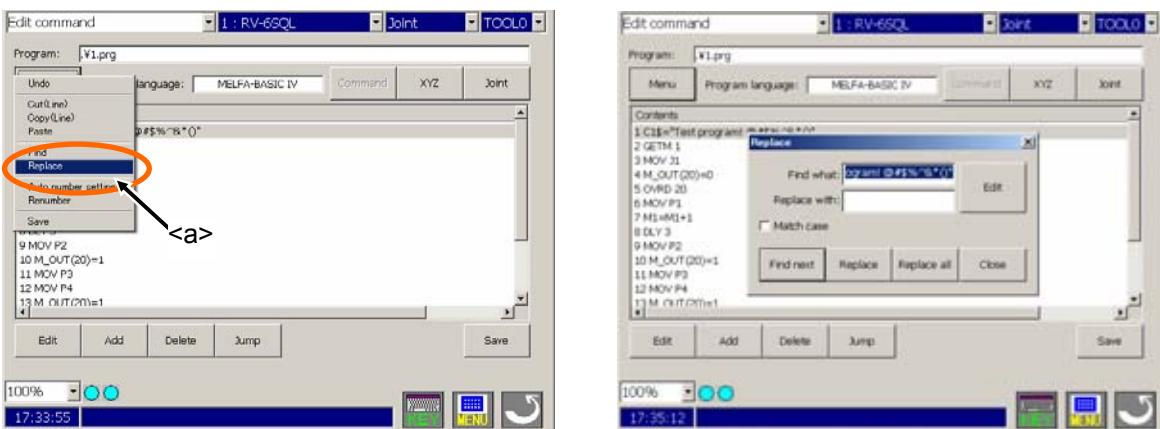
11.1.13. Replace

If the program of the USB memory is being edited, the specification character string can be replaced by command edit.

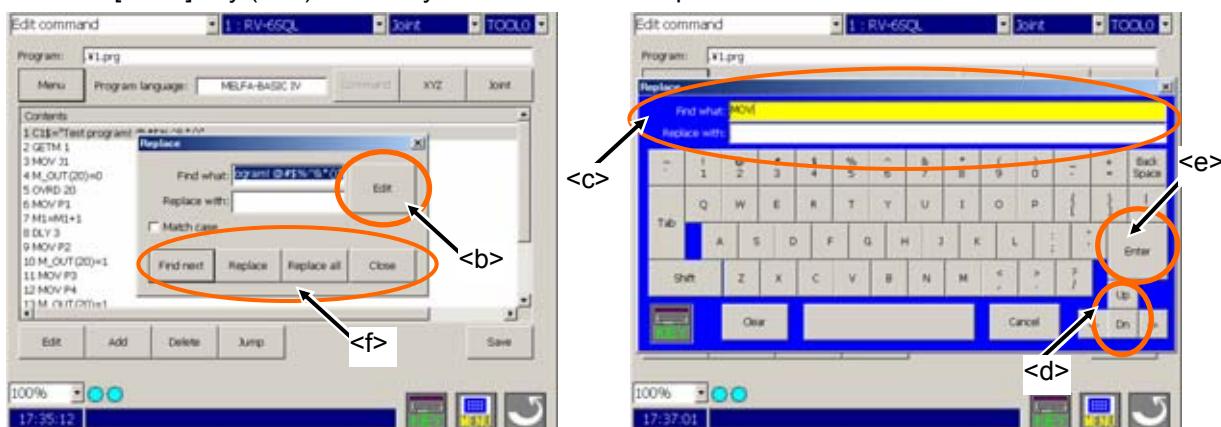
It can be specified whether the capital letter/small letter is differentiated or not.

- Clicks the [Menu] button and select the "Replace" (<a>) of the command edit screen, the setting screen will be displayed.

The line of code selected beforehand is inputted into "Find what" as a specification character string.



- The input of the character string to search or replace, clicks the [Edit] button (), and uses the keyboard that displayed. The character strings of searching are specified as "Find what", and of replacement are specified as "Replace with". (<c>) The cursor is movable by the [Up]/[Down] key (<d>) of the keyboard. Click the [Enter] key (<e>) of the keyboard to finish the input.



- If each button of the replacement character string specified screen is clicked, it will operate as follows. (<f>)

[Find next]button Search of the character string

[Replace]button Replace the one place and search the next.

[Replace all]button Replace all the searched character strings.

[Close]button Finish. Close the screen.

If the "Match case" is checked at this time, the capital letter and the small letter will be differentiated.



CAUTION

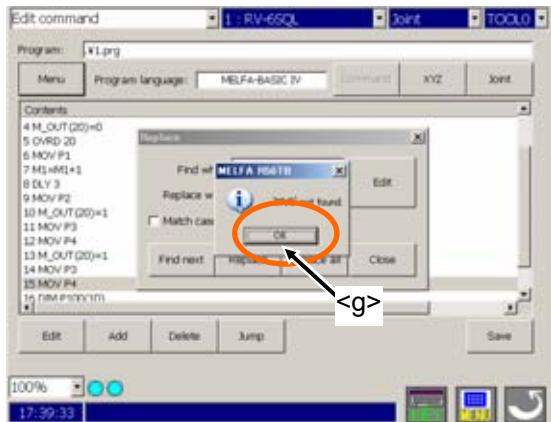
When executing replacement, the message of confirmation does not display.

The character strings of the line selected will be replaced, if you click the [Replace] button.

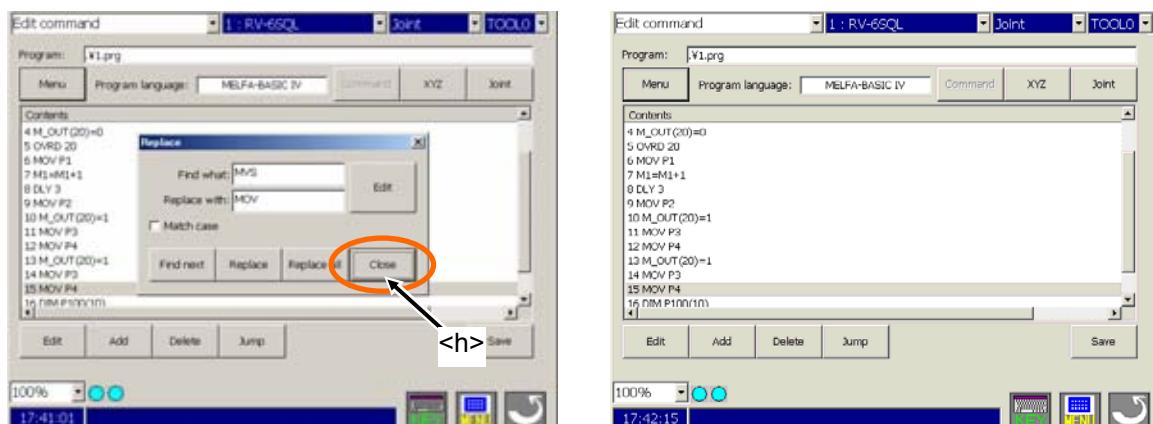
All character strings to the last of program will be replaced, if you click the [Replace all] button.

Please check that the specified character string is correct before executing replacement.

Display the message, if the character string to search is not found. Click the [OK] button. (<g>)



- 4) Click the [Close] button (<h>) to finish.



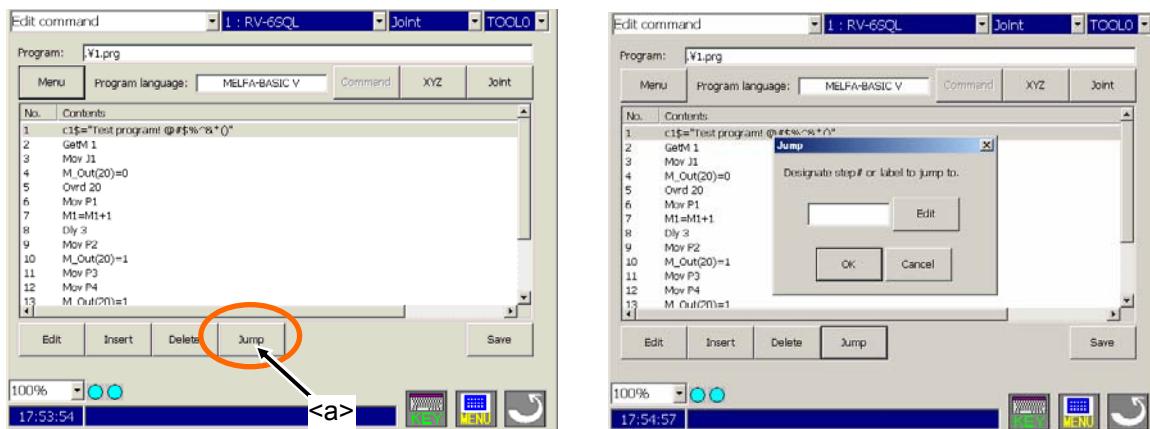
Advice

Only last one operation is valid to undo. All cannot be returned if two or more operations have been mistaken. In this case, it is necessary to finish program edit, without saving and to do over edit from the start. To prevent such a situation, we recommend you to copy the program before edit beforehand and to reserve separately.

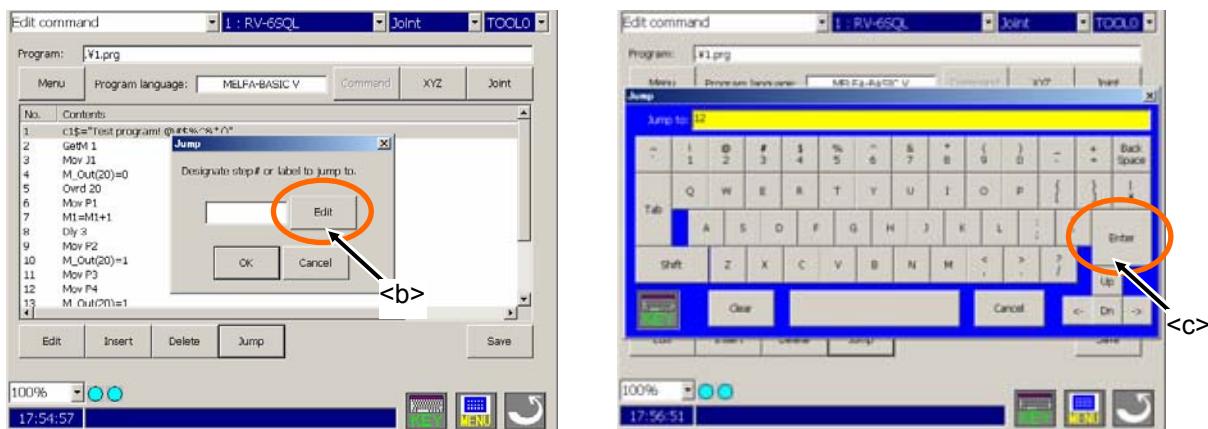
11.1.14. Jump

The program jumps to the designated label or line number. To carry out jumping, click the [Jump] button.

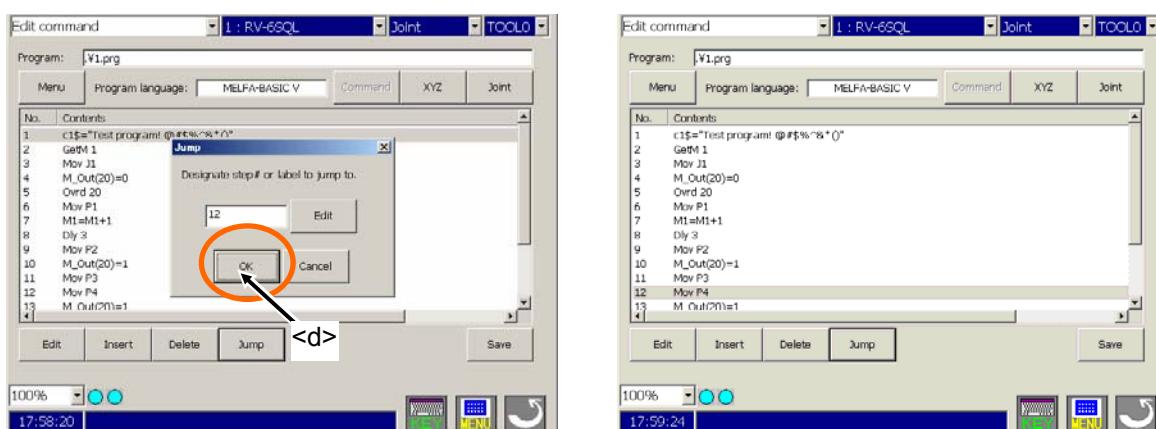
- Click the "Jump" button (<a>) of the command edit screen. The setting screen will be displayed.



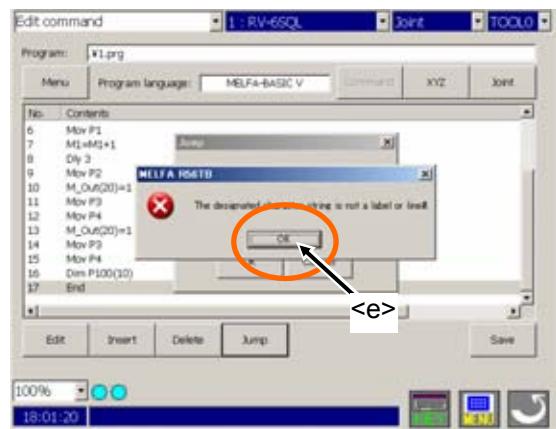
- To input the label or line number, click the [Edit] button (), and uses the keyboard that displayed. Click the [Enter] key (<c>) of the keyboard to finish the input.



- Click the [OK] button (<d>) to jump to the specified line or label.

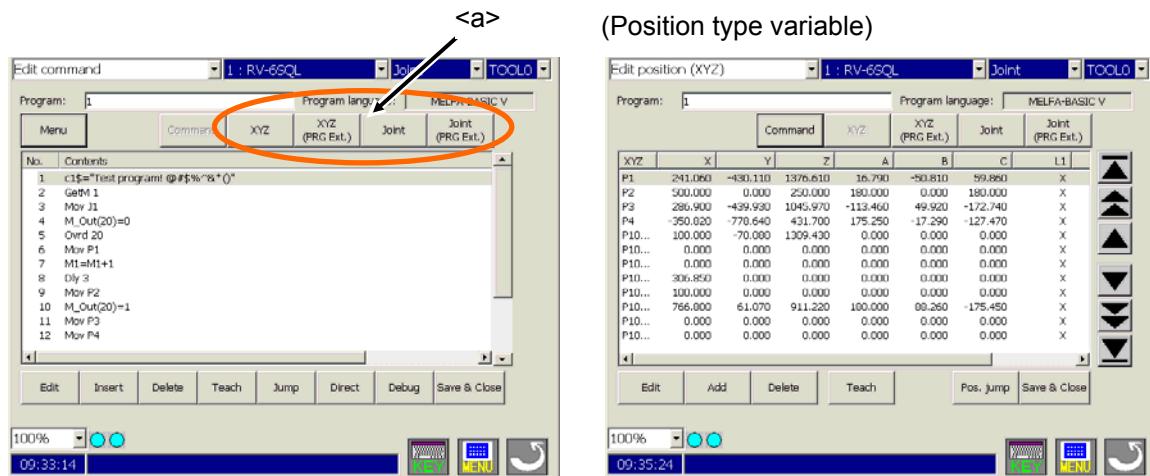


If the specified row number does not exist, jump to the near place. Display the error message, if the specified label does not exist. Click the [OK] button (<e>), close the error message window, and try again.



11.2. Editing the position variable

Edit the position on the position edit screen. Push the [XYZ], [XYZ (Global)], [Joint], or [Joint (Global)] button. (<a>) The position editing screen will appear.

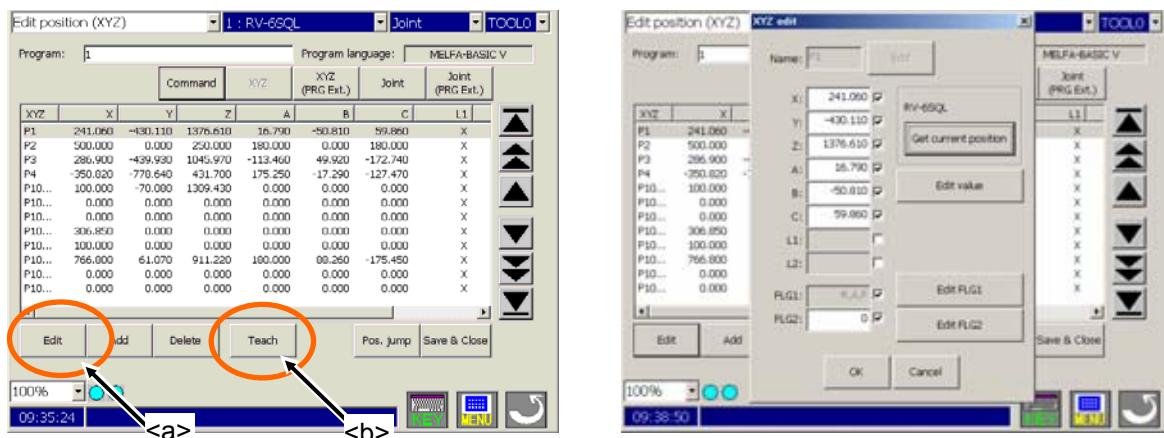


- [XYZ]Position type variable
- [XYZ (Global)]Position type variable (System variable)
- [Joint]Joint type variable
- [Joint (Global)].....Joint type variable (System variable)

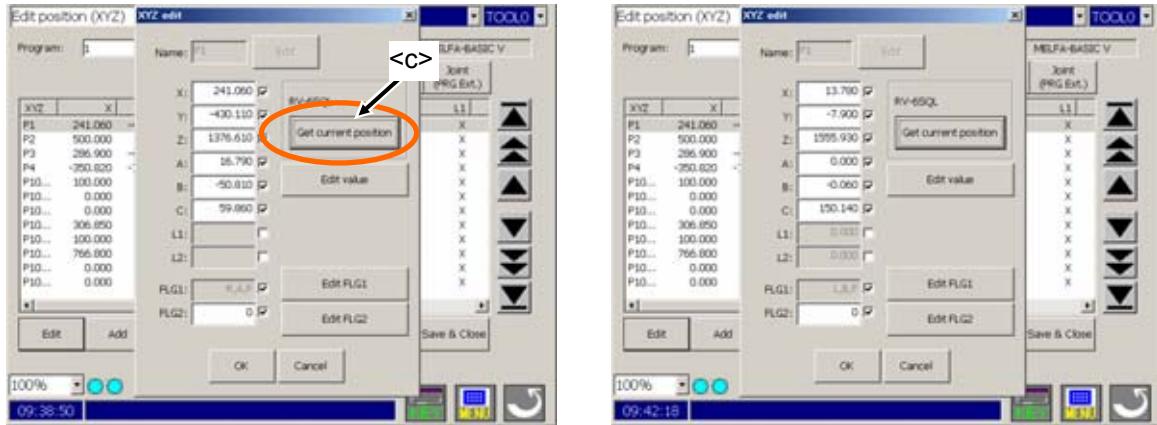
11.2.1. Registering the current position data

The procedure of registering the robot's current position is shown.

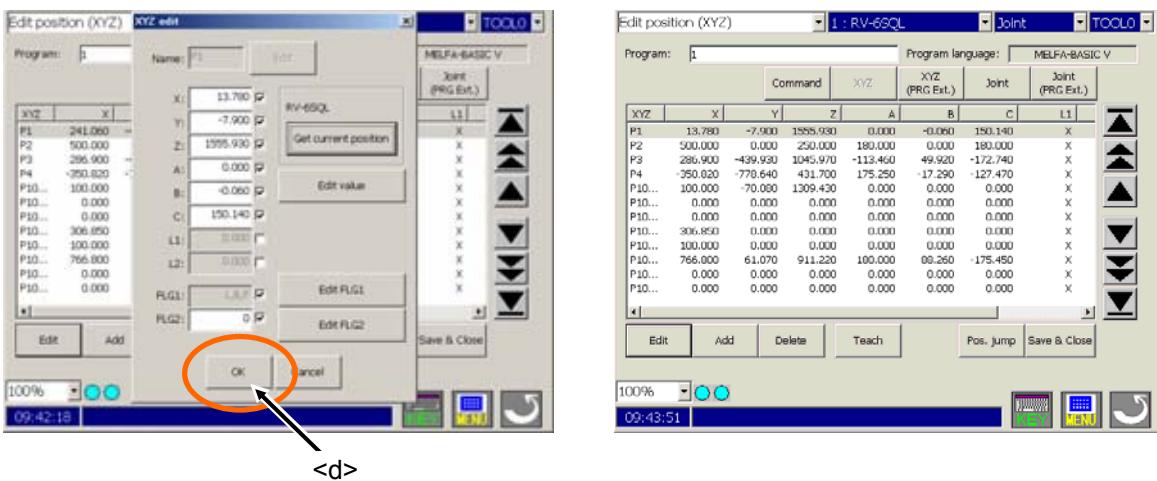
- 1) By jog operation, move the robot to the teaching position beforehand.
- 2) Select the variable of teaching and click the [Teach] button (). The current position can be taught. If you want to teach after confirming the current position data, click the [Edit] button (<a>) and display the data edit screen.



3) If the [Get current position] button (<c>) of the data edit screen is pushed, will take in the robot's current coordinate value.



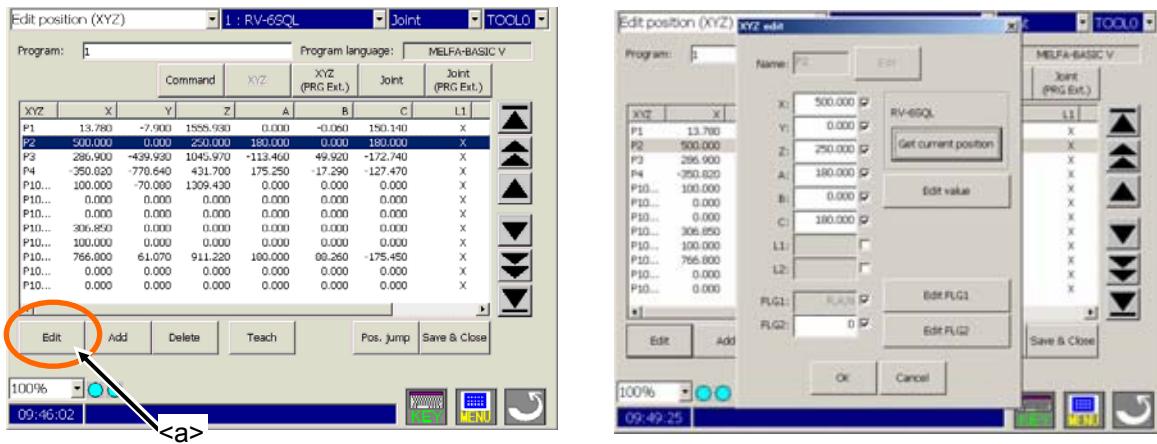
4) Click the [OK] button (<d>) and register the data.



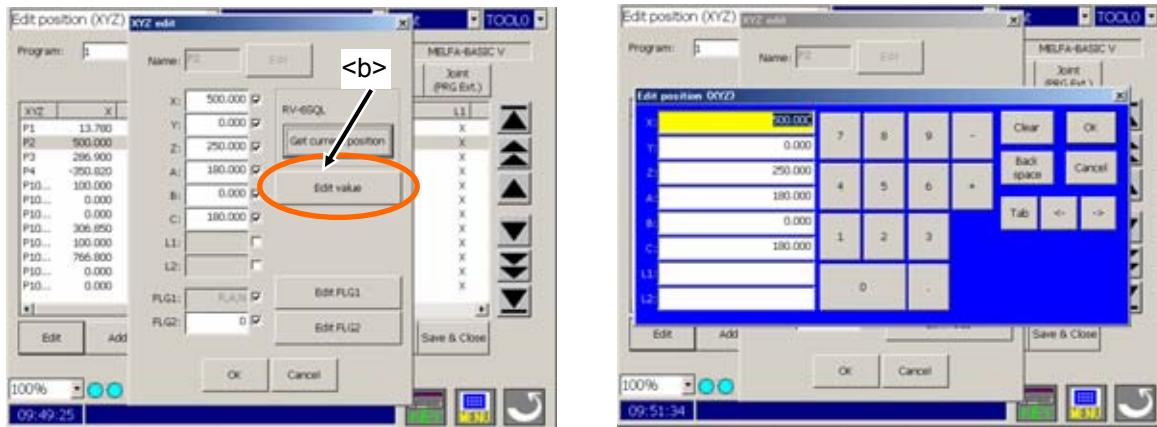
11.2.2. Edit of position data

The procedure of direct input of the numerical value is shown.

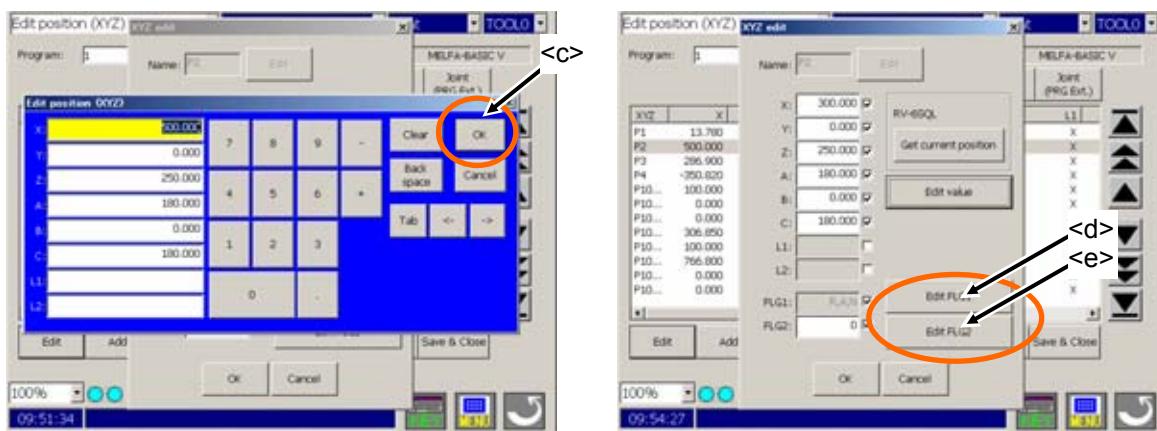
- Select the variable of editing and click the [Edit] button. (<a>) The data edit screen is displayed.



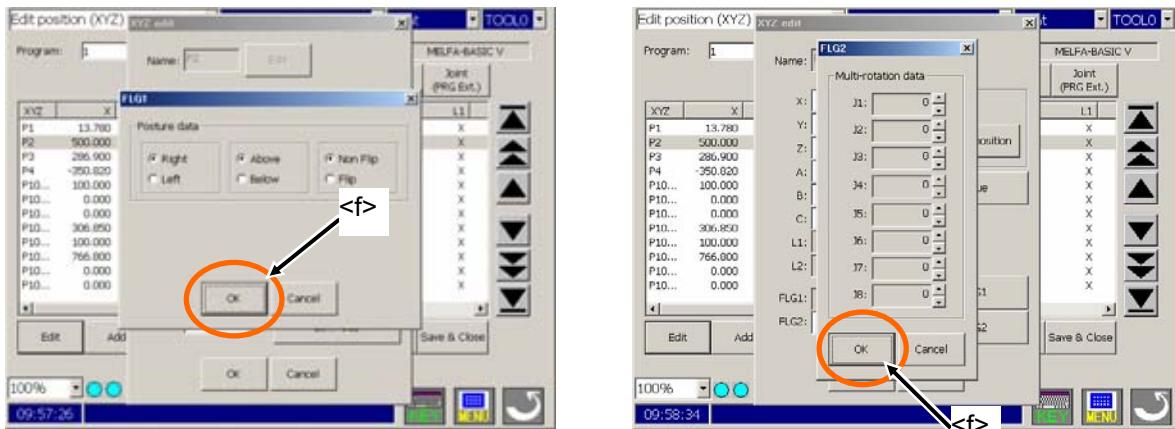
- Click the [Edit value] button. () The data input screen is displayed.



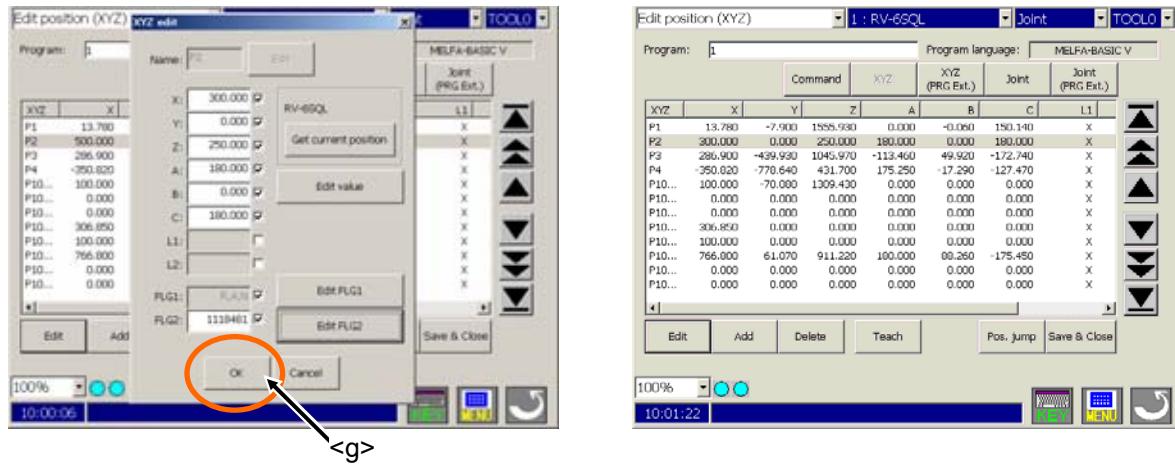
- The data is inputted into each coordinate value, click the [OK] key (<c>), and finish the data input.



- 4) The structure flag can be edited by the [Edit FLG1] button. (<d>
 The multi-rotation flag can be edited by the [Edit FLG2] button. (<e>
 Click the [OK] button, (<f>) will fix the data.



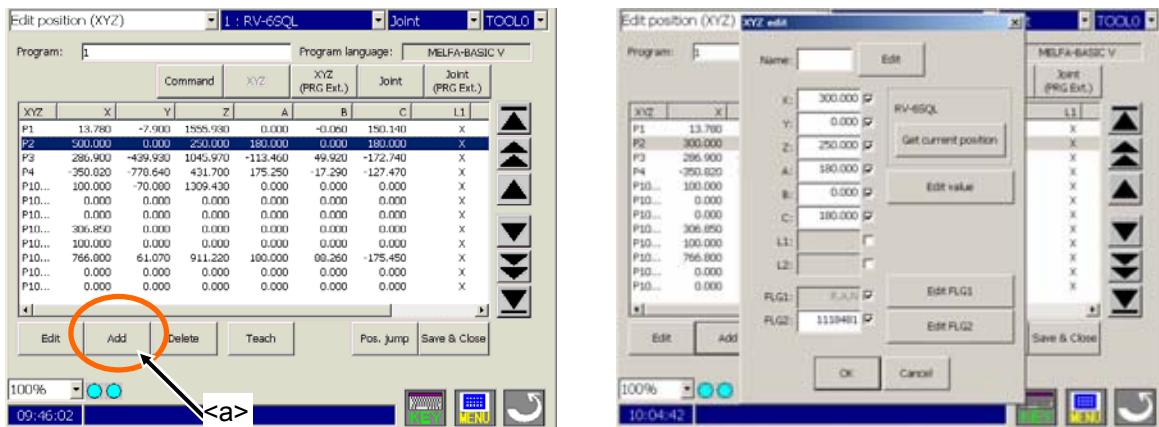
- 5) The [OK] button (<g>) will be clicked if edit of all the data is completed. The position variable data is registered.



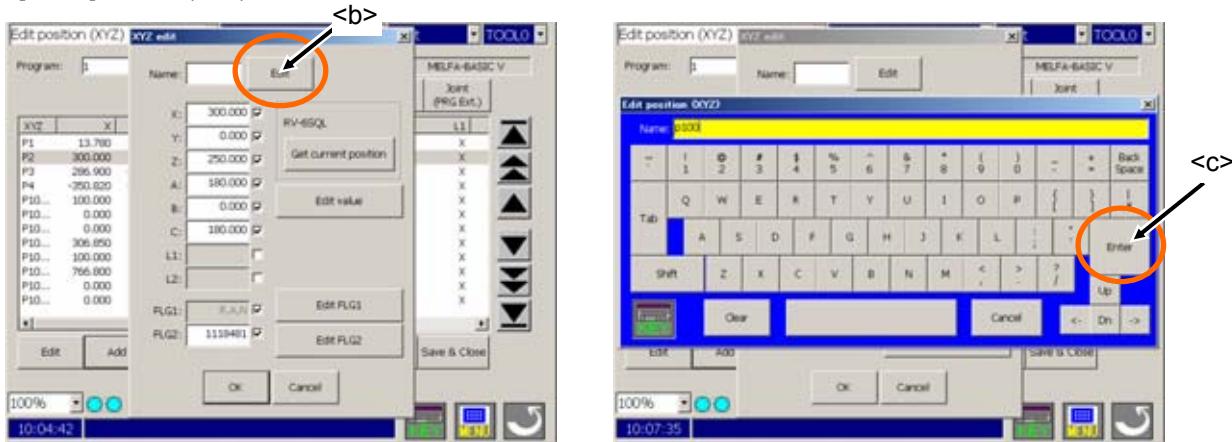
11.2.3. Addition of position data

Although the position variable used by the command line is displayed on the screen, it can add newly.

- Click the [Add] button. (<a>) The position edit screen is displayed.



- The [Edit] button () is clicked and input the variable name from the keyboard displayed, and click the [Enter] button (<c>) to fix it.



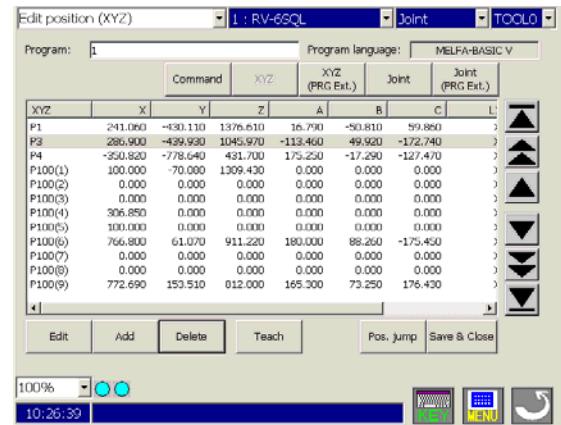
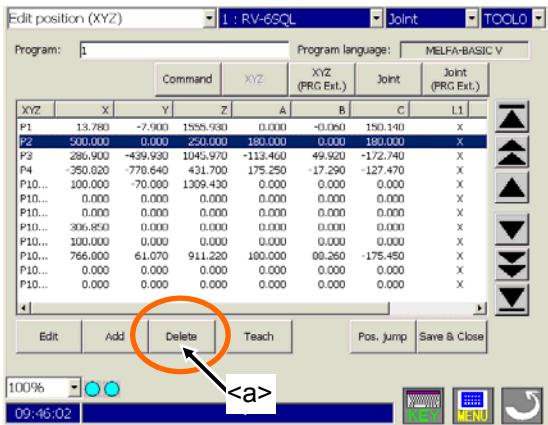
- Input the each coordinate value, the structure flag and multi-rotation data.
One method is taking the current position of robot. And another method is direct input of the numerical value.
If you wish to take the current position of robot, refer to "(1) Registering the current position data."
If you wish to input the numerical value, refer to "(2) Edit of position data."

11.2.4. Deletion of position data

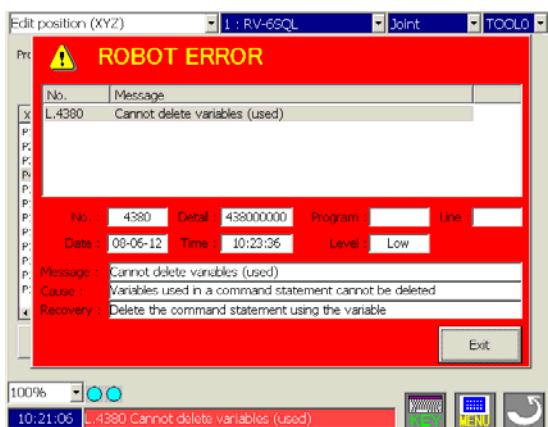
The procedure of deletion of position data is shown.

The variable currently used by the command line cannot be deleted.

Select the variable of deleting and click the [Delete] button. (<a>) The selected position variable is deleted.



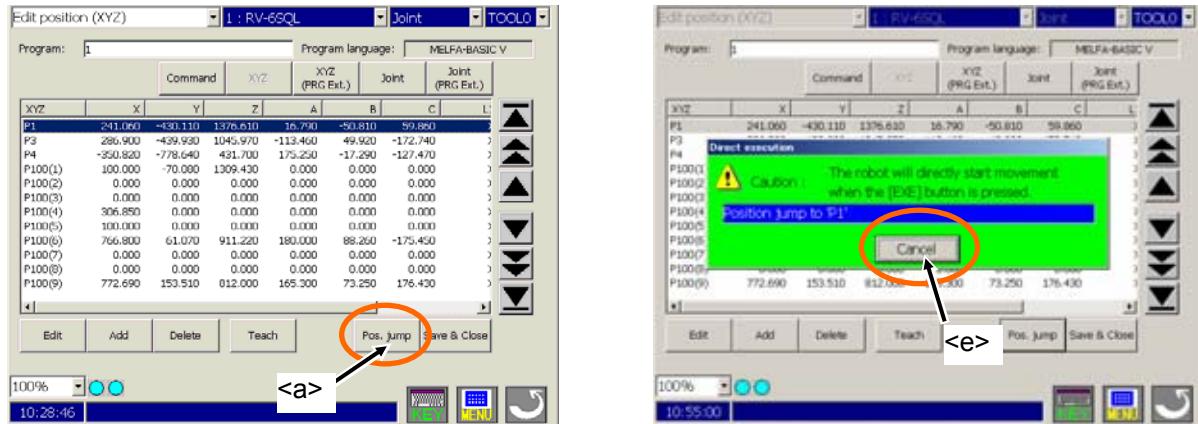
The position variable currently used by the command line cannot be deleted. The error occurs.
Push the [RESET] button () to cancel the error.



11.2.5. Confirming the position data (Position jump)

The robot can be moved to the teaching position and the position can be checked.
The interpolation method is the current jog mode.

- 1) By jog operation, move the robot to the safe position beforehand.
- 2) Select the target position variable and click the [Pos. jump] button. (<a>) The confirmation screen is displayed. Please click [Cancel] key (<e>) when discontinuing it.



- 3) The servo will turn ON when the [SERVO] button () pushed, in the condition that the enable switch (<c>) is pushed. When the servo turns on, LED (green) of the [SERVO] button lights up.
- 4) Only while the enable switch is pushed and the [EXE] button (<d>) is pushed, the robot will move. LED (green) of the [START] switch of the controller lights up during movement.



CAUTION

By jog operation, move the robot to the safe position beforehand and do this movement.
Failure to do so could lead to interference with the work piece or peripheral devices.
The key is separated to stop the robot or the enable switch is separated or it strongly pushes it.

12. Debugging

Debugging refers to testing that the created program operates correctly, and to correcting errors if an abnormality is found. These can be carried out by using the T/B's debugging function.

Always carry out debugging after creating a robot program, and confirm that the program runs without error.

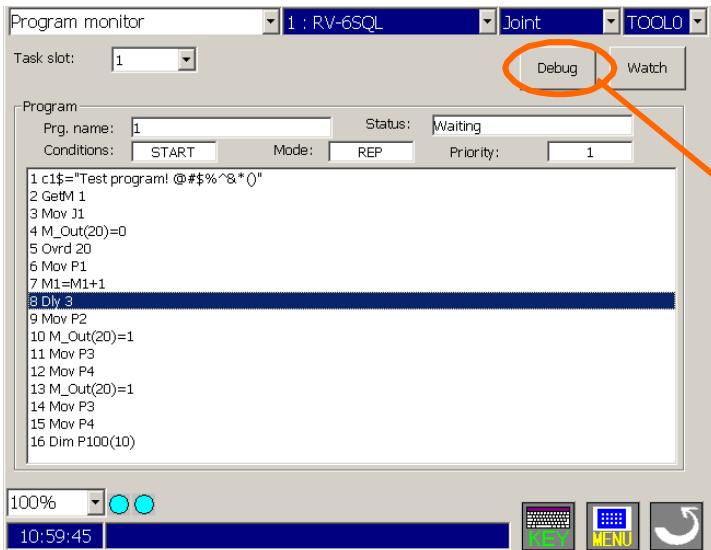
12.1. Starting the step operation

The "Debugging" window is shown from the "Edit command" window (editing in the robot controller) or the "Program monitor" window.

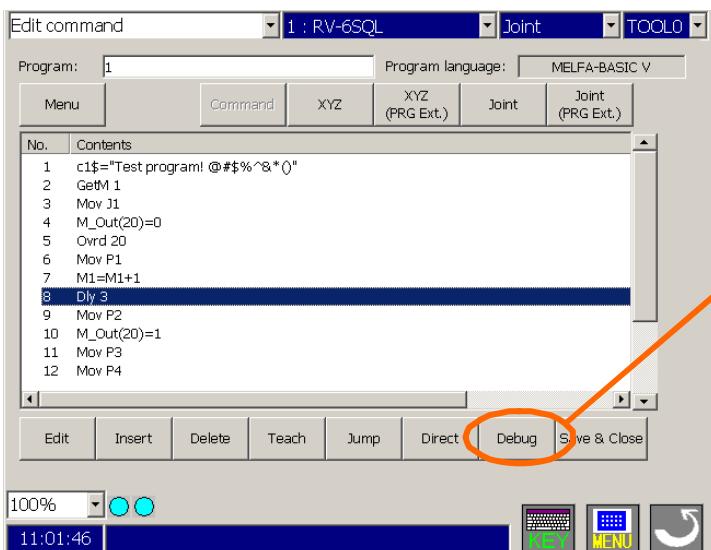
Click the "Debug" button (<a>) in these windows, and the "Debugging" window will appear at the right of T/B as follows.

When operating it, push the sheet-key "+" key corresponding to the position of this window.

"Program monitor" window



"Edit command" window



12.2. Step operation

"Step operation" executes the program line by line. The operation speed is slow, and the robot stops after each line, so the program and operation position can be confirmed.

During execution, the lamp on the controller's [START] switch will light.

Perform the operations which moves the robot while pushing lightly on the enable switch of the T/B after the servo has been turned on.



Caution

Take special care to the robot movements during operation. If any abnormality occurs, such as interference with the peripheral devices, release the "+" key or enable switch, or press the enable switch with force and stop the robot.

Immediately stopping the robot during operation

- * Press the [EMG. STOP] (emergency stop) switch.
The servo will turn OFF, and the moving robot will immediately stop.
To resume operation, reset the error, turn the servo ON, and start step operation.
- * Release or forcibly push the "enable" switch.
The servo will turn OFF, and the moving robot will immediately stop. Error 2000 will occur.
To resume operation, reset the error, lightly push the "enable" switch, press the "SERVO" key to turn ON the servo, and then start step operation.
- * Release the "+" key.
The step execution will be stopped. The servo will not turn OFF.
To resume operation, press the "+" key.

12.2.1. Step forward

Push continually the sheet-key "+" key corresponding to the "STEP FORWD".

The program is run one line at a time in the forward direction. The program is run in line order from the head or the designated line.

If the "+" button is released during this step, the running one line is stopped.

12.2.2. Step Backward

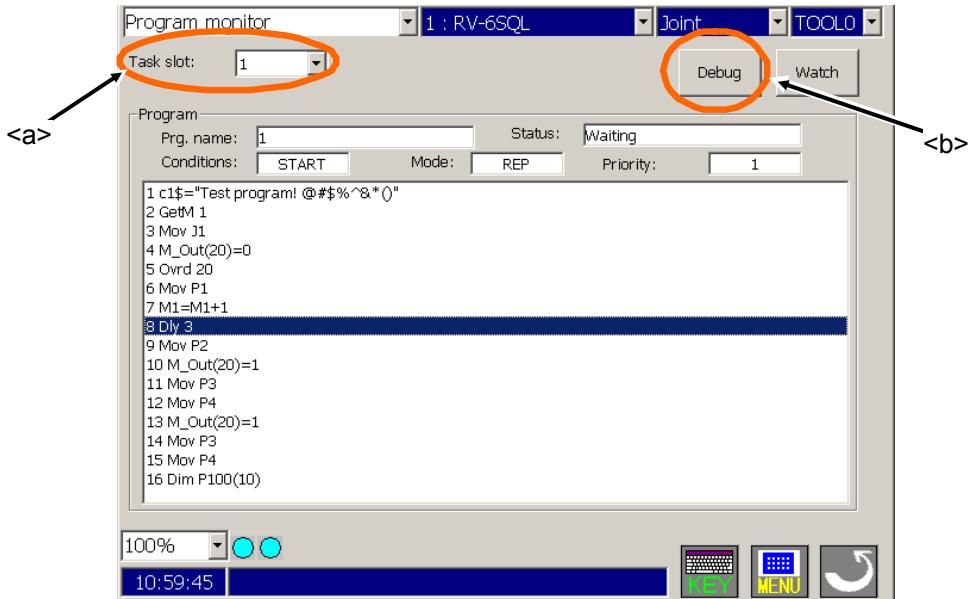
Push continually the sheet-key "+" key corresponding to the "STEP BACKWD".

The line of a program that has been stopped with step forward or normal operation is returned one line at a time and executed. This can be used only for the interpolation commands. Note that only up to 4 lines can be returned. If the "+" button is released during this step, the running one line is stopped.

12.2.3. Step forward in another slot

When checking a multitask program, use with the “Program monitor” window, it is possible to do step operation in another slot.

1. In the “Program monitor”, select the slot with “task slot”. (<a>)
2. Click the “Debug” button. ()
3. The “Debugging” window will appear, so operate the step forward / backward for the selected slot.

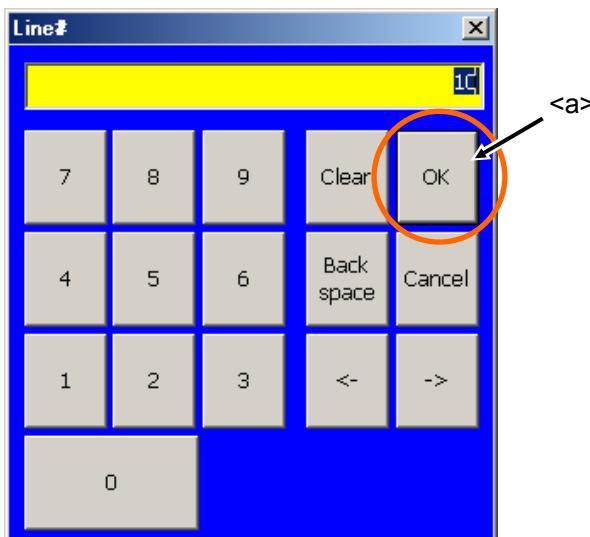


12.2.4. Step jump

It is possible to change the start line.

1. Push the sheet-key “+” key corresponding to the “JUMP”, the “Line#” window will appear.
2. Set the line number and click the “OK” button. (<a>)
3. The start line is changed.

However, an undefined error or similar will occur if lines for initialization of variables, etc. are skipped.



12.3. Program reset

It is possible to reset the program.

Push the sheet-key “+” corresponding to the “Program RESET”.

The start line is changed to top of the program.

12.4. Setting and deleting breakpoints

You can set breakpoints in the Command editing screen when editing the program in the Robot controller. If you set a breakpoint, you can stop the program at the line while executing the Continuous execution. After stops, you can execute the program continuously.
(This function corresponds to the R56TB Ver.2.1 or later.)

Breakpoints can be set up to 128. Moreover, when the program is quitted, every breakpoint is deleted. There are the following two types of breakpoints.

Permanent breakpoint : After stopping, the breakpoint keeps being set.

One-time breakpoint : After stopping, the breakpoint is automatically deleted at the same time as stopping..



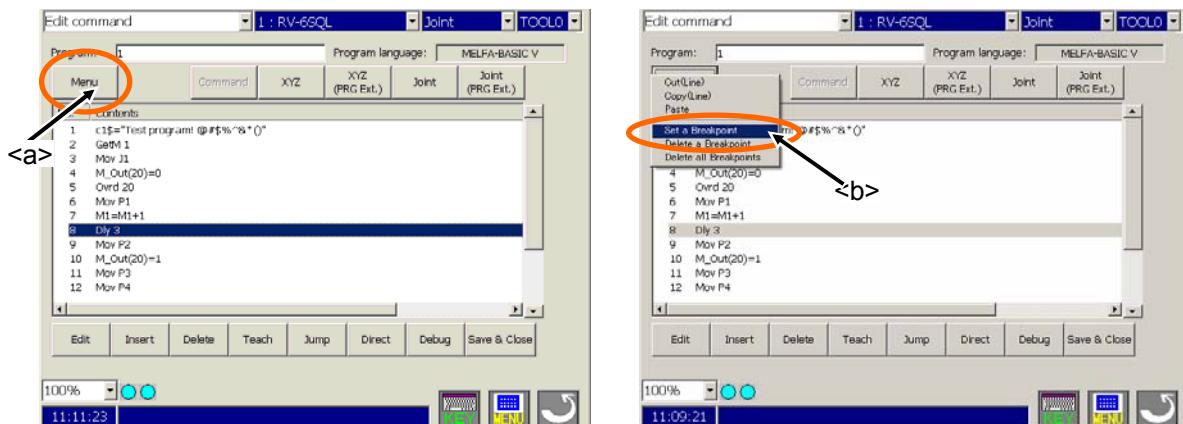
CAUTION

Breakpoints can only be used with MELFA-BASIC V.

(1) Set a Breakpoint

The breakpoint is set according to the following procedure.

- 1) Select the command line where breakpoint is set, then click on [menu] button <a>, and click on [Set a Breakpoint] .

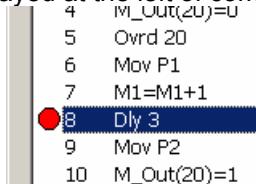


- 2) The breakpoint setting screen is displayed.

Select the type of breakpoint to set, and then click the [OK] button. The breakpoint is set at the specified command line.



- 3) "●" is displayed at the left of command lines at which breakpoints are set.



(2) Delete a Breakpoint

To delete a breakpoint, select the command line with the breakpoint to be deleted, then click on "Delete a breakpoint" of [menu] button.

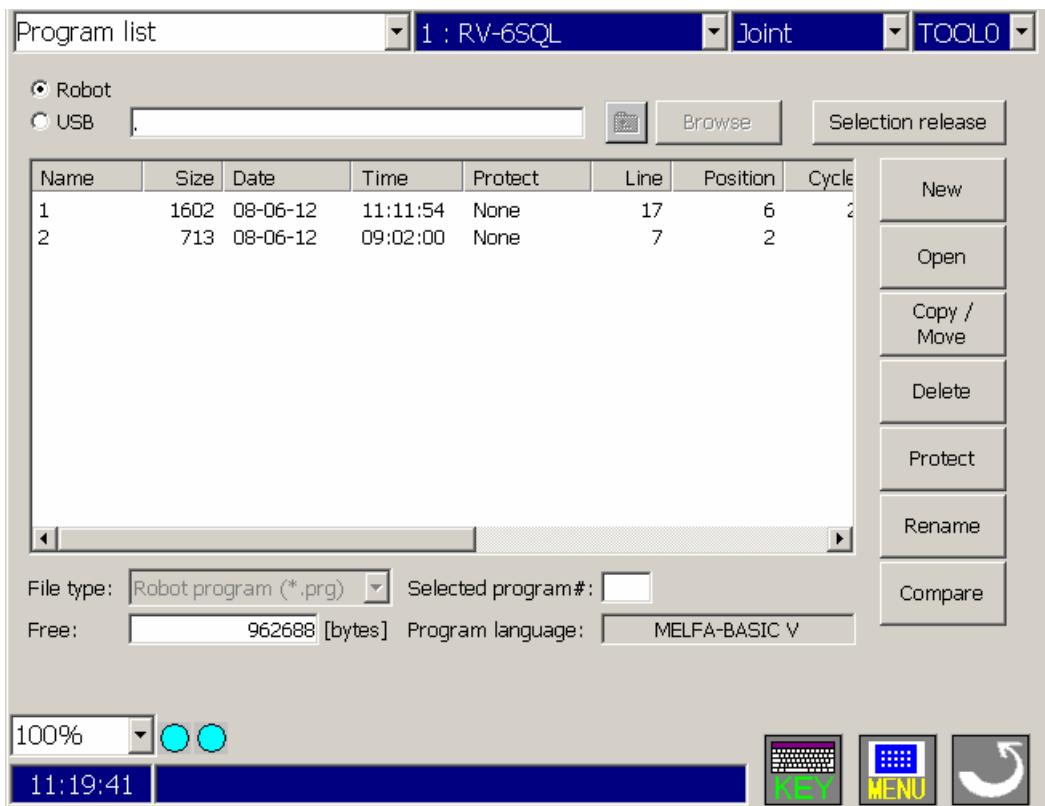
To delete all the breakpoints set in this program, click on "Delete all Breakpoints" of [menu] button.

13. Program management

The program files can be copied, moved, deleted, protected, renamed and the contents compared.

13.1. Starting

Select the “Program” from the menu, and program list shown below appears.



Caution

The targets of any operations in this function are the Robot program files.



Caution

Do not write-protect the USB memory when you do the operation as write to it.

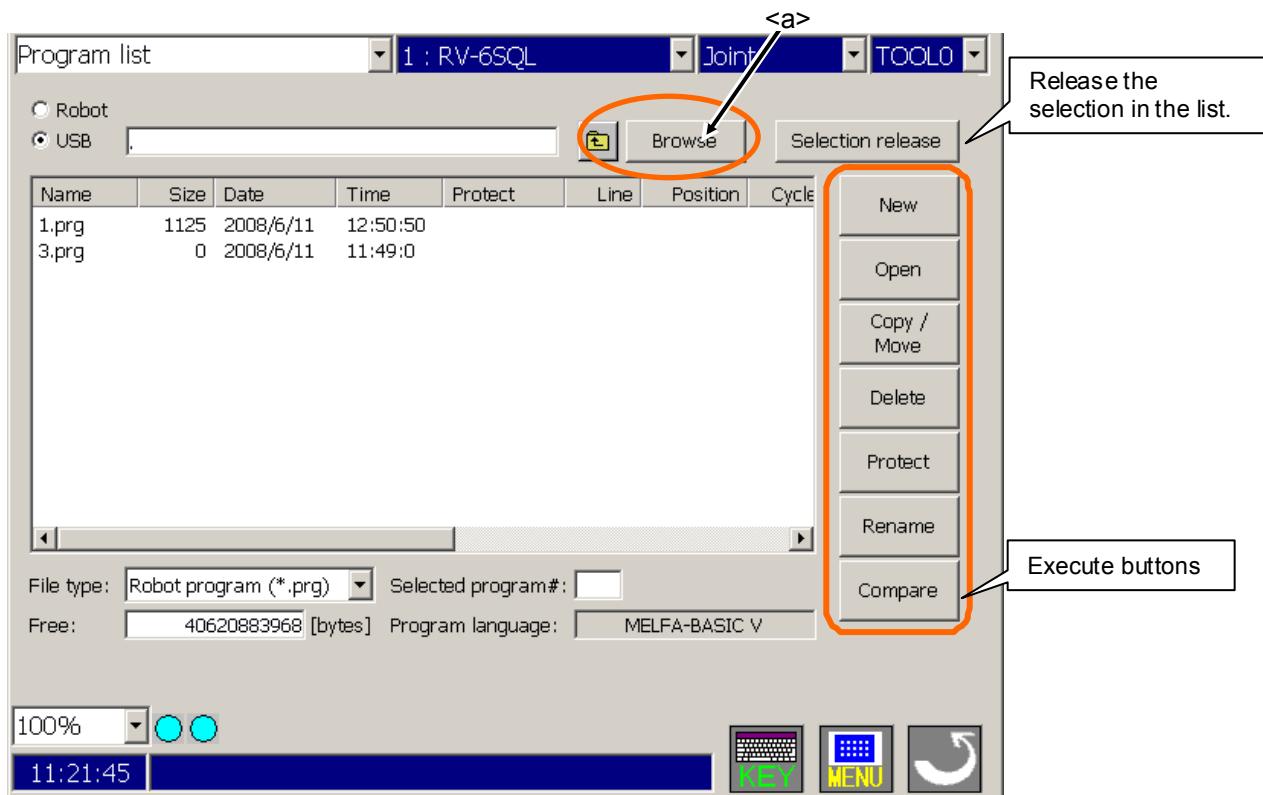
Even if it seems to have been able to write it without the error occurring by the operation copy and delete etc., when write-protection of USB memory is released, all operation is canceled. Or, the file might be made but its size is 0.

13.2. Program list

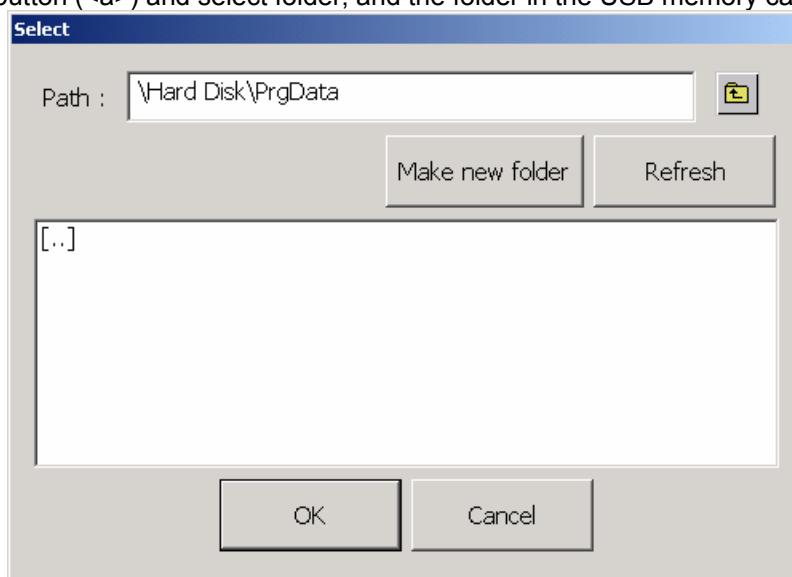
The lists of the program files are displayed.

For programs in the robot controller, the "Name", "Size", "Date", "Time", as well as the "Protect information", "No. of lines", "No. of position variables", "Latest cycle time", "Average cycle time", "Operation time", "No. of cycles" and "Comment" are displayed.

* As for the program files in the USB memory and in the controller, when even the contents are the same, the program sizes are different.



Click on the “Browse” button (<a>) and select folder, and the folder in the USB memory can be shown.

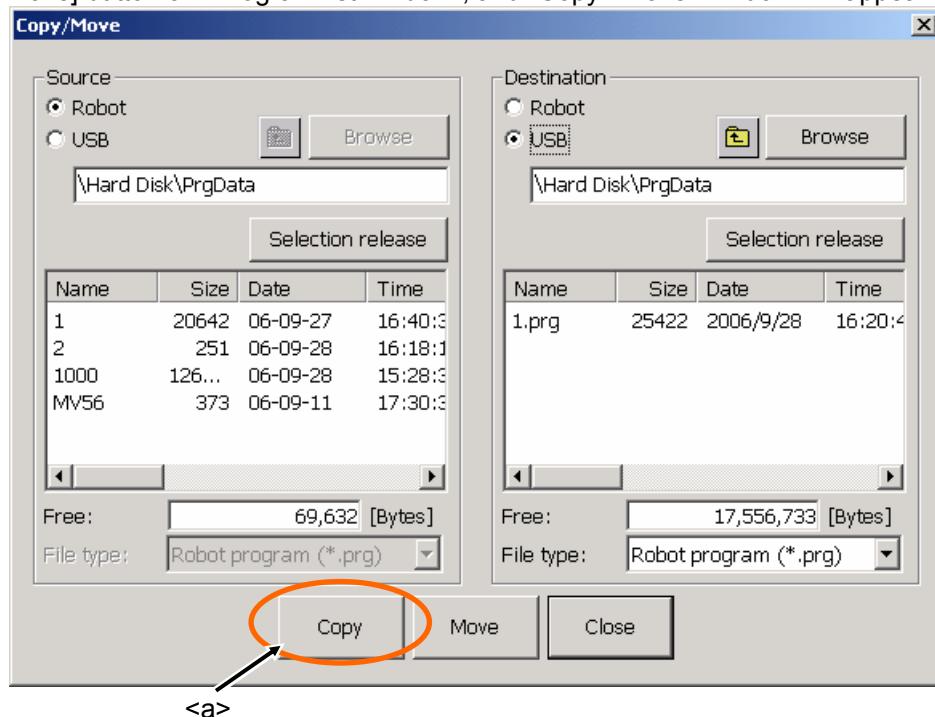


13.3. Copy

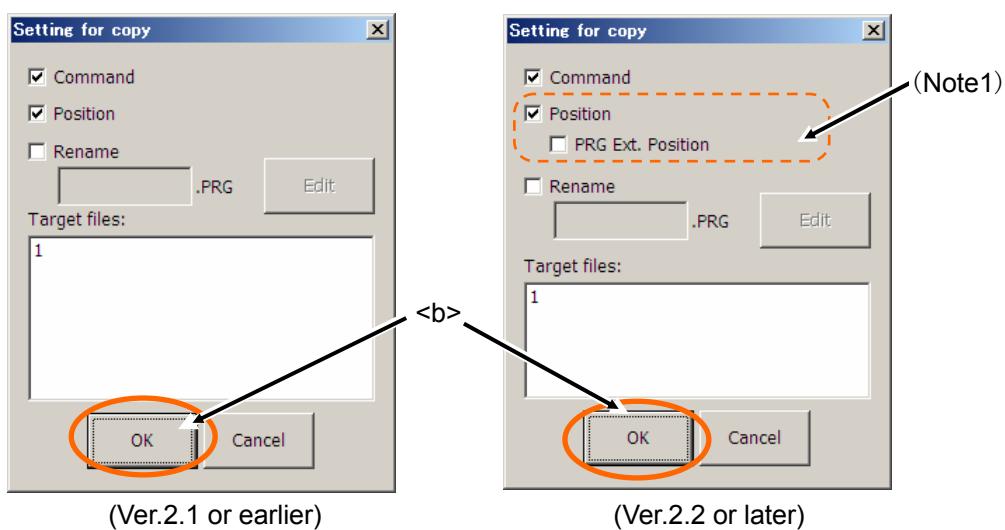
The program files are copied.

Copying of the entire program file or only the command statements or only the position variables is possible.

Click the [Copy / Move] button on "Program list window", and "Copy / Move" window will appear.



- 1) Select the program files to copy from the "Source" list, and designate the destination (robot or folder in the USB memory) at the "Destination" to copy to.
The multiple program files can be selected at the same time, but for copying with changing its name, only ONE program must be selected.
- 2) Click the [Copy] button (<a>), and "Setting for copy" window will appear.
- 3) Set the condition of the copy, and click the [OK] button. ()

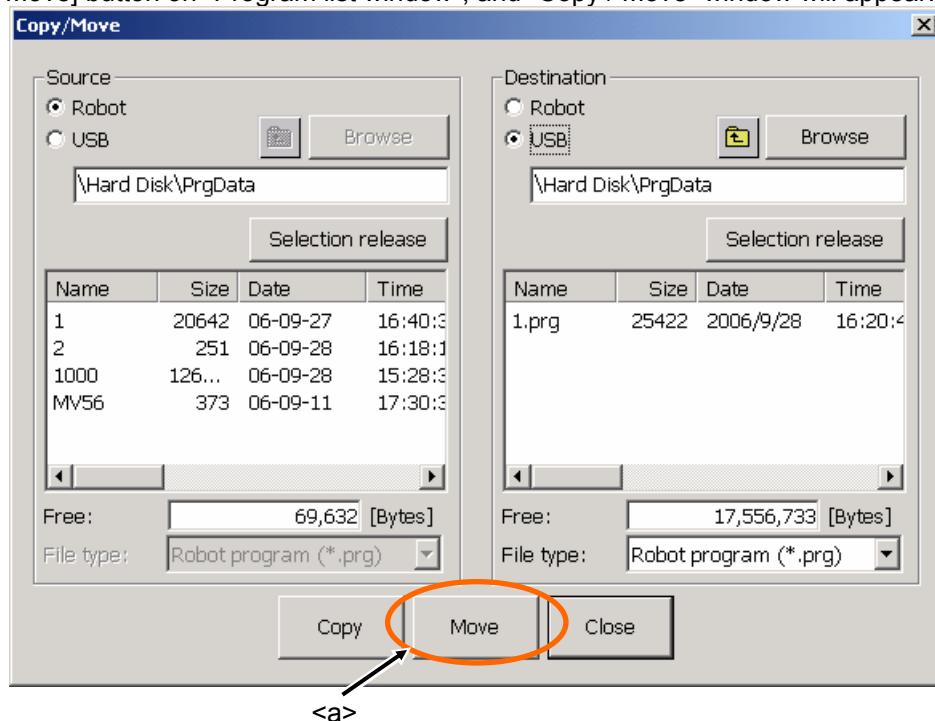


(Note 1) Copy of [PRG Ext. Position] is supported by version 2.2 or later of this software.

13.4. Move

The program files can be moved.

Click the [Copy / Move] button on "Program list window", and "Copy / Move" window will appear.



- 1) Select the program files to move from the "Source" list, and designate the destination (robot or folder in the USB memory) at the "Destination" to move to.
The multiple program files can be selected at the same time.
- 2) Click the [Move] button. (<a>)

13.5. Delete

The program files can be deleted.

- 1) Select the program files to delete from the list. The multiple program files can be selected at the same time.
- 2) Click the [Delete] button on "Program list window".



Caution

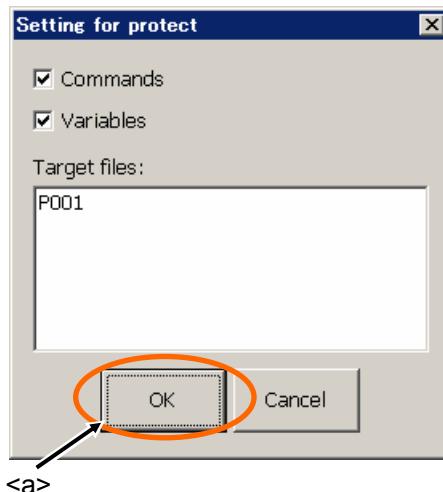
Note that once the program files are deleted, they cannot be recovered.

13.6. Protect

The program files in the robot controller can be protected.

The entire program file can be protected, or just the command statements or position variables can be protected.

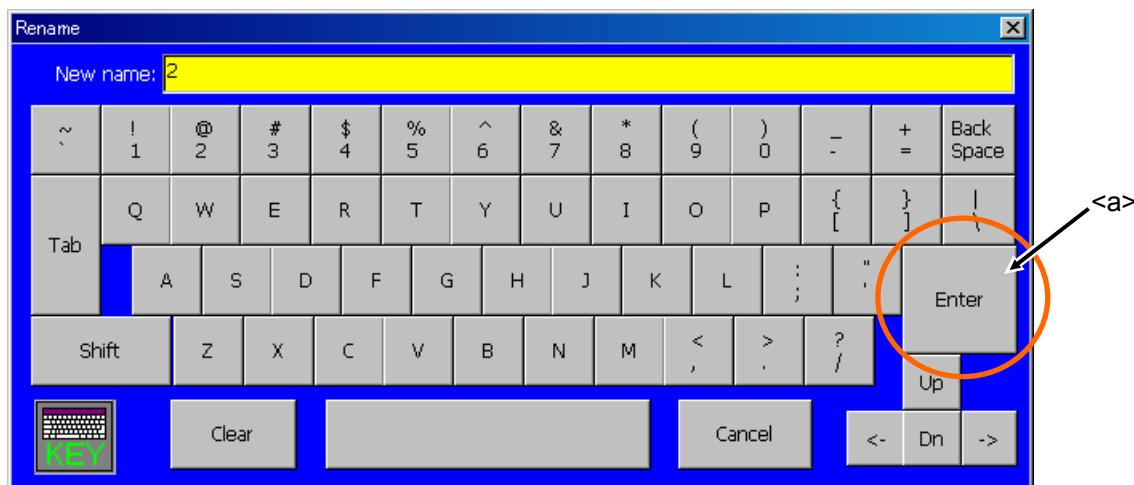
- 1) Select the program files to be protected from the lists. The multiple program files can be selected at the same time.
- 2) Click the [Protect] button on "Program list window", and "Setting for protect" window will appear.
- 3) Set the condition of the protect, and click the [OK] button. (<a>)



13.7. Rename

A program file name is renamed.

- 1) Select the name of the only one program file to be renamed from the list.
- 2) Click the [Rename] button on "Program list window", and "Rename" window will appear.
- 3) Set the new file name, and the click the [Enter] button. (<a>)

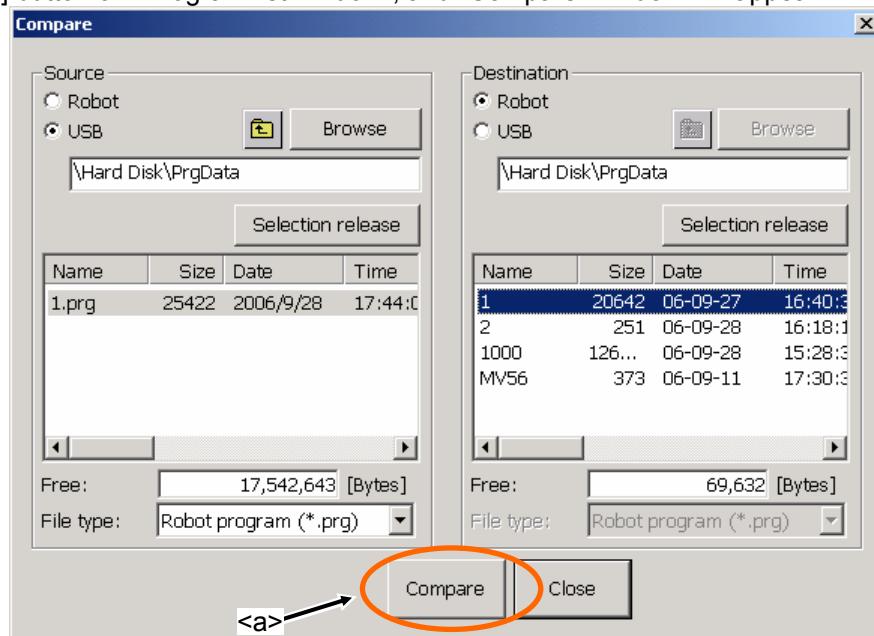


13.8. Compare

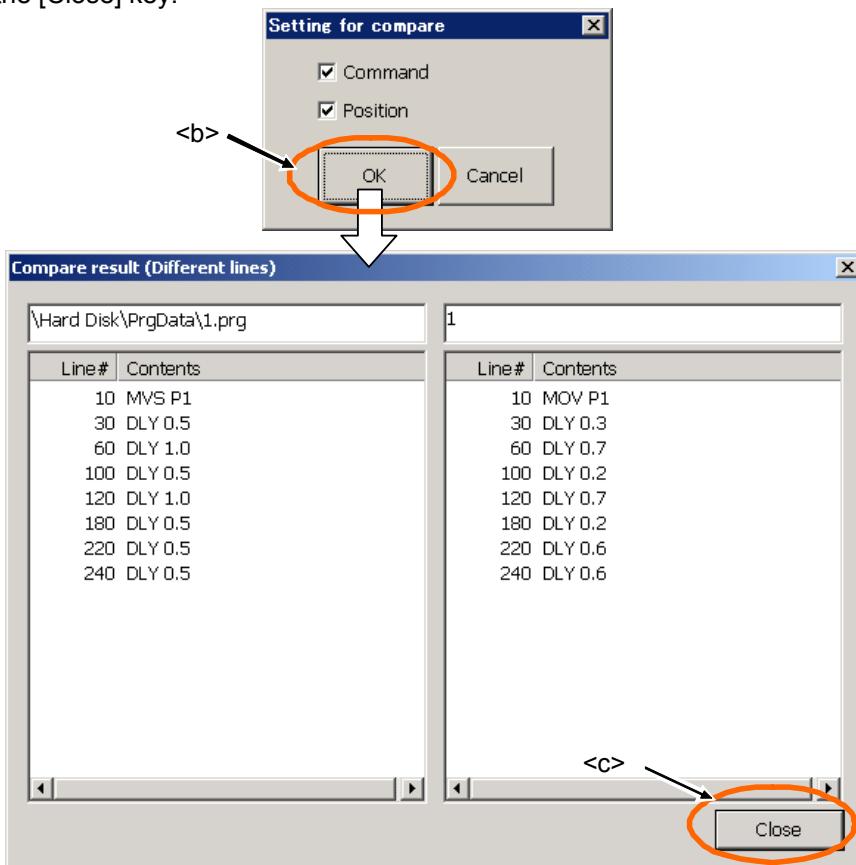
The program files can be compared.

Compare of only the command statements or only the position variables is possible.

Click the [Compare] button on "Program list window", and "Compare" window will appear.



- 1) Select the program files to be compared from the left and right lists.
- 2) Click the [Compare] button (<a>), and "Setting for compare" window will appear.
- 3) Set the condition of the compare, and click the [OK] button. ()
- 4) The "Compare result" window will appear.
- 5) It ends clicking the [Close] key.



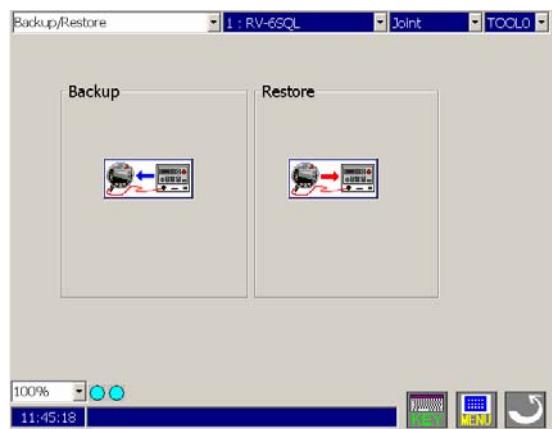
14. Backup/Restore

The information on the robot controller can be backed up to the USB memory, or the backup information saved on the USB memory can be restored to the robot controller.

Backup (Robot -> USB memory)	Saves the backup data on the robot controller to the USB memory.
Restore (USB memory -> Robot)	Transfers the backup data saved on the USB memory to the robot controller.

14.1. Starting

Select [Backup/Restore] from the menu. The following "Backup/Restore" window appears.

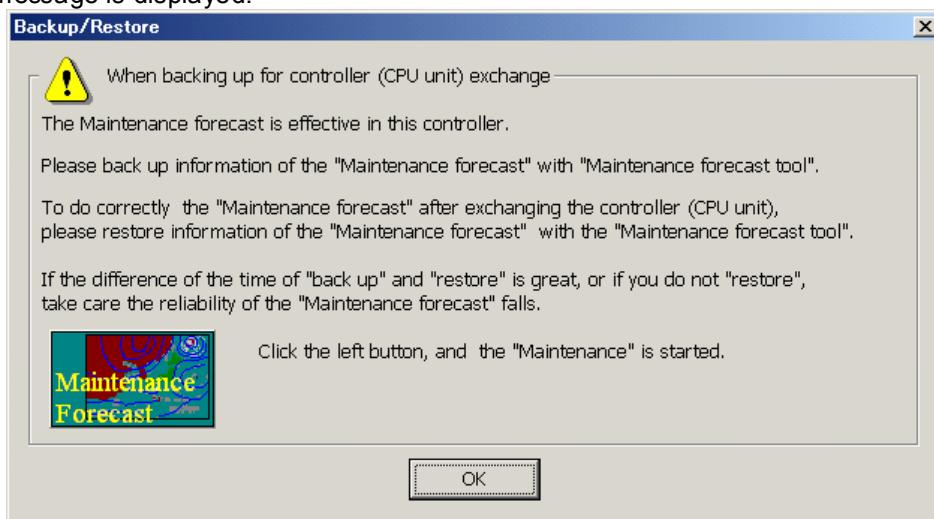


Caution

Precautions when executing a backup/restore operation during the replacement of a controller (CPU) that supports Maintenance Forecast

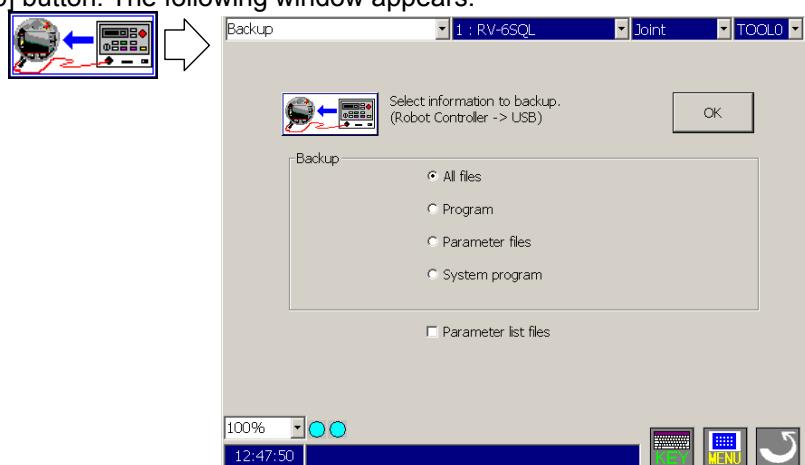
When executing a backup/restore operation during the replacement of a controller (CPU) that supports Maintenance Forecast, also perform the backup/restore operation using the Maintenance Forecast tool.

After a backup operation is performed on a controller that supports Maintenance Forecast, the following message is displayed.



14.2. Backup (Robot -> USB memory)

Save the information on the robot controller to a file on the USB memory.
Click the [Backup] button. The following window appears.



<< Backup >>

All Files : Saves all files (robot program, parameter files, etc.) in the robot controller into the designated folder.

Program : Saves the robot program file into the designated folder.

Parameter Files : Saves the parameter files into the designated folder.

System Program: Saves the system base program file into the designated folder.

Note that this Save (Robot -> USB memory) is intended to back up the robot controller, so the program cannot be edited using the program editing tool.

[Parameter List Files]

This is used to edit the parameter information saved by backup in offline mode of RT ToolBox, and is not required for backup. If this is not checked, the time required to save all files will be shortened.

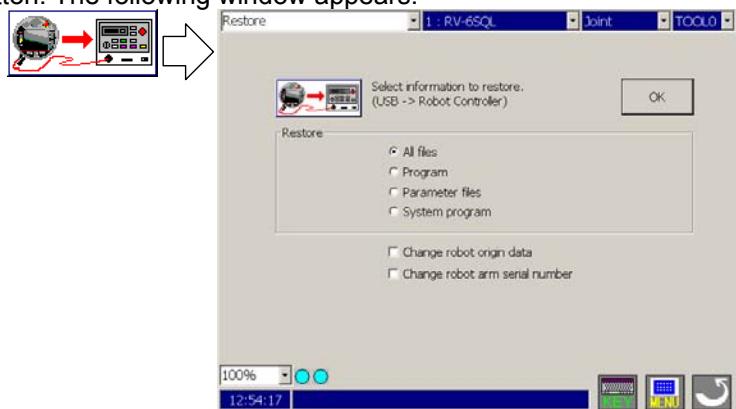
BKUP.SYS and MECHA.SYS files are automatically created in the designated folder. These files contain the saved mechanical information of the robot controller and describe the save format. If these files are deleted or overwritten, please note that offline data editing and data transfer to the robot controller cannot be performed.

Precaution for Backup

When backing up the values of the robot (system) status variables and the values of the program external variables, reset the power to the robot controller first, and then perform a backup operation.

14.3. Restore (USB memory -> Robot)

The backup data saved in the USB memory is transmitted to the robot controller. Click the [Restore] button. The following window appears.

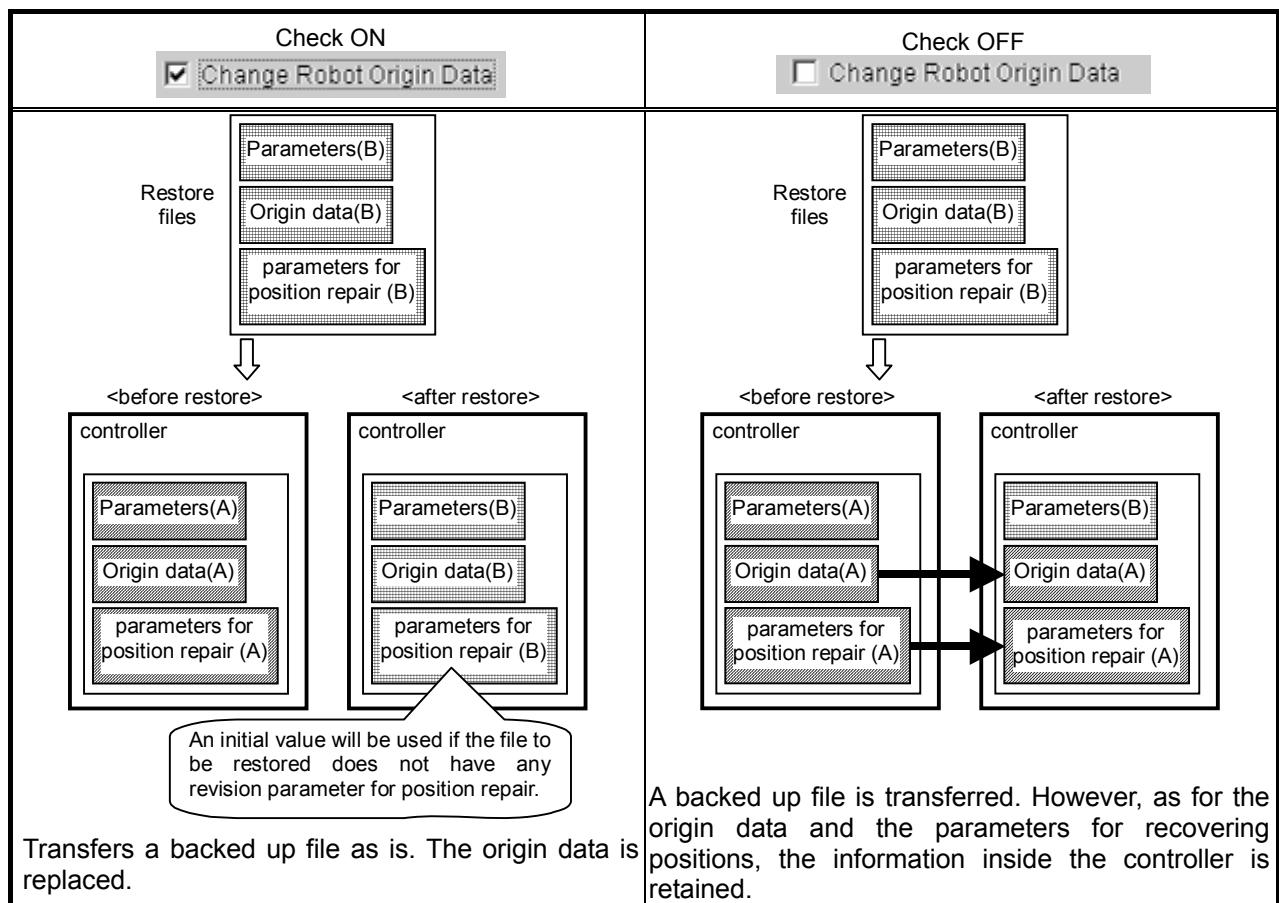


<< Restore >>

- All Files** : Transfers all files (except BKUP.SYS and MECHA.SYS) in the designated folder to the robot controller after all information in the robot controller is cleared (initialized).
- Program** : Transfers the robot program file in the designated folder to the robot controller.
- Parameter Files** : Transfers the parameter file in the designated folder to the robot controller.
- System program**: Transfers the system base program file in the designated folder to the robot controller.

[Change robot origin data] Valid only when [All Files] or [Parameter Files] is selected under [Backup].

- If checked** : Replaces the origin information in the robot controller with the contents of the mechanical parameter file to be transferred.
- If not checked** : Loads the origin information from the robot controller, transfers the information in the designated folder, and then returns the origin information that has been loaded to the robot controller.



[Change robot arm serial number] Valid only when [All Files] or [Parameter Files] is selected under [Backup].

If checked : Replaces serial number of the robot arm in the robot controller with the contents of the mechanical parameter file to be transferred.

If not checked : A backed up file is transferred. However, the serial number of the robot arm is retained the information inside the controller.

If communication is cancelled during a series of restore processing, please note that the origin data may have been changed.



Caution

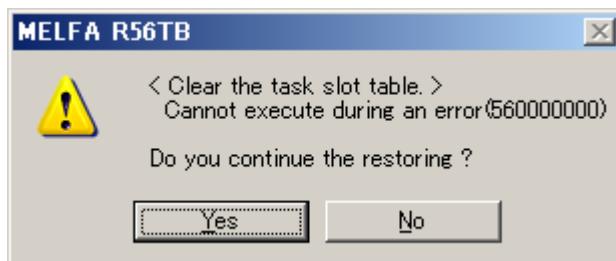
Precaution for Restore

When a program is running or the ALWAYS program is set up

If a batch restoration or a program restoration is executed when the program is being started, the program will automatically be stopped.

At this time, if there is an error in the controller, the program in operation cannot be stopped, and the message shown on the below will be displayed.

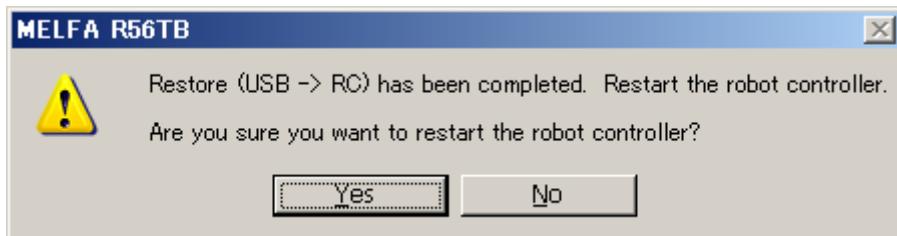
Although a restoration process can be executed even in such a case, the program currently selected or the program that is started by ALWAYS cannot be re-written. If it is possible to remove the cause of the error, reset the error and execute the restoration process again.



14.4. Power Reset of the Robot Controller

To make the restored information effective, it is necessary to power on the robot controller again.
If connecting to the CRnD-700 series controller, the power reset of the robot controller can be performed from the T/B.
If connecting to the CRnQ-700 series controller, please reset the power by switch of the robot controller.

After restoring, the power reset conformation screen appears. To immediately reset the power, select [Yes].



15. Monitor

With the monitor, all of the information in the currently connected robot controller can be constantly displayed.

15.1. Starting

Select the "Monitor" from the Menu. The "Monitor menu" shown below will appear.

After selecting the robot you wan to monitor, click an item. The monitor window for selected robot appears.



15.2. Outline of each function and starting methods

15.2.1. Outline of each function

Each monitor function is explained briefly in this section. The monitor functions are largely classified into the following three groups.

1. Robot movement monitor Items related to robot movement are monitored.
2. Signal monitor Items related to the state of the signal is monitored.
3. Operation monitor Items related to the robot's operation are monitored.
4. Servo monitor..... The robot's servo system information is monitored.

	Monitor name	Explanation
Robot movement monitor	Slot run state	The operation state of each slot can be confirmed.
	Program monitor	The program execution line set for each slot, the contents of the variable used in the program, and the robot current position, etc., can be confirmed.
	Movement State	The current position information and hand open/close state of each connected mechanism can be confirmed.
	Error	The currently occurring error can be confirmed. The history of the errors that have occurred can be confirmed.
Signal monitor	General-purpose signal	The state of the signal input from an external device to the robot controller / output from the robot controller to an external device can be confirmed.
	Named signal	The status can be checked by naming the status of the dedicated I/O signal that has been set in the robot controller, as well as each bit or within the range of 32 bits of the general-purpose signal. The signals are set via parameter setting (Parameter editor).
	Stop signal	The stop signal input into the robot controller can be confirmed.
	Register	The input registers in the CC-Link function can be monitored and pseudo-input, and the output registers in the CC-Link function can be monitored and forcibly output.
Operation monitor	Operating hours	The robot operation time (power ON, etc.) can be confirmed.
	Production information	The operating time of the program in the robot controller and the No. of program cycles can be confirmed.
	Additional board information	Information on the option card mounted on the robot controller can be referred to.
Servo monitor	Servo monitor position, speed, current, load, power	The servo system information can be monitored.

15.3. Each monitor function

Each monitor function is explained in this section.

15.3.1. Robot movement monitor

15.3.1.1. Slot run state

The state of the slots in the robot controller can be monitored.

The No. of displayed slots is determined with the parameters.

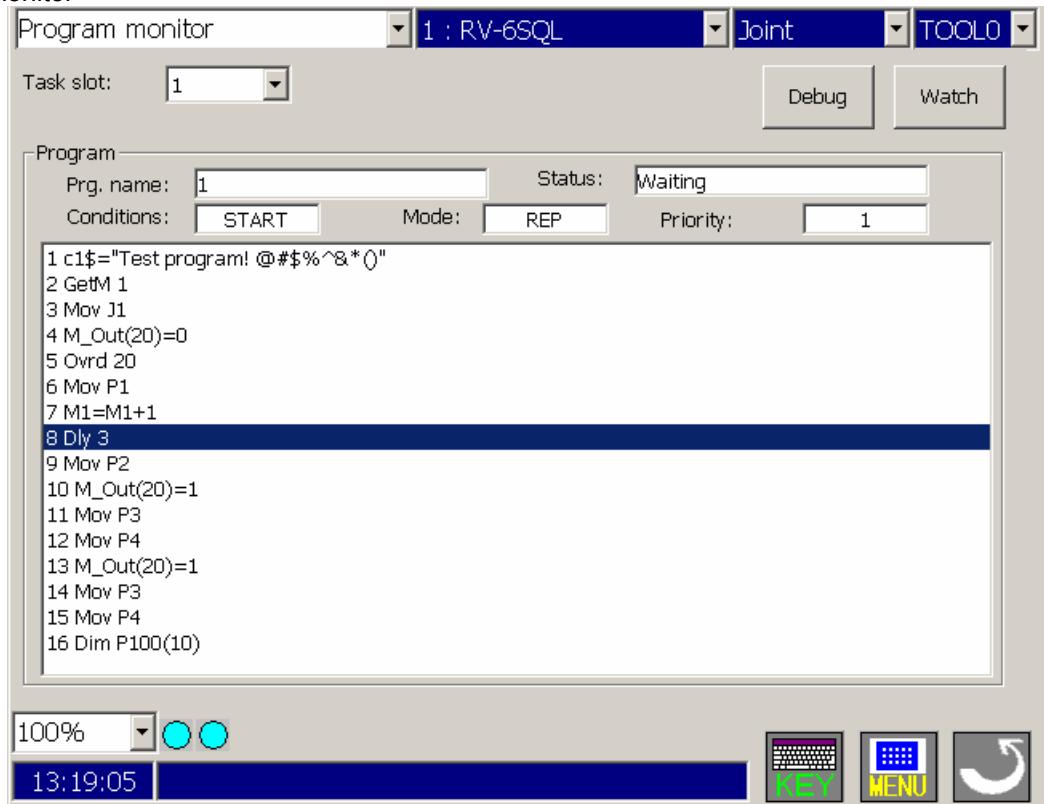
No.	Status	Program	Robot	Conditions	Mode	Priority
1	Waiting	1		START	REP	1
2	Program selection possible			START	REP	1
3	Program selection possible			START	REP	1
4	Program selection possible			START	REP	1
5	Program selection possible			START	REP	1
6	Program selection possible			START	REP	1
7	Program selection possible			START	REP	1
8	Program selection possible			START	REP	1

100% 
13:16:03   

15.3.1.2. Program monitor

Information of the running program can be monitored.

1) Program monitor



[Watch] : The constant display window for the variables used in the running program is displayed.

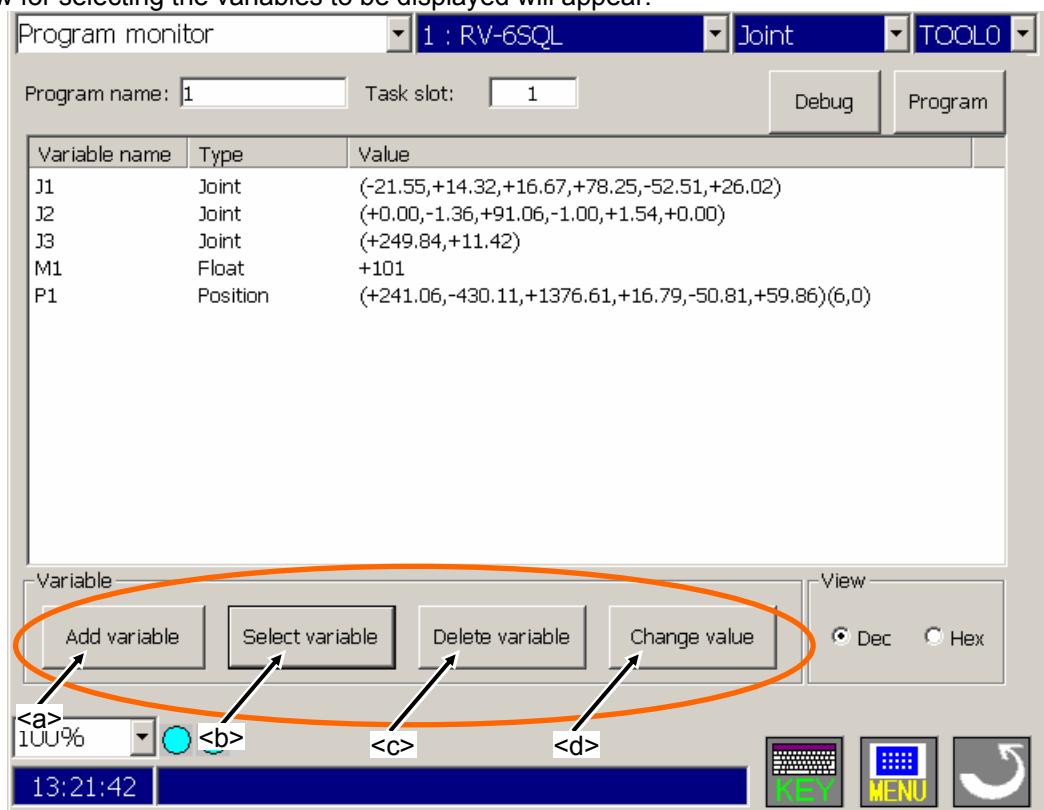
[Debug] : The “Debugging” window will appear at the right of T/B.

For debugging, please refer to the “12 Debugging”.

2) Watch monitor

With the watch monitor, the variables to be constantly displayed can be selected.

When the [Watch] button on "Program monitor window" is clicked on, the watch monitor window and a window for selecting the variables to be displayed will appear.



[Select variable]

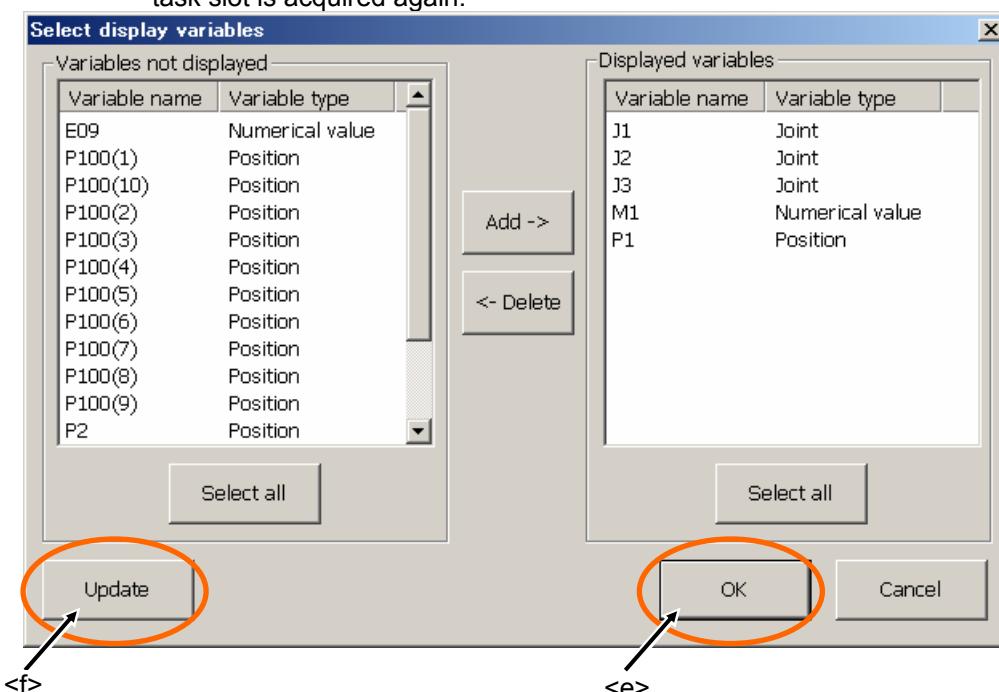
The watched variable can be selected from the variable list used by the program.

When [Select value] button () is clicked, the following screen is displayed.

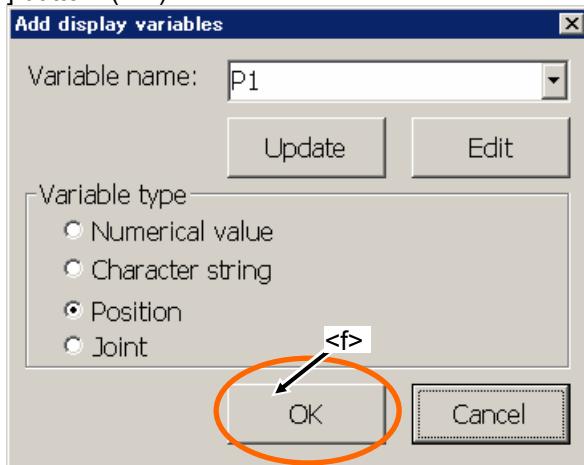
[Add] button is clicked after the variable watched on this screen is selected, and the variable monitored to "Displayed variables" is selected. If all the variables to wish are selected, click the [OK] button. (<e>)

The variable, which is not displayed here can be specified by the [Add variable] button. (<a>)

When the [Update] button (<f>) is clicked, the variable of the program loaded into the task slot is acquired again.



[Add Variable] The variables to be monitored can be designated.
 <a> Input the variable in Variable Name, select the variable type, and then click on the [OK] button. (<f>)

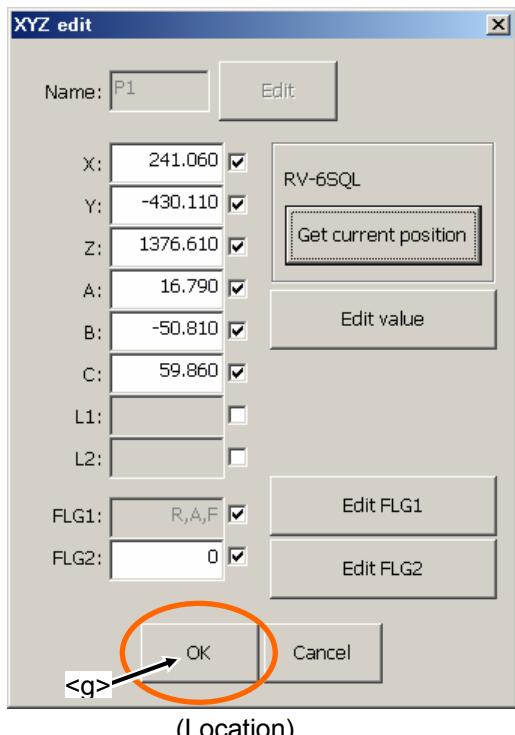


[Change value] The value of the variable being watched now is changed. Variable identifier to which the value is changed is clicked double or [Change value] button (<d>) is clicked while selected. Variable value change window is displayed.

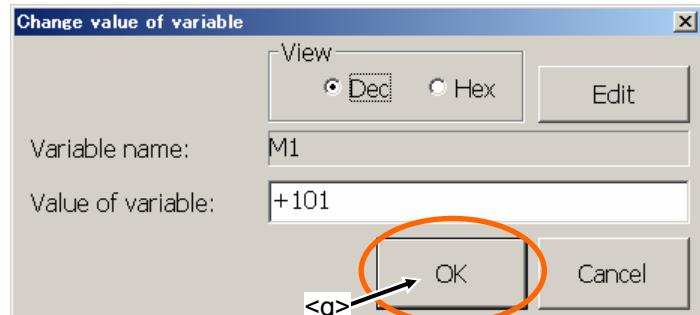
⚠ Caution

Please note that the movement of the robot might change by the change enough when you change the value.

When the variable name is selected and the [Change value] button (<d>) is clicked on, the window for making changes will appear.



(Location)



(Integer, Float, String)

Please click [OK] button (<g>) after changing the value. However, please note that the movement of the robot might change by the change enough when you change the value.

[Delete variable] The value of the variable being watched now is changed. Variable identifier to which the value is changed is clicked double or [Change] button is clicked while selected. Variable value change window is displayed.

About the hexadecimal number display

The variable displayed with "Watch monitor" and "Change value of variable" can be switched to the hexadecimal number / the decimal number.

Please select the type, which wants to be displayed with "View" on each screen.

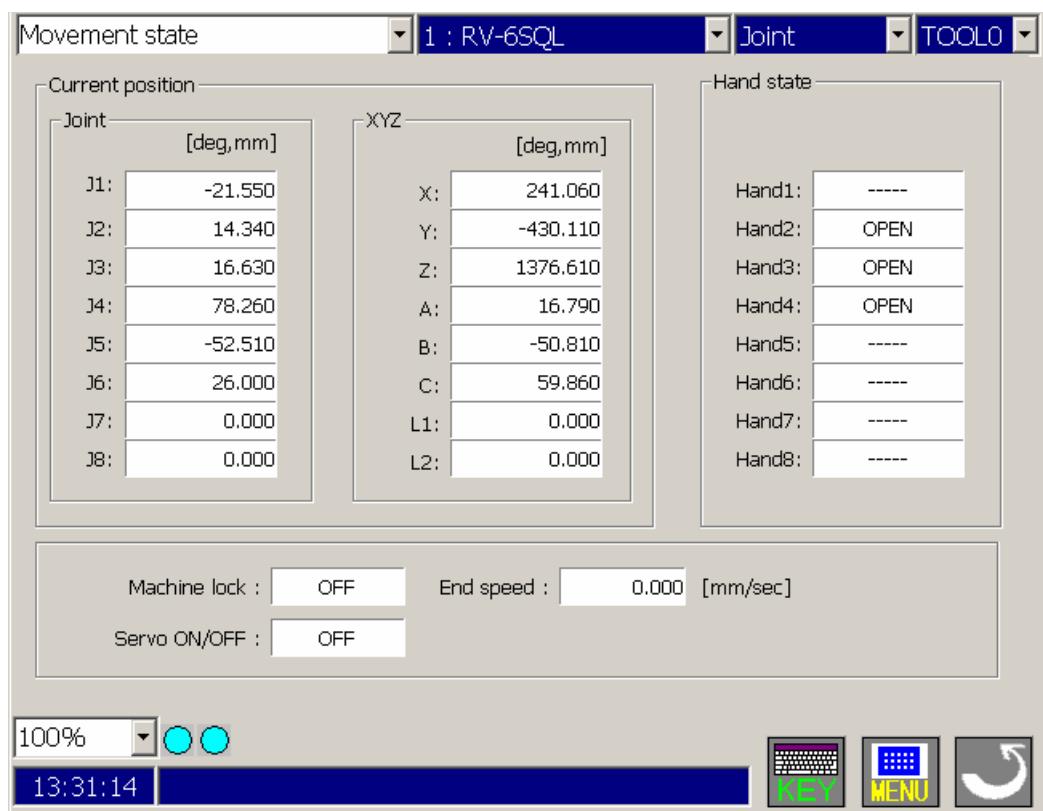
Please refer to the following for the variable, which can be displayed by the hexadecimal number.

Integer	The displayed variable can be switched to the hexadecimal number/the decimal number.
Float	When it is 0 below the decimal point, it is possible to switch to the hexadecimal number/the decimal number. However, the value is the one within the range of -9999999-9999999.
String	The hexadecimal number is not displayed.
Location	The hexadecimal number is not displayed.

As for the value displayed by the hexadecimal number, &H is added to the head of the value.

15.3.1.3. Movement State

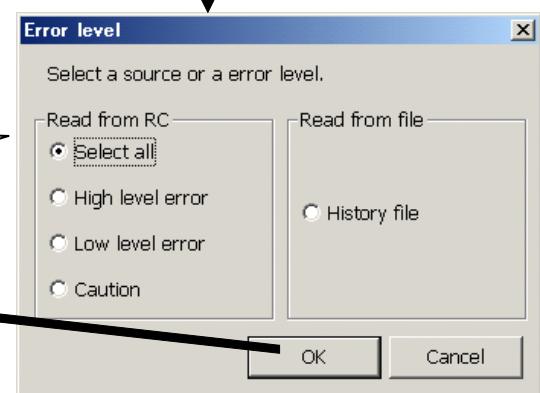
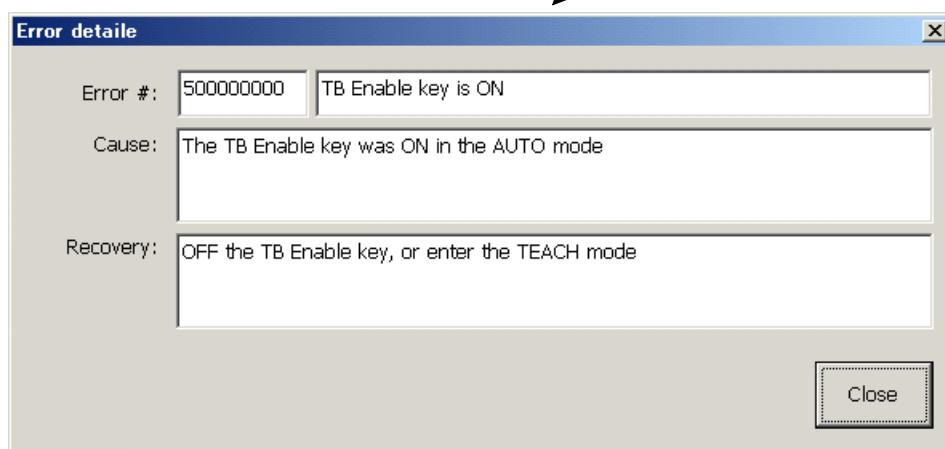
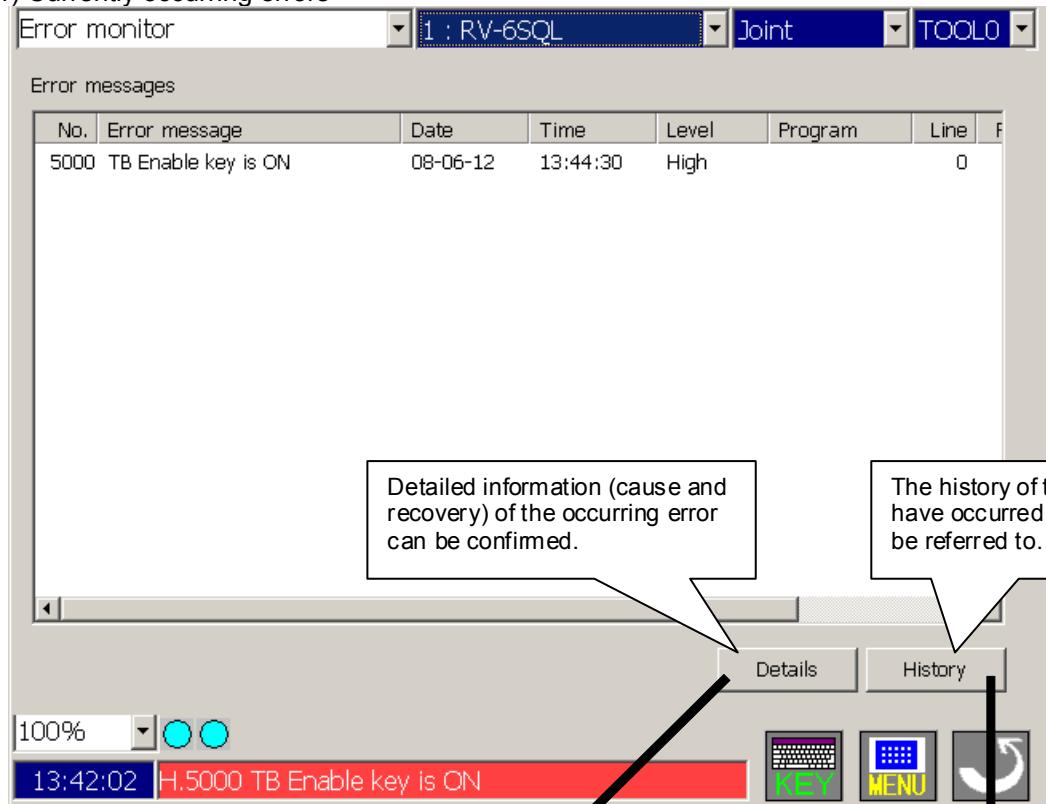
With the operation confirmation, the robot's movement range, current position and hand open / close state, etc., can be confirmed.



15.3.1.4. Error

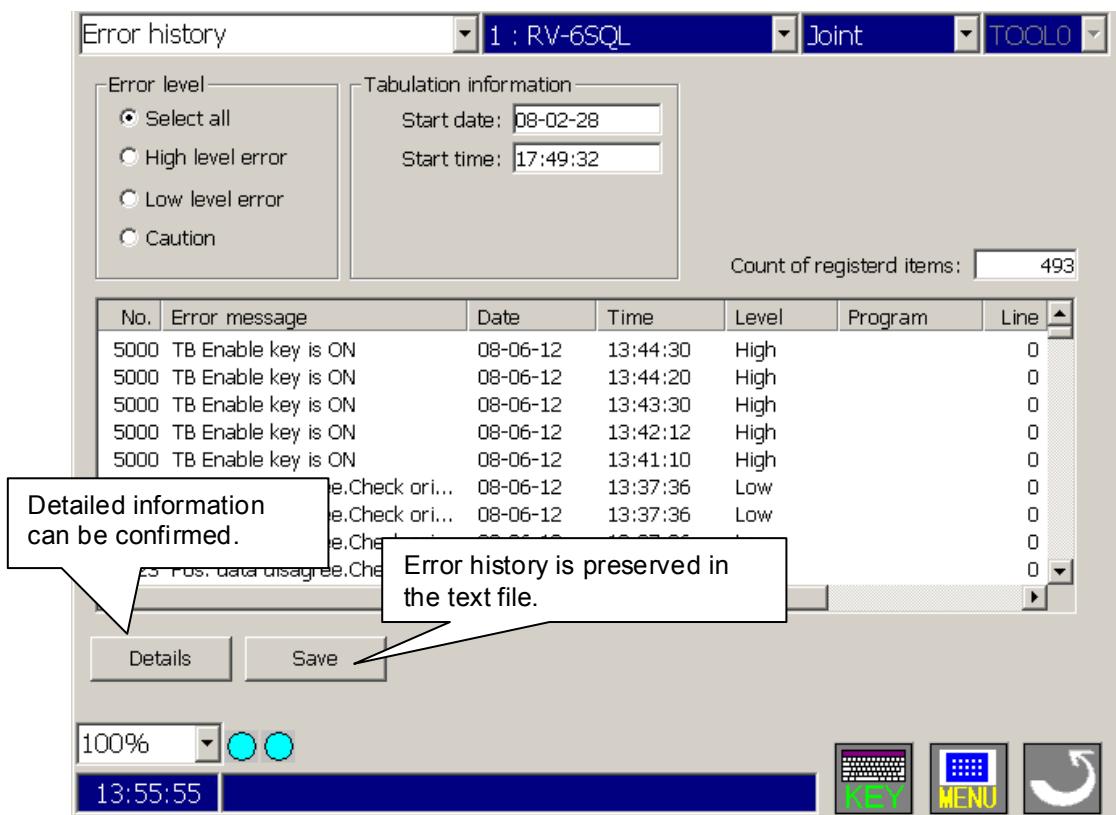
The errors currently occurring in the robot controller are displayed.

1) Currently occurring errors



2) Error history

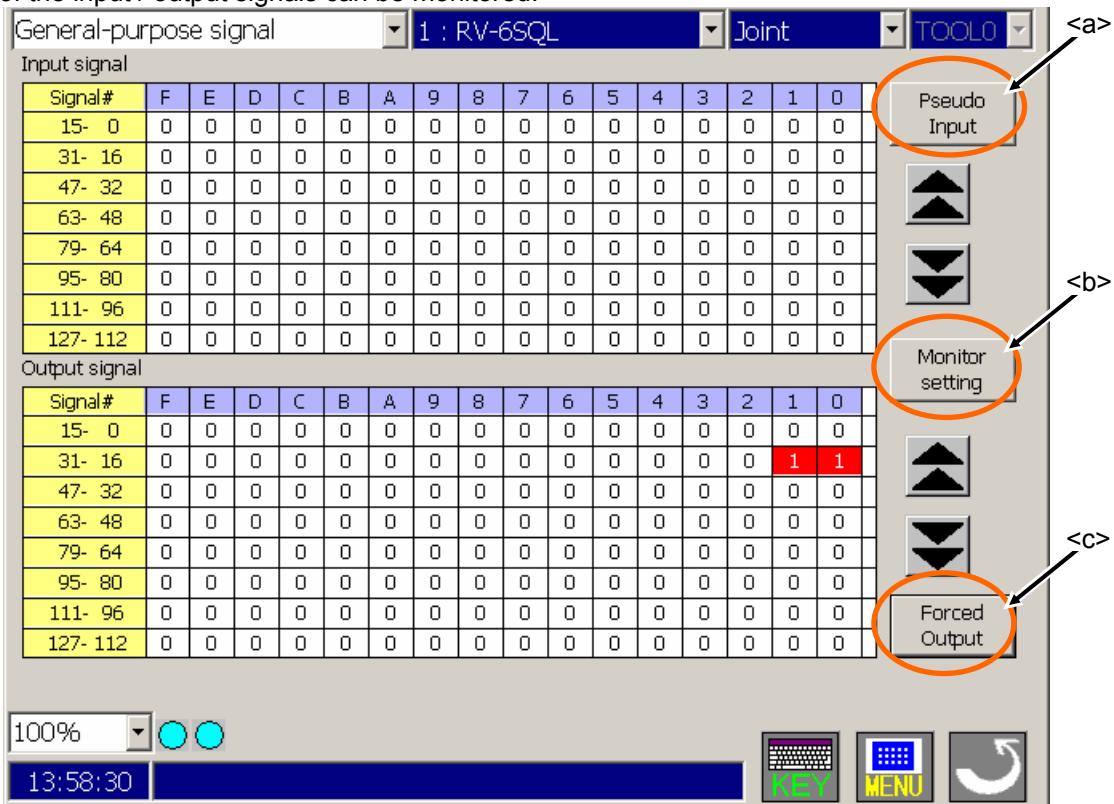
The history of errors that have occurred in the past can be referred to.
This display is not shown at all times.



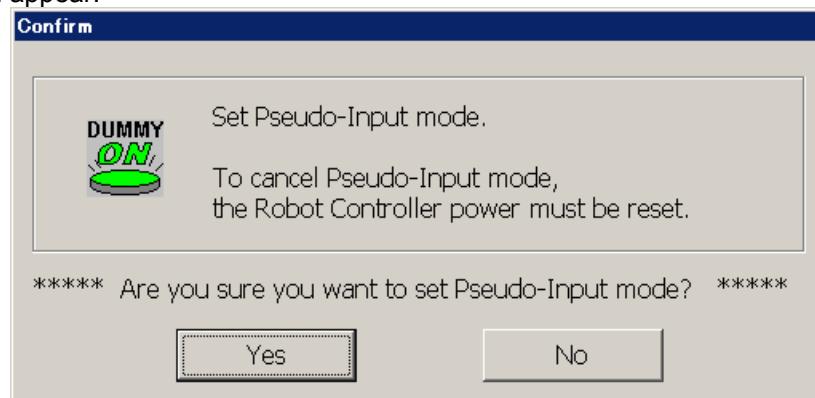
15.3.2. Signal monitor

15.3.2.1. General-purpose signal

The status of the input / output signals can be monitored.



When the [Pseudo-input] button is clicked on, the robot controller will enter the "pseudo-input mode, and the following window will appear.

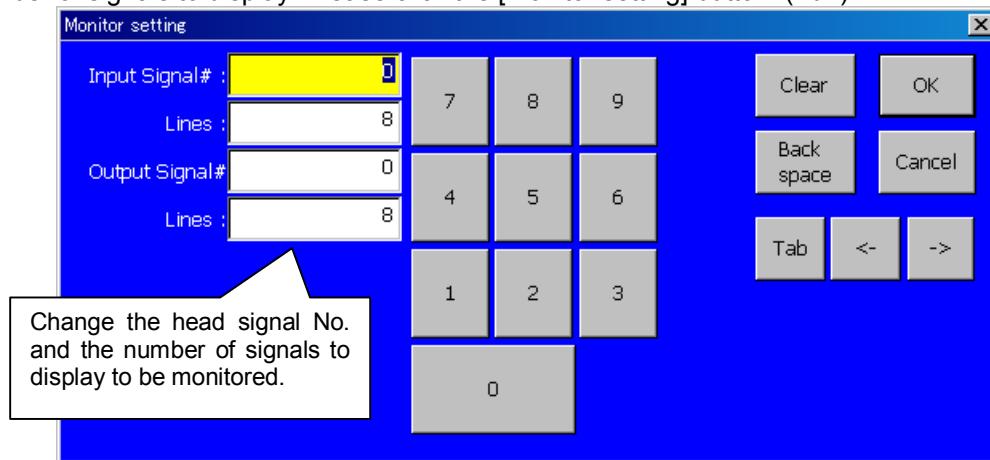


Caution

To cancel the pseudo-input mode, the robot controller power must be turned ON again.

1) General-purpose signal monitor

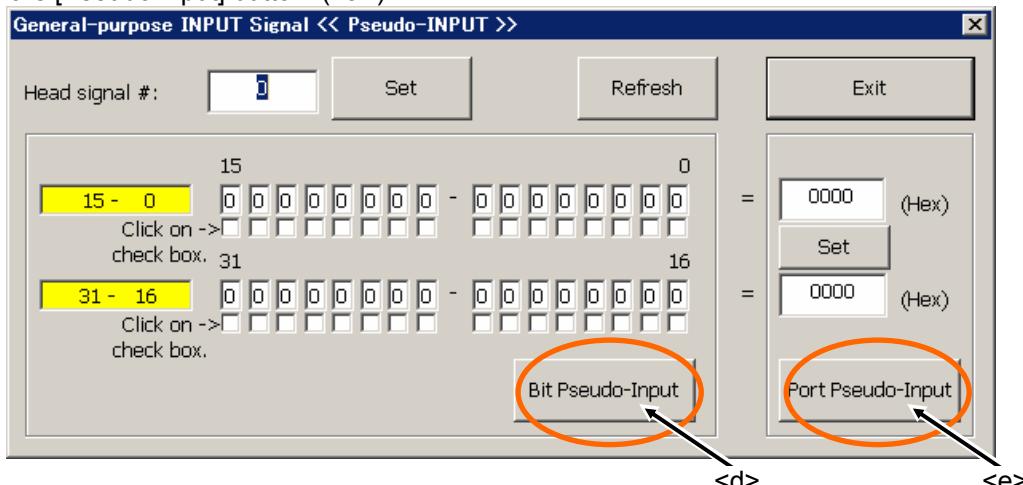
With the general-purpose signal monitor, monitoring can be carried out by designating the head signal No. and number of signals to display. Please click the [Monitor setting] button. ()



2) Pseudo-input

In the pseudo-input mode, the state input from the following window is interpreted as the input signal instead of the robot controller general-purpose input signals.

Click on the [Pseudo input] button. (<a>)



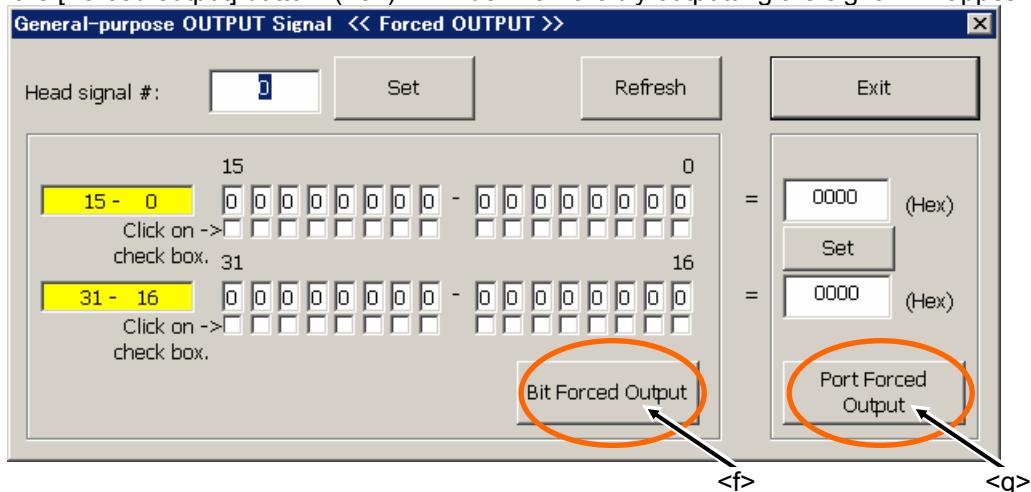
- First the signal to be pseudo-input signal is read.
16 signals can be set simultaneously. Input the head No. of the signal to be read, and then click on the "Set" button.
- The input state of the 16 signals is displayed with the designated signal at the head. Set the pseudo-input state, and then click on the [Bit Pseudo-Input] button. (<d>)
- 16 signals from the No. designated as the head can be forcibly output as a hexadecimal. Input the hexadecimal value, and then click on the [Port Pseudo-Input] button. (<e>)

The pseudo-input mode is canceled when this button is closed.

3) Forced output

The robot controller's general-purpose signals can be forcibly output.

Click on the [Forced output] button. (<c>) A window for forcibly outputting the signal will appear.



- i) First, read out the signal to be forcibly output.
16 signals can be output simultaneously. Input the head No. of the signal to be read, and then click on the "Set" button.
- ii) The output state of the 16 signals is displayed with the designated signal at the head. Set the output state, and then click on the [Bit Forced Output] button. (<f>)
- iii) 16 signals from the No. designated as the head can be forcibly output as a hexadecimal.
Input the hexadecimal value, and then click on the [Port Forced Output] button. (<g>)



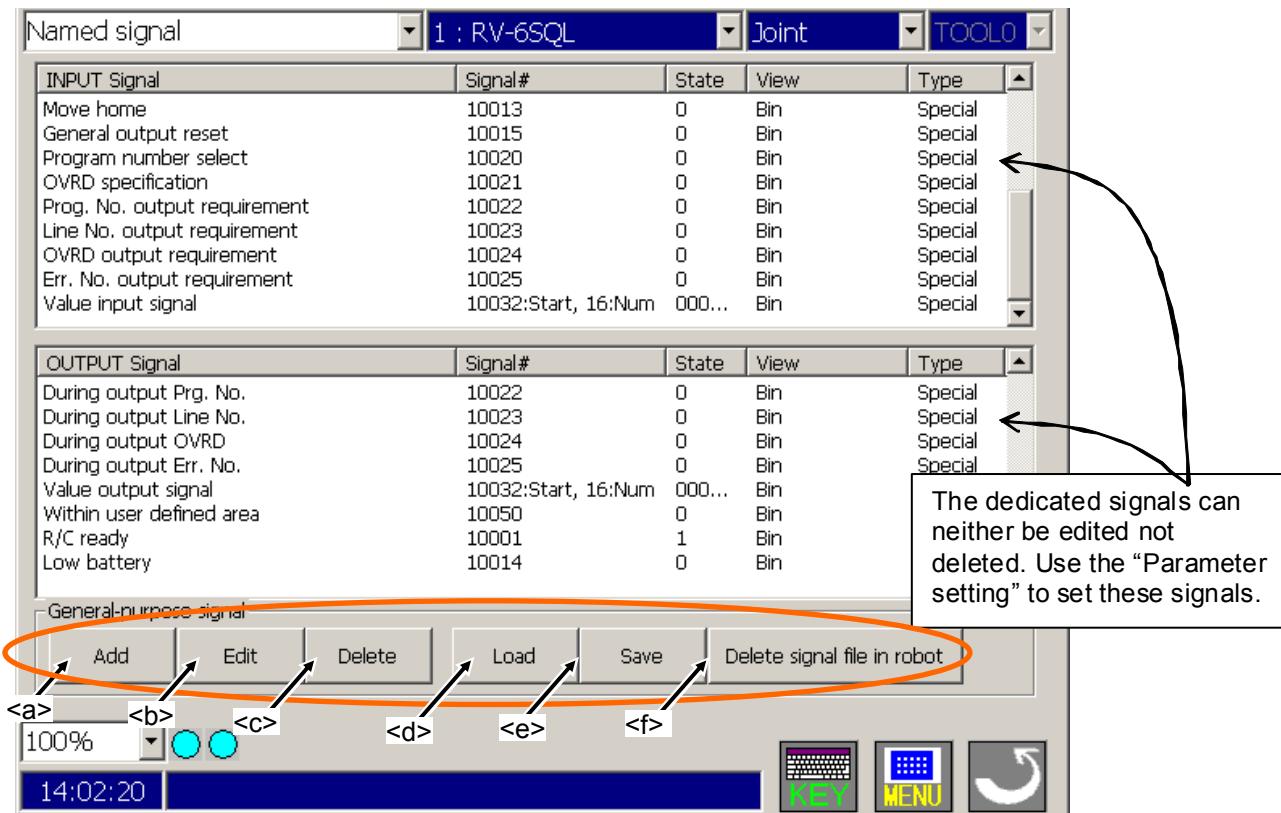
Caution

- The signal Nos. assigned (used) with the dedicated output signal cannot be forcibly output.
- Forced output is possible in the [TEACH], [AUTO (OP)] and [AUTO (EXT.)] states, but if even one program is running, output is not possible. (Excluding the ALWAYS program.)

15.3.2.2. Named signal

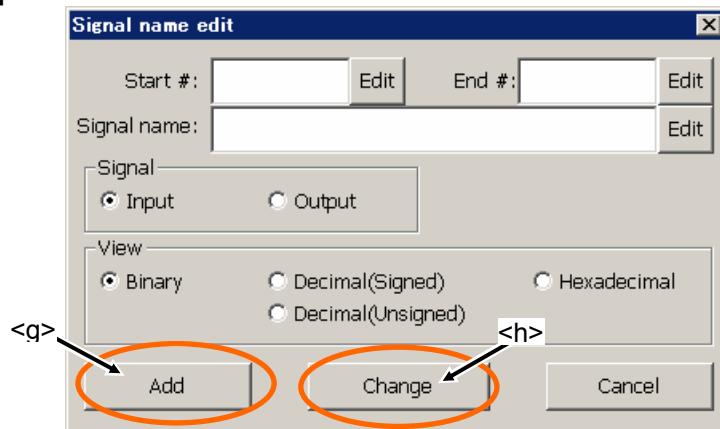
The status can be checked by naming the status of the dedicated I/O signal that has been set in the robot controller, as well as each bit or within the range of 32 bits of the general-purpose signal. The signal file in the robot controller is loaded at startup. If, however, it is not found, the previously used file is loaded.

The signals are set via parameter setting (Parameter editor).



[Add] / [Edit] / [Delete]

<a> <c>



The I/O signals you want to monitor can be added or edited.

Enter the range of the signals you want to monitor in the "Start #" and "End #" boxes, and name it. If the signal you want to monitor is one bit, enter only the start No. For multiple bits, enter the numbers so that the start No. is smaller than the end No. (If reversed, an error will occur.)

Binary, decimal or hexadecimal notation can be selected as the display method. For decimal notation, signed display using the most significant bit as a signed bit can also be performed.

Once the entry is finished, click the [Add] / [Change] button. (<g>/<h>)

If the [Add] button (<g>) is clicked when a signal name is being selected, it is inserted to the selected line.

If a signal name is not being selected, it is added at the end of the list.

You can delete unwanted signal names from the list by selecting them and clicking the [Delete] button. (<c>)

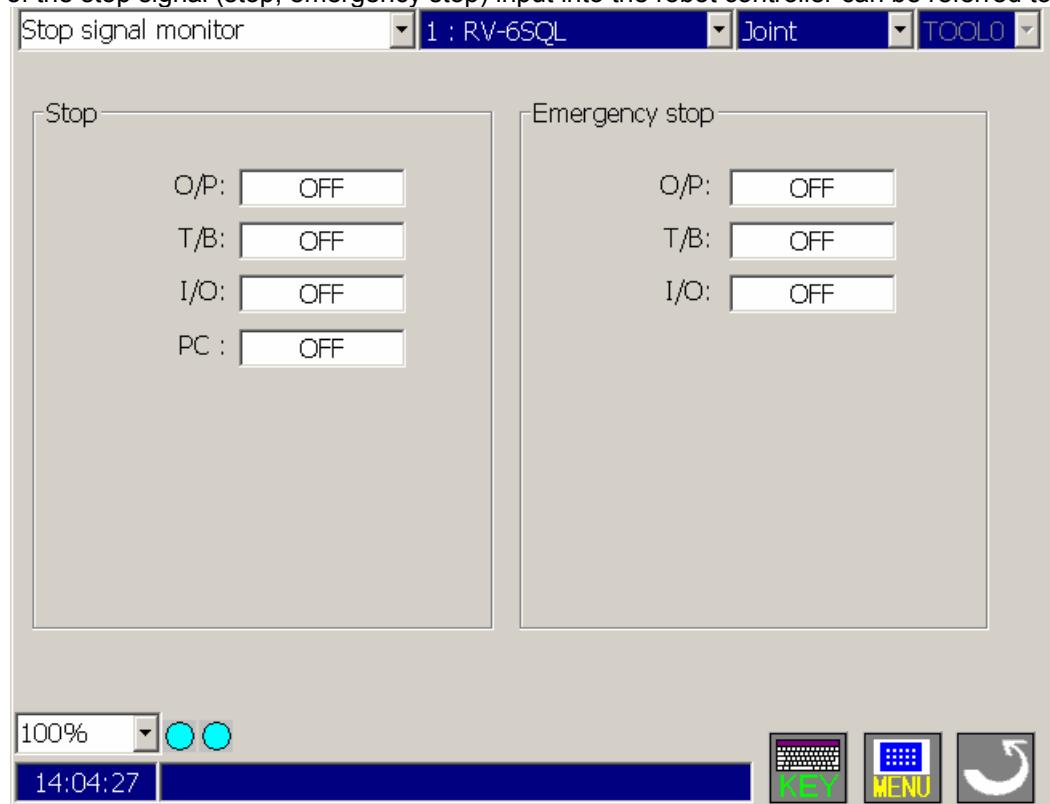
[Load] / [Save] / [Delete signal file in robot]
<d> <e> <f>

The edited result can be saved on or loaded to a personal computer or robot controller. Specify the save destination / load destination and click the [OK] button. If the save destination is a personal computer, a file name can be specified. However, if the save destination is a robot controller, the result will be overwritten on the previous information.

The file can be deleted with the [Delete signal file in robot] button. (<f>)

15.3.2.3. Stop signal

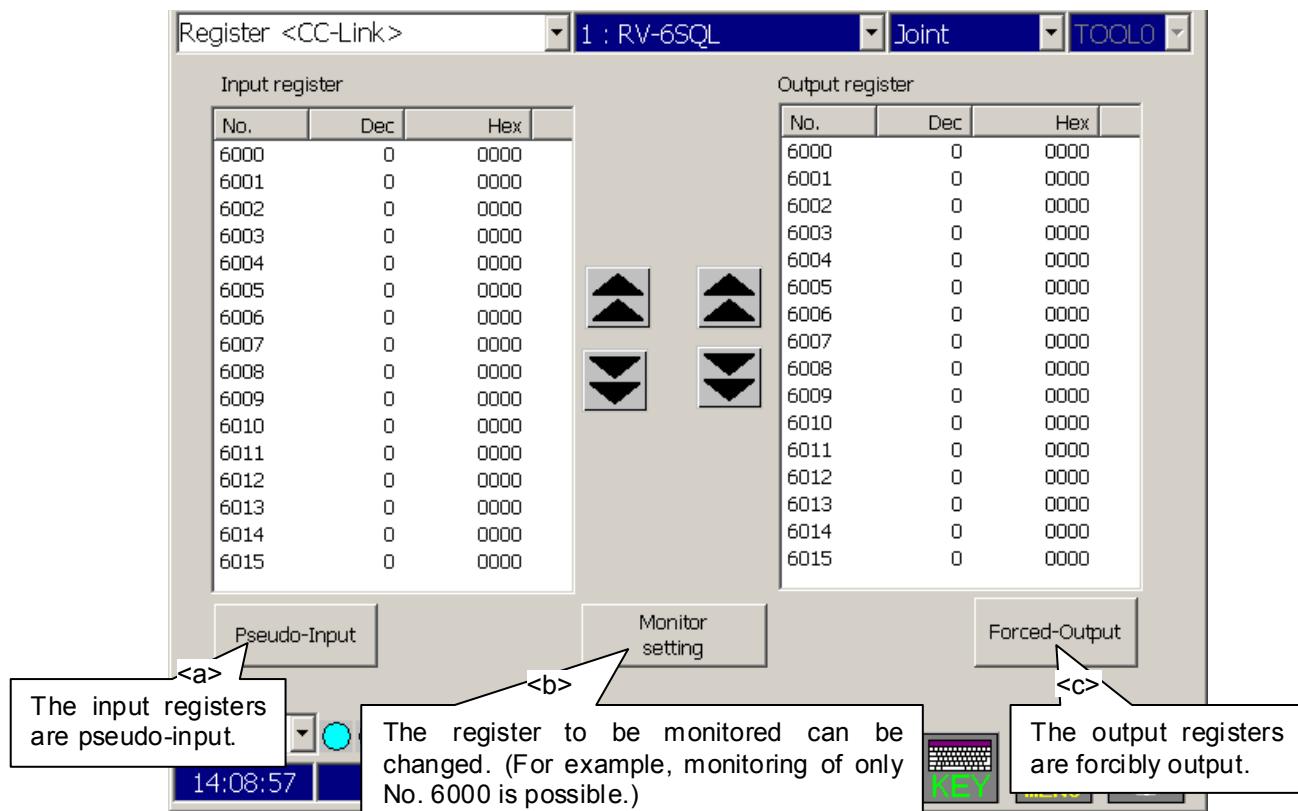
The state of the stop signal (stop, emergency stop) input into the robot controller can be referred to.



15.3.2.4. Register

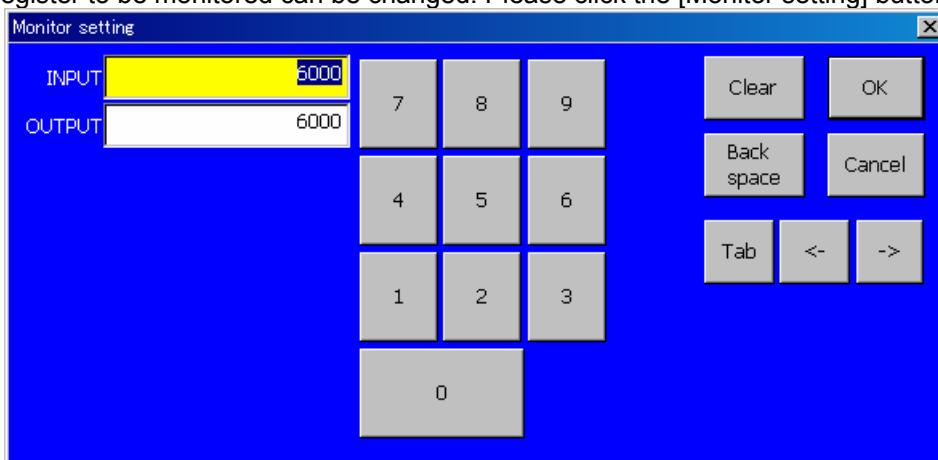
This screen cannot be referred to if the CC-Link option card is not mounted on the robot controller.

The values of the CC-Link function input registers can be monitored.



1) Monitor setting

The register to be monitored can be changed. Please click the [Monitor setting] button. ()

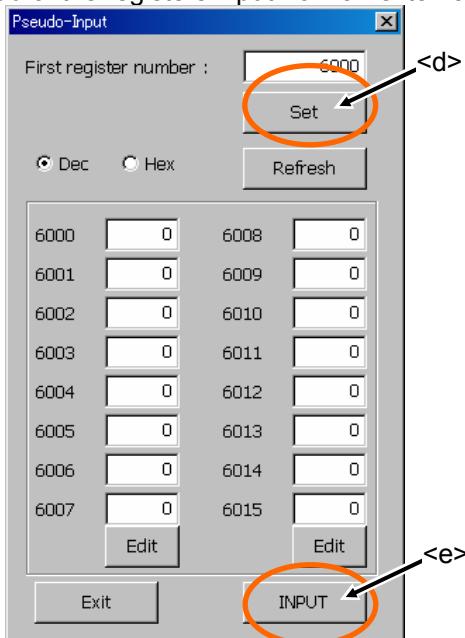


Caution

When a large amount of information is monitored, the communication size with the robot controller will increase, and it may take time to update the information.
It is recommended to monitor only the required registers with the monitor setting.

2) Pseudo-input

With the pseudo-input mode, the values input from the following window will be interpreted as the input register values instead of the registers input from an external source.

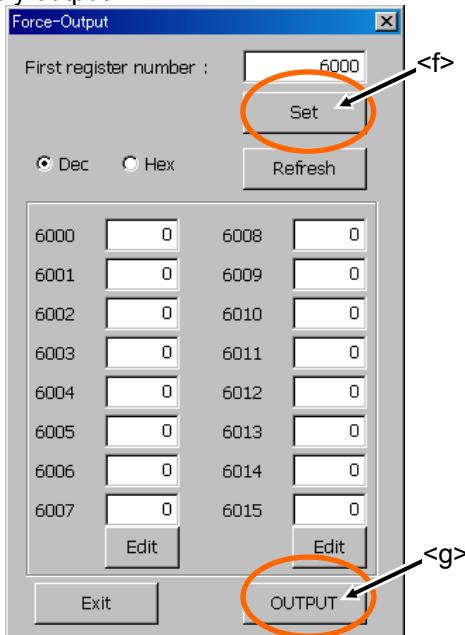


- i) First, read out the registers to be pseudo-input. Up to 16 sequential registers can be set simultaneously.
Input the head No. of the register to be read and the number of registers to read, and then click on the [Set] button. (<d>)
- ii) The values of the designated number of registers will appear with the designated register at the head.
- iii) Set the register value, and click on the [INPUT] button. (<e>)

The pseudo-input mode is canceled when this window is closed.

3) Forced output

The registers can be forcibly output.

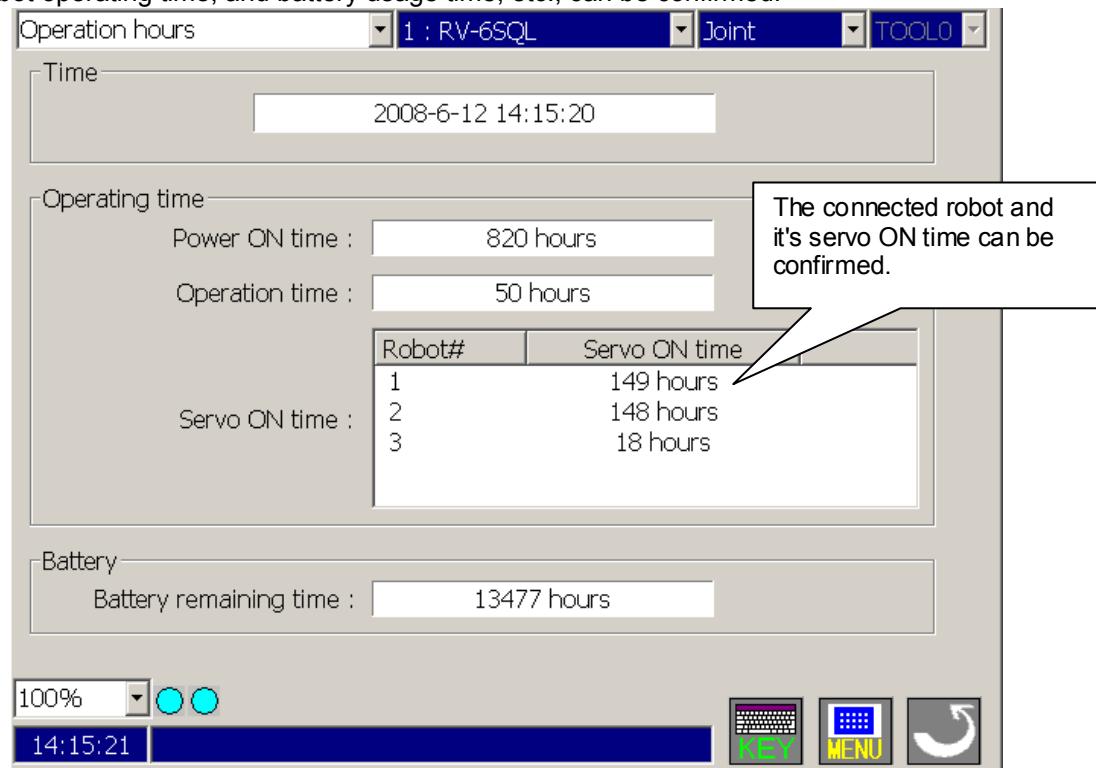


- i) First, read out the registers to be forcibly output. Up to 16 sequential registers can be output simultaneously.
Input the head No. of the register to be read and the number of registers to read, and then click on the [Set] button. (<f>)
- ii) The designated number of registers will appear with the designated register at the head.
- iii) Set the register value, and click on the [OUTPUT] button. (<g>)

15.3.3. Operation monitor

15.3.3.1. Operating hours

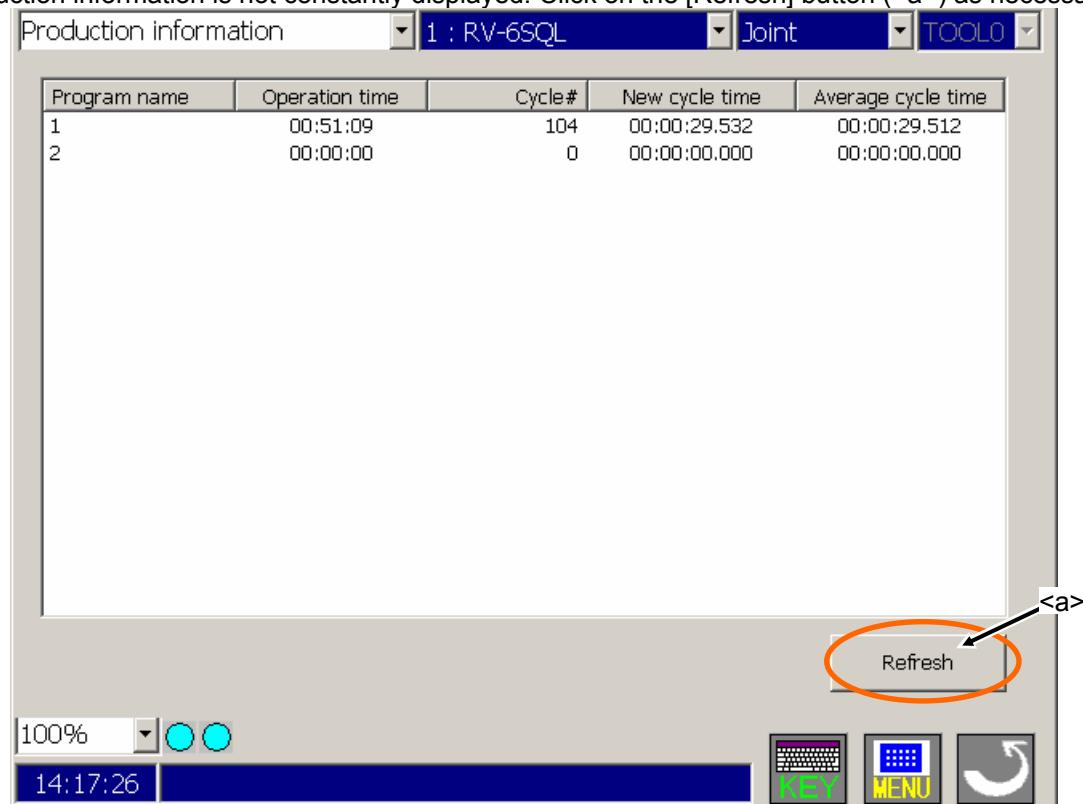
The robot operating time, and battery usage time, etc., can be confirmed.



15.3.3.2. Production information

The latest cycle, operation time, No. of cycles and average cycle time for each program in the robot controller can be confirmed.

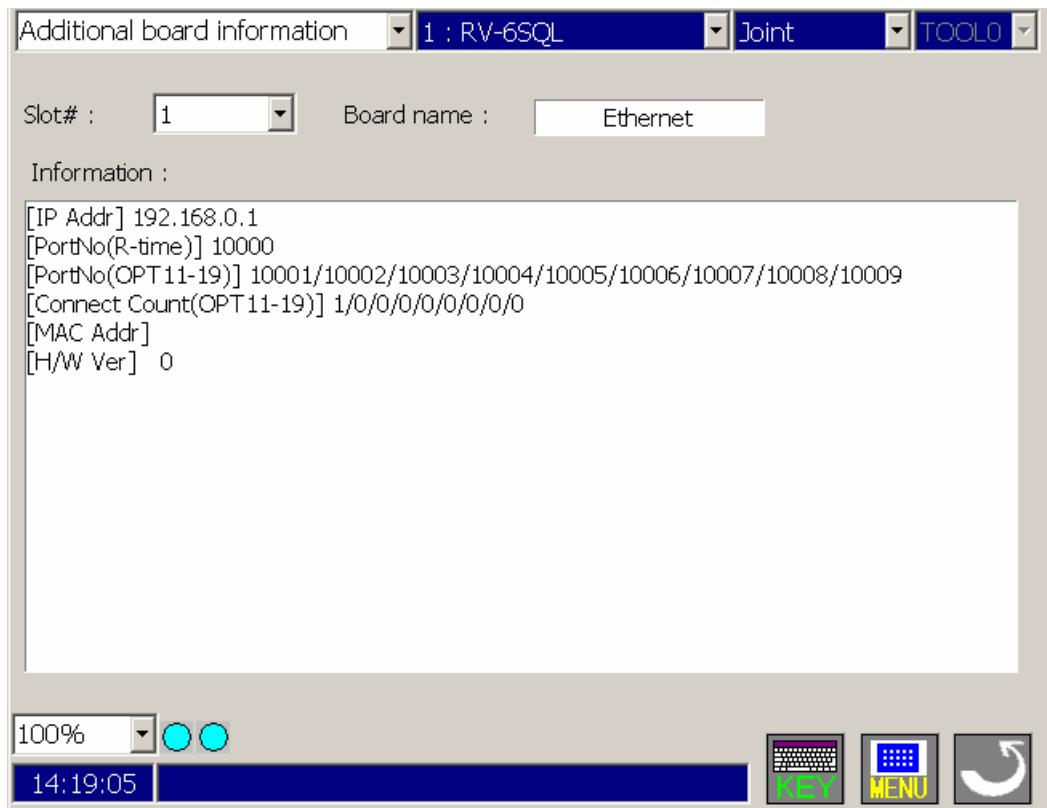
The production information is not constantly displayed. Click on the [Refresh] button (<a>) as necessary.



15.3.3.3. Additional board information

Information on the option card mounted on the robot controller can be confirmed.

Note that this screen cannot be referred to if robot controller is not provided with a slot for mounting the option card.



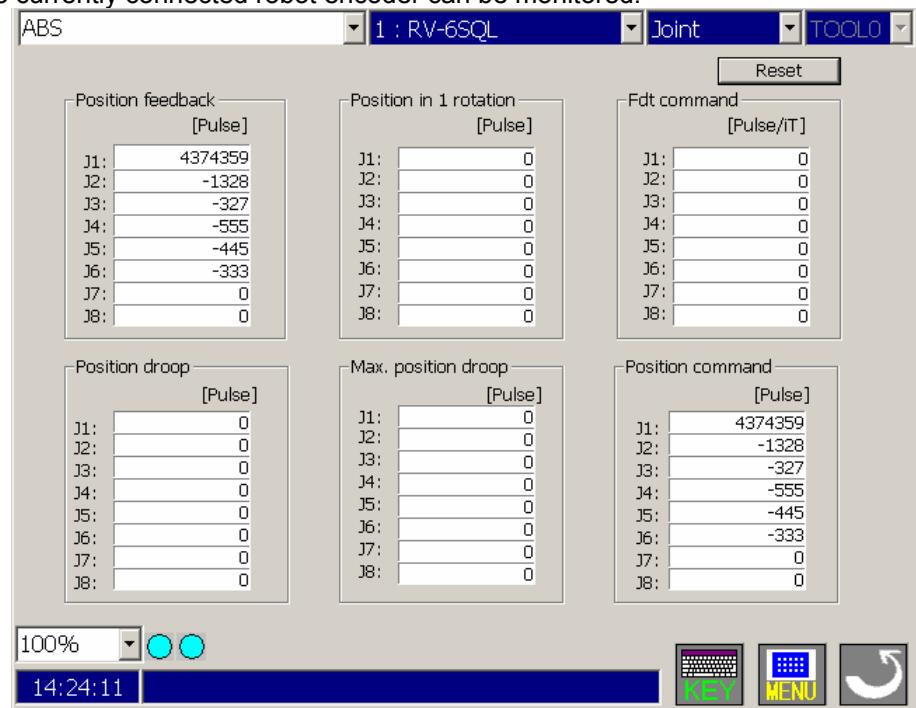
15.3.4. Servo monitor

The servo system is monitored.

When the [Reset] button is clicked of each screen, the maximum value and the minimum value of all monitoring servo information of position, speed, current, load and power are reset by the batch.

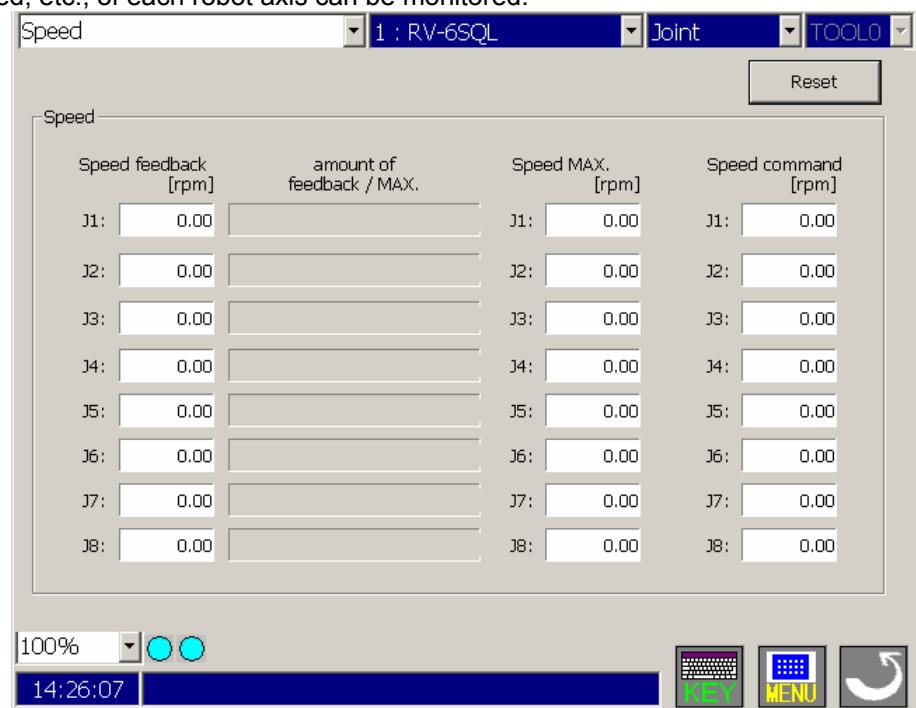
15.3.4.1. Position (ABS)

The state of the currently connected robot encoder can be monitored.



15.3.4.2. Speed

The motor speed, etc., of each robot axis can be monitored.



15.3.4.3. Current

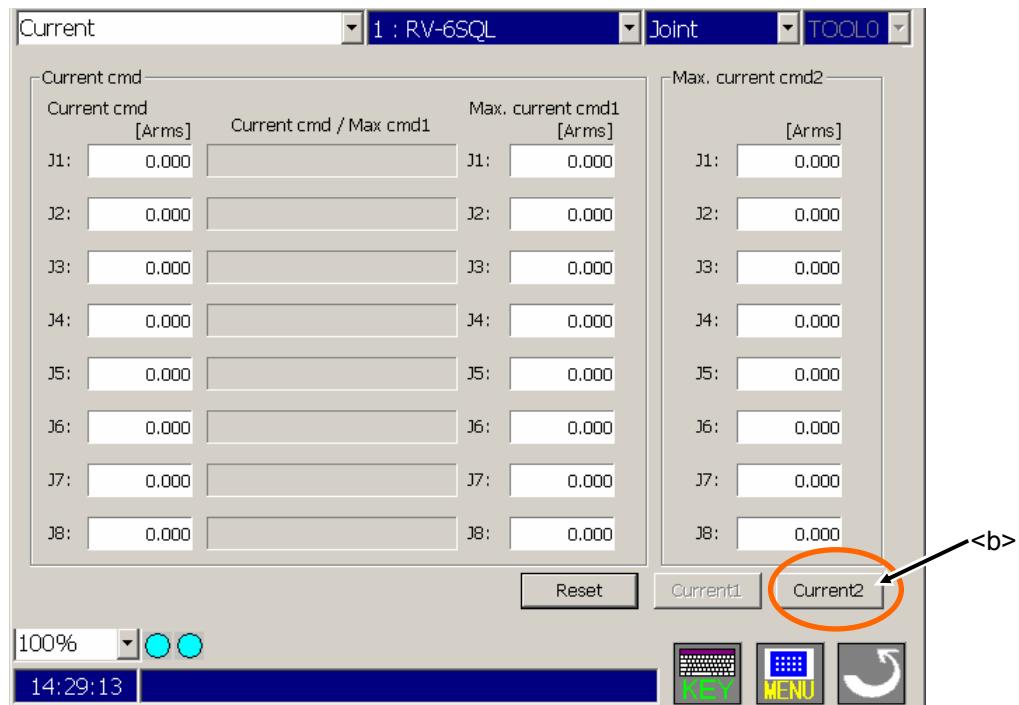
The current state of each robot axis can be monitored.

“Current1” display the current command data.

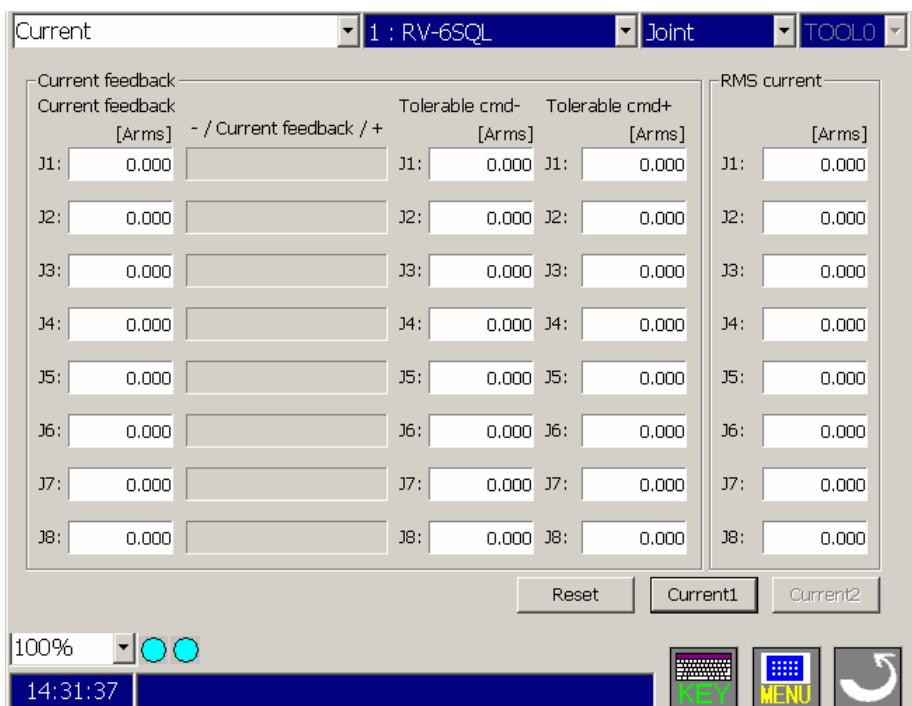
“Current2” display the current feedback data and RMS current data.

These are switched by clicking the [Current1] button (<a>) and the “Current2” button. ()

Current1

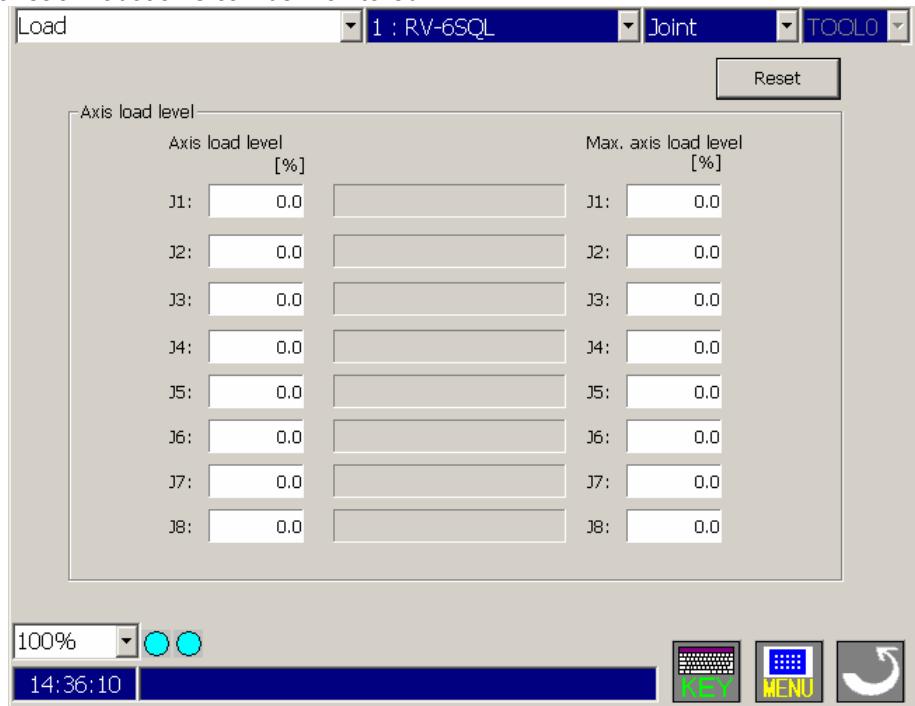


Current2



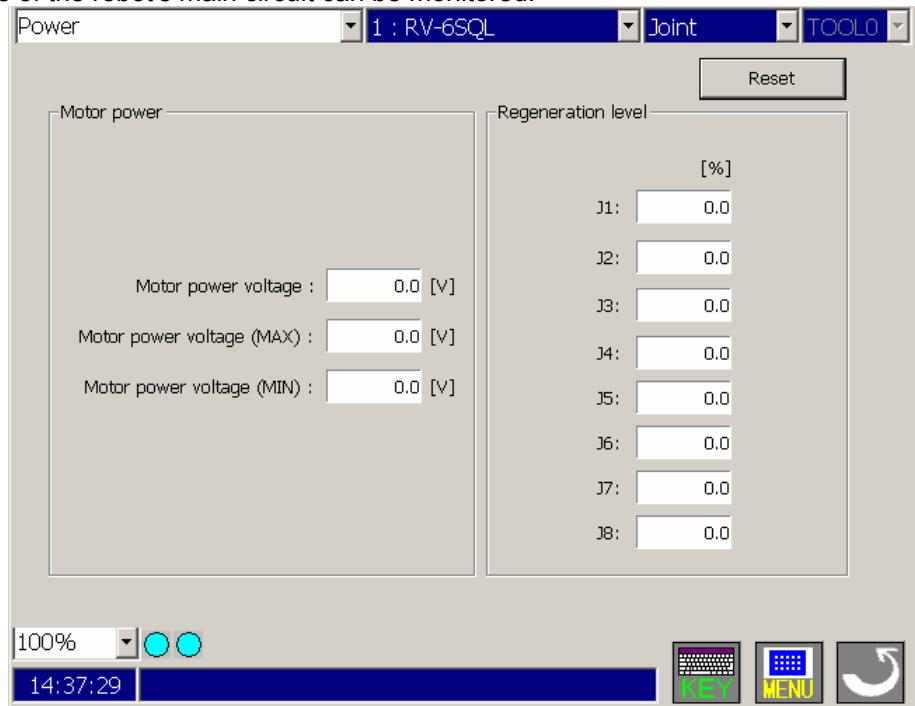
15.3.4.4. Load

The load state of each robot axis can be monitored.



15.3.4.5. Power

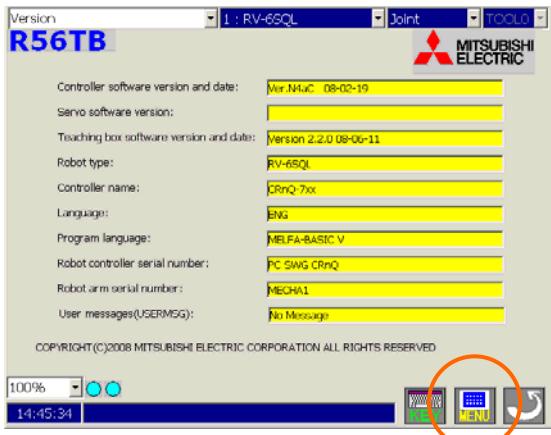
The power state of the robot's main circuit can be monitored.



16. Maintenance

There are functions of concerning the system construction of the robot in "Maintenance" menu. Maintenance menu is shown by following operation.

Version



Menu



Maintenance menu



"User definition screen" is supported by version 2.2 or later of this software.

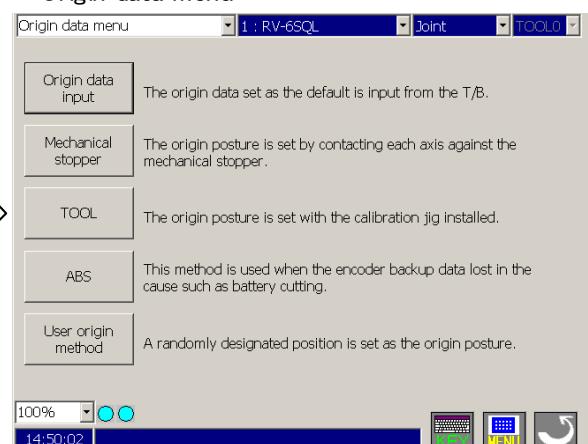
16.1. Origin data

The origin is set so that the robot can be used with a high accuracy. After purchasing the robot, always carry out this step before starting work. The origin must be reset if the combination of robot and controller being used is changed or if the motor is changed causing an encoder area.

Refer to the separate manual: "Robot arm setup & maintenance" for details on the operation.



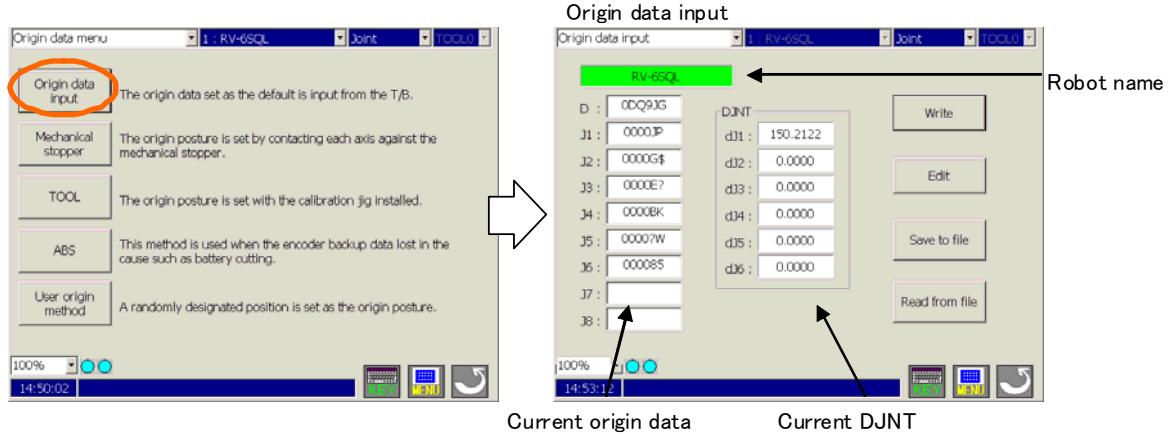
Origin data menu



16.1.1. Origin data input

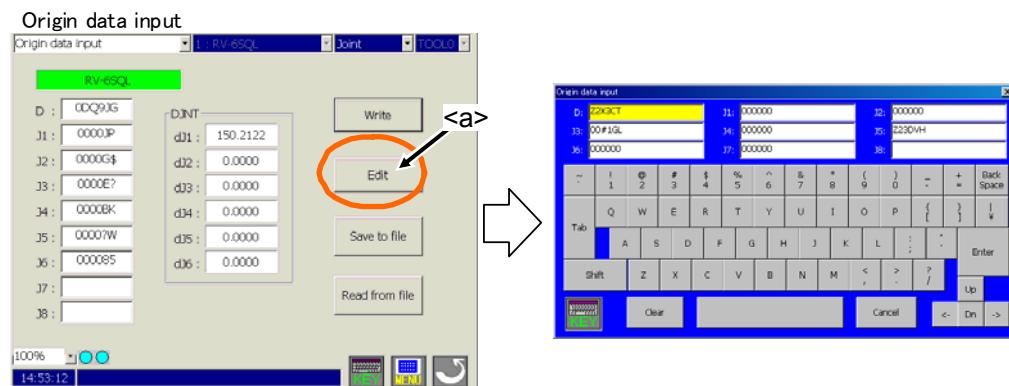
The origin data to be input is noted in the origin data sheet enclosed with the robot arm, or on the origin data history table attached to the back side of the robot arm cover.

"DJNT" value is used by the position repair tool in RT ToolBox.



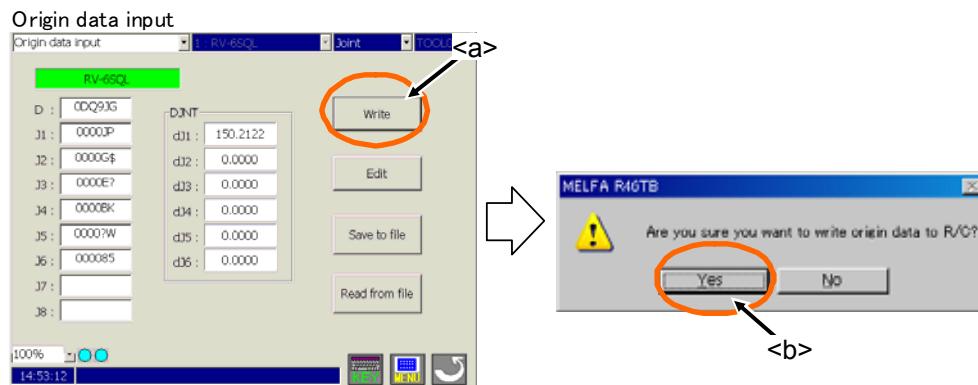
(1) Edit origin data

If origin data is changed, click [Edit] button (<a>) and shown the following window.



(2) Write origin data to the controller

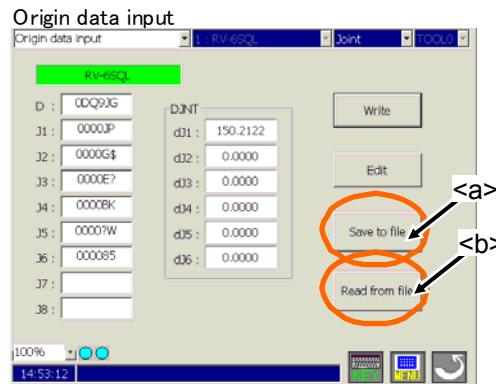
Click [Write] button (<a>) and click [Yes] button () on the confirmation dialog, and the current origin data is written to the controller.



(3) Save to file, Read from file in T/B

Click [Save to file] button (<a>), the current origin data is saved into the designated file.

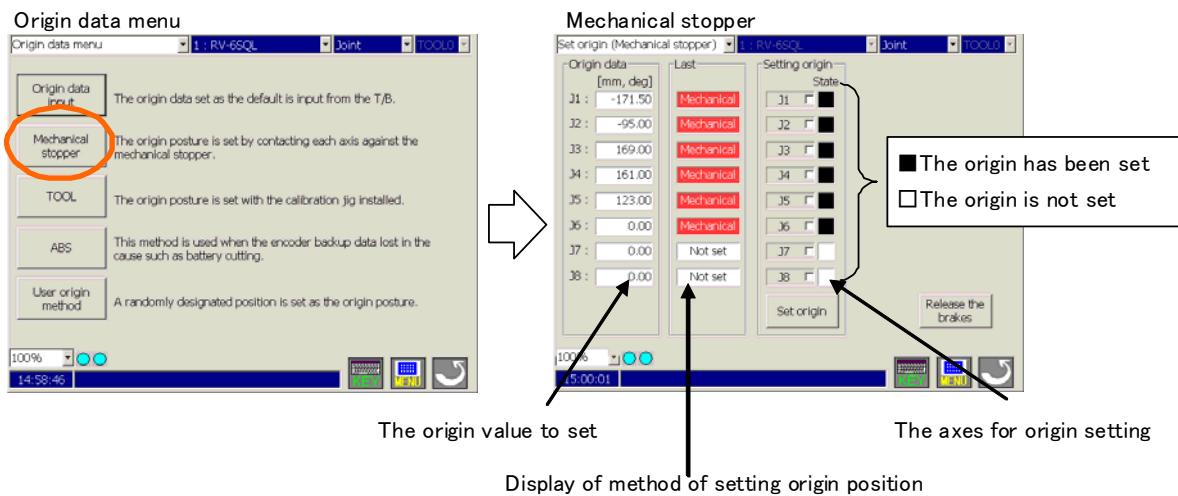
Click [Read from file] button (), the origin data in the designated file is loaded.



16.1.2. The others (Mechanical stopper, TOOL, ABS, User origin method)

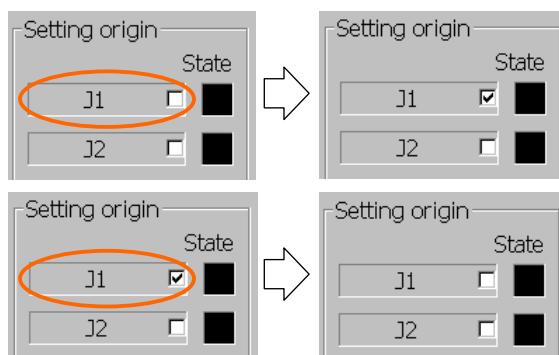
These origins set way is shown almost the same screen, and do the same operation.

In the following, explain "Mechanical stopper" as an example.



(1) Select the axes for origin setting

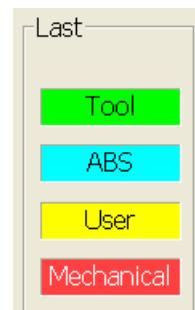
Click the axis string (ex. "J1", "J2", ...), and the selection is switched.



(2) Display of method of setting origin position

The method of origin position set last time is displayed.
(This function corresponds to the R56TB Ver.2.1 or later.)

Tool	Green
ABS	Light blue
User origin method	Yellow
Mechanical stopper	Red

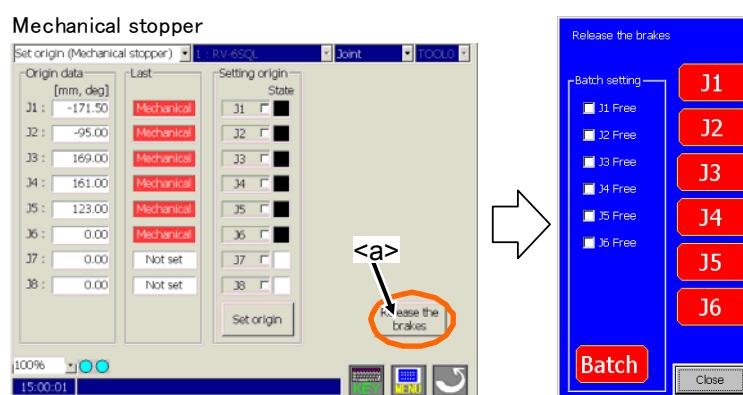


(3) Release the brakes

If you need move axis with brake by the hand, please release the break and work by two people.

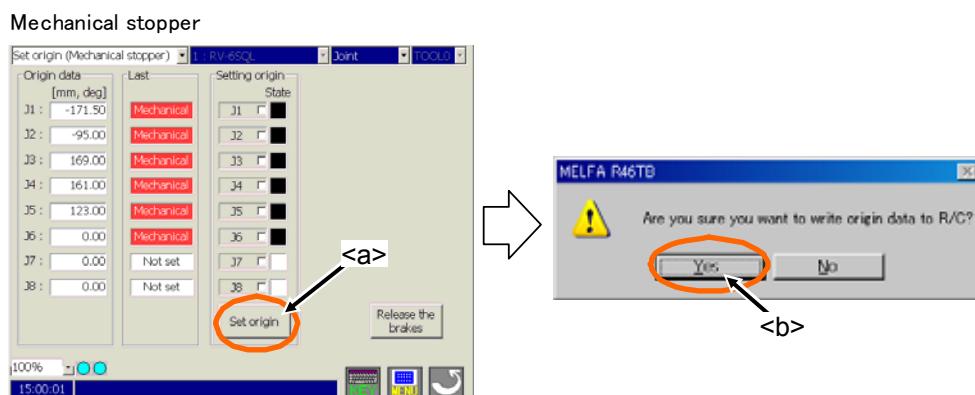
Click [Release the brakes] button (<a>), the Release the brakes screen is displayed.

See chapter "16.4 Releasing the brakes". Refer to the separate manual: "Robot arm setup & maintenance" for the direction axis is moved.



(4) Execute the origin setting

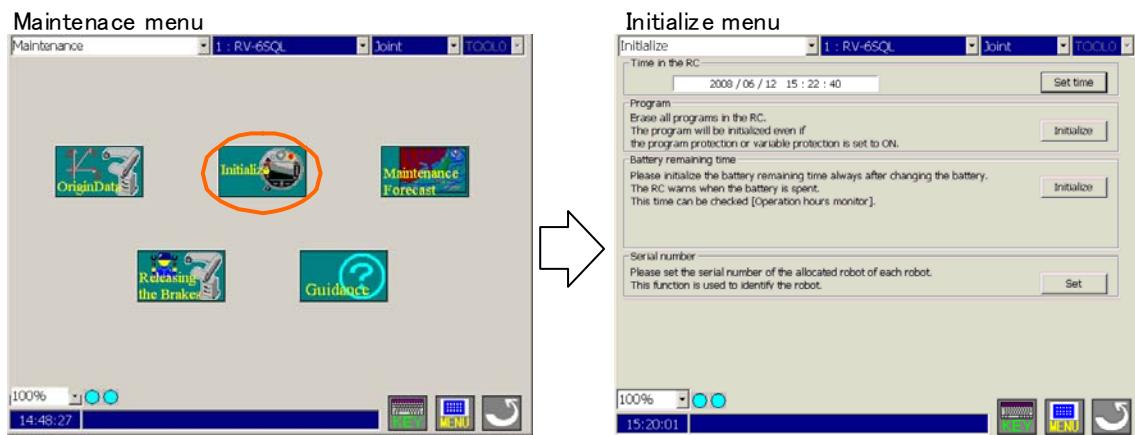
Click [Set origin] button (<a>) and click [Yes] button () on the confirmation dialog, and the origin of selected axes is set at the current robot position.



16.2. Initialize

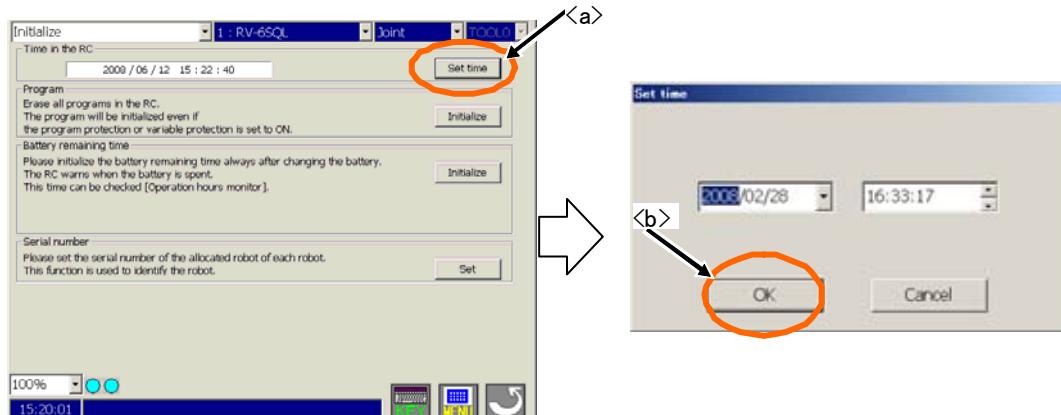
"Initialize" has three functions.

1. Setting the controller's date and time.
2. Erase all programs in the controller.
3. Initialize the battery remaining time.
4. Set a serial number



16.2.1. Setting the controller's date and time

Click the [Set time] button (<a>). Set the present date and time, and click the [OK] button.

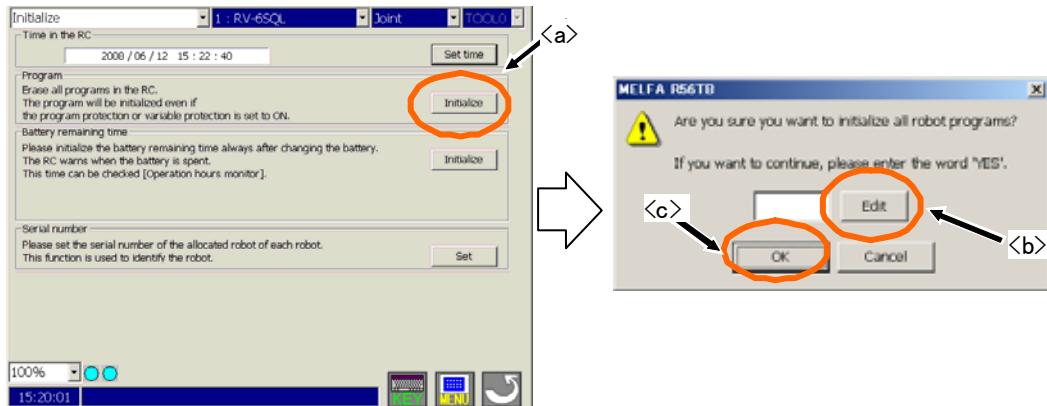


16.2.2. Erase all programs in the controller

To delete all programs, follow the procedure below.

- (1) Click the [Initialize] button<a> of "program".
- (2) Click the [Edit] button of the confirmation screen.
- (3) Input "YES" with the keyboard, and click the [Enter] key.
- (4) Click the [OK] button<c> of the confirmation screen.

All programs in the robot controller are deleted by operating the above-mentioned.

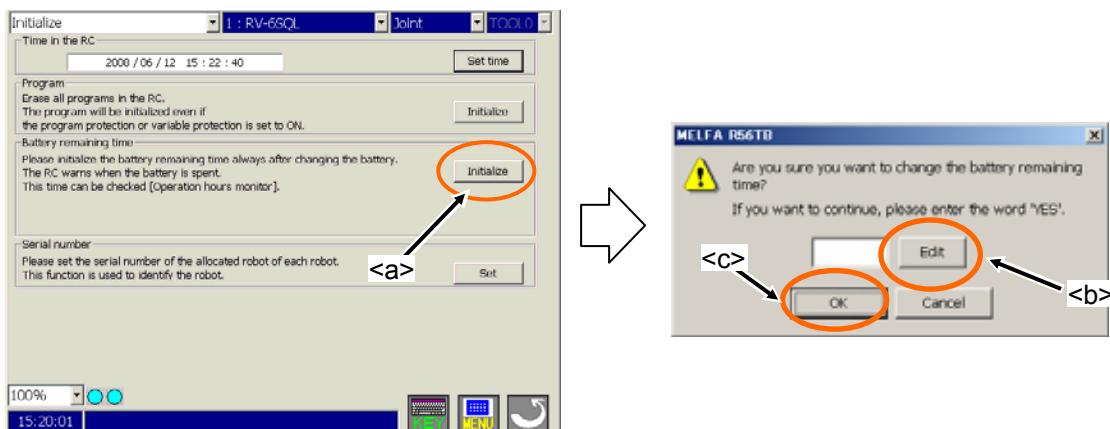


16.2.3. Initialize the battery remaining time

To initialize the battery remaining time, follow the procedure below.

- (1) Click the [Initialize] button of "battery remaining time".
- (2) Click the [Edit] button of the confirmation screen.
- (3) Input "YES" with the keyboard, and click the [Enter] key.
- (4) Click the [OK] button<c> of the confirmation screen.

The battery remaining time is initialized by operating the above-mentioned.

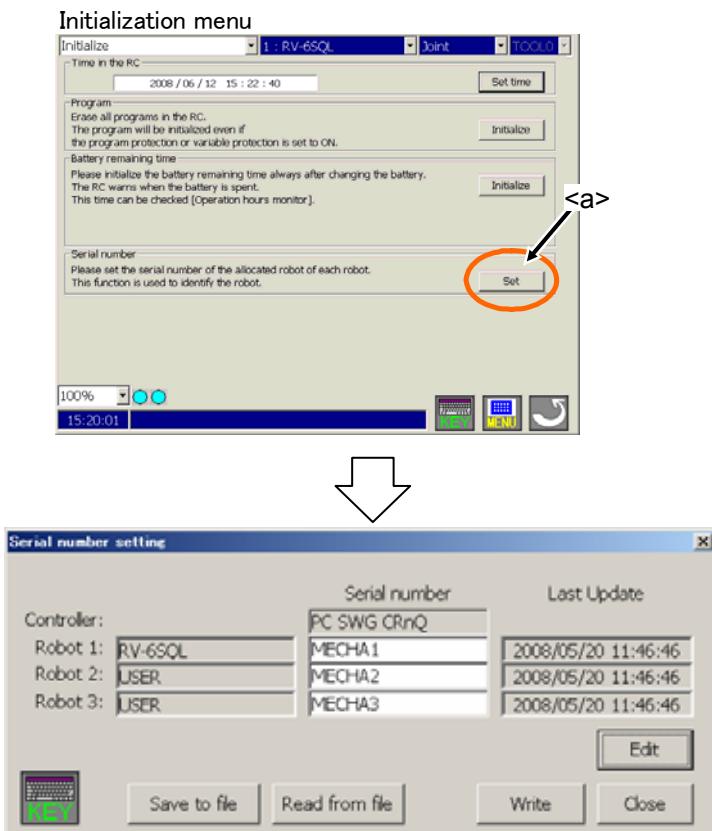


16.3. Serial number

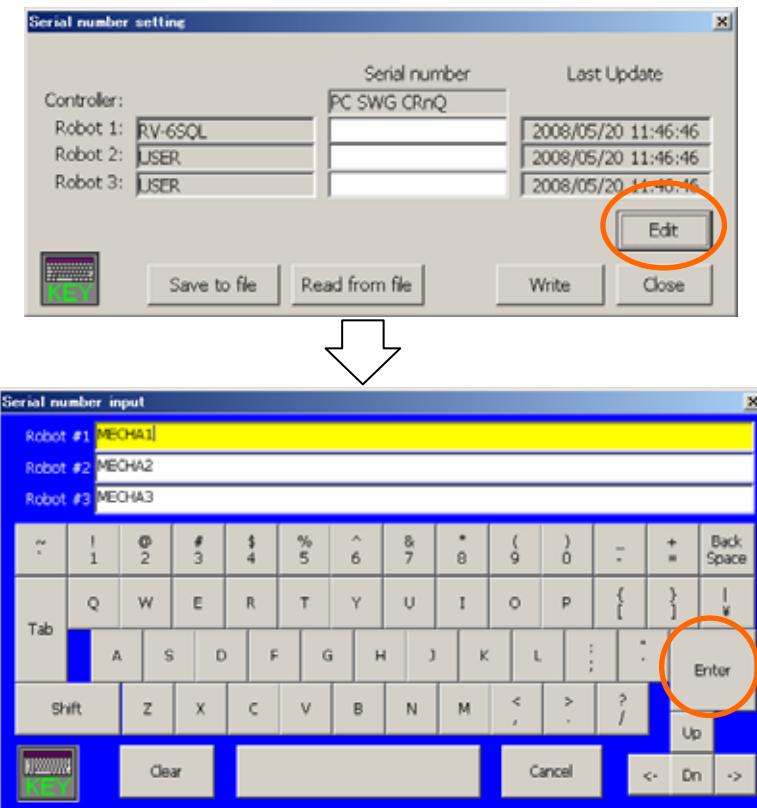
The serial number of the robot arm is set (Each mechanism can be set). The serial number of the robot arm has been put on the back of the body of the robot base.

16.3.1. Serial Number setting

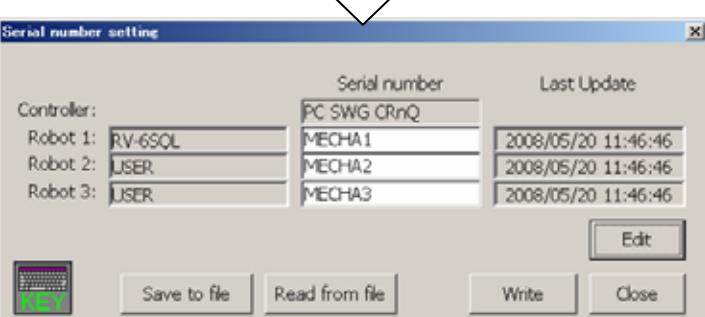
- (1) Click on [Set] button <a> of the Serial number.



- (2) Click on [Edit] button of the serial number setting. Input the serial number from the displayed keyboard.

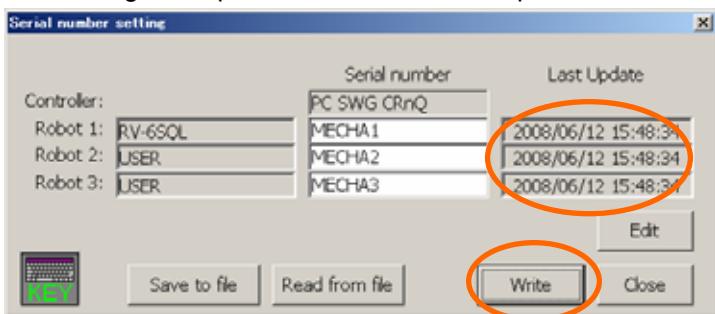


After the serial number is input, click on [Enter] key of the keyboard.



- (3) Click on [Write] button to write into the controller.

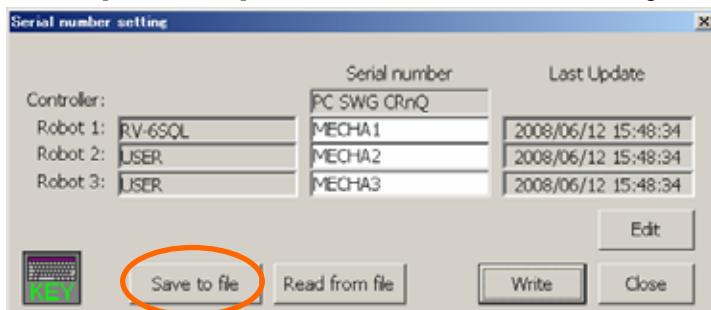
After writing, last updated date and time is updated.



Setting serial number ends above.

16.3.2. Save serial number to file

- (1) Click on [Save to file] button of the serial number setting.

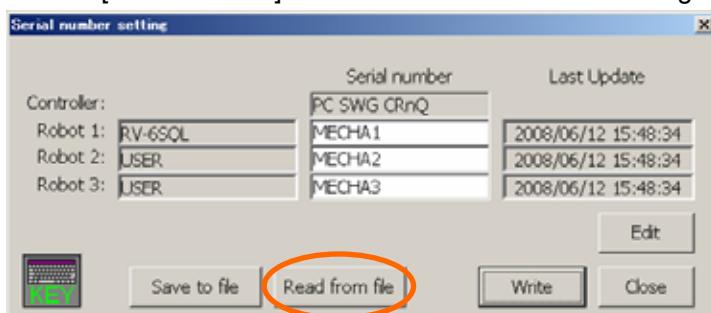


- (2) When [Save] button is clicked specifying the file name, serial number is saved in a specified file.

Save serial number to file ends above.

16.3.3. Write serial number in a file to the controller

- (1) Click on [Read from file] button of the serial number setting.



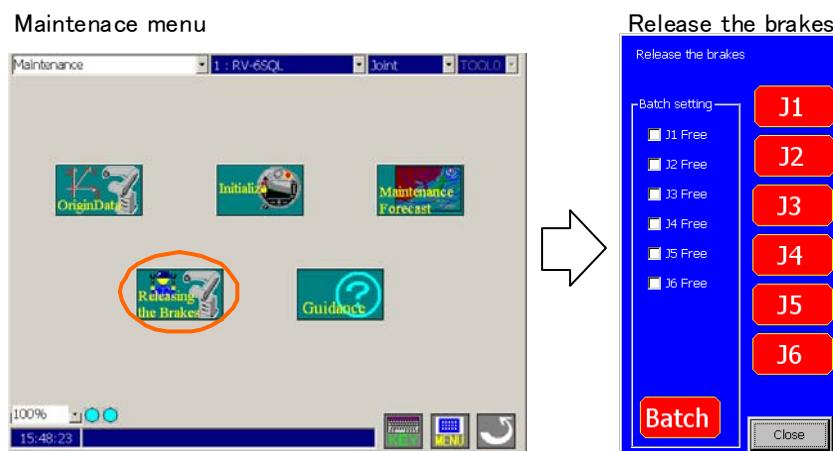
- (2) When [Open] button is clicked specifying the file name, serial number is read from a specified file.

- (3) Click on [Write] button to write serial number into the controller.

Write serial number in a file to the controller ends above.

16.4. Releasing the brakes

This function releases the servomotor brakes when the servo is OFF.
This function is used to directly move the robot arm by hand, etc.



Caution

Due to the robot configuration, when the brakes are released, the robot arm will drop with its own weight depending on the released axis.

Always assign an operator other than the T/B operator to prevent the arm from dropping. This operation must be carried out with the T/B operator giving signals.

16.4.1. Preparation for releasing the brakes

Before releasing the brakes, it is necessary to do the following operation.

1. The MODE changeover switch is set to MANUAL.



2. T/B enable button is set to ON.



3. Push the enable switch.



4. Press the CAUTION button. Another person supports the Robot arm which releases brake.



16.4.2. Releasing the brake of one axis

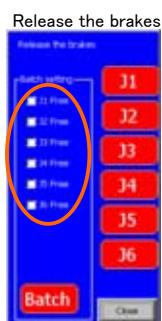
For releasing the brake of one axis, press [+] button of J1~J6 after doing (1) operation.
The brake is released only while the button is being pressed.



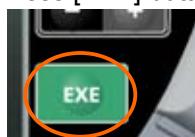
16.4.3. Releasing the brakes of two or more axes

For releasing the brakes of two or more axes, do following operation after doing (1) operation.

1. Select axes to release the brakes.



2. Press [EXE] button. The brake is released only while the button is being pressed.



If [Close] key to the brake release screen is clicked, the brake release operation is ended.

16.5. Maintenance Forecast

In Maintenance Forecast, the parts replacement (grease replenishment, battery and belt replacements) times can be checked from the up-to-date operating data collected inside the controller.

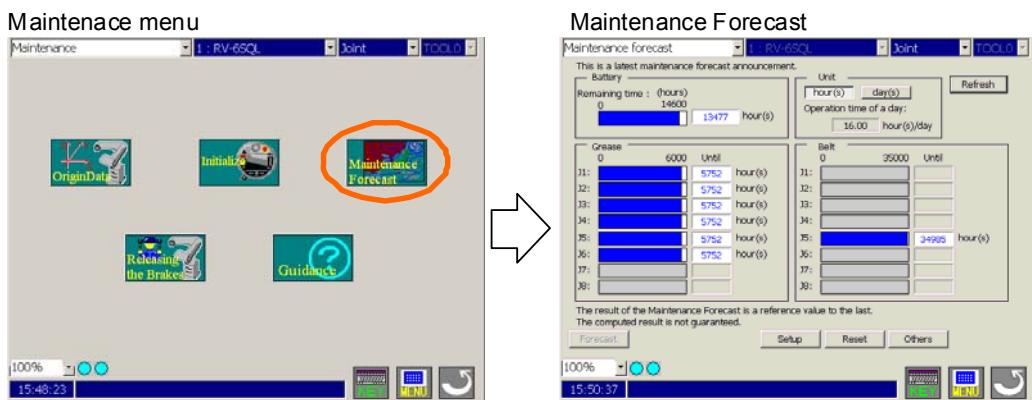
Caution

The results of calculations in Maintenance Forecast merely show reference values.

Please execute the daily inspection and the periodic inspection to prevent the breakdown beforehand, and to secure safety.

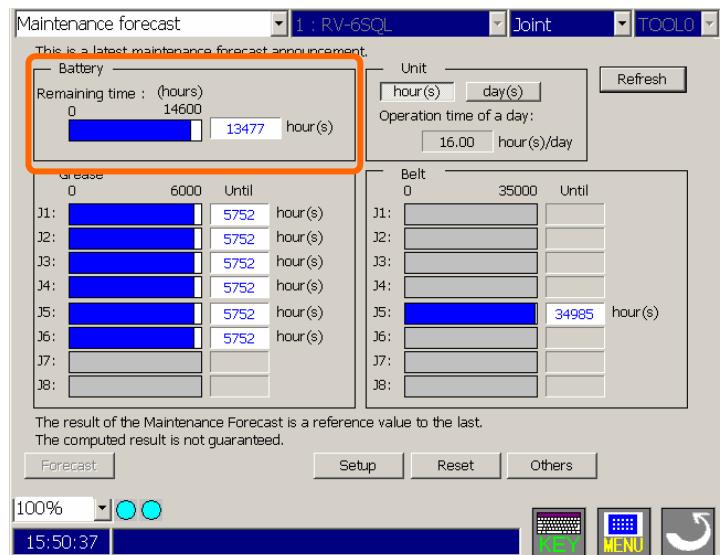
16.5.1. Start

Click [Maintenance Forecast] button on Maintenance menu. The Maintenance Forecast window appears.



16.5.2. Forecast (Battery)

When the information for Maintenance Forecast has been loaded from the controller, the following window appears.



If the battery remaining time has reached

(Remaining time) < [The remainder days until presumed maintenance time] on the Setup screen)
x (24 - [Operation time of a day])

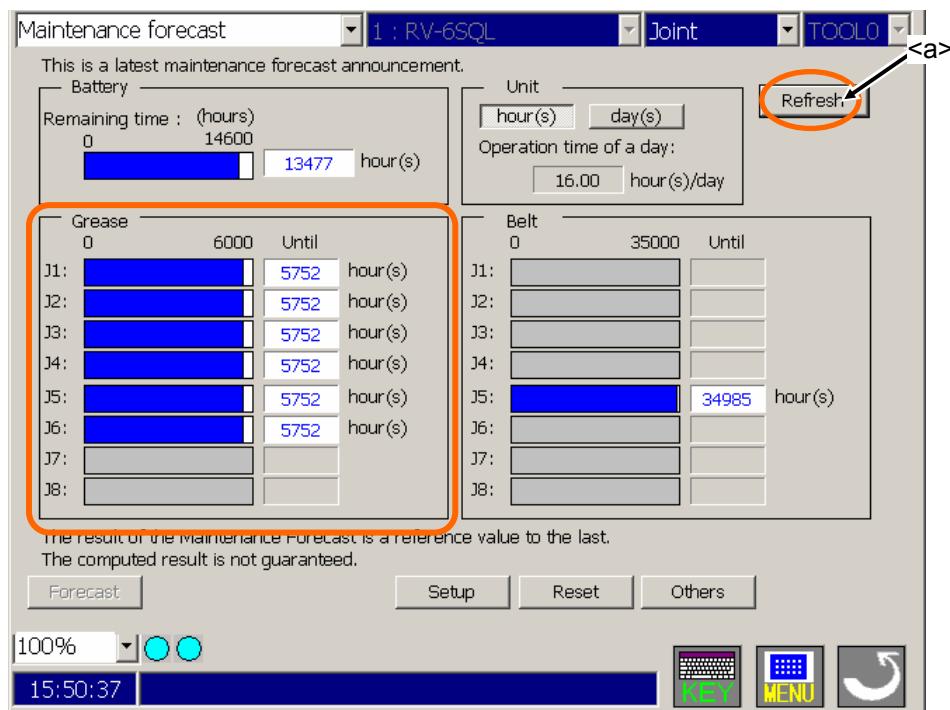
, the hours and bar graphs are displayed in orange.

(The battery replacement time is calculated during the time when the controller's power is not on.)

When the [Refresh] button is clicked on in upper-right corner of the window, the information about the maintenance is acquired again from the controller.

16.5.3. Forecast (Grease)

When [Grease] is seen in Item, the "hours until grease replenishment time" can be checked for each axis.



If the hours until replenishment time has reached
(Hours until replenishment time)

< ([The remainder days until presumed maintenance time] on the Setup screen)

x ([Operation time of a day]),

the hours and bar graphs are displayed in orange.

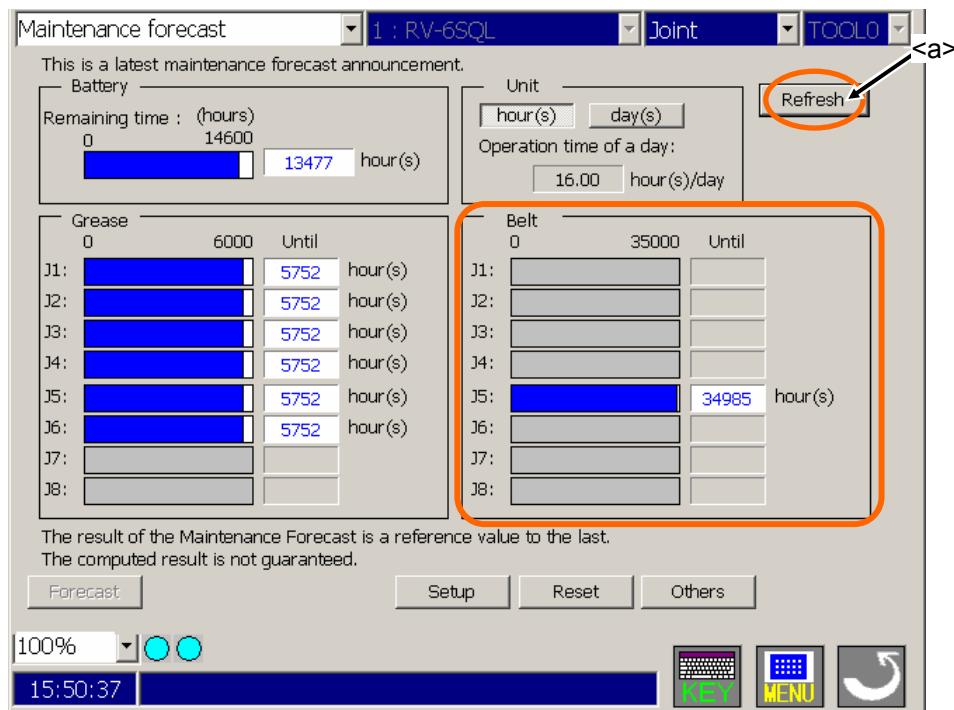
The display unit setting can be switched between time and day.

If day is selected in the display unit setting, the display will show the number of days in operation based on the operating hours per day.

When the [Refresh] button (<a>) is clicked on in upper-right corner of the window, the information about the maintenance is acquired again from the controller.

16.5.4. Forecast (Belt)

When [Belt] is seen in Item, the "hours until belt replacement time" can be checked for each axis.



If the hours until belt replacement time has reached

(Hours until belt replacement time)

< ([The remainder days until presumed maintenance time] on the Setup screen)

 x ([Operation time of a day]),

the hours and bar graphs are displayed in orange.

The display unit setting can be switched between time and day.

If day is selected in the display unit setting, the display will show the number of days in operation based on the operating hours per day.

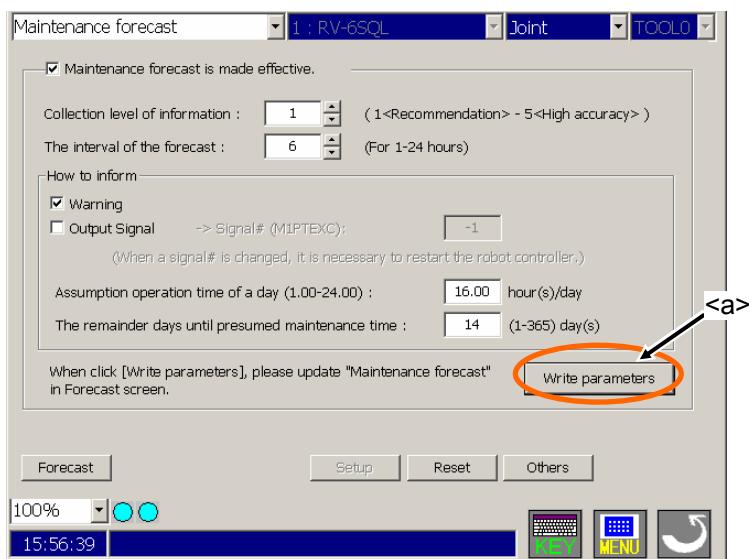
When the [Refresh] button (<a>) is clicked on in upper-right corner of the window, the information about the maintenance is acquired again from the controller.

16.5.5. Setup

Touch the Setup button.

Here, the timing to collect the information for Maintenance Forecast, the notification method and other items

can be set up.



When the [Write Parameters] button (<a>) is touched after setting each item, the setting values are written into the controller. All items other than the signal numbers of dedicated outputs take effect after they are written into the controller. If a dedicated output signal has been changed, it is necessary to power on the controller again.

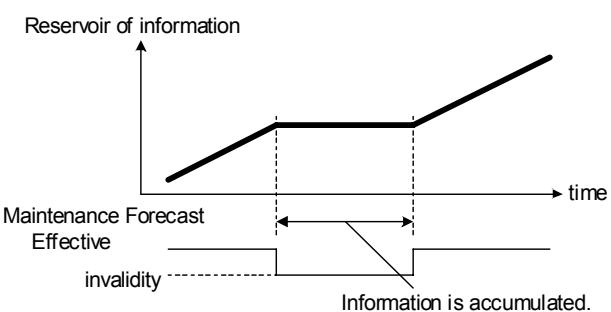
For more information about the setup items, see “Tab. Setup Screen”



Caution

Information needed to “Maintenance Forecast” is not accumulated while the Maintenance forecast is being invalidly set.

Factory preset value is invalidity. When the Maintenance Forecast is invalidated, information of Maintenance Forecast is not accumulated. When switched effectively from invalidity again, the reservoir of information is continued from the last value. If you have invalidated the Maintenance Forecast for a long term, the correct maintenance times cannot be calculated.



Tab. Setup Screen

Item	Explanation	Factory preset value
(1) Maintenance Forecast is made effective.	If this is checked, the Maintenance Forecast function takes effect. *If a checkmark is removed, the collection of the information for Maintenance Forecast stops, and the correct maintenance times cannot be calculated.	Check ON
(2) Collection level of information	Five levels can be specified to collect the information about the maintenance. *As an information collection level gets higher, the accuracy of the maintenance improves, but it affects the tact time more.	1 (Recommended)
(3) The interval of the forecast	Specify the interval to notify the maintenance time.	6 hours
How to inform	When the grease replenishment, belt replacement and other maintenance times have reached, they can be notified by generating a warning or outputting a dedicated signal. As for the battery replacement time, one of warnings, C7500, C7510 and C7520, is generated, regardless of whether or not [Warning] under [How to inform] is checked. A warning to be generated varies depending on each situation.	
(4) Warning	If this item is checked, the maintenance time is notified as a warning. The warning numbers are listed as follows: Grease : C753* (* is the axis No.) Belt : C754* (* is the axis No.)	Check ON
(5) Output Signal	If this item is checked, signal numbers can be entered. If this item is checked and a signal number is entered correctly, the maintenance time is notified using the output of the designated signal.	Check OFF
(6) Assumption operation time of a day	Enter an estimated robot operation hours per day.	16 hours
(7) The remainder days until presumed maintenance time	Specify the number of days remaining until presumed maintenance time to be used as a reference to notify the maintenance time.	14 days



Memo

Methods for resetting the alarm and alarm signal output

As a method of notifying the replacement time of each part, an alarm (C753* and C754* (* represents the axis number)), or a dedicated output signal (M*PTEXC (* represents the robot number)) will be output.

If both are set up as the notification methods, executing the error reset operation will reset the alarm and end the signal output.

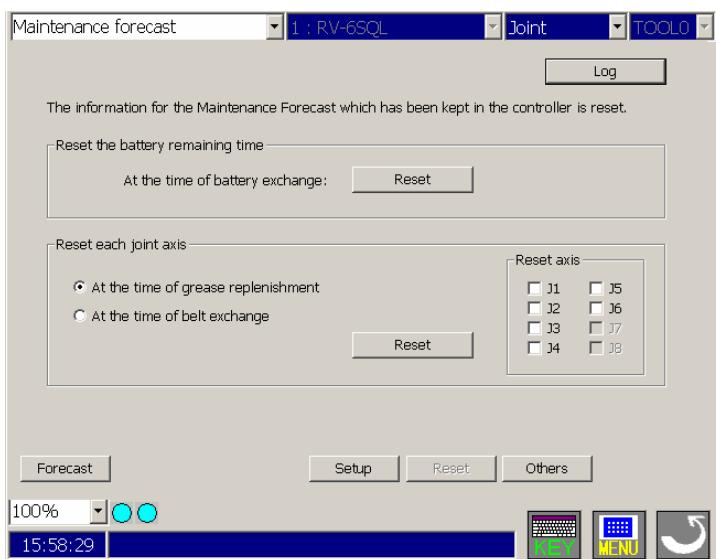
If the “alarm” method is disabled and only the output of the dedicated output signal is selected as the notification method, pushing the reset button on the front side of the controller will not end the signal output. In this case, push the [RESET] key on the teaching pendant or enter the error reset signal (ERRRESET) to end the signal output.

Notification method setting		Notification method	Methods to reset the notification (alarm or dedicated signal output)		
Warning	Output Signal		[RESET] key on the front of the controller	[ERROR RESET] key on the T/B	External error reset signal
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Alarm	Will reset the alarm	Will reset the alarm	Will reset the alarm
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Alarm and dedicated signal output	Will reset the alarm and the dedicated signal output	Will reset the alarm and the dedicated signal output	Will reset the alarm and the dedicated signal output
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Dedicated signal output	Will not reset the dedicated signal output	Will ENABLE reset the dedicated signal output	Will ENABLE reset the dedicated signal output

16.5.6. Reset

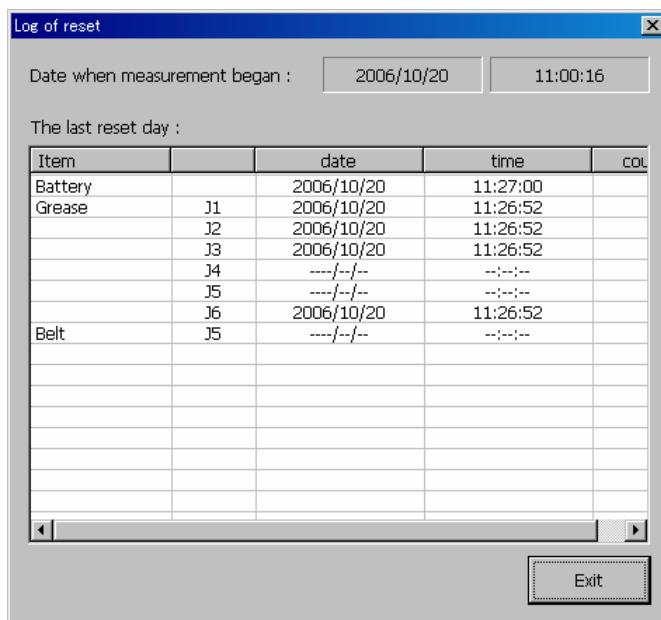
When axes were exchanged or replenished by generating warning of the Maintenance forecast function to urge the battery exchange, the grease replenishment, and the belt exchange, the axes which executes the exchange and replenishment should reset information accumulate among controllers.

The information (about battery, grease and belt) for Maintenance Forecast kept in the controller can be reset.



Types of resets	Explanation	Note
At the time of battery exchange	It is used when an alarm urging to replace the batteries (C7500, C7510 or C7520) occurs and the batteries have been replaced. Be sure to reset the battery remaining time after a battery has been replaced.	
At the time of grease replenishment	When an alarm urging to perform periodic inspections and replenish grease (alarm numbers in the 7530s) occurs, replenish the grease and reset the replenished axis.	Axes are reset in units of joint axes. Multiple joint axes can be reset at the same time.
At the time of belt exchange	When an alarm urging to perform periodic inspections and to replace the belt when it is damaged (alarm numbers in the 7540s) occurs, replace the belt and reset the axis for which the belt is replaced.	Axes are reset in units of joint axes. Multiple joint axes can be reset at the same time.

When the [Log] button is pressed in the upper-right corner of the window, the previous reset date/time and reset count can be checked.
 However, the battery reset count is not displayed.
 If no reset has not made previously, “----/-/- --:--:--“ is displayed.



16.5.7. Others

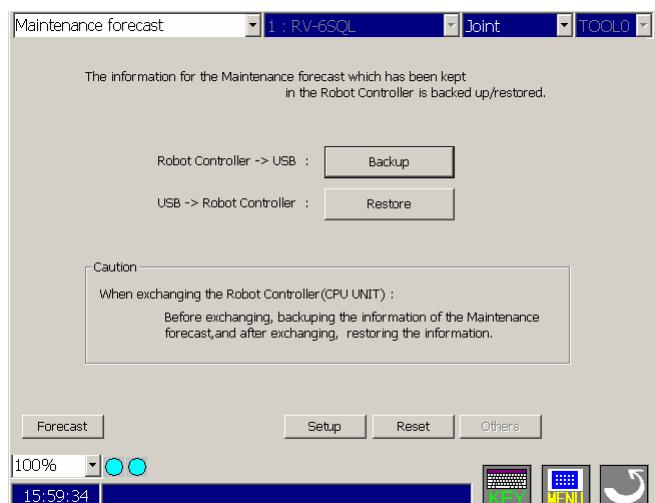
The information for Maintenance Forecast kept in the controller can be backed up and/or restored.



Caution

***The backup and restore operations are performed
when the controller (CPU) is replaced.***

When the controller (CPU) is replaced, perform both backup and restore operations in a batch using the Backup/Restore tool. Also, be sure to back up the information for Maintenance Forecast before replacement, and restore the backed up information after replacement.
 After the controller (CPU) has been replaced, if the information for Maintenance Forecast is not restored, or it is restored after a substantial time has elapsed since the time of backup, please note that the reliability of Maintenance Forecast will be degraded.



16.6. Guidance

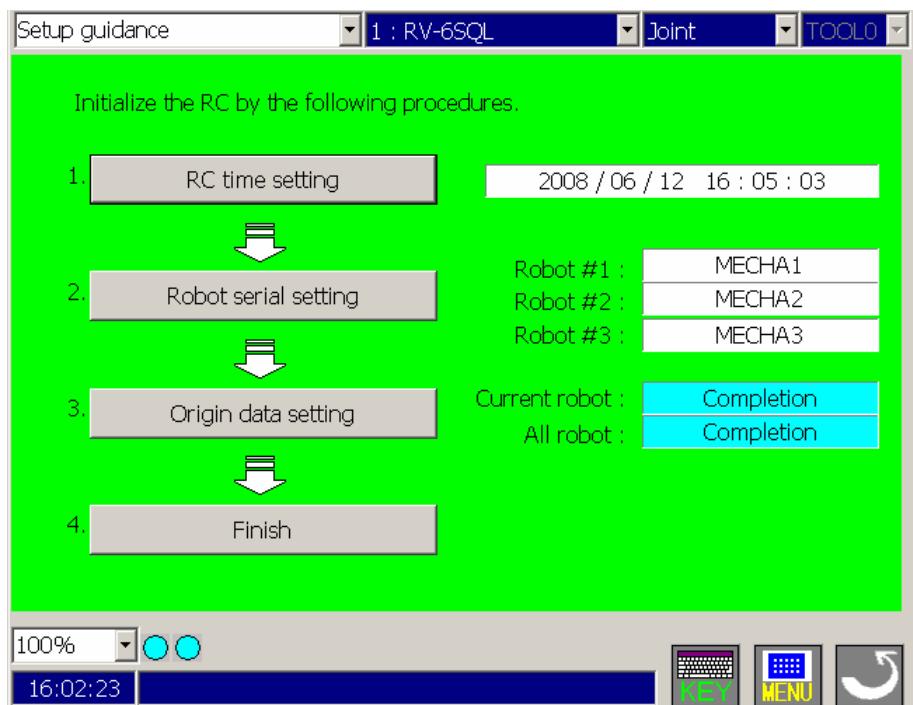
The guidance screen to do a basic setting to set the origin data to the during starting the controller first time is displayed.

In this screen, the following three functions are provided.

For more information, please refer to the "エラー! 参照元が見つかりません。 エラー! 参照元が見つかりません。

"

- (1) RC time setting
- (2) RC management code setting(Only when the CRn-500 controller is connected)
- (3) Setting the serial number of the robot arm (Only when The CRn-700 controller is connected)
- (4) Origin data setting

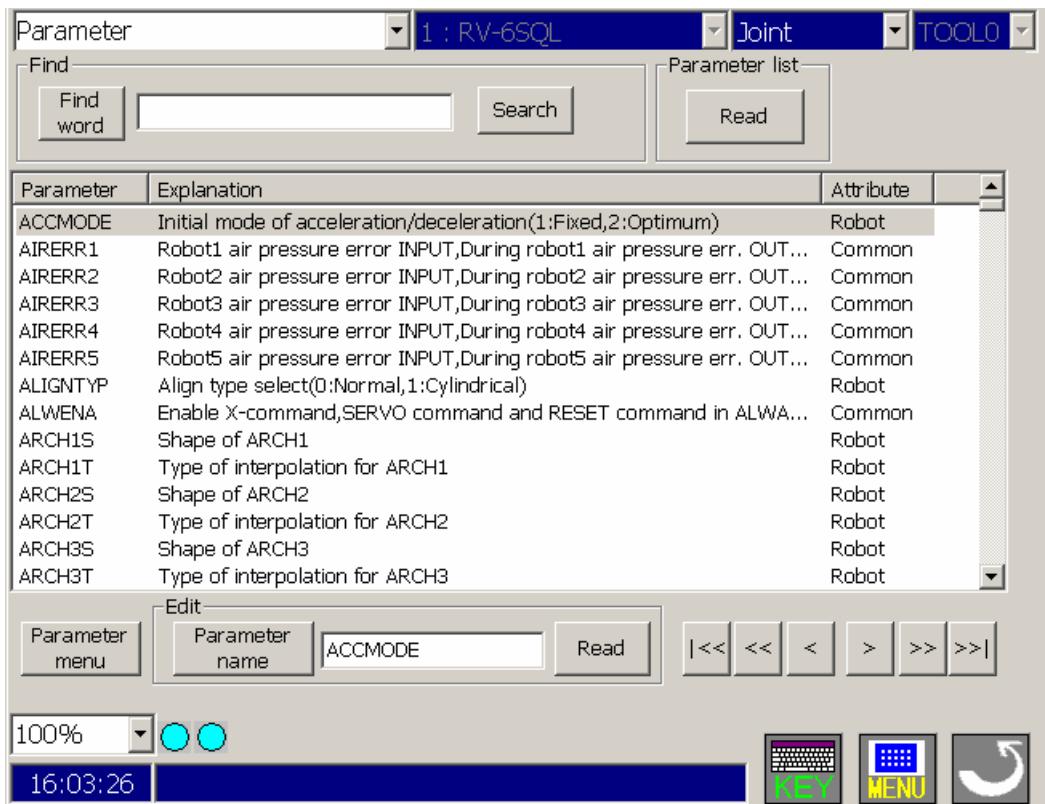


17. Parameter editor

The parameter editor can be used to reference and rewrite the parameter information set in the robot controller.

17.1. Starting

Select the “Parameter” from the menu, and parameter editor shown below appears.



17.2. Downloading the parameter list (Robot controller -> T/B)

The message to confirm whether to download the parameter list when the parameter edit is started might be displayed.

This message will be appeared in the following cases.

- (1) When the parameter list can be read from the robot controller or when the [Read] button (<a>) is clicked on "Parameter window" of T/B.

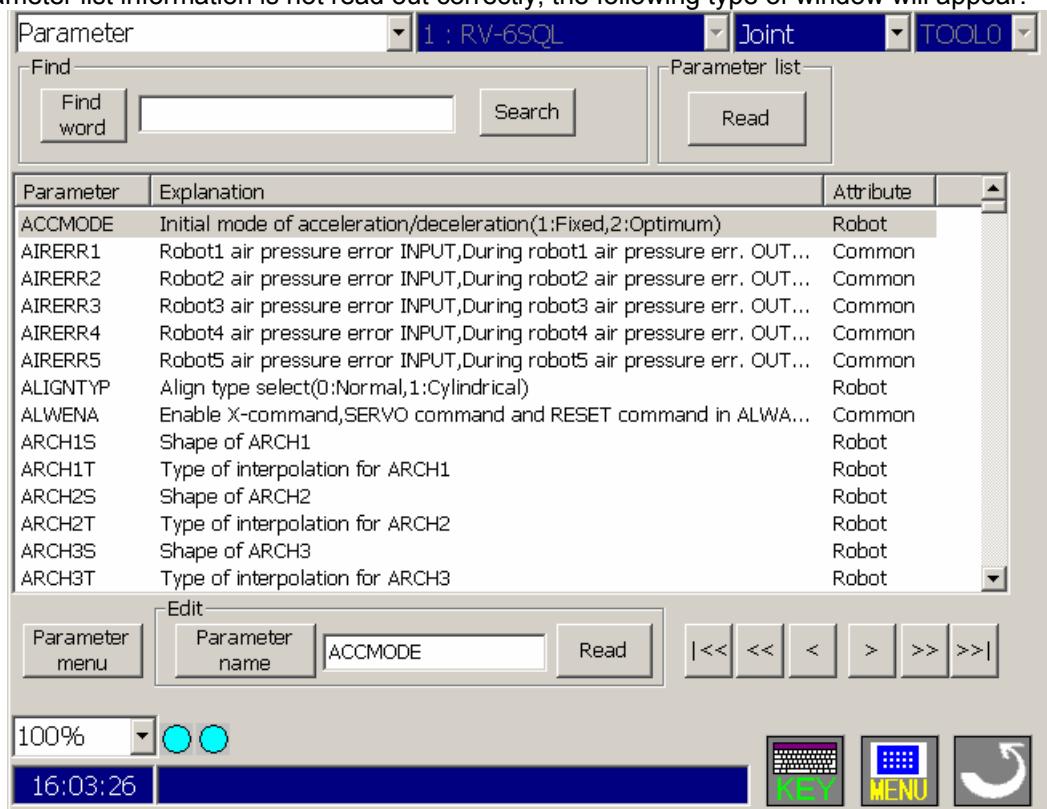


- (2) When there is no parameter list information in the T/B.

- (3) When the parameter list used in the robot controller is newer than the parameter list already stored in the T/B.

* Although it will takes few minutes to download the parameter list information, using the latest parameter information is recommended.

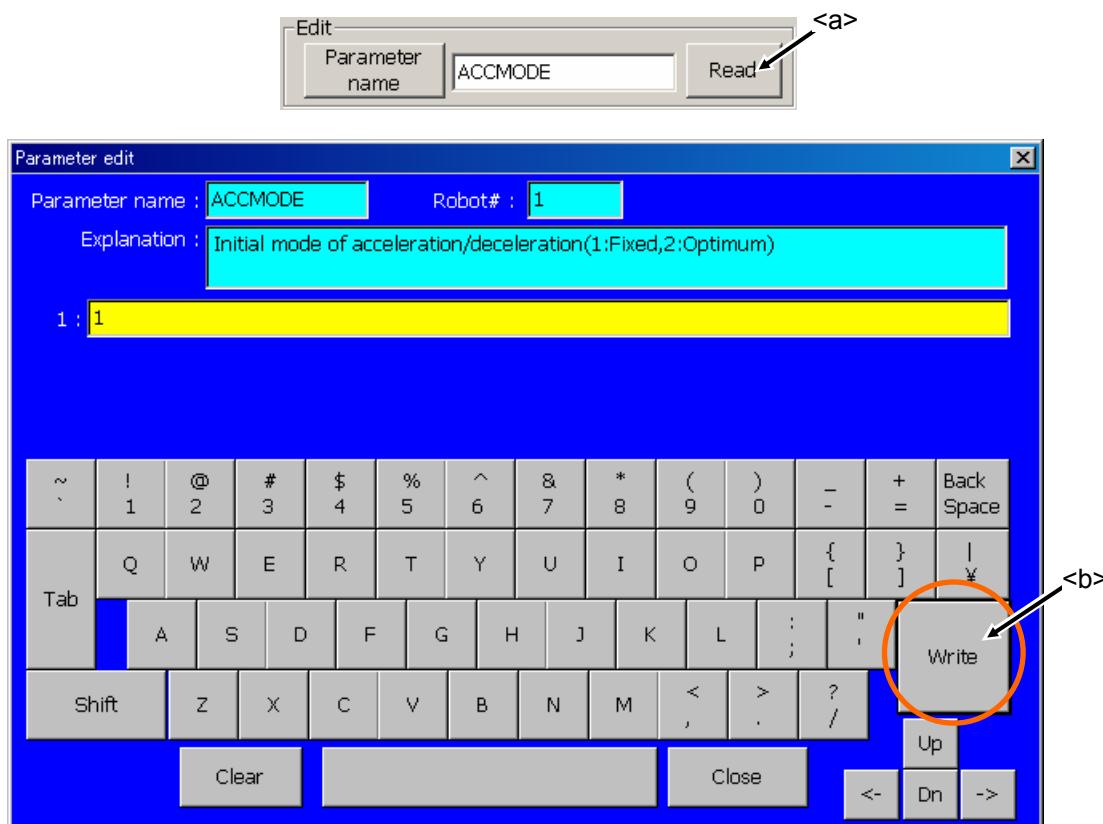
If the parameter list information is not read out correctly, the following type of window will appear.



17.3. Changing the parameters

Select a parameter displayed in the list, or input the parameter name and then click on the [Read] button (<a>) on "Parameter window".

The designated parameter information in the robot controller will be appeared.



After confirming the parameter, the parameter information in the robot controller can be rewritten by clicking on the [Write] button. ()



Caution

Use upper case letters when naming the programs in alphabetic characters.

Lower case alphabetic characters can be used in this parameter setting.

Use upper case letters when naming the programs in alphabetic characters for the parameters of the base program (PRGUSR) or slot table (SLT*), etc. All of the program names within the robot controller will be expressed in upper case letters.

If lower case letters are used, the programs will not be properly recognized.



Caution

To validate the rewritten parameter information in the robot controller, the robot controller power must be turned ON again.



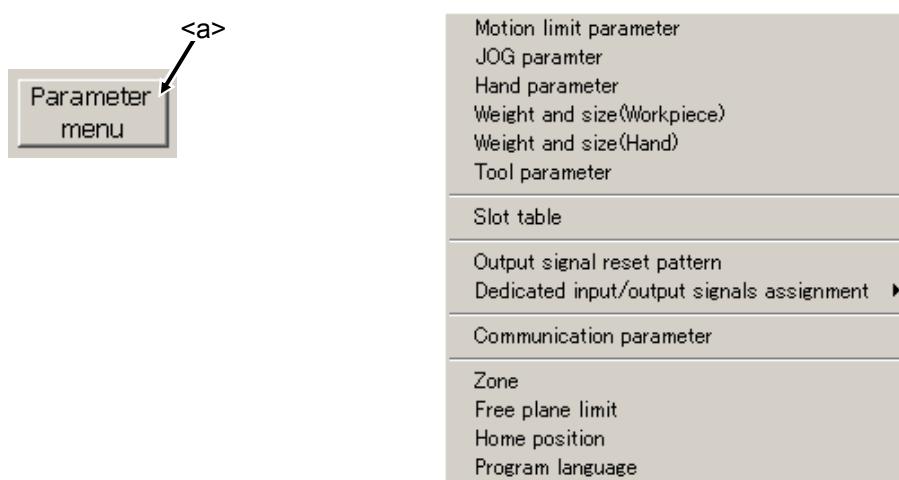
Caution

Operating Modes of the Robot Controller When Writing Parameters

Parameters can be written only in Teach mode.

17.4. Parameter menu

With this tool, parameter panels grouped as windows for each function are prepared. Select the name of the parameter to be referred to with the [Parameter menu] button (<a>) on "Parameter window".



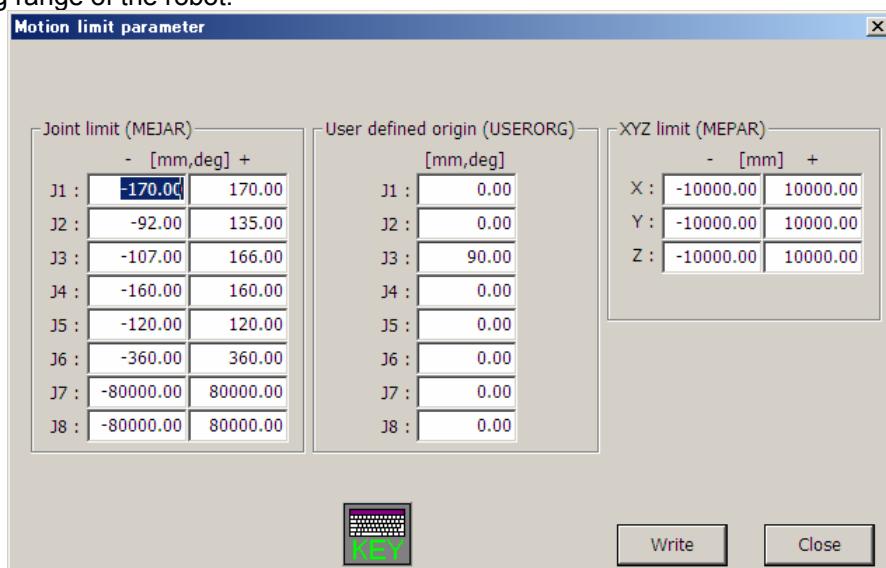
Caution

The program language (MELFA-BASIC IV / MOVEMASTER command) to be used by the controller can be changed with the "Program language" window.

Note that the robot models that can use the MOVEMASTER commands are limited. Refer to the Standard Specifications for the model in use to confirm whether the commands can be used.

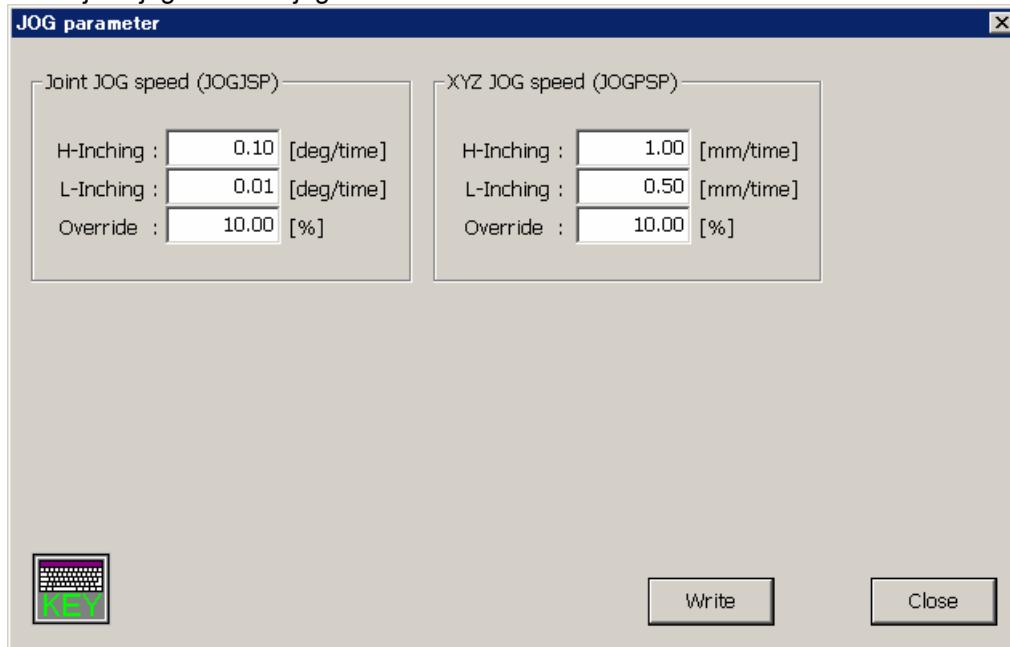
17.4.1. Motion limit parameter

Set the operating range of the robot.



17.4.2. JOG Parameter

Set the speeds of joint jog and XYZ jog.



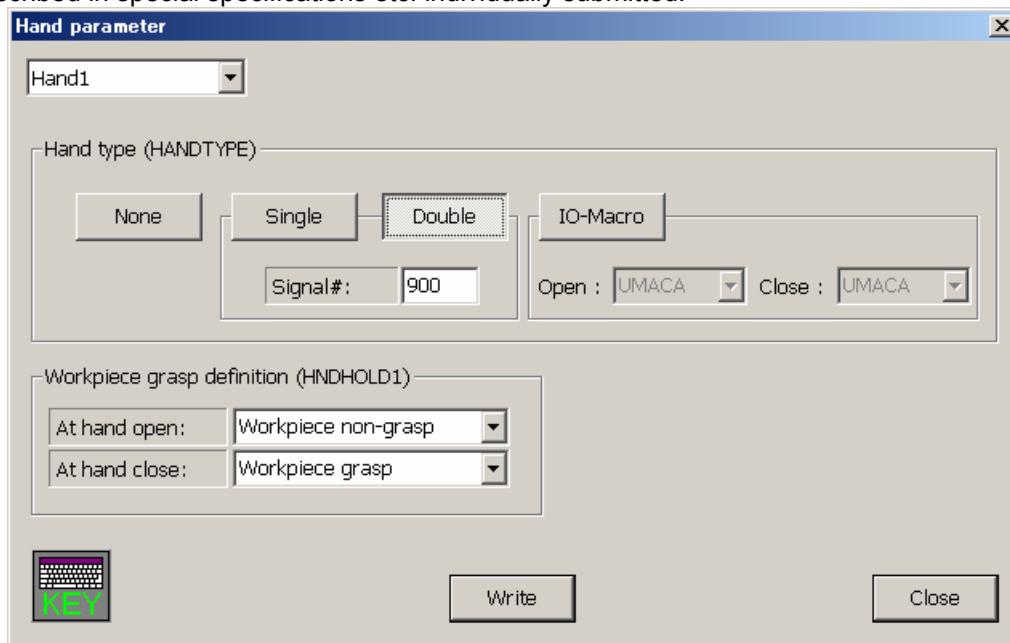
Memo

Override specifies maximum speed. Maximum speed can be suppressed by reducing the value.

17.4.3. Hand parameter

Set the type of the hand (single solenoid/double solenoid, etc.) and work holding/non-holding when HOPEN* (open hand) and HCLOSE* (close hand) are executed.

The IO-Macro is a function for a special usage. The customer who is using this function must refer to the setting method described in special specifications etc. individually submitted.



17.4.4. Weight and size (Workpiece)

Set the work conditions.

WRKDAT0 might not be able to set according to the kind of the connected robot. In that case, the row of WRKDAT0 cannot be input.

Weight and size (Workpiece)		WRKDAT0	WRKDAT1	WRKDAT2	WRKDAT3	WRKDAT4	WRKDAT5
Weight [Kg] :		0.00	0.00	0.00	0.00	0.00	0.00
Size [mm]	X :	0.00	0.00	0.00	0.00	0.00	0.00
	Y :	0.00	0.00	0.00	0.00	0.00	0.00
	Z :	0.00	0.10	0.00	0.00	0.00	0.00
Center of gravity position [mm]	X :	0.00	0.00	0.00	0.00	0.00	0.00
	Y :	0.00	0.00	0.00	0.00	0.00	0.00
	Z :	0.00	0.00	0.00	0.00	0.00	0.00
Weight [Kg] :		WRKDAT6	WRKDAT7	WRKDAT8			
Size [mm]	X :	0.00	0.00	0.00			
	Y :	0.00	0.00	0.00			
	Z :	0.00	0.00	0.00			
Center of gravity position [mm]	X :	0.00	0.00	0.00			
	Y :	0.00	0.00	0.00			
	Z :	0.00	0.00	0.00			

 KEY Write Close

17.4.5. Weight and size (Hand)

Set the hand conditions.

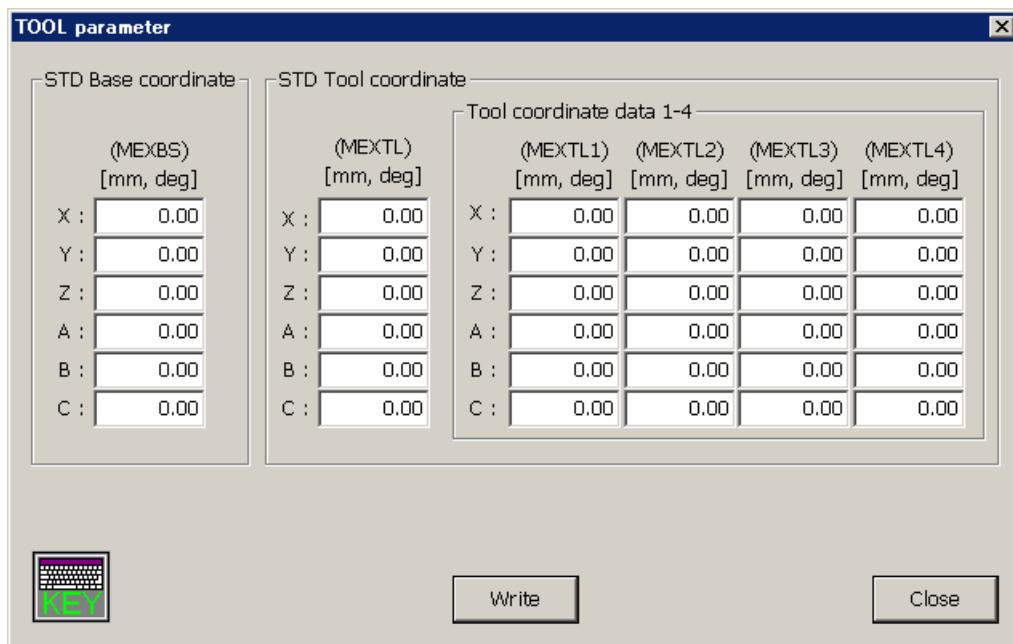
HNDDAT0 might not be able to set according to the kind of the connected robot. In that case, the row of HNDDAT0 cannot be input.

Weight and size (Hand)		HNDDAT0	HNDDAT1	HNDDAT2	HNDDAT3	HNDDAT4	HNDDAT5
Weight [Kg] :		12.00	10.00	10.00	10.00	10.00	10.00
Size [mm]	X :	265.00	0.00	0.00	0.00	0.00	0.00
	Y :	265.00	0.00	0.00	0.00	0.00	0.00
	Z :	22.00	0.00	0.00	0.00	0.00	0.00
Center of gravity position [mm]	X :	0.00	0.00	0.00	0.00	0.00	0.00
	Y :	0.00	0.00	0.00	0.00	0.00	0.00
	Z :	66.00	0.00	0.00	0.00	0.00	0.00
Weight [Kg] :		HNDDAT6	HNDDAT7	HNDDAT8			
Size [mm]	X :	0.00	0.00	0.00			
	Y :	0.00	0.00	0.00			
	Z :	0.00	0.00	0.00			
Center of gravity position [mm]	X :	0.00	0.00	0.00			
	Y :	0.00	0.00	0.00			
	Z :	0.00	0.00	0.00			

 KEY Write Close

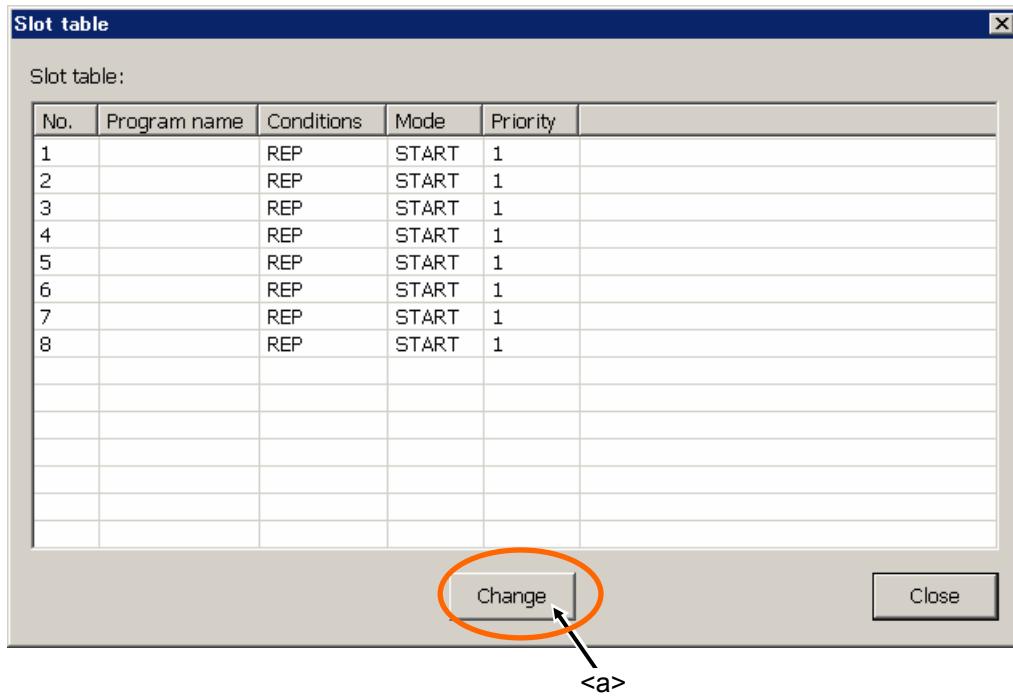
17.4.6. TOOL parameter

Set the standard tool coordinates and standard base coordinates.

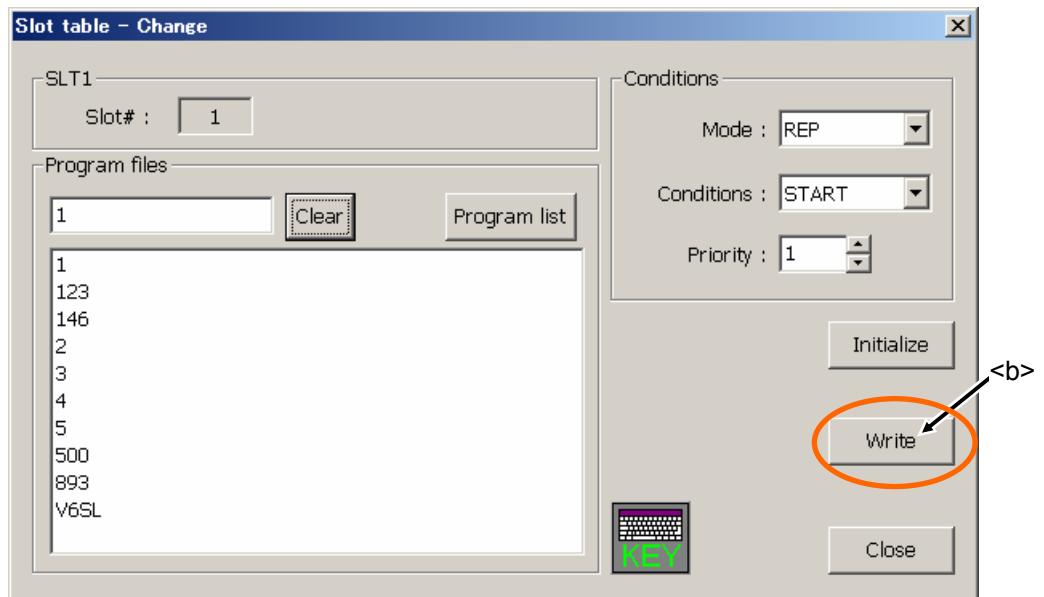


17.4.7. Slot table

Set the operating conditions of each task slot during multi-task operation.

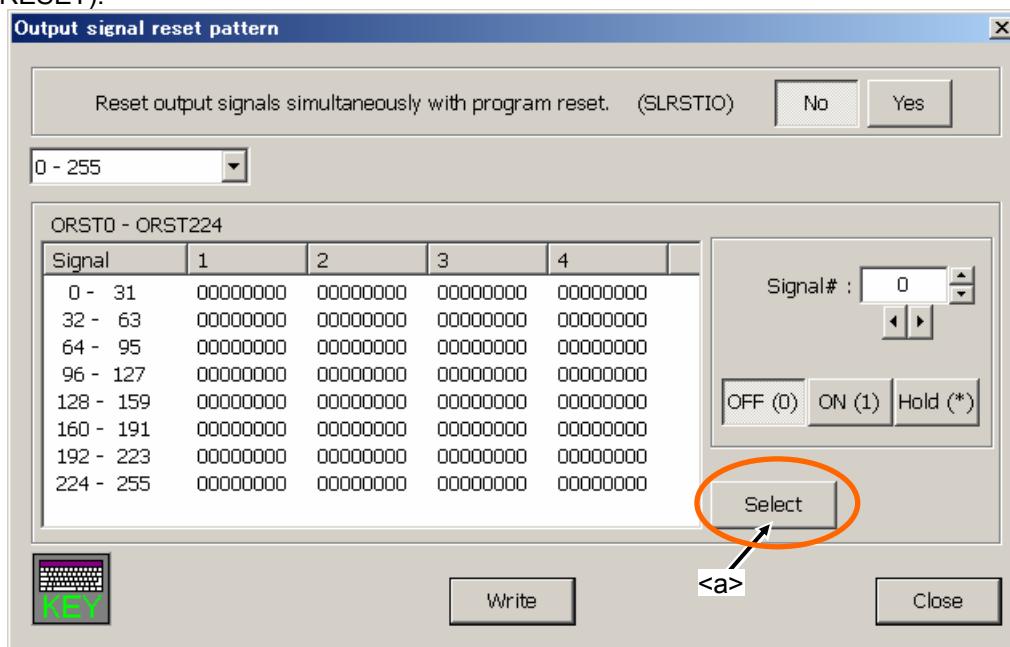


Select the task slot number you are changing and click the [Change] button. (<a>
When the modification window appears, set the program name, operating conditions, startup conditions and task priority, and then click [Write] button. ()



17.4.8. Output signal reset pattern

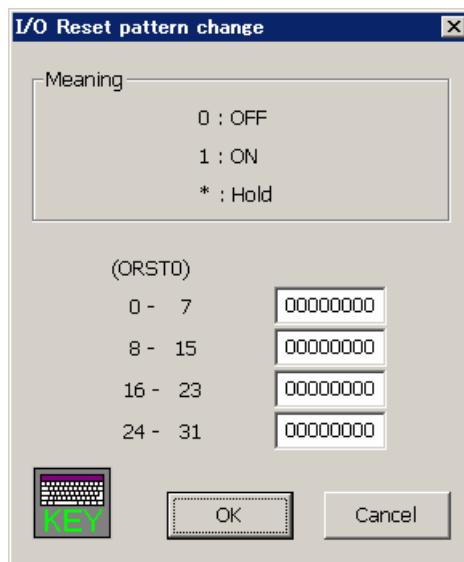
Set the operation when resetting the general-purpose output signals such as the CLR instruction and dedicated input (OUTRESET).



Set a signal number, and then select one from [OFF] / [ON] / [Hold].

The value of the signal having the specified number displayed in the list changes.

Also, selecting a signal group (for example, "0 - 31") and then clicking the [Select] button (<a>) changes 32 signals at once.

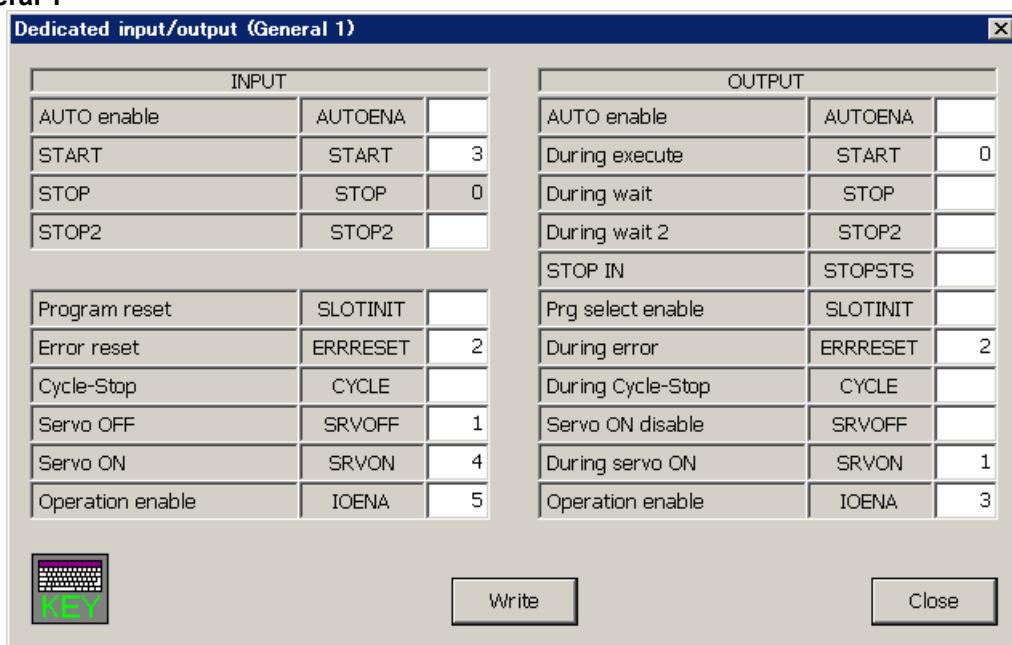


After confirming the signal number and settings of each signal, click the [Write] button on the keyboard.

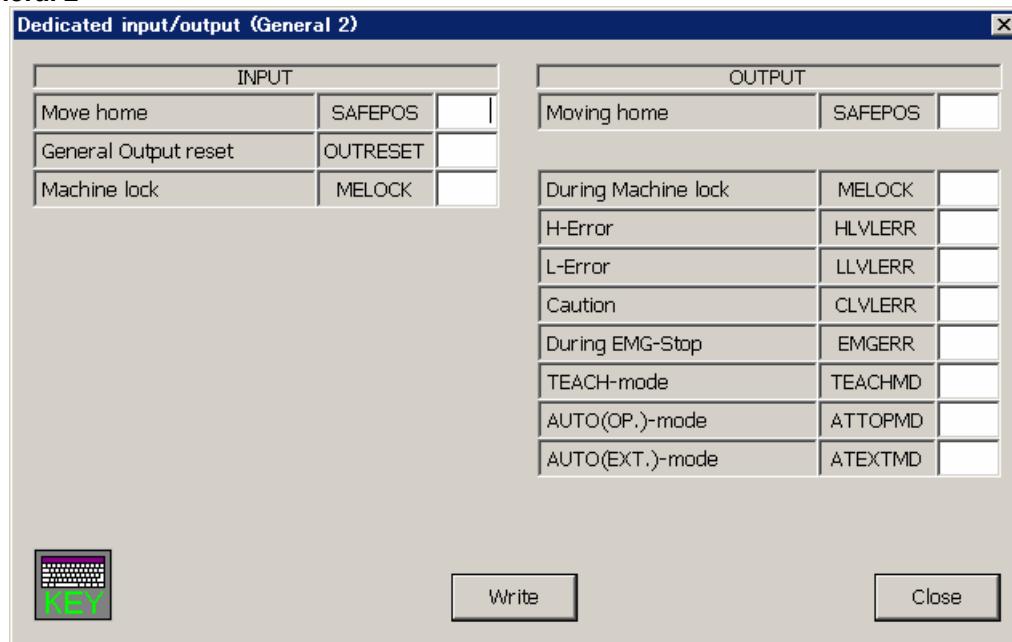
17.4.9. Dedicated input / output

Assign signal numbers to functions in order to perform the remote operations to execute and stop robot programs, and display/operate the execution progress information and servo power supply status, etc.

17.4.9.1. General 1



17.4.9.2. General 2



17.4.9.3. Data

Dedicated input/output (Data)

INPUT		OUTPUT	
Program select	PRGSEL	R/C ready	RCREADY
OVRD specification	OVRDSEL	Low battery	BATERR
		During output Prog. #	PRGOUT
		During output Line #	LINEOUT
Prog. # output req.	PRGOUT	During output OVRD	OVRDOUT
Line# output req.	LINEOUT	During output Err. #	ERROUT
OVRD output req.	OVRDOUT		
Err.# output req.	ERROUT		
Start End		Start End	
Value input	IODATA	Value output	IODATA
		Within user defined area (8)	USRAREA

 Write Close

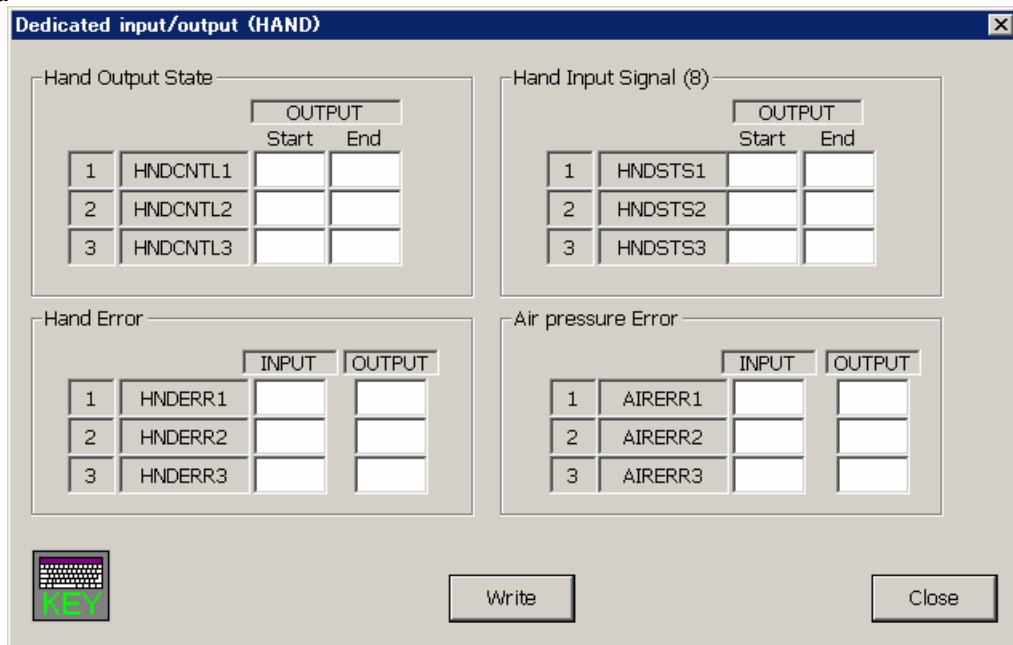
17.4.9.4. Jog

Dedicated input/output (JOG)

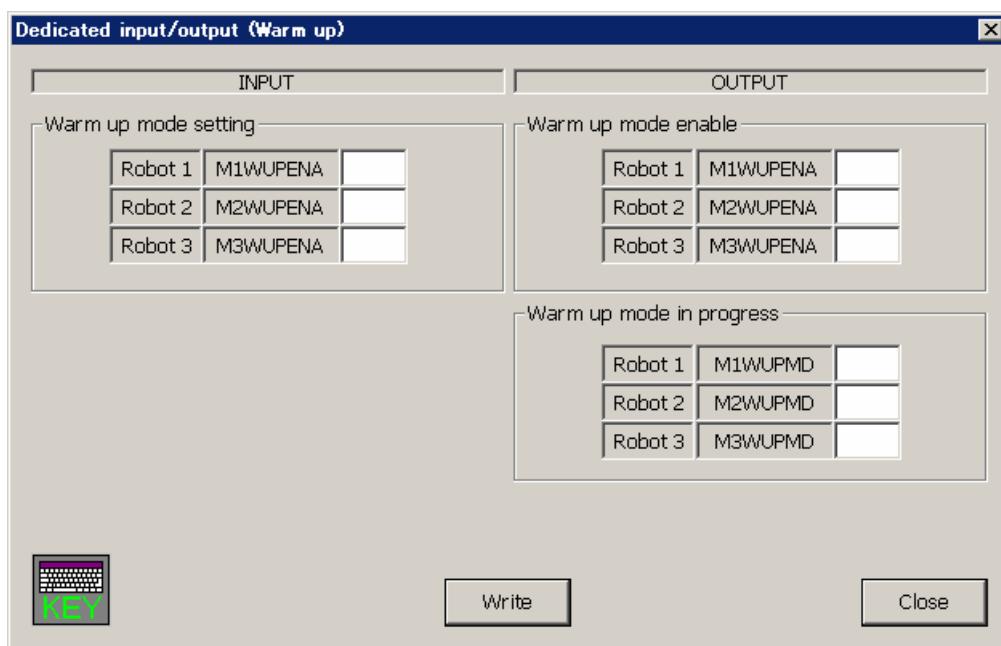
INPUT		OUTPUT	
JOG mode specification	JOGENA	JOG mode	JOGENA
Start End		Start End	
JOG(+) specification	JOG+		
JOG(-) specification	JOG-		
JOG mode specification	JOGM	JOG mode	JOGM
Error disregard at JOG	JOGNER	During error disregard at JOG	JOGNER

 Write Close

17.4.9.5. Hand



17.4.9.6. Warm up



17.4.9.7. Start (each slot)

Start(each slot)

	INPUT	OUTPUT		INPUT	OUTPUT		INPUT	OUTPUT			
1:	S1START			12:	S12START			23:	S23START		
2:	S2START			13:	S13START			24:	S24START		
3:	S3START			14:	S14START			25:	S25START		
4:	S4START			15:	S15START			26:	S26START		
5:	S5START			16:	S16START			27:	S27START		
6:	S6START			17:	S17START			28:	S28START		
7:	S7START			18:	S18START			29:	S29START		
8:	S8START			19:	S19START			30:	S30START		
9:	S9START			20:	S20START			31:	S31START		
10:	S10START			21:	S21START			32:	S32START		
11:	S11START			22:	S22START						

 KEY Write Close

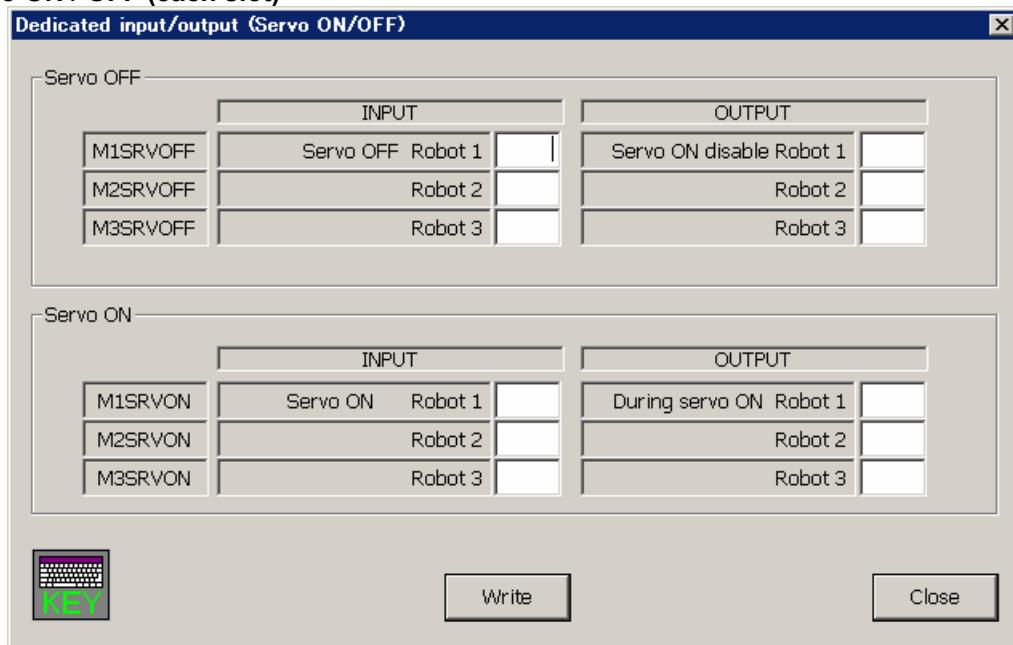
17.4.9.8. Stop (each slot)

Stop(each slot)

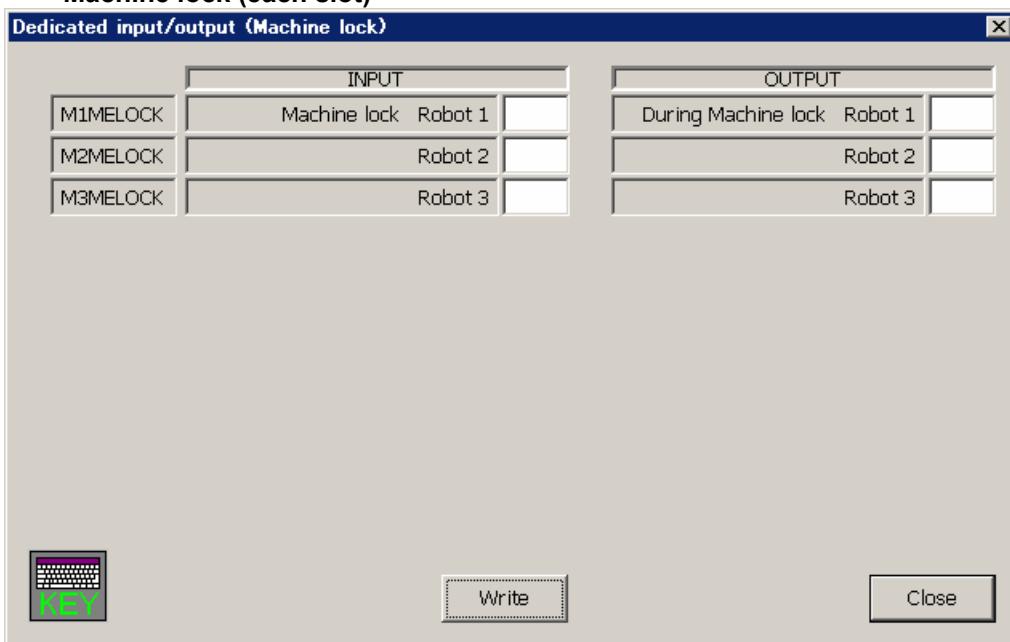
	INPUT	OUTPUT		INPUT	OUTPUT		INPUT	OUTPUT			
1:	S1STOP			12:	S12STOP			23:	S23STOP		
2:	S2STOP			13:	S13STOP			24:	S24STOP		
3:	S3STOP			14:	S14STOP			25:	S25STOP		
4:	S4STOP			15:	S15STOP			26:	S26STOP		
5:	S5STOP			16:	S16STOP			27:	S27STOP		
6:	S6STOP			17:	S17STOP			28:	S28STOP		
7:	S7STOP			18:	S18STOP			29:	S29STOP		
8:	S8STOP			19:	S19STOP			30:	S30STOP		
9:	S9STOP			20:	S20STOP			31:	S31STOP		
10:	S10STOP			21:	S21STOP			32:	S32STOP		
11:	S11STOP			22:	S22STOP						

 KEY Write Close

17.4.9.9. Servo ON / OFF (each slot)

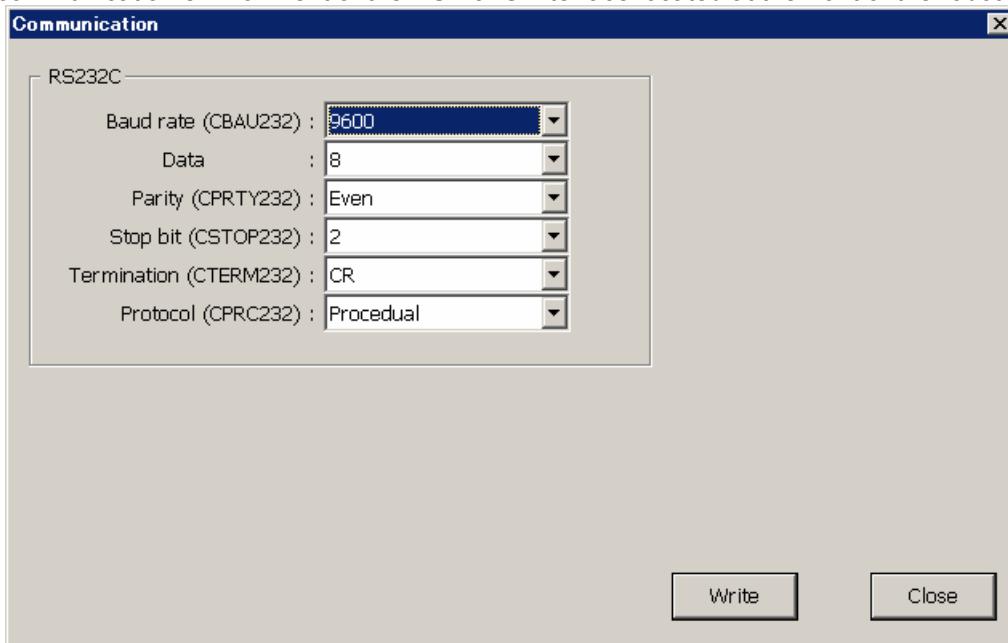


17.4.9.10. Machine lock (each slot)



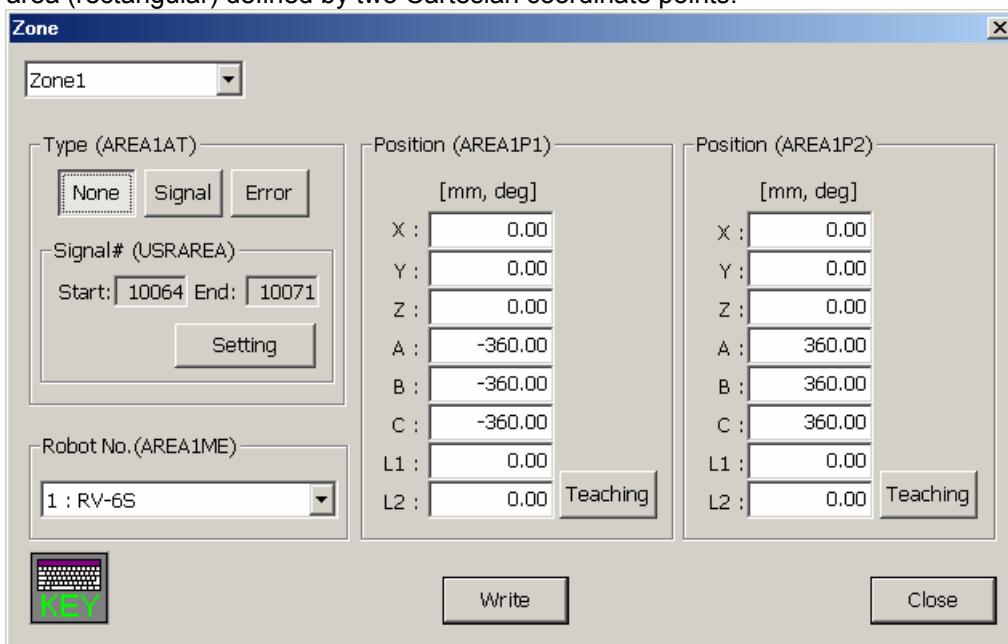
17.4.10. Communication parameter

Set up the communication environment of the RS-232C interface located at the front of the robot controller.



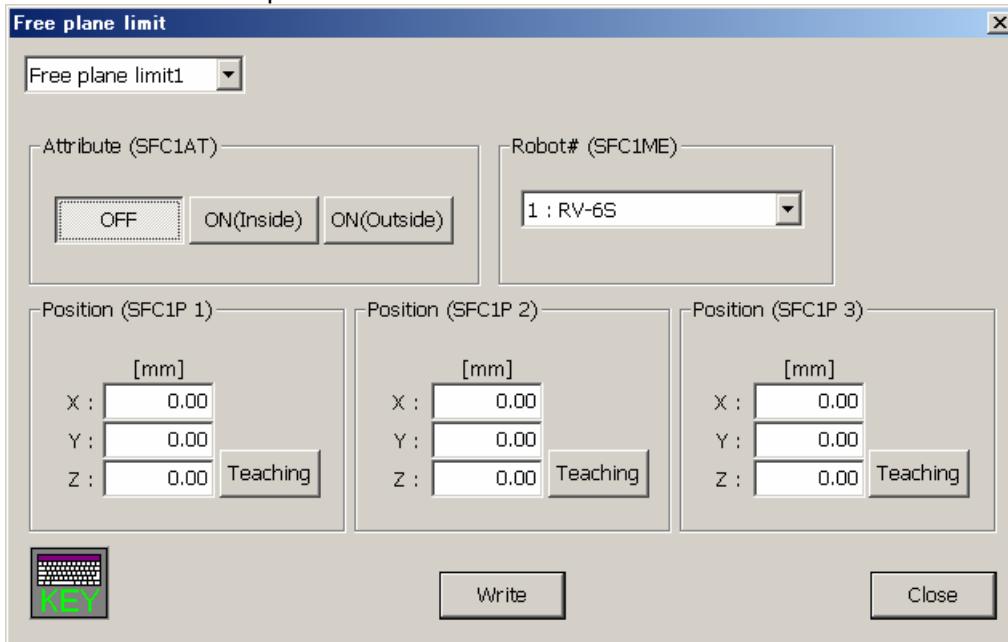
17.4.11. Zone

Specify the area (rectangular) defined by two Cartesian coordinate points.



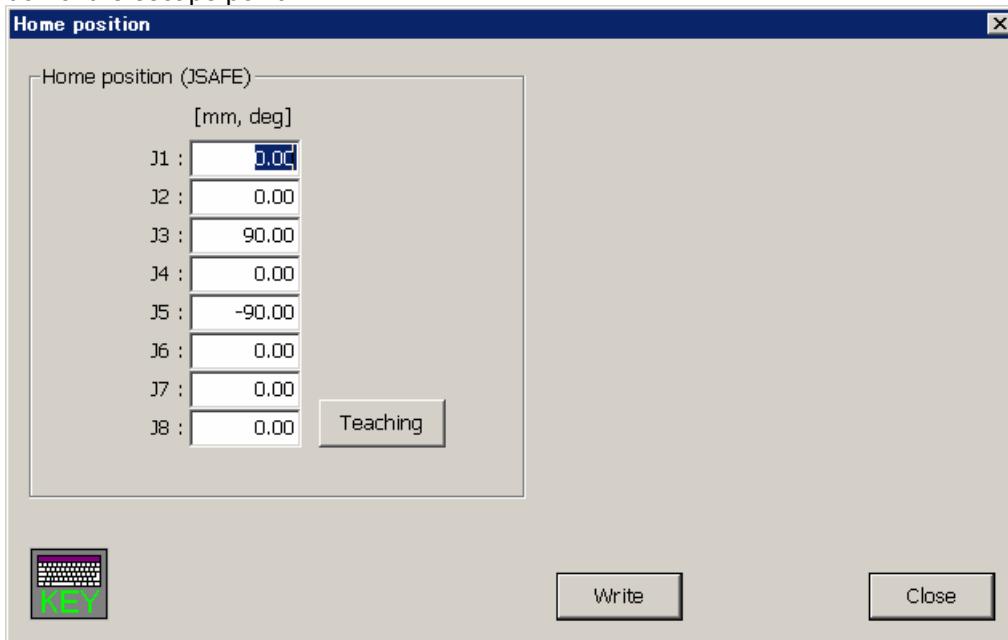
17.4.12. Free plane limit

Set the overrun limit used on free planes.



17.4.13. Home position

Set the position of the escape point.



17.4.14. Program language

Set the program language.



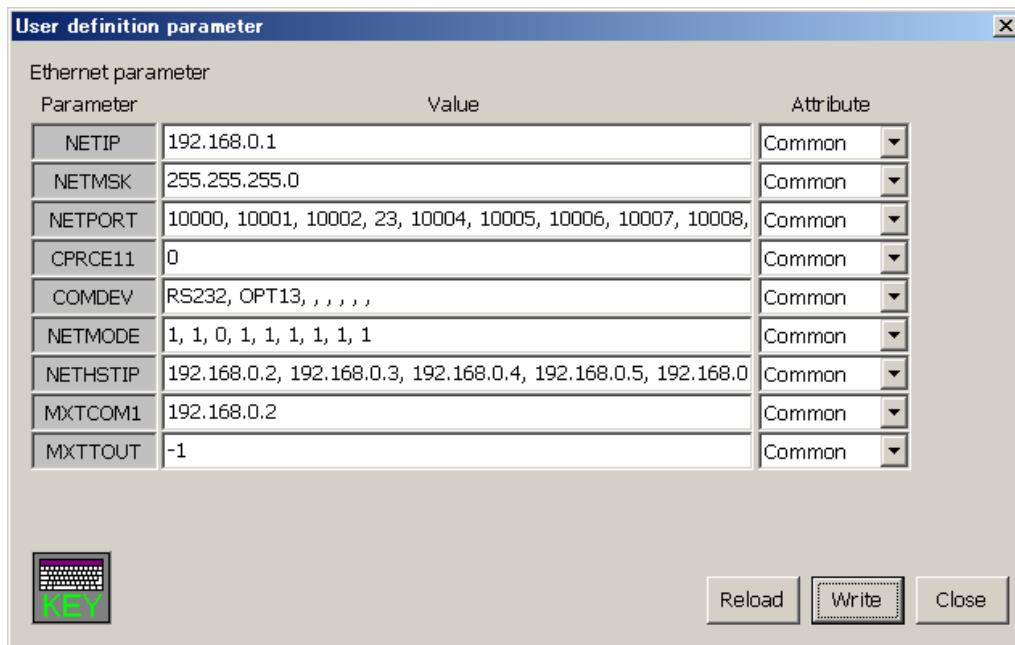
Caution

The program language (MELFA-BASIC IV / MOVEMASTER command) to be used by the controller can be changed with the "Program language" window.

Note that the robot models that can use the MOVEMASTER commands are limited. Refer to the Standard Specifications for the model in use to confirm whether the commands can be used.

17.4.15. User definition parameter

In the “User definition parameter” window, it is possible to edit the parameters, which prepared by the definition files, at the one window.



Create the definition files beforehand in PC, and copy the files to T/B.

File name

Paramxx.TXT (xx = 01 to 10)

It is possible to create the different definition files up to 10.

Folder in T/B to copy to

/ IPSM / MELFA / UserDef

Please make the “UserDef” folder by yourself.

Format of the parameter definition

The 1st line : ";" (semicolon) + title string

The 2nd line : parameter name + ";" (semicolon)

One parameter name is written on one line, and these can be arrayed up to 10 line.

(Example)

```
;Ethernet parameter
NETIP;
NETMSK;
NETPORT;
CPRCE11;
COMDEV;
NETMODE;
NETHSTIP;
MXTCOM1;
MXTTOUT;
```

17.5. Find

Strings can be found from the parameter list being displayed.

Click the [Find word] button, and enter the string you want to find in the find string field, and click [Search] button. (<a>)

The specified string is found from the current cursor position in the parameter list to the direction specified.



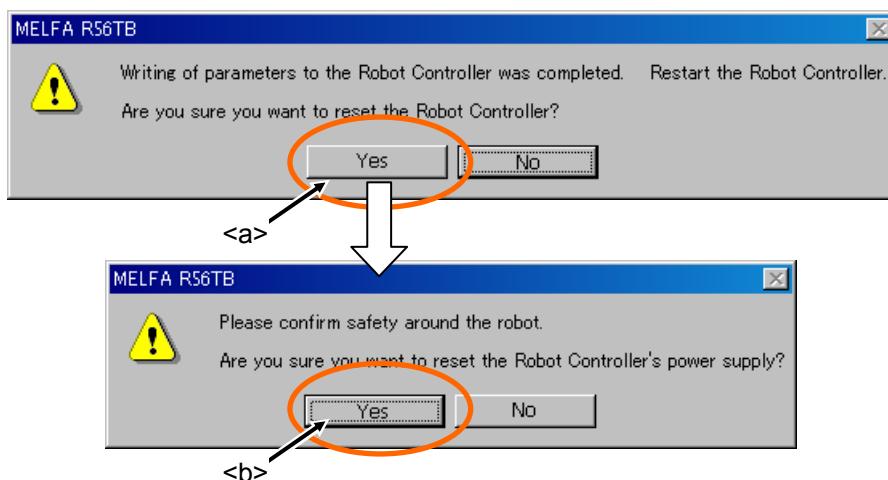
17.6. Power Reset of the Robot Controller

To make modified parameters effective, it is necessary to power on the robot controller again.
The power reset of the robot controller can be performed from T/B.

After setting parameters, the power reset confirmation screen appears.

To immediately reset the power, select [Yes]. (<a>)

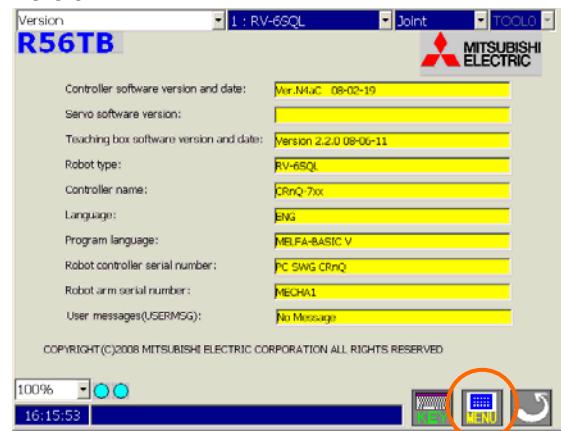
To set more parameters, set all the necessary parameters first, and then select [Yes]. ()



18. System option

“System option” has system property setting functions.
“System option” is shown by following operation.

Version

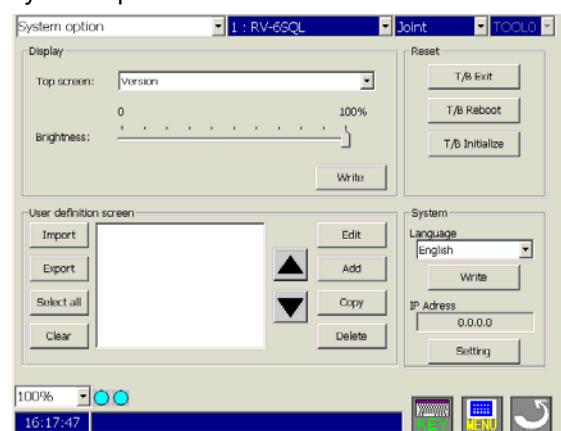


Menu



“User definition screen” is supported by version 2.2 or later of this software.

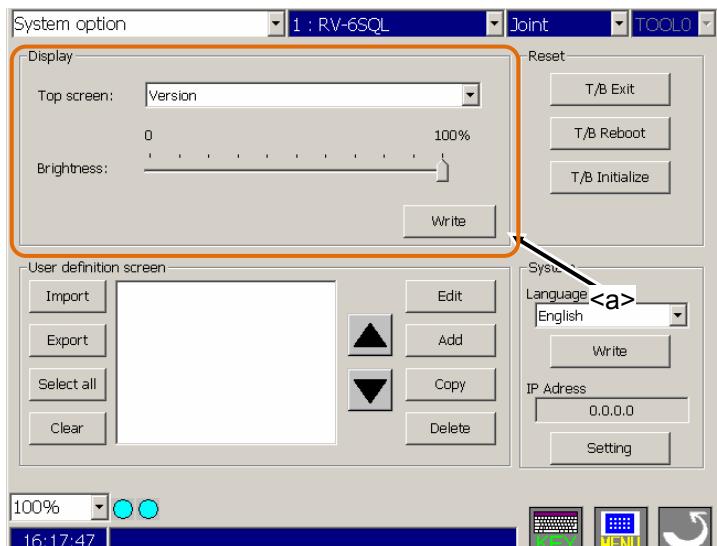
System option



18.1. Display

On “Display”, set the screen name when T/B is started and T/B brightness. The operation is as follows.

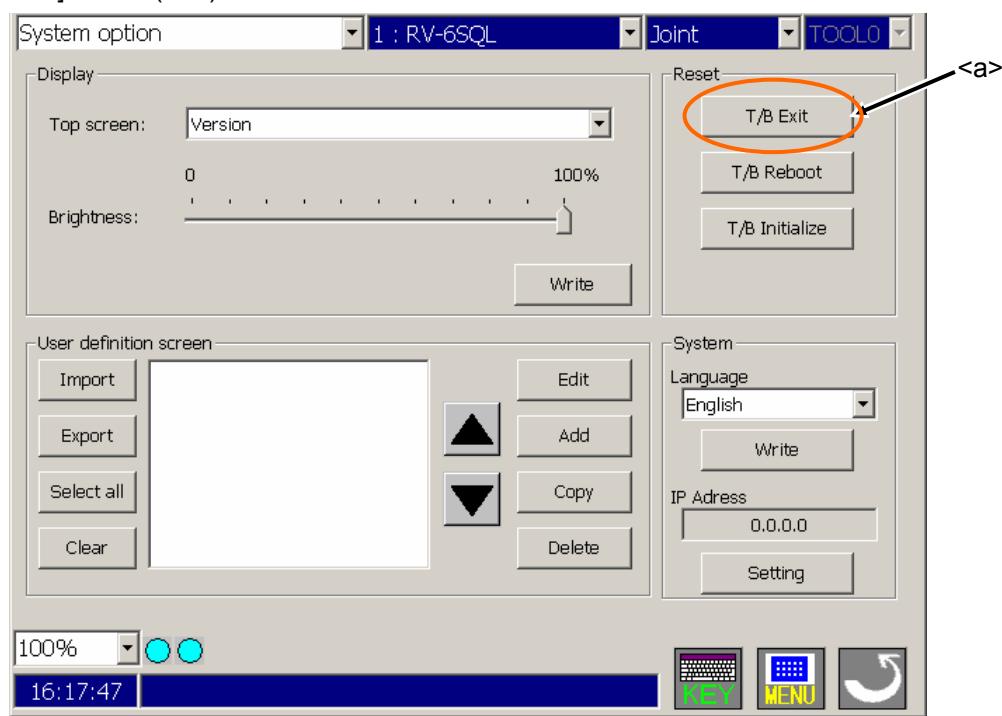
- 1) Set the screen name when T/B is started to “Top screen”.
- 2) Set T/B brightness to “Brightness”.
- 3) Press [Write] button. (<a>)



“User definition screen” is supported by version 2.2 or later of this software.

18.2. T/B exit

Touch [T/B Exit] button (<a>) and exit T/B software.

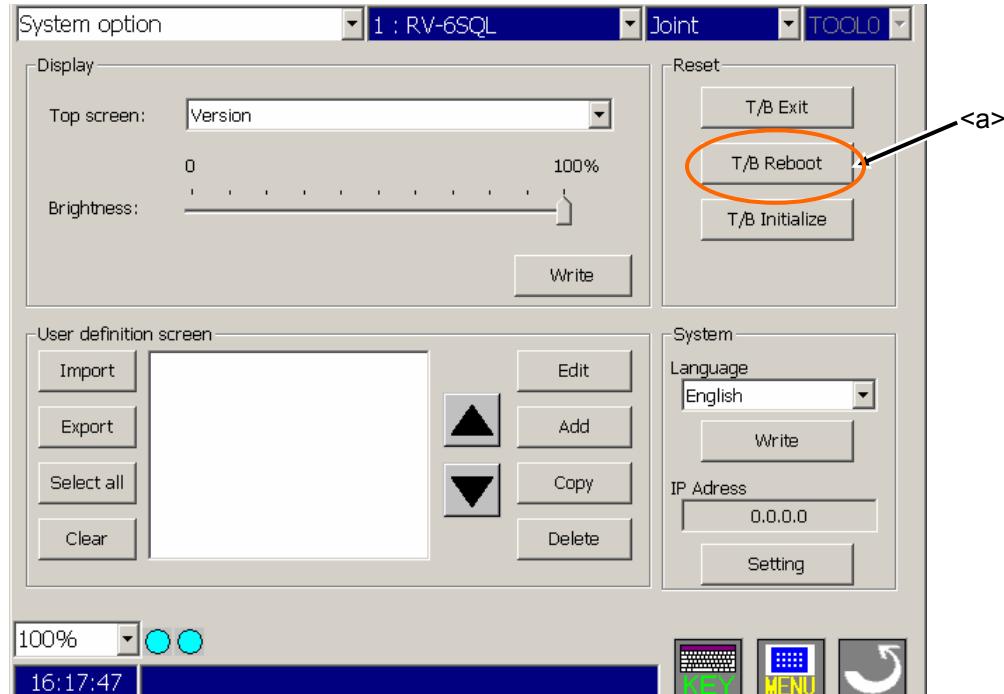


"User definition screen" is supported by version 2.2 or later of this software.

The screen of Windows CE will be displayed when completed.

18.3. T/B reboot

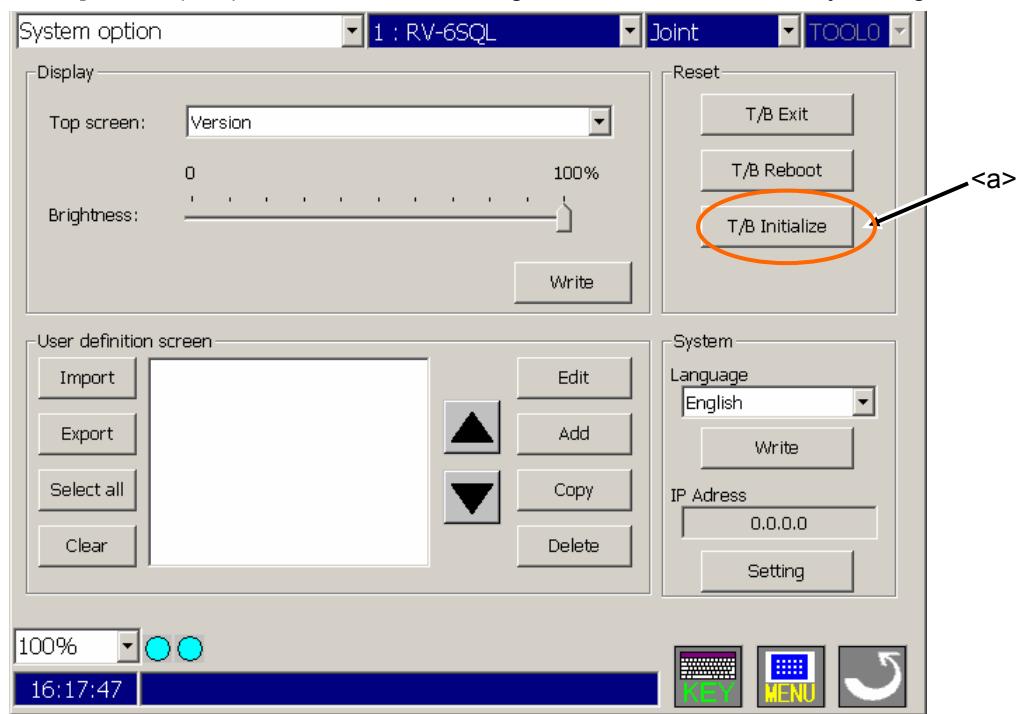
Touch [T/B Reboot] button (<a>) and restart T/B software.



"User definition screen" is supported by version 2.2 or later of this software.

18.4. T/B initialize

Touch [T/B Initialize] button (<a>) and initialize the settings of T/B software to factory setting value.



"User definition screen" is supported by version 2.2 or later of this software.

19. User definition screen

"User definition screen" is supported by version 2.2 or later of this software.

You can make the customized screen by arranging the parts such as the button and the lamp that synchronize with the I/O signal. You can make two or more pages of definition screens.

This screen can be used by the following usages.

- This screen is used as an operation monitor.
- When the state of T/B is enabling, the peripheral devices such as conveyers is made to work by the button on the screen.

Parts that can be displayed on the user definition screen are as follows.

List 19-1 List of parts

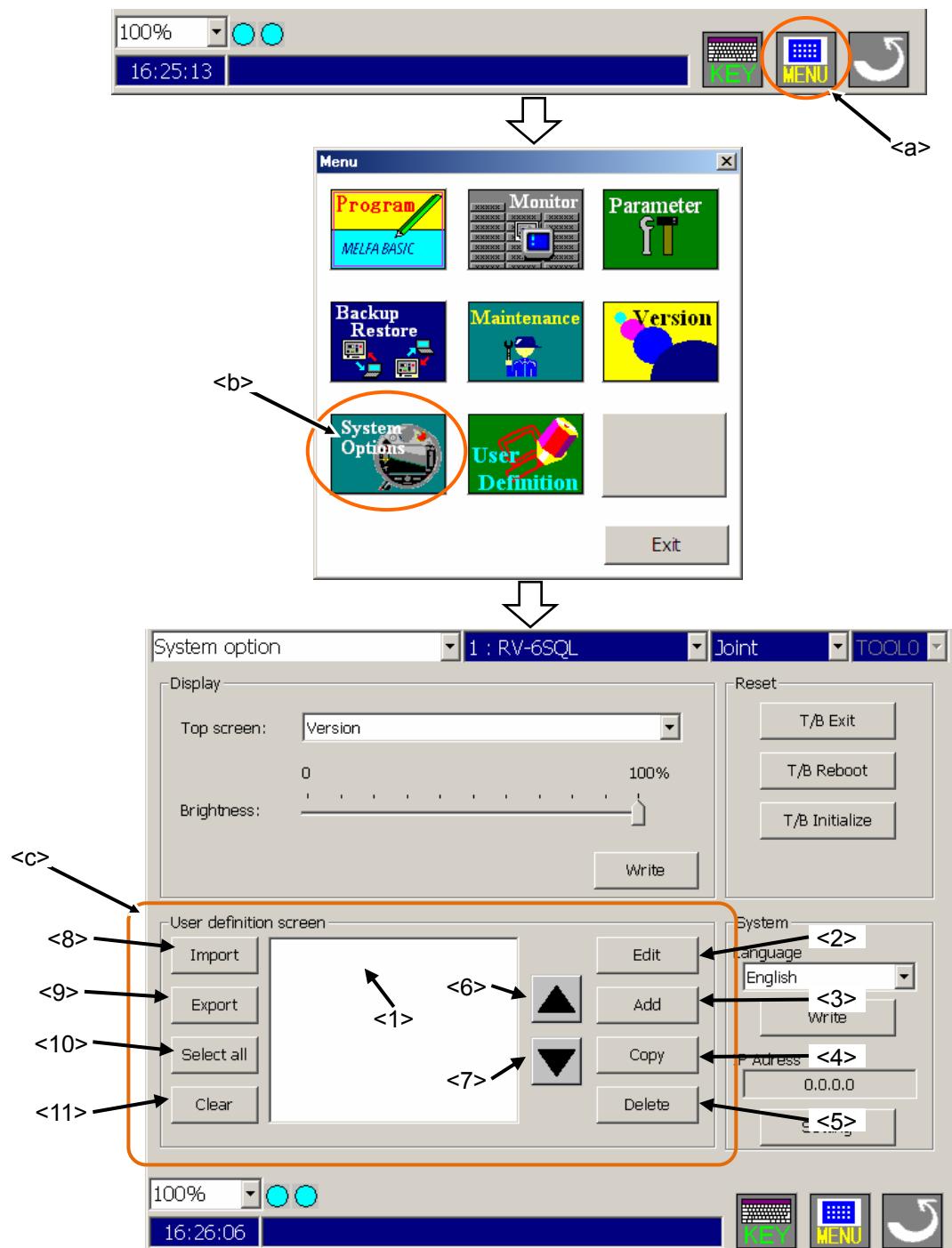
	Parts	Explanation
1	Button	The signal can be output from the robot controller by clicking the button. The signal can be output only in T/B Enabling state.
2	Lamp	The lamp can be turning on/off by the state of the I/O signal.
3 Robot information	Variable	The value of the specified variable can be displayed.
	Exe lines	The executing program lines can be displayed.
	Program name	The executing program name can be displayed.
	Exe line num.	The executing line number of the program can be displayed.
	Cur pos	Current positional data of the cartesian type can be displayed.
	Cur jnt	Current positional data of the joint type can be displayed.
4	Label	The character string can be displayed.

19.1. User definition Editor

It is necessary to make the "User definition screen" beforehand to use it.

The "User definition screen" is edited on the system information screen.

- (1) Click the [MENU] button (<a>) of a T/B screen and display menu panel.
- (2) Click the [Option] button () in the menu. The System option is displayed.
- (3) You can edit by "User definition screen"(<c>) of "System option" window.



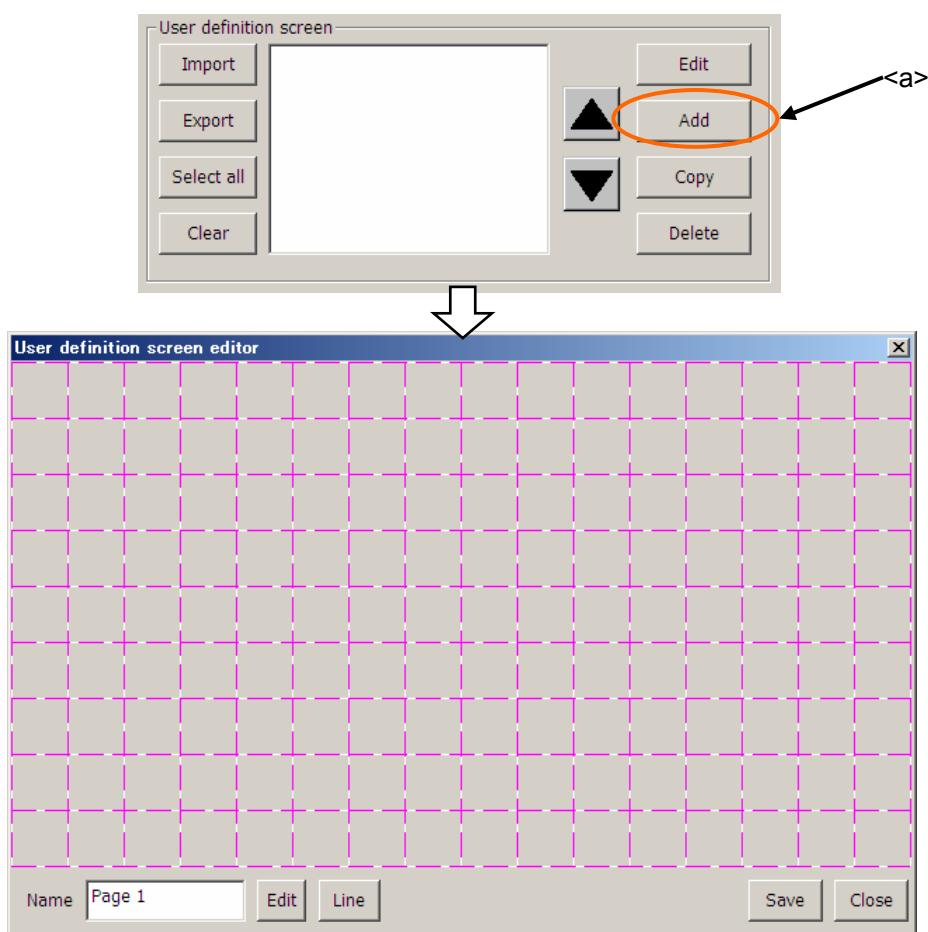
Please refer to "List 19-2 Explanation of user definition " for the explanation.

List 19-2 Explanation of user definition screen

	Name	Explanation
<1>	List	The list of registered "User definition screen" is displayed. "User definition screen" is displayed in order as displayed here.
<2>	[Edit]	Existing "User definition screen" is edited.
<3>	[Add]	"User definition screen" is newly added.
<4>	[Copy]	"User definition screen" is copied.
<5>	[Delete]	"User definition screen" is deleted.
<6>	▲	"User definition screen" that has been selected is moved to above.
<7>	▼	"User definition screen" that has been selected is moved to below.
<8>	[Import]	"User definition screen" preserved in USB memory is imported.
<9>	[Export]	Selected "User definition screen" is exported in USB memory.
<10>	[Select all]	"User definition screen" displayed in the list are all selected.
<11>	[Clear]	A present selection is released.

19.1.1. Adding the new page.

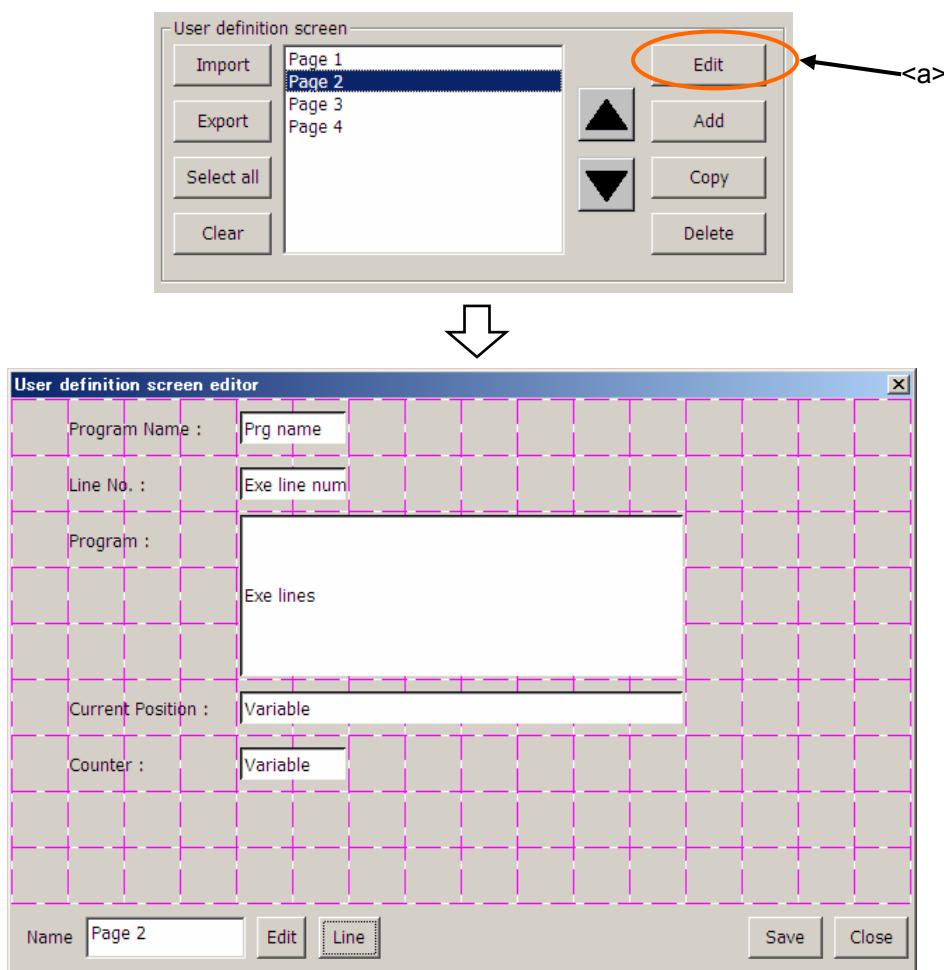
To make the new page of "User definition screen", click [Add] button (<a>).
"User definition screen" window is displayed.



Please refer to "19.1.5 Page edit of "User definition screen"" for the method of editing the page.

19.1.2. Edit of existing page

To edit an existing "User definition screen", click [Edit] button () on the window after selecting the user definition screen edited from the list.
The edit display of selected "User definition screen" is displayed.



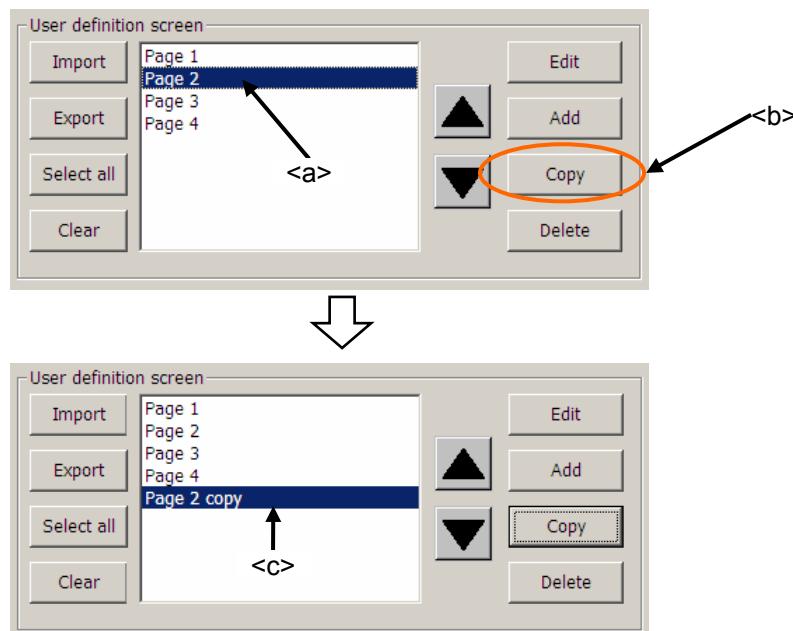
Please refer to "19.1.5 Page edit of "User definition screen"" for the method of editing the page.

19.1.3. Copy of page

You can copy "User definition screen".

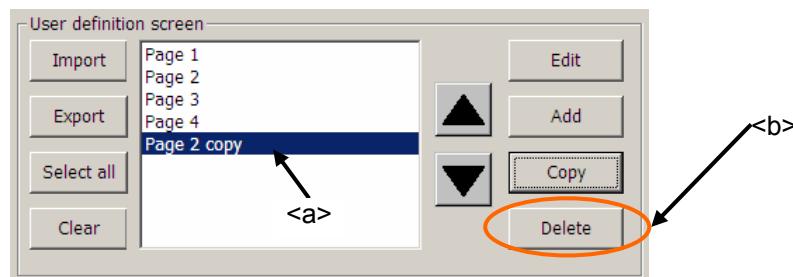
To make the copy of existing "User definition screen", click [Copy] button () after selecting the user definition screen from the list (<a>).

The copy of the selected user definition screen is made (<c>). The name of the copied user definition screen becomes "<Origin Name> copy".



19.1.4. Deletion of page

To delete the existing "User definition screen", click [Delete] button () after selecting the user definition screen from the list (<a>). After the deletion confirmation message is displayed, click the [Yes] button.

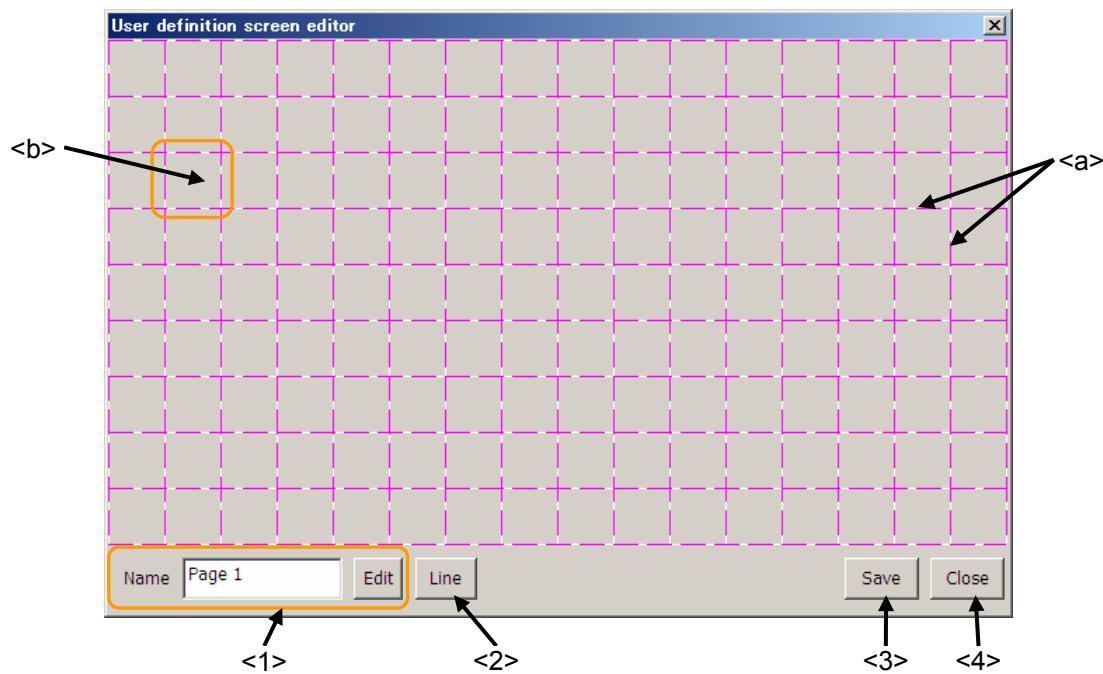


Caution

Note that once "User definition screen" are deleted, they cannot be recovered.

19.1.5. Page edit of "User definition screen"

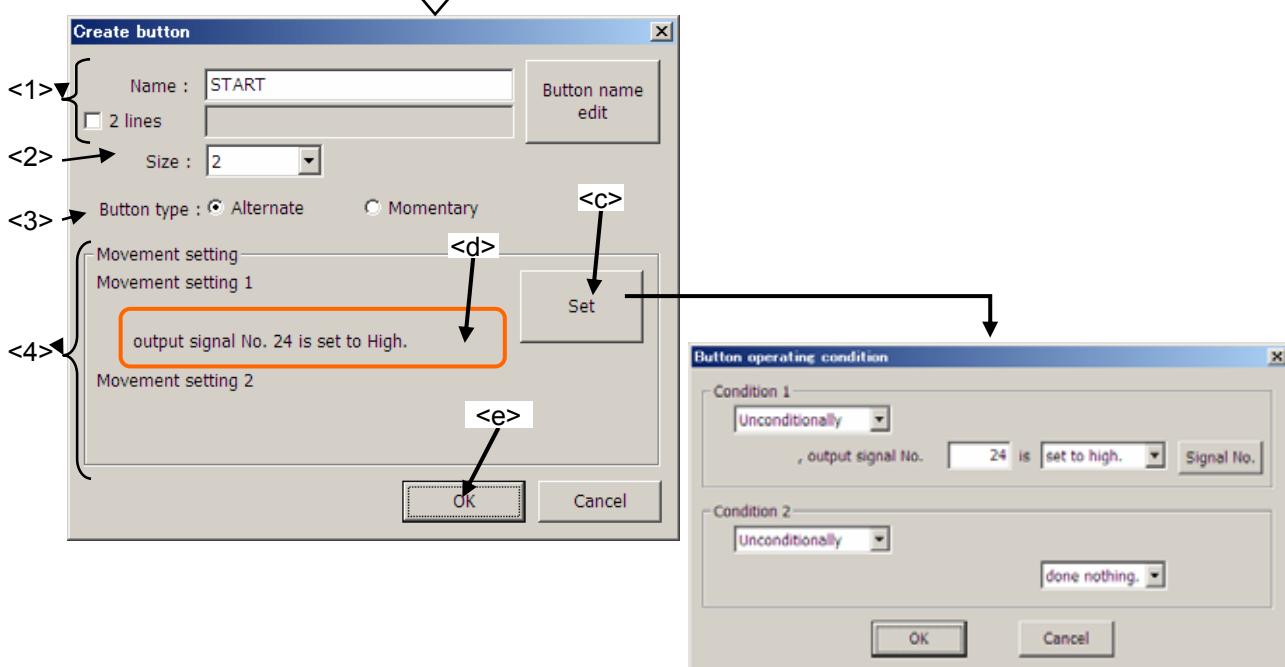
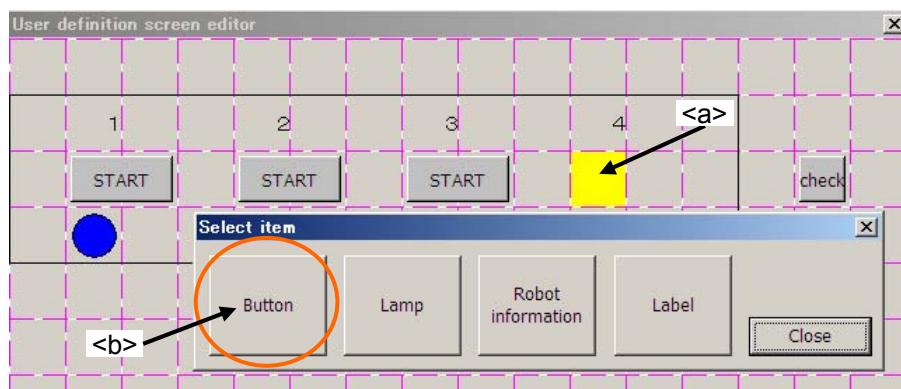
The grid line (<a>) is displayed in the edit display of the user definition screen. Each part can be registered with the block unit () delimited in this grid line.



- <1> Name : Page name is set. The name can be input by [Edit] button.
- <2> Line : The ruled line is drawn on "User definition screen".
- <3> Save : The content of the edit is preserved.
- <4> Close : The edit display is closed. When it closes without preserving, the attention message is displayed.

19.1.5.1. Button

- (1) Click the position (block) in which the button is made (<a>). Left side of the button is arranged in this position.
- (2) After "Select item" window is displayed, click [Button] button ().
- (3) Set the button name, button size and the kind of button on "Create button" windows.
- (4) The movement of when the button is clicked is set by [Set] button (<c>). The set content is displayed in "Movement setting" (<d>).
- (5) After the setting is completed, click [OK] button (<e>).



<1> Name : The name of the button is set.
The button name can be input by [Button name edit] button.
The button name can be displayed by two lines by checking "2 lines".

<2> Size : The width of the button can be set.
The width of the button that can be set is 1/2/3.



<3> Button type :	The kind of the button can be set.				
	<table border="1"> <tr> <td>Alternate</td><td>When the button is clicked once, the button keeps ON state. And when the button is clicked again, it returns to OFF state. The signal output is kept too.</td></tr> <tr> <td>Momentary</td><td>The button keeps ON state while it is being pushed.</td></tr> </table>	Alternate	When the button is clicked once, the button keeps ON state. And when the button is clicked again, it returns to OFF state. The signal output is kept too.	Momentary	The button keeps ON state while it is being pushed.
Alternate	When the button is clicked once, the button keeps ON state. And when the button is clicked again, it returns to OFF state. The signal output is kept too.				
Momentary	The button keeps ON state while it is being pushed.				

<4> Movement setting : The condition and the signal output operation when the button ON can be set.

The condition can be selected as follows. Please set the signal number etc. when you make the signal state the condition. When the button is ON or OFF, the condition is judged.

- Unconditionally
- State of the specified Input signal
- State of the specified output signal

The signal output operation can be selected as follows. Please set the signal number etc. when you output the signal.

- Done nothing
- Output the specified output signal

Operation setting can be set up to two.

Two operation settings operate individually by using each condition.

Moreover, when High and Low are set to output to the same signal, and both conditions become true, the Condition2 is given priority.

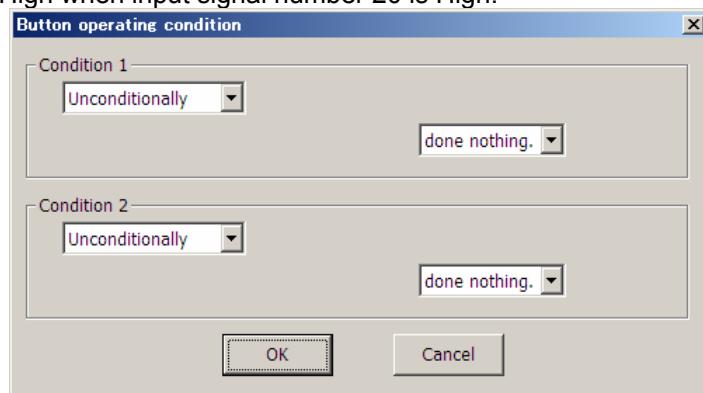
If the operation is set signal output, when the button is OFF, the signal is output in the state opposite High/Low state at the time of ON.

Example of setting the movement of button

For example:

The button that output signal number 20 to High when input signal number 20 is High.

(1) A default value of "Button operating condition" window is shown in a right picture.

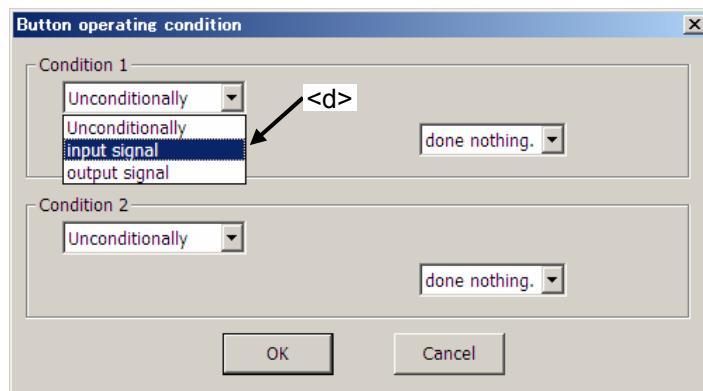


(2) Set the condition of operation.

Click <d>, and select the signal type.

When things except "Unconditionally" are selected, the input area of signal number and the combo box to select the state are displayed.

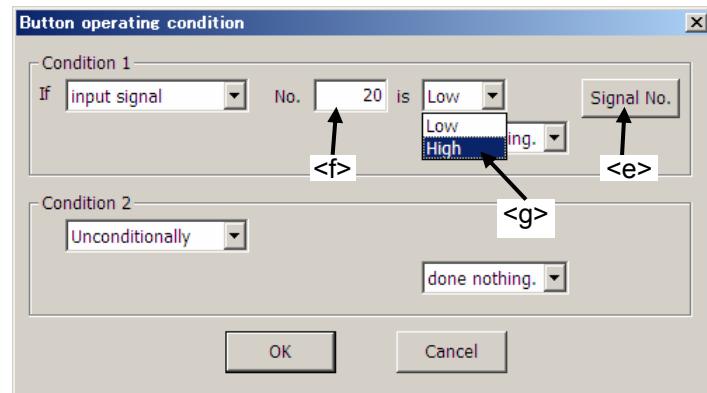
Now, select "input signal".



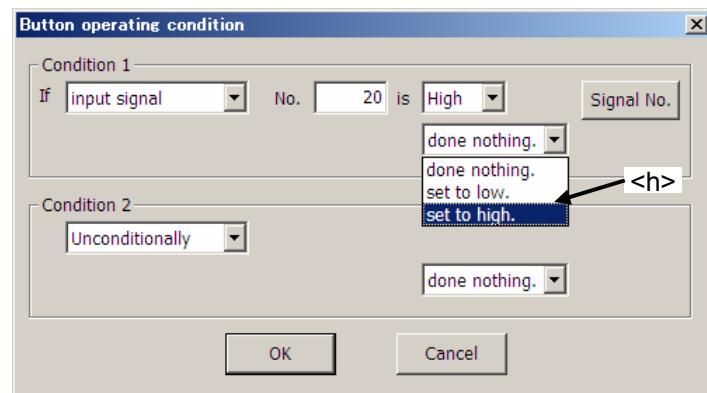
(3) Click [Signal No.] button (<e>), and input "20" to signal number (<f>).

Click the state of the signal (<g>), and select "High".

Now, select "Input signal".



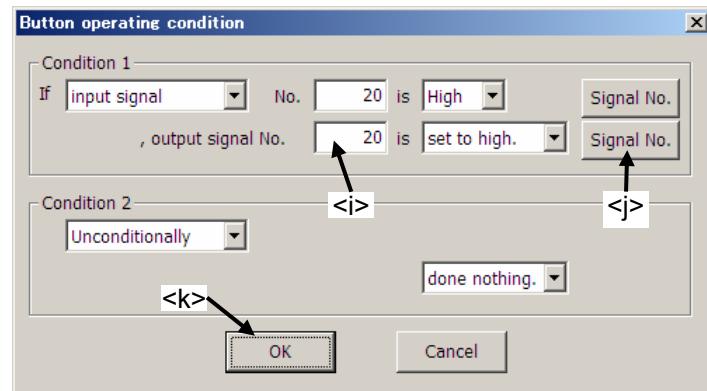
(4) Select "High" as signal operation of when clicking on a button (<h>).



(5) The input area of output signal number is displayed.

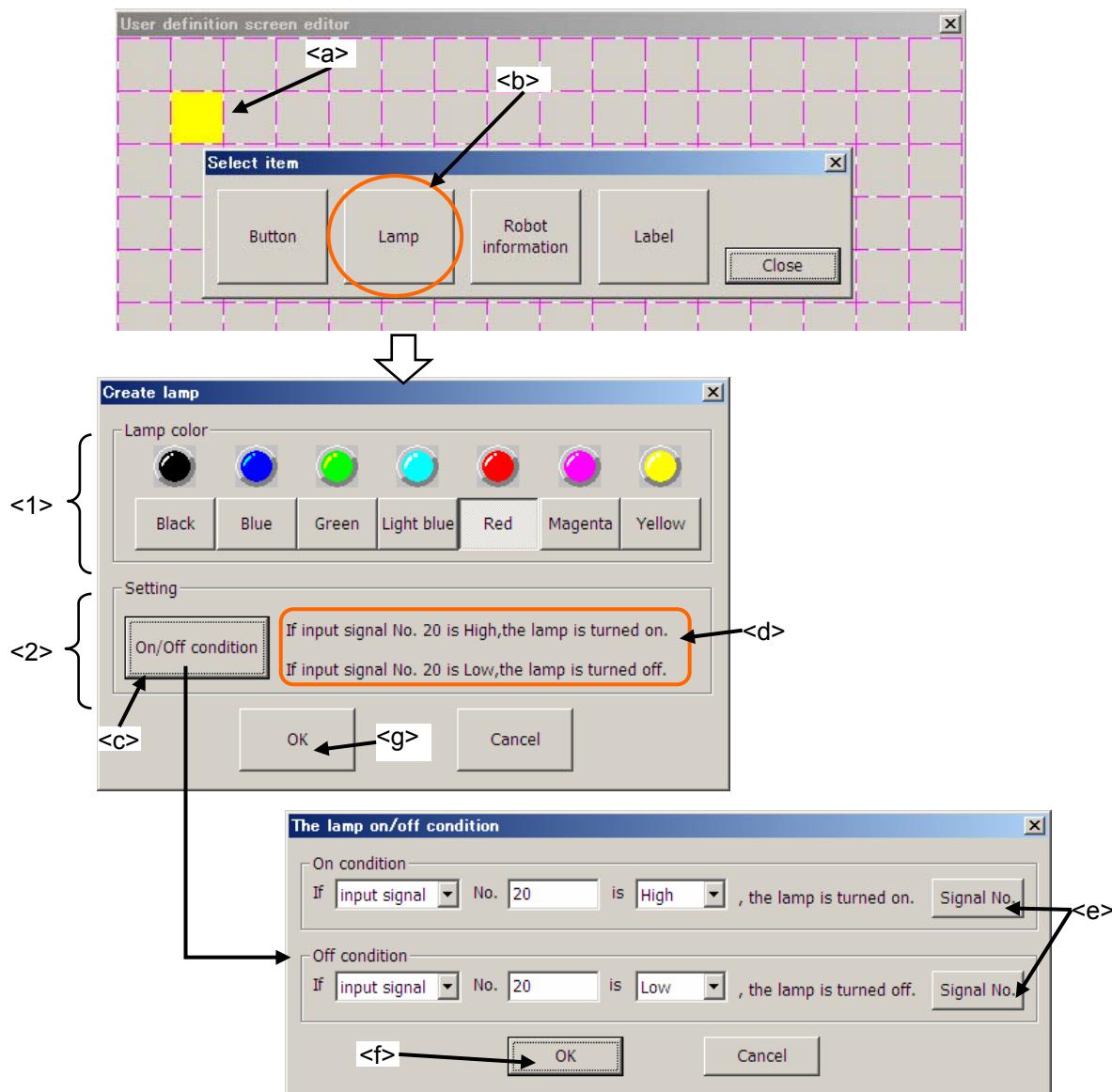
Click [Signal No.] button (<j>), and input "20" to the signal number (<i>).

(6) After the setting is completed, click [OK] button (<k>).



19.1.5.2. Lamp

- (1) Click the position (block) in which the lamp is made (<a>). The lamp is arranged at this position.
- (2) After "Select item" window is displayed, click [Lamp] button ().
- (3) Select the lighting color of the lamp on "Create lamp" window.
- (4) Click [On/Off condition] button (<c>), and set the lighting condition and the turning off condition on "The lamp on/off condition" window.
Signal number can be set by [Signal No.] button (<e>). After setting the lighting condition and the turning off condition, click [OK] button (<f>). The set content is displayed (<d>) in the right of the [On/Off condition] button.
- (5) After setting the lamp color and lighting condition and the turning off condition, click [OK] button (<g>).



<1> Lamp color
<2> Setting

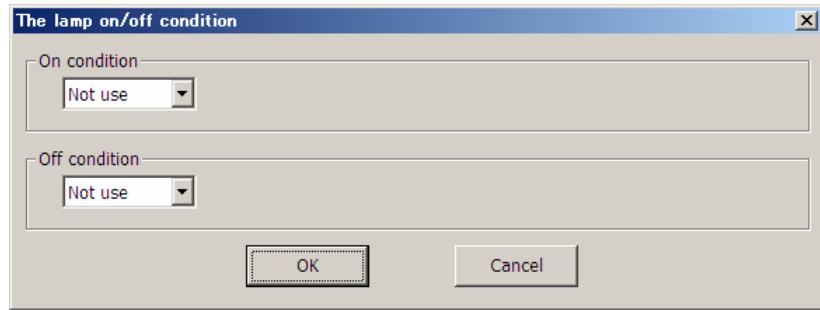
- : The lighting color of the lamp can be selected.
- : The condition of turning on / turning off the lamp can be set.
If only one condition is set, the lamp is operated like the other condition is set the opposite High/Low state to the same signal number.
Moreover, when both the ON condition and the OFF condition are true, the ON condition is given priority.

Example of setting lamp ON/OFF

For example:

Lamp that is turned on when the input signal number 20 is High, and is turned off when the input signal number 20 is Low.

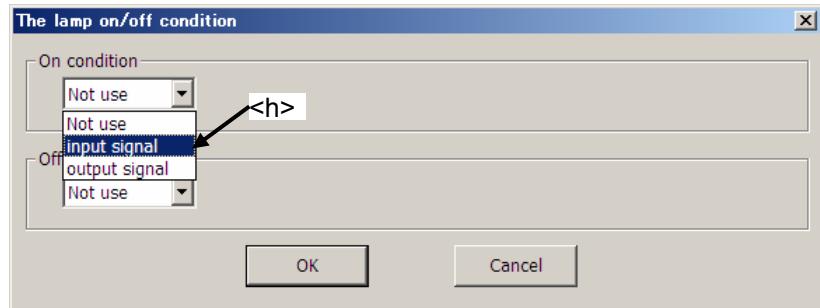
- (1) A default value of “The Lamp on/off condition” window is shown in a right picture.



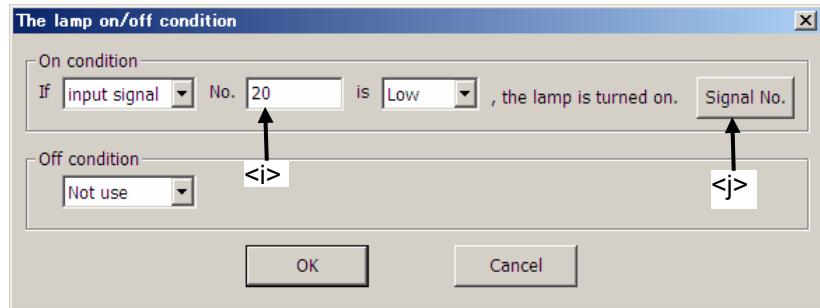
- (2) Set “On condition”.

Click <h>, and Select the signal type.

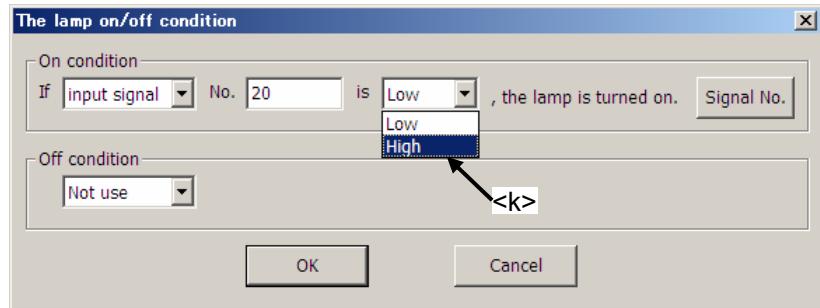
Now, select “input signal”.



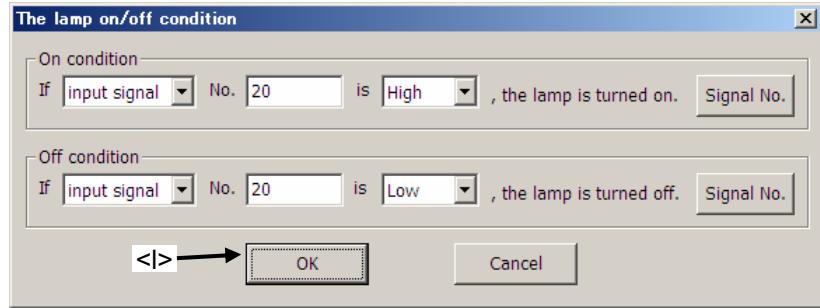
- (3) Click [Signal No.] button (<j>), and set “20” to signal number (<i>).



- (4) Select "High" (<k>), as a state of signal to light the lamp.



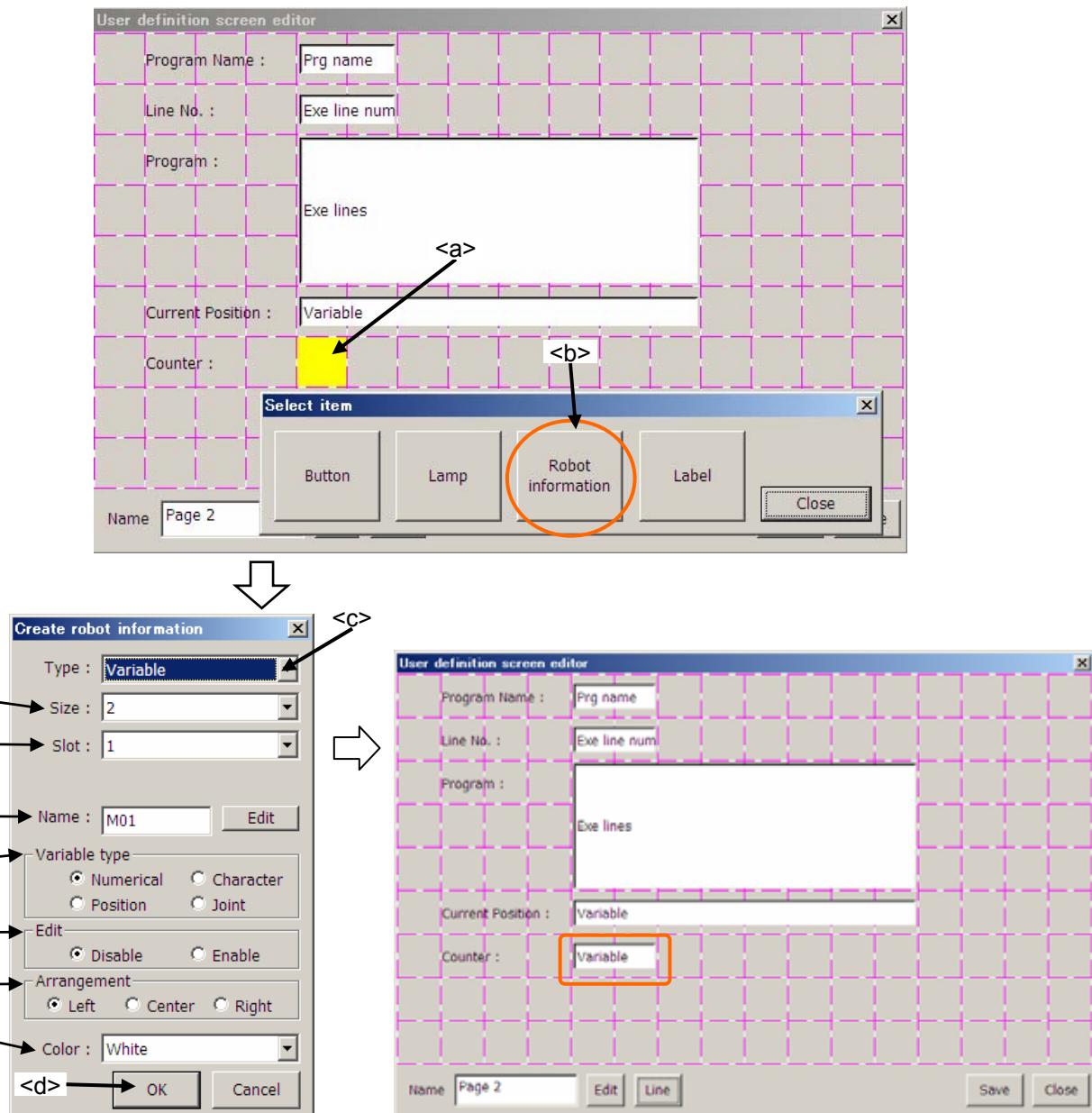
- (5) Similarly, set the condition for turning off the lamp, and click [OK] button (<l>).



19.1.5.3. Variable

The value of the specified variable is displayed.

- (1) Click the position (block) in which the variable is displayed (<a>). Left side of the variable is arranged in this position.
- (2) After "Select item" window is displayed, click [Robot information] button ().
- (3) Select "variable" (<c>) as the type on "Create robot information" window.
- (4) After setting the information of the variable, click [OK] button (<d>).

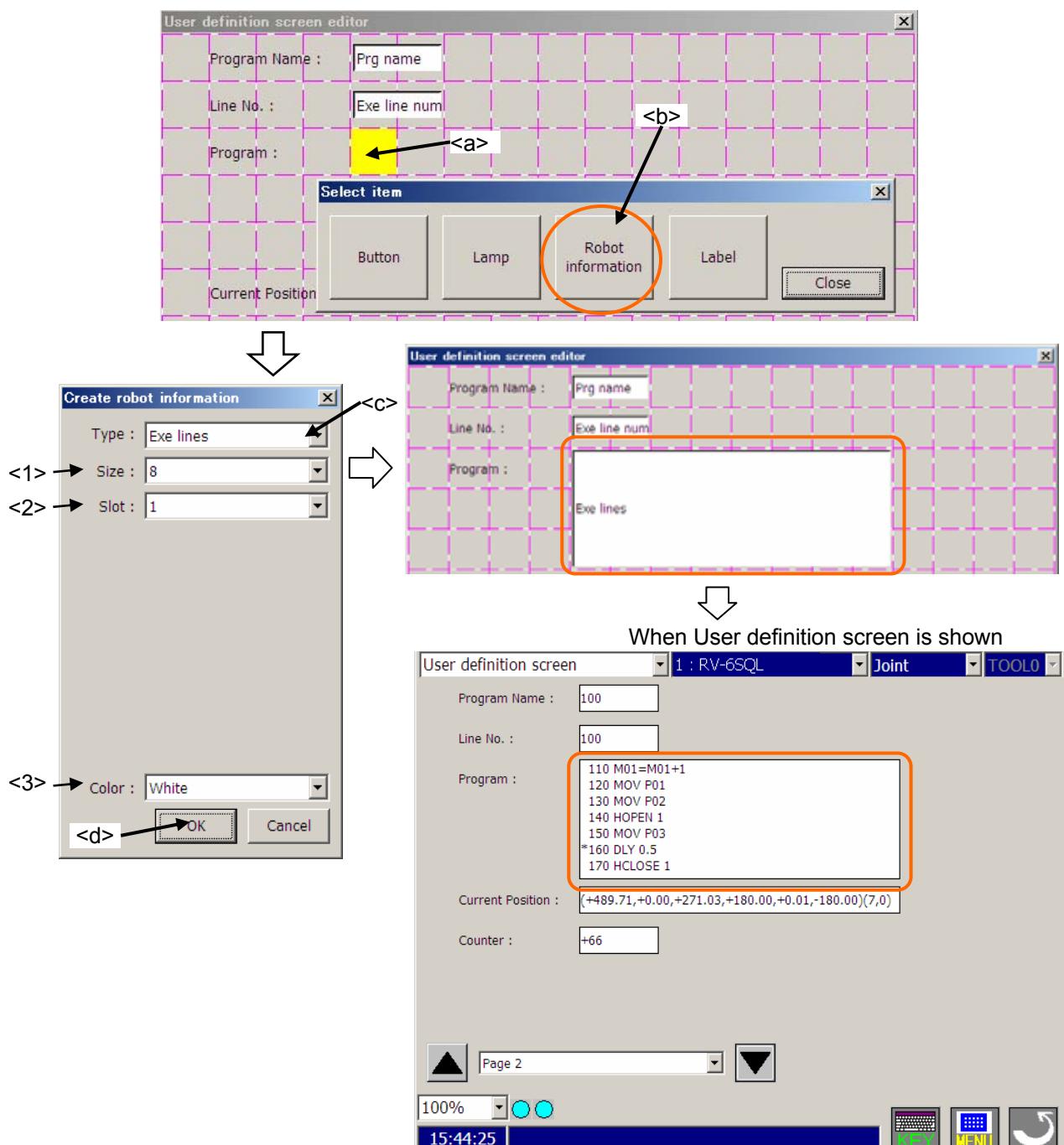


- | | |
|-------------------|---|
| <1> Size | : Set the width of box in which the variable is displayed. The value from 1 to 16 can be set. |
| <2> Slot | : Select task slot number for which the variable is used. The range of slot number that can be set is different according to the system that uses it. |
| <3> Name | : Set the variable name. Robot Status Variable also can be set. The name is input by [Edit] button. |
| <4> Variable type | : Select the variable type. |
| <5> Edit | : Select the edit permission of the variable. When set Enable, while displaying this screen, you can change the value of this variable by touching this parts and displaying the input value screen. (Only at T/B state is enabling.) |
| <6> Arrangement | : Select the position in which the variable is arranged. |
| <7> Color | : Select the background color of the area where the variable is displayed. |

19.1.5.4. Program execution content

The content of the program being executed is displayed. The amount of 7 lines, the execution line, upper 3 lines and lower 3 lines, are displayed.

- (1) Click the position (block) in which the content of the program is displayed (<a>). Left side of the content of the program is arranged in this position.
- (2) After "Select item" window is displayed, click [Robot information] button ().
- (3) Select "Exe line" (<c>) as the type on "Create robot information" window.
- (4) After setting the information on the content of the program, click [OK] button (<d>).

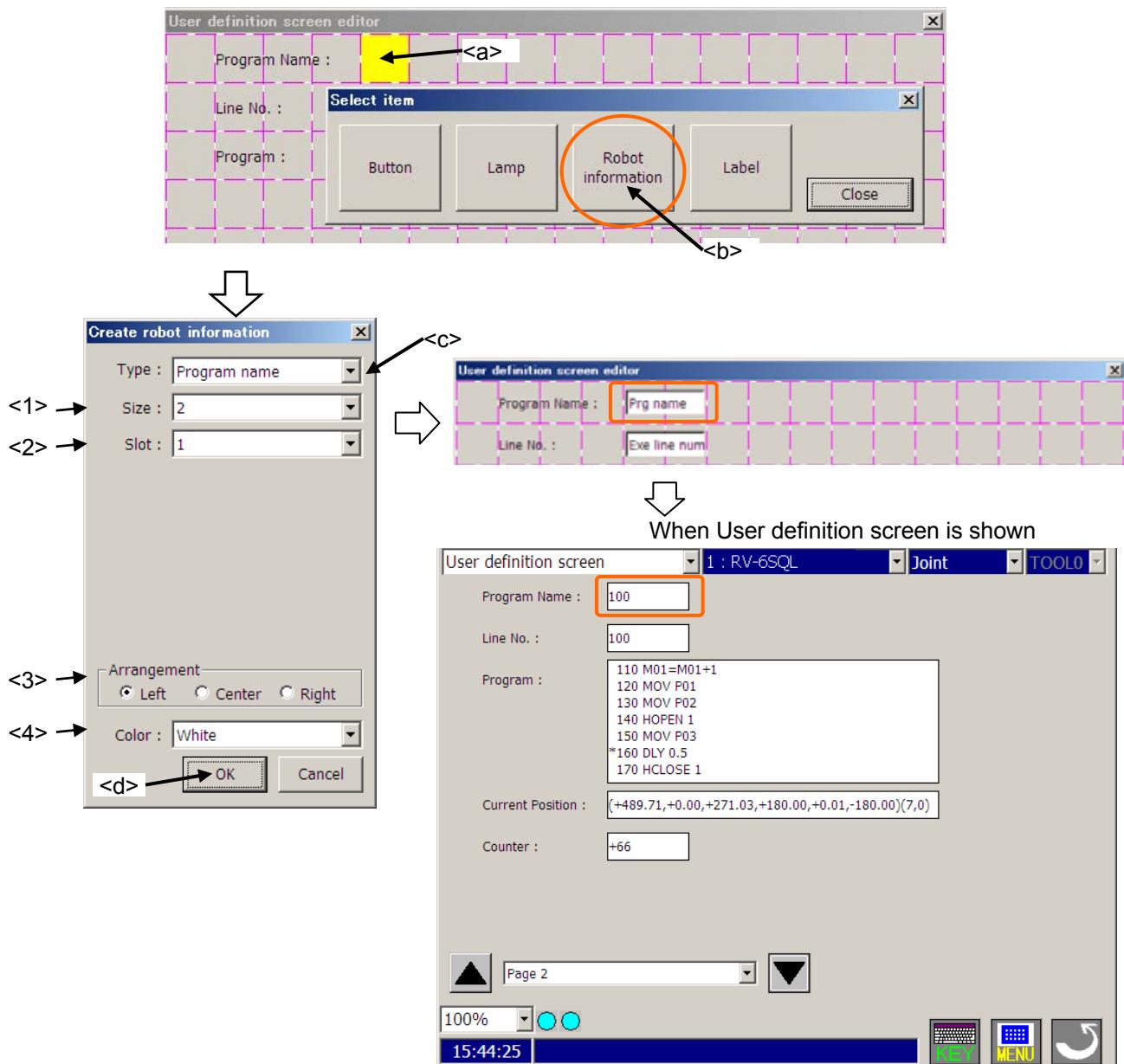


- | | |
|-----------|--|
| <1> Size | : Set the width of box in which the content of program is displayed. The value from 1 to 16 can be set. |
| <2> Slot | : Select task slot number for which the program is executed. The range of slot number that can be set is different according to the system that uses it. |
| <3> Color | : Select the background color of the area where the content of program is displayed. |

19.1.5.5. Program name

The name of program being executed is displayed.

- (1) Click the position (block) in which program name is displayed (<a>). Left side of the box is arranged in this position.
- (2) After "Select item" window is displayed, click [Robot information] button ().
- (3) Select "Program name" (<c>) as the type on "Create robot information" window.
- (4) After setting the information of program name, click [OK] button (<d>).

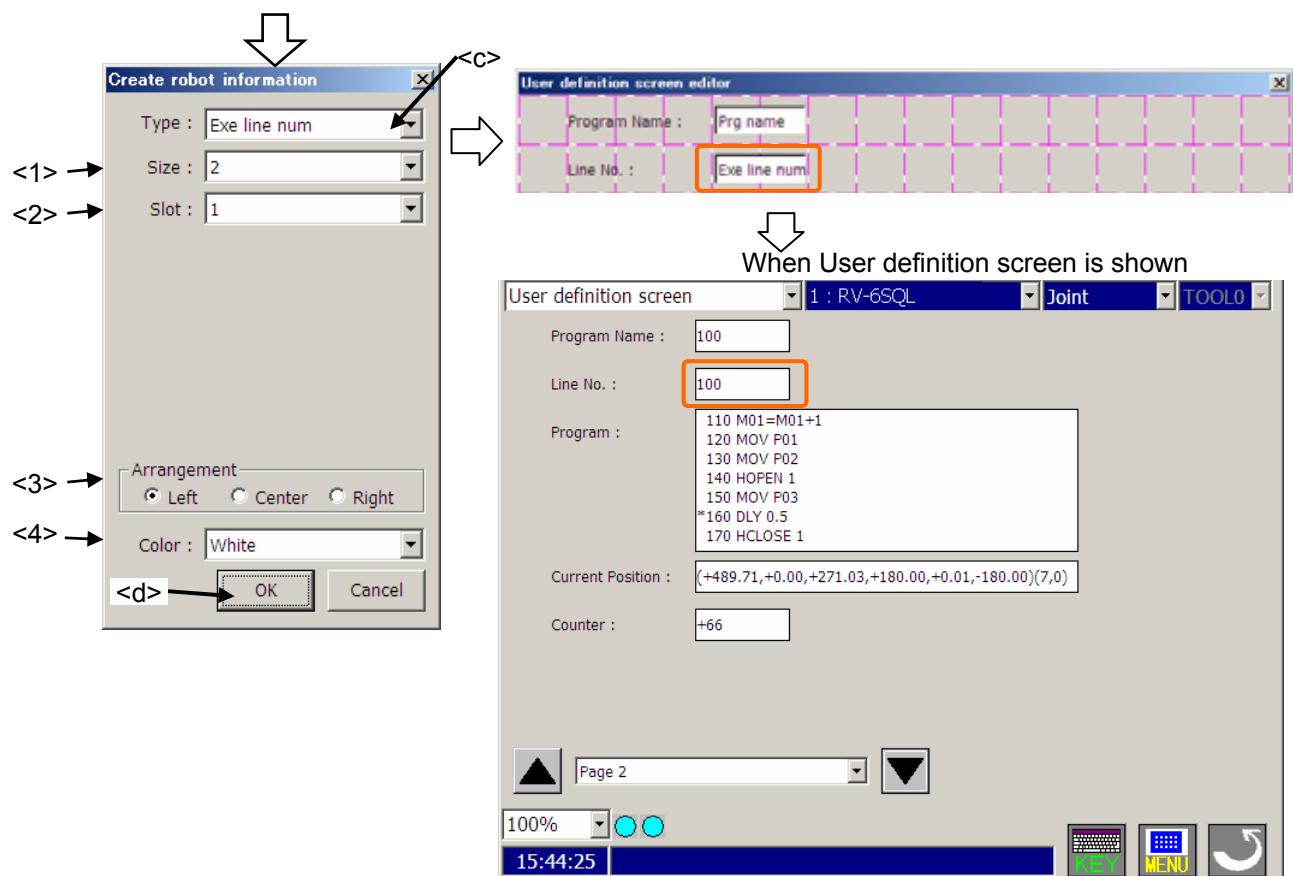
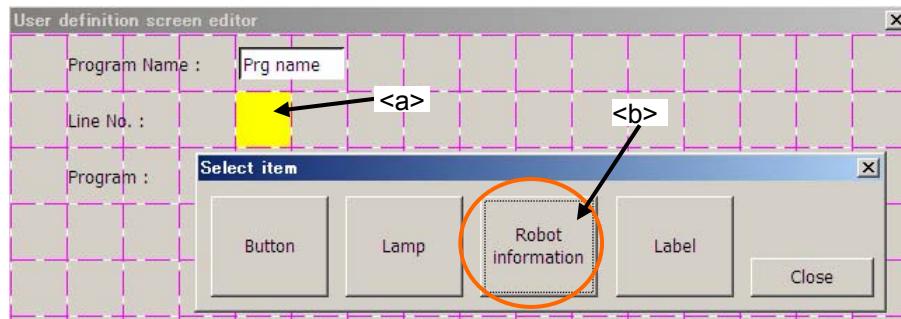


- | | |
|-----------------|--|
| <1> Size | : Set the width of box in which program name is displayed. The value from 1 to 16 can be set. |
| <2> Slot | : Select task slot number for which the program is executed. The range of slot number that can be set is different according to the system that uses it. |
| <3> Arrangement | : Select the position in which the program name is arranged. |
| <4> Color | : Select the background color of the area where the program name is displayed. |

19.1.5.6. Execution line number of program

The line number of program being executed is displayed.

- (1) Click the position (block) in which execution line number is displayed (<a>). Left side of the box is arranged in this position.
- (2) After "Select item" window is displayed, click [Robot information] button ().
- (3) Select "Exe line num" (<c>) as the type on "Create robot information" window.
- (4) After setting the information of execution line number, click [OK] button (<d>).



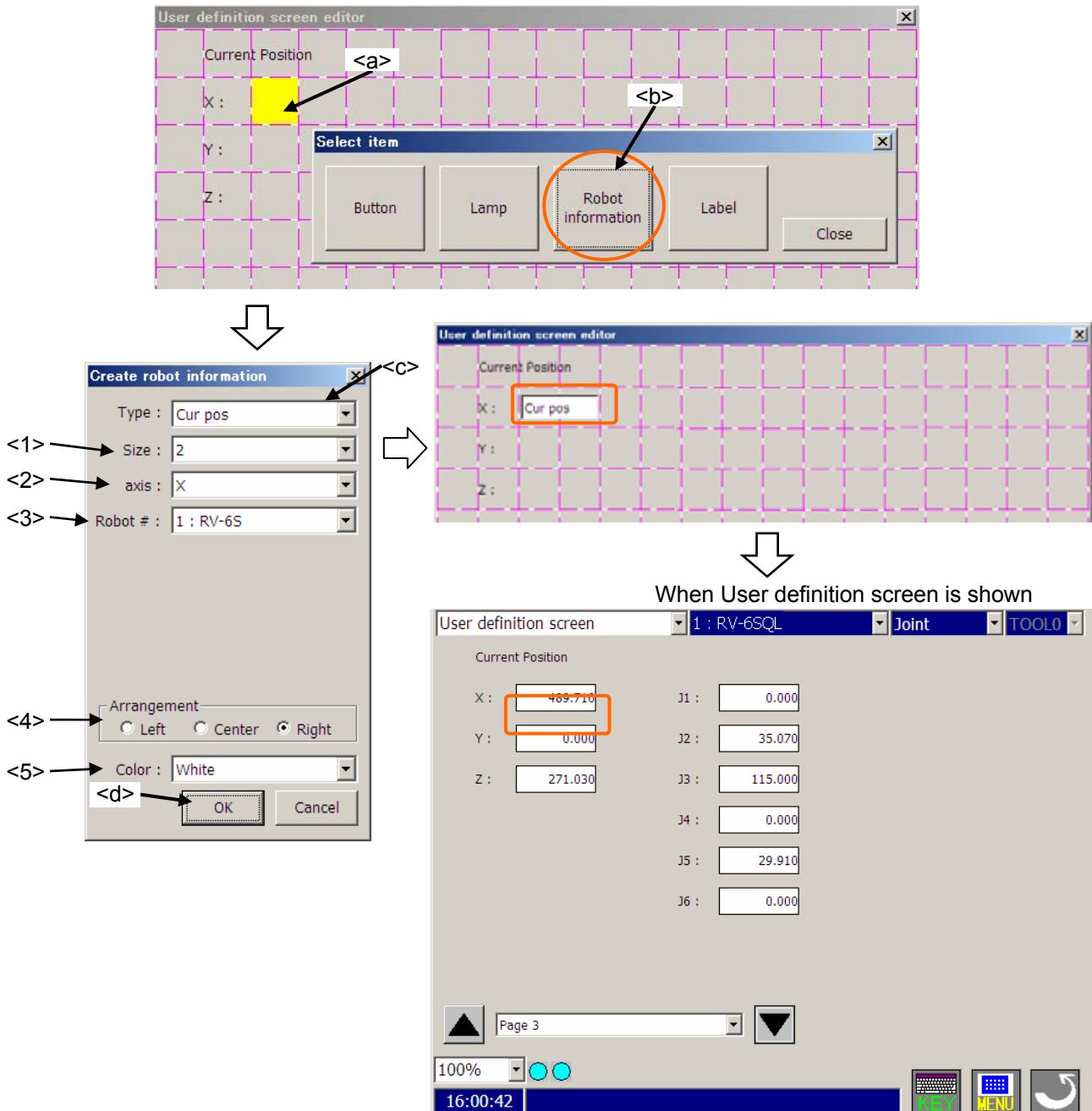
- | | |
|--|--|
| <1> Size
<2> Slot
<3> Arrangement
<4> Color | <ul style="list-style-type: none"> : Set the width of box in which execution line number is displayed. The value from 1 to 16 can be set. : Select task slot number for which the program is executed. The range of slot number that can be set is different according to the system that uses it. : Select the position in which execution line number is arranged. : Select the background color of the area where execution line number is displayed. |
|--|--|

19.1.5.7. Current position data (cartesian type)

The current position data of robot is displayed with each cartesian type axis.

If you want to display the current position data (cartesian type) all together, please use "Variable" type and set the Robot Status Variable "P_CURR". Please refer to "[19.1.5.3 Variable](#)" for details.

- (1) Click the position (block) in which the current position data is displayed (<a>). Left side of the box is arranged in this position.
- (2) After "Select item" window is displayed, click [Robot information] button ().
- (3) Select "Cur pos" (<c>) as the type on "Create robot information" window.
- (4) After setting the information of the current position data (cartesian type), click [OK] button (<d>).



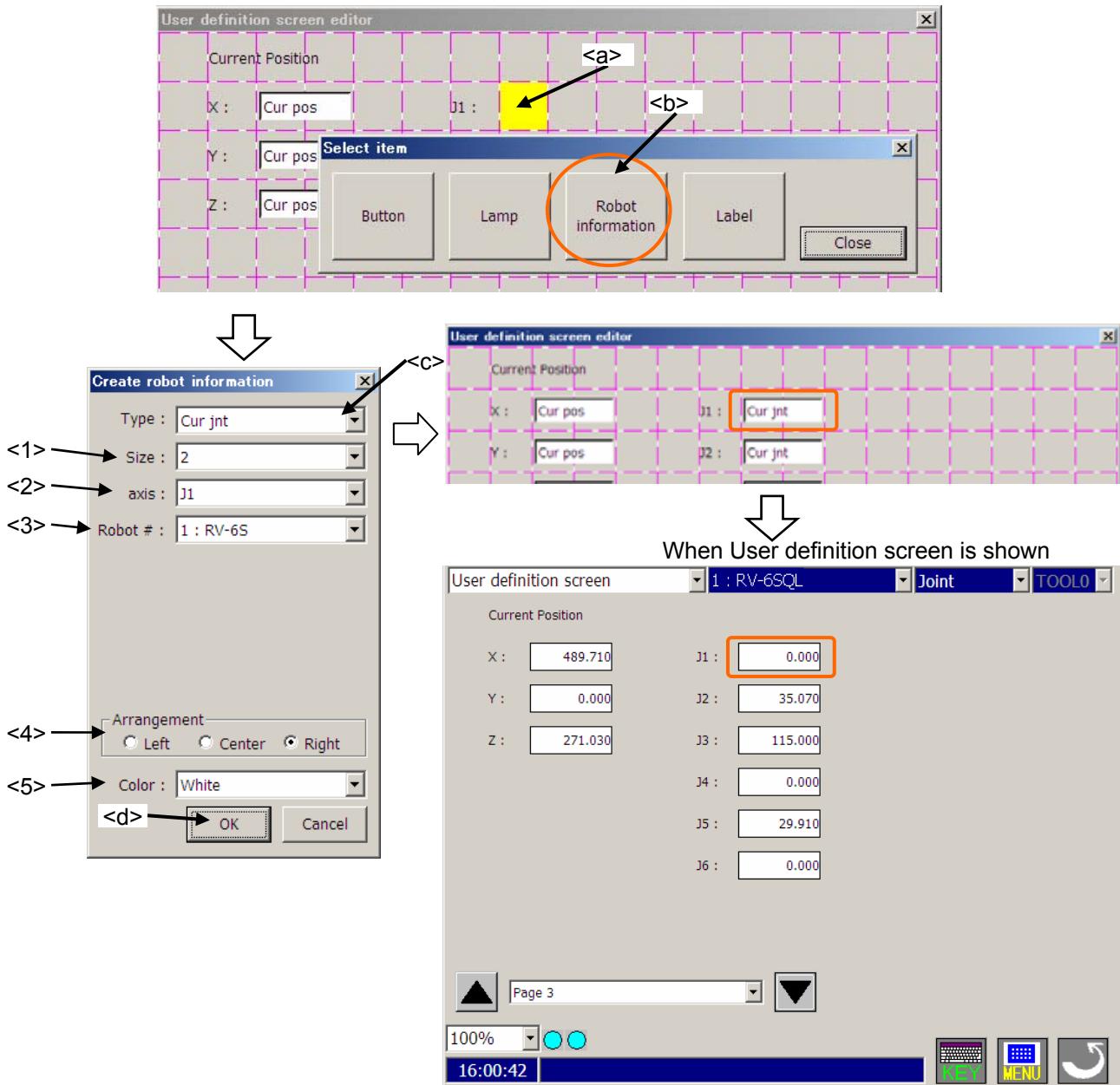
- | | |
|-----------------|---|
| <1> Size | : Set the width of box in which the current position data (cartesian type) is displayed. The value from 1 to 16 can be set. |
| <2> axis | : Select the displayed axis of the current position data (cartesian type). |
| <3> Robot # | : Select the robot number which displays the current position data. |
| <4> Arrangement | : Select the position in which the current position data (cartesian type) is arranged. |
| <5> Color | : Select the background color of the area where the current position data (cartesian type) is displayed. |

19.1.5.8. Current position data (joint type)

The current position data of robot is displayed with each joint type axis.

If you want to display the current position data (joint type) all together, please use "Variable" type and set the Robot Status Variable "J_CURR". Please refer to "[19.1.5.3 Variable](#)" for details.

- (1) Click the position (block) in which the current position data is displayed (<a>). Left side of the box is arranged in this position.
- (2) After "Select item" window is displayed, click [Robot information] button ().
- (3) Select "Cur jnt" (<c>) as the type on "Create robot information" window.
- (4) After setting the information of the current position data (joint type), click [OK] button (<d>).

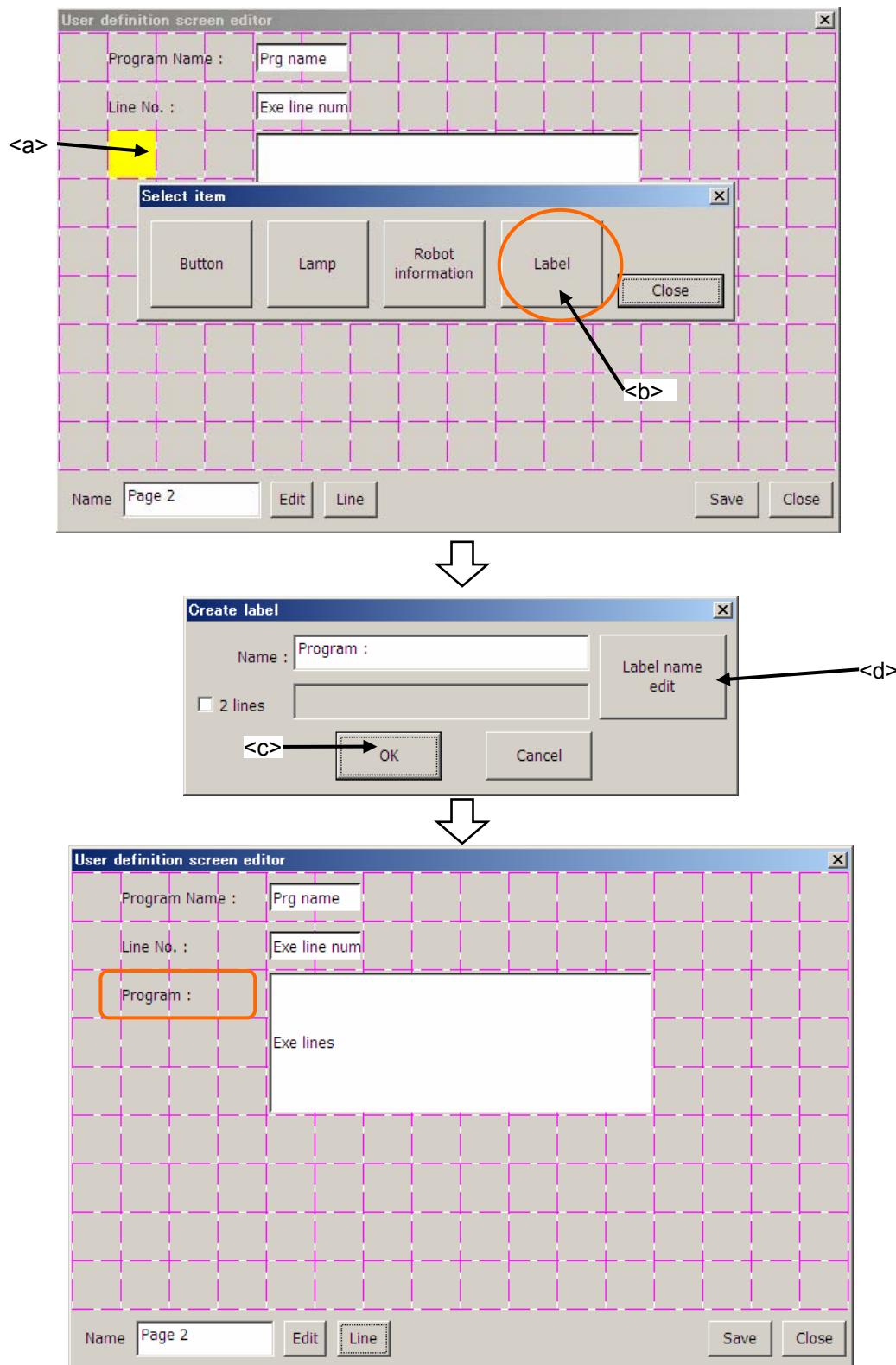


- | | |
|-----------------|---|
| <1> Size | : Set the width of box in which the current position data (joint type) is displayed. The value from 1 to 16 can be set. |
| <2> axis | : Select the displayed axis of the current position data (joint type). |
| <3> Robot # | : Select the robot number which displays the current position data. |
| <4> Arrangement | : Select the position in which the current position data (joint type) is arranged. |
| <5> Color | : Select the background color of the area where the current position data (joint type) is displayed. |

19.1.5.9. Label

The label can be displayed at the specified position.

- (1) Click the position (block) in which the label is made (<a>). The label is arranged in this position.
- (2) After "Select item" window is displayed, click [Label] button ().
- (3) After setting the label on "Create label" window, click [OK] button (<c>). The label name is set by [Label name edit] button (<d>).



19.1.5.10. Save and end of editing user definition screen

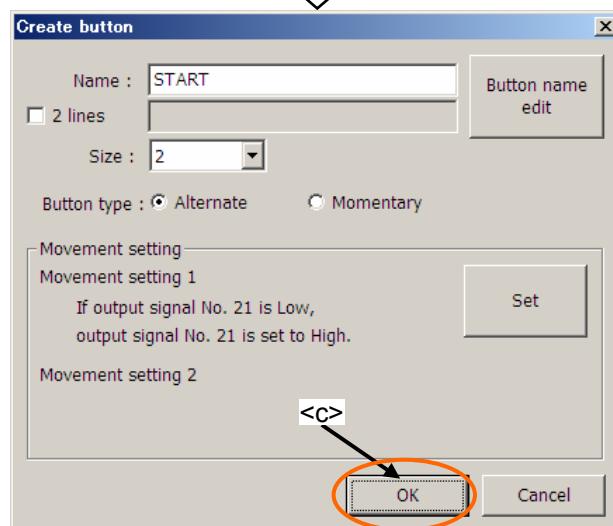
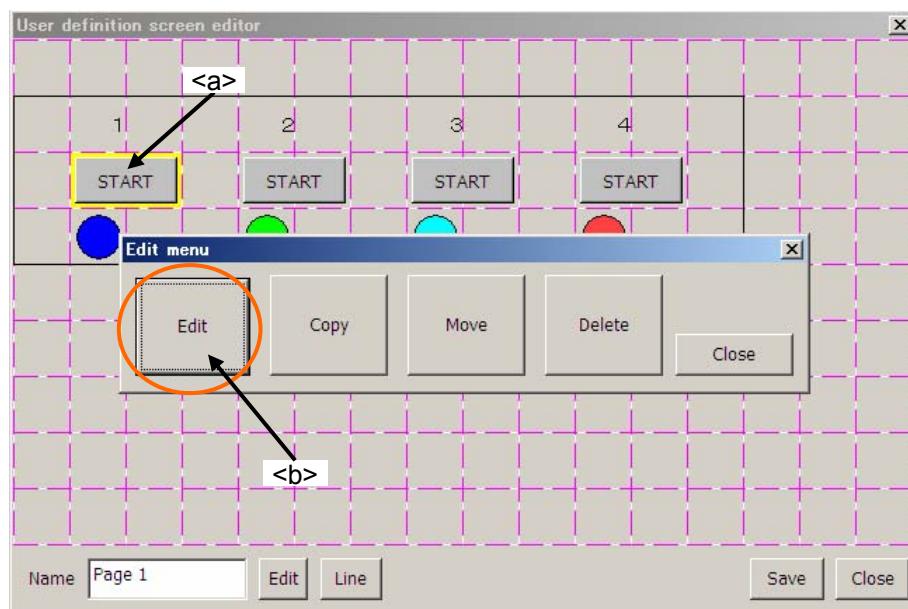
After the editing of user definition screen is completed, click [Save] button (<a>). To end the edit, click [Close] button ().



19.1.6. Edit of existing parts

Edit of existing parts is as follows:

- (1) Click a part which is edited (<a>).
- (2) After "Edit menu" window is displayed, Click [Edit] button ().
- (3) The edit displays of selected parts are displayed. After changing contents, click [OK] button (<c>).



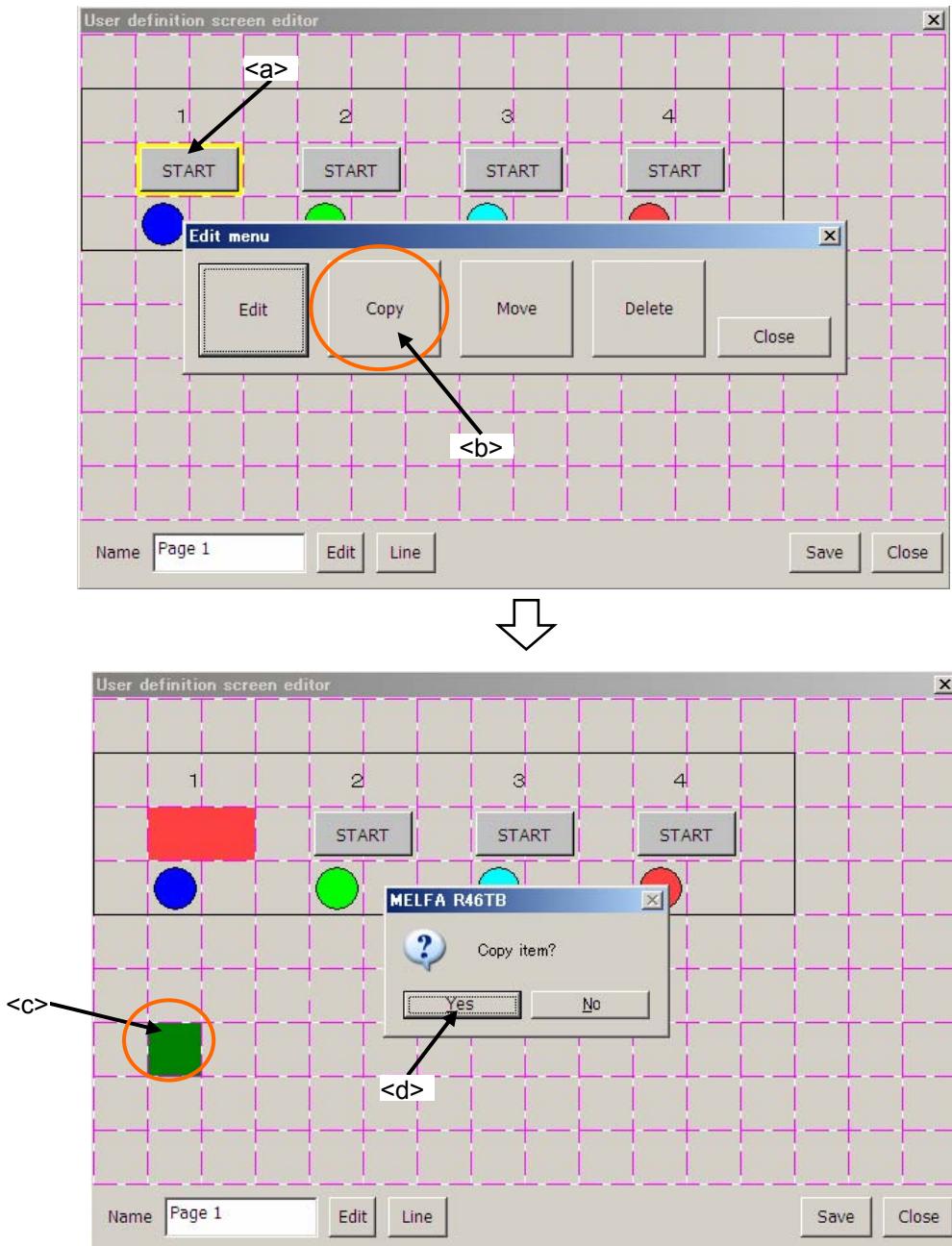
<c>

<c></

19.1.7. Copy/movement of parts

Parts can be copied or be moved.

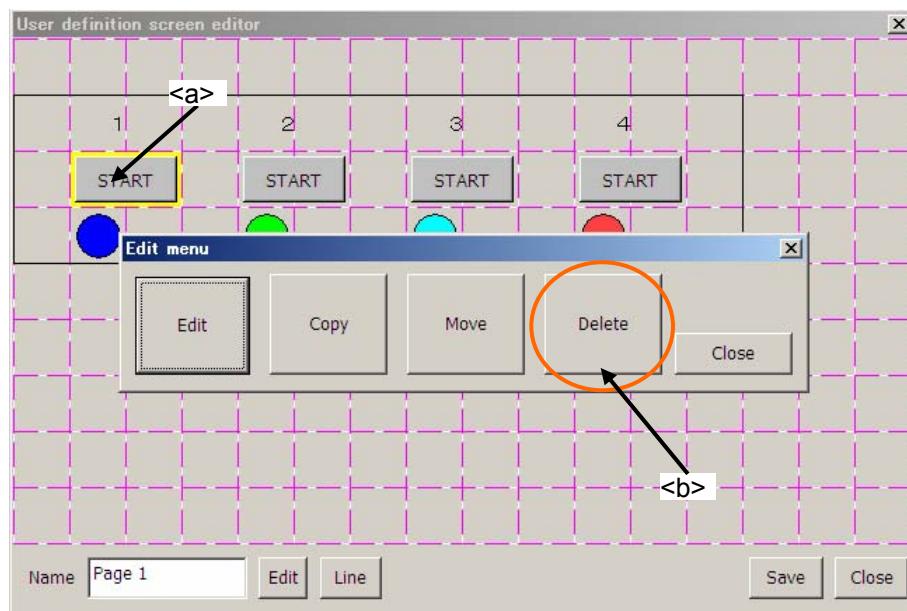
- (1) Click the part to copy, and select it (<a>).
- (2) After "Edit menu" window is displayed, click [Copy] button (). When parts are moved, click [Move] button.
- (3) Click the position(block) where the part is copied onto (moved to).
At this time, the current position(block) of part is red, and the position(block) where the part is copied onto is green. Click [Yes] button (<d>) on the confirmation message.



19.1.8. Deletion of parts

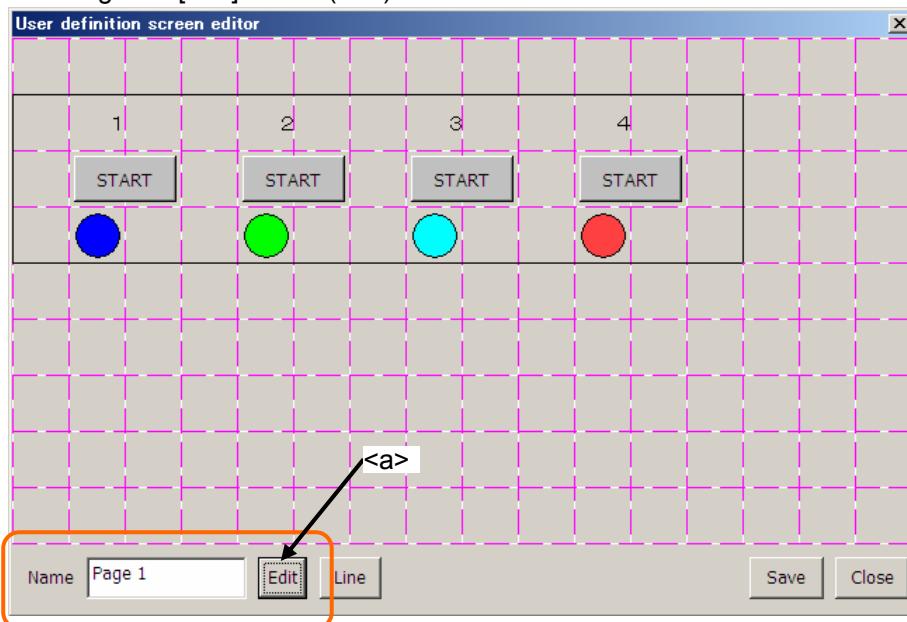
Parts can be deleted.

- (1) Click the part to delete, and select it (<a>).
- (2) After "Edit menu" window is displayed, click [Delete] button ().
- (3) Click [Yes] button on the confirmation message.



19.1.9. Change of page name

Page name can be changed in [Edit] button (<a>) under the left of the window.



Caution

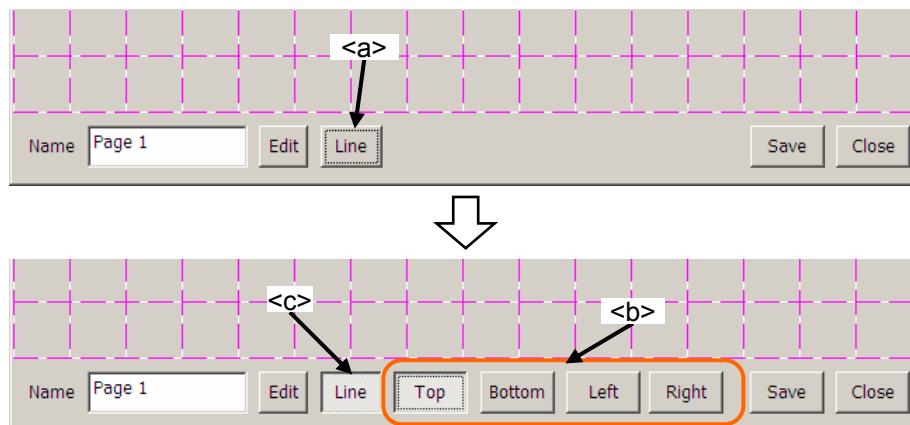
When page name that has already been registered is input, it becomes an error.

19.1.10. Edit of ruled line

The ruled line can be drawn on the user definition screen.

19.1.10.1. Drawing the ruled line

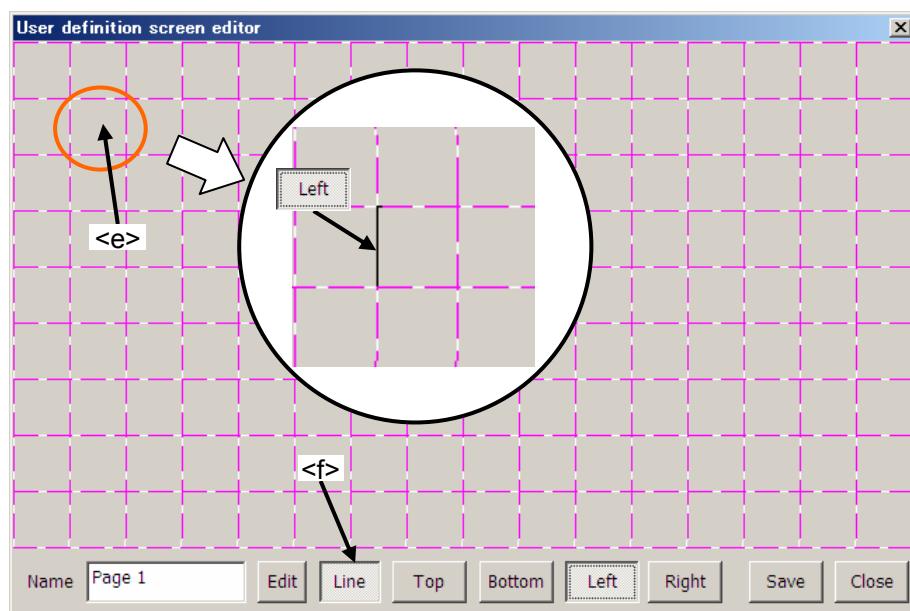
- (1) Click [Line] button (<a>) on the window.
- (2) The button ("[Top],[Bottom],[Left],[Right]") () for the ruled line is displayed in the right of [Line] button. These buttons to draw the ruled line disappear when [Line] button (<c>) is clicked again.



- (3) Select the kind of ruled line (<d>). Only one kind of the ruled line can be selected.



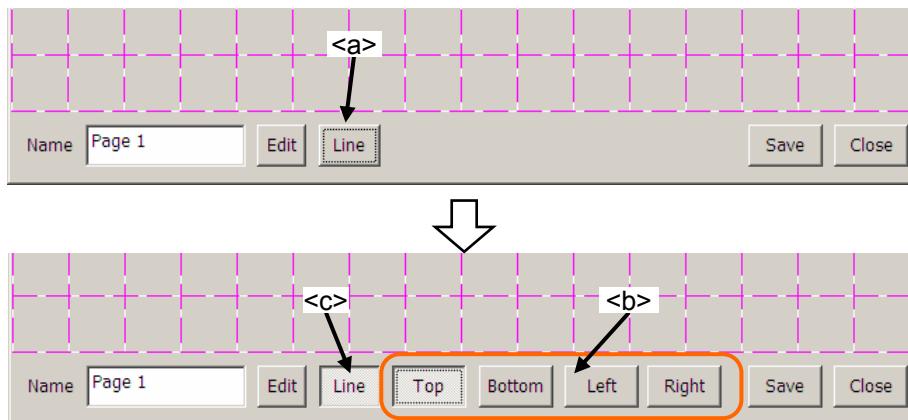
- (4) Click the block (<e>) where the ruled line is drawn. The ruled line of the specified position on the selected block can be drawn.



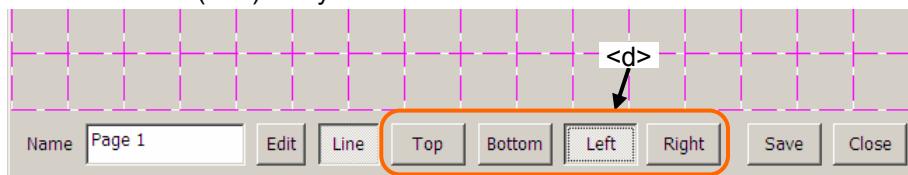
- (5) After editing the ruled line, click [Line] button (<f>) again.

19.1.10.2. Erasing the ruled line

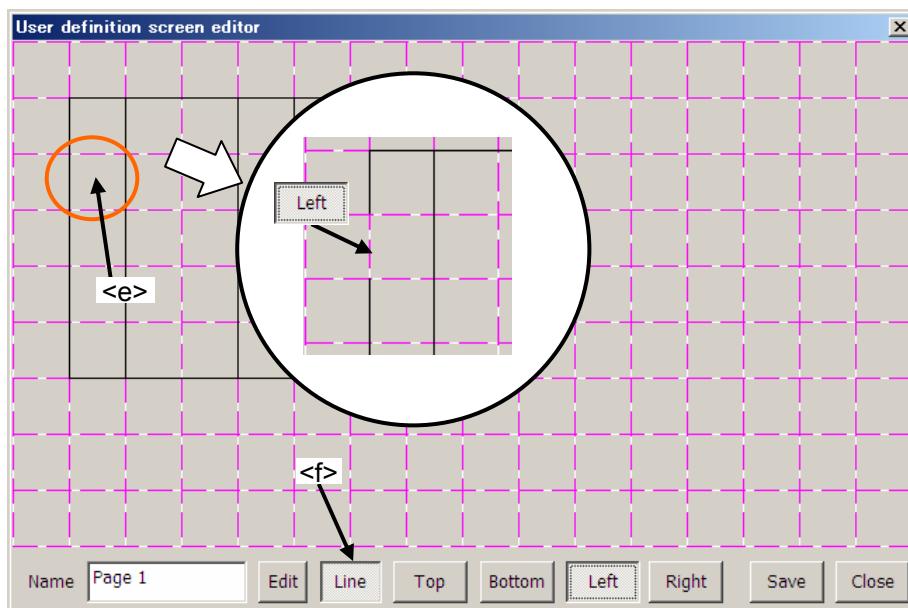
- (1) Click [Line] button (<a>) on the window.
- (2) The button ("[Top],[Bottom],[Left],[Right]") () for the ruled line is displayed in the right of [Line] button. These buttons to draw the ruled line disappear when [Line] button (<c>) is clicked again.



- (3) Select the kind of ruled line (<d>). Only one kind of the ruled line can be selected.



- (4) Click the block (<e>) where the ruled line is erased. The ruled line of the specified position on the selected block can be erased.



- (5) After editing the ruled line, click [Line] button (<f>) again.

19.1.11. Import / Export of page

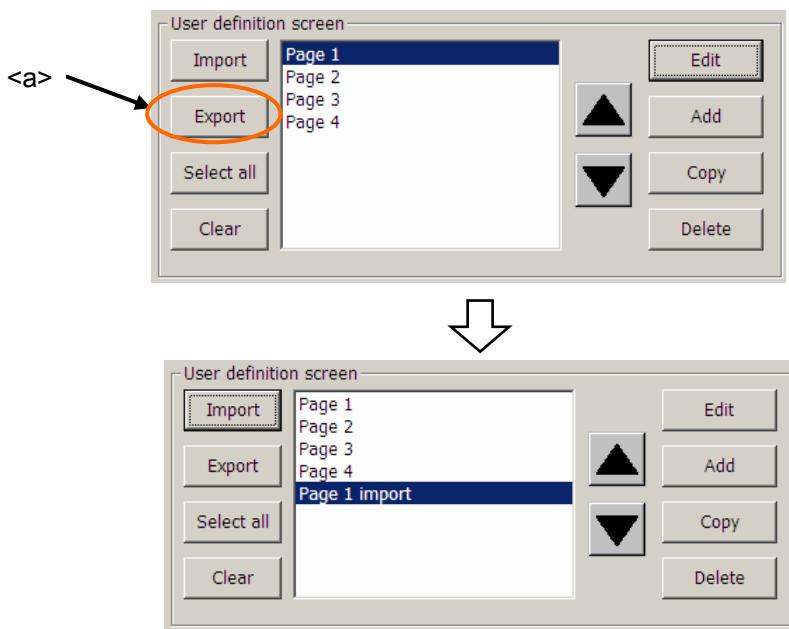
The made user definition screen can be saved in USB memory or can be read from USB memory.

- Import : The user definition screen specified from USB memory is read.
Export : The specified user definition screen is saved in USB memory.

When [Import] button or [Export] button is clicked with USB memory not installed, the error is displayed.

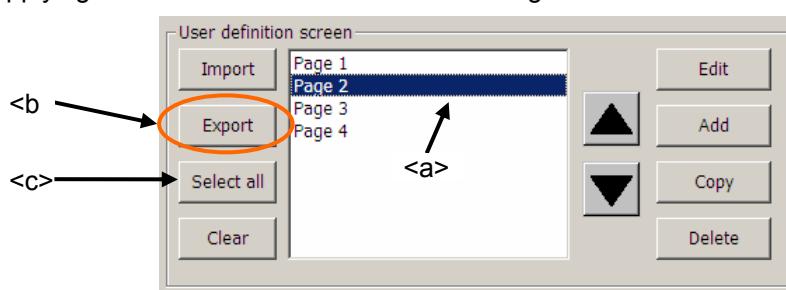
19.1.11.1. Import of page (Reading from USB memory)

- (1) Install the USB memory.
- (2) Click [Import] button (<a>).
- (3) Select the import file in USB memory on "Open" window, and click [open] button.
- (4) The selected user definition screen is added to the list. If the user definition screen of the same name has already been registered in the list, "import" is added to the name of the user definition screen.



19.1.11.2. Export of page(Save to USB memory)

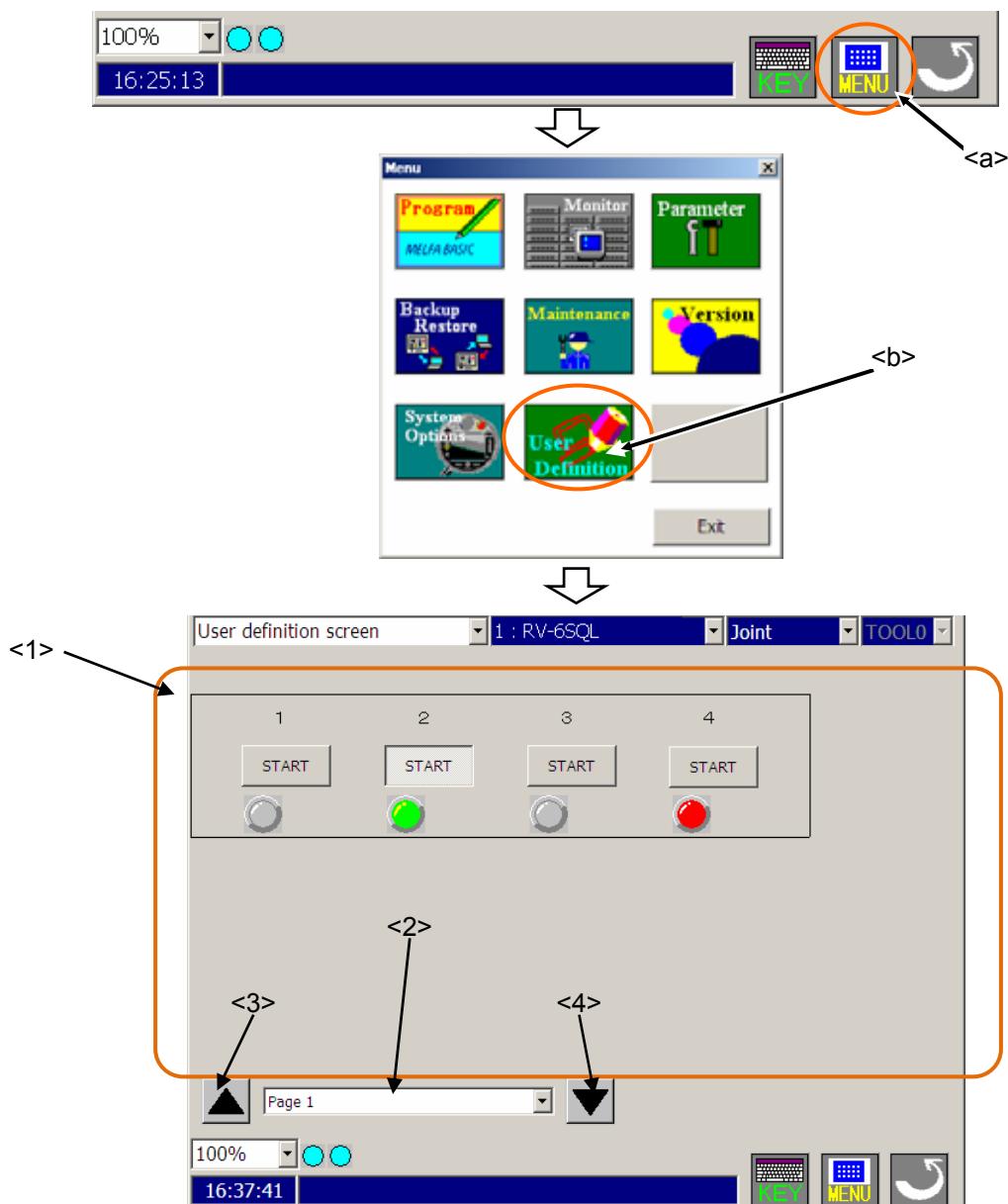
- (1) Install the USB memory.
- (2) Select the user definition screen to export (<a>). If [Select all] button (<c>) was clicked, all the user definition screens can be selected.
- (3) Click [Export] button ().
- (4) Save it applying the file name on the screen for saving.



19.2. Operation of user definition screen

The user definition screen can be displayed by the following operations.

- (1) Click the [MENU] button (<a>) of a T/B screen and display menu panel.
- (2) Click the [User Definition] button () in the menu.
- (3) The user definition screen is displayed.



- <1> User definition screen : The registered user definition screen is displayed.
On this screen, you can change the value of the variable parts set value edit
Enable by touching this parts and displaying the input value screen. (Only at
T/B state is enabling.)
- <2> Page name : The name of the user definition screen is displayed.
- <3> ▲ <4> ▼ : The page is switched.



Caution

The signal can be output only in the T/B enabling state when the button is clicked.

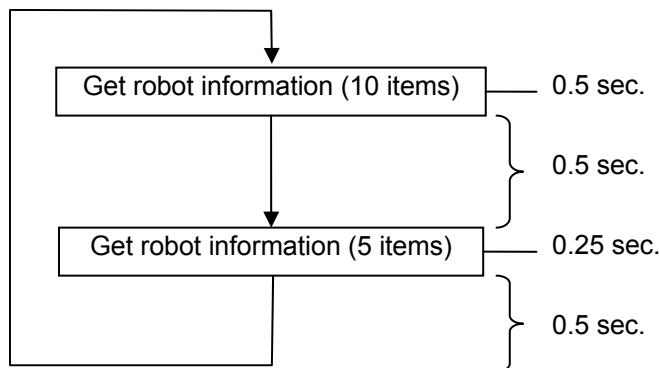
Enable the T/B state when the signal is outputted by the button which registered on the user definition screen. Please note that the signal cannot be output in the T/B disabling state.

The state of the signal can be seen to regardless of the state of T/B.

19.2.1. Mechanism of screen update

It takes 0.5 seconds or less to update the state of the lamp and robot information, and the update which cannot have been updated during that time is done after 0.5 seconds.

For example, it becomes the following if there are 15 information items to update, and 10 items can be dealt by every 0.5 seconds.



While getting robot information, the signal is not outputted by click or touch the button.

- (1) The signal output by the button clicked or touched is delayed 0.5 seconds or less.
- (2) When parts increase, the update interval of the lamp and robot information becomes longer.



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