MITSUBISHI ELECTRIC

Mitsubishi Electric Industrial Robot

CR700 Series Controller
CR800 Series Controller
R86TB Instruction Manual

SAFETY PRECAUTIONS

Read the separate Safety Manual thoroughly before using this product. Take precautions as necessary.

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.
The precautions given in this manual are concerned with this product only. For the safety precautions of the robot system, refer to the user's manual for the peripheral equipment used.
In this manual, the safety precautions are classified into three levels: "⚠ DANGER", "⚠ WARNING", and "⚠ CAUTION".

⚠DANGER	Precaution indicating cases where there is a risk of operator fatality or serious injury if handling is mistaken. Always observe these precautions to safely use the robot.
⚠WARNING	Precaution indicating cases where the operator could be subject to fatalities or serious injuries if handling is mistaken. Always observe these precautions to safely use the robot.
⚠CAUTION	Precaution indicating cases where operator could be subject to injury or physical damage could occur if handling is mistaken. Always observe these precautions to safely use the robot.

Under some circumstances, failure to observe the precautions given under "⚠CAUTION" may lead to serious consequences.
Observe the precautions of all the levels because they are important for personal and system safety.
Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

A. These show precautions based on the Ordinance on Industrial Safety and Health (Articles 36, 104, 150, 151).

⚠DANGER

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

⚠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

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

B. This shows precaution points given in the "Safety Manual".

For details, please read the text of the "Safety Manual".

⚠ 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.
- Securely ground the robot and controller.
  Failure to observe this could lead to malfunctioning by noise or to electric shock accidents.
- 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.
- 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.
- When using a horizontally articulated robot
  Note that the hand falls under its own weight while the brake release switch on the robot arm is being pressed. The downward movement may cause a collision between the hand and peripheral equipment, or hands or fingers to become caught.

⚠ CAUTION

- Use the robot within the environment given in the specifications.
  Failure to do so could lead to a decrease in reliability or faults.
  (Temperature, humidity, atmosphere, noise environment, etc.)
- 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.
- Always use the robot installed on a secure table.
  Use in an unstable posture could lead to positional deviation and vibration.
- Wire the cable as far away from noise sources as possible.
  If placed near a noise source, positional deviation or malfunction could occur.
- 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.
- 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.
- Indicate the operation state during robot operation.
  Failure to indicate the state could lead to operators approaching the robot or to incorrect operation.
- 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.
- 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.
- 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.
- Do not stop the robot or apply emergency stop by turning OFF the controller's main power.
  If the controller's 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.
- Do not turn OFF the main power to the controller while rewriting the internal information of the controller such as the program or parameters.
  If the main power to the controller is turned OFF while in automatic operation or rewriting the program or parameters, the internal information of the controller may be damaged.
- To maintain the security (confidentiality, integrity, and availability) of the robot and the system against unauthorized access, DoS[*1] attacks, computer viruses, and other cyberattacks from unreliable networks and devices via network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions.
  Mitsubishi Electric Corporation will not be held responsible for any robot or system problems arising from DoS attacks, unauthorized access, computer viruses, and cyber attacks.
  *1 DoS: A denial-of-service (DoS) attack disrupts services by overloading systems or exploiting vulnerabilities, resulting in a denial-of-service (DoS) state.

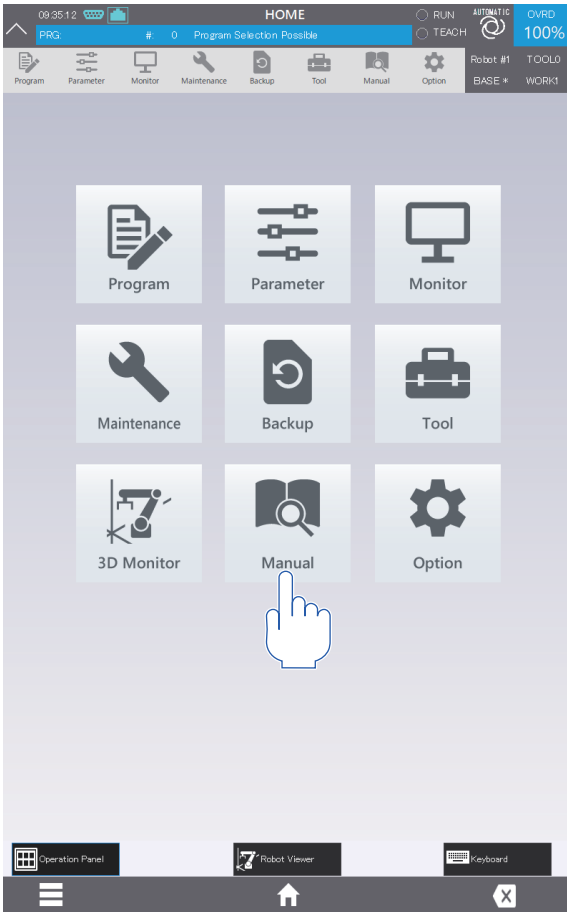
CONTENTS

1 BEFORE USE

The R86TB is a teaching pendant (T/B) with a touch panel that allows you to operate the robot easily.
Other instruction manuals use the R33TB/R32TB to explain how to operate the robot. When using the R86TB, refer to this instruction manual.
Additionally, this instruction manual uses MELFA-BASIC V programs to show how to edit programs and perform other operations for explanation purposes.

1.1 Instruction manual

The instruction manual can be viewed on the R86TB.
Tapping [Manual] in the menu will display the instruction manual.



Tapping [Manual] in the menu at the top will display a page in the instruction manual to show information related to the opened screen.
Multiple pages in the instruction manual can be opened, but up to 10 pages can be displayed at a time.

Terms and symbols used in this manual

Terms and symbols used in this manual are explained in the following table.
Learn the meaning of the terms and symbols before reading this manual.

Category	Term/Symbol	Meaning
Term	Controller	Indicates a controller which controls the robot arm.
	RT ToolBox3	Indicates any of the following software packages (engineering tools). RT ToolBox3 (3F-14C-WINE) RT ToolBox3 mini (3F-15C-WINE) RT ToolBox3 Pro (3F-16D-WINE)
Symbol	Example) [JOG]	Words in brackets indicate buttons displayed on the screen or keys on the teaching pendant.
	T/B	Indicates a teaching pendant.

1.2 Items in package

This product includes the items shown in the following section. Check that all the items are present.

- Teaching pendant (R86TB)

Point

- Do not change settings such as the language settings from the screen keyboard.

If the language settings are changed on the OS settings screen, the T/B may not operate properly.
When changing the language settings of the T/B, use the system option screen for the settings.
☞ Page 302 SYSTEM OPTIONS

2 CONNECTING THE CONTROLLER

⚠CAUTION

Note that forcibly pulling or excessively bending the T/B cable may result in disconnection of the cable or damage to the connector.
When installing or removing the T/B, hold the connector to protect the cable from stress.

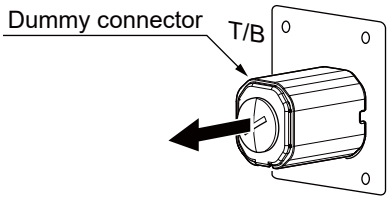
Install or remove the T/B with the control power of the controller turned off. If the T/B is installed or removed with the control power turned on, an emergency stop alarm will occur.
When the CR800 series controller is used, the T/B can be removed from the controller without an emergency stop alarm in the following way: Press the 3-position enable switch on the T/B in AUTOMATIC mode, then remove the T/B connector within five seconds.
For information on how to operate the 3-position enable switch, refer to the following page:
☞ Page 18 How to use the T/B
If using the robot without connecting the T/B, attach the dummy connector that comes with the product.

2.1 Installation of the T/B

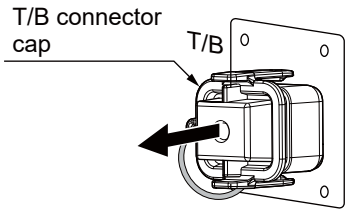
The following shows how to install the T/B.

1. Ensure that the controller is powered off.

2. Remove the dummy connector or T/B connector cap if it is attached to the T/B port on the controller.

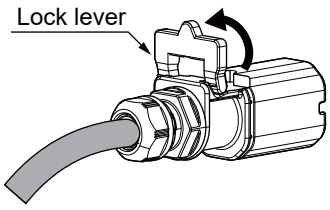


Enlarged view of the controller T/B with a dummy connector



Enlarged view of the controller T/B with a T/B connector cap

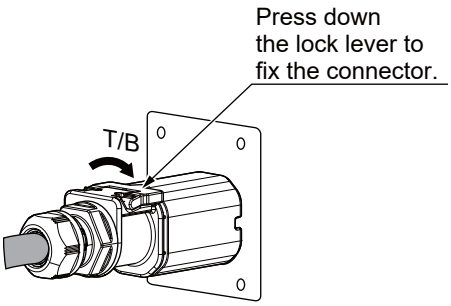
3. Lift the lock lever of the T/B connection connector on the T/B.



Enlarged view of the T/B connection connector

4. Connect the T/B connector to the T/B port on the controller. Push the connector in until it snaps into place.

5. Press down the lock lever to fix the connector.



2.2 Removal of the T/B

⚠CAUTION

Note that removing the T/B during program or user definition screen editing will cause edited data not to be saved.

The following shows how to remove the T/B.

In MANUAL mode

1. Ensure that the controller is powered off.
2. Lift the lock lever at the top of the connector, and hold the connector to pull it out by referring to step 3 on the following page:

☞ Page 13 Installation of the T/B

In AUTOMATIC mode (CR800 series controller only)

1. Press the 3-position enable switch on the T/B.
2. Pull out the T/B connector within five seconds after step 1. Lift the lock lever at the top of the connector, and hold the connector to pull it out by referring to the above page.

3 SPECIFICATIONS

3.1 Product specifications

⚠CAUTION

- Using this product in environments where a large amount of dust, oil mist, or other substances exists may cause a malfunction. Avoid using or storing this product in such environments.
- A USB memory with a capacity of 32G bytes or more cannot be used.

Using a large-capacity USB memory will consume the system resource dramatically. Use a USB memory whose capacity is as small as possible.

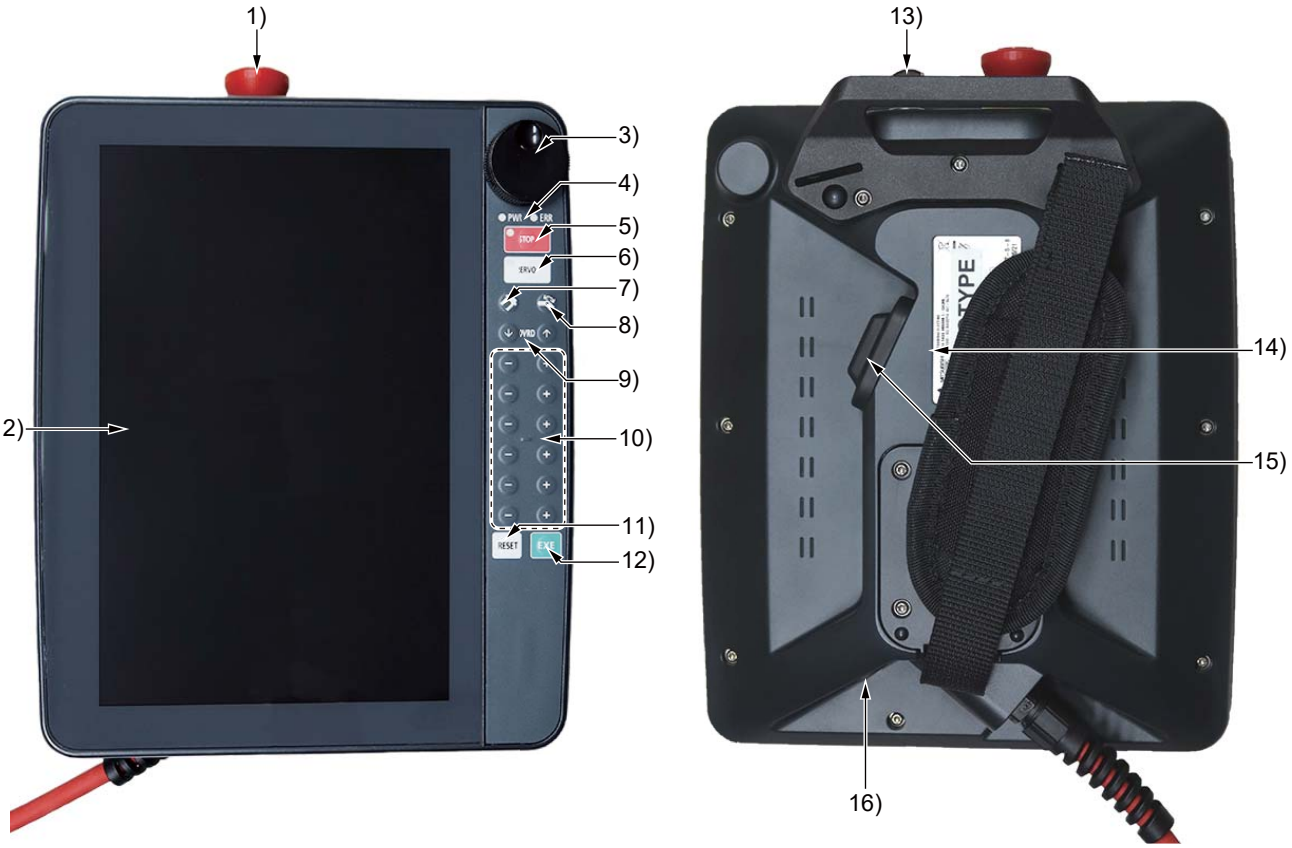
Item	Specifications	Remarks
Dimensions	215 (W) × 284 (H) × 76 (D)	—
Weight	Approx. 1,200g	Cable not included
Connection method	Connected to a controller with a square connector Cable length: 7m	—
Interface	RS-422 Ethernet (10BASE-T)	Used to connect a controller.
	USB host (Type-A)	32G bytes or less
Display	10.1" TFT (800 × 1280) color touch panel with a back light	—

3.2 Function list

The following lists the main functions of the R86TB.

No.	Name	Description
1)	Program	Programs required for automatic robot operation can be created or edited. Additionally, spline files and position data for SQ Direct can be edited. ☞ Page 49 CREATING A PROGRAM
2)	Parameter	Parameters set on the controller can be referenced or rewritten. ☞ Page 98 SETTING PARAMETERS
3)	Monitor	Information in the controller and robot can be checked in real time. ☞ Page 184 STATUS MONITORING
4)	Maintenance	Robot maintenance such as setting origin data and initializing information can be performed. ☞ Page 218 MAINTENANCE
5)	Backup	Information in the controller can be backed up to the T/B or USB memory. Backup data stored on the T/B or USB memory can be restored to the controller. ☞ Page 245 BACKUP AND RESTORE
6)	Tool	Functions for effective use of the robot, such as the oscillograph function and user definition screens can be used. ☞ Page 251 TOOL FUNCTIONS
7)	3D Monitor	Using the 3D monitor allows you to check the robot movement in 3D mode. ☞ Page 291 3D MONITOR
8)	Option	Settings of the T/B, such as switching the language and changing the user level, can be configured. ☞ Page 302 SYSTEM OPTIONS

3.3 Part names



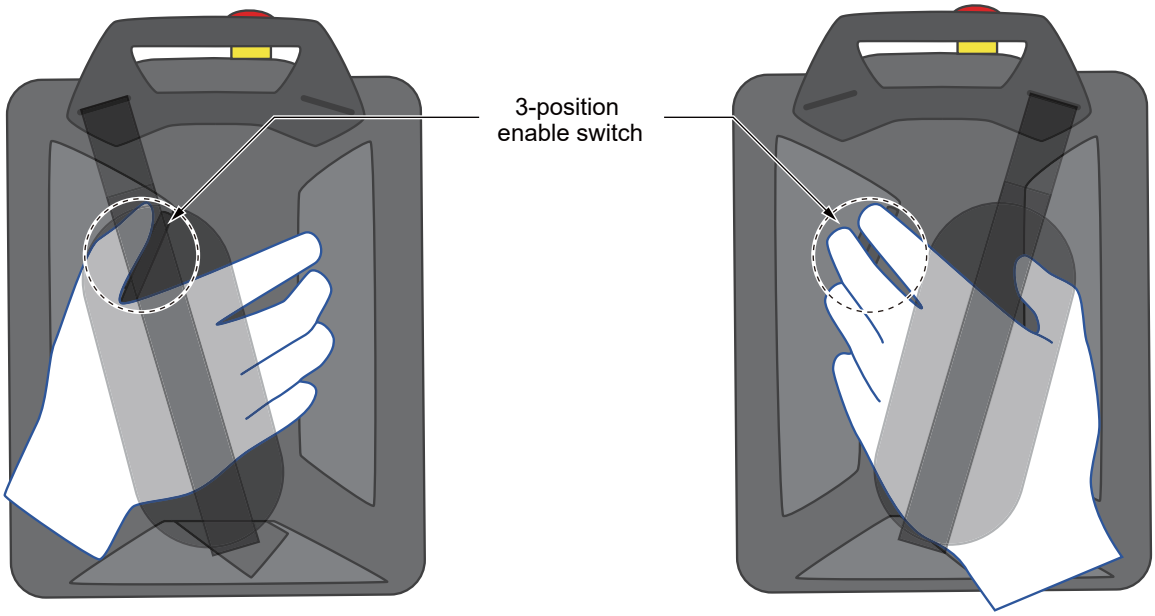
No.	Name	Description
1)	Emergency stop button	Powers off the robot servos to bring the robot to an emergency stop. Turn the button to the right to release.
2)	Display (touch panel)	Displays each screen of the T/B. Touch the display with your finger for operation.
3)	Wheel	Moves the cursor to select each menu, etc.
4)	Power lamp and error lamp	The power lamp is always on while power is being supplied. The error lamp flashes during error.
5)	STOP button	Brings the robot to an emergency stop. The servo power remains on. The lamp (red) is on while the robot stops.
6)	SERVO button	By pressing the button while pressing the 3-position enable switch, the servo power is turned on. The lamp (green) is on while the servo is powered on.
7)	HAND button	Displays the hand operation guide.
8)	JOG button	Displays the jog operation guide.
9)	OVRD button	Press the [↑] button to raise the overriding level. Press the [↓] button to lower the overriding level.
10)	+/- button	Used for purposes such as jog operation, hand operation, brake releasing, and program debugging. The explanations of each key are displayed on the key operation guide.
11)	RESET button	Releases the alarm state. When the operation panel is displayed, the program can be reset.
12)	EXE button	Use this button in the following situations: Executing functions to operate the robot such as hand alignment and position jump, moving specified multiple axes using jog operation, or releasing brakes.
13)	Key switch	Switches robot operation rights. Setting the key switch to "MANUAL" will make the T/B acquire operation rights. Robot operations such as turning on the servos and using jog operation are possible while the T/B has operation rights. Setting the key switch to "AUTO" will make the T/B relinquish operation rights.
14)	Grip handle	Grip the grip handle to hold the T/B.
15)	3-position enable switch	By releasing this switch or pressing it firmly when the servo is powered on, the servo power is turned off. When operating the robot in situations such as using jog operation, hold down this switch for the operation. ☞ Page 18 3-position enable switch
16)	USB connector	Connect a USB memory.

4 BASIC OPERATIONS

The basic method of operating the T/B is shown below.

4.1 How to use the T/B

When operating the T/B, hold the grip handle with one hand, and operate the 3-position enable switch.
When holding the T/B with your right hand, operate the 3-position enable switch with the thumb.
When holding the T/B with your left hand, operate the 3-position enable switch with the index finger.



When holding the T/B with your right hand

When holding the T/B with your left hand

3-position enable switch

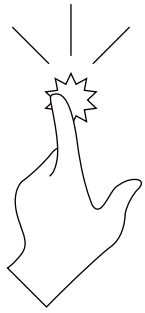
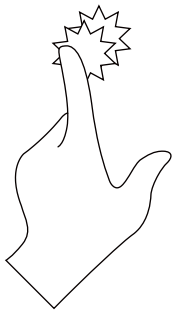
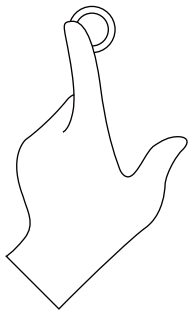
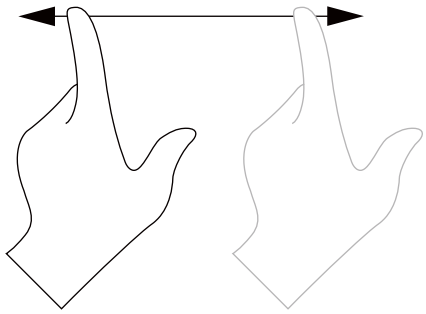
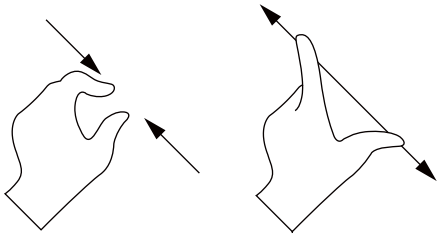
By pressing the [SERVO] button (sheet key) while pressing the 3-position enable switch, the servo power is turned on.
When operating the robot manually in situations such as using jog operation, hold down the 3-position enable switch for the operation.
To turn off the servo power, release your hand from the 3-position enable switch or press the switch firmly.

Servo ON

Servo OFF

4.2 How to operate the touch panel

The R86TB has a touch panel display. Touch the screen with your finger for operation.
The following shows representative methods of operating the touch panel.

Command name	Operation and explanation	Operation image
Tap	Touch the screen once quickly and release your finger. This operation is used in situations such as pressing a button on the screen and selecting an item.	
Double-tap	Tap the same area on the screen twice quickly. This operation is used in situations such as opening the program editing screen from the program list screen.	
Press and hold	Keep touching the screen for one or two seconds. This operation is used in situations such as selecting multiple program position variables.	
Drag	Move the finger while touching the screen. This operation is used in situations such as scrolling the screen and rotating the model in the robot viewer.	
Pinch-in Pinch-out	Move two fingers close to each other or away from each other while touching the screen with the two fingers. This operation is used in situations such as zooming in or out on the robot viewer.	 Pinch-in Pinch-out

5 CONNECTING A USB MEMORY

A USB memory is required to transfer files or update the software.
The following shows how to connect a USB memory to the T/B.

5.1 Installing a USB memory

⚠CAUTION

Do not remove the USB memory while the T/B is accessing the USB memory (during reading or writing). Failure to observe this may result in malfunction.

Check the orientation of the USB connector, then insert the USB memory.
The following figure shows the location of the USB port.

Once the USB memory is connected correctly, it will be detected by the operating system and displayed as a device.

5.2 Removing the USB memory

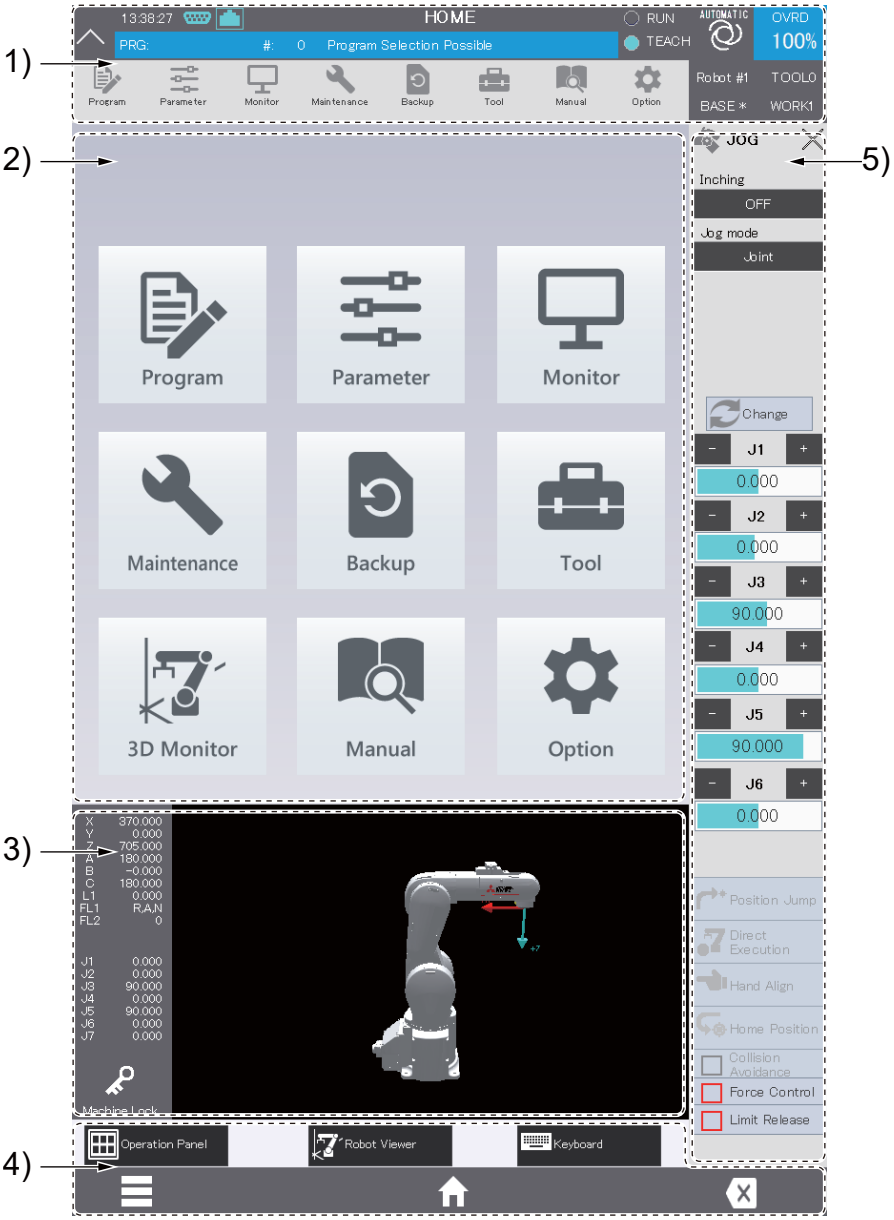
⚠CAUTION

Do not remove the USB memory while the T/B is accessing the USB memory (during reading or writing). Failure to observe this may result in malfunction.

Check that the T/B is not accessing the USB memory before removing the USB memory.

6 EXPLANATIONS ON SCREENS

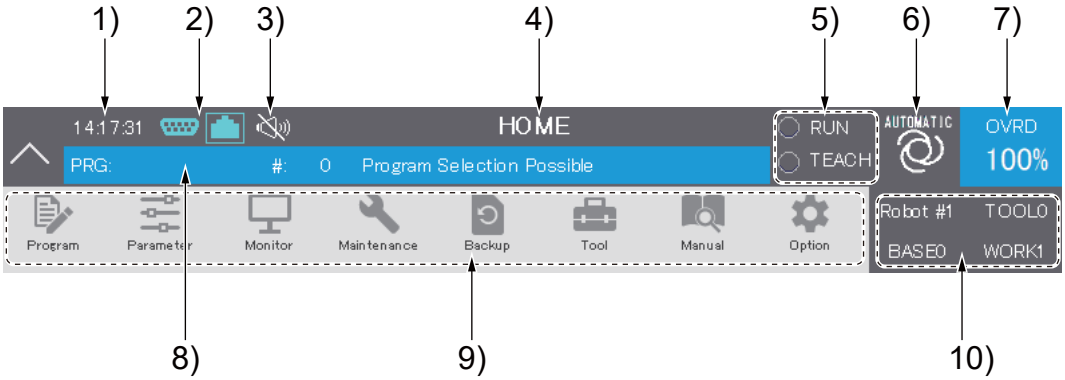
The R86TB screen is composed as follows:



No.	Name	Description
1)	Header	Displays the title of the current page and the robot status. It also displays the tool and base switching buttons and the override setting button. ☞ Page 22 Header
2)	Page	Displays the screen to operate functions such as editing programs and parameters. ☞ Page 25 Page
3)	Auxiliary screen	Displays an auxiliary screen such as the robot viewer and operation panel. ☞ Page 26 Auxiliary screen
4)	Footer	Displays the menu button, home button, back button, etc. ☞ Page 26 Footer
5)	Key operation guide	Displayed when using sheet keys for purposes such as jog operation, hand operation, and program debugging. ☞ Page 28 Key operation guide

6.1 Header

The header is composed as follows:



No.	Name	Description
1)	Current time	Displays the time of the internal clock of the T/B.
2)	Connection status	Displays the status of connection between the T/B and the controller. ☞ Page 22 Connection status
3)	Buzzer OFF	Displayed when the buzzer of the T/B is off (parameter TBBZR is 0).
4)	Page title	Displays the title of the current page. Tapping the title will display the page list screen. ☞ Page 27 Page list screen
5)	RUN lamp and TEACH lamp	The RUN lamp is on while a program is being executed. The TEACH lamp is on when the key switch is set to MANUAL.
6)	Operation mode	Displays the controller operation mode (AUTO/MANUAL). The debug icon is displayed while the program is being debugged.
7)	Override settings	Displays the override value. Tapping the display allows you to set the override.
8)	Program information	Displays the name and current line number of the program executed in slot 1, and the slot status. ☞ Page 23 Program information
9)	Menu	Tapping a button will display the page of the function.
10)	Robot/tool/base/workpiece information	Displays the selected robot, tool, base, and workpiece. Tapping the display will display drop-down lists to switch each item. ☞ Page 24 Robot/tool/base/workpiece information

Connection status

The status of connection between the T/B and the controller is displayed as an icon.

The following table shows the types and explanations of icons.

Type	Icon	Description
RS-422		Disconnected Indicates that the controller and T/B are not connected through an RS-422 line.
		Connected Indicates that the controller and T/B are connected through an RS-422 line. Even if an Ethernet line is not connected, the parameter editing function can be used as long as an RS-422 line is connected.
Ethernet		Disconnected Indicates that the controller and T/B are not connected through an Ethernet line. The following conditions bring to an unconnected state. ·The controller information is being acquired. ·The Ethernet line with the controller is disconnected. ·No connection can be established due to a difference in the segment of the IP address.*1
		Connected Indicates that the controller and T/B are connected through an Ethernet line. While the RS-422 line and Ethernet line are connected, all of the R86TB functions are available.

*1 If the segment of the IP address is different from that of the controller, an error message will appear.

Program information

The name and current line number of the program executed in slot 1, and the slot status are displayed.
The display color changes depending on the slot status as follows.

- Program selectable

- During operation

- Standby

Program change

If the following conditions are met, the program of slot 1 can be changed.

■In MANUAL mode

- T/B enabled
- Not during debugging
- Not during operation
- No alarm

■In AUTOMATIC mode

- Not during operation
- No alarm

Tapping the displayed program name will display the program selection dialog. Select a program, then tap [OK].
A confirmation message will appear. Tapping [Yes] will change the program of slot 1.

Changing the line to be executed

If the following conditions are met, the program line to be executed can be changed.

■In MANUAL mode

- T/B enabled
- Program selected
- Not during operation
- No alarm

■In AUTOMATIC mode

- Program selected
- Not during operation
- No alarm

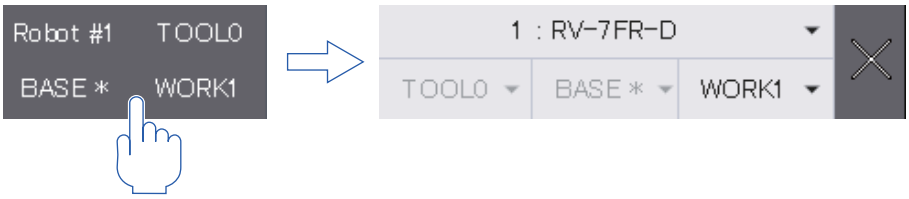
Tapping the displayed program execution line will display the value input dialog. The dialog shows the line being executed.
Enter a line number, then tap [OK]. The line to be executed will be changed.

Error display

If an error occurs, the following information will be displayed in the program information section.
Tapping that area during error will display the error monitor screen.

Robot/tool/base/workpiece information

The selected robot, tool, base, and workpiece are displayed.
Tapping the robot/tool/base/workpiece information will display drop-down lists to change the settings.
Tapping the close button will make the display show information only as before.



Changing the robot

If the multi-mechanism control function is used, tapping the drop-down list allows you to select a robot targeted for multi-mechanism control.
The robot cannot be changed while any screen used to configure settings related to the robot such as tool parameters is displayed.
For details on the settings of the robot targeted for multi-mechanism control, refer to the following page:
☞ Page 30 SETTING A ROBOT TARGETED FOR MULTI-MECHANISM CONTROL

Changing the tool

To use multiple tools, tapping the drop-down list allows you to select a tool parameter you want to use.
Selecting a tool will display a confirmation message. Selecting "Yes" will change the tool.
The tool can be changed only when the T/B has operation rights.

Changing the base

Tapping the drop-down list allows you to select base coordinates you want to use.
Selecting base coordinates will display a confirmation message. Selecting "Yes" will change the base.
The base can be changed only when the T/B has operation rights.
The base information is not displayed unless the parameter "MEXBSNO" exists.

Changing the workpiece

Tapping the drop-down list allows you to select a workpiece number used for workpiece jog operation.
The workpiece can be changed even if the T/B does not have operation rights.
If the parameter "VTWKREG" does not exist or the value is 0, the workpiece information is not displayed.

6.2 Page

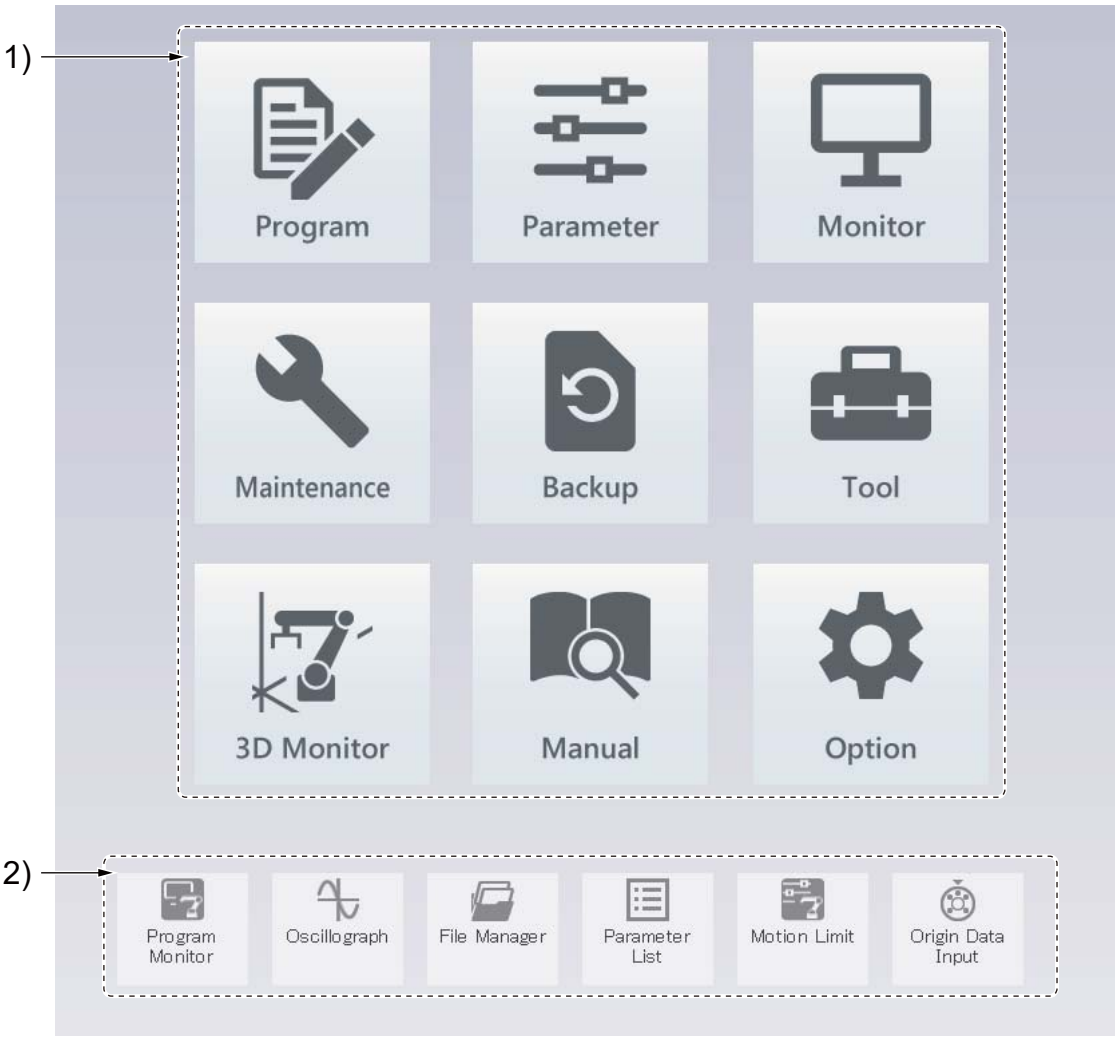
The HOME screen will appear upon start of the T/B.

Tapping a button in the header or HOME menu will display the page of the function.

HOME screen

Tapping the home button in the footer will display the HOME screen.

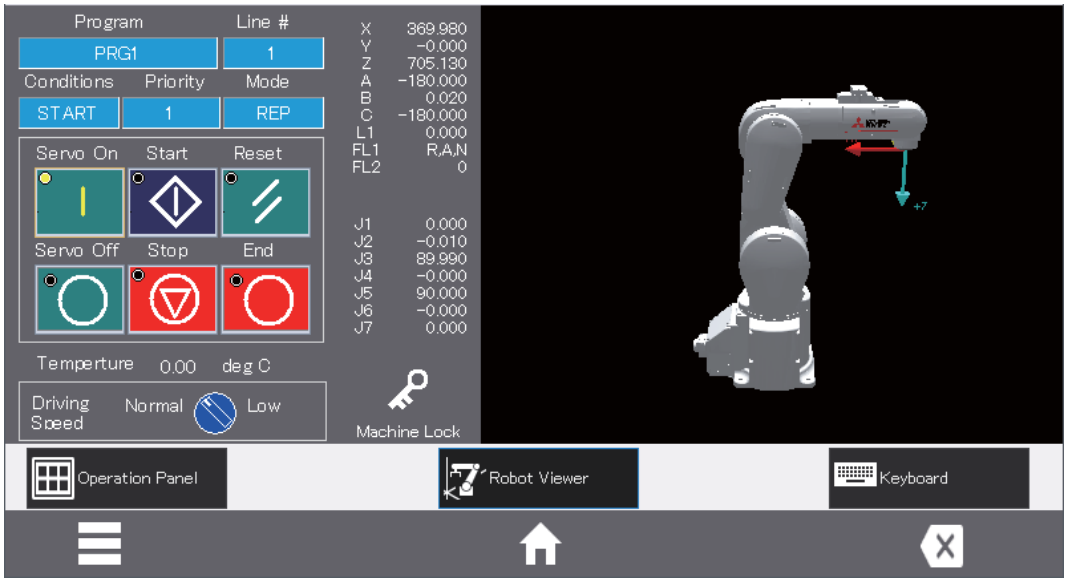
The HOME screen is composed as follows:



No.	Name	Description
1)	Home menu	Tapping a button will display the page of the function.
2)	Shortcut	User-set shortcut buttons are displayed. For information on how to set a shortcut, refer to the following page: ☞ Page 310 Shortcut

6.3 Auxiliary screen

The auxiliary screen shows the "operation panel screen", "robot viewer screen", or "force sense control screen".
Up to two types of screens can be displayed on the auxiliary screen side by side.



For details on each screen, refer to the following page:

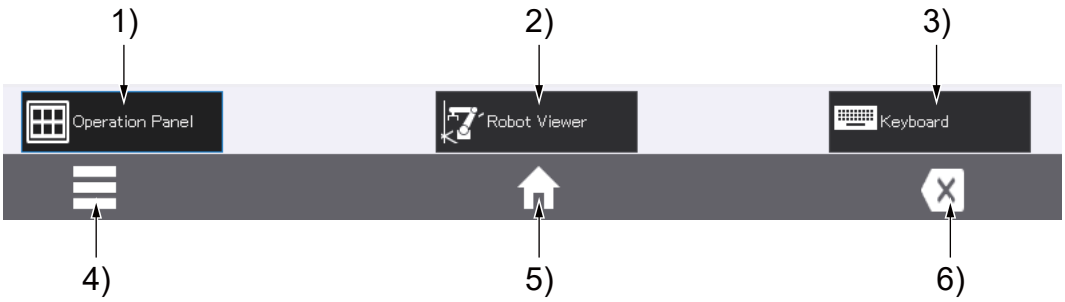
☞ Page 288 OPERATION PANEL FUNCTIONS

☞ Page 292 3D monitor (auxiliary screen)

☞ Page 44 Force sense control

6.4 Footer

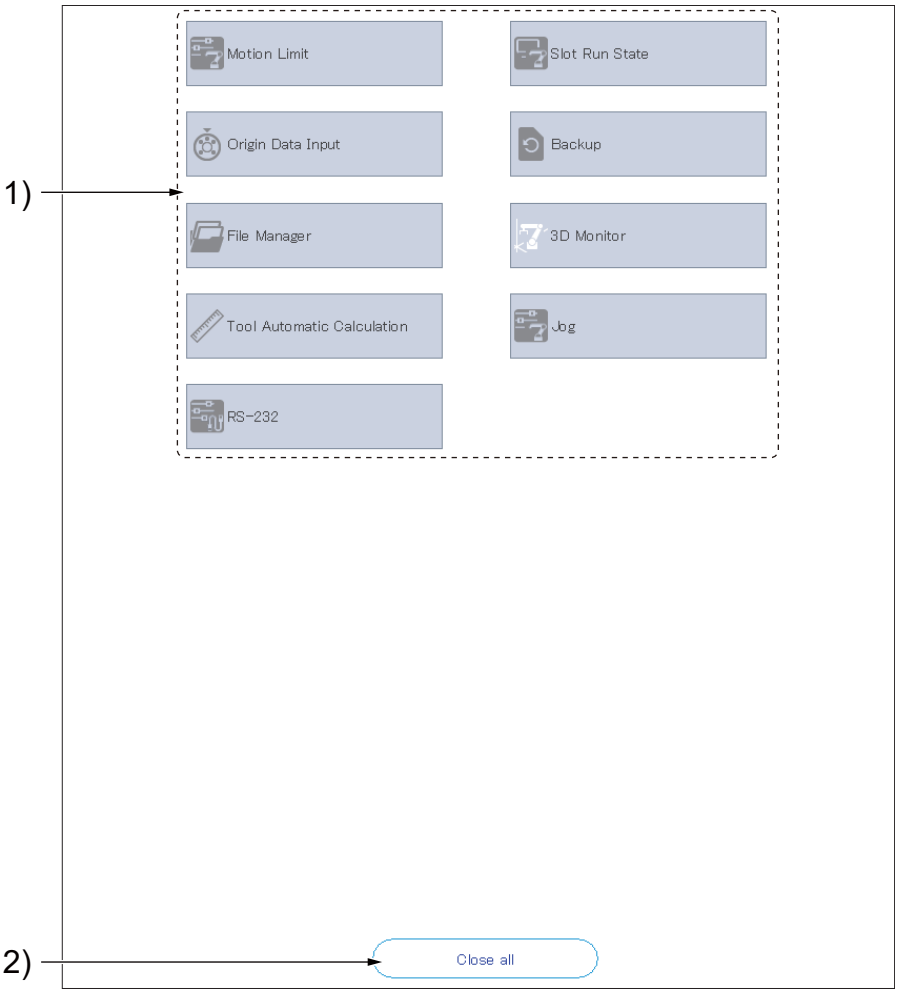
The footer is composed as follows:



No.	Name	Description
1)	Operation panel display button	Displays an operation panel on the auxiliary screen. ☞ Page 288 OPERATION PANEL FUNCTIONS
2)	Robot viewer display button	Displays a robot viewer on the auxiliary screen. ☞ Page 292 3D monitor (auxiliary screen)
3)	Keyboard display button	Displays a software keyboard on the auxiliary screen.
4)	Page list button	Displays the page list screen. ☞ Page 27 Page list screen
5)	Home button	Displays the HOME screen. ☞ Page 25 HOME screen
6)	Close button	Closes the current page.

Page list screen

Tapping the page list button in the footer or the page title in the header will list the currently opened pages.
Up to 16 pages can be opened.
The page list screen is composed as follows:



No.	Name	Description
1)	List of opened pages	Displays the list of the currently opened pages.
2)	Close all button	Closes all the currently opened pages and displays the HOME screen.

Opening a page

Tapping the title or an icon button on each page will display the corresponding page.

Closing a page

■Closing one page

Dragging and releasing a page button you want to close in any directions (up, down, right, or left) will close the page.
The HOME screen cannot be closed.

■Closing all pages

Tapping the [Close all] button will close all the currently opened pages.

■Closing the page being edited

Attempting to close the page being edited will display a confirmation dialog.
Selecting [Yes] will save the edited data and close the page.
Selecting [No] will close the page without saving the edited data.
Selecting [Cancel] will display the page list screen or HOME screen without closing the page.

6.5 Key operation guide

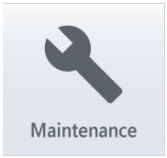
The key operation guide is displayed when sheet keys are used.

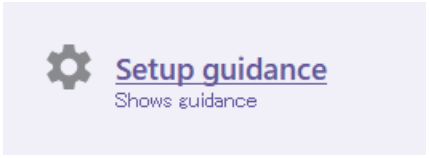
The key operation guide is used in the following functions.

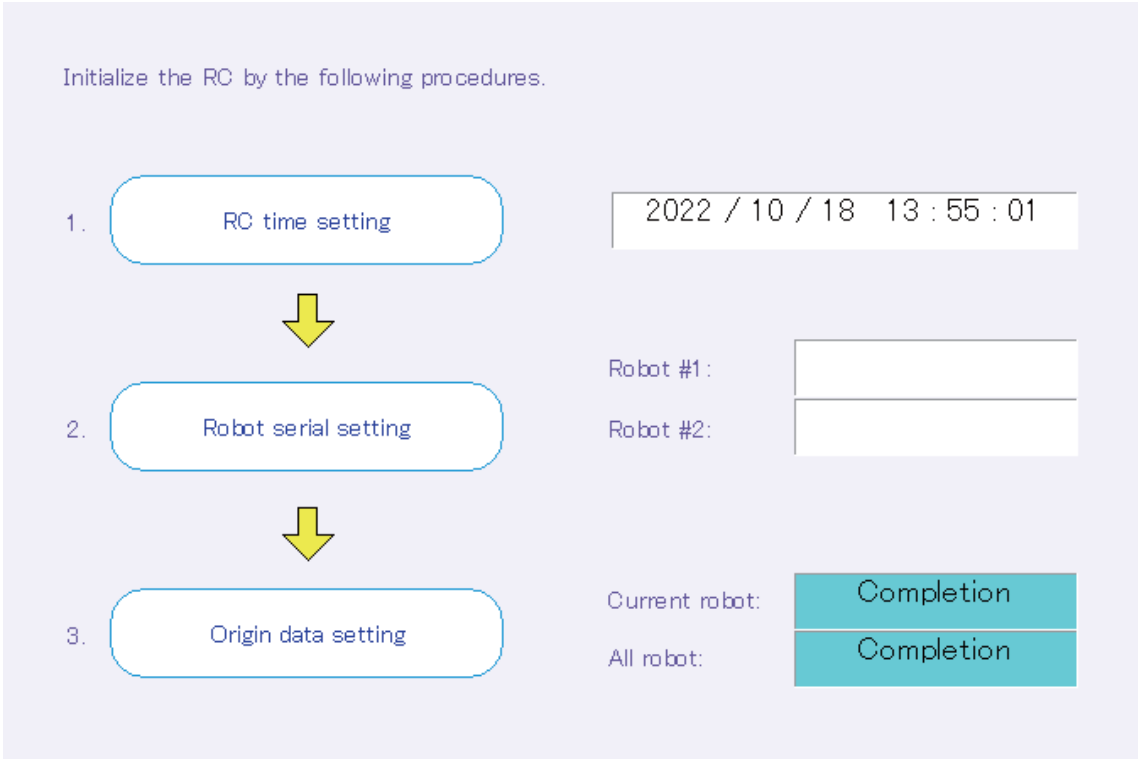
Name	Description	Display method
Jog operation	Used to operate the robot arm.	Press the JOG button on the sheet key. ☞ Page 36 Jog operation
Hand operation	Used to operate the robot hand.	Press the HAND button on the sheet key. ☞ Page 45 Hand operation
Electric hand operation	Used to operate the robot electric hand.	Tap the switch button on the hand operation screen. ☞ Page 45 Hand operation
Releasing brakes	Used to release the brake of each robot axis.	Tapping [Release the brakes] on the maintenance function menu screen ☞ Page 239 Releasing brakes
Program debugging	Used to check if the program runs properly.	Tap [Debug start] on the program editing screen. ☞ Page 74 Program debugging

7 INITIAL SETTINGS

When the controller is started for the first time, check that the basic settings have been configured on the setup guidance screen.
Tap [Maintenance] in the menu to open the maintenance menu screen, then [Setup guidance].







If there is an item that has not been set, complete the settings on the relevant setting screen.
Tapping [RC time setting], [Robot serial setting], or [Origin data setting] will display the relevant setting screen.
For information on how to set each item, refer to the following pages:

☞ Page 229 Setting the time on the robot controller
☞ Page 230 Serial number
☞ Page 219 Origin data input method

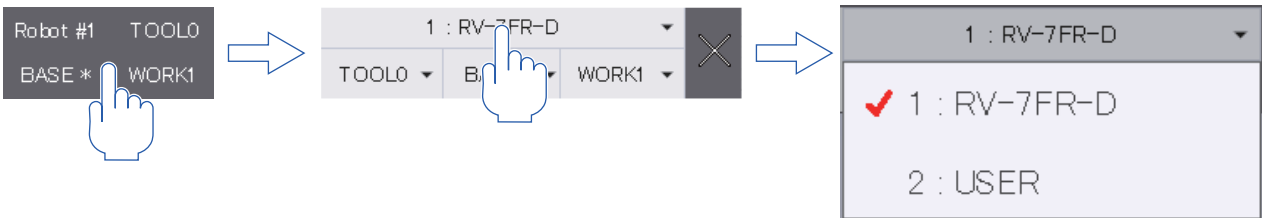
8 SETTING A ROBOT TARGETED FOR MULTI-MECHANISM CONTROL

⚠CAUTION

• A robot targeted for step operation

The robot which moves when step operation is executed is the same as the robot which moves when automatic operation of the program is executed. When the GETM command is executed, the robot selected by the GETM command moves in the execution of subsequent operation commands.

Tapping the robot/tool/base/workpiece information in the header will display drop-down lists to change the settings.
Tapping the drop-down list allows you to select a robot targeted for multi-mechanism control.



The selected robot is subject to the following operations and monitoring.

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

* Multi-mechanism control is a function that can control multiple robots (user mechanisms) assembled with servo motors besides the standard robots. For details, refer to the following manuals:

📖CR800 series controller ADDITIONAL AXIS FUNCTION INSTRUCTION MANUAL (BFP-A3504)
📖CR750/CR751 series controller, CRn-700 series controller ADDITIONAL AXIS FUNCTION INSTRUCTION MANUAL (BFP-A8663)

9 OPERATING THE ROBOT (JOG OPERATION)

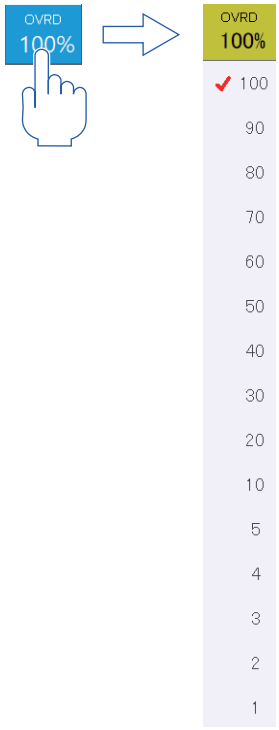
This chapter explains the functions of the jog operation guide.

☞ Page 36 Jog operation
☞ Page 39 Canceling the operating range
☞ Page 43 Home position return
☞ Page 43 Collision avoidance
☞ Page 44 Force sense control

9.1 Speed settings

Set the override with the OVRD buttons [↑] and [↓] (sheet keys).
The set override will be displayed in the controller's STATUS NUMBER display.
Also, you can set the override in the combo box at the top right of the T/B screen.

OVRD buttons (sheet keys)



Combo box at the top right of the T/B screen

Point

Even if 100% is set, the speed of jog operation is reduced for safety. (250mm/s max.)
The maximum speed and fixed-length feed amount during jog operation can be set with the parameter settings.
Parameters: JOGJSP, JOGPSP, JOGSPMX

9.2 Jog mode

The following six types of jog modes are available.

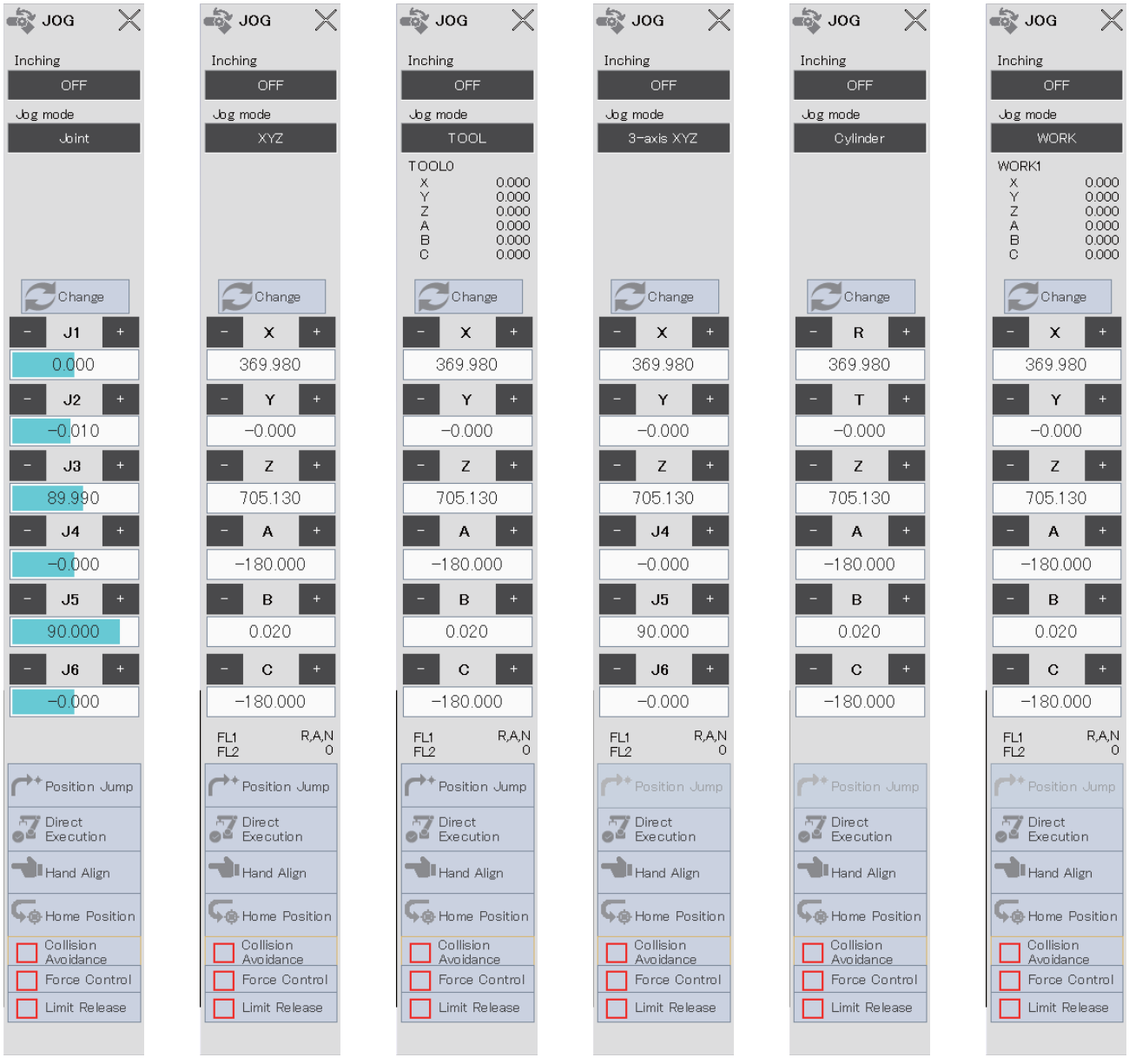
- JOINT JOG
- XYZ JOG
- TOOL JOG
- 3-axis XYZ jog
- CYLINDER JOG
- WORK jog*1

*1 The workpiece jog function is supported with the following controller software versions.

Controller name	Controller software version
CR800-D/R/Q	All versions
CR750-D/CRnD-700	Ver.P8 or later
CR750-Q/CRnQ-700	Ver.N8 or later

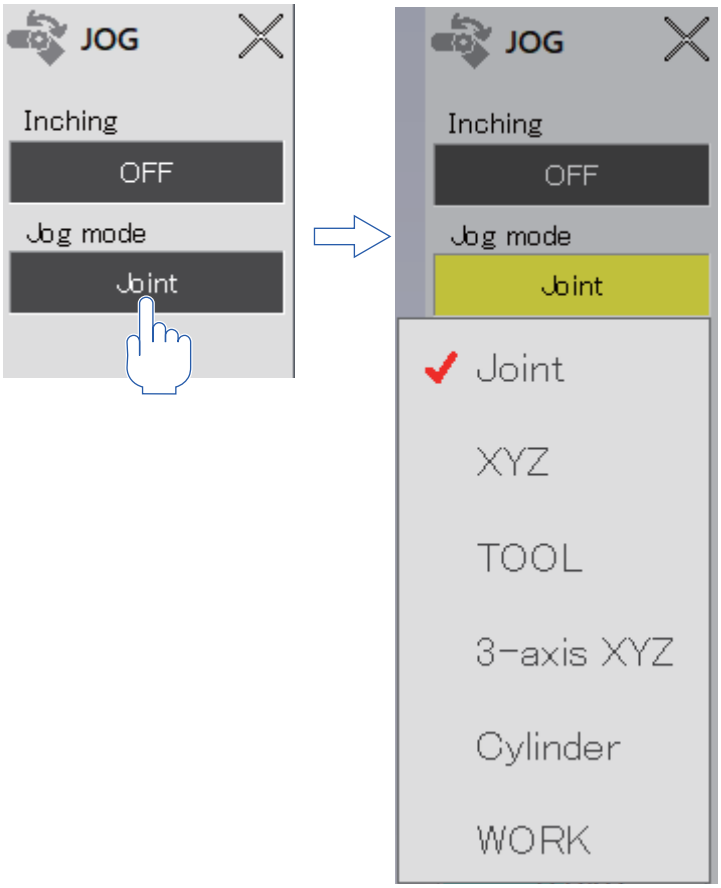
For details on the jog modes, refer to the instruction manual for the robot being used, "Robot Arm Setup, Basic Operation, and Maintenance".

The jog operation guides of each jog mode are shown below.



Switching jog mode

The current jog mode is displayed on the jog operation guide.
Pressing the [JOG] button (sheet key) will display the jog operation guide.
Tapping the displayed jog mode will change the jog mode.

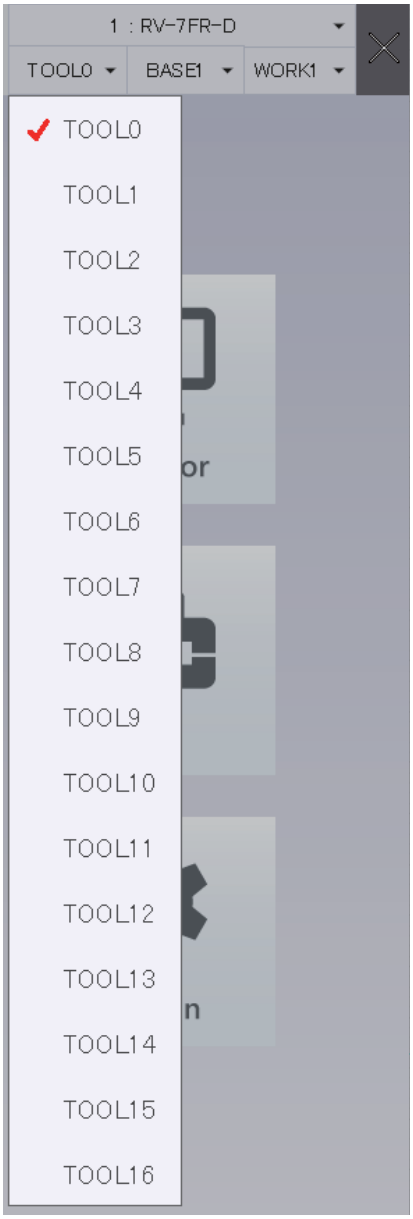


9.3 Switching tool data

⚠CAUTION

- To move the robot to a taught position while switching tool data (MEXTL* parameter) during automatic program operation, substitute a tool number for the M_TOOL variable when needed to switch tool data for the operation. Exercise caution as the robot moves in an unexpected direction if the tool data during teaching does not match the tool number during operation.
- When moving the robot while switching tool data during the step operation of the program, exercise caution as the robot moves in an unexpected direction if the tool data during teaching does not match the tool number during step operation.

If multiple tools are used, set the tool data corresponding to the tools to be used in the parameter "MEXTL*".
Tapping the robot/tool/base/workpiece information in the header will display drop-down lists to change the settings. Select tool data you want to use from the drop-down list.
If tool data does not need to be changed, this operation is not required.

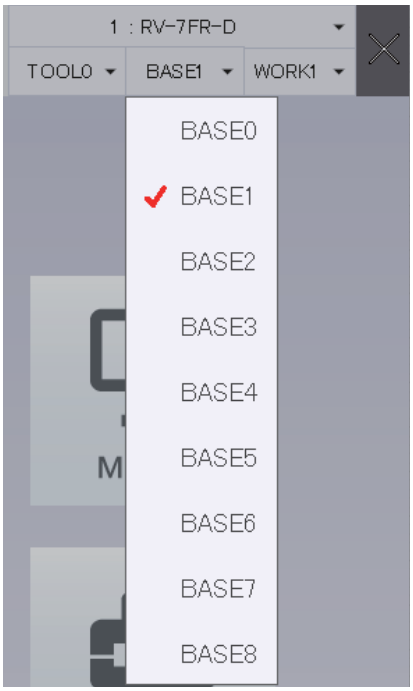


9.4 Switching base coordinates

Tapping the robot/tool/base/workpiece information in the header will display drop-down lists to change the settings. Select base coordinates you want to use from the drop-down list.

Base coordinates can be switched with the following controller software versions.

Controller name	Controller software version
CR800-D/R/Q	All versions
CR750-D/CRnD-700	Ver.S1 or later
CR750-Q/CRnQ-700	Ver.R1 or later



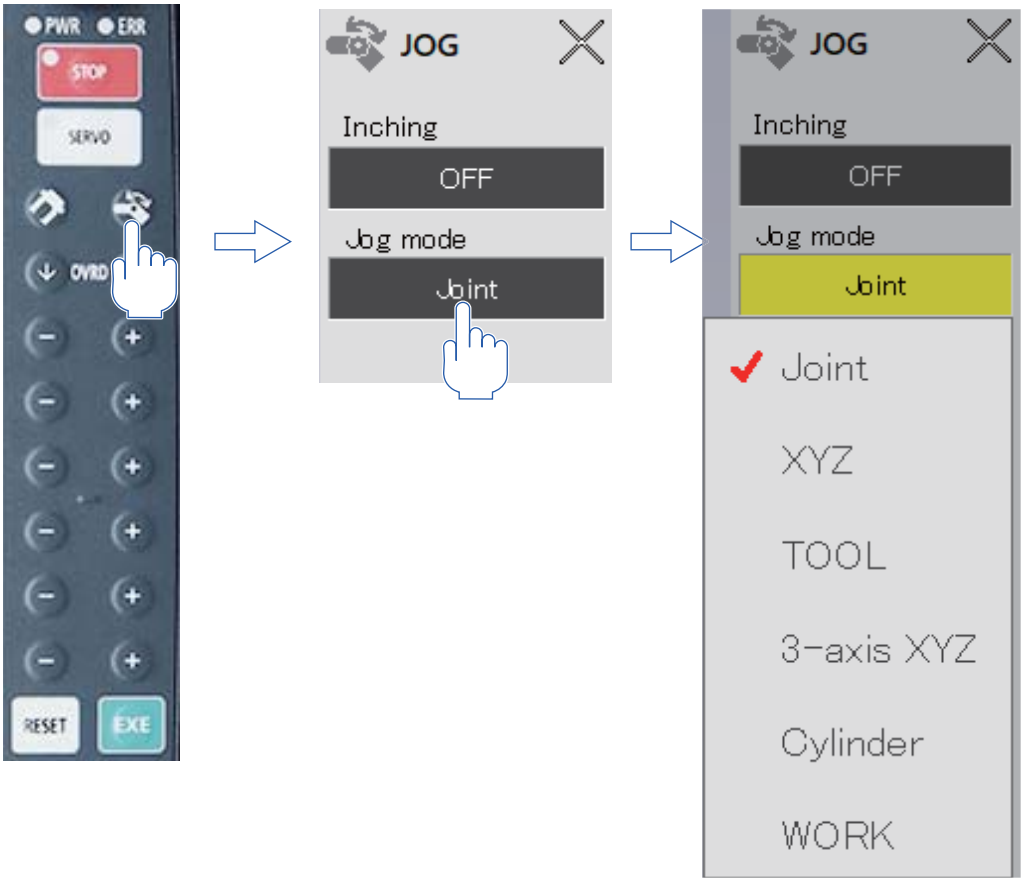
The content of the display is as follows.

Display	Information
BASE*	The state where base conversion data is directly specified by the program
BASE0	The state of the system initial value (P_NBase)
BASE1 to 8	The state where the base coordinates number (1 to 8) is specified

9.5 Jog operation

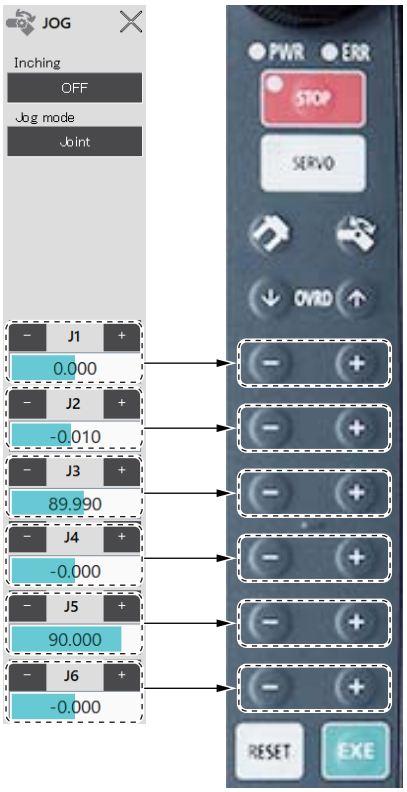
The following shows the procedure for operating the robot (jog operation) using the T/B.

1. Set the key switch on the T/B to "MANUAL".
2. Press the [JOG] button (sheet key) to display the jog operation guide, and select the jog mode.



3. Lightly hold the 3-position enable switch (maintaining position 2) of the T/B.
4. Press the [SERVO] button (sheet key) to turn on the servo power. The LED (green) of the [SERVO] button is on while the servo power is on.

5. The robot moves while the [+] or [-] button (sheet key) corresponding to the displayed jog operation guide is pressed.



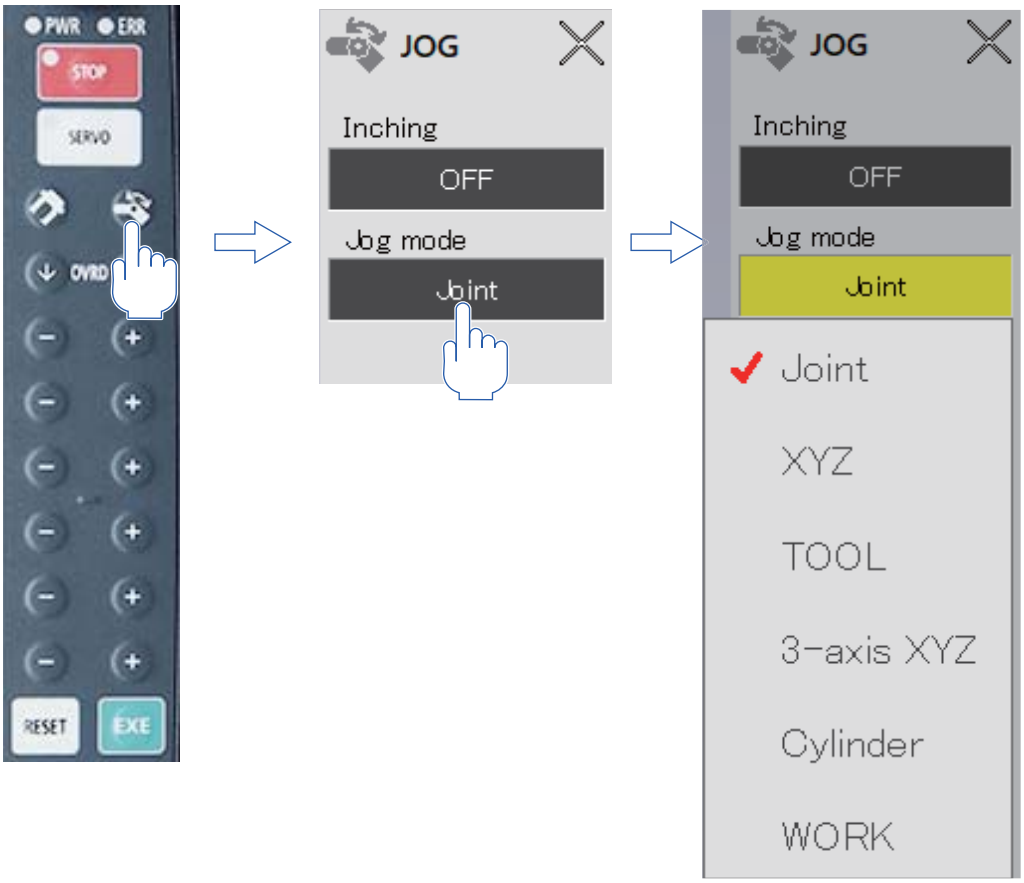
By pressing the 3-position enable switch firmly or releasing your hand from the switch, the servo power is turned off, stopping the robot.

Tap the close button at the top right of the jog operation guide. The jog operation guide will close.

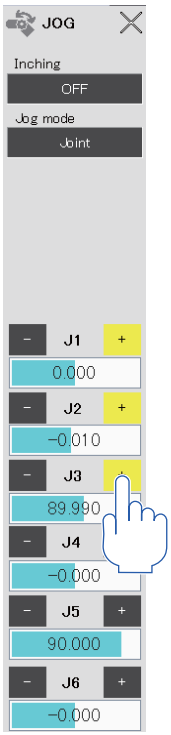
Operating multiple axes simultaneously

The following shows the procedure for operating multiple axes of the robot simultaneously.

1. Set the key switch on the T/B to "MANUAL".
2. Press the [JOG] button (sheet key) to display the jog operation guide, and select the jog mode.



3. On the jog operation guide, select in which direction the axis you want to operate should move (The selected axis is displayed in yellow).



4. Lightly hold the 3-position enable switch (maintaining position 2) of the T/B.
5. Press the [SERVO] button (sheet key) to turn on the servo power. The LED (green) of the [SERVO] button is on while the servo power is on.

6. The robot moves while the [EXE] button (sheet key) is pressed.

Canceling the operating range

Canceling the operating range allows you to move the robot beyond the operating range during jog operation.
The following shows the procedure for canceling the operating range.

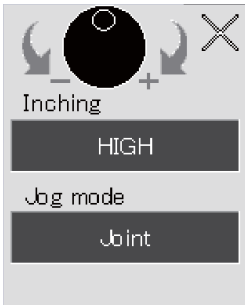
1. Tap [Limit Release] on the jog operation guide.
2. A warning dialog will appear. Read it, then tap [Yes].

Tapping [Limit Release] while the operating range is canceled will set the operating range.

9.6 Jog operation with the wheel (fixed-length feeding)

Setting [HIGH] or [LOW] for inching on the jog operation guide allows you to move the robot by a constant amount (fixed-length feeding).
Fixed-length feeding is possible with the wheel in addition to the sheet key for robot operation.
The following shows the procedure for performing fixed-length feeding with the wheel.

1. Setting [HIGH] or [LOW] for inching on the jog operation guide.



2. Tap to select the name of the axis you want to operate. Tapping the name again will cancel the selection. Additionally, multiple axes can be selected.

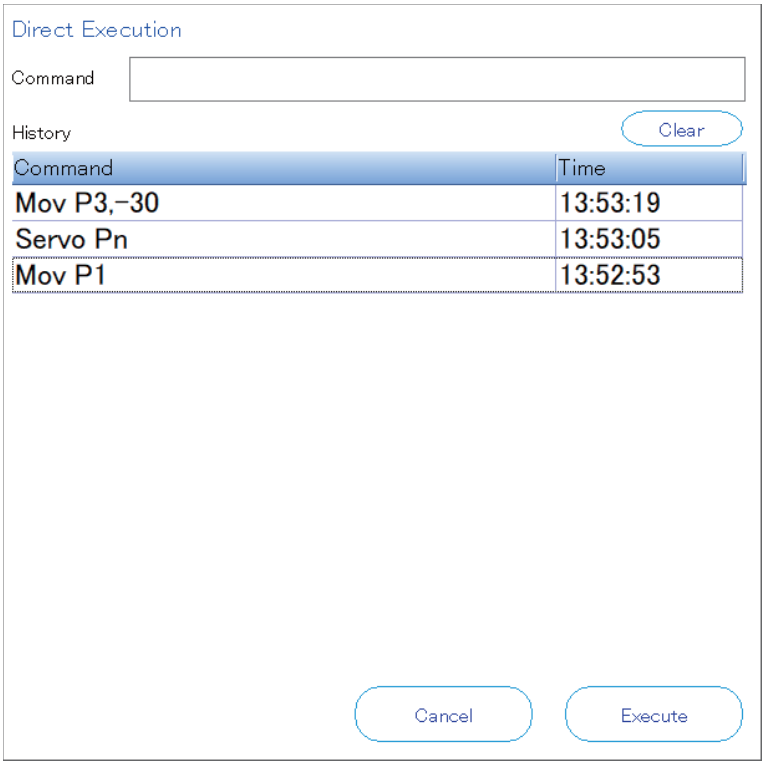
3. Rotating the wheel will move the selected axis. (Rotating the wheel clockwise will move the axis in the positive direction and rotating it counterclockwise will move the axis in the negative direction.)

Fixed-length feeding is available in any jog mode.

9.7 Direct execution

It is possible to operate the robot directly by inputting a command statement.
The following shows the procedure for direct execution.

1. Set the key switch on the T/B to "MANUAL".
2. Tap [Direct Execution] on the jog operation guide. The direct execution dialog will appear.

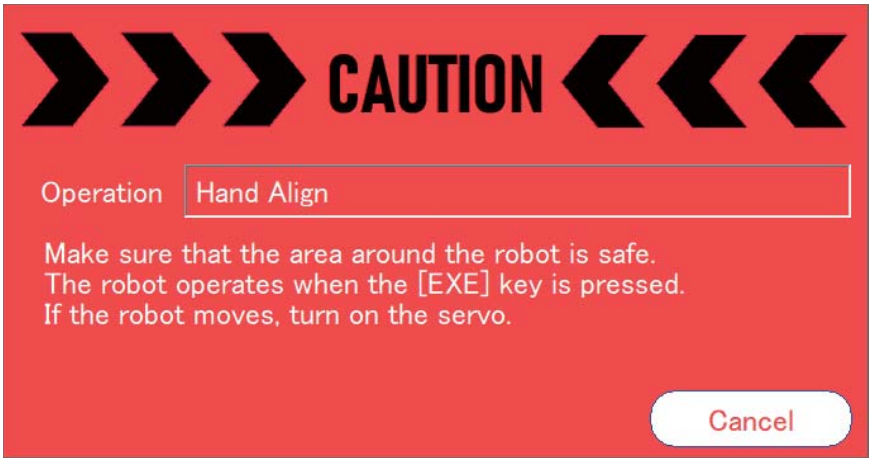


3. Enter a command to be executed in the Command field. Selecting a command from the direct execution history also allows you to enter the command.
4. Tapping [Execute] will display a warning dialog.
5. To execute a command that operates the robot, turn on the servo power.
6. The robot moves while the [EXE] button (sheet key) is pressed.

9.8 Hand alignment

The posture of the robot hand can be aligned in 90° increments.
This function moves the hand in 90° increments to the values closest to the current positions of components A, B, and C.
If tool coordinates are specified with the TOOL command or parameters, the hand will be aligned at the specified tool coordinates. If not specified, the hand will be aligned at the center of the mechanical interface.
The following procedure shows how to align the hand.

1. Set the key switch on the T/B to "MANUAL".
2. Tap [Hand Align] on the jog operation guide or hand operation guide. A confirmation dialog will appear.



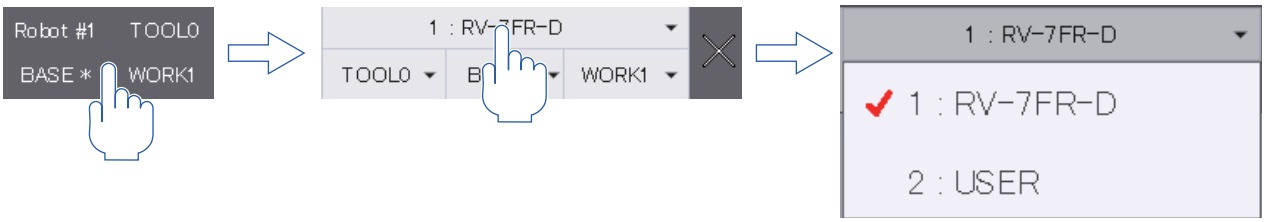
3. Lightly hold the 3-position enable switch (maintaining position 2) of the T/B.
4. Press the [SERVO] button (sheet key) to turn on the servo power. The LED (green) of the [SERVO] button is on while the servo power is on.
5. The robot moves while the [EXE] button (sheet key) is pressed.
6. After the hand has been aligned, releasing the [EXE] button will close the confirmation dialog.

9.9 Home position return

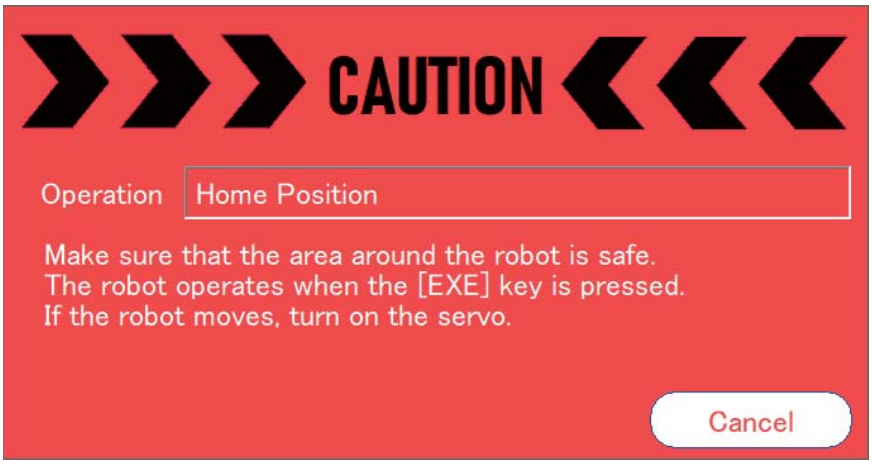
The robot can be moved to the preset home position. The robot moves to the position specified with the parameter "JSAFE" using joint interpolation. The speed depends on the override.
For information on how to set the home position, refer to the following section.
The following shows the procedure for returning the robot to the home position.

1. Set the key switch on the T/B to "MANUAL".
2. Select the model of the robot you want to operate.

When using multi-mechanism control, select a robot from the robot selection combo box at the top of the screen. When multi-mechanism control is not used, the model does not need to be selected.



3. Tap [Home Position] on the jog operation guide or hand operation guide. A confirmation dialog will appear.



4. Lightly hold the 3-position enable switch (maintaining position 2) of the T/B.
5. Press the [SERVO] button (sheet key) to turn on the servo power. The LED (green) of the [SERVO] button is on while the servo power is on.
6. The robot moves while the [EXE] button (sheet key) is pressed.
7. After the robot has been returned to the home position, releasing the [EXE] button will close the confirmation dialog.

9.10 Collision avoidance

When the collision avoidance function is enabled, the [Collision Avoidance] button is displayed on the jog operation guide.
Tapping the [Collision Avoidance] button will turn on or off the collision avoidance function.
The collision avoidance function is supported with the following controller software versions.
For details on the collision avoidance function, refer to the instruction manual for the robot being used, "Detailed explanations of functions and operations".

Controller name	Controller software version
CR800-D/R/Q	All versions
CR750-D	-
CR750-Q	Ver.S3 or later

9.11 Force sense control

When the force control function is used, the [Force Control] button is displayed on the jog operation guide. Tapping the [Force Control] button will display the force control screen.

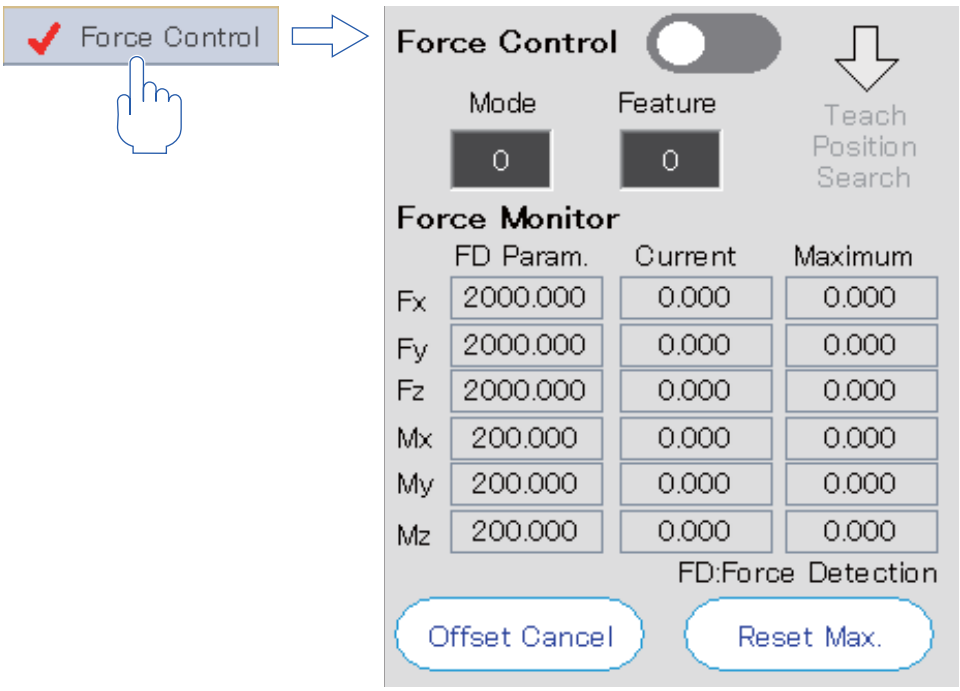
The force control function is supported with the following controller software versions.

Controller name	Controller software version
CR800-D/R/Q	All versions
CR750-D	Ver.R3 or later
CR750-Q	Ver.S3 or later

This screen can be used to specify whether to enable or disable force control, check the current status, and monitor force sensor data.

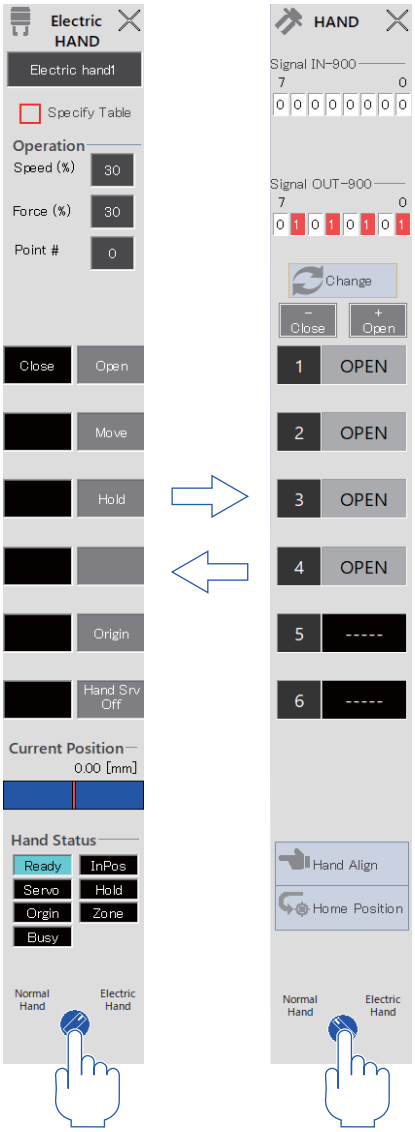
For details on the force control function, refer to the following manuals:

📖CR800 series controller Instruction Manual Force Sense Function (BFP-A3510)
📖CR750/CR751 series controller Instruction Manual Force Sense Function (BFP-A8947)



9.12 Hand operation

Pressing the [HAND] button (sheet key) will display the hand operation guide.
If a multi-function electric hand is attached to the robot, the electric hand operation guide will appear. The button at the bottom of the hand operation guide can be used to switch between the electric hand operation guide and normal hand operation guide.



Multi-function electric hand operation

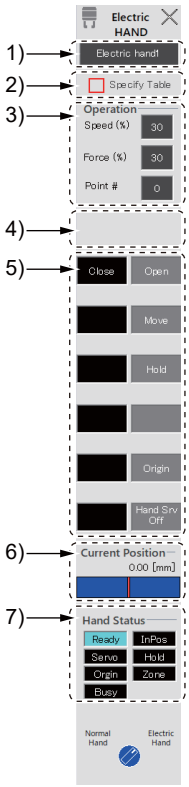
⚠ CAUTION

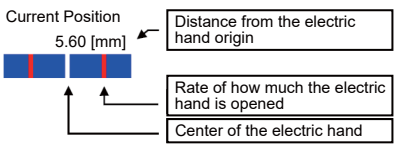
• The driving power of the multi-function electric hand can be turned off only by the hand servo OFF operation from the T/B.
Even if a robot emergency stop or an H level error occurs, or the robot servos are turned off, the driving power of the electric hand will not be turned off (except when an electric hand alarm occurs).
The driving power of the electric hand is automatically turned on when the operation command is executed.
Be sure to turn off the driving power before adjustment, such as adjusting the electric hand manually. Otherwise, the hand or fingers may get caught.

Multi-function electric hand operation is supported with the following controller software versions.

Controller name	Controller software version
CR800-D/R/Q	All versions
CR750-D/CRnD-700	Ver.S2a or later
CR750-Q/CRnQ-700	Ver.R2a or later

Pressing the [HAND] button (sheet key) will display the electric hand operation guide. If the normal hand operation guide is displayed, the button at the bottom of the hand operation guide can be used to display the electric hand operation guide.



No.	Name	Description
1)	Electric hand switching	Switches the electric hand to be operated.
2)	Specify Table	Enable it when using the electric hand table method. ☞ Page 47 Specifying a table
3)	Operation	Set a hand operating speed, force, and point number. If the table specification is enabled, set a table number.
4)	Comment display	Displays a comment if set in the selected point number or table number.
5)	Hand operation	Displays the name of the command when the corresponding sheet key is pressed. ☞ Page 47 Hand operation
6)	Current Position	Displays the distance from the hand origin. 
7)	Hand Status	Displays the status of the electric hand. ☞ Page 47 Hand conditions

Specifying a table

Selecting the [Specify Table] check box allows you to switch the operation mode. Additionally, the comment corresponding to the set table number or point number will appear.

The electric hand table method can be used with the following controller software versions.

Controller name	Controller software version
CR800-D/R/Q	All versions
CR750-D/CRnD-700	Ver.S3e or later
CR750-Q/CRnQ-700	Ver.R3e or later

Hand operation

Hand operation	Function explanation
Open	Opens the hand (only while the button is being pressed). Based on the setting values of the speed and force, the operation is the same as when the EHOpen command is executed.
Close	Closes the hand (only while the button is being pressed). Based on the setting values of the speed and force, the operation is the same as when the EHClose command is executed.
Operation	Specifies a table (only while the button is being pressed). Based on the setting value of the table number, the operation is the same as when the EHTbl command is executed.
Move	Moves the hand (only while the button is being pressed). Based on the setting values of the speed and point number, the operation is the same as when the EHMov command is executed.
Hold	Performs hand grasping (only while the button is being pressed). Based on the setting values of the speed, force, and point number, the operation is the same as when the EHHold command is executed.
Origin	Performs a home position return (only while the button is being pressed). The operation is the same as when the EHOrg command is executed.
Hand Srv Off	Turns off the driving power of the multi-function electric hand. This makes it possible to teach the robot directly by moving it by hand.

The conditions in which the electric hand can operate are as follows.

Controller conditions	Electric hand conditions
(1) Not during operation (2) Not during emergency stop (3) Not during stop input (4) T/B enabled * The operation can be performed regardless of whether the enable switch is on or off. * The operation can be performed even if an H/L error occurs (except when an electric hand error occurs).	(1) Connected (2) Model selected (3) Home position return completed (except while a home position return is performed) (4) Any of electric hand alarms (L8141/L8151/L8161) or electric hand errors (L8142/L8152/L8162) is not occurring. (5) Not during electric hand operation

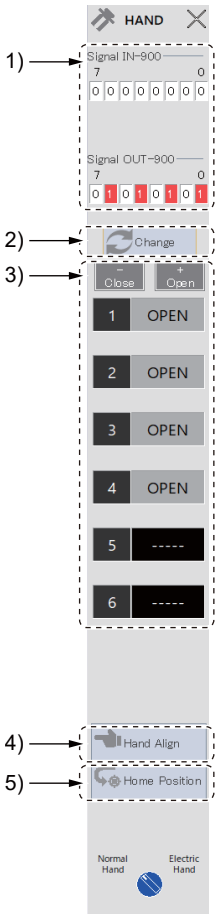
Hand conditions

The status of the hand is displayed as shown below.

Status name	Electric hand status	
	Background color: light blue	Background color: black
Ready	Ready for operation	Waiting for ready or during error
Servo	Servo ON	Servo OFF
Origin	Home position return complete	Home position return not complete
Busy	During operation	Stopped
InPos	Arrived at the target position	Not arrived at the destination point
Hold	During grasp	During open
Zone	Located in the area specified by hand open, hand close, or hand grasp operation.	Not located in the area specified by hand open, hand close, or hand grasp operation.

Standard hand operation

Pressing the [HAND] button (sheet key) will display the hand operation guide. If the electric hand operation guide is displayed, the button at the bottom of the hand operation guide can be used to display the normal hand operation guide.



No.	Name	Description
1)	Hand input/output signal	Displays the status of hand I/O signals. ☞ Page 48 Hand input/output signals
2)	Display switching	Displays hand numbers 7 and 8.
3)	Hand status	Displays whether the hand opens or closes. The hand is opened or closed by pressing the corresponding sheet key.
4)	Hand Align	Aligns the hand. ☞ Page 42 Hand alignment
5)	Home Position	Returns the robot to the home position. ☞ Page 43 Home position return

Hand input/output signals

The status of hand I/O signals is displayed.

If a multi-hand is connected with remote I/O, the hand signals will be displayed as follows:

Hand type	Signal	Outline of signals
Standard hand	IN-900 to 907 (Input signals 900 to 907)	ON: "1" is displayed and the background color becomes red. OFF: "0" is displayed and the background color becomes white.
	OUT-900 to 907 (Output signals 900 to 907)	
Multi-hand	IN-716 to 731 (Input signals 716 to 731)	
	OUT-716 to 723 (Output signals 716 to 723)	

10 CREATING A PROGRAM

⚠ CAUTION

• Program names that cannot be used with the T/B

If the name of a program in the controller is the same as a "reserved word" in Windows, an error will occur when the program is opened with program editing. In this case, change the name of the program in the controller.

"Reserved words" are special characters used by Windows in the system, which cannot be used as file names on the computer. The following characters are "reserved words".

AUX, COM1 to COM9, CON, LPT1 to 9, NUL, PRN

• Program names that cannot be used in the controller

The following program names cannot be used in the controller.

1. Too long (13 characters or longer)
2. Characters other than alphabetic characters or numbers (two-byte characters cannot be used)
3. Characters starting with 0

Program names including the conditions shown above will cause a warning to be displayed in some situations such as creating a new program, copying, renaming, or converting a program.

• If a password is registered in programs by the security function of the controller, programs in the controller cannot be read, saved, copied, renamed, or deleted.

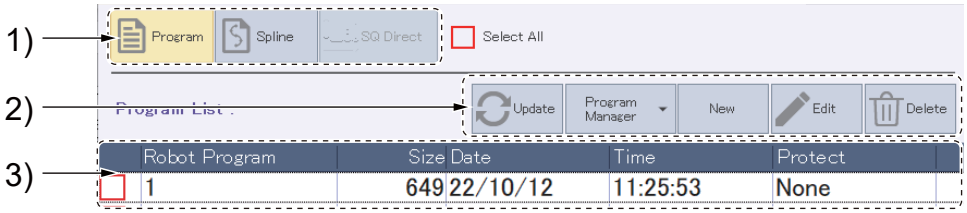
To perform these operations, delete the password of the security function of the controller. For information on how to delete the password, refer to the following page:

☞ Page 244 Deleting the password

This section explains how to edit robot programs.

Tapping [Program] in the menu will display the program list screen.

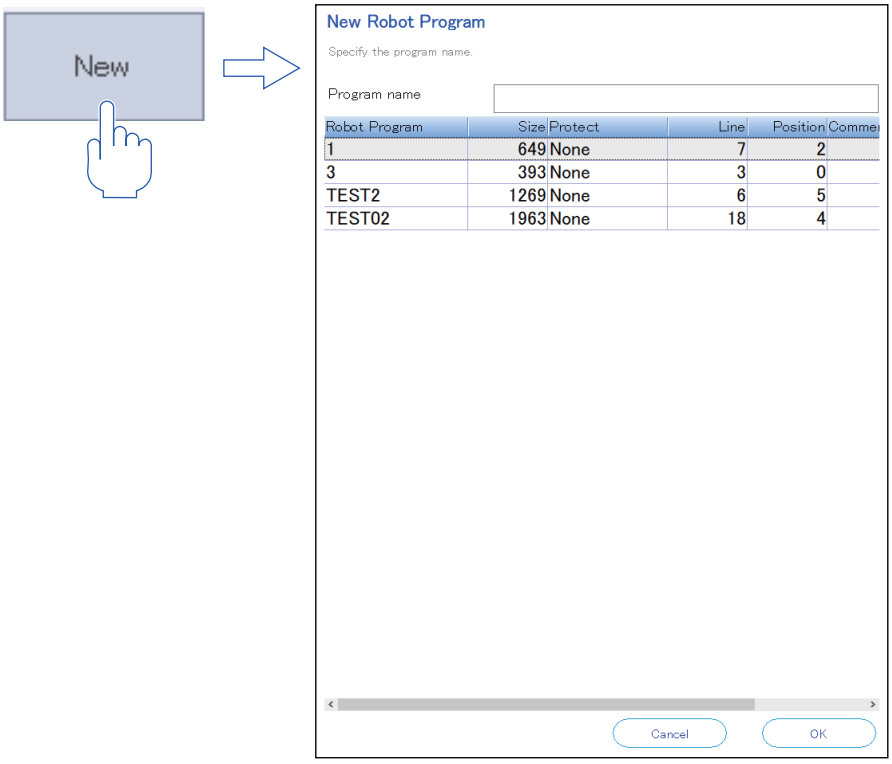
The program list screen is composed as follows:



No.	Name	Description
1)	Screen change buttons	Switches between the program list screen, spline file list screen, and SQ Direct editing screen.
2)	Program editing menu	Used for purposes such as updating the list of programs and creating a new program.
3)	Program list	Displays the list of programs read from the controller.

10.1 Creating a new program

Tapping [New] on the program list screen will display the dialog to create a new program.
Enter a program name, then tap [OK]. The program editing screen will appear.

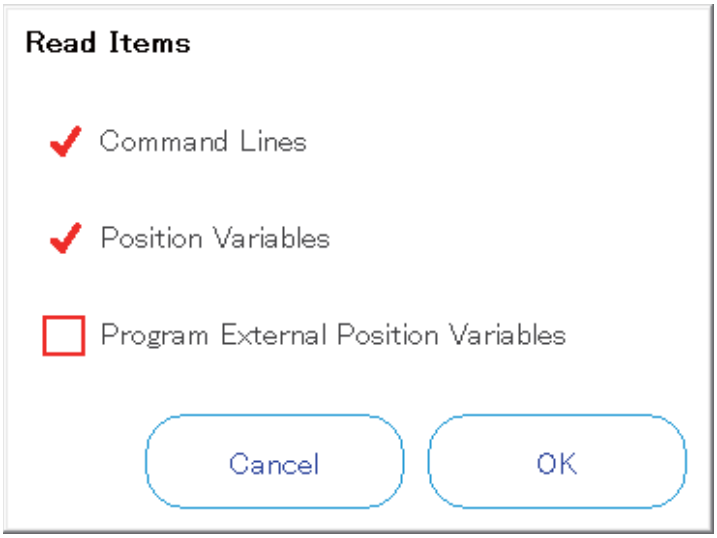


10.2 Opening an existing program

Select a program you want to edit from the program list, then tap [Edit]. The program editing screen will appear.
Double-tapping a displayed program name will also display the program editing screen.
If read protection is set for the program, release the protection.
For information on how to release the protection, refer to the following page:
☞ Page 82 Protection settings

Read items when opening a program

When a program is opened, commands, position variables, and program external variables can be selected to be read.
In the initial settings, items that will be read are as follows:



The following table shows which program external variables are read.
For details on the program external variables, refer to the instruction manual for the robot being used, "Detailed explanations of functions and operations".

Read items			Position variables, joint variables (P_01, J_02, etc.)	Position array variables, joint array variables (P_100( ), J_102( ), etc.)
Command	Position	External position variable		
✓	✓	✓	Reads only the external position variables (position variables, joint variables) used in command statements.	Reads all the elements used in command statements. *1
✓	☐	✓		
☐	✓	✓	Reads all external position variables (position variables, joint variables, position array variables, joint array variables).	
☐	☐	✓		

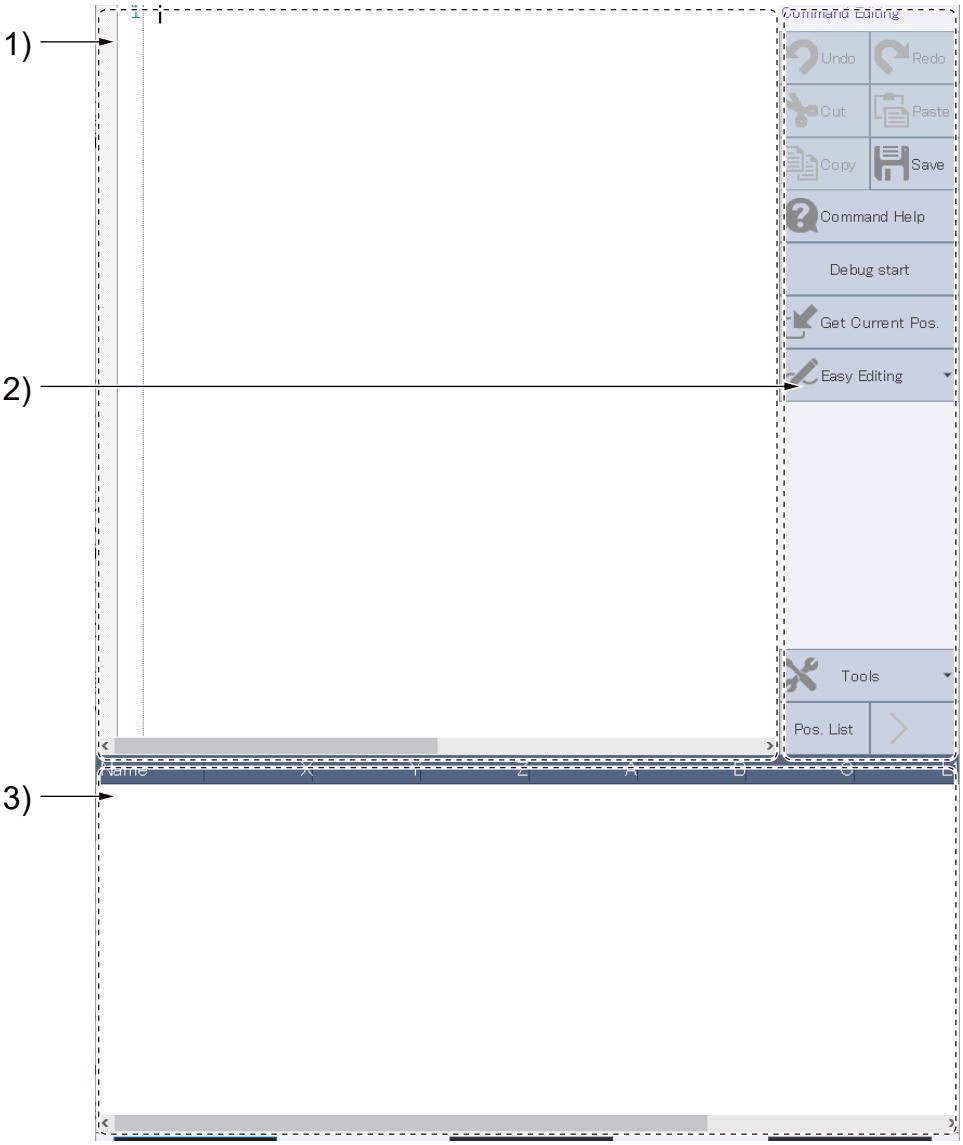
*1 If only P_100(1) is used in the command statement, P_100(1) to P_100(10) are all read. However, the number of valid elements differs depending on the controller software version.

Updating the list of programs

Tapping [Update] on the program list screen will read the programs in the controller.

10.3 Program editing screen

The program editing screen is composed as follows:



No.	Name	Description
1)	Command editing area	An area to edit program command lines ☞ Page 53 Editing command statements
2)	Edit menu	Displays the command editing menu or position editing menu. ☞ Page 57 Edit assist functions ☞ Page 59 Tool ☞ Page 66 Easy program editing ☞ Page 72 Position jump ☞ Page 73 Saving a program ☞ Page 74 Program debugging
3)	Position variable editing area	An area to edit program position variables ☞ Page 54 Editing position variables

10.4 Editing a program

⚠CAUTION

• Do not edit visual programs with the T/B.

If a program created using the visual program function is saved in the controller, sub programs automatically generated by the visual program are displayed in the program list. Do not edit these programs with the T/B.

The following shows a list of sub programs for the visual program.

• MVPBRANCH
• MVPCALCULATE
• MVPHAND
• MVPMOVE
• MVPPALLET
• MVPSIGNAL
• MVPVISION
• MVPWAIT

This section explains how to edit MELFA-BASIC V or MELFA-BASIC VI programs.

Editing command statements

The command statement editing area allows you to enter command statements with the keyboard like a general text editor.
Additionally, the cursor position can be manipulated with the wheel at the top of the sheet key.
Step numbers will automatically appear at the left end of the command editing area.

Tapping [Save] in the command editing menu will write the program to the controller.
Even if command statements are entered in lower case letters only, they will be converted into upper and lower case letters correctly when the program is written to the controller.
For information on other functions regarding the command editing menu, refer to the following page:
☞ Page 57 Edit assist functions

Editing position variables

⚠ CAUTION

• Upper and lower case letters in position variable names

In MELFA-BASIC V and MELFA-BASIC VI, lower case letters can be used in position variable names.

Position variable names are not case-sensitive in this software. For example, position variables "PA" and "pa" are recognized as the same position variable.

When a position variable name is defined for the first time, the controller will convert later variables according to the defined position variable name.

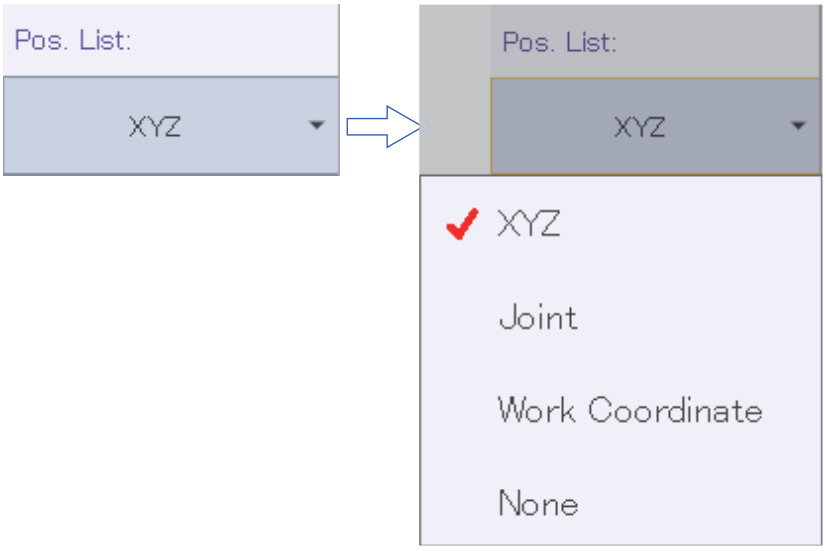
For example, if a program is created as follows, the position variable "pa" will be used. Therefore, "PA" will be converted into "pa".

```
1 Mov pa          1 Mov pa
2 Mov PA    ⇨     2 Mov pa
```

Writing the program to the controller will convert the letters into the ones shown on the right in the controller.

Program position variables are displayed in the position variable editing area.

[Pos. List] in the position editing menu allows you to select the type of position variables to be displayed in the position variable editing area.



Array variables are deployed and displayed in each list.

Name	X	Y	Z	A	B	C	L1
PA(1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PA(2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PA(3)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PA(4)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PA(5)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PA(6)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PA(7)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PA(8)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PA(9)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PA(10)	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Selecting multiple position variables

Selecting multiple position variables allows you to edit or delete them at a time.
Holding down the position variable editing area for 1+ second will select multiple position variables.
While they are selected, the color of the header in the position variable editing area is blue.
Holding down the position variable editing area again will deselect the position variables.
The types of position variables that can be used differ depending on the robot program language. The following types of position variables can be used in each robot program language.

Robot program language	Position variables that can be used		
	XYZ position variable	Joint position variable	Workpiece coordinate position variable
MELFA-BASIC VI	○	○	○
MELFA-BASIC V	○	○	×

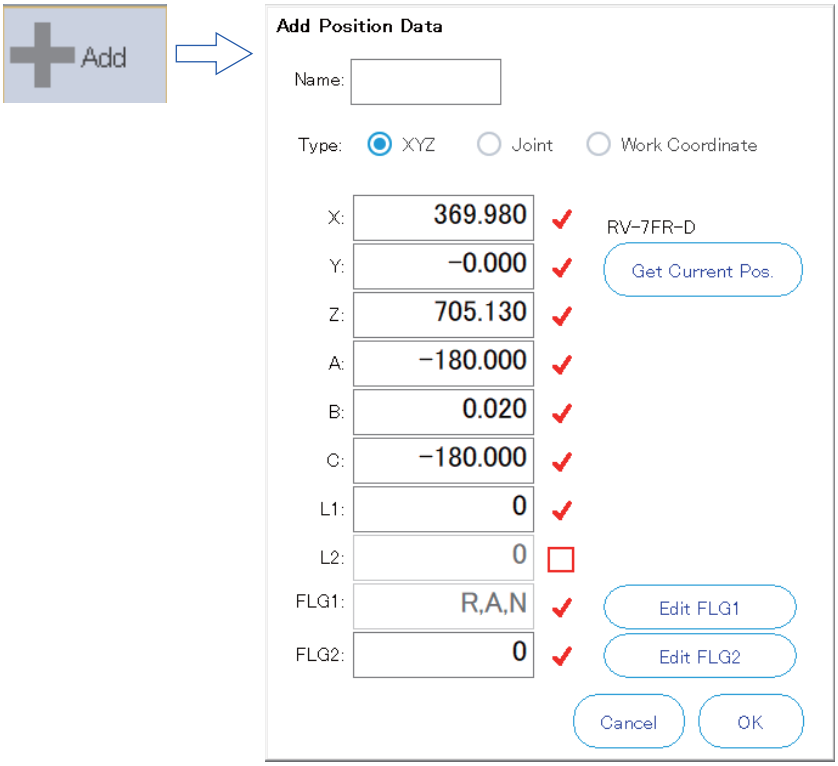
Adding/changing position variables

⚠CAUTION

• To add a position array variable, specify an array name and element number in the variable name.
Additionally, be sure to write the Dim declaration in the command statement before writing the program to the controller. Otherwise, an error will occur in the process of writing the program to the controller.
• The element unit to be used differs depending on the robot. Refer to the instruction manual for the robot being used.
• If the current position is acquired from a different model of robot, note that the acquired position data differs from the intended position.

■Adding position variables

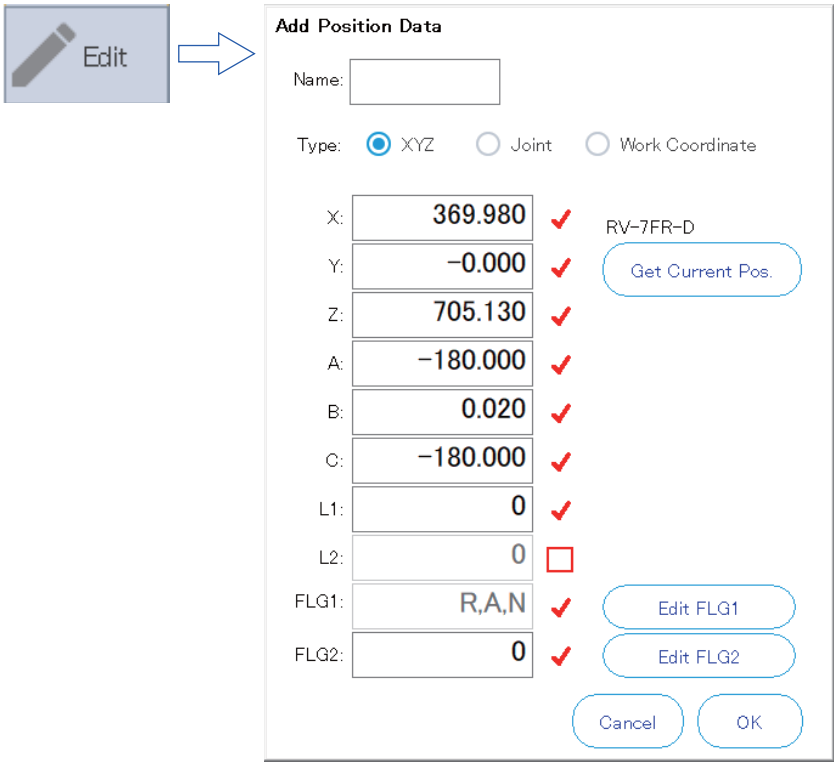
Tapping [Add] in the position editing menu or double-tapping the position variable editing area will display a dialog.
The check boxes on the right of axis names can be used to activate or deactivate the input fields.
Enter a variable name, type, and values of each axis, then tap [OK]. The variable will be added.
When a robot is connected to the controller, tapping [Get Current Pos.] will enter the values of the current robot position in the fields of each axis. Additionally, if [Get Current Position Automatically] is enabled in the program option settings, the values of the current robot position are entered in the fields of each axis automatically.
For workpiece coordinate variables, however, the current position cannot be acquired.
Tapping [Edit FLG1] or [Edit FLG2] will display the edit dialog.



Saving position variables in the controller will modify valid axes according to the robot axis configuration.

■Changing position variables

Select a variable name in the position variable editing area, then tap [Edit] in the position editing menu. A dialog will appear.
Double-tapping the variable name in the position variable editing area will also display the dialog.
The check boxes on the right of axis names can be used to activate or deactivate the input fields.
Enter a variable name, type, and values of each axis, then tap [OK]. The variable will be changed.
Tapping [Edit FLG1] or [Edit FLG2] will display the edit dialog.



For SQ Direct or when a program is opened for debugging, the variable name cannot be changed.

Deleting position variables

⚠CAUTION

• To delete a position array variable, delete the Dim declaration in the command statement.
Even if a position variable is deleted in this software, when a program with a Dim declaration is written to the controller, the position array variables remain as 0 for each component.

Select a variable name in the position variable editing area, then tap [Delete] in the position editing menu. A confirmation dialog will appear. Tapping [Yes] will delete the position variable.

Edit assist functions

This section explains the edit assist functions useful for program editing.
Use the edit assist functions from the command editing menu or position editing menu.

Copy

Copy characters in the command editing area. Multiple lines can be copied.
Select a character string you want to copy, then tap [Copy] in the command editing menu.
The paste function allows you to paste the copied character string in another location in the program.

Cut

Cut a character string in the command editing area. Multiple lines can be cut.
Select a character string you want to cut, then tap [Cut] in the command editing menu.
The paste function allows you to paste the cut character string in another location in the program.

Paste

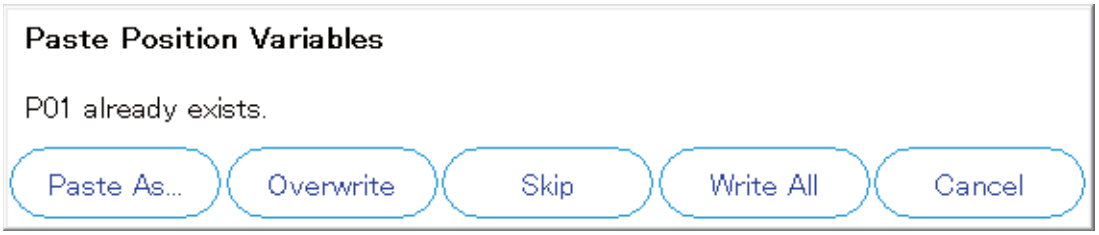
Paste a copied or cut character string in a specified location.
Place the cursor over the location you want to paste, then tap [Paste] in the command editing menu.
The copied or cut character string will be inserted into the specified location.

Copying a position variable

Copy a position variable. Multiple position variables can be copied.
Select a position variable you want to copy, then tap [Copy] in the position editing menu.

Pasting a position variable

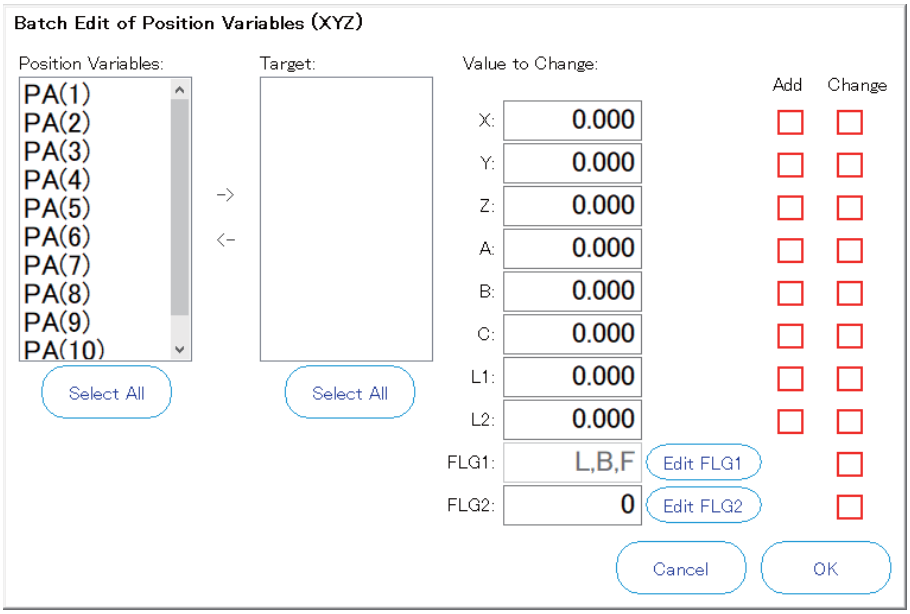
Paste the copied position variable.
Tap [Paste] in the position editing menu. The copied position variable will be added.
If a position variable with the same name exists, a confirmation message will appear.



Position variable batch editing

Position variables can be batch changed or values can be added.

Select a variable type you want to edit from the Pos. List drop-down list in the position editing menu, then tap [Batch Edit].



Select a variable name you want to edit from Position Variables, then tap [->] to add it to Target. Tapping [<-] will delete it from Target.

Enter a value in the Value to Change field, select the [Add] or [Change] check box, then tap [OK]. The value of the position variable will be changed.

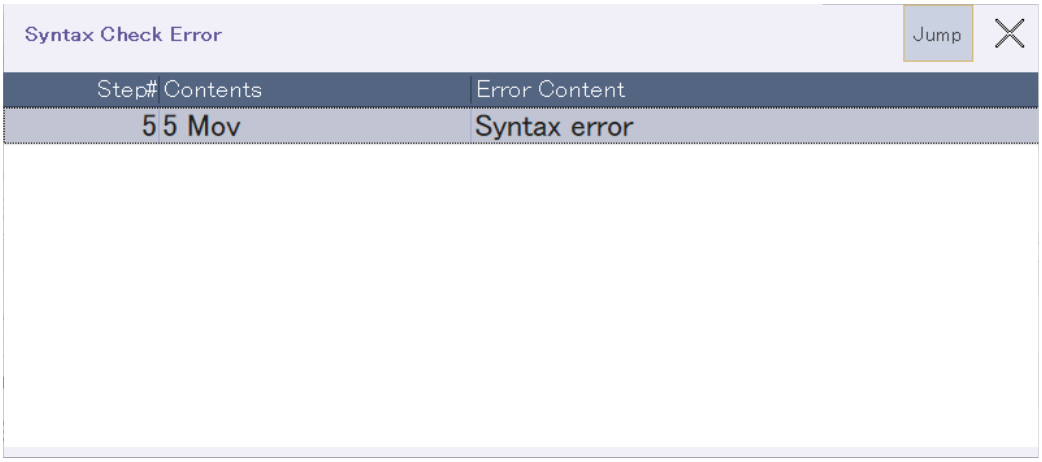
In this step, both [Add] and [Change] cannot be selected for the same element. Additionally, only [Change] can be selected for the structure flags (FLG1 and FLG2).

Tool

Tapping [Tools] in the command editing menu will display a drop-down list.
Tap and select a function you want to use from the drop-down list.

Syntax check

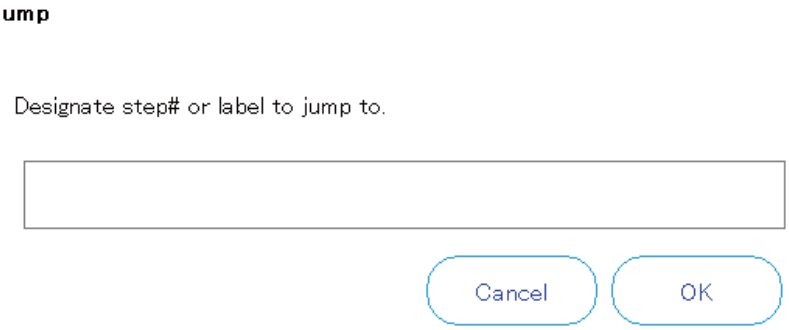
Whether the syntax of the robot program is correct can be checked.
Tap [Tools] in the command editing menu, then [Syntax Check]. Syntax check will start. If there is an error in the syntax, the location and details of the error will appear under the command editing area.



Double-tapping the detected error or selecting the list and tapping [Jump] will jump to the command line with the error.

Jumping to a specified line

Jump to a specified step number or label.
Tap [Tools] in the command editing menu, then [Jump]. The jump dialog will appear.
Enter a step number or label, then tap [OK]. The cursor will jump to the specified step number or label.



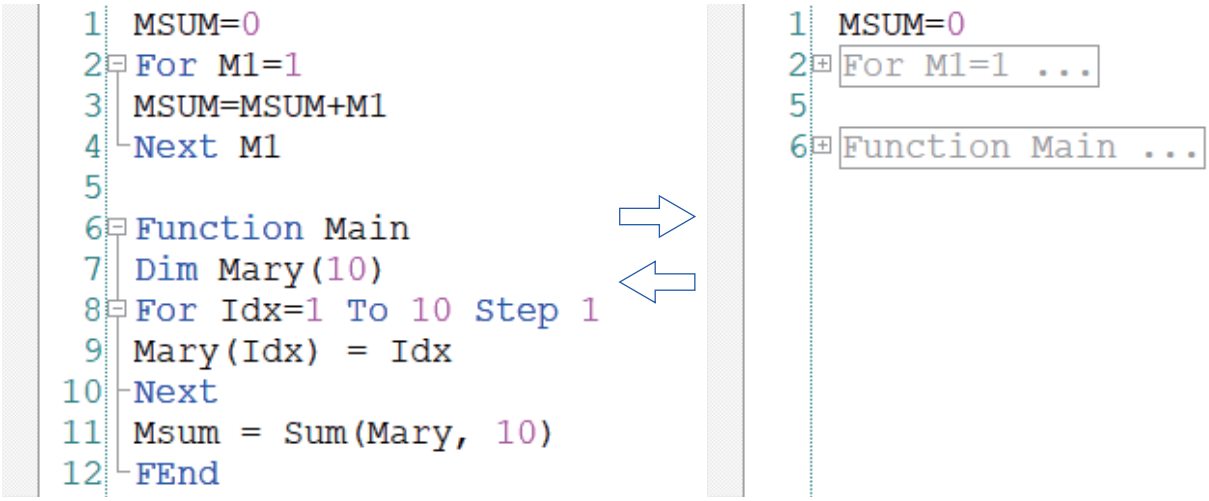
Jumping to a label/procedure definition line

Place the cursor over a label name or procedure name in the command editing area, tap [Tools] in the command editing menu, then [Move To Definition]. The cursor will jump to the label or procedure definition line.
The following robot program languages are available in this function.

Program language	Label	Procedure
MELFA-BASIC VI	Jumping possible	Jumping possible
MELFA-BASIC V	Jumping possible	Jumping impossible

Collapsing command blocks

This function collapses command blocks or procedures in the program, which makes it easy to view the program.



Tapping [Tools] in the command editing menu, then [Collapse All] will collapse all the command blocks and procedures.
Tapping [Tools] in the command editing menu, then [Expand All] will expand all the command blocks and procedures.

Search

Search for a specified character string.

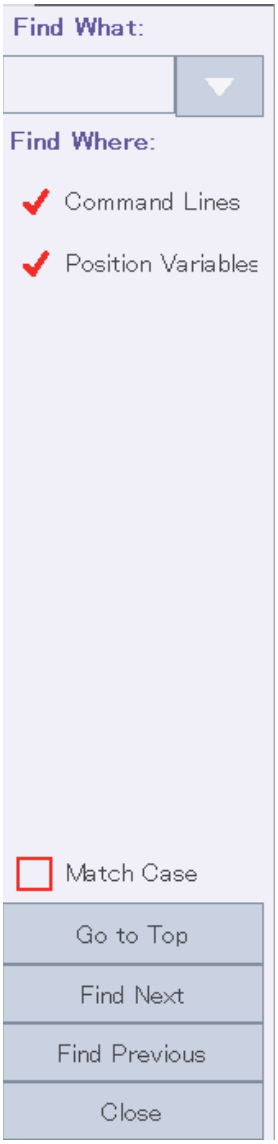
Tap [Tools] in the command editing menu, then [Find]. The search screen will appear.

Tapping [Find] while a command statement is selected will enter the selected characters in the input field.

Enter a character string to search for, then tap [Find Next] or [Find Previous]. The search will start.

Tapping ▼ on the right of the input field will display the search history.

Once the program editing screen is closed, the search history will be deleted.



Replace

Replace a specified character string with another one.

Tap [Tools] in the command editing menu, then [Replace]. The replace screen will appear.

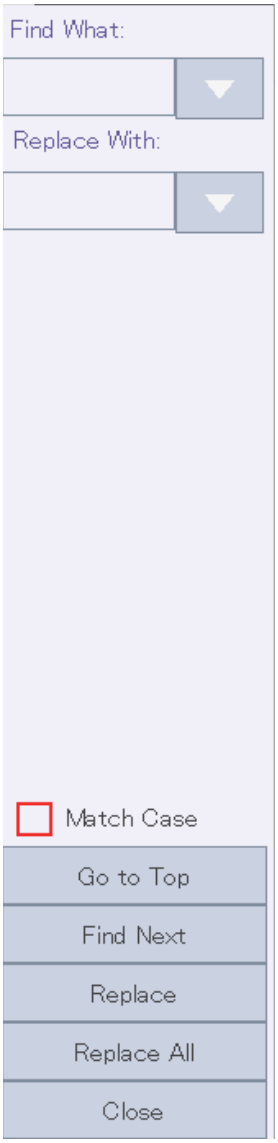
Tapping [Replace] while a command statement is selected will enter the selected characters in the input field.

Enter a character string to search for and a character string you want to replace with, then tap [Find Next]. The search will start. Tapping [Replace] will replace the searched character string.

Tapping [Replace All] will replace all the searched character strings in the command line.

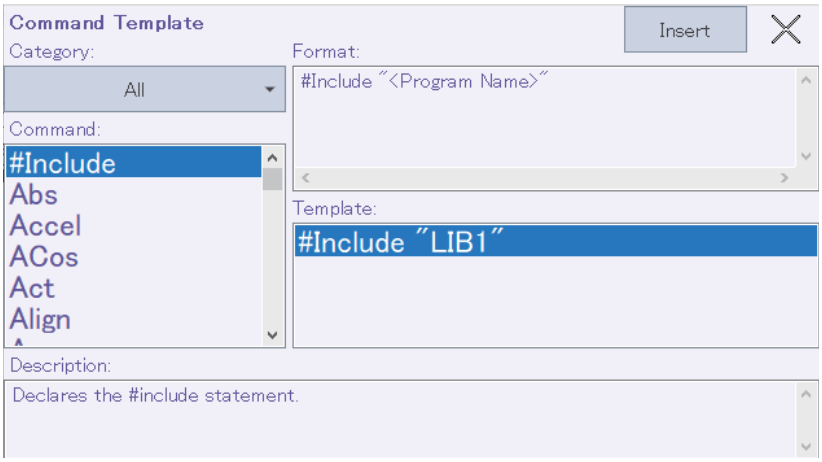
Tapping ▼ on the right of the input field will display the search history.

Once the program editing screen is closed, the search history will be deleted.



Command template

Selecting a command statement from the command list allows you to insert it into the program command editing screen.
Tap [Tools] in the command editing menu, then [Command Template]. The command template screen will appear.
Select a command and template you want to insert, then tap [Insert]. The command template will be inserted into the command editing area.
When modifying the command statement entered using the command template, do not use [Undo].
Doing so may delete not only the command statement inserted previously but also other command statements inserted using the command template.

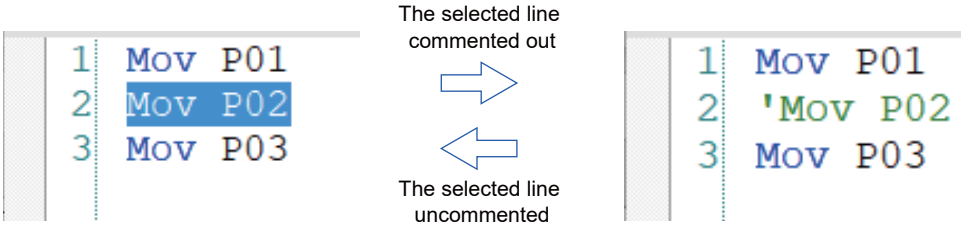


Comment selection/uncomment selection

⚠CAUTION

• Precautions when setting or removing a comment in the program opened in the debugging state
Once a comment is set or removed in the program opened in the debugging state, it will be written to the controller immediately. If continuous execution is underway, or the robot controller is running, an error will occur.

Selected lines can be batch commented out or uncommented.
Select a line to be commented out in the command editing area, tap [Tools] in the command editing menu, then [Comment Selection]. An "'" (comment character) will be prepended to the selected line.
Selecting a line to be uncommented, tap [Tools] in the command editing menu, then [Uncomment Selection]. An "'" (comment character) will be deleted from the beginning of the selected line. Even if a REM command is uncommented, "REM" will not be deleted.



Batch removing comments

⚠CAUTION

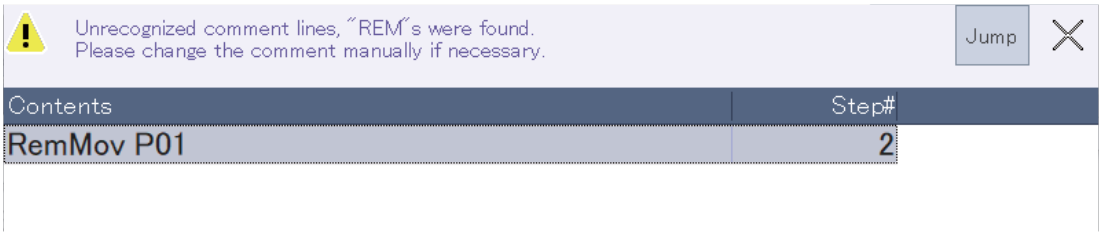
• Removal process for special comment command "Rem"

A space delimiter must be usually inserted between the comment command "Rem" and the line number or other command. However, even if a space is not used, robot controllers may judge the comment command "Rem" as a comment in some descriptions.

This software, however, judges the comment command as a comment when delimited by a space.

If a character "Rem" found in the command line is not delimited by a space, the comment will not be removed. After the processing is complete, the command line will be listed. Check the contents, then remove the comment on the command editing screen.

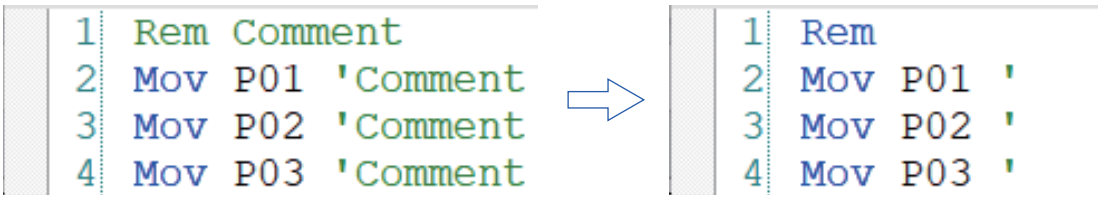
Selecting a command line from the list and tapping [Jump] will jump to the command line on the command editing screen. (Jumped to the line with the step number displayed in the list. After the list is displayed, if a line is added or deleted on the command editing screen, note that the cursor will jump to a line with different contents.)



All the comments set in the program being edited can be batch removed.

Tap [Tools] in the command editing menu, then [Remove All Comments]. A confirmation dialog will appear.

Tapping [Yes] will delete all the comments in the program. However, the comment command "Rem" and "'" will not be deleted.

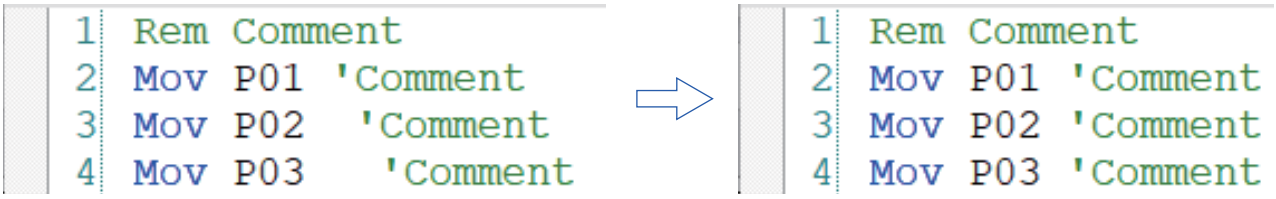


Automatically aligning comment start positions

All comment start columns set in the program being edited can be automatically aligned.

Tap [Tools] in the command editing menu, then [Alignment Comments Start Pos]. A dialog will appear.

Enter a value in Comment Start Column, then tap [OK]. All the comment start columns in the program will be aligned at the set position automatically. However, this operation does not apply to lines containing only comment commands.



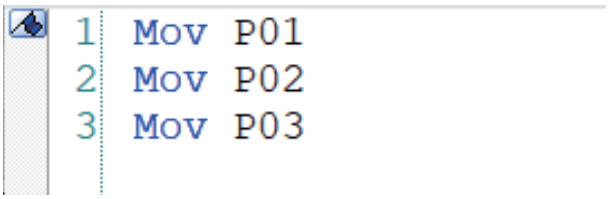
Bookmark

Setting bookmarks in the program being edited allows you to jump the cursor to a line with a bookmark. This function is useful for temporarily making a note of lines being edited and label lines at jump destinations.

■Adding a bookmark

A line with a bookmark has a "  " at the left end of the command line.

Additionally, the set bookmark is available only when the program editing screen is opened. Once the program editing screen is closed, all the set bookmarks will be deleted.



■Deleting a bookmark

To delete a bookmark, place the cursor over the command line with the bookmark, tap [Tools] in the command editing menu, then [Delete a Bookmark].

To delete all the bookmarks set in the program, tap [Tools] in the command editing menu, then [Delete All Bookmarks].

■Jumping to a line with a bookmark

When bookmarks have been set, tap [Tools] in the command editing menu, then [Jump to Prev Bookmark] or [Jump to Next Bookmark]. The cursor will jump to the line with a bookmark closest to the current location.

10.5 Easy program editing

Selecting setting items will generate a command statement automatically, which allows you to insert it into the program.
Tap [Easy Editing] in the command editing menu, then a command you want to enter. The setting screen will appear.
Enter a value, then tap [Insert]. The command statement will be inserted into the program.
When modifying a command statement entered using the easy program editing function, do not use [Undo].
Doing so may delete not only the command statement inserted previously but also other command statements inserted using the easy program editing function.

[Move] command

Tap [Easy Editing] in the command editing menu, then [Move].

The following shows the settings.

Setting	Description	Remarks
Position	Select the position variable at the destination.	Mandatory field
Movement	Select how the robot moves. • Straight (Mvs) The path from the movement start point to the target position becomes a straight line. • Non Straight (Mov) The path from the movement start point to the target position becomes a shallow curve. The path differs depending on the posture of the robot when it moves.	Initial setting: Straight
Distance Above a Position	Specify the amount of offset for the move position.	Initial value: 0.000

The following shows an example of programs to be inserted.

Program	Position	Movement	Distance Above a Position
Mvs P1	P1	Straight	0 or no value
Mov P1, -50	P1	Non Straight	50

[Hand] command

Tap [Easy Editing] in the command editing menu, then [Hand].

The following shows the settings.

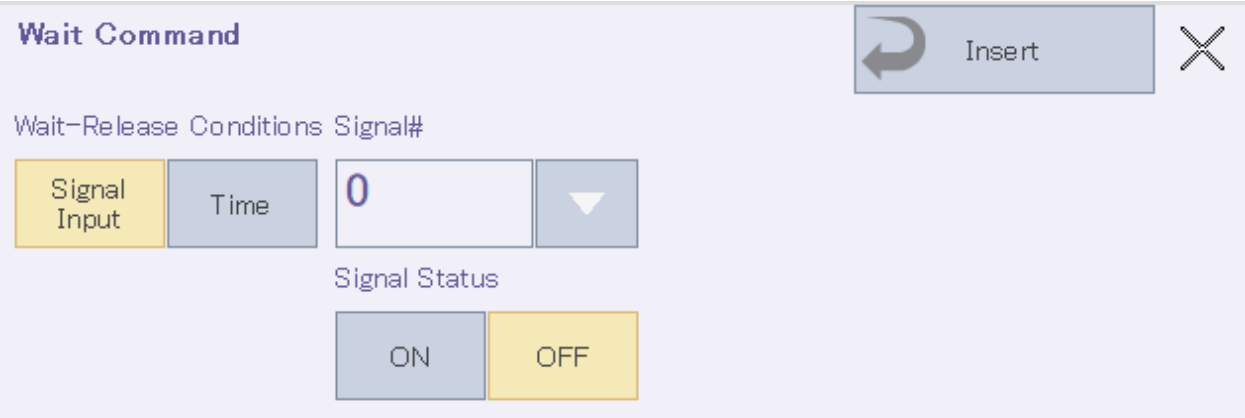
Setting	Description	Remarks
Hand No.	Select the number of a hand you want to operate.	—
Hand Operation	Select the operation of the hand. • Open (HOpen/EHOpen) • Close (HClose/EHClose)	Initial value: Close
Electric Hand	Select the check box to use the electric hand command.	—
Speed	Set the speed of the electric hand.	Displayed only when the Electric Hand check box is selected.
Force	Set the force of the electric hand.	Displayed only when the Electric Hand check box is selected.

The following shows an example of programs to be inserted.

Program	Hand No.	Hand Operation	Electric Hand	Speed	Force
HClose 1	1	Close	Not selected	—	—
EHOpen 1, 100, 80	1	Open	Selected	100	80

[Wait] command

Tap [Easy Editing] in the command editing menu, then [Wait].



The following shows the settings.

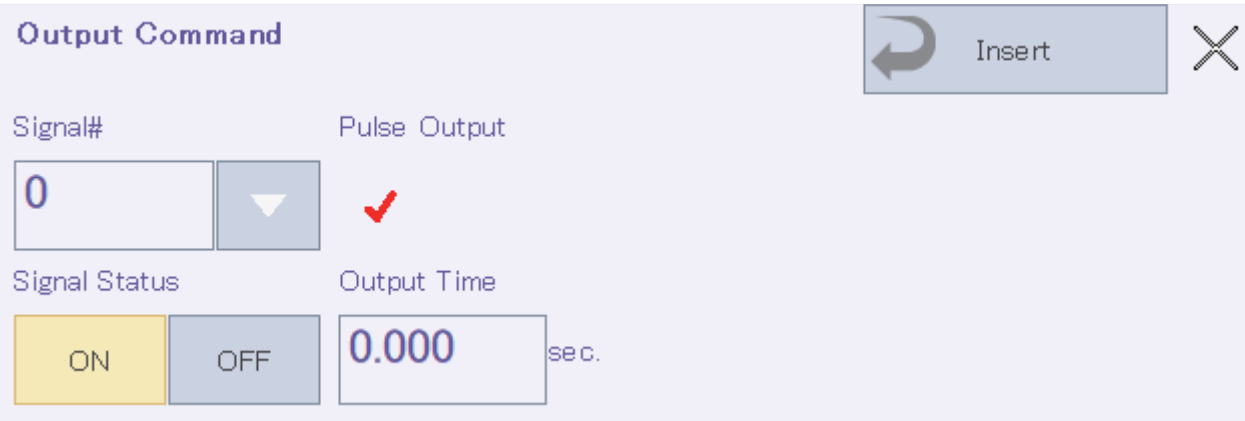
Setting	Description	Remarks
Wait-Release Conditions	Select the conditions under which the program should stop waiting. • Signal Input (Wait M_In( )) Waiting state until a specified signal turns on or off • Time (Dly) Waiting state for a specified time	—
Signal#	If Signal Input is set in Wait-Release Conditions, enter a signal number. Tapping ▼ on the right of the input field will display the input history. Once the program editing screen is closed, the input history will be deleted.	Initial value: 0 Handled as 0 if no value is entered in the field.
Signal Value	If Signal Input is set in Wait-Release Conditions, enter the status of the signal.	Initial value: OFF
Waiting Time	If Time is set in Wait-Release Conditions, enter a waiting time.	Ensure that a higher value than 0 is entered. Initial value: 0.100

The following shows an example of programs to be inserted.

Program	Wait-Release Conditions	Signal#	Signal Value	Waiting Time
Wait M_In(32) = 1	Signal Input	32	ON	—
Dly 0.5	Time	—	—	0.5

[Output] command

Tap [Easy Editing] in the command editing menu, then [Output].



The following shows the settings.

Setting	Description	Remarks
Signal#	Enter a signal number you want to output. Tapping ▼ on the right of the input field will display the input history. Once the program editing screen is closed, the input history will be deleted.	Initial value: 0 Handled as 0 if no value is entered in the field.
Signal Value	Select the status of the signal to be output.	Initial value: OFF
Pulse Output	Select the check box to use pulse output.	Initial value: OFF
Output Time	Enter the output time of the signal.	Displayed only when the Pulse Output check box is selected. Ensure that a higher value than 0 is entered.

The following shows an example of programs to be inserted.

Program	Signal#	Signal Value	Pulse Output	Output Time
M_Out(32) = 0	32	OFF	Not selected	—
M_Out(32) = 1 Dly 3	32	ON	Selected	3

[Calculus] command

Tap [Easy Editing] in the command editing menu, then [Calculus].

The following shows the settings.

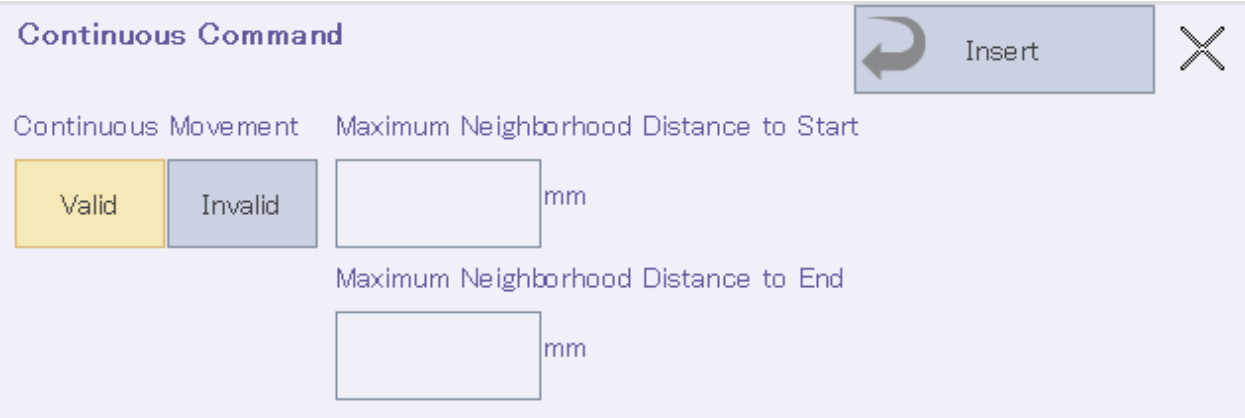
Setting	Description	Remarks
Operation	Select what operational treatment you want to perform. • Initialize Initialize the value of a specified variable. "Initial Value" in the settings can be used to set a value after initialization. • +/- Increase or decrease the value of a specified variable. "Increase/decrease by" in the settings can be used to set a value for increment or decrement.	—
Variable Name	Enter a variable name for operational treatment.	Mandatory field
Initial Value	If "+/-" is selected for Operation, enter the amount of increment/decrement for the variable.	Initial value: 0
Increase/decrease by	If "Increment/Decrement" is selected for Operation, enter the amount of increment/decrement for the variable.	Enter a value other than 0.

The following shows an example of programs to be inserted.

Program	Operation	Variable Name	Initial Value	Increase/decrease by
M1 = 1	Initialize	M1	1	—
M1 = M1 + 2	+/-	M1	—	2

[Continuous] command

Tap [Easy Editing] in the command editing menu, then [Continuous].



The following shows the settings.

Setting	Description	Remarks
Continuous Movement	Select whether to enable or disable continuous movement.	—
Maximum Neighborhood Distance to Start	Enter the maximum neighborhood distance at the start of continuous movement.	Displayed only when continuous movement is enabled.
Maximum Neighborhood Distance to End	Enter the maximum neighborhood distance at the end of continuous movement.	Displayed only when continuous movement is enabled.

The following shows an example of programs to be inserted.

Program	Continuous Movement	Maximum Neighborhood Distance to Start	Maximum Neighborhood Distance to End
Cnt 0	Invalid	—	—
Cnt 1 100, 200	Valid	100	200

10.6 Position jump

⚠CAUTION

• Robot operation after arch interpolation is interrupted
Even if the [EXE] button is released during position jump, pressing the [EXE] button again will cause the robot to move.
When Arch (Mva) is selected for Interpolation, the robot will move in arch interpolation again from where the operation is resumed.
Ensure safety around the robot, then resume the operation.

The robot can be moved to specified coordinates.

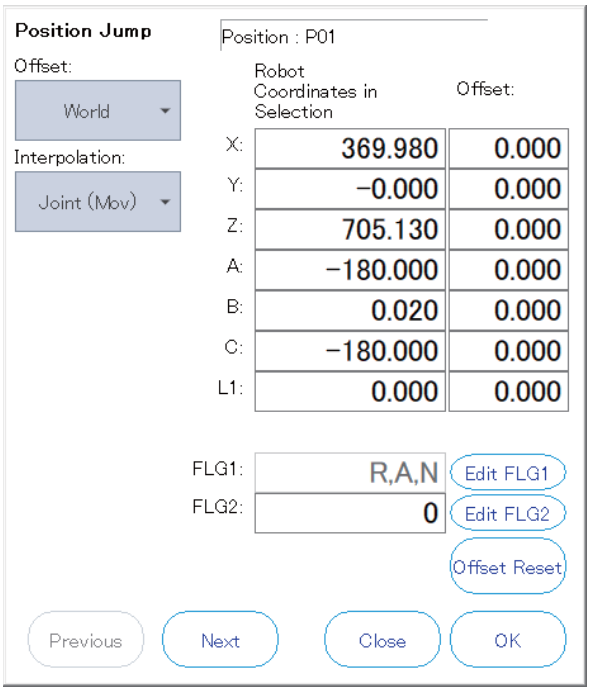
Workpiece coordinate variables cannot be used in this function.

The following explains how to operate position jump.

1. Select which robot you want to move. (When multiple mechanisms are set.)

2. Select one position variable from the position variable editing area.

3. Tap [Pos. Jump] in the position editing menu. A dialog will appear.



4. Enter coordinates at the destination. Tapping [Offset Reset] will set the offset value to 0.

5. Select how the robot moves. (Mov: Joint interpolation, Mvs: Linear interpolation, Mva: arch interpolation)

6. Tapping [OK] will display a confirmation dialog.

7. Press the [SERVO] button (sheet key) to turn on the servo power.

8. The robot moves while the [EXE] button (sheet key) is pressed.

9. After the position jump is complete, the confirmation dialog will close.

When the key switch is set to "AUTO", the position jump function can be used by displaying the operation panel.

10.7 Saving a program

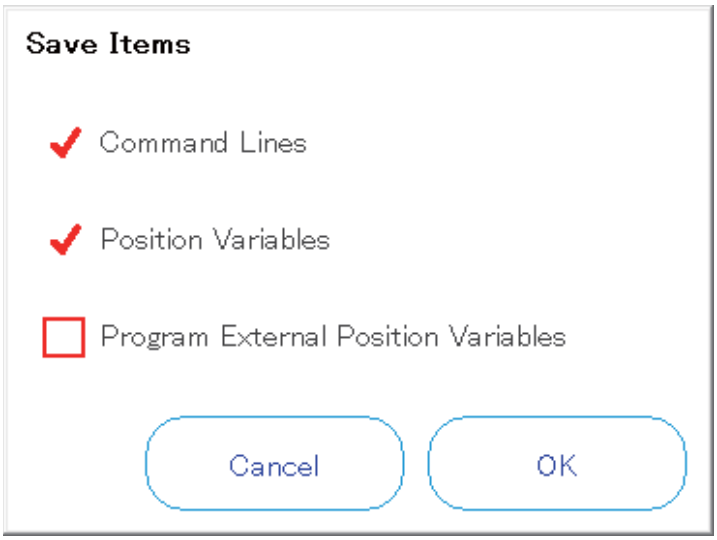
⚠CAUTION

• Timing at which program external variables are written.
The timing at which the program external variables can be backed up is the next time the power supply is turned on.
To use the program external variables written to the controller, cycle the power of the controller.

Be sure to save the edited program.

Tapping [Save] in the command editing menu will write the program to the controller.

When the program is saved, commands, position variables, and program external variables can be selected to be written.



10.8 Program debugging

Created robot programs can be debugged.

Start debugging

Tap [Debug start] in the command editing menu. The program save screen will appear. After the saving process, the debug guide will appear on the right side of the screen.

The execution line cursor is displayed at the left end of the command editing area during debugging. A line with the execution line cursor is the line being executed.
When [Always show execution lines] is enabled, the execution line can be seen on the screen at all times even if the execution line changes.

Running a program using step operation

⚠CAUTION

• Take special care to the robot movements during operation. If there is a possibility that any abnormality will occur, such as interference with the peripheral devices, immediately release the [+] button to stop the robot. Additionally, releasing the 3-position enable switch or pressing it tightly will also stop the robot.

The program can be executed line by line during debugging (step operation).

To move the robot using step operation, lightly hold down the 3-position enable switch on the T/B to turn on the servo power.

Immediately stopping the robot during debugging

• Press the emergency stop button.

The servo power will be turned off and the robot will stop immediately, causing an error.

Step operation can be resumed after the error is reset and the servo power is turned on.

• Release the 3-position enable switch or press it tightly.

The servo power will be turned off and the robot will stop immediately.

Step operation can be resumed after the servo power is turned on.

• Release the [+] button.

The robot will stop immediately. The servo power remains on.

Pressing the [+] button will resume step operation.

Step forward

Keep pressing the [+] button (sheet key) corresponding to "step forward".

The program is run one line only at a time. The program can be run from the first line or a specified line. Once the [+] button is released during execution, the robot will stop immediately.

Step backward

Keep pressing the [+] button (sheet key) corresponding to "step backward".

The program stopped by reasons such as step forward goes back one line and runs. This operation is available only for the interpolation command, and the program can go back up to four lines and run. Once the [+] button is released during execution, the robot will stop immediately.

Continuous execution

Keep pressing the [+] button (sheet key) corresponding to "continuous execution".

The program is run from the current line onward.

Skip

Pressing the [+] button (sheet key) corresponding to "skip" allows you to move one line ahead without executing the currently selected program line. Pressing the [-] button allows you to move back one line without executing the currently selected program line.

The skip function is available even when the 3-position enable switch is not pressed or the robot is in the servo OFF state.

Keeping pressing the [+] or [-] button does not skip lines continuously.

Step jump

A line to be executed can be specified.

1. Pressing the [+] button (sheet key) corresponding to "JUMP" on the debug screen will display the screen to set a line number.

2. Enter a line number, then tap [OK].

3. The number of the execution line will be changed.

A variable undefined error or similar error will occur if a command line such as initializing variables is skipped.

Program reset

Resetting a program being executed can return the execution line to the beginning.

Press the [+] button (sheet key) corresponding to "Program RESET" on the debug screen.

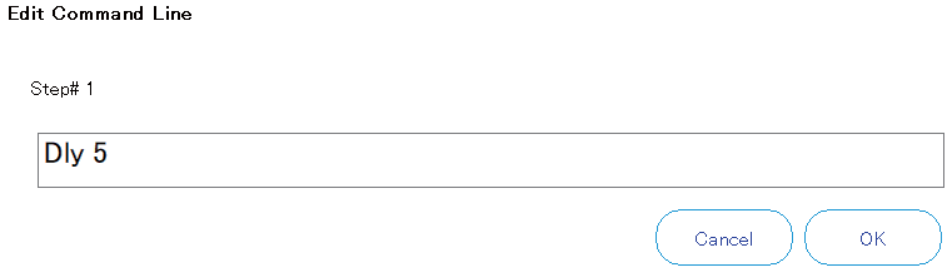
Modifying a program

Edit a command statement in the program opened in the debugging state from [Tools] in the command editing menu.

Editing a command line

A specified command line can be edited.

Place the cursor over the command line you want to edit, tap [Tools] in the command editing menu, then [Edit Command Line]. The edit dialog will appear. Edit the command line, then tap [OK]. The program will be written to the controller.



Inserting a command line

A command statement can be inserted into a specified line.

Place the cursor over the next line after where you want to insert a command statement, tap [Tools] in the command editing menu, then [Insert Command Line]. The edit dialog will appear. Enter a command line you want to insert, then tap [OK]. The program will be written to the controller.

Deleting a command line

A specified command line can be deleted.

Place the cursor over the command line you want to delete, tap [Tools] in the command editing menu, then [Delete Command Line]. A confirmation dialog will appear. Tap [Yes]. The specified command line will be deleted, and the program will be written to the controller.

Editing position variables

⚠CAUTION

• Pay sufficient attention when changing a variable value.
Changing a value will change the destination point of the robot, causing interference with surrounding objects. A dangerous situation arises especially while the robot is moving. Be sure to carefully check the values you will change.

Position variables can be edited as usual even during debugging.

☞ Page 54 Editing position variables

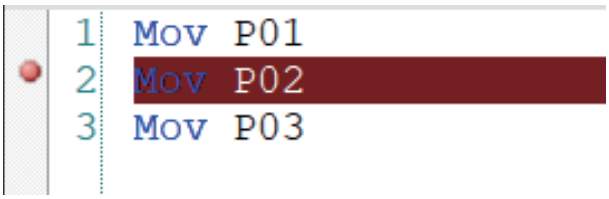
Setting and deleting breakpoints

If a breakpoint is set in a program, the program will stop at the line where the breakpoint has been set even if the program is executed continuously at the time of debugging. After the program stops, step operation can be continued.
Once the T/B is rebooted, the settings of all the breakpoints will be deleted.
Up to 128 breakpoints can be set.

Setting breakpoints

Set a breakpoint using the following steps.

1. Place the cursor over the command line where you want to set a breakpoint, tap [Tools] in the command editing menu, then [Set a Breakpoint]. Or tap the left side of the line number.
2. The line where a breakpoint has been set will have a "  " at the left end of the command line and the background will be colored brown.



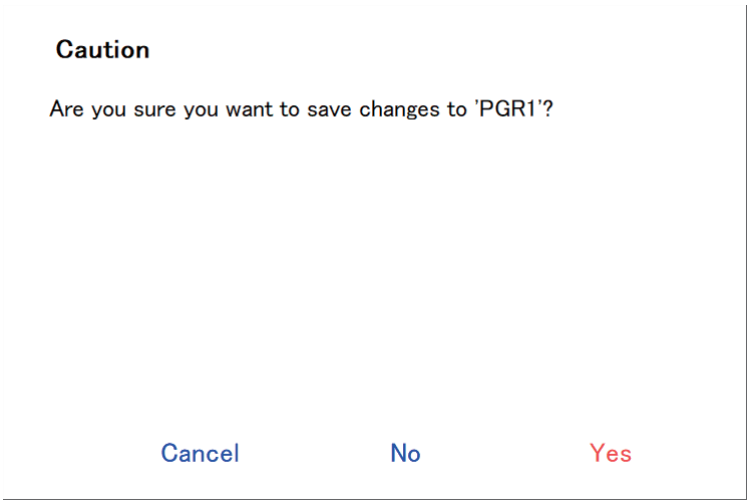
When a breakpoint is added during debugging, a continuous breakpoint or temporary breakpoint can be selected.
If a continuous breakpoint is selected, the breakpoint settings remain even after the program stops at the breakpoint.
If a temporary breakpoint is selected, the breakpoint settings are canceled after the program stops at the breakpoint.

Deleting breakpoints

To delete a breakpoint, place the cursor over the command line with the breakpoint you want to delete, then tap [Tools] in the command editing menu, then [Delete a Breakpoint]. Or tap the left side of the line number.
To delete all the breakpoints set in the program, tap [Tools] in the command editing menu, then [Delete All Breakpoints].

Finish debugging

To finish debugging, tap [Tools] in the command editing menu, then [Debug stop], or tap the close button at the top right of the debug operation guide.
If a change has been made to the program, a confirmation message will appear.



If "No" is selected, the changed data will be discarded. To apply the changed data, be sure to select "Yes".

10.9 Program manager

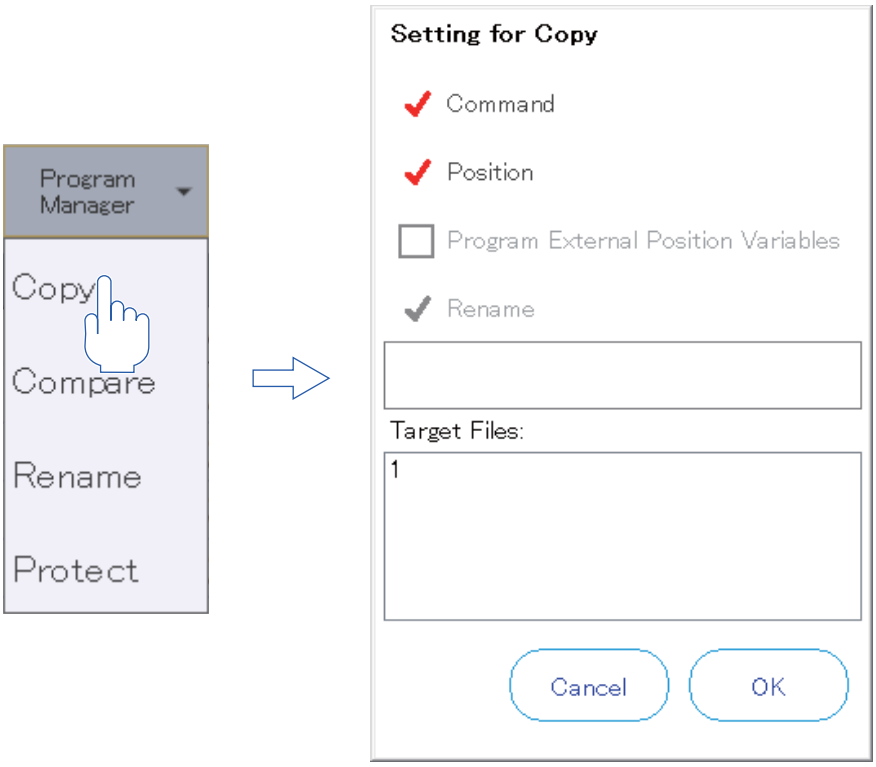
⚠CAUTION

All the operations in this function are for robot programs.

Robot programs can be copied, compared, renamed, and protected.

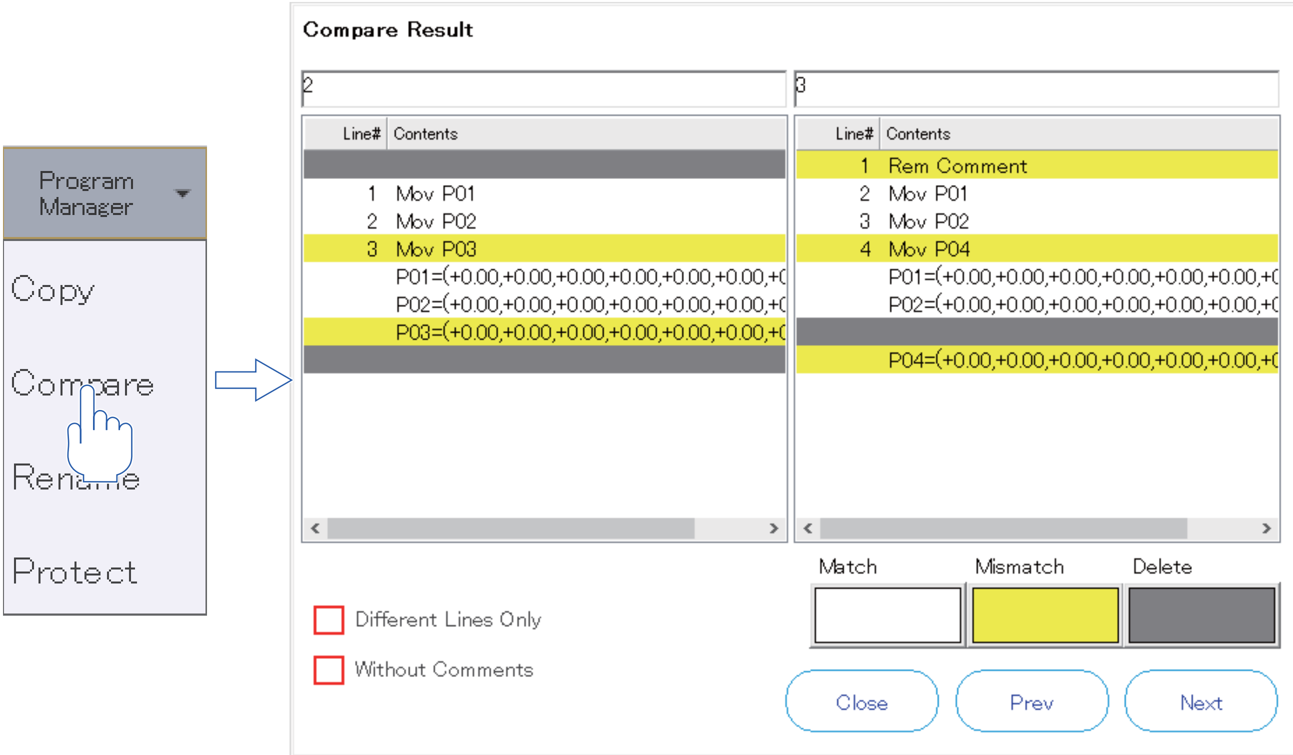
Copying programs

Select a program you want to copy on the program list screen, tap [Program Manager], then [Copy].
Select an item you want to copy, enter a program name, then tap [OK]. The program will be copied.
If a program with the same name exists, a confirmation dialog will appear.



Program comparison

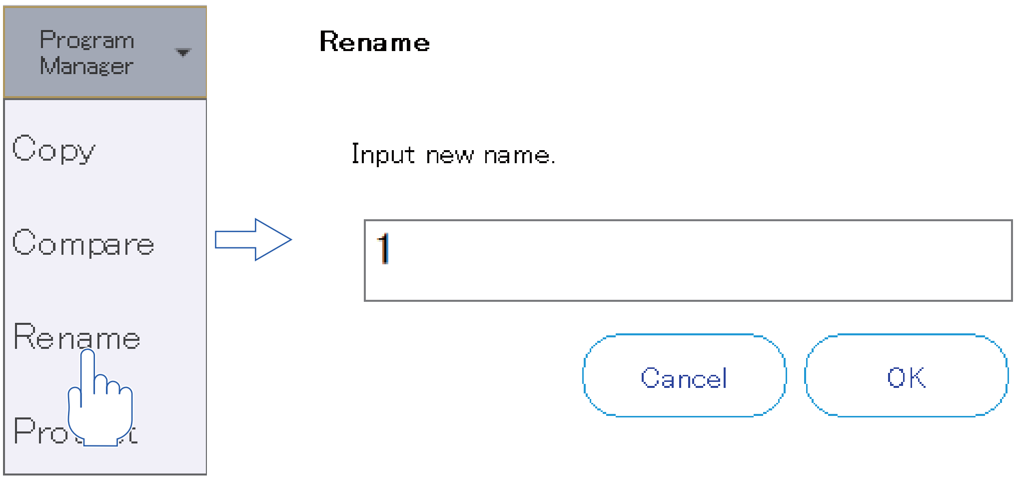
Compare the contents in programs. Program command statements and position variables can be compared respectively. Select a program you want to compare on the program list screen, tap [Program Manager], then [Compare]. Select an item you want to compare in the dialog, then tap [OK]. The comparison results will appear.



Programs being edited cannot be compared.
Additionally, programs with read protection cannot be compared.

Rename

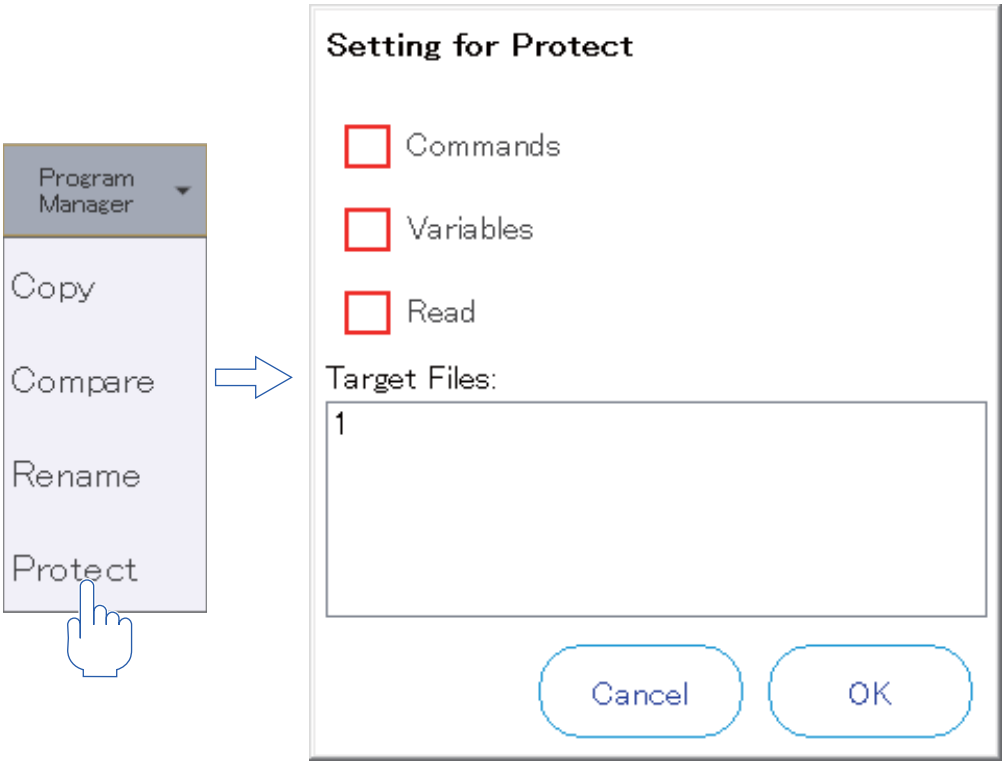
Select a program you want to rename on the program list screen, tap [Program Manager], then [Rename].
Enter a program name, then tap [OK]. The program name will be changed.



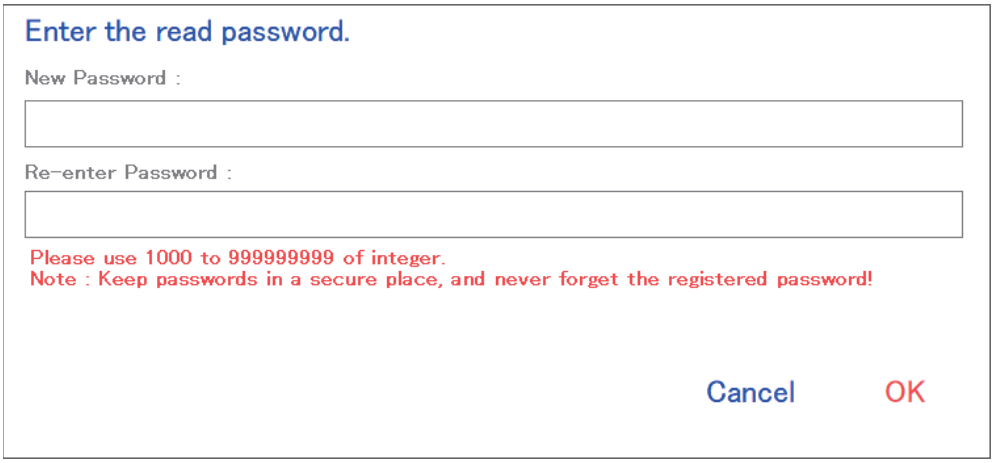
The program being edited cannot be renamed.
Additionally, programs with read protection cannot be renamed.

Protection settings

Set protection on a program for operation restrictions.
Protection can be set on program command statements and position variables respectively.
Select a program on which you want to set protection on the program list screen, tap [Program Manager], then [Protect].
Select an item on which you want to set protection, then tap [OK]. Protection will be set on the item.



When setting or releasing read protection, the following password registration or deletion screen will appear. Enter a password for registration or deletion, then tap [OK].



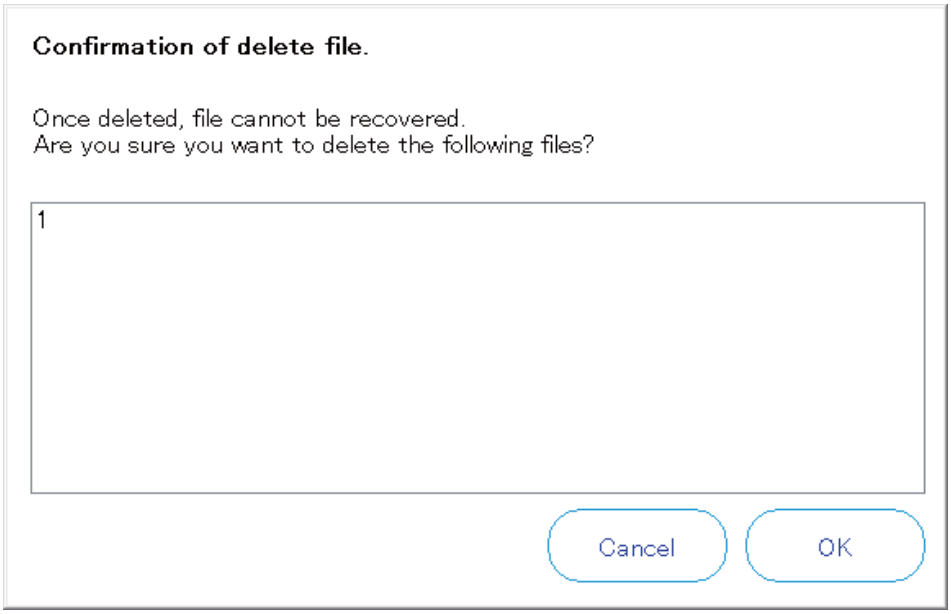
Attempting to edit an item on which protection has been set and save the program will cause an error. Additionally, attempting to edit a program with read protection will cause an error.
Protected files cannot be moved, deleted, or renamed.

10.10 Deleting programs

⚠ CAUTION

• The program being edited cannot be deleted.
Attempting to delete the program being edited will display an error. To delete a program, complete the edit before doing so.
• Note that program files cannot be recovered once deleted.

Select a program you want to delete on the program list screen, then tap [Delete].
Tapping [Yes] in the confirmation dialog will delete the program.



Programs with protection cannot be deleted.

10.11 Editing position data for SQ Direct

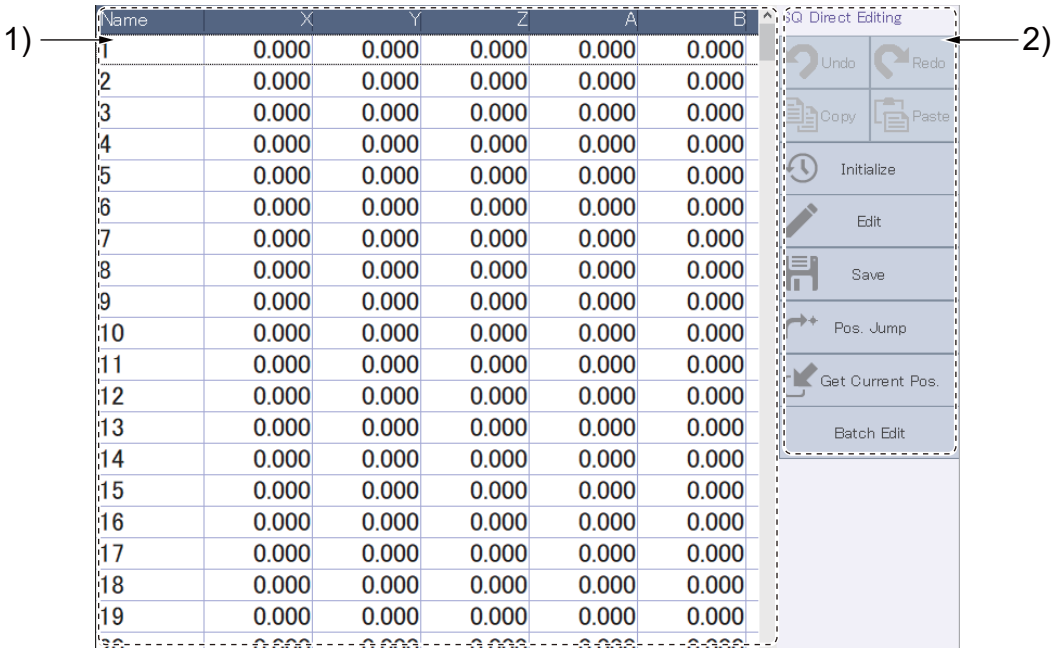
⚠CAUTION

Only XYZ position data can be used in the SQ Direct Function.

The SQ Direct Function is supported with CRnQ-700 series controller software version P8 or later.
To use the function, set the parameters of the controller.
For details, refer to the following manuals.
📖CR800-R/CR800-Q series controller iQ Platform Supporting Extended Function Instruction Manual
📖CR750-Q/CR751-Q series and CRnQ-700 series Extended Function Instruction Manual
Available position data for SQ Direct is XYZ variables only, and 999 points whose position number is 1 to 999. The position data is handled as external variables P_DM(1) to P_DM(999) in the controller. Additionally, the name of the SQ Direct file is always "*SQ Direct" in the controller.

SQ Direct editing screen

Tapping [SQ Direct] on the program list screen will display the SQ Direct editing screen.



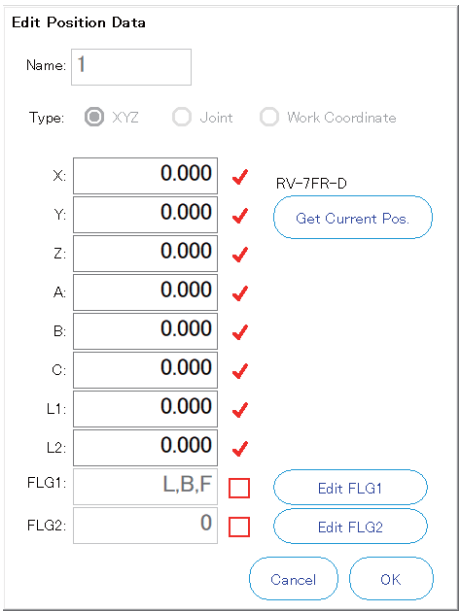
No.	Name	Description
1)	Position data editing area	Displays a list of position data.
2)	Position data edit menu	Used for purposes such as editing or initializing position data.

Selecting multiple position data

Selecting multiple position data allows you to edit or initialize them at a time.
Holding down the position data editing area for 1+ second will select multiple position data.
While they are selected, the color of the header in the position data editing area is blue.
Holding down the position data editing area again will deselect the position data.

Editing position data

Select position data you want to edit, then tap [Edit] in the position data editing area.
Enter values, then tap [OK]. Position data will be changed.



Initializing position data

Select position data you want to initialize, then tap [Initialize] in the position data editing area.
Tapping [Yes] in the confirmation dialog will change position data.

Checking position data (position jump)

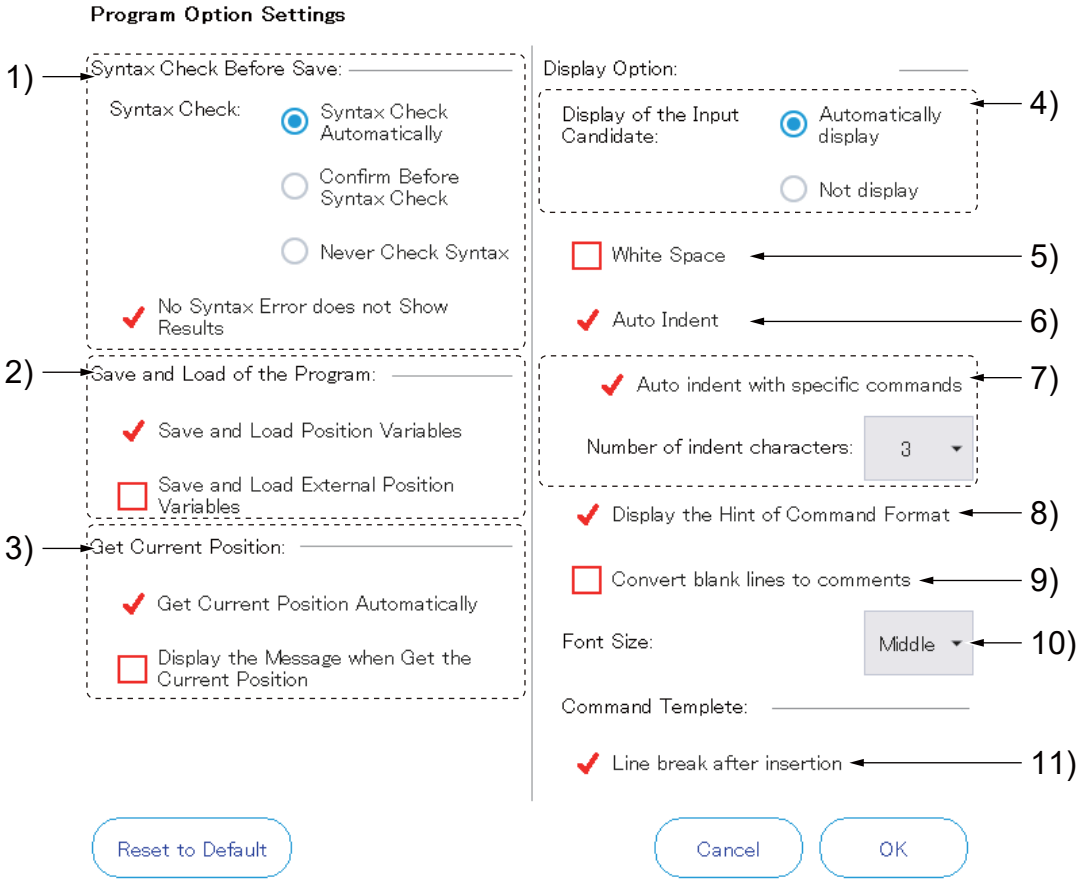
The robot can be moved to the coordinates of specified position data to check position data.
For the operation method, refer to the following page:
☞ Page 72 Position jump

10.12 Option

Optional items related to program editing can be set.

Tap [Option] in the header menu. The program option setting screen will appear.

After the settings have been changed, tap [OK] to apply the settings.

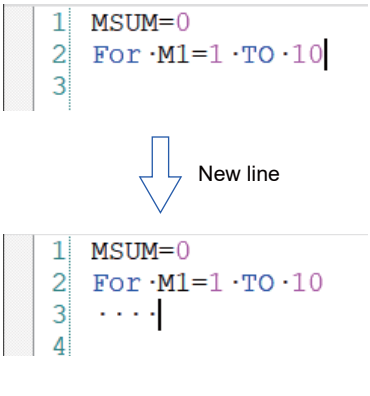


No.	Name	Description
1)	Syntax Check Before Save	Configure the settings related to syntax check at the time of program saving.
2)	Save and Load of the Program	Configure the settings related to confirmation dialogs for program writing items and reading items. When a confirmation dialog appears, it displays check boxes as selected here.
3)	Get Current Position	Enabling "Get Current Position Automatically" will acquire the current position automatically when a position variable is added. Enabling "Display the Message when Get the Current Position" will display a confirmation message when [Get Current Pos.] is tapped.
4)	Display of the Input Candidate	In the command editing area, when you start entering some part of a robot program command, system function, or system status variable from the first letter, an input candidate can be selected from the list and entered.
5)	White Space	Displays spaces in the command editing area as visible characters.
6)	Auto Indent	Aligns the starting position of a new line in the command editing area with that of the previous line automatically.
7)	Auto indent with specific commands	Aligns the indentations of specific command statements automatically. This function is available only when "6) Auto Indent" is enabled. ☞ Page 87 Auto indent with specific commands
8)	Display the Hint of Command Format	Displays the formats and explanations of robot program commands, system functions, and system status variables displayed in the command editing area with a pop-up.
9)	Convert blank lines to comments	Inserts a comment (') into blank command lines in situations such as saving programs and performing syntax check. Use this feature if you do not wish to delete blank lines automatically.
10)	Font Size	Changes the font size in the command editing area.
11)	Line break after insertion	Starts a new line at the end of the command line when a command template is inserted.

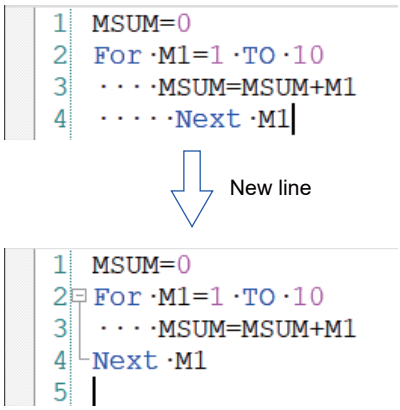
Auto indent with specific commands

After a new line is started after a specific command statement, an indentation is automatically inserted, or the starting position is aligned.

[Number of indent characters] allows you to set the number of indent characters you want to insert automatically.



Inserting an indentation



Aligning indentations

The following commands are subject to automatic indentation.

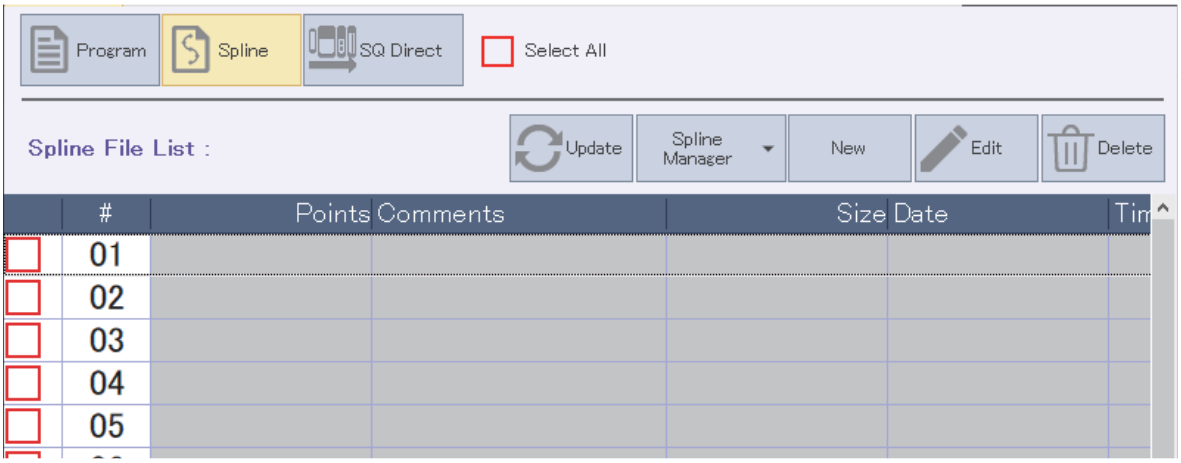
	Combinations of corresponding commands				
Inserting an indentation	If	For	Function	Select	While

Aligning indentations*1	ElseIf
	Else
	EndIf
		Next	FEnd	End Select	WEnd

*1 The indentation is aligned with the starting position of the command statement in "Inserting an indentation".

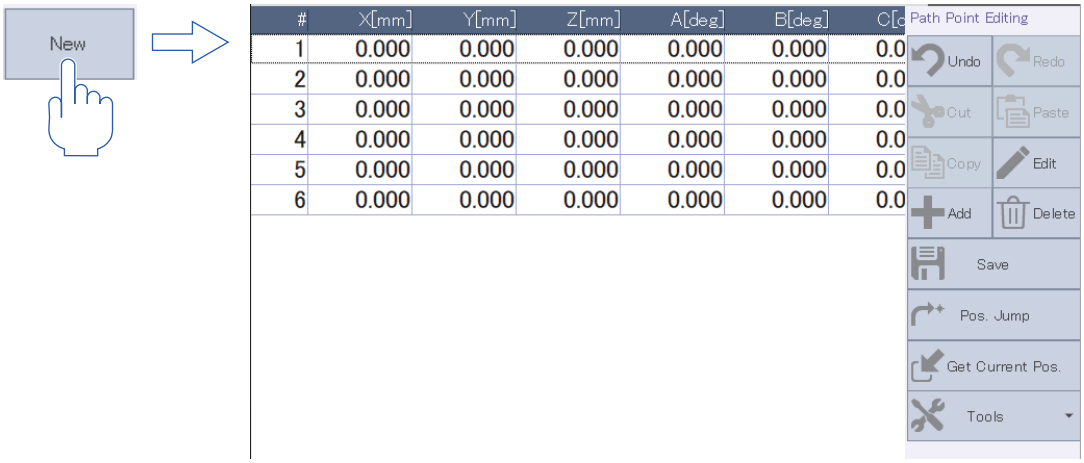
11 CREATING SPLINE FILES

This section explains how to create spline files to be used in the spline interpolation function.
This function moves the robot at a specified speed along a smooth spline curve between specified path points.
For details on the spline interpolation function, refer to the following manual:
CR800 Series Controller INSTRUCTION MANUAL Detailed explanations of functions and operations
Tapping [Spline] on the program list screen will display the spline file list screen.



11.1 Creating a new file

Tapping [New] on the spline file list screen will display the spline file editing screen.



11.2 Opening an existing file

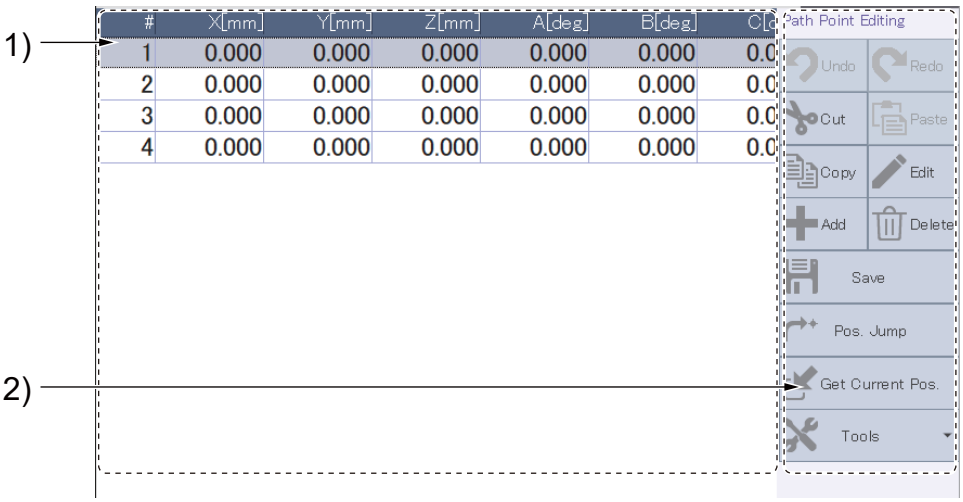
Select a spline file you want to edit from the spline file list, then tap [Edit]. The spline file editing screen will appear.
Double-tapping a spline file number will also display the spline file editing screen.

Updating the list of spline files

Tapping [Update] on the spline file list screen will read the spline files in the controller.

11.3 Spline file editing screen

The spline file editing screen is composed as follows:



No.	Name	Description
1)	Path point list	Displays a list of path point data.
2)	Path point editing menu	Used for purposes such as adding or editing path points. ☞ Page 90 Editing spline files ☞ Page 91 Edit assist functions ☞ Page 91 Tools ☞ Page 95 Position jump ☞ Page 96 Saving spline files

11.4 Editing spline files

This section explains how to edit spline files.

Editing path point data

Adding and editing path points

■Adding path points

Tap [Add] in the path point editing menu or double-tap a blank area in the path point list. The path point will be added.

■Editing path points

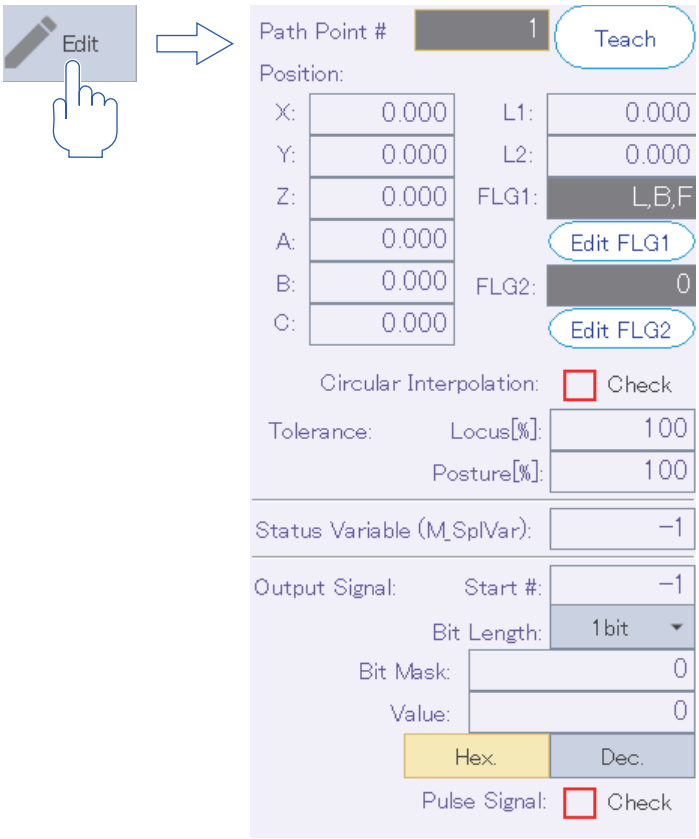
Select a path point in the path point list, then tap [Edit] in the path point editing menu. The edit screen will appear.

Additionally, double-tapping a path point in the path point list will display the edit screen.

Enter a variable name, type, and values of each axis, then tap [OK]. The variable will be changed.

When a robot is connected to the controller, tapping [Get Current Pos.] will enter the values of the current robot position in the fields of each axis.

Tapping [Edit FLG1] or [Edit FLG2] will display the edit dialog.



Deleting path points

Select a path point in the path point list, then tap [Delete] in the path point editing menu. A confirmation dialog will appear.

Tapping [Yes] will delete the path point.

Selecting multiple path points

Selecting multiple path points allows you to edit or delete them at a time.

Holding down the path point list for 1+ second will select multiple path points.

While they are selected, the color of the header in the path point list is blue.

Holding down the path point list again will deselect the path points.

Additionally, tap [Tools] in the path point editing menu, then [Select All]. All the path points will be selected.

Edit assist functions

This section explains the edit assist functions useful for spline file editing.
Use the edit assist functions from the path point editing menu.

Cut

Cut path point data. Multiple path point data can be cut.
Select path point data you want to cut, then tap [Cut] in the path point editing menu.
The paste function allows you to paste the cut path point data in other path point data.

Copy

Copy a path point data value. Multiple path point data can be copied.
Select path point data you want to copy, then tap [Copy] in the path point editing menu.

Paste

Paste a copied or cut path point data.
Select path point data, then tap [Paste] in the path point editing menu. The copied or cut path point data value will be pasted.

Tools

Tapping [Tools] in the path point editing menu will display a drop-down list.
Tap and select a function you want to use from the drop-down list.

Displaying spline curves

Tap [Tools] in the path point editing menu, then [Spline Curve Display]. The spline curve being edited will be displayed in the robot viewer.
Select a path point you want to check from the path point list. The position of the path point (including the posture) will be displayed in the spline curve.
Tapping [Tools] and [Spline Curve Hidden] will hide the spline curve when displayed.

Inserting path points

Select a path point, then tap [Tools] and [Insert Before the Selected Line]. The path point will be inserted before the selected line.
When a path point is copied, tap [Tools] in the path point editing menu, then [Insert Copied Points]. The path point will be inserted before the selected line.

Batch editing

The settings of multiple path points can be edited at a time.

■FLG1 and FLG2 batch editing

Select path points, then tap [Tools] in the path point editing menu, and [Edit FLG1] or [Edit FLG2]. The edit dialog will appear.
After selecting the settings, tapping [OK] will change the FLG settings at a time.

■Tolerance batch editing

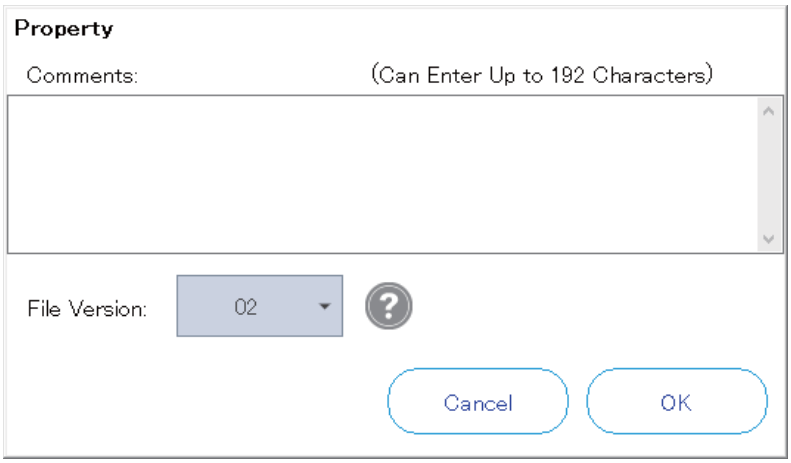
Select path points, then tap [Tools] in the path point editing menu, and [Edit Tolerance]. The edit dialog will appear.
After setting the values, tapping [OK] will change the tolerance values at a time.

■Circular arc batch specifying

Select path points, then tap [Tools] in the path point editing menu, and [Circular Interpolation]. The selected path points will be specified as a circular arc at a time.

Property

Comments can be entered, and the file version can be selected.



■Entering comments

The entered comments are displayed in the Comments field of the spline file list.

It is useful when selecting a spline file if comments such as work details and conditions are written.

Up to 96 two-byte characters (192 single-byte characters) can be entered in the Comments field. Line breaks are not available.

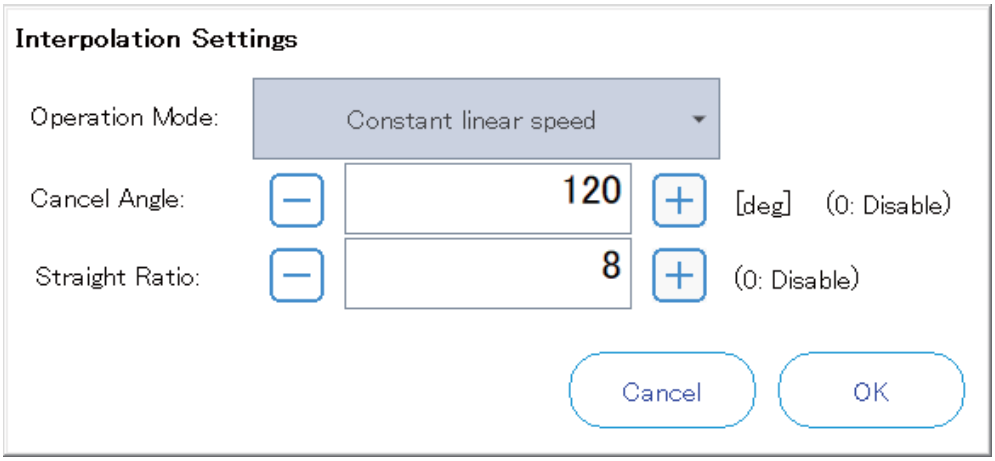
■Selecting the file version

The file version can be selected from "01" or "02".

Tapping the icon on the right of the file version selection section will show an explanation of the file version.

Interpolation settings

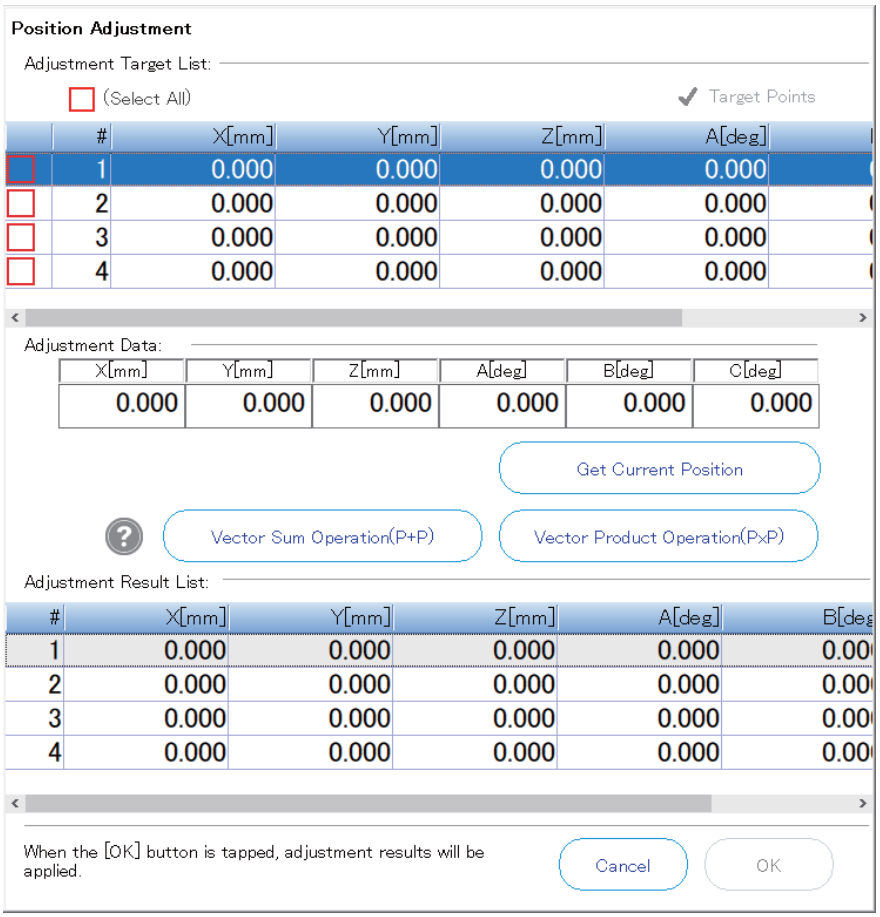
Tap [Tools] in the path point editing menu, then [Interpolation Settings]. The edit dialog will appear.



After selecting the settings, tapping [OK] will change the settings.

Position adjustment

Tap [Tools] in the path point editing menu, then [Position Adjustment]. The position adjustment dialog will appear.

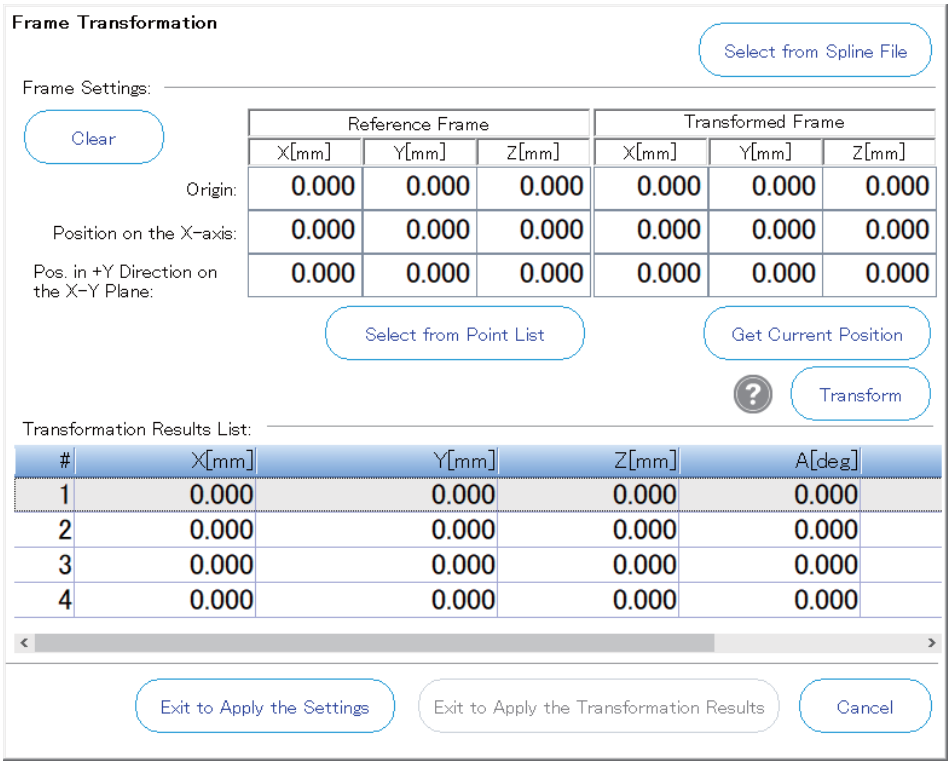


The following shows how to adjust positions.

1. Select the check box of a path point you want to adjust from the Adjustment Target List.
2. Enter values in the Adjustment Data fields. Tapping [Get Current Position] will enter the current position coordinates of the robot.
3. Select the adjustment method from [Vector Sum Operation(P+P)] or [Vector Product Operation(P×P)].
4. Tapping [OK] will apply the adjustment results.

Frame transformation

Tap [Tools] in the path point editing menu, then [Frame Transformation]. The frame transformation dialog will appear.

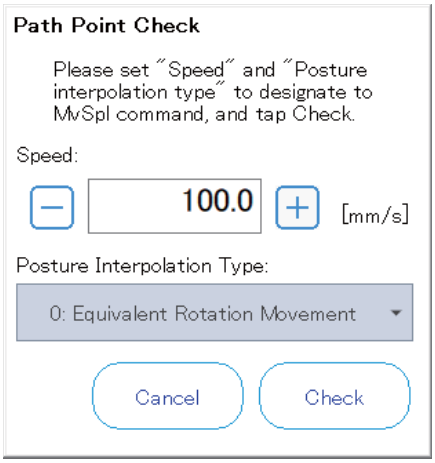


The following shows the frame transformation method.

1. Select "Origin", "Position on the X-axis", or "Pos. in +Y Direction on the X-Y Plane" in the Reference Frame section, and tap [Select from Point List...] to enter values. Additionally, individual values can be entered directly.
2. Select "Origin", "Position on the X-axis", or "Pos. in +Y Direction on the X-Y Plane" in the Transformed Frame section, and tap [Get Current Position] to enter values. Additionally, individual values can be entered directly.
3. Tapping [Transform] will execute a frame transformation (space shift) for all path points.
4. Tapping [OK] will apply the transformation results.

Path point check

Tap [Tools] in the path point editing menu, then [Path Point Check]. A dialog will appear.



Enter the speed and posture interpolation type, then tap [Check]. Whether the robot can move to individual path points will be checked.

If a path point is found to cause an error, the error details will be displayed.

Ex-T control settings

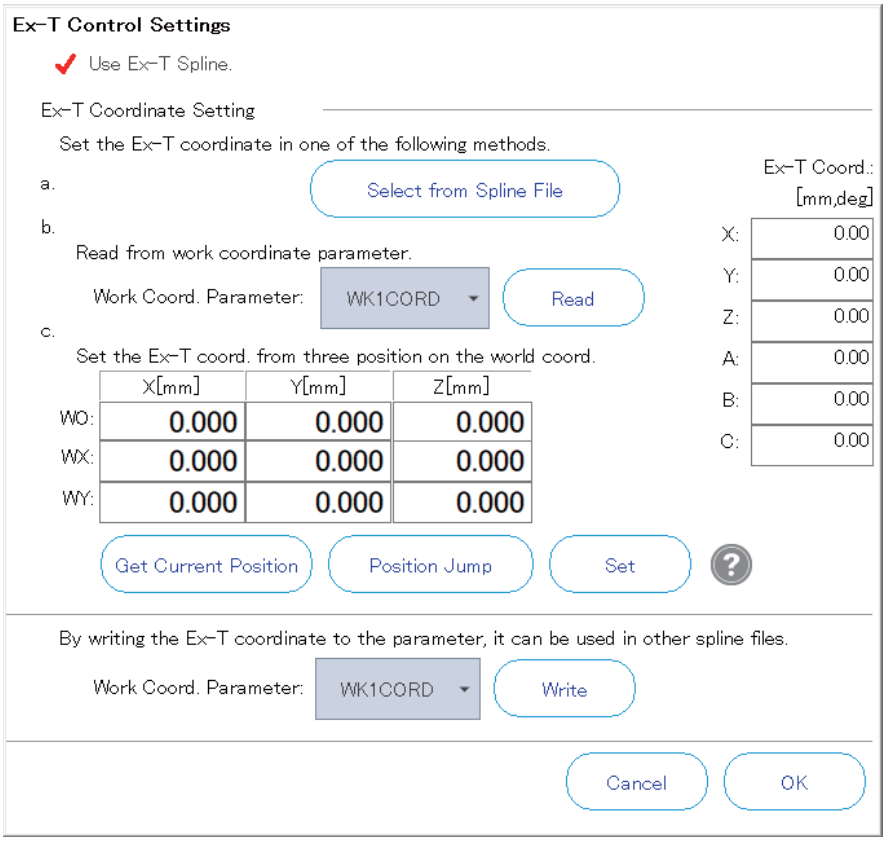
Configure the settings when using Ex-T control.

Ex-T control is a function to operate the robot assuming that the origin in the coordinate system fixed outside as a robot tool center point.

For details, refer to the following manual:

📖CR800 Series Controller INSTRUCTION MANUAL Detailed explanations of functions and operations

Tap [Tools] in the path point editing menu, then [Ex-T Control Settings]. The setting dialog will appear.



Selecting the [Use Ex-T Spline.] check box allows you to use the Ex-T control function.

After configuring the settings, tapping [OK] will change the settings.

Calculate maximum speed

Calculate the maximum operating speed that can be specified for spline interpolation command/Ex-T spline interpolation command.

Tap [Tools] in the path point editing menu, then [Calculate Maximum Speed]. The maximum operating speed will be calculated and displayed.

If the calculation fails, an error message will appear.

Position jump

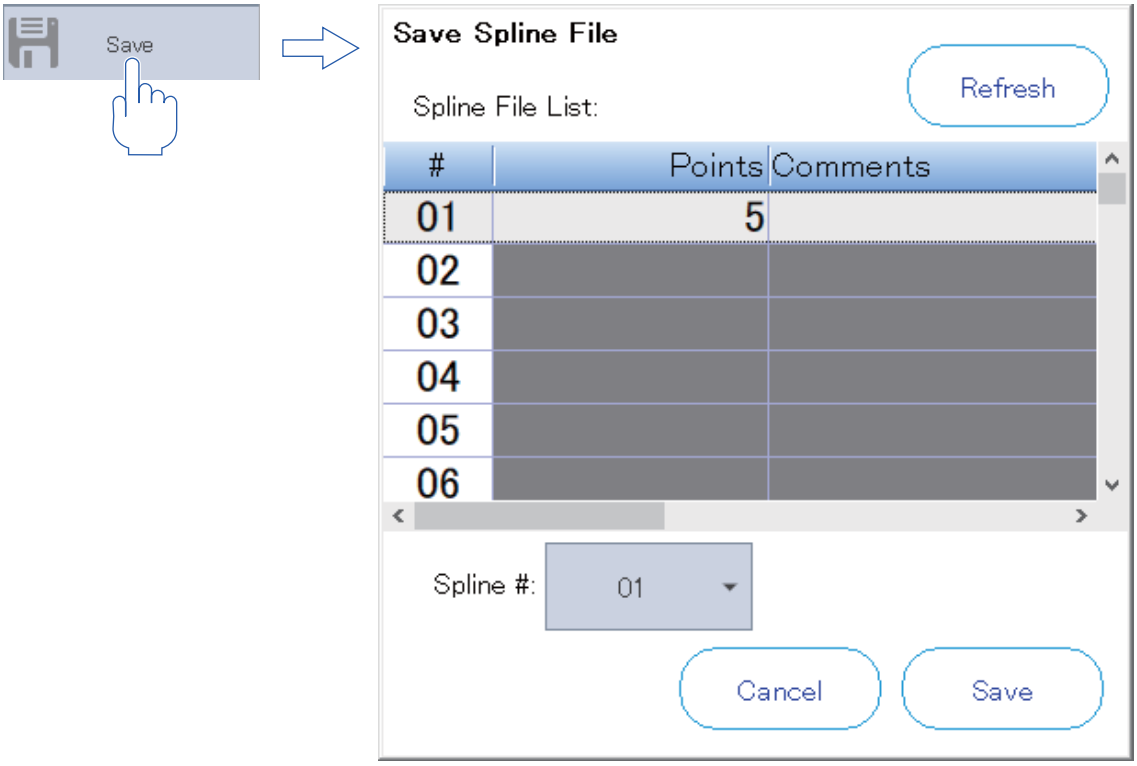
The robot can be moved to the path point selected in the path point list.

For information on how to use the position jump function, refer to the following page:

☞ Page 72 Position jump

11.5 Saving spline files

Tapping [Save] on the spline file editing screen will save the spline file.
If a spline file is newly created, the spline file save screen will appear.



11.6 Spline manager

Spline files can be copied or compared, and spline numbers can be changed.

Copying spline files

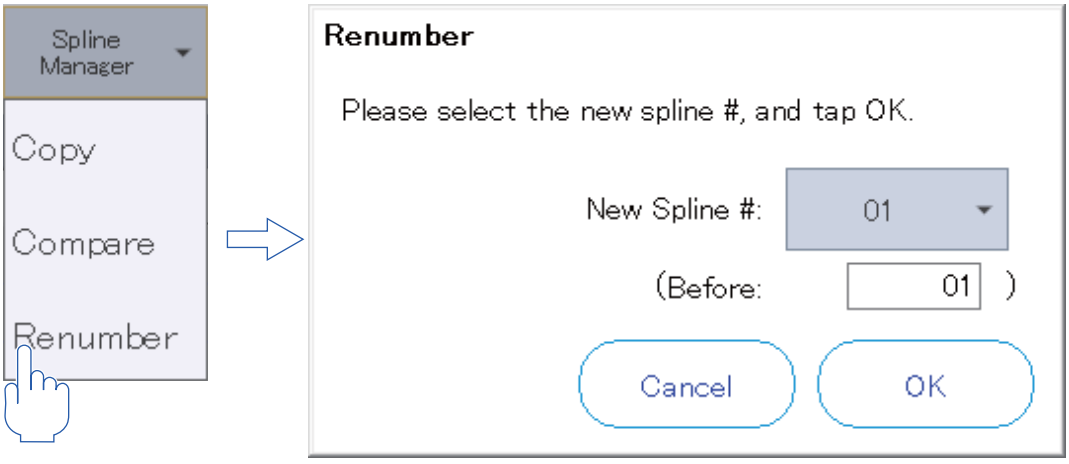
Select a spline file you want to copy on the spline file list screen, tap [Spline Manager], then [Copy].
Select a new spline number, then tap [OK]. The spline file will be copied.
If there is a spline file with the selected spline number, a confirmation dialog will appear.

Comparing spline files

You can check whether there is any difference in the contents of spline files.
Select a spline file you want to compare on the spline file list screen, tap [Spline Manager], then [Compare]. The comparison results will appear.

Changing spline numbers

On the spline file list screen, select a spline file that has the spline number you want to change, tap [Spline Manager], then [Renumber].
After selecting a spline number, tap [OK]. The spline number will be changed.
If there is a spline file with the selected spline number, a confirmation dialog will appear.

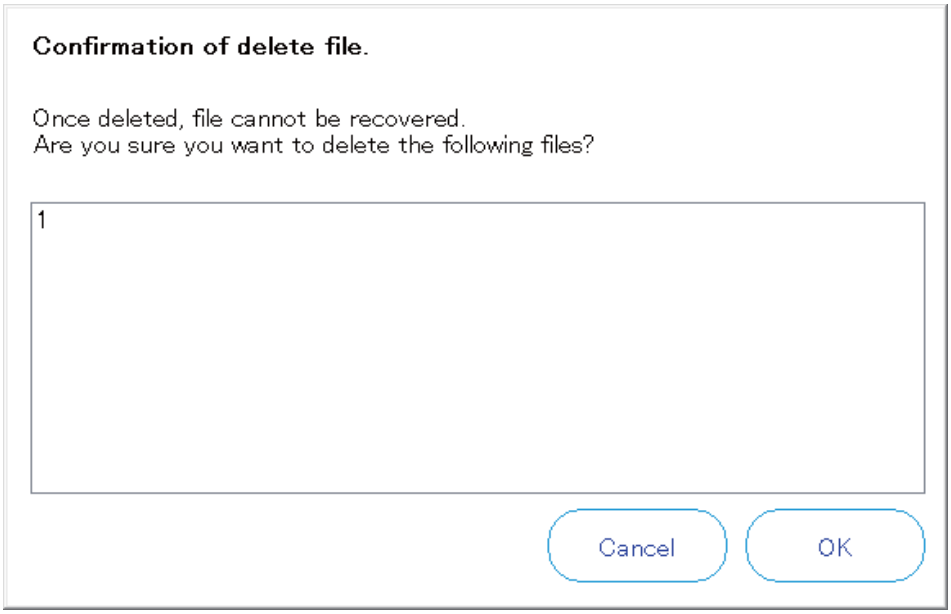


11.7 Deleting spline files

⚠CAUTION

• The spline file being edited cannot be deleted.
Attempting to delete the spline file being edited will display an error. To delete a spline file, complete the edit before doing so.
• Note that spline files cannot be recovered once deleted.

Select a spline file you want to delete on the spline file list screen, then tap [Delete].
Tapping [Yes] in the confirmation dialog will delete the spline file.



12 SETTING PARAMETERS

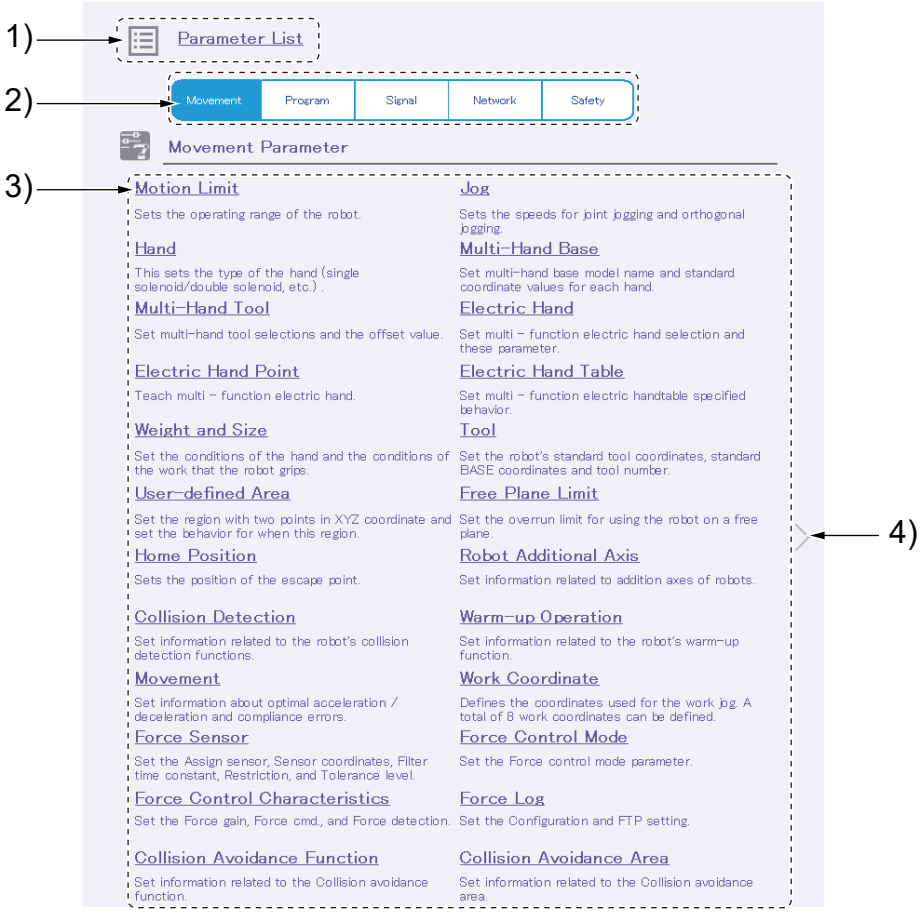
⚠CAUTION

• If a password is registered in parameters by the security function of the controller, the parameters cannot be rewritten.
To rewrite a parameter, delete the password of the security function. For information on how to delete the password, refer to the following page:
☞ Page 244 Deleting the password
It is possible to read the parameters even if the security function is enabled.

In the parameter settings, you can refer to and rewrite parameter information set on the controller.
There are two methods for setting parameters: specifying a parameter name and setting the parameter, or configuring the settings on a per-function basis.

12.1 Parameter menu screen

Tapping [Parameter] in the menu will display the parameter menu screen.
The parameter menu screen is composed as follows:



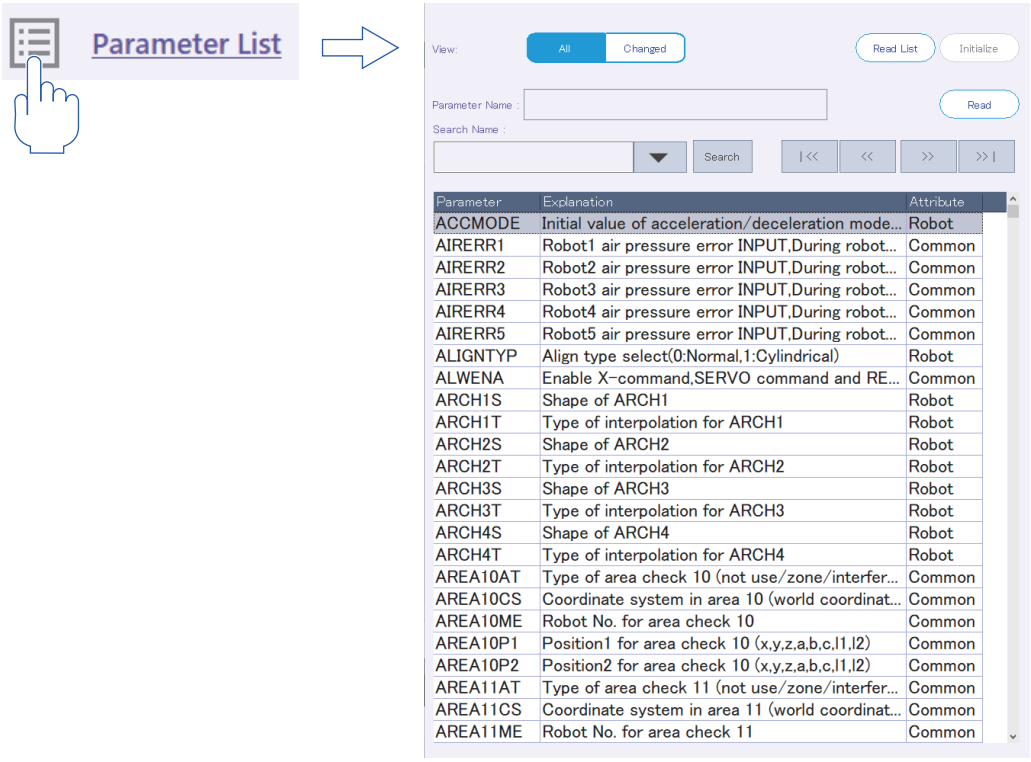
No.	Name	Description
1)	Parameter List button	Displays the parameter list screen. ☞ Page 99 Editing from the parameter list
2)	Category selectors	Switches parameters displayed on the parameter selection screen. ☞ Page 103 Movement parameters ☞ Page 137 Program parameters ☞ Page 141 Signal parameters ☞ Page 153 Network parameters ☞ Page 167 Programmable controller cooperation parameters ☞ Page 169 Safety parameters
3)	Parameter selection screen	Displays the names and explanations of the parameters in the category selected by a category selector. Tapping a parameter name will display the parameter editing screen.
4)	Arrow button	Switches parameters displayed on the parameter selection screen.

12.2 Editing from the parameter list

In the parameter list, you can refer to or rewrite parameter information by specifying a parameter name.

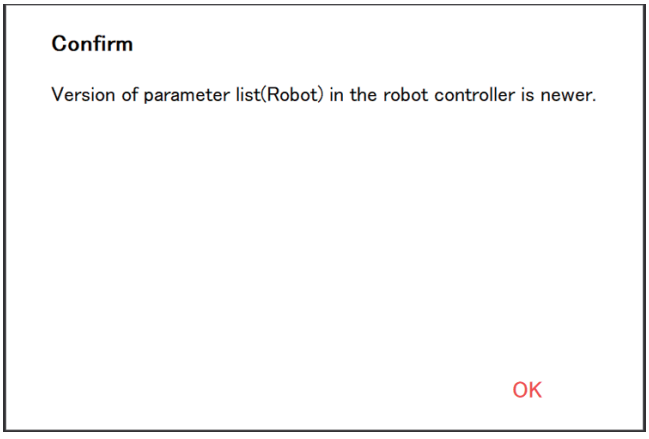
Displaying the parameter list screen

Tap [Parameter List] on the parameter menu screen.



Parameter	Explanation	Attribute
ACCMODE	Initial value of acceleration/deceleration mode...	Robot
AIRERR1	Robot1 air pressure error INPUT,During robot...	Common
AIRERR2	Robot2 air pressure error INPUT,During robot...	Common
AIRERR3	Robot3 air pressure error INPUT,During robot...	Common
AIRERR4	Robot4 air pressure error INPUT,During robot...	Common
AIRERR5	Robot5 air pressure error INPUT,During robot...	Common
ALIGNTYP	Align type select(0:Normal,1:Cylindrical)	Robot
ALWENA	Enable X-command,SERVO command and RE...	Common
ARCH1S	Shape of ARCH1	Robot
ARCH1T	Type of interpolation for ARCH1	Robot
ARCH2S	Shape of ARCH2	Robot
ARCH2T	Type of interpolation for ARCH2	Robot
ARCH3S	Shape of ARCH3	Robot
ARCH3T	Type of interpolation for ARCH3	Robot
ARCH4S	Shape of ARCH4	Robot
ARCH4T	Type of interpolation for ARCH4	Robot
AREA10AT	Type of area check 10 (not use/zone/interfer...	Common
AREA10CS	Coordinate system in area 10 (world coordinat...	Common
AREA10ME	Robot No. for area check 10	Common
AREA10P1	Position1 for area check 10 (x,y,z,a,b,c,l1,l2)	Common
AREA10P2	Position2 for area check 10 (x,y,z,a,b,c,l1,l2)	Common
AREA11AT	Type of area check 11 (not use/zone/interfer...	Common
AREA11CS	Coordinate system in area 11 (world coordinat...	Common
AREA11ME	Robot No. for area check 11	Common

The following confirmation message may appear showing information on the parameter list.
Read the parameter list from the controller.
☞ Page 101 Parameter list reading



Point

• What is the parameter list?

The parameter list is a list of parameters displayed on the parameter list screen. The list is comprised of information such as parameter names and explanations. The parameter list can be downloaded from the controller. The version of the parameter list may differ depending on the controller software version. It is recommended to download the latest parameter list from the controller.

Parameter editing

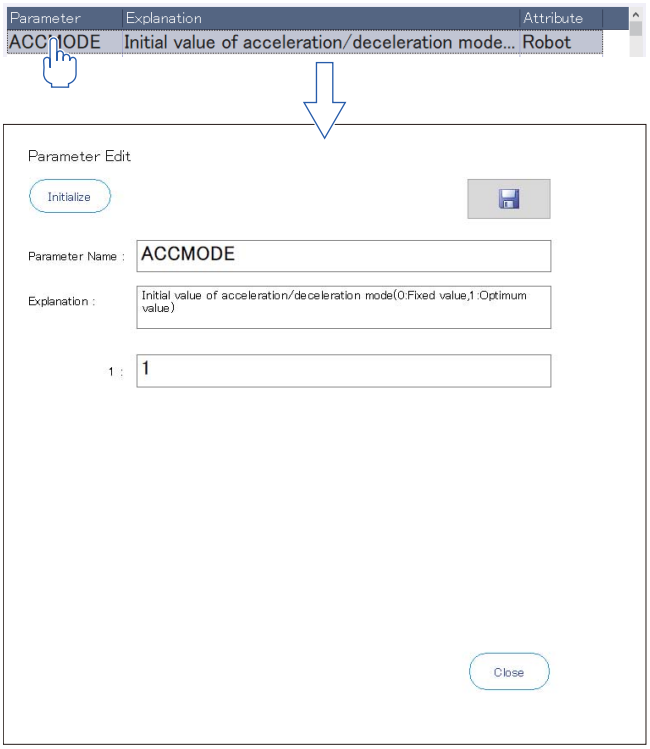
⚠CAUTION

• Use upper-case letters when naming programs in alphabetic characters.
Lower-case alphabetic characters can be used in the parameter settings. However, be sure to use upper-case letters when naming programs in alphabetic characters for the parameters of the base program (PRGUSR), slot table (SLT*), etc. All of the program names in the controller are treated as upper-case letters. Note that program names with lower-case alphabetic characters cannot be recognized correctly.

• To apply the new values of parameters, cycle the power of the controller.
It is required to cycle the power of the controller to apply new parameter information in the controller.

Double-tap a parameter displayed in the list, or enter a parameter name and tap [Read]. The parameter editing screen will appear.

After changing the value, tap the save icon. The parameter will be written to the controller.



Editing parameters changed from the initial values

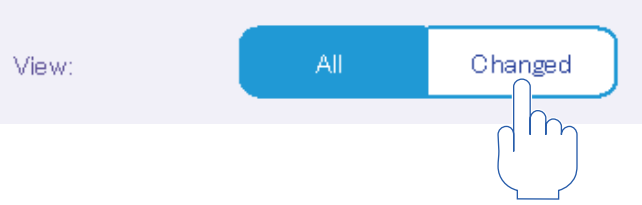
Displaying the list of parameters changed from the initial values allows you to check which parameter has been changed.
This function is supported with the following controller software versions.

Controller name	Controller software version
CR800-D/R/Q	All versions
CR750-D/CRnD-700	Ver.P6 or later
CR750-Q/CRnQ-700	Ver.N6 or later

*1 If unusable, the display switching button at the top of the screen will not appear.

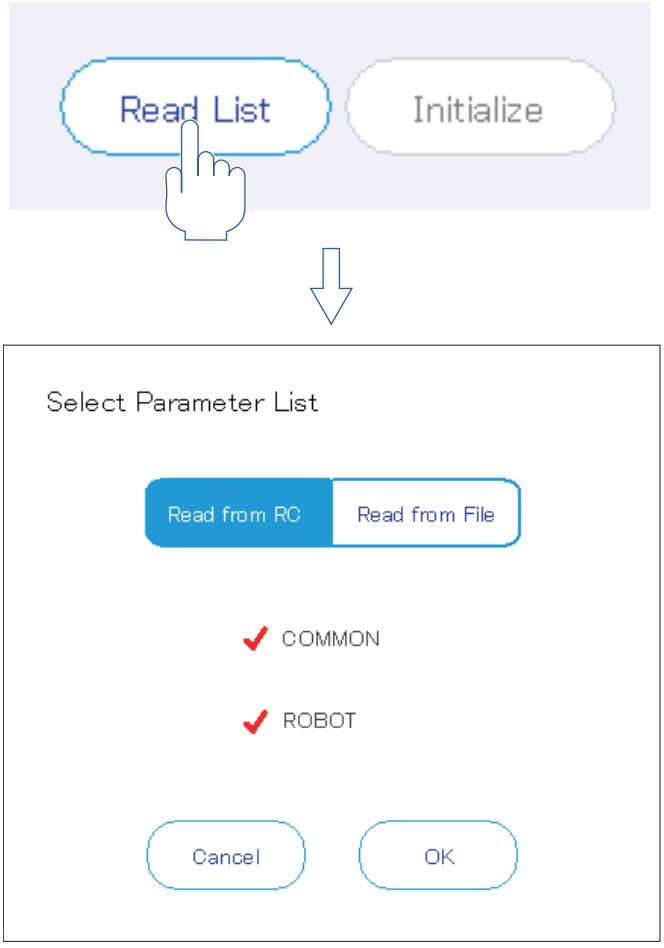
When the parameter list is displayed while a supported controller is connected, the display switching button appears at the top of the screen.

Selecting "Changed" will display the list of the parameters that have been changed from the initial values.
(Some parameters may be changed from the factory depending on the specifications of the model.)



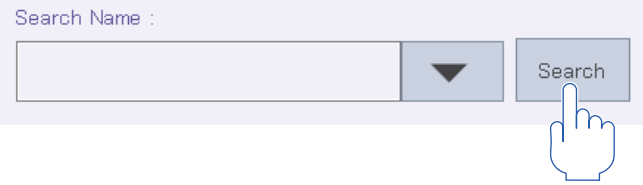
Parameter list reading

If no parameter name is displayed on the parameter list screen, the parameter list can be read.
Tapping [Read List] at the top right of the parameter list screen will display the screen to select where to read the list from.
After selecting an option, set the parameter list to be read, then tap [OK].
While data is being acquired from the controller, a dialog appears showing that communication is in progress.



Finding parameters

A character string can be searched for in the parameter list.
Enter a character string to search for in the text box on the parameter list screen, then tap [Search].
Parameters that include the character string in parameter names or explanations will be selected.



Parameter initialization

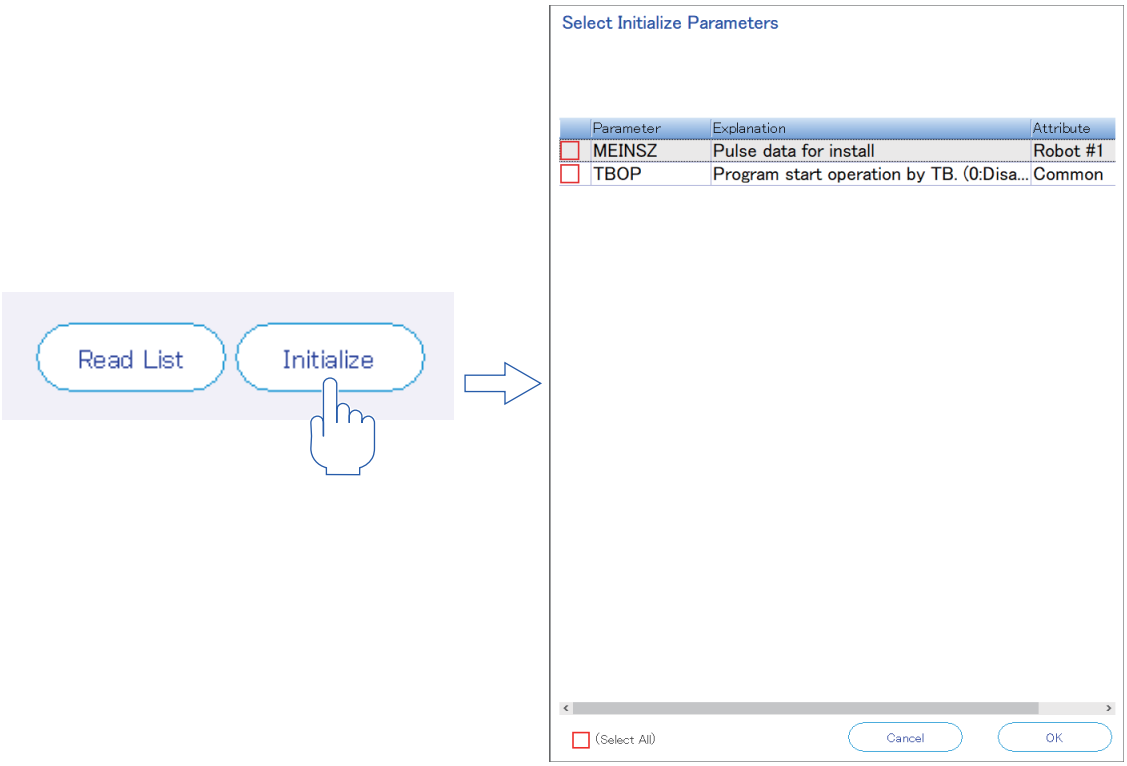
There are two methods for initializing parameters as shown below.

- Initializing parameters one by one

Select a parameter and open the parameter editing screen. Tapping [Initialize] displayed at the upper left of the screen will initialize the parameter.

- Initializing the changed parameters at a time

Select [Changed] (located at the top of the parameter list screen) and tap [Initialize]. Select parameters to be initialized, then tap [OK]. The selected parameters will be initialized.



12.3 Movement parameters

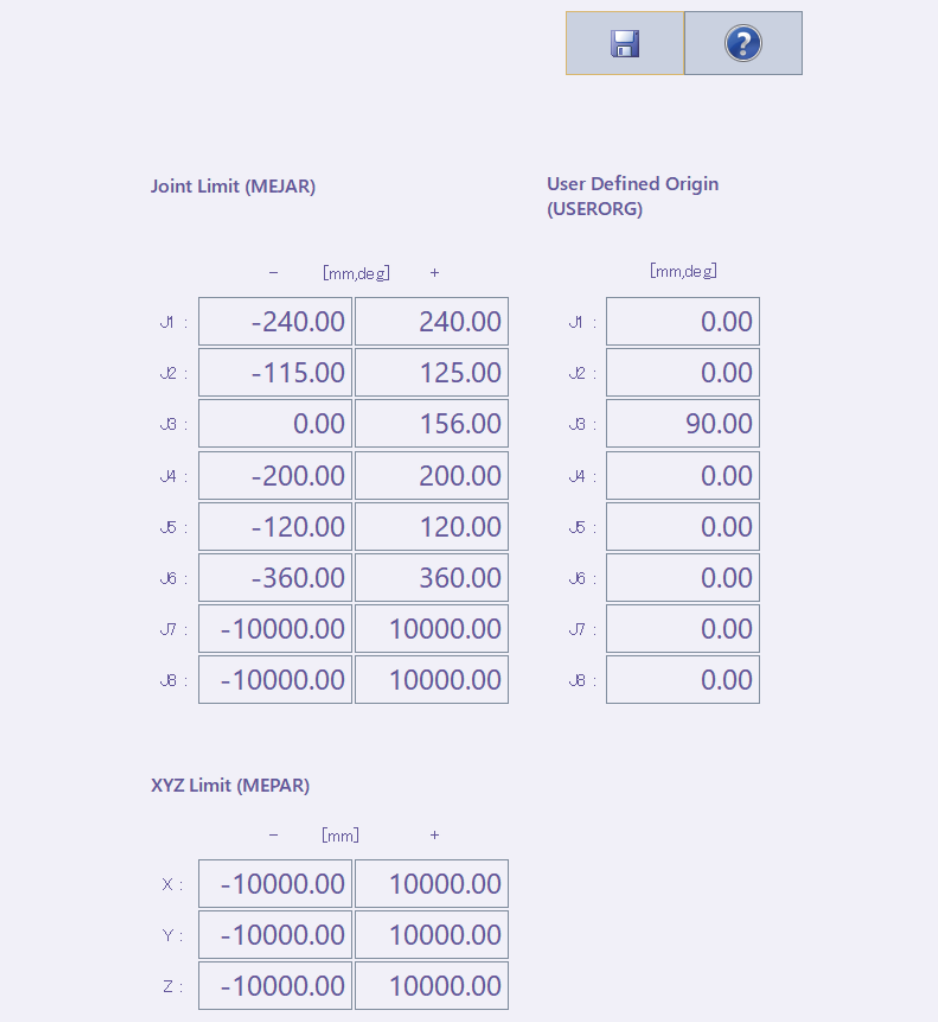
Operating range

The operating range of the robot can be set.

Tap [Motion Limit] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



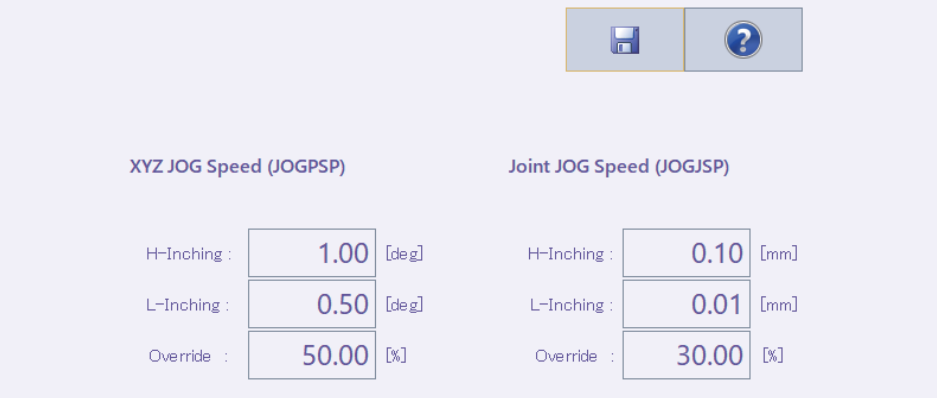
Jog

The speeds for robot's joint jog and XYZ jog can be set.

Tap [Jog] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



Hand

The parameters for the hand attached to the robot can be set.

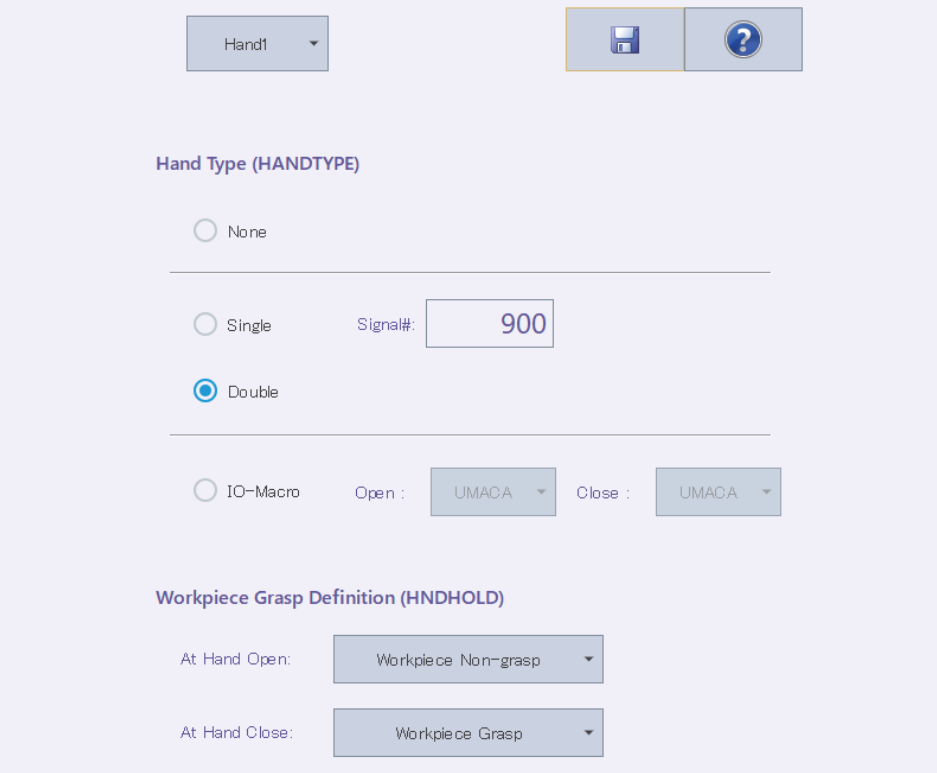
Hand

The parameters can set the type (single solenoid/double solenoid, etc.) of the hand attached to the robot, and whether a workpiece is grasped or not when HOPEN* (hand open) or HCLOSE* (hand closed) is executed.

Tap [Hand] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

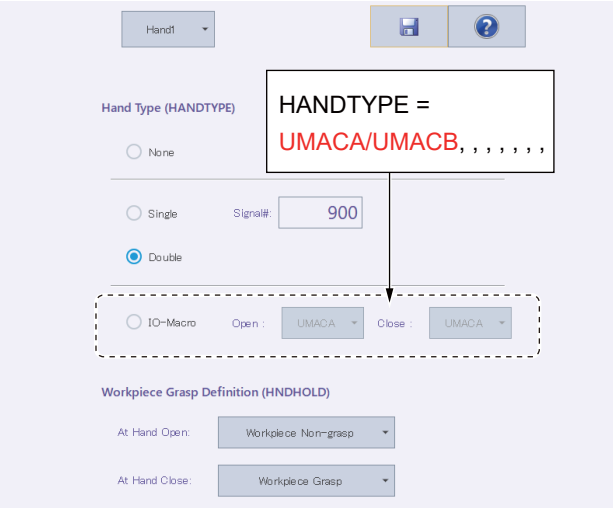
Tapping [ ] will show an explanation of the parameter.



■Hand macro functions

Specify any of the names of macros UMACA to UMACZ in the HANDTYPE parameter, then set any of the applicable subroutines L_UMACA to L_UMACZ in the user base program (PRGUSR parameter). The hand macro can be executed when the hand is opened or closed with the T/B.

1. Parameter settings



2. Macro program registration (user base program)

```
1 *L_UMACA ' Open Hand 1
2 M_Out(900)=1
3 M_Out(901)=0
4 Return
```

Opening hand 1 will execute subroutine L_UMACA.

```
5 *L_UMACB ' Close Hand 1
6 M_Out(900)=0
7 M_Out(901)=1
8 Return
```

Closing hand 1 will execute subroutine L_UMACB.

Signal output (e.g. M_Out(900)=1), variable substitution (e.g. M_Data=1), and timer (e.g. Dly 0.5) can be described in the subroutines.

Multi-hand base

A multi-hand base model name and standard coordinate values for each hand can be set.

If the connected robot and controller support the multi-hand function, items related to multi-hand will be displayed on the parameter menu screen.

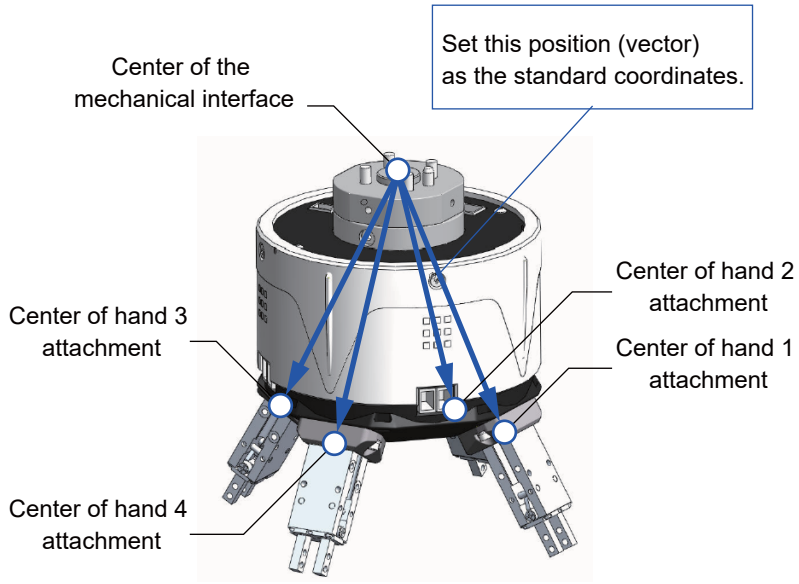
This function is supported with the following controller software versions.

Controller name	Controller software version
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.S2a or later
CR750-Q/CRnQ-700	Ver.R2a or later

Tap [Multi-Hand Base] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



Standard coordinates settings

Multi-hand tool

A multi-hand base can be selected, and the offset values of each hand can be set with respect to the selected hand base. The multi-hand tool can be connected to the robot with remote I/O or parallel I/O.

If the connected robot and controller support the multi-hand function, items related to multi-hand will be displayed on the parameter menu screen.

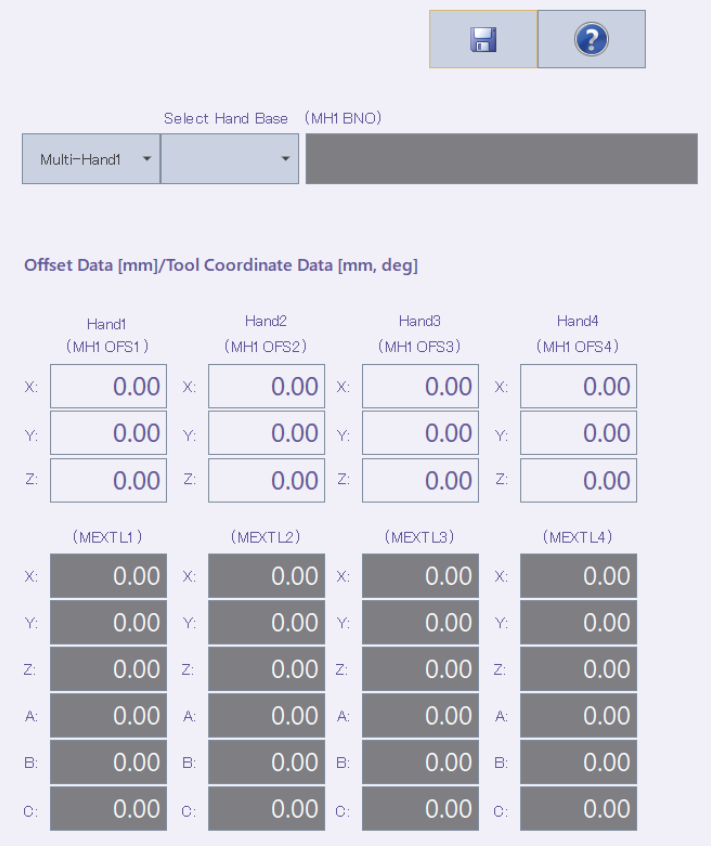
This function is supported with the following controller software versions.

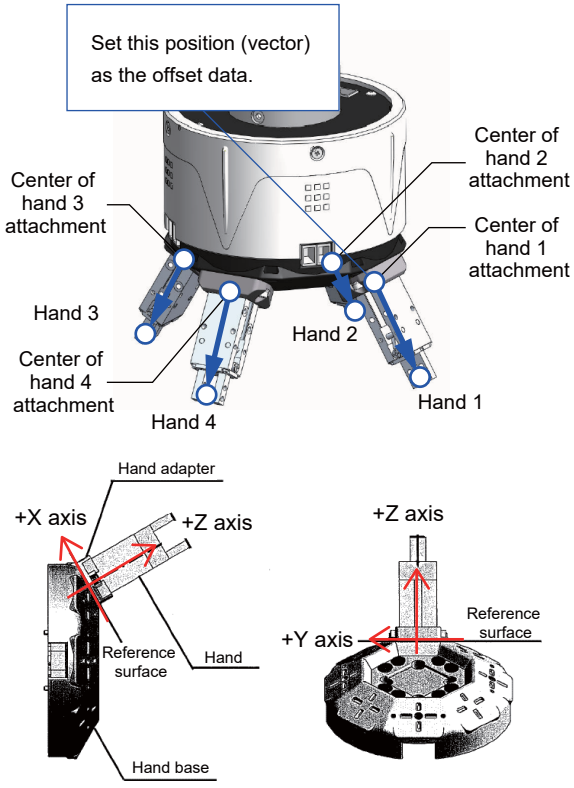
Controller name	Controller software version
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.S2a or later
CR750-Q/CRnQ-700	Ver.R2a or later

Tap [Multi-Hand Tool] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.





Offset data settings

When a multi-hand tool is connected to the robot using remote I/O, the behavior when the output signal is reset can be set using parameters ORST700, ORST732, and ORST764. These parameters can be set on the output signal reset pattern parameter screen.

When a multi-hand tool is connected using remote I/O, the information is displayed on Board.

Electric hand

A multi-function electric hand model can be selected, and the parameters can be set.

This function is supported with the following controller software versions.

Controller name	Controller software version
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.S2a or later
CR750-Q/CRnQ-700	Ver.R2a or later

Tap [Electric Hand] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.

Tapping [Initialize] will initialize the settings to the parameters of the selected electric hand model.

Electric hand point

Teach the multi-function electric hand.

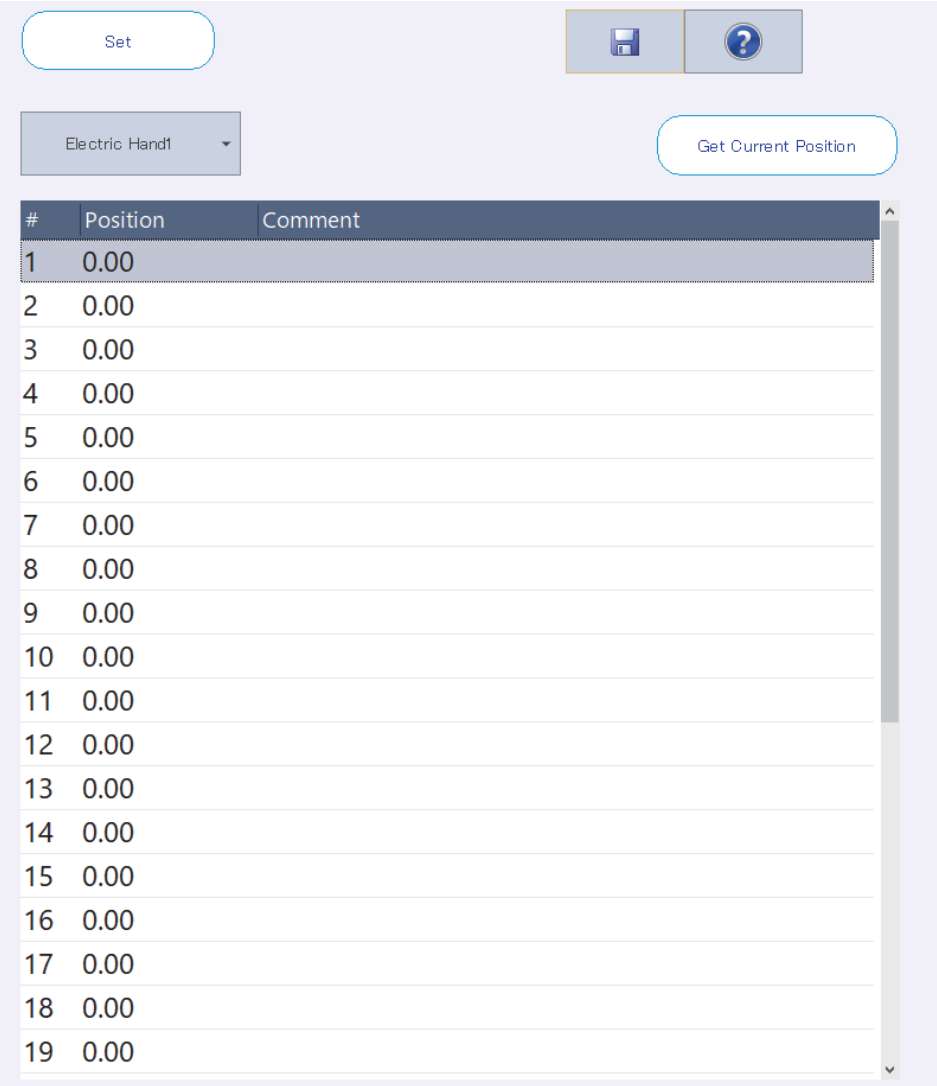
This function is supported with the following controller software versions.

Controller name	Controller software version
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.S2a or later
CR750-Q/CRnQ-700	Ver.R2a or later

Tap [Electric Hand Point] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

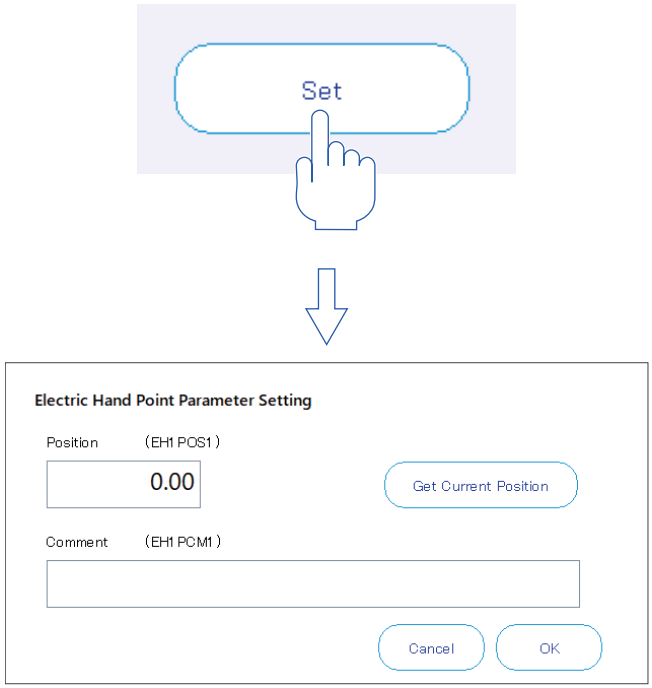
Tapping [ ] will show an explanation of the parameter.



Tapping [Get Current Position] will set the current position of the electric hand in the selected point number.

After selecting a point, tap [Set]. The "Electric Hand Point Parameter Setting" screen will appear.
After entering a position value and comment, tap [OK]. The list of electric hand points will be updated.
Comments can be set with the following controllers.

Controller name	Controller software version
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.S3e or later
CR750-Q/CRnQ-700	Ver.R3e or later



Electric hand table

Set parameters related to the specification of multi-function electric hand tables.

This function is supported with the following controller software versions.

Controller name	Controller software version
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.S3e or later
CR750-Q/CRnQ-700	Ver.R3e or later

Tap [Electric Hand Table] in the [Movement] category on the parameter menu screen.

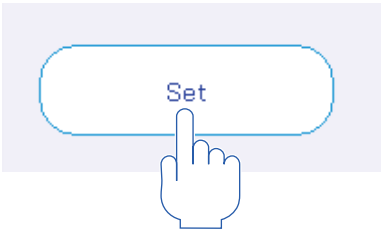
After changing the value, tapping [ ] will write the parameter to the controller.

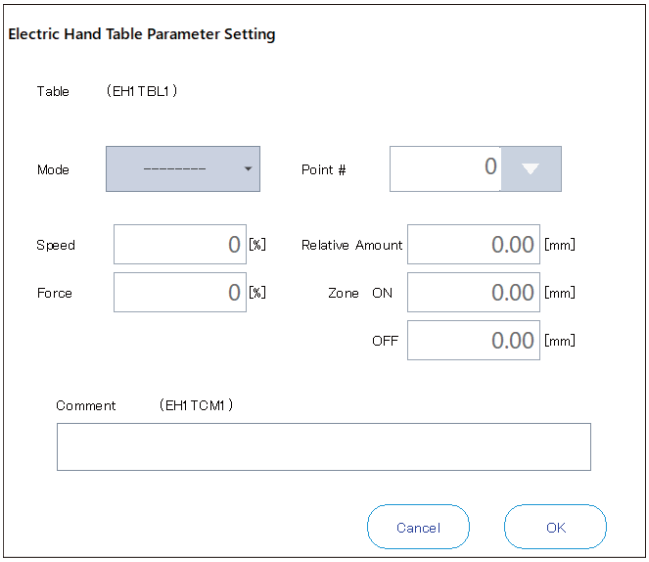
Tapping [ ] will show an explanation of the parameter.

Tapping [Electric Hand Point] will display the target electric hand point screen. For information on the electric hand point screen, refer to the following section:

☞ Electric hand point

After selecting a table, tap [Set]. The electric hand table setting screen will appear.
After entering table data, tap [OK]. The list of electric hand tables will be updated.





Weight and size

You can set the conditions for the hand attached to the robot and the conditions for the workpiece grasped by the robot.
Tap [Weight and Size] in the [Movement] category on the parameter menu screen.
After changing the value, tapping [ ] will write the parameter to the controller.
Tapping [ ] will show an explanation of the parameter.

Work (WRKDAT)

		WRKDAT0	WRKDAT1	WRKDAT2	WRKDAT3	WRKDAT4
Weight [Kg] :		0.00	0.00	0.00	0.00	0.00
Size [mm]	X :	0.00	0.00	0.00	0.00	0.00
	Y :	0.00	0.00	0.00	0.00	0.00
	Z :	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
	Y :	0.00	0.00	0.00	0.00	0.00
	Z :	0.00	0.00	0.00	0.00	0.00

Hand (HNDDAT)

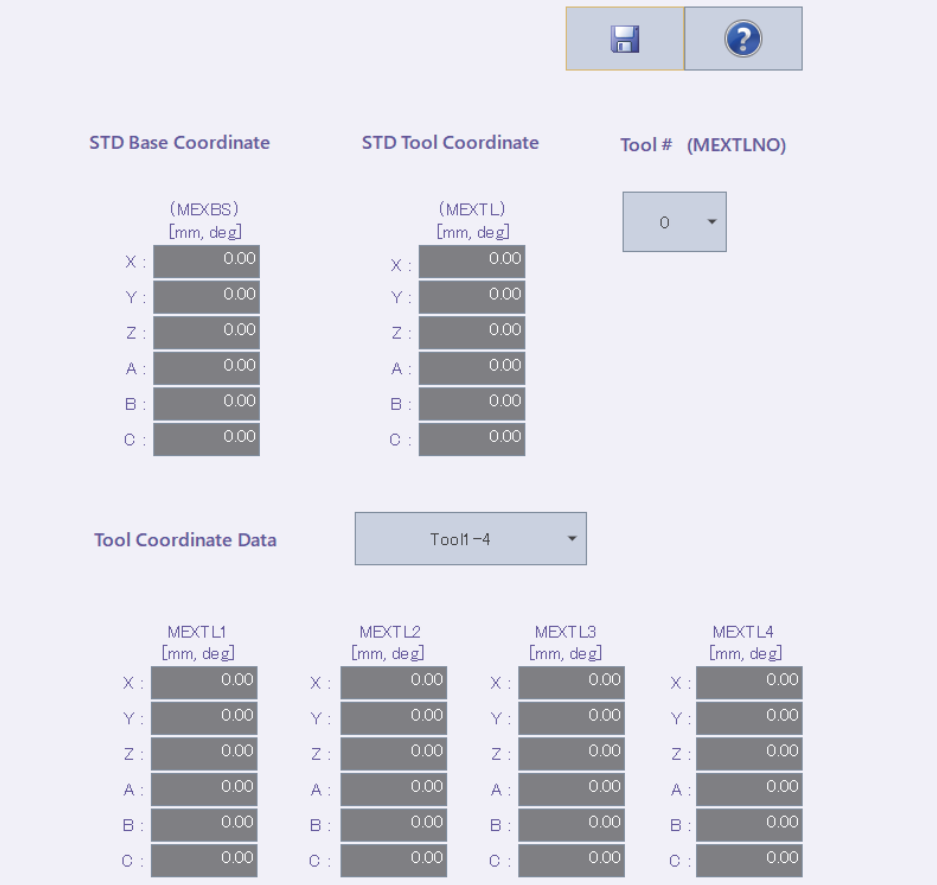
		HNDDAT0	HNDDAT1	HNDDAT2	HNDDAT3	HNDDAT4
Weight [Kg] :		7.00	7.00	7.00	7.00	7.00
Size [mm]	X :	95.00	0.00	0.00	0.00	0.00
	Y :	95.00	0.00	0.00	0.00	0.00
	Z :	95.00	0.00	0.00	0.00	0.00
Center of Gravity Position [mm]	X :	0.00	0.00	0.00	0.00	0.00
	Y :	0.00	0.00	0.00	0.00	0.00
	Z :	155.00	0.00	0.00	0.00	0.00

Tool

Robot's standard base coordinates, standard tool coordinates, and tool number can be set.
If the connected robot supports multi-hand, tool data "tool 5" and later can be set.
The multi-hand function is supported with the following controller software versions.

Controller name	Controller software version
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.S2a or later
CR750-Q/CRnQ-700	Ver.R2a or later

Tap [Tool] in the [Movement] category on the parameter menu screen.
After changing the value, tapping [ ] will write the parameter to the controller.
Tapping [ ] will show an explanation of the parameter.



The tool coordinate system (MEXTL) can be entered only when the tool number is "0". Additionally, changing the tool number to "0" will set all the values of the tool coordinate system to "0". However, if the displayed tool number is "0", changing the number to a value other than "0" and returning it to "0" again will display the values of the tool coordinate system before the change.

User-defined area

Specifying an area (cuboid) defined with two points in the robot XYZ coordinates allows you to set the behavior for when the robot enters the area.

Tap [User-defined Area] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.

In the default settings, the [Not teach posture] and [Not teach L1L2] check boxes are selected. In this state, tapping [Teach] each for AREA*P1 and AREA*P2 will set the following values in the robot postures (A, B, C), and additional axes (L1, L2).

	AREA*P1	AREA*P2
Robot postures (A, B, C)	-360	360
Additional axes (L1, L2)	-100000	100000

To check the robot posture and additional axes, deselect the [Not teach posture] and [Not teach L1L2] check boxes.

Free plane limit

The overrun limit that the robot uses on a free plane can be set.

Tap [Free Plane Limit] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.

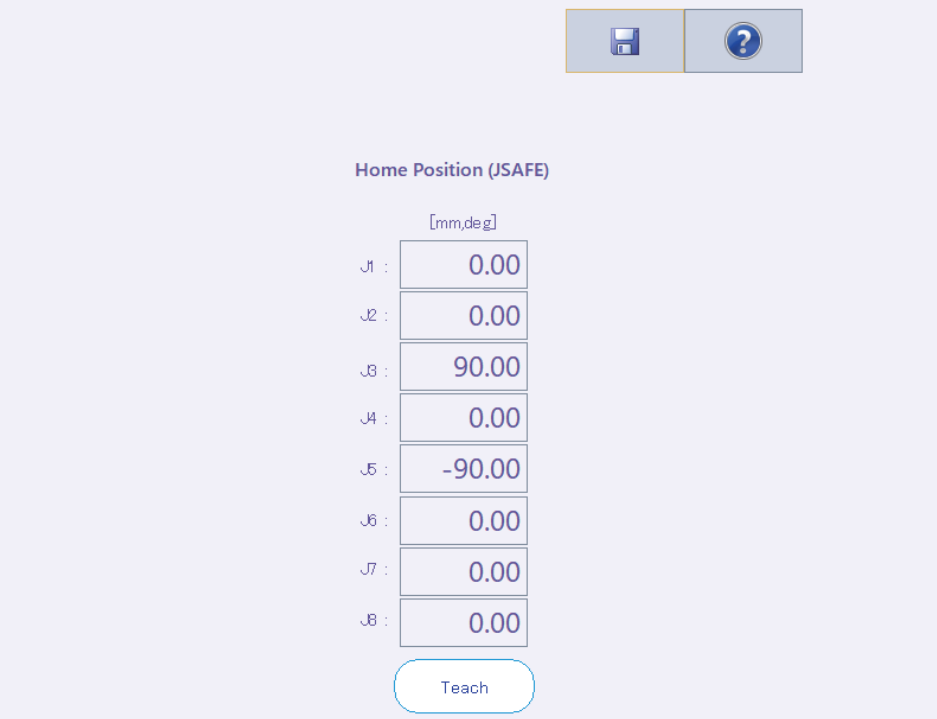
Home position

The robot's home position can be set.

Tap [Home Position] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



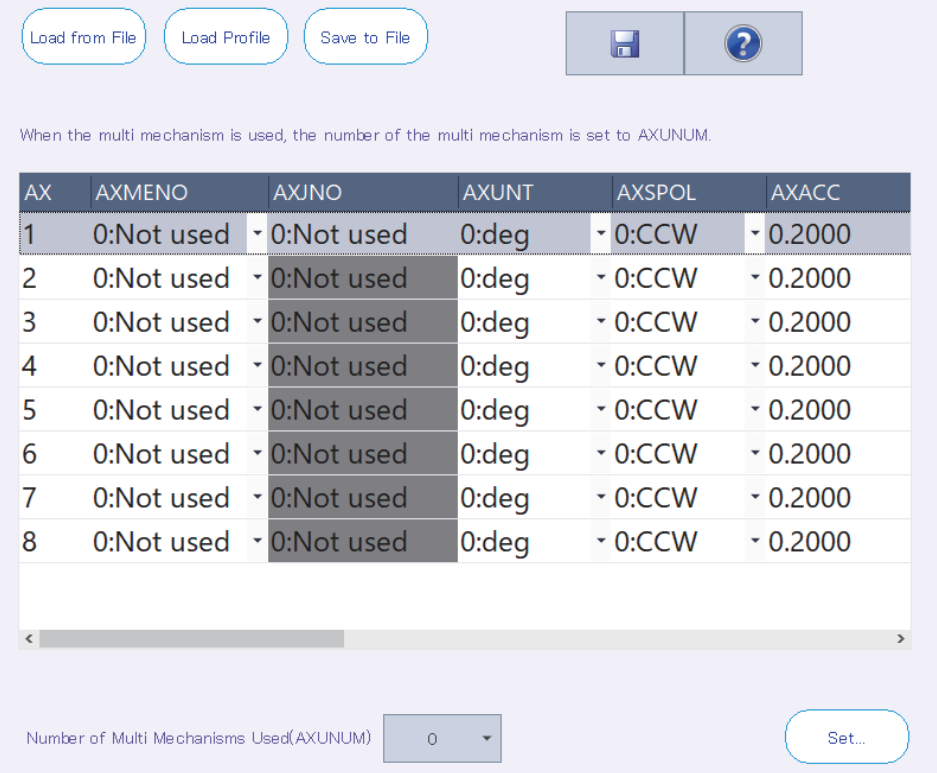
Additional axes

Information related to the additional axes of robots can be set.

Tap [Robot Additional Axis] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



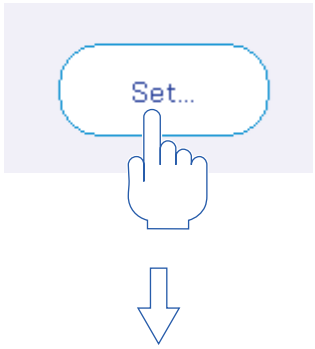
An additional axis can be set by loading the profile of an electric actuator (SMC Corporation, THK CO., LTD., etc.). Download the profile from their websites.

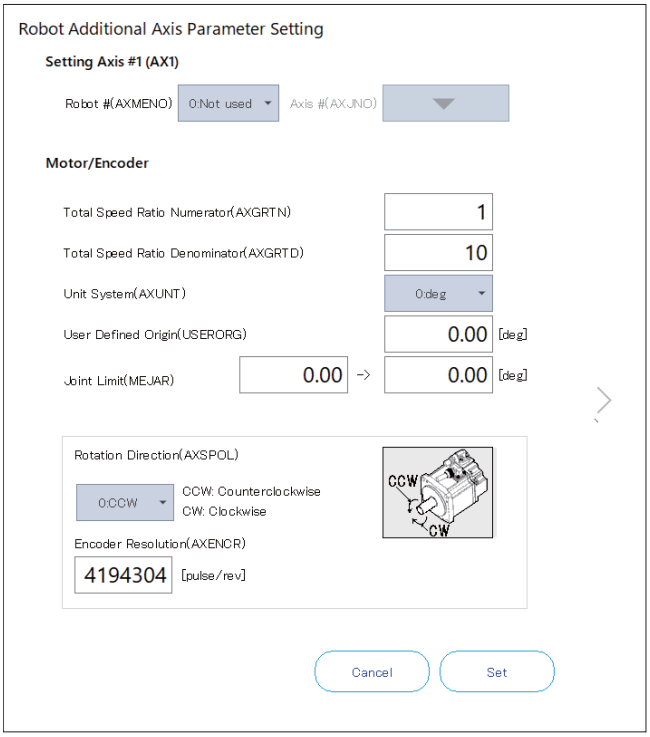
The [Load Profile] button allows you to load a profile to the selected axis.

The [Load from File] button allows you to display additional axis data saved in the file.

The [Save to File] button allows you to save the displayed additional axis parameters in the file.

Tapping [Set...] button will display the screen to set each information on the selected additional axis.





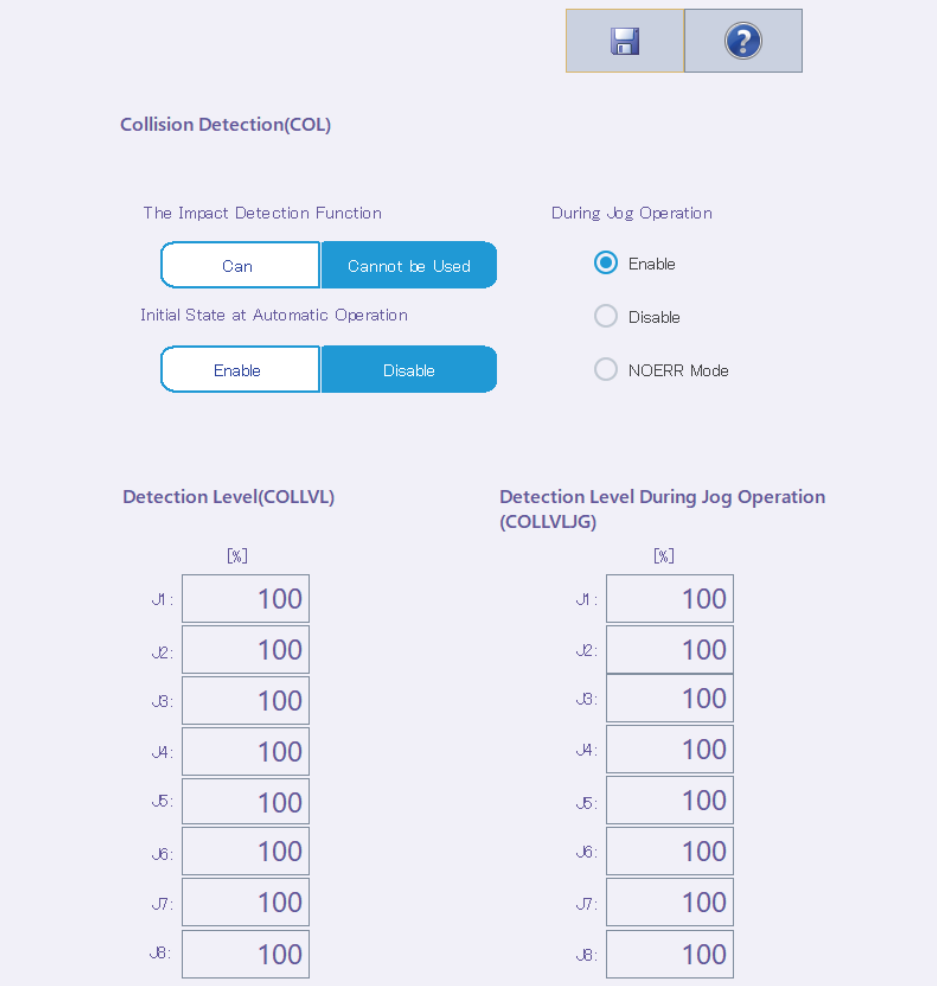
Collision detection

Information related to the robot's collision detection functions can be set.

Tap [Collision Detection] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



The parameter setting values for the detection level during jog operation can be easily adjusted by displaying the "collision detection level reference value" data as a graph by the oscillograph function.

For details, refer to the following page:

☞ Page 252 Oscillograph

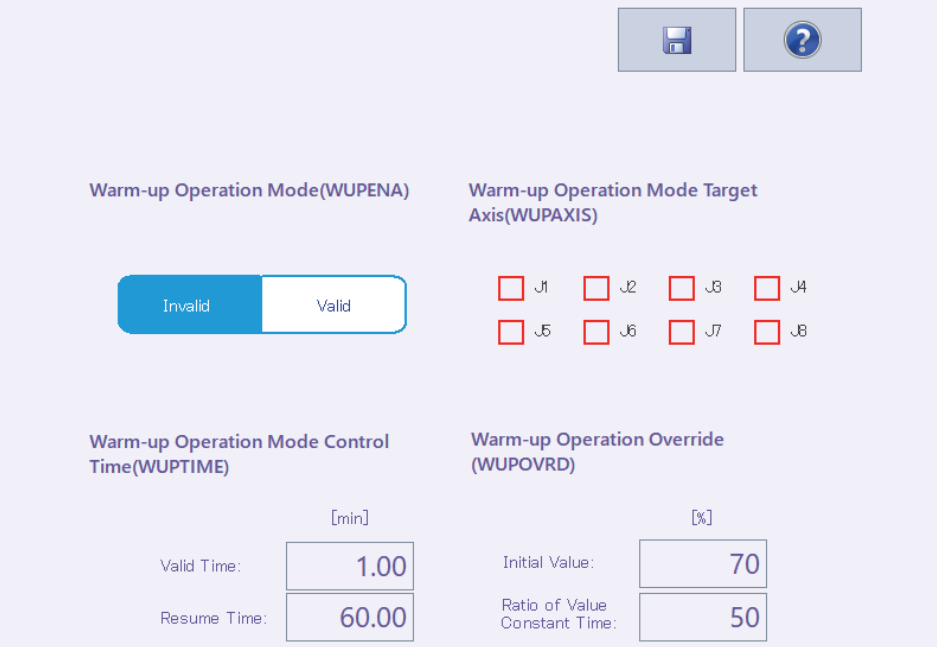
Warm-up operation

Information related to the robot's warm-up operation function can be set.

Tap [Warm-up Operation] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



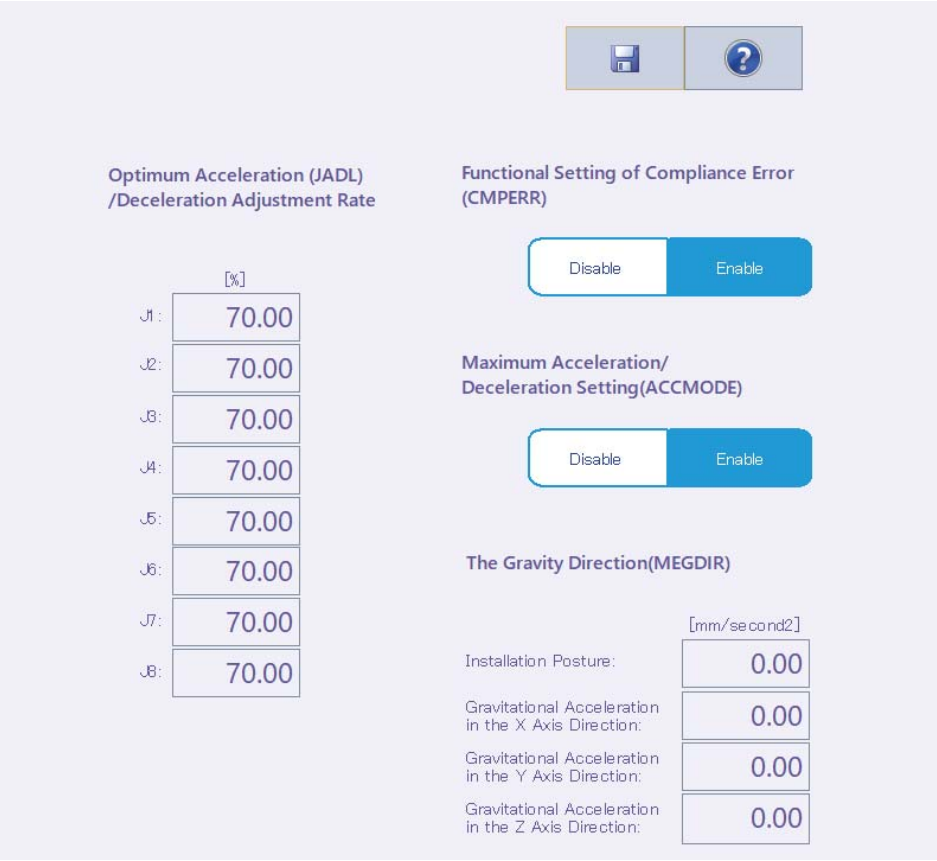
Movement

Information related to the optimum acceleration/deceleration for robot operation and compliance errors can be set.

Tap [Movement] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



Workpiece coordinates

Workpiece coordinate parameters define the coordinate system for work jog. Up to eight workpiece coordinates can be defined.

This function is supported with the following controller software versions.

Controller name	Controller software version
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.P8 or later
CR750-Q/CRnQ-700	Ver.N8 or later

Tap [Work Coordinate] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.

Workpiece coordinates are defined by "Origin WO", "+X WX" and "+Y WY".

Force sense control

Set parameters related to force sense control.

For information on the parameters, refer to the following manuals:

📖CR800 series controller Instruction Manual Force Sense Function (BFP-A3510)

📖CR750/CR751 series controller Instruction Manual Force Sense Function (BFP-A8947)

Force sensor

Set a robot for force sensor assignment, coordinate system, filter time constant, restriction, and tolerance level which are used by the force control function.

Tap [Force Sensor] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.

Initialize the force sensor with the [Setting] button. Thereby, the following values will be set.

Sensor type	Robot #	Axis #	Left/Right	Place/Angle	Filter time constant	Max. offset	Tolerance level
1F-FS001-W200	The first element is 1, and the others are 0.	The first element is 9, and the others are 0.	Left-Handed	X 0.00 Y 0.00 Z 32.00 A 0.00 B 180.00 C 0.00	1.70	Position 200.00 Angle 150.00	Fx 200.00 Fy 200.00 Fz 200.00 Mx 4.00 My 4.00 Mz 4.00
1F-FS001-W1000				X 0.00 Y 0.00 Z 34.00 A 0.00 B 180.00 C 0.00			Fx 1000.00 Fy 1000.00 Fz 1000.00 Mx 30.00 My 30.00 Mz 30.00

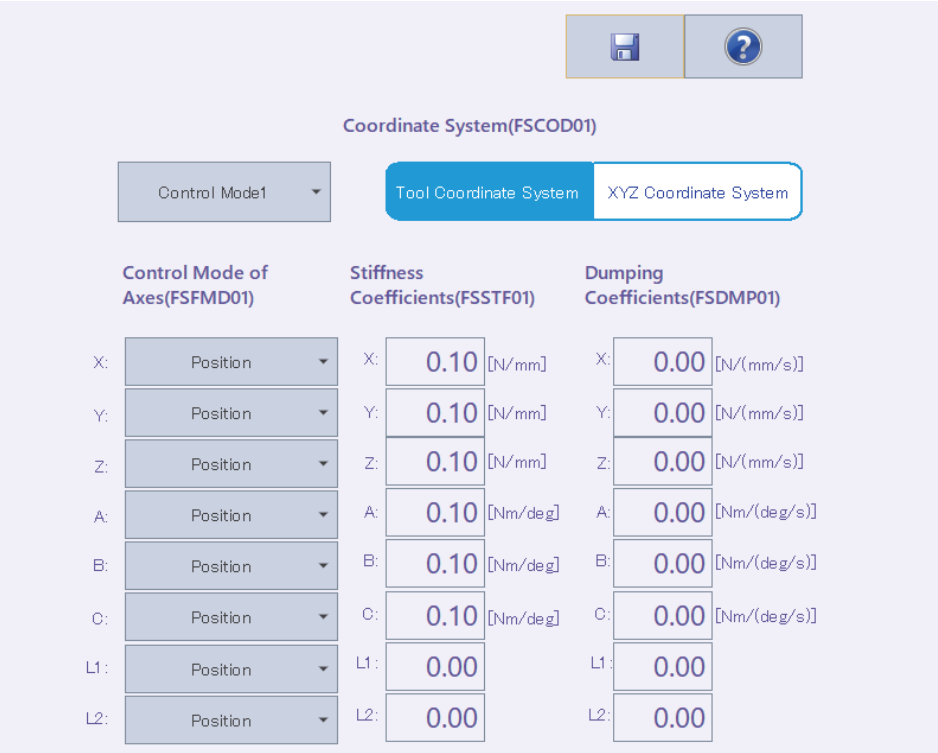
Control mode

Set a coordinate system, control modes of axes, stiffness coefficients, and dumping coefficients which are used by the control mode of the force control function.

Tap [Force Control Mode] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



Control characteristics

Set force sense control gains, force command values, and force detection setting values which are used by the control characteristics of the force control function.

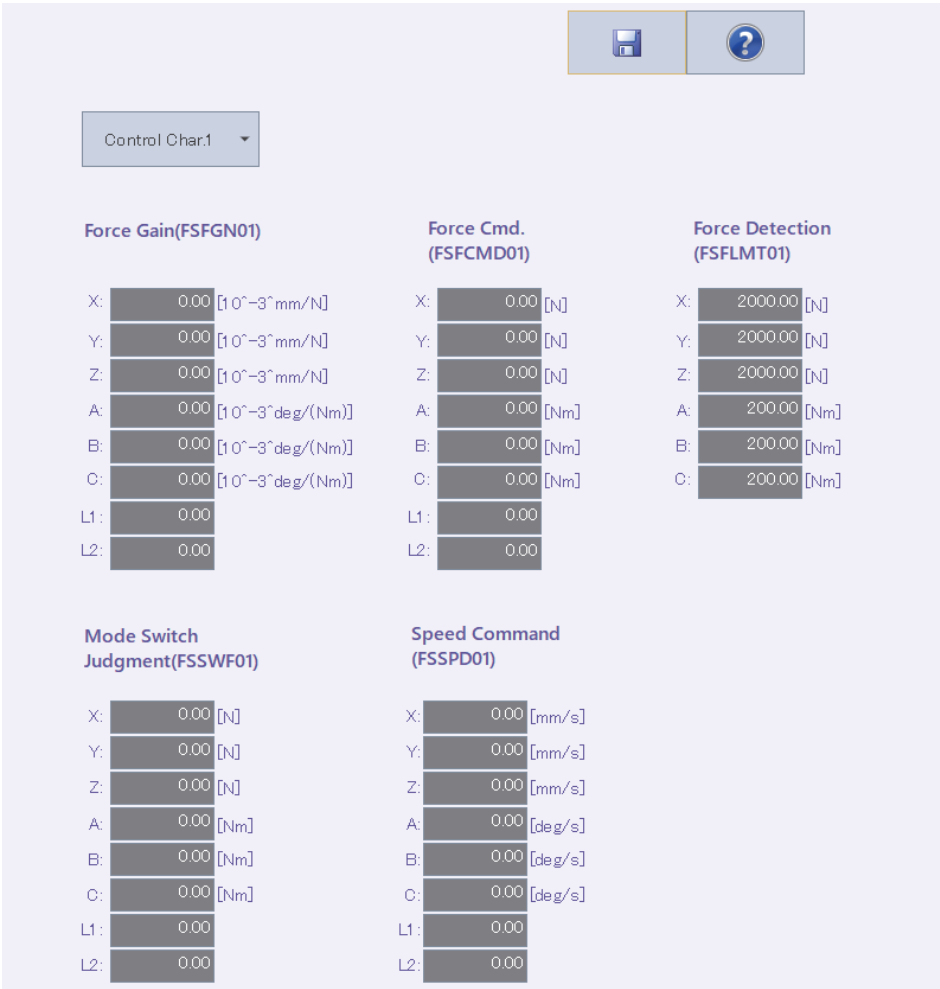
Tap [Force Control Characteristics] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.

The controllers which can set mode switch judgment values and speed command values are as follows.

Controller name	Controller software version
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.S3g or later
CR750-Q/CRnQ-700	Ver.R3g or later



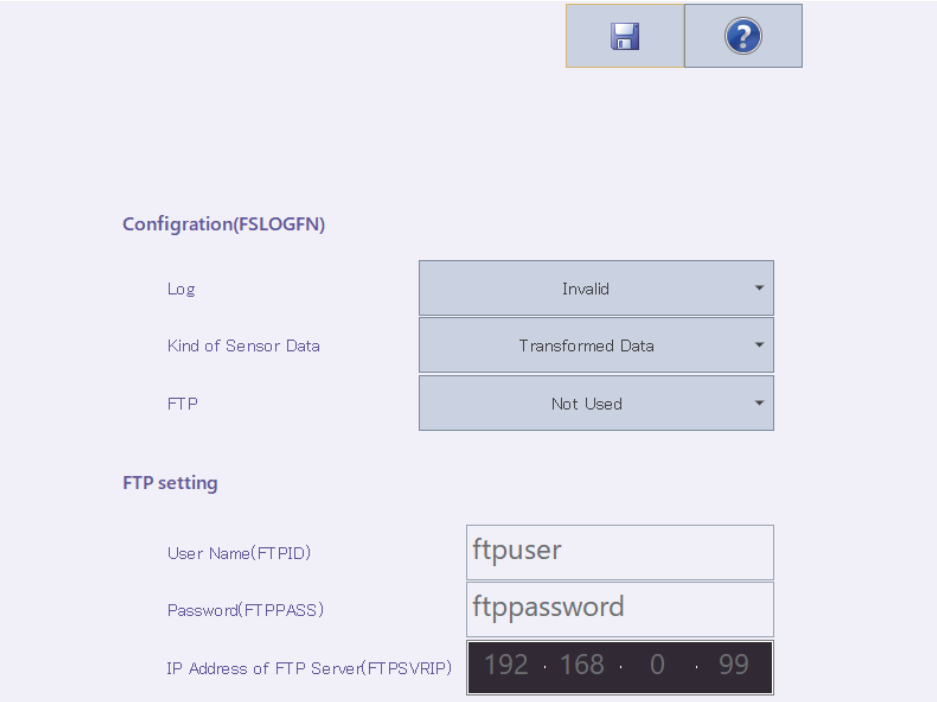
Logging function

Configure the logging function settings and FTP communication settings which are used by the force control function.

Tap [Force Log] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



Collision avoidance

Set parameters related to collision avoidance.

For information on the parameters, refer to the following manuals:

📖CR800 Series Controller INSTRUCTION MANUAL Detailed explanations of functions and operations (BFP-A3478)

📖CR750/CR751/CR760 Series Controller INSTRUCTION MANUAL Detailed explanations of functions and operations (BFP-A8869)

Collision avoidance function

The parameters of the robot's collision avoidance function can be set.

This function is supported with the following controller software versions.

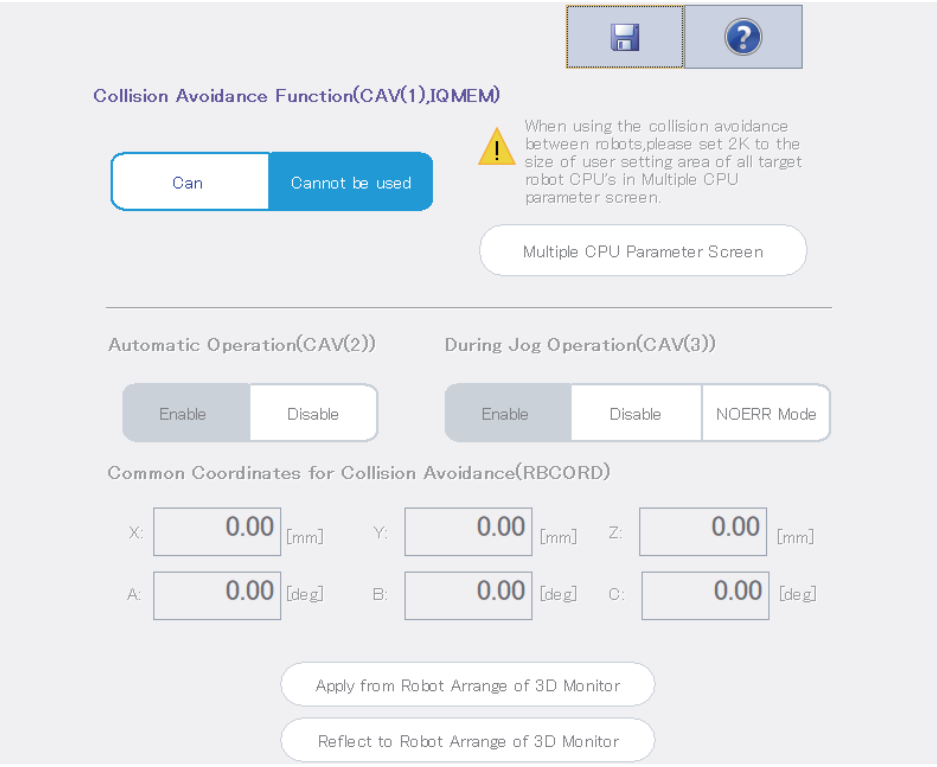
Controller name	Controller software version	Robot model type
CR800-D*1/CR800-R/CR800-Q	All versions	RV-FR, RH-FR
CR750-D/CRnD-700*1	Ver.S6b or later	RV-F, RH-F
CR750-Q/CRnQ-700	Ver.R3a or later	RV-F, RH-F

*1 The following operations are not possible.
Tapping [Multiple CPU Parameter Screen]
Setting the common coordinates for collision avoidance
Tapping [Apply from Robot Arrange of 3D Monitor]
Tapping [Reflect to Robot Arrange of 3D Monitor]

Tap [Collision Avoidance Function] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



Tapping [Multiple CPU Parameter Screen] will display the multiple CPU parameter setting screen.
(The size of the user free area can be changed on the multiple CPU parameter setting screen.)

Tapping [Apply from Robot Arrange of 3D Monitor] will set the coordinates of the robot in the 3D monitor in [Common Coordinates for Collision Avoidance].

Tapping [Reflect to Robot Arrange of 3D Monitor] will reflect the values entered in [Common Coordinates for Collision Avoidance] to the coordinates of the robot in the 3D monitor.

Collision avoidance area

The parameters of the robot's collision avoidance area can be set.

This function is supported with the following controller software versions.

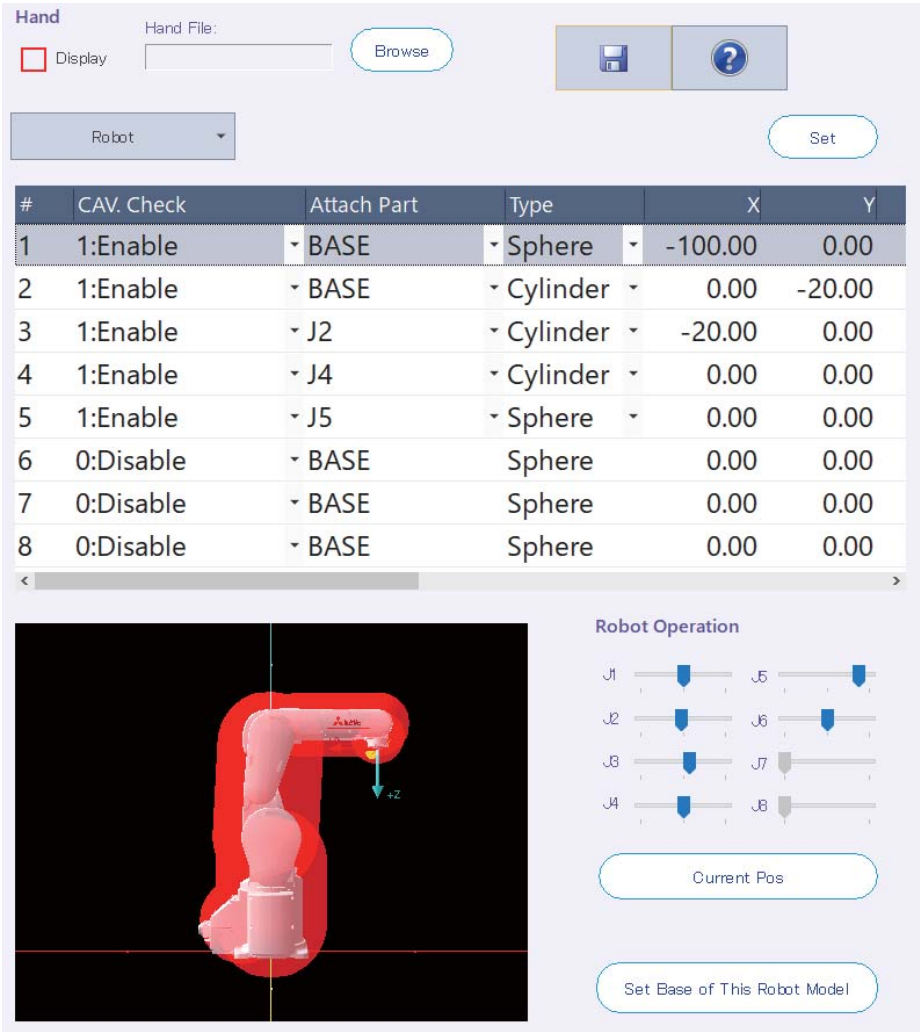
Controller name	Controller software version	Robot model type	Supported model
CR800-D	All versions	RV-FR, RH-FR	Free plane limit
CR800-R/CR800-Q	All versions	RV-FR, RH-FR	Robot/hand/workpiece/free plane limit
CR750-D/CRnD-700	Ver.S6b or later	RV-F, RH-F	Free plane limit
CR750-Q/CRnQ-700	Ver.R3a or later*1	RV-F, RH-F	Robot/hand/workpiece
CR750-Q/CRnQ-700	Ver.R6b or later	RV-F, RH-F	Robot/hand/workpiece/free plane limit

*1 The cylinder model is supported by Ver.R3m or later.

Tap [Collision Avoidance Area] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



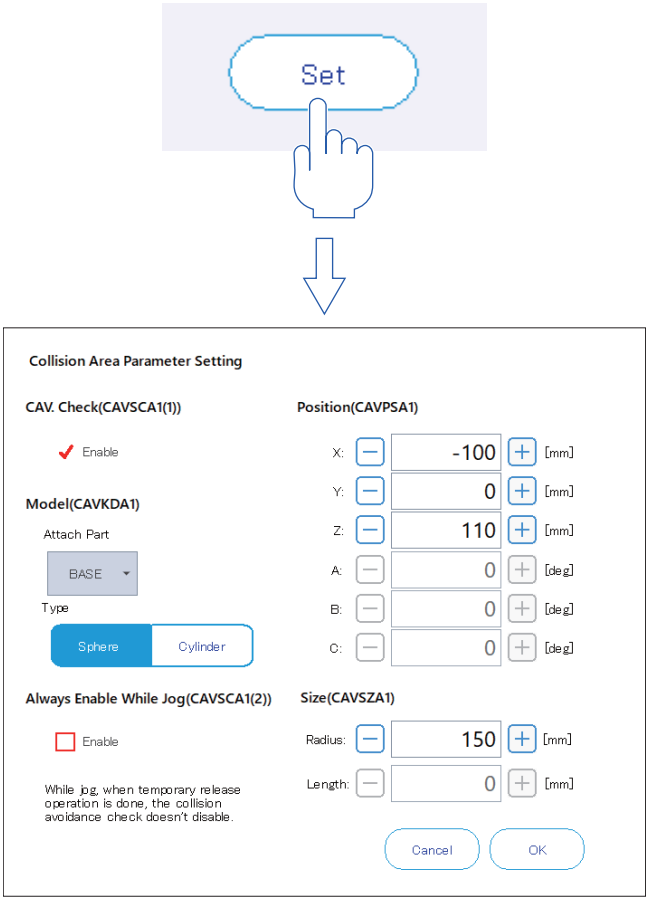
You can change the model type (robot/hand/workpiece/free plane limit) for the collision avoidance area to be edited with the combo box.

The selected collision avoidance area is colored blue on the 3D model. The following shows how to change the viewpoint of the 3D model.

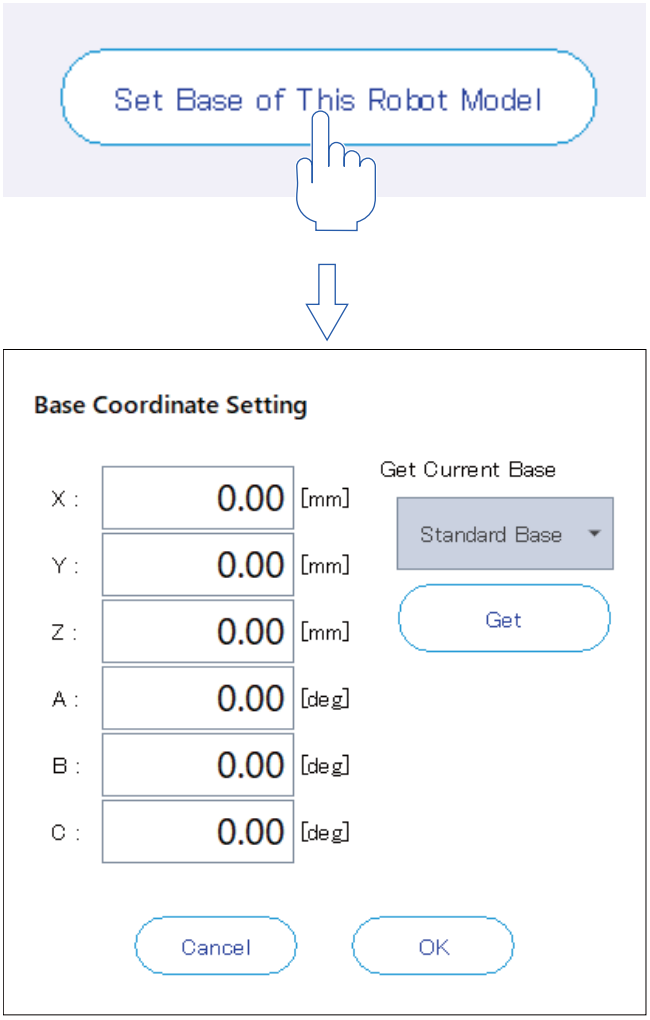
Viewpoint	Mouse operations on the graphic
Rotation	Moving the fingers left or right while touching the screen: Rotation around the Z axis Moving the fingers up or down while touching the screen: Rotation around the X axis
Move	Moving two fingers while touching the screen
Zoom	Moving two fingers close to each other or away from each other while touching the screen

Tap the [Browse] button and select a hand file, then select the [Display] check box.

The selected hand will be displayed as the 3D model.Select one collision avoidance area from the list and tap the [Set] button, or double-tap the list. The dialog for the collision avoidance area settings will appear.



Operating the [Robot Operation] slider will move the axis of the 3D robot model.
The [Current Pos] button allows you to make the posture of the 3D robot model the same as that of the robot being connected.
The [Set Base of This Robot Model] button allows you to set the base coordinate values of the robot. To display the position of the free plane limit when [World] is selected in the coordinate system, set the actual base coordinate values.



Safety

This screen is used to set parameters related to the robot safety option of the CR750/CR700 series controllers. For information on the robot safety option, refer to the following manual:

📖CR750/CR751 series controller Robot Safety Option Instruction Manual (BFP-A3372)

This function is supported with the following controller software versions.

Controller name	Controller software version
CR750-D/CRnD-700	Ver.S6 or later*1
CR750-Q/CRnQ-700	Ver.R6 or later*1

*1 The robot safety option is required.

The method for setting safety parameters of the CR800 series controller differs. For details, refer to the following page:

☞ Page 169 Safety parameters

Enabled/disabled

You can set whether to enable or disable the safety monitoring function of the robot safety option, configure the DSI signal settings, and change the password.

Tap [Safety] in the [Movement] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.

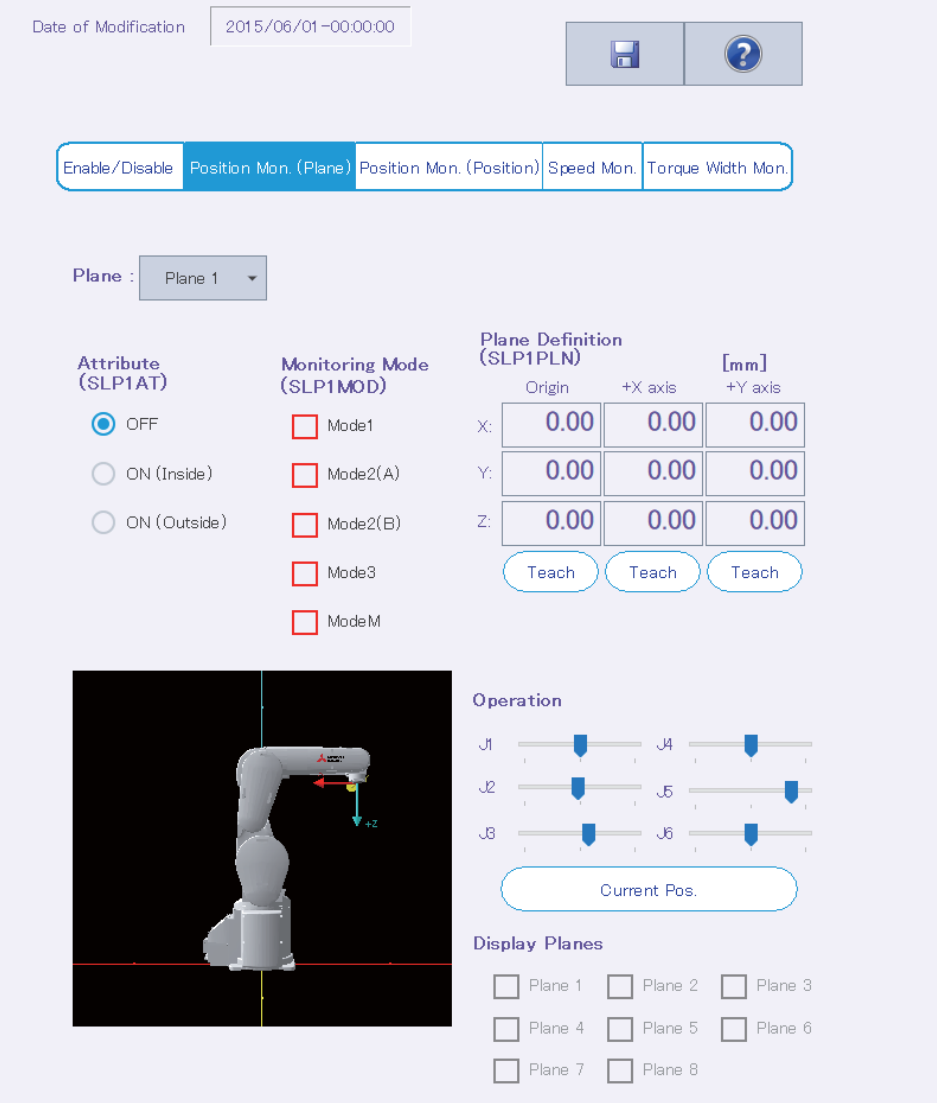
The [CRC of Parameter File Output #] settings are displayed in the CR750/CR700 controller software Ver.R6b/S6b or later.

Position monitoring (plane settings)

Planes for the SLP function can be set. The SLP function monitors that the monitoring area of the robot does not exceed the defined position monitoring plane.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



Selecting any of the options under "Display Planes" will display a position monitoring plane in the graphics display section. Thereby, the relationship between the plane and the robot can be checked. The graphics display section is not linked with the 3D monitor.

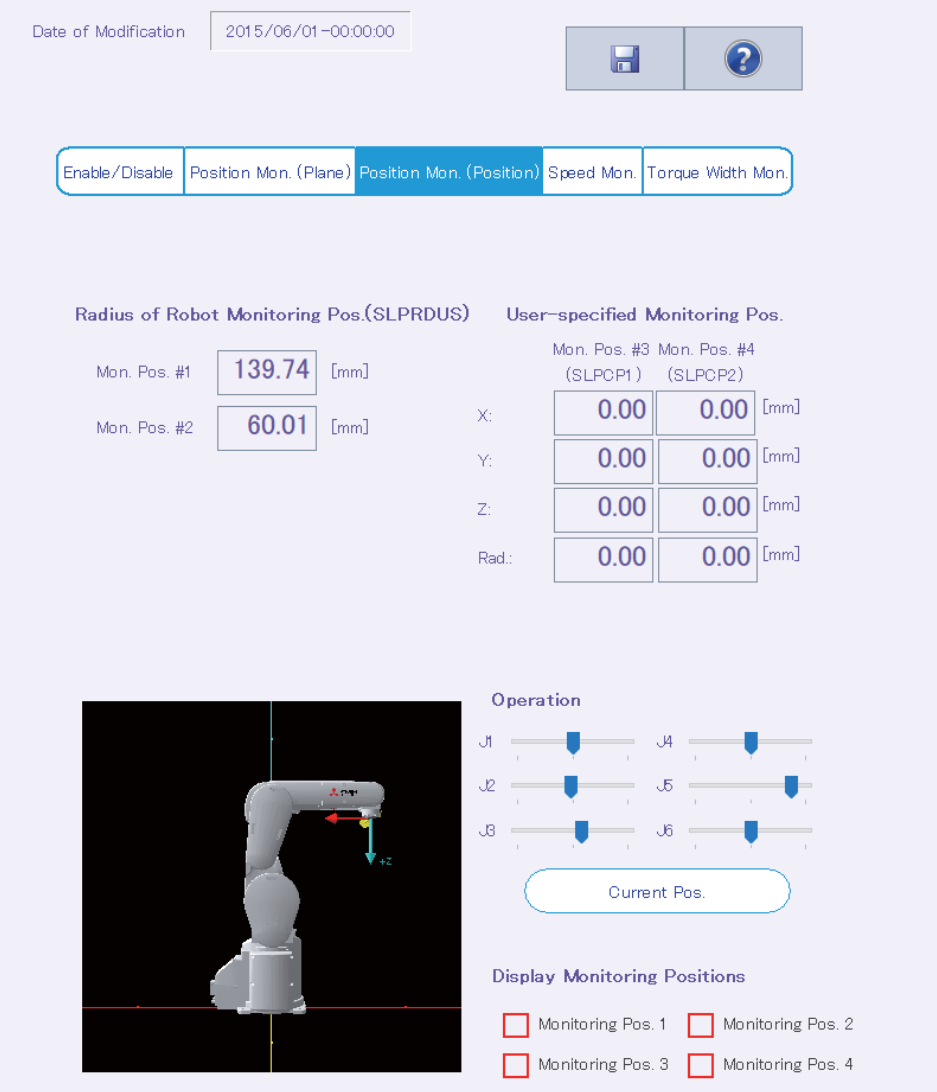
The [Current Pos.] button allows you to make the posture of the robot in the graphics display section the same as that of the robot being connected.

Position monitoring (position settings)

Monitoring positions for the SLP function can be set. The SLP function monitors that the monitoring area of the robot does not exceed the defined position monitoring plane.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



Selecting any of the options under "Display Monitoring Positions" will display a position monitoring sphere in the graphics display section. Thereby, the size of the sphere and the relationship between the sphere and the robot can be checked. The graphics display section is not linked with the 3D monitor.

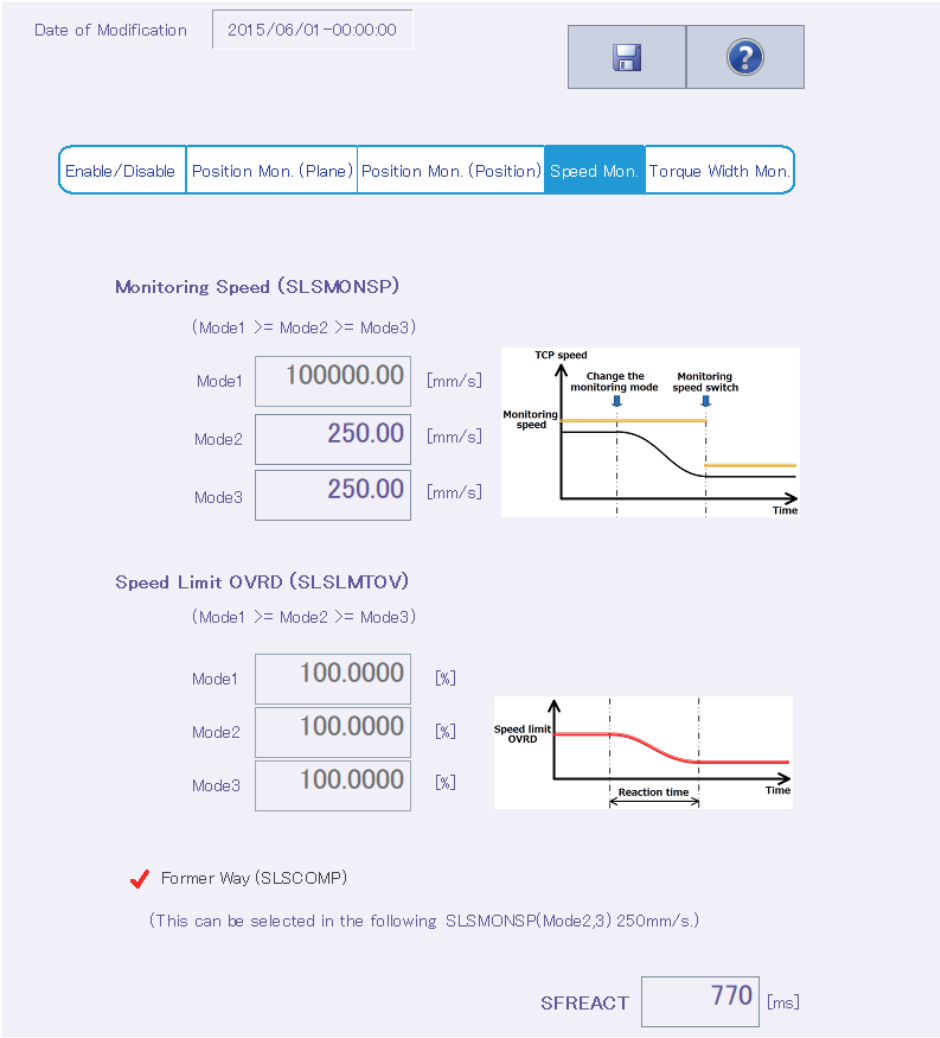
The [Current Pos.] button allows you to make the posture of the robot in the graphics display section the same as that of the robot being connected.

Speed monitoring

You can configure the settings of the function (SLS function) that keeps the speed of the robot below the monitoring speed and monitors that the robot operating speed does not exceed the monitoring speed.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.

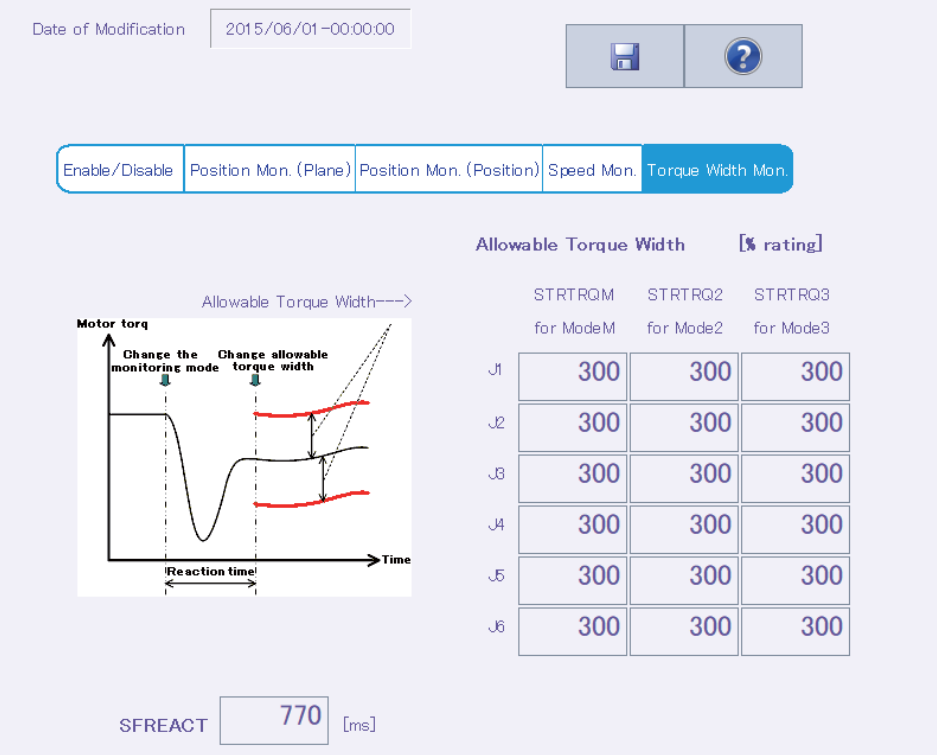


Torque width monitoring

You can configure the settings of the function (STR function) that monitors that the actual torque is within the permissible torque range which is established from the estimated torque of the robot.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



12.4 Program parameters

Slot table

The operating conditions of each task slot for multi-task operation can be set.

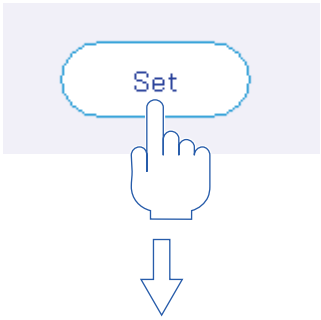
Tap [Slot Table] in the [Program] category on the parameter menu screen.

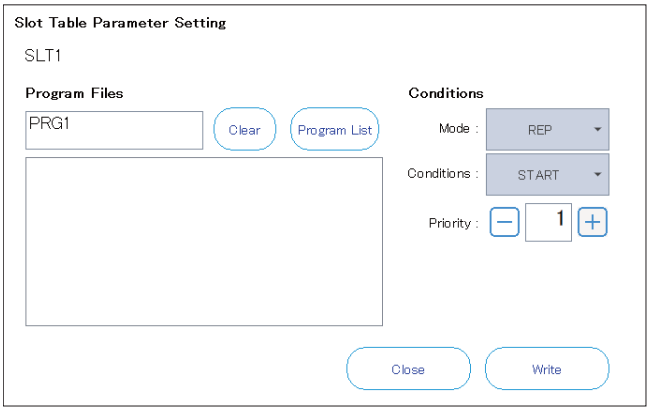
Select the number of the task slot to be changed, then tap [Setting].

Set a program name, operating conditions, start conditions, and task priority on the displayed setting screen, then tap [Write].

The slot table parameters in the controller can be rewritten.

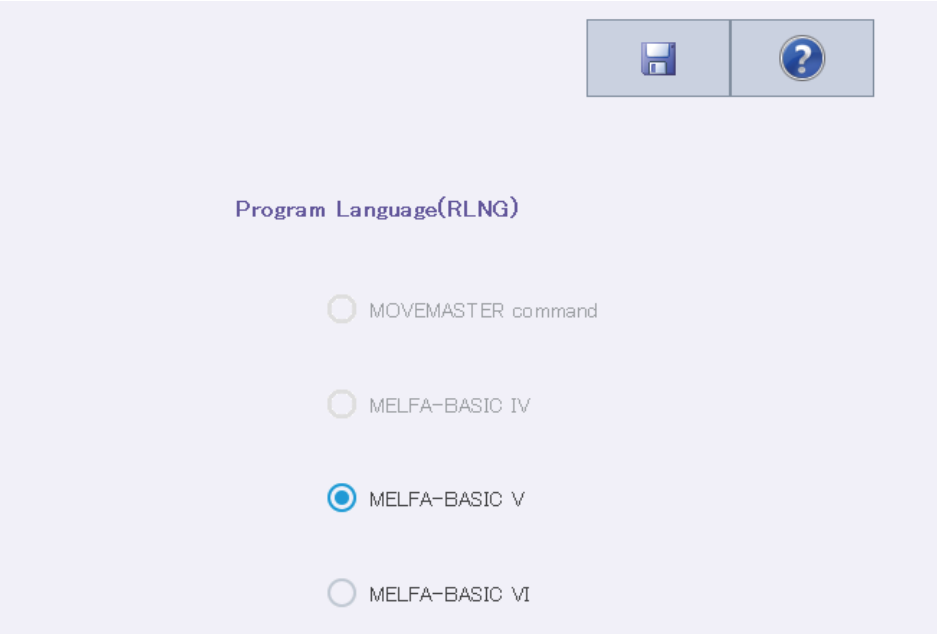
Tapping [ ] will show an explanation of the parameter.





Robot language

The robot program language (MELFA-BASIC VI/MELFA-BASIC V/MELFA-BASIC IV) to be used in the controller can be set.
Tap [Program Language] in the [Program] category on the parameter menu screen.
After changing the value, tapping [ ] will write the parameter to the controller.
Tapping [ ] will show an explanation of the parameter.



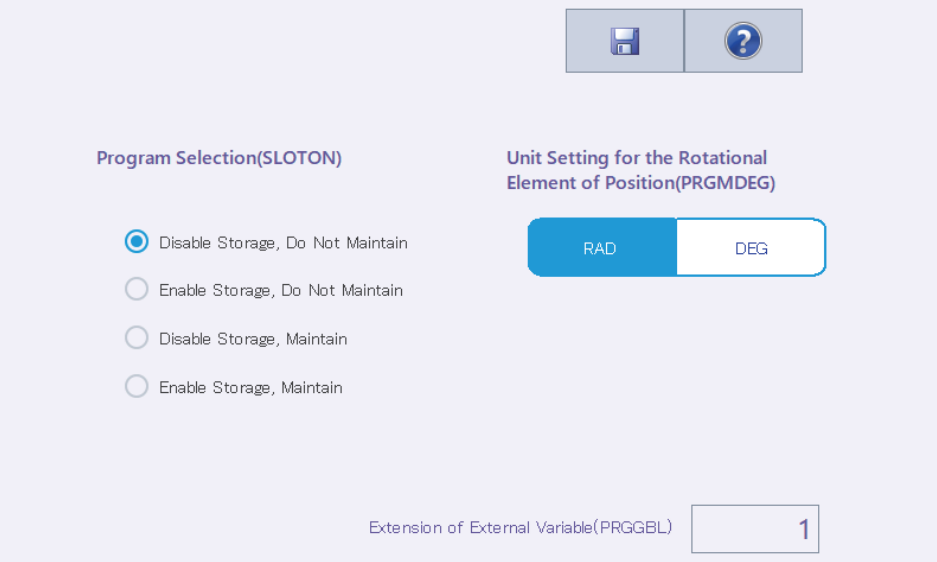
Programs

Parameters related to robot programs can be set.

Tap [Command] in the [Program] category on the parameter menu screen.

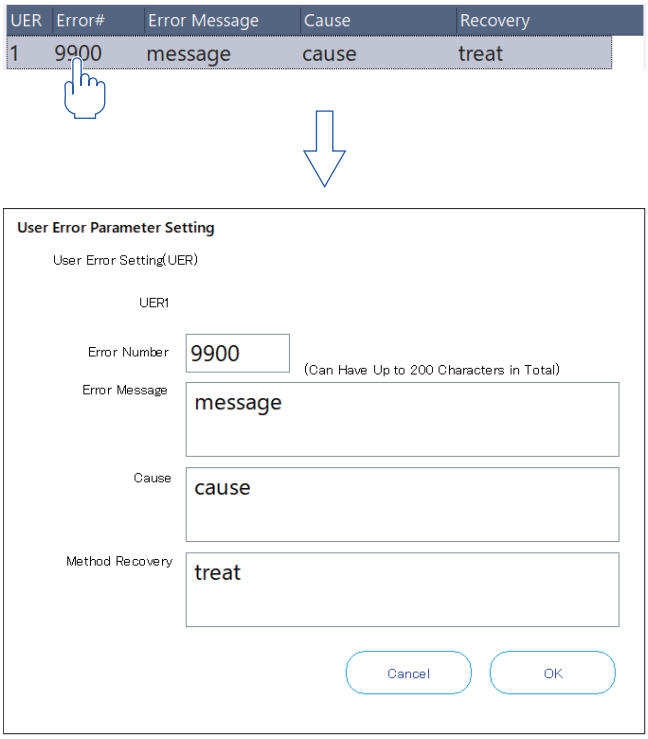
After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



User errors

You can set the message, cause, and recovery method for user errors set with a program.
Tap [User Error] in the [Program] category on the parameter menu screen.
Double-tapping an error number to be edited from the list will display the user error parameter setting screen.
After entering an error number, error message, cause, and recovery method, tap [OK]. The entered user error will be displayed in the list.
Enter any error number from "9000" to "9299".
After changing the value, tapping [ ] will write the parameter to the controller.
Tapping [ ] will show an explanation of the parameter.
Note that the displayed list is not sorted by error number.



12.5 Signal parameters

Output signal reset pattern

⚠CAUTION

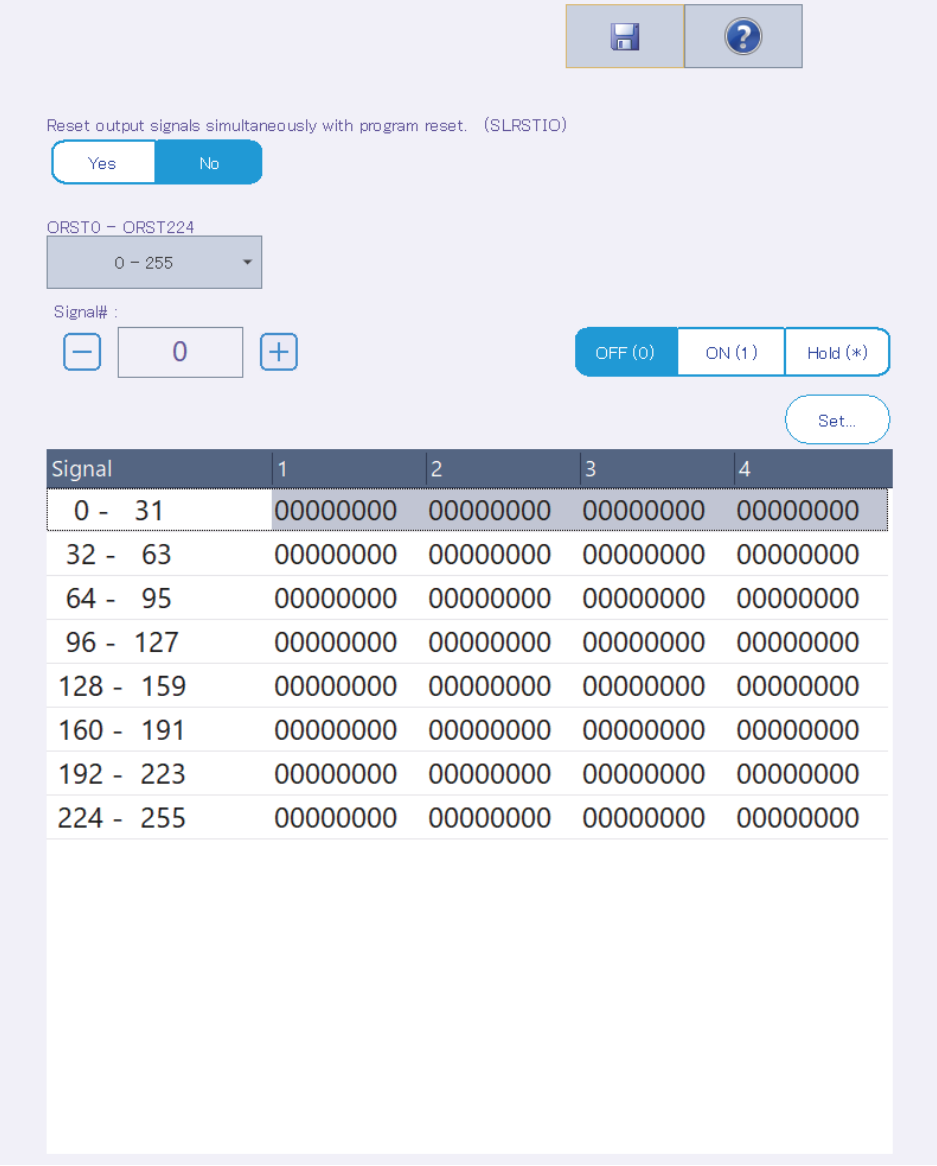
• Read the parameter list of the controller being connected.
Use this screen after reading the parameter list of the controller being connected. Thereby, the output signals corresponding to the functions of the controller can be displayed. Read the parameter list on the parameter list screen.

You can set the operation when general-purpose output signals such as the CLR instruction and dedicated input (OUTRESET) are reset.

Tap [Output Signal Reset Pattern] in the [Signal] category on the parameter menu screen.

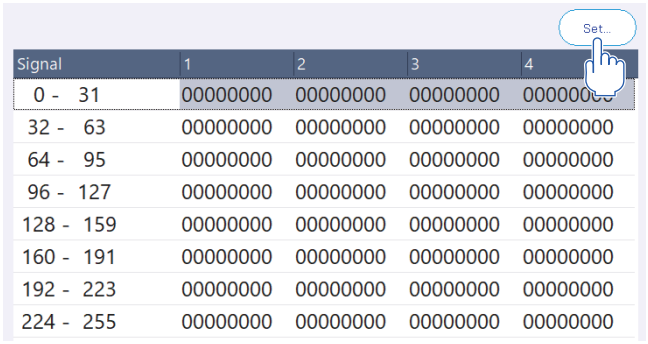
After changing the value, tapping [ ] will write the parameter to the controller.

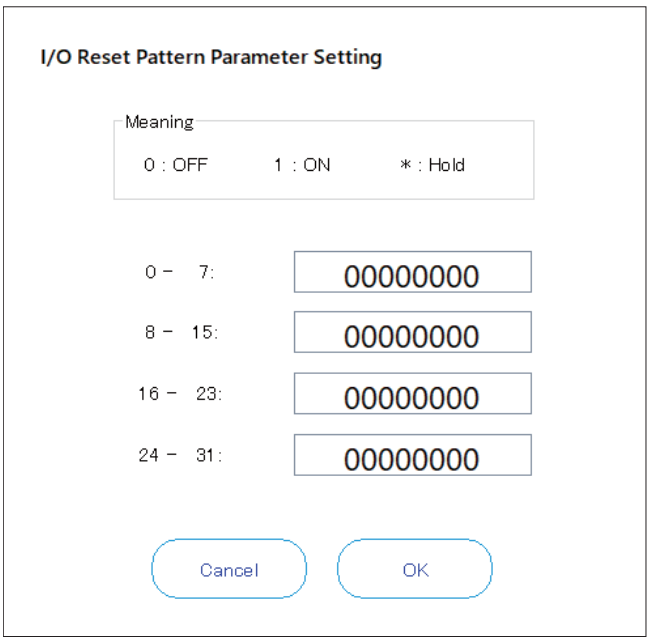
Tapping [ ] will show an explanation of the parameter.



Set a signal number, then select any of [OFF], [ON], and [Hold]. The value of the signal with the specified number displayed in the list will change.

Also, selecting a signal group (for example, "0-31") and tapping [Set...] will change 32 signals at a time.





Assigning dedicated I/O signals

You can assign signal numbers to each function in order to perform remote operations such as running and stopping robot programs, and to display/manipulate execution progress information and servo power supply status, etc.

General 1

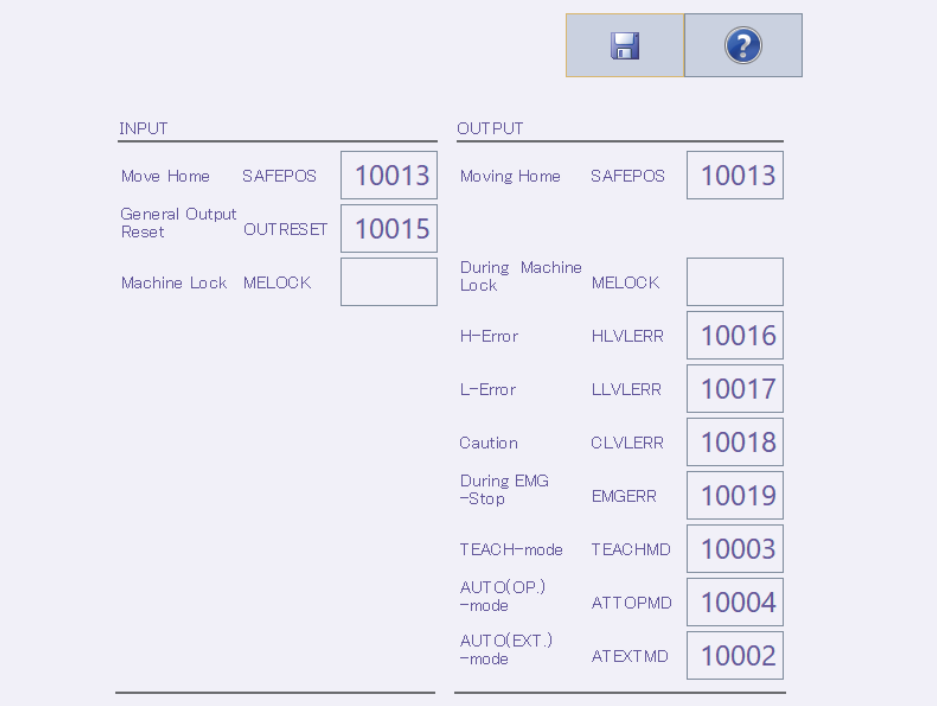
Tap [General1] in the [Signal] category on the parameter menu screen.
After changing the value, tapping [ ] will write the parameter to the controller.
Tapping [ ] will show an explanation of the parameter.

General 2

Tap [General2] in the [Signal] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.

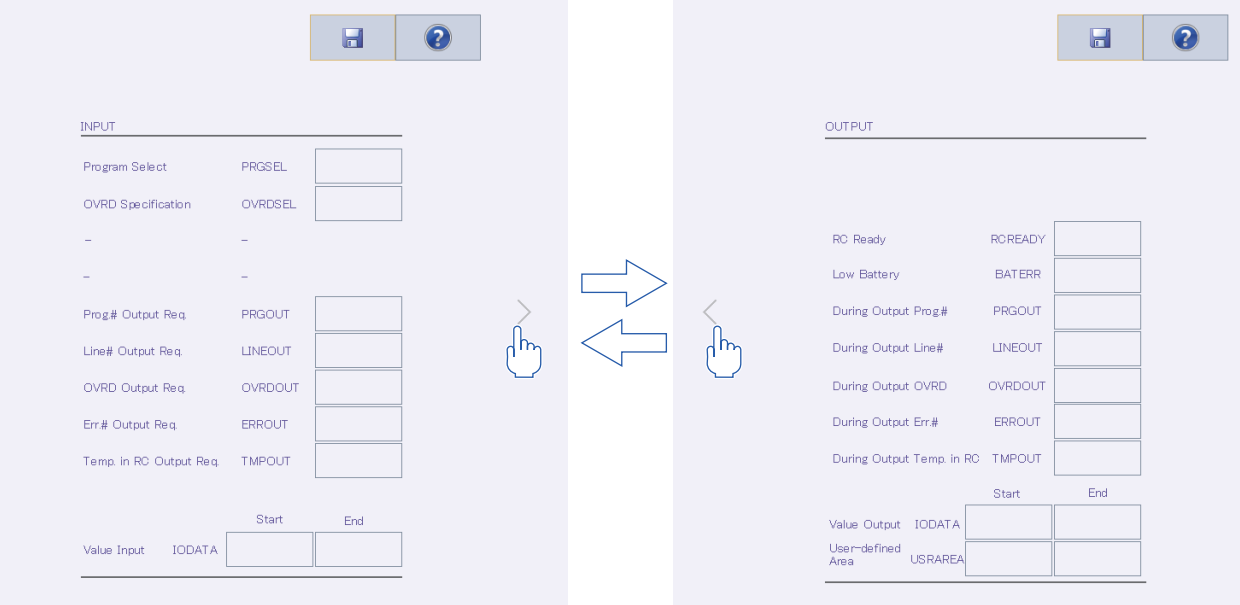


Data

Tap [Data] in the [Signal] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.

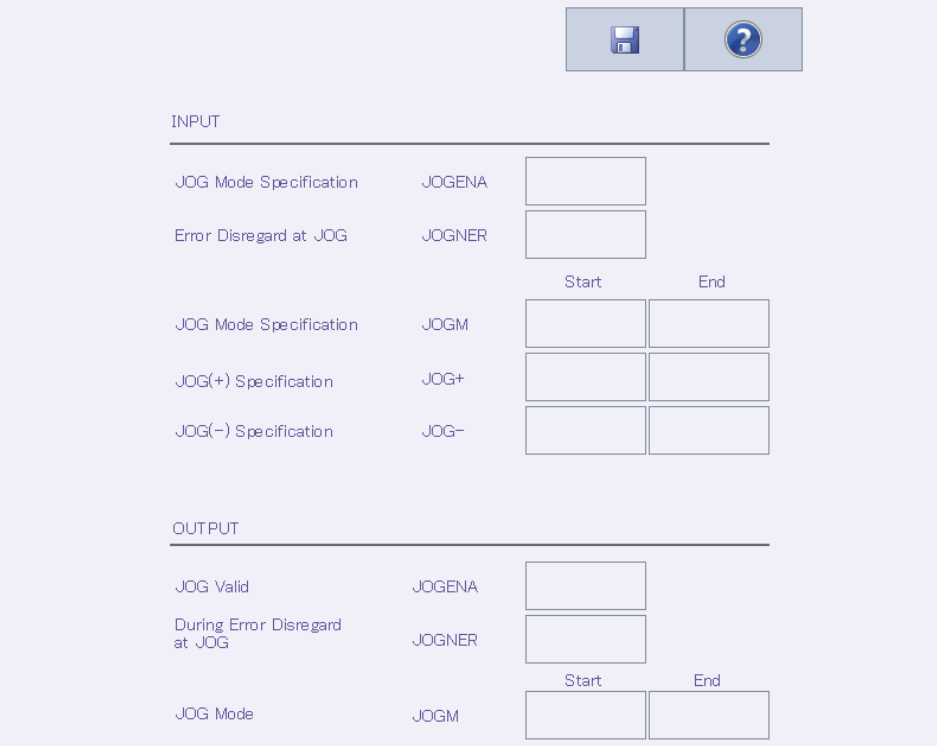


The [Temp. in RC Output Req.] and [During Output Temp. in RC] parameters are supported with the following controller software versions.

Controller name	Controller software version
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.S1c or later
CR750-Q/CRnQ-700	Ver.R1c or later

Jog

Tap [Jog] in the [Signal] category on the parameter menu screen.
After changing the value, tapping [ ] will write the parameter to the controller.
Tapping [ ] will show an explanation of the parameter.



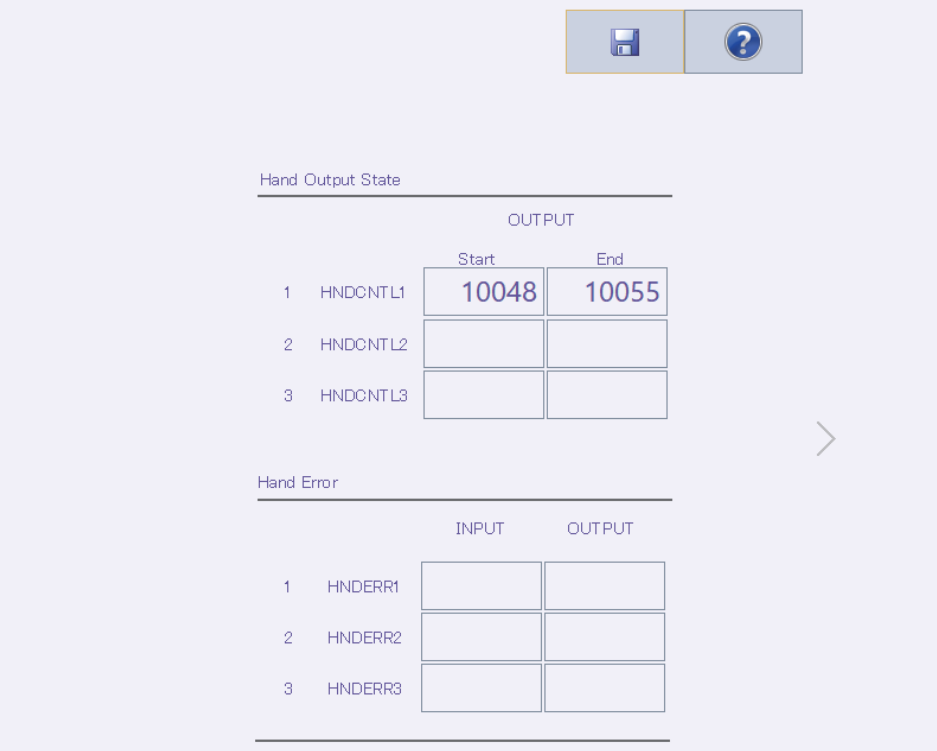
The JOGNER (Input signal: Error Disregard at JOG and Output signal: During Error Disregard at JOG) parameters can be used with the CR800/750/700 series controllers.

Hand

Tap [Hand] in the [Signal] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



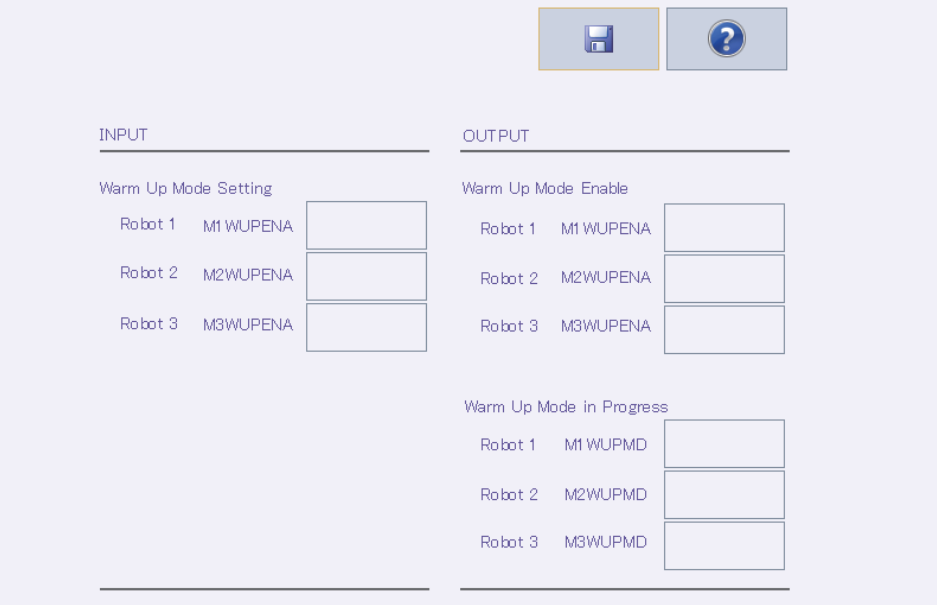
Warm-up operation

The warm-up operation parameters can be set when the CR800/750/700 series controller is connected.

Tap [Warm Up] in the [Signal] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.

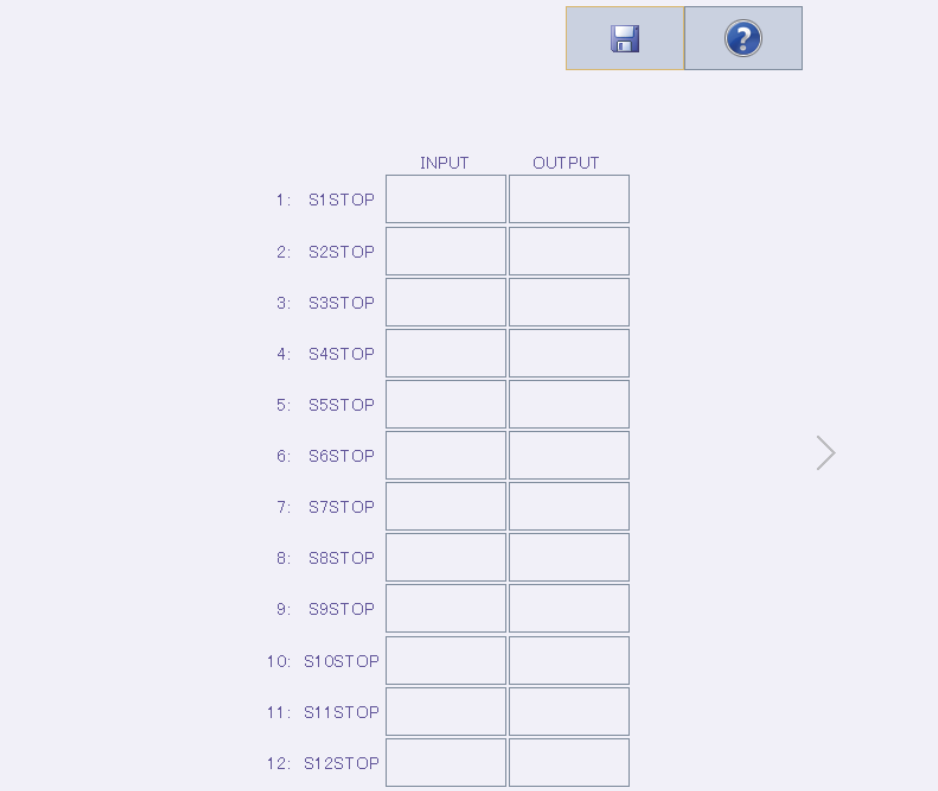


Slot start (each slot)

Tap [Start (Each Slot)] in the [Signal] category on the parameter menu screen.
After changing the value, tapping [ ] will write the parameter to the controller.
Tapping [ ] will show an explanation of the parameter.

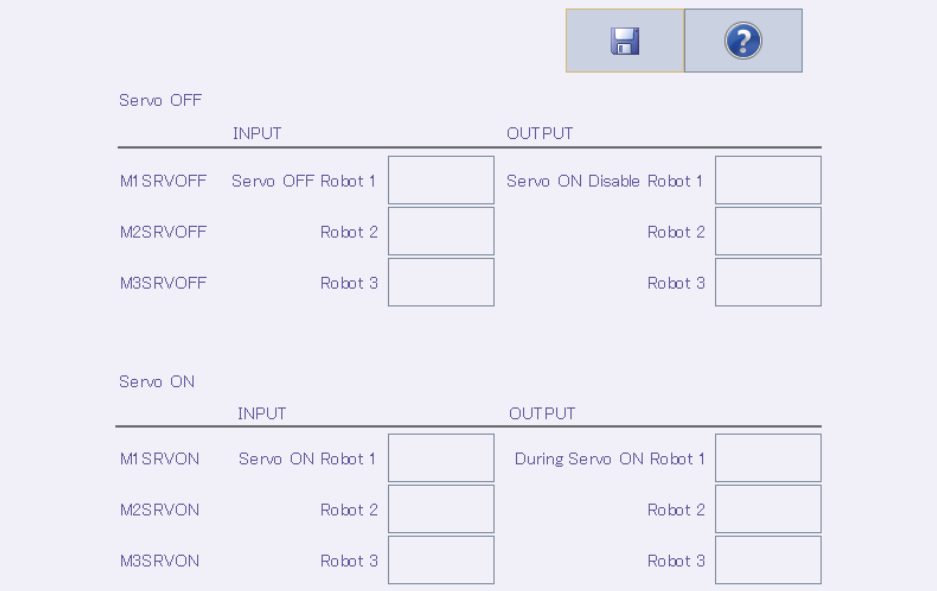
Slot stop (each slot)

Tap [Stop (Each Slot)] in the [Signal] category on the parameter menu screen.
After changing the value, tapping [ ] will write the parameter to the controller.
Tapping [ ] will show an explanation of the parameter.



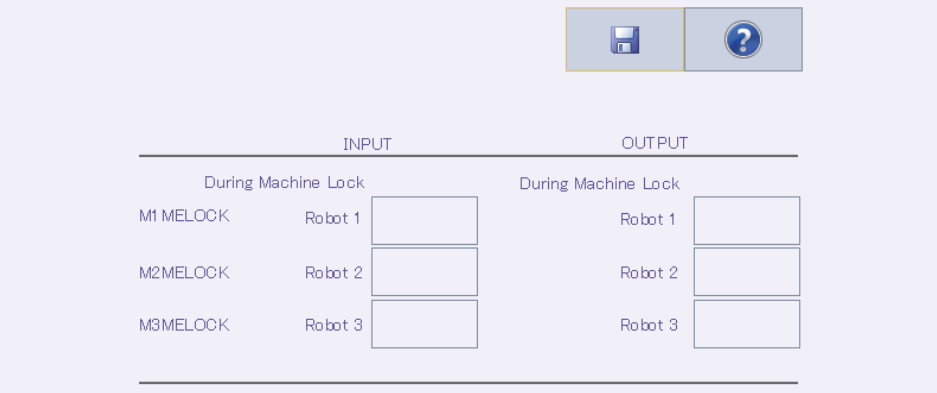
Servo ON/OFF (each robot)

Tap [Servo ON/OFF (Each Robot)] in the [Signal] category on the parameter menu screen.
After changing the value, tapping [ ] will write the parameter to the controller.
Tapping [ ] will show an explanation of the parameter.



Machine lock (each robot)

Tap [Machine Lock (Each Robot)] in the [Signal] category on the parameter menu screen.
After changing the value, tapping [ ] will write the parameter to the controller.
Tapping [ ] will show an explanation of the parameter.



12.6 Network parameters

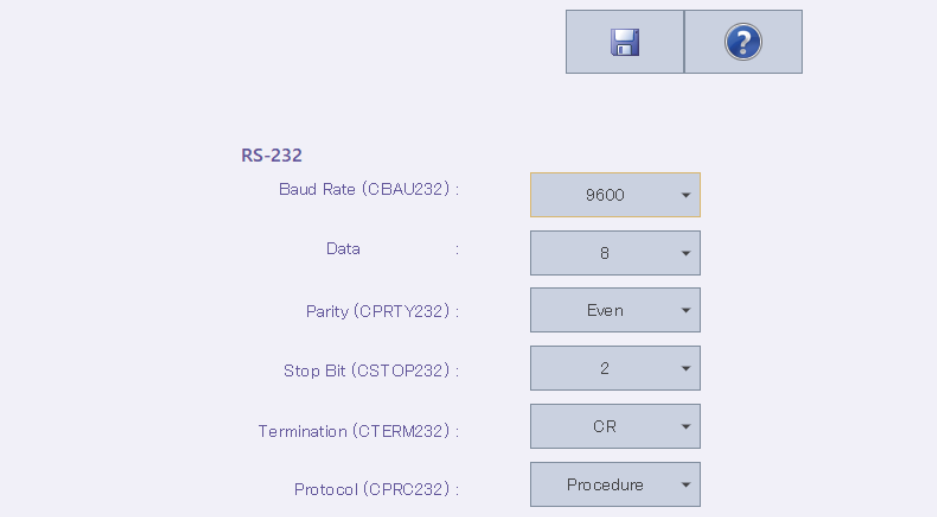
RS-232

RS-232 information of the controller can be set.

Tap [RS-232] in the [Network] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



Ethernet

Ethernet information of the controller can be set.

Tap [Ethernet] in the [Network] category on the parameter menu screen.

Tapping a tab will display the screen according to the tab.

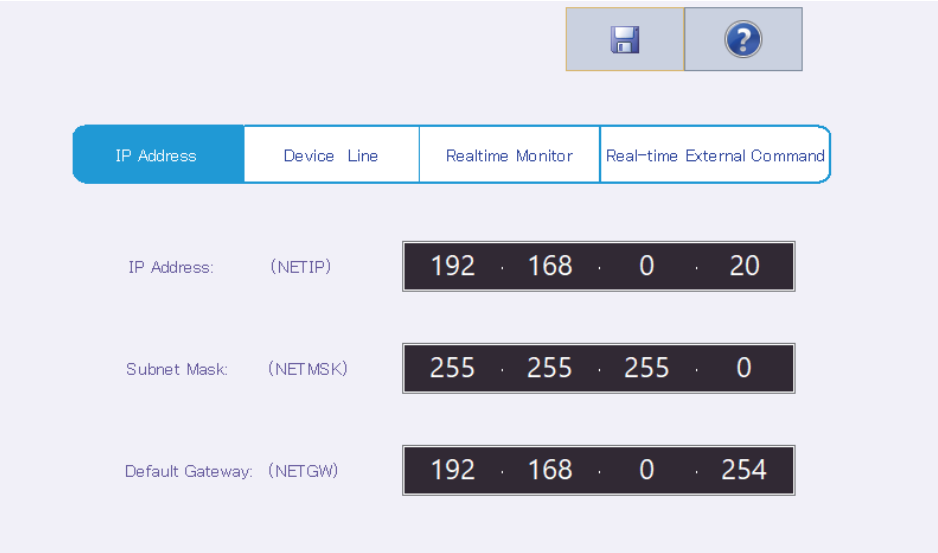
☞ Page 154 IP address
☞ Page 155 Devices and lines
☞ Page 157 Real time monitor
☞ Page 158 Real-time external control command

IP address

Parameters related to the IP address of the controller can be set.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.

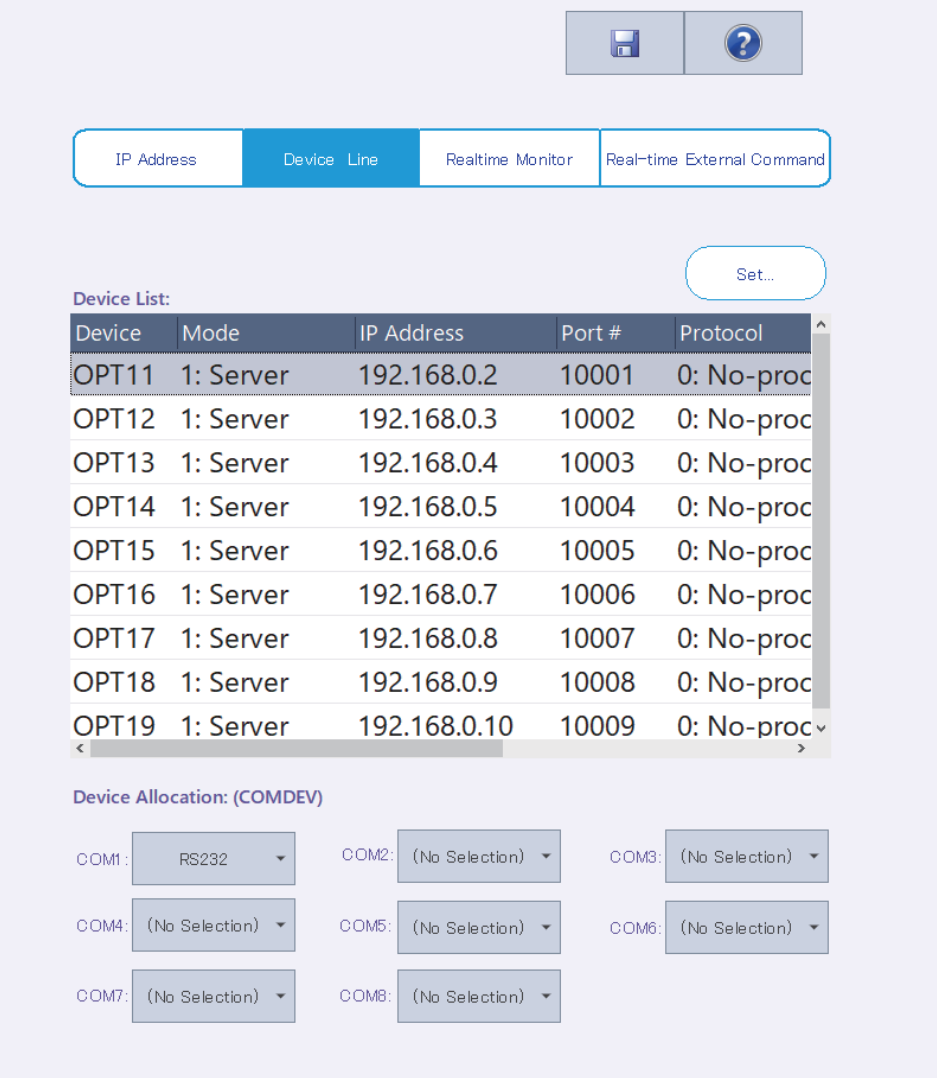


Devices and lines

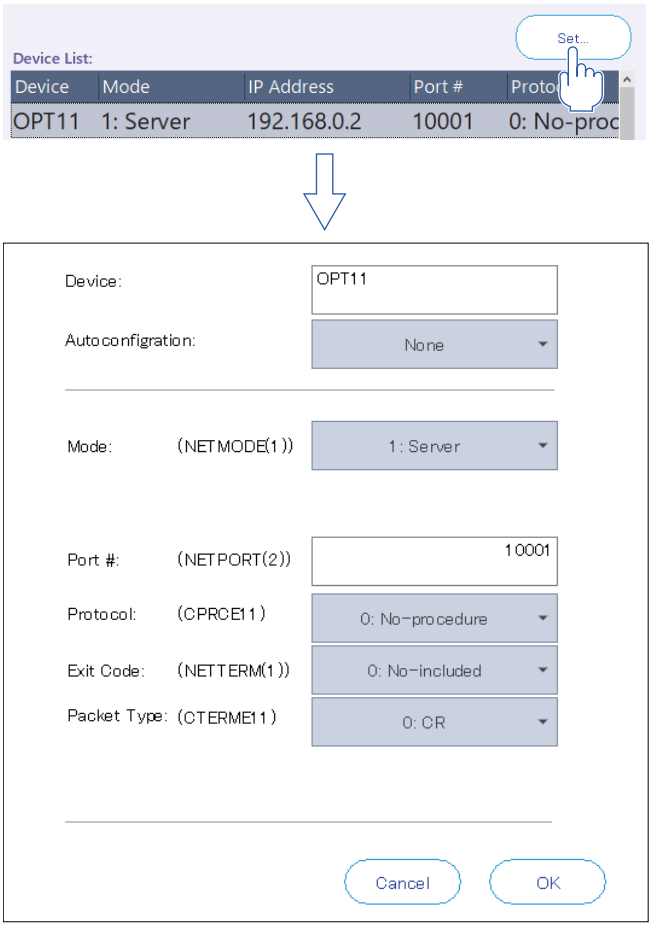
Parameters related to controller devices and lines can be set.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



Select the device to be edited, then tap [Set...]. The device parameter setting screen will appear.
Selecting [MELFA-3D Vision] or [Network Vision Sensor (2D)] from the [Autoconfiguration] combo box will display setting values in the Mode and subsequent settings according to the selection.



Real time monitor

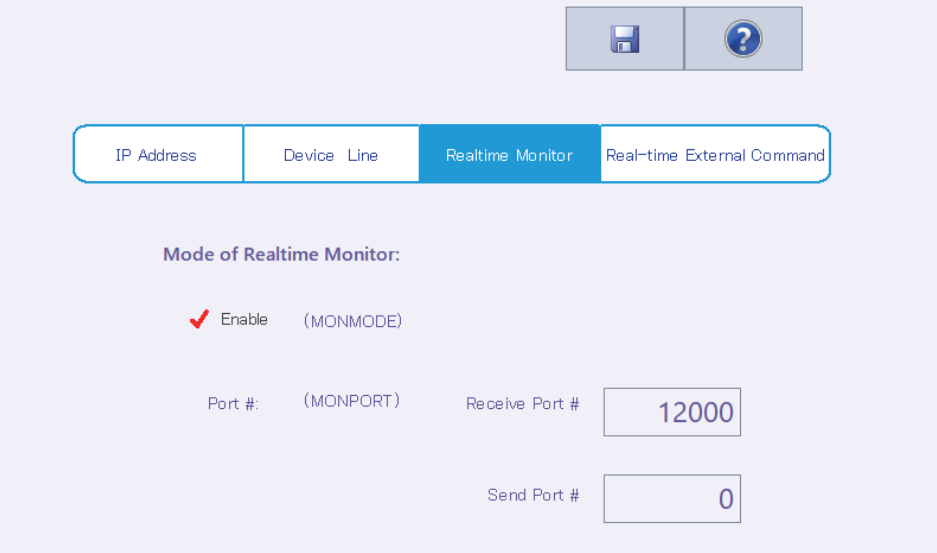
Parameters related to the real time monitor function of the controller can be set.

The real time monitor function is supported with the following controller software versions.

Controller name	Controller software version
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.S3q or later
CR750-Q/CRnQ-700	Ver.R3q or later

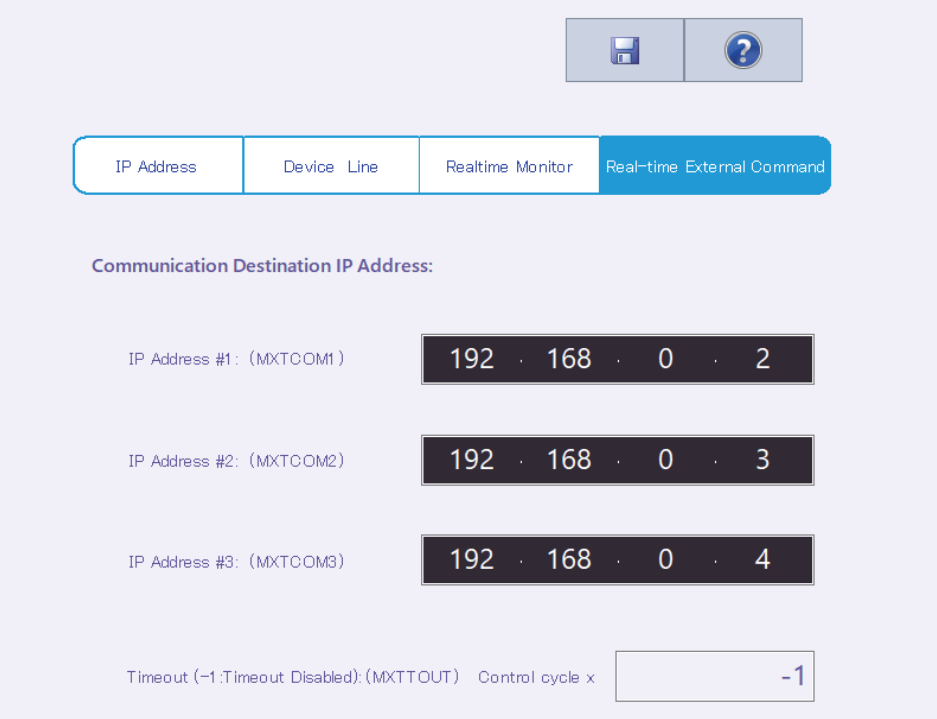
After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



Real-time external control command

Parameters related to the communication settings of the real time external control command of the controller can be set.
After changing the value, tapping [ ] will write the parameter to the controller.
Tapping [ ] will show an explanation of the parameter.



CC-Link

CC-Link information of the controller can be set.

This function is supported with the following controller software versions.

Controller name	Controller software version
CR800-D/CR750-D/CRnD-700	All versions

Tap [CC-Link] in the [Network] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.

Tapping [Err.Cancel] will reset CC-Link interface card errors, and prevent the same error from occurring. This function is enabled while the controller is powered on. When the power is turned off, the error may occur again.

CC-Link IE Field

CC-Link IE Field information of the controller can be set.

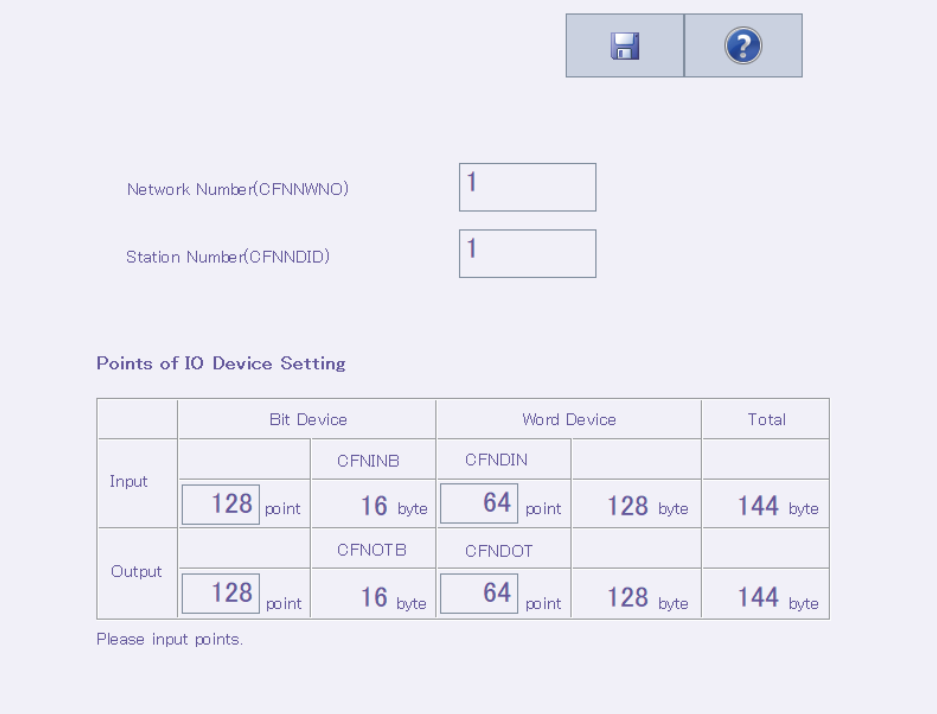
This function is supported with the following controller software versions.

Controller name	Controller software version
CR800-D	All versions

Tap [CC-Link IE Field] in the [Network] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



CC-Link IE Field Basic

CC-Link IE Field Basic information of the controller can be set.

This function is supported with the following controller software versions.

Controller name	Controller software version
CR800-D/CR800-R/CR800-Q	All versions

Tap [CC-Link IE Field Basic] in the [Network] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.

PROFIBUS

PROFIBUS information of the controller can be set.

This function is supported with the following controller software versions.

Controller name	Controller software version
CR800-D/CR750-D/CRnD-700	All versions

Tap [PROFIBUS] in the [Network] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.

Tapping [Err. Cancel] will reset PROFIBUS interface card errors, and prevent the same error from occurring. This function is enabled while the controller is powered on. When the power is turned off, the error may occur again.

PROFINET

PROFINET information of the controller can be set.

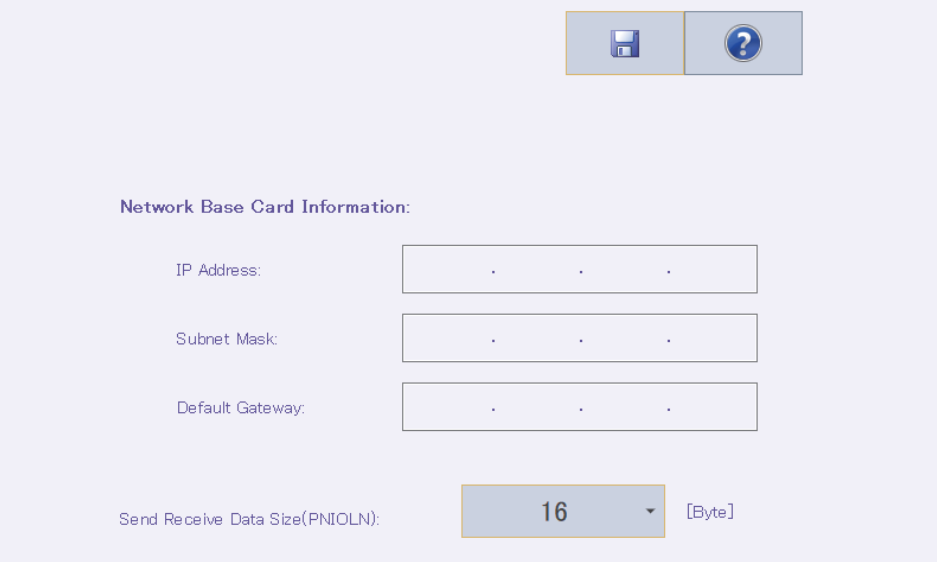
This function is supported with the following controller software versions.

Controller name	Controller software version
CR800-D/CR750-D/CRnD-700	All versions

Tap [PROFINET] in the [Network] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



When the PROFINET IO 2-Port module is mounted, the contents of the option card information are displayed in "Network Base Card Information". When the module is not mounted, no information is displayed.

DeviceNet

DeviceNet information of the controller can be set.

This function is supported with the following controller software versions.

Controller name	Controller software version
CR800-D/CR750-D/CRnD-700	All versions

Tap [DeviceNet] in the [Network] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.

Tapping [Err. Cancel] will reset DeviceNet interface card errors, and prevent the same error from occurring. This function is enabled while the controller is powered on. When the power is turned off, the error may occur again.

EtherNet/IP

EtherNet/IP information of the controller can be set.

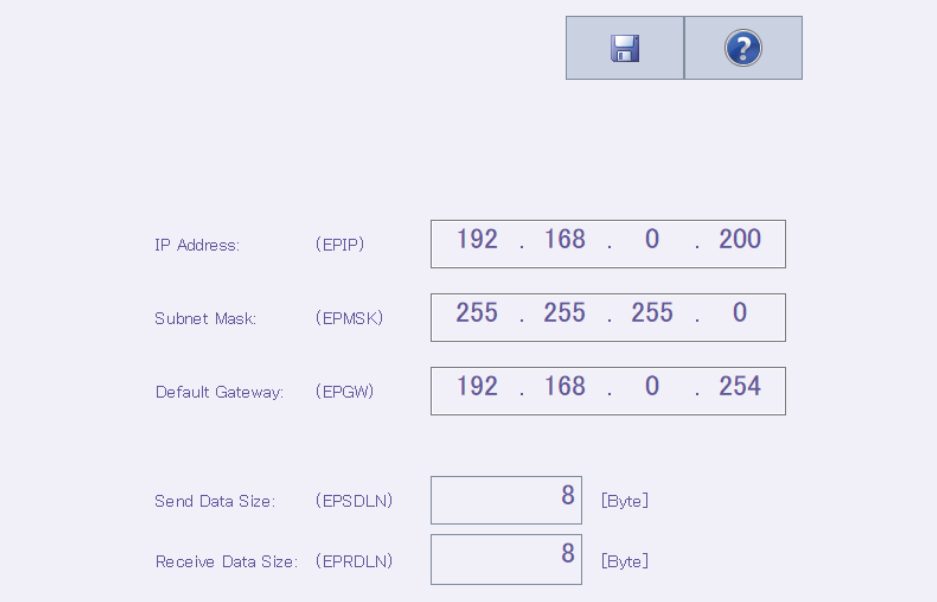
This function is supported with the following controller software versions.

Controller name	Controller software version
CR800-D/CR750-D/CRnD-700	All versions

Tap [EtherNet/IP] in the [Network] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.



EtherCAT

EtherCAT information of the controller can be set.

This function is supported with the following controller software versions.

Controller name	Controller software version
CR800-D	All versions

Tap [EtherCAT] in the [Network] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Tapping [ ] will show an explanation of the parameter.

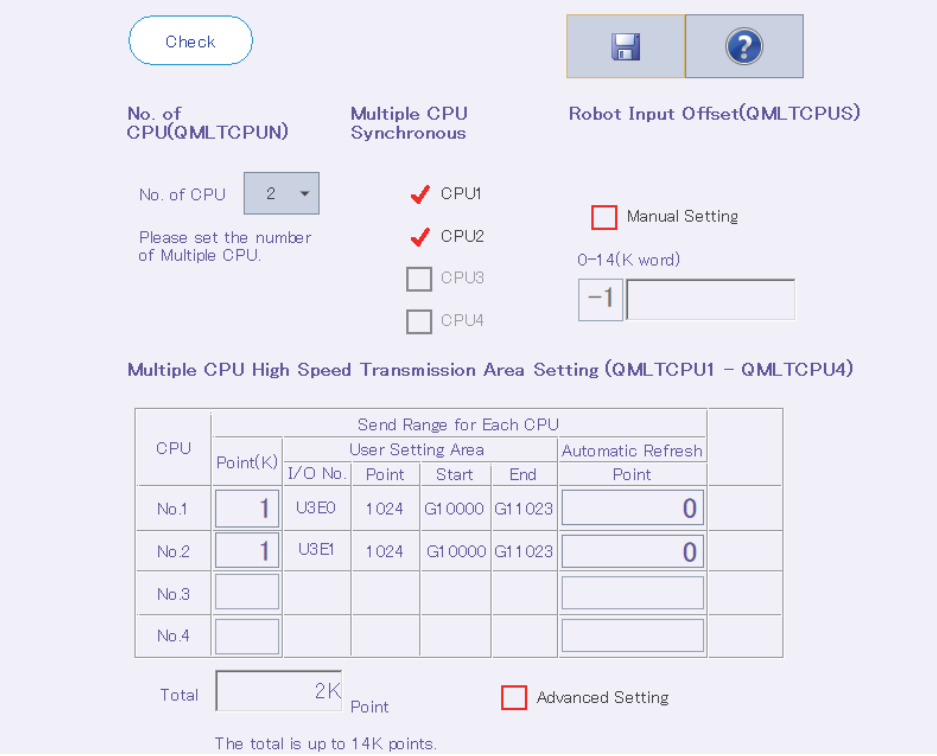
12.7 Programmable controller cooperation parameters

Multiple CPU

This function is supported with the following controller software versions.

Controller name	Controller software version
CR800-R/CR800-Q/CR750-Q/CRnQ-700	All versions

Tap [Multiple CPU] in the [PLC] category on the parameter menu screen.
After changing the value, tapping [ ] will write the parameter to the controller.
Tapping [ ] will show an explanation of the parameter.



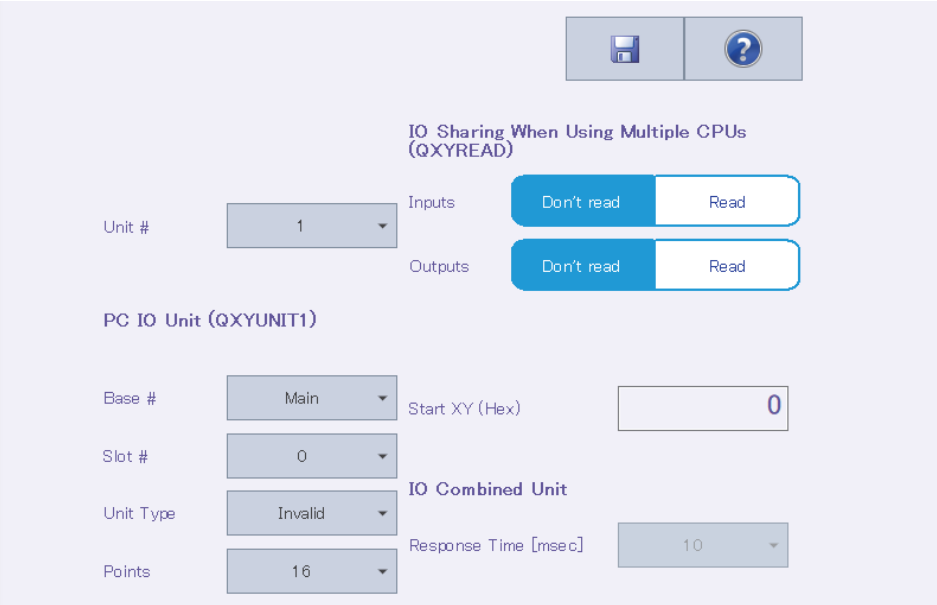
For the CR800-R series controller, set the number of CPU modules only.
If the CR800-Q/CR750-Q/CRnQ-700 series controller is connected, the [Check] button allows you to check the number of points entered and the total range.
For details on the multiple CPU settings, refer to the following manual:
📖QCPU User's Manual (Multiple CPU System) (SH-080485ENG)

IO unit

This function is supported with the following controller software versions.

Controller name	Controller software version
CR800-Q/CR750-Q/CRnQ-700	All versions

Tap [IO Unit] in the [PLC] category on the parameter menu screen.
After changing the value, tapping [ ] will write the parameter to the controller.
Tapping [ ] will show an explanation of the parameter.



Specifying a unit number will display the parameters of the unit number in the PC IO Unit fields.
Set whether to read XY signals in [IO Sharing When Using Multiple CPUs].

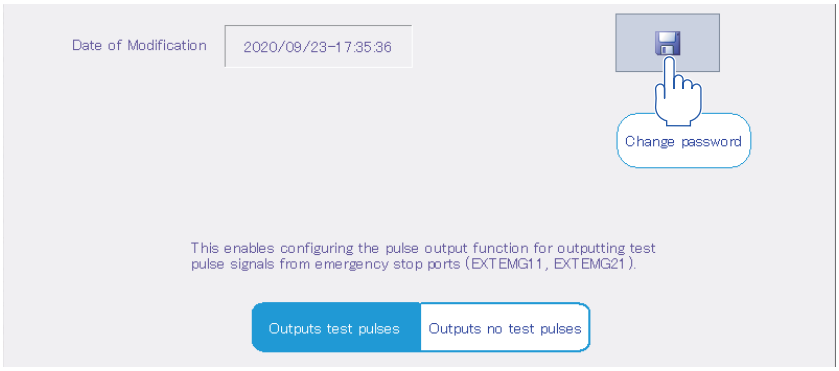
12.8 Safety parameters

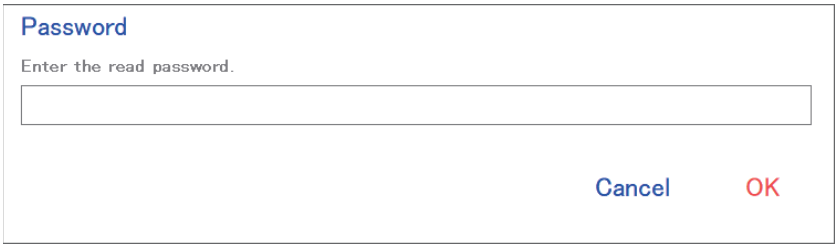
Safety diagnosis function

⚠CAUTION

• Pay sufficient attention to password management.
The settings of the safety diagnosis function cannot be changed without entering the correct password. Pay sufficient attention to password management. To reset the password, it is required to restore the factory settings. Resetting the robot type will restore the factory settings. For further information on resetting the robot type, refer to the "Detailed explanations of functions and operations".

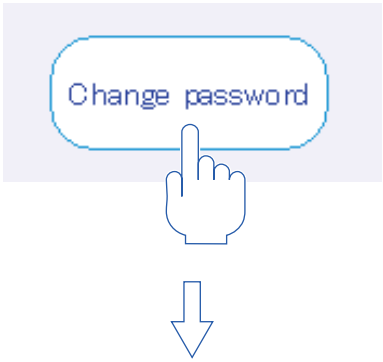
Whether to output test pulses or not from the emergency stop ports (EXTEMG11, EXTEMG21) can be specified.
This function can be used with the CR800 series controller.
Tap [Safety diagnosis function] in the [Safety] category on the parameter menu screen.
The password is required to write this parameter.
After changing the value, tapping [ ] will display the password input screen. Enter the password correctly, then tap [OK]. The parameter will be written to the controller.
If an incorrect password is entered, the parameter cannot be written. The password is required only when writing the first parameter after displaying the parameter editing screen of the safety diagnosis function.
The default password is "MELFASafetyPSWD".

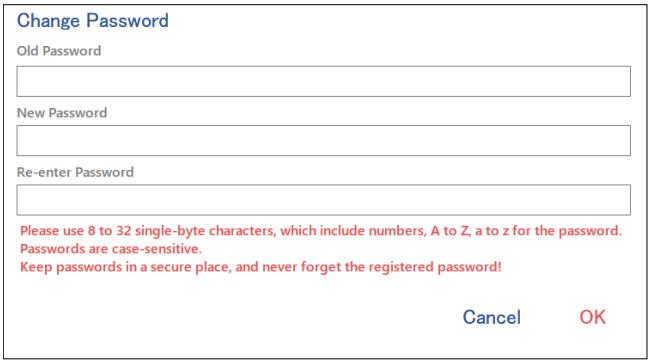




For the safety diagnosis function (test pulse diagnosis), refer to the "Standard Specifications" of the robot being used.

To change the password, tap [Change password]. Enter the current and new passwords, then tap [OK]. The new password will be applied.
The password must be 8 to 32 characters long. Passwords are case-sensitive and only single-byte alphanumeric characters (0 to 9, A to Z, and a to z) can be used.





Safety option

Set parameters related to the robot safety option/safety communication function of the CR800 series controller. For information on the robot safety option/safety communication function, refer to the following manuals:

📖Robot Safety Option Instruction Manual (BFP-A3531)

📖Safety Communication Function Instruction Manual (BFP-A3772)

This function can be used with the CR800 series controller (robot safety option/safety communication function required).

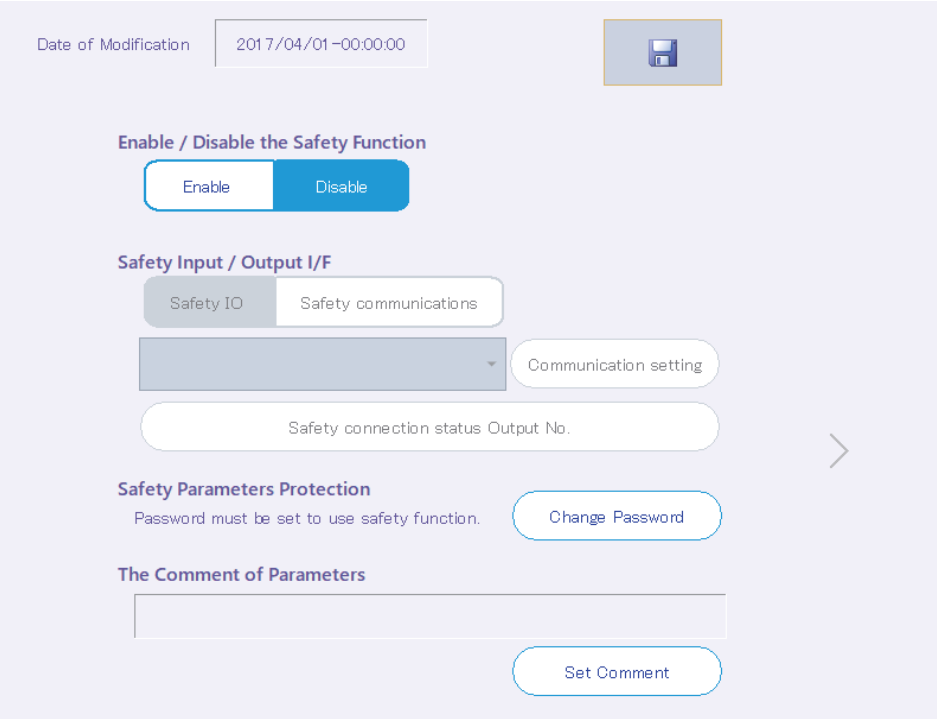
The method for setting safety parameters of the CR750/CR700 series controllers differs. For details, refer to the following page: ☞ Page 132 Safety

Basic settings

Configure the basic settings of the safety function.

Tap [Basic Configuration] in the [Safety] category on the parameter menu screen.

After changing the value, tapping [💾] will write the parameter to the controller.



The CC-Link IE TSN safety communication function is supported with the following controller software versions and dates of manufacture.

Controller name	Controller software version	Date of manufacture*1
CR800-R	Ver.C2 or later	April 2021 or later

*1 The date of manufacture can be found in the DATE column on the rating plate located on the right side of the controller.

Robot model

Set a robot model used for safety function monitoring.

Tap [Robot Model] in the [Safety] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

Safety logic

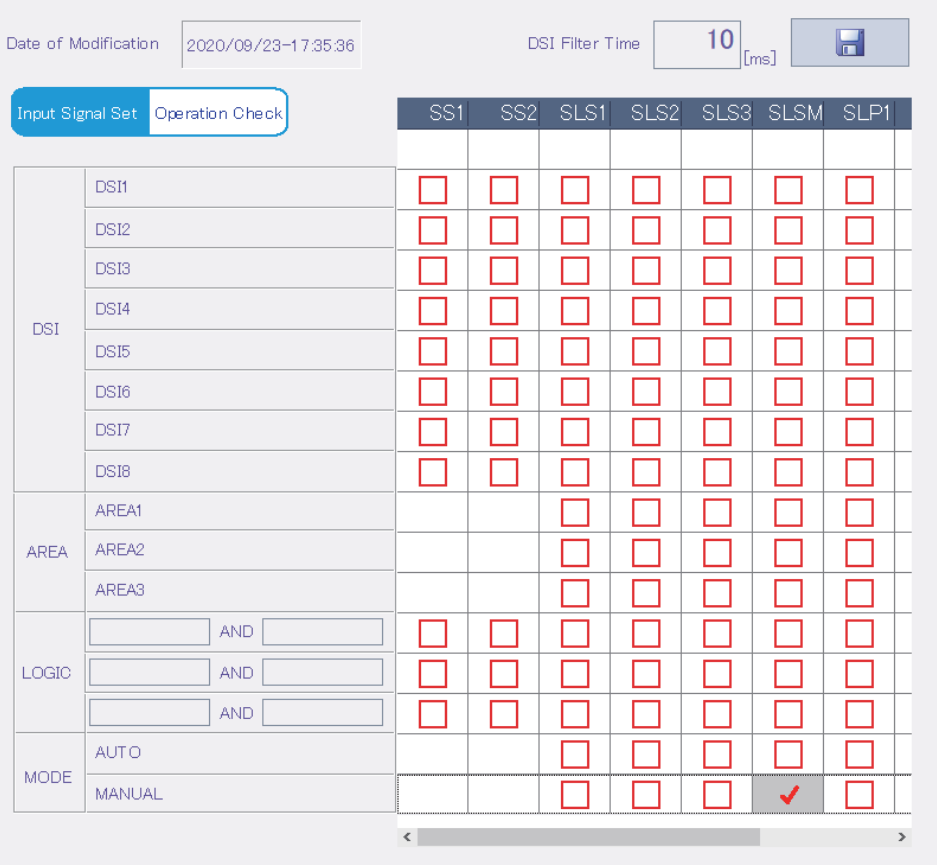
Set safety logic parameters.

Safety input (safety IO) parameters

Set parameters related to the input signals of the safety function.

Tap [Safety Input(Safety IO)] in the [Safety] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

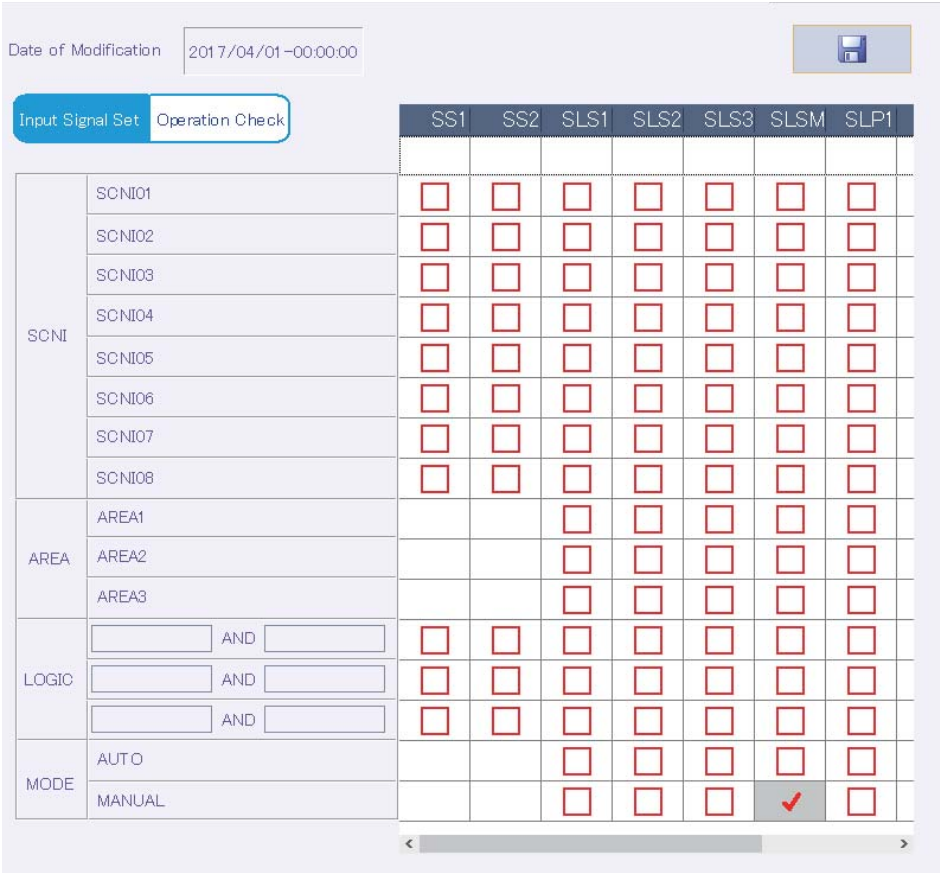


Safety input (safety communication) parameters

Set parameters related to the input signals of the safety communication function.

Tap [Safety Input (Safety Communications)] in the [Safety] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.



This function is supported with the following controller software versions and dates of manufacture.

Controller name	Controller software version	Date of manufacture*1
CR800-R	Ver.C2 or later	April 2021 or later

*1 The date of manufacture can be found in the DATE column on the rating plate located on the right side of the controller.

AREA input parameters

Set parameters related to the areas to be monitored for safety.

Tap [Area Input] in the [Safety] category on the parameter menu screen.

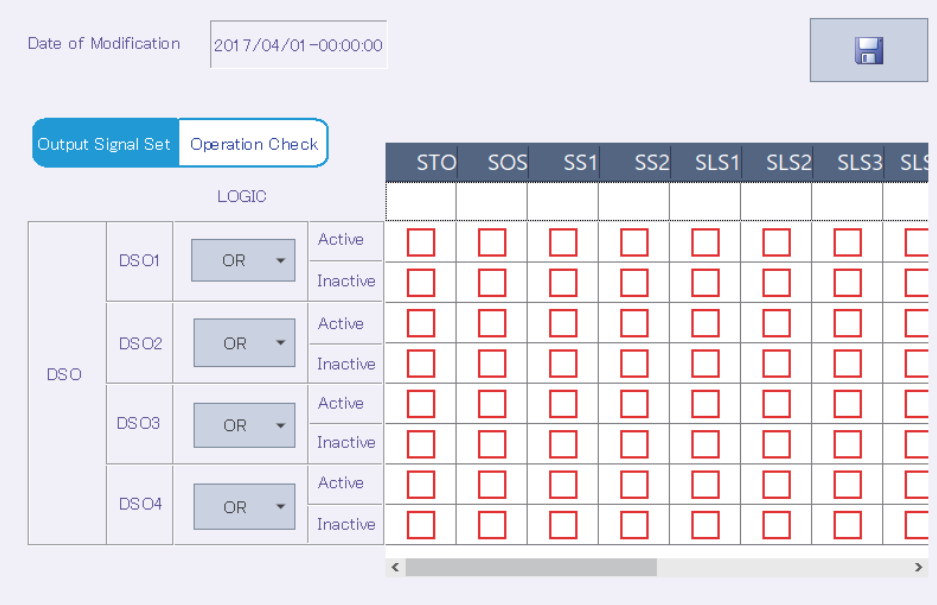
After changing the value, tapping [ ] will write the parameter to the controller.

Safety output (safety IO) parameters

Set parameters related to the output signals of the safety function.

Tap [Safety Output(Safety IO)] in the [Safety] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.



Safety output (safety communication) parameters

Set parameters related to the output signals of the safety communication function.

Tap [Safety Output (Safety Communications)] in the [Safety] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

This function is supported with the following controller software versions and dates of manufacture.

Controller name	Controller software version	Date of manufacture*1
CR800-R	Ver.C2 or later	April 2021 or later

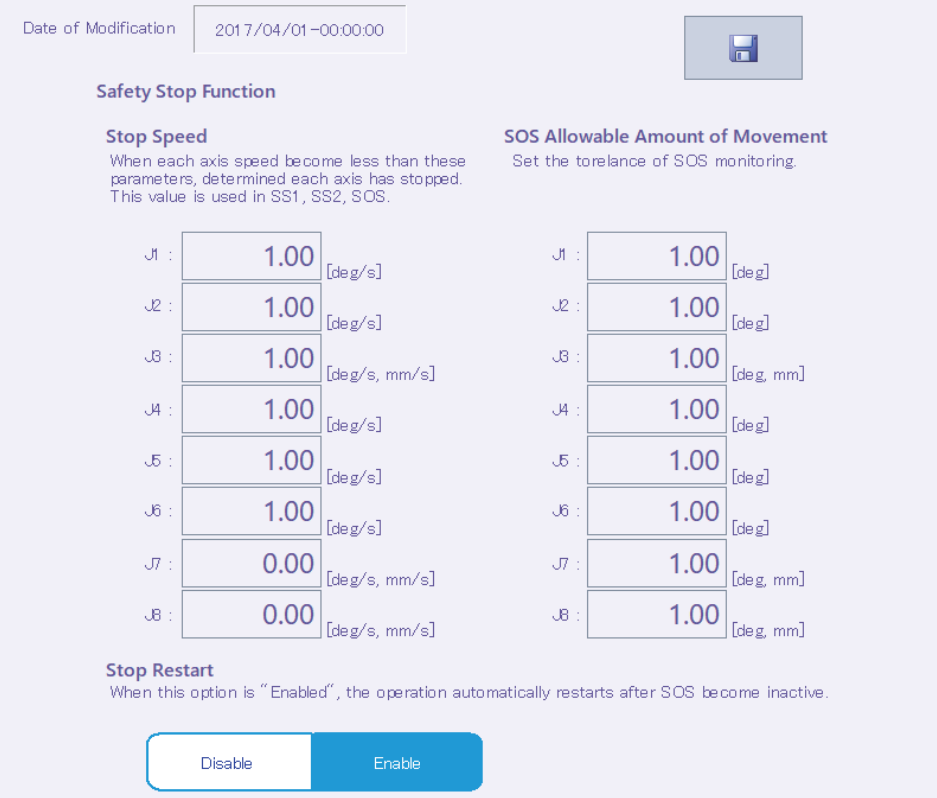
*1 The date of manufacture can be found in the DATE column on the rating plate located on the right side of the controller.

SOS

Set parameters related to stop of the robot when the safety function is activated.

Tap [SOS] in the [Safety] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.



SLS

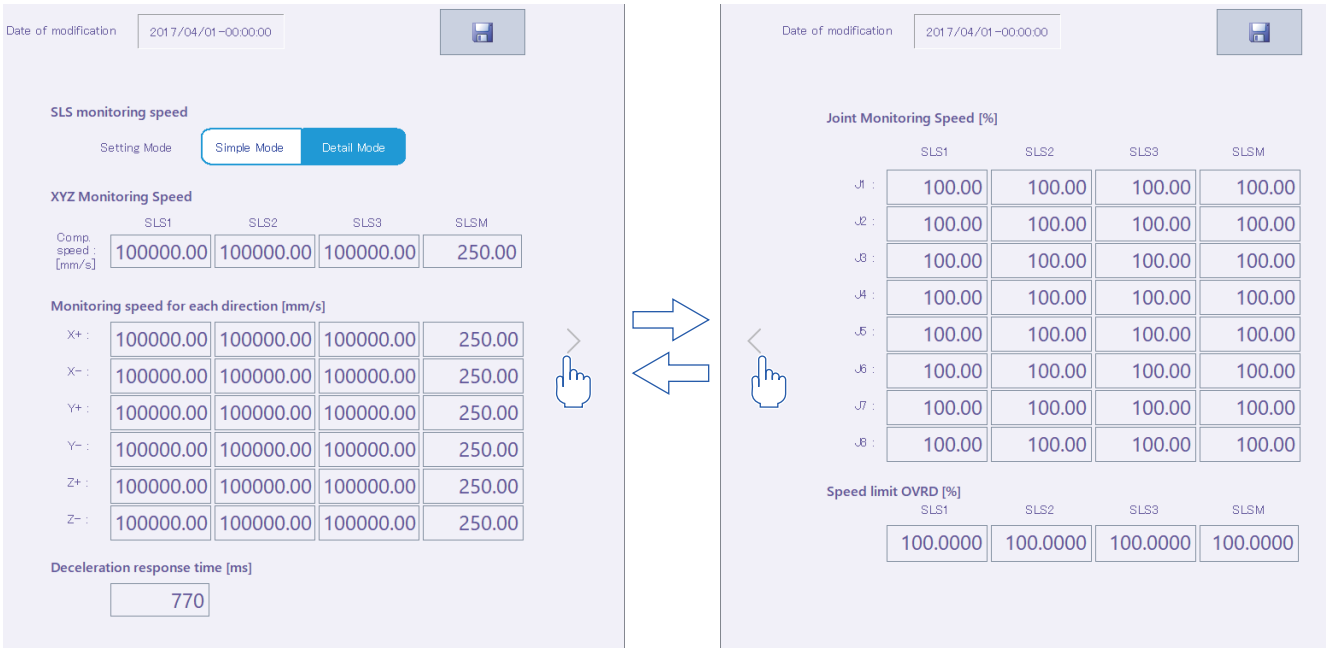
Set parameters related to SLS (Safely-limited speed).

Speed parameters

Set parameters related to speed control.

Tap [Speed] in the [Safety] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.



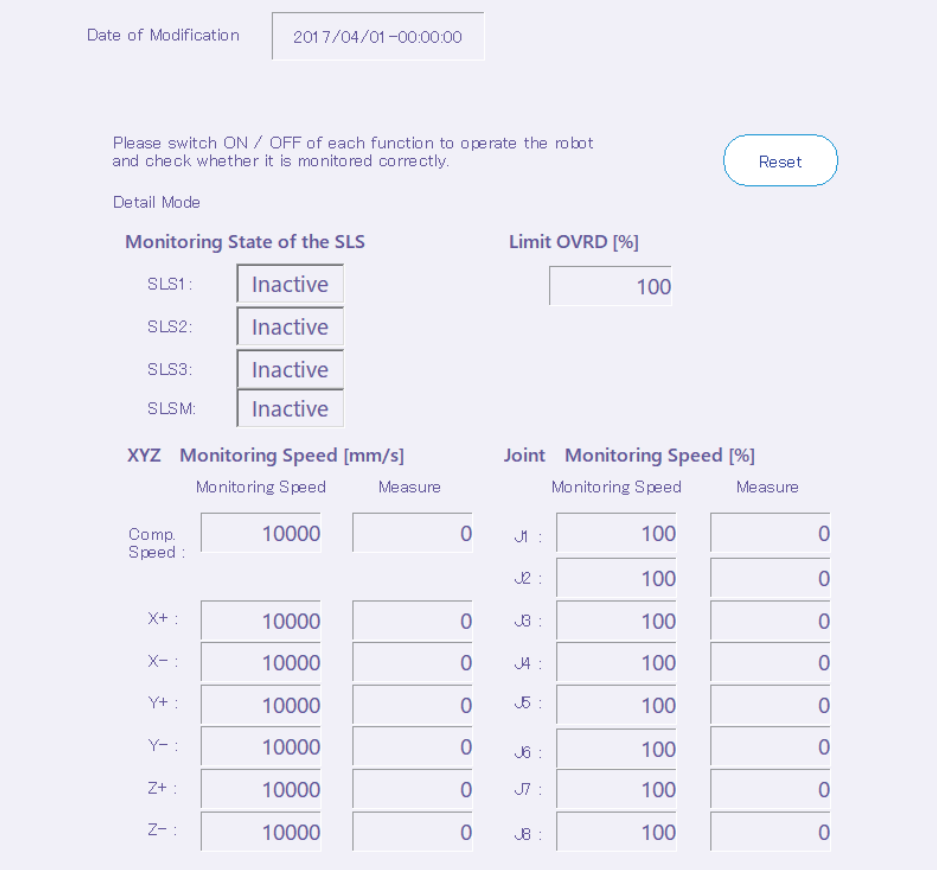
Operation check

Check control operation of SLS.

Tap [Operation Check(SLS)] in the [Safety] category on the parameter menu screen.

The parameter settings are not required on this screen.

Tapping [Reset] will reset the maximum value of the measured value.



SLP

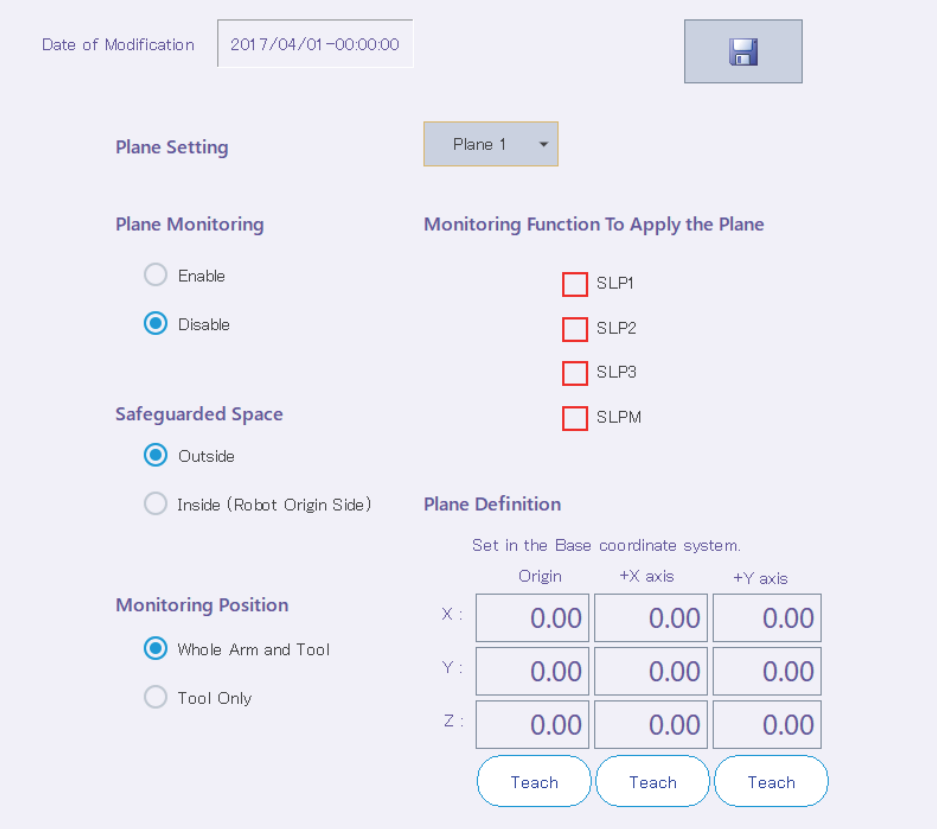
Set parameters related to SLP (Safely-limited position).

Plane parameters

Set parameters related to plane monitoring.

Tap [Plane] in the [Safety] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

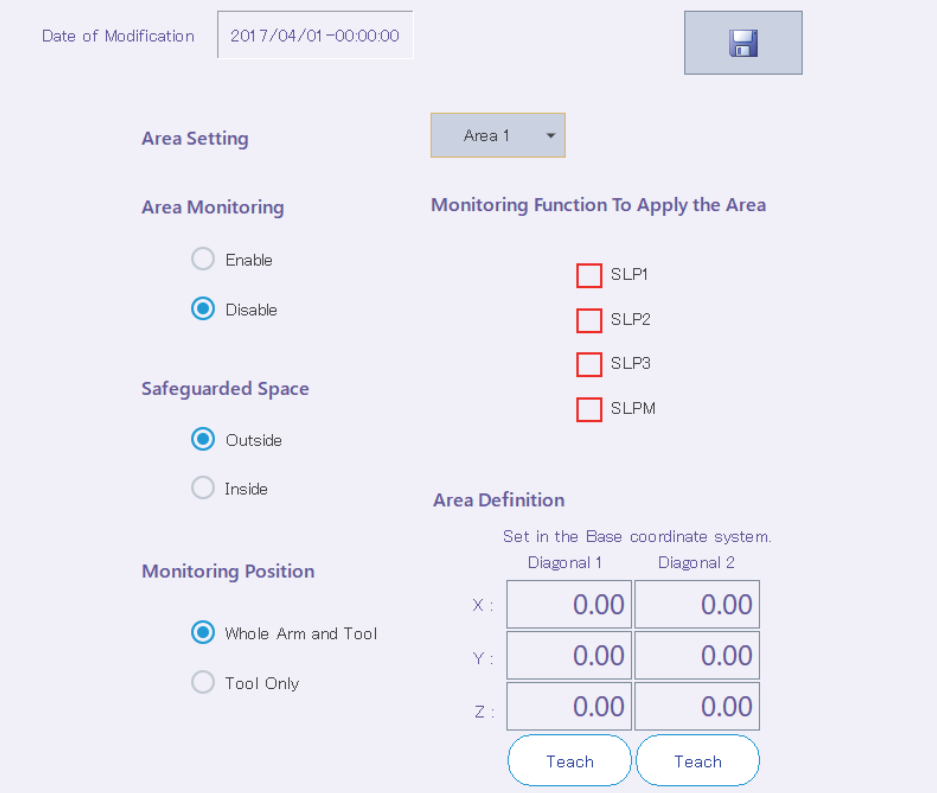


Area parameters

Set parameters related to area monitoring.

Tap [Area] in the [Safety] category on the parameter menu screen.

After changing the value, tapping [ ] will write the parameter to the controller.

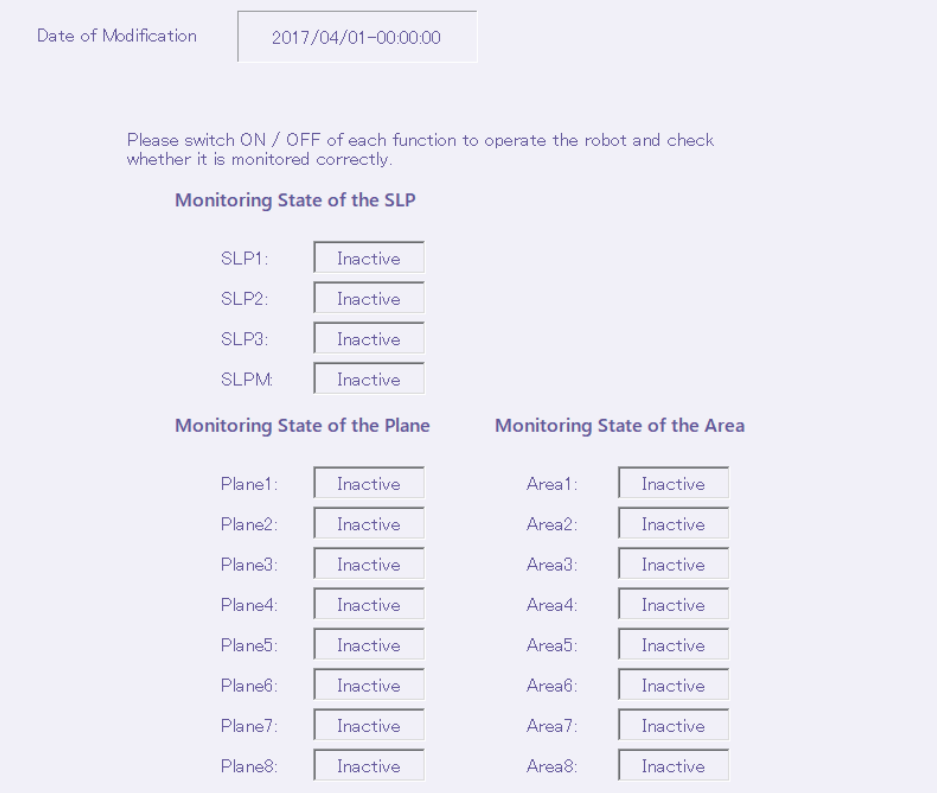


Operation check

Check control operation of SLP.

Tap [Operation Check(SLP)] in the [Safety] category on the parameter menu screen.

The parameter settings are not required on this screen.



13 STATUS MONITORING

Various information in the connected controller can be displayed.
The monitor functions are roughly divided into the following four categories.

- Robot movement monitor: Monitors items related to robot movement.
- Signal monitor: Monitors items related to robot's I/O signals.
- Operation monitor: Monitors items related to what operation the robot performed.
- Servo monitor: Monitors information on the robot's servo system.

☞ Page 185 Movement monitor
☞ Page 199 Signal monitor
☞ Page 211 Operation monitor
☞ Page 213 Servo monitor

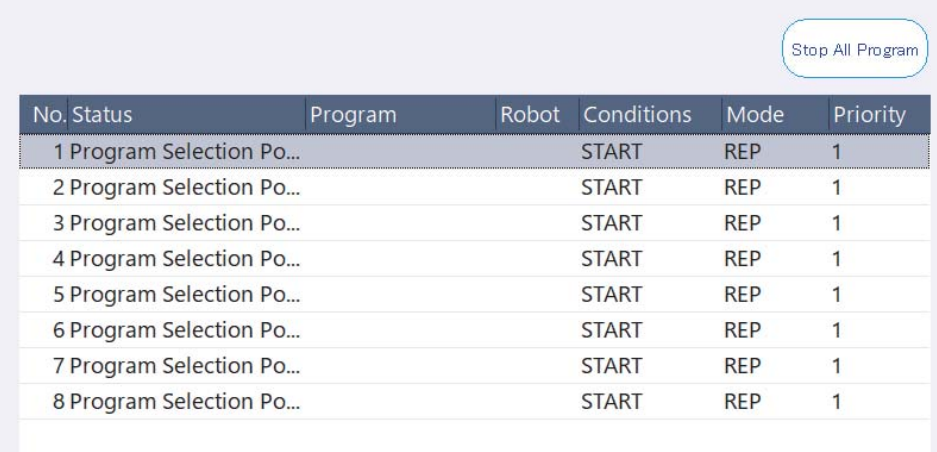
13.1 Monitor menu screen

Tapping [Monitor] in the menu will display the monitor menu screen.
The monitor menu screen displays the names and explanations of monitors by category.
Tapping a monitor name will display the monitor screen.

13.2 Movement monitor

Slot status

The status of task slots in the controller can be monitored.
Tap [Slot Run State] on the monitor menu screen.



Tapping [Stop All Program] will stop the programs executed in all slots (including slots whose startup condition is set to "ALWAYS").
To edit programs whose startup condition is set to "ALWAYS", be sure to use this method to stop the programs executed in all slots beforehand.
The number of task slots displayed is determined by the relevant parameter.

Program monitor

⚠CAUTION

• Pay sufficient attention when changing a variable value.
Changing a value will change the destination point of the robot, causing interference with surrounding objects. A dangerous situation arises especially while the robot is moving. Be sure to carefully check the values you will change.
• The Display format drop-down list may not be displayed depending on the type of the variable.
You can change the display format only when the type of the variable is "integer type" and the value after the decimal point is 0, "real type".
However, "real type" cannot be changed to "unsigned decimal".

The running program, variables, general-purpose signals, and register information can be monitored.

For information on how to monitor program external variables, refer to the following page:

☞ Page 193 Program external variable monitor

Tap [Program] on the monitor menu screen to open a drop-down list, then select an item you want to monitor.

Program monitor setting file

Once the program monitor screen is closed, the items set on the screen will be saved automatically, and the settings will be applied next time the screen is displayed.

The settings are saved for each task slot.

The display settings of the program monitor can be saved to a file.

The saved file can be read or deleted on this screen.

Display format

The display format for the values displayed on the variable monitor, general-purpose signal monitor, and register monitor can be switched.

The display may not switch depending on the type of the variable. For details, refer to the following table:

Variable monitor	Integer type	The displayed value can be switched between hexadecimal, unsigned decimal, and signed decimal.
	Real type	If the value after the decimal point is 0, it is possible to switch between hexadecimal and signed decimal. However, if the single-precision real number type is selected and the value exceeds the range of -999,999 to 999,999, an index will be displayed. If the value after the decimal point is not 0, only signed decimal is available.
	Character string type	The display is not switched.
	Position data	The display is not switched in the XYZ, joint, and workpiece coordinate systems.
General-purpose signal monitor		The displayed value can be switched between hexadecimal, hexadecimal (32bit), unsigned decimal, and signed decimal.
Register monitor		The displayed value can be switched between hexadecimal, unsigned decimal, and signed decimal.

*1 As for the hexadecimal value displayed on the variable monitor, "&H" is prepended to the value.

Debugging

Tapping [Debug] will display the debug operation guide.

On the program monitor screen, the debugging function that is available is program execution only.

To modify the program during debugging, perform debugging on the program editing screen.

For the debug method, refer to the following page:

☞ Page 74 Program debugging

To finish debugging, tap [Debug] again or tap the close button at the top right of the debug operation guide.

Program information

The program being selected, and the operation status and name of the program can be checked.

The line being executed in the program is highlighted.

General-purpose signal monitor

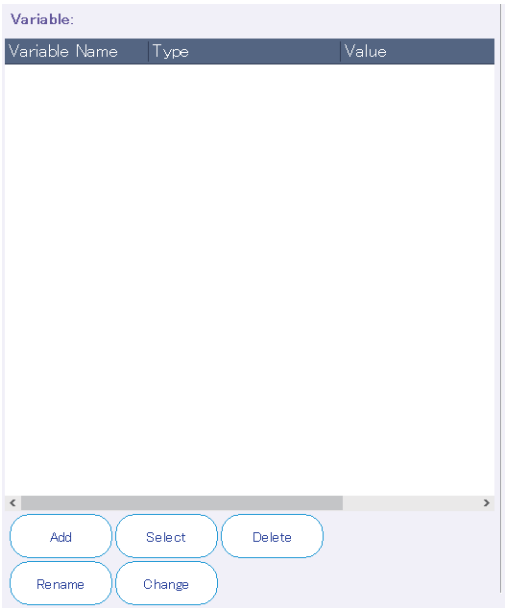
The status of signals input to the controller from external devices and that of signals output to the external devices from the controller can be checked.

No.	Name	Description
1)	Signal number settings	The start numbers of input and output signals can be set within the range of 0 to 32704.
2)	Show/hide general-purpose signal monitor	Tapping this area will show or hide the general-purpose signal monitor.
3)	Pseudo input	Displays the pseudo input screen. ☞ Page 201 Pseudo input
4)	Forced output	Displays the forced output screen. ☞ Page 202 Forced output

Variable monitor

The values of the variables used in the selected program can be checked.

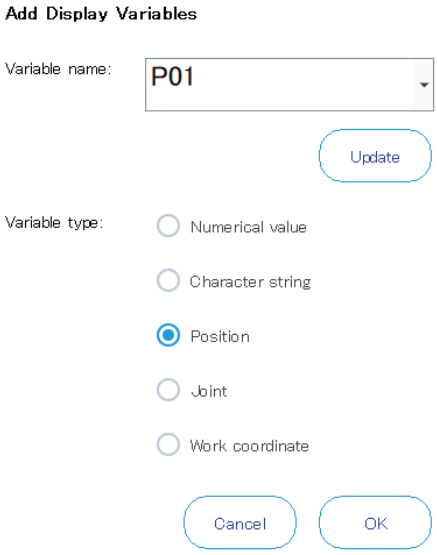
Workpiece coordinate variables can be monitored only when the robot program language is set to "MELFA-BASIC VI".



No.	Name	Description
1)	Add	Add variables to monitor. ☞ Page 189 Adding variables
2)	Select	Batch select variables to monitor from the list of variables used in the program. ☞ Page 190 Selecting variables
3)	Delete	Delete variables registered on the variable monitor from the list. ☞ Page 190 Deleting variables
4)	Rename	Change variables to monitor by renaming variables registered on the variable monitor. ☞ Page 190 Rename
5)	Change	Change the values of variables registered on the variable monitor. ☞ Page 191 Changing variables

■Adding variables

Add variables to monitor.



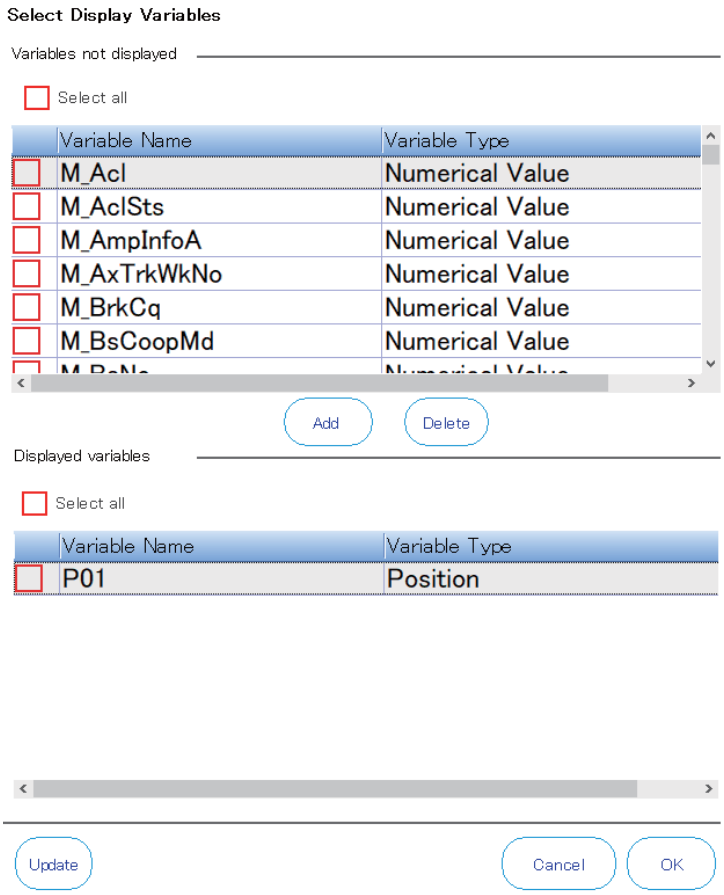
Enter a variable name, or select one from the drop-down list, set the variable type, then tap [OK].

The drop-down list displays the variables used in the program. Enter some part of a variable name from the first letter. A variable name that matches the input characters will be selected automatically.

If a variable is selected from the drop-down list, the variable type will be selected automatically.

■Selecting variables

Batch select variables to monitor from the list of variables used in the program.



The upper list displays "Variables not displayed", and the lower list displays "Displayed variables".

Select a variable from the "Variables not displayed" list, then tap [Add]. The variable will be added to the "Displayed variables" list.

Select a variable from the "Displayed variables" list, then tap [Delete]. The variable will be deleted from the "Displayed variables" list.

Tapping [OK] will display the variables registered in the "Displayed variables" list on the variable monitor.

■Deleting variables

Delete variables registered on the variable monitor from the list. This operation does not delete the variables in the program.

Select a variable you want to delete from the variable monitor, then tap [Delete].

Selecting multiple variables allows you to delete them at a time.

Holding down the variable list for 1+ second will select multiple variables.

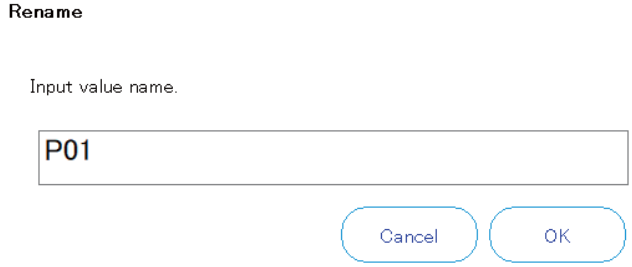
While they are selected, the color of the variable list header is blue.

Holding down the variable list again will deselect the variables.

■Rename

Change variables to monitor by renaming variables registered on the variable monitor.

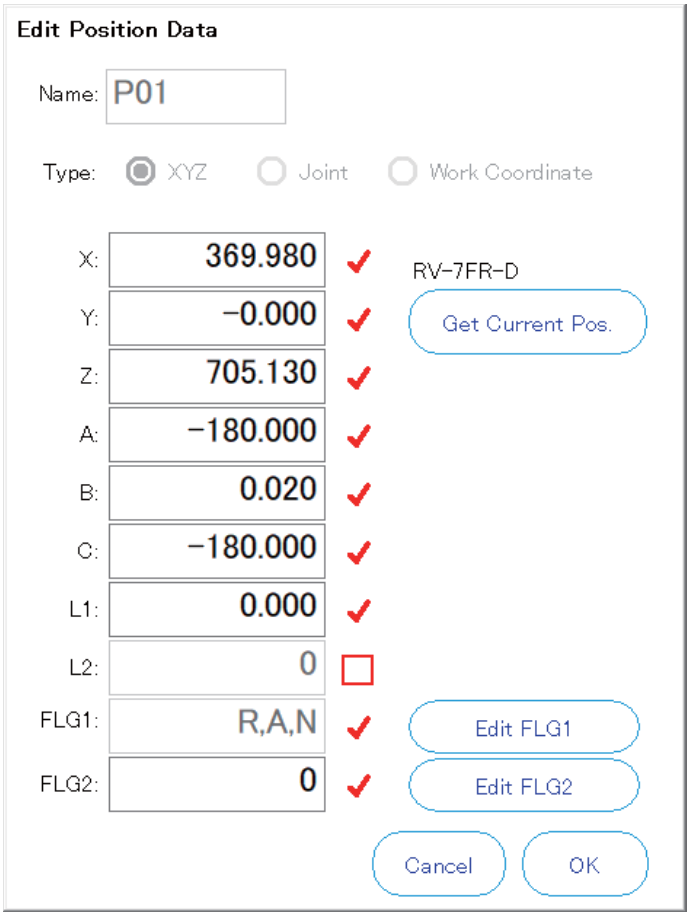
Select a variable you want to rename from the variable monitor, then tap [Rename].



■Changing variables

Change the values of variables registered on the variable monitor.

Select a variable you want to change its value from the variable monitor, then tap [Change]. The position data editing dialog will appear.

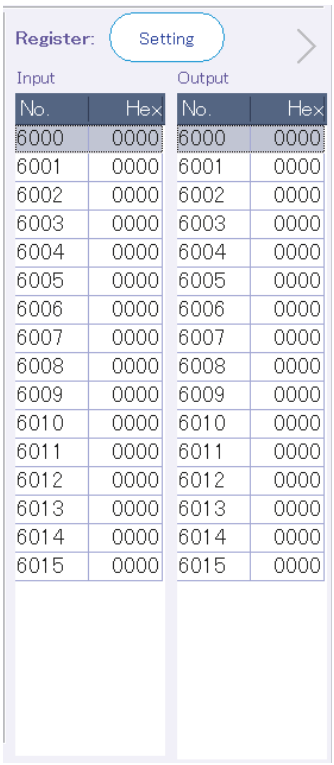


Check the variable name, enter values, then tap [OK].

Register monitor

The status of register values input to the controller from external devices and that of register values output to the external devices from the controller can be checked.

If an option card is not attached, the register monitor will not appear.



No.	Name	Description
1)	Register number settings	The start numbers of input and output registers can be set within the range of 6000 to 6496.
2)	Show/hide register monitor	Tapping this area will show or hide the register monitor.

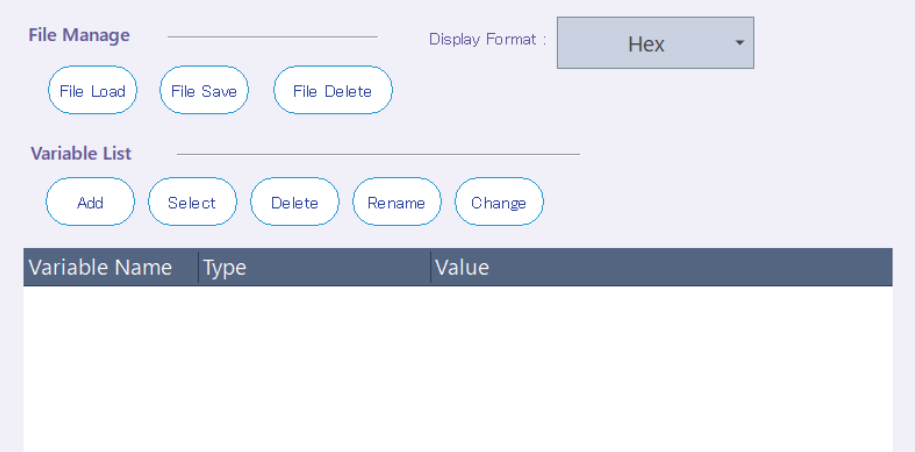
Program external variable monitor

⚠CAUTION

• Pay sufficient attention when changing a variable value.
Changing a value will change the destination point of the robot, causing interference with surrounding objects. A dangerous situation arises especially while the robot is moving. Be sure to carefully check the values you will change.
• The Display Format drop-down list may not be displayed depending on the type of the variable.
You can change the display format only when the type of the variable is "integer type" and the value after the decimal point is 0, "real type".
However, "real type" cannot be changed to "unsigned decimal".

Program external variables can be monitored.

Tap [Program External Variables] on the monitor menu screen.



Program external variable monitor setting file

Once the program external variable monitor screen is closed, the items set on the screen will be saved automatically, and the settings will be applied next time the screen is displayed.

The display settings of the program external variable monitor can be saved to a file.

The saved file can be read or deleted on this screen.

Display format

The display format for the values displayed on the program external variable monitor can be switched.

The display may not switch depending on the type of the variable. For details, refer to the following table:

Variable monitor	Integer type	The displayed value can be switched between hexadecimal, unsigned decimal, and signed decimal.
	Real type	If the value after the decimal point is 0, it is possible to switch between hexadecimal and signed decimal. However, if the single-precision real number type is selected and the value exceeds the range of -999,999 to 999,999, an index will be displayed. If the value after the decimal point is not 0, only signed decimal is available.
	Character string type	The display is not switched.
	Position data	The display is not switched in the XYZ, joint, and workpiece coordinate systems.

*1 As for the hexadecimal value displayed on the variable monitor, "&H" is prepended to the value.

Variable monitor

The values of program external variables can be checked.

For information on how to operate the variable monitor, refer to the following page:

☞ Page 189 Variable monitor

Operation status

The robot's current position, destination point, and whether the hand is opened or closed can be checked.

Tap [Movement State] on the monitor menu screen.

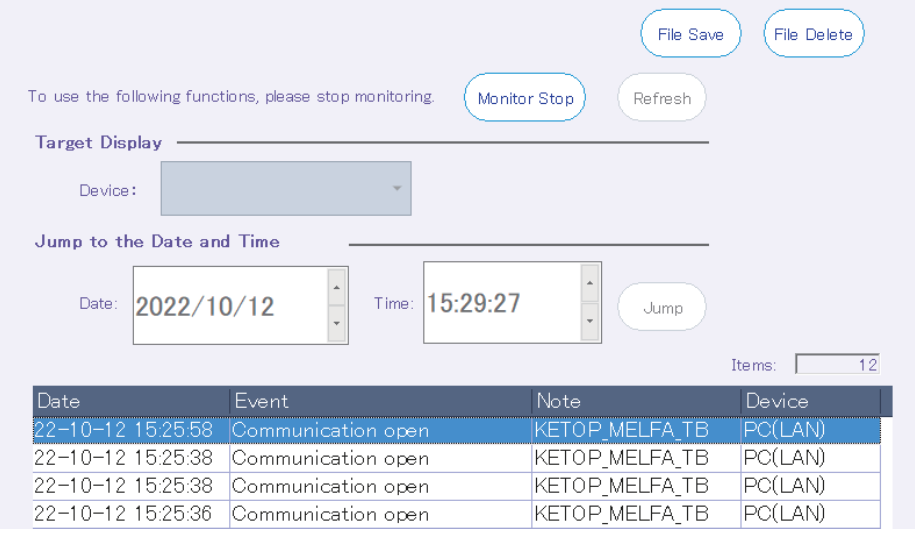
Event history

The operation event history of the controller can be checked.

This function can be used with the CR800 series controller.

Tap [Event History] on the monitor menu screen.

While data is being acquired from the controller, a dialog appears showing that communication is in progress.



No.	Name	Description
1)	File Save File Delete	Tapping [File Save] will save the listed events in the text file format (.txt). Tapping [File Delete] allows you to select and delete saved files.
2)	Monitor Stop Refresh	Tapping [Monitor Stop] will stop monitoring of the event history. To acquire the latest event history while monitoring is stopped, tap [Refresh]. While data is being acquired from the controller, a dialog appears showing that communication is in progress.
3)	Target Display	Selecting a device name from the drop-down list will display only the selected device event in the event history list. To display all events, select the blank at the top of the drop-down list.
4)	Jump to the Date and Time	Searching for events occurred around a specified date and time allows you to jump to the corresponding line in the list. Specify the date and time you want to search for, then tap [Jump].
5)	Event history list	Displays the list of events that occurred in the controller. ☞ Page 195 Event history list

Event history list

The list of events that occurred in the controller is displayed. The event occurred most recently is displayed on the first line.

Up to 10,000 events can be registered. The oldest event will be deleted when the number of events exceeds 10,000.

The following information is displayed for each event.

Item	Description
Date	Displays the date and time of the event.
Event	Displays the details on the event.
Note	For specific events, additional information is displayed (such as the name of the selected program and the name of the software used for line connection).
Device	Displays devices that issued an operation request to the controller.

The following devices are displayed.

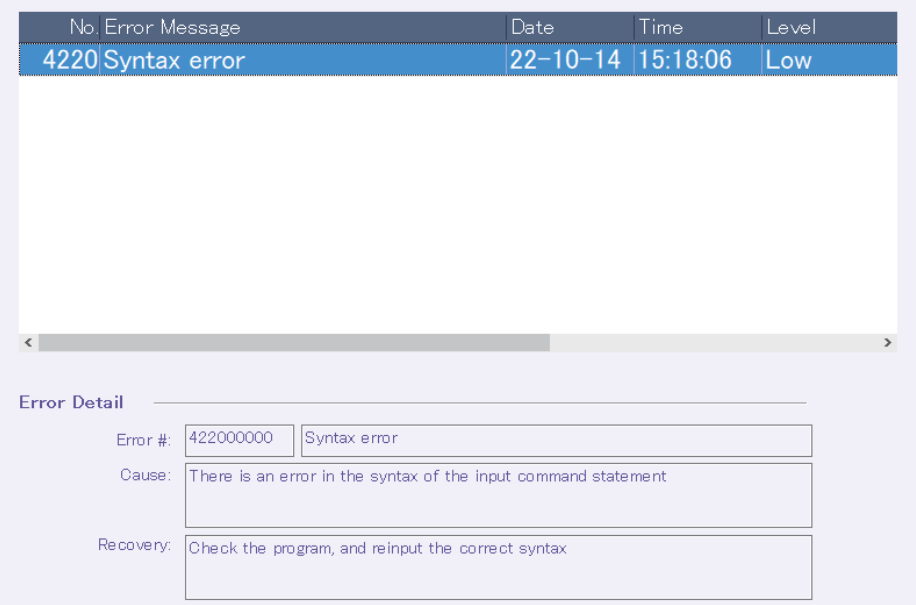
Device	Description
IO()	Indicates events by the signal input of the programmable controller, etc. The input signal number is displayed in the parentheses.
TB(422)	Indicates events by RS-422 communication of the T/B.
PC(LAN) PC(USB)	Indicates events by supported software such as RT ToolBox on the computer. The communication path is displayed in the parentheses.
none	Indicates that the controller was operated directly (power on/off, etc.).

Error

The error that is occurring in the controller can be checked.

Tap [Error] on the monitor menu screen.

Selecting an error from the list will display the cause and solution of the error in the Error Detail section.

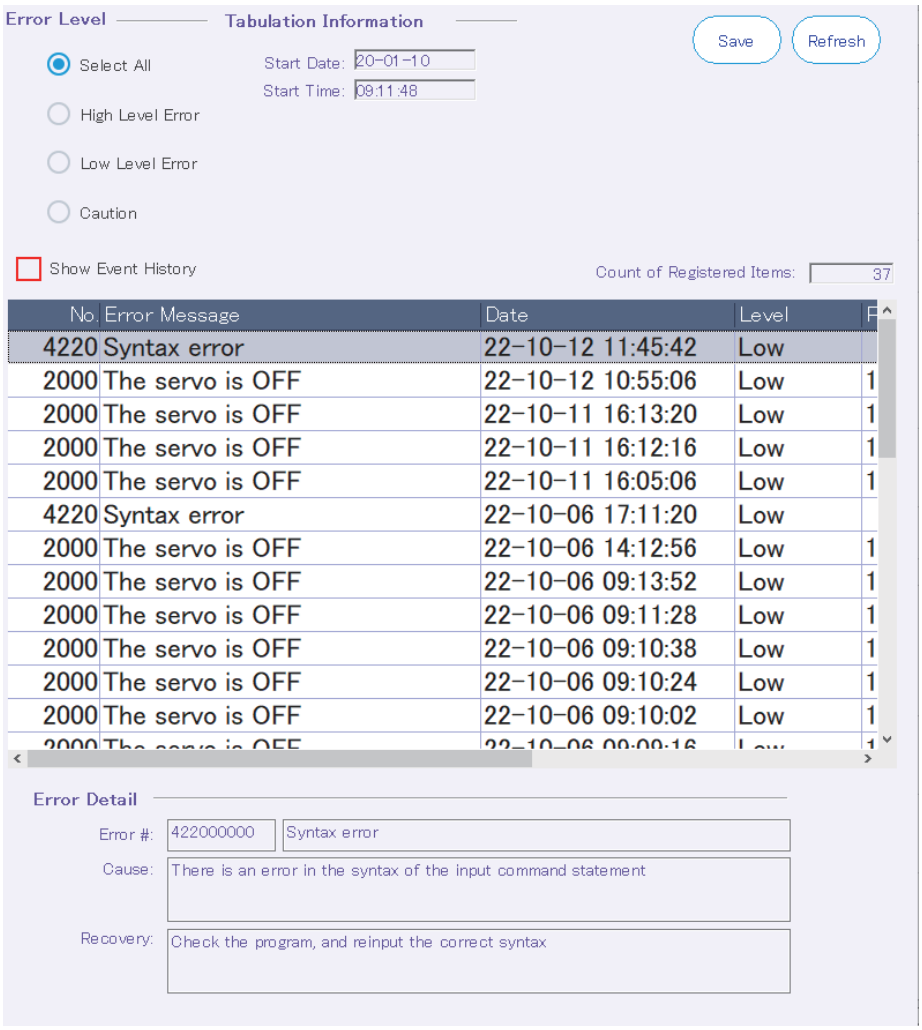


Error history

The error history can be checked.

Tap [Error History] on the monitor menu screen.

While data is being acquired from the controller, a dialog appears showing that communication is in progress.



No.	Name	Description
1)	Error Level	Narrows down and displays the error history list according to the error level.
2)	Tabulation Information	Displays the start date and time of error history collection.
3)	Save	Saves the displayed error history information in the text file format (.txt). The name of the error history file is set as follows: "Controller serial number"_"Current date"_"Current time". File name example: AR0703001_20100924_092623.txt
4)	Refresh	Tapping [Refresh] will update the error history list. While data is being acquired from the controller, a dialog appears showing that communication is in progress.
5)	Show Event History	Enabling it will display the event history in the error history list (displays the event history on and after the date that error recording started). This function can only be used with the CR800 series controller.
6)	Error history list	Displays the list of errors that occurred in the controller.

Error record

⚠CAUTION

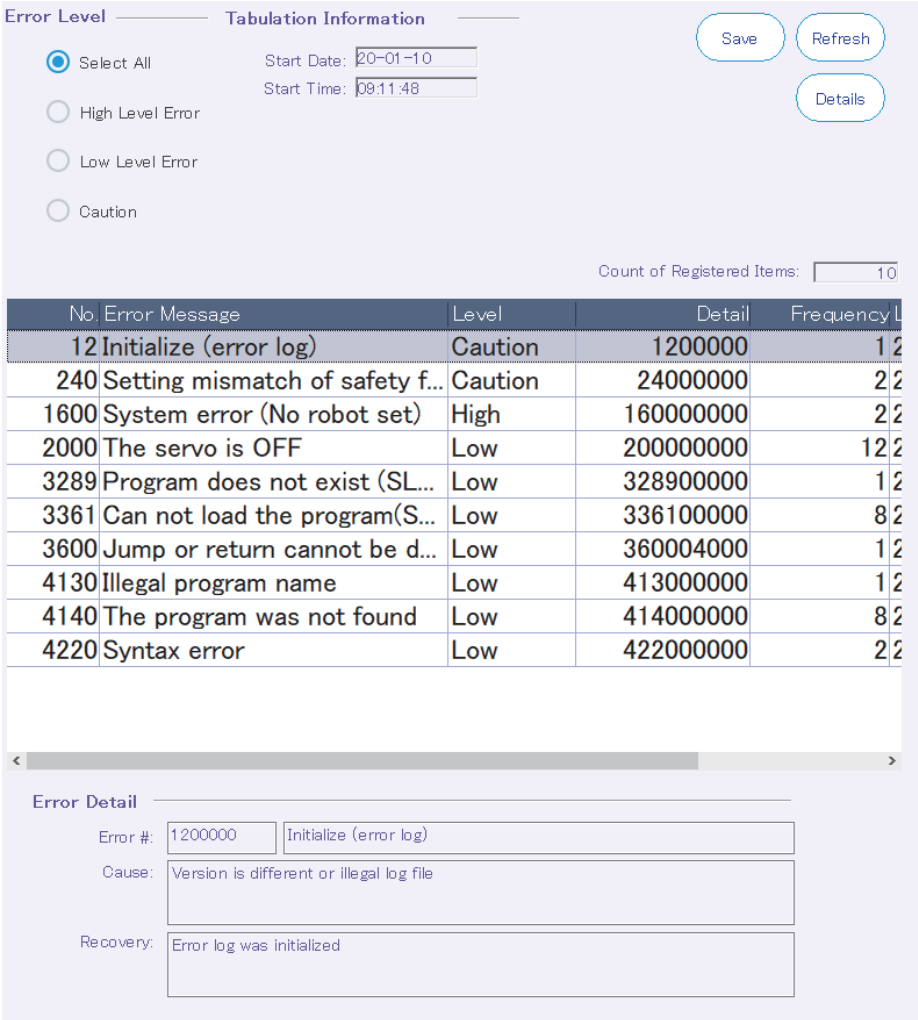
• Timing at which error information is registered in the error record.
The registration is performed upon error reset.
Note that turning off the power without resetting the error will cause the generated error not to be registered in the error record.

The number of times that each error occurred can be checked.

The error record function is supported with the following controller software versions.

Controller name	Supported controller software versions
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.S1j or later
CR750-Q/CRnQ-700	Ver.R1j or later

Tap [Error Record] on the monitor menu screen.



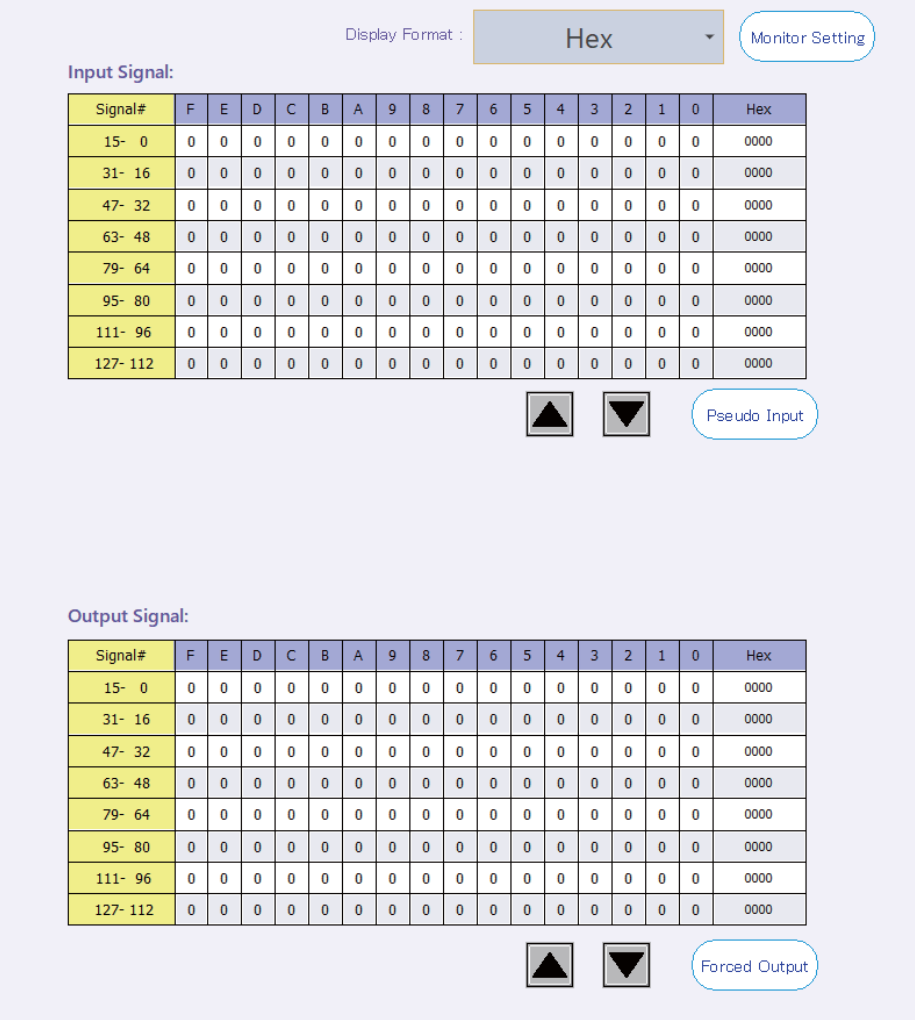
No.	Name	Description
1)	Error Level	Narrows down and displays the error record list according to the error level.
2)	Tabulation Information	Displays the start date and time of error record collection.
3)	Save	Saves the displayed error record information in the text file format (.txt). The name of the error record file is set as follows: "Controller serial number"_"Current date"_"Current time" "REC (character string representing error recording)". File name example: AR0703001_20100924_092623REC.txt
4)	Refresh	Tapping [Refresh] will update the error record list.
5)	Details	Tapping [Details] allows you to check the details of the error history.
6)	Error record list	Displays the list of errors occurred in the controller and the number of times that the errors occurred.

13.3 Signal monitor

General-purpose signals

The status of signals input to the controller from external devices and that of signals output to the external devices from the controller can be checked.

Tap [General Purpose Signal] on the monitor menu screen.



No.	Name	Description
1)	Display Format	Switch the display format for signal values. The display format can be selected from among hexadecimal, unsigned decimal, and signed decimal.
2)	Monitor Setting	Set the range of signals to be displayed on the screen. ☞ Page 200 Monitor settings
3)	Input Signal list	Displays the input signal bit information and signal values. Signal numbers to be displayed in the list can be switched with [▲] and [▼] under the list.
4)	Pseudo Input	Pseudo input of signals is possible. ☞ Page 201 Pseudo input
5)	Output Signal list	Displays the output signal bit information and signal values. Signal numbers to be displayed in the list can be switched with [▲] and [▼] under the list.
6)	Forced Output	Forced output of signals is possible. ☞ Page 202 Forced output

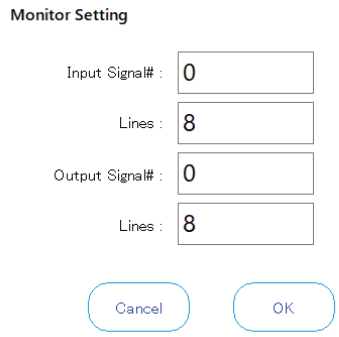
Monitor settings

Signals to be displayed can freely be set in a continuous range.

Tapping [Monitor Setting] will display the setting dialog.

Set the start numbers of signals in Input Signal# and Output Signal#, set each display range in Lines, then tap [OK].

Once the screen is closed, the set input and output signal numbers, and lines will be saved automatically. The settings will be applied next time the screen is displayed.

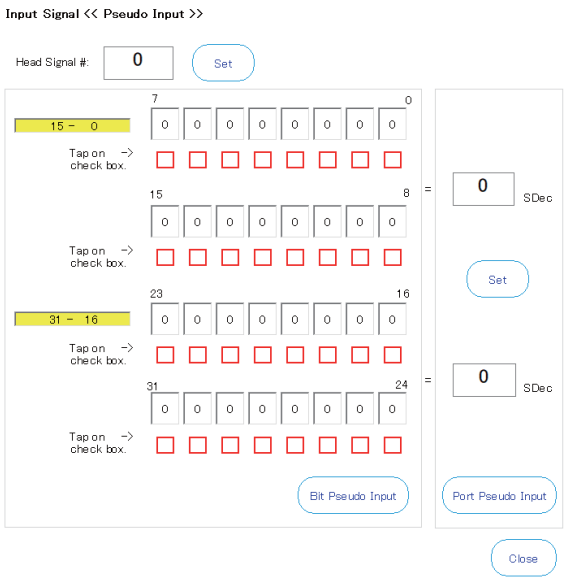


Pseudo input

⚠CAUTION

• While the controller is in pseudo input mode, signal input from external devices cannot be received.
To use pseudo input, put the controller into pseudo input mode. While the controller is in pseudo input mode, the controller cannot receive signal input from external devices.
• To release the controller from pseudo input mode, turn on the power of the controller again.

In pseudo input mode, the status of signals input on the pseudo input screen (not general-purpose input signals of the controller) is recognized as input signals.
Tap [Pseudo Input]. The pseudo input screen will appear.



1. Set signals for pseudo input.
32 signals can be set at a time. Enter a signal number to be set as the start signal number, then tap [Set].

2. The input status of 32 signals will appear. Change the values of each signal using the check boxes.

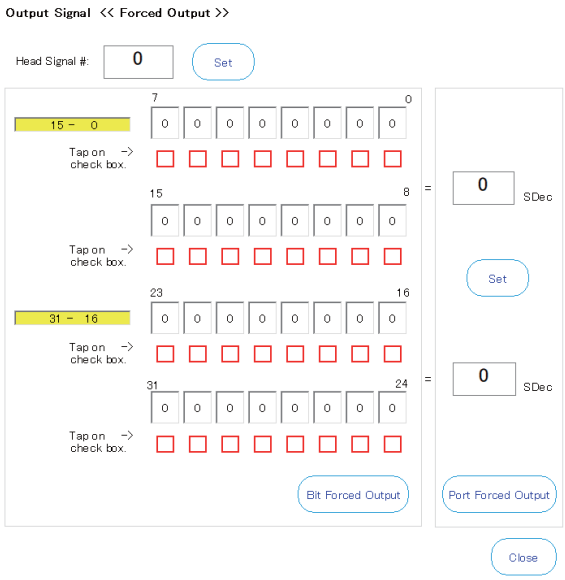
3. Tapping [Bit Pseudo Input] will input signals to the controller.
Enter a signal value in the input field on the right side of the screen, then tap [Set]. The signal values shown on the left side of the screen will be changed.
The setting selected in [Display Format] on the general-purpose signal screen is used in the display format for the input field. (Hexadecimal: Hex, Unsigned decimal: UDec, Signed decimal: SDec)
Tapping [Port Pseudo Input] will input signals to the controller.

Forced output

⚠CAUTION

• Signal forced output
Signal numbers assigned (used) as dedicated output signals cannot be forcibly output.
Forced output is possible regardless of whether the controller mode is either [AUTOMATIC] or [MANUAL]. However, if any of the programs is running, forced output is not possible. (Except ALWAYS programs)

Signals can be forcibly output from the controller to external devices.
Tap [Forced Output]. The forced output screen will appear.



1. Set signals for forced output.

32 signals can be output at a time. Enter a signal number to be set as the start signal number, then tap [Set].

2. The output status of 32 signals starting with the specified signal number will appear. Change the values of each signal using the check boxes.

3. Tapping [Bit Forced Output] will output signals from the controller.

Enter a signal value in the input field on the right side of the screen, then tap [Set]. The signal values shown on the left side of the screen will be changed.
The setting selected in [Display Format] on the general-purpose signal screen is used in the display format for the input field. (Hexadecimal: Hex, Unsigned decimal: UDec, Signed decimal: SDec)
Tapping [Port Forced Output] will output signals from the controller.

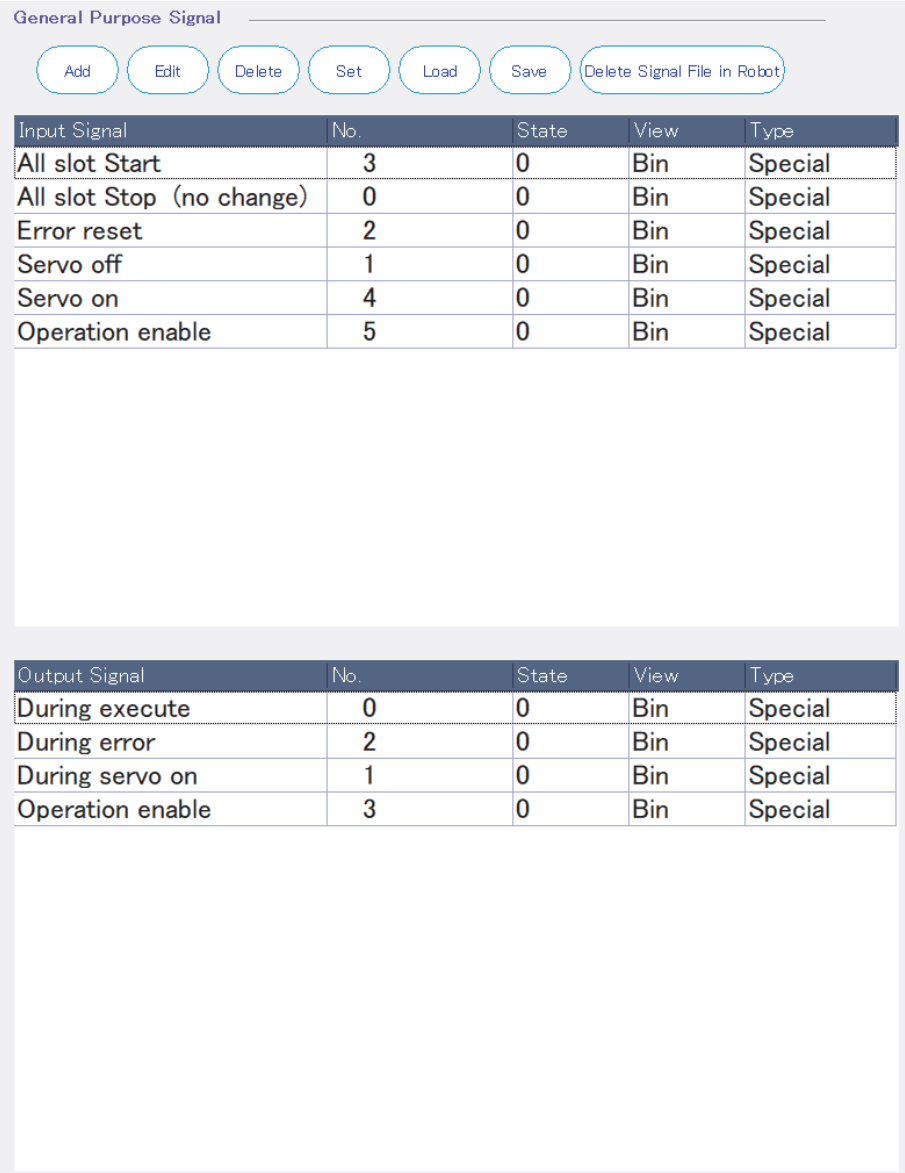
Named signals

Naming general-purpose I/O signals allows you to check the status.

"Named Signal" allows you to check the status of dedicated I/O signals and named general-purpose I/O signals.

Read a definition file for named signals in the controller at startup.

Tap [Named Signal] on the monitor menu screen.

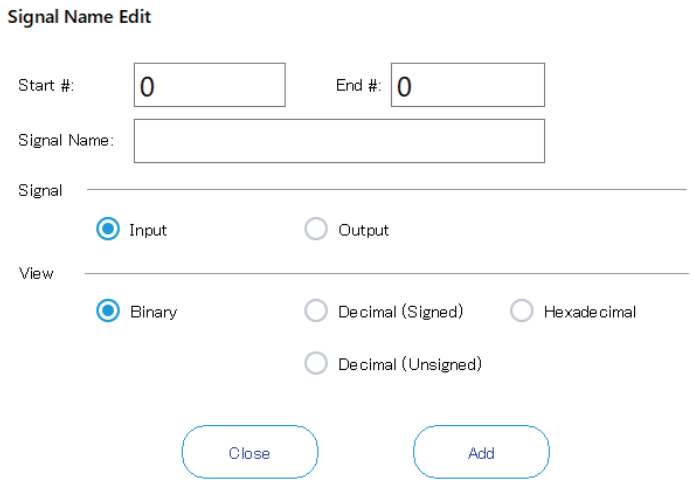


No.	Name	Description
1)	Add Edit	Opens the signal name editing dialog. ☞ Page 204 Adding or editing named signals
2)	Delete	Deletes the selected signal. However, dedicated I/O signals cannot be deleted.
3)	Set	Executes pseudo input/forced output for I/O signals. Select a signal from the list, then tap [Set]. The pseudo input screen or forced output screen will appear. For information on how to use pseudo input and forced output, refer to the following pages: ☞ Page 201 Pseudo input ☞ Page 202 Forced output
4)	Load	Reads definition information on named signals saved in the controller.
5)	Save	Saves information on the set named signals in the controller.
6)	Delete Signal File in Robot	Deletes information on named signals in the controller.
7)	Named signal list	Displays lists of dedicated I/O signals and named general-purpose I/O signals. The contents of the list are displayed by reading a definition file for named signals in the controller.

Adding or editing named signals

To add a named signal, tap [Add].

To edit a named signal, select it from the list, then tap [Edit].



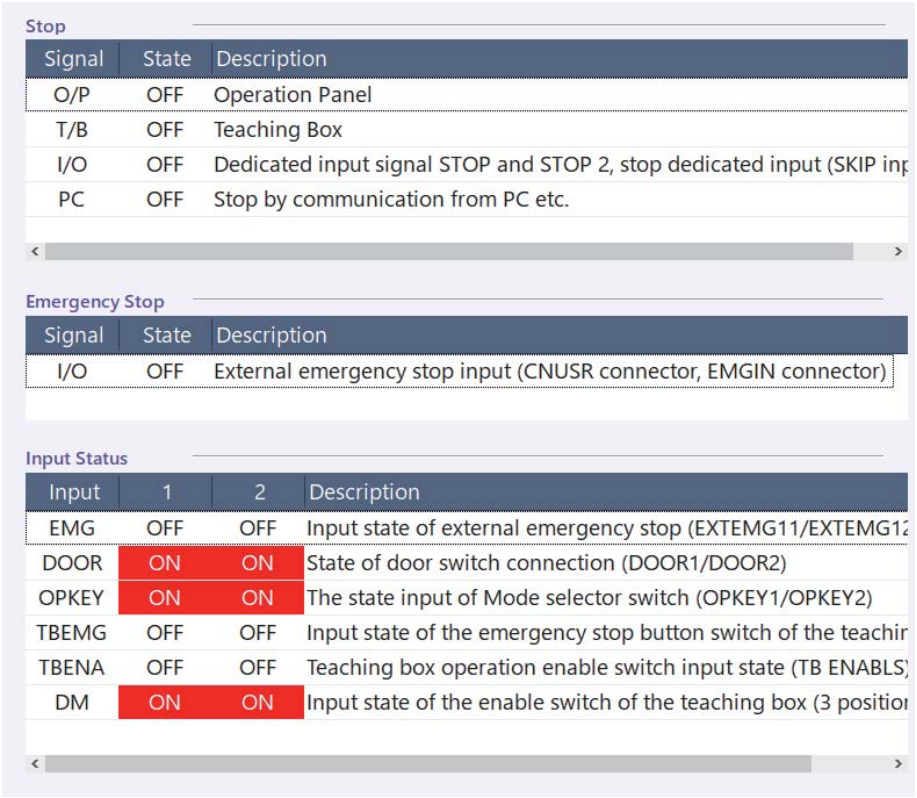
Enter general-purpose signal numbers and name, select the signal type and display format, then tap [Add] or [Change]. The list will be updated.

The [Add] button does not close the signal name editing screen, so you can continue to add more signals.

Stop signals

The status of stop signals (stop and emergency stop) input to the controller can be checked.

Tap [Stop Signal] on the monitor menu screen.



The displayed contents differ depending on the controller being connected.

Register

⚠ CAUTION

• It is available when the CC-Link/EtherCAT option card is attached to the controller or the CC-Link IE Field Basic function is enabled.

The status of register values input to the controller from external devices and that of register values output to the external devices from the controller can be checked.

Tap [Register (CC-Link)] or [Register (EtherCAT)] on the monitor menu screen.

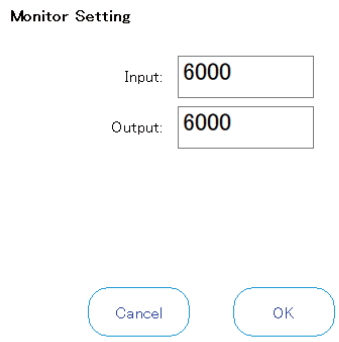
No.	Name	Description
1)	Pseudo Input	Pseudo input of register values is possible. ☞ Page 206 Pseudo input
2)	Monitor Setting	Set the display range of the register list. ☞ Page 206 Monitor settings
3)	Forced Output	Forced output of register values is possible. ☞ Page 207 Forced output
4)	Register list	Displays the values of input and output registers. Signal numbers to be displayed in the list can be switched with [▲] and [▼] under the list.

Monitor settings

Registers to be displayed can freely be set in a continuous range.

Tapping [Monitor Setting] will display the setting dialog.

Set the start numbers of signals in the input signal number and output signal number, then tap [OK].



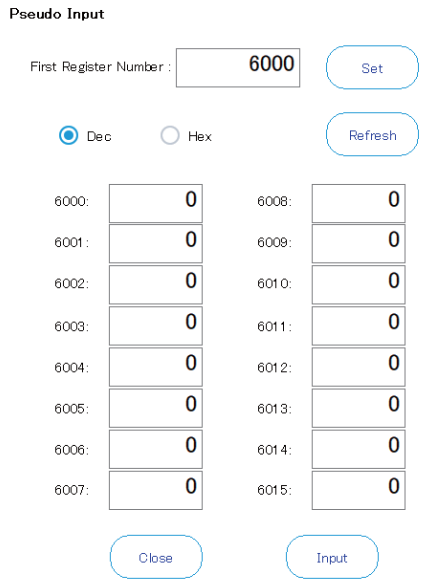
Pseudo input

⚠CAUTION

• While the controller is in pseudo input mode, register input from external devices cannot be received.
To use pseudo input, put the controller into pseudo input mode. While the controller is in pseudo input mode, the controller cannot receive register input from external devices.
• To release the controller from pseudo input mode, turn on the power of the controller again.

In pseudo input mode, values input on the pseudo input screen (not external register input) are recognized as input register values.

Tap [Pseudo Input]. The pseudo input screen will appear.



1. Set registers for pseudo input.

16 registers can be set at a time. Enter a register number to be set as the start register, then tap [Set].

2. The input status of 16 registers starting with the specified register number will appear. Enter each register value.

3. Tapping [Input] will pseudo input the register values to the controller.

If "Hex" is selected in [Monitor Setting], enter a hexadecimal register value.

Tapping [Refresh] will display the latest register information.

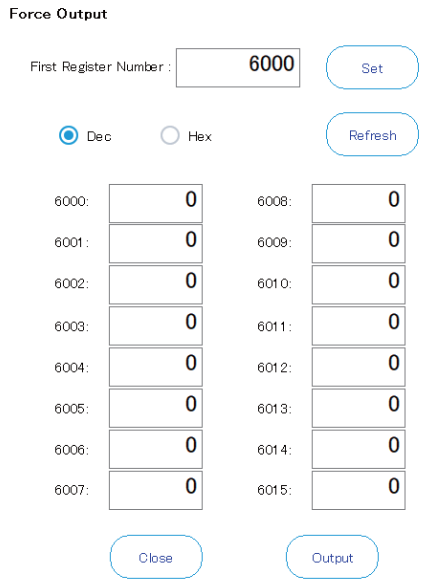
Forced output

⚠CAUTION

• Register forced output
Forced output is possible regardless of whether the controller mode is either [AUTOMATIC] or [MANUAL]. However, if any of the programs is running, forced output is not possible. (Except ALWAYS programs)

Register values can be forcibly output from the controller to external devices.

Tap [Forced Output]. The forced output screen will appear.



1. Read registers for forced output.

16 registers can be output at a time. Enter a register number to be set as the start register, then tap [Set].

2. The output status of 16 registers starting with the specified register number will appear. Enter each register value.

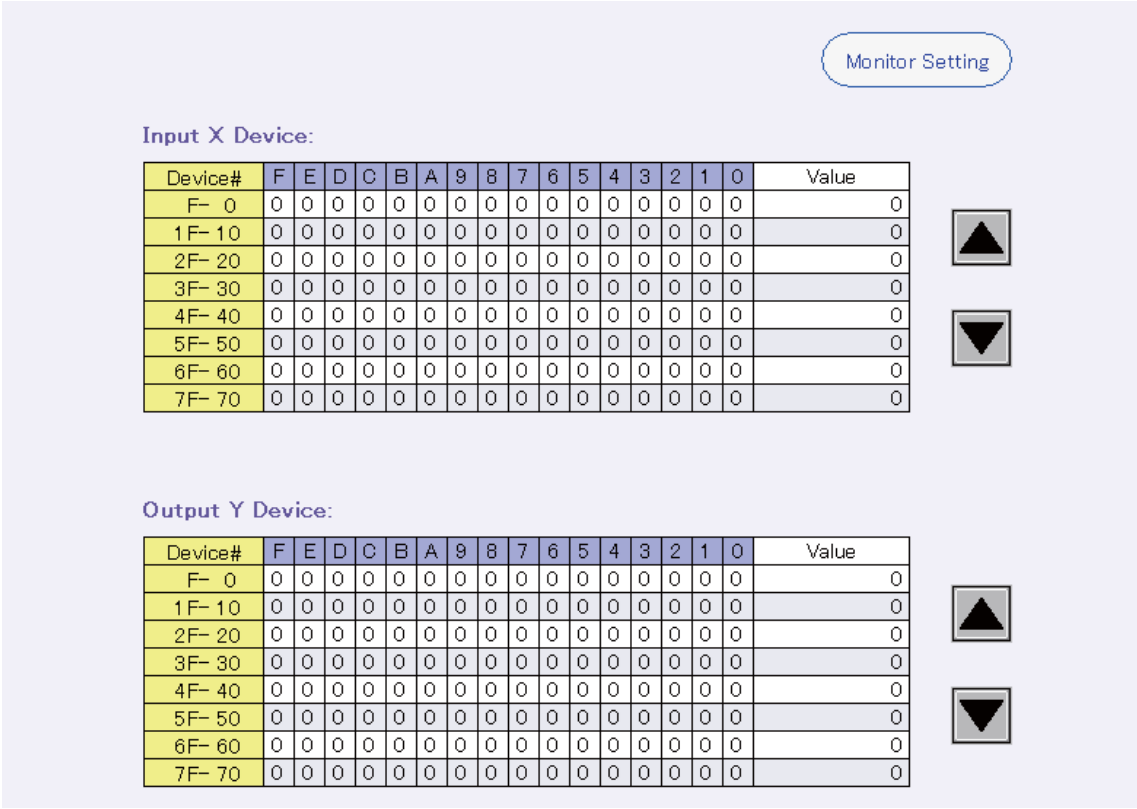
3. Tapping [Output] will output register values from the controller.

If "Hex" is selected in [Monitor Setting], enter a hexadecimal register value.

Tapping [Refresh] will display the latest register information.

IO unit

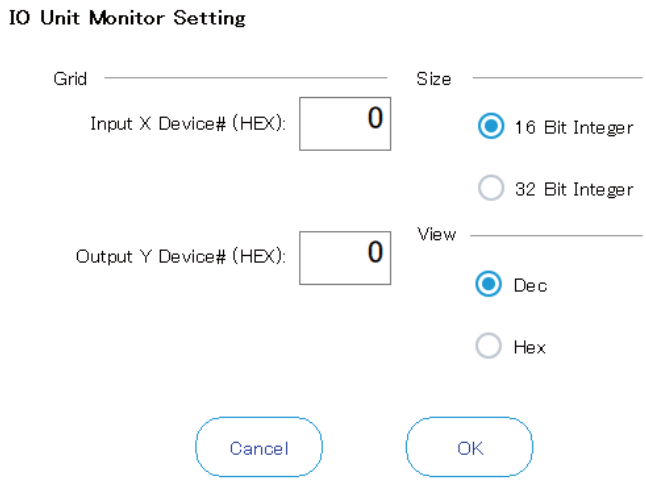
The status of XY device variables of the programmable controller I/O module can be monitored.
This function can be used with all the versions of the CR800-R/CR800-Q series controllers and Ver.R3 or later of the CR750-Q/CRnQ-700 controllers.
Tap [IO Unit] on the monitor menu screen.



No.	Name	Description
1)	Monitor Setting	Set the display range of the XY device variable list and the display format for signal values. ☞ Page 208 Monitor settings
2)	XY device variable list	Displays the values of input X devices and output Y devices. Device numbers to be displayed in the list can be switched with [▲] and [▼] shown on the right side of the list.

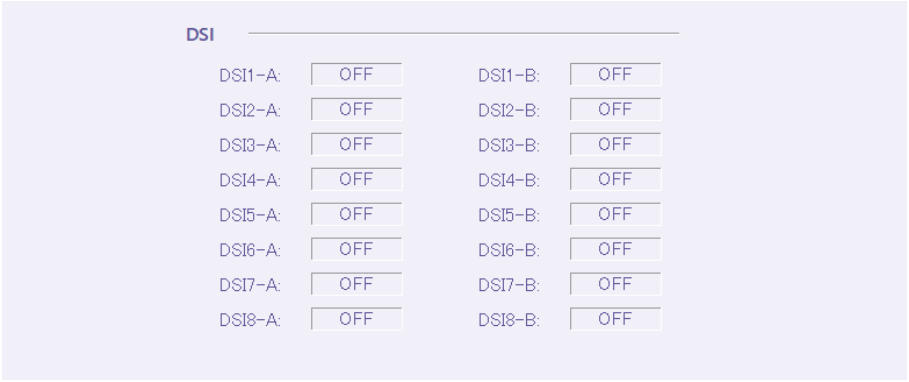
Monitor settings

Tapping [Monitor Setting] will display the setting dialog.
Set the start numbers of each device and the data size and display format used when signals are displayed, then tap [OK].



Safety input signals

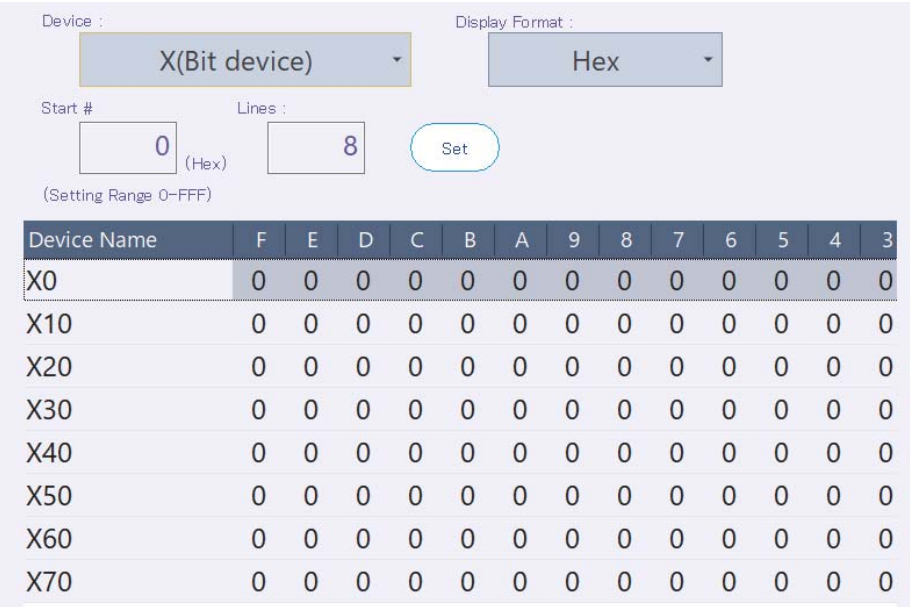
You can monitor the DSI1 and DSI2 input signals that switch the monitoring items of the safety monitoring functions and the monitor modes of the safety monitoring functions (SLS/SLP/STR).
For information on the robot safety option, refer to the following manual:
📖Robot Safety Option Instruction Manual (BFP-A3531)
This function can be used with all the versions of the CR800 series controllers and software Ver.R6, S6 or later of the CR750/700 controllers.
The monitoring items on this screen differ depending on the controller being connected.



Devices

The bit status of devices of the robot CPU (R16RTCPU) that can be accessed from external devices can be checked.
This function can be used with the CR800 series controller.
Tap [Device] on the monitor menu screen.
Tapping the Device drop-down list will display a list of accessible devices.
Selecting a device will show the bit status of the device and a list of device values.
The following devices can be selected.

When connecting the CR800-D controller	When connecting the CR800-R controller	When connecting the CR800-Q controller
X (bit device) Y (bit device) D (word device) SM (bit device) SD (word device) U3E0\HG (word device) U3E1\HG (word device)	X (bit device) Y (bit device) M (bit device) D (word device) SM (bit device) SD (word device) U3E0\G (word device) U3E1\G (word device) U3E2\G (word device) U3E3\G (word device) U3E0\HG (word device) U3E1\HG (word device) U3E2\HG (word device) U3E3\HG (word device)	X (bit device) Y (bit device) M (bit device) D (word device) SM (bit device) SD (word device) U3E0\G (word device) U3E1\G (word device) U3E2\G (word device) U3E3\G (word device)

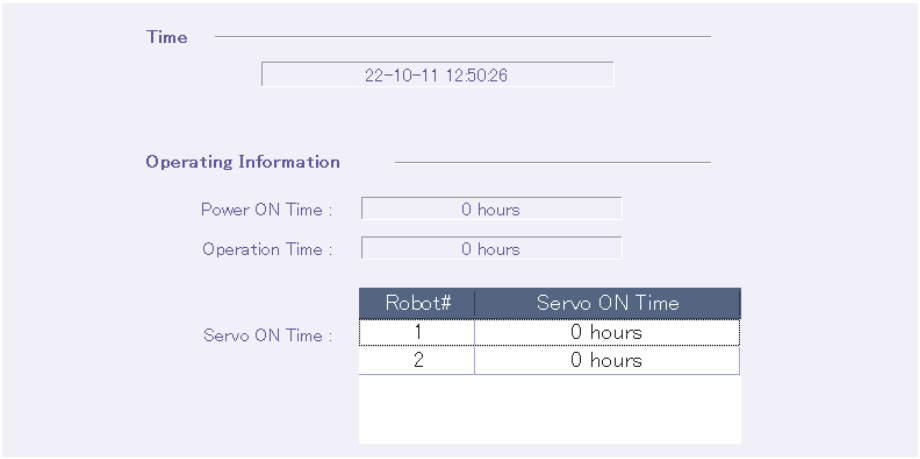


The values of bits on each line are displayed at the right end of the list with the setting selected in [Display Format].
The display format can be selected from among hexadecimal, unsigned decimal, and signed decimal.
Enter the start number and the number of lines to be displayed (1 to 32), then tap [Set]. The list display range will be set.
Tap a device bit value on the list, then tap the value again. The bit value will be changed.

13.4 Operation monitor

Operating information

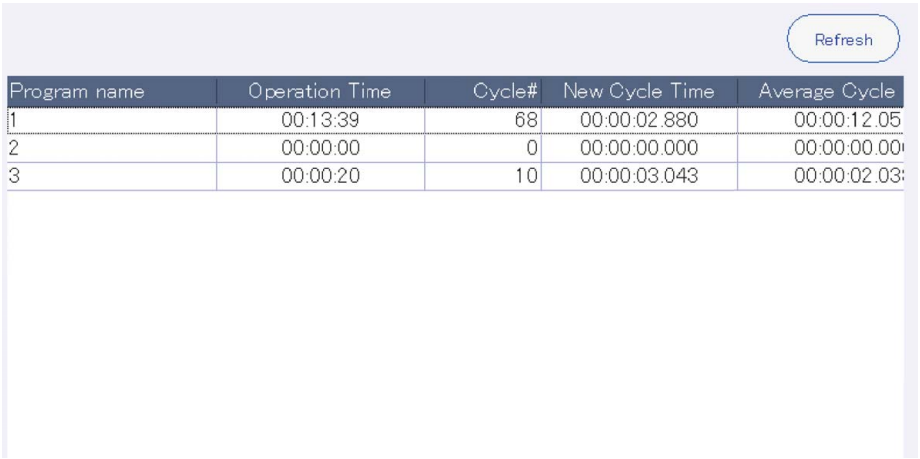
Information such as the robot's operation time and battery usage time can be checked.
Tap [Operating Information] on the monitor menu screen.



When the CR800 series controller is connected, the battery remaining time is not displayed.
For information on how to initialize the battery remaining time, refer to the following page:
☞ Page 231 Initializing the battery remaining time

Production information

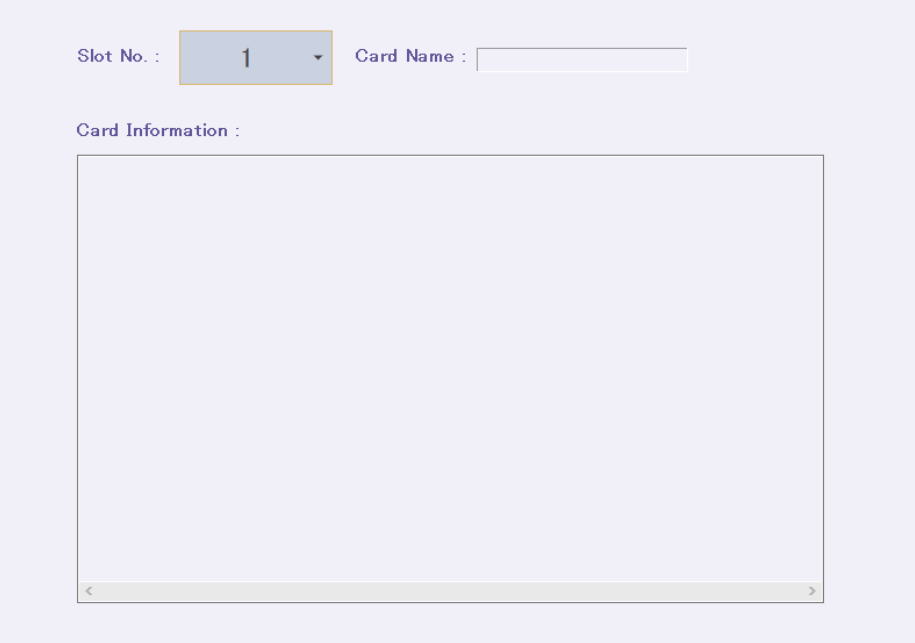
The latest takt time, operation time, cycle count, average takt time for each program in the controller can be checked.
The operation time, latest takt time, and average takt time can be measured up to 1193 hours (approx. 49 days).
Tap [Production Information] on the monitor menu screen.



Tapping [Refresh] will update production information.

Option card

Information on the option card attached to the controller can be checked.
Tap [Board] on the monitor menu screen.



Selecting a slot from the Slot No. drop-down list will display the card name and card information.
If an option card is not attached to the slot or the controller has no slot available for the attachment, the card name and card information will not appear.

13.5 Servo monitor

Information on the robot's servo system is monitored.

ABS

Data related to the positions of each axis motor referenced by servo processing can be monitored.

- Position Feedback

Displays the current motor rotation position in encoder pulses.

- Position in 1 Rotation

Displays the current position within one encoder revolution.
("0" is always displayed.)

- Fdt Command

Displays the amount of change of the position command between control cycles.
("0" is always displayed.)

- Position Droop

Displays the deviation amount of the motor rotation position with respect to the position command.

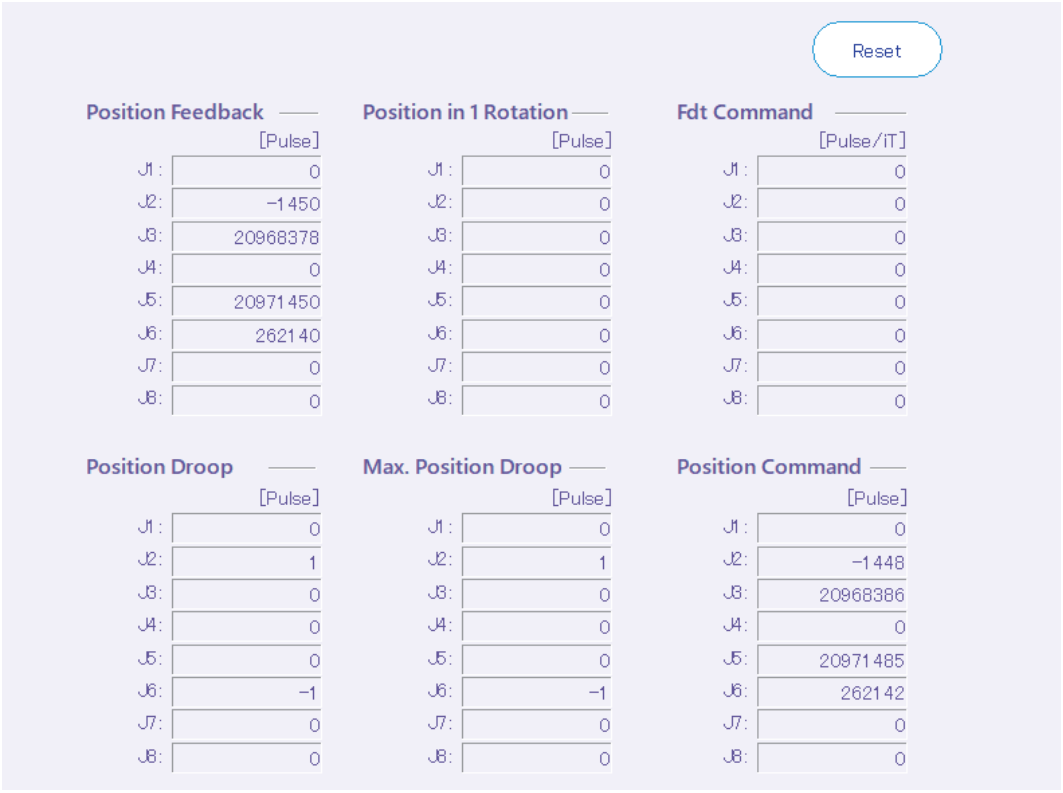
- Max. Position Droop

Displays the maximum value of the position droop after the controller is powered on.

- Position Command

Displays the command of the motor rotation position to the servo in pulses.

Tapping [Reset] will reset all the servo monitors.



Speed

Data related to the speed of motors of each axis can be monitored.

• Amount of Feedback / MAX.

Displays the current motor speed in rpm.

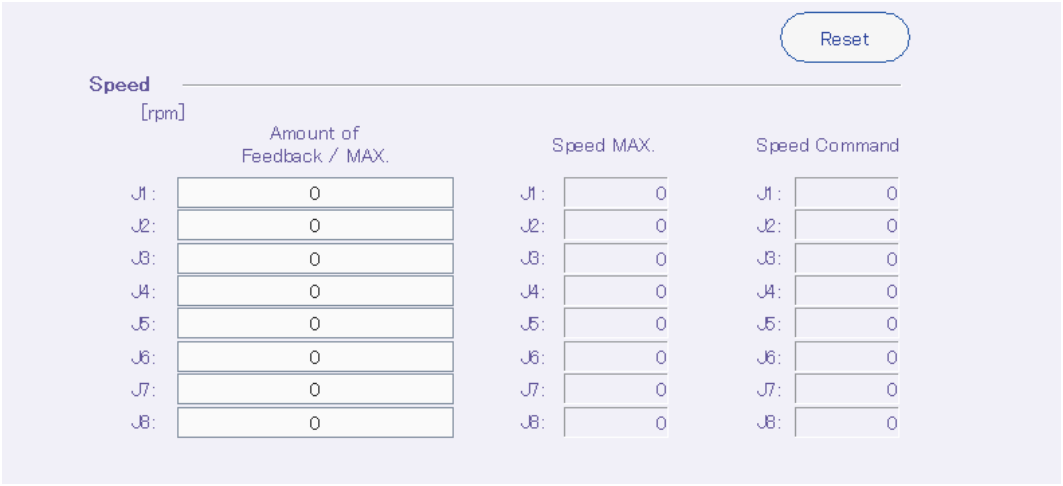
• Speed MAX.

Displays the maximum value of speed feedback after the controller is powered on.

• Speed Command

Displays the command of the speed to the motor in rpm.

Tapping [Reset] will reset all the servo monitors.



Current

Data related to the current values of motors of each axis can be monitored.

- Current Cmd

Displays the current command to the motor.

- Max. Current Cmd1

Displays the maximum value of the current command after the controller is powered on.

- Max. Current Cmd2

Displays the maximum value of the current command for the latest two seconds.

- Current Feedback

Displays the current value of the motor current.

- Tolerable Cmd-/+

Displays the limit values on the - side and + side of the current command set for each axis motor.

- RMS Current

Displays the current effective motor current value (RMS).

Tapping [Reset] will reset all the servo monitors.

Load

The load status of each axis motor and the temperature of the encoder can be monitored.

The encoder temperature function is supported with the following controller software versions.

Controller name	Controller software version
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.S3 or later
CR750-Q/CRnQ-700	Ver.R3 or later

• Axis Load Level

Displays the current load ratio of each motor as an alarm level. If this value reaches 100%, an overload error will occur.

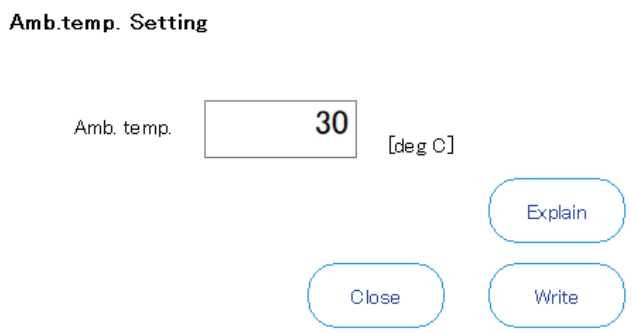
• Max. Axis Load Level

Displays the maximum value of the axial load level after the controller is powered on.

Tapping [Reset] will reset all the servo monitors.

Tapping [Change] will start the ambient temperature setting dialog.

This dialog allows you to change the ambient temperature parameter.



Power

Data related to the main circuit power of the controller can be monitored.

• Motor Power Voltage

Displays the current value of the power supply voltage.

• Motor Power Voltage (MAX)

Displays the maximum value of the motor power supply voltage in the servo ON state.

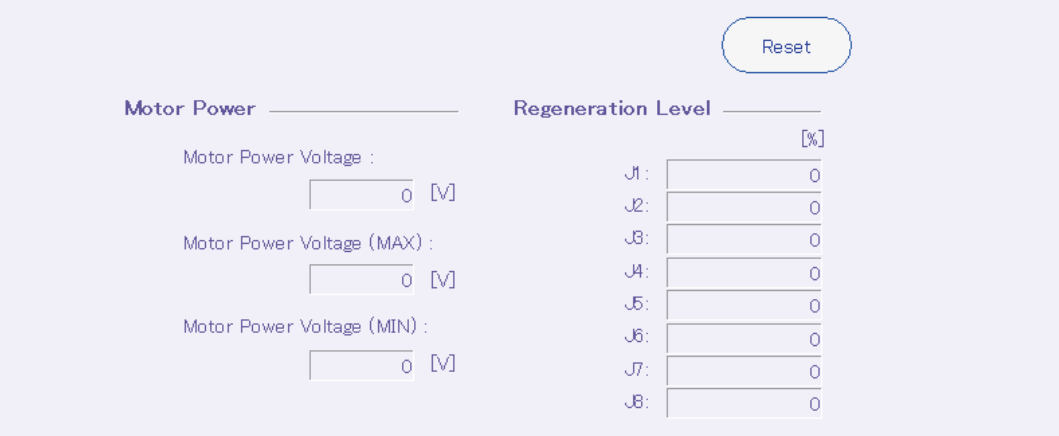
• Motor Power Voltage (MIN)

Displays the minimum value of the motor power supply voltage in the servo ON state.

• Regeneration Level

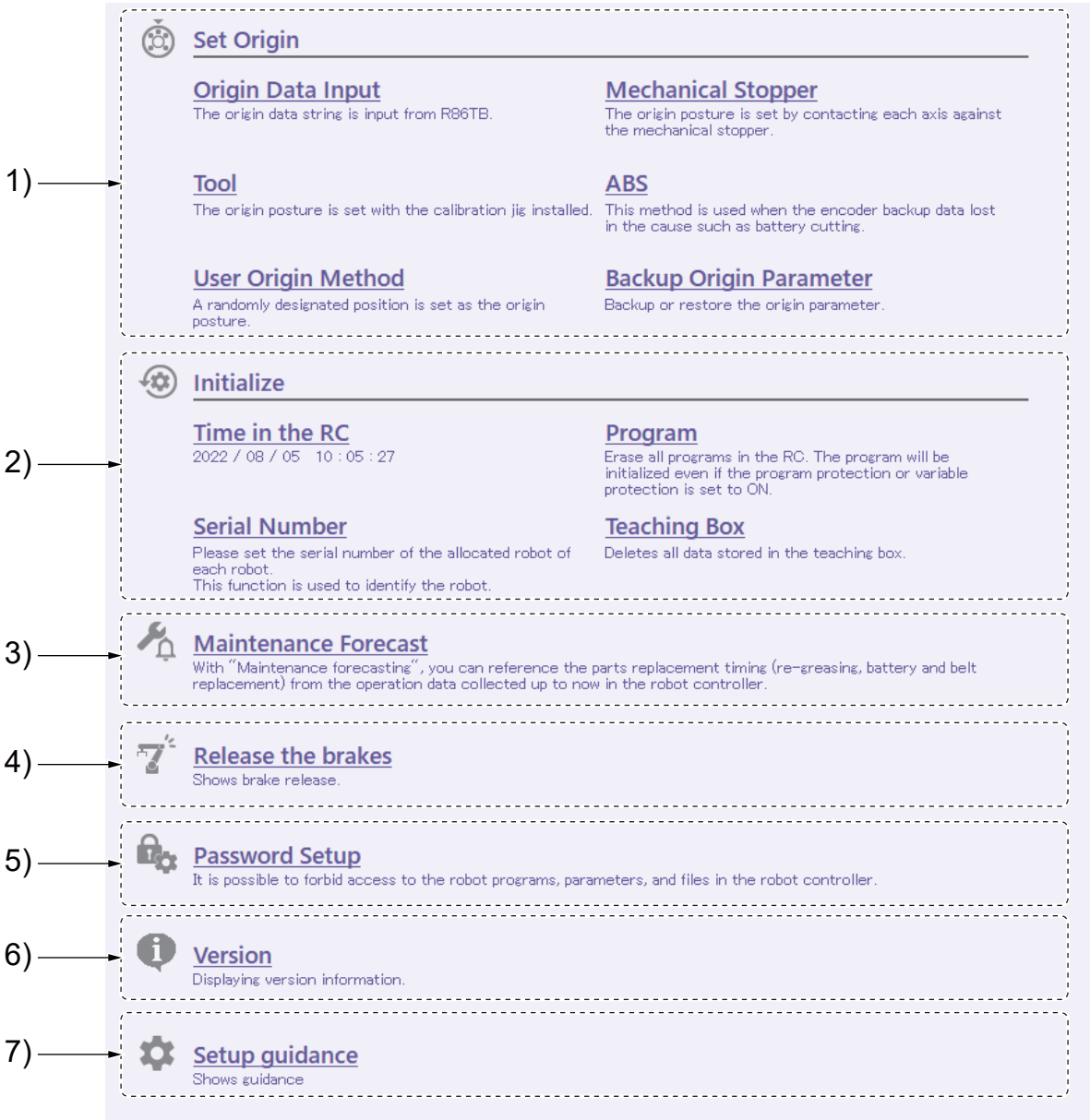
Displays the regenerative current values of each axis as an alarm level. If this value reaches 100%, an excessive regeneration error will occur.

Tapping [Reset] will reset all the servo monitors.



14 MAINTENANCE

Robot maintenance such as setting origin data and initializing information can be performed.
Tapping [Maintenance] in the menu will display the maintenance menu screen.
The maintenance menu screen is composed as follows:



No.	Name	Description
1)	Set Origin	Sets robot origin data. ☞ Page 219 Origin settings
2)	Initialize	Initializes the data in the robot controller. ☞ Page 229 Initialization
3)	Maintenance Forecast	Displays the replacement timing of parts based on the calculation from robot operation data. ☞ Page 232 Maintenance forecast
4)	Release the brakes	Releases the brake of each robot axis. Use this operation when directly moving the robot arm by hand. ☞ Page 239 Releasing brakes
5)	Password Setup	Sets a password for program editing, parameter editing, and controller file editing for function restriction. ☞ Page 241 Robot controller security function (password settings)
6)	Version	Used to check the software versions of the robot controller and teaching pendant. ☞ Page 244 Version
7)	Setup guidance	Configures the basic settings when the controller is started for the first time. ☞ Page 29 INITIAL SETTINGS

14.1 Origin settings

The origin of the robot can be set, and origin parameters can be backed up.

Origin data input method

⚠CAUTION

Be sure to enter correct values for the origin data of the J7 and J8 axes.
For the origin data of the J1 through J6 axes, the compatibility of values in the robot controller is checked. For the origin data of the J7 and J8 axes, however, the compatibility is not checked. Ensure that the correct values are entered.
The origin data of the J7 and J8 axes is displayed only when the corresponding additional axes are used.

The origin is set by entering the coded data of each axis origin. Additionally, robot origin data can be saved in a file.
Tap [Origin Data Input] on the maintenance menu screen.

[Save to File]	:	Saves the displayed origin data in a file.
[Read from File]	:	Reads saved origin data from a file and displays it on the screen.
[Write]	:	Writes the origin data displayed on the screen to the robot controller.
[Refresh]	:	Reads the origin data from the robot controller and displays the latest status.

This method sets an origin by entering the coded data of each axis origin.
The following shows the setting procedure.

1. Turn off the control power of the controller and remove the robot cover with the origin data sticker.
2. Enter origin data in the D and J1 to J8 columns on the setting screen shown above.
3. Tap [Write].

The origin data sticker is affixed to the cover of the robot arm.
The affixing position differs depending on the model. For details, refer to the instruction manual for the robot being used, "Robot Arm Setup and Maintenance".

Point

About DJNT (origin position error) parameters

DJNT shows the origin position error. When the origin position is revised using the position repair tool, the values will be set in DJNT. (When the origin position is not revised using the position repair tool, all the elements are 0. However, for the RV-4A, the values are entered beforehand.)

DJNT is not released to general customers, so the values cannot be changed directly.

About DJNT parameter display

Sometimes DJNT parameters are not displayed for certain robots (for example, robots that do not support the position repair function, etc.).

Mechanical stopper method

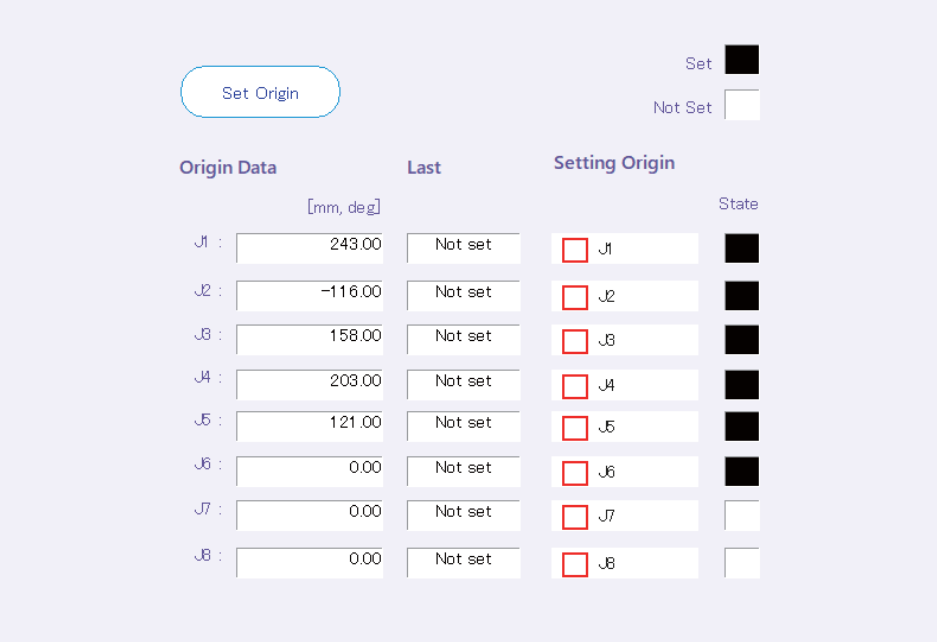
⚠CAUTION

Releasing a brake will cause the robot arm to fall under its own weight depending on the posture. As a safety measure, take steps such as supporting the arm to prevent it falling before releasing the brake.

Set the origin of the robot using the robot mechanical stopper.

Tap [Mechanical Stopper] on the maintenance menu screen.

"Last" displays the origin setting method used last time. It is not displayed depending on the controller software version.



This method sets an origin by bringing the robot arm into contact with the mechanical stopper.

The following shows the setting procedure.

Common to the RH/RV series

Perform the following steps for the J1 and J2 axes when using the RH series, and the J1 to J4 axes when using the RV series. Multiple axes can be set at a time.

1. Release the brake of the axis to set its origin or use jog operation to bring the robot arm into contact with the mechanical stopper. The mechanical stopper is located on the + side and the - side. The sign of the mechanical stopper origin position (joint coordinates) parameter "MORG" allows you to check in which direction the robot arm should move for contact with the mechanical stopper.
2. Stop releasing the brake or turn off the servo while the robot arm comes into contact with the mechanical stopper.
3. On the setting screen, select an axis to set its origin, and tap [Set Origin].

For the RH series

Set the origins of the J3 and J4 axes at a time.

1. Release the brake of the J3 axis, then slowly bring the axis into contact with the mechanical stopper on the + side.
2. In this state, align the J4 axis with the mark.
3. Stop releasing the brake.
4. On the setting screen, select the J3 and J4 axes, and tap [Set Origin].

For the RV series

Set the origins of the J5 and J6 axes at a time.

1. Release the brake of the J5 axis or use jog operation to bring the robot arm into contact with the mechanical stopper.
2. Stop releasing the brake or turn off the servo while the robot arm comes into contact with the mechanical stopper.
3. In this state, align the J6 axis with the mark.
4. On the setting screen, select the J5 and J6 axes, and tap [Set Origin].

Tool method

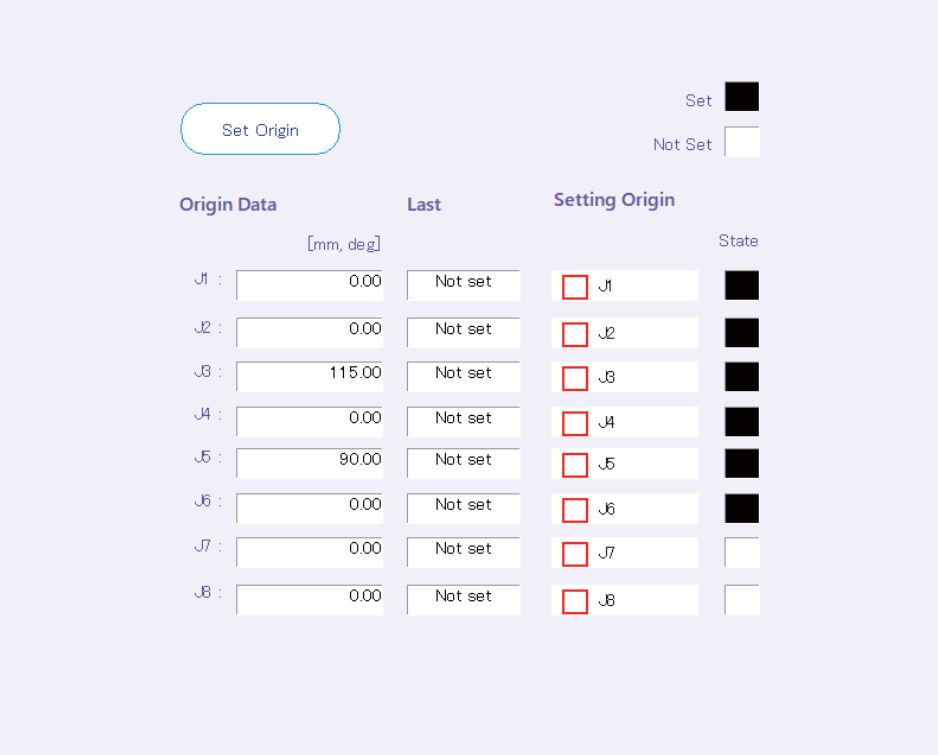
⚠CAUTION

If the brakes are released, some axes may fall under their own weight.
Releasing a brake will cause the robot arm to fall under its own weight depending on the posture. As a safety measure, take steps such as supporting the arm to prevent it falling before releasing the brake.

Set the origin of the robot using the origin setting tool.

Tap [Tool] on the maintenance menu screen.

"Last" displays the origin setting method used last time. It is not displayed depending on the controller software version.



This method sets an origin by inserting the origin setting tool into the pin hole for the origin setting.

*1 If an origin setting tool is required, contact the dealer.

*2 The positions of pin holes vary depending on the model. For details, refer to the instruction manual for the robot being used, "Robot Arm Setup and Maintenance".

The following shows the setting procedure.

Common to the RH/RV series

Perform the following steps for the J1 and J2 axes when using the RH series, and the J1 to J4 axes when using the RV series.

Set origins for each axis.

1. Release the brake or use jog operation to match the pin hole for the origin setting.
2. Move the axis back and forth to put the origin setting tool through the pin hole.
3. After putting the tool through the pin hole and fixing it into place, stop releasing the brake or turn off the servo.
4. On the setting screen, select an axis to set its origin, and tap [Set Origin].

For the RH series

Set the origins of the J3 and J4 axes at a time.

1. Release the brake of the J3 axis, then slowly bring the axis into contact with the mechanical stopper on the + side.
2. In this state, align the J4 axis with the mark.
3. Stop releasing the brake.
4. On the setting screen, select the J3 and J4 axes, and tap [Set Origin].

For the RV series

Set the origins of the J5 and J6 axes at a time.

1. Release the brake of the J5 axis or use jog operation to bring the robot arm into contact with the mechanical stopper.
2. Stop releasing the brake or turn off the servo while the robot arm comes into contact with the mechanical stopper.
3. In this state, align the J6 axis with the mark.
4. On the setting screen, select the J5 and J6 axes, and tap [Set Origin].

ABS origin method

Set the origin of the robot using the robot's ABS origin position.

Tap [ABS] on the maintenance menu screen.

"Last" displays the origin setting method used last time. It is not displayed depending on the controller software version.

This method sets the origin using the ABS marks. The ABS mark is a triangular mark affixed to each axis or scribe line.

*1 The positions of ABS marks vary depending on the model. For details, refer to the instruction manual for the robot being used, "Robot Arm Setup and Maintenance".

The following shows the setting procedure.

Common to the RH/RV series

Perform the following steps for the J1 and J2 axes when using the RH series, and the J1 to J4 axes when using the RV series.

Multiple axes can be set at a time.

1. Move the robot arm using jog operation so that the deviation amount of the ABS mark is within 1mm.
2. On the setting screen, select an axis to set its origin, and tap [Set Origin].

For the RH series

Set the origins of the J3 and J4 axes at a time.

1. Release the brake of the J3 axis, then slowly bring the axis into contact with the mechanical stopper on the + side.
2. In this state, align the J4 axis with the mark.
3. Stop releasing the brake.
4. On the setting screen, select the J3 and J4 axes, and tap [Set Origin].

For the RV series

Be sure to set the origins of the J5 and J6 axes at a time.

Otherwise, error C1780 (Cannot set origin (illegal axis)) will occur.

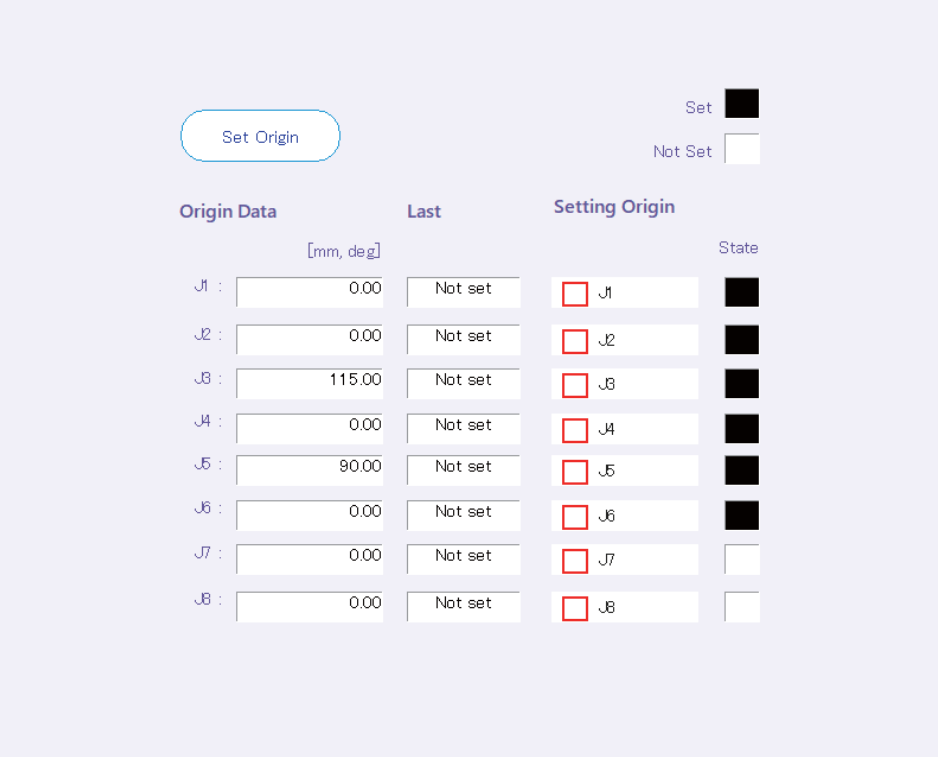
1. Move the robot arm using jog operation so that the deviation amount of the ABS mark is within 1mm.
2. On the setting screen, select the J5 and J6 axes, and tap [Set Origin].

User origin method

Set the origin of the robot using the robot user origin.

Tap [User Origin Method] on the maintenance menu screen.

"Last" displays the origin setting method used last time. It is not displayed depending on the controller software version.



This method sets an origin by using the origin posture specified by the customer and the joint values. Before using this method, set the origin using another method.

*1 For details, refer to the instruction manual for the robot being used, "Robot Arm Setup and Maintenance".

The following shows the setting procedure.

Setting an origin using this method for the first time

1. Move the robot using jog operation to determine a posture to be used as the user origin. At this time, place a mark on the robot so that you can return the robot to the same posture using jog operation.
2. Set the current joint values read from the teaching pendant or RT ToolBox3 in the user defined origin parameter (USERORG) and write the values. This operation associates the current posture with the joint values and displays them on the origin setting (user origin method) screen as the origin data.

Setting an origin using this method for the second time or later

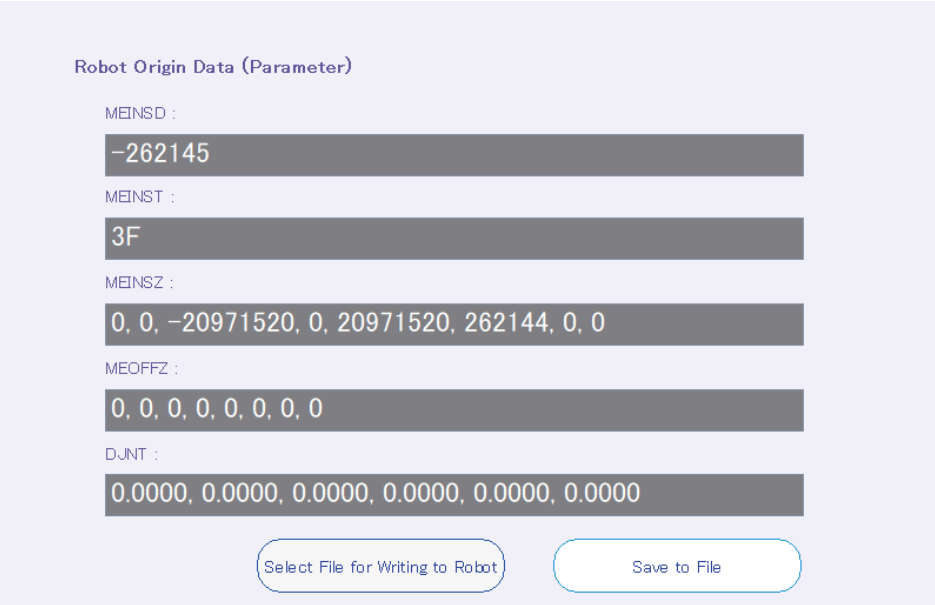
1. Move the robot into the posture specified in "☞ Setting an origin using this method for the first time".
2. On the setting screen, select an axis to set its origin, and tap [Set Origin].

Backing up origin parameters

⚠CAUTION

• If a password is registered in a parameter by the security function of the robot controller, backed-up origin data cannot be transfered.
To rewrite a parameter, delete the password of the security function. For information on how to delete the password, refer to the following page:
☞ Page 244 Deleting the password

The parameters that make up origin data can be backed up. Additionally, backed-up data can be transfered to the controller.
Tap [Backup Origin Parameter] on the maintenance menu screen.



[Select File for Writing to Robot] : Transfers the origin parameters saved in a file to the controller.
[Save to File] : Saves origin parameters read from the controller (displayed parameters) in a file.

14.2 Initialization

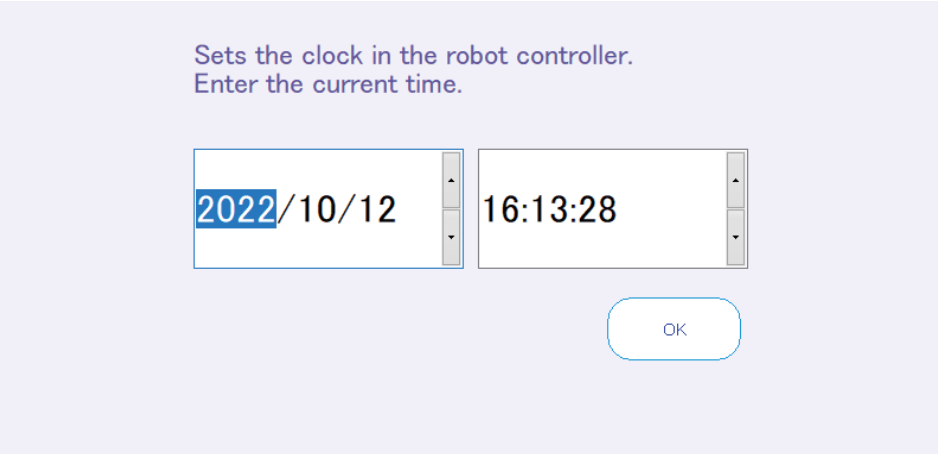
The following information stored in the robot controller can be set or initialized.

- Setting the time
- Initializing all programs
- Robot controller battery remaining time
- Checking the serial number of the robot controller
- Setting the serial number of the robot being connected

Setting the time on the robot controller

The time on the robot controller can be set.

Tap [Time in the RC] on the maintenance menu screen.



After setting the time, tap [OK].

Deleting all robot programs

⚠CAUTION

- If a password is registered in programs by the security function of the robot controller, all robot programs cannot be deleted.

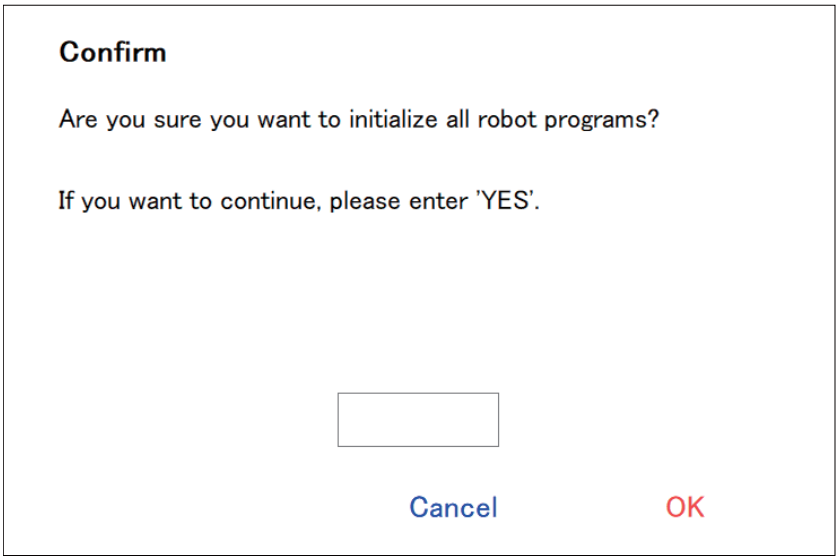
To delete all robot programs, delete the password of the security function. For information on how to delete the password, refer to the following page:

☞ Page 244 Deleting the password

Delete all the programs in the robot controller.

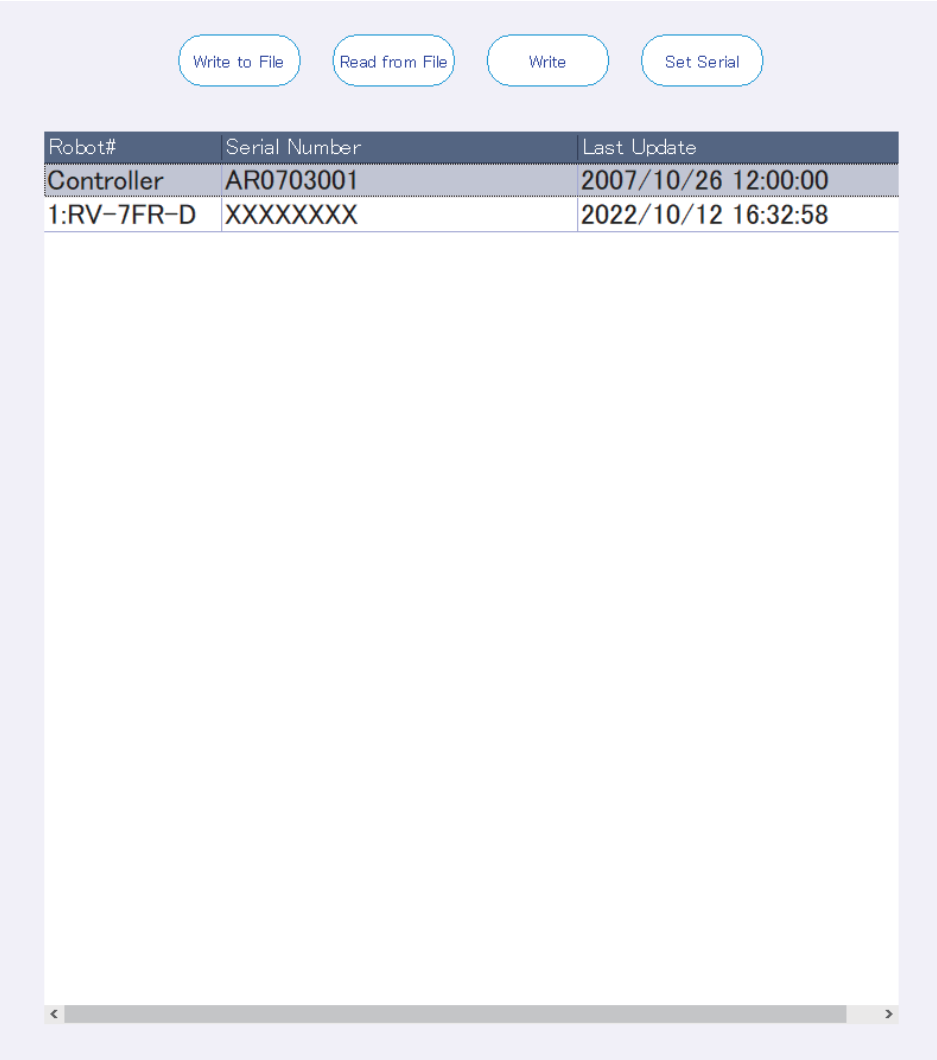
Tap [Program] on the maintenance menu screen.

A confirmation screen will appear. Enter "YES", then tap [OK].



Serial number

Check the serial number in the robot controller and set the serial number of the robot being connected.
Tap [Serial Number] on the maintenance menu screen.
For the CR750/700 series robot controllers, the warning C0150 or C0152 (Undefined robot serial number) will occur when the robot controller starts for the first time after the purchase. Set the serial number of the robot on this screen.



[Save to File]	:	Saves the displayed serial number in a file.
[Read from File]	:	Reads the saved serial number from a file and displays it on the screen.
[Write]	:	Writes the serial number displayed on the screen to the robot or controller.
[Set Serial]	:	Sets the serial number of the robot.

Initializing the battery remaining time

⚠CAUTION

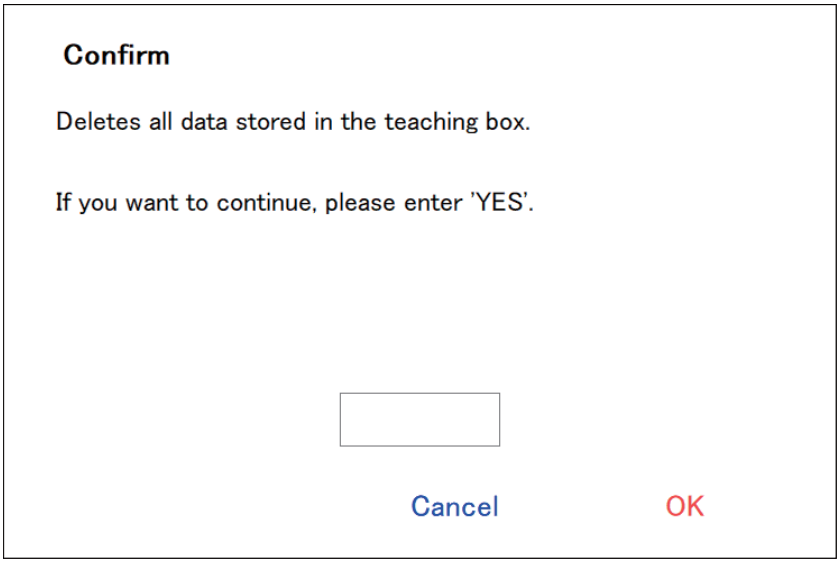
Do not initialize the time unless the battery has been replaced.
Doing so will cause the correct remaining time not to be referenced.

Initialize the robot controller battery remaining time.

This function cannot be used when the CR800 series robot controller is connected.

Tap [Battery Remaining Time INIT] on the maintenance menu screen.

A confirmation screen will appear. Enter "YES", then tap [OK].



14.3 Maintenance forecast

⚠CAUTION

The results calculated by the maintenance forecast function are reference values.
To prevent failures and ensure safety, be sure to perform daily and periodic inspections.

The operation data collected in the controller can be used to refer to the replacement timing of parts (grease replenishment, battery and belt replacement).
Tap [Maintenance Forecast] on the maintenance menu screen.

Forecast (battery, grease, and belt)

You can refer to the "time until battery replacement", "time until grease replenishment", and "time until belt replacement".

Tapping [Refresh] at the top right of the screen will obtain information on maintenance from the controller again.

Battery

If the battery remaining time meets the following conditions, the graph will be colored orange.

(Remaining time) < ([The Remainder Days Until Presumed Maintenance Time] on the Setup screen) × (24 - [Operation Time of a Day])

(The battery replacement timing is calculated from the time when the controller is not powered on.)
When the CR800 series controller is connected, this information is not displayed.

Grease

If the time until grease replenishment meets the following conditions, the graph will be colored orange.

(Hours until replenishment time) < ([The Remainder Days Until Presumed Maintenance Time] on the Setup screen) × ([Operation Time of a Day])

Belt

If the time until belt replacement meets the following conditions, the graph will be colored orange.

(Hours until replacement time) < ([The Remainder Days Until Presumed Maintenance Time] on the Setup screen) × ([Operation Time of a Day])

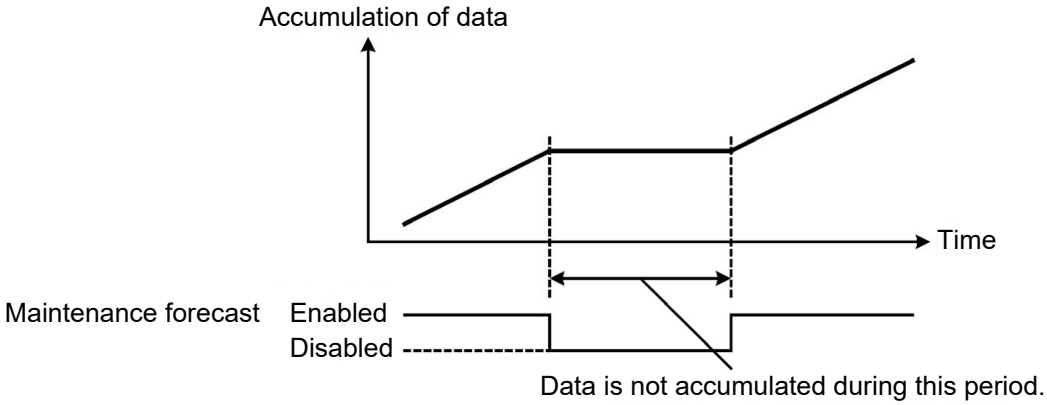
Display unit

The display units for "Grease" and "Belt" can be switched between hours and days. If "day(s)" is selected as the display unit, the number of days of operation calculated from the daily operating hours will be displayed.

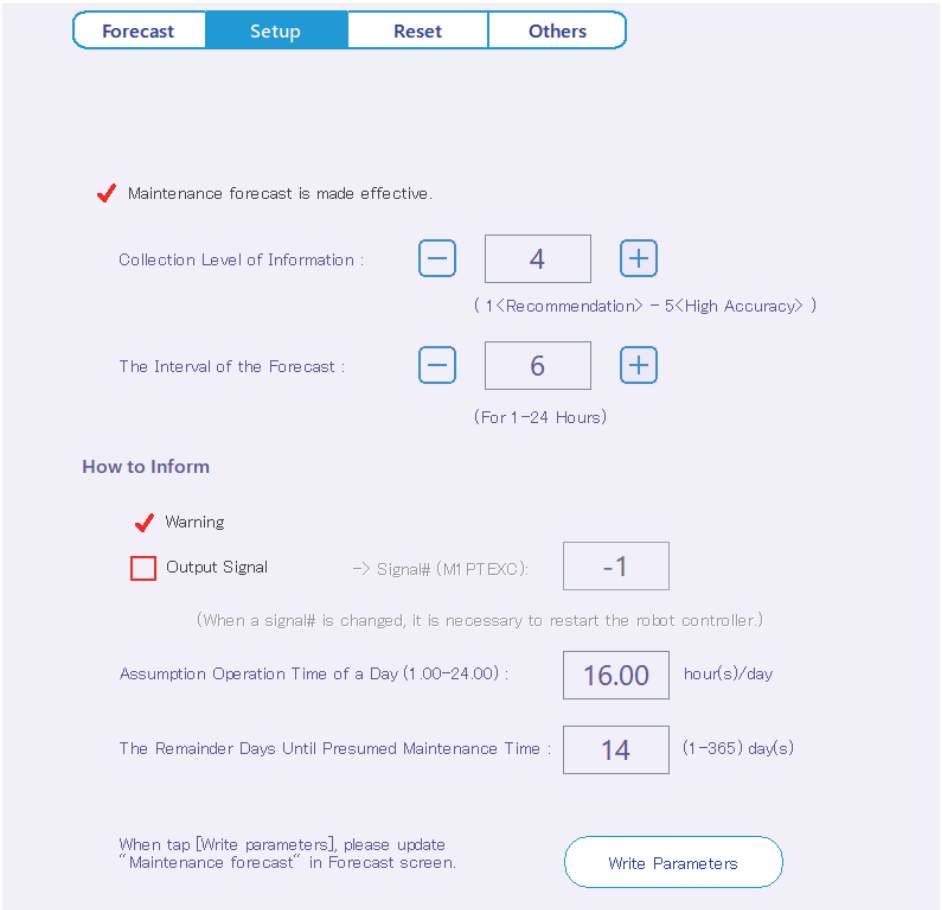
Settings

⚠ CAUTION

Information needed for maintenance forecast is not accumulated while the maintenance forecast function is set to "disabled".
The maintenance forecast function is enabled from the factory. Disabling the maintenance forecast function will not accumulate data. When the function is changed from disabled to enabled again, data will start to be accumulated from the last state when the function was disabled. If the maintenance forecast function has been disabled for a long time, the correct maintenance timing cannot be calculated.



Here, you can set the timing for collecting information on maintenance forecast, the notification method, etc.



After configuring the settings, tap [Write Parameters]. The setting values will be written to the controller. The settings other than the dedicated output signal number will be applied after the writing process. If a dedicated output signal has been changed, it is necessary to power on the controller again.

The following shows the settings.

Setting	Description	Default settings
(1) Maintenance forecast is made effective.	Selecting the check box will enable the maintenance forecast function. * Deselecting the check box will stop collecting information on maintenance forecast, causing the correct maintenance timing not to be calculated.	Enabled
(2) Collection Level of Information	Five levels can be specified to collect information on maintenance. * As the information collection level gets higher, the accuracy of maintenance improves, but it may extend the takt time.	1 (recommended)
(3) The Interval of the Forecast	Specify the interval of maintenance time notification.	6 hours
How to Inform	When the grease replenishment, belt replacement, and other maintenance times have been reached, they can be notified by generating a warning or outputting a dedicated signal. As for the battery replacement time, any of warnings C7500, C7510, and C7520 is generated regardless of whether [Warning] under [How to inform] is selected. The warning generated varies depending on each situation.	
(4) Warning	Selecting this item will notify the maintenance time as a warning. Warning numbers are as follows: Grease: C753* (* represents an axis number.) Belt: C754* (* represents an axis number.)	Selected
(5) Output Signal and Signal#	If this item is selected, signal numbers can be entered. If this item is selected and a signal number is entered correctly, the maintenance time will be notified by outputting the designated signal.	Not selected
(6) Assumption Operation Time of a Day	Enter estimated robot operation hours per day.	16 hours
(7) The Remainder Days Until Presumed Maintenance Time: *** day(s)	Specify the remaining days until estimated maintenance time for use as a reference to notify the maintenance time.	14 days

Point

How to reset the generated warning and output warning signal

There are two method for notifying the replacement timing of each part: Warnings (C753*, C754* (* represents an axis number)) and output of the dedicated output signal (M*PTEXC (* represents a robot number)).

If both methods are set in "How to Inform", it is possible to turn off the warning occurrence and signal output by resetting the error.

If "Warning" is set to disabled in "How to Inform" and only "Output Signal" is set to enabled, the output signal will not be turned off even if the reset button* at the front of the controller is pressed. In this case, pressing the [RESET] key on the T/B or inputting the error reset signal (ERRRESET) will turn off the output signal.

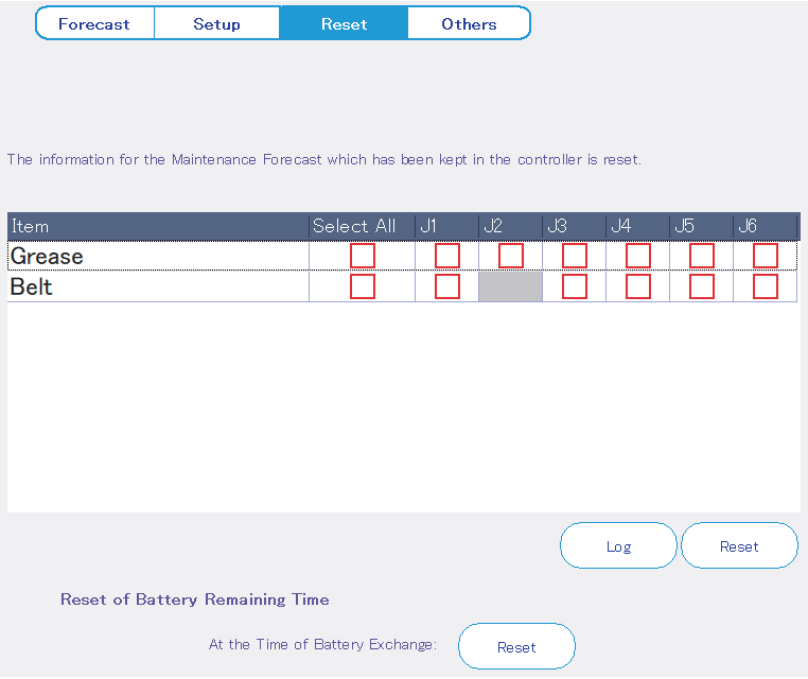
How to Inform settings		How to Inform	How to reset notification (warning or dedicated signal output)		
Warning	Output Signal		[RESET] on the front of the controller	[ERROR RESET] on the T/B	Error reset signal from outside
☑	☐	Warning	Resettable		
☑	☑	Warning and dedicated signal output	Warning and dedicated signal resettable		
☐	☑	Dedicated signal output	Not resettable	Resettable	

* The CR800 series controllers and CR751 series controllers do not have a reset button on the front.

Reset

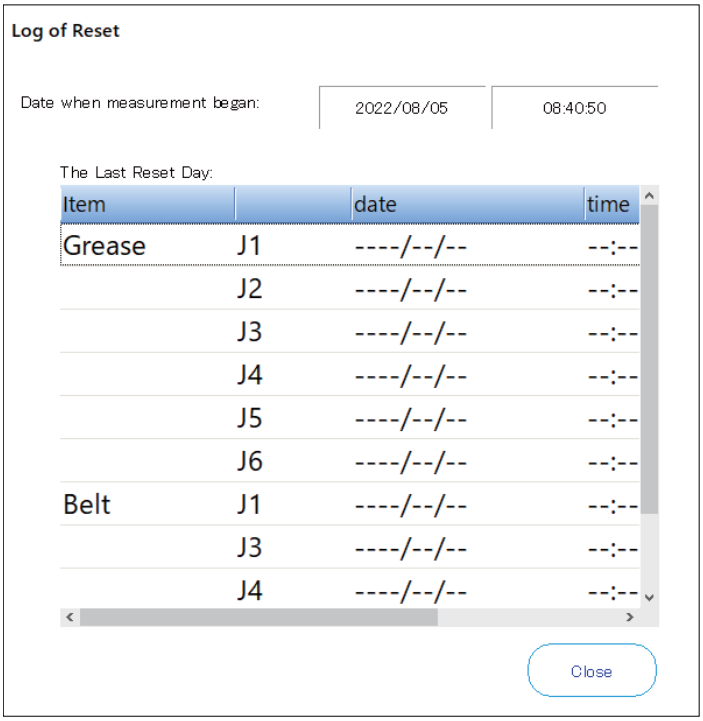
If a warning that calls for battery replacement, grease replenishment, or belt replacement by the maintenance forecast function occurs, and replacement or replenishment has been performed, the data of the relevant axis that is stored in the controller needs to be reset.

On the Reset screen, information on battery, grease, and belt used for maintenance forecast stored in the controller can be reset.



Type of reset	Description	Note
At the time of battery replacement	When any of the warnings (C7500, C7510, and C7520) that call for battery replacement occurs, and the battery has been replaced, use this reset function. Be sure to reset the battery remaining time after the battery has been replaced.	When the CR800 series controller is connected, this information is not displayed.
At the time of grease replenishment	When a warning (warning numbers in the 7530s) that calls for periodic inspection or grease replenishment, or other case occurs, and grease has been replenished, use this reset function for the relevant axis.	Reset information joint axis by joint axis. Information on multiple joint axes can be reset at a time.
At the time of belt replacement	When a warning (warning numbers in the 7540s) that calls for periodic inspection or belt replacement, or notifies damage on a belt, or other case occurs, and the belt has been replaced, use this reset function for the relevant axis.	Reset information joint axis by joint axis. Information on multiple joint axes can be reset at a time.

Tapping [Log] allows you to refer to the last reset date/time and reset count.
However, the battery reset count is not displayed.
If resetting has never been performed, "----/--/-- --:--:--" is displayed.

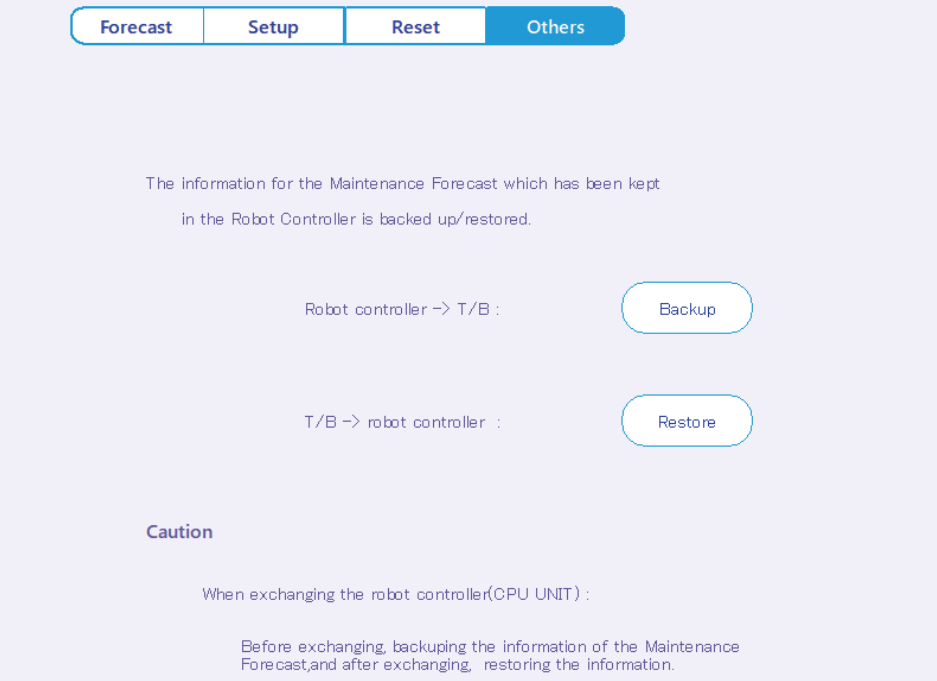


Others

⚠CAUTION

Backup and restore information when replacing the controller (CPU module).
When replacing the controller (CPU module), perform a full backup and restore using the Backup/Restore tool. Also, be sure to back up information on maintenance forecast before replacement, and restore the backed-up information after replacement.
Perform backup and restore between controllers of the same version. Otherwise, an error may occur.
After the controller (CPU module) has been replaced, if information on maintenance forecast is not restored, or it is restored after a substantial time has elapsed since the time of backup, note that the reliability of maintenance forecast will decrease.

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



14.4 Releasing brakes

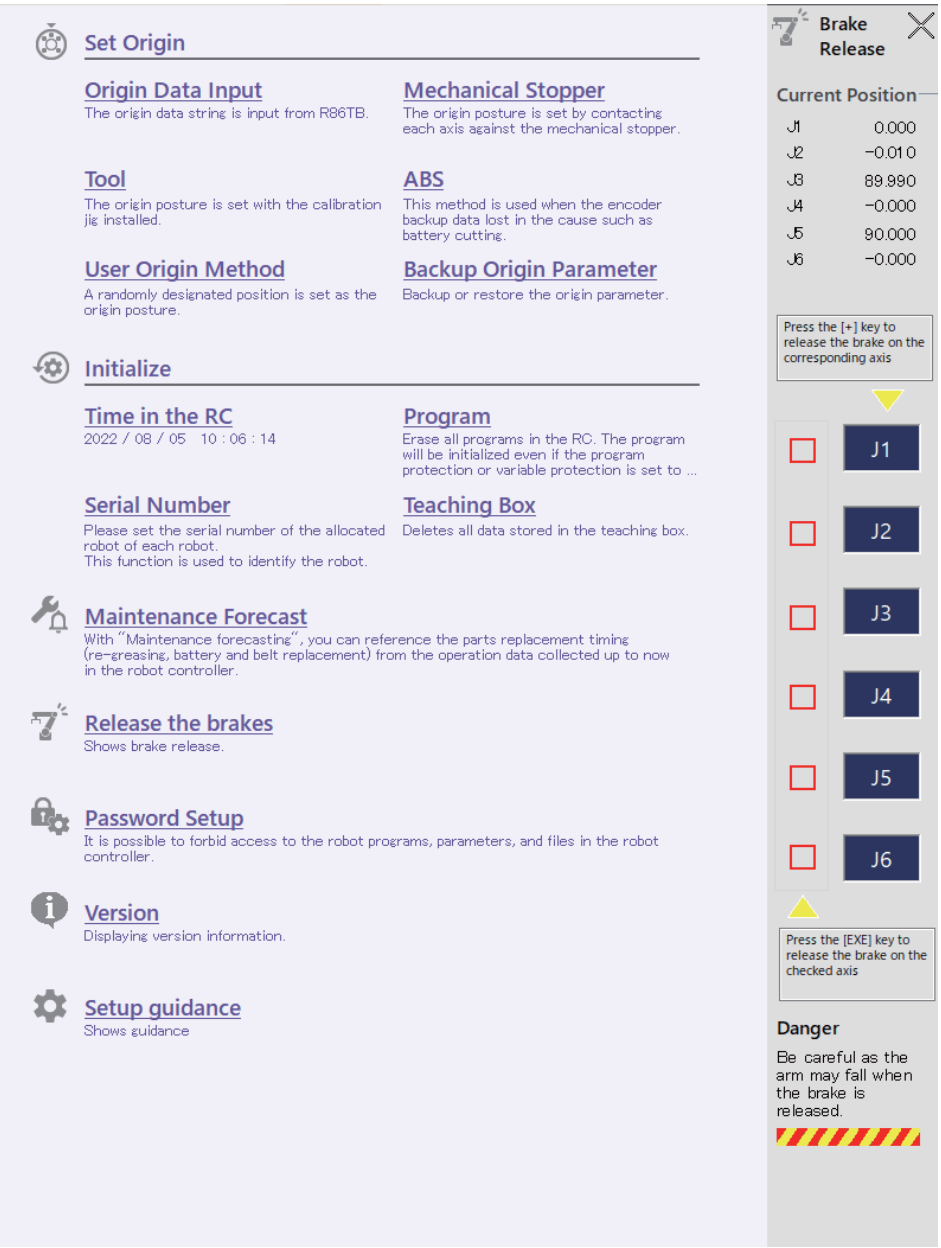
⚠CAUTION

The robot arm may fall under its own weight depending on which brake is released or how the robot is configured.
A person other than the T/B operator should prevent the arm from falling before this operation. Ensure that they give signals to each other during this operation.

Release the brake while the servo power is turned off.

Use this operation when directly moving the robot arm by hand.

Tapping [Release the brakes] on the maintenance menu screen will display the brake release operation guide.



Releasing the brake of one axis

As a safety measure, be sure to use two people to release the brake.

1. Change the controller mode to MANUAL.
2. One person should lightly hold down the 3-position enable switch on the teaching pendant.
3. The other person should support the robot arm to release its brake.
4. The brake will be released while the [+] button with the corresponding axis name (sheet key) is pressed.

Releasing the brakes of two or more axes

As a safety measure, be sure to use two people to release the brakes.

1. Change the robot controller mode to MANUAL.
2. One person should lightly hold down the 3-position enable switch on the teaching pendant.
3. The other person should support the robot arm to release the brakes.
4. Select axes to release the brakes.
5. The brakes will be released while the [EXE] button (sheet key) is pressed.

14.5 Robot controller security function (password settings)

It is possible to restrict access to the robot programs, parameters, and files in the robot controller.

The security function is supported with the following controller software versions.

Controller name	Supported software version
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.S3 or later
CR750-Q/CRnQ-700	Ver.R3 or later

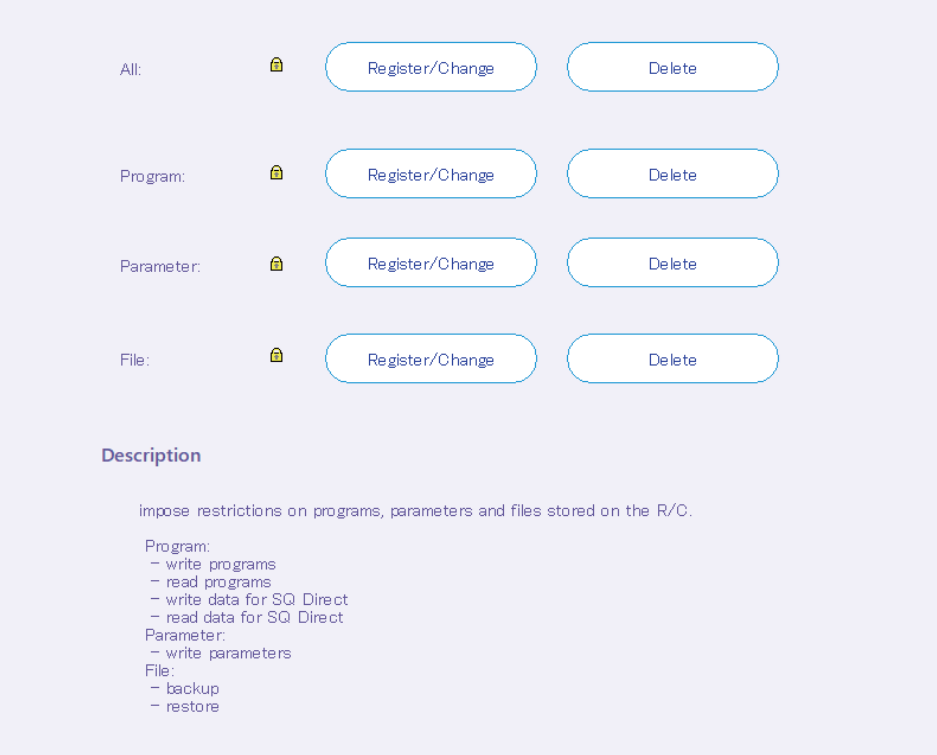
It is possible to restrict access to the following functions.

The password for access to programs, parameters, and files can be individually set or unlocked.

The security function of the controller is set to off from the factory.

Type	Access-restricted function	Remarks
Program	• Writing programs	
	• Reading programs	
	• Copying programs	
	• Renaming programs	
	• Deleting programs	
	• SQ Direct data writing	
	• SQ Direct data reading	
	• Initializing programs	
	• File manager	Files cannot be deleted and renamed.
Parameter	• Writing parameters	Parameters can be read.
	• Position repair function	It is not possible to write generated revision parameters to the controller.
	• Transferring backed-up origin data	
	• Restoring program information	
File	• Backup	
	• Restore	
	• Position repair function	

Tap [Password Setup] on the maintenance menu screen.



When the security function has been turned on, the mark is displayed on the left of the button of the item to which access is restricted.

Password registration

⚠CAUTION

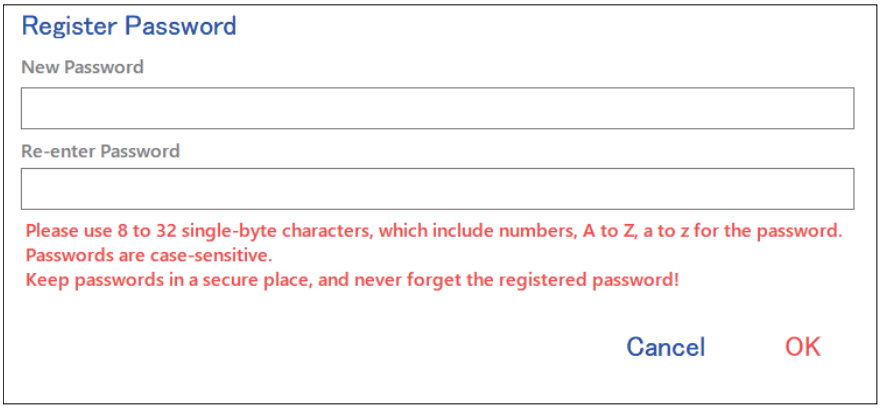
Pay sufficient attention to password management.
The security function of the robot cannot be deactivated without entering the correct password. Pay sufficient attention to password management.

Register a password in the controller.

On the Password Setup screen, tap [Register/Change] of the item for password registration. After entering a password on the Register/Change Password screen, tap [OK]. The entered password will be shown with "*" or "●".

Set a password that is 8 to 32 single-byte characters in length. The following characters can be used.

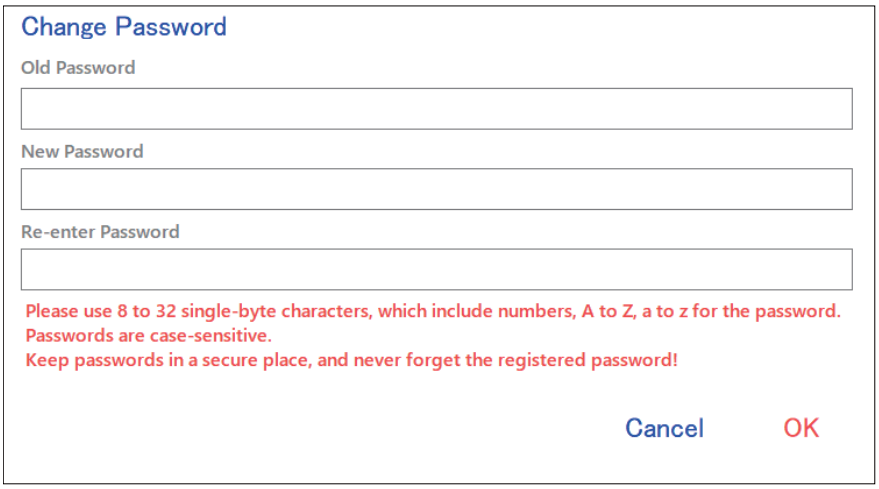
Characters available for passwords (8 to 32 single-byte characters)
Numbers (0 to 9) Alphabets (A to Z, a to z) (Note) They are case-sensitive.



Changing the password

Change the password set on the controller.

On the Password Setup screen, tap [Register/Change] of the item for password change. Enter the current password and a new password on the Register/Change Password screen, then tap [OK].

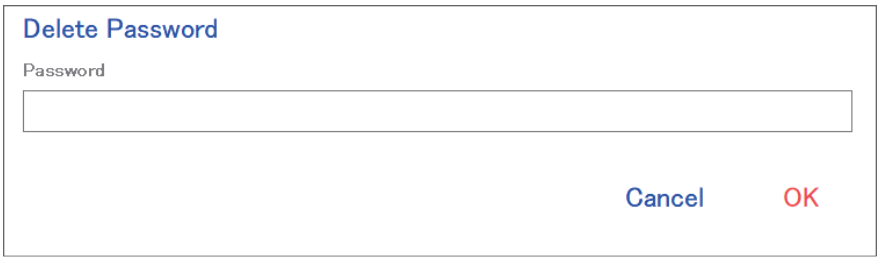


If the same password has been registered for all the items, the password can be changed at a time.

Deleting the password

Delete the password set on the controller.

Tap [Delete] of the item for password deletion on the Password Setup screen. Enter the current password on the Delete Password screen, then tap [OK].

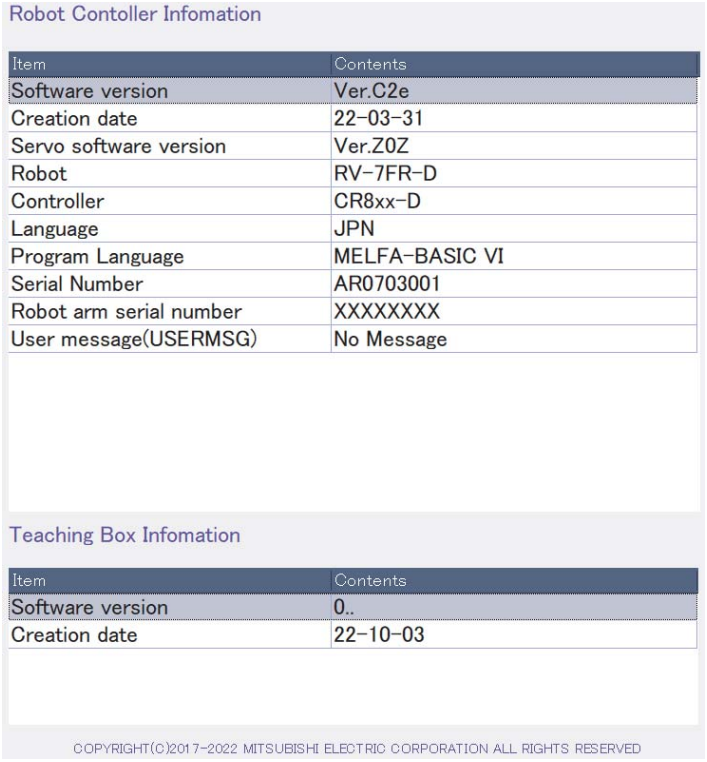


If the same password has been set for all the items, the password can be deleted at a time.

14.6 Version

The software versions of the robot controller and T/B can be checked.

Tap [Version] on the maintenance menu screen.



15 BACKUP AND RESTORE

⚠CAUTION

• If a password is registered in files by the security function of the controller, backup and restore cannot be performed.
To perform a backup or restore, delete the password of the security function. For information on how to delete the password, refer to the following page:
☞ Page 244 Deleting the password

Information in the controller can be backed up to the T/B or USB memory.

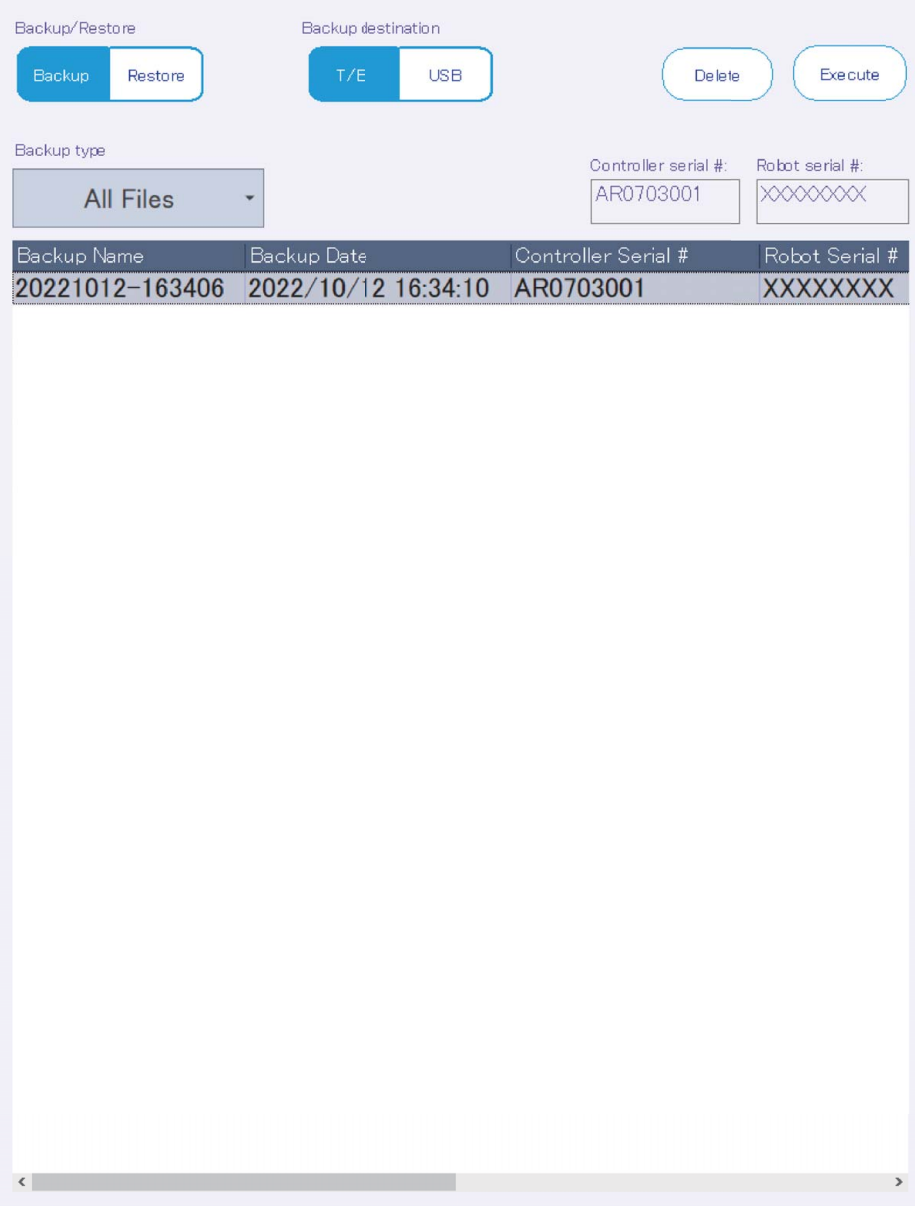
Backup data stored on the T/B or USB memory can be restored to the controller.

☞ Page 246 Backup
☞ Page 247 Restore

15.1 Backup/restore screen

Tapping [Backup] in the menu will display the backup/restore screen.

Select which operation you want to perform from [Backup/Restore] at the top left of the screen.



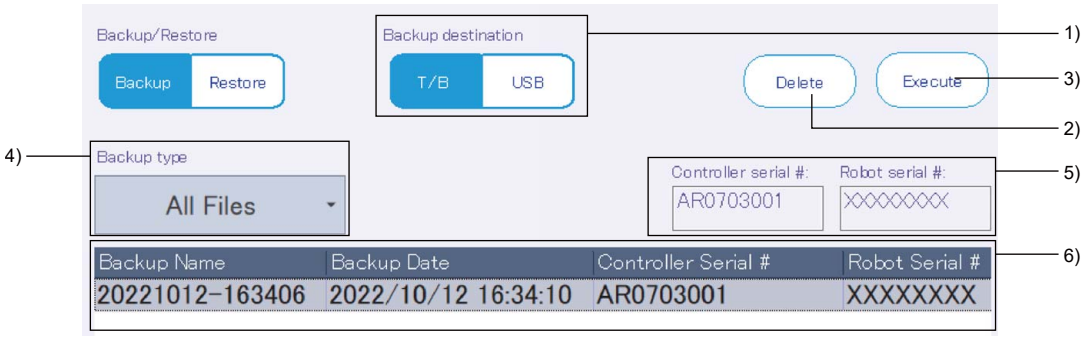
15.2 Backup

⚠CAUTION

- To backup the values of robot (system) status variables or program external variables, reset the power of the controller, then perform a backup.
- System file created at the time of backup

When a backup is performed, BKUP.SYS and MECHA.SYS files will be created automatically. Note that deleting or overwriting these files will cause backed-up data not to be edited in offline mode or not to be restored to the controller.

Information in the controller is saved on the T/B or USB memory.



No.	Name	Description
1)	Backup destination	Select where to save backup data.
2)	Delete	Delete backup data saved on the T/B or USB memory.
3)	Execute	Perform a backup.
4)	Backup type	Select the backup type. ☞ Page 246 Backup information
5)	Serial #	Displays the serial numbers of the controller and robot being connected.
6)	Backup data list	Displays the list of backup data saved on the T/B or USB memory. It displays only the backup data selected by Backup type.

Backup information

There are four types of backup.

All Files	Backs up all the files (robot programs, parameter files, etc.) in the controller. To backup/restore data for the same robot, batch back up data.
Program	Backs up robot program files only. It is useful when restoring only robot programs to another robot.
Parameter Files	Backs up parameter files only. It is useful when restoring only parameter files to another robot.
System Program	Saves system base program files. System base programs contain system variables. This type is used to back up system variables only.

■Backing up the parameter list

Selecting [All Files] or [Parameter Files] from Backup type will display [Backup parameter list] in the dialog in the process of backup execution.

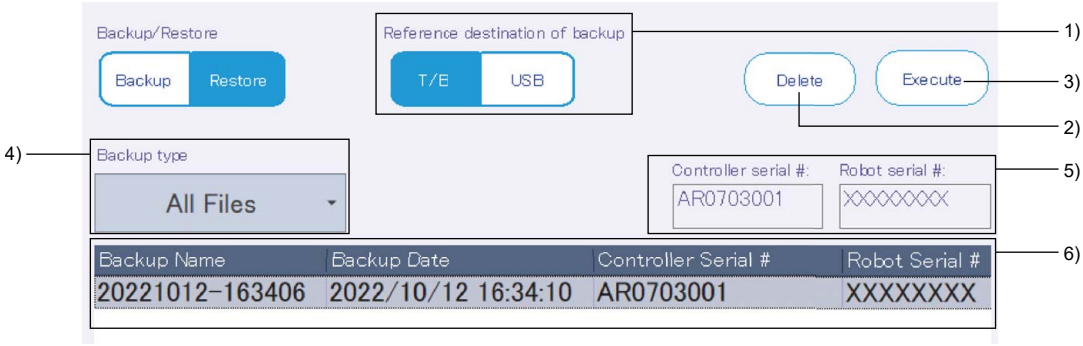
When editing the parameter saved through the backup process using RT ToolBox in offline mode, select the check box.

For backup only, the check box does not need to be selected.

Deselecting the check box will shorten the time required for backup.

15.3 Restore

Backup data stored on the T/B or USB memory is transferred to the controller.



No.	Name	Description
1)	Reference destination of backup	Select the reference destination of backup data used for restore.
2)	Delete	Delete backup data saved on the T/B or USB memory.
3)	Execute	Perform a restore.
4)	Backup type	Select the restore type. ☞ Page 247 Restore information
5)	Serial #	Displays the serial numbers of the controller and robot being connected.
6)	Backup information list	Displays the list of backup data saved on the T/B or USB memory. It displays only the backup data selected by Backup type.

Restore information

There are four types of restore.

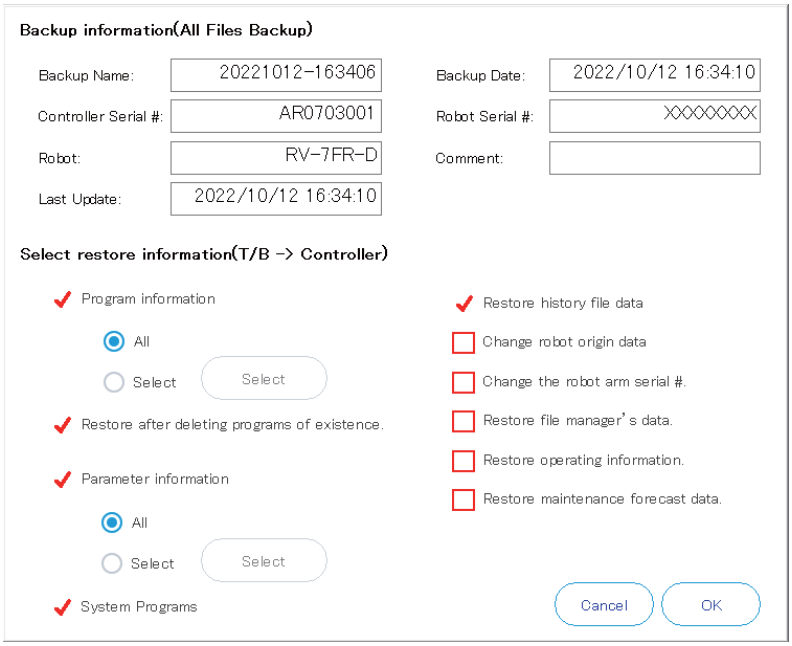
All Files	Initializes all the information in the controller, then transfers all the files (except BKUP.SYS and MECHA.SYS) in the specified folder to the controller.
Program	Transfers the robot program files in the specified folder to the controller.
Parameter Files	Transfers the parameter files in the specified folder to the controller.
System Program	Transfers the system base program files in the specified folder to the controller.

Restore settings

Once a restore is performed, the restore setting screen will appear.

The restore setting screen allows you to select information you want to restore. Selectable items differ depending on the type of restore.

Note that origin data or position revision parameters may change if communication is canceled in the process of restore.



■Program information

When [All] is specified, all the robot program files in the folder will be transferred to the controller.

When [Select] is specified, the robot program files specified within the folder will be transferred to the controller. When [Select] is tapped, files to be transferred can be selected.

■Restore after deleting programs of existence

Selecting the check box will perform a restore after all the robot programs in the controller have been deleted.

■Parameter information

When [All] is specified, all the parameter files in the folder will be transferred to the controller.

When [Select] is specified, the parameters specified within the folder will be transferred to the controller. When [Select] is tapped, parameters to be transferred can be selected.

■System Programs

Selecting the check box will transfer the system base program files in the specified folder to the controller.

■Restore history file data

It is available only when "All Files" is selected in Backup type.

Selected: The error history of the controller is replaced with that of backup data.

Not selected: The error history file of backup data is not transferred.

■Change robot origin data

It is available only when "All Files" or "Parameter Files" is selected in Backup type.

Selected: The origin data and position recovery parameter of the controller are replaced with those of backup data.

Not selected: Retains the origin data and position recovery parameter of the controller.

■Change the robot arm serial #.

It is available only when "All Files" or "Parameter Files" is selected in Backup type.

Selected: The robot serial number of the controller is replaced with that of backup data.

Not selected: Retains the robot serial number of the controller.

■Restore file manager's data.

It is available only when "All Files" is selected in Backup type.

Selected: Files stored in the NG folder are also transferred and replaced.

Not selected: Files stored in the NG folder are not transferred.

■Restore operating information.

It is available only when "All Files" or "Parameter Files" is selected in Backup type.

Selected: The operating information of the controller is replaced with that of backup data.

Not selected: Backed up operation information files are not transferred.

■Restore maintenance forecast data.

It is available only when "All Files" or "Parameter Files" is selected in Backup type.

Selected: Information related to the controller's maintenance forecast and preventive maintenance/predictive maintenance (supported models only) is replaced with the contents in the backup data's maintenance forecast and preventive maintenance/predictive maintenance files.

Not selected: Backed up maintenance forecast and preventive maintenance/predictive maintenance (supported models only) files are not transferred.

Restore complete

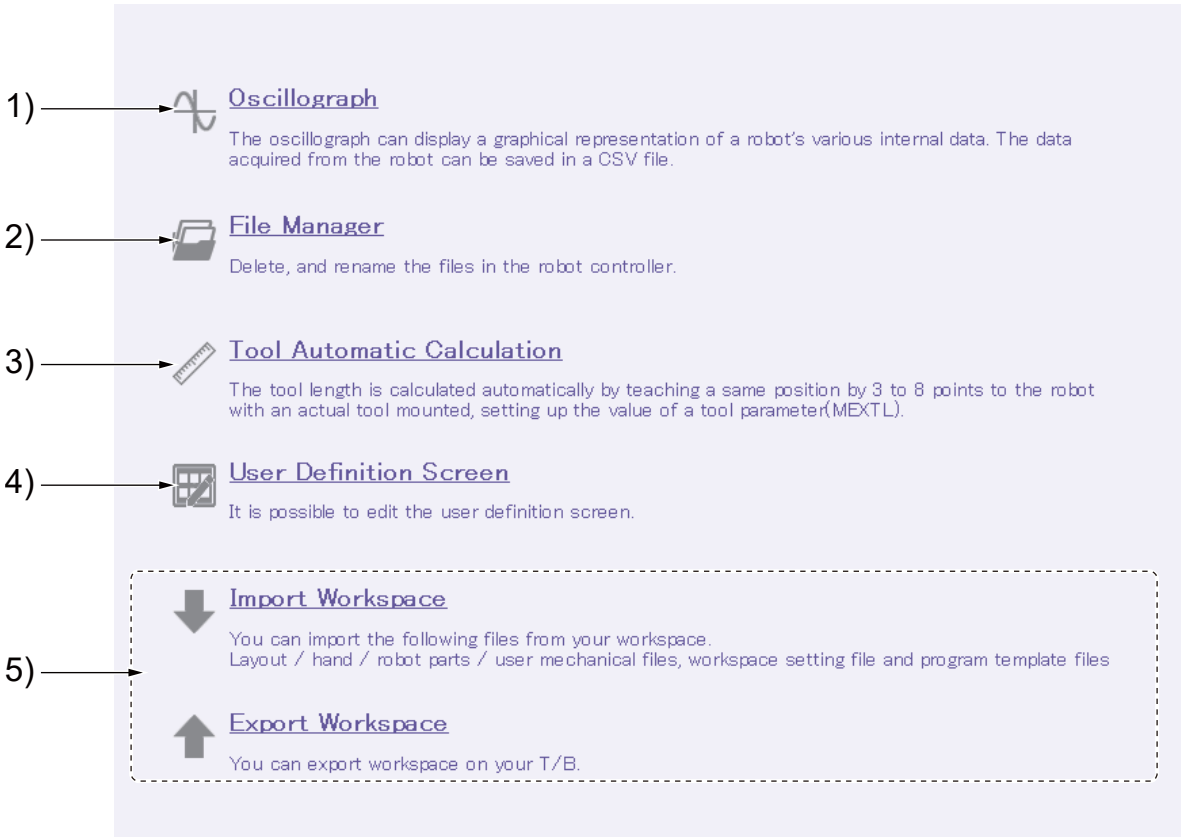
To apply the restored information, cycle the power of the controller.

When the CR800-D/CR750-D/CR751-D/CRnD-700 series controller is connected, the controller power can be reset from the T/B.

When the CR800-R/CR800-Q/CR750-Q/CR751-Q/CRnQ-700 series controller is connected, reset the power with the power switch on the controller, etc.

16 TOOL FUNCTIONS

Tapping [Tool] in the menu will display the tool menu screen.
The tool menu screen is composed as follows:



No.	Name	Description
1)	Oscillograph	Displays data inside the robot on a graph. ☞ Page 252 Oscillograph
2)	File Manager	Used to copy, delete, or rename files in the controller. ☞ Page 262 File management
3)	Tool Automatic Calculation	Used to measure the length of the tool attached to the robot automatically and set the values of the tool parameter (MEXTL). ☞ Page 264 Tool automatic calculation
4)	User Definition Screen	Used to create and display a user definition screen. ☞ Page 266 User definition screen
5)	Import/Export Workspace	Used to import or export workspaces. ☞ Page 286 Importing/exporting workspaces

16.1 Oscillograph

The oscillograph functions of the R86TB and RT ToolBox3 cannot be used at the same time.
Attempting to use both the functions will end the oscillograph function that has started first.
Oscillograph is a function to display various data inside the robot on a graph.
Data obtained using the oscillograph function can be saved or reread as a CSV file.
Long hour data recording is possible by specifying the data saving interval.
In addition to various data, program names, execution line numbers, and I/O signals can also be recorded at the same time.

Real time monitor settings

To use the oscillograph function, enable the real time monitor mode of the controller.
For information on how to set the real time monitor, refer to the following page:
☞ Page 157 Real time monitor
The specifications of the real time monitor are as follows.

Item	Description
Maximum number of data that can be stored	80,000 (Data acquisition possible for approx. 9 minutes)
Acquirable data	Up to 4 data sets can be selected and acquired. ☞ Page 252 Acquirable data
Data acquisition interval	CR800 series: 3.5msec max. CR750/700 series: 7.1msec max.
Supported controller software version	CR800 series: All versions CR750/700 series: S4b, R4b or later

Acquirable data

The following table shows the list of data that can be acquired from the robot.

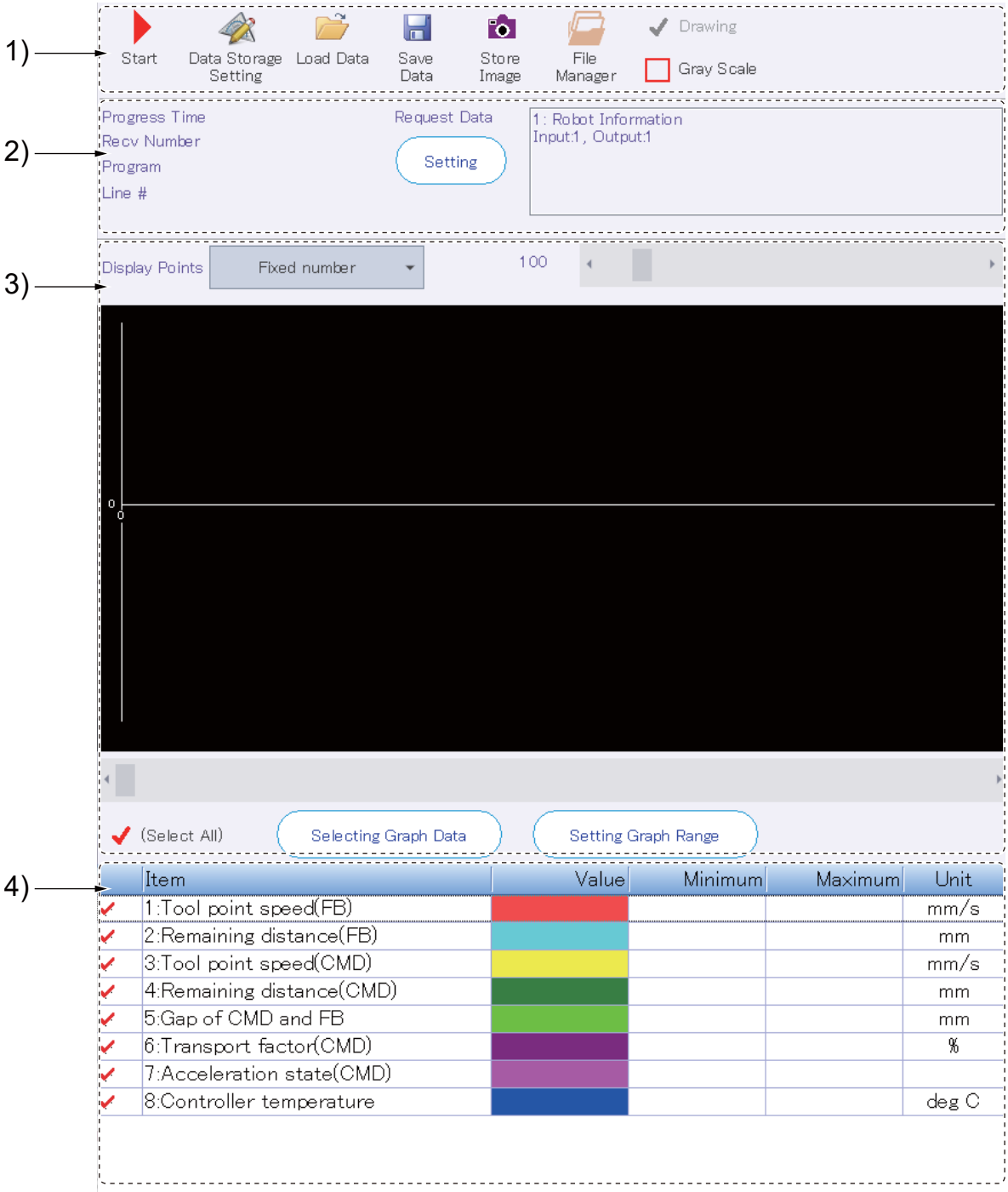
Notation on graph	Unit	Explanation
Current feedback	[Arms]	Motor current value
Axis load level	[%]	Load ratio of each motor displayed as an alarm level
Position feedback	[Pulse]	Motor rotation position displayed as an encoder pulse value
Joint position(CMD)	[mm deg]	Current joint position
XYZ position(CMD)	[mm deg]	Current XYZ position
Joint position (FB)	[deg]	Joint feedback position
XYZ position (FB)	[mm deg]	XYZ feedback position
Position droop	[Pulse]	Deviation amount of the motor rotation position with respect to the position command
Speed (FB)	[rpm]	Current motor rotation speed
Voltage	[V]	Power voltage value
RMS current	[Arms]	Effective motor current value (RMS)
Regeneration level	[%]	Regenerative current value of each axis displayed as an alarm level
Encoder temperature	[deg C]	Encoder temperature of each axis (can be acquired with the F series or later)
Current command	[Arms]	Current command to the motor
Tolerable command +	[Arms]	+ side of the current command set for the motor of each axis
Tolerable command -	[Arms]	- side of the current command set for the motor of each axis
Force sensor	[N Nm]	Input value from the force sensor
Force sensor(+resultants)	[N Nm]	Input value (resultant force and resultant moment) from the force sensor
Force pos CMD(XYZ)	[mm rag]	Move command calculated by force sense control
COL threshold +	[0.1%] Ratio to the rated current	Upper detection threshold (+ side) of the collision detection function
COL threshold -	[0.1%] Ratio to the rated current	Upper detection threshold (- side) of the collision detection function

Notation on graph		Unit	Explanation
COL presumed torque		[0.1%] Ratio to the rated current	Estimated torque of the collision detection function
COL torque		[0.1%] Ratio to the rated current	Actual torque of the collision detection function
Ref. value of COL level		[%]	Displays the difference between the estimated torque and the actual torque for collision detection level (ColLvl command, parameter COLLVL, COLLVLJG setting). The value is displayed while the collision detection is enabled and the servo is on.
Error of presumed torque		[% rating]	Absolute value of difference between the estimated torque of each axis and the actual torque (The value is displayed only when torque width monitoring is enabled for the safety option.)
Ex-T coordinates speed		[mm/s]	Ex-T coordinate transit speed during Ex-T control/Ex-T spline interpolation
Ex-T coordinates position		[mm deg]	Current position in the Ex-T coordinate system
Spline path point of adjusted speed		—	Path point number on which speed adjustment occurred during spline interpolation/Ex-T spline interpolation
Robot information	Tool point speed(FB)	[mm/s]	Speed (feedback value) of the tool center point
	Remaining distance(FB)	[mm]	Remaining distance (feedback value) to the target position for interpolation in progress
	Tool point speed(CMD)	[mm/s]	Speed (command value) of the tool center point. Same as the robot status variable M_RSpd.
	Remaining distance(CMD)	[mm]	Remaining distance (command value) to the target position for interpolation in progress. Same as the robot status variable M_RDst.
	Gap of CMD and FB	[mm]	Difference between the commanded position and the feedback position. Same as the robot status variable M_Fbd.
	Transport factor(CMD)	[%]	Arrival rate (command value) to the target position during operation
	Acceleration state(CMD)	—	Acceleration status during operation (command value) [0 = stop, 1 = acceleration, 2 = constant speed, 3 = deceleration] Same as the robot status variable M_AclSts.
	Controller temperature	[deg C]	Temperature in the controller
Safety input		—	Turned on when either safety input signal A or safety input signal B is off.
Safety input signal A		—	Input signals 128 through 135
Safety input signal B		—	Input signals 160 through 167
SCNI Signal		—	Input signals 1264 through 1271
INPUT		—	Input signal of 32 consecutive points
OUTPUT		—	Output signal of 32 consecutive points
Predictive maintenance score (speed reducer abnormality)		—	Current abnormality score of the reduction gear (wave gear unit)
Predictive maintenance score (encoder data error)		—	Current abnormality score of encoder data
Predictive maintenance score (encoder communication error)		—	Current abnormality score of encoder communication

Oscillograph screen

Tapping [Oscillograph] on the tool menu screen will display the oscillograph screen.

The oscillograph screen is composed as follows:



No.	Name	Description
1)	Menu	Used for purposes such as starting or stopping data recording and saving or reading log files. ☞ Page 256 Start/stop ☞ Page 259 Data saving settings
2)	Information display area	Displays information such as the data reception status and the program being executed. Data to be acquired from the controller can also be set. ☞ Page 255 Communication settings
3)	Graph display area	Displays data acquired from the controller on a graph. The number of data sets to be displayed on the graph, vertical and horizontal axes of the graph can also be set. ☞ Page 256 Graph settings
4)	List of elements displayed on the graph	Lists the items displayed on the graph. ☞ Page 258 List of elements displayed on the graph

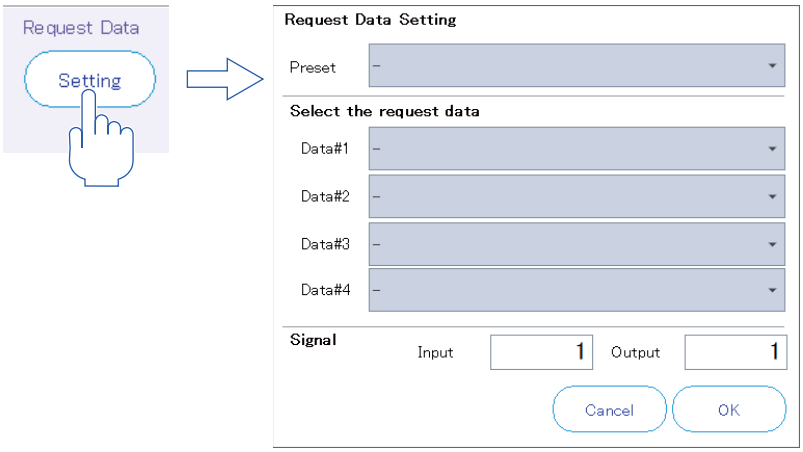
Communication settings

CAUTION

• To display the program name and execution line number in the information display area, specify "Robot Information" in the Request Data settings.

Specify data to be acquired from the controller.

Tapping [Setting] in the information display area will display the communication setting dialog.



Specify which data you want to acquire from the controller as request data.

To acquire I/O signals, enter the start numbers of each signal.

Signals of 32 consecutive points starting with the entered number are acquired from the controller.

You can also specify a combination of frequently used data sets with the preset.

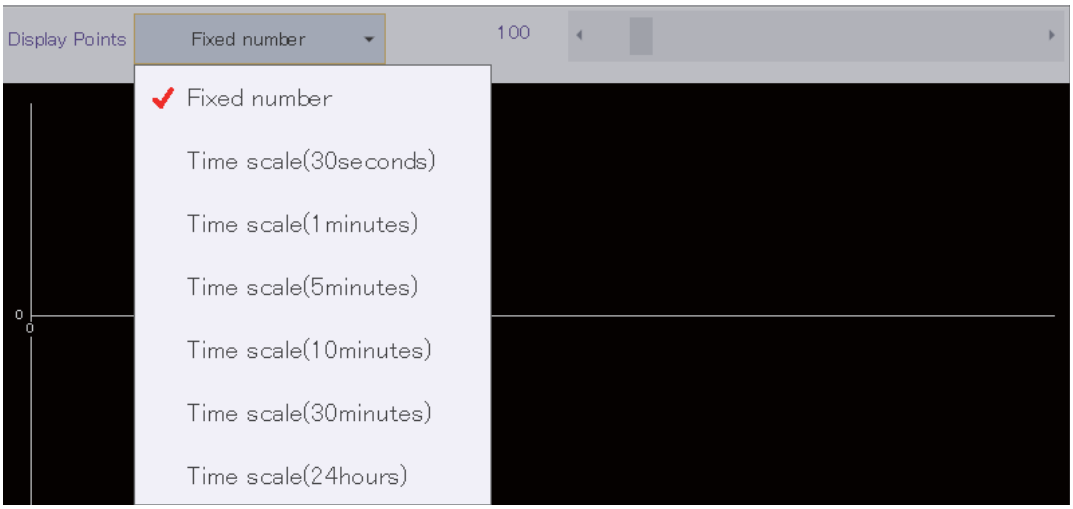
Preset name	Request data	Application
Force sense setting	Force sensor(+resultants)	Estimating the optimal posture and movement while checking the values of the force sensor
	Force pos CMD(XYZ)	
	XYZ position(FB)	
	Robot Information	
Collision detection setting	COL torque	Adjusting the optimal value for collision detection
	COL threshold +	
	COL threshold -	
	Ref. value of COL level	
Collision detection error investigation	Speed(FB)	Investigating the causes of errors found in collision detection
	Current feedback	
	Ref. value of COL level	
	Robot Information	
Failure investigation(General)	Current feedback	Investigating the causes of failures when errors occur (for general investigation)
	Speed(FB)	
	Joint position(FB)	
	Robot Information	
Failure investigation(Overload error)	Speed(FB)	Investigating the causes of failures when overload errors occur
	Current feedback	
	Axis load level	
	Robot Information	
Failure investigation(Power supply voltage)	Speed(FB)	Investigating the causes of failures when power supply voltage-related errors occur
	Current feedback	
	Voltage	
	Regeneration level	
Predictive maintenance	PM score (gear)	Detecting abnormality and deterioration of robot components as soon as possible (Available only when the MELFA Smart Plus predictive maintenance function is enabled.)
	PM score (encoder data)	
	PM score (encoder com.)	
	—	

Start/stop

Tapping [Start] in the menu will start drawing a graph by acquiring data from the controller.
Deselecting the [Drawing] check box on the right side of the menu will stop the drawing.
To stop acquiring data, tap [Stop].

Display points of the graph

The number of data points displayed on the graph can be specified by number or time.
Select a specification method from the drop-down list above the graph display area, then set a value using the scroll bar.



Graph settings

Select items to be displayed on the graph's horizontal axis and the graph.
The graph settings can be changed even during data acquisition.
Tapping [Selecting Graph Data] in the graph display area will display a dialog.

Item	Setting
Horizontal Axis	Select time or acquired data for the graph's horizontal axis.
Graph Data	Select types of data to be displayed on the graph.

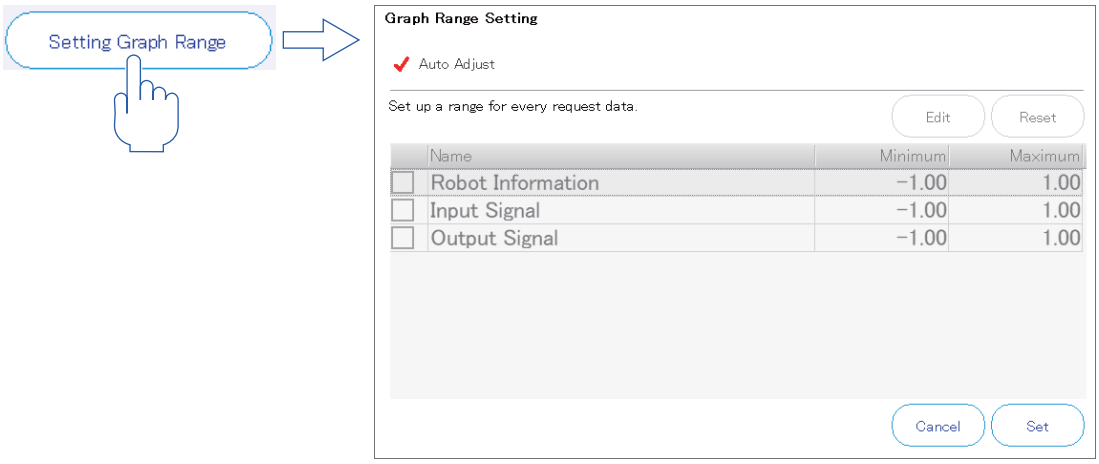
Tapping [Clear All] will unselect all the items in the Graph Data settings.
Tapping [OK] will apply the settings to the graph.

Display range settings

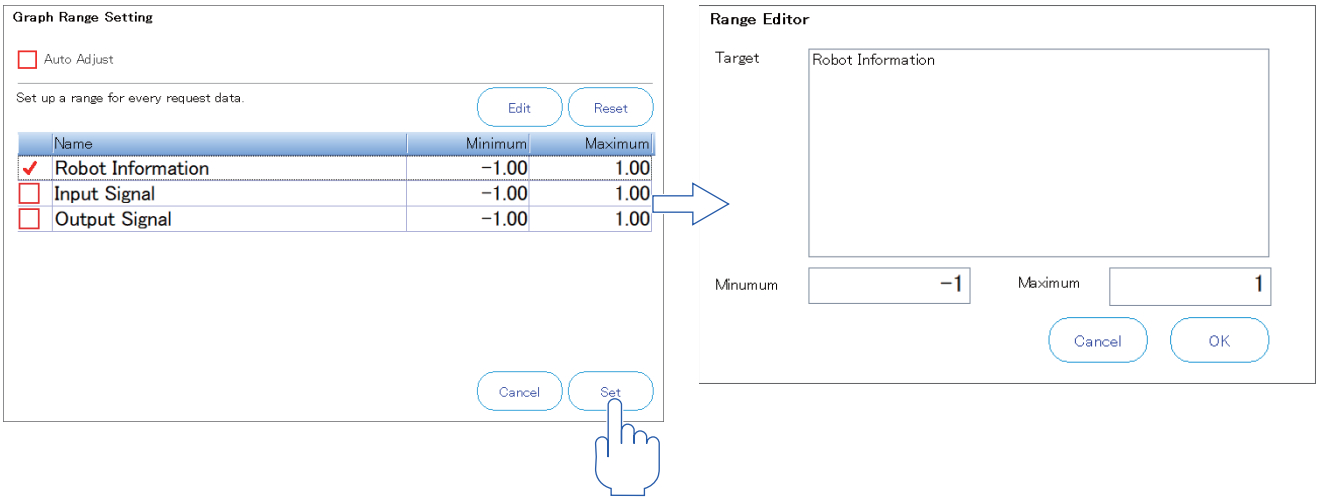
The display range of the vertical axis for each data can be set.

Tapping [Setting Graph Range] in the graph display area will display a dialog.

Selecting the [Auto Adjust] check box will automatically adjust the vertical axis of the graph.



Select an item you want to set, then tap [Edit]. The minimum and maximum values of the display range can be set.



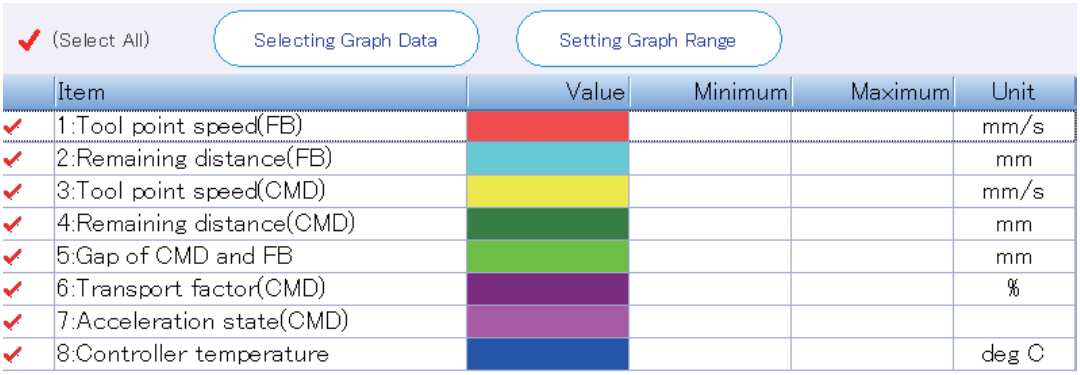
Tapping [Reset] will match the minimum and maximum values of the selected data to those of the current data.

Selecting multiple items allows you to simultaneously set or reset them.

List of elements displayed on the graph

The items selected in [Selecting Graph Data] will be listed.

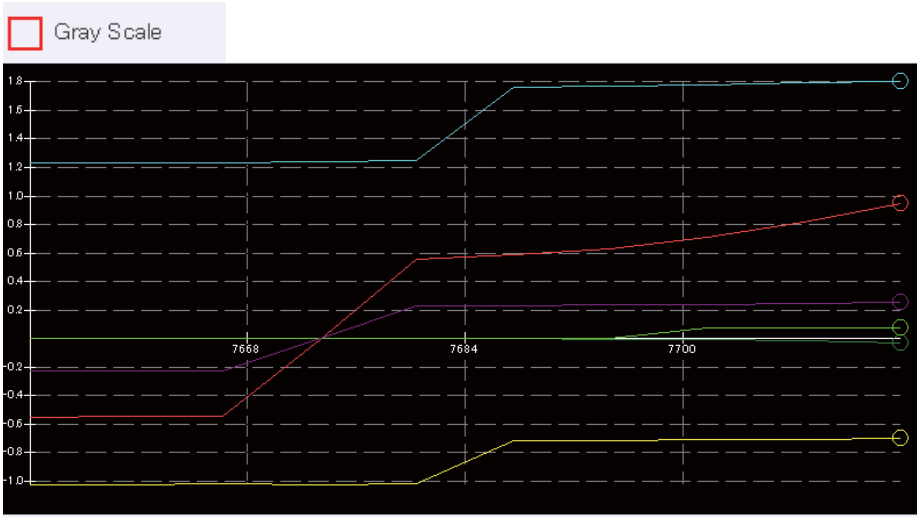
The check boxes on the left can be used to show or hide the items on the graph.

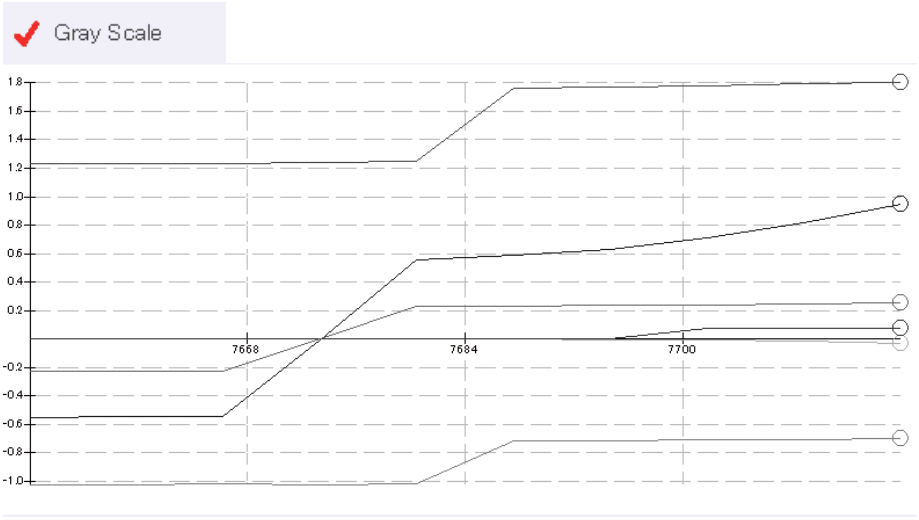


	Item	Value	Minimum	Maximum	Unit
✔	1:Tool point speed(FB)				mm/s
✔	2:Remaining distance(FB)				mm
✔	3:Tool point speed(CMD)				mm/s
✔	4:Remaining distance(CMD)				mm
✔	5:Gap of CMD and FB				mm
✔	6:Transport factor(CMD)				%
✔	7:Acceleration state(CMD)				
✔	8:Controller temperature				deg C

Gray scale of the graph

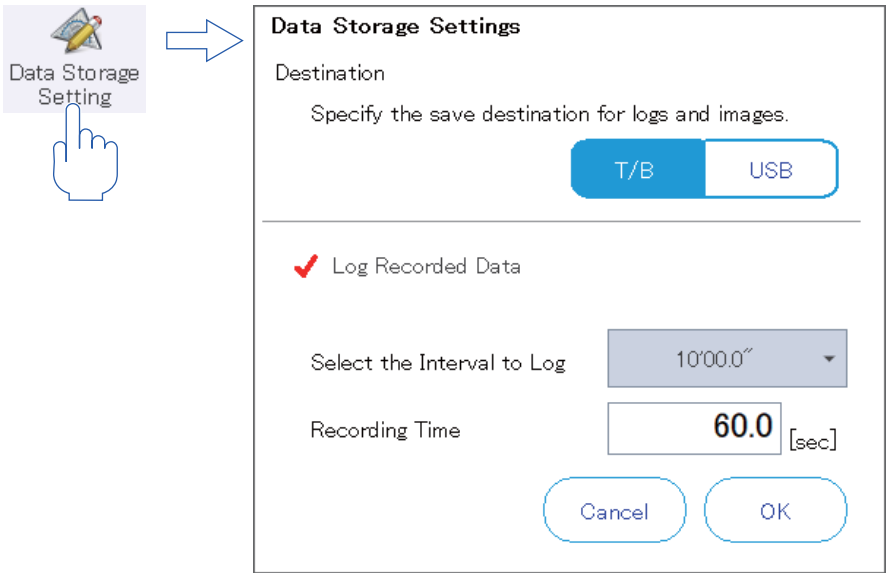
Selecting the [Gray Scale] check box in the menu will switch the graph to the gray scale display.





Data saving settings

The save destination of data recorded using the oscillograph function and the method of recording log data can be set.
Tapping [Data Storage Setting] in the menu will display a dialog.

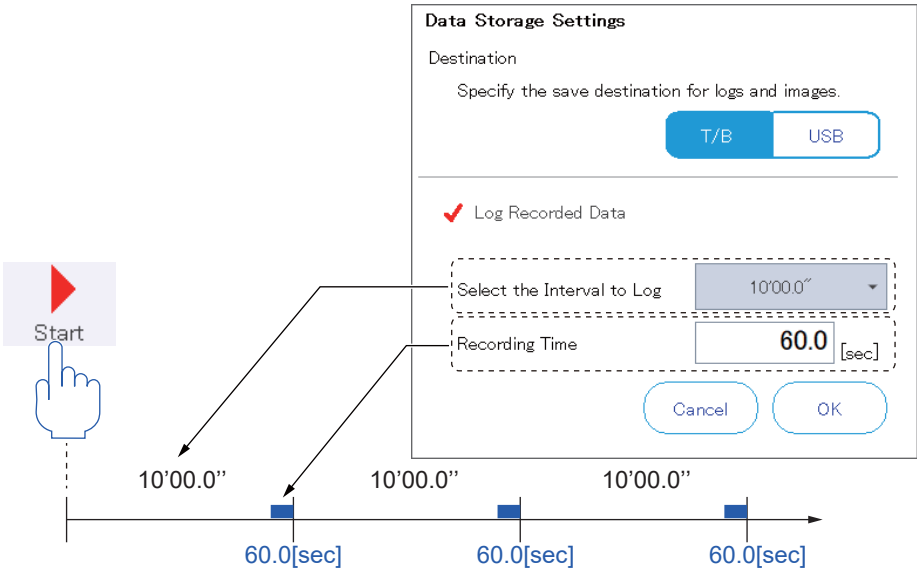


Select a data save destination from T/B or USB.
The data save location (folder) is as follows.

Save destination	Data type	Save location (folder)
TB	Log file	My document\MELFA_TB_WORKSPACE\RC1\Oscillograph\Log
	Image file	My document\MELFA_TB_WORKSPACE\RC1\Oscillograph\Image
USB	Log file	Directly under the USB memory root area
	Image file	Directly under the USB memory root area

Log file saving

Selecting the [Log Recorded Data] check box will write data to a log file at constant time interval.
The interval of writing log files can be set from the [Select the Interval to Log] drop-down list.
Selecting a log save interval of three minutes or more allows you to set [Recording Time]. Setting [Recording Time] will save log data for the specified period of time at the set log save interval. Up to half the log save interval can be set in [Recording Time].
However, if the log save interval is set to 10 minutes or more, up to three minutes (180 seconds) can be set in [Recording Time].
The following image shows when the log save interval is set to 10 minutes and the recording time to 60 seconds.



If [Recording Time] is set to 0, data is written to the log at constant time interval in the same manner as when the log save interval is set to two seconds or less.
The following table shows the file name and save destination of the log.

Item	Description
File name	Log<time stamp>.csv <Time stamp> represents the time at which data acquisition starts and is indicated by the following format. "<Year (4 digits)><month (2 digits)><day (2 digits)>-<hour (2 digits)><minute (2 digits)><second (2 digits)>" Example: Log20130911-183525.csv
Save destination	Save destination set in [Data Storage Setting]

Reading data

The saved data is read, then displayed on the oscillograph.

Tapping [Load Data] in the menu will display the file selection dialog.

Select data, then tap [OK]. The data will be displayed on the oscillograph.

Saving data

The data acquired from the controller is saved.

Tapping [Save Data] in the menu will save the data.

The following table shows the file name and save destination of the data.

Item	Description
File name	Store<time stamp>.csv <Time stamp> represents the time at which [Save Data] is tapped and is indicated by the following format. "<Year (4 digits)><month (2 digits)><day (2 digits)>-<hour (2 digits)><minute (2 digits)><second (2 digits)>" Example: Store20130911-183525.csv
Save destination	Save destination set in [Data Storage Setting]

Saving an image

Tapping [Store Image] in the menu will save the displayed graph in the bitmap format.

The following table shows the file name and save destination of the image.

Item	Description
File name	Img<time stamp>.bmp <Time stamp> represents the time at which [Store Image] is tapped and is indicated by the following format. "<Year (4 digits)><month (2 digits)><day (2 digits)>-<hour (2 digits)><minute (2 digits)><second (2 digits)>" Example: Img20161111-153525.bmp
Save destination	Save destination set in [Data Storage Setting]

File management

To delete data saved using the oscillograph function or transfer data to the USB memory, use the file management function.

Tapping [File Manager] in the menu will display the file manager screen.

For information on how to use the file management function, refer to the following page:

☞ Page 262 File management

16.2 File management

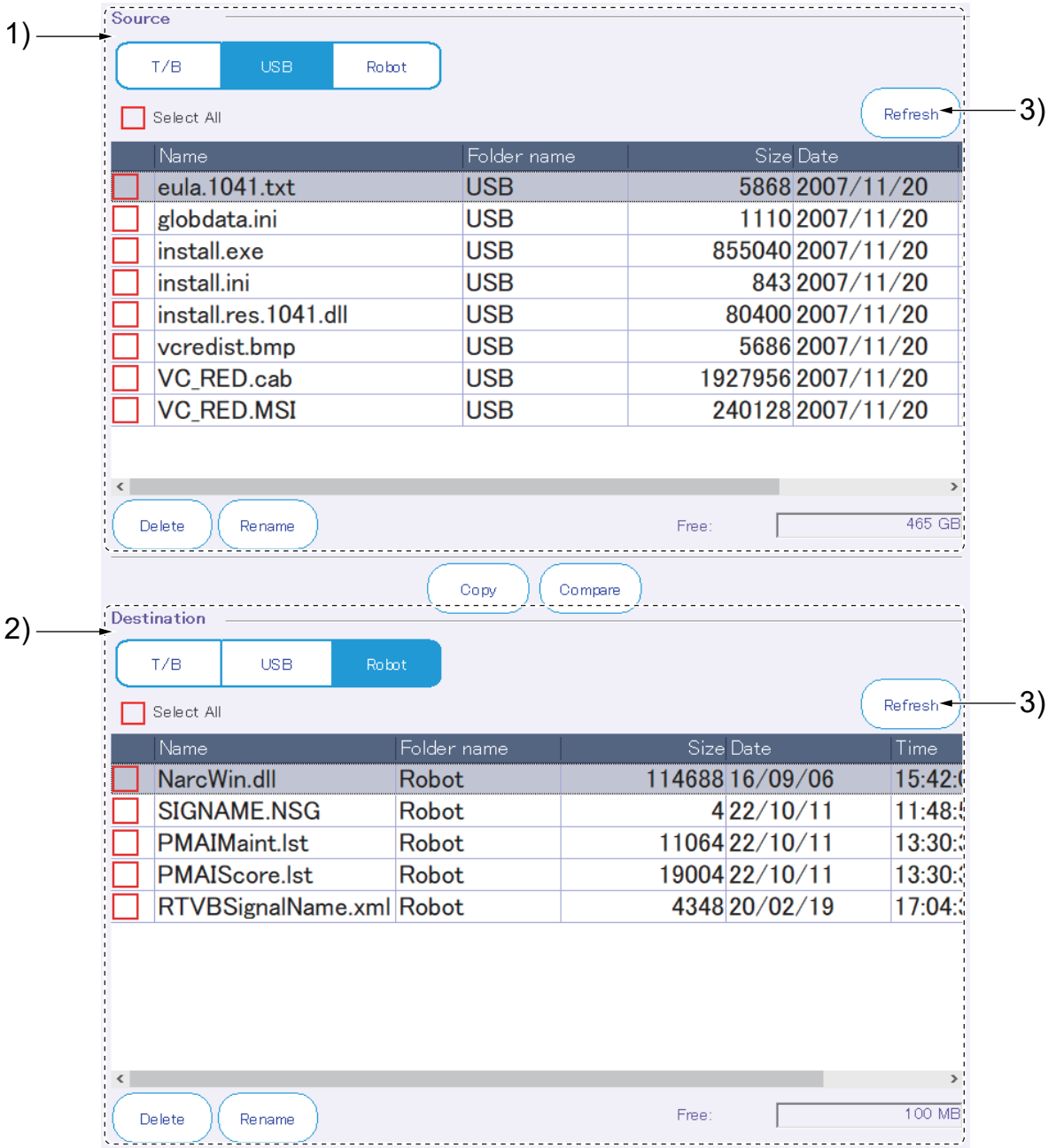
⚠CAUTION

• The following operations cannot be performed with the CR750/700 controllers with earlier than Ver.R3e/S3e.
·Deleting or renaming files with no extension
·Deleting or renaming files with a name that is longer than 16 characters
·Manipulating files with a name starting with '0'
• File names including two-byte characters cannot be used.
• If a password is registered in programs by the security function of the controller, files cannot be deleted or renamed.
To delete or rename a file, delete the password of the security function.
For information on how to delete the password, refer to the following page:
☞ Page 244 Deleting the password

Files in the T/B, USB memory, and controller can be copied, deleted, or renamed.

Tapping [File Manager] on the tool menu screen will display the file manager screen.

While data is being acquired from the controller, a dialog appears showing that communication is in progress.



No.	Name	Description
1)	List of files at the transfer source	Select from where files should be copied.

No.	Name	Description
2)	List of files at the transfer destination	Select where files should be copied to.
3)	Refresh button	Updates the file list.

There are some files that cannot be manipulated on this screen (e.g. robot programs and parameter files in the controller).
Files that cannot be manipulated are not listed.
The following types of files cannot be manipulated on this screen.

No.	File type	File name or extension
1	Program file	.MB4/.MB5/.MB6/.prg
2	Parameter file	.PRM
3	Error log file	AError.log CError.log HError.log LError.log
4	I/O log (I/O signals)	IOLogInp.log IOLogOut.log
5	Trap function log (program execution log)	.trp
6	Servo data log (This file is reconstructed at power-on.)	.sdl/.sdb
7	Force sense data log (This file is deleted at power-off.)	.fsl
8	Error record log	TTLERROR.DAT ERRORLOG.CSV
9	Command information file	COMMANDS.XML
10	System file (Backup information, etc.)	.SYS
11	Serial information file (This file is created at the time of backup.)	.ser

Copying files

Select a file you want to copy from the source file list, set where the file should be copied to, then tap [Copy].
Tapping [OK] in the confirmation dialog will copy the file.
If a file with the same name exists at the transfer destination, an overwrite confirmation message will appear.
Multiple files can be selected for copy.

Deleting files

Select a file you want to delete from the list, then tap [Delete].
Tapping [OK] in the confirmation dialog will delete the file.
Multiple files can be selected for deletion.

Renaming files

Select a file you want to rename from the list, then tap [Rename].
Enter a new name, then tap [OK]. The file will be renamed.
Changing the name of a file saved in the controller will convert all the lower case letters into upper case letters.

Comparing files

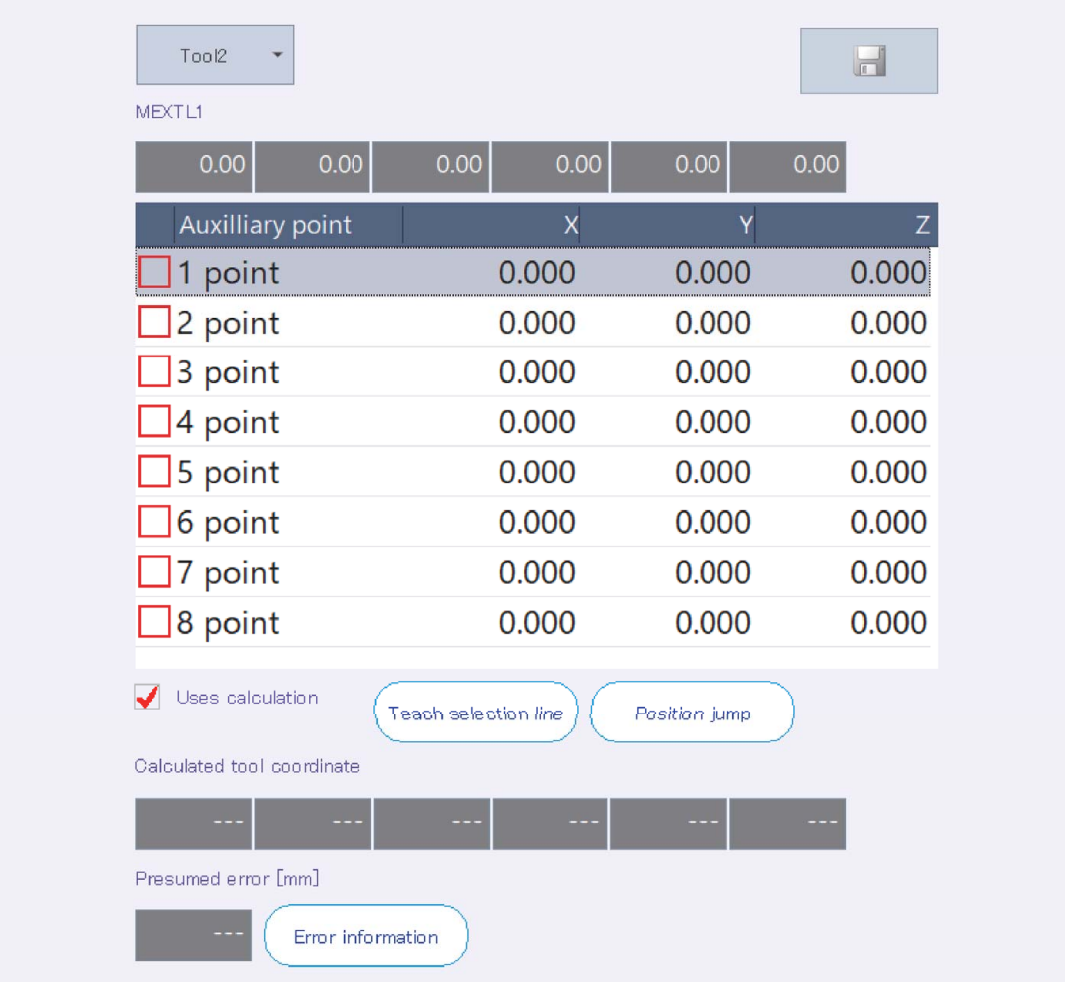
You can check whether there is any difference in the contents of files.
Select files you want to compare from the Source list and the Destination list, then tap [Compare]. The comparison results will appear.

16.3 Tool automatic calculation

With "Tool automatic calculation", the tool length is automatically calculated by teaching three to eight points for the same point with the actual tool mounted, allowing the tool parameter (MEXTL) value to be set.
"Tool automatic calculation" is available for the following models and controller software versions.

Model	Controller name	Controller software version
Vertical 6-axis robots	CR800	All versions
	CR750/700	R3e/S3e or later
Vertical 5-axis robots	CR800/CR750/700	Not available
Horizontal 4-axis robots	CR800	All versions
	CR750/700	R3e/S3e or later

Tapping [Tool Automatic Calculation] on the tool menu screen will display the tool automatic calculation screen.



Measurement method

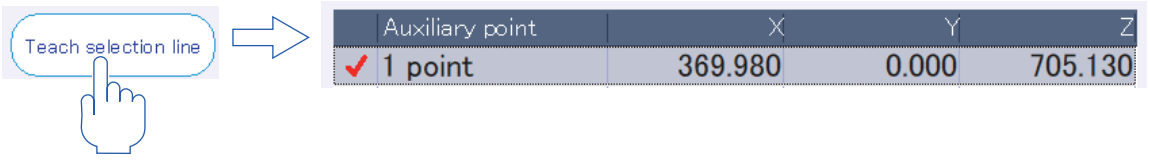
⚠CAUTION

• When teaching a calculation auxiliary point, change the robot posture greatly.
If a small change is made to the robot posture, tool coordinates may not be calculated.

1. Attach a tool to the robot, and specify a tool number you want to set.

2. Select the first point in the calculation auxiliary point list, then tap [Teach selection line].

The robot's current position will be entered in the list.



3. Change only the robot posture without changing the position of the tip of the tool using jog operation.

4. Select the second point in the calculation auxiliary point list, then tap [Teach selection line].

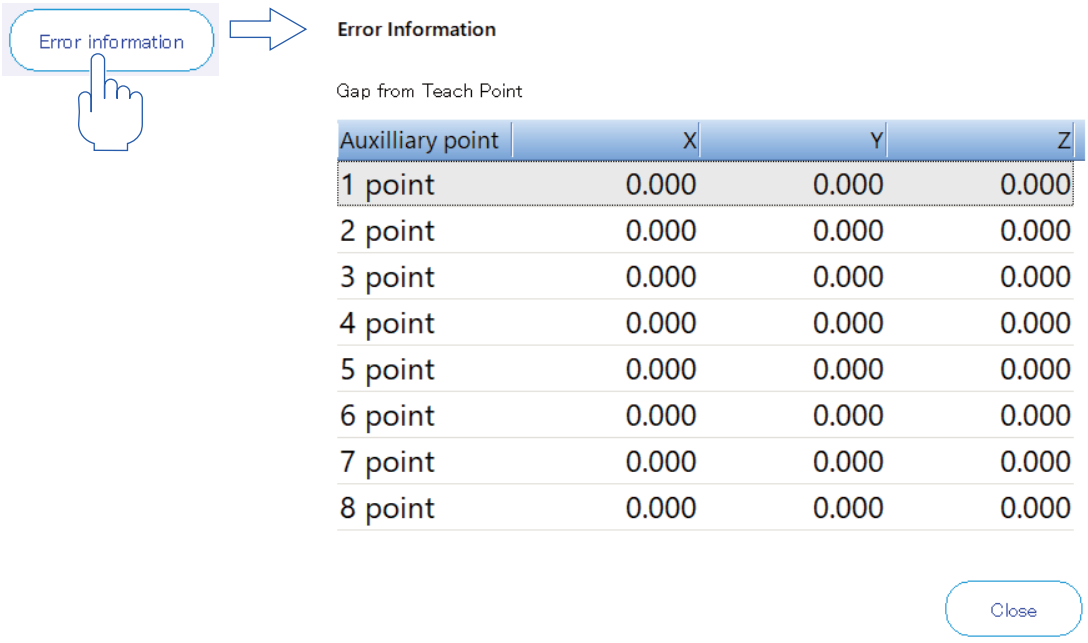
5. Enter values in the calculation auxiliary point list using the same steps until values are entered in "Calculated tool coordinate".

6. Tapping the save icon while values are displayed in "Calculated tool coordinate" will write the values to the controller.

Tapping [Position jump] while a calculation auxiliary point is selected allows you to move the robot into the taught posture.
Refer to the following for details on how to use the position jump function.

☞ Page 72 Position jump

Additionally, tapping [Error information] allows you to check the deviation between the calculation auxiliary point and the taught position.



16.4 User definition screen

It allows you to create a screen by freely placing parts (such as buttons and lamps that work based on I/O signals) on the screen.

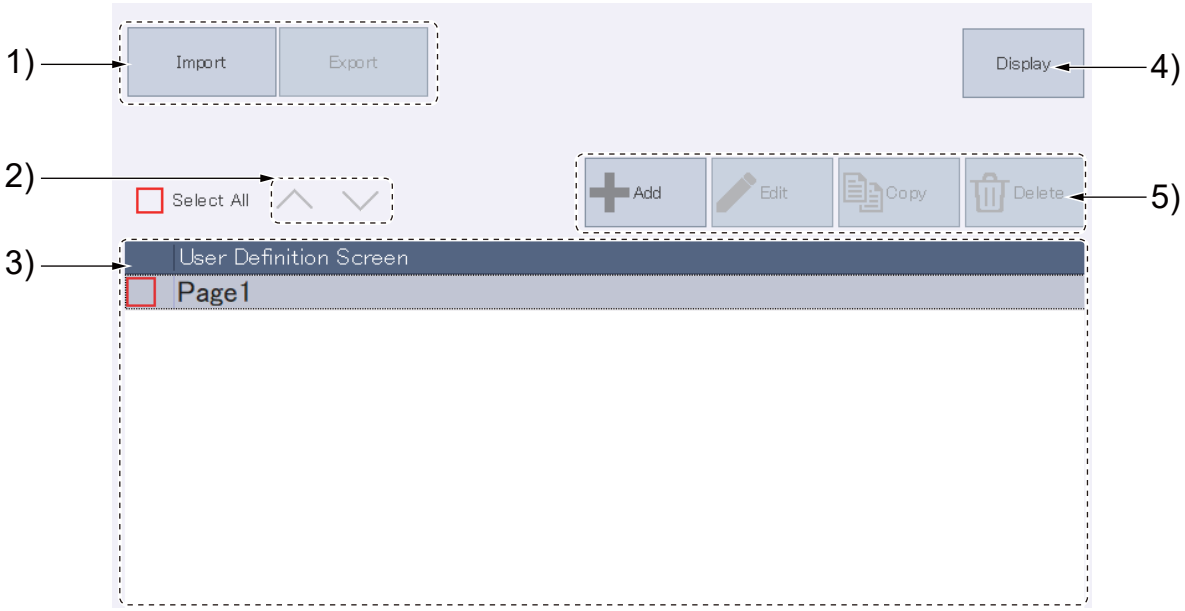
User definition screens can be used in the following applications.

- As an operation status monitor.
- Moving peripheral devices such as conveyors with buttons on the screen.

The following parts can be displayed on the user definition screen.

Part name		Description
Button		Tapping it will output a signal from the controller.
Lamp		Displays the on or off state of the lamp depending on the status of I/O signals.
Robot Information	Variable	Displays the value of a specified variable.
	Exe Lines	Displays the contents of the execution line of the program being executed.
	Program name	Displays the name of the program being executed.
	Exe Line#	Displays the number of the execution line of the program being executed.
	Cur Pos	Displays the robot's current position in the XYZ coordinate system.
	Cur Jnt	Displays the robot's current position in the joint coordinate system.
Label		Displays character strings.
OP Button		Displays operation buttons on the operation panel screen.
Menu Button		Displays the menu button that switches to the specified screen.
Jog Button		Displays the jog button to operate an axis of the robot.
Line		Draws a vertical or horizontal ruled line.
Message		Displays a message if set conditions are met (message not displayed at all times).

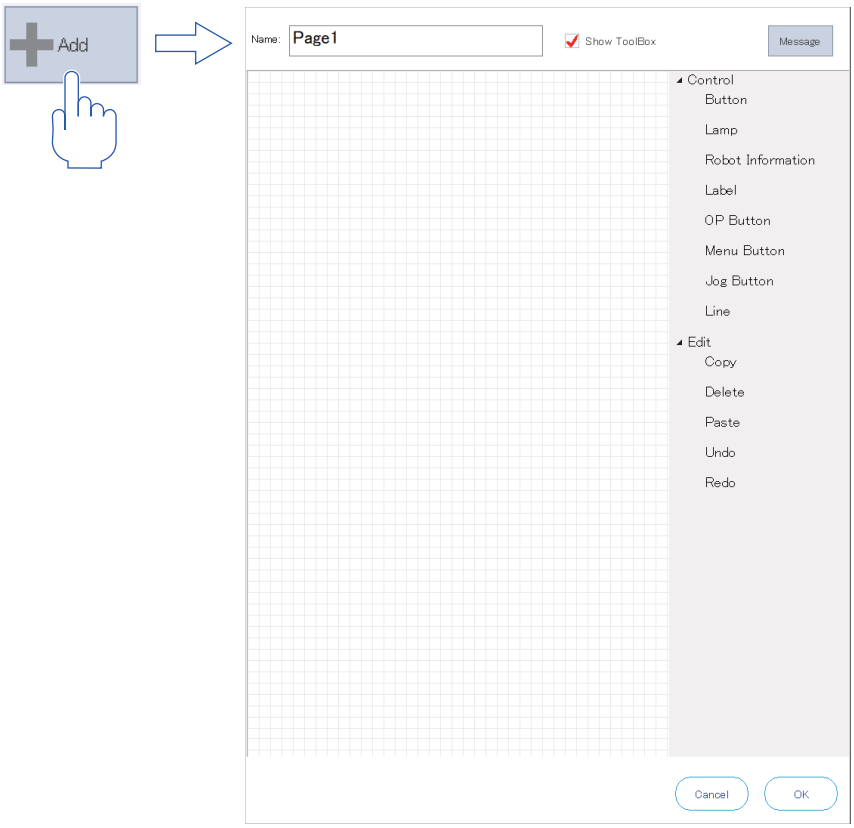
Tapping [User Definition Screen] on the tool menu screen will display the user definition screen setting screen.



	Name	Description
1)	Import/Export	Reads a user definition screen from the USB memory. Additionally, created user definition screens are saved in the USB memory. ☞ Page 284 Importing and exporting user definition screens
2)	Sort buttons	Sort the selected user definition screens displayed in the screen list.
3)	Screen list	Displays a list of created user definition screens.
4)	Display	Displays the created user definition screen. ☞ Page 285 Displaying the user definition screen
5)	Edit menu	Adds, edits, copies, or deletes user definition screens. ☞ Page 267 Creating a new user definition screen ☞ Page 267 Copying user definition screens ☞ Page 268 Deleting user definition screens ☞ Page 269 Editing user definition screens

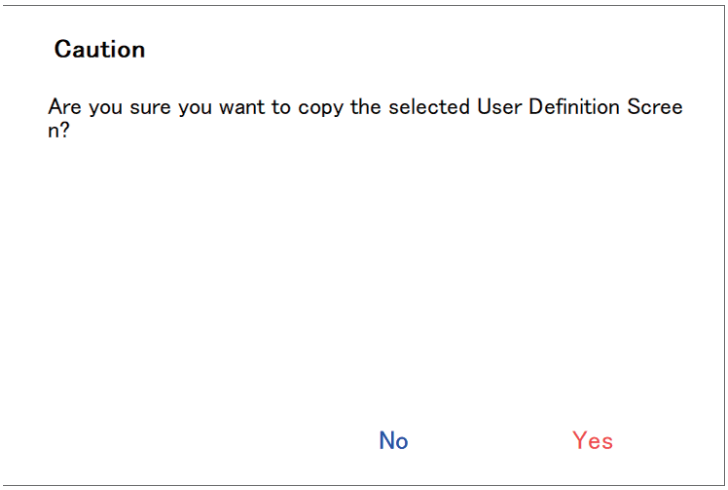
Creating a new user definition screen

Tapping [Add] in the edit menu will display a user definition screen editing screen.
Tapping [OK] will add the user definition screen in the screen list.



Copying user definition screens

Select a user definition screen from the screen list, then tap [Copy]. A dialog will appear.
Tapping [Yes] will copy the user definition screen.
The name of the copied user definition screen is "(name of the copy source) Copy".

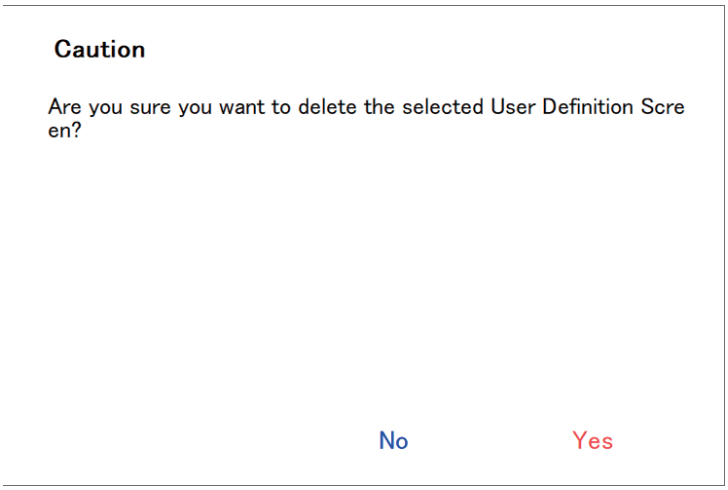


Deleting user definition screens

⚠ CAUTION

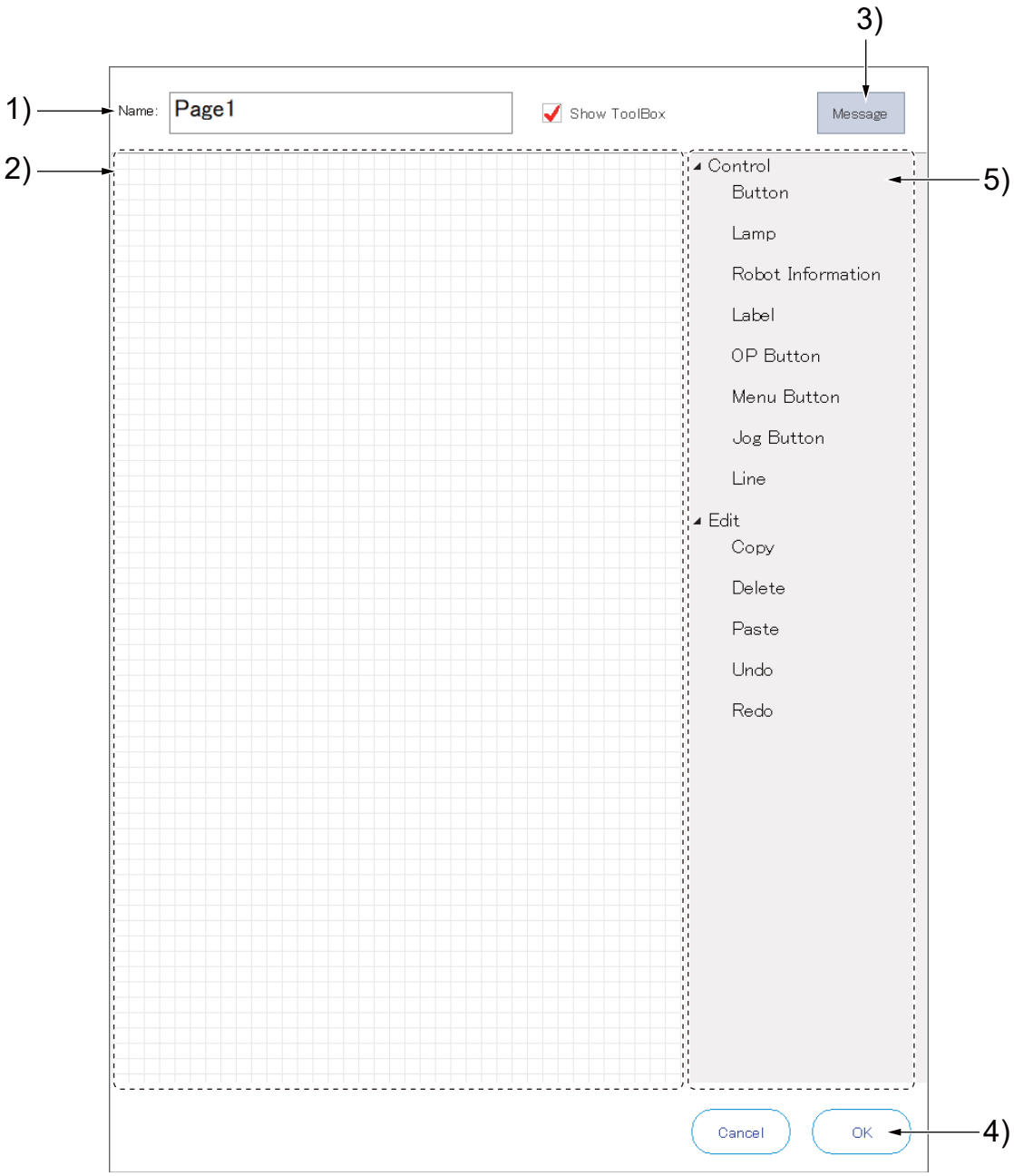
Note that user definition screens cannot be recovered once deleted.

Select a user definition screen from the screen list, then tap [Delete]. A dialog will appear.
Tapping [Yes] will delete the user definition screen.



Editing user definition screens

Select a user definition screen from the screen list, then tap [Edit]. The edit screen will appear.
The edit screen is composed as follows:



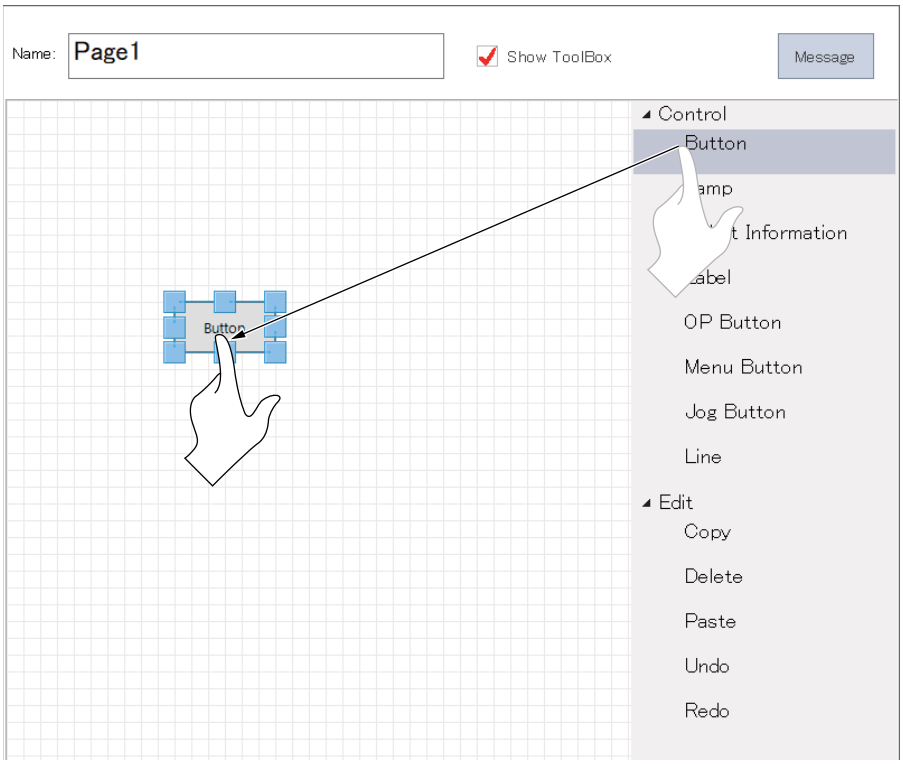
No.	Name	Description
1)	Screen title	Set the name of the page.
2)	Edit area	Create a user definition screen by placing parts in this area.
3)	Message	Add, edit, or delete messages. ☞ Page 282 Message settings
4)	OK	Save edited data and close the edit screen.
5)	Tool box	Add or edit parts. ☞ Page 270 Adding and editing parts

Adding and editing parts

Select a part from the tool box and place it in the edit area.

■Placing parts

Select a part you want to place from the tool box, then drag and release the part in the edit area. The part will be placed.

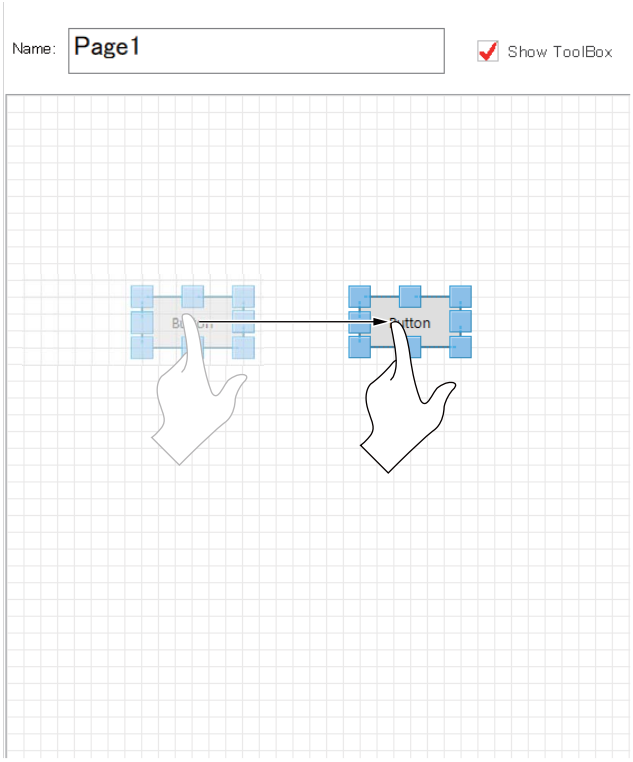


■Moving parts

Selecting a placed part and dragging it allows you to adjust its position.

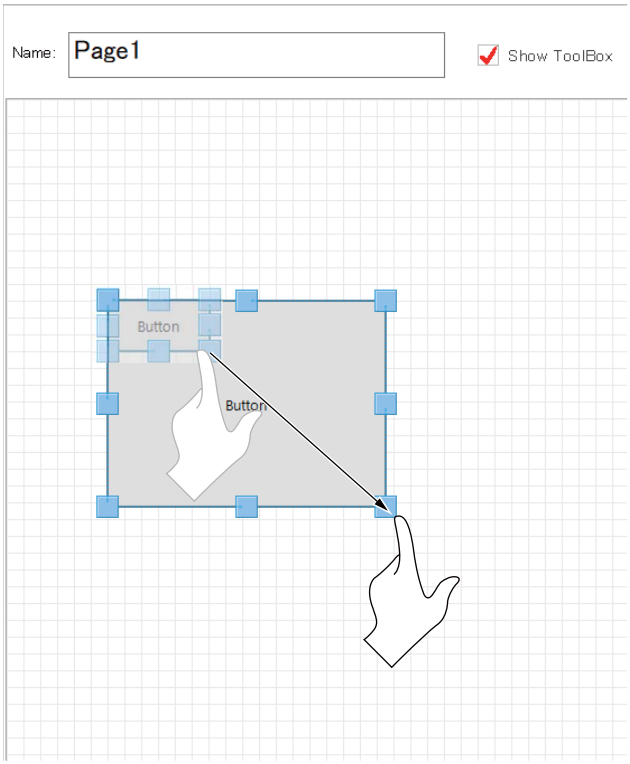
Dragging a blank area in the edit area allows you to select multiple parts.

Selecting multiple parts allows you to move them at a time.



■Changing the size of a part

Tapping a placed part will display a bounding box. Dragging the bounding box allows you to change the size of the part.



■Parts settings

Double-tapping a placed part will display the part setting screen.

For parts settings, refer to the following pages:

☞ Page 272 Button settings
☞ Page 273 Lamp settings
☞ Page 274 Variable display settings
☞ Page 275 Program execution content display settings
☞ Page 275 Program name display settings
☞ Page 276 Program execution line number display settings
☞ Page 277 Setting the display of the current position (XYZ type)
☞ Page 277 Setting the display of the current position (joint type)
☞ Page 278 Label settings
☞ Page 278 OP button settings
☞ Page 278 Menu button settings
☞ Page 281 Jog button settings

■Copy/paste

Tap [Copy] while a part is selected and tap [Paste]. The part will be copied.

Selecting multiple parts allows you to copy them at a time.

■Delete

Tap [Delete] while a part is selected. The part will be deleted.

Selecting multiple parts allows you to delete them at a time.

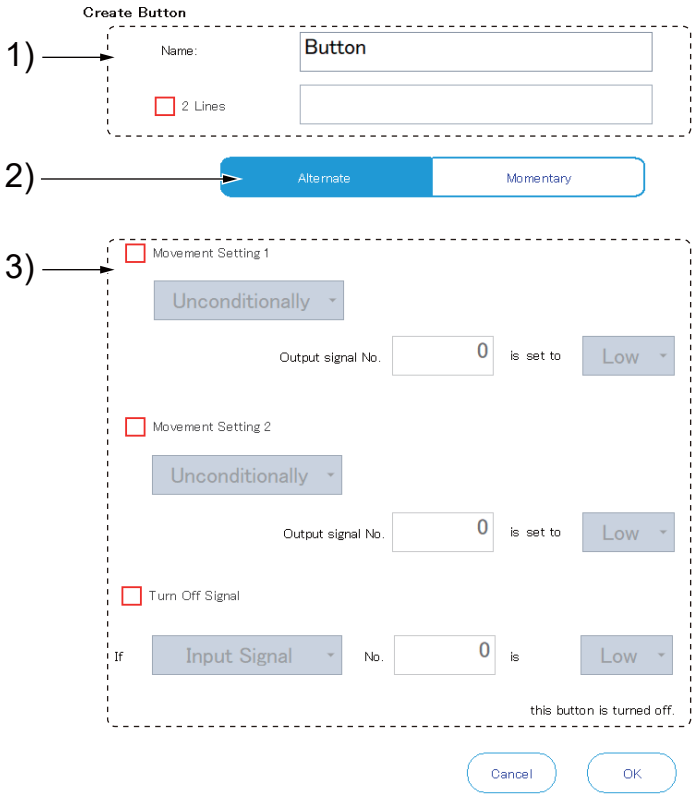
■Undo/redo

Tapping [Undo] allows you to undo operations such as adding or editing parts.

Tapping [Redo] allows you to redo operations such as adding or editing parts.

Button settings

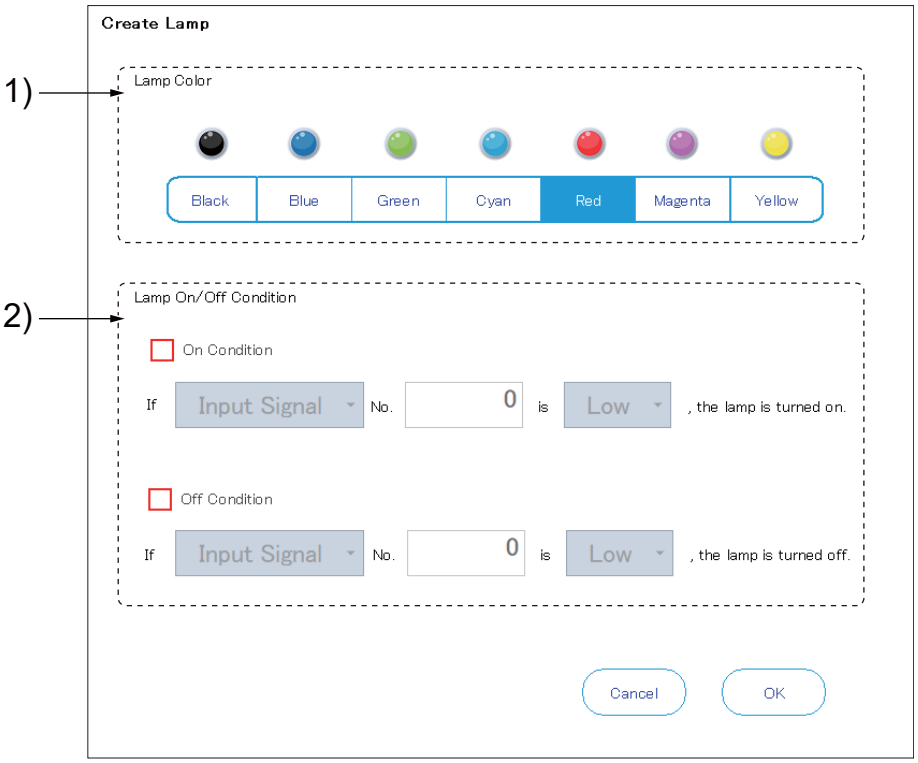
Double-tapping a button will display the setting screen.



No.	Name	Description
1)	Name	Set the name of the button. Selecting the [2 Lines] check box allows you to display the button name with two lines.
2)	Button type	Set the type of the button. • Alternate Once the button is tapped, it will remain in the ON state. Tapping the button again will return to the OFF state. The signal output is held too. Once the state of the signal set in [Turn Off Signal] is established, the button will return to the OFF state. • Momentary While the button is tapped, the ON state is maintained.
3)	Movement settings	Set the preconditions and signal output operation at the time the button is turned on. [Turn Off Signal] allows you to set the signal that turns off the button automatically. • Movement Setting 1, Movement Setting 2 You can set the signal to be output when the button turns on and the conditions in which the signal is output. If the conditions of Movement Setting 1 and Movement Setting 2 are true, and High and Low are set to output to the same signal number, Movement Setting 2 will be given priority. Turning off the button while the movement setting is enabled will output the value that is opposite to the value of the output signal specified in the movement setting. • Turn Off Signal The conditions of a signal that turns off the button can be set. The button turns off when the conditions of the set signal are true.

Lamp settings

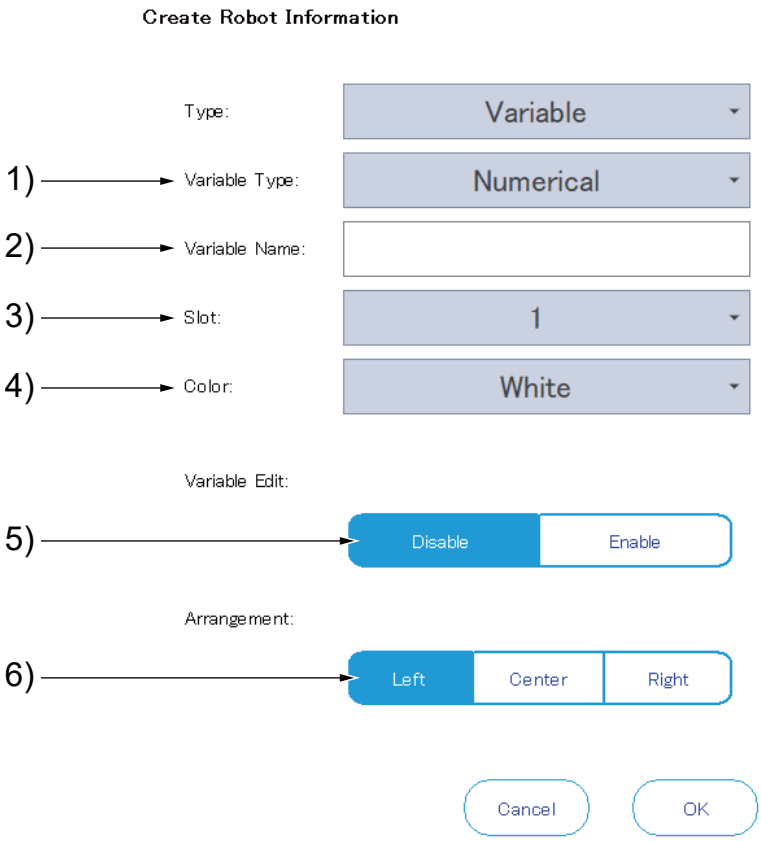
Double-tapping a lamp will display the setting screen.



No.	Name	Description
1)	Lamp Color	Select the lighting color of the lamp.
2)	On/Off Condition	Set the conditions to turn on or off the lamp. If only one condition is set, the lamp is operated assuming that the other condition is set that the High/Low states for the same signal number are opposite. Moreover, when both the ON condition and the OFF condition are true, the ON condition is given priority.

Variable display settings

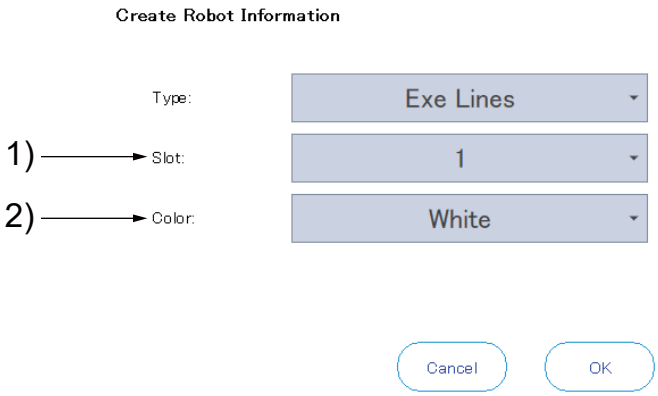
Adding [Robot Information] from the tool box will place a variable display. Double-tapping the variable display will display the setting screen.



No.	Name	Description
1)	Variable Type	Select the variable type.
2)	Variable Name	Set the name of the variable to be displayed. A system status variable can also be set.
3)	Slot	Specify the number of the task slot that uses the variable to be displayed. The range of settable slot numbers differs depending on the system being used.
4)	Color	Set the background color of the variable display.
5)	Variable Edit	Specify whether to permit a change in the variable value to be displayed. If "Enable" is selected, tapping the part will display the value input screen, which allows you to change the variable value.
6)	Arrangement	Set a position in which the variable is placed.

Program execution content display settings

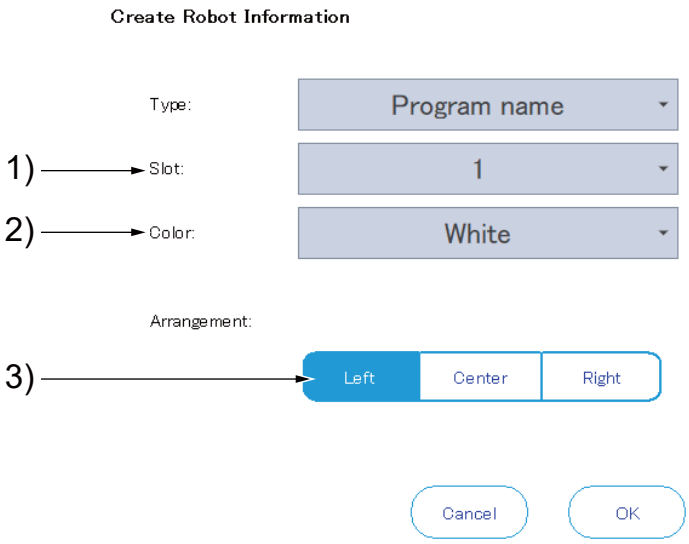
Adding [Robot Information] from the tool box will place a variable display.
Double-tapping the variable display will display the setting screen.
Selecting [Exe Lines] from the Type drop-down list will switch the setting screen.



No.	Name	Description
1)	Slot	Specify the number of the task slot that uses the program to be displayed. The range of settable slot numbers differs depending on the system being used.
2)	Color	Set the background color of the program execution line content display.

Program name display settings

Adding [Robot Information] from the tool box will place a variable display.
Double-tapping the variable display will display the setting screen.
Selecting [Program name] from the Type drop-down list will switch the setting screen.



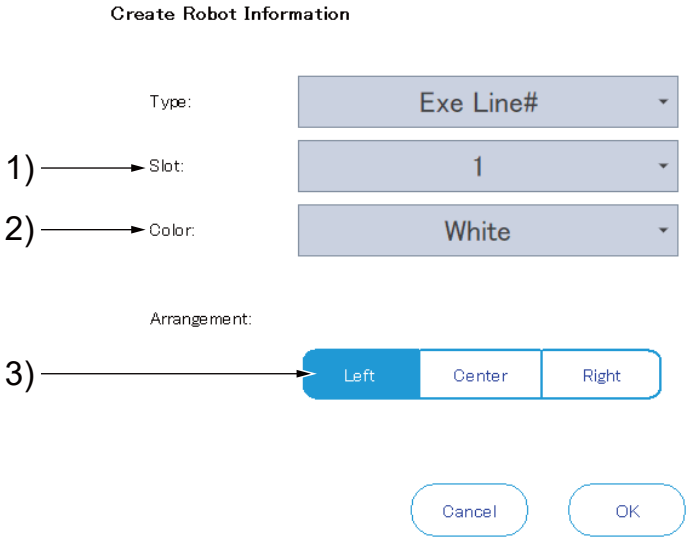
No.	Name	Description
1)	Slot	Specify the number of the task slot that displays the program name. The range of settable slot numbers differs depending on the system being used.
2)	Color	Set the background color of the program name display.
3)	Arrangement	Set a position in which the program name is placed.

Program execution line number display settings

Adding [Robot Information] from the tool box will place a variable display.

Double-tapping the variable display will display the setting screen.

Selecting [Exe Line#] from the Type drop-down list will switch the setting screen.



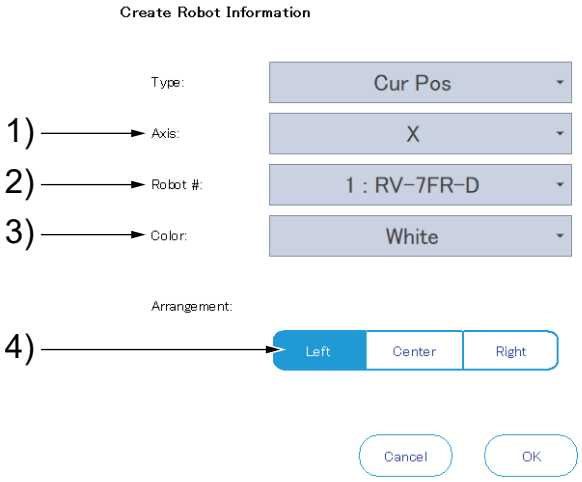
No.	Name	Description
1)	Slot	Specify the number of the task slot that displays the execution line number. The range of settable slot numbers differs depending on the system being used.
2)	Color	Set the background color of the execution line number display.
3)	Arrangement	Set a position in which the execution line number is placed.

Setting the display of the current position (XYZ type)

Adding [Robot Information] from the tool box will place a variable display.

Double-tapping the variable display will display the setting screen.

Selecting [Cur Pos] from the Type drop-down list will switch the setting screen.



No.	Name	Description
1)	Axis	Set an element axis of the current position (XYZ type) to be displayed.
2)	Robot #	Specify the number of the robot for which the current position is displayed.
3)	Color	Set the background color for the display of the current position (XYZ type).
4)	Arrangement	Set a position in which the current position (XYZ type) is placed.

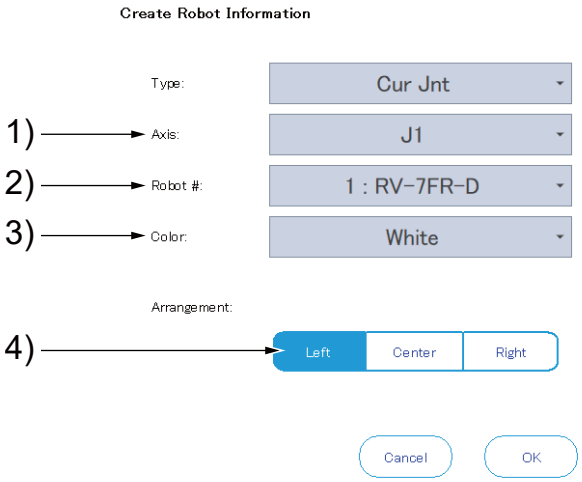
To display the XYZ data of the current position collectively, set "P_CURR" for the variable display.

Setting the display of the current position (joint type)

Adding [Robot Information] from the tool box will place a variable display.

Double-tapping the variable display will display the setting screen.

Selecting [Cur Jnt] from the Type drop-down list will switch the setting screen.



No.	Name	Description
1)	Axis	Set an element axis of the current position (joint type) to be displayed.
2)	Robot #	Specify the number of the robot for which the current position is displayed.
3)	Color	Set the background color for the display of the current position (joint type).
4)	Arrangement	Set a position in which the current position (joint type) is placed.

To display the joint data of the current position collectively, set "J_CURR" for the variable display.

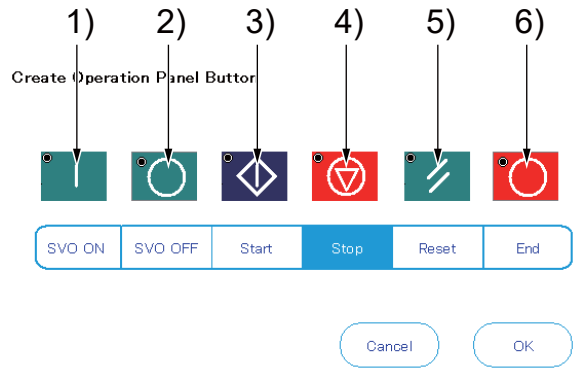
Label settings

Double-tapping a label will display the setting screen.

No.	Name	Description
1)	Name	Set characters to be displayed on the label. Selecting the [2 Lines] check box allows you to display the characters on the label with two lines.

OP button settings

Double-tapping an OP button will display the setting screen.

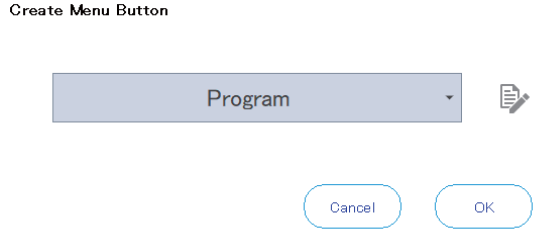


The following types of OP buttons can be placed.

No.	Name	Description
1)	SVO ON	Turns on the servo power.
2)	SVO OFF	Turns off the servo power.
3)	Start	Starts automatic operation.
4)	Stop	Stops the running program immediately and decelerates the moving robot to a stop.
5)	Reset	Clears the controller error during error. In other cases, it cancels the suspended state of the program and returns the execution line to the beginning (resets the program).
6)	End	Tapping it during continuous operation will turn on cycle stop and stop the robot after one cycle. Tapping it during cycle stop again will resume continuous operation.

Menu button settings

Double-tapping a menu button will display the setting screen.



The following types of menu buttons can be placed.

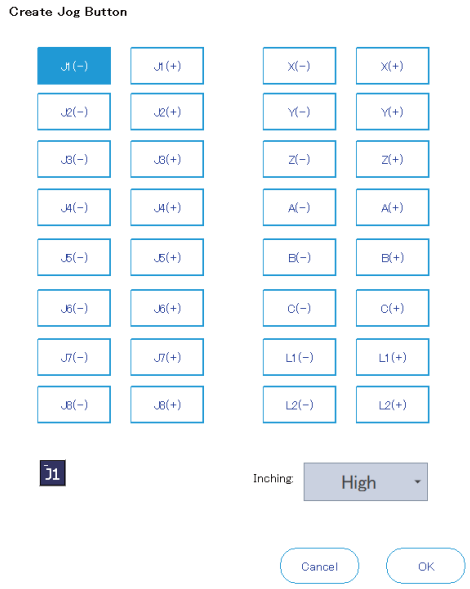
Button image[*1]	Description
	Switches to the program menu screen.
	Switches to the monitor menu screen.
	Switches to the slot status monitor screen.
	Switches to the program monitor screen.
	Switches to the program external variable monitor screen.
	Switches to the operation status monitor screen.
	Switches to the error monitor screen.
	Switches to the event history screen.
	Switches to the error history screen.
	Switches to the error record screen.
	Switches to the general-purpose signal monitor screen.
	Switches to the named signal monitor screen.
	Switches to the stop signal monitor screen.
	Switches to the register <CC-Link> monitor screen.
	Switches to the I/O unit monitor screen.
	Switches to the register (EtherCAT) screen.
	Switches to the DSI/CNUSER2 input signal screen.
	Switches to the safety input signal screen.
	Switches to the device screen.
	Switches to the operation hours screen.
	Switches to the production information monitor screen.
	Switches to the option card screen.
	Switches to the position monitor screen.
	Switches to the speed monitor screen.
	Switches to the load monitor screen.
	Switches to the power monitor screen.
	Switches to the current monitor screen.
	Switches to the parameter list screen.
	Switches to the backup screen.
	Switches to the maintenance menu screen.
	Switches to the maintenance forecast screen.
	Switches to the setup guidance screen.
	Switches to the password setting screen.
	Switches to the tool menu screen.
	Switches to the oscillograph screen.
	Switches to the file manager screen.

Button image[*1]	Description
	Switches to the tool automatic calculation screen.
	Switches to the version information screen.
	Switches to the 3D monitor screen.
	Switches to the system option screen.
	Switches to the SQ Direct position editing screen.
	Displays an operation panel.

*1 The name of the screen after switched is displayed under the button.

Jog button settings

Double-tapping a jog button will display the setting screen.



Inching	Description
Off	Moves the axis while the button is pressed.
High	Moves the axis by the amount specified by the jog parameter "inching H".
Low	Moves the axis by the amount specified by the jog parameter "inching L".

The following types of jog buttons can be placed.

Button image	Description
	Moves the J1 axis.
	Moves the J2 axis.
	Moves the J3 axis.
	Moves the J4 axis.
	Moves the J5 axis.
	Moves the J6 axis.
	Moves the J7 axis (additional axis).
	Moves the J8 axis (additional axis).
	Moves in the X coordinate direction.

Button image	Description
	Moves the arm in the Y direction.
	Moves the arm in the Z direction
	Rotates around the X axis.
	Rotates around the Y axis.
	Rotates around the Z axis.
	Moves the L1 axis (additional axis).
	Moves the L2 axis (additional axis).

When using the jog button, set the key switch to "MANUAL".

If the key switch is set to "AUTO", the jog button is not available.

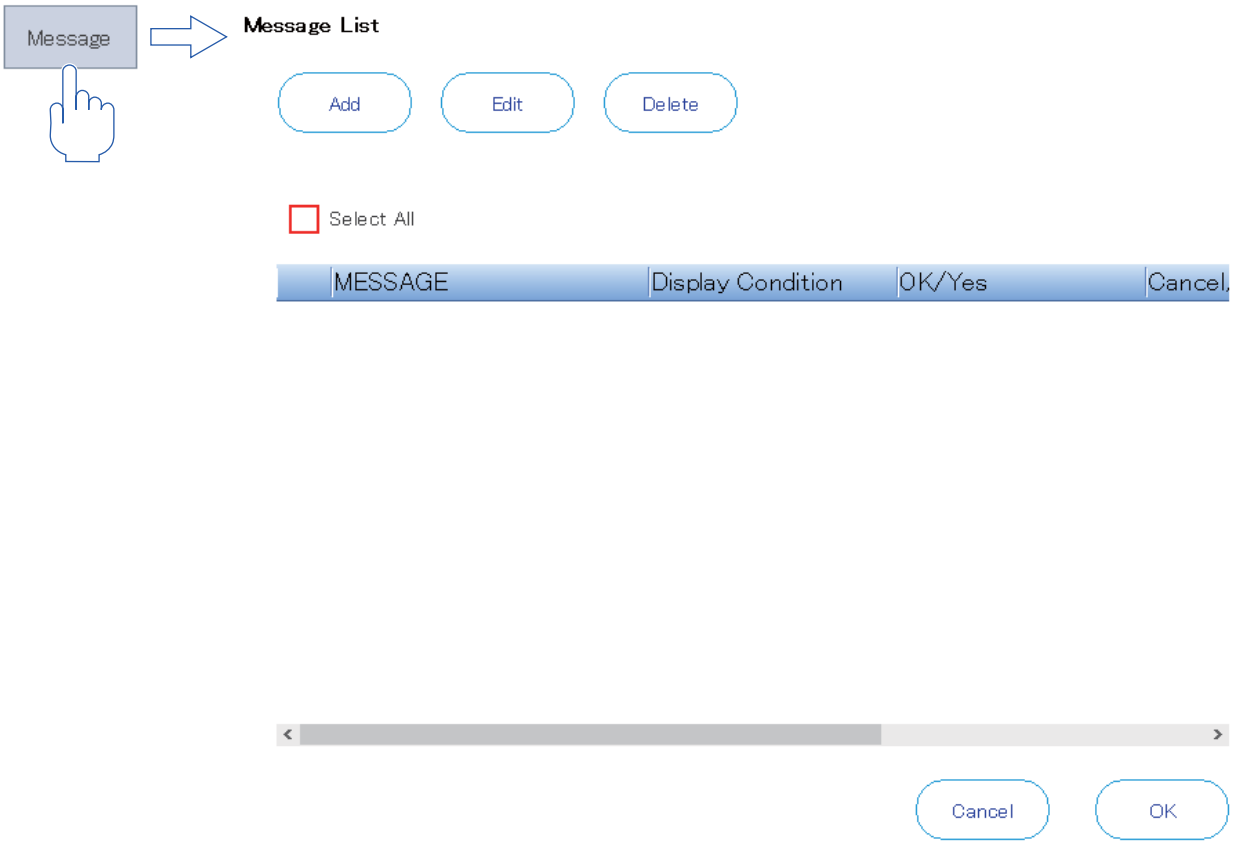
For details on jog operation, refer to the following page:

☞ Page 31 OPERATING THE ROBOT (JOG OPERATION)

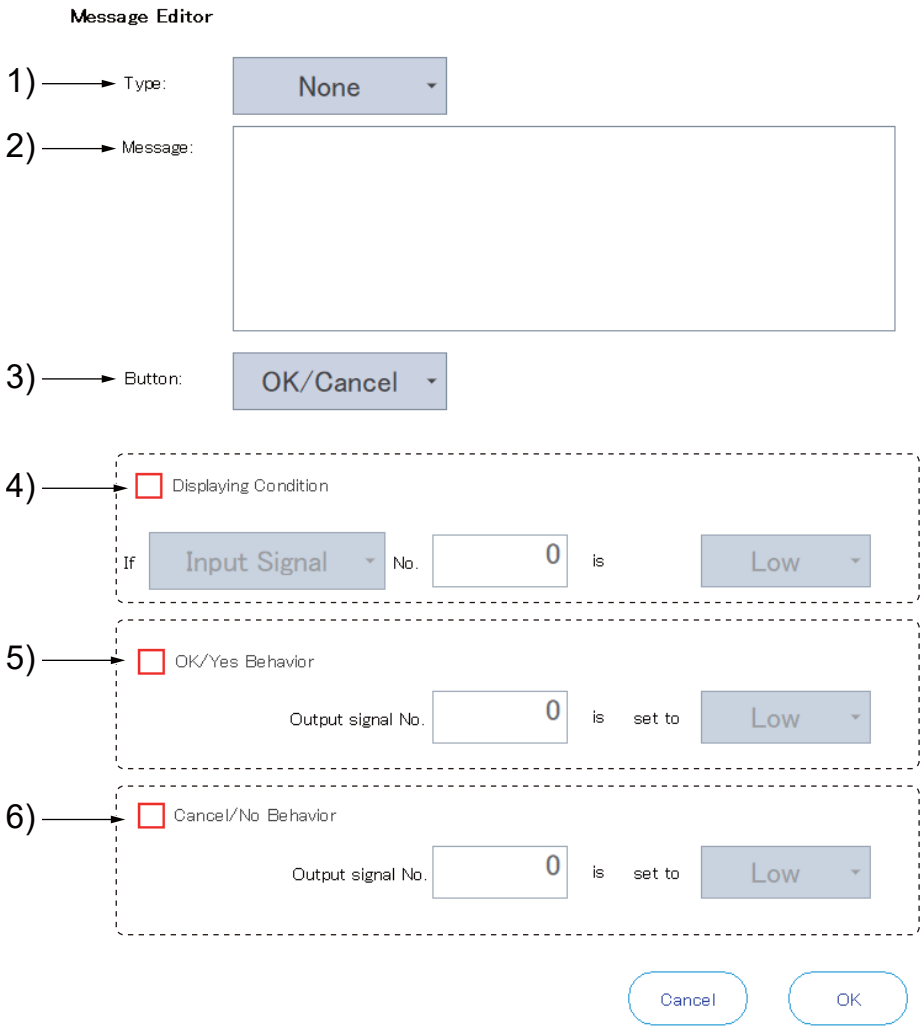
Message settings

Messages to be displayed according to the status of I/O signals can be set.

Tapping [Message] on the edit screen will display a list of messages.



Tapping [Add] will display the message editing screen.



No.	Name	Description
1)	Type	Select the message type.
2)	Message	Enter a message you want to display.
3)	Button	Select the type of the button for the message.
4)	Display condition	Set the conditions in which the message is displayed.
5)	OK/Yes Behavior	Set the operation when [OK] or [Yes] is tapped.
6)	Cancel/No Behavior	Set the operation when [Cancel] or [No] is tapped. Enabled only when the button type is set to [OK/Cancel] or [Yes/No].

Importing and exporting user definition screens

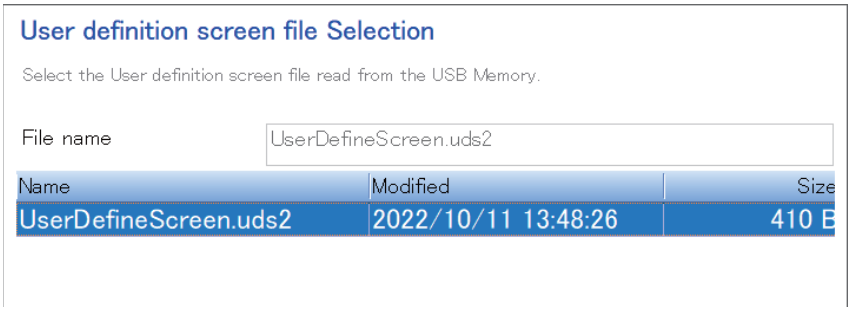
⚠ CAUTION

• Compatibility of user definition screens created in R86TB
User definition screens created in R86TB cannot be read with RT ToolBox2, RT ToolBox3, R46TB, or R56TB.

Read a user definition screen from the USB memory. Additionally, save created user definition screens in the USB memory.
Tapping [Import] or [Export] without connecting the USB memory will display an error.

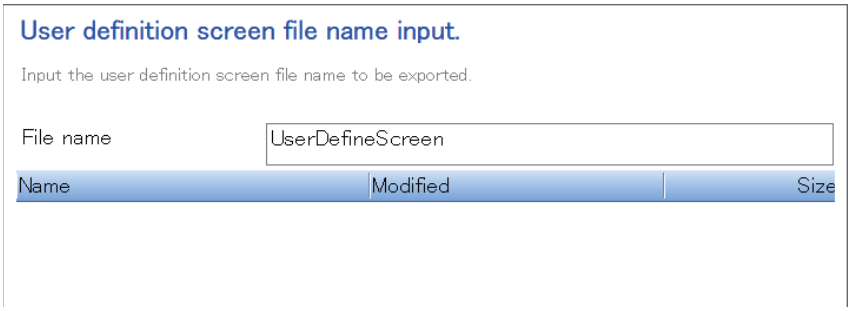
Importing a user definition screen (reading it from the USB memory)

1. Connect the USB memory to the T/B.
2. Tapping [Import] will display the file selection screen.
3. Select a file you want to import, then tap [OK].
4. The selected user definition screen will be displayed in the screen list. If a user definition screen with the same name has been registered, "import" will be added to the name of the imported user definition screen.



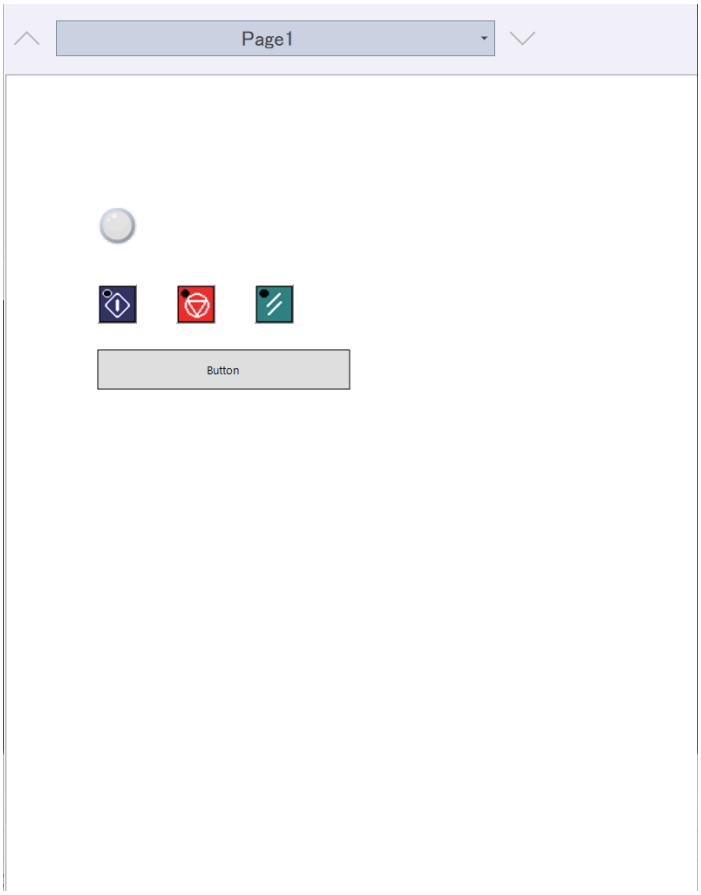
Exporting a user definition screen (saving it in the USB memory)

1. Connect the USB memory to the T/B.
2. Select a user definition screen you want to export. Tapping [All select] allows you to select all the user definition screens displayed in the screen list.
3. Tapping [Export] will display the file name input screen.
4. Enter a file name, then tap [OK]. The user definition screen will be saved.



Displaying the user definition screen

Select a created user definition screen from the screen list, then tap [Display]. The screen will appear.



No.	Name	Description
1)	Name display	Displays the name of the user definition screen.
2)	[▲]/[▼]	Switches pages.
3)	User definition screen	Displays the created user definition screen. If a part for variable display has been set so that the value can be changed, tapping the part on this screen will display the value input screen, which allows you to change the variable value.

16.5 Importing/exporting workspaces

A USB memory can be used to import or export workspaces.

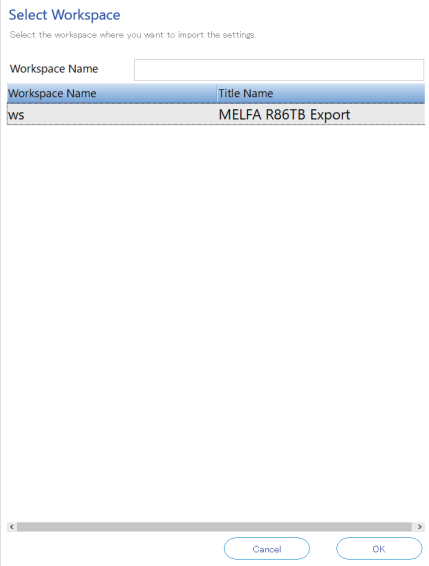
Import

This function imports a workspace created in RT ToolBox3 to the T/B.
The files and folders shown below are imported.

Folder/file name	Information
Hand	Hand setting file
Layout	Layout setting file
RobotParts	Robot parts setting file
UserMecha	User mechanism setting file
MELFA_WSP.xml	Workspace setting file

The following shows the import procedure.

1. Connect the USB memory containing a workspace you want to import to the T/B.
2. Tapping [Import Workspace] on the tool menu screen will display a dialog.

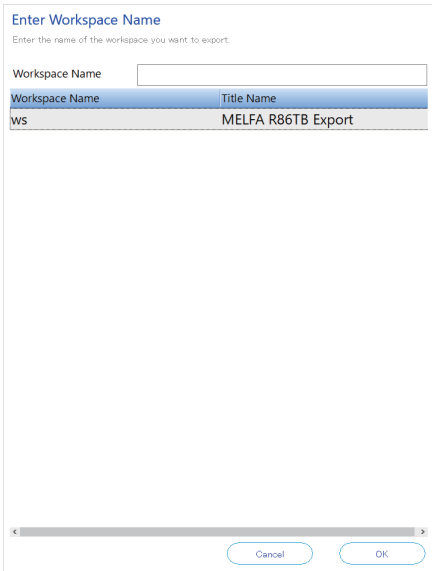


3. Select a workspace you want to import, then tap [OK]. The import process will start.
4. After the import process, reboot the T/B.

Export

This function exports the workspace of the T/B to the USB memory.
The contents in the workspace folder (folder that has MELFA_WSP.rt3wsp) are all exported.
The following shows the export procedure.

1. Connect the USB memory to the T/B.
2. Tapping [Export Workspace] on the tool menu screen will display a dialog.



3. Enter a workspace name, then tap [OK]. The export process will start.
4. After the export process, a message will appear.

17 OPERATION PANEL FUNCTIONS

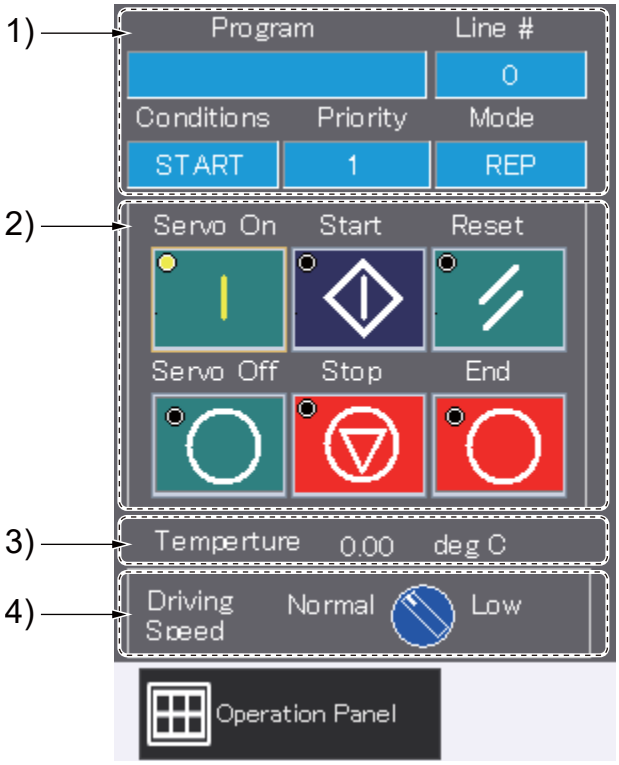
⚠CAUTION

• In "MANUAL" mode
To operate the robot, lightly hold down the enable switch on the T/B.
Releasing the enable switch while the robot is operating will turn off the servo power, stopping the robot.
The robot will operate below the JOG limited speed.
Performing jog operation or operating the electric hand during automatic operation will stop the running program immediately and decelerate the moving robot to a stop. After the robot has stopped, jog operation and electric hand operation are possible as usual.

The operation panel function is for controllers without an operation panel. It has functions equivalent to the operation panel of the controller, which allows you to select and run a program.
The operation panel function can be used in either AUTOMATIC or MANUAL mode.
The operation panel functions are supported with the following controller software versions.

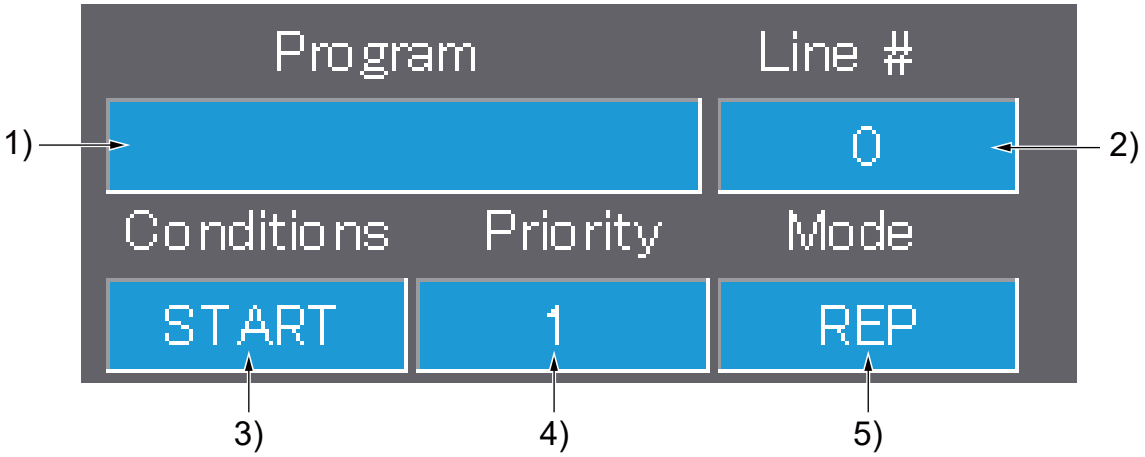
Controller name	Controller software version
CR800-D/R/Q	All versions
CR750-D/CRnD-700	Ver.R3 or later
CR750-Q/CRnQ-700	Ver.S3 or later

Tapping [Operation Panel] in the footer will display an operation panel on the auxiliary screen.



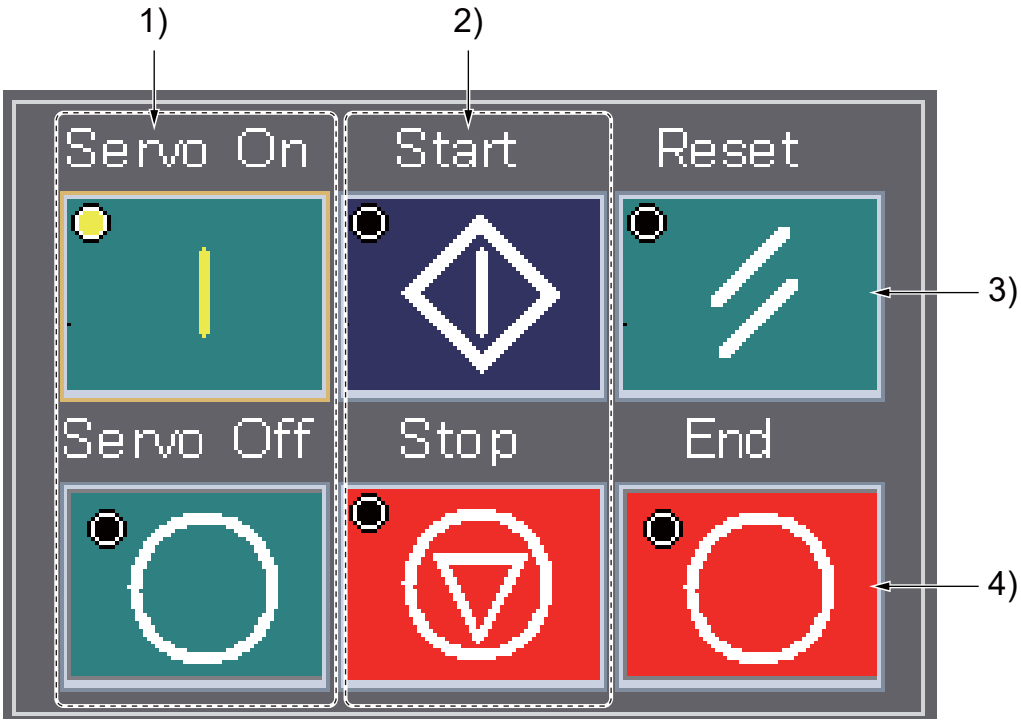
No.	Name	Description
1)	Task slot status	Displays the status of task slot 1. ☞ Page 289 Task slot status
2)	Operation buttons	Performs operations such as turning on or off the servo power, and starting or stopping automatic operation. ☞ Page 290 Operation buttons
3)	Internal temperature display	Displays the temperature inside the controller.
4)	Operating speed switching	Switches the operating speed of the robot.

17.1 Task slot status



No.	Name	Description
1)	Program	Displays the name of the program set in task slot 1. If the robot has stopped and the T/B has operation rights, tapping this area allows you to select a program.
2)	Line #	Displays the program line number being executed. If the robot has stopped and the T/B has operation rights, tapping this area allows you to change the line to be executed.
3)	Conditions	Displays the start conditions of task slot 1.
4)	Priority	Displays the priority of task slot 1.
5)	Mode	Displays the operation mode of task slot 1.

17.2 Operation buttons



No.	Name	Description
1)	Servo On/Servo Off	Turns on/off the servo power of the robot.
2)	Start/Stop	Starts/stops automatic robot operation. ☞ Page 290 Starting/stopping automatic operation
3)	Reset	Resets the error or program. ☞ Page 290 Reset
4)	End	Turns on/off cycle stop. ☞ Page 290 Cycle stop

Starting/stopping automatic operation

⚠CAUTION

In AUTOMATIC mode, note that the robot will operate at a regular speed.

Automatic robot operation is performed.

Tapping [Start] when the T/B has operation rights will display a warning dialog.

Ensure it is safe to operate the robot, then tap [OK]. Automatic operation will start.

Tapping [Stop] will end automatic operation.

Reset

The lamp at the top left of the button flashes during error.

Tapping [Reset] during error will reset the error.

Tapping [Reset] while no error has occurred will cancel the suspended state of the program and return the execution line to the beginning (reset the program).

Cycle stop

Tapping [Stop] during continuous operation will turn on cycle stop and stop the robot after one cycle.

When cycle stop is on, the lamp at the top left of the button flashes.

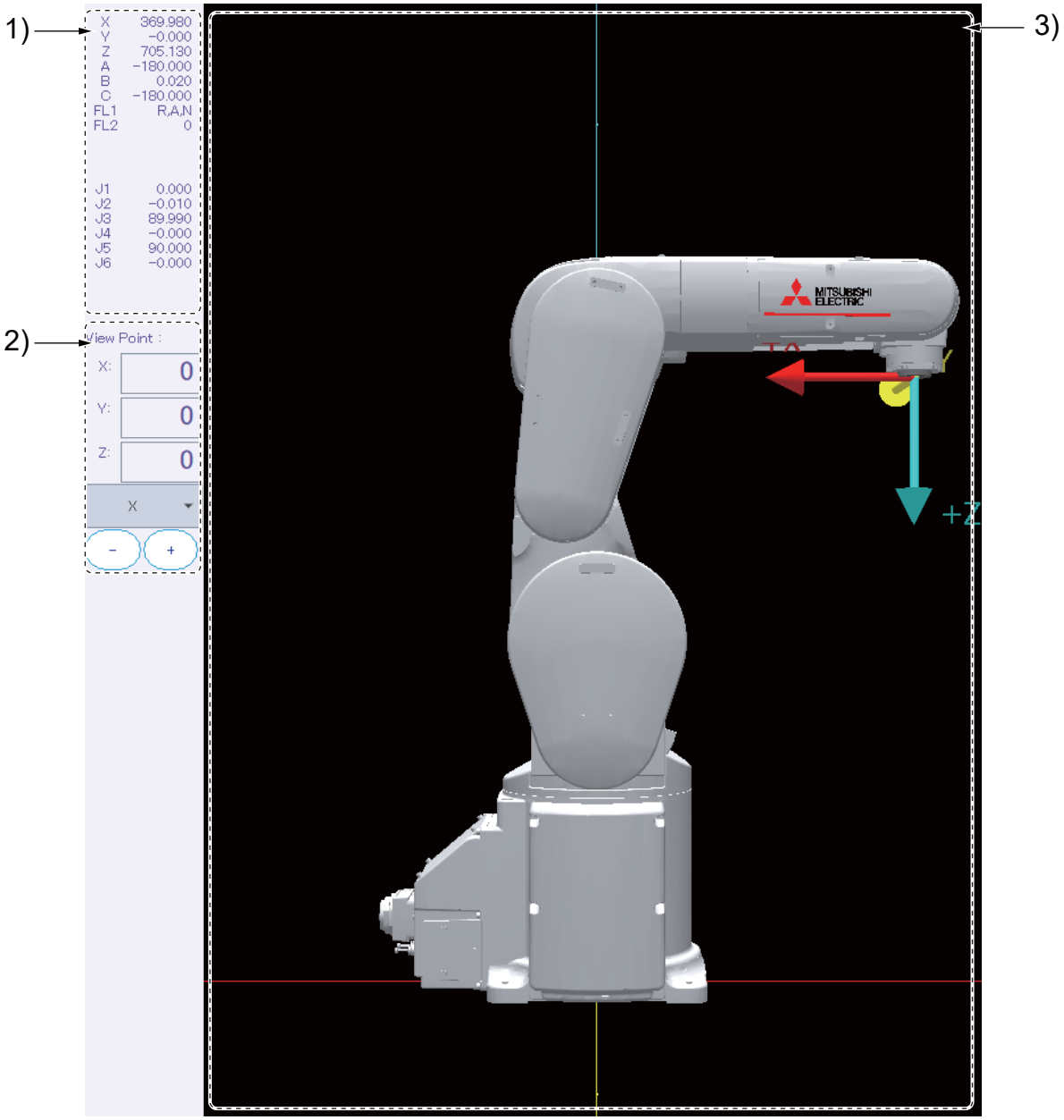
Tapping [Stop] during cycle stop again will resume continuous operation.

18 3D MONITOR

Using the 3D monitor allows you to check the robot movement in 3D mode.
There are two types of 3D monitors, full screen and auxiliary screen.
☞ Page 291 3D monitor (full screen)
☞ Page 292 3D monitor (auxiliary screen)
☞ Page 292 Viewpoint operation

18.1 3D monitor (full screen)

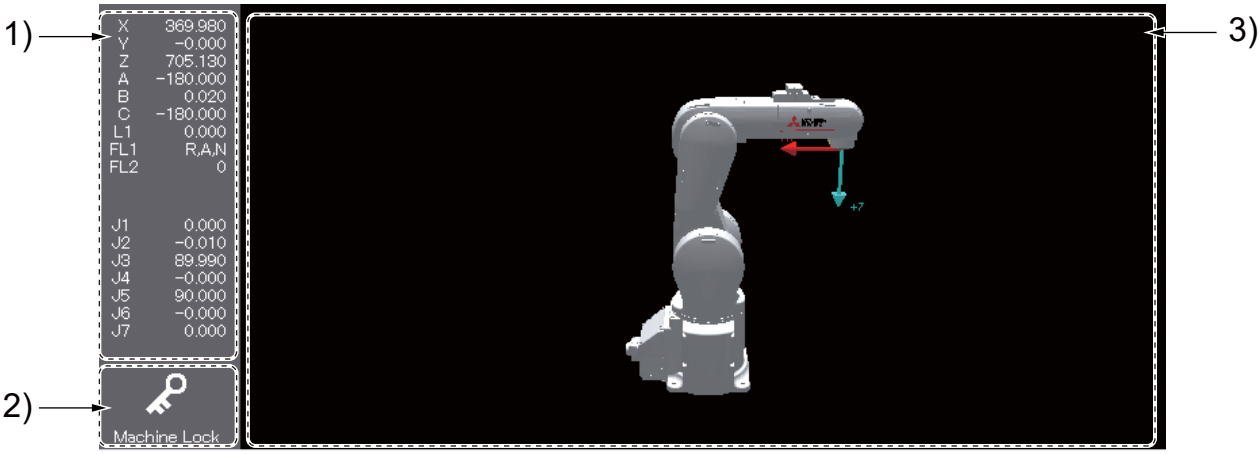
Tapping [3D Monitor] on the HOME screen will display the 3D monitor in full screen mode.



No.	Name	Description
1)	Current position	Displays the robot's current position in the XYZ coordinate system or joint coordinate system.
2)	View Point	Entering values in X/Y/Z allows you to rotate the viewpoint in the 3D monitor. Additionally, selecting X, Y, or Z from the drop-down list and tapping [-] or [+] will finely adjust the viewpoint.
3)	3D model	Displays a 3D robot model. The settings can be changed with the option settings. ☞ Page 293 Options

18.2 3D monitor (auxiliary screen)

Tapping [Robot Viewer] in the footer will display the 3D monitor in auxiliary screen mode.



No.	Name	Description
1)	Current position	Displays the robot's current position in the XYZ coordinate system or joint coordinate system.
2)	Machine Lock	Using the machine lock function allows you to check the movement of the robot in the 3D monitor without moving the robot. While the machine lock is on, the robot does not move. The machine lock function can be used only when the T/B is enabled. The machine lock function cannot be used if the controller's safety functions are enabled or the ASSISTA series robot is used.
3)	3D model	Displays a 3D robot model. The settings can be changed with the option settings. ☞ Page 293 Options

18.3 Viewpoint operation

Operating the touch panel allows you to change the viewpoint in the 3D monitor and zoom in or out the display.

For information on how to operate the touch panel, refer to the following page:

☞ Page 19 How to operate the touch panel

Movement	Operation	Details
Zoom in/out	Pinch-in/pinch-out	☞ Page 292 Zoom in/out
Viewpoint rotation	Drag with one finger	☞ Page 292 Viewpoint rotation
Moving the viewpoint parallel	Drag with two fingers	☞ Page 293 Moving the viewpoint parallel

Zoom in/out

The display can be zoomed in or out by pinching in or out.

Selecting the zoom type allows you to change the center of zooming.

The zoom type can be set with the option settings.

☞ Page 295 Zoom type switching

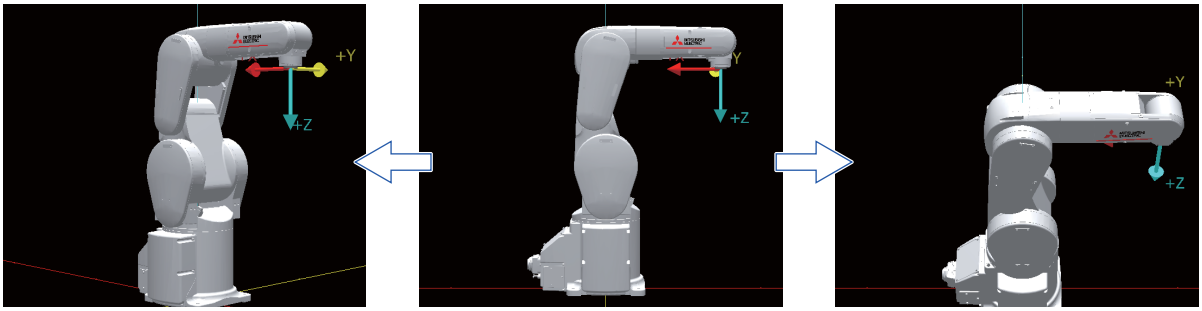
The relationship between the zoom type and center of zooming is as follows.

Zoom type	Center of zooming
Zoom toward origin center	3D monitor origin
Zoom toward screen center	Center of screen

Viewpoint rotation

The viewpoint can be rotated by dragging on the screen.

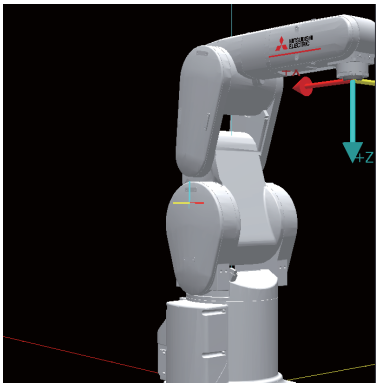
Movement	Operation
Rotation around the X axis	Drag up or down
Rotation around the Z axis	Drag left or right



The rotational center of the viewpoint differs depending on the zoom type settings.
The rotational center for zooming toward origin center is always at the origin of the 3D monitor.
The rotational center for zooming toward screen center differs depending on the status of the 3D monitor when the screen is tapped.

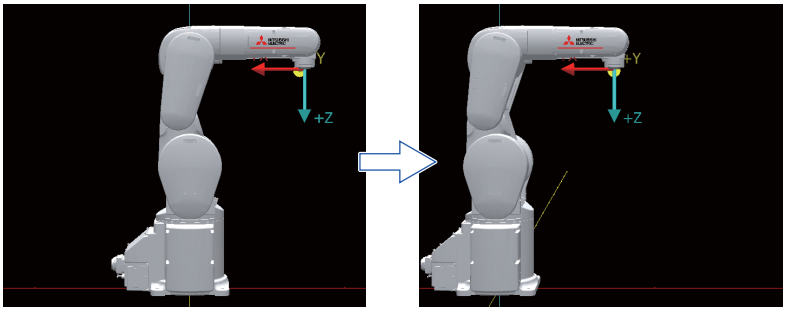
Status of the 3D monitor upon tapping the screen	Rotational center of the viewpoint
A non-transparent object exists in the center of the screen.	Center of the 3D monitor screen
A non-transparent object does not exist in the center of the screen.	3D monitor origin

While the viewpoint is being rotated around a point other than the origin, small coordinate axes are displayed at the rotational center.



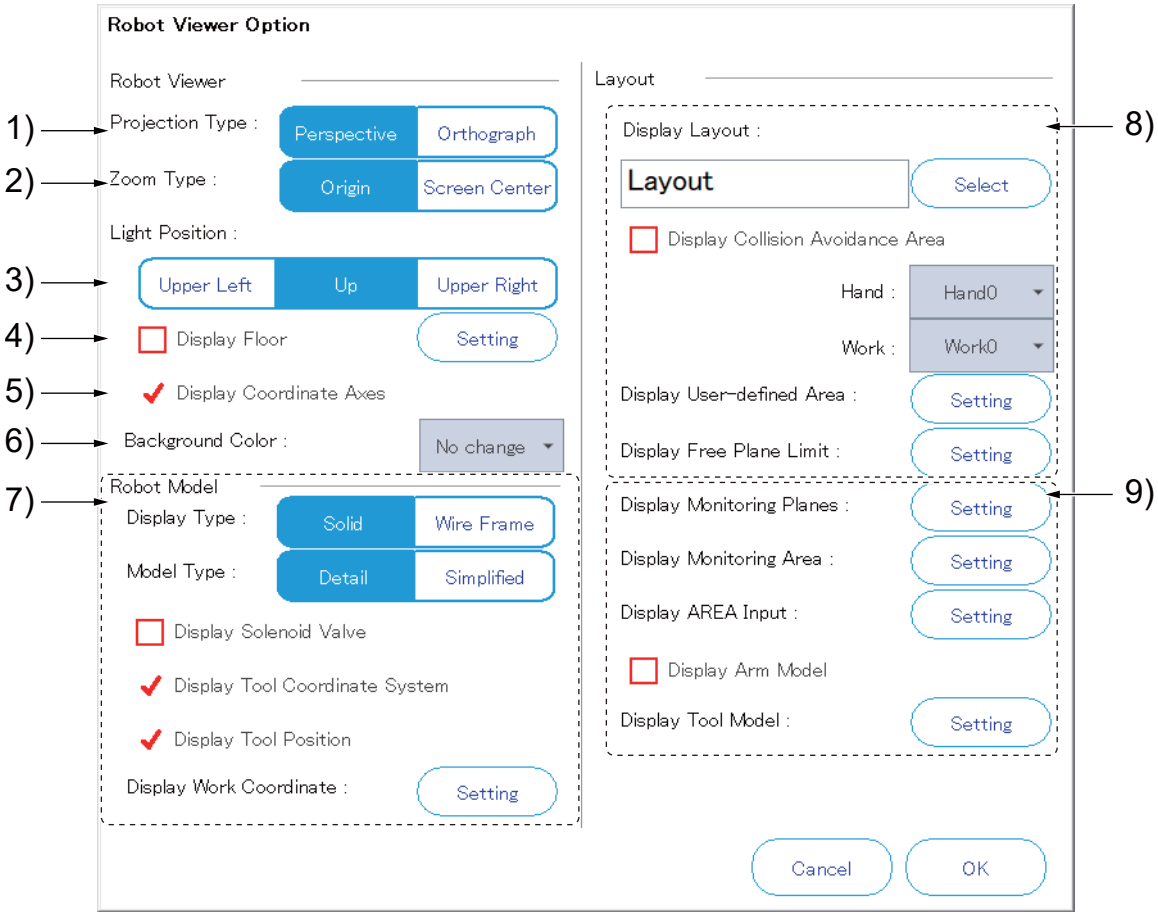
Moving the viewpoint parallel

The viewpoint can be moved parallel by dragging on the screen with two fingers.
In the 3D monitor (full screen mode), closing the screen will reset the parallel movement of the viewpoint.



18.4 Options

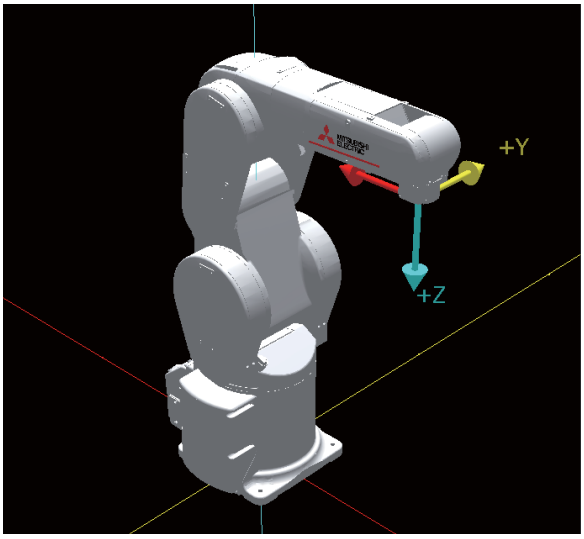
Tap [Option] in the menu while the 3D monitor is displayed in full screen mode. The option setting screen will appear.



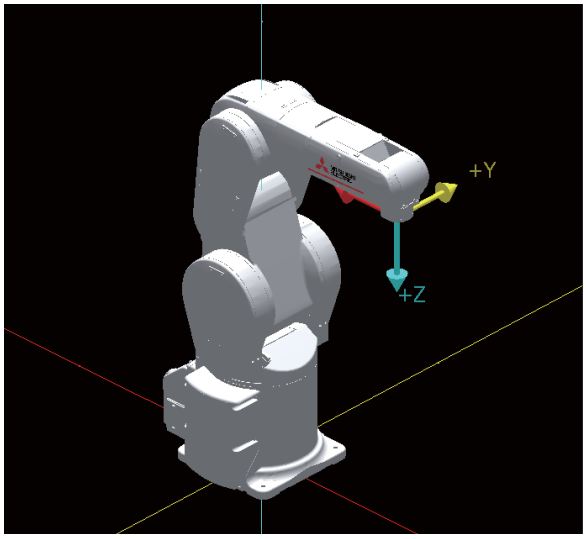
No.	Name	Description
1)	Projection Type	Set the 3D model projection method. ☞ Page 294 Projection type switching
2)	Zoom Type	Set the zoom type. ☞ Page 295 Zoom type switching
3)	Light Position	Set the light source position. ☞ Page 295 Light source position
4)	Floor	Configure settings such as whether to show or hide the floor. ☞ Page 295 Floor
5)	Display Coordinate Axes	Show or hide the coordinate axes. ☞ Page 296 Displaying coordinate axes
6)	Background Color	Set the background color of the 3D monitor. ☞ Page 297 Background color
7)	Robot Model	Set the appearance of the 3D model. ☞ Page 297 Robot model
8)	Layout	Read layout files created in RT ToolBox3. ☞ Page 299 Layout
9)	Safety monitoring	Set the display related to safety parameters. ☞ Page 300 Safety monitoring

Projection type switching

The 3D model projection method can be selected from [Perspective] or [Orthograph].



Perspective



Orthograph

Zoom type switching

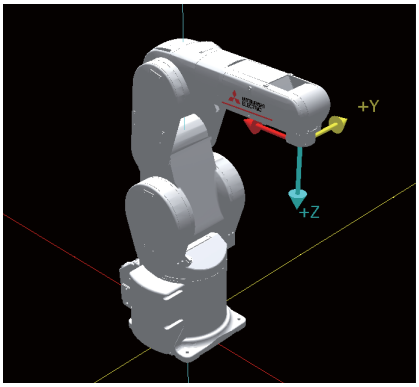
The center when the 3D monitor is zoomed in or out can be selected.

Zoom type	Center of zooming
Zoom toward origin center	3D monitor origin
Zoom toward screen center	Center of screen

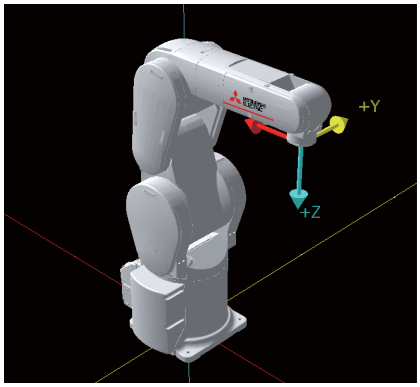
Light source position

The light source position in the 3D monitor can be selected.

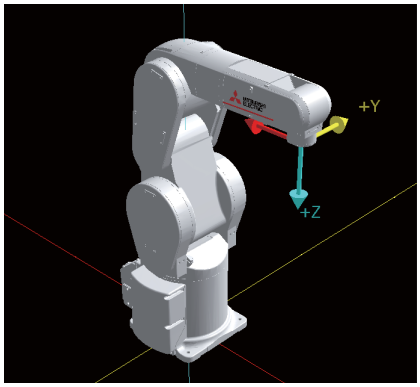
The light source position can be selected from among [Up], [Upper Left], and [Upper Right].



Top



Top left



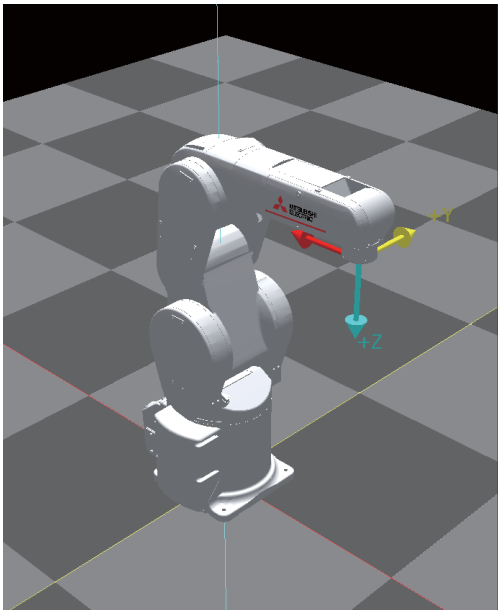
Top right

Floor

The floor to be displayed in the 3D monitor can be set.

Floor display

Selecting the [Display Floor] check box will display a floor in the 3D monitor.

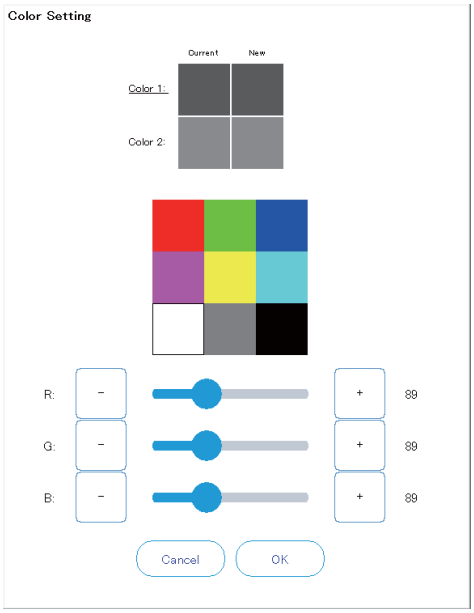


Color settings

Set the color of the floor.

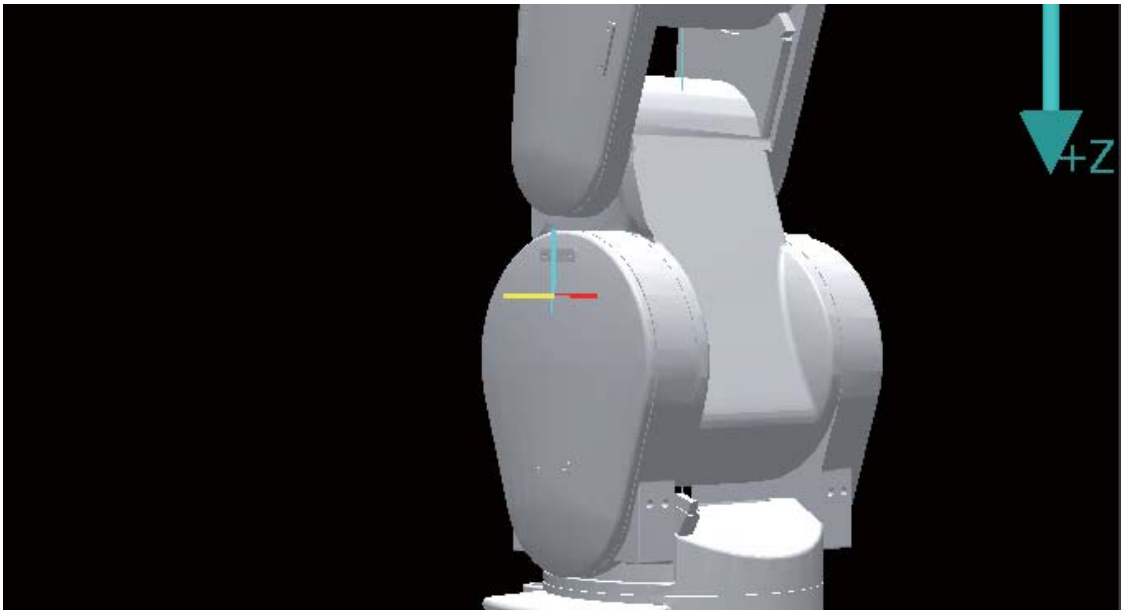
Select the color of [Color 1] or [Color 2] for change, and specify a color with the color picker in the middle.

The color can also be specified by entering an RGB value.



Displaying coordinate axes

Selecting the [Display Coordinate Axes] check box will display coordinate axes shown at the origin in the 3D monitor and small coordinate axes shown at the reference point in the robot model.



Background color

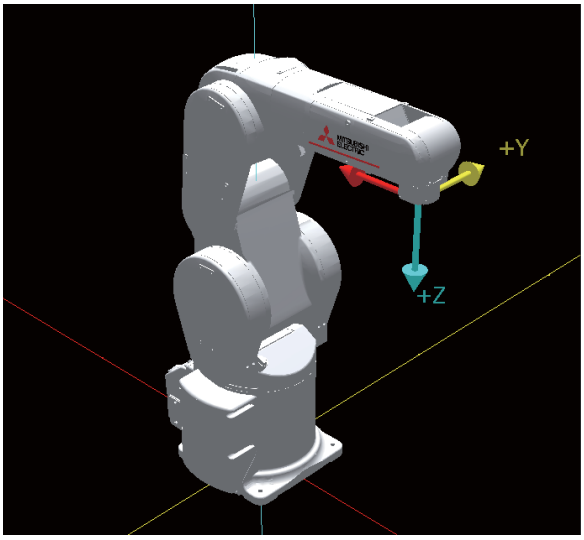
The background color of the 3D monitor can be selected.

If a layout file has been read, the background color of the layout is applied.

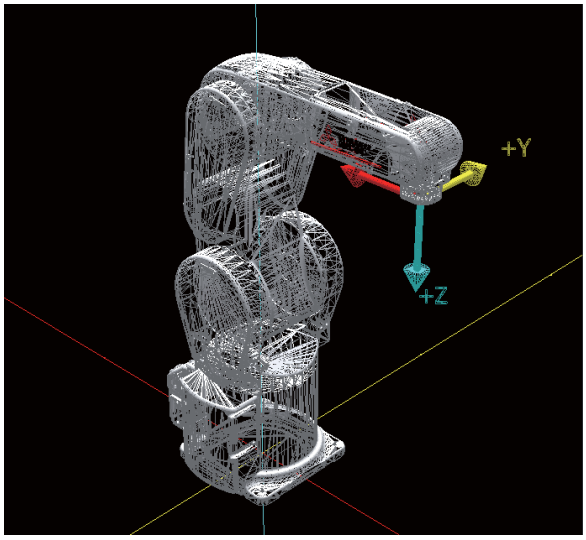
Robot model

Display type

The display type can be selected from [Solid] or [Wire Frame].



Solid

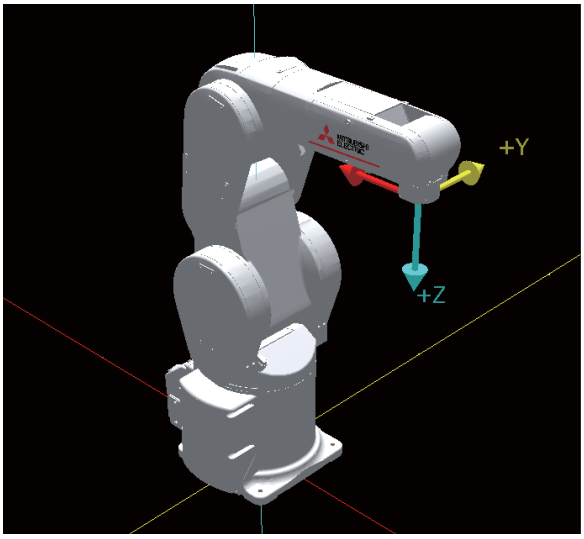


Wire frame

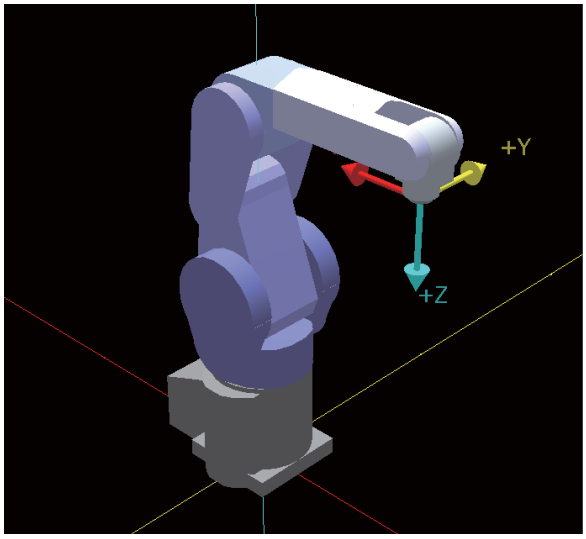
Model type

The model type can be selected from [Detail] or [Simplified].

However, the detail model display is not available for some models.



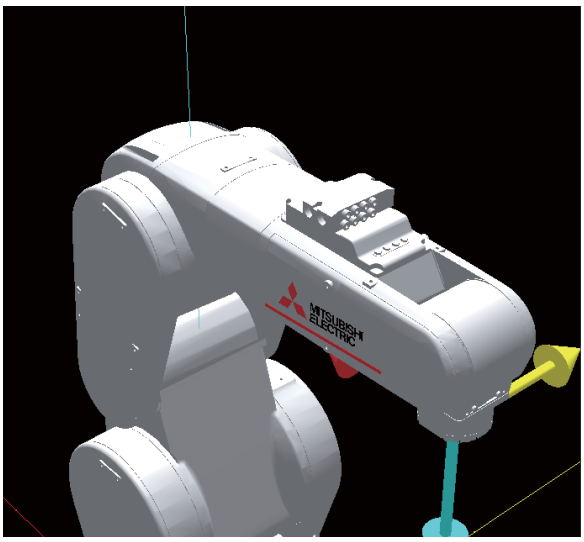
Detail



Simplified

Displaying a solenoid valve

Selecting the [Display Solenoid Valve] check box will display a solenoid valve for the robot in the 3D monitor.



This function is available on robots capable of being mounted with the following solenoid valves, and displays a solenoid valve with four valves.

Solenoid valves (☐ represents the number of valves)	1F-VD0☐(E)-02 1F-VD0☐(E)-03
Robots for which a solenoid valve can be displayed	RV-4FR series RV-7FR series RV-13FR series RV-20FR series RV-4F series RV-7F series RV-13F series RV-20F series

This function is available when the model type is set to [Detail].

Displaying the tool coordinate system

Selecting the [Display Tool Coordinate System] check box will display the position of the mechanical interface or arrows that show the tool coordinate system in the tool coordinates.

Displaying the tool position

Selecting the [Display Tool Position] check box will display the tool currently selected by the controller in the 3D monitor.

Displaying the workpiece coordinates

Tapping [Setting] will display the setting screen.

Select the number of the workpiece coordinates you want to display, then tap [OK].

The workpiece coordinates are displayed in the following format: "(Robot ID): Workn (workpiece number)".

Layout

Layout files created in RT ToolBox3 can be displayed in the T/B.

The layout file contains the settings of 3D monitor, robot, hand, robot parts, user mechanism, spline, and layout objects.

Reading layout information

Tapping [Select] will display the layout file selection dialog.

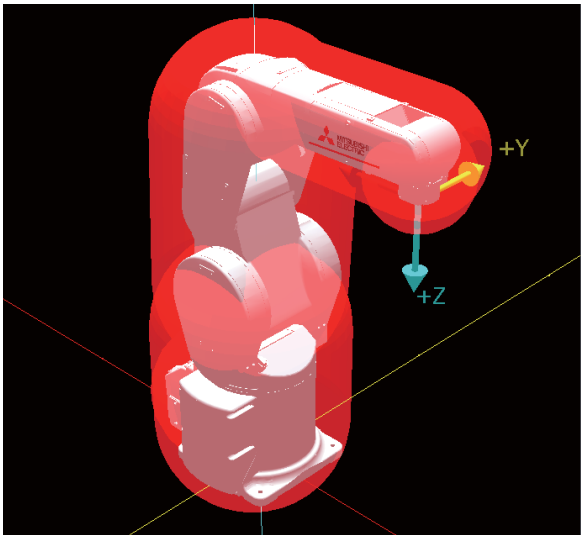
Select a file and tap [OK]. The layout file will be read.

Collision avoidance area

Selecting the [Display Collision Avoidance Area] check box will display the collision avoidance areas of the robot, hand, and workpiece in the 3D monitor.

The hand and workpiece used to display collision avoidance areas can be selected from the drop-down list.

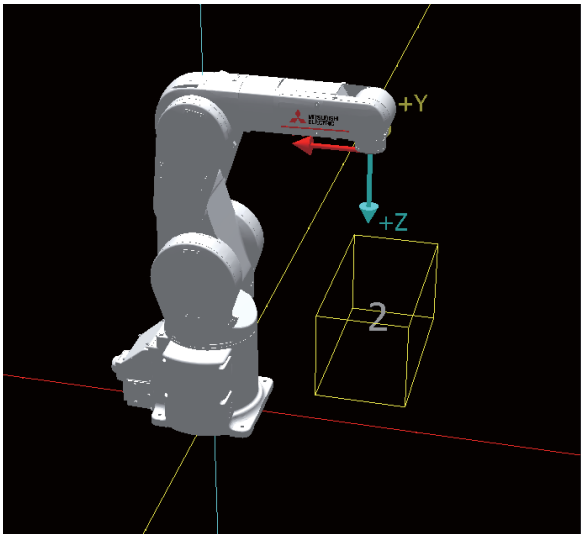
Collision avoidance areas are not displayed for robots that do not support the collision avoidance function.



User-defined area

Tapping [Setting] will display the setting screen.

Select a user-defined area you want to display, then tap [OK].

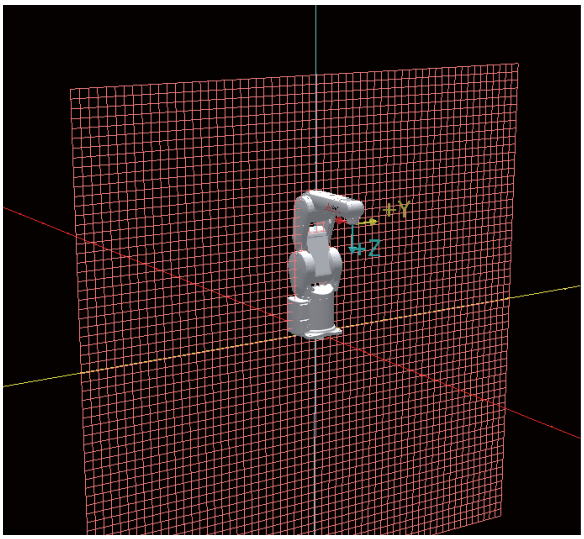


Free plane limit

Tapping [Setting] will display the setting screen.

Select a free plane limit you want to display, then tap [OK].

[Length] allows you to change the length of one side of the free plane limit.



Safety monitoring

⚠CAUTION

- The monitoring planes, monitoring positions, and other elements that are set using safety parameters are different from free plane limits, collision avoidance areas, and user-defined areas.

The monitoring planes, monitoring positions, and other elements of the safety parameters can be checked in the 3D monitor.

The setting items differ depending on the CR800 series or CR750/CR700 series.

CR800 series safety monitoring

The robot safety option is required to use this function.

For information on the robot safety option, refer to the following manual:

📖Robot Safety Option Instruction Manual (BFP-A3531)

■Displaying monitoring planes

Tapping [Setting] will display the setting screen.

Select an item you want to display, then tap [OK]. The plane set with the safety parameter regarding SLP monitoring planes will be displayed in the 3D monitor.

[Length] allows you to change the length of one side of the monitoring plane.

If the safety parameter is set to disabled, the plane will not appear.

■Displaying monitoring areas

Tapping [Setting] will display the setting screen.

Select an item you want to display, then tap [OK]. The area set with the safety parameter regarding SLP monitoring areas will be displayed in the 3D monitor.

If the safety parameter is set to disabled, the area will not appear.

■Displaying AREA input

Tapping [Setting] will display the setting screen.

Select an item you want to display, then tap [OK]. The area set with the safety parameter regarding AREA input areas will be displayed in the 3D monitor.

If the safety parameter is set to disabled, the area will not appear.

■Arm monitoring model

Selecting the [Display Arm Model] check box will display an arm monitoring model in the 3D monitor.

■Displaying tool monitoring models

Tapping [Setting] will display the setting screen.

Select an item you want to display, then tap [OK]. The user-specified monitoring position set with the safety parameter regarding robot models will be displayed in the 3D monitor.

CR750/CR700 series safety monitoring

This function is supported with controller software Ver.R6, S6 or later.

The robot safety option is required to use this function.

For information on the robot safety option, refer to the following manual:

📖Robot Safety Option Instruction Manual (BFP-A3531)

■Displaying monitoring planes

Tapping [Setting] will display the setting screen.

Select an item you want to display, then tap [OK]. The plane set with the safety parameter regarding position monitoring (plane settings) will be displayed in the 3D monitor.

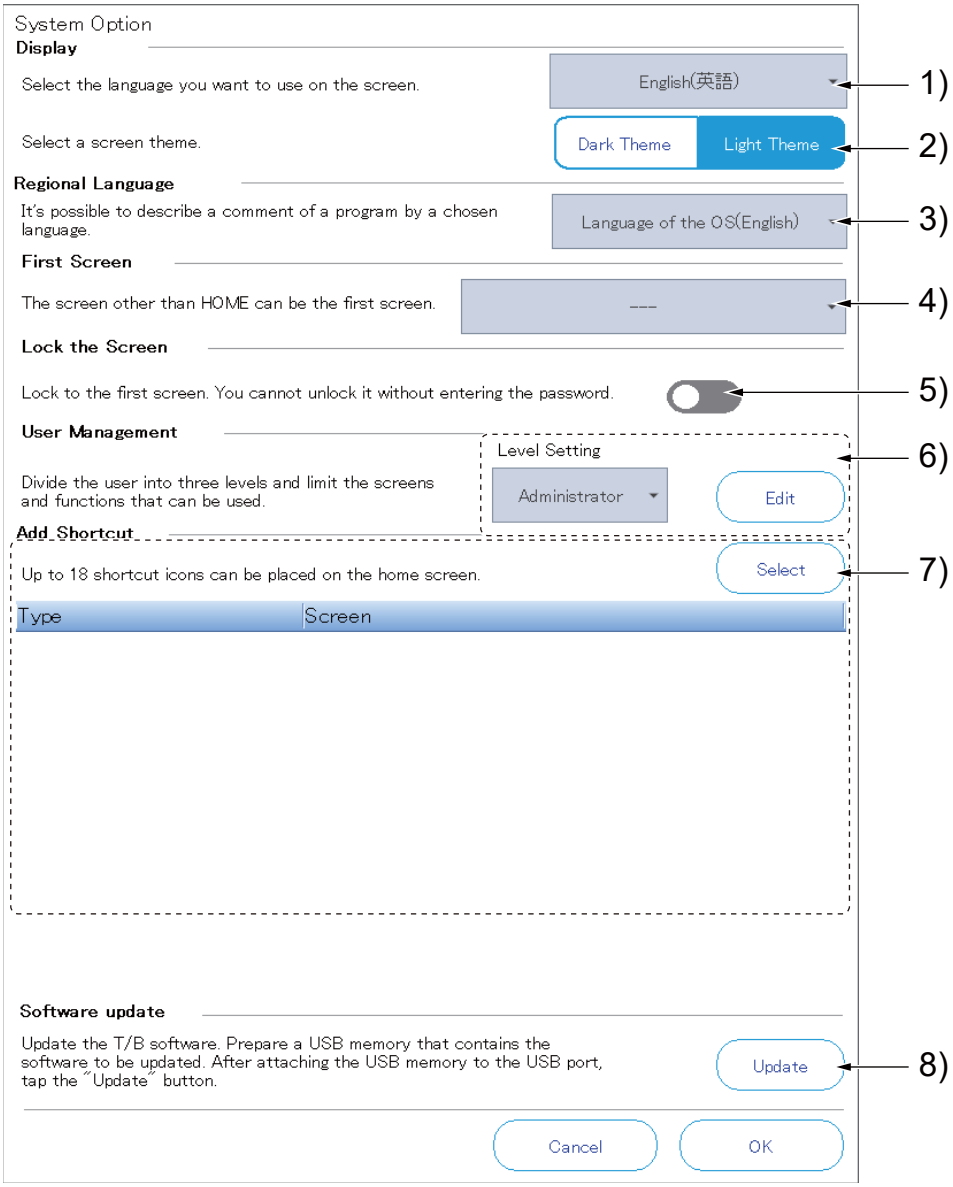
■Displaying monitoring positions

Tapping [Setting] will display the setting screen.

Select an item you want to display, then tap [OK]. The position set with the safety parameter regarding position monitoring (position settings) will be displayed in the 3D monitor.

19 SYSTEM OPTIONS

Tap [Option] in the menu while the HOME screen is displayed. The system option screen will appear.
The system option screen is composed as follows:



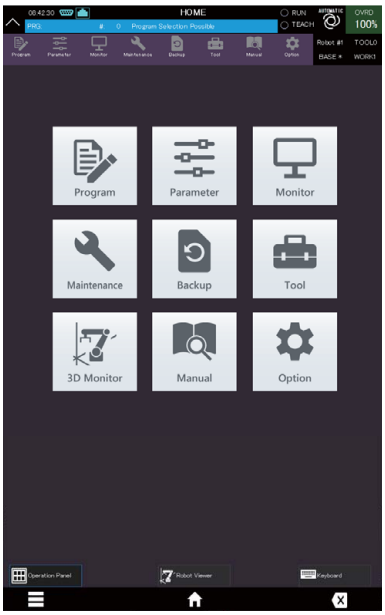
No.	Name	Description
1)	Display language	Change the display language of the T/B. ☞ Page 303 Display language
2)	Screen theme	Selects the screen theme. ☞ Page 303 Screen theme
3)	Regional language	Switches the language to the one used in the comments of the program. ☞ Page 304 Regional language
4)	First screen	Sets the screen displayed at startup of the T/B. ☞ Page 304 First screen
5)	Lock the screen	Locks the screen. ☞ Page 306 Locking the screen
6)	User management	Switches the user level. ☞ Page 307 User management
7)	Add shortcut	Adds or edits the shortcuts displayed on the HOME screen. ☞ Page 310 Shortcut
8)	Software update	Updates the software of the T/B. ☞ Page 311 Updating the T/B

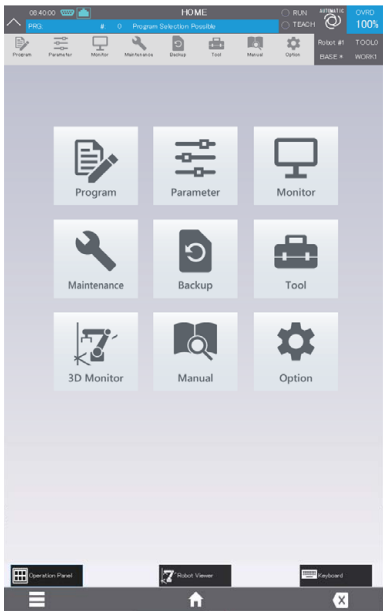
19.1 Display language

Change the display language of the T/B.
Select a language from the drop-down list.
If the regional language and display language are different, note that information such as program comments may not be displayed correctly.
Tapping [OK] will display a dialog asking whether to reboot the T/B.
To apply the settings completely, reboot the T/B.

19.2 Screen theme

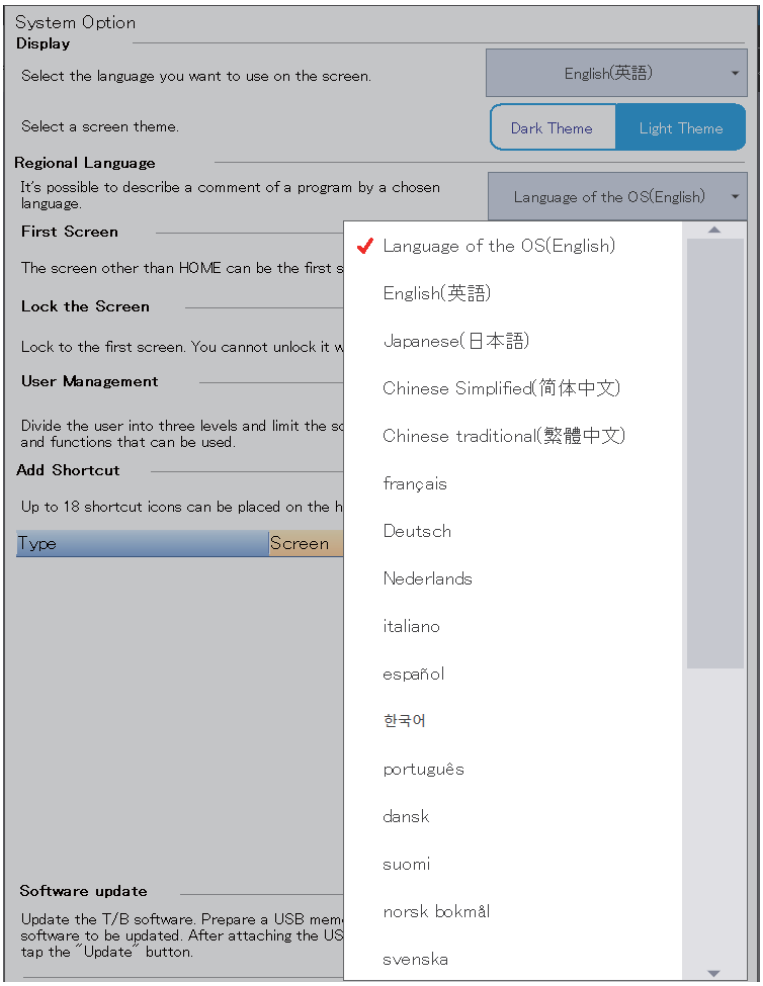
Change the screen theme of the T/B.
Tap [Dark Theme] or [Light Theme] to select the screen theme.
Tapping [OK] will display a dialog asking whether to reboot the T/B.
To apply the settings completely, reboot the T/B.





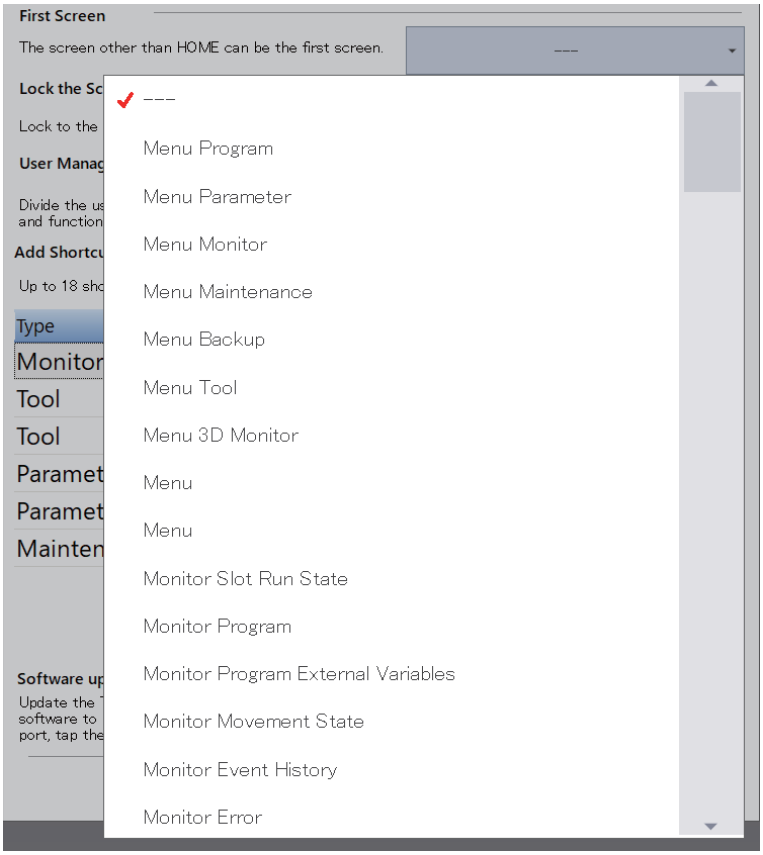
19.3 Regional language

Switches the language to the one used in the comments of the program.
Select a language from the drop-down list.
If the regional language and display language are different, note that information such as program comments may not be displayed correctly.
Tapping [OK] will display a dialog asking whether to reboot the T/B.
To apply the settings completely, reboot the T/B.



19.4 First screen

Set the screen displayed at startup of the T/B.
Select the page you want to set as the first screen from the drop-down list.
Tapping [OK] will change the settings.


First Screen
The screen other than HOME can be the first screen.

Lock the Sc
Lock to the
User Manag
Divide the us
and function
Add Shortcu
Up to 18 sho
Type
Monitor
Tool
Tool
Paramet
Paramet
Mainten
Software up
Update the
software to
port, tap the

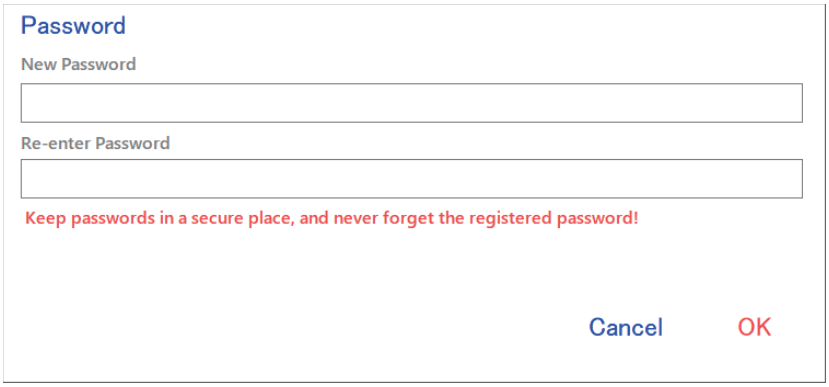
Menu Program
Menu Parameter
Menu Monitor
Menu Maintenance
Menu Backup
Menu Tool
Menu 3D Monitor
Menu
Menu
Monitor Slot Run State
Monitor Program
Monitor Program External Variables
Monitor Movement State
Monitor Event History
Monitor Error

19.5 Locking the screen

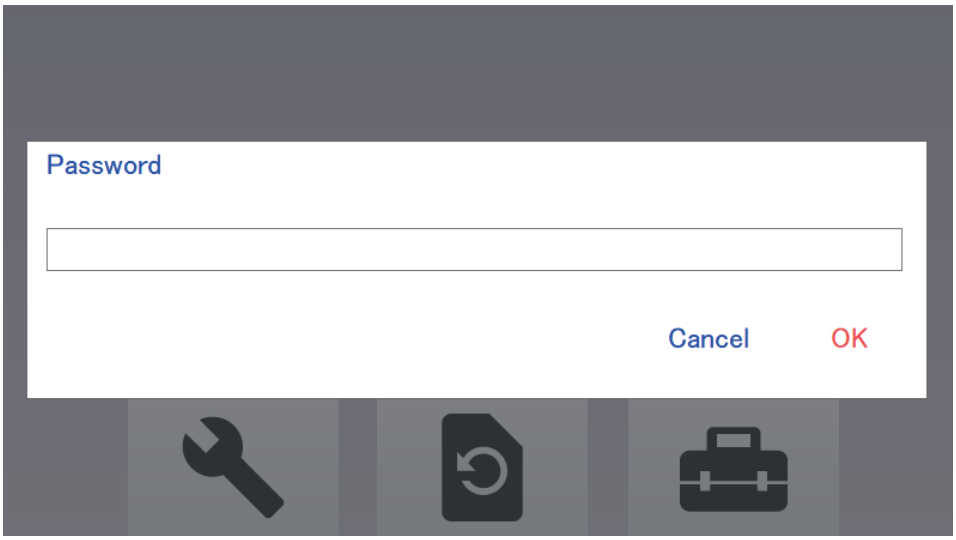
⚠CAUTION

• Pay sufficient attention to password management.
The screen cannot be unlocked without entering the correct password. Pay sufficient attention to the management of the set password.

Operations on screens other than the first screen can be restricted by setting a password.
Tapping the switch on the system option screen will display the password setting screen.
Enter a password you want to set, then tap [OK]. The screen will be locked.



When the screen is locked, attempting to switch to another screen from the first screen will display the password input screen.
Enter the set password. The screen will be unlocked.



Upon restart of the T/B, the screen will be locked again.
To deactivate the locking function of the screen, change the settings on the system option screen.
The following operations are possible even if the screen is locked.

- Override change
- Jog operation
- Hand operation
- Electric hand operation

19.6 User management

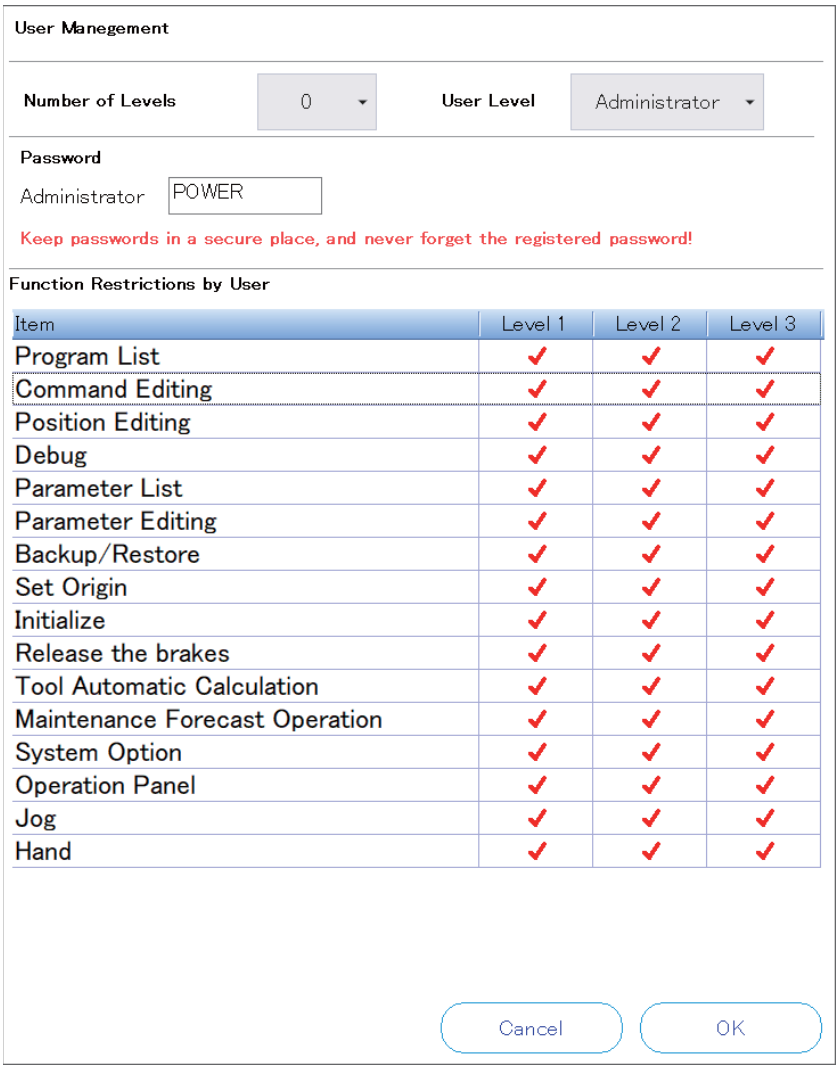
This function is used to restrict the use of the T/B screen.
In addition to the administrator, up to three levels can be set.
The use of functions can be restricted according to the following levels of priority: Administrator > Level 1 > Level 2 > Level 3

Editing the user level

⚠CAUTION

• Pay sufficient attention to password management.
The user level cannot be set or switched without entering the correct password. Pay sufficient attention to the management of the set password.

Tap [Edit]. The password input screen will appear.
The initial password is "POWER". This password can be changed on the user management screen.
In the initial state, the number of user levels is 0, and only the administrator exists.



The following shows how to set the user level.

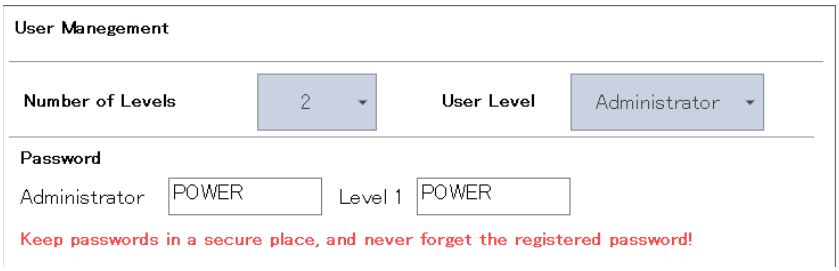
1. Select the number of user levels (any number from 0 to 3) from the drop-down list.

If not using user management, set the number of user levels to 0.

2. Set passwords for the administrator and each user level.

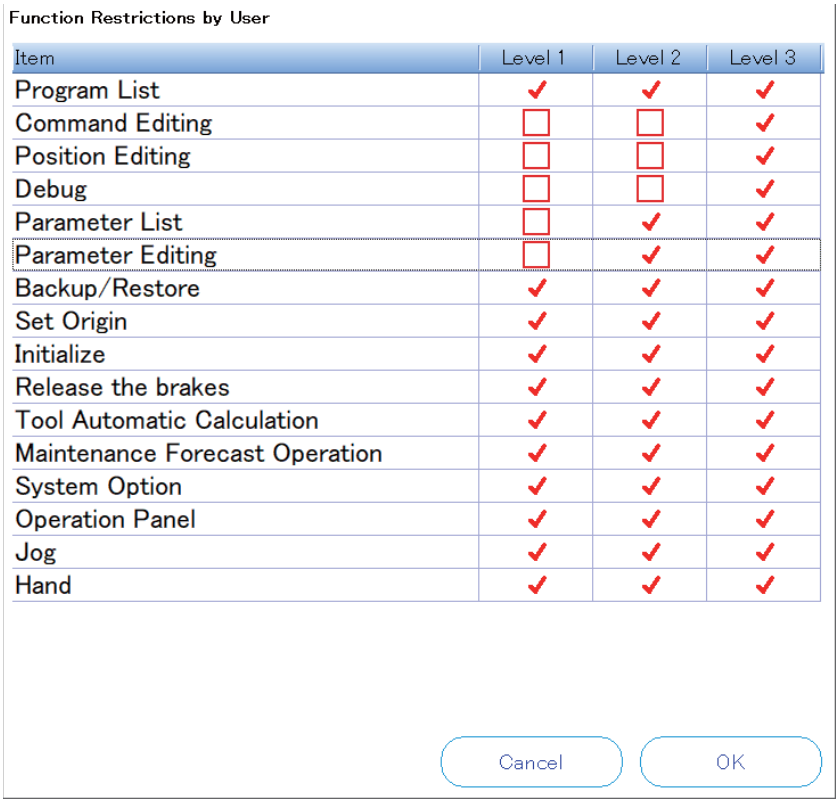
A password does not need to be set for the lowest level.

For example, if the number of user levels is 2, a password cannot be set for level 2 (lowest user level).



3. Set use restrictions for each screen by level.

Only screens with selected check boxes are available.



4. From the drop-down list at the top right of the screen, select the user level applied when the user management screen is closed.

The user level can also be changed on the system option screen.

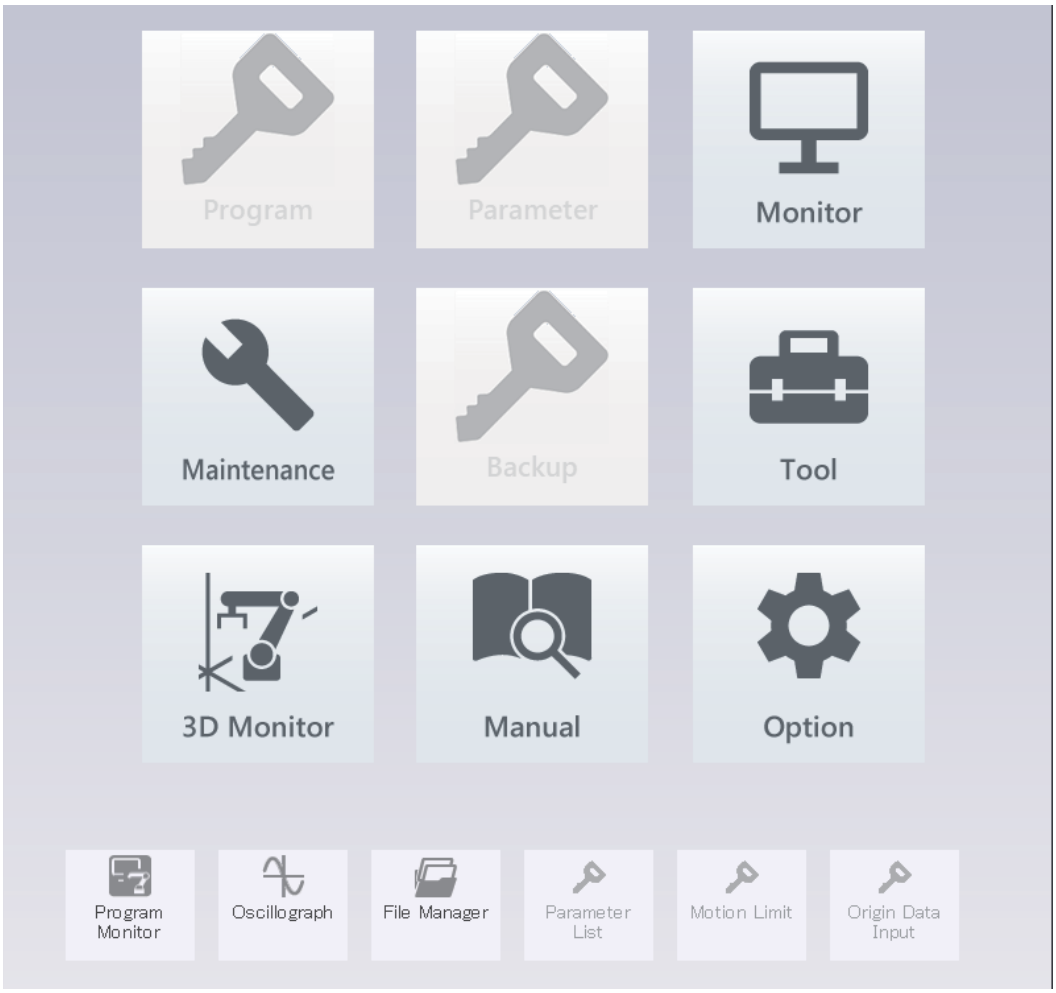
5. Tapping [OK] will apply the settings.

Switching the user level

No password input is required to switch to a lower user level.

Attempting to switch to a higher user level will display the password input screen.

 is displayed for screens under use restrictions, and they are unavailable.



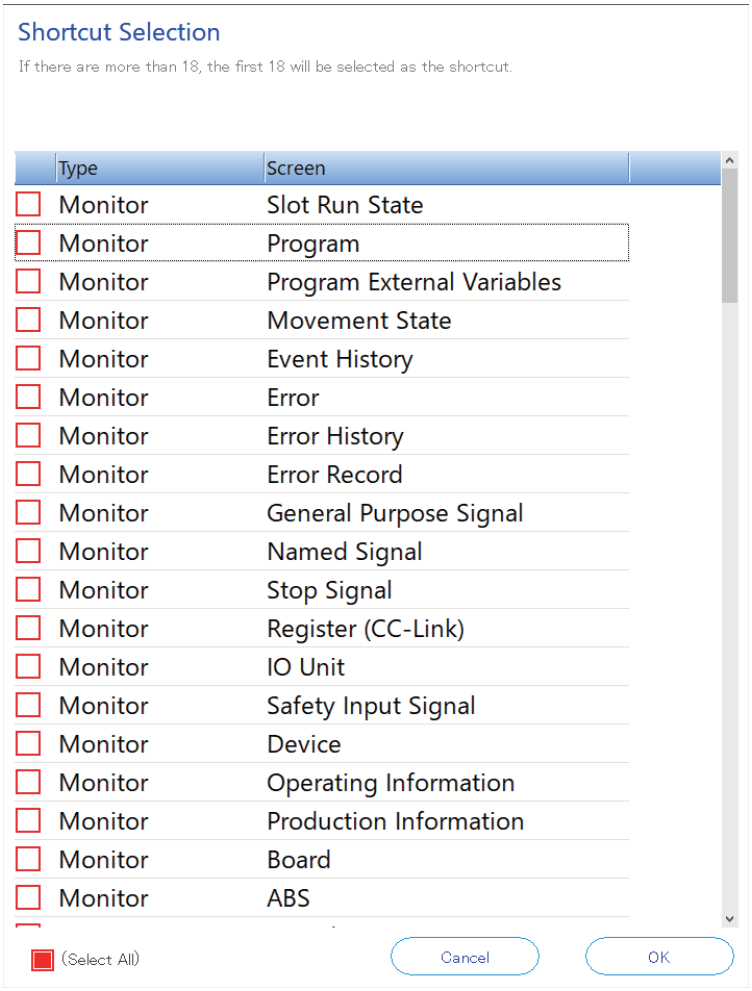
19.7 Shortcut

Set a shortcut to be displayed on the HOME screen.

Tapping [Select] will display the page selection screen for shortcut settings.

Select a page you want to set as a shortcut, then tap [OK]. The list on the option screen will be updated.

Up to 18 shortcuts can be set.



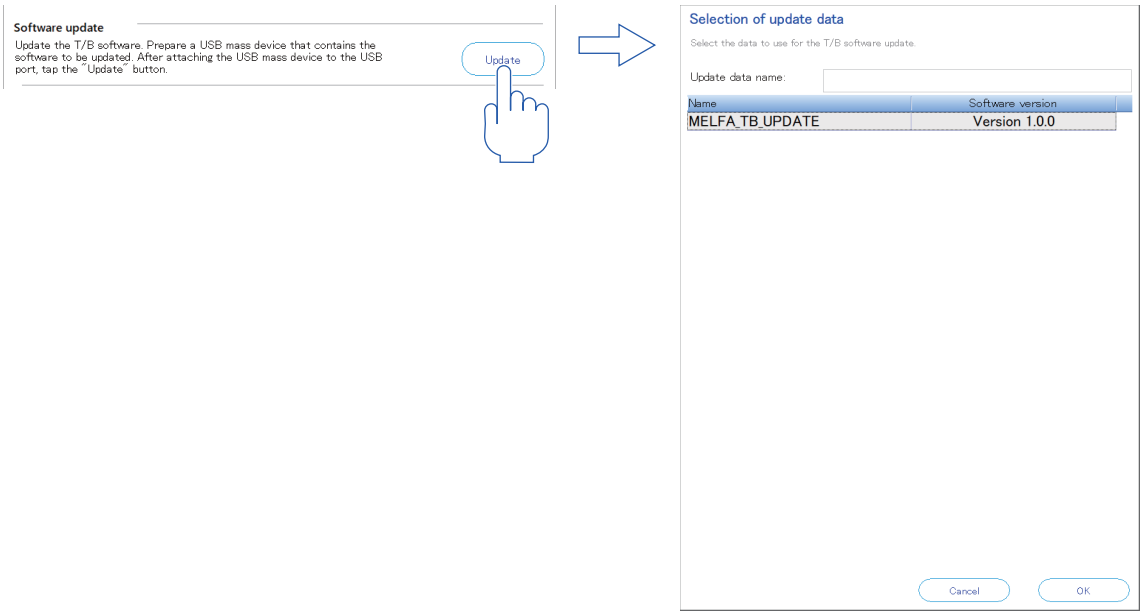
19.8 Updating the T/B

⚠CAUTION

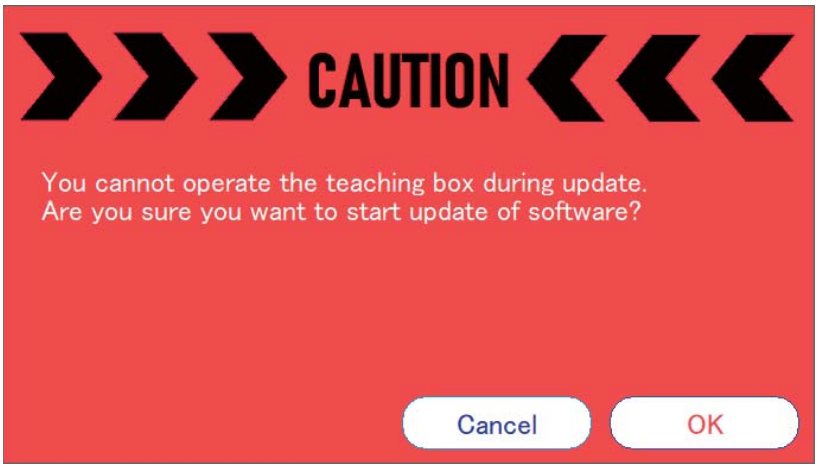
- Do not power off the controller during update. Doing so may cause the T/B to malfunction.
- Do not remove the USB memory from the T/B during update. Doing so may cause the T/B to malfunction.

Update the software of the T/B.

1. Download update data (compressed file) from the MITSUBISHI ELECTRIC FA website. MITSUBISHI ELECTRIC FA website URL: https://www.mitsubishielectric.com/fa/
2. Decompress the downloaded data (compressed file).
3. Copy the "MELFA_TB_UPDATE" folder in the decompressed data to the USB memory. Copy the "MELFA_TB_UPDATE" folder to the root folder in the USB memory. (If the USB memory drive is "D", the "D:\" folder is the root folder.)
4. Insert the USB memory with the copied "MELFA_TB_UPDATE" folder into the T/B.
5. Tapping [Update] on the system option screen will display the update data selection screen.

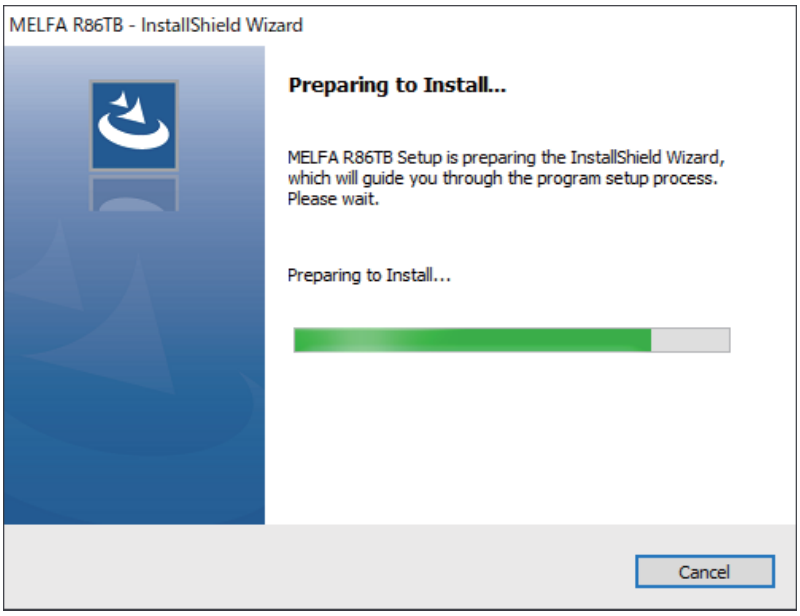


6. Select "MELFA_TB_UPDATE", then tap [OK]. A dialog will appear.



7. Read the precautions, then tap [OK]. The installer will start up, and the update process of the T/B will start.

Tapping [Cancel] in the following window during installer startup will interrupt the update process, causing the software not to be rebooted properly. In this case, reboot the T/B, and perform an update process again.



REVISIONS

*The manual number is on the bottom left of the back cover.

Revision date	*Manual No.	Description
December 2022	BFP-A3826-A	First edition

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Specifications are based on in-house standardized tests.
An effort has been made to make full descriptions in this manual. Do not handle the product in ways other than those described in this manual, and also keep in mind that handling the product in such ways may cause an alarm. If any discrepancies or unclear points are found, please contact your dealer.
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Illustrations in this instruction manual may differ from the actual products.

BFP-A3826-A(2212)MEE

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