

Mitsubishi Electric Industrial Robot

RT VisualBox Instruction Manual

3G-30C-WINE

SAFETY PRECAUTIONS

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

BASIC PRECAUTIONS AND IMPORTANT POINTS WHEN USING COLLABORATIVE ROBOTS

Collaborative robots have a variety of safety functions, so unlike conventional industrial robots, they can work in the same space as humans without being separated by a machine guard.

Even though collaborative robots are equipped with safety functions, it does not guarantee that they will not cause injury. To prevent injury, robot users, machine manufacturers who construct robot systems, and system builders such as system integrators must select and use functions correctly. Peripherals must be designed, manufactured, set, programmed, maintained, and inspected appropriately. Before working with collaborative robots, conduct risk assessments, check that no risk is present, and ensure all required documentation is in order.

It is vitally important that all the points mentioned above are fully understood in order to work with collaborative robots safely and without incident. When using collaborative robots, always keep in mind that they may move unexpectedly.

INTRODUCTION

Thank you for purchasing Mitsubishi Electric MELFA industrial robots. This document is the user manual for MELSOFT RT VisualBox. This manual will help you to maximize the functions of this software over a wide range of stages, from initial robot startup to program writing, editing, and management. To operate the robot safely, make sure to read this manual and the Safety Manual included with the robot. Keep the manuals in a safe place so that they can be read whenever necessary.

Applicable products

This manual is for RT VisualBox, and applies to the following robot controller:
CR800-05VD robot controller for the RV-5AS-D collaborative robot

This manual is suitable for the following readers:

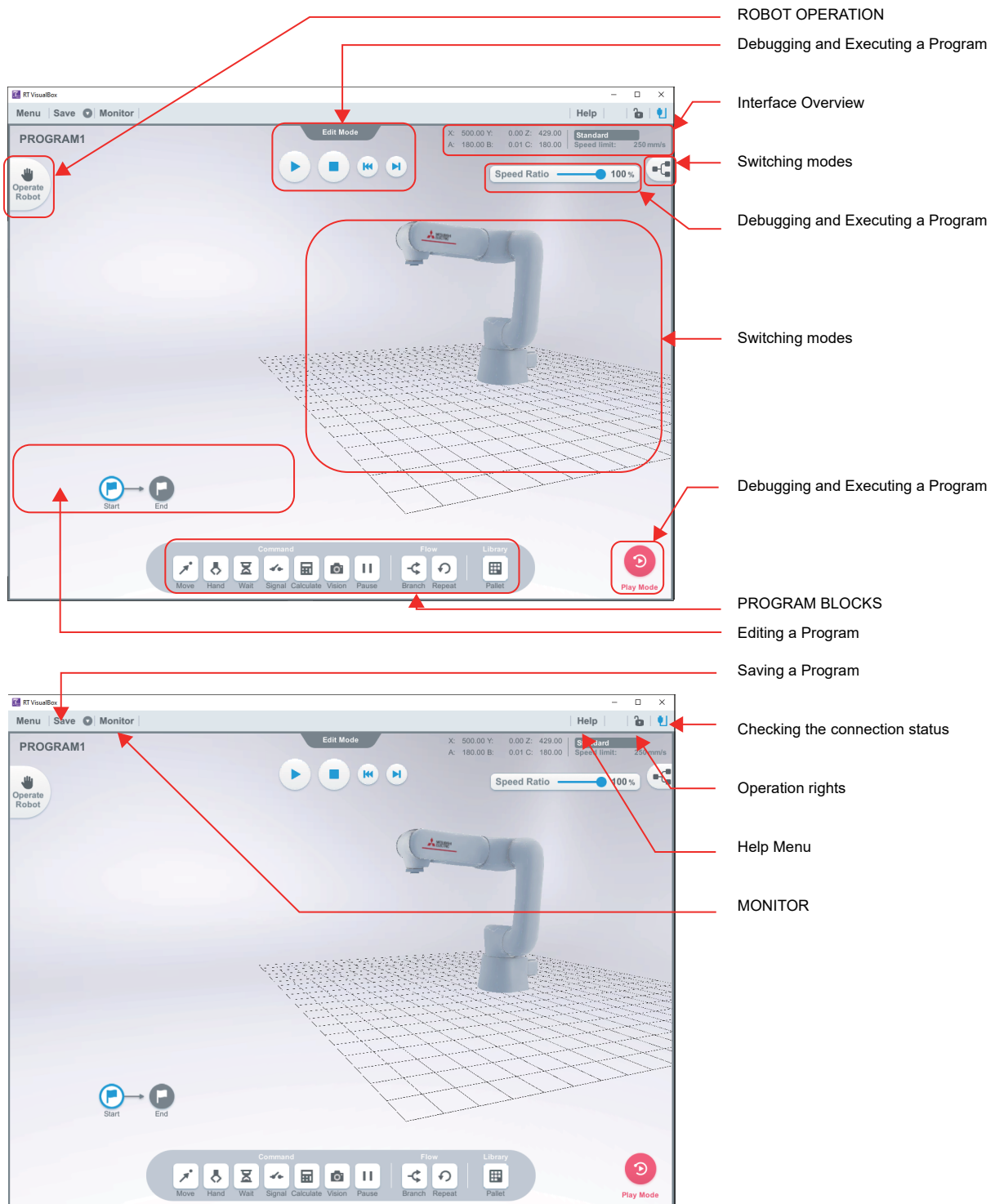
This manual assumes that the reader is familiar with computers, basic Microsoft Windows operations, and the robot controller. Those who have not mastered basic computer operations should read their computer user manual.

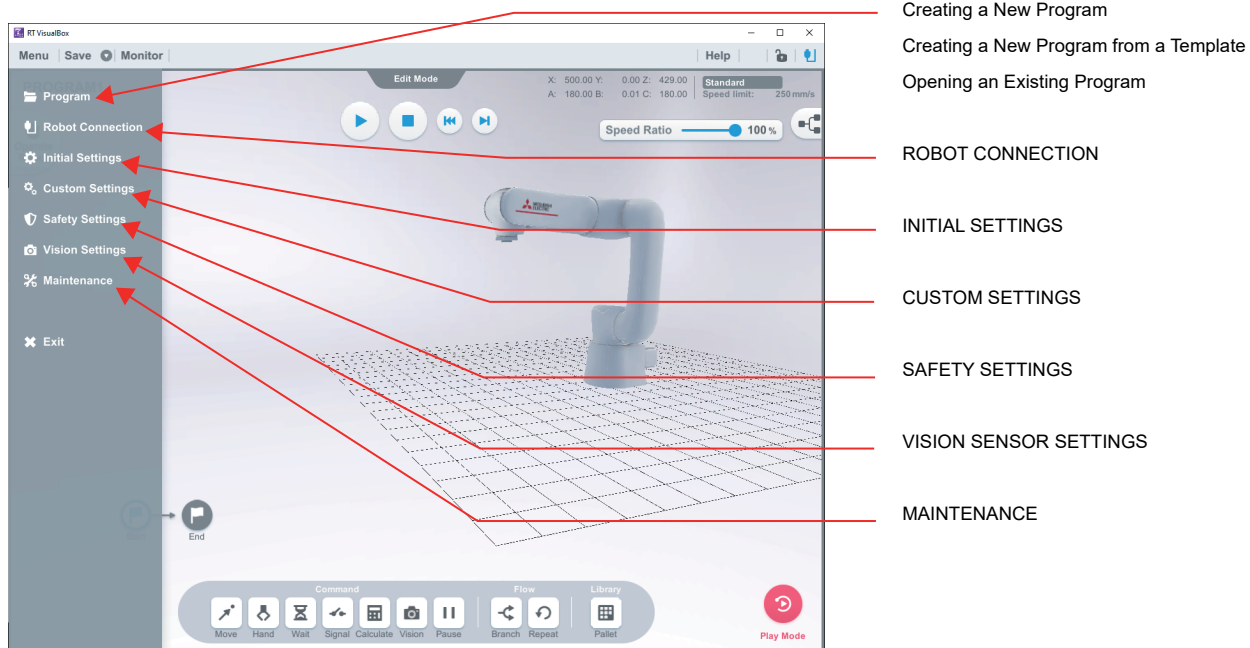
Symbols

 DANGER	Incorrect handling may result in imminent danger, leading to death or serious injury.
 WARNING	Incorrect handling may lead to death or serious injury.
 CAUTION	Incorrect handling may lead to injury or property damage.

- No part of this document may be reproduced by any means or in any form, without prior consent from Mitsubishi Electric.
- The contents of this document are subject to change without notice.
- We make every effort to ensure that the information in this document is as accurate as possible. Please contact us if you find any incorrect, questionable, or missing information.

USER INTERFACE OVERVIEW





CONTENTS

SAFETY PRECAUTIONS	1
BASIC PRECAUTIONS AND IMPORTANT POINTS WHEN USING COLLABORATIVE ROBOTS.....	1
INTRODUCTION.....	2
USER INTERFACE OVERVIEW.....	3
CHAPTER 1 BEFORE USE	9
1.1 This Document.....	9
1.2 Items in Package	9
1.3 Equipment Supplied by Customer.....	9
Computer system	9
Computer cable	9
1.4 Operating Environment.....	10
Connectable robot controllers	10
System requirements.....	10
1.5 Installation/Uninstallation.....	10
Installation	10
Uninstallation.....	13
USB driver installation	13
1.6 Attempting to Start Other Robot Software While RT VisualBox Is Running	13
1.7 Upgrading Software	13
CHAPTER 2 HOW TO USE RT VisualBox	14
2.1 Starting RT VisualBox.....	14
2.2 Interface Overview.....	15
Main screen.....	15
Program block panel	16
2.3 Familiarizing Yourself with RT VisualBox.....	16
Connecting the robot to the computer	16
Initial settings.....	18
Teaching the robot.....	20
Creating a program	22
Executing a program	25
Error Message window	26
2.4 Changing the Display Language of RT VisualBox.....	27
2.5 Help Menu	28
Viewing the Instruction Manual	28
Viewing software information.....	28
2.6 Closing RT VisualBox.....	29
CHAPTER 3 BASIC FUNCTIONS	30
CHAPTER 4 SHARED SCREEN OPERATIONS	31
4.1 Touch Operations and Equivalent Mouse Operations.....	31
4.2 Programming screen modes	31
Switching modes	31
Mouse and touch operations for Programming/3D mode	32
CHAPTER 5 ROBOT CONNECTION	34

5.1	Creating a Project	34
	Creating a new project	34
	Opening an existing project	36
5.2	Selecting a Device	38
	Connectable robot controllers and communication types	38
	Connecting the robot to the computer	38
	Device Connection Settings	39
	Checking the connection status	44
CHAPTER 6 INITIAL SETTINGS		45
6.1	Installation Type Settings	45
6.2	Hand Pre-Installation Steps	45
6.3	Installing a Hand	46
6.4	Selecting a Hand	47
6.5	Hand Settings	49
6.6	Workpiece Settings	51
6.7	Workpiece Grasp Position Settings	52
6.8	Confirming the Settings	53
CHAPTER 7 CREATING A PROGRAM		54
7.1	Creating a New Program	54
7.2	Creating a New Program from a Template	55
7.3	Opening an Existing Program	56
7.4	Editing a Program	57
	Adding (placing) a block	58
	Deleting a block	59
7.5	Saving a Program	60
	Overwriting (saving) a program	60
	Save as	61
	Save as template	61
7.6	Debugging and Executing a Program	62
	Operation rights	63
	Debugging a program (Edit Mode)	63
	Error	65
	Executing a program (Play Mode)	66
CHAPTER 8 PROGRAM BLOCKS		68
8.1	Move Block	69
	Function	69
	Program block	69
	Block properties	69
8.2	Hand Block	72
	Function	72
	Program block	72
	Block properties	72
8.3	Wait Block	73
	Function	73
	Program block	73
	Block properties	73
8.4	Signal Block	74

Function	74
Program block	74
Block properties	74
8.5 Calculate Block	75
Function	75
Program block	75
Block properties	75
8.6 Vision Block	77
Function	77
Program block	77
Block properties	77
8.7 Pause Block	80
Function	80
Program block	80
Block properties	80
8.8 Branch Block	81
Function	81
Program block	81
Block properties	81
8.9 Repeat Block	83
Function	83
Program block	83
Block properties	83
8.10 Pallet Block	86
Function	86
Program block	86
Block properties	86
Pallet settings	87
Deleting Pallet blocks	90

CHAPTER 9 ROBOT OPERATION 91

9.1 Direct Teaching	92
9.2 Jog Operation	94
Motion type: Translational	95
Motion type: Rotational	95
9.3 Inching	96
Motion type: Translational	97
Motion type: Rotational motion	97
9.4 Joint Operation	98
9.5 Hand Alignment	99
9.6 Home Position	100
9.7 Opening/Closing the Hand	100
9.8 Teaching	101

CHAPTER 10 MONITOR 102

10.1 Position List	102
10.2 Variable Monitor	103
10.3 Signal Monitor	106
10.4 Error History	108

CHAPTER 11 CUSTOM SETTINGS	109
11.1 Language Settings	109
11.2 Workpiece Grasp Position Settings	110
11.3 Signal Settings	112
Setting General-purpose signal names	112
Setting Hand signal names	113
11.4 Date & Time Settings	115
CHAPTER 12 SAFETY SETTINGS	116
12.1 Safety Settings Screen	116
12.2 Entering/Changing Passwords	117
12.3 Monitoring Model Settings	118
12.4 Tool Model	118
12.5 Arm Model	119
12.6 Speed Limiting Settings	119
12.7 Low-Speed Space Settings	120
12.8 Safety Input/Output Settings	121
12.9 Position Limiting Settings	123
12.10 Plane Settings	124
12.11 Area Settings	125
CHAPTER 13 VISION SENSOR SETTINGS	126
13.1 Compatible Vision Sensors	126
13.2 Vision Sensor Connection	126
13.3 Workpiece Transfer Settings	129
Registering workpiece transfer settings	129
Workpiece transfer settings list	137
Adjusting identification accuracy for workpiece transfer settings	138
13.4 Pattern identification settings	139
Creating new pattern identification settings	139
Pattern identification settings list	142
Adjusting identification accuracy for pattern identification settings	143
CHAPTER 14 MAINTENANCE	144
14.1 Backup	144
14.2 Restore	145
14.3 Origin Settings	147
14.4 Parameter Settings	150
Reading parameters	150
Writing parameters	151
APPENDIX	152
Appendix 1 Q&A	152
Appendix 2 Copyright & Disclaimer	155
MixedRealityToolkit-Unity	155
REVISIONS	156
SOFTWARE REVISION HISTORY	157
TRADEMARKS	158
COPYRIGHTS	158

1 BEFORE USE

This chapter explains precautions that must be known and things that must be checked before using this software.

1.1 This Document

The user's manual for this software (this document) is stored on the CD-ROM included with the product.

D:\Doc\RTVBMannual.pdf

(if the CD-ROM drive is "D:")

1.2 Items in Package

Check if the package includes the following items.

☐ CD-ROM "RT VisualBox"

☐ Setup Guide

☐ END-USER SOFTWARE LICENSE AGREEMENT

☐ License Certificate (Check that the Product Name and Product ID are printed on it.)

If any items are missing, please contact the branch office or distributor from which you purchased the product.

1.3 Equipment Supplied by Customer

This section explains what equipment is required to use this software.

Computer system

A computer is required to run RT VisualBox. For detailed computer specifications, refer to the following:

 Page 10 Operating Environment

Computer cable

A cable is required to connect the controller and computer. The cable required depends on the connection type, as detailed below.

Connection type	Description
USB	USB Type-A to Mini USB Type-B
Ethernet	10BASE-T / 100BASE-TX

1.4 Operating Environment

This section provides information on the operating environment.

Connectable robot controllers

This software can connect to the following robot controllers.

Robot controller	Communication type ^{*1}	Remarks
CR800-05VD robot controller for RV-5AS-D	USB	Some commercially available products such as computers and cables may not be compatible with our equipment or the temperature and electrical noise of some FA environments. Commercially available products may be susceptible to noise. Check the robot operation carefully to determine if protection against EMI or the addition of a ferrite core is required.
	Ethernet (TCP/IP)	—

^{*1} The computer must have a port for communication.

Only one controller can be connected to this software. It is not possible to connect multiple controllers to this software at the same time.

System requirements

This software operates on PC/AT compatible computers that meet the following specifications.

Item	System requirements
CPU / Graphics	Intel® Core™ i3; 2 GHz or more (8th generation or later) / Graphics card with 1 GB or more of VRAM
Memory	4 GB or more
Storage	5 GB or more
Virtual memory	512 MB or more
Display	1280 × 1024 or more recommended, 1024 × 768 minimum required
Disk drive	CD-ROM
Input interface	Touchscreen or mouse and keyboard
Communication functions/ports	Either USB 2.0 or LAN (100Base-TX or 10Base-T)
Operating system	Windows 11 Home ^{*1} , Windows 11 Pro ^{*1} , Windows 11 Enterprise ^{*1}

^{*1} When installing this software, ".NET Framework 3.5 (includes .NET 2.0 and 3.0)" must be enabled. For information on how to check the current settings and how to enable Windows features, refer to the following page:

☞ Page 12 Points to check when installing this software on Windows 11

1.5 Installation/Uninstallation

This section explains how to install and uninstall the software.

Precautions

If RT VisualBox has already been installed on the computer, uninstall it before installing this software.

Installation

Precautions

- When installing this software, log in as a user with administrator rights. The system will not let you install the software if you log in as a user who does not have administrator rights.
- Close all running applications before installation. If you install this software while other applications are running, it may not work properly.
- If a product ID is not entered, the trial version of this software will be installed. Robots cannot be connected to the trial version of this software.
- Uninstall the trial version of this software before installing the full version. For information on how to uninstall the trial version, refer to the following page:

☞ Page 13 Uninstallation

Installation procedure

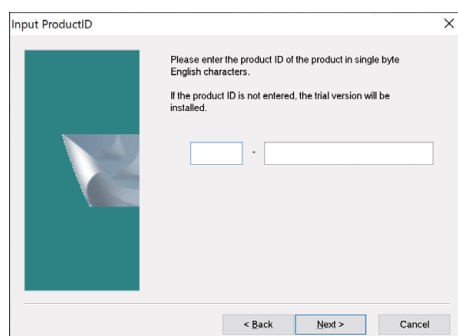
Install this software on the computer with the procedure below.

Inserting this software into the computer's CD-ROM drive will display the Setup screen. If the Setup screen does not appear, display the screen by referring to the following:

☞ Page 11 Displaying the Setup screen

Operating procedure

1. Insert the CD-ROM into the computer's CD-ROM drive.
2. Start the installation wizard.
3. Read the License Agreement.
4. Enter the user information (user name, company name).
5. Enter the product ID of the purchased product. (The product ID is indicated on the License Certificate.)



6. Select the installation destination.
7. After the installation completes, start RT VisualBox to check for correct operation.
8. A message requesting a reboot of the computer may appear after the installation. Reboot the computer as directed on the screen.

■Displaying the Setup screen

Operating procedure

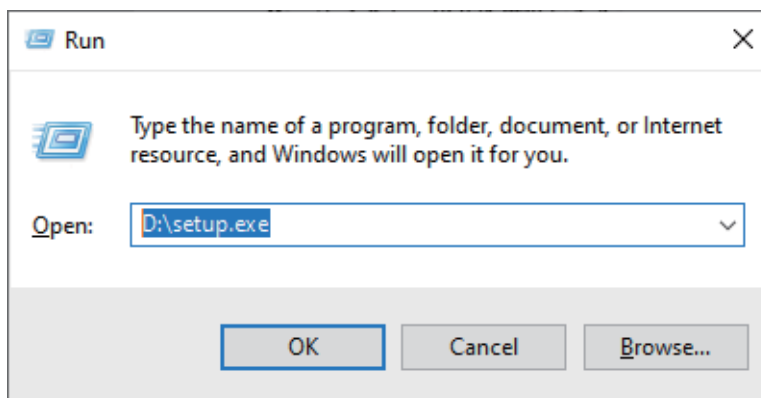
1. Display the Run dialog box.

Operating system	Display method
Windows 11	Keyboard Windows key +

2. After checking the CD-ROM drive name, enter the following:

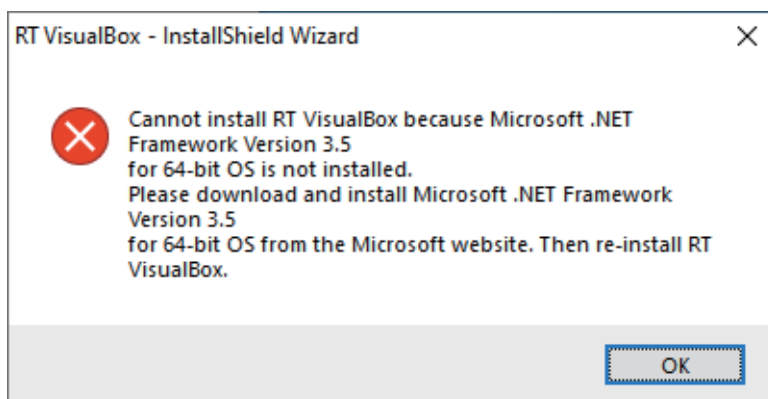
Drive name:\Setup.exe

If the CD-ROM drive is "D:", enter "D:\Setup.exe".



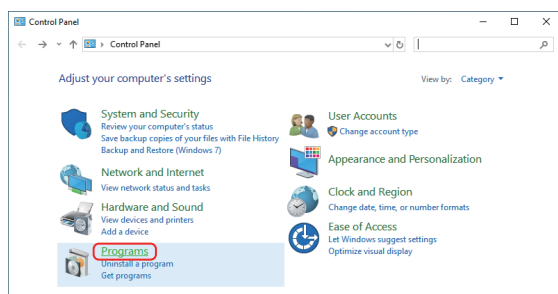
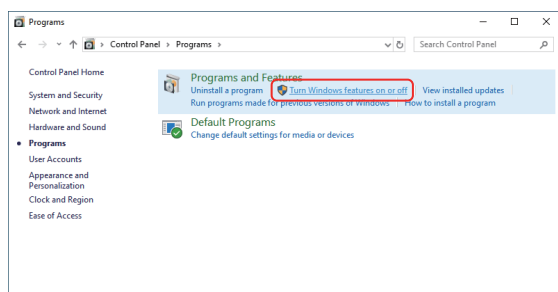
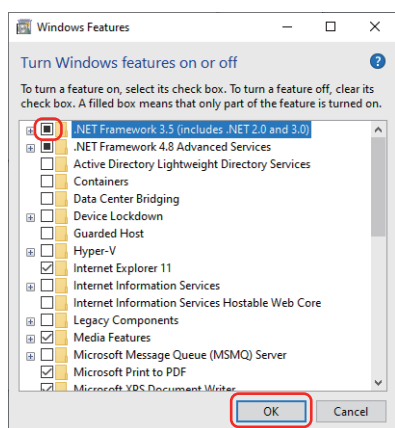
Points to check when installing this software on Windows 11

Before installing this software on a Windows 11 computer, ".NET Framework 3.5 (includes .NET 2.0 and 3.0)" must be enabled on the computer. Attempting to install the software without enabling ".NET Framework 3.5 (includes .NET 2.0 and 3.0)" will display the following message and stop the installation.

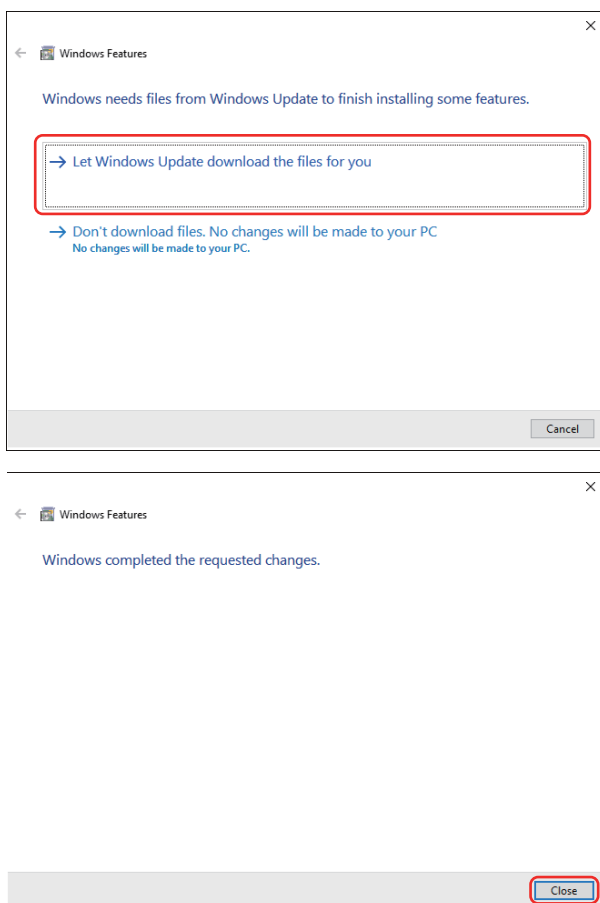


If this message appears, install the software again after enabling ".NET Framework 3.5 (includes .NET 2.0 and 3.0)".

Operating procedure



1. Configure the settings to connect the computer to the Internet.
2. From the Control Panel, select [Programs].
3. Select [Turn Windows features on or off].
4. Select the ".NET Framework 3.5 (includes .NET 2.0 and 3.0)" check box in the Turn Windows features on or off dialog box, and then click/tap [OK].



5. When the window on the left appears, select [Let Windows Update download the files for you].

6. The window on the left will appear when the setting have been configured.

7. Click/tap [Close] to close the window.

Uninstallation

Uninstall the software from the Control Panel of Windows.

Uninstall the software with the following procedure.

Operating procedure

1. Select [Start] → [Control Panel] to display the Control Panel.
2. Select [Programs and Features] or [Uninstall a program].
3. To uninstall a program, select it and click/tap [Uninstall].

USB driver installation

When the computer and robot controller are connected with a USB cable, the installation starts and completes automatically.

1.6 Attempting to Start Other Robot Software While RT VisualBox Is Running

RT ToolBox2 or RT ToolBox3 cannot start while this software is running, and this software cannot start while RT ToolBox2 or RT ToolBox3 is running.

1.7 Upgrading Software

The latest version of RT VisualBox can be downloaded from the MITSUBISHI ELECTRIC FA website, which offers information on MITSUBISHI ELECTRIC FA products.

<https://www.mitsubishielectric.com/fa/products/rbt/robot/items/eng/index.html>

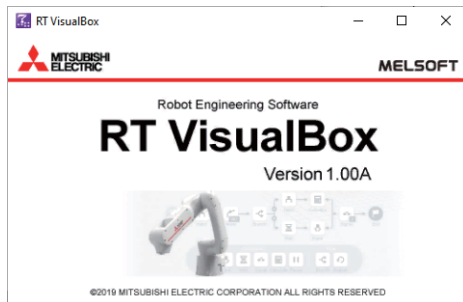
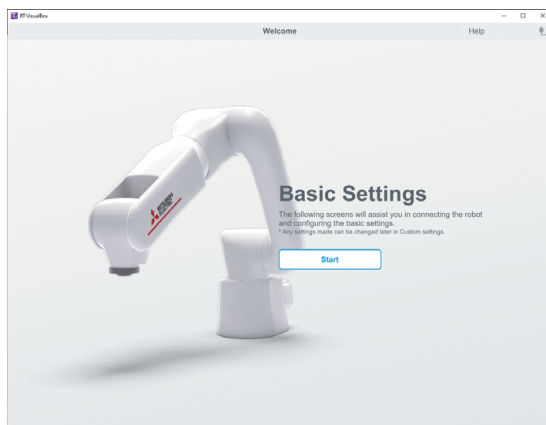
Register as an FA member to download software.

2 HOW TO USE RT VisualBox

This chapter provides a brief description of how to use this software.

2.1 Starting RT VisualBox

Operating procedure



1. A shortcut will be created on the desktop after this software has been installed. Double-tap/click this shortcut to start RT VisualBox.

Alternatively, select [Start] → [All Programs] → [MELSOFT] → [RT VisualBox].

2. The screen on the left only appears when this software starts for the first time.

Tap/click the [Start] button and configure the settings as directed on the screen.

Refer to the following pages for further details.

☞ Page 27 Changing the Display Language of RT VisualBox

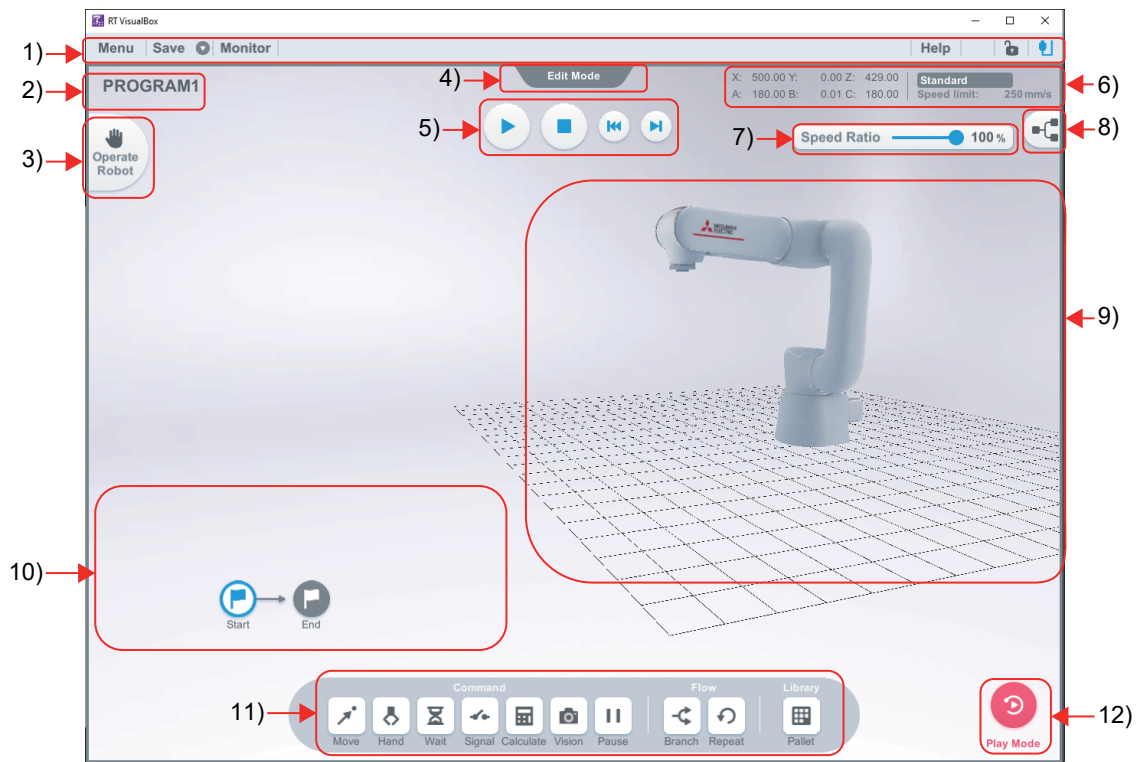
☞ Page 34 ROBOT CONNECTION

☞ Page 45 INITIAL SETTINGS

2.2 Interface Overview

Main screen

The figure and table below explain the interface of the main screen.



No.	Name	Use
1)	Menu bar	Contains various menus and indicates the connection status of the robot controller
2)	Program name	Displays the name of the program
3)	Operate Robot button	Displays a panel used for operating the robot
4)	Display mode	Displays the current display mode <ul style="list-style-type: none"> Edit mode: Program creation mode Play mode: Program execution mode
5)	Program execution buttons	Start, stop, reset the program and perform step operation
6)	Robot status	Displays the robot's current position, safe speed mode, and speed limit "Current position" refers to the current position of the tip of the hand. Refer to the following page for information on how to set the current position. 📖 Page 52 Workpiece Grasp Position Settings
7)	Speed slider-bar	Sets the robot's operation speed
8)	Programming/3D view button	Switches between programming view and 3D view <div> <div> </div> <div>Enables the user to move the blocks placed in the programming area around the screen</div> <div> </div> <div>Enables the user to view the robot from different angles in 3D</div> </div>
9)	3D area	Displays a 3D model of the robot and positions that have been taught to it
10)	Programming area	The area used to create a program by placing and arranging program blocks
11)	Program block panel	Used to select program blocks when creating a program (Displayed in Edit mode)
12)	Mode button	Switches between Edit mode and Play mode

Program block panel

The table below outlines the functions each block in the program block panel.



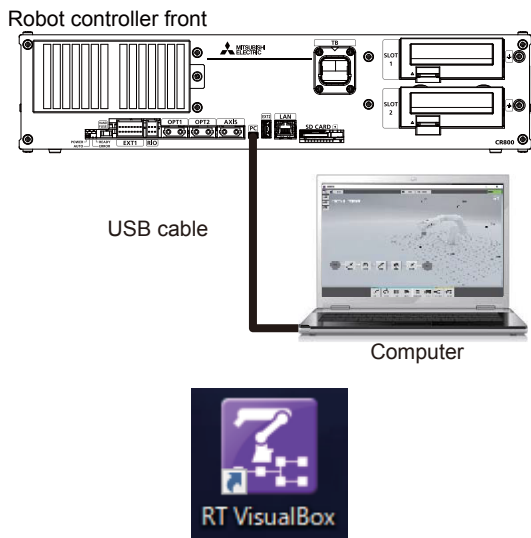
Block name	Description
Move	Moves the robot (Tap/click to configure settings)
Hand	Opens/closes the hand (Tap/click to configure settings)
Wait	Instructs the robot to wait (Tap/click to configure settings)
Signal	Outputs signals (Tap/click to configure settings)
Calculate	Performs calculations (Tap/click to configure settings)
Vision	Identifies the workpiece (Tap/click to configure settings) (This block becomes available when a robot is connected to the software.)
Pause	Pauses the operation
Branch	Branches conditions (Tap/click to configure settings)
Repeat	Repeats the operation (Tap/click to configure settings)
Pallet	Used to set up palletizing operations (Tap/click to configure settings).

2.3 Familiarizing Yourself with RT VisualBox

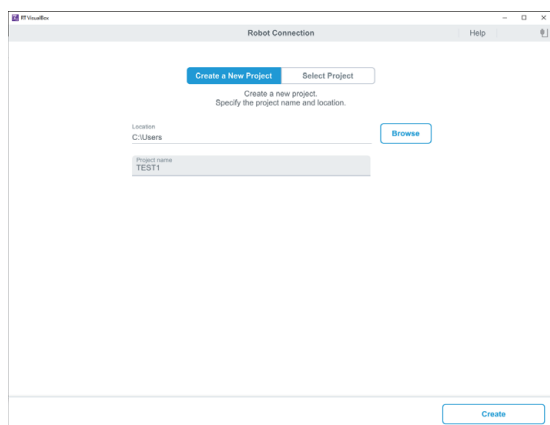
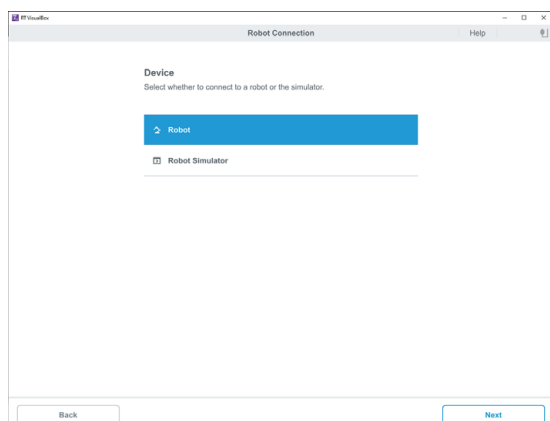
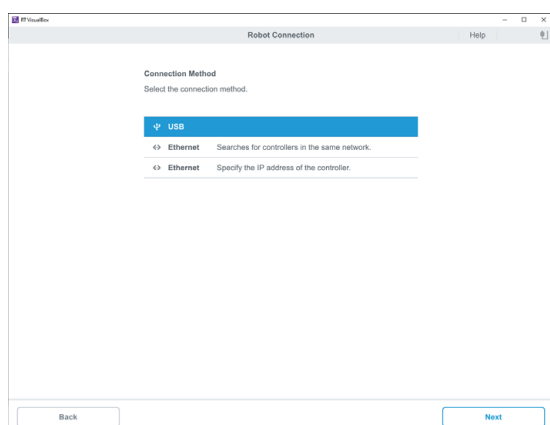
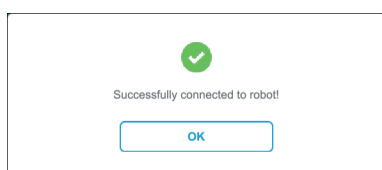
First, let's create a simple program with RT VisualBox and use it to move the robot.
This section provides an overview of how to use this software. See subsequent sections for further information on each topic.
Follow the steps below.

Connecting the robot to the computer

Operating procedure



1. Turn on the power of the robot controller and connect the controller to the computer with a USB cable.
2. Tap/click this shortcut to start RT VisualBox.



3. Select [Create a New Project], then choose a location to save the project and enter a project name.

(The Basic Settings screen will be displayed initially when this software starts for the first time. Here you can select the display language.)

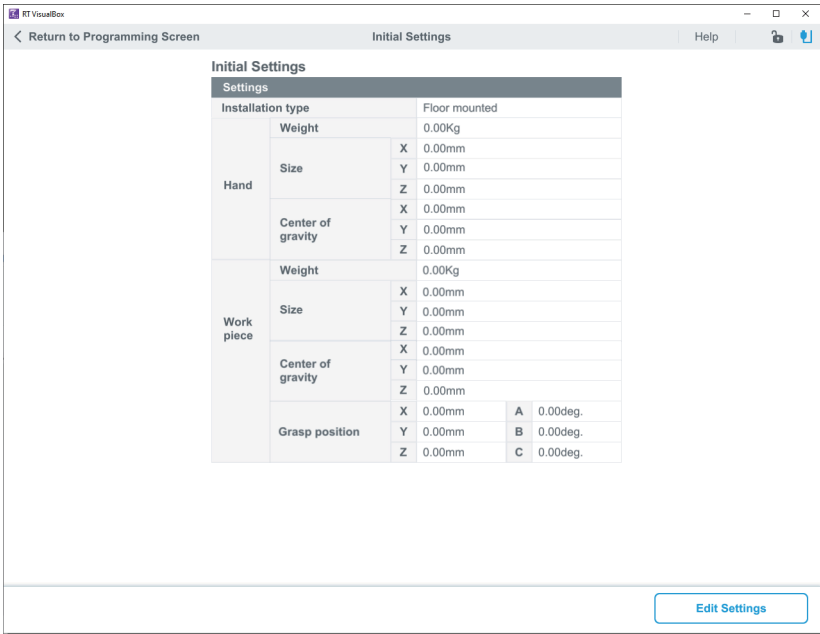
4. Select [Robot] as the device to connect to. Robots cannot be connected to the trial version of this software.

5. Select [USB] as the connection method.

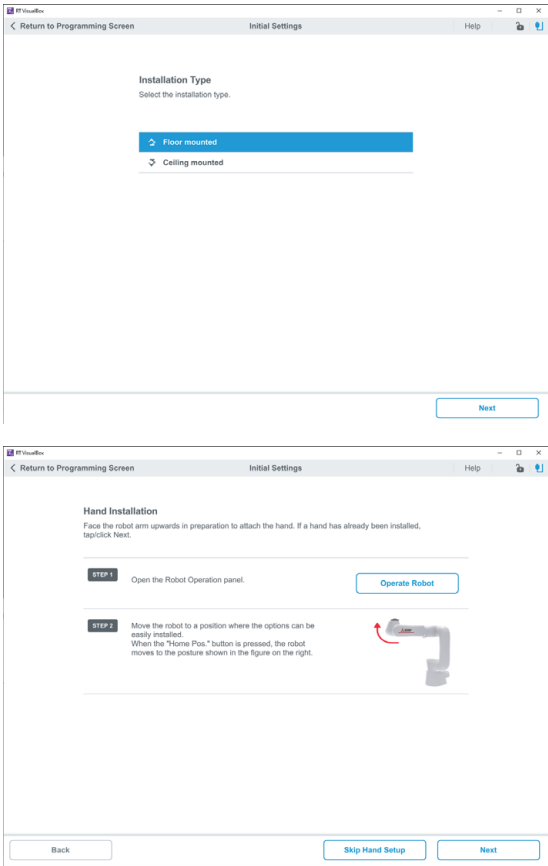
6. The robot will now be connected to the computer.

Initial settings

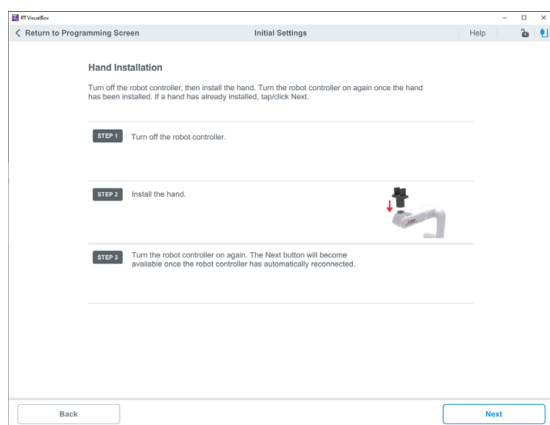
Initial settings are configured on the Initial Settings screen.
Tap/click the [Edit Settings] button and configure the settings as directed on the screen.
If a robot controller with no initial settings is connected to the computer, the Installation Type screen will appear after the Successfully connected to robot! dialog box.



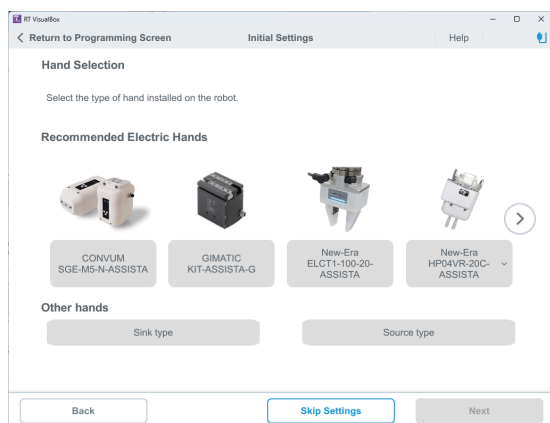
Operating procedure



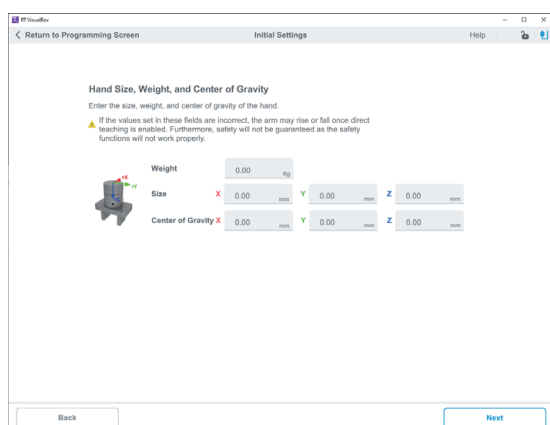
1. Select the installation type.
2. Perform the pre-installation steps before installing a hand.



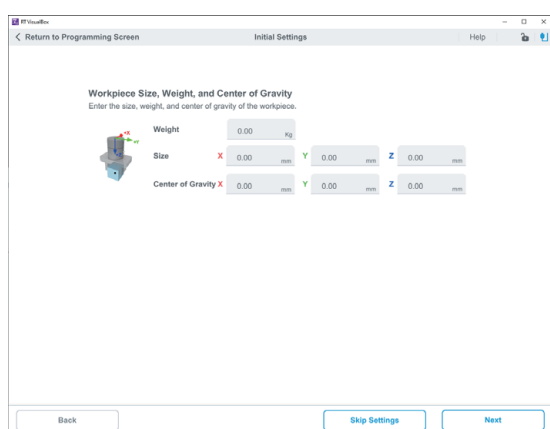
3. Install the hand.



4. Select the type of hand installed on the robot.

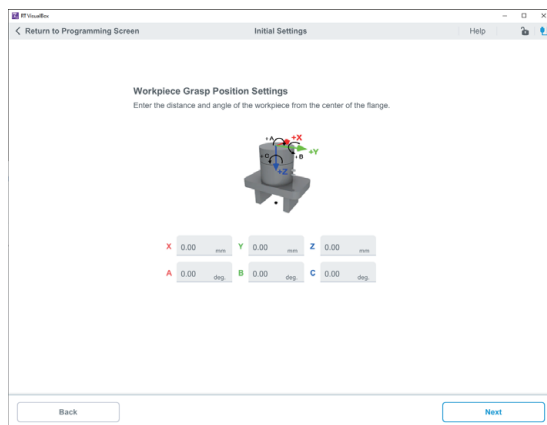


5. Enter the size, weight, and center of gravity of the hand. Ensure that the correct values are set. Not doing so will affect safety functions and operation during direct teaching.

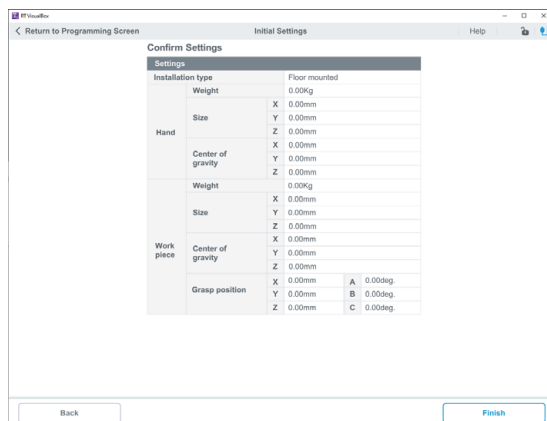


6. Enter the size, weight, and center of gravity of the workpiece.

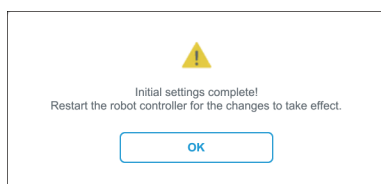
Ensure that the correct values are set. Not doing so will affect safety functions and operation during direct teaching.



7. Set the workpiece grasp position.



8. Check the settings.

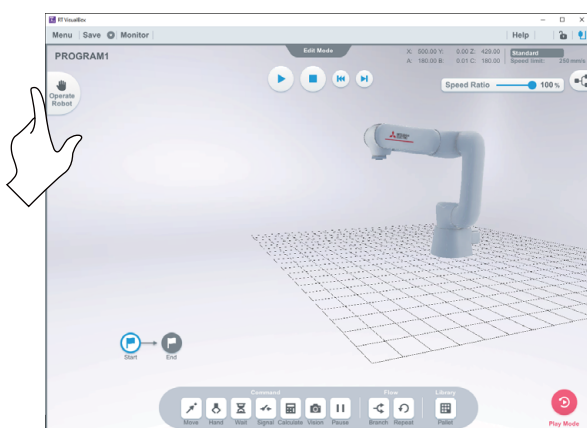


9. Configuration of the initial settings is complete. Restart the robot controller for the settings to take effect.

Teaching the robot

Teach positions to the robot using direct teaching.

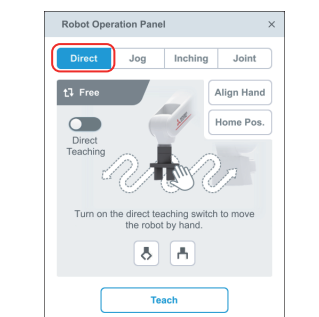
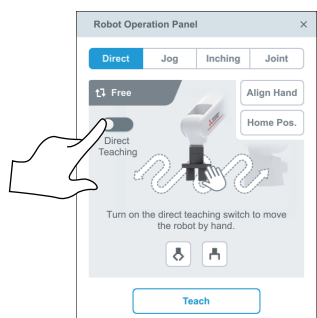
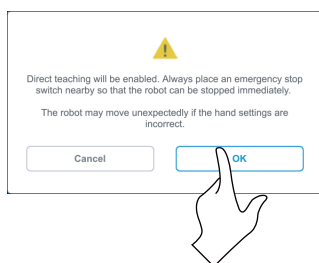
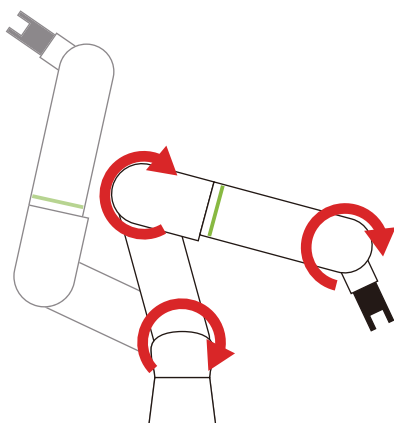
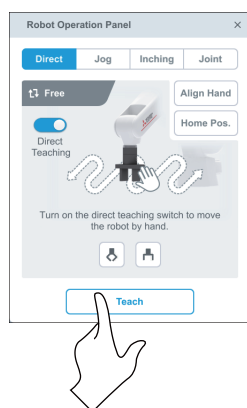
Operating procedure



1. Check that the mode selector switch input on the robot controller is set to "Automatic".

(If not, set it to "Automatic".)

2. Tap/click the [Operate Robot] button to display the Robot Operation panel.



3. Check that the [Direct] tab is selected in the Robot Operation panel.

4. Tap/click the [Direct Teaching] switch in the Robot Operation panel.

A conformation dialog box will appear.

5. Tap/click the [OK] button in the confirmation dialog box to turn on direct teaching.

The LED at the top-left of the [DIRECT TEACHING] button on the arm will turn on.

Point

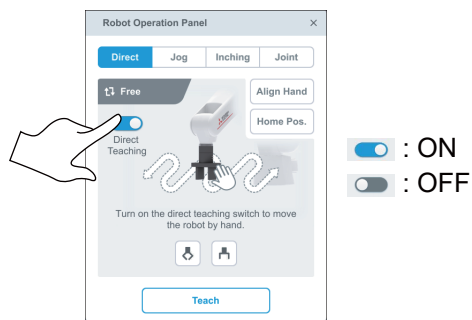
- Direct teaching will remain enabled until the [Direct Teaching] switch is turned off.
- Direct teaching is automatically turned off when switching to the [Jog], [Inching], or [Joint] tab or if an error occurs.

6. Hold the robot arm directly with your hands, and move it to the desired position/posture.

7. Tap/click the [Teach] button in the Robot Operation panel to teach the current position.

Point

Pressing the [TEACH] button on the top of the robot arm performs the same operation as tapping/clicking the [Teach] button in the Robot Operation panel.



8. Tap/click the [Direct Teaching] switch again in the Robot Operation panel to turn off direct teaching.

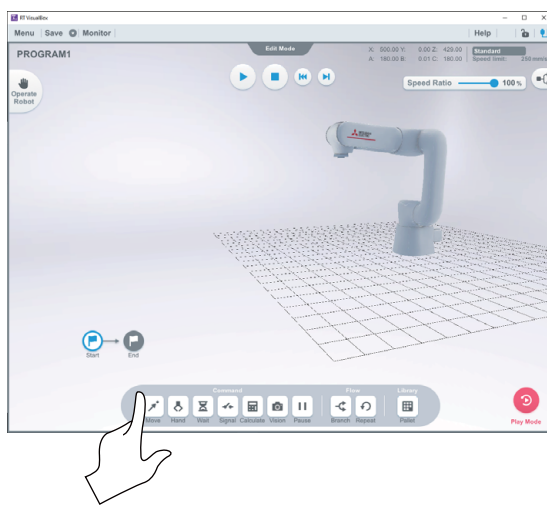
Point

If the robot arm is not moved for a certain period of time (the initial value is 60 seconds) after direct teaching is turned on, direct teaching is automatically turned off.

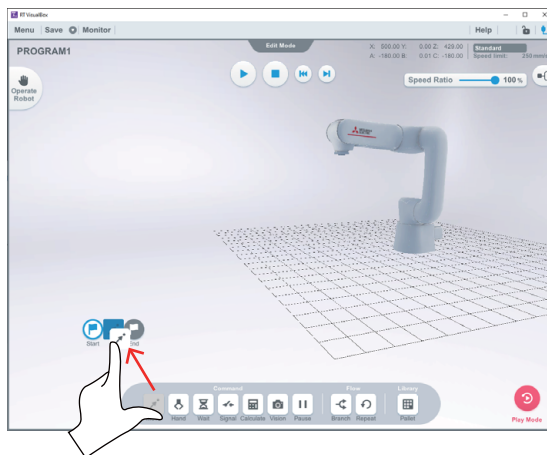
Creating a program

Adding a block

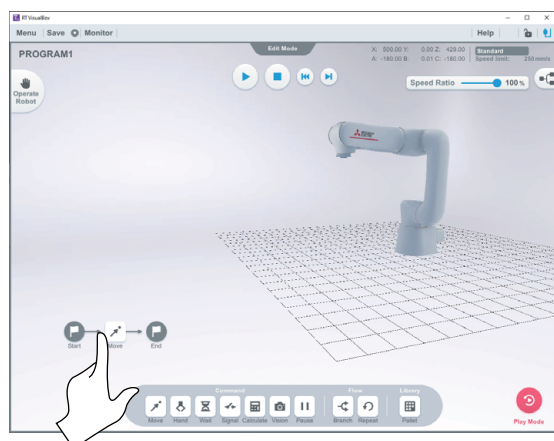
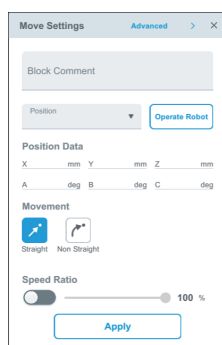
Operating procedure



1. Select a block to instruct the robot to perform an action.



2. Drag and drop the selected block to the area between Start and End.



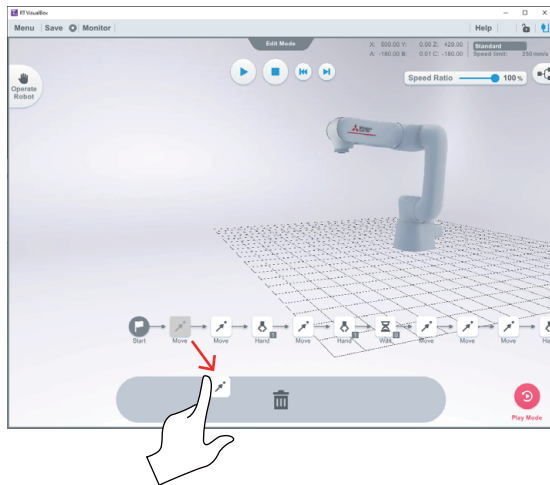
3. Tap/click on a block which has been inserted into the program to display its settings.

4. The settings window for that block will appear. Configure the block's settings.

5. Repeat the steps above to create a program.

Deleting a block

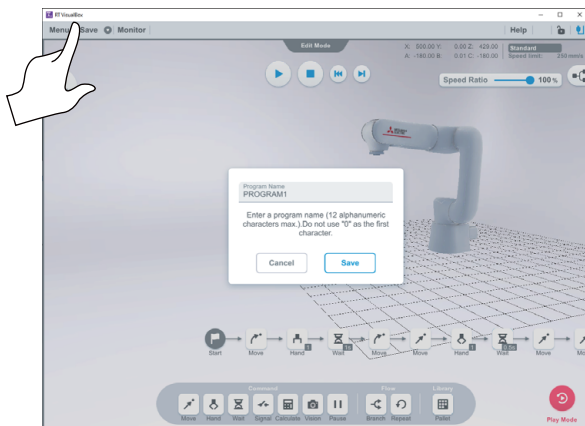
Operating procedure



1. Select a block and drag it downwards. A trash can will appear. To delete the block, move it to the trash can and release it.

Saving a program

Operating procedure



1. Tap/click [Save] on the menu bar to save the program. The program will be saved to the robot controller.

Executing a program

Operate the robot as follows.

CAUTION

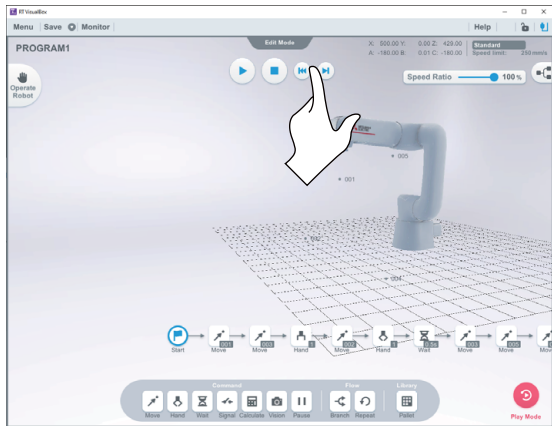
Before operating the robot from RT VisualBox, be sure to place an emergency stop switch nearby so that the robot can be stopped immediately.

2

Step operation

Check the operation of the program.

Operating procedure



1. Tap/click the [Step forward] button and perform each step in the program to check the operation.

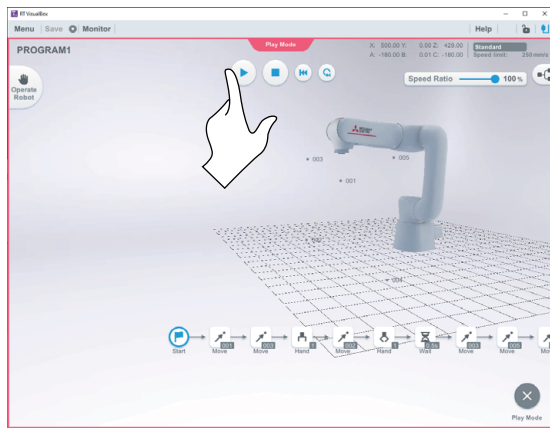
Automatic operation

Operating procedure



1. Tap/click the [Mode] button to switch to Play mode.

Point To modify the program, switch to Edit mode.



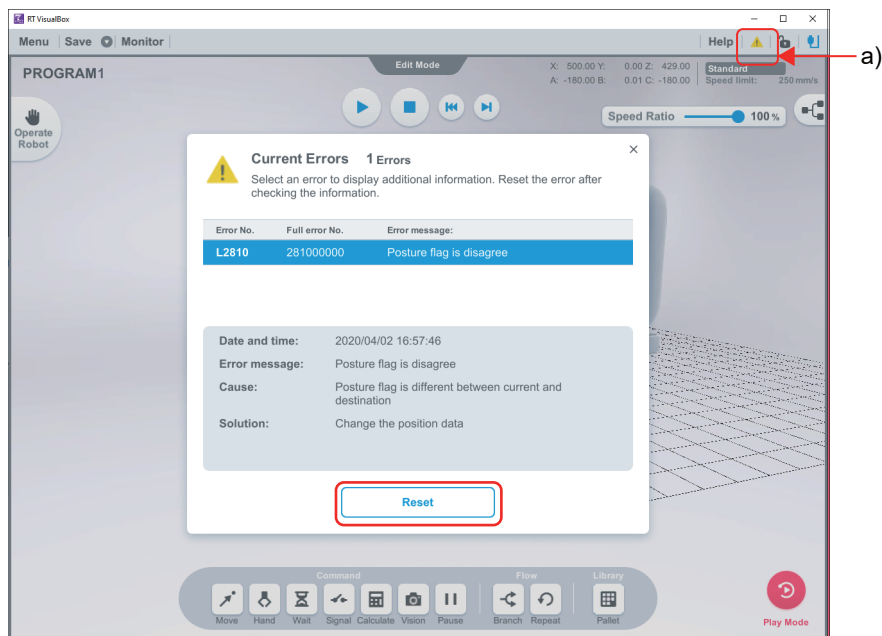
2. Tap/click the [Play] button to start automatic operation.

Error Message window

The Error Message window will appear automatically if an error occurs with the robot controller.

Errors can be cleared by pressing the [Reset] button.

To display the error message again after closing the window, click the icon in the menu bar indicated by "a".



2.4 Changing the Display Language of RT VisualBox

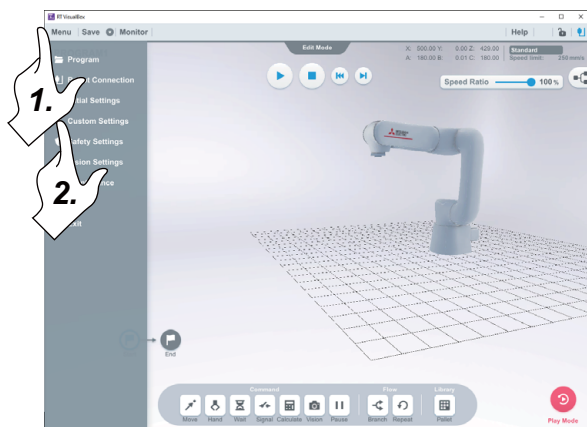
The display language of RT VisualBox can be changed.

The following languages are available.

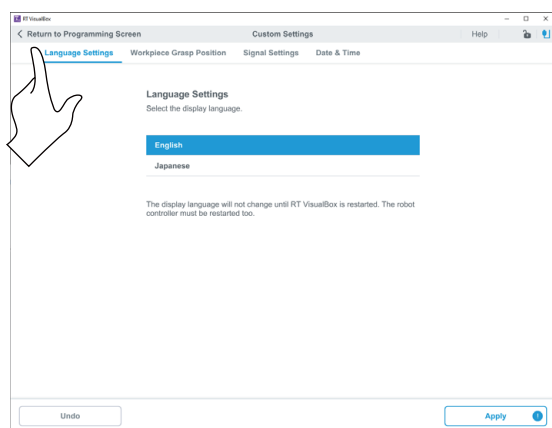
- English
- Japanese

2

Operating procedure



1. Tap/click the [Menu] tab on the menu bar.
2. Tap/click [Custom Settings].



3. To change the display language, tap/click the [Language Settings] tab.

Point

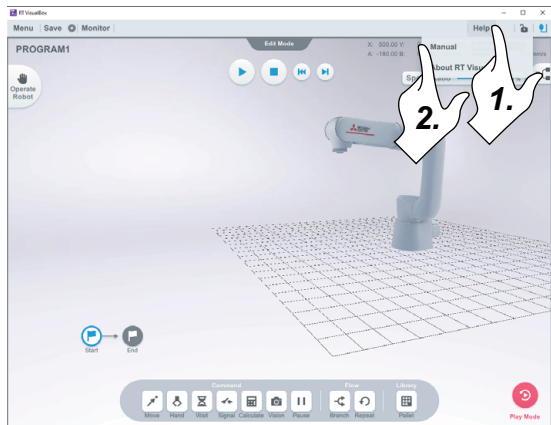
The display language will change next time RT VisualBox is started.

2.5 Help Menu

Software information and the RT VisualBox Instruction Manual can be found in the Help menu.

Viewing the Instruction Manual

Operating procedure

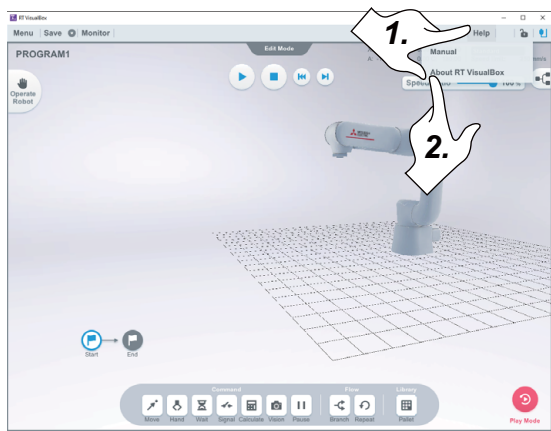


1. Tap/click the [Help] tab on the menu bar.
2. Tap/click [Manual] to view the RT VisualBox Instruction Manual.

Viewing software information

Information such as the software version and product ID can be viewed from the Help menu.

Operating procedure



1. Tap/click the [Help] tab on the menu bar.
2. Tap/click [About RT VisualBox].

3. The window shown on the left will appear.



2.6 Closing RT VisualBox

RT VisualBox can be closed via the following methods:

- Tap/click the [Exit] button in the [Menu] tab on the menu bar.
- Tap/click the [×] button in the top right of the window.

3 BASIC FUNCTIONS

The basic functions of this software are described below.

Function		Description	Reference
Robot connection		Used to select how the robot is connected	☞ Page 34 ROBOT CONNECTION
Initial settings		Used to configure the initial settings (installation type, hand settings, workpiece settings, and workpiece grasp position)	☞ Page 45 INITIAL SETTINGS
Programming	Visual programming (Main screen)	<ul style="list-style-type: none"> • Programs can be created by dragging and dropping program blocks. • Programs can be executed and debugged. • The 3D layout and simulation can be viewed from this screen. 	☞ Page 54 CREATING A PROGRAM ☞ Page 14 HOW TO USE RT VisualBox
	Block properties	Used to configure the advance settings of each block	☞ Page 68 PROGRAM BLOCKS
	Robot operation panel	Used to operate the robot arm The robot can be operated using the following four modes: Direct teaching, Jog, Inching, and Joint mode.	☞ Page 91 ROBOT OPERATION
	Monitor	Position list, signals, variables, errors	☞ Page 102 MONITOR
Custom settings	Select language	Used to select the display language	☞ Page 109 Language Settings
	Workpiece grasp position settings	Used to configure the workpiece grasp position settings (These settings are available in the initial settings.)	☞ Page 110 Workpiece Grasp Position Settings
	Signal settings	A separate name can be specified for each input signal and each output signal.	☞ Page 112 Signal Settings
	Date and time settings	Used to set the date and time	☞ Page 115 Date & Time Settings
Safety settings		Used to configure the mandatory settings of safety functions	☞ Page 116 SAFETY SETTINGS
Vision sensor settings	Connection settings	Used to configure the vision sensor connection settings	☞ Page 126 VISION SENSOR SETTINGS
	Workpiece transportation	Used to configure pick-up point and workpiece identification settings	☞ Page 129 Workpiece Transfer Settings
	Pattern identification	Used to configure pattern identification settings	☞ Page 139 Pattern identification settings
Maintenance	Backup	Exports data from the currently connected robot as a backup file	☞ Page 144 Backup
	Restore	Sends backup file data to the currently connected robot	☞ Page 145 Restore
	Origin settings	<ul style="list-style-type: none"> • Used to configure the origin settings of each axis • Used to release the brakes 	☞ Page 147 Origin Settings
	Parameter settings	Used to read and write parameters	☞ Page 150 Parameter Settings
Help	Manual	Displays the Instruction Manual for this product	☞ Page 28 Viewing the Instruction Manual
	Software version	Shows the software version	☞ Page 28 Viewing software information

4 SHARED SCREEN OPERATIONS

This section explains screen operations that can be performed using either a mouse or touchscreen.

4.1 Touch Operations and Equivalent Mouse Operations

Touch operations and their equivalent mouse operations are shown in the table below.

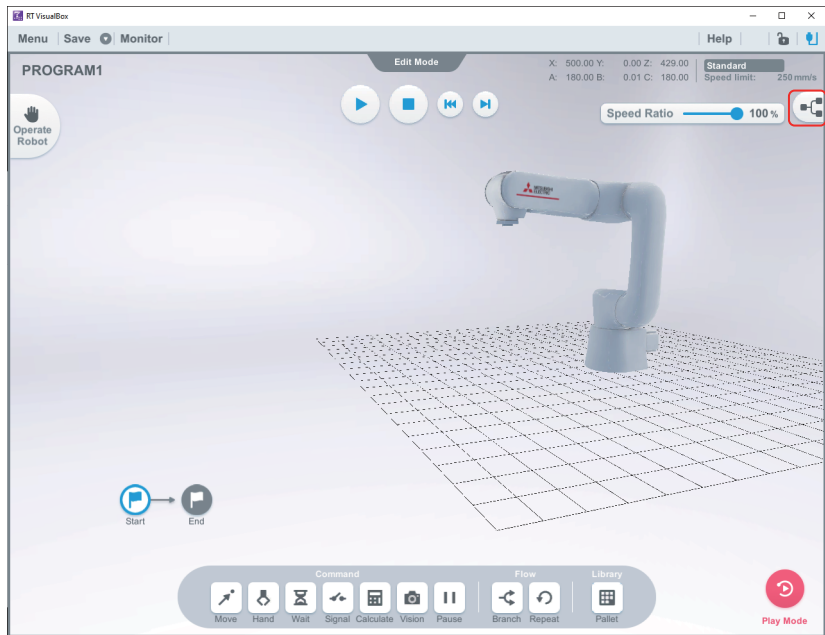
Touch operation	Mouse operation
Tap	Left-click
Double-click	Double left-click
Press and hold	Right-click
Drag	Left-click drag
Two-finger drag	Right-click drag
Pinch-in/Pinch-out	 + mouse wheel

The screen cannot be swiped, flicked, and rotated using a mouse.

4.2 Programming screen modes

Switching modes

Tapping/clicking the Programming/3D mode button allows you to switch between Programming mode and 3D mode.



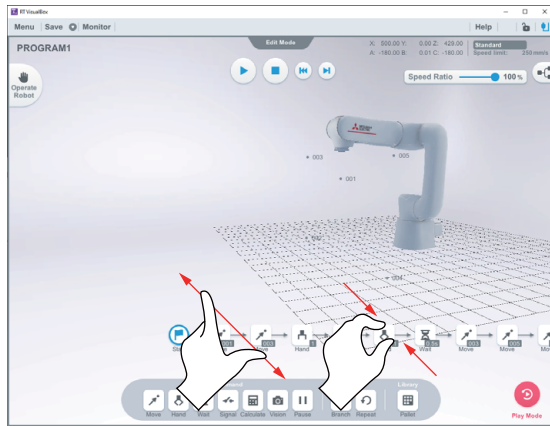
This symbol indicates that Programming mode is enabled. Programs can be edited in this mode. The position and size of programs can be adjusted, which is helpful when constructing long programs.



This symbol indicates that 3D mode is enabled. Programs cannot be edited in this mode. The angle and position of which the robot is viewed in can be adjusted in 3D mode.

Mouse and touch operations for Programming/3D mode

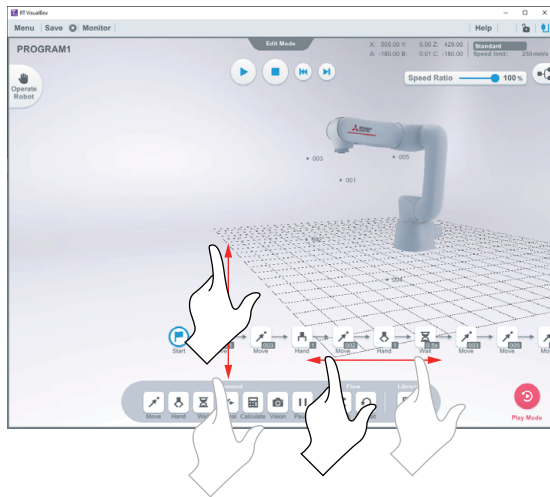
Programming mode



Touch operation: Pinch-in/Pinch-out

Mouse operation: **Ctrl** + mouse wheel

Action: increases/decreases the size of the programming blocks.



Touch operation: Drag

Mouse operation: Left-click drag

Action: moves the programming blocks up, down, left and right.

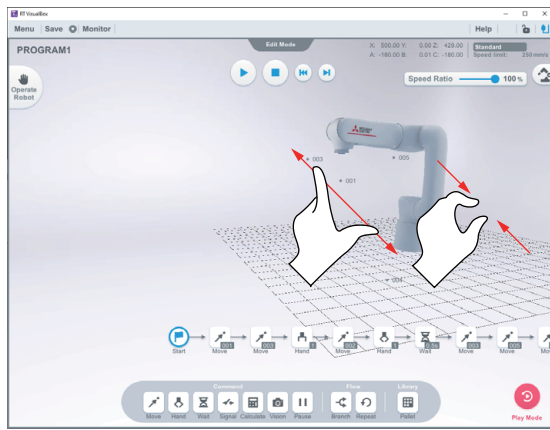
3D mode



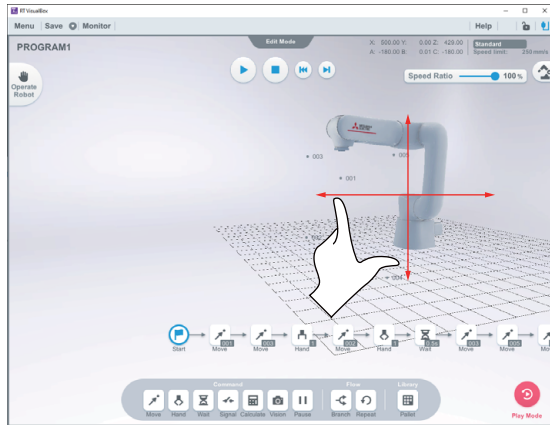
Touch operation: Drag

Mouse operation: Left-click drag

Action: rotates the view around the robot.



Touch operation: Pinch-in/Pinch-out
 Mouse operation: **Ctrl** + mouse wheel
 Action: zooms in/out on the robot.



Touch operation: Two-finger drag
 Mouse operation: Right-click drag
 Action: moves the view of the robot up, down, left and right.

5 ROBOT CONNECTION

This chapter explains how to connect the robot controller to the computer.
Communication settings must be configured for all RT VisualBox projects.

Precautions

- Do not disconnect LAN/USB cables during communication.

Do not disconnect the LAN/USB cable during communication with the robot controller.

If the cable is disconnected during communication, data will not be acquired properly and the operation of the robot controller or computer may be affected.

Only disconnect the cable while in Offline mode or after exiting this software.

When using the USB function, do not disconnect the USB cable until communication has finished.

5.1 Creating a Project

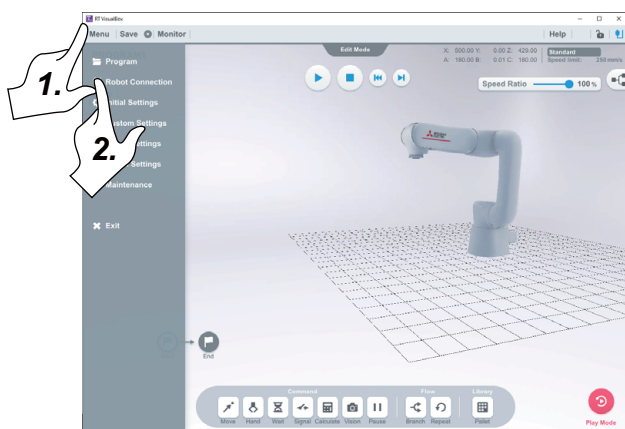
This software manages information for one robot controller per project.

Creating a new project

New projects can be created in the Project Creation/Selection screen.

The Project Creation/Selection screen will appear automatically when RT VisualBox starts up.

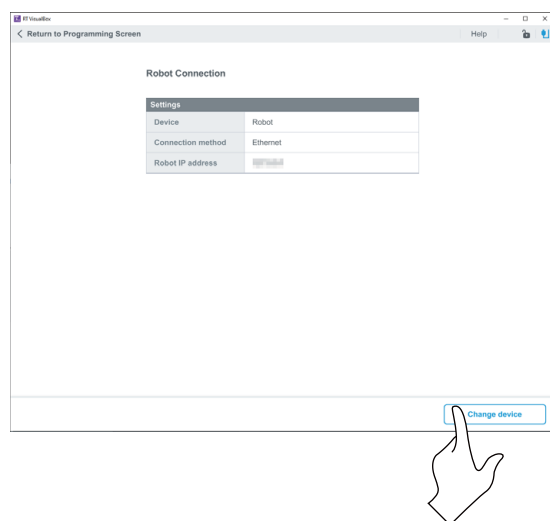
Operating procedure



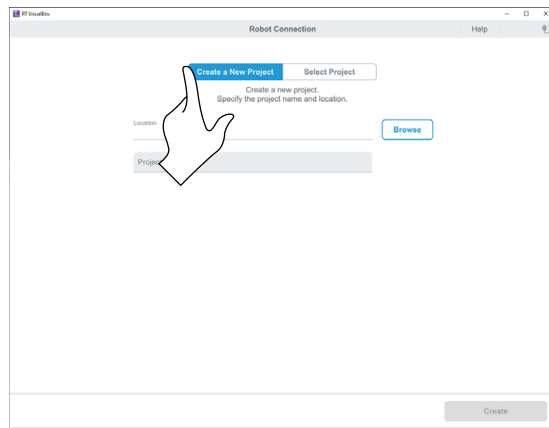
1. Follow these steps to navigate to the Project Creation/ Selection screen.

Tap/click the [Menu] tab on the menu bar.

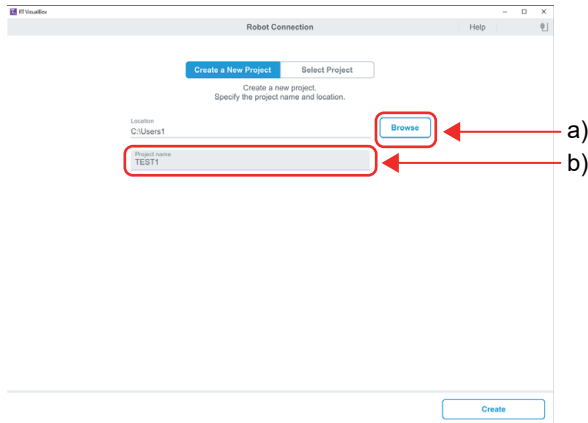
2. Tap/click [Robot Connection].



3. Tap/click [Change Device].



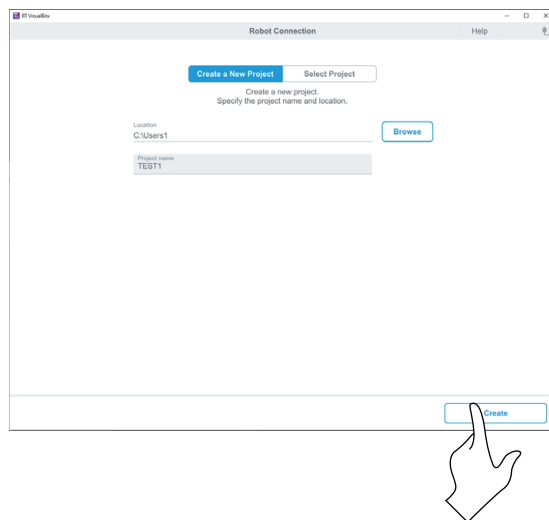
4. The Project Creation/Selection screen will appear. Tap/click [Create a New Project] to display the Project Creation/Selection screen.



5. Enter the project name and location.

- a) Tap/click the [Browse] button to select a location to save the project.
- b) Enter a project name (32 characters max.).

5



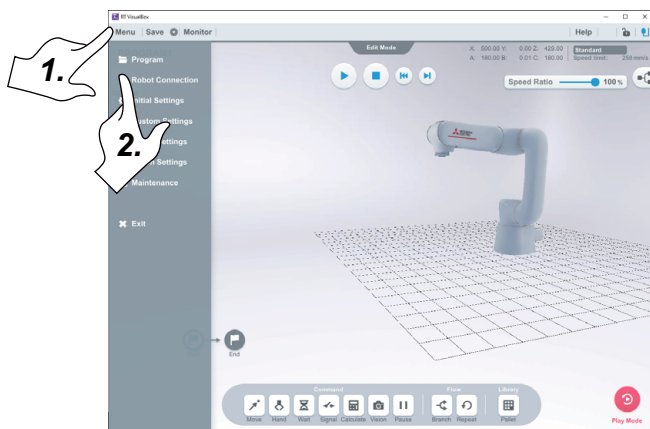
6. Tap/click the [Create] button to proceed to the Device Selection screen.

Opening an existing project

Existing projects can be opened in the Project Creation/Selection screen.

The Project Creation/Selection screen will appear automatically when RT VisualBox starts up.

Operating procedure

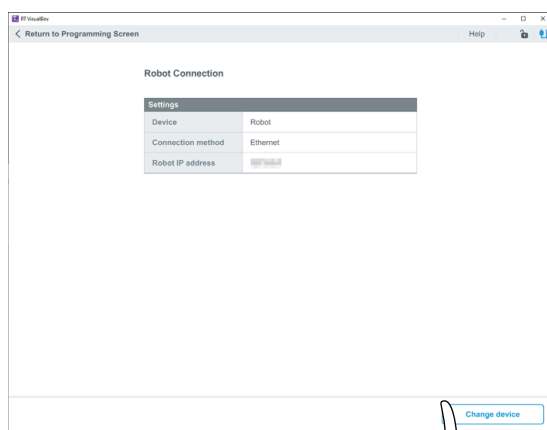


1. Follow these steps to navigate to the Project Creation/ Selection screen.

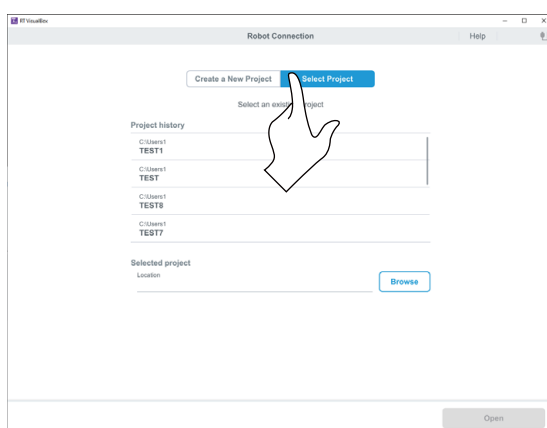
Tap/click the [Menu] tab on the menu bar.

2. Tap/click [Robot Connection].

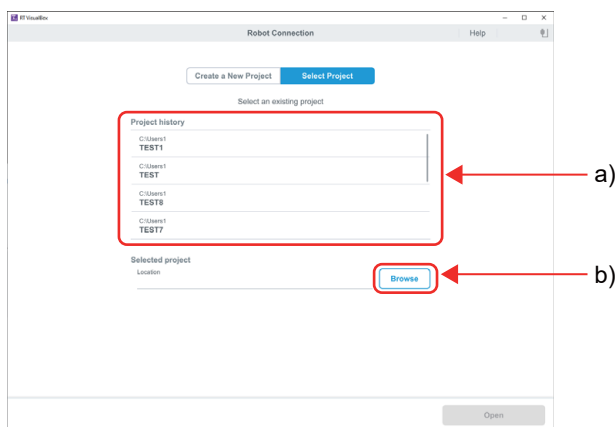
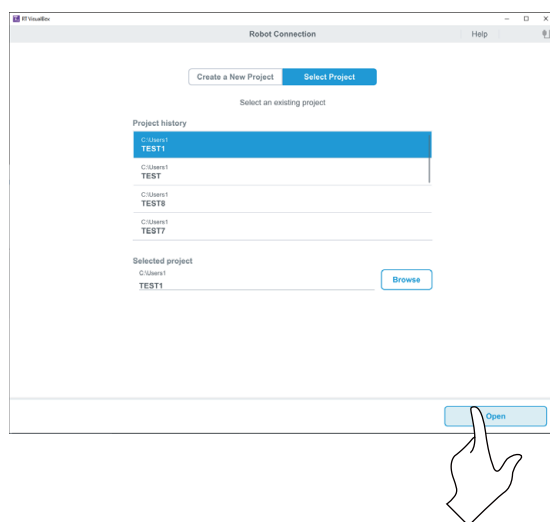
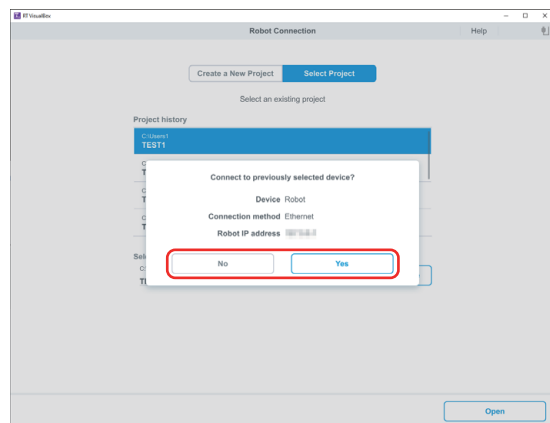
The Project Creation/Selection screen will appear automatically when RT VisualBox starts up.



3. Tap/click [Change Device].



4. The Project Creation/Selection screen will appear. Tap/click the [Select Project] to display existing projects.



5. Select an existing project.

Existing projects can be selected using either of the following methods.

- Recently used projects are displayed under "Project history". Tap/click the project you want to open.
- Alternatively, tap/click the [Browse] button, select the project to edit, then tap/click [Select Folder].

6. Tap/click the [Open] button.

7. If communication settings have been previously configured, a dialog box will appear asking whether to connect to the previously selected device.

- To connect to the previously selected device: Tap/click [Yes].
- If communication settings have not been previously configured or you want to change the access point: Tap/click [No] to proceed to the Device Selection screen. Robots cannot be connected to the trial version of this software.

5.2 Selecting a Device

This software can be connected to a robot or used in simulation mode.
This software can be used in simulation mode without connecting it to a robot controller.

Connectable robot controllers and communication types

This software can connect to the following robot controllers.

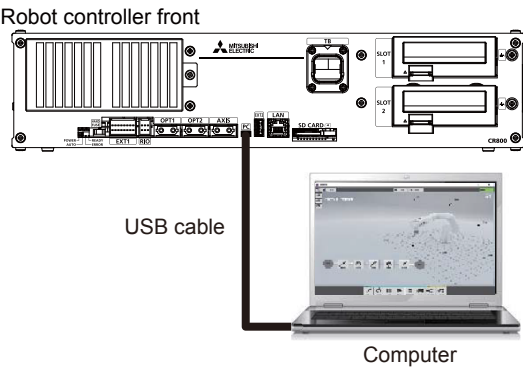
Robot controller	Communication type	Remarks
CR800-05VD robot controller for RV-5AS-D	USB	Some commercially available products such as computers and cables may not be compatible with our equipment or the temperature and electrical noise of some FA environments. Commercially available products may be susceptible to noise. Check the robot operation carefully to determine if protection against EMI or the addition of a ferrite core is required.
	Ethernet (TCP/IP)	—

Only one controller can be connected to this software. It is not possible to connect multiple controllers to this software at the same time.

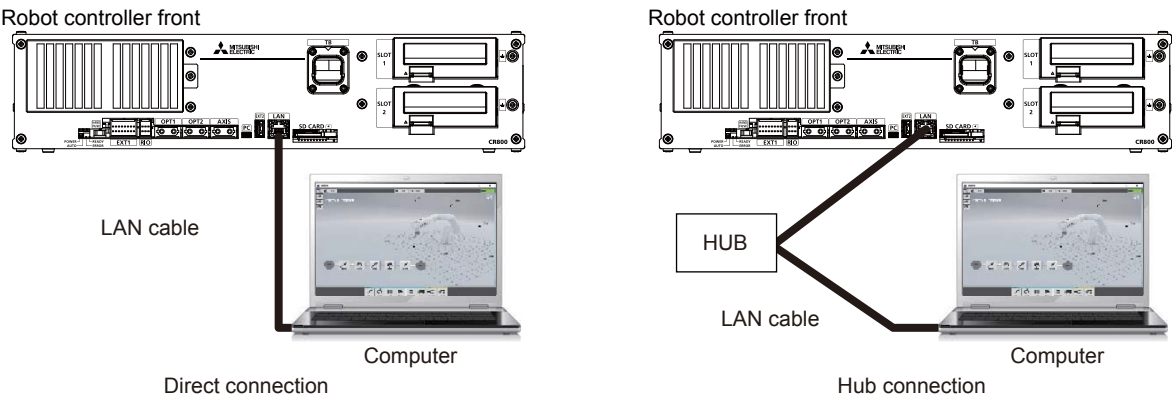
Connecting the robot to the computer

To connect the robot to the software, first power-on the computer and robot controller. Then connect the controller to the computer via a USB or LAN cable.

Connection via USB: Connect to the "PC" port on the front of the controller



Connection via LAN: Connect to the "LAN" port (Ethernet port) on the front of the controller



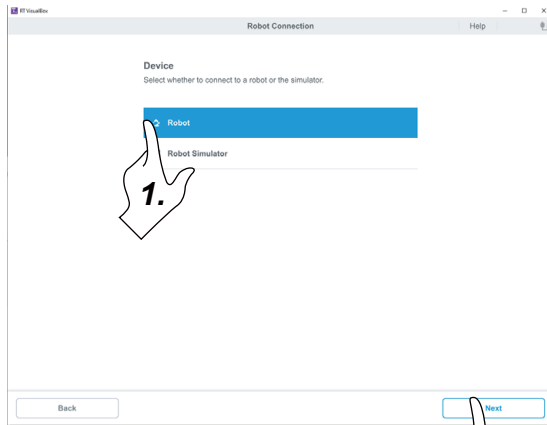
Device Connection Settings

Select which device to connect to.

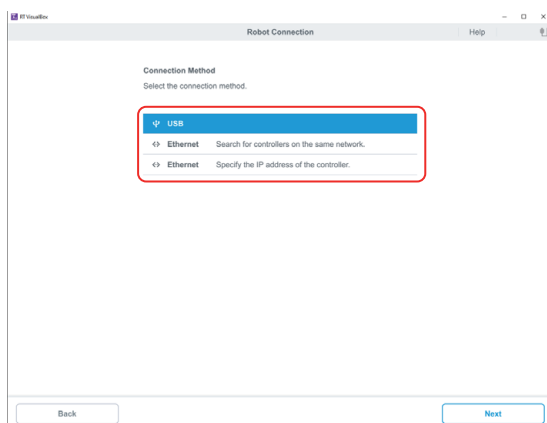
This software can be connected to a robot or used in simulation mode. Robots cannot be connected to the trial version of this software.

Creating a program/checking the operation when connected to a robot

Operating procedure



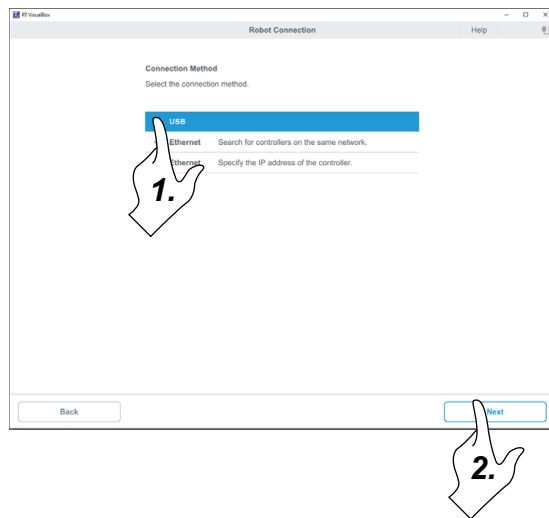
1. Tap/click [Robot].
2. Tap/click the [Next] button.



3. Select the connection method.

■ Connection via USB

Operating procedure



1. Tap/click [USB].

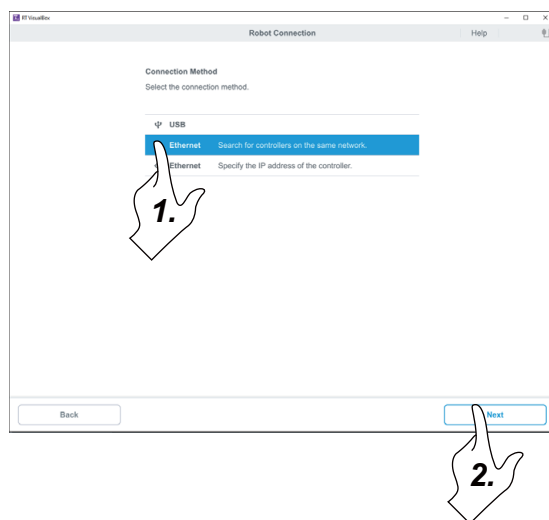
2. Tap/click the [Next] button.

You will be taken to the Programming screen once the robot is connected.

(If the initial settings have not been configured, you will be taken to the Initial Settings screen.)

■ Connection via Ethernet to a robot controller on the same network

Operating procedure

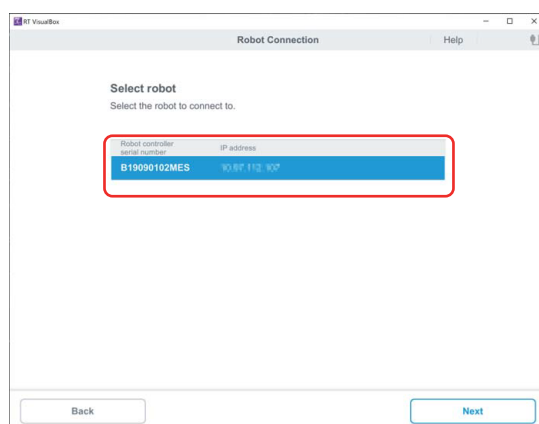


1. Tap/click [Search for controllers on the same network].

2. Tap/click the [Next] button.

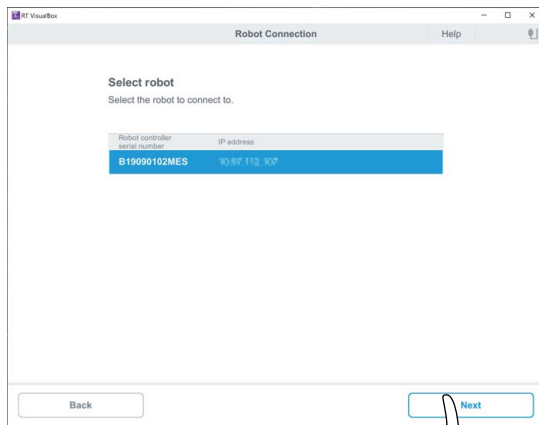
Point

If the computer has multiple network adapters, select the network adapter you want to use.



3. Select the robot you want to connect to.

(The serial number and IP address of robot controllers that can be connected are displayed.)



4. Tap/click the [Next] button.

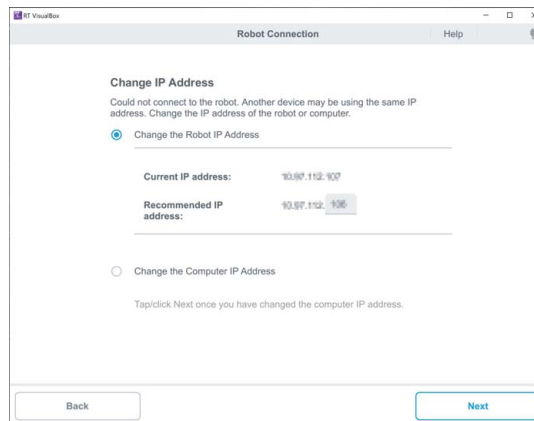
You will be taken to the Programming screen once the robot is connected.

(If the initial settings have not been configured, you will be taken to the Initial Settings screen.)

Point

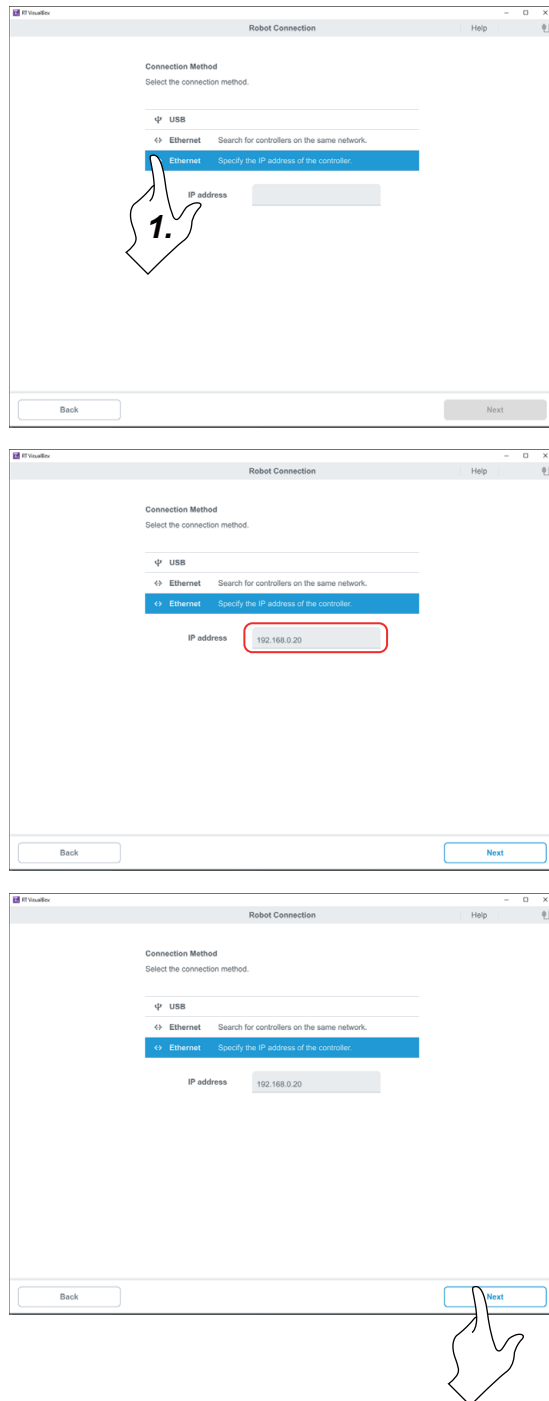
If the program cannot connect to the robot, you will be taken to the screen for changing the IP address. Follow the on-screen instructions, and change the IP address of either the robot or computer.

5



■ Connection via Ethernet

Operating procedure



1. Tap/click [Specify the IP address of the controller].

2. Specify the IP address of the robot you want to connect to.

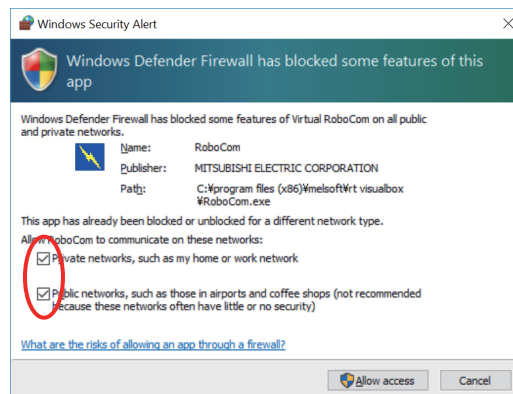
3. Tap/click the [Next] button.

You will be taken to the Programming screen once the robot is connected.

(If the initial settings have not been configured, you will be taken to the Initial Setting screen.)

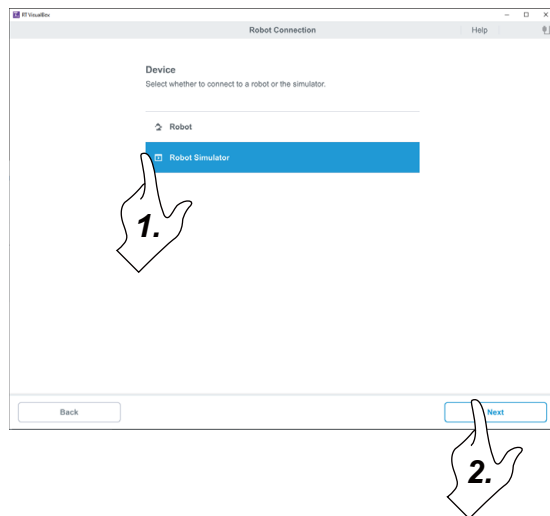
Precautions

If the following window appears while attempting to connect the robot controller via Ethernet, check both boxes, then tap/click the [Allow access] button.



Creating a program/checking the operation when connected to the simulator

Operating procedure



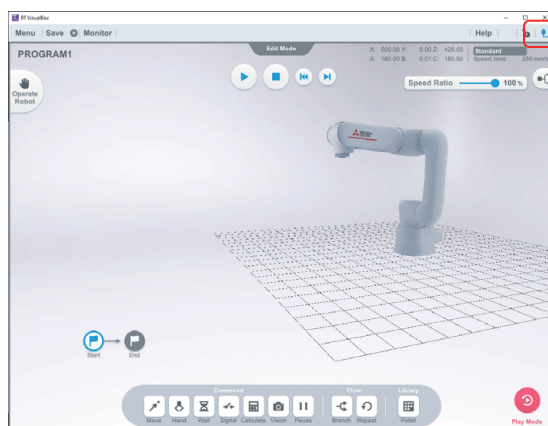
1. Tap/click [Robot Simulator].

2. Tap/click the [Next] button.

You will be taken to the Programming screen once the simulator is connected.

Checking the connection status

When this software is connected to a robot or used in simulation mode, the connection status icon in the upper right corner will turn to "On".



Connection status: On

Connection status: Off

6 INITIAL SETTINGS

This chapter explains the initial settings for the robot controller.

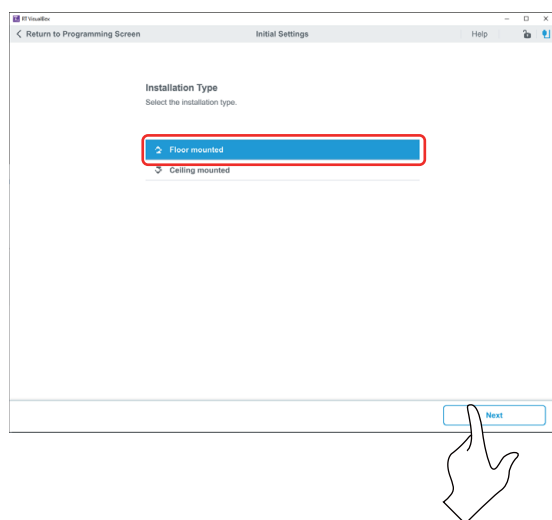
Initial settings must be made for each controller.

If a robot controller with no initial settings is connected to the robot, the Installation Type screen will appear.

To display the Installation Type screen, tap/click [Menu] → [Initial Settings] on the menu bar, then tap/click the [Edit Settings] button.

6.1 Installation Type Settings

Operating procedure



1. Select the applicable installation type.

2. Tap/click the [Next] button.

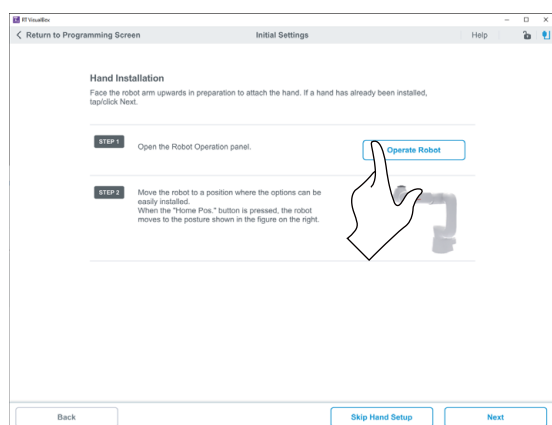
If you have changed the installation type, the robot controller must be restarted for the changes to take effect.

6

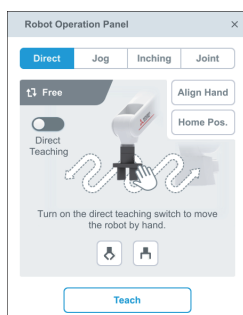
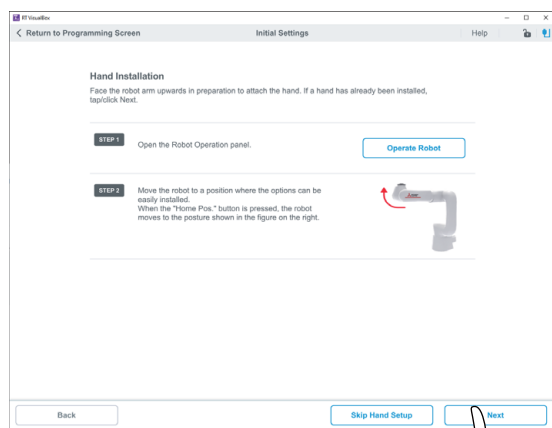
6.2 Hand Pre-Installation Steps

To install a hand, move the robot arm by following the instructions on the screen.

Operating procedure



1. Tap/click the [Robot Operation] button.



2. The Robot Operation panel will appear.
Move the robot arm into a posture which makes it easy to attach the hand (turn the arm so that the flange is facing up, etc.).
For details on how to use the Robot Operation panel, refer to the following page:

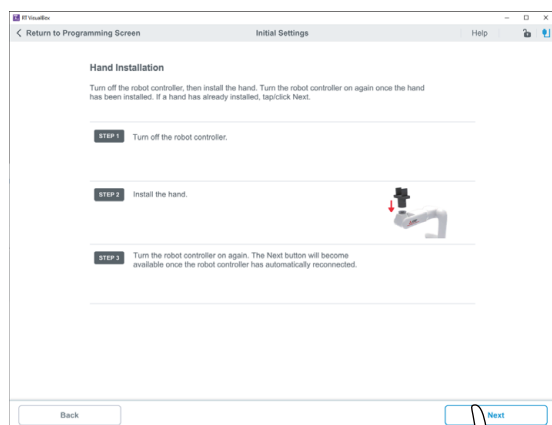
➞ Page 91 ROBOT OPERATION

3. Tap/click the [Next] button.

6.3 Installing a Hand

Install a hand by following the on-screen instructions.

Operating procedure



1. Turn off the power of the robot controller.
2. Install a hand.
3. Turn on the power of the robot controller again.
The software will automatically reconnect to the robot controller, and the [Next] button will become available.
4. Tap/click the [Next] button.

6.4 Selecting a Hand

Select the hand installed on the robot.

For hands other than recommended hands, select either [Sink type] or [Source type] depending on the type of hand being used.

The input/output signals of the hand will be set.

Refer to the following table for further information.

- Recommended electric hands

Recommended electric hand (Manufacturer)	Hand input/output signal
KIT-ASSISTA-G (GIMATIC)	Input signal 900: Grasp Input signal 902: Sensor 1 Input signal 903: Sensor 2 Output signal 900: Open/close hand
ELCT1-100-20-ASSISTA (New-Era)	Input signal 900: Open End Input signal 901: Close End Output signal 900: Hand Open Output signal 901: Hand Close Output signal 902: Deceleration pos. hold Output signal 903: Deceleration pos. reset
Co-act EGP-C40 N-N-Assista (SCHUNK)	Input signal 900: Sensor 1 Input signal 901: Sensor 2 Output signal 900: Hand open Output signal 901: Hand close Output signal 902: LED 1 Output signal 903: LED 2
HRC-03-099455 (ZIMMER)	Input signal 900: Sensor 1 Input signal 901: Sensor 2 Output signal 900: Hand open Output signal 901: Hand close

- Recommended pneumatic hands

Recommended pneumatic hand (Manufacturer)	Hand input/output signal
HP04VR-20C-ASSISTA HP04VR-20C-ASSISTA-A (New-Era)	Input signal 900: Close side switch Input signal 901: Open side switch Output signal 901: Hand close
JMHZ2-16D-X7400B-ASSISTA JMHZ2-16D-X7400B-ASSISTA-P (SMC)	Input signal 900: Finger open side Input signal 901: Finger close side Output signal 900: Hand open Output signal 901: Hand close

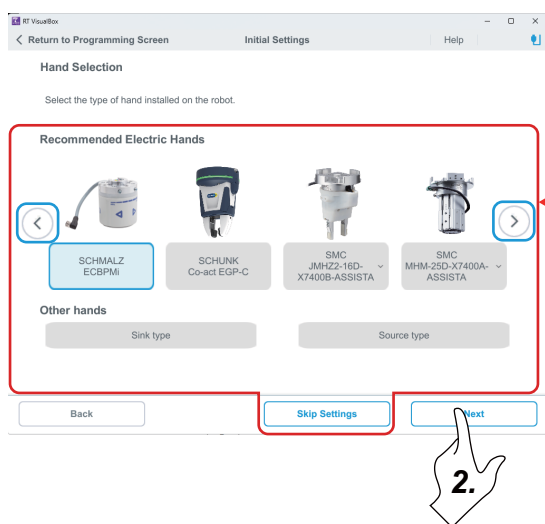
- Recommended suction hands

Recommended suction hand (Manufacturer)	Hand input/output signal
SGE-M5-N-ASSISTA (CONVUM)	Input signal 900: Suction check Output signal 901: Suction
ROB-SET ECBPMi ASSISTA (SCHMALZ)	Output signal 900: Release Output signal 901: Suction
ZXP7A-ZP16JS-X1-ASSISTA ZXP7A-ZP16JS-X1A-ASSISTA ZXP7A-ZP16JS-X1B-ASSISTA ZXP7A-ZP16JS-X1C-ASSISTA ZXP7A-ZP16JS-X1D-ASSISTA ZXP7A-ZP16JS-X1E-ASSISTA (SMC)	Input signal 901: Pressure switch Output signal 901: Suction
TNH04-VN12-00 (THK)	Output signal 904: Suction start Output signal 905: Suction stop Output signal 906: Shaft unlock Output signal 907: Shaft lock

- Recommended magnetic hands

Recommended magnetic hand (Manufacturer)	Hand input/output signal
MHM-25D-X7400A-ASSISTA MHM-25D-X7400A-ASSISTA-P (SMC)	Input signal 900: Work release side Input signal 901: Work hold side Output signal 900: Work release Output signal 901: Work hold

Operating procedure



1. Select the recommended or type of hand being used. Use the left and right buttons to scroll through the hands. If no applicable hand setting can be found on the screen, tap/click [Skip Settings].

2. Tap/click the [Next] button.

Precautions

The hand type parameter settings must be changed if a pneumatic hand is installed. Refer to the following page for information on how to set parameters.

📖 Page 150 Parameter Settings

For further information on hand type parameter setting values, refer to "About the hand type" in the following manual.

📖 CR800 Series Controller Instruction Manual: Detailed explanations of functions and operations (BFP-A3478)

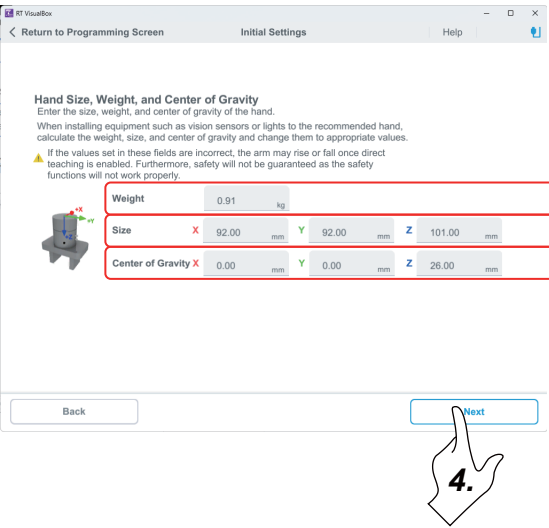
6.5 Hand Settings

Set the size, weight, and center of gravity of the hand.

CAUTION

Ensure that the correct values are set.
Incorrect values may cause the robot arm to rise or fall upon the start of direct teaching. Furthermore, the safety functions may not work properly.

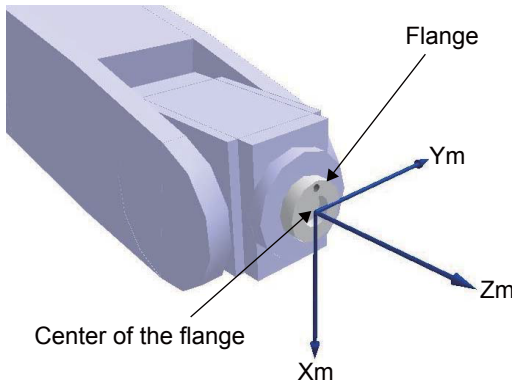
Operating procedure



1. Enter the weight of the hand. (Unit: kg)
2. Enter the size of the hand in the X, Y, and Z directions. (Unit: mm)
3. Enter the center of gravity of the hand as X, Y, and Z components. (Unit: mm)
4. Tap/click the [Next] button.

Point

X, Y, and Z components are set in the mechanical interface coordinate system.
The origin of the mechanical interface coordinate system is located at the center of the flange as shown in the following figure.
The X, Y, and Z axes of the mechanical interface coordinate system are denoted as X_m , Y_m , and Z_m respectively.
 Z_m passes through the center of the flange and is perpendicular to the flange surface. The plus direction of Z_m faces away from the flange.
 X_m and Y_m are parallel to the flange surface.
The X_m axis passes through the center of the flange and the positioning pin hole. The plus direction of the X_m axis faces in the opposite direction of the pin hole.



The settings for recommended hands are shown below. If non-standard fingers are installed, adjust the values according to the fingers you are using.

- Recommended electric hands

Recommended electric hand (Manufacturer)	Hand settings				
	Weight (Kg)	Size (mm)		Center of gravity (mm)	
KIT-ASSISTA-G (GIMATIC)	0.92	X	92	X	0
		Y	90	Y	0
		Z	82	Z	38
ELCT1-100-20-ASSISTA (New-Era)	1.65	X	81	X	-1
		Y	117	Y	-2
		Z	90	Z	44
Co-act EGP-C40 N-N-Assista (SCHUNK)	0.89	X	92	X	0
		Y	90	Y	-1
		Z	180	Z	45
HRC-03-099455 (ZIMMER)	0.96	X	92	X	0
		Y	112	Y	10
		Z	158	Z	50

- Recommended pneumatic hands

Recommended pneumatic hand (Manufacturer)	Hand settings				
	Weight (Kg)	Size (mm)		Center of gravity (mm)	
HP04VR-20C-ASSISTA HP04VR-20C-ASSISTA-A (New-Era)	0.95	X	90	X	-2
		Y	90	Y	-4
		Z	164	Z	53
JMHZ2-16D-X7400B-ASSISTA JMHZ2-16D-X7400B-ASSISTA-P (SMC)	0.68	X	90	X	3
		Y	90	Y	-7
		Z	152	Z	41

- Recommended suction hands

Recommended suction hand (Manufacturer)	Hand settings				
	Weight (Kg)	Size (mm)		Center of gravity (mm)	
SGE-M5-N-ASSISTA (CONVUM)	0.43	X	90	X	0
		Y	90	Y	0
		Z	176	Z	63
ROB-SET ECBPMi ASSISTA (SCHMALZ)	0.91	X	92	X	0
		Y	92	Y	0
		Z	101	Z	26
ZXP7A-ZP16JS-X1-ASSISTA ZXP7A-ZP16JS-X1A-ASSISTA ZXP7A-ZP16JS-X1B-ASSISTA ZXP7A-ZP16JS-X1C-ASSISTA ZXP7A-ZP16JS-X1D-ASSISTA ZXP7A-ZP16JS-X1E-ASSISTA (SMC)	1.07	X	90	X	-3
		Y	90	Y	-2
		Z	167	Z	58
TNH04-VN12-00 (THK)	0.84	X	61	X	0
		Y	57	Y	0
		Z	190	Z	65

- Recommended magnetic hands

Recommended magnetic hand (Manufacturer)	Hand settings				
	Weight (Kg)	Size (mm)		Center of gravity (mm)	
MHM-25D-X7400A-ASSISTA MHM-25D-X7400A-ASSISTA-P (SMC)	0.78	X	90	X	0
		Y	90	Y	0
		Z	134	Z	50

When installing equipment such as vision sensors or lights, set the weight, size, and center of gravity based on your own calculations.

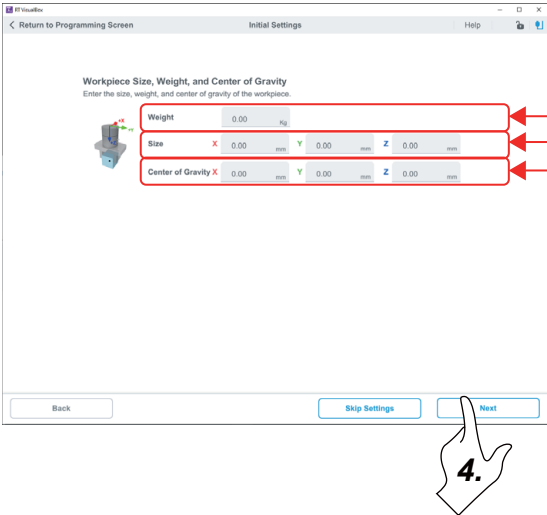
6.6 Workpiece Settings

Set the size, weight, and center of gravity of the workpiece.

CAUTION

Ensure that the correct values are set.

Operating procedure



1. Enter the weight of the workpiece. (Unit: kg)
2. Enter the size of the workpiece in the X, Y, and Z directions. (Unit: mm)
3. Enter the center of gravity of the workpiece as X, Y, and Z components. (Unit: mm)
4. Tap/click the [Next] button.

6

Point

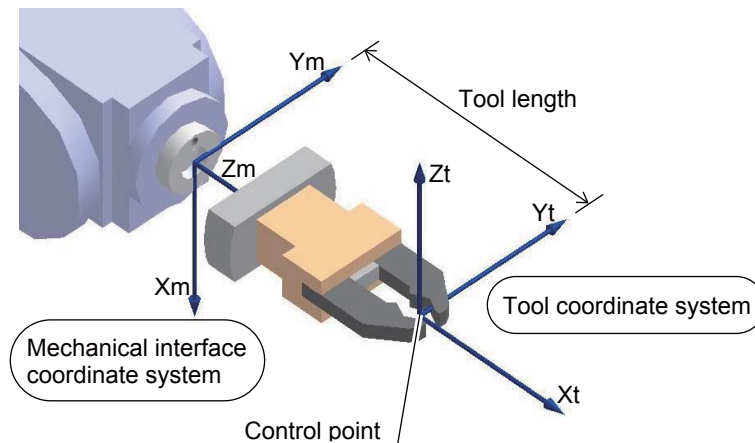
X, Y, and Z components are set in the mechanical interface coordinate system.
 For information on the mechanical interface coordinate system, refer to the following page:
 ➞ Page 49 Hand Settings

6.7 Workpiece Grasp Position Settings

Set the distance and angle from the tip of the robot arm to the position where the hand grasps the workpiece. These settings allow you to set the tool coordinate system according to the installed tool (hand). These settings can also be made from Custom Settings.

Point

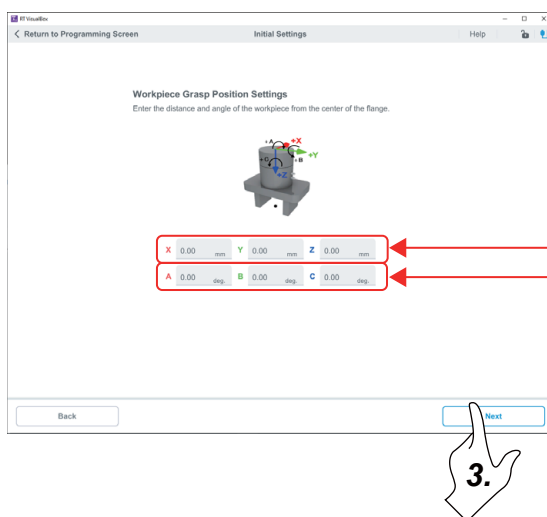
The tool coordinate system refers to the coordinate system centered on the tip of the hand (hand control point). In the tool coordinate system, the origin of the mechanical interface coordinate system is shifted to the tip of the hand (control point) and rotational components are included. The figure below shows coordinate systems with the following values.
 $X = 0$, $Y = 0$, $Z = \text{Tool length}$, $A = 0$, $B = -90$, $C = 0$



CAUTION

Ensure that the correct values are set.

Operating procedure



1. Enter the X, Y, and Z components of the grasp position. (Unit: mm)
2. Enter the A, B, and C components of the grasp position. (Unit: deg)
3. Tap/click the [Next] button.

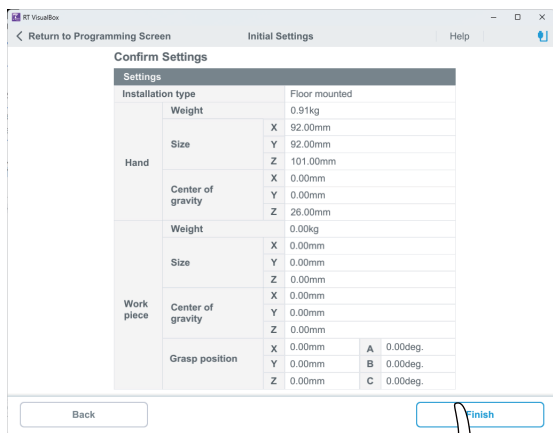
Point

X, Y, Z, A, B, and C components are set in the mechanical interface coordinate system. For details on the mechanical interface coordinate system, refer to the following page:
 ➞ Page 49 Hand Settings

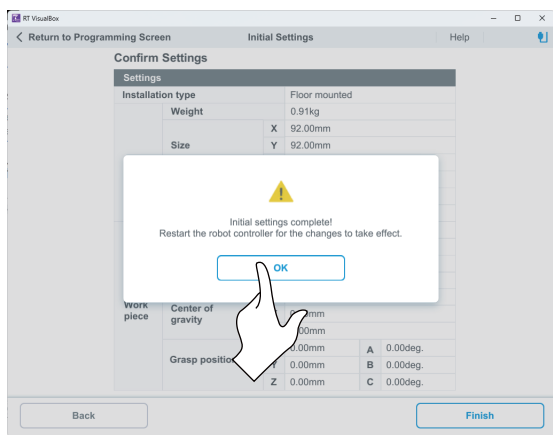
6.8 Confirming the Settings

Confirm the settings.

Operating procedure



1. Check if there are any errors in the settings.
If all the settings are correct, tap/click the [Finish] button.
If the settings are incorrect, tap/click the [Back] button and make corrections on the applicable setting screen.



2. The settings will be applied, and the programming screen will appear.
The robot controller may restart in order to apply the settings.
If the controller restarts, tap/click the [OK] button.

Precautions

The settings will be applied to the robot controller after the [Next] button is tapped/clicked.
The settings that have been configured on the previous screens are saved even if the [Return to Programming Screen] button is tapped/clicked.

7 CREATING A PROGRAM

This chapter explains how to create and edit robot programs.

Precautions

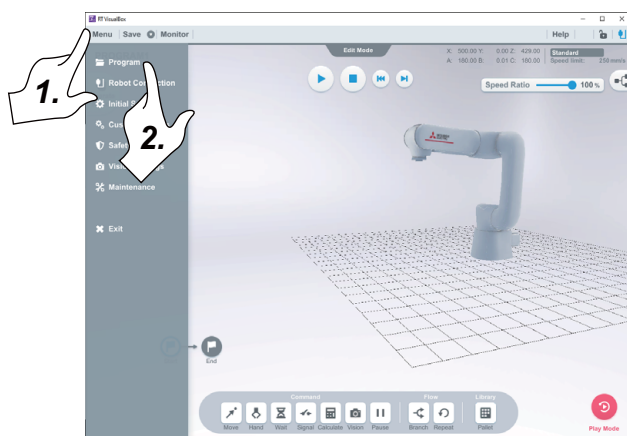
The programming screen displayed after startup shows the program set in slot 1 of the robot controller.

If no program is set in slot 1, an empty program will appear.

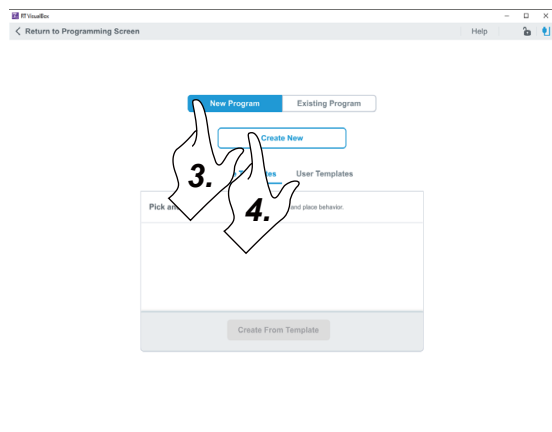
7.1 Creating a New Program

Create an empty new program.

Operating procedure



1. Tap/click the [Menu] tab on the menu bar.
2. Tap/click [Program]. The New Program/Existing Program screen will appear.

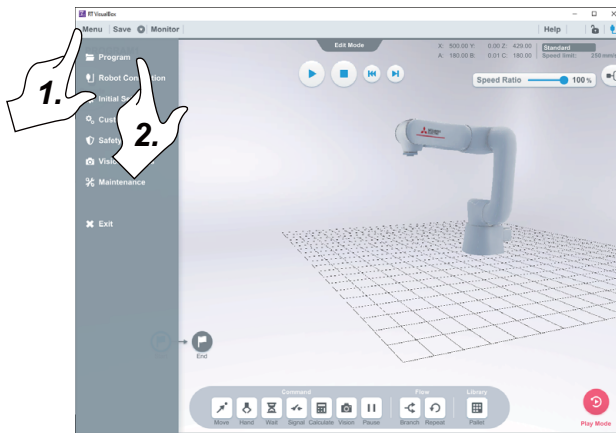


3. Select the [New Program] tab.
4. Tap/click the [Create New] button. An empty program will be created.

7.2 Creating a New Program from a Template

Create a new program based on a registered template.

Operating procedure

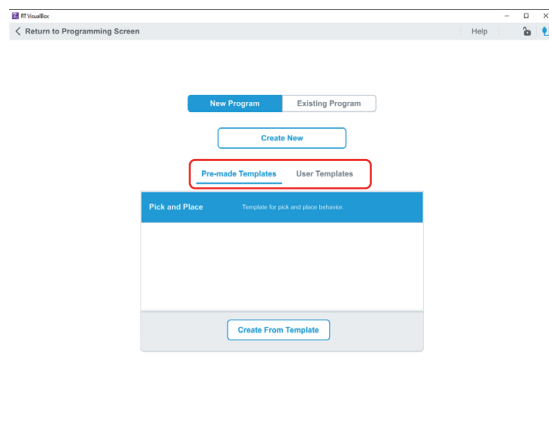


1. Tap/click the [Menu] tab on the menu bar.
2. Tap/click the [Program] tab. The New Program/Existing Program screen will appear.

Point

Templates store the order of program blocks and any properties that have been set in them.

They can be used to assist the creation of a new program. Positions which have been taught are not saved.

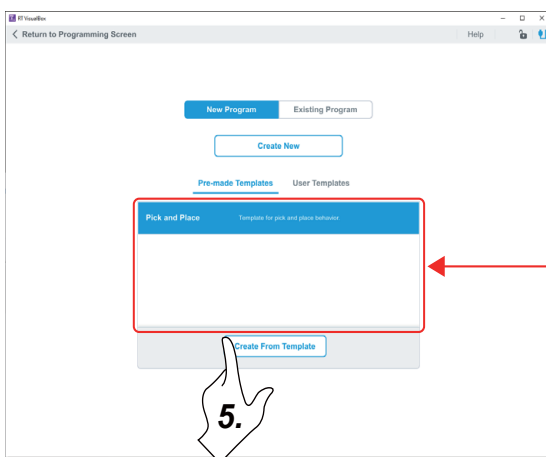


3. Select "Pre-made Templates" or "User Templates". A list of templates will appear.

Pre-made Templates: templates supplied by the manufacturer.

User Templates: templates created by the customer. For further information on user templates, refer to the following page:

Page 60 Saving a Program

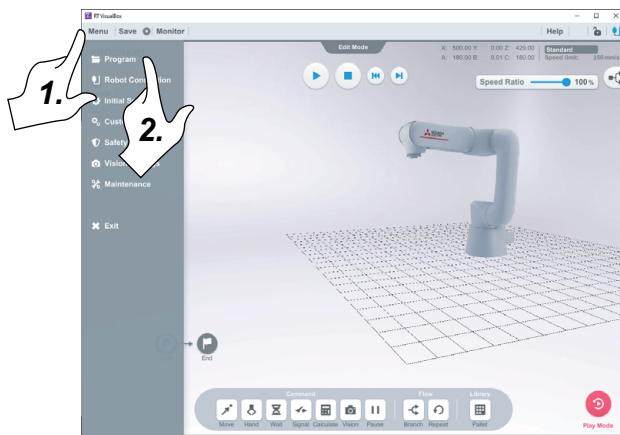


4. Select a suitable template to create a new program.
 5. Tap/click the [Create From Template] tab. A program based on the selected template will be created.
- The position settings of Move blocks are not set. Teach a position for each Move block.

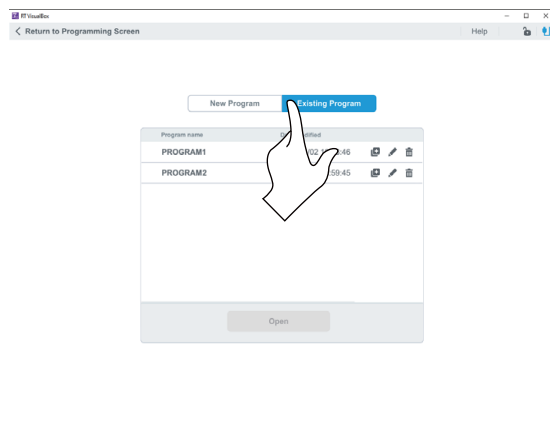
7.3 Opening an Existing Program

Open a saved program.

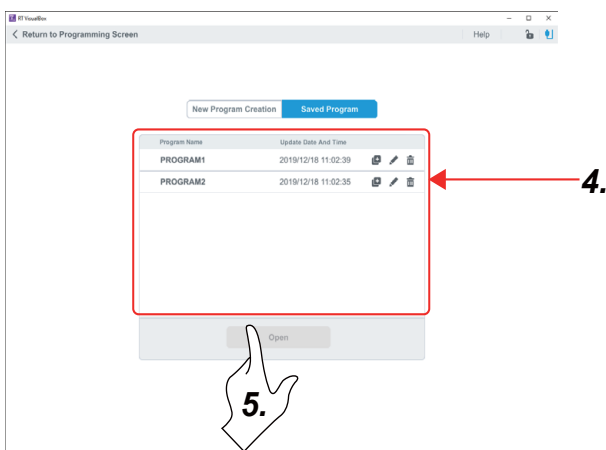
Operating procedure



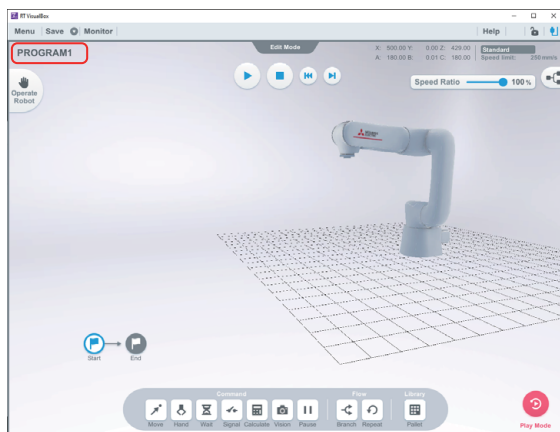
1. Tap/click the [Menu] tab on the menu bar.
2. Tap/click [Program]. The New Program/Existing Program screen will appear.



3. Select the [Existing Program] tab. A list of saved programs will appear.



4. Select a program from the list.
5. Tap/click the [Open] button to display the selected program.



6. The name of the currently opened program is displayed on the screen.



You can copy, rename, or delete programs by tapping/clicking the icons to the right of the programs.

Program name	Date modified	
PROGRAM1	2020/04/02 18:18:46	  

a) b) c)

- a) Copying a program: enter the name of the program that you want to create and tap/click the [Copy] button.
- b) Renaming a program: enter the new name of the program and tap/click the [Change] button.
- c) Deleting a program: tap/click the [OK] button.

7

Precautions

- Programs that have been edited with RT ToolBox3 may not open with RT VisualBox. If the selected program cannot be opened, open it in RT ToolBox3.
- The "Date modified" displayed on the program selection screen may be updated during program running.

Program name	Date modified	
PROGRAM1	2020/04/02 18:18:46	  

7.4 Editing a Program

This section explains how to edit robot programs.

Programs can be edited in Edit mode. In Edit Mode, you can add, move, and delete blocks as well as configure block settings.

In Play Mode, you can only check the settings (display the block properties).

When the program is run in automatic operation mode, it will start again once it has reached "End".

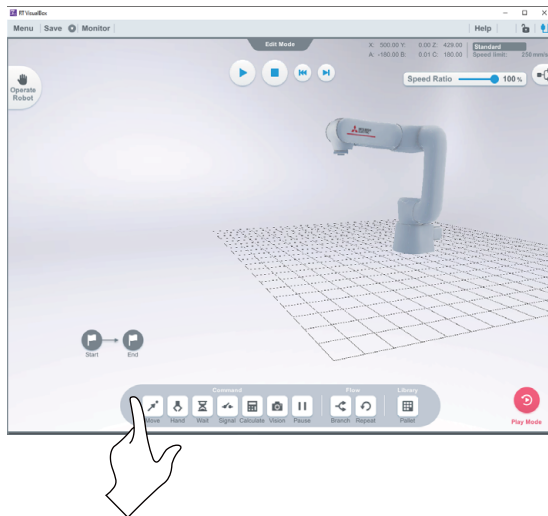
For further information on automatic operation, refer to the following page:

📖 Page 66 Executing a program (Play Mode)

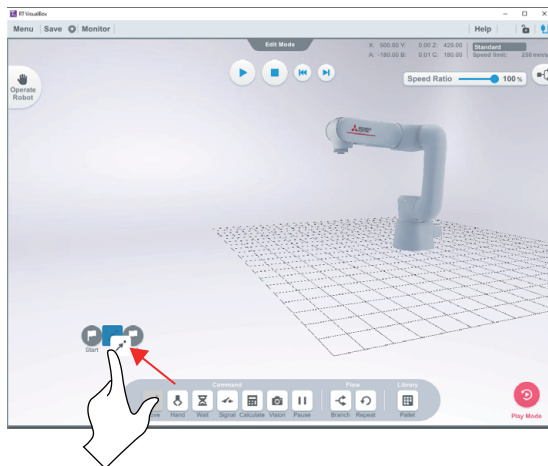
Adding (placing) a block

To add (place) a program block, follow the steps below.

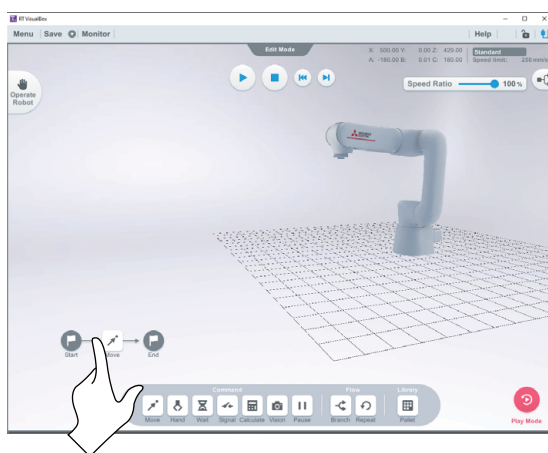
Operating procedure



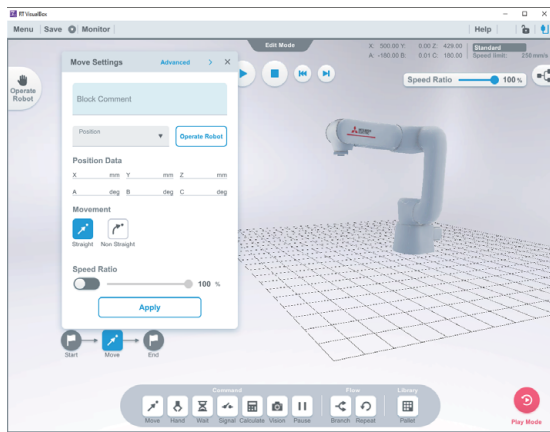
1. Select a block to instruct the robot to perform an action.



2. Drag and release the block between Start and End where the action is to be performed.



3. Tap/click on the block to display its settings.



4. The settings window for that block will appear. Configure the block's settings.

5. Repeat the steps above to create a program.

Inserted blocks can be relocated within the program by dragging and dropping them.

You can use the pinch-in/pinch-out gestures to zoom in/out on the program and make it easier to see.

The program can also be moved around by dragging it.

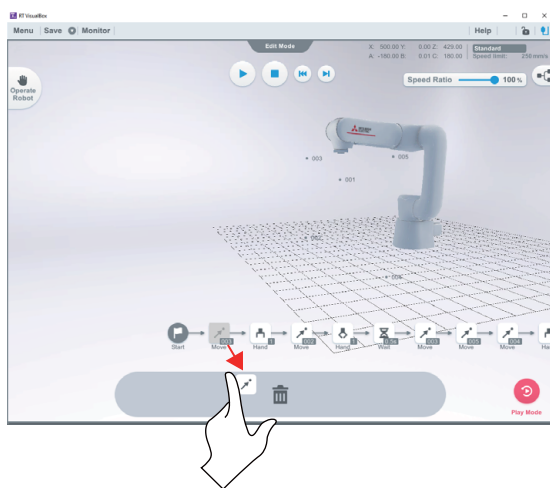
For further information, refer to the following page:

👉 Page 31 Programming screen modes

Deleting a block

To delete a program block in a program, follow the steps below.

Operating procedure



1. Select a program block in the program and drag the block downwards. A trash can will appear. To delete the block, move it to the trash can and release it.

7

Precautions

Deleting a branch block or repeat block will also delete the blocks set in the branch block or repeat block.

Be careful when deleting program blocks as this cannot be undone.

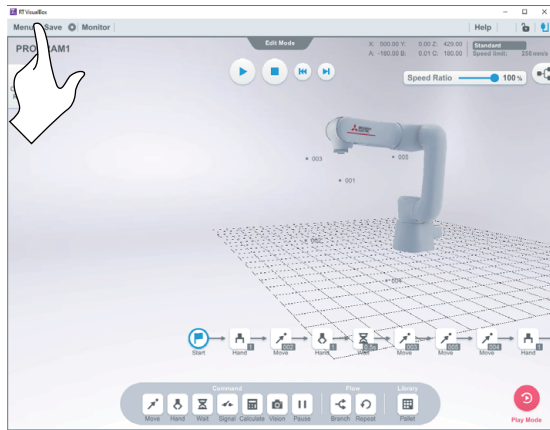
7.5 Saving a Program

To save a program, follow the steps below.

Overwriting (saving) a program

Overwrite the program.

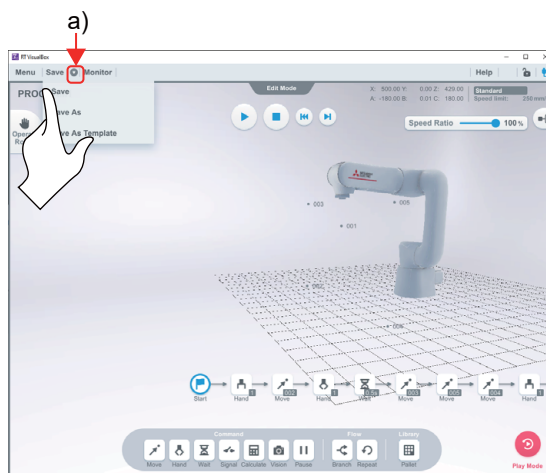
Operating procedure



1. Tap/click [Save] on the menu bar to save the program.
If a robot is connected to this software, this action will save the program to the robot controller.
If the software is in simulation mode, this action will overwrite the program saved on the computer.

Point

Programs can also be saved by tapping/clicking the button indicated by "a" next to [Save] on the menu bar, then clicking [Save].



Save as

Save the program with a new name.

Operating procedure



1. Tap/click the button indicated by "a" next to [Save] on the menu bar, then tap/click [Save As]. A dialog box for entering a program name will appear.

2. Enter a new program name in the program name field.
3. Tap/click the [Save] button. The program will be saved with the specified name.

If a robot is connected to this software, this action will save the program in the robot controller.

If the software is in simulation mode, this action will overwrite the program saved on the computer.

7

Precautions

Programs containing errors cannot be saved.

Check the properties of each block to see if all settings have been configured.

Save as template

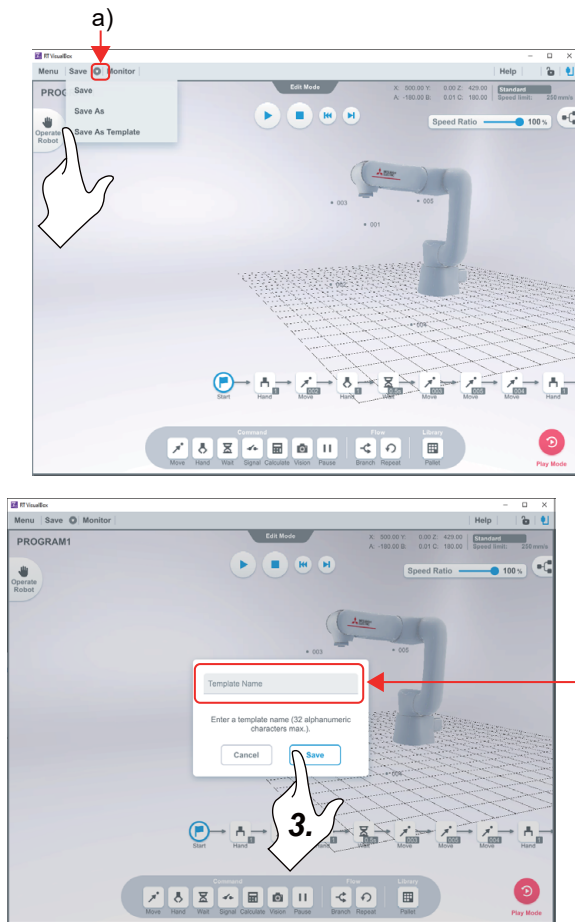
Save the program as a template.

Programs saved as templates are displayed in the list of user templates in the New Program screen.

For the list of user templates, refer to the following:

📖 Page 55 Creating a New Program from a Template

Operating procedure



1. Tap/click the button indicated by "a" next to [Save] on the menu bar and then [Save As Template]. A dialog box for entering a template name will appear.

2. Enter a template name.

3. Tap/click the [Save] button.

The program will be saved as a template.

7.6 Debugging and Executing a Program

This section explains how to debug and execute robot programs.

Programs can be debugged in Edit mode.

To execute a newly created program using automatic operation, execute the program in Play Mode.

Point

For information on how to move the robot by using a program created in simulation mode, refer to the following page:

📖 Page 152 Q&A

Operation rights

Multiple devices, such as the operation buttons on the robot arm, RT VisualBox, or external signals, can be used to operate the robot controller. However, only one of these devices can operate the controller at the same time as another device (commands for operation, servo on, etc.). This single device has “operation rights”.

Operations that involve risk require operation rights. It is essential that other workers are not able to obtain operation rights when you are near the robot while it is operating. Operation rights can be secured using the Operation rights function.

Operations that start the robot, such as starting a program or servo ON, require operation rights. For safety reasons, operations that stop the robot, such as stopping a program or servo OFF, do not require operation rights.

For further information on operation rights, refer to "Operation rights" in the following manual.

Collaborative Robot: Detailed explanations of functions and operations (BFP-A3735)

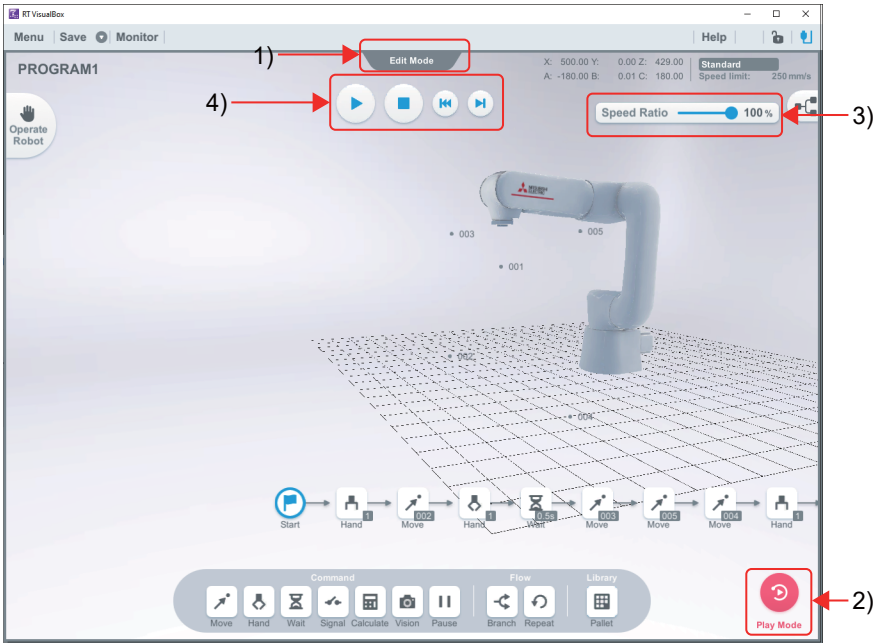
The padlock icon on the right of the menu bar indicates whether operation rights have been secured or requested. Clicking this icon allows the user to secure or request operation rights.



	This icon indicates that operation rights have not been requested. Tap/click the icon to request operation rights.
	This icon indicates that operation rights have been secured. Tap/click the icon to release operation rights.
	This icon indicates that operation rights have been requested but have not yet been secured. Other devices, such as the operation buttons or teaching pendant, may have already taken operation rights. Tap/click this icon to cancel the request for operation rights.

Debugging a program (Edit Mode)

Debug a program in Edit Mode.



No.	Name	Use
1)	Current mode	This tab displays the current mode.
2)	Switch mode	This button is used to switch between Edit mode and Play mode.
3)	Speed ratio	The speed of the robot can be set as a percentage. The speed can be set between 10% and 100% in ten percent intervals.
4)	Program execution buttons	These buttons are used to move the robot connected to this software. In simulation mode, the robot in the 3D area on-screen will move according to the created program.

When a robot is connected to this software, ensure that the mode selector switch on the robot controller is set to "Automatic". (If not, set it to "Automatic".)

If the currently displayed program has never been saved, or it has been edited, a message will appear prompting you to save the program to the robot or computer (simulation) before starting the program. Save the program.

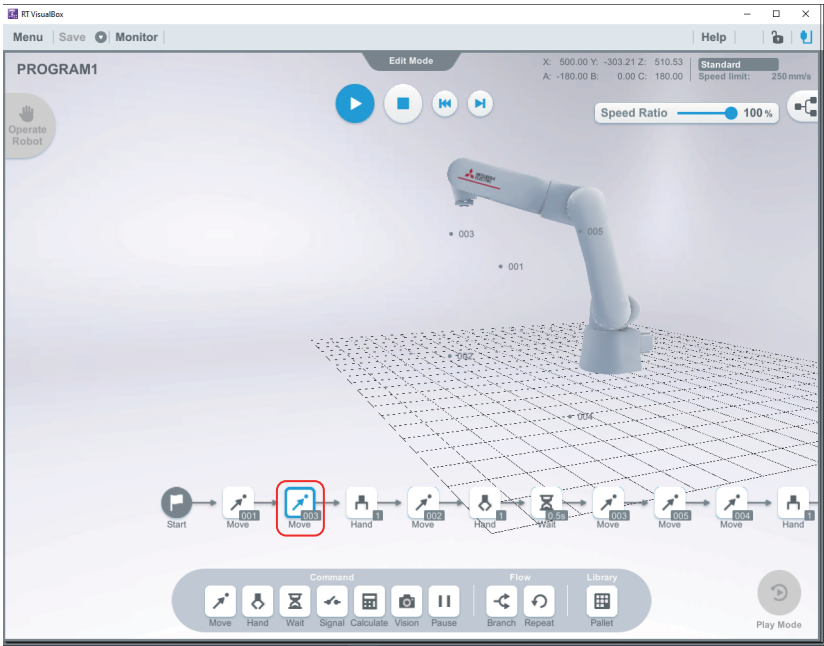
Start a program by tapping/clicking the program execution buttons indicated by number 4 in the figure.

To check the operation of a new program, first use the [Step forward] button to check the operation of the program one block at a time.

After confirming that there are no problems in step operation, run one cycle of the program with the [Play] button and check that there are no problems.

Name		Use
Step forward button		This button is used to execute the program in steps from the current position. The program stops once one program block has been executed.
Play button		This button is used to run the program from the start. If the program has been paused, it will resume from its current position. The program will stop once it reaches End.
Stop button		This button is used to stop the program that is currently running.
Reset button		This button is used to reset the program. The program will return to Start.

Program blocks that are being executed are highlighted.



When the program finishes executing a highlighted program block, the next block will be highlighted.

⚠ CAUTION

- The robot may operate at a higher speed than expected. Reduce the speed of the robot before debugging the program. Pay attention to safety around the robot.
- Before operating the robot from RT VisualBox, always place an emergency stop switch nearby so that the robot can be stopped immediately.

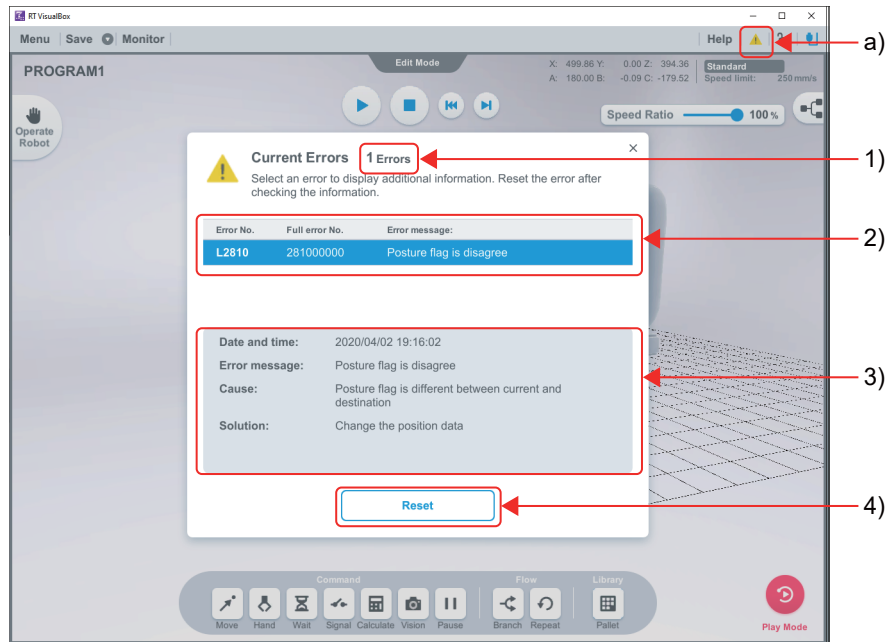
Error

If an error occurs with the robot controller, the Current Errors window will appear automatically.

The error can be reset with the [Reset] button.

To forcibly close this window, tap/click the × in the upper right corner.

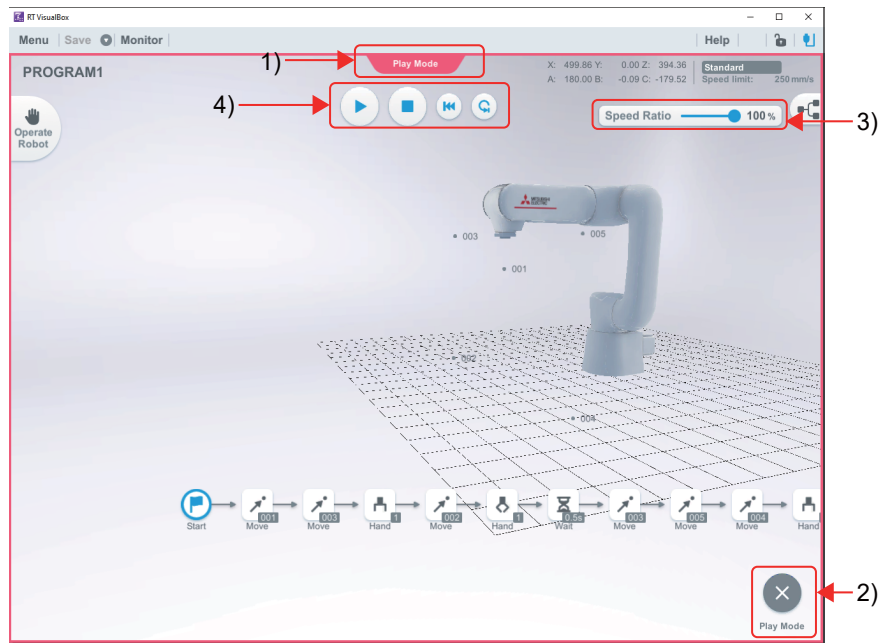
To display the error message again after closing the window, tap/click the icon in the menu bar indicated by "a".



No.	Name	Use
1)	Number of errors	The number displayed here indicates the number of current errors.
2)	Error list	Current errors are listed here.
3)	Error details and solutions	Selecting an error displays details of that error and solutions to it. Follow the solutions to each error to resolve them.
4)	Error reset button	Tap/click the [Reset] button after an error has been resolved. The Current Errors window will close when there are no errors remaining. If there is more than one error remaining, the error list will be updated.

Executing a program (Play Mode)

Execute a program (automatic operation) in Play Mode.



No.	Name	Use
1)	Current mode	This tab displays the current mode.
2)	Switch mode	This button is used to switch between Edit mode and Play mode.
3)	Speed ratio	The speed of the robot can be set as a percentage. The speed can be set between 10% and 100% in ten percent intervals.
4)	Program execution buttons	These buttons are used to move the robot connected to this software. In simulation mode, the robot in the 3D area on-screen will move according to the created program.

When a robot is connected to this software, ensure that the mode selector switch on the robot controller is set to "Automatic". (If not, set it to "Automatic".)

If the currently displayed program has never been saved, or it has been edited, a message will appear prompting you to save the program to the robot or computer (simulation) before starting the program. Save the program.

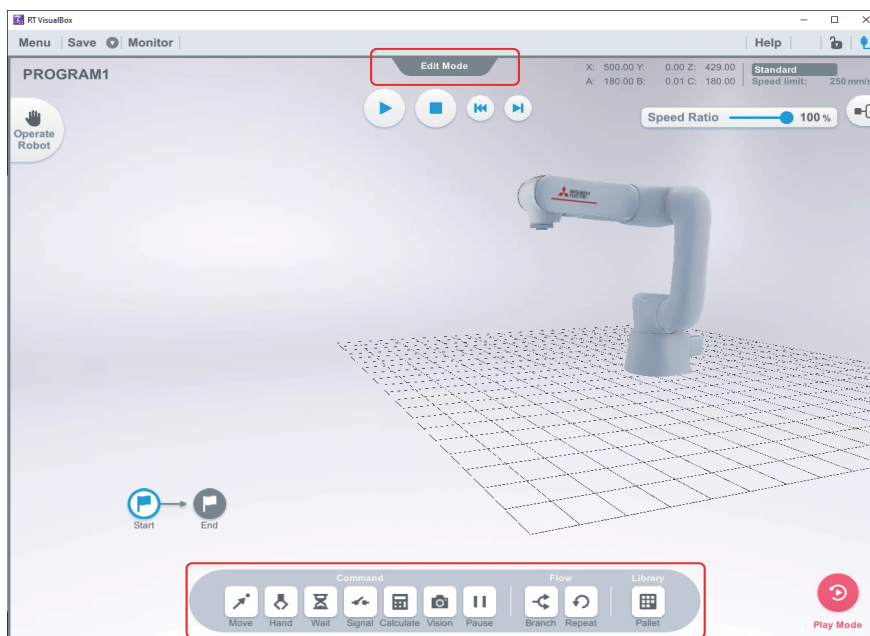
Name		Use
Play button		This button is used to run the program from the start. If the program has been paused, it will resume from its current position. In Continuous operation mode: repeats the program continuously until it is stopped. Once the program reaches End, it starts again from Start. In Cycle operation mode: Once the program reaches End, program execution stops.
		When the button highlights in blue, it indicates that the program is being executed.
Stop button		This button is used to stop the program that is currently running.
Reset button		This button is used to reset the program. If the program has been paused, it will return to Start.
End button		This button is used to switch between Continuous operation mode and Cycle operation mode. If the mode is switched to Cycle operation mode during operation, the mode cannot be switched again until the cycle is complete.
		When the button is white, this indicates that Continuous operation mode is selected.
		When the button is blue, this indicate that Cycle operation mode is selected.

CAUTION

- Before operating the robot from RT VisualBox, always place an emergency stop switch nearby so that the robot can be stopped immediately.
 - Operation rights are required to switch from Play mode to Edit mode. If the mode cannot be changed, check whether another device has the operation rights.
-

8 PROGRAM BLOCKS

This chapter provides detailed information on the functions of the program blocks used in RT VisualBox programming. Program blocks are displayed in the program block panel at the bottom of the screen in Edit mode. Explanations of each block are provided in the table below.



Block name	Description
Move	Moves the robot (Tap/click to configure settings)
Hand	Opens/closes the hand (Tap/click to configure settings)
Wait	Instructs the robot to wait (Tap/click to configure settings)
Signal	Outputs signals (Tap/click to configure settings)
Calculate	Performs calculations (Tap/click to configure settings)
Vision	Identifies the workpiece (Tap/click to configure settings) (This block becomes available when a robot is connected to the software.)
Pause	Pauses the operation
Branch	Branches conditions (Tap/click to configure settings)
Repeat	Repeats the operation (Tap/click to configure settings)
Pallet	Used to set up palletizing operations (Tap/click to configure settings).

Point

Comments entered in a blocks settings will be displayed above the block.
The comment will be displayed in two lines. Not all of the comment will be visible.



Precautions

Multibyte characters used in the comment may not be displayed properly if the program is used on an operating system in a different language.

8.1 Move Block

Function

This block is used to move the robot from its current position to another position.

Program block

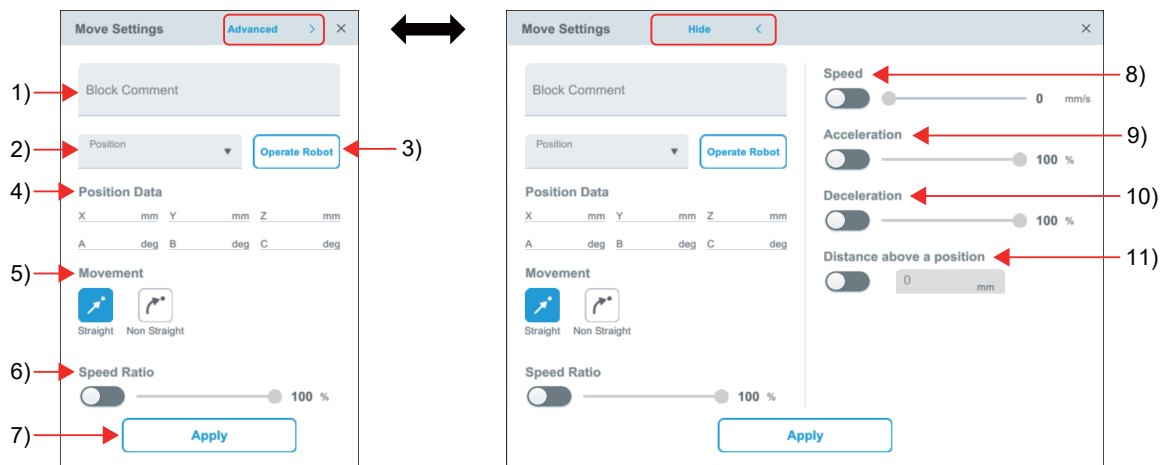


Block properties

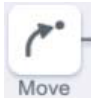
Tap/click the [Move] block in the program to open the Move Settings window.

Advanced settings can be configured here.

Tap/click [Customize] in the top right of the window to open the screen used for setting speed, acceleration, deceleration, and a distance above a position.



No.	Name	Use
1)	Block comment	This field is used to enter comments for this block.
2)	Position	This field is used to select a position from a list of registered positions.  The selected position is displayed in the bottom right of the program block once it is set.
3)	Operate Robot	Clicking this button displays a panel used for operating the robot. Moving the robot arm and then tapping/clicking [Teach] performs one of the following operations. If no position is selected: creates a new position. If a position is selected: updates the current position.
4)	Position data	This field displays the coordinates of the selected position.

No.	Name	Use
5)	Movement	This field allows the user to select how the robot moves.
		 <p>Straight: Performs linear interpolation. In linear interpolation, the control point moves along a straight trajectory.</p>
		 <p>Non straight: Performs joint interpolation. Joint interpolated motion evenly interpolates the joint angle difference of each axis. Therefore, the trajectory of the tip of the hand may change.</p>
6)	Speed ratio	<p>This switch is used to enable/disable the speed ratio. The initial value is 100%. The speed ratio can be specified from 0% to 100% of the robot movement speed. Once set, the speed is maintained until it is changed by the next Move block, or until the program finishes or is reset. The speed ratio value returns to the initial value when the program reaches "End" or is reset.</p>
		 <p>Off: operates at the speed specified in the previous operation.</p>
		 <p>On: operates at the speed set with the slider. The slider becomes active. Specify the speed from 0% to 100%. The switch turns to the Off position when the slider is set to 0%.</p>
7)	Apply	<p>Tap/click the [Apply] button to apply the settings that have been made. Tapping/clicking [×] in the top right of the window discards the settings. Tapping/clicking another program block also discards the settings.</p>
8)	Speed	<p>This can only be set when [Movement] is set to [Straight]. This switch is used to enable/disable speed settings. The initial value is 1000 mm/s. The speed can be specified from 0 to 1000 mm/s for straight movement. Once set, the speed is maintained until it is changed by the next Move block, or until the program finishes or is reset. The speed ratio value returns to the initial value when the program reaches "End" or is reset.</p>
		 <p>Off: operates at the speed specified in the previous Move block.</p>
		 <p>On: the robot operates at the speed set with the slider. The slider becomes active. Specify the speed from 0 mm/s to 1000 mm/s. The switch turns to the Off position when the slider is set to 0 mm/s.</p>
9)	Acceleration	<p>This can only be set when [Movement] is set to [Straight]. This switch is used to enable/disable acceleration settings. The initial value is 100%. The acceleration of the robot's movement can be specified from 0% to 100%. Once set, acceleration is maintained until it is changed by the next Move block, or until the program finishes or is reset. The acceleration value returns to the initial value when the program reaches "End" or is reset.</p>
		 <p>Off: the robot accelerates according to the value specified in the previous Move block.</p>
		 <p>On: the robot accelerates according to the value set with the slider. The slider becomes active. Specify the acceleration from 0% to 100%. The switch turns to the Off position when the slider is set to 0%.</p>
10)	Deceleration	<p>This can only be set when [Movement] is set to [Straight]. This switch is used to enable/disable deceleration settings. The initial value is 100%. The deceleration of the robot's movement can be specified from 0% to 100%. Once set, deceleration is maintained until it is changed by the next Move block, or until the program finishes or is reset. The deceleration value returns to the initial value when the program reaches "End" or is reset.</p>
		 <p>Off: the robot decelerates according to the value specified in the previous Move block.</p>
		 <p>On: the robot decelerates according to the value set with the slider. The slider becomes active. Specify the deceleration from 0% to 100%. The switch turns to the Off position when the slider is set to 0%.</p>

No.	Name	Use
11)	Distance above a position	This switch is used to enable/disable the "Distance above a position" settings. This setting is disabled by default. Moving diagonally to a position or moving to a position that is far away may increase the possibility of the robot colliding with something and losing its grasp on the workpiece. Enabling this setting prevents collisions by allowing the robot to move to a position set above a taught position.
		 Disabled: The robot moves to a taught position.
		 Enabled: The robot moves to a position at specified distance above a taught position. The switch turns to the Off position if a distance of 0 mm is specified.

Precautions

When [Movement] is set to [Straight], there may be instances when linear movement is not possible due to the robot's posture or the relationship between the start position and end position of the movement. In such instances, an error will occur.

This can be rectified with the following methods:

- Change the movement to [Non Straight].
- Change the robot's posture or the start/end position of the movement.
- Set a via point between the start and end positions of the movement.

⚠ CAUTION

- Changing how the robot moves will change the path that the robot takes. Be aware that this may cause the robot to interfere with workpieces or peripheral devices.
- With RT VisualBox version 1.11M or later, if a position is not registered for the Move block, the position variable PInvalid = (0,0,0,0,0,0,0)(7,0) is automatically registered and the program is saved. When a saved program is opened with an earlier version of RT VisualBox 1.11M or RT ToolBox3, the position data of a Move block with no registered position will be "Invalid" or "PInvalid". Do not use a Move block with an "Invalid" or "PInvalid" position. Register a new position for the block.
- When a program that includes a block with no registered position is opened with an earlier version of RT VisualBox 1.11M, the position data of the block is displayed as "Invalid".



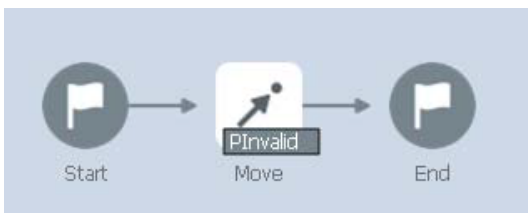
Position
Invalid

Operate Robot

Position Data

X	+0.00 mm	Y	+0.00 mm	Z	+0.00 mm
A	+0.00 deg.	B	+0.00 deg.	C	+0.00 deg.

- When a program that includes a block with no registered position is opened with RT ToolBox3, the position data of the block is displayed as "PInvalid".



Position
PInvalid

Operate Robot

Position Data

X	0.000 mm	Y	0.000 mm	Z	0.000 mm		
A	0.000 deg	B	0.000 deg	C	0.000 deg		
L1	0.000	L2	0.000	FL1	R,A,N	FL2	0

8.2 Hand Block

Function

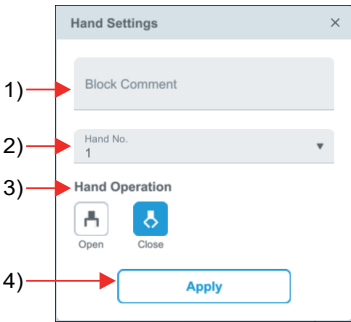
This block is used to operate the hand.

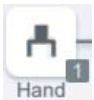
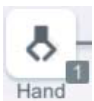
Program block



Block properties

Tap/click the [Hand] block in the program to open the Hand Settings window.
Advanced settings can be configured here.



No.	Name	Use	
1)	Block comment	This field is used to enter comments for this block.	
2)	Hand No.		No. 1 is the only number selectable.
3)	Hand motion	These buttons are used to select the operation of the hand. Verification of hand open/closed status signals is done with hand signals (Wait block, Signal block, and Branch block).	
			Open: opens the hand.
			Close: closes the hand.
4)	Apply	Tap/click the [Apply] button to apply the settings that have been made. Tapping/clicking [×] in the top right of the window discards the settings. Tapping/clicking another program block also discards the settings.	

8.3 Wait Block

Function

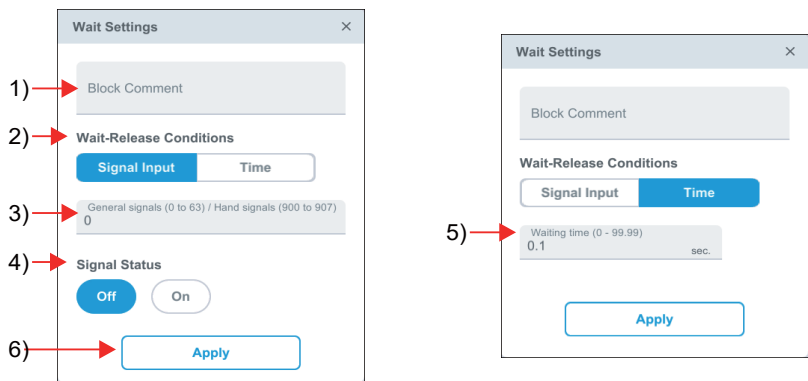
This block is used to make the robot wait until specified conditions are met.
When executing a program in simulation mode while the Wait release conditions field is set to [Signal Input], the program moves to the next block without waiting for signal input.

Program block



Block properties

Tap/click the [Wait] block in the program to open the Wait Settings window.
Advanced settings can be configured here.



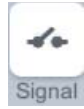
No.	Name	Use
1)	Block comment	This field is used to enter comments for this block.
2)	Wait-release conditions	This field is used to select the conditions under which the program should stop waiting. <ul style="list-style-type: none">• Signal input: the program will stop waiting depending on the input status of the specified signal.• Time: the program will stop waiting when the specified time has elapsed.
3)	Input signal number	<div></div> <div>This field is displayed when [Wait-Release Conditions] is set to [Signal Input]. This field is used to select an input signal that will be used as the condition. Signals 0 to 63 can be specified for general-purpose signals. Signals 900 to 907 can be specified for hand signals. The input signal is displayed in the bottom right of the program block once it is set.</div>
4)	Signal status	This field is displayed when [Wait-Release Conditions] is set to [Signal Input]. Select the status of the signal that will be used as the condition. <ul style="list-style-type: none">• Off: the program stops waiting when the specified signal turns off.• On: the program stops waiting when the specified signal turns on.
5)	Time setting	<div></div> <div>This field is displayed when [Wait-Release Conditions] is set to [Time]. Set the amount of time the program should wait. The wait time can be set from 0 to 99.99 sec. The standby time is displayed in the bottom right of the program block once it is set.</div>
6)	Apply	Tap/click the [Apply] button to apply the settings that have been made. Tapping/clicking [×] in the top right of the window discards the settings. Tapping/clicking another program block also discards the settings.

8.4 Signal Block

Function

This block is used to output signals (bits).

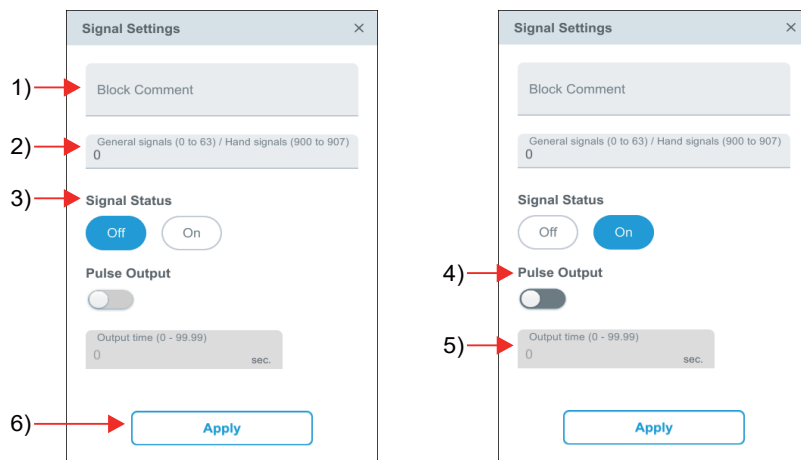
Program block



Block properties

Tap/click the [Signal] block in the program to open the Signal Settings window.

Advanced settings can be configured here.



No.	Name	Use
1)	Block comment	This field is used to enter comments for this block.
2)	Output signal number	 Set the output signal number. Signals 0 to 63 can be specified for general-purpose signals. Signals 900 to 907 can be specified for hand signals. The output signal is displayed in the bottom right of the program block once it is set.
3)	Signal status	Used to select the status of the output signal • Off: turns the output signal Off. • On: turns the output signal On.
4)	Pulse output	This can be set when [Signal Status] is set to On. It enables/disables pulse output.  Off: outputs a constant signal.  On: outputs a pulse signal.
5)	Output time	This can be set when [Pulse Output] is set to On. This field is used to set the pulse output time. The pulse output time can be set from 0 to 99.99 sec.
6)	Apply	Tap/click the [Apply] button to apply the settings that have been made. Tapping/clicking [×] in the top right of the window discards the settings. Tapping/clicking another program block also discards the settings.

8.5 Calculate Block

Function

This block is used to calculate variables.

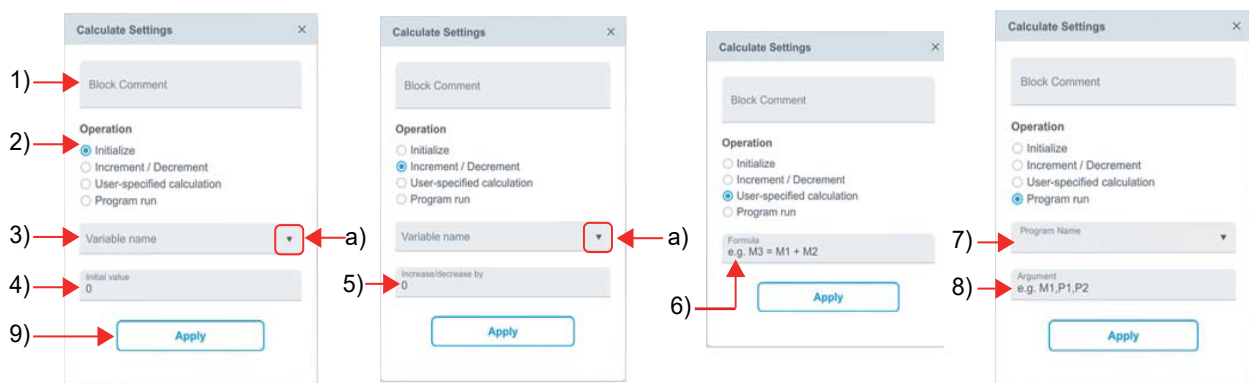
Program block



Block properties

Tap/click the [Calculate] block in the program to open the Calculate Settings window.

Advanced settings can be configured here.



No.	Name	Use
1)	Block comment	This field is used to enter comments for this block.
2)	Operation	This field is used to select an operation type. <ul style="list-style-type: none">• Initialize: Initial values are assigned to variables.• Increment / Decrement: variables are incremented/decremented.• User-specified calculation: user-specified calculations are executed.• Program run: Programs created with MELFA BASIC VI can be executed. This operation is available for version 1.10L or later.
3)	Variable name	This field is displayed when [Operation] is set to [Initialize] or [Increment / Decrement]. This field is used to select the variable name. Tapping/clicking the arrow indicated by "a" displays the set variable name. A variable name can be selected from the variables displayed. Variable names can be entered by tapping/clicking anywhere in the field next to the arrow indicated by "a". Use this field to enter a new variable name.
4)	Initial value	This field is displayed when [Operation] is set to [Initialize]. Enter a value to be used as the initial value. The initial value can be set from -2147483648 to 2147483647.
5)	Increase / Decrease Amount	This field is displayed when [Operation] is set to [Increment / Decrement]. Enter a value to be added/deducted. The increment/decrement amount can be set from -2147483648 to 2147483647. <ul style="list-style-type: none">• If a positive value has been entered, the variable is incremented (increased).• If a negative value has been entered, the variable is decremented (decreased).
6)	Formula	This field is displayed when [Operation] is set to [User-specified calculation]. User-specified formulas can be entered in this field.
7)	Program Name	This field is displayed when [Operation] is set to [Program run]. Select a program you want to execute.
8)	Argument	This field is displayed when [Operation] is set to [Program run]. If you use arguments, create a program with FPrm command in RT ToolBox3. If setting multiple arguments, separate them with a comma.
9)	Apply	Tap/click the [Apply] button to apply the settings that have been made. Tapping/clicking [X] in the top right of the window discards the settings. Tapping/clicking another program block also discards the settings.

Precautions

Only numerical variables can be entered for the settings of the variable selected. Do not enter a variable name starting with P, J, C or W.

Variable names are in single-precision floating-point format.

Refer to the MELFA-BASIC VI Manual stated below for information on the programming language of variables.

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

8.6 Vision Block

Function

This function is used to transport workpieces or identify patterns with the help of a vision sensor.

Precautions

This block becomes available when a robot is connected to the software.

Program block

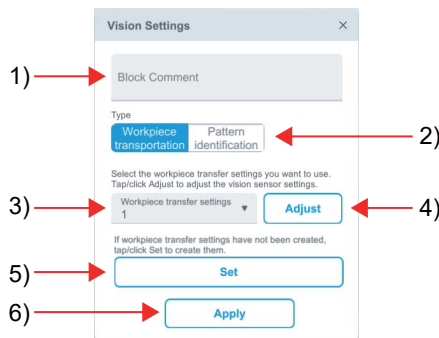


Block properties

Tap/click the [Vision] block in the program to open the Vision Settings window.

Advanced settings can be configured here.

Workpiece transportation



No.	Name	Use
1)	Block comment	This field is used to enter comments for this block.
2)	Type	Used to select the type of vision sensor settings.
3)	Workpiece transfer settings	This field is used to select a registered workpiece transfer setting. Refer to the following page for information on how to configure the workpiece transfer settings. 📖 Page 129 Workpiece Transfer Settings
4)	Adjust	This button is enabled when a setting is selected in [Workpiece transfer settings]. Tap/click this button to open the Adjusting workpiece identification settings screen. Refer to the following page for further information on how to adjust the vision sensor. 📖 Page 138 Adjusting identification accuracy for workpiece transfer settings
5)	Set	Workpiece transfer settings can be created if no settings have been registered yet. Tap/click this button to display the Vision Settings window.
6)	Apply	Tap/click the [Apply] button to apply the settings that have been made. Tapping/clicking [X] in the top right of the window discards the settings. Tapping/clicking another program block also discards the settings.

Refer to the following page for information on vision sensor settings and adjustment.

📖 Page 126 VISION SENSOR SETTINGS

Precautions

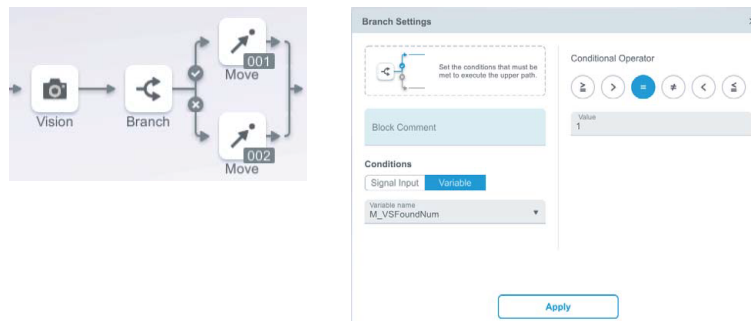
Once the program has started and the vision sensor has imaged a workpiece, the vision sensor will try to identify that workpiece with the registered image of the master workpiece.

If the vision sensor can identify the workpiece, the robot will grasp the workpiece. If the vision sensor cannot identify the workpiece, the robot will stay in the imaging position.

The result of whether the vision sensor has identified the workpiece will be stored as the variable "M_VSFoundNum". If the workpiece can be identified, the value "1" will be stored. If the workpiece cannot be identified, the value "0" will be stored. Set these conditions for the variable "M_VSFoundNum" in the branch block and create the operations that will occur depending on whether the sensor was able to identify the workpiece.

➡ Page 81 Branch Block

For example, place the blocks in the configuration shown below and set the Branch block properties so that the robot will move to Position 001 if the workpiece can be identified or Position 002 if it cannot be identified.



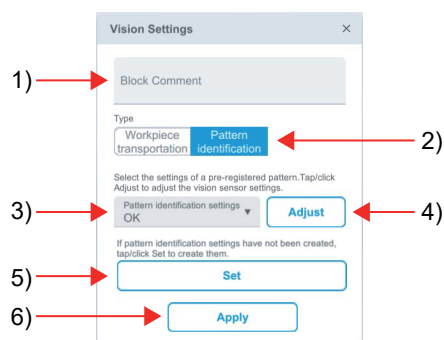
If the workpiece cannot be identified, check the position and angle of the workpiece as well as surrounding light levels.

Tap/click the [Adjust] button to open the Adjusting workpiece identification settings screen and check if the vision sensor can identify the workpiece.

Refer to the following page for further information.

➡ Page 138 Adjusting identification accuracy for workpiece transfer settings

Pattern identification



No.	Name	Use
1)	Block comment	This field is used to enter comments for this block.
2)	Type	Used to select the type of vision sensor settings.
3)	Pattern identification settings	This field is used to select a registered pattern identification setting. Refer to the following page for information on how to configure pattern identification settings. ➡ Page 139 Pattern identification settings
4)	Adjust	This button is enabled when a setting is selected in [Pattern identification settings]. Tap/click this button to open the Adjusting pattern identification settings screen. Refer to the following page for further information on how to adjust the vision sensor. ➡ Page 143 Adjusting identification accuracy for pattern identification settings
5)	Set	Pattern identification settings can be created if no settings have been registered yet. Tap/click this button to display the Vision Settings window.
6)	Apply	Tap/click the [Apply] button to apply the settings that have been made. Tapping/clicking [×] in the top right of the window discards the settings. Tapping/clicking another program block also discards the settings.

Refer to the following page for information on vision sensor settings and adjustment.

➡ Page 126 VISION SENSOR SETTINGS

Precautions

Once the program has started and the vision sensor has imaged a pattern, the vision sensor will try to identify that pattern with the registered image of the master pattern.

The result of whether the vision sensor has identified the pattern will be stored in the variable "M_VSFoundNum". If the pattern can be identified, the value "1" will be stored. If the pattern cannot be identified, the value "0" will be stored. Set these conditions for the variable "M_VSFoundNum" in the Branch block and create the operations that will occur depending on whether the sensor was able to identify the pattern.

 Page 81 Branch Block

The score (to what degree the pattern matches the registered master pattern) is stored in the variable "M_VSMatchScore". Use this variable if using multiple pattern identification settings sequentially.

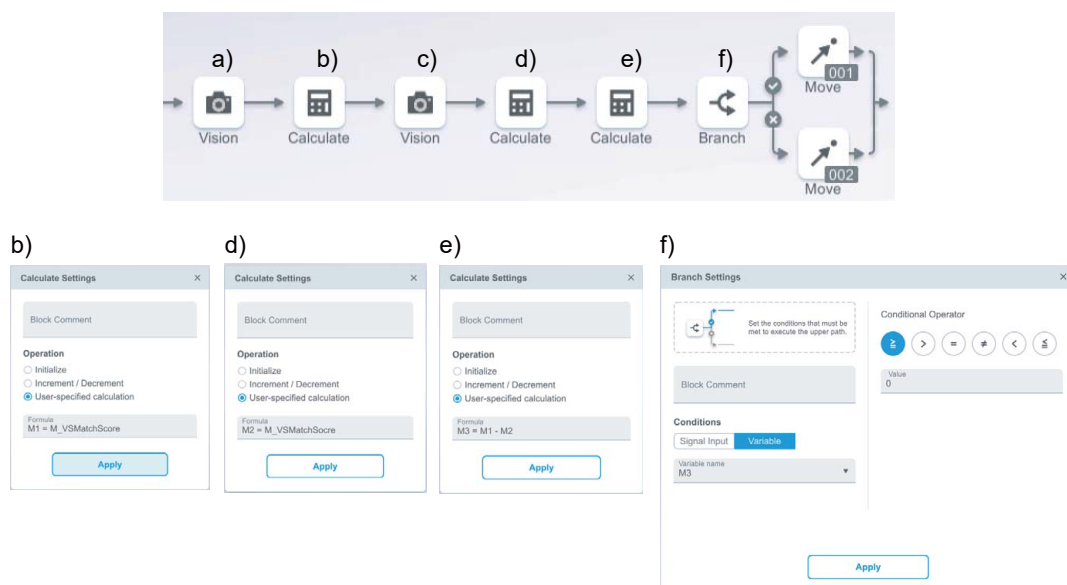
As an example, a program in which two sets of pattern identification settings (A and B) are used is shown below. If the pattern matches the pattern in Setting A more than Setting B, the robot will move to Position 001. If the pattern matches the pattern in Setting B more than Setting A, the robot will move to Position 002.

1. Place the program blocks in the following configuration.
2. Configure Setting A and Setting B in Vision blocks "a" and "c" respectively.
3. Enter "M1 = M_VSMatchScore" in the User-specified calculation field of the Calculation block indicated by "b".
4. Enter "M2 = M_VSMatchScore" in the User-specified calculation field of the Calculation block indicated by "d".
5. Enter "M3 = M1 - M2" in the User-specified calculation field of the Calculation block indicated by "e".
6. Enter the following settings in the Branch block indicated by "f".

Variable name: M3

Conditional Operator: $\geq$

Value: 0



If the pattern cannot be properly identified, check the position and angle of the pattern as well as surrounding light levels. Tap/click the [Adjust] button to open the Adjusting pattern identification settings screen and check if the vision sensor can identify the pattern.

Refer to the following page for further information.

 Page 143 Adjusting identification accuracy for pattern identification settings

8.7 Pause Block

Function

This block is used to suspend the program and make the robot wait.
Tap/click the [Play] button or [Step forward] button to restart the program.

Program block



Block properties

This block does not have block properties.

8.8 Branch Block

Function

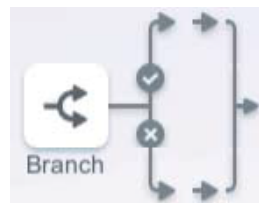
This block branches the program according to conditions set by the user.

If the conditions set for the branch block are met, the upper path is executed. If the conditions set for the branch block are not met, the lower path is executed.

Program block



Branch block in the block panel

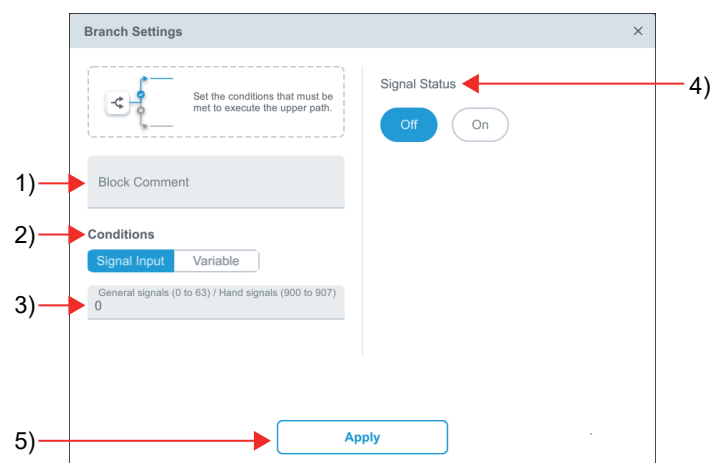


Branch block placed in the program

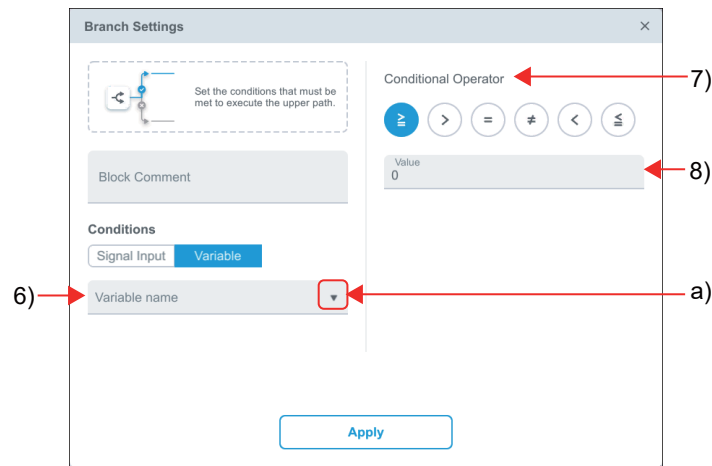
Block properties

Tap/click the [Branch] block in the program to open the Branch Settings window.

Advanced settings can be configured here.



No.	Name	Use
1)	Block comment	This field is used to enter comments for this block.
2)	Conditions	This field is used to set the conditions by which the upper path is executed. <ul style="list-style-type: none">• Signal input: the status of the specified input signal number is used as the condition.• Variable: the status of the variable is used as the condition.
3)	Input signal number	This is displayed when [Conditions] is set to [Signal Input]. This field is used to select an input signal that will be used as the condition. Signals 0 to 63 can be specified for general-purpose signals. Signals 900 to 907 can be specified for hand signals.
4)	Signal Status	This is displayed when [Conditions] is set to [Signal Input]. This field is used to set the status of the input signal being used as the condition. <ul style="list-style-type: none">• Off: if the signal is Off, the upper path is executed.• On: if the signal is On, the upper path is executed.
5)	Apply	Tap/click the [Apply] button to apply the settings that have been made. Tapping/clicking [X] in the top right of the window discards the settings. Tapping/clicking another program block also discards the settings.



No.	Name	Use
6)	Variable name	This field is displayed when [Conditions] is set to [Variable]. This field is used to select the variable which will be used as the condition. Tapping/clicking the arrow indicated by "a" displays the set variable name. A variable name can be selected from the variables displayed. Variable names can be entered by tapping/clicking anywhere in the field next to the arrow indicated by "a". Use this field to enter a new variable name.
7)	Conditional expression symbols	This field is displayed when [Conditions] is set to [Variable]. Select the expression to be used as the condition.
8)	Value	This field is displayed when [Conditions] is set to [Variable]. This field is used to enter a numeric value which will be used as the condition.

Precautions

Only numerical variables can be entered for the settings of the variable selected. Do not enter a variable name starting with P, J, C or W.

Variable names are in single-precision floating-point format.

Refer to the section "MELFA-BASIC VI" in the manual stated below for information on the programming language of variables.

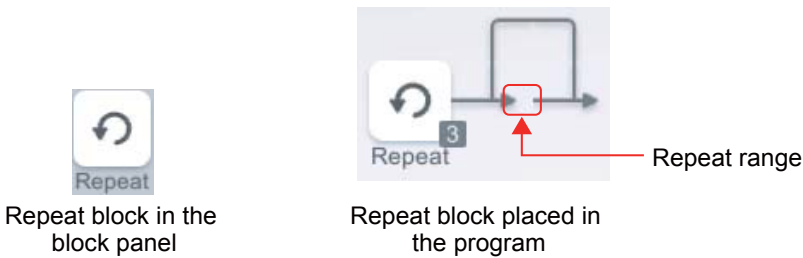
📖 CR800 Series Controller INSTRUCTION MANUAL Detailed explanations of functions and operations (BFP-A3478)

8.9 Repeat Block

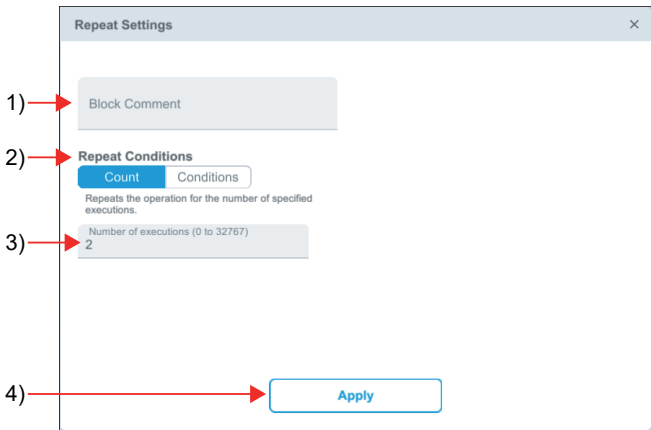
Function

This block is used to repeat the program.
It will repeat the operations of blocks placed within the repeat range the number of times specified. It will also repeat the operations as long as the specified conditions are met.

Program block



Block properties



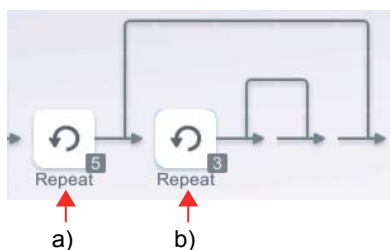
No.	Name	Use
1)	Block comment	This field is used to enter comments for this block.
2)	Repeat Conditions	This setting is used to set repeat conditions. <ul style="list-style-type: none">• Count: Repeats the operation for the number of specified executions.• Conditions: Repeats the operation as long as the specified conditions are met.
3)	Number of executions	Set the number of times to repeat the operations of blocks placed within the repeat range.
4)	Apply	Tap/click the [Apply] button to apply the settings that have been made. Tapping/clicking [×] in the top right of the window discards the settings. Tapping/clicking another program block also discards the settings.

The variable names "MrepeatN" are created automatically. The current number of times the program has been repeated is stored in the variable.

"N" represents a number at the end of a variable name. This number indicates the position of the block within the order of Repeat blocks.

For example, the variable name of the Repeat block indicated by "a" below is Mrepeat1, and the block indicated by "b" is Mrepeat2.

This variable can be set in the conditions of the Branch block.



Repeat Settings

Block Comment

Repeat Conditions

Count

Conditions

Repeats the operation as long as the specified conditions are met.

5) → Conditions

Signal Input

Variable

6) → General signals (0 to 63) / Hand signals (900 to 907)

0

Signal Status

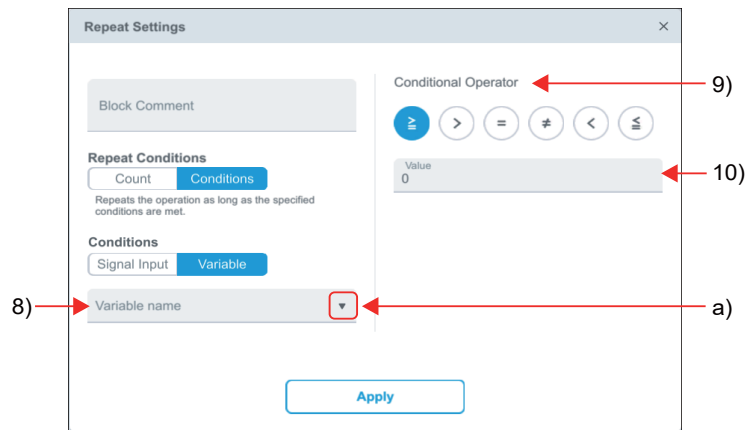
7) →

Off

On

Apply

No.	Name	Use
5)	Repeat conditions	This setting is used to select the type of condition to be used for the repeat block. <ul style="list-style-type: none"> • Signal Input: the status of the specified input signal number is used as the condition. • Variable: the status of the variable is used as the condition.
6)	Input signal number	This is displayed when [Conditions] is set to [Signal Input]. This field is used to select an input signal that will be used as the condition. Signals 0 to 63 can be specified for general-purpose signals. Signals 900 to 907 can be specified for hand signals.
7)	Signal status	This is displayed when [Conditions] is set to [Signal Input]. This field is used to set the status of the input signal being used as the condition. <ul style="list-style-type: none"> • Off: if the signal is Off, the operation is repeated. • On: if the signal is On, the operation is repeated.



No.	Name	Use
8)	Variable name	This field is displayed when [Conditions] is set to [Variable]. This field is used to select the variable which will be used as the condition. Tapping/clicking the arrow indicated by "a" displays the set variable name. A variable name can be selected from the variables displayed. Variable names can be entered by tapping/clicking anywhere in the field next to the arrow indicated by "a". Use this field to enter a new variable name.
9)	Conditional expression symbols	This field is displayed when [Conditions] is set to [Variable]. Select the expression to be used as the condition.
10)	Condition value	This field is displayed when [Conditions] is set to [Variable]. This field is used to enter a numeric value which will be used as the condition.

Precautions

Only numerical variables can be entered for the settings of the variable selected. Do not enter a variable name starting with P, J, C or W.

Variable names are in single-precision floating-point format.

Refer to the section "MELFA-BASIC VI" in the manual stated below for information on the programming language of variables.

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

8.10 Pallet Block

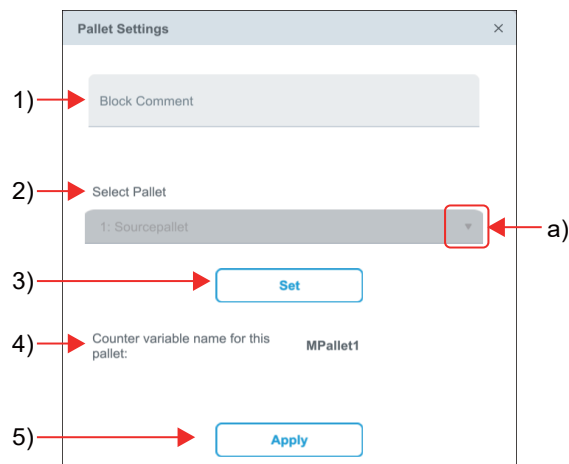
Function

This function is used to palletize and depalletize workpieces/products. I.e. it loads and unloads pallets neatly. When the robot moves to a pallet cell, its hand will be fixed to the posture (direction) it was in at the start position.

Program block



Block properties



No.	Name	Use
1)	Block comment	This field is used to enter comments for this block.
2)	Pallet selection	This field is used to create new pallet settings or select existing ones. Tapping/clicking the arrow indicated by "a" displays existing pallet settings. If this window appears after placing a pallet block in the program, this setting will be unavailable.
3)	Pallet settings	Tap/click this button to configure the pallet settings (size, position, operation pattern, etc.). Pallet settings can be configured for a new or existing pallet. Refer to the following page for information on how to configure pallet settings. 📖 Page 87 Pallet settings
4)	Counter variable name for this pallet	This is the variable name which will be used as the counter for this pallet when a program is being executed. This counter variable can be used when you want to change the settings of a specific pallet. The variable name for this counter is "MPalletN". The letter "N" indicates the pallet number. This variable name will only appear after a pallet block has been configured and placed in the program.
5)	Apply	This button only becomes available once existing pallet settings have been selected. Tap/click the [Apply] button to apply the settings that have been made.

Precautions

- Up to eight pallets can be set in any one program. If a new pallet cannot be created, delete any unnecessary pallet blocks, save the program, then try again.
- This function does not support the use of a vision sensor. It is not possible to use a vision sensor to adjust the movement to pallet cells.
- If an error occurs with this block when the program is executed, change the positions in the pallet settings.

📖 Page 90 Editing existing pallet settings

If the error persists, it may have something to do with the relationship between the position of the robot and pallet. For further information, refer to "Def Plt (Define pallet)" in the following manual:

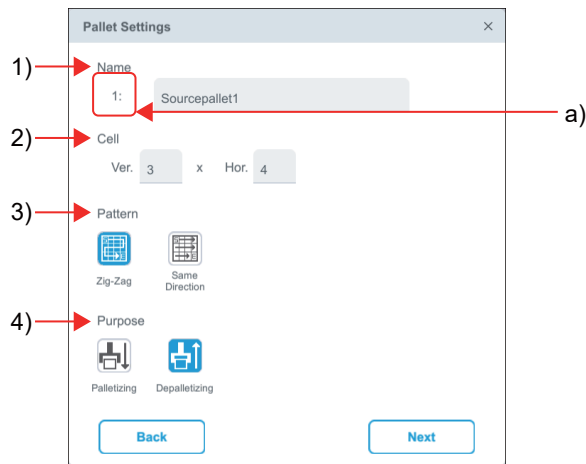
📖 Instruction Manual/Detailed explanations of functions and operations (BFP-A3478)

Pallet settings

Creating new pallet settings

Operating procedure

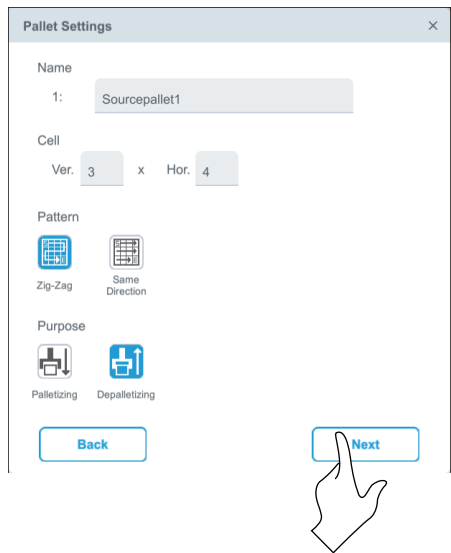
1. Configure the basic pallet settings.

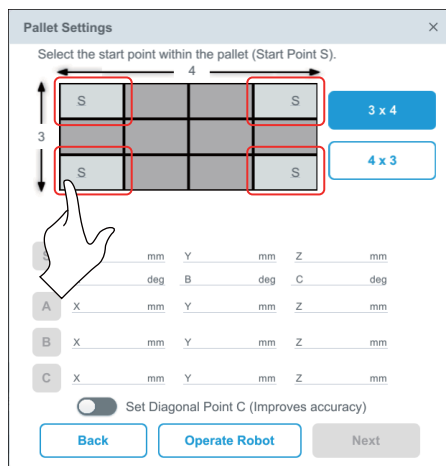


No.	Name	Use
1)	Name	Enter a pallet name. The number indicated by "a" is the pallet number.
2)	Cell	Enter the number of cells in the horizontal and vertical directions. Cell numbers can be specified from 1 to 999.
3)	Pattern	Choose the direction in which the robot should operate.
4)	Purpose	Choose the purpose of the operation. Palletize: Stack workpieces (goods or materials) onto a pallet. Depalletize: Remove workpieces (goods or materials) from a pallet.

8

2. Tap/click [Next].





- Click one of the cells in the four corners of the pallet to set Start Point S.

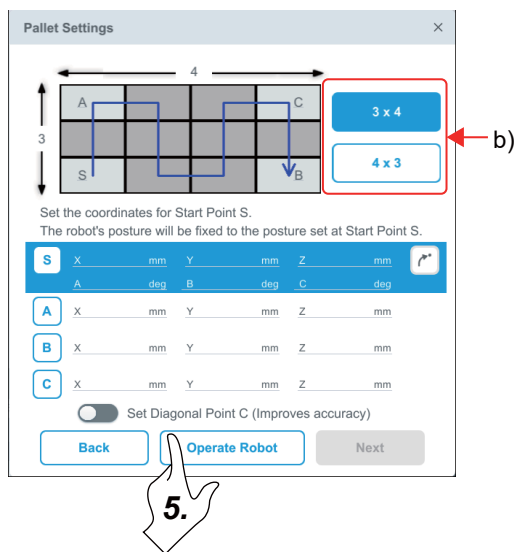
Start Point S: the first point the robot will move to.

End Point A: the first point the robot should not continue past.

The robot will continue the operation for every cell from the side of Start Point S to the side of End Point A.

End Point B: the second point the robot should not continue past.

Diagonal Point C: the cell diagonally-opposite Start Point S.



- The direction of the pallet operation will be displayed. Tap/click the buttons indicated by "b" to invert End Point A and End Point B. Tapping/clicking a corner other than that of Start Point S will show the direction of the pallet operation with the selected cell set as Start Point S.

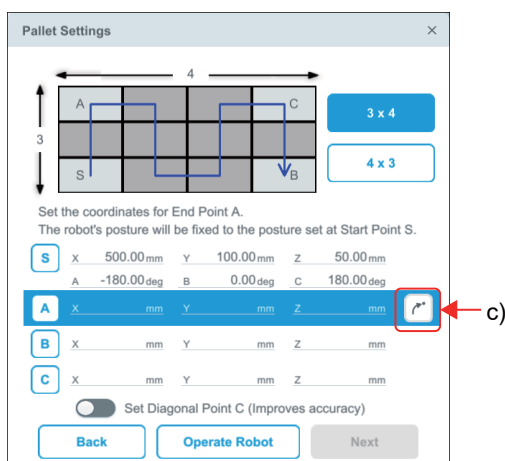
- Tap/click [Operate Robot], then move the robot to the position of Start Point S.

- Tap/click [Teach] in the Robot Operation panel.

⚠ CAUTION

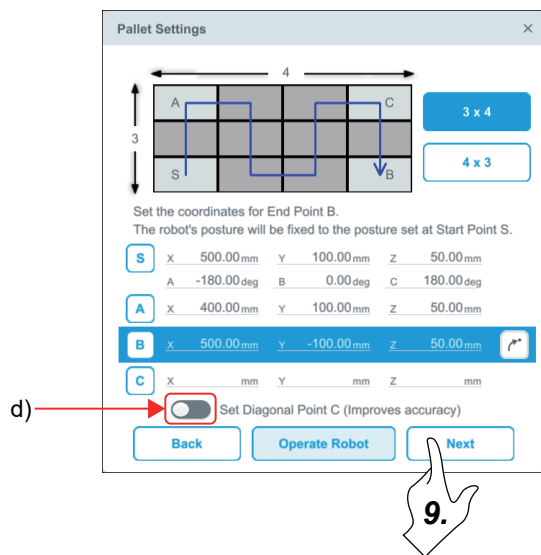
The direction of the pallet operation shown in the figure above is for illustration purposes only. The actual pallet operation will follow the positions that have been set for points S, A, B, and C.

Teach positions S, A, B, and C so that they match the figure in the Pallet Settings window.



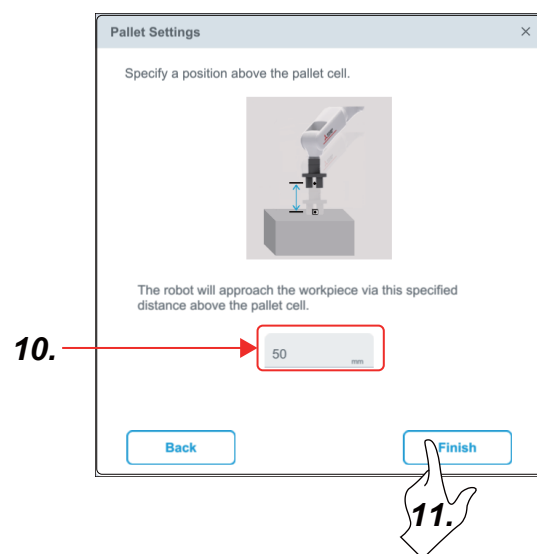
- Teach End Point A and End Point B the same way as indicated in steps 5 and 6.

Tapping/clicking the [Jump position] button indicated by "c" will move the robot to the selected set point.



8. By default, Diagonal Point C does not need to be set. Turn on [Set Diagonal Point C (Improves accuracy)] and set Diagonal Point C if the pallet you are using is distorted or you want to improve the accuracy of the pallet operation.

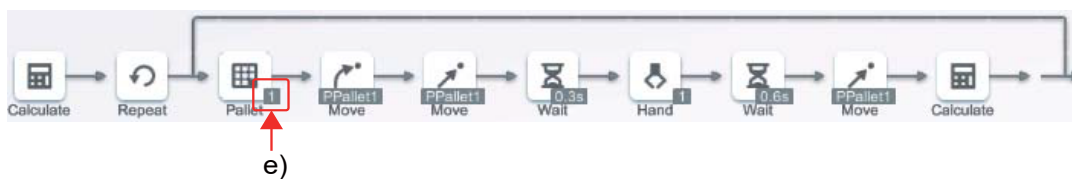
9. Tap/click [Next].



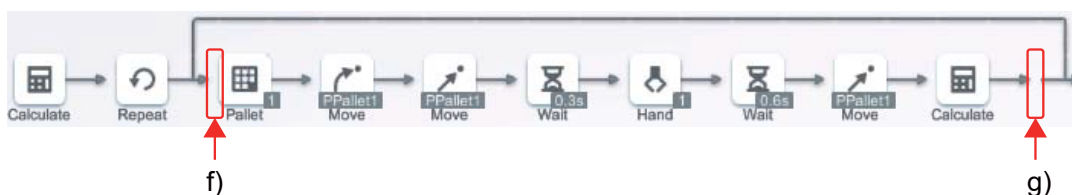
10. Specify the distance the robot should keep above the pallet before it approaches a pallet cell.

11. Tap/click the [Finish] button.

12. A repeating program for the number of cells in the pallet operation will be automatically inserted to the left and right of the [Pallet] block in the program. The pallet number (indicated by "e") will appear in the bottom right of the [Pallet] block.



13. For palletizing operations, use the area indicated by "f" just before the [Pallet] block to instruct the robot where to pick the workpieces from. For depalletizing operations, use the area indicated by "g" just after the last [Calculate] block to instruct the robot where to place the workpieces.



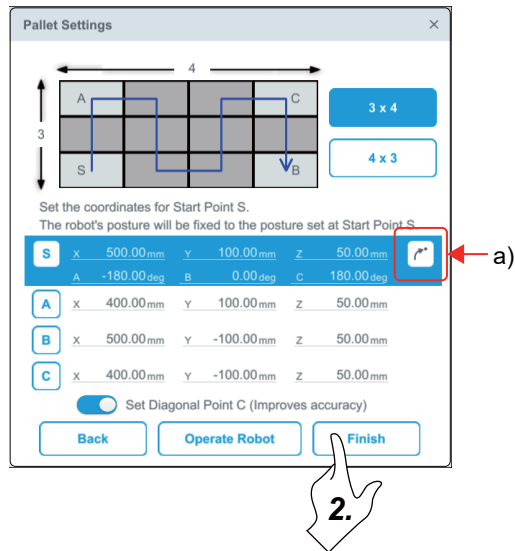
Point

By placing a pallet block in the areas indicated by "f" and "g", it is possible to make the robot transfer workpieces from one pallet to another.

When creating such an operation, edit the settings of blocks to create your desired program. For example, edit the conditions in the [Repeat] block or adjust the position of the [Calculate] block that initializes the operation counter.

Editing existing pallet settings

Operating procedure



1. Change existing pallet settings (operation direction, pallet position, etc.) with the same steps used for creating new pallet settings.
Tapping/clicking the [Jump position] button indicated by "a" will move the robot to the selected set point.
2. Tap/click [Finish] once changes have been made.
3. To change the distance the robot should keep above the pallet, change the distance in the advance settings of the [Move] block.

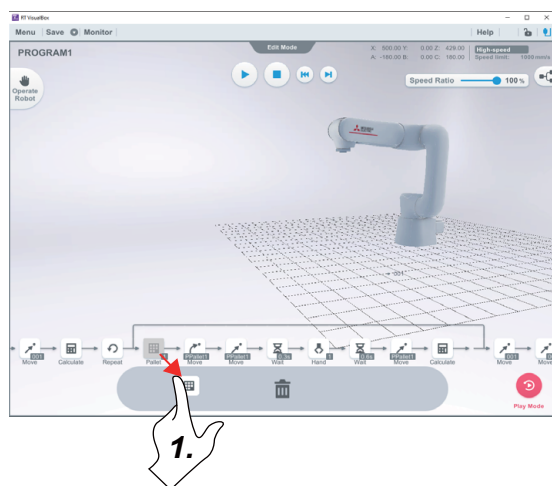
Point

If the robot is not moving to positions on the pallet accurately, setting Diagonal Point C may increase position accuracy.

Deleting Pallet blocks

Follow the steps below to delete any unnecessary [Pallet] blocks in the program.

Operating procedure



1. To delete the [Pallet] blocks that were automatically inserted into the program, drag them downwards into the trash can.

Point

By deleting the [Repeat] block in front of the [Pallet] block, it is possible to delete all the [Pallet] blocks in the repeat area at once. Be aware that by doing this, any blocks that have manually been inserted into this area will also be deleted.

2. Save the program.

9 ROBOT OPERATION

This chapter explains how to operate the robot.

The following robot operations can be performed with this software.

- Direct teaching
- Jog operation
- Inching
- Joint operation

The robot can be taught directly using direct teaching. Simply push/pull the arm to the position you want to teach to the robot. The robot's movement can be limited to translational motion.

Movement in the coordinate (Cartesian) axes is also possible using Jog operation, and individual joints can be moved independently using Joint operation.

The robot can also be operated in Inching mode (in user-specified distances) to move the robot to a precise position.

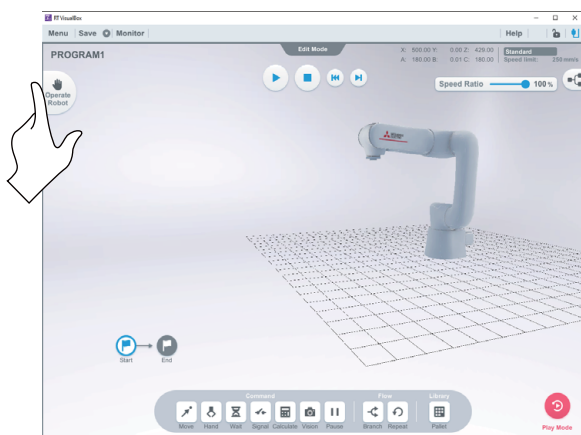
To put it simply, Direct teaching, Jog operation, and Joint operation are used to make big movements, whereas Inching mode is used to make fine adjustments.

When a robot is connected to this software, the robot will move using the selected robot operation mode. When this software is used in simulation mode, the robot in the 3D area on-screen will move using the selected robot operation mode.

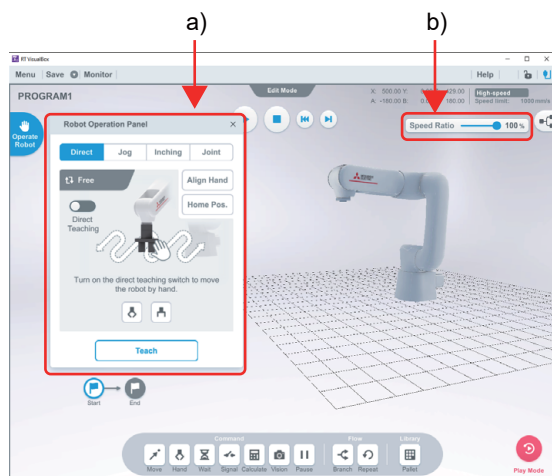
Direct teaching can only be selected when a robot is connected.

When a robot is connected to this software, ensure that the mode selector switch on the robot controller is set to "Automatic". (If not, set it to "Automatic".)

Operating procedure



1. Tap/click the [Operate Robot] button.



2. Select the desired operation mode to operate the robot.

The speed at which the robot operates can be set on the speed panel on the screen.

9.1 Direct Teaching

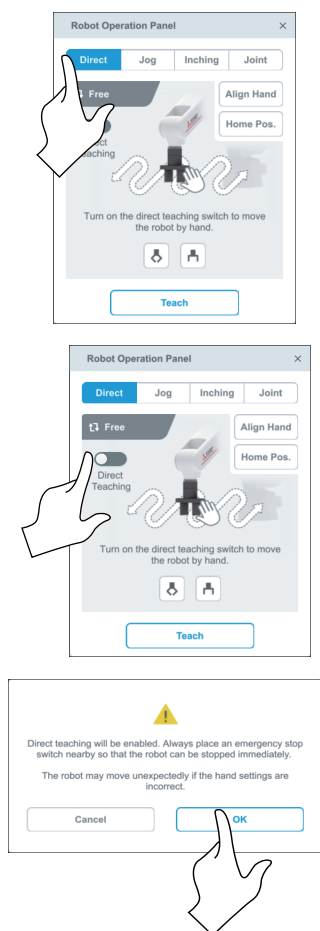
The arm can be moved by simply pushing or pulling it.

The robot's movement can be limited to translational or rotational motion.

CAUTION

- Place an emergency stop switch in an easily accessible place near the robot. Connect the emergency stop switch to the external emergency stop terminals of the robot controller.
- If the settings for the hand are not configured correctly, the arm may rise or fall when direct teaching is turned on. Furthermore, the safety functions may not work properly. Ensure the settings are correct.
- The robot arm may continue to move under its own inertia in direct teaching mode. Do not release your hands from the robot arm until it has stopped moving.
- Workpiece settings are not enabled during direct teaching. The robot arm may fall depending on the weight of the workpiece. Do not release your hands from the robot arm until it stops completely.
- If using one of the hand settings from HNDDAT1 to HNDDAT8 set in RT ToolBox3, be aware that the hand setting in the controller will be reset to HNDDAT0 if the controller's power is cycled. In this case the arm may rise or fall as the correct hand settings will no longer be set.

Operating procedure



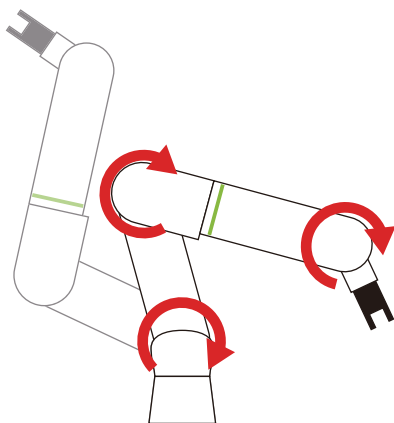
1. Select the [Direct] tab in the Robot Operation panel.

2. Tap/click the [Direct Teaching] switch in the Robot Operation panel. A conformation dialog box will appear.

3. Tap/click the [OK] button in the confirmation dialog box to turn on direct teaching.

Direct teaching will remain enabled until the [Direct Teaching] switch is turned off.

4. The robot can be put in the desired position/posture by moving the arm directly with your hands.

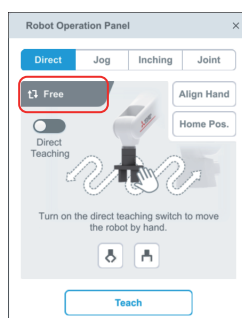


Point

- Direct teaching is automatically turned off when switching to the Jog, Inching, or Joint windows, or when an error occurs.

Tapping/clicking the [Motion type] button in the Robot Operation panel allows you to switch between motion types.

- Free: each joint moves freely.
- Translational: the robot moves in the coordinate (Cartesian) axes.
- Rotational: the robot moves in the rotational direction of the coordinate (Cartesian) axes. (Supported with controller software version B1c or later.)



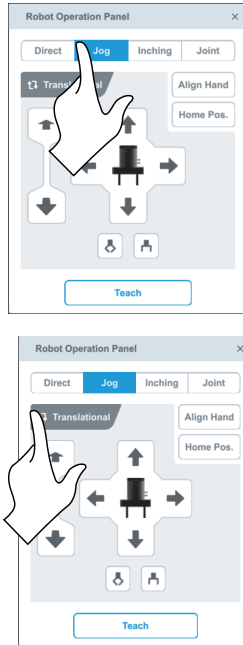
Press the [DIRECT TEACHING] button on the top of the robot arm to turn Direct teaching on.

-	Direct teaching status	Operation
Press and hold (Two seconds or more)	OFF	Turns Direct teaching on.
	ON	Turns Direct teaching off.
Single press	OFF	—
	ON	Switches the operation mode in the following order: Free → Translational → Rotational Pressing this button in Rotational mode switches the operation mode back to Free mode.

9.2 Jog Operation

Jog operation allows the robot arm to be moved in the coordinate (Cartesian) axes via the Robot Operation panel. Translational or rotational movement can be selected.

Operating procedure



1. Select the [Jog] tab in the Robot Operation panel.

2. Tapping/clicking the [Motion type] button in the Robot Operation panel allows you to switch between motion types.

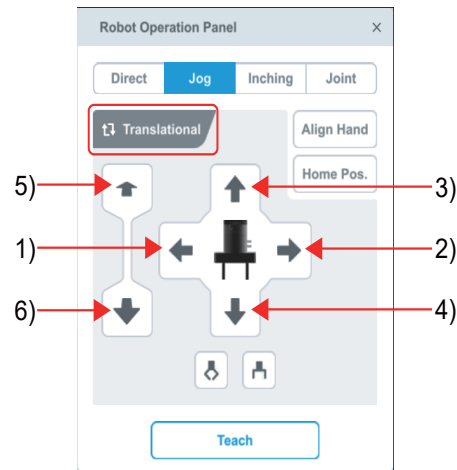
- Translational: the robot moves in the coordinate (Cartesian) axes within the Tool coordinate system.
- Rotational: the robot moves in the rotational direction within the Tool coordinate system.

Refer to the page below for information on the Tool coordinate system.

 [Page 52 Workpiece Grasp Position Settings](#)

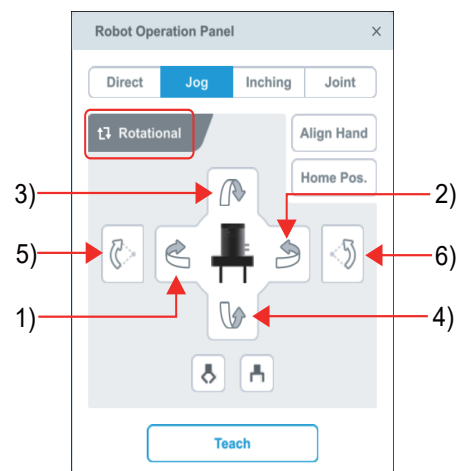
The robot moves in the specified direction while any of the move buttons (arrows) in the Robot Operation panel are pressed.

Motion type: Translational



No.	Direction
1)	Moves the arm in the negative Y direction
2)	Moves the arm in the positive Y direction
3)	Moves the arm in the negative Z direction
4)	Moves the arm in the positive Z direction
5)	Moves the arm in the positive X direction
6)	Moves the arm in the negative X direction

Motion type: Rotational

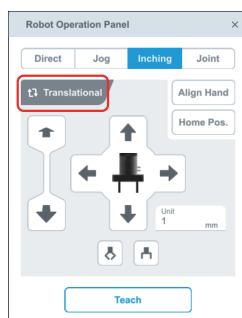
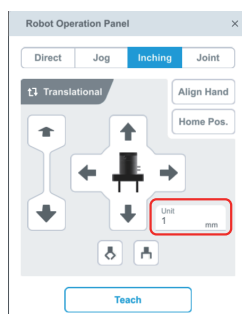


No.	Direction
1)	Rotates the arm in the positive C direction
2)	Rotates the arm in the negative C direction
3)	Rotates the arm in the negative B direction
4)	Rotates the arm in the positive B direction
5)	Rotates the arm in the positive A direction
6)	Rotates the arm in the negative A direction

9.3 Inching

Inching mode allows the robot arm to be moved in specific distances via the Robot Operation panel. Translational or rotational movement can be selected.

Operating procedure



1. Select the [Inching] tab in the Robot Operation panel.

2. Tap/click the [Motion type] button in the Robot Operation panel to switch between motion types.

- Translational: the robot moves in the coordinate (Cartesian) axes within the Tool coordinate system.
- Rotational: the robot moves in the rotational direction within the Tool coordinate system.

Refer to the page below for information on the Tool coordinate system.

 Page 52 Workpiece Grasp Position Settings

3. In the Unit field, set the distance of each movement in Inching mode.

The value entered in the Unit field needs to be entered separately for both translational and rotational motion.

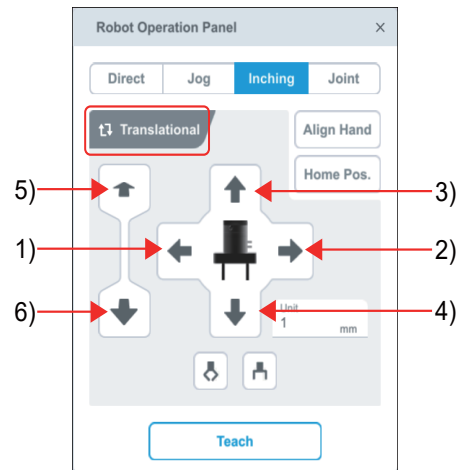
- Translational: enter distances in millimeters.
- Rotational: enter distances in degrees.

Numbers with up to two decimal places can be entered.

The robot moves the distance set in the Unit field when any of the arrows in the Robot Operation panel are pressed.

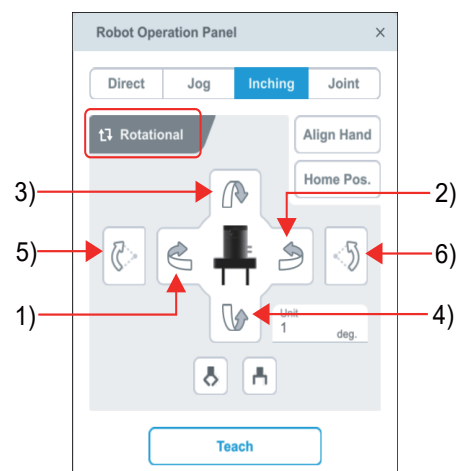
The robot will stop moving once it reaches the specified distance even if the arrow buttons continue to be held down.

Motion type: Translational



No.	Direction
1)	Moves the arm in the negative Y direction
2)	Moves the arm in the positive Y direction
3)	Moves the arm in the negative Z direction
4)	Moves the arm in the positive Z direction
5)	Moves the arm in the positive X direction
6)	Moves the arm in the negative X direction

Motion type: Rotational motion

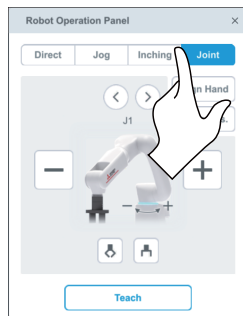
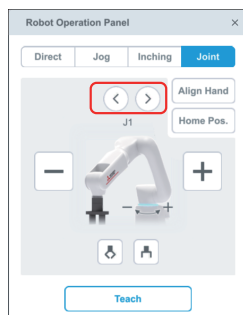
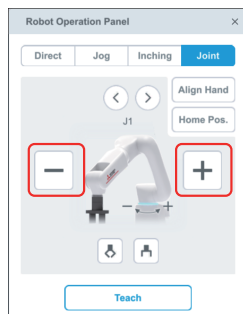


No.	Direction
1)	Rotates the arm in the positive C direction
2)	Rotates the arm in the negative C direction
3)	Rotates the arm in the negative B direction
4)	Rotates the arm in the positive B direction
5)	Rotates the arm in the positive A direction
6)	Rotates the arm in the negative A direction

9.4 Joint Operation

Joint operation allows individual joints of the robot arm to be moved via the Robot Operation panel.

Operating procedure

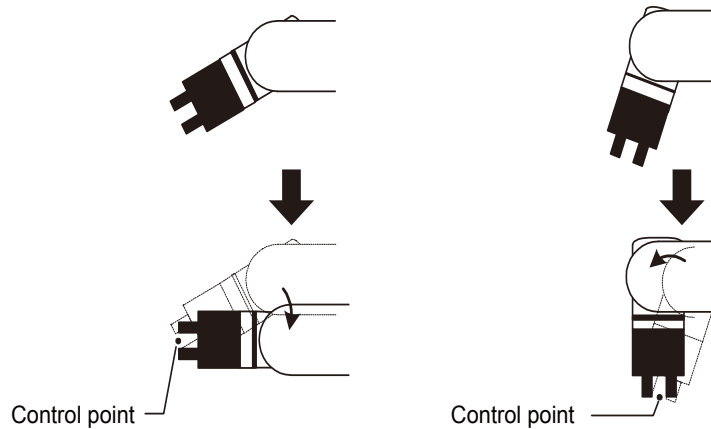


1. Select the [Joint] tab in the Robot Operation panel.
2. Tap/click the joint selection buttons in the Robot Operation panel to select the joint you want to operate (J1 to J6).
3. Hold down the [+] or [-] buttons to move the robot in the respective directions.
 - [-] button: rotates the specified joint in the negative direction.
 - [+] button: rotates the specified joint in the positive direction.

9.5 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.



Operating procedure



1. Tap/click the [Align Hand] button in any operation mode to align the hand.

If the robot is in High-speed operation mode, the speed ratio will reduce to 20%.

9.6 Home Position

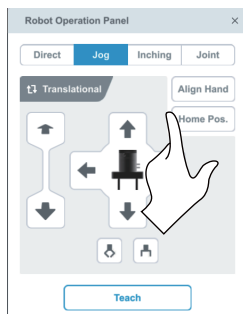
The Home Position function moves the robot to a safe position where it will not interfere with any peripheral devices or equipment.

This function is used to move the robot to a safe position after an error has caused the robot to stop.

Once the robot has moved to a safe position, the cause of the error can then be identified.

It can also be used to move the robot to a safe, preset position before a program starts.

Operating procedure



1. Tap/click the [Home Pos.] button in any of the operation modes to move the robot to the home position.

If the robot is in High-speed operation mode, the speed ratio will reduce to 20%.

Point

The image below shows the default home position.

For information on the parameter to set for home position, refer to "Home position" in "Table 5-1: List Movement parameter" of the following manual:

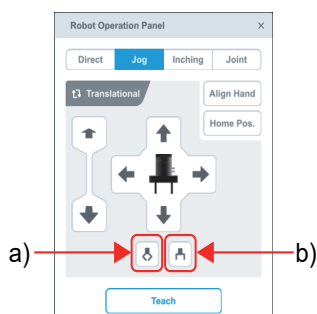
📖 Instruction Manual: Detailed explanations of functions and operations (BFP-A3478)



9.7 Opening/Closing the Hand

The [Open] and [Close] buttons are used to open and close the robot hand.

Operating procedure



1. Tap/click the buttons indicated by "a" and "b" in any operation mode to open/close the hand.

- a: outputs the Close hand signal.
- b: outputs the Open hand signal.

9.8 Teaching

This operation is used to teach positions to the robot.

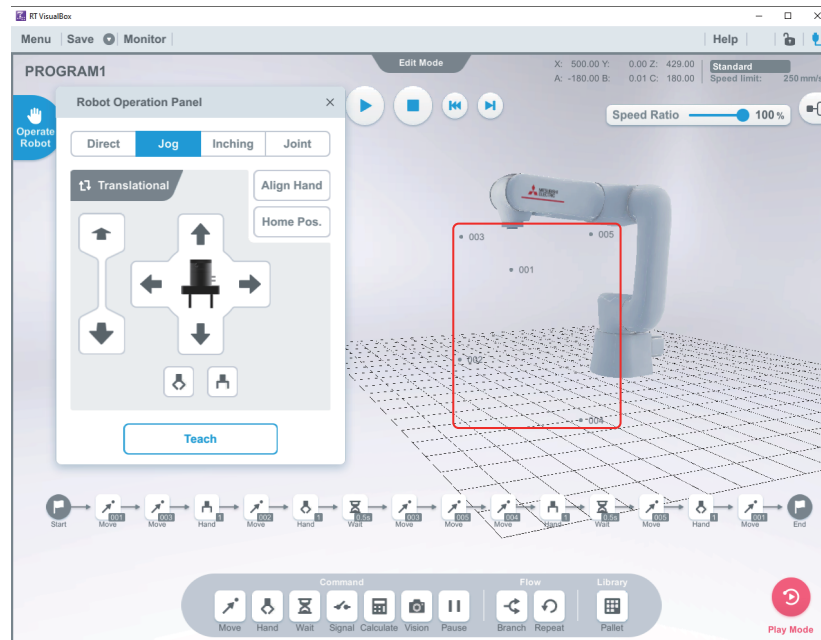
(Positions which are taught to the robot are stored in the program.)

Positions that are taught to the robot are automatically numbered from 001 and stored in consecutive order.

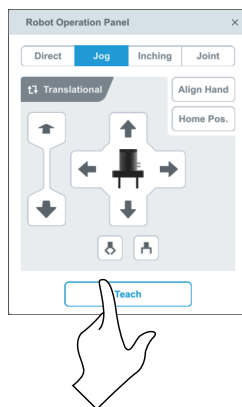
The taught position data is displayed in the 3D display area.

Detailed coordinate data can be checked by going to [Monitor] → [Position List].

Taught positions can be selected in the [Move] block properties.



Operating procedure



1. Tap/click the [Teach] button to teach the current position.

Point

- "Current position" refers to the current position of the tip of the hand.

Refer to the following page for information on how to set a position.

📖 Page 52 Workpiece Grasp Position Settings

- Pressing the [TEACH] button on the top of the robot arm performs the same operation as tapping/clicking the [Teach] button in the Robot Operation panel.

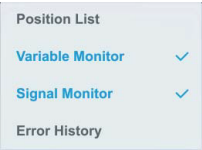
10 MONITOR

This chapter explains the monitor function.
The following items can be displayed with the monitoring function.

Item	Description
Position list	Used to check taught positions
Variable monitor	Used to monitor the values of variables
Signal monitor	Used to monitor the status of input/output signals
Error history	Used to check the error history



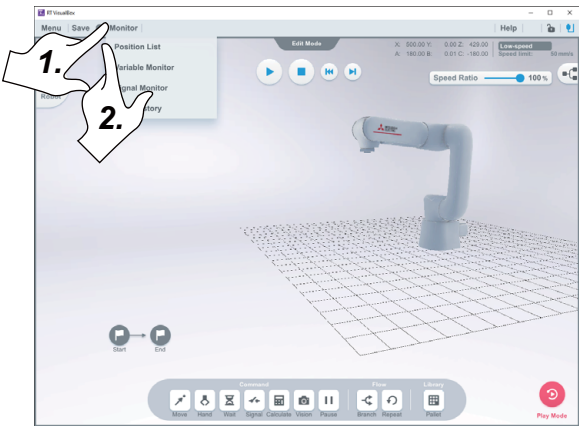
To close a monitor window, tap/click the [×] button in the top right of the window or select it again from the monitor list. A check mark will appear to the right of a monitor on the menu bar when it is open.



10.1 Position List

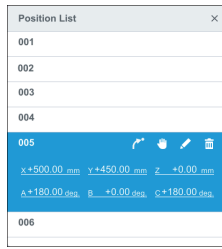
The teaching position list is a list of taught position data.

Operating procedure



1. Tap/click [Monitor] on the menu bar.
2. Tap/click [Position List].
3. The Position List window will appear.
Click on the name of the taught position you want to check.

Position List	×
001	
002	
003	
004	
005	
006	
007	
008	



4. The coordinates of the taught position will be displayed. The icons in the following table can be used to re-teach, delete, and jump positions, or to edit position numbers.

Icon	Description
	If a robot is connected to this software, a confirmation screen will appear when this button is pressed. Tapping/clicking the [OK] button will move the robot to the selected position. If the simulator is connected to this software, the confirmation screen will not appear. If the robot is in High-speed operation mode, the speed ratio will reduce to 20%.
	This icon displays the Robot Operation panel. When [Teach] is tapped/clicked in the Robot Operation panel, the position is overwritten with the robot's current position.
	This icon displays a window that is used to change the position number. Entering a new number and tapping/clicking the [Change] button changes the position number.
	This icon displays a window that is used to delete the selected position. Tapping/clicking the [OK] button deletes the position.

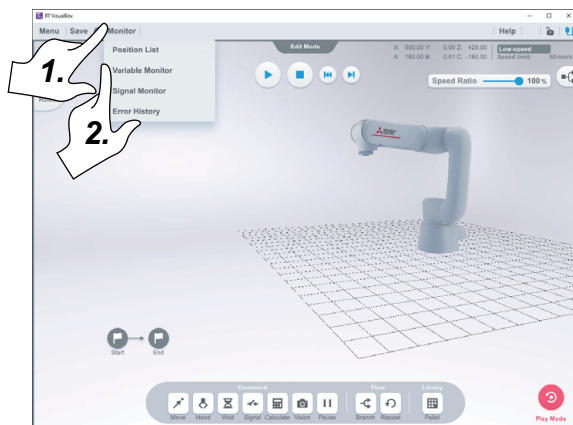
⚠ CAUTION

Tapping/clicking the [Jump position] button will cause the robot to move. Be sure to place an emergency stop switch nearby so that the robot can be stopped immediately.

10.2 Variable Monitor

The variable monitor displays the values of variables. Variables can be checked while viewing the robot with the program running.

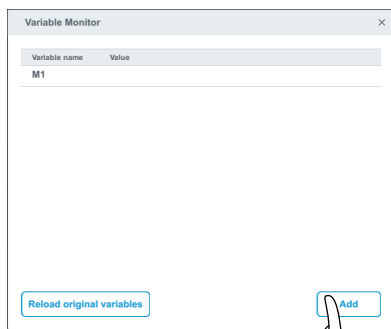
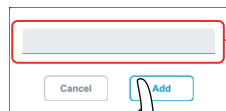
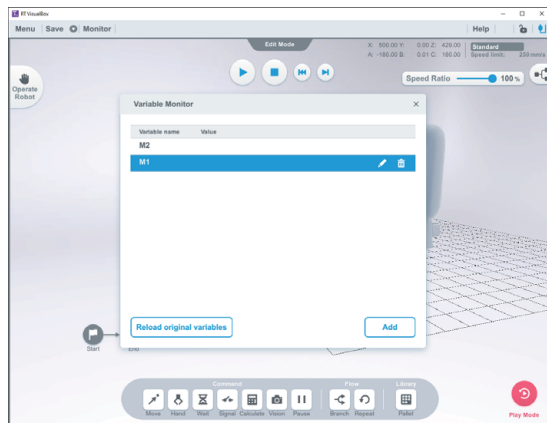
Operating procedure



1. Tap/click [Monitor] on the menu bar.
2. Tapping/clicking [Variable Monitor] displays the Variable monitor window.

When this is displayed for the first time, variables used by the current program are listed.

From the second time onward, the variables listed previously will be displayed.



3. Tap/click the [Add] button.

4. Enter the name of the variable you want to monitor in the variable name input field.

5. Tap/click the [Add] button.

It is possible to add robot (system) state variables.

6. Added variable names and their current values are displayed in a list.

Selecting a variable name will display the icons in the table below. Variables can be deleted and their values edited by tapping/clicking on the icons in the table below.

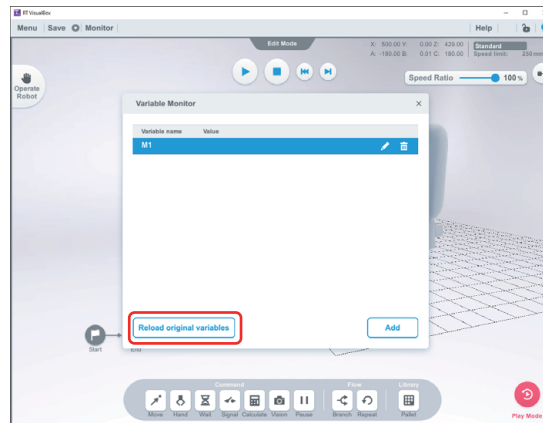
Icon	Description
	This icon displays a window that is used to edit variables. Tapping/clicking the [Change] button after editing the value overwrites the value of the variable.
	This icon displays the dialog box asking whether it is okay to delete the variable from the monitor. Tapping/clicking the [OK] button deletes the variable from the list.

Precautions

Variable values to be monitored or changed are not displayed if a program has not been saved or executed.

The values of each variable in the list can be cleared and reread.

Tapping/clicking the [Reload original variables] button updates the variable list with only the variables that are used in the current program.

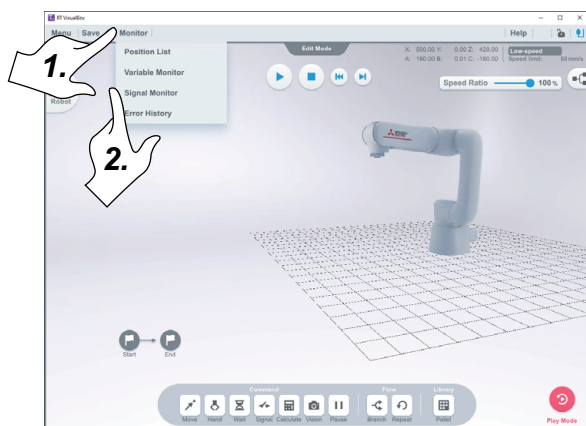


10.3 Signal Monitor

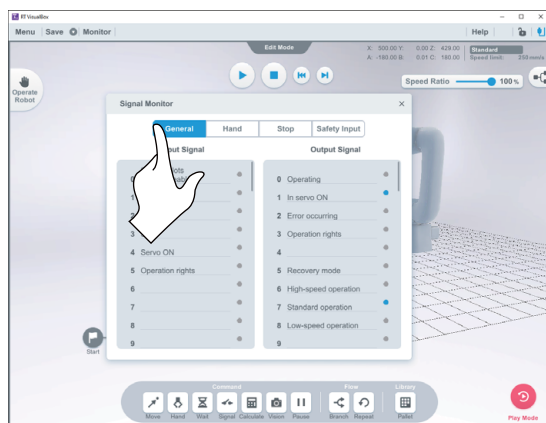
The Signal monitor displays the state of input/output signals. Signal states can be checked while viewing the robot with the program running.

General-purpose signals, hand signals, stop signals, and safety input signals can be monitored with the signal monitor.

Operating procedure

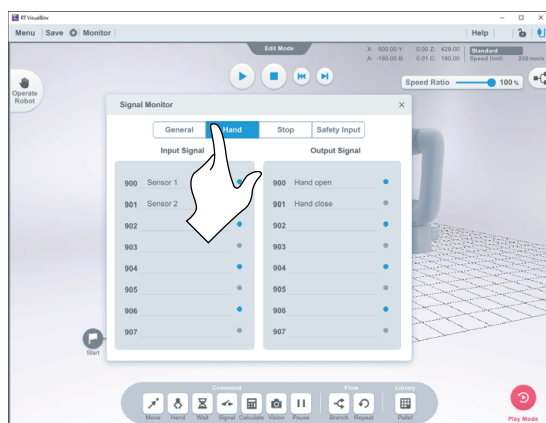


1. Tap/click [Monitor] on the menu bar.
2. Tapping/clicking [Signal Monitor] displays the Signal Monitor window.



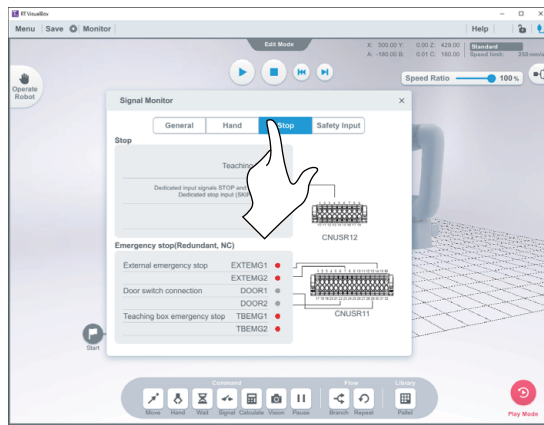
3. General-purpose signals
Tapping/clicking the [General] tab displays the names and numbers of general-purpose input/output signals and whether the signals are On/Off.

● : ON
● : OFF



4. Hand
Tapping/clicking the [Hand] tab displays the names and numbers of hand input/output signals and whether the signals are On/Off.

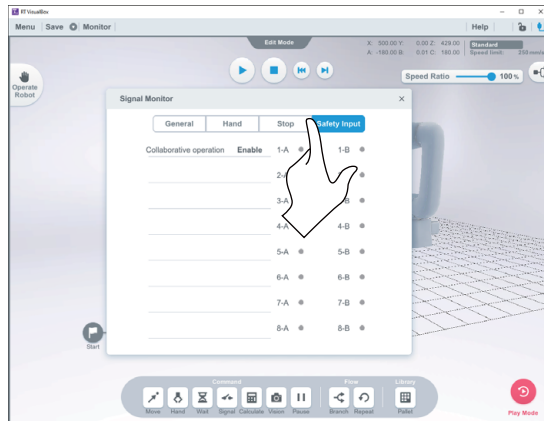
● : ON
● : OFF



5. Stop signals

Tapping/clicking the [Stop signal] tab displays the names and numbers of stop input/output signals and whether the signals are On/Off.

- : ON
- : OFF
- : Emergency stop output



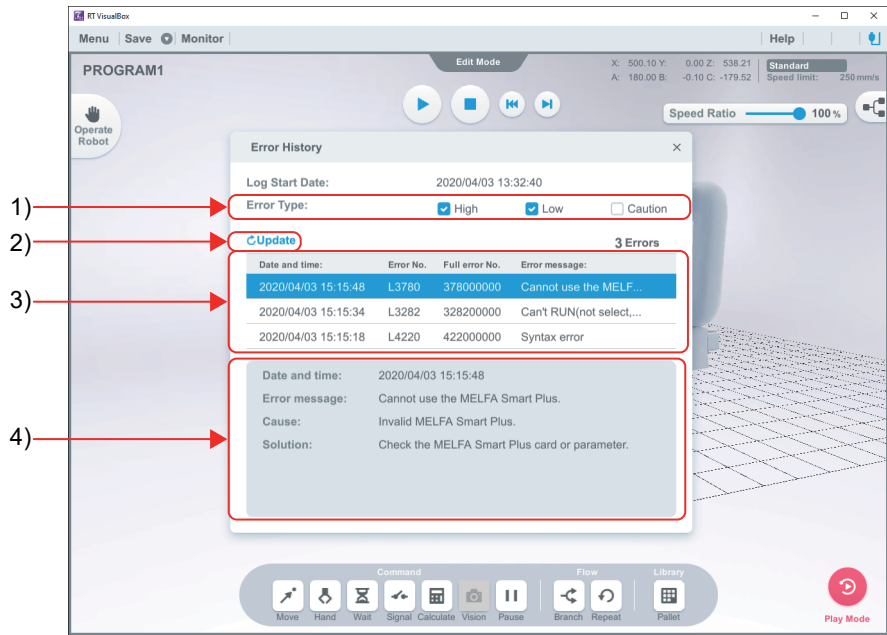
6. Safety Input

Tapping/clicking the [Safety Input] tab displays whether the safety input signals are On/Off.

- : ON
- : OFF

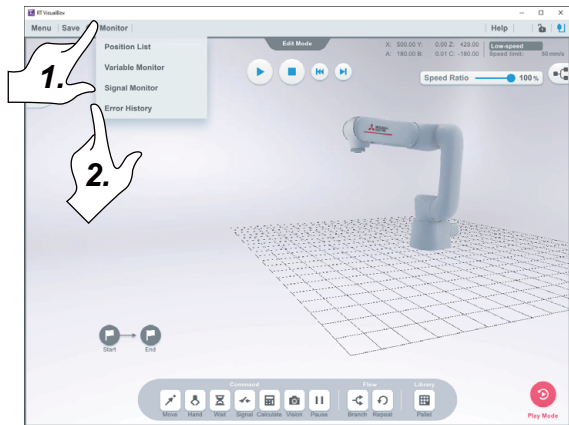
10.4 Error History

The error history displays errors that have previously occurred.



No.	Items in window	Description
1)	Error Type	It is possible to choose which error levels are displayed. Choose from High, Low, and Caution.
2)	Update	Tapping/clicking [Update] displays errors corresponding to the error levels selected will be found and the list will be updated.
3)	List	Errors that have occurred previously are displayed in the list.
4)	Error details	Selecting an error displays the details of that error.

Operating procedure



1. Tap/click [Monitor] on the menu bar.
2. Tapping/clicking [Error History] displays the Error history window.

11 CUSTOM SETTINGS

This chapter explains the custom settings.
The following properties can be set in Custom settings.

Properties	Description
Language settings	Used to set the display language of this software
Workpiece grasp position	Used to set the workpiece grasp position
Signal settings	Used to set the names of input/output signals
Date & time	Used to set the current date and time of the robot controller

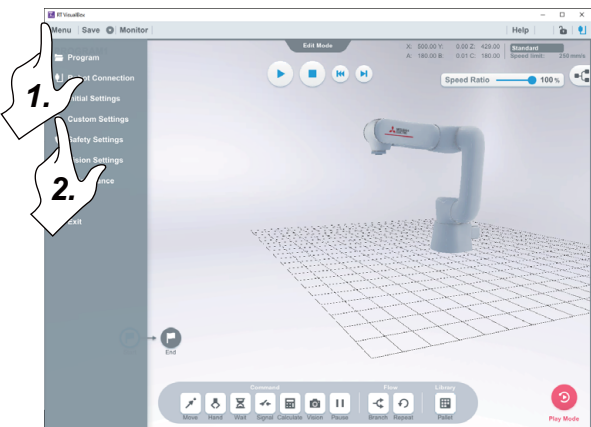
11

11.1 Language Settings

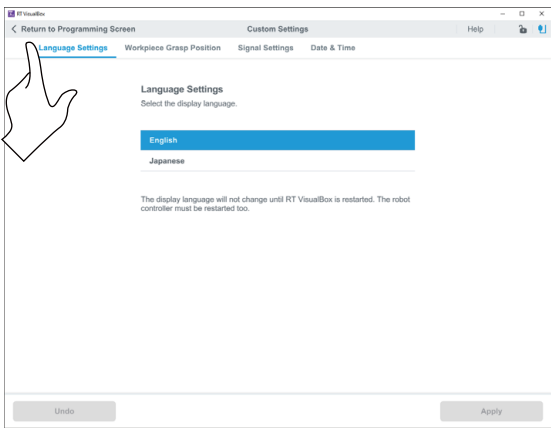
The display language of RT VisualBox can be changed.
The following languages are available:

- English
- Japanese

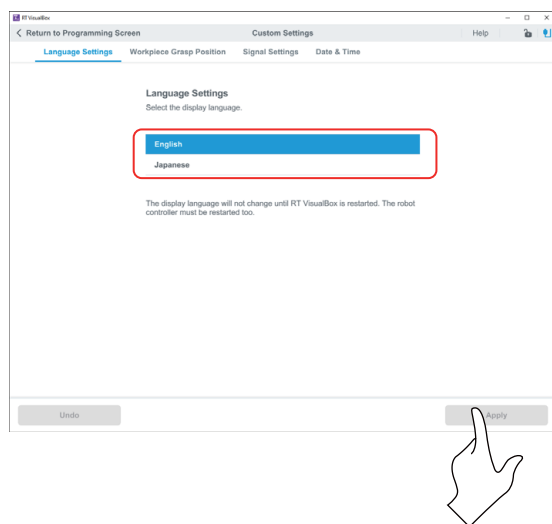
Operating procedure



1. Tap/click the [Menu] tab on the menu bar.
2. Tap/click [Custom settings].



3. To change the display language, tap/click the [Language Settings] tab.



4. Select the desired language and tap/click the [Apply] button.



The display language will change next time RT VisualBox is started.

11.2 Workpiece Grasp Position Settings

These settings are used to change the workpiece grasp position.

Set the distance and angle from the tip of the robot arm to the position where the hand grasps the workpiece.

These settings allow you to set the tool coordinate system for the tool (hand) that is installed on the robot.

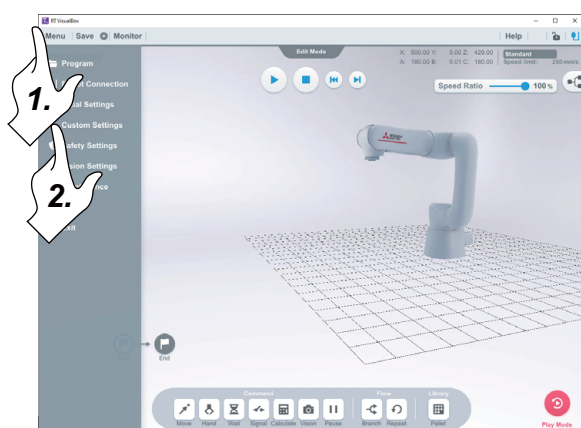
For information on the tool coordinate system, refer to the following page:

☞ Page 52 Workpiece Grasp Position Settings

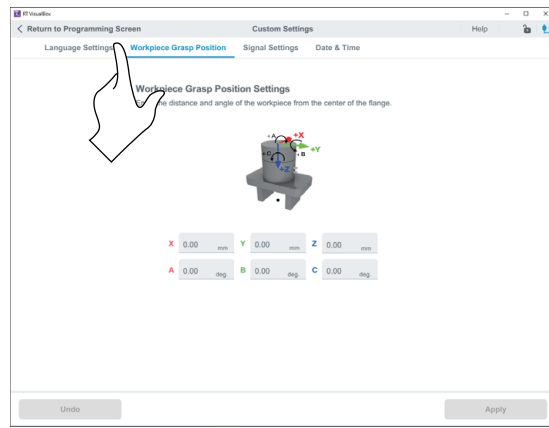
⚠ CAUTION

Ensure that the correct values are set.

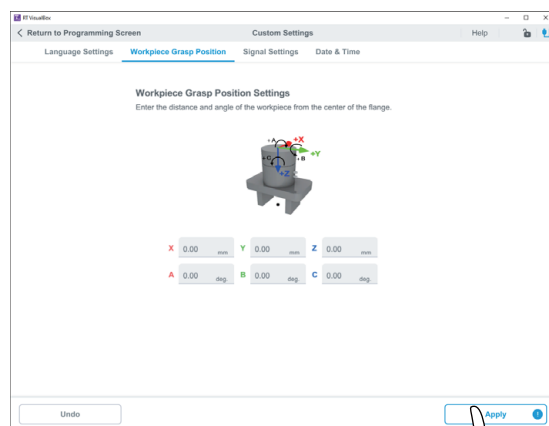
Operating procedure



1. Tap/click the [Menu] tab on the menu bar.
2. Tap/click [Custom Settings].



4. → X 0.00 mm Y 0.00 mm Z 0.00 mm
5. → A 0.00 deg B 0.00 deg C 0.00 deg



3. Tapping/clicking [Workpiece Grasp Position] displays the window used for changing the workpiece grasp position.

4. Enter the X, Y, and Z components of the grasp position.
(Unit: mm)

X, Y, and Z components are set in the mechanical interface coordinate system.

5. Enter the A, B, and C components of the grasp position.
(Unit: deg)

A, B, and C components are set in the mechanical interface coordinate system.

6. Tap/click the [Apply] button.



For information on the mechanical interface coordinate system, refer to the following page:

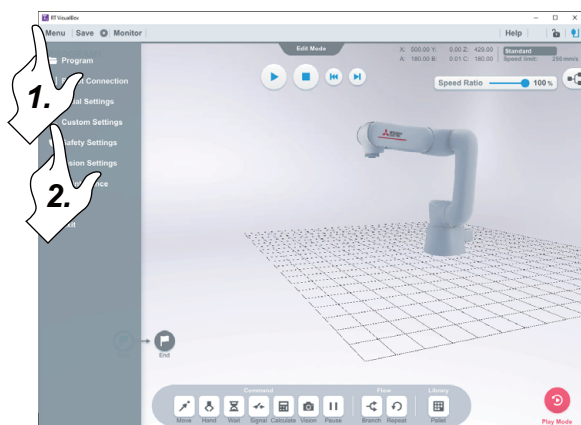
👉 Page 49 Hand Settings

11.3 Signal Settings

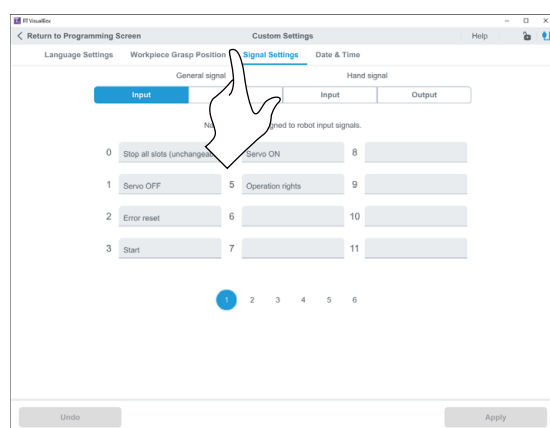
The names of the input/output signals can be set. Setting a name for each input/output signal allows for signals to be easily identified.

Setting General-purpose signal names

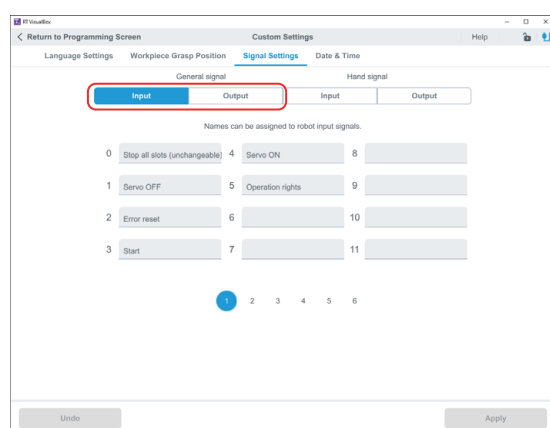
Operating procedure



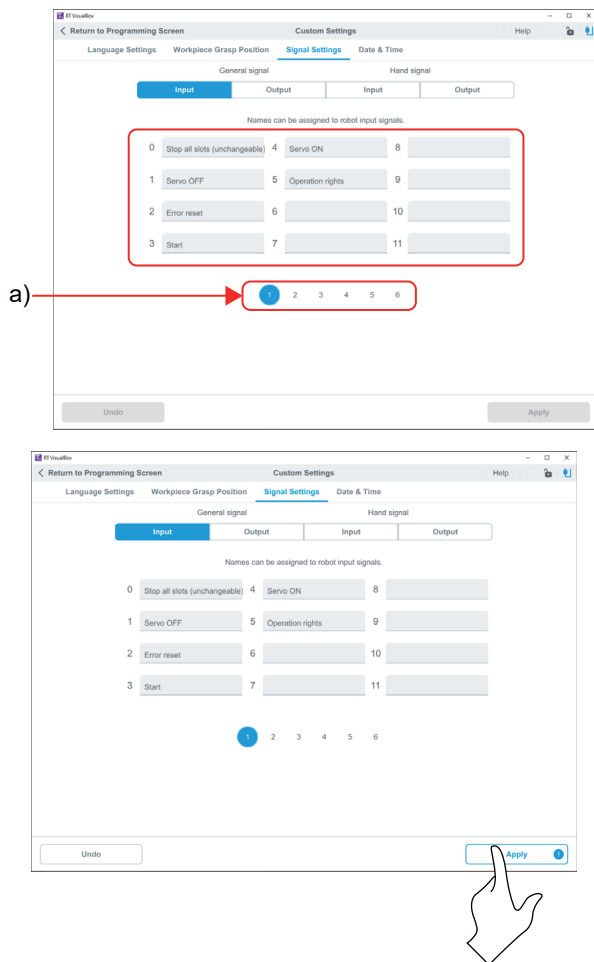
1. Tap/click the [Menu] tab on the menu bar.
2. Tap/click [Custom Settings].



3. Tapping/clicking [Signal Settings] displays the screen for setting the input/output signal names.



4. Tapping/clicking the [Input] or [Output] tab under "General-purpose signal" displays the screen used for setting the name of general-purpose signals.

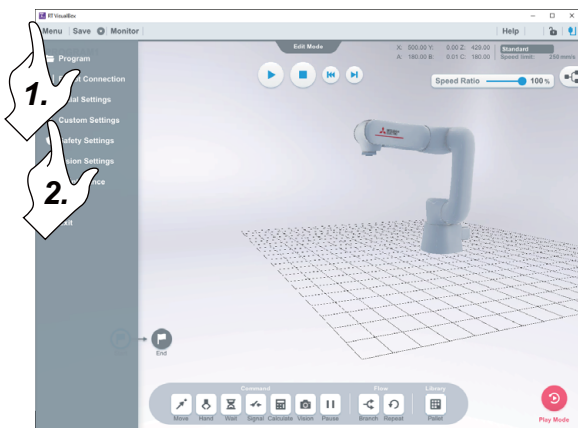


5. Enter the signal name in the Signal name field.
Tap/click the page buttons indicated by "a" in the figure to switch pages.

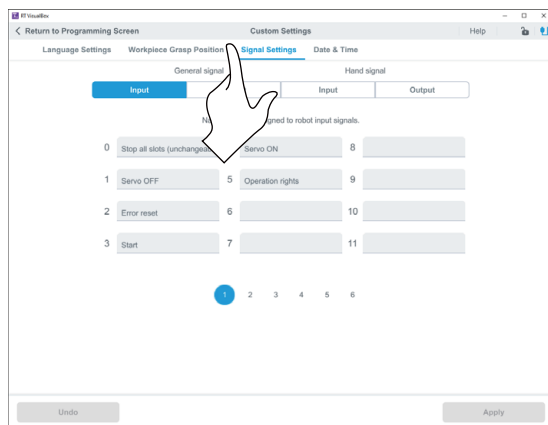
6. After entering the signal name, tap/click the [Apply] button. The entered name will be set.

Setting Hand signal names

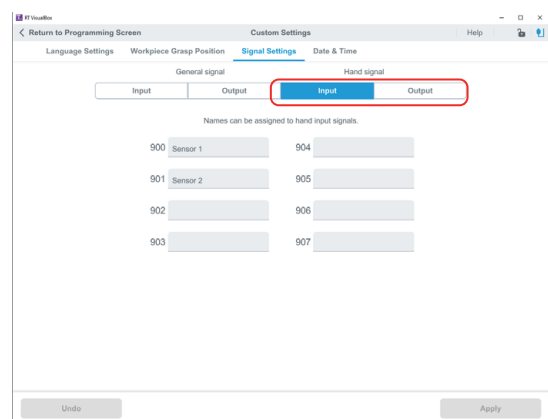
Operating procedure



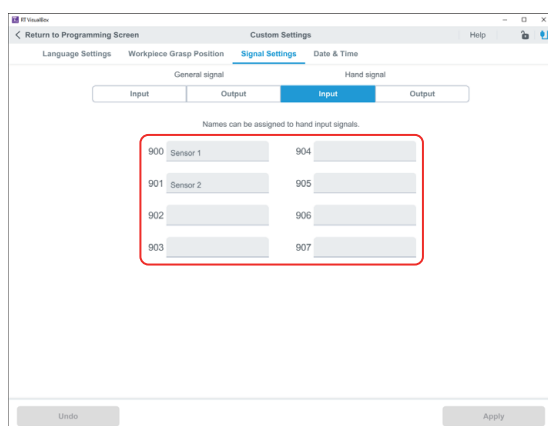
1. Tap/click the [Menu] tab on the menu bar.
2. Tap/click [Custom Settings].



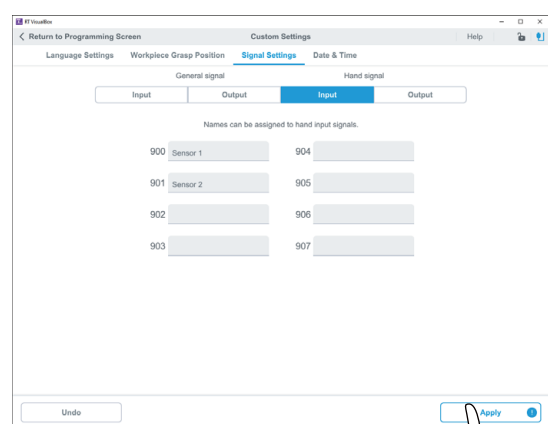
3. Tapping/clicking [Signal Settings] displays the screen for setting the input/output signal names.



4. Tapping/clicking the [Input] or [Output] tab under "Hand signal" displays the screen for setting the name of hand signals.



5. Enter the signal name in the Signal name field.



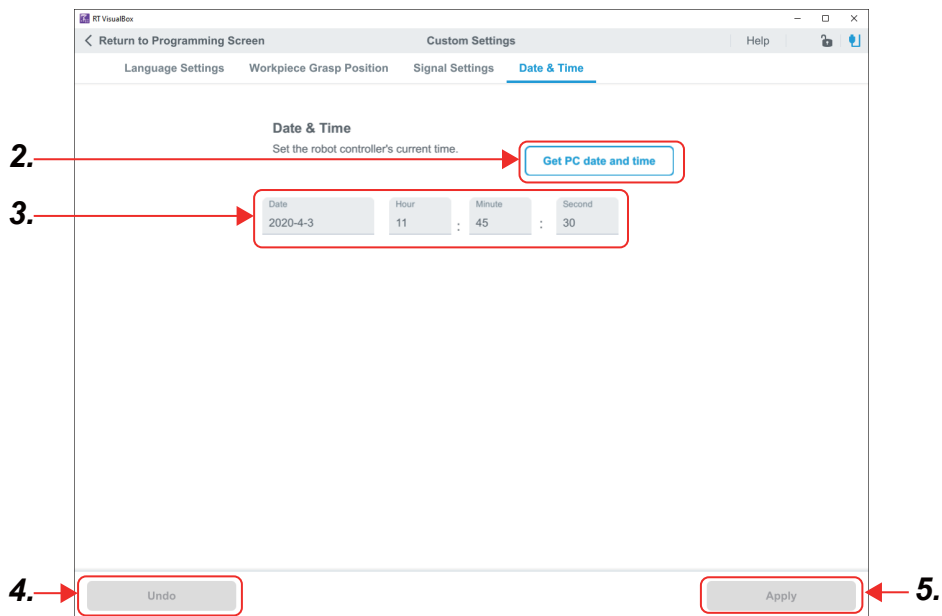
6. After entering the signal name, tap/click the [Apply] button. The entered name will be set.

11.4 Date & Time Settings

The current time for the robot controller can be set.

Operating procedure

1. Tap/click [Menu] → [Custom Settings] → [Date & Time] on the menu bar to display the screen for setting the time.



2. Get PC date and time

Tapping/clicking [Get PC date and time] displays the acquired values in the Date, Hour, Minute, and Second fields.

3. Date and time input field

The Date, Hour, Minute and Second fields can be set manually.

4. Undo

To discard the time settings, tap/click the [Undo] button.

5. Apply

Tap/click the [Apply] button to set the time that has been entered.

Precautions

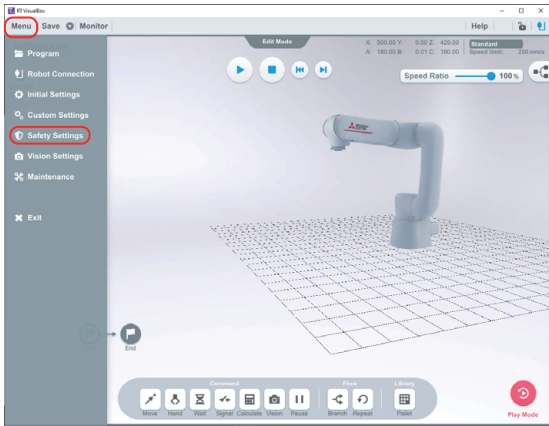
This setting cannot be configured while in simulator mode.

12 SAFETY SETTINGS

This chapter explains how to configure safety settings.

12.1 Safety Settings Screen

Tapping/clicking [Menu] → [Safety Settings] on the menu bar displays the Safety Settings screen.



⚠ CAUTION

These settings greatly affect the safety of the robot. Read the following precautions and document thoroughly before configuring safety settings. Take precautions as necessary.

📄 Page 1 BASIC PRECAUTIONS AND IMPORTANT POINTS WHEN USING COLLABORATIVE ROBOTS

📖 Collaborative Robot Safety Manual (BFP-A3733)

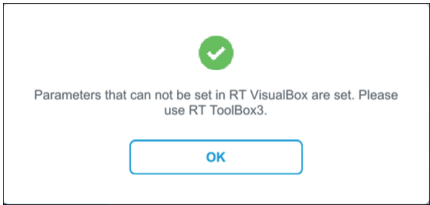
The following settings can be configured on the Safety Settings screen.

Item	Description
Speed limiting	These setting are used to set the maximum speed and low-speed space for each operation type.
Safety I/O	These setting are used to assign safety inputs and safety outputs.
Position limiting	These settings are used to set the areas where the robot cannot enter.
Monitoring model	These settings are used to set the areas to be monitored.
Change password	This setting is used to change the password for the safety settings.

If the robot is connected to this software, a password must be entered to change these settings.

Precautions

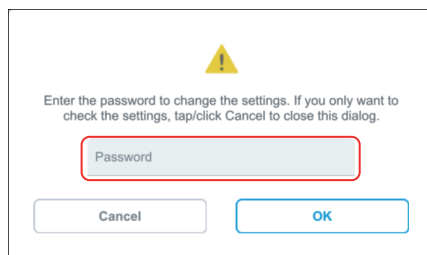
The settings of some windows/screens cannot be configured using RT VisualBox if safety parameters have been set with RT ToolBox3. If the error message below appears, configure the settings in RT ToolBox3.



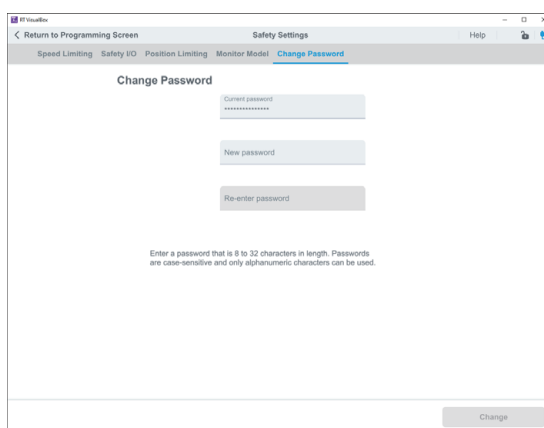
12.2 Entering/Changing Passwords

The Password Input window will appear when a robot is connected to this software or if an incorrect password has been entered. Enter the correct password.

The default password is "MELFASafetyPSWD".

A dialog box with a yellow warning triangle icon at the top. The text inside says: "Enter the password to change the settings. If you only want to check the settings, tap/click Cancel to close this dialog." Below the text is a text input field labeled "Password". At the bottom are two buttons: "Cancel" and "OK".

The safety settings cannot be changed without changing the default password. When the default password is entered, the Change Password screen will appear. Change the password.

A screenshot of the "Change Password" screen within the "Safety Settings" application. The screen has a title bar with "Return to Programming Screen", "Safety Settings", and "Help". Below the title bar are tabs: "Speed Limiting", "Safety I/O", "Position Limiting", "Monitor Model", and "Change Password" (which is selected). The main content area is titled "Change Password" and contains three input fields: "Current password" (with a masked password), "New password", and "Re-enter password". At the bottom right is a "Change" button. A note at the bottom states: "Enter a password that is 8 to 32 characters in length. Passwords are case-sensitive and only alphanumeric characters can be used."

12

Precautions

- Even if a password has not been entered, it is still possible to view the Safety Settings screen. However, the setting values cannot be changed.
- The password must be 8 to 32 characters in length. Passwords are case-sensitive and only single-byte alphanumeric characters (0 to 9 and A to Z) can be used.
- Safety settings cannot be set without entering the correct password so ensure the password is something that is not easily forgotten.

To reset the password, the robot controller must be returned to factory settings. Resetting the parameter "MECHRST" will clear the controller memory and return it to factory settings. For further information on resetting the controller memory, refer to the following manual:

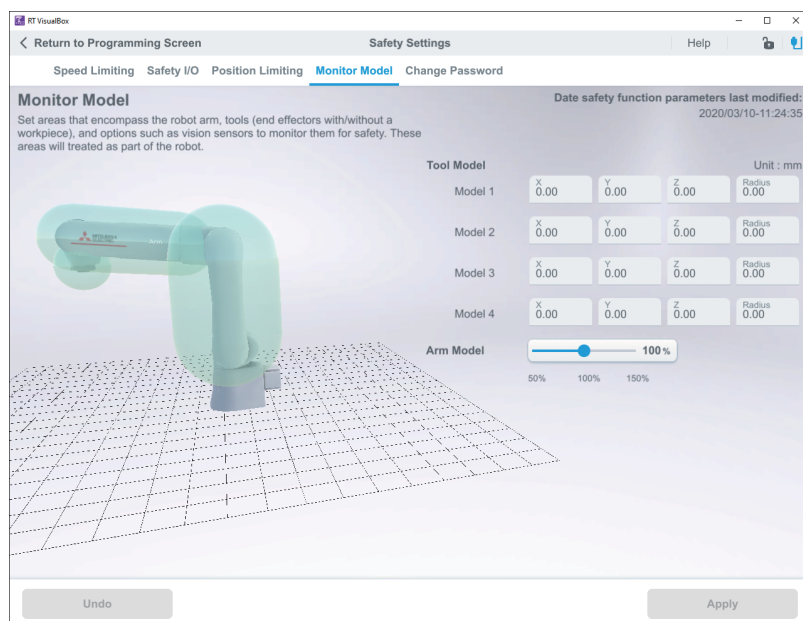
 Instruction Manual: Detailed explanations of functions and operations (BFP-A3478)

- To prevent inadvertent changes to the safety settings, keep your password secret and do not share it with third parties.

12.3 Monitoring Model Settings

Areas set in this screen are monitored as a part of the robot and also used in the speed limiting settings and the position limiting settings.

If tools such as a hand or a vision sensor are installed, configure the settings for "Tool Model" so that the set area can be recognized as a part of the robot. If accessories such as cables or solenoid valves are installed, set "Arm Model" so that the set area can be recognized as a part of the robot.



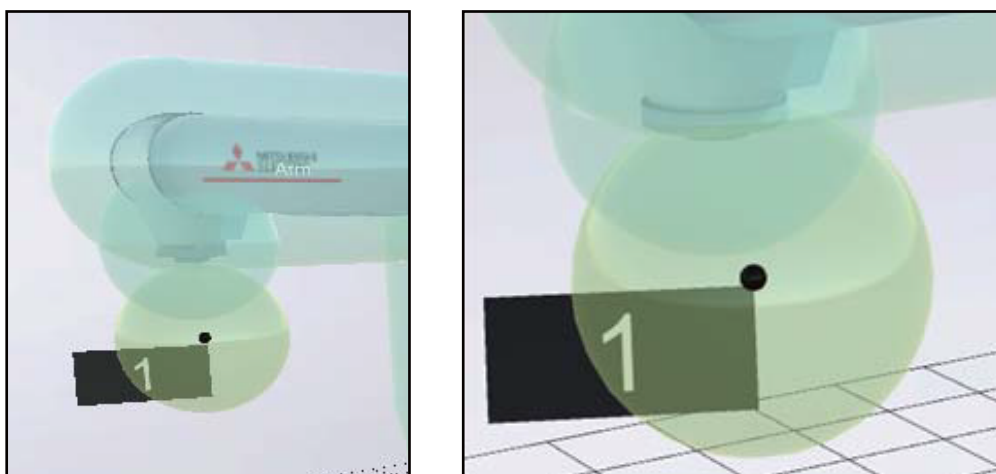
12.4 Tool Model

Define the shape of the tool (hand, vision sensor, etc.) with up to four spheres. Create a shape that is roughly the size of the tool that is attached to the robot. If the radius is greater than 0, the tool model will be subject to position monitoring.

The center of the tool model sphere will also be subject to speed monitoring. All tool models are subject to speed monitoring by default. Use RT ToolBox3 to disable the speed monitoring of specific tool models.

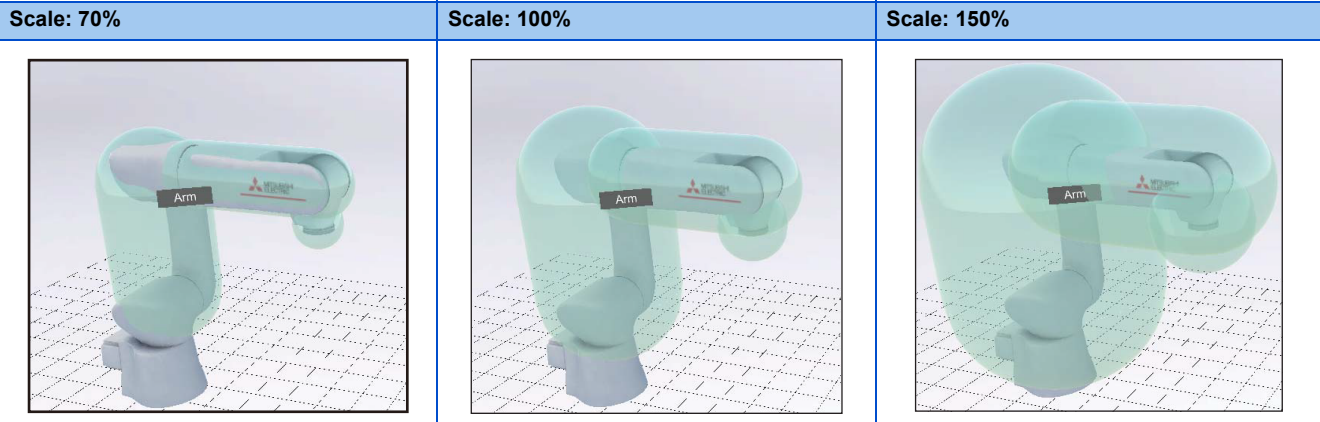
The coordinates are set in the mechanical interface coordinate system. By default (all coordinates set to "0"), the center of the mechanical interface is subject to speed monitoring. For information on the mechanical interface coordinate system, refer to the following manual:

📖 Instruction Manual: Detailed explanations of functions and operations (BFP-A3478)



12.5 Arm Model

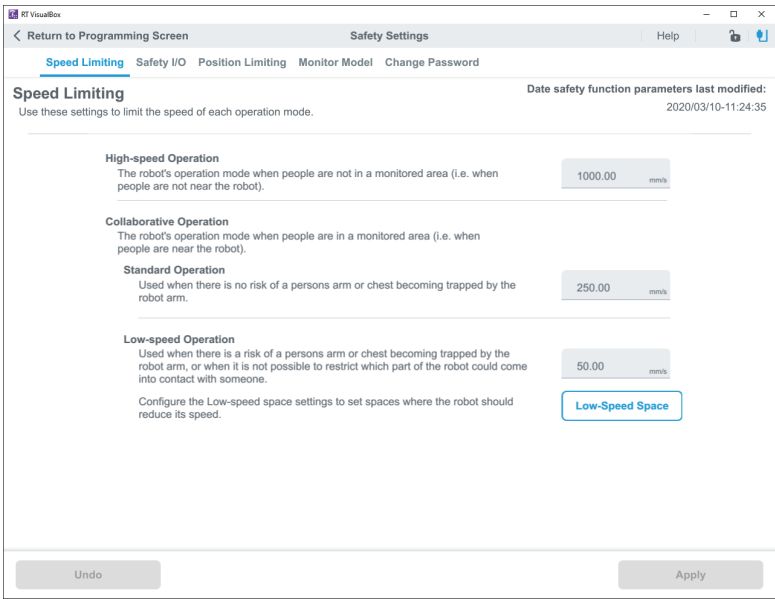
After modeling the shape of the robot arm with spheres and cylinders, the speed and area of the robot can be determined. When attaching accessories, such as cables and solenoid valves, to the robot arm, resize the model accordingly. It is possible to adjust the radius of the spheres and cylinders. The length of the cylinders cannot be changed.



12.6 Speed Limiting Settings

The maximum speed and low-speed area can be set for each operation mode. This setting is used for the speed-limiting safety function (SLS). This function monitors the speed of the robot arm and tools so that the speed does not exceed the specified value. For further information on this function, refer to the following manual: [CR800 series controller Robot Safety Option Instruction Manual \(BFP-A3531\)](#)

The maximum speed for each operation mode can be set.



The settings of the following operation modes can be configured.

- High-speed operation mode
- Collaborative operation mode (Standard operation)
- Collaborative operation mode (Low-speed operation)

After changing the setting values, tap/click the [Apply] button.

A lower speed than the default setting value^{*1} can be set. A higher speed than the default setting value cannot be set.

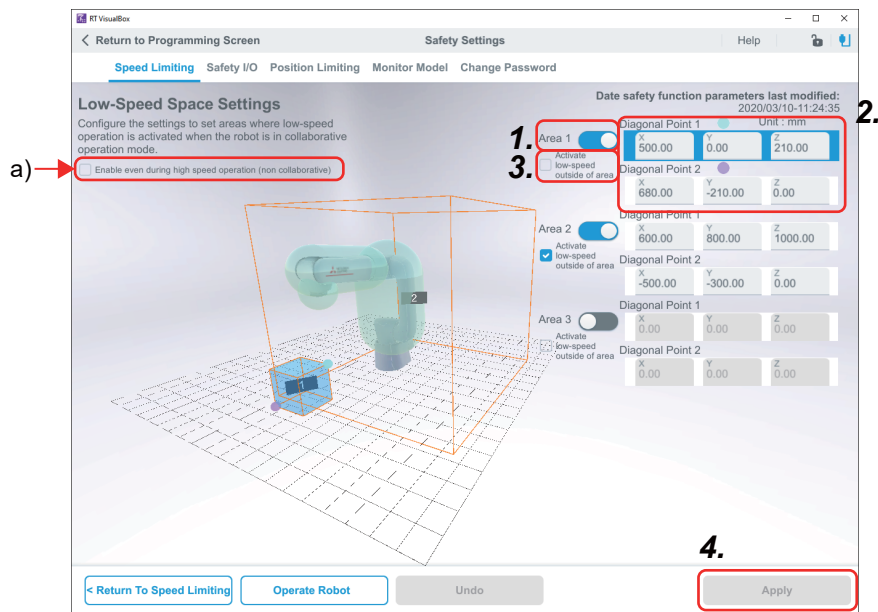
To set low-speed areas, tap/click the [Low-Speed Space] button.

^{*1} Default setting values for the speed limiting settings
High-speed operation: 1000 [mm/s]
Standard operation: 250 [mm/s]
Low-speed operation: 50 [mm/s]

12.7 Low-Speed Space Settings

Up to three low-speed areas can be set.

Operating procedure



1. Turn on the area switch.
2. Enter two diagonal points. An area will appear on-screen once valid values have been set.
Diagonal points can also be set while moving the robot. To set points while moving the robot, tap/click the [Operate Robot] button, and move the robot to the desired destination. Then tap/click the [Teach] button. The current position is stored in the X, Y, and Z coordinates of the currently selected diagonal point.
3. Set which side of the created area is to be set as the low-speed area with the [Activate low-speed outside of area] check box.
4. Tap/click the [Apply] button.

[Activate low-speed outside of area]: OFF	[Activate low-speed outside of area]: ON
If the robot enters this area, it will operate at low speed.	If the robot exits the shaded area, it will operate at low speed.

⚠ CAUTION

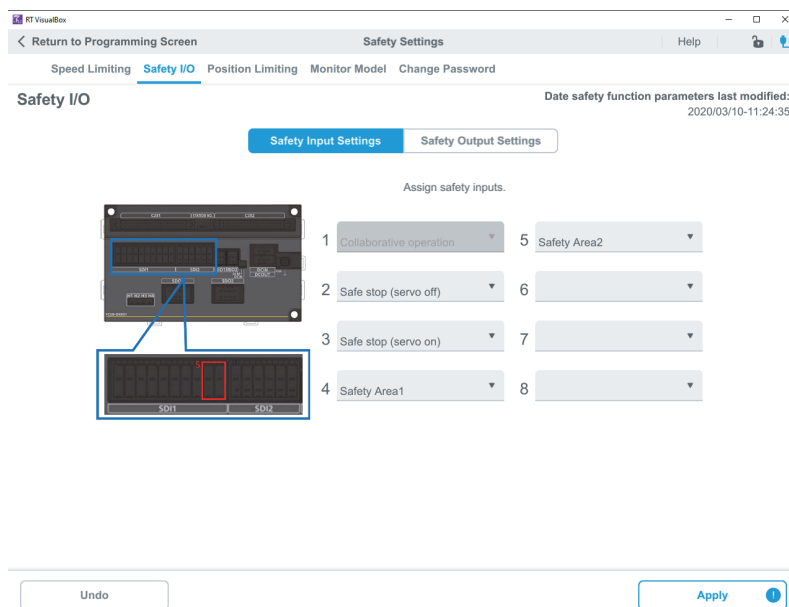
If [Enable even during high speed operation (non collaborative)] indicated by "a" and the area switch of a low-speed area are set to On, the robot operating at high speed will slow down upon entry into the low-speed area. In this situation, the robot is not in Collaborative operation mode. To work with the robot in the same space, follow risk assessments, use Safety input 1 and operate the robot in Collaborative operation mode.

12.8 Safety Input/Output Settings

Safety inputs/outputs can be assigned.

Safety Input Settings

Assign safety inputs to the eight redundant signals of the SDI1 and SDI2 ports on the safety extension unit.



Assign the inputs show in the table below. Safety input 1 cannot be changed from "Collaborative operation". "Collaborative operation" can only be assigned to Safety input 1.

Input	Description
Collaborative operation	When the input is enabled (Open), the robot is set to Collaborative operation mode ^{*1} . When the input is disabled (Closed), the robot is set to High-speed operation mode.
Safe stop (servo off)	When the input is enabled (Open), Safe stop 1 (SS1) ^{*2} is activated.
Safe stop (servo on)	When the input is enabled (Open), Safe stop 2 (SS2) ^{*3} is activated.
Safety areas 1 and 2	When input is enabled (Open), the area which the robot is not permitted to enter is enabled. Safety areas are set in "Position restriction setting".

^{*1} Collaborative operation mode switches depending on whether the monitored area of the robot is in the low-speed area.

Collaborative operation modes	Conditions that enable this mode
Standard operation	When Safety input 1 is enabled (Open)
Low speed	When Safety input 1 is enabled (Open) and the monitored area of the robot enters the low-speed area

^{*2} Safe stop 1: stops the robot safely and shuts off power to the motors even after the robot has stopped.

^{*3} Safe stop 2: stops the robot safely, maintains control over the motors even after they have stopped, and ensures that the robot does not move.

For further information, refer to the following manual:

📖 CR800 series controller Robot Safety Option Instruction Manual (BFP-A3531)

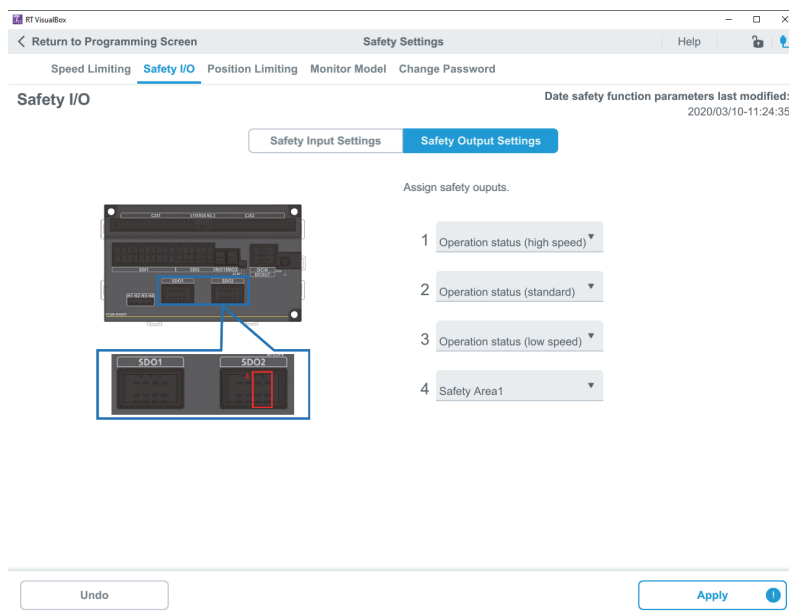


- Advanced settings can be configured with RT ToolBox3. For further information, refer to the following manual:

📖 RT ToolBox3 / RT ToolBox3 mini User's Manual (BFP-A3495)

Safety output settings

Assign safety outputs to the four redundant signals of the SDO1 and SDO2 ports on the safety extension unit.



Assign the outputs show in the table below.

Output	Description
Operation status (high speed, standard, low speed)	This signal turns on when the operation status has been switched and monitoring enabled.
Safe stop (servo off)	This signal turns on after the robot stops and the servo turns off (STO [Safe Torque Off]). ^{*1}
Safe stop (servo on)	This signal turns on after the robot stops (SOS [Safe Operating Stop]). ^{*2}
Safety areas 1 and 2	These signals turn on when safety areas are enabled.

*1 Safe Torque Off: shuts off power to the motors in the robot.

*2 Safe Operating Stop: checks that the robot has stopped without shutting off power to the motors in the robot.

For further information, refer to the following manual:

📖 CR800 series controller Robot Safety Option Instruction Manual (BFP-A3531)

Point

- Advanced settings can be configured with RT ToolBox3. For further information, refer to the following manual:

📖 RT ToolBox3 / RT ToolBox3 mini User's Manual (BFP-A3495)

- Servo OFF:

When the robot servos are off, the safety outputs that set the robot's operation mode turn off.

⚠ CAUTION

There is a delay of up to 21.3 ms from when the redundant output signals turn off until the safety outputs turn off. This may temporarily cause multiple operation mode commands to be output at the same time (e.g. High speed and Standard operation mode commands output at the same time). Conduct a risk assessment to ensure safety.

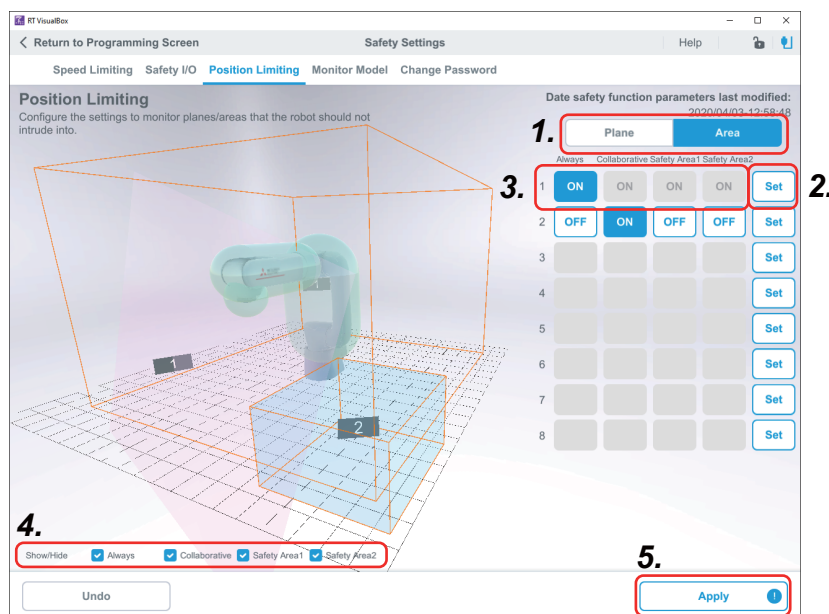
12.9 Position Limiting Settings

Areas and conditions can be set to prevent robot interfering with the workpiece platform or other equipment. The robot will stop when it nears designated safe areas.

This setting is used for the Safely-limited position function (SLP). This function monitors whether the hand or robot arm has entered a safe area. For further information, refer to the following manual:

📖 CR800 series controller Robot Safety Option Instruction Manual (BFP-A3531)

Operating procedure



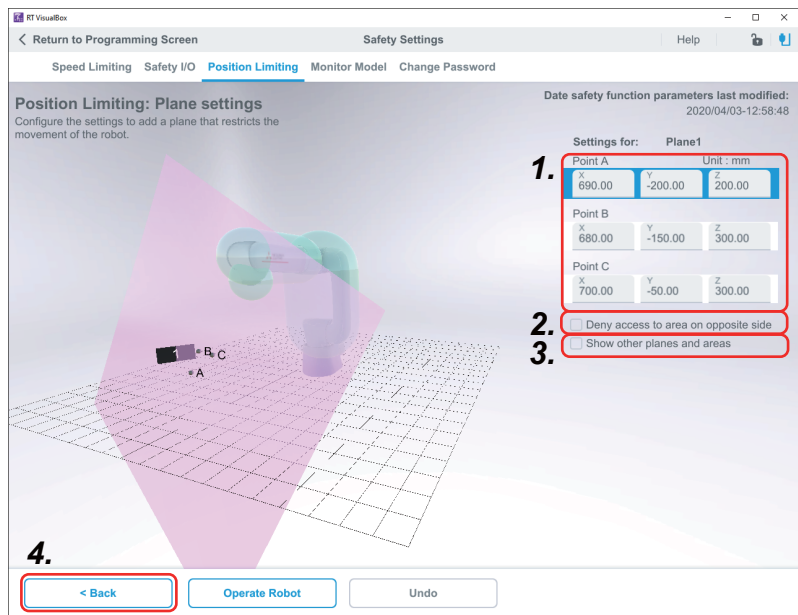
1. Select the plane or area to set by selecting the [Plane] or [Area] tab.
2. Tap/click the [Set] button, and set a plane or area in the Plane Setting or Area Setting screen.
3. Use the ON/OFF buttons to enable/disable the conditions for each plane or area. ON/OFF buttons are only available if a plane or area has been created. Create a plane or area first.
4. Configure the settings then check them. Using the [Show/Hide] check boxes, show or hide a plane or area and check whether the conditions for enabling the plane or area are correct.
5. Tap/click the [Apply] button.

Conditions	Description
Always	The plane or area is always enabled while the robot is moving.
Collaborative	The plane or area is enabled when the robot is in Collaborative operation mode (Standard or Low-speed operation mode). The plane or area is disabled when the robot is in High-speed operation mode.
Safety areas 1 and 2	The pane or area is enabled when "Safety Area1" and "Safety Area2" are assigned in the safety input settings.

12.10 Plane Settings

Set a plane to be used in the position restriction settings.

Operating procedure



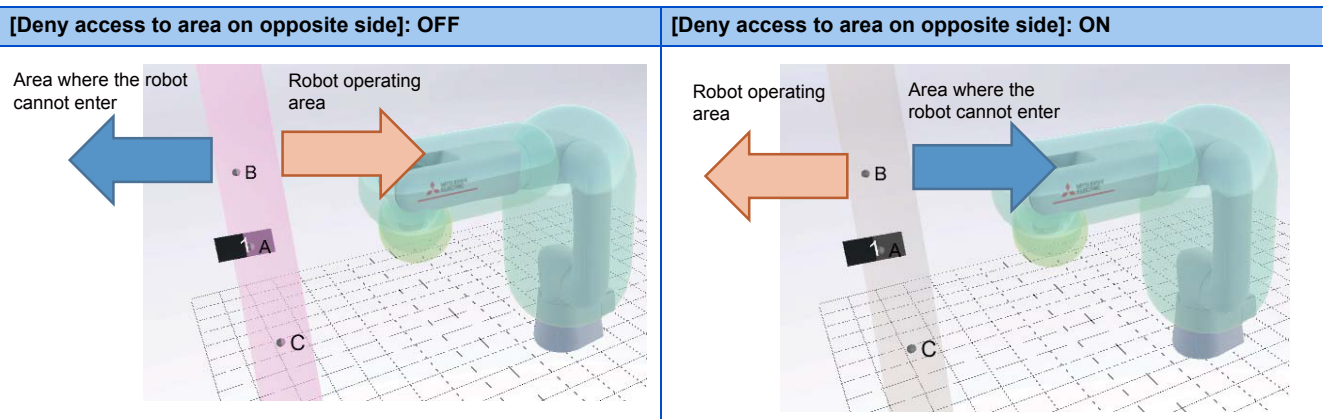
1. Enter points A to C. After the three points have been entered, a plane passing through the points will appear on the screen.

The points can also be set while moving the robot. To set points while moving the robot, tap/click the [Operate Robot] button, and move the robot to the desired destination. Then, tap/click the [Teach] button. The current position is stored in X, Y, and Z of the currently selected point.

2. The robot cannot access the area on the pink side of the plane. By default, the area on the outside of the plane is inaccessible. To change the setting, select the [Deny access to area on opposite side] check box.

3. To keep previously set plains and areas visible while creating a new plane, select the [Show other planes and areas] check box.

4. After setting the plane, tap/click the [< Back] button to return to the Position Limiting screen.

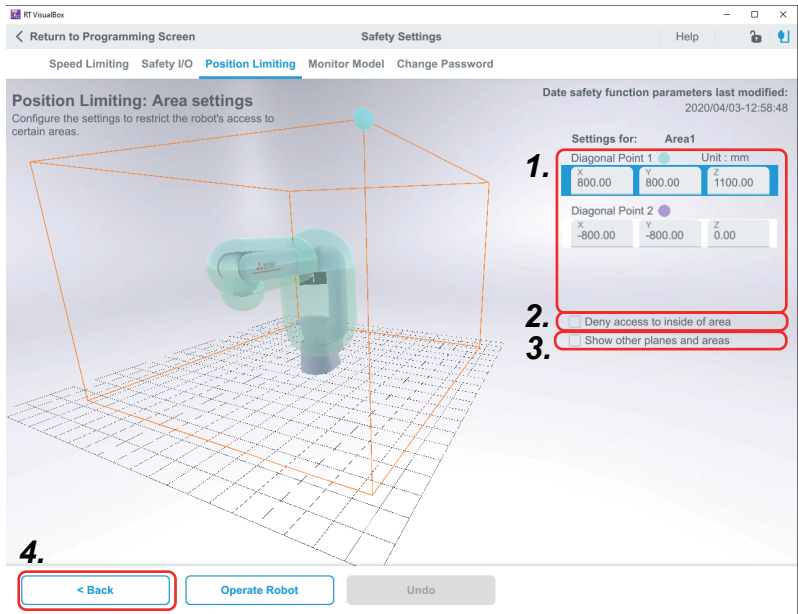


* Robot origin indicates that X, Y, and Z (all axes) are 0.

12.11 Area Settings

Set an area to be used for the position restriction settings.

Operating procedure



1. Enter two diagonal points. An area will appear on-screen once valid values have been set. Diagonal points can also be set while moving the robot. To set points while moving the robot, tap/click the [Operate Robot] button, and move the robot to the desired destination. Then, tap/click the [Teach] button. The current position is stored in the X, Y, and Z coordinates of the currently selected diagonal point.
2. By default, the area on the outside of a defined area is inaccessible. To change the settings, select the [Deny access to inside of area] check box.
3. To keep previously set plains and areas visible while creating a new area, select the [Show other planes and areas] check box.
4. After setting the area, tap/click the [< Back] button to return to the Position Limiting screen.

[Deny access to inside of area]: OFF	[Deny access to inside of area]: ON
<p>The robot will stop moving before it leaves the defined area.</p>	<p>The robot will stop moving before it enters the blue area.</p>

13 VISION SENSOR SETTINGS

This chapter explains the vision sensor settings.
The following can be configured in the vision sensor settings.

- Vision sensor connection

Use the vision sensor connection settings to connect supported vision sensors. Refer to the following page for further information.

☞ Page 126 Vision Sensor Connection

- Workpiece transfer settings

A program that instructs the robot to pick up a workpiece from a specified pickup point can be created in the workpiece transfer settings. Using a vision sensor to identify workpieces enables the robot to adjust its grasp position of the workpiece. Refer to the following page for further information.

☞ Page 129 Workpiece Transfer Settings

- Pattern identification settings

In these settings, a program that determines whether the vision sensor is able to identify a registered pattern can be created. Refer to the following page for further information.

☞ Page 139 Pattern identification settings

To use the settings made in this window in the program, set them in the Vision block.

Precautions

Vision sensor settings cannot be accessed while in simulator mode.

13.1 Compatible Vision Sensors

This software supports the following vision sensors.

-	Information
Model	VS80M-202, VS80M-202-R (Manufactured by Mitsubishi Electric)*1 In-Sight 8402M-363-50, In-Sight 8402M-373-50 (Manufactured by Cognex)
Application	Hand-eye*2

*1 Only available in Japan.

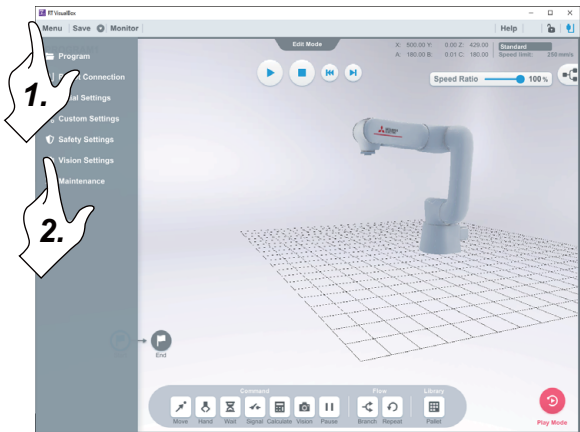
*2 After installing the vision sensor, refer to the following page to configure the settings for the tool model.

☞ Page 118 Tool Model

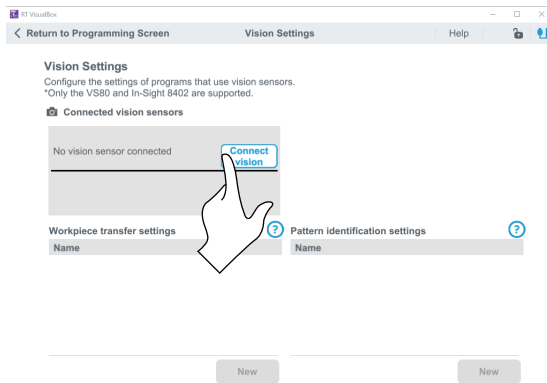
13.2 Vision Sensor Connection

Connect the vision sensor attached to the robot to the computer.

Operating procedure

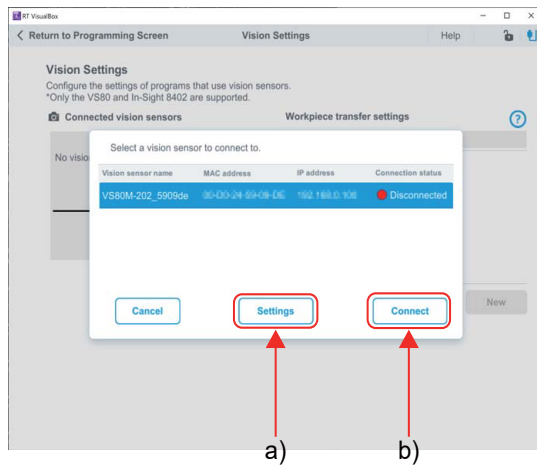


1. Tap/click the [Menu] tab on the menu bar.
2. Tap/click [Vision Settings] to display the Vision Settings screen.



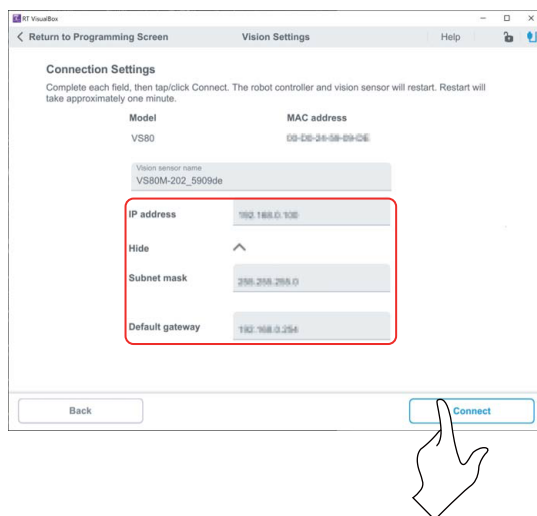
3. Tap/click [Connect Vision].

If the computer has multiple network adapters, select the network adapter you want to use.



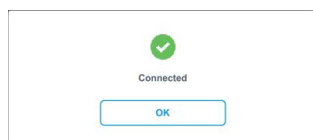
4. When connecting a vision sensor for the first time or if the connection fails, tap/click the [Set] button indicated by "a".

If not, select the vision sensor you want to connect and tap/click the [Connect] button indicated by "b".



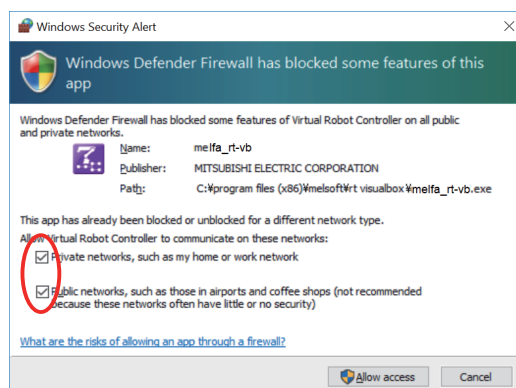
5. If settings need to be configured, enter the network settings then tap/click the [Connect] button. Once the settings have been configured, the robot controller and vision sensor will automatically restart.

6. Please wait while a connection between the computer and vision sensor is established.



Precautions

If the following window appears while attempting to connect the vision sensor, check both boxes, then tap/click the [Allow access] button.



13.3 Workpiece Transfer Settings

In this section we will configure the workpiece transportation program used for the vision sensor.

If the robot attempts to pick up a workpiece from a position specified by the Move block, it may not be able to grasp the workpiece properly if the workpiece has deviated from that position. However, once these settings have been configured, the robot will be able to utilize vision sensor image data to adjust its grasp position.

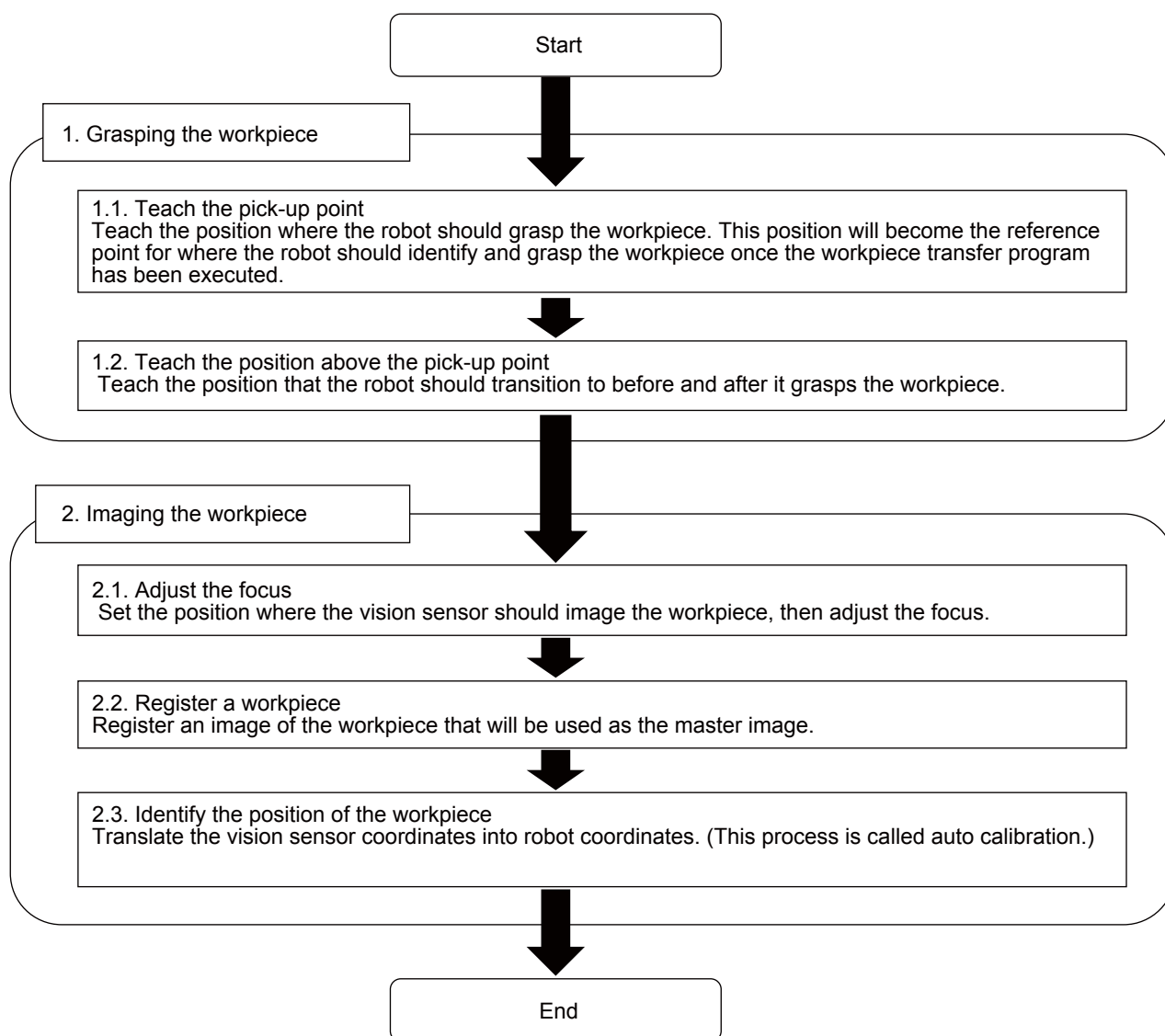
Refer to the following page for further information on the Move block.

 Page 69 Move Block

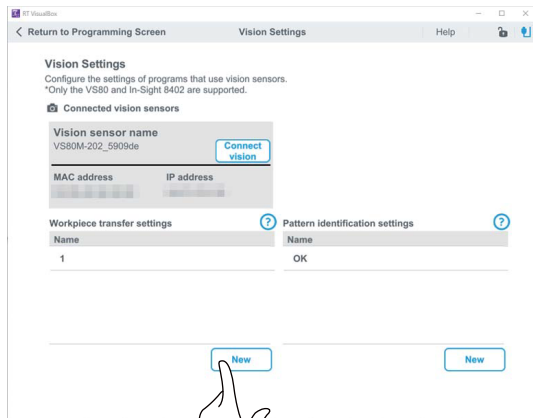
Registering workpiece transfer settings

Follow the process below to configure the workpiece transfer settings. Configure these settings while the vision sensor is connected to the computer.

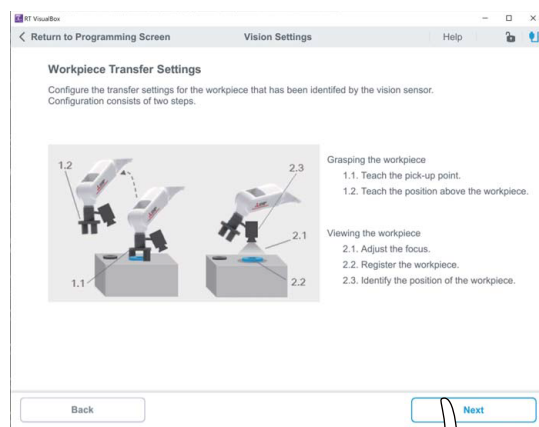
13



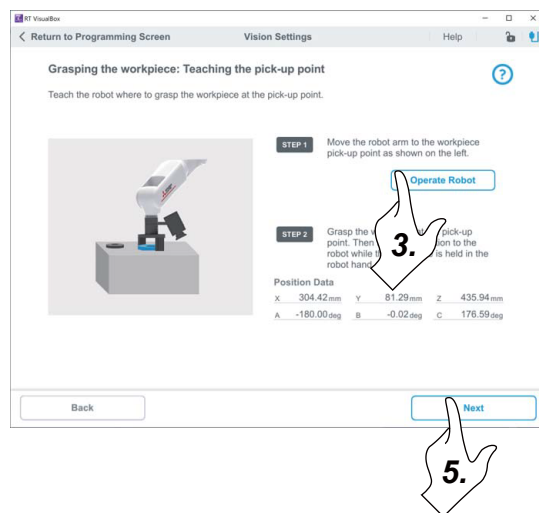
Operating procedure



1. Tap/click [New] under [Workpiece transfer settings].



2. The workpiece transfer settings process will appear. Tap/click [Next].

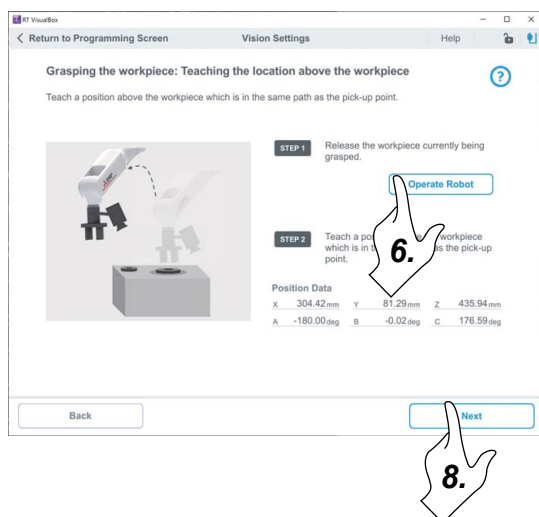


Teach the position where the robot should grasp the workpiece. This position will become the reference point used for adjusting the robot's grasp position during operation of the program that was created with the workpiece transfer settings.

3. Tap/click [Robot operation] and move the robot to the position where it will grasp the workpiece.

4. Grasp the workpiece and then tap/click [Teach] in the Robot Operation panel.

5. Check that the current position appears in the Position Data fields, then tap/click [Next].



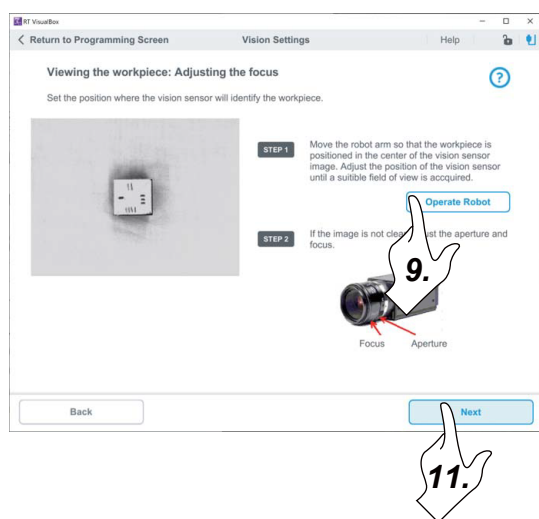
Teach the position above the pick-up point.

6. Tap/click [Operate Robot] and release the workpiece.
7. Move the robot arm to a position above the workpiece, then tap/click the [Teach] button in the Robot Operation panel. This position will become the via point.
8. Check that the current position appears in the Position Data fields, then tap/click [Next].

This position will be the position the robot diverts to before and after it grasps the workpiece. If a position far away from the workpiece is taught, there is a possibility that the robot will collide with other objects. It may also become impossible for the robot to grasp the workpiece.

CAUTION

After releasing the workpiece in Step 6, do not move the workpiece until it has been registered as instructed in Step 17. Doing so may lower recognition accuracy.

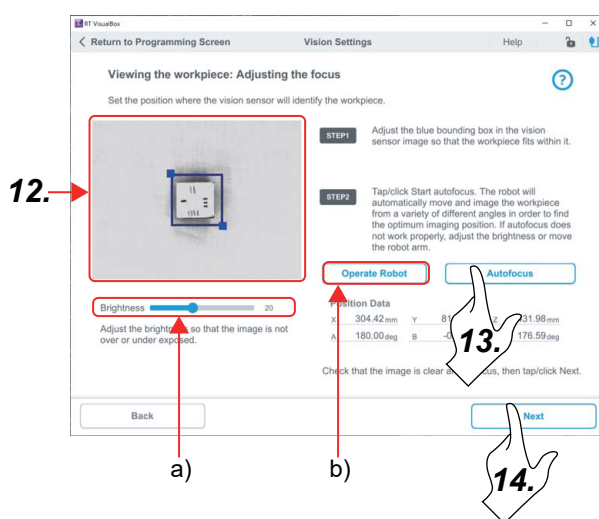


Move the robot arm to a position where the vision sensor can identify the workpiece.

9. Tap/click the [Operate Robot] button. While looking at the image displayed by the vision sensor, move the robot so that the workpiece is in the center of the image and fits within the frame.
10. If the image is not clear, adjust the aperture and focus of the vision sensor.
11. After making the necessary adjustments, tap/click [Next].

CAUTION

At this stage, the field of view (FOV) is determined. If the workpiece pick-up point will change during automatic operation, ensure that the vision sensor's FOV is large enough to encompass all the pick-up points.



Use autofocus to have the robot move to an optimal focal position.

12. Adjust the blue bounding box in the vision sensor image so that the workpiece fits within it.

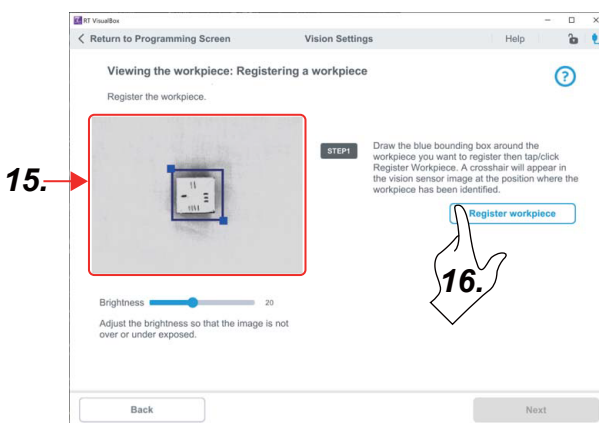
13. Tap/click the [Autofocus] button.

14. If autofocus is successful, the robot stops and the position data is updated. Tap/click [Next].

If autofocus fails, adjust the brightness or tap/click [Operate Robot] to change the robot position.

⚠ CAUTION

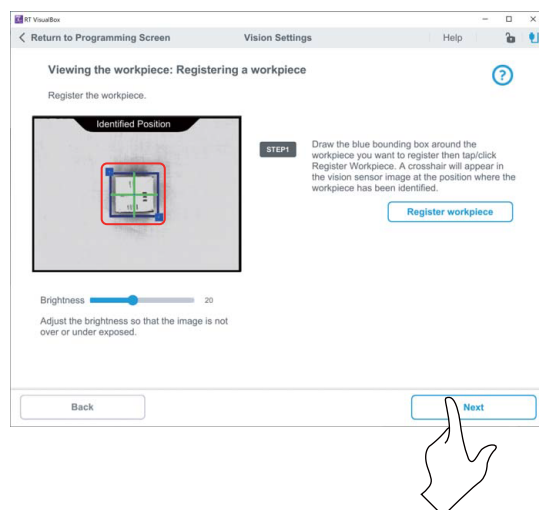
The robot moves during autofocus. Be sure to place an emergency stop switch nearby so that the robot can be stopped immediately.



Register the workpiece.

15. Adjust the blue bounding box in the vision sensor image so that the workpiece fits within it.

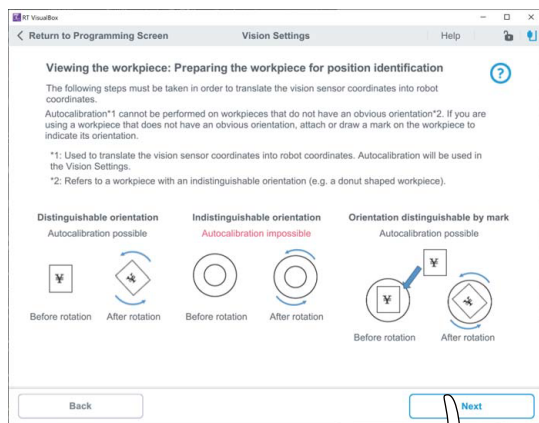
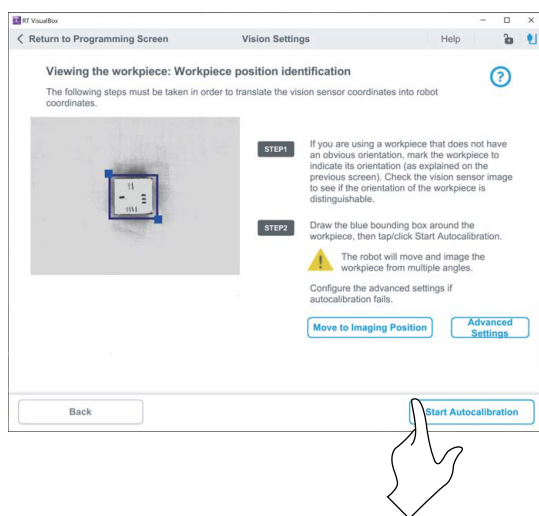
16. Tap/click [Register workpiece].



17. A crosshair will appear in the center of the workpiece. Tap/click [Next].

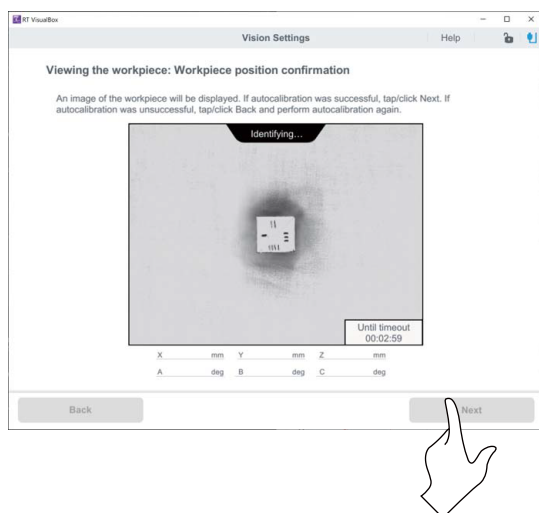
⚠ CAUTION

- This registered image will become the master image. Adjust the brightness to achieve the greatest possible clarity.
- Only one type of workpiece can be registered per set of workpiece transfer settings. To register a different type of workpiece, create a new set of workpiece transfer settings.



⚠ CAUTION

The robot operates during autocalibration. Be sure to place an emergency stop switch nearby so that the robot can be stopped immediately.



18. Precautions regarding workpiece orientation that should be noted when using autocalibration will appear. Follow the on-screen instructions and check if autocalibration is possible with the workpiece you are using.

Tap/click [Next].

Point

Autocalibration is a function that translates the vision sensor coordinates into robot coordinates. It allows the robot to distinguish its position in relation to positions in the image captured by the vision sensor.

Execute autocalibration.

19. Draw a mark indicating the orientation of the workpiece if the workpiece does not have a feature that helps determine its orientation.

20. Draw the blue bounding box around the workpiece, then tap/click [Start Autocalibration].

21. Check the autocalibration result.

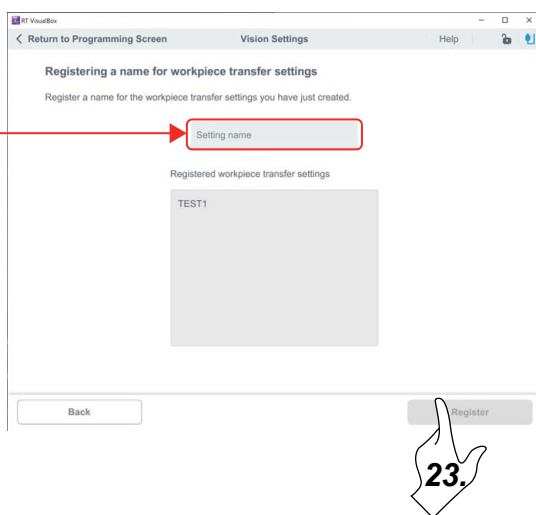
During autocalibration, an image will be displayed every time an image is captured.

If autocalibration is successful, the robot stops and the workpiece position data is updated. Tap/click [Next].

If autocalibration fails, return to Step 19. Refer to the following page and restart autocalibration.

➡ Page 134 If autocalibration fails

22.



Decide on a name for the workpiece transfer settings.

22. Enter a name.

23. Tap/click the [Register] button.

Place the Vision block on the Programming screen to set the created workpiece transfer settings.

If autocalibration fails

If autocalibration fails, tap/click [Move to Imaging Position] and check the points below after the robot has moved back to the position it was in before autocalibration.

No.	Possible cause	Solution
1	Are you trying to perform autocalibration on a workpiece that has an indistinguishable orientation?	Refer to the following: ☞ Page 134 Solution to No.1
2	Is the workpiece within the vision sensor's FOV during calibration?	Refer to the following: ☞ Page 134 Solution to No.2
3	Has error L2602 (destination point out of robot's operating range) occurred?	Refer to the following: ☞ Page 134 Solution to No.3
4	Has the robot arm come into contact with a surrounding object or become entangled with a cable during calibration?	Refer to the following: ☞ Page 135 Solution to No.4
5	Did the software time-out before calibration finished?	Refer to the following: ☞ Page 135 Solution to No.5
6	Was the workpiece within the blue bounding box before calibration started?	Refer to the following: ☞ Page 135 Solution to No.6
7	Is the Permissible error during calibration too small?	Refer to the following: ☞ Page 135 Solution to No.7

■Solution to No.1

Go back to Step 19 and make sure that a mark has been put on the workpiece to indicate its orientation. Then perform autocalibration again.

■Solution to No.2

There are three solutions to this problem.

- Place the workpiece in the center of the vision sensor's FOV, then start autocalibration. If the workpiece is not placed in the center of the vision sensor's FOV, it may leave the vision sensor's FOV altogether while the robot arm is moving during calibration.
- Go to [Advanced Settings] and adjust the values of each movement stated below so that the workpiece is within the vision sensor's FOV.
 - Rotational movement
 - Movement in the X axis
 - Movement in the Y axis
- If non of the steps above resolve the problem, re-teach the pick-up point and try autocalibration again. Move the vision sensor back from the workpiece so that the workpiece occupies less space within the vision sensor's FOV.

■Solution to No.3

There are two solutions to this problem.

1. Go to [Advanced Settings] and adjust the values of each movement stated below to change the distance the arm is allowed to move during calibration.

- Rotational movement
- Movement in the X axis
- Movement in the Y axis

Inverting the direction of rotation is acceptable when adjusting the values for rotational movement.

2. If the above step does not resolve the problem, change the posture of the robot and configure the vision sensor settings from the start again.

■Solution to No.4

There are two solutions to this problem.

1. Go to [Advanced Settings] and adjust the value of the movement stated below. Change the distance the arm is allowed to move so that it does not interfere with surrounding objects or become entangled in cables, etc.

- Rotational movement

In order to improve accuracy, ensure that rotational movement increases in progressively larger degrees of movement as stated below:

1st rotation < 2nd rotation < 3rd rotation ≤ 4th rotation

2. Go to [Advanced Settings] and adjust the values of each movement stated below. Change the distance the arm is allowed to move so that it does not interfere with surrounding objects or become entangled in cables, etc.

- Movement in the X axis
- Movement in the Y axis

■Solution to No.5

There are two solutions to this problem.

1. The speed of the movement may be too slow. Increase the speed of the movement or increase the Time out time in [Advanced Settings].

2. The robot may have stopped due to the position limiting settings. Go to [Advanced Settings] and adjust the values of each movement stated below to change how much the robot moves during calibration.

- Rotational movement
- Movement in the X axis
- Movement in the Y axis

■Solution to No.6

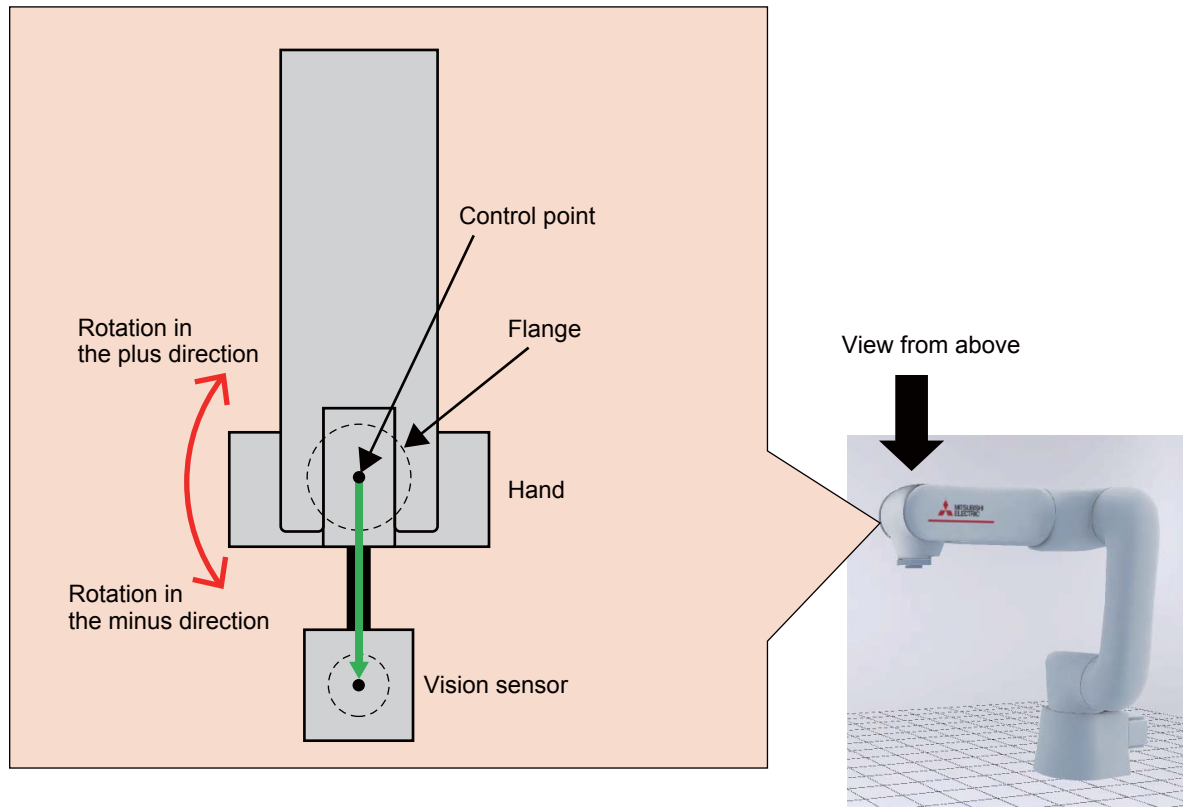
Draw the blue bounding box around the workpiece, then start autocalibration.

■Solution to No.7

Go to [Advanced Settings] and increase the permissible error in 0.01 increments, then perform autocalibration. "Permissible error" refers to the amount of error that is permissible between the resultant position and the target position.

■Supplementary information regarding rotational movement

The diagram below shows the rotational direction of the J6 axis and the centers of rotation used for calibration.



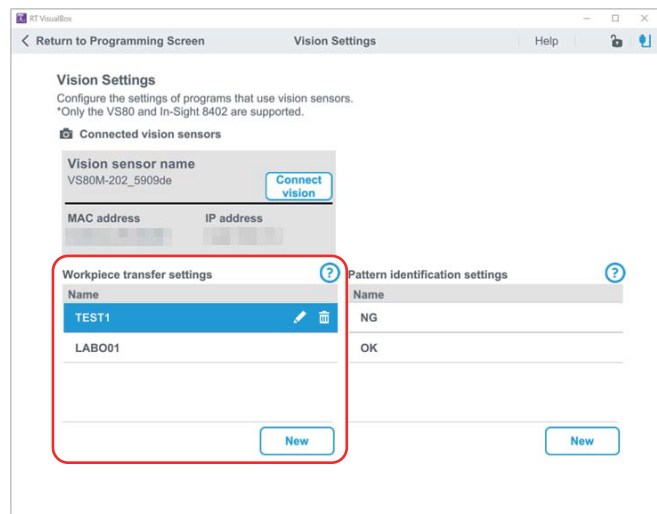
The center of rotation is the control point for the 1st revolution. The J6 axis rotates in increasing amounts for the 2nd and 3rd revolutions. For the 4th revolution, the center of the vision sensor's FOV will become the center of rotation.

If a plus or minus symbol is not used in the values input in the advanced settings, the J6 axis will rotate in the positive direction. If a minus symbol is used, the J6 axis will rotate in the negative direction.

-	Rotational amount in the positive direction (deg)	Rotational amount in the negative direction (deg)
1st movement	3	-3
2nd movement	20	-20
3rd movement	90	-90
4th movement	90	-90

Workpiece transfer settings list

When a vision sensor is connected to the computer, a list of pre-set workpiece transport settings will be displayed. Select a workpiece from the list to edit or delete its workpiece transfer settings.



Icon	Description
	Click this button to display the screen for adjusting the workpiece identification settings. Refer to the following page for further information.  Page 138 Adjusting identification accuracy for workpiece transfer settings
	Click this button to delete the workpiece transfer settings. A confirmation dialog box will appear. Tap/click the [OK] button to delete the settings.

Precautions

If the workpiece transfer settings set in a Vision block are deleted, the created program will stop working. Ensure that these settings are not being used by any other block before deleting them.

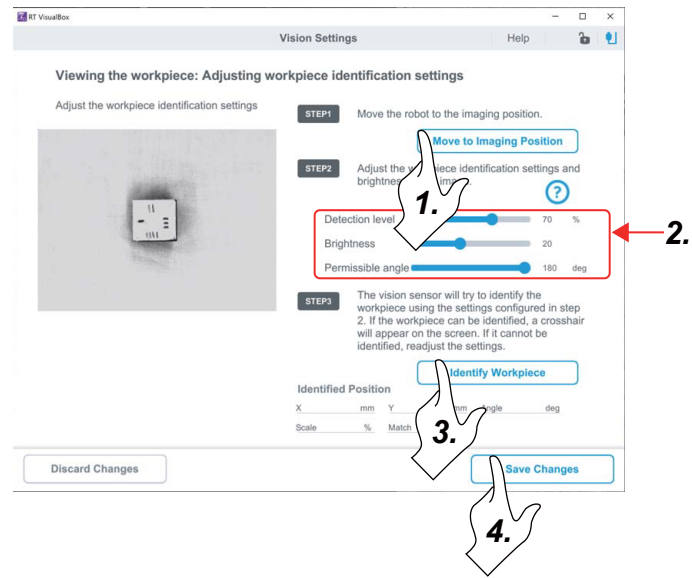
Adjusting identification accuracy for workpiece transfer settings

Workpiece identification accuracy can be adjusted. Once you have configured the vision sensor settings and checked that the program works properly, use these settings to adjust workpiece identification accuracy.

Adjustments can be made via either of the following:

- Page 77 Vision Block
- Page 137 Workpiece transfer settings list

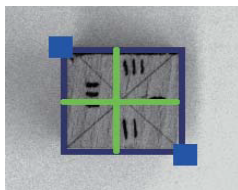
Operating procedure



1. Tap/click [Move to imaging position] to move the robot to the workpiece imaging position.
2. Adjust each of the settings. Refer to the settings in the table below.

Settings	Description
Detection level Range: 1 to 100% Initial value: 70%	The detection level is used to set to what extent the workpiece in the vision sensor's FOV should match the image of the registered workpiece (master). Increasing the detection level will increase workpiece identification accuracy but at the same time make it harder to identify a workpiece. Decreasing the detection level will make it easier to identify workpieces but increase the probability of the vision sensor identifying objects that are not workpieces.
Brightness Range: 0 to 50 Initial value: *	Used to adjust image brightness. Adjust the value while checking the vision sensor image. * The initial value is the value entered when the workpiece was registered.
Permissible angle Range: 1 to 180° Initial value: 180°	Permissible angle is used to set what rotational angle of the workpiece in the vision sensor's FOV is permissible in comparison to the image of the registered workpiece (master). For example: When this value is set to 120°, a workpiece rotated within the range of $\pm 120^\circ$ will be identified. When this value is set to 180°, a workpiece will be identified no matter what angle it is in.

3. Tap/click [Identify Workpiece] to check whether the workpiece can be recognized. A crosshair will appear in the center of the workpiece if the workpiece can be identified.



Repeat Steps 2 and 3 while changing the position and angle of the workpiece to increase workpiece identification accuracy.

4. After completing the adjustments, tap/click [Save changes].

⚠ CAUTION

The robot will move to the imaging position. Be sure to place an emergency stop switch nearby so that the robot can be stopped immediately.

13.4 Pattern identification settings

In this section we will configure the pattern identification program used for the vision sensor.

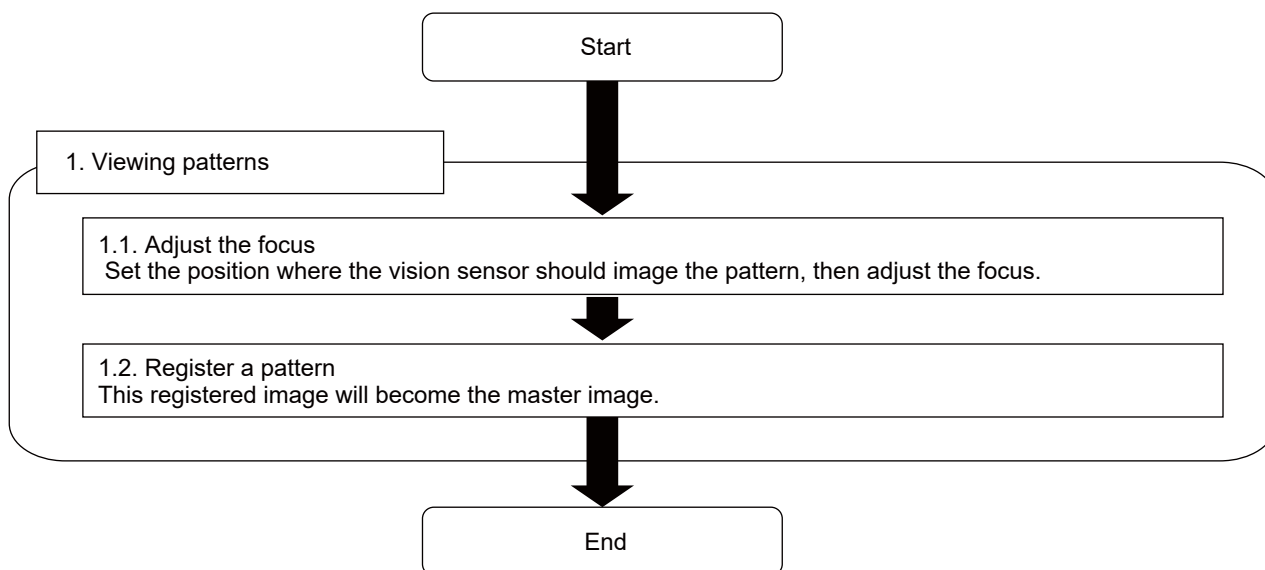
Once these settings have been configured, the robot will be able to determine whether the registered pattern is present in the image taken by the vision sensor.

Registering a pattern, such as characters or a workpiece, enables the robot to switch operations based on whether the pattern is present. Refer to the following page for information on how to configure the pattern identification program.

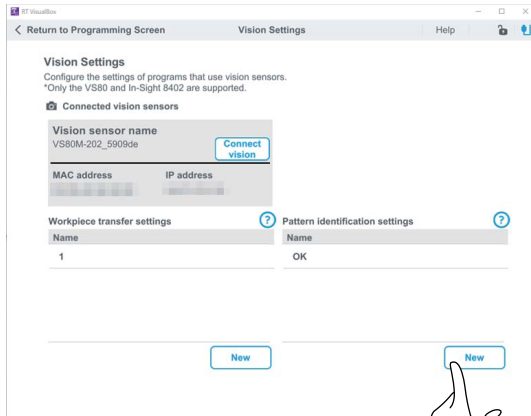
📖 Page 77 Vision Block

Creating new pattern identification settings

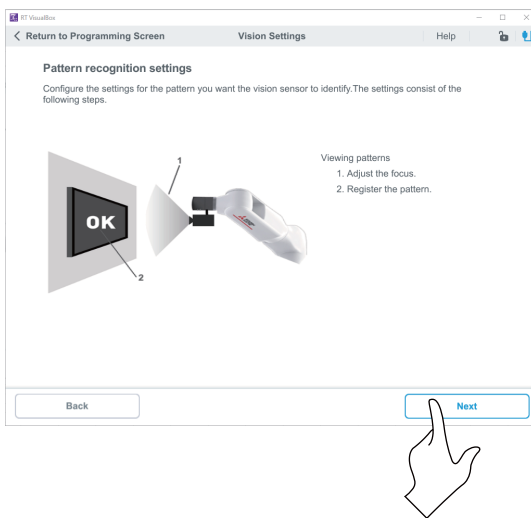
Follow the process below to create the pattern identification settings. Configure these settings while the vision sensor is connected to the computer.



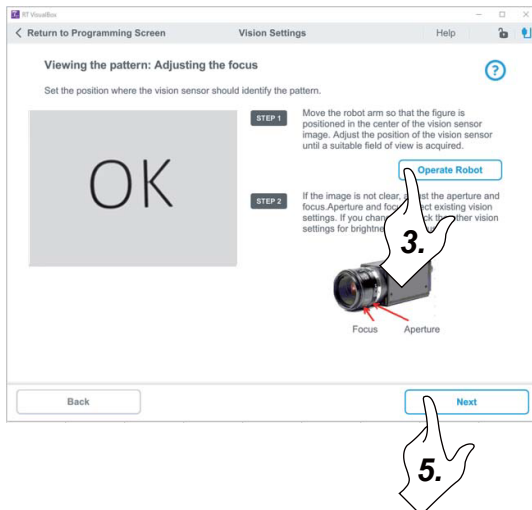
Operating procedure



1. Tap/click [New] under [Pattern identification settings].



2. The pattern identification settings process will appear. Tap/click [Next].

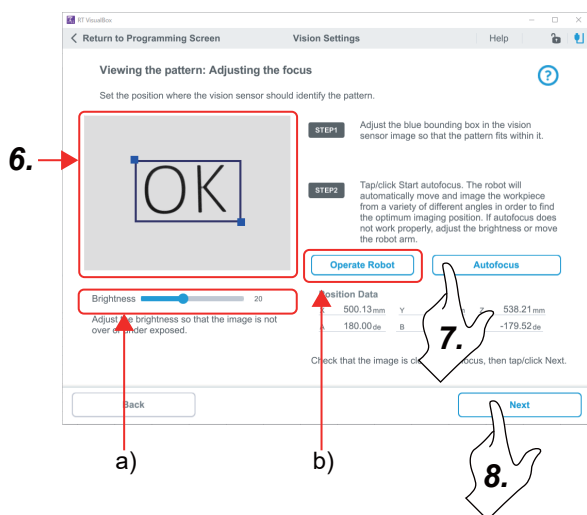


Move the robot arm to a position where the vision sensor can identify the pattern.

3. Tap/click the [Operate Robot] button. While looking at the image displayed by the vision sensor, move the robot so that the pattern is in the center of the image and fits within the frame.
4. If the image is not clear, adjust the aperture and focus of the vision sensor.
5. After making the necessary adjustments, tap/click [Next].

⚠ CAUTION

At this stage, the field of view (FOV) is determined. If the pattern imaging point will change during automatic operation, ensure that the vision sensor's FOV is large enough to encompass all the imaging points.



Use autofocus to have the robot move to an optimal focal position.

6. Adjust the blue bounding box in the vision sensor image so that the pattern fits within it.

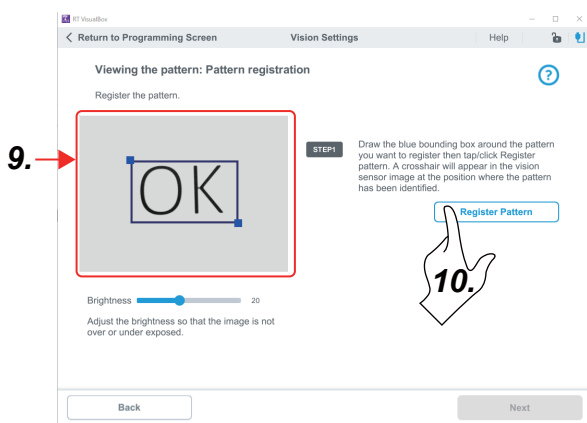
7. Tap/click the [Autofocus] button.

8. If autofocus is successful, the robot stops and the position data is updated. Tap/click [Next].

If autofocus fails, adjust the brightness or tap/click [Operate Robot] to change the robot position.

CAUTION

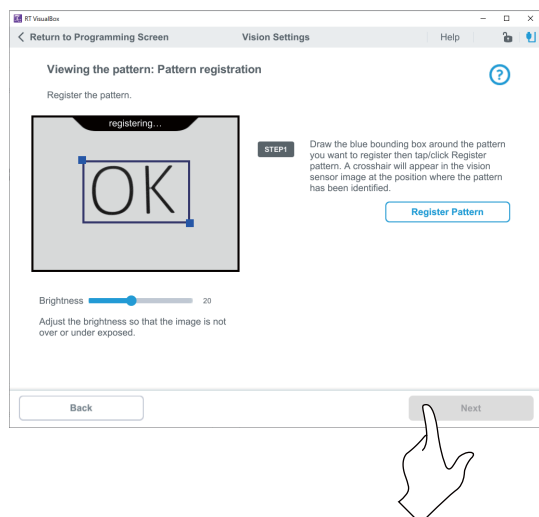
The robot moves during autofocus. Be sure to place an emergency stop switch nearby so that the robot can be stopped immediately.



Register the pattern.

9. Adjust the blue bounding box in the vision sensor image so that the pattern fits within it.

10. Tap/click [Register Pattern].

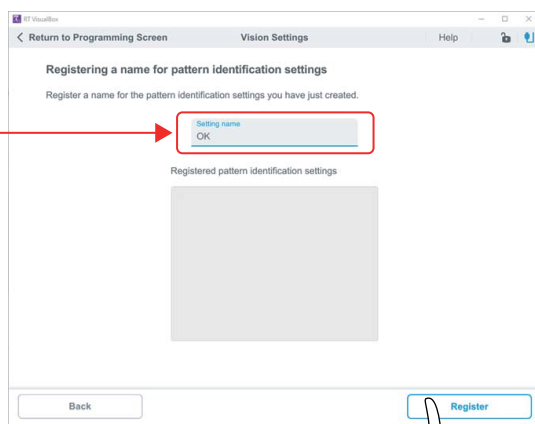


11. A crosshair will appear in the center of the pattern. Tap/click [Next].

CAUTION

- This registered image will become the master image. Adjust the brightness to achieve the greatest possible clarity.
- Only one type of pattern can be registered per set of pattern identification settings. To register a different pattern, create a new set of pattern identification settings.
- The larger the bounding box, the longer it takes to identify the pattern. If it is taking a long time to identify the pattern, create new recognition settings and make the bounding box smaller, or move the vision sensor further away from the pattern.

12.



13.

Decide on a name for the pattern identification settings.

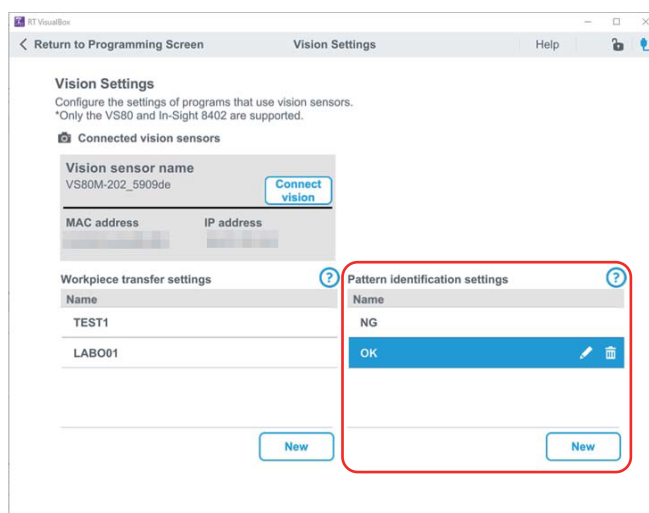
12. Enter a name.

13. Tap/click the [Register] button.

Place the Vision block on the Programming screen to set the created pattern identification settings.

Pattern identification settings list

When a vision sensor is connected, a list of pre-set pattern identification settings will be displayed. Select a pattern from the list to edit or delete its settings.



Icon	Description
	Tap/click this button to display the screen for adjusting the pattern identification settings. Refer to the following page for further information. 📖 Page 143 Adjusting identification accuracy for pattern identification settings
	Tap/click this button to delete the pattern identification settings. A confirmation dialog box will appear. Tap/click the [OK] button to delete the settings.

Precautions

If the pattern identification settings set in a Vision block are deleted, the created program will stop working. Ensure that these settings are not being used by any other block before deleting them.

Adjusting identification accuracy for pattern identification settings

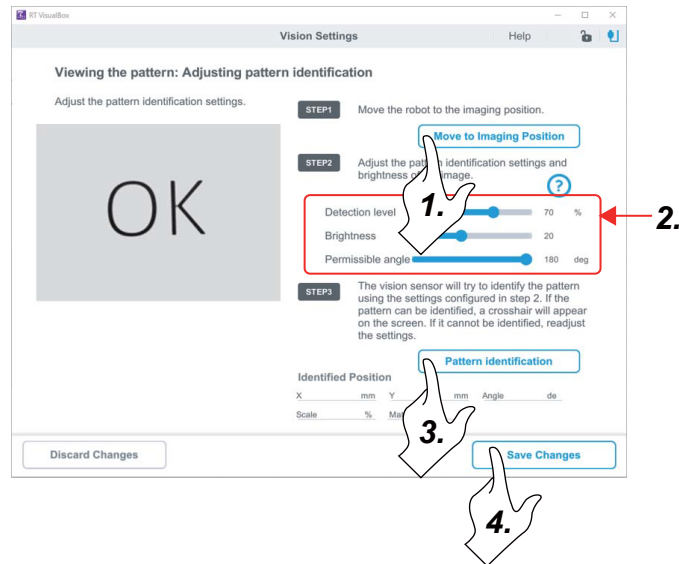
Pattern identification accuracy can be adjusted. Once you have configured the vision sensor settings and checked that the program works properly, use these settings to adjust pattern identification accuracy.

Adjustments can be made via either of the following:

☞ Page 77 Vision Block

☞ Page 142 Pattern identification settings list

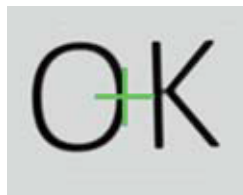
Operating procedure



1. Tap/click [Move to imaging position] to move the robot to the pattern imaging position.
2. Adjust each of the settings. Refer to the settings in the table below.

Settings	Description
Detection level Range: 1 to 100% Initial value: 70%	The detection level is used to set to what extent the pattern in the vision sensor's FOV should match the image of the registered pattern (master). Increasing the detection level will increase pattern identification accuracy but at the same time make it harder to identify a pattern. Decreasing the detection level will make it easier to identify patterns but increase the probability of the vision sensor identifying objects that are not the pattern.
Brightness Range: 0 to 50 Initial value: *	Used to adjust image brightness. Adjust the value while checking the vision sensor image. * The initial value is the value entered when the pattern was registered.
Permissible angle Range: 1 to 180° Initial value: 180°	Permissible angle is used to set what rotational angle of the pattern in the vision sensor's FOV is permissible in comparison to the image of the registered pattern (master). For example: When this value is set to 120°, a pattern rotated within the range of $\pm 120^\circ$ will be identified. When this value is set to 180°, a pattern will be identified no matter what angle it is in.

3. Tap/click [Identify Pattern] to check whether the pattern can be identified. A crosshair will appear in the center of the pattern if the pattern can be identified.



Repeat Steps 2 and 3 while changing the position and angle of the pattern to increase pattern identification accuracy.

4. After completing the adjustments, tap/click [Save changes].

⚠ CAUTION

The robot will move to the imaging position. Be sure to place an emergency stop switch nearby so that the robot can be stopped immediately.

14 MAINTENANCE

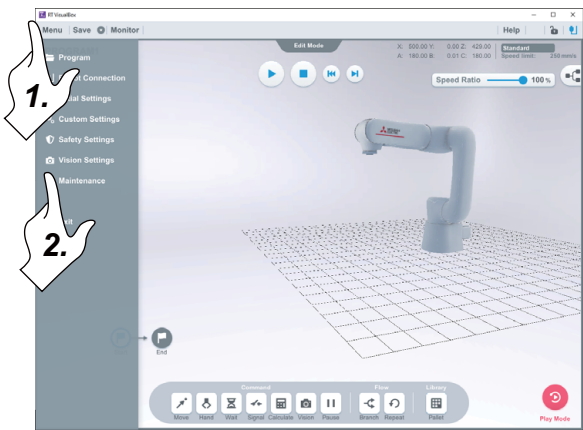
This chapter is about maintenance. The actions in the table below can be carried out in order to conduct maintenance.

	Description
Backup	Use Backup to back up the data in the robot controller to the computer.
Restore	Use Restore to backup data stored on the computer to the robot controller.
Origin settings	Use Origin Settings to set the origin position for each joint. The brakes of the joints can be temporarily released from this window.
Parameter settings	Use Parameter Settings to view and overwrite parameters in the robot controller.

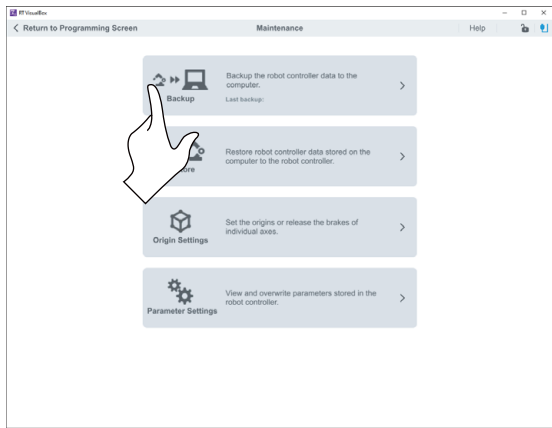
14.1 Backup

Backup performs a full backup of the data stored in the robot controller to the computer.

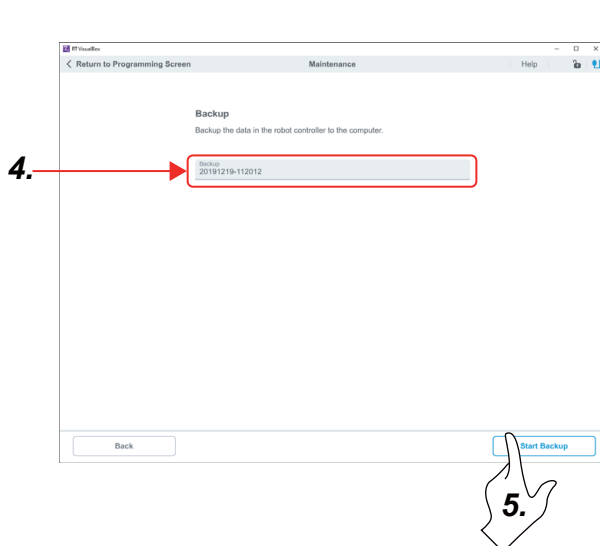
Operating procedure



1. Tap/click the [Menu] tab on the menu bar.
2. Tap/click [Maintenance] to display the Maintenance screen.



3. Tap/click [Backup]. The Backup screen will appear.



4. Enter a name for the backup.

5. Tap/click the [Start Backup] button.

The Backup in progress... dialog box will appear when the backup starts. When the backup is complete, the Backup complete! dialog box will appear.

14.2 Restore

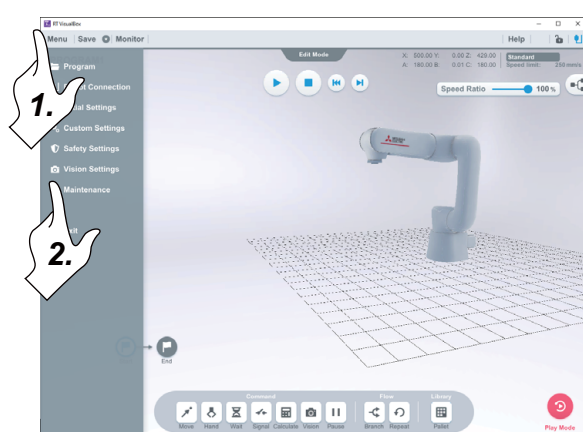
Restores the backup data stored on the computer to the robot controller. The content that is restored is the same as the default content displayed in the RT ToolBox3 Restore window. Refer to the following for further information.

- Program information
- Parameter information
- System program

Precautions

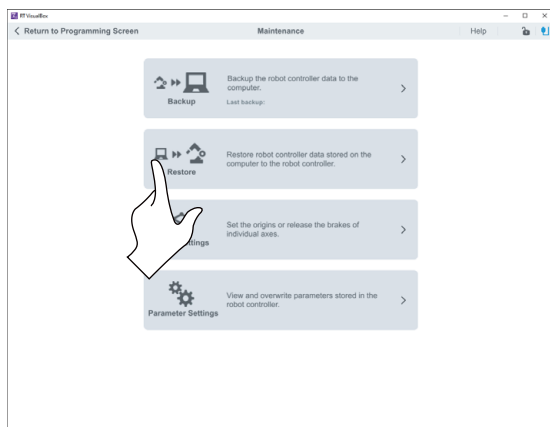
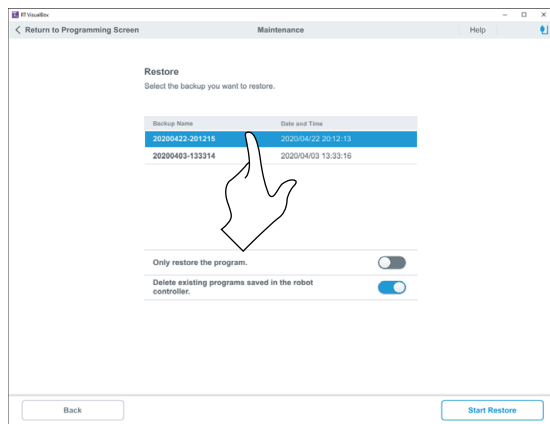
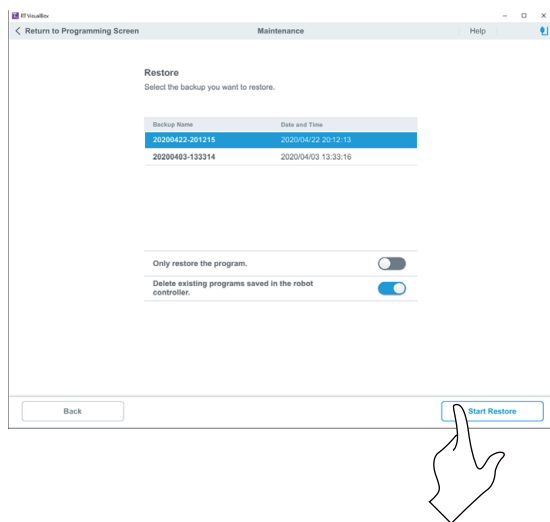
- Origin information is not overwritten.
- The serial number (the same serial number as the one on the robot arm) is not overwritten.
- File management data is not restored.
- Movement information is not restored.
- Preventive maintenance data is not overwritten.
- When [Only restore the program.] is set to [On], only program information will be restored.

Operating procedure



1. Tap/click the [Menu] tab on the menu bar.

2. Tap/click [Maintenance] to display the Maintenance screen.



3. Tap/click [Restore]. The Restore screen will appear.

4. A list of previously backed-up data will appear. Select the data that you want to restore.

5. To only restore programs from the backed up data, toggle the [Only restore the program] switch to On.

Turn off to restore all data ☐ OFF

Turn on to restore programs only ☒ ON

6. To delete existing programs in the robot controller during a restore, toggle the [Delete existing programs saved in the robot controller.] switch to On.

Turn off to retain existing programs ☐ OFF
* Programs with the same name will be overwritten.

Turn on to delete existing programs ☒ ON

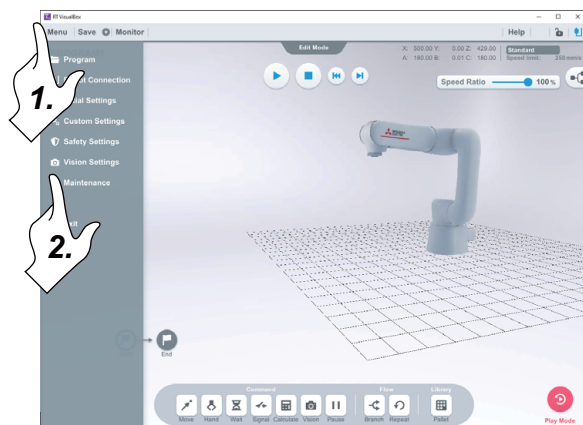
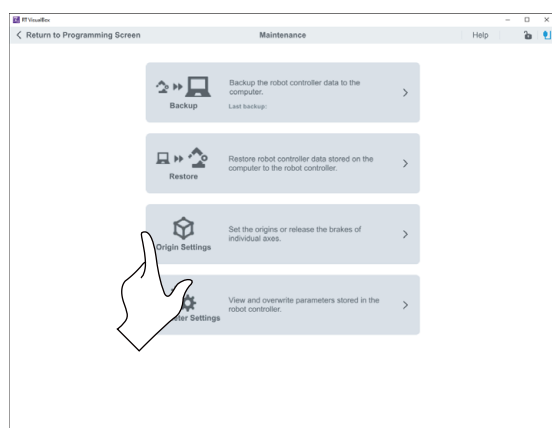
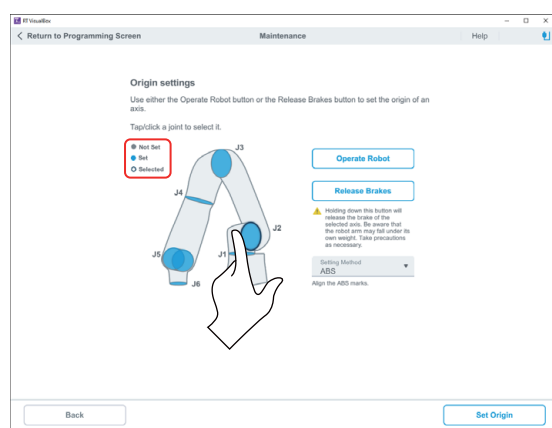
7. Tap/click the [Start Restore] button.

The Restoring... dialog box will appear and the restore will start. Once the restore is complete, a dialog box will appear indicating that the restore was successful and that the robot controller will restart. After the controller has restarted, another dialog box will appear indicating that the controller has restarted.

14.3 Origin Settings

Set the origin position for each joint. The origin of each joint can be set from this screen if encoder backup data has been lost. The brakes of each joint can also be temporarily released from this screen.

Operating procedure



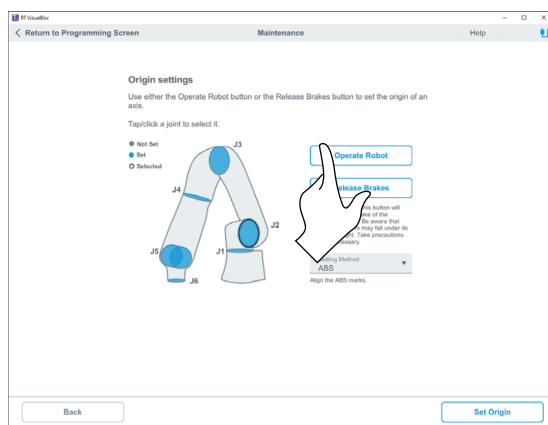
1. Tap/click the [Menu] tab on the menu bar.
2. Tap/click [Maintenance] to display the Maintenance screen.

3. Tap/click [Origin Settings]. The Origin Settings screen will appear.

4. Select an axis to set its origin.

Each joint in the figure of the robot indicates whether the origin is set.

Tap/click on an axis in the figure to set the origin for that axis. Tapping/clicking on an axis will release the brake of that axis (once "Release brakes" has been selected).



5. Set the origin position of the robot arm.

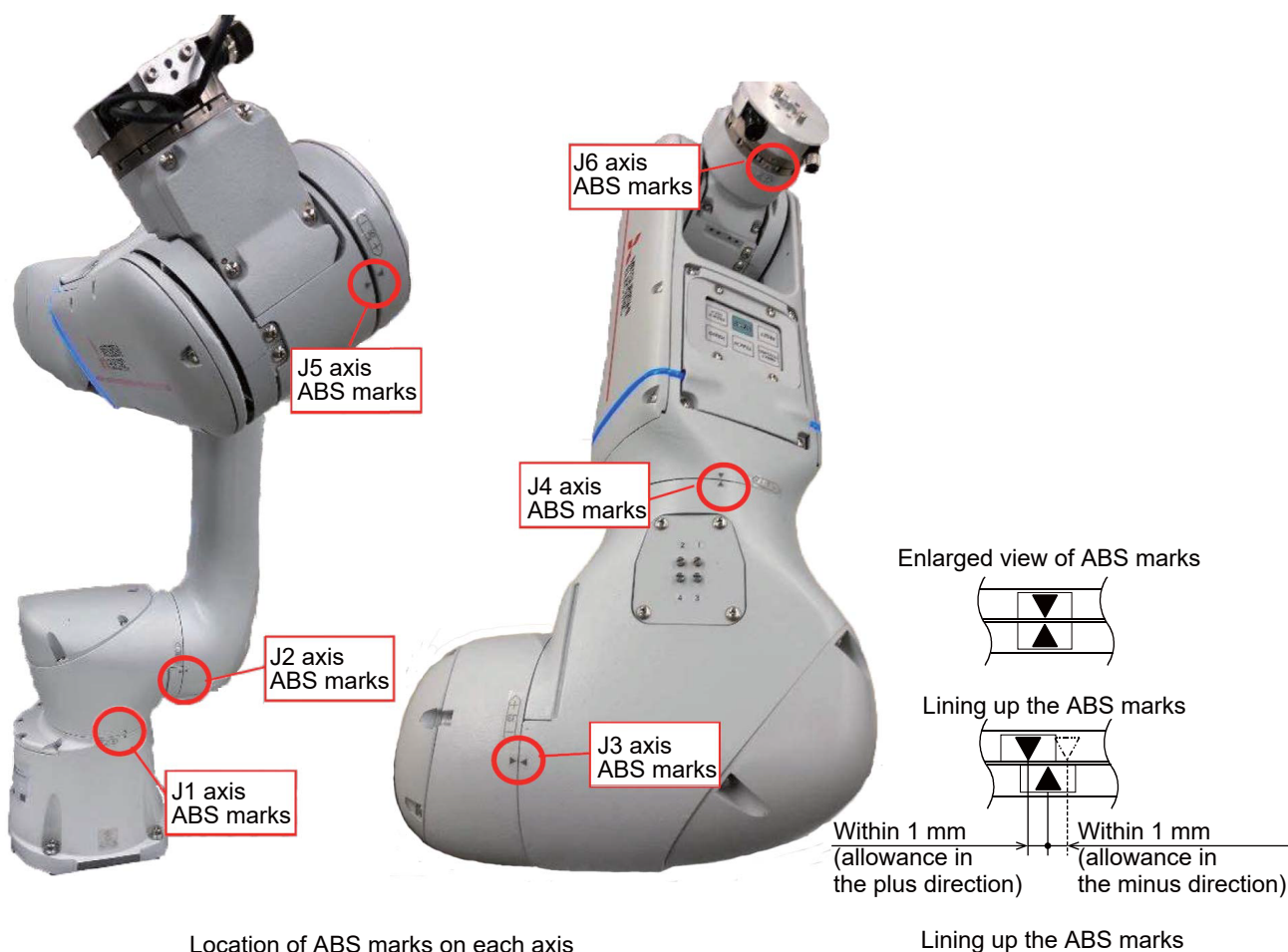
Tap/click the [Operate Robot] button to display the Robot Operation panel. Align the ABS marks of the joint selected in the Robot Operation panel. Refer to the following page for further information on operating the robot.

➡ Page 91 ROBOT OPERATION

Alternatively, tap/click the [Release Brakes] button to release the brake of the axis selected in the figure of the robot. The brake will be released while this button is pressed. Moving the arm by hand, align the ABS marks of the selected joint. The brakes of axis J2 and J3 will be repeatedly applied and released while the [Release Brakes] button is pressed. The brakes of all the other axes will be released continuously while the same button is pressed.

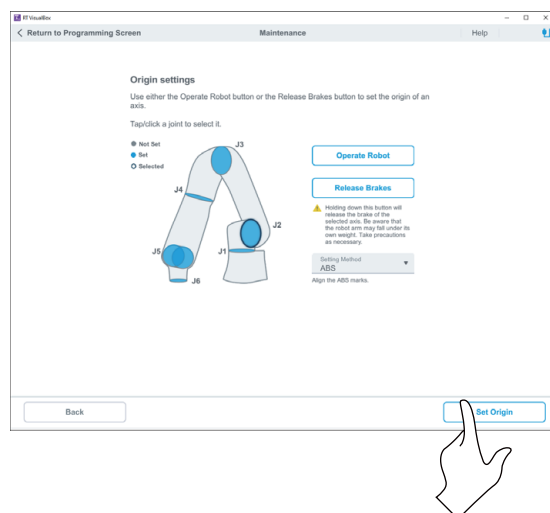
Point

The following figure shows the location of ABS marks on each axis and the method of lining up the ABS marks.



CAUTION

The robot arm may fall under its own weight depending on which brake is released or how the robot is configured. Take steps such as supporting the arm to prevent it falling under its own weight.



6. Set the origin.

Tap/click [Set Origin] to set the origin of the selected axis to its current position.

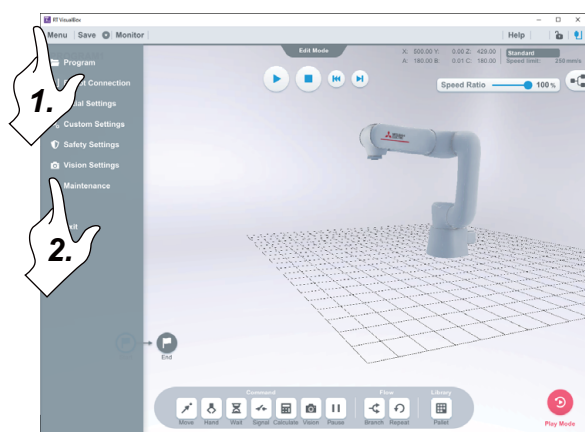
To discard the settings, tap/click [Back].

14.4 Parameter Settings

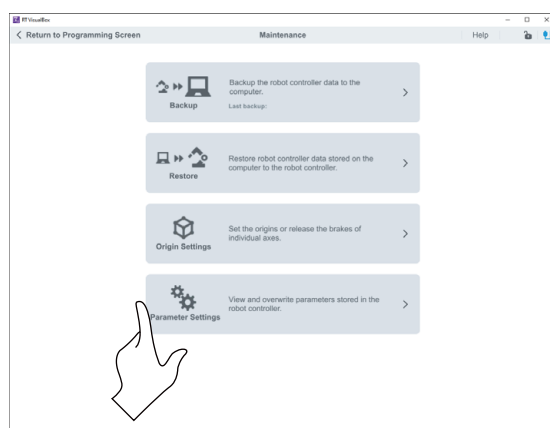
The parameters in the robot controller can be read and their values can be written.

Reading parameters

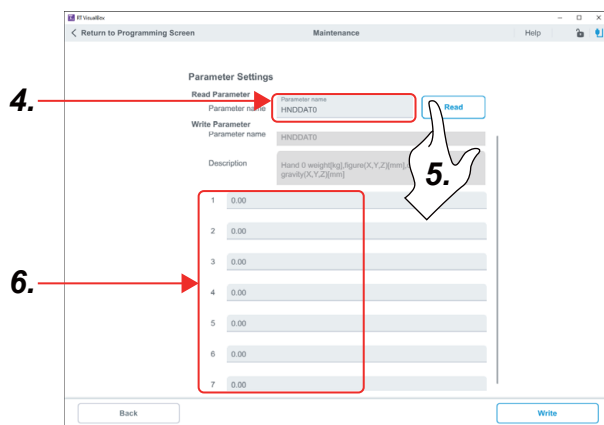
Operating procedure



1. Tap/click the [Menu] tab on the menu bar.
2. Tap/click [Maintenance] to display the Maintenance screen.



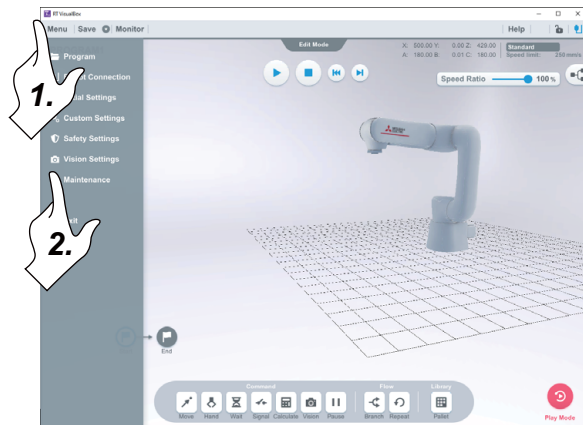
3. Tap/click [Parameter Settings]. The Parameter Settings screen will appear.



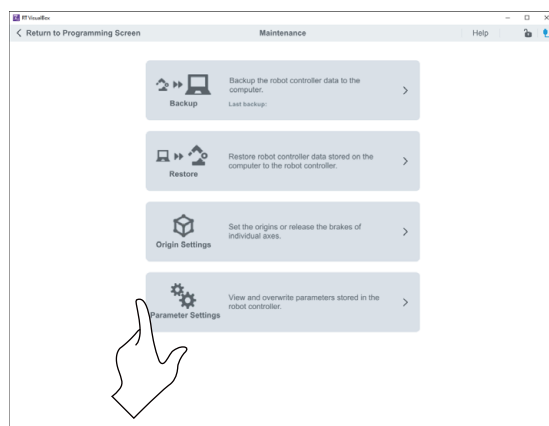
4. Enter the name of the parameter in the Parameter name field.
5. Tap/click [Read].
6. The current values for the read parameter are displayed in the area below "Write Parameter".

Writing parameters

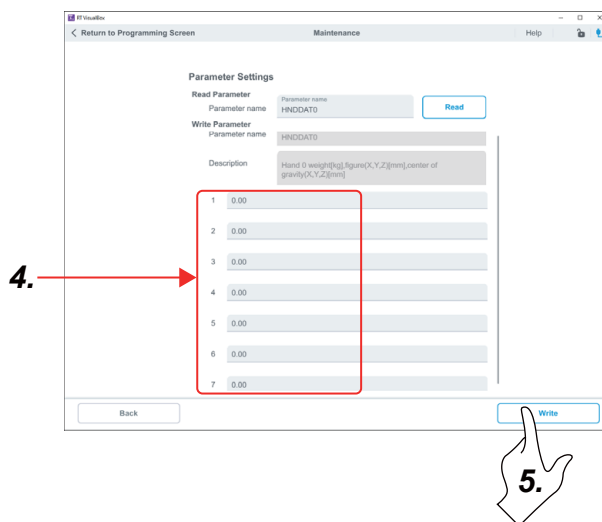
Operating procedure



1. Tap/click the [Menu] tab on the menu bar.
2. Click [Maintenance] to display the Maintenance screen.



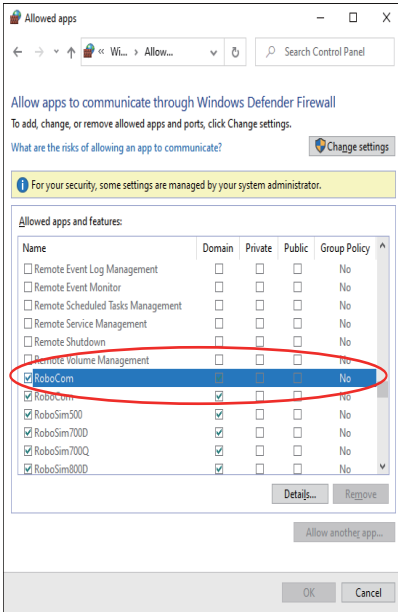
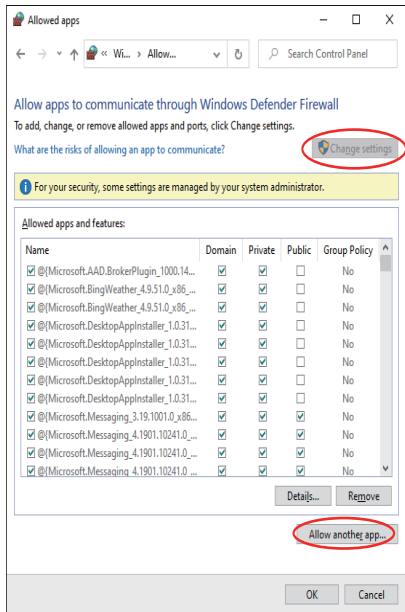
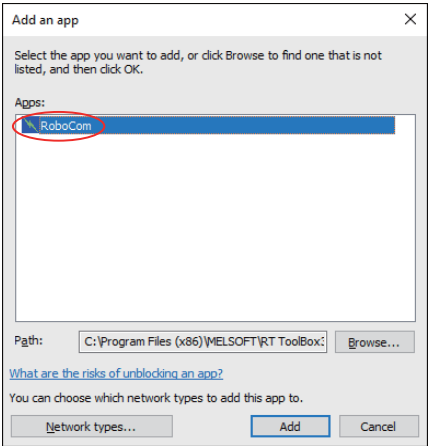
3. Tap/click [Parameter Settings]. The Parameter Settings screen will appear.

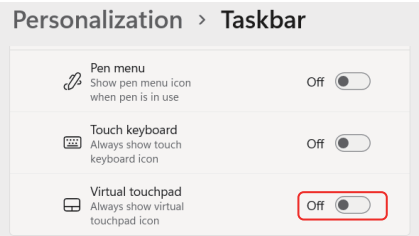


4. Overwrite the existing values with new values in the area below "Write Parameter".
5. Tap/click the [Write] button.
To cancel writing parameter values, tap/click the [Back] button.

APPENDIX

Appendix 1 Q&A

Problem	Cause	Solution
Cannot connect to the robot via Ethernet.	<p>If the robot still cannot be connected even after you have rectified the problem indicated by the error message, it may be that the settings of Windows Firewall need to be adjusted. Use the steps below to check the settings.</p> <p>Go to [Control Panel] → [System and Security] → [Windows Defender Firewall] → [Allow an app or feature through Windows Defender Firewall] to display the window below.</p>  <p>You will see [RoboCom] in the Allowed apps and features list. Does the robot have access to the network you are using it on?</p>	<p>If [RoboCom] does not appear in the Allowed apps and features list, tap/click [Allow another app...]. If the [Allow another app...] button is grayed out, select [Change settings].</p>  <p>Select [RoboCom] in the Allow an app window, then tap/click [Add]. If it does not appear in the list, tap/click [Browse...] to find it. Select [RoboCom.exe] from the RT VisualBox installation folder.</p>  <p>Select the Domain, Private, or Public check box depending on the type of networks you want to allow access to.</p>
The screen freezes once a vision sensor is connected.	RT VisualBox (MELFA_RT-VB.exe) does not have permission to communicate through Windows Firewall.	<p>Change the settings so that RT VisualBox (MELFA_RT-VB.exe) has permission to communicate through Windows Firewall. Refer to "Cannot connect to the robot via Ethernet" and follow the same steps to change the firewall settings for MELFA_RT-VB.exe.</p> <p>Page 152 Q&A</p>

Problem	Cause	Solution
Cannot select the menu bar when using a touchscreen.	<p>The following issues arise when using this software on a touchscreen.</p> <ul style="list-style-type: none"> When the software window is maximized, the Minimize, Maximize and Close buttons are inoperable The window cannot be dragged using the menu bar and the Minimize, Maximize and Close buttons are inoperable in the left half of the screen 	<p>These issues occur with versions earlier than version 1.03D. Please update the software to version 1.03D or later.</p> <p>If any of these issues occur with versions earlier than version 1.03D, use a mouse or the Windows 11 Virtual Touchpad.</p> <p>Use the following steps to display the Virtual Touchpad.</p> <ol style="list-style-type: none"> Press and hold the Taskbar. Tap [Taskbar settings]. [Personalization > Taskbar] will appear. Tap to switch on [Virtual touchpad].  <p>4. Tap the touchpad icon that is displayed on the Taskbar.</p> 
Cannot see vision sensor image in the Adjusting the focus screen, or Autofocus fails.	The vision sensor settings may have been changed with dedicated vision sensor software.	<p>Use the steps below to reconnect the vision sensor and restart the operation.</p> <ol style="list-style-type: none"> Refer to the following page and carry out steps 1 to 3. <p> Page 126 Vision Sensor Connection</p> <ol style="list-style-type: none"> Tap/click the [Set] button indicated by "a" in step 4. Tap/click the [Connect] button as shown in step 5. Do not change the IP address or any other field. The robot controller and vision sensor will restart. Wait until the vision sensor has connected.
I want to move the robot by using a program created in simulation mode.	Programs created in simulation mode need to be written to the robot controller.	<p>Write the program to the controller using the following steps.</p> <ol style="list-style-type: none"> While in simulation mode, go to [Maintenance] → [Backup], then create a backup. Go to [Robot Connection] in the Menu, then tap/click [Change device]. Select the same project that was used in step 1, then connect to the robot. Go to [Maintenance] → [Restore], then select the backup that was created in step 1. If you do not wish to change the parameters in the robot controller, toggle the [Only restore the program.] switch to On. Tap/click [Start Restore] to write the backup to the robot controller.
After a connection to the robot is attempted, the screen still remains blank without any update.	<p>Only programs in visual programming format can be opened in RT VisualBox.</p> <p>A program edited in RT ToolBox3 or with the teaching pendant may be set in slot 1 of the robot controller.</p>	<p>Clear the program in slot 1.</p> <ul style="list-style-type: none"> Procedure in RT ToolBox3 <p>Refer to "Slot table parameters" in the following manual:</p> <p> RT ToolBox3 User's Manual (BFP-A3495)</p> <ul style="list-style-type: none"> Procedure on the teaching pendant <p>Delete the first element (program name) of the parameter "SLT1".</p>

MEMO

Appendix 2 Copyright & Disclaimer

MixedRealityToolkit-Unity

Copyright (c) Microsoft Corporation.

MIT License

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED *AS IS*, WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

REVISIONS

*The manual number is on the bottom left of the back cover.

Revision date	*Manual No.	Description
April 2020	BFP-A3696	First edition
August 2020	BFP-A3696-A	Added information on software trial version.
September 2020	BFP-A3696-B	<ul style="list-style-type: none">• Added support for pattern identification with a vision sensor.• Revised solution for instances where the menu bar cannot be selected when using a touchscreen.• Added Rotational mode to direct teaching.
July 2021	BFP-A3696-C	<ul style="list-style-type: none">• Added one case to the Q&A section.• Added precautions regarding the program modified date.• Corrected the weight of hands (HRC-03-099455 (ZIMMER), ROB-SET ECBPM ASSISTA (SCHMALZ)).
March 2023	BFP-A3696-D	<ul style="list-style-type: none">• Added support for Windows 11.• Added the program run operation to the calculate block (program block).
April 2024	BFP-A3696-E	<ul style="list-style-type: none">• Added the recommended hands (CONVUM, New-Era, and SMC).• Changed the specifications of the Calculate block.• Changed the conditions for saving a program.
October 2025	BFP-A3696-F	<ul style="list-style-type: none">• End of support for Windows 10

This manual confers no industrial property rights or any rights of any other kind, nor does it confer any patent licenses. Mitsubishi Electric Corporation cannot be held responsible for any problems involving industrial property rights which may occur as a result of using the contents noted in this manual.

© 2020 MITSUBISHI ELECTRIC CORPORATION

SOFTWARE REVISION HISTORY

Version	Release date	Description
1.00A	April 2020	First release
1.01B	August 2020	Added trial version.
1.03D	September 2020	<ul style="list-style-type: none">• Added support for pattern identification with a vision sensor.• Amended solution for instances where the menu bar cannot be selected when using a touchscreen.• Added Rotational mode to direct teaching.
1.10L	March 2023	<ul style="list-style-type: none">• Added support for Windows 11.• Added the program run operation to the calculate block (program block).
1.11M	April 2024	<ul style="list-style-type: none">• Added the recommended hands (CONVUM, New-Era, and SMC).• Changed the specifications of the Calculate block.• Changed the conditions for saving a program.
1.12N	October 2025	<ul style="list-style-type: none">• End of support for Windows 10

TRADEMARKS

Ethernet is a registered trademark of FUJIFILM Business Innovation Corp.

Microsoft and Windows are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

Adobe and Adobe Reader are registered trademarks of Adobe Systems Incorporated.

Unicode is either a registered trademark or a trademark of Unicode, Inc. in the United States and other countries.

The company names, system names, and product names mentioned in this manual are either registered trademarks or trademarks of their respective companies.

In some cases, trademark symbols such as [™] or [®] are omitted in this manual.

COPYRIGHTS

The screens (screenshots) are used in accordance with the Microsoft Corporation guideline.

BFP-A3696-F(2510)MEE

mitsubishi electric corporation

HEAD OFFICE: TOKYO BLDG., 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN
NAGOYA WORKS: 1-14, YADA-MINAMI 5-CHOME, HIGASHI-KU, NAGOYA 461-8670, JAPAN

Specifications subject to change without notice.