EPSON

Robot Controller Option
Teach Pendant TP4

Original instructions

©Seiko Epson Corporation 2023-2026

Rev.10
ENM263P8517F

Table of Contents

1. FOREWORD

1.1 FOREWORD

Thank you for purchasing our robot products.
This manual contains the information necessary for the correct use of the Teach Pendant.
Please carefully read this manual and other related manuals before installing the robot system.
Keep this manual handy for easy access at all times.

The robot system and its optional parts are shipped to our customers only after being subjected to the strictest quality controls, tests, and inspections to certify its compliance with our high performance standards. Please note that the basic performance of the product will not be exhibited if our robot system is used outside of the usage conditions and product specifications described in the manuals.

This manual describes possible dangers and consequences that we can foresee. Be sure to comply with safety precautions on this manual to use our robot system safety and correctly.

1.2 Trademarks

Microsoft, Windows, and the Windows logo are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries. All other company names, brand names, and product names are registered trademarks or trademarks of their respective companies.

1.3 TRADEMARK NOTATION IN THIS MANUAL

- Microsoft® Windows® 10 Operating system
  Microsoft® Windows® 11 Operating system
  Throughout this manual, Windows 10 and Windows 11 refer to each of the above operating systems, respectively. In some cases, Windows refers generically to Windows 10 and Windows 11.
- A coordinate point including the arm pose is defined as “position (point),” and the data is called “point data.”

1.4 Terms of Use

No part of this instruction manual may be reproduced or reprinted in any form without express written permission.
The information in this document is subject to change without notice.
Please contact us if you find any errors in this document or if you have any questions about the information in this document.

1.5 Manufacturer

SEIKO EPSON CORPORATION

1.6 Contact Information

Contact information details are listed in the "Supplier" section in the following manual.
Note that the contact information may vary depending on your region.
"Safety Manual - Contact Information"

The Safety Manual is also available at the following site.
URL: https://download.epson.biz/robots/

1.7 Disposal of Battery

1.7.1 For Customers in the European Union

The crossed out wheeled bin label that can be found on your product indicates that this product and incorporated batteries should not be disposed of via the normal household waste stream.
To prevent adverse effects on the environment and human health, the product and its batteries should be separated from other waste and recycled in an environmentally responsible manner. Contact your local government or product distributor for information on collection facilities.
The Pb, Cd, or Hg symbol means that these metals are used in the battery.

KEY POINTS

This information only applies to customers in the European Union, according to Directive 2006/66/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL OF 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC and legislation transposing and implementing it into the various national legal systems, and to customers in countries in Europe, Middle East and Africa (EMEA) where they have implemented equivalent regulations.

For information on recycling products in other countries, please contact your local government.

1.7.2 For Customers in the Taiwan Region

Used batteries should be separated from other waste and recycled in an environmentally responsible manner. Contact your local government or product distributor for information on collection facilities.

1.8 Before Reading This Manual

⚠ CAUTION

- Required organizational measures against cybersecurity risks

  The following organizational measures against cybersecurity risks are required:

  - Perform risk analysis based on security risks and vulnerabilities related to the organization's assets.
  - Establish security policies against cybersecurity risks and educate and train appropriate personnel.
  - Create guidelines to address security issues and keep every person in your organization informed about them.
- Do not connect any other devices than specified in this manual to the external connectors of this product. Also do not use the external connectors for any other purposes than specified in this manual. Doing so may cause unauthorized login, data falsification, data leakage, and/or interruption of the robot system.

1.9 Control System Configuration

This option is used with the following combinations of Manipulators and Controller firmware.

Manipulator	Controller	Controller Firmware
T series	-	7.5.54.x or later
T-B series	-	7.5.54.x or later
VT series	-	7.5.54.x or later
VT-B series	-	7.5.58.x or later
RS series	RC700-A	7.5.4.x or later
N series	RC700-A	7.5.4.x or later
G series	RC700-A	7.5.4.x or later *1
C4 series	RC700-A	7.5.4.x or later *1
C8, C12 series	RC700-A	7.5.4.x or later *1
GX series	RC700-D	7.5.4.x or later
GX4-B, GX8-B series	RC700-E	7.5.4.x or later
GX10-B, GX20-B series	RC700-E	7.5.4.x or later
C4-B, C8-B, C12-B series	RC700-E	7.5.4.x or later
GX4-C, GX8-C series	RC800-A	8.0.0.4 or later
GX10-C, GX20-C series	RC800-A	8.0.0.4 or later
C8-C, C12-C series	RC800-A	8.0.0.10 or later
CX4-A, CX7-A series	RC800-A	8.1.x.x or later
GX1-C series	RC800-A	8.0.0.10 or later

Manipulator	Controller	Controller Firmware
RS-C series	RC800-A	8.1.1.0 or later
LS20-C series	RC800-A	8.1.x.x or later
LS50-C series	RC800-A	8.1.0.8 or later
LS4-C, LS8-C series	RC800-A	8.1.x.x or later

*1 If the Controller is configured using CU or DU, a Controller firmware version that is 7.5.4.16 or later is required.

1.10 For T series Manipulator user only

T series Manipulators are Controller integrated Manipulators.
Read “Controller” and “Robot Controller” described in this manual as “T series Manipulator”.

1.11 For VT series Manipulator user only

VT series Manipulators are Controller integrated Manipulators.
Read “Controller” and “Robot Controller” described in this manual as “VT series Manipulator”.

2. Functions & Installation

This section contains information about functions and installation of the Teach Pendant to be known before operation and maintenance.

2.1 Safety

2.1.1 Safety

This product is a device dedicated to Epson robots used in industrial environments.
Before using this product, refer to the following manual for the basic safety precautions:
Safety Manual
Keep this manual handy for easy access at all times.

Conventions
Safety precautions are indicated by the following symbols. Be sure to read them.

⚠ WARNING

This symbol indicates that a danger of possible serious injury or death exists if the associated instructions are not followed properly.

⚠ WARNING

This symbol indicates that a danger of possible harm to people caused by electric shock exists if the associated instructions are not followed properly.

⚠ CAUTION

This symbol indicates that a danger of possible harm to people or physical damage to equipment and facilities exists if the associated instructions are not followed properly.

KEY POINTS

The “TIP” sections describe hints for easier or alternative operations.

2.1.1.1 Safety Precautions

⚠ WARNING

- The robot system should be designed and installed by personnel who has taken robot system training held by us and suppliers.
- Only qualified personnel who have taken the safety training should be allowed to execute teaching or calibration of the robot system. The safety training is the program for industrial robot operator that follows the laws and regulations of each nation. The personnel who have taken the safety training acquire knowledge of industrial robots (operations, teaching, etc.). The personnel who have completed the robot system-training class held by the manufacturer, dealer, or locally-incorporated company are allowed to maintain the robot system.
- Only personnel who has taken maintenance training held by us and suppliers should be allowed to perform the maintenance of robot system.

- Immediately press the Emergency Stop switch whenever you suspect any danger. The Teach Pendant is equipped with an Emergency Stop switch. Before operating the Teach Pendant, make sure that the Emergency Stop switch on the Teach Pendant functions properly. Operating the Teach Pendant when the switch does not function properly is extremely hazardous and may result in serious bodily injury and/or serious damage to the equipment, as the switch cannot fulfill its intended function in an emergency. When nothing appears on its display window, the Teach Pendant is not connected with the Controller. In this case, the Emergency Stop switch on the Teach Pendant will not function.
- If the Teach Pendant is not connected to the Controller, DO NOT place it within easy reach during operation. You might press the Emergency Stop switch on the unconnected Teach Pendant by mistake to stop the robot system in an emergency. Pressing the Emergency Stop switch on the disconnected Teach Pendant in an emergency is extremely hazardous and may cause serious safety problems.
- When entering the safeguarded area for teaching, change the mode of the Teach Pendant to TEACH and take out the key for the mode selector key switch and then enter the safeguarded area with the key. Leaving the key in the mode selector key switch is extremely hazardous and may cause serious safety problems as someone else may inadvertently change the mode to the automatic operation.
- Be sure to switch the mode outside the safeguarded area.

⚠ WARNING

Be sure to connect the cables between the Controller and the Teach Pendant properly. Do not allow unnecessary strain on the cables. (Do not put heavy objects on the cables. Do not bend or pull the cables forcibly.) The unnecessary strain on the cables may result in damage to the cables, disconnection, and/or contact failure. Damaged cables, disconnection, or contact failure is extremely hazardous and may result in electric shock and/or improper function of the system. Do not use the cables near heat or fire.

⚠ CAUTION

- Do not shock the Teach Pendant physically or place any object on Teach Pendant. A liquid crystal display is used for the Teach Pendant display. If the display is damaged, liquid crystal may leak out. Liquid crystal is harmful. If it sticks on your skin or clothes, immediately wash your skin and clothes thoroughly with clean water and soap immediately.
- The Teach Pendant must be used within the environmental conditions described in this manual. This product has been designed and manufactured strictly for use in a normal indoor environment. Using this product in the environment that exceeds the conditions may not only shorten the life cycle of the product but also cause serious safety problems.
- Do not disassemble, repair, or modify the Teach Pendant by yourself. Improper disassembly, repair, or modification of the Teach Pendant may cause not only improper function of the robot system but also serious safety problems.
- Since Teach Pendant is susceptible to electrostatic discharge, do not open the housing or touch screws while power is applied to it (except for the maintenance cover).

2.1.1.2 Safety-related Requirements

Specific tolerances and operating conditions for safety are contained in the manuals for the robot, Controller and other devices. Be sure to read those manuals as well. The following are examples of safety standards related to robot systems and other safety standards. Therefore, to ensure that safety measures are complete, please refer to the other standards listed as well. (Note: The following is only a partial list of the necessary safety standards.)

ISO 10218-1	Robots and robotic devices -- Safety requirements for industrial robots – Part 1: Robots
ISO 10218-2	Robots and robotic devices -- Safety requirements for industrial robots -- Part 2: Robot systems and integration
ANSI/RIA R15.06	American National Standard for Industrial Robots and Robot Systems -- Safety Requirements
ISO 12100	Safety of machinery -- General principles for design -- Risk assessment and risk reduction
ISO 13849-1	Safety of machinery -- Safety-related parts of control systems -- Part 1: General principles for design
ISO 13850	Safety of machinery -- Emergency stop -- Principles for design
ISO 13855	Safety of machinery - Positioning of safeguards with respect to the approach speeds of parts of the human body.
ISO 13857	Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs.
ISO 14120	Safety of machinery -- Guards -- General requirements for the design and construction of fixed and movable guards
IEC 60204-1	Safety of machinery -- Electrical equipment of machines -- Part 1: General requirements
CISPR11	Industrial, scientific and medical (ISM) radio-frequency equipment -- Electromagnetic disturbance characteristics -- Limits and methods of measurement
IEC 61000-6-2	Electromagnetic compatibility (EMC) -- Part 6-2: Generic standards -- Immunity for industrial environments

2.1.2 Emergency Stop

⚠ WARNING

Immediately press the Emergency Stop switch whenever you suspect any danger. The Teach Pendant is equipped with an Emergency Stop switch. Before operating the Teach Pendant, make sure that the Emergency Stop switch on the Teach Pendant functions properly. Operating the Teach Pendant when the switch does not function properly is extremely hazardous and may result in serious bodily injury and/or serious damage to the equipment, as the switch cannot fulfill its intended function in an emergency. When nothing appears on its display window, the Teach Pendant is not connected with the Controller. In this case, the Emergency Stop switch on the Teach Pendant will not function.

Pressing the Emergency Stop switch stops program execution and stops excitation of the motors on the robot axes. Programs and point data will not be corrupted.
When pushed, the Emergency Stop switch holds the Emergency Stop state mechanically and electrically.

How to reset EMERGENCY STOP

Follow the steps below to reset the Emergency Stop state.

1. Remove the cause of the Emergency Stop and verify that it is safe to operate the robot again.
2. Turn the Emergency Stop switch right and release the mechanical hold.
3. Turn the Teach Pendant mode selector key switch to “TEACH”.
4. Press the [Reset] button on the operation keys to reset the Emergency Stop state.

5. Check that [EStop] on the status bar of the touch panel is “OFF”.

2.1.3 Enable Switch

> ⚠ WARNING
>
> The Teach Pendant is equipped with the Enable switch. Before operating the Teach Pendant, make sure that the Enable switch on the Teach Pendant functions properly. Operating the Teach Pendant when the switch does not function properly is extremely hazardous and may result in serious bodily injury and/or serious damage to the equipment, as the switch cannot fulfill its intended safety functions. When nothing appears on its display window, the Teach Pendant is not connected with the Controller. In this case, the Enable switch on the Teach Pendant will not function.

Refer to the following for how to inspect the Enable switch.
Periodic Inspections

2.1.4 Using Teach Pendant in Safeguarded Area

When you switch the mode selector switch of the Teach Pendant to “TEACH” mode and hold down the Enable Switch, you can jog and move the robot in slow speed while the safeguard is open.
When you switch to the test mode (T1 or T2) and hold down the Enable Switch, you can verify a program while the safeguard is open.
Person who will be using the Teach Pendant should be thoroughly trained on how to use it.
Follow the guidelines below when using the Teach Pendant in the safeguarded area:

1. Before entering the safeguarded area to use the Teach Pendant, turn the mode selector key switch to “TEACH”.
2. Pull out the mode selector key and enter the safeguarded area, and then perform teaching operations and verify a program in “TEACH” or “TEST”.
3. After teaching is completed, leave the safeguarded area and close the safeguard.
4. Switch the mode selector key switch to “AUTO”.
5. Close the latch release input. For details of signal assignment of the latch release input, refer to the following manual:
   "RC700 series Manual"
   "RC700-D Manual"
   "RC700-E Manual"
   "RC800-A Manual"
   "T series Manual"
   "T-B series Manual"
   "VT series Manual"

> KEY POINTS
>
> TEACH mode status is latched by software.

To switch the mode from TEACH to AUTO, release the latched condition by inputting the latch release input signal.

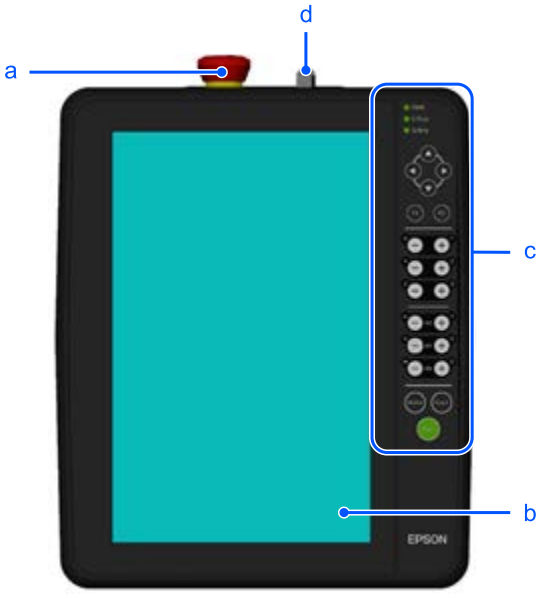
⚠ CAUTION

Although the Teach Pendant can be operated inside the safeguarded area as described above, operate the robot system while all operators are outside of the safeguarded area wherever possible.

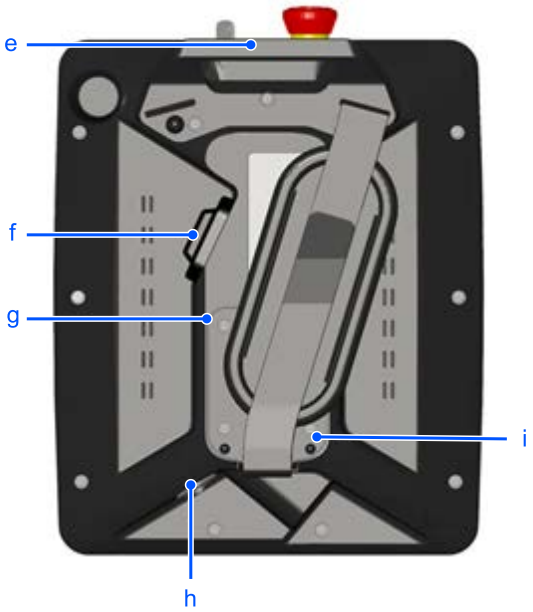
2.2 Specification

2.2.1 Part Names and Functions

Front view



Back view



a: EMERGENCY STOP switch

The EMERGENCY STOP switch is used to stop the Teach Pendant immediately. When this switch is pushed, the Emergency

Stop state is held both mechanically and electrically. Pushing the switch stops the program, removes power to robot motors and stops the Manipulator motion immediately.
Reference: **Emergency Stop**

b: Touch panel
The touch panel is used to display various kinds of information, select the functions, and enter the setting values.

c: Operation keys
The keys are used for teaching operation and command execution.

d: Mode selector key switch
The mode selector key switch is used to change the operation mode between TEACH*1 and AUTO. The mode can be fixed by pulling out the key.
*1: For the test mode: T1 and T2
When the mode is switched while a program is running, the program will be stopped.
To switch the mode from TEACH to AUTO, release the latched condition using the latch release input.
To change to the test mode, switch the mode selector key switch to TEACH, and tap the [Test] tab on the touch panel.
Reference: **Operation Mode (TEACH, AUTO, TEST)**

KEY POINTS

T2 mode cannot be used on RC700-A and RC700-D Controllers complying with the UL standards.

For RC700-E and RC800-A Contollers, T2 mode can be used.

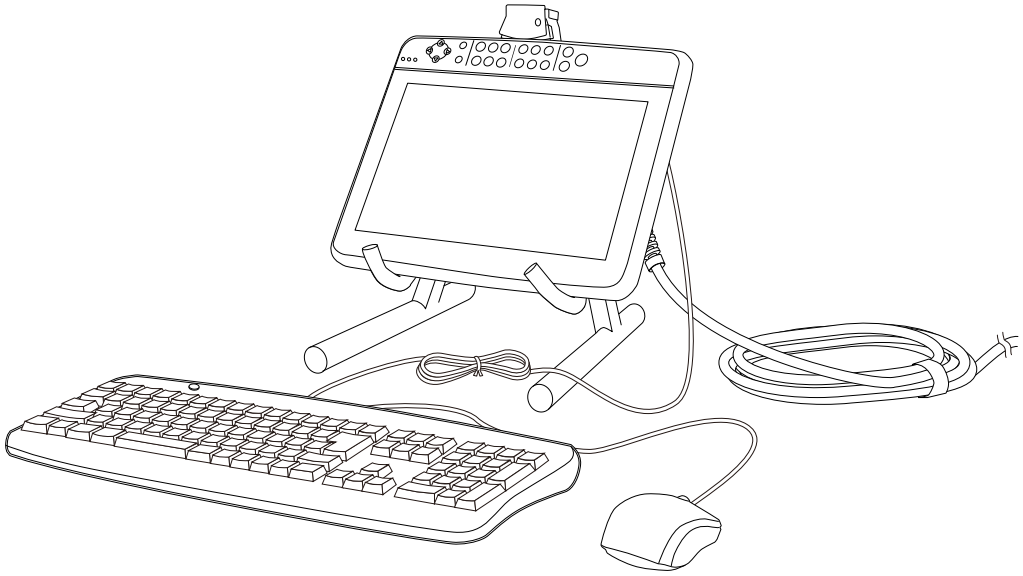
e: Handle
The handle is used to carry or operate the Teach Pendant, as well as to attach it to a panel using the optional Wall Bracket.
Reference: **Wall Bracket (Option)**

f: Enable switch
This is a three-position Enable switch. To operate the robot in the TEACH mode, grip the switch and use the jog keys. When operating the robot in the test mode, set the switch to ON position. The switch turns ON when it is at the midpoint, and it turns OFF when it is fully gripped or released.

g: Rear handle
The rear handle is used to carry or operate the Teach Pendant.

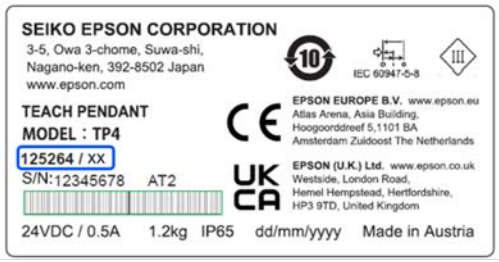
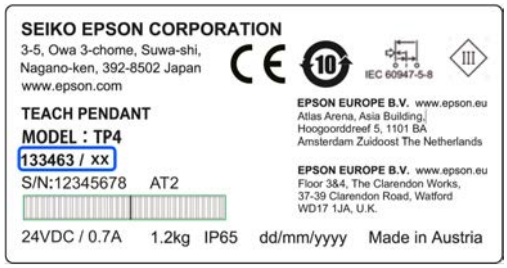
h: USB port
Connect the USB flash drive to this port to update the software.
For more information to get the software, refer to the following manual in Epson Robot Software Installer software disc.
"Epson Robot Software Installer"
To check the current software version, refer to the following section:
System Information
To update the Teach Pendant, refer to the following section:
Home Screen
In the AUTO mode, connect the keyboard or mouse to this port to easily input data.
For AUTO mode, it may be difficult to tap the teach pendant screen.

We recommend connecting a mouse and keyboard to operate the device.
(Reference diagram)

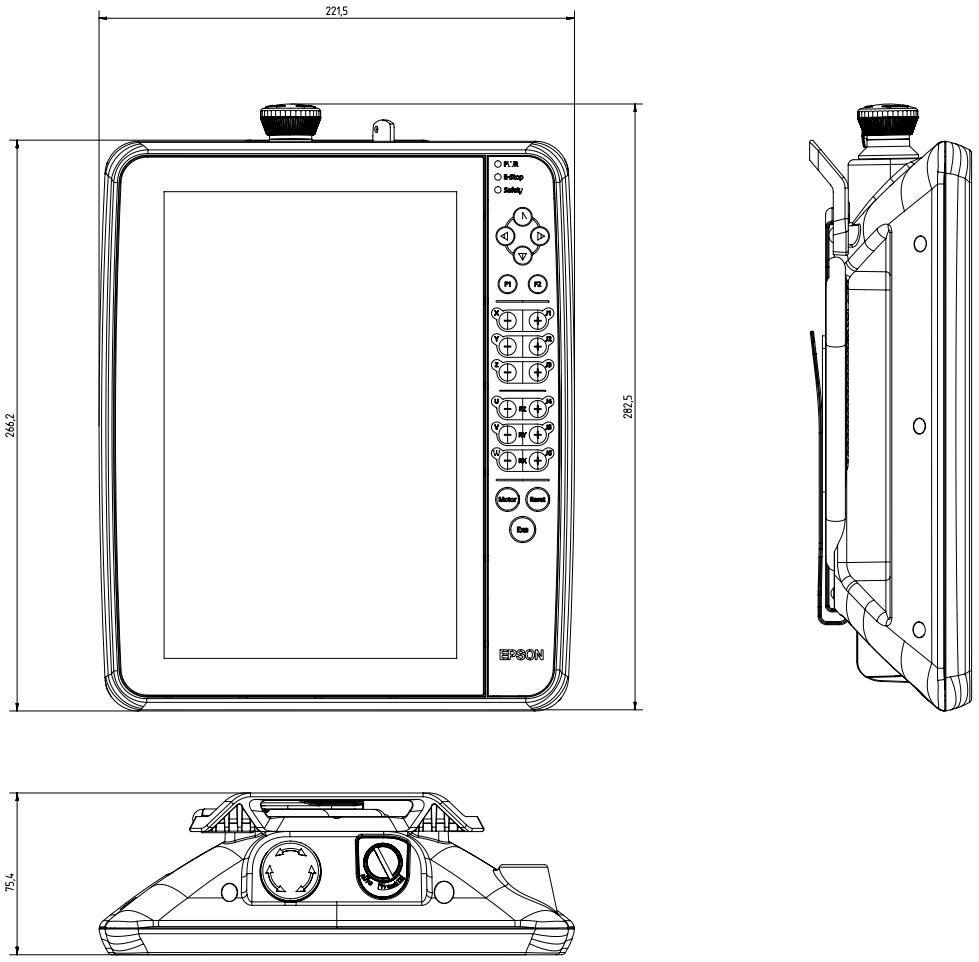


i: Maintenance cover
Open this cover for maintenance.

2.2.2 Standard Specifications

Item		Specification
General specifications	Rated voltage	24 VDC
	Current consumption	 Mat. Nr.: 125264 : 0.5A  Mat. Nr.: 133463 : 0.7A
	Weight	Approx. 1.2 kg (excluding cables)
Display specifications	Size	10.1-inch TFT display
	Pixels	1280 × 800

2.2.3 Outer Dimensions



(Unit: mm)

KEY POINTS

Use the Wall Bracket (Option) when attaching the Teach Pendant to a panel, or the like.

2.3 Installation

2.3.1 Contents

- Teach Pendant (with cables): 1 unit
- Mode selector key: 2 units
- Epson Robot Software Installer (software disc): 1 disc

2.3.2 Environmental Conditions

The Teach Pendant must be used in an environment that conforms to the following requirements to ensure safe and reliable operation.

Item	Condition
Ambient temperature	0 to 45°C (with minimal variation)

Item	Condition
Ambient relative humidity	5 to 95% (no dewing)
Protection structure	IP65
Environment	■ Install the product at a well-ventilated indoor place. ■ Avoid direct sunlight. ■ Avoid radiated heat. ■ Keep the product away from dust, oily mist, oily smoke, salinity, metal powder, corrosive gas, and other contaminants. ■ Avoid impact and vibration. ■ Keep the product away from relays, contactors, and other electric noise sources. ■ Avoid strong magnetic field or electric field.
Storage condition	Storage temperature: -25°C to +70°C
Operating condition	■ Vibration resistance in accordance with IEC 60068-2-6: Frequency range 5 Hz ≤ f < 150 Hz (with an amplitude of 3.5 mm) ■ Impact resistance in accordance with EN 61131-2 or EN 60068-2-27: 15 g (acceleration) / 11 ms (duration) ■ Attitude (above sea level): 2,000 m or lower

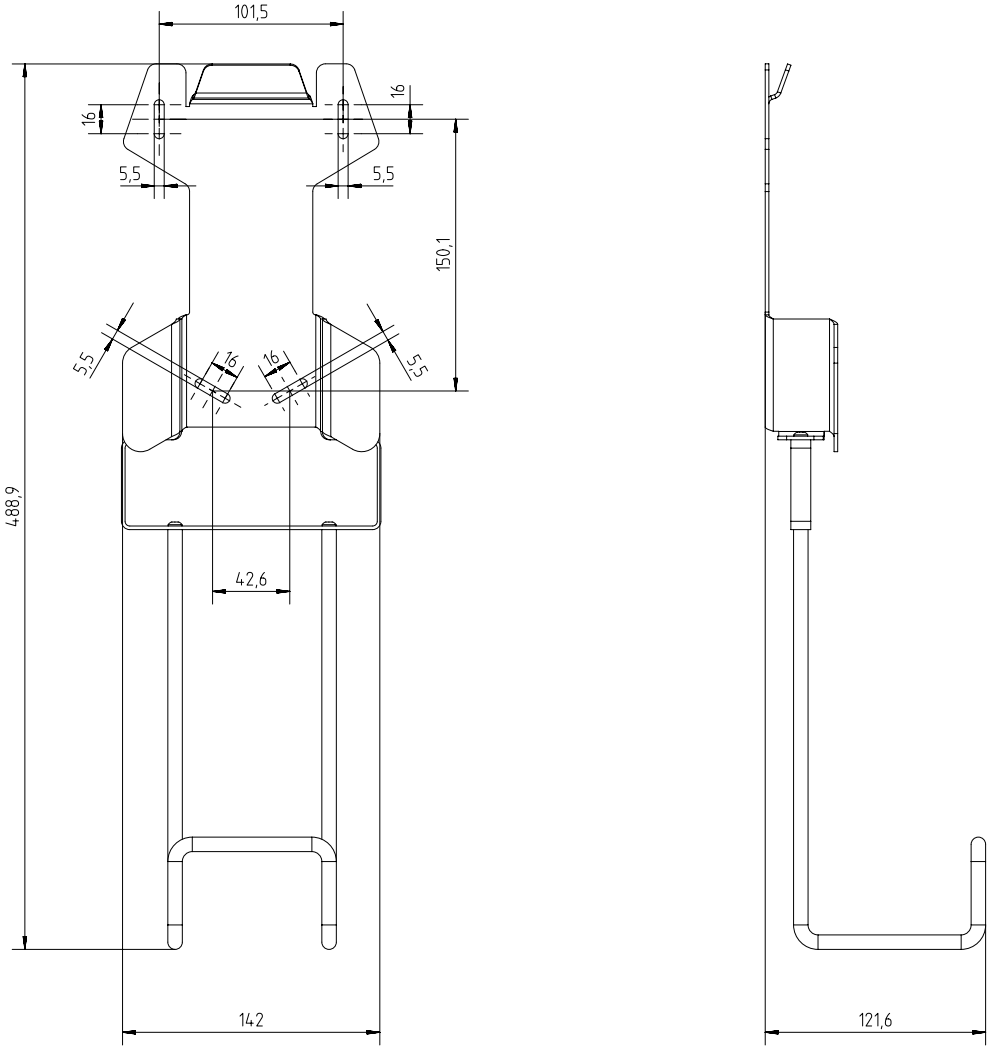
2.3.3 Operating Precautions

⚠ CAUTION

- Do not drop the Teach Pendant or hit hard against other objects to avoid damage. As the case of the Teach Pendant may be damaged since the main body is made of resin.
- Do not hit the touch panel of the Teach Pendant against a hard object or put excessive pressure on it. The touch panel is made of glass. Therefore, if excessive pressure is put on it, it may be damaged.
- Do not press or rub the surface of the front panel push buttons with a hard object such as a tool. The surface of the buttons may be damaged as they are easily scratched.
- Wipe the dirt and oils adhering to the surface of the Teach Pendant display with a soft cloth dampened with neutral detergent or alcohol solvent.
- Put the Teach Pendant in the packaging box when transporting it. The rear handle may got broken if the product is not treated properly.

2.3.4 Wall Bracket (Option)

2.3.4.1 Outer Dimensions

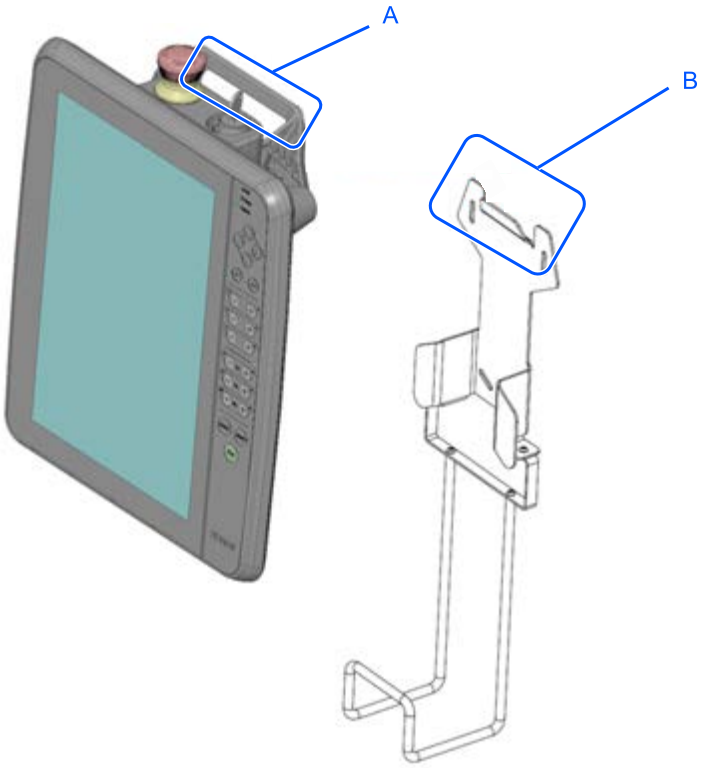


2.3.4.2 How to Mount and Use the Teach Pendant

To use the Teach Pendant with the wall bracket, follow the steps below.
For the screw mounting locations, refer to the following:

Outer Dimensions

1. Screw the Wall Bracket and fix it to the wall. Mounting locations: 4 locations, Screw size: M5
2. Hang A of the Teach Pendant on B of the Wall Bracket.



⚠ CAUTION

If attaching the Wall Bracket at a high position, or installing or uninstalling the Teach Pendant, use a fall prevention strap. If the Teach Pendant is dropped from a high position, it may get broken.

2.3.5 Connection

This section describes the connection of the Controller and the Teach Pendant. You can connect the dedicated main cable only.

⚠ CAUTION

- Be sure to connect the cables of Controller and Teach Pendant properly. Do not allow unnecessary strain on the cables. (Do not put heavy objects on the cables. Do not bend or pull the cables forcibly.) The unnecessary strain on the cables may result in damage to the cables, disconnection, and/or contact failure. Damaged cables, disconnection, or contact failure is extremely hazardous and may result in improper function of the system.
- Make sure that the pins are not bent when connecting the connector. Connecting the connector with the pin bent may cause malfunction and result in improper function of the system.

2.3.5.1 Connection to the Robot Controller

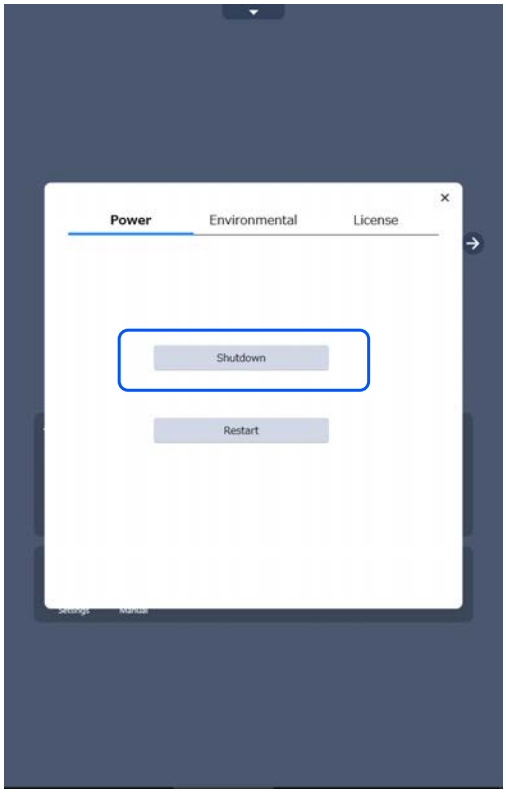
1. Check that the Controller and the Robot are connected properly.
2. Connect the connector of the Teach Pendant to the TP port of the Controller. Turn the △ mark on the connector of the Teach Pendant upwards and push while aligning to the △ mark of the connector on the Controller.
3. Turn ON the controller.

KEY POINTS

- When the Teach Pendant connector is removed from the Controller with the mode selector key switch of the Teach Pendant in “TEACH” position, the operation mode will remain in TEACH mode. The operation mode cannot be switched to AUTO mode. Make sure to remove the Teach Pendant after switching the operation mode to “AUTO”.
  When switching from TEACH mode to AUTO mode, the latch must be released.
- The Controller enters the Emergency Stop state if nothing is connected to the TP port. Connect the TP bypass plug when the Teach Pendant is not connected.

Removal from the Robot Controller

1. Switch the mode selector key switch to “AUTO”.
   When switching from TEACH mode to AUTO mode, the latch must be released.
2. Tap the [HOME] button to display the home screen.
3. Tap the [Settings] button to start the application.
4. Select “Power” from the tab.
5. Tap the [Shutdown] button to shut down the Teach Pendant.



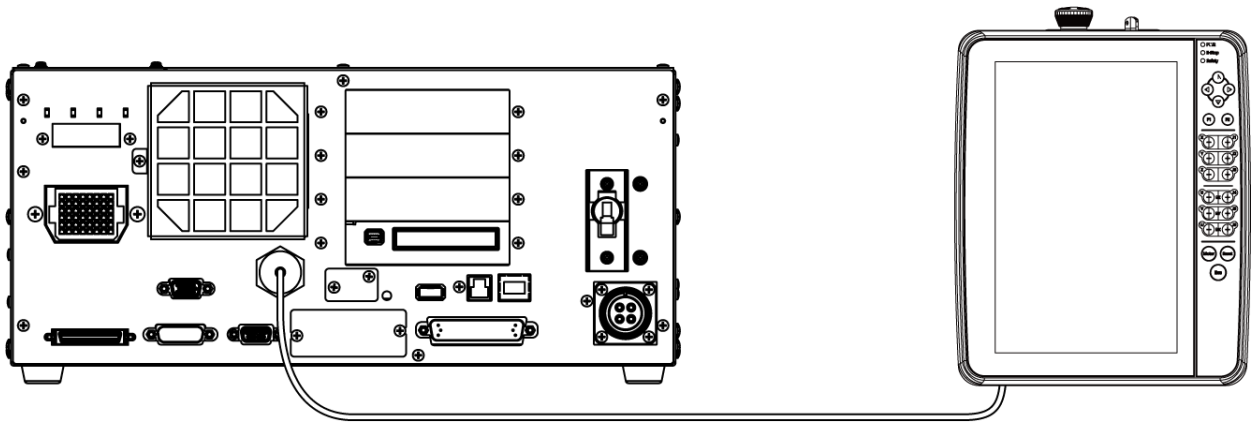
6. Turn the connector of the Teach Pendant counterclockwise lightly and pull it from the TP port of the Controller.

⚠ CAUTION

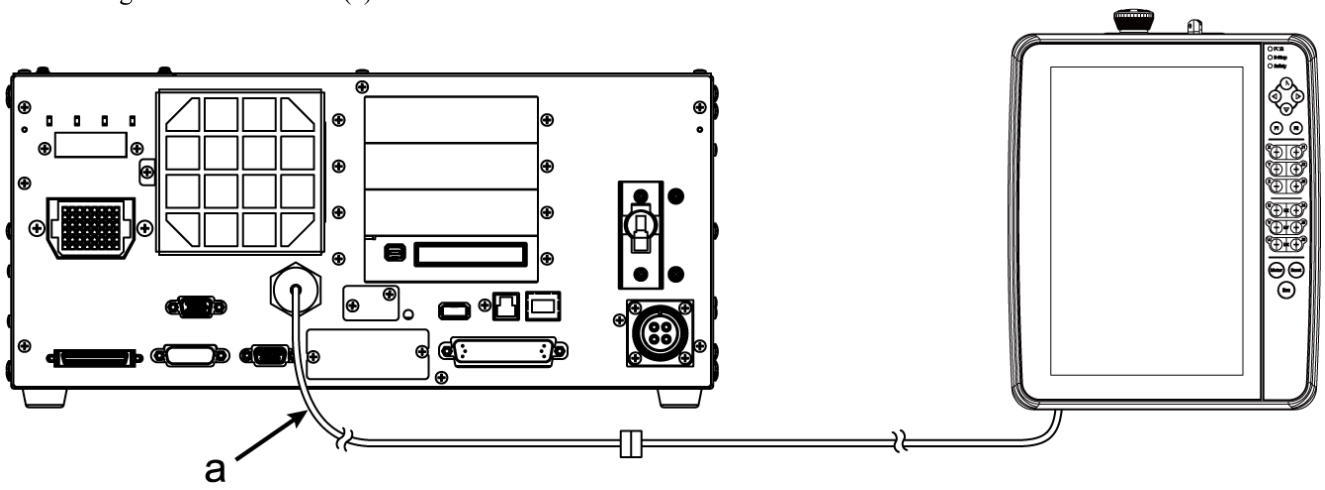
Before removing the Teach Pendant connector from the TP port on the Controller, be sure to shut down the Teach Pendant by tapping the [Shutdown] button on the [Power] panel. If the connector is removed without shutting down, the data may not be saved properly.

2.3.5.2 Connection Examples

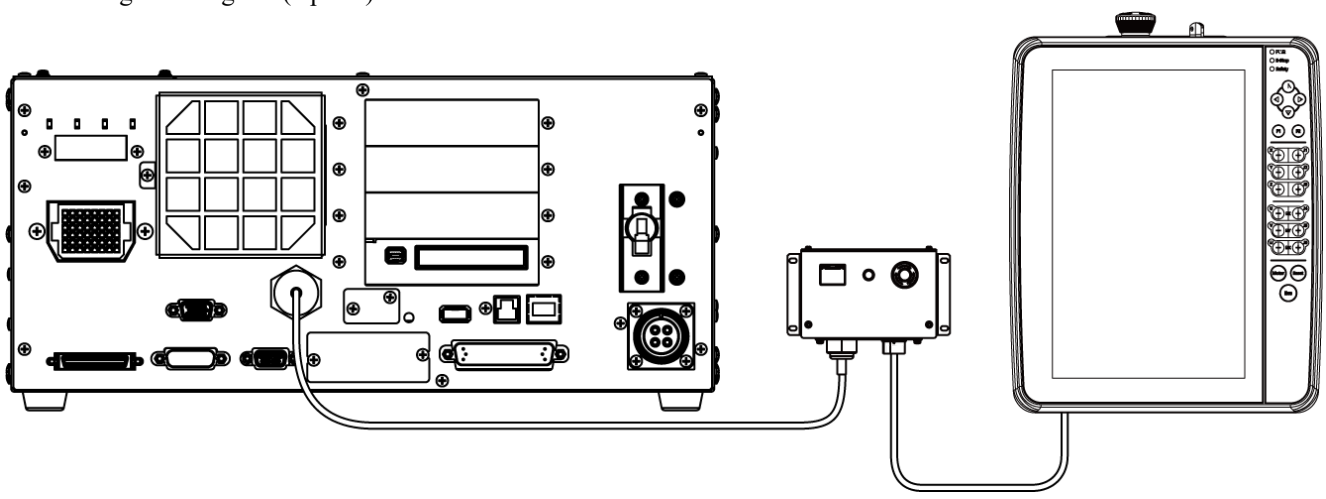
When connecting the Teach Pendant to the Controller directly:



When using an extension cable (a):



When using Hot Plug Kit (Option):

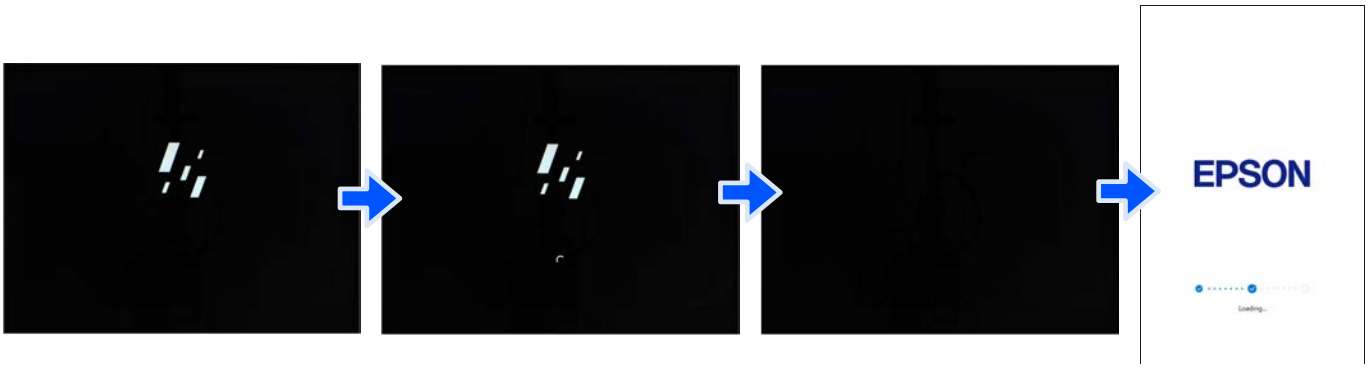


KEY POINTS

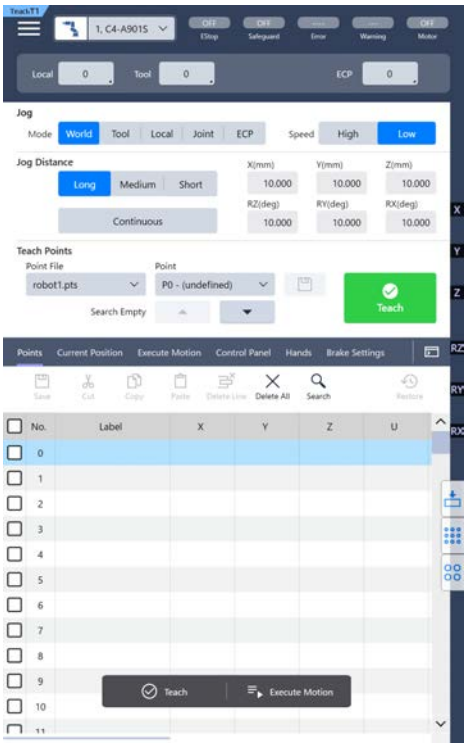
To extend the cable, use the extension cable.

2.3.6 Power-On

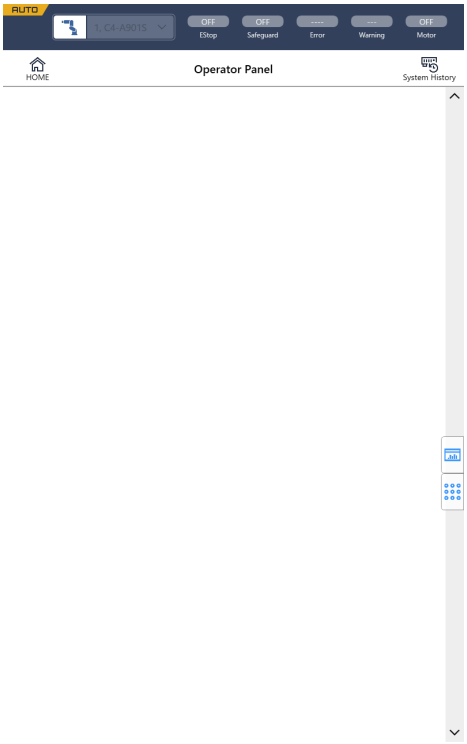
The power to the Teach Pendant is supplied via the TP connector on the Controller.
After the screen translation below, communication between the Controller and the Teach Pendant is established and then the screen will switch to the TEACH mode / AUTO mode.



TEACH mode



AUTO mode



2.4 Operation Mode (TEACH, AUTO, TEST)

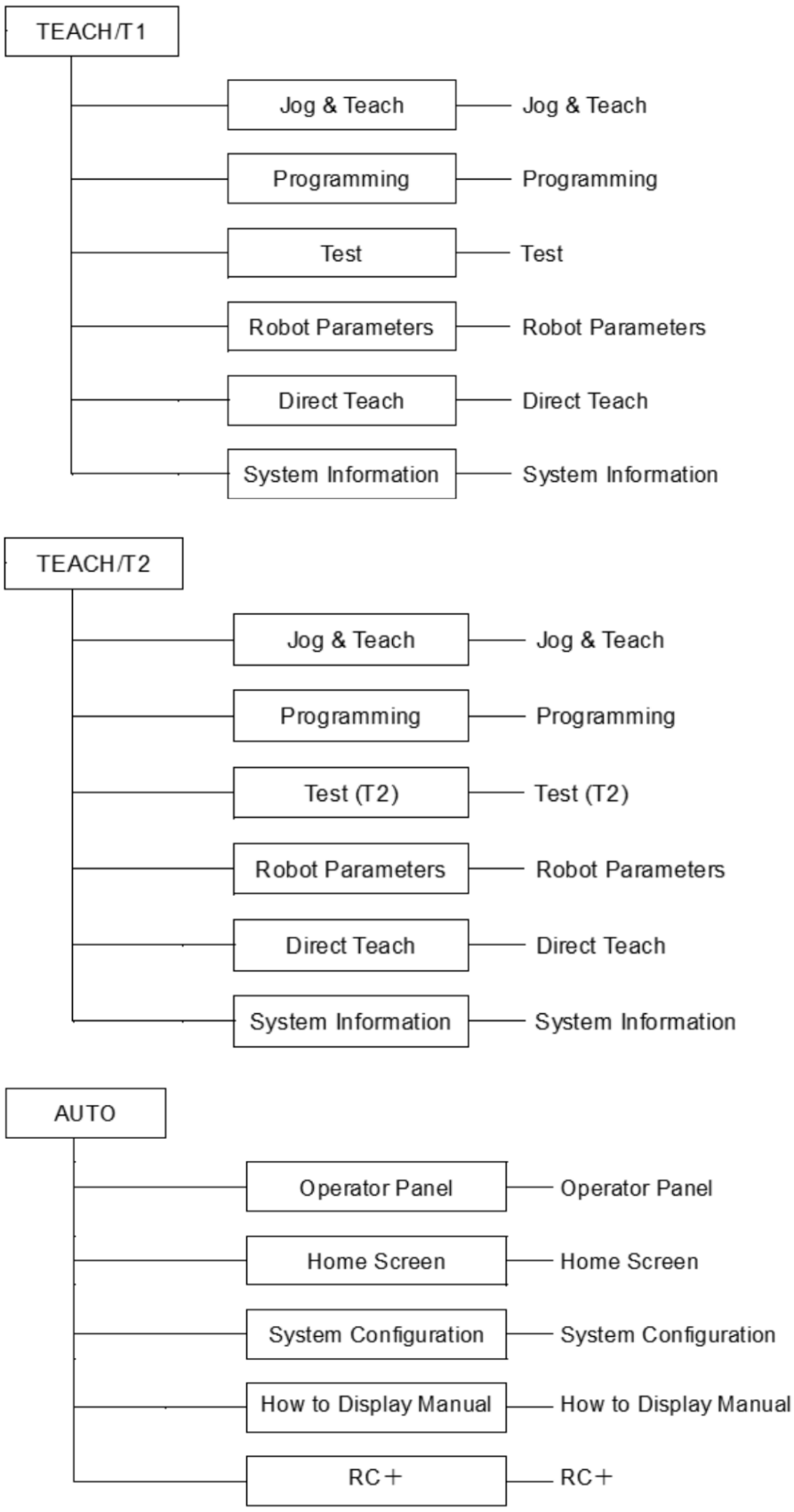
KEY POINTS

A coordinate point including the arm pose is defined as “position (point),” and the data is called “point data.”

2.4.1 Overview of Operation Mode

The robot system has three operation modes: TEACH, AUTO, and TEST modes.

TEACH mode	This mode enables point data teaching and checking close from the Robot using the Teach Pendant. Robot operates in Low power status.
AUTO mode	This mode enables automatic operation (program execution) of the Robot system at the factory. In this mode, robot operation and program execution are not allowed when the safeguard is open.
TEST mode	T1: This mode enables program verification while the Enable switch is held down and the safeguard is open. This is a low speed program verification function (T1: manual deceleration mode) which is defined in Safety Standards. In this mode, the specified Function can be executed with multi-task / single-task, multi-Manipulator / single-Manipulator at low speed. T2: This mode enables program verification while the Enable switch is held down and the safeguard is open. This is a high speed program verification function (T2: manual acceleration mode) which is defined in Safety Standards. Unlike the TEST/T1, the program verification in a high speed is available in this mode. In this mode, the specified Function can be executed with multi-task / single-task, multi-Manipulator / single-Manipulator at high speed.



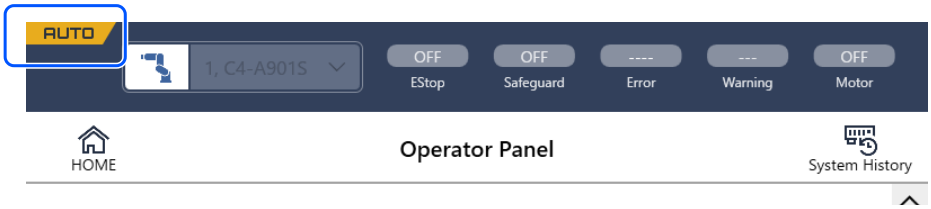
KEY POINTS

T2 mode cannot be used on RC700-A and RC700-D Controllers complying with the UL standards.

For RC700-E and RC800-A Contollers, T2 mode can be used.

2.4.2 Switching the Operation Mode

The mode selector key switch on the Teach Pendant switches between TEACH mode and AUTO mode. To change to TEST (T1 or T2) mode, switch the mode selector key switch to TEACH, and then tap [Test] on the touch panel menu. For the current mode, check the badge at the top left of the screen.



TEACH mode	Turn the mode selector key switch to “TEACH” for TEACH mode. (TEACH mode is available when the key switch is either at TEACH/T1 or TEACH/T2) The running program pauses when the operation mode is switched to TEACH mode. In addition, the moving robot immediately stops. (Quick Pause)
AUTO mode	Turn the mode selector key switch to “AUTO”, and then do the following operation to change to AUTO mode. - For RC700-A/RC700-D Turn on the latch release input of the EMERGENCY connector to release the latch status. - For RC700-E/RC800-A Turn on the latch release input of the Safety I/O connector to release the latch status.
TEST mode	T1: Turn the mode selector key switch to “TEACH/T1” for “TEACH” mode. Tap [Test] on the menu to change the mode to T1. T2: Turn the mode selector key switch to “TEACH/T2” for “TEACH” mode. Tap [Test (T2)] on the menu to change the mode to T2. Enter the password if it is set. T2 mode cannot be used on RC700-A and RC700-D Controllers complying with the UL standards. For RC700-E and RC800-A Contollers, T2 mode can be used.

TEACH mode status is latched by software.
To switch the mode from TEACH to AUTO, release the latched condition using the latch release input.

⚠ WARNING

Be sure to switch the mode to AUTO outside the safeguarded area with safety secured. When switching the mode, the message “Workers must leave the safeguarded area” appears on the display. Ensure safety when working.

For details on how to release latch, refer to the following manuals:
"RC700 series Manual"
"RC700-D Manual"
"RC700-E Manual"
"RC800-A Manual"
"T series Manual"
"T-B series Manual"
"VT series Manual"

KEY POINTS

When the mode is switched with the mode selector key switch, the motor is turned off.
When switching from TEACH mode to AUTO mode, the latch must be released.

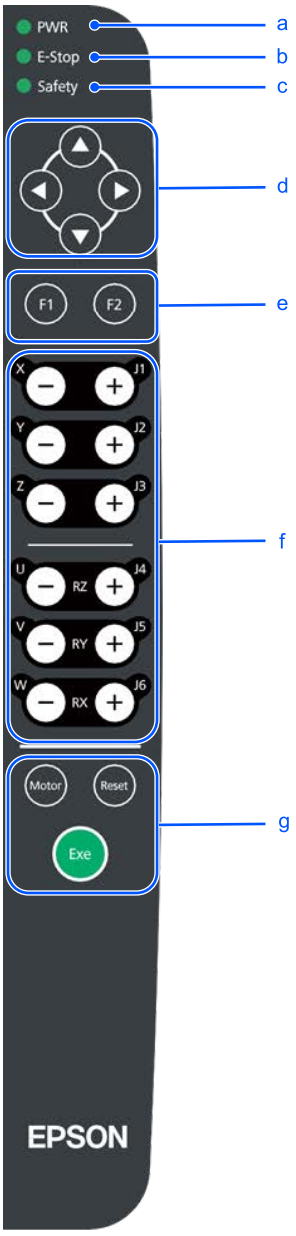
KEY POINTS

Turn off enable switch, when you switch the mode with the mode selector key switch.

If the mode is switched with the mode selector key switch while the enable switch is turned on, and the motor is turned on, an error will occur. Be sure to turn the enable switch off once and then on again before turning the motor on.

2.5 Operation Key

2.5.1 Operation Key Description



a: PWR
Turns on when the power is supplied.

b: E-Stop
Turns on when the product is in the Emergency Stop state.

c: Safety
Turns on when the safeguard is open.

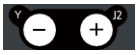
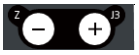
d: Arrow Keys
Use the arrow keys to move the cursor.

e: Function Keys
Descriptions for function keys are as follows:

Function Keys	Description
F1 key 	**When connecting to TEACH mode:** Stores the current position data at the following panels: - Jog & Teach - Direct Teach Displays screen keyboard at the following panels: - Command Window - Program Editing - Point Data Editing **When RC+ is on:** Stores the project.
F2 key 	**When connecting to TEACH mode:** Stores the following data: - Jog & Teach (point data) - Programming (program file or point data) - Robot parameters (local coordinates, tool coordinates, additional arms) - Direct Teach (point data) **When RC+ is on:** Builds the project.

f: Jog Key

Descriptions for the jog keys are as follows. You can use the keys when connecting to TEACH mode or RC+ is on.

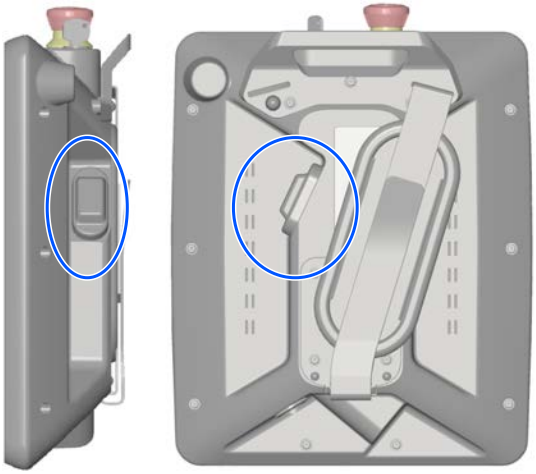
Jog Key	Description	
	Joint mode	Jogs J1
	Other than Joint mode	Jogs in X direction of the rectangular coordinate system
	Joint mode	Jogs J2
	Other than Joint mode	Jogs in Y direction of the rectangular coordinate system
	Joint mode	Jogs J3
	Other than Joint mode	Jogs in Z direction of the rectangular coordinate system
	Joint mode	Jogs J4 or J7
	Other than Joint mode	Rotates the tool coordinate system around the Z axis of the rectangular coordinate system.
	Joint mode	Jogs J5 or J8 (additional axis) You can use the additional axis only when in TEACH mode.
	Other than Joint mode	Rotates the tool coordinate system around the Y axis of the rectangular coordinate system. Or jogs the S axis (additional axis). You can use the additional axis only when in TEACH mode.
	Joint mode	Jogs J6 or J9 (additional axis) You can use the additional axis only when in TEACH mode.
	Other than Joint mode	Rotates the tool coordinate system around the X axis of the rectangular coordinate system. Or jogs the T axis (additional axis). You can use the additional axis only when in TEACH mode.

g: Other Keys
Descriptions for other keys are as follows:

Other Keys	Description
Motor key 	**When connecting to TEACH mode / RC+ is on:** Turns the motor on or off.
Reset key 	**When connecting to TEACH mode / RC+ is on:** Clears the error or emergency stop status.
Exe key 	**When connecting to TEACH mode (disable when RC+ is on):** To perform the following operations, press the Enable switch and the [Exe] key at the same time. - To execute the commands in TEACH mode - To execute the program in TEST mode

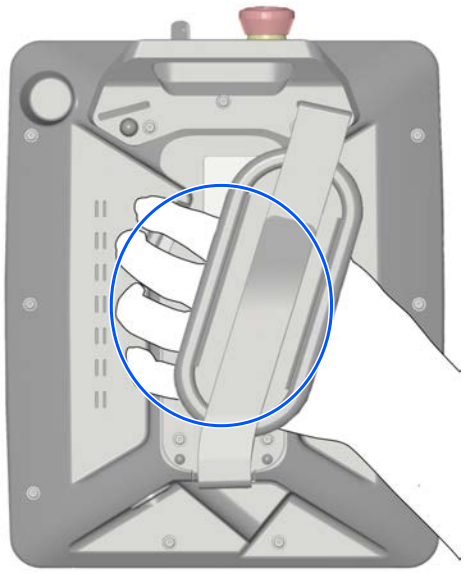
2.6 Enable Switch

In TEACH mode and jog operation when starting RC+, some operations require use of the enable switch located on the back of the Teach Pendant. When operation of the Enable switch is required, grip the switch to the center position (ON state). If you grip the switch harder, it will be OFF state and the robot will stop.

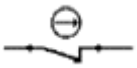


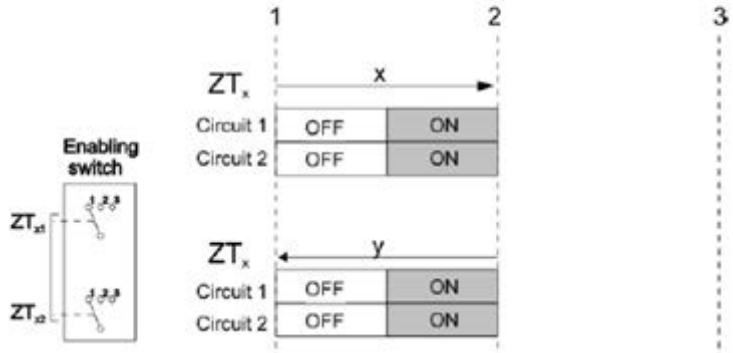
How to press the Enable switch

Grip the enable switch by fingers of the hand holding the rear handle.
Example: When gripping by the left hand

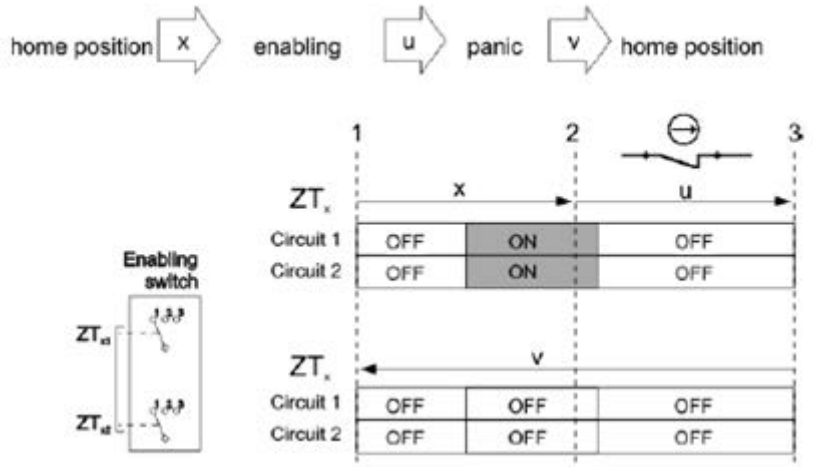


This is a three-position Enable switch.

Position	Role	Enable switch	Contact
1	home	Released	Enable output is open.
2	enabling	Pushed in	Enable output is closed.
3	panic	Pushed in deep	Enable output is open. 



panic:
The product is configured to skip the enabling position when the Enable switch has been pushed into the panic position and then released.



⚠ WARNING

- The Enable switch can be used as a protective function if and only if the operator can notice the danger and take a proper counteraction against it. Deceleration of operation may be required as a further counteraction. Determine the acceptable speed based on the risk assessment.
- Only a person who enabled the Enable switch can enter the dangerous area.

2.7 Touch Panel

2.7.1 Operating the Touch Panel

The touch panel can be operated by fingers. The following actions are required to use the Teach Pendant.

Name	How to operate
Tap	Tap the touch panel as if pressing the button.
Long tap	Keep touching one point on the panel.
Flick	Touch and slide a finger or touch pen in one direction and immediately release.
Swipe	Touch the panel and move a finger or touch pen to one direction while keeping the finger/pen touches the panel.
Pinch-in	Move two fingers closer to each other as if you are pinching the screen.
Pinch-out	Move two fingers away from each other as if you are widening a target on the screen.

2.8 USB Port

Connect a commercial USB flash drive to the Teach Pendant USB port to use the following features. For details, refer to the following manual.
"Epson RC+ User's Guide"

- Backup Controller information to a USB flash drive.
- Restore Controller information from a USB flash drive.
- Export a project to a USB flash drive.
- Update Software.

2.8.1 Precautions

- The USB port is intended for development work. Connect the Teach Pendant and a USB device directly with a USB cable which is 5 m or shorter in length, without using a USB hub or extension cable.
- Do not connect any devices other than a USB flash drive, mouse, or keyboard.
- To operate the product in the USB 2.0 High-Speed mode, use a USB cable and USB device capable of this mode.
- Do not bend or pull the cables forcibly. Do not apply excessive force to the connector.
- Insert a USB flash drive directly into the Teach Pendant USB port. Operation is not guaranteed when there are cables or hubs between the Teach Pendant and a USB flash drive.
- Insert and remove a USB flash drive slowly and surely.
- Do not edit the saved files by the editor. Operation of the robot system after data restoration is not guaranteed.
- Do not use two USB flash drives at once.

2.8.1.1 Available USB Flash Drive

Use a USB flash drive that meets the following conditions.

- USB2.0 supported
- Without security function
  USB flash drive with password input function cannot be used.

2.9 Beep Sound

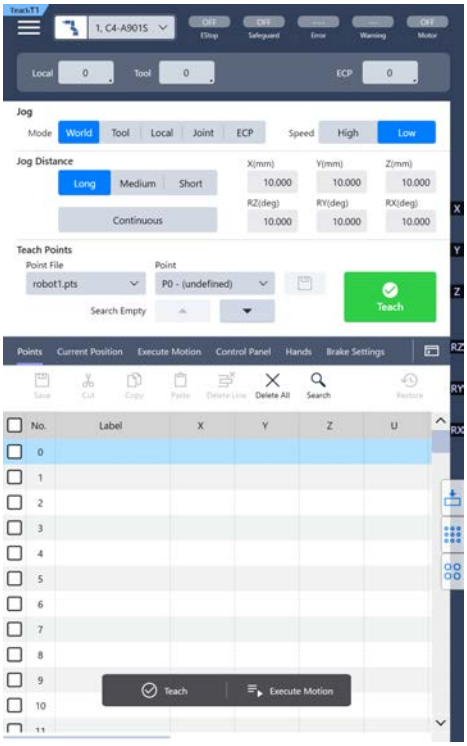
The Teach Pendant beeps when the robot passes the singularity.
You can also set the beep sound for clicking a button created by RC+ GUI Builder.

3. Operation

This section contains information about operation of the Teach Pendant and maintenance procedure.

3.1 Teaching Procedure

This chapter describes basic jog operation and teaching methods using the Teach Pendant.
Switching the mode selector key switch to [TEACH/T1] or [TEACH/T2] and selecting [Jog & Teach] displays the following panel.



To change the robot, refer to the following section:
Current Robot

KEY POINTS

- T2 mode cannot be used on RC700-A and RC700-D Controllers complying with the UL standards.
  For RC700-E and RC800-A Contollers, T2 mode can be used.
- When you switch the mode to [TEACH/T1] or [TEACH/T2], the speed setting of the robot will be the speed ([Low] or [High]) on the [Jog & Teach] window. Since the motion command will be executed at this speed after the above operation, set the speed again by the commands such as Motor, Speed, and Accel.

3.1.1 Jog Operation

The robot can be moved to the teaching position by either of the following operation.

- Step Jog operation
- Continuous Jog operation

3.1.1.1 Step Jog operation

In Step Jog, the robot moves each time the Jog key is pressed. The jog distance has to be configured in [Jog Distance] beforehand (Long, Medium, and Short).

Reference: **Jog & Teach**
Pressing the Jog key while holding the Enable Switch executes step jogs.

> **KEY POINTS**
>
> In Step Jog, the robot moves in one direction even if two keys are pressed at the same time. The robot does not move if more than three keys are pressed at the same time.

3.1.1.2 Continuous Jog operation

In Continuous Jog, the robot moves while pressing the Jog key.
Specify the jog distance to “Continuous” in the [Jog Distance].
Reference: **Jog & Teach**
The continuous jog can be executed by pressing the Jog key while gripping the Enable Switch.

> **KEY POINTS**
>
> In Continuous Jog, the jog can be executed by pressing two jog keys at a time. For example, pressing the “+X” and “+Y” keys together executes a continuous jog diagonally.

3.1.2 Teaching

Teach the robot position to the specified point number.

1. Specify the following items in the [Jog & Teach] panel.
   [Point File] : Point file name
   [Point] : Point number
2. Tap the [Teach] button. When the point number is already used, the message asking whether to overwrite the data will appear.
3. Enter the point label and comment in the displayed message dialog box.
4. Tap the [OK] button of the message dialog box to temporarily store the robot position.
5. Tap the [Save] button to save your changes.

3.1.3 Direct Teaching

3.1.3.1 Direct Teaching of SCARA Robot

The SCARA robot can be moved manually by freeing a joint to teach. This teaching method is referred to as “Direct teaching”. Teach a position of the manually moved robot to the specified point number.

1. Select the [Control Panel] tab and move to the [Control Panel] panel.
2. Turn OFF the motor of the joint to move in the [Free Joints]. De-energized joint can be moved manually.
3. Move the robot arm to the position where you want to teach.
4. Tap the [Teach] button. If the point number is already used, the message asking whether to overwrite the data will appear.
5. Enter the point label and comment in the message dialog box.
6. Tap the [OK] button of the message dialog box to temporarily store the robot position.
7. Tap the [Save] button to save your changes.

3.1.3.2 Direct Teaching of Force Sensor

⚠ CAUTION

Executing the direct teaching with improper settings of the Force Sensor, coordinate transformation, and gravity compensation may result in unintended motion. Be careful when configuring the settings and check operation before executing the direct teaching.

For details of the setting and operation check, refer to the following manual.

"Epson RC+ Option Force Guide"

KEY POINTS

This function is available when Force Guide is setup.

For usage of the Force Guide, refer to the following manual.

"Epson RC+ Option Force Guide"

Teach a position of the manually moved robot to the specified point number.

1. Select [Direct Teach] and move to [Direct Teach] panel.
2. Select the mass property object.

⚠ CAUTION

Executing the direct teaching with improper settings of the mass property object may result in unintended motion. Be careful when configuring the settings before executing the direct teaching

3. Select the mode.
4. Select the motion direction.
5. Select the hardness.
6. Reset the Force Sensor.

⚠ CAUTION

Be sure to reset the Force Sensor with no external force applied to it. If it is reset with an external force applied to it, the state in which an external force applied is “0”. Therefore, if the force applied is removed, the Force Sensor detects a force even if no force is applied. If executing the direct teach in this state, the robot may move unintentionally. Caution is required in this regard.

7. Tap the [Direct Teach Start] button. The confirmation dialog box will appear.
8. Tap the [OK] button on the confirmation panel with turning ON the Enable switch.
9. Move the robot arm to the position where you want to teach.

⚠ CAUTION

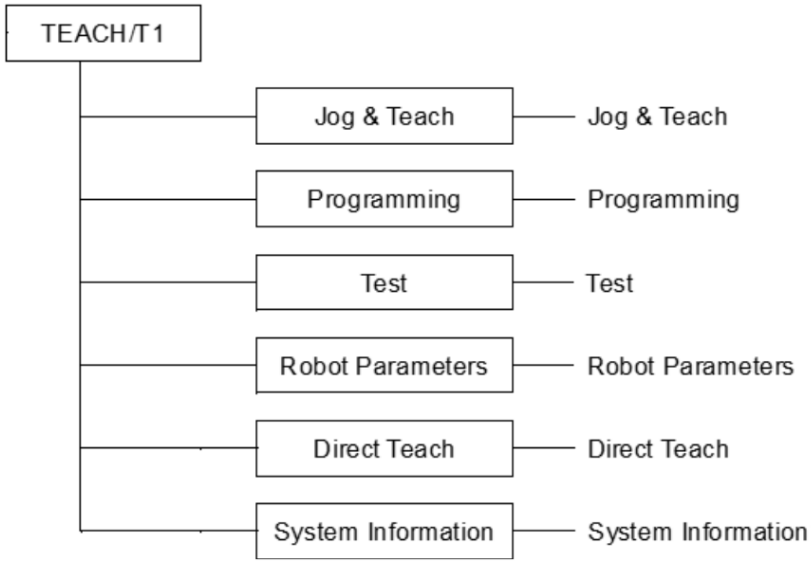
- Executing the direct teaching with improper mode or motion direction may result in unintended motion. Be careful when configuring the setting before executing the direct teach.

- Apply the force to the hand or workpiece which is attached near the tip than the Force Sensor when applying the force to the Force Sensor. The Force Sensor cannot detect the force when it is applied to the robot arm or the Force Sensor itself, and it may result in unintended robot motion. Caution is required in this regard.
- When operating the robot, pay attention not only to the position of the hand or workpiece, but also to the movement of the robot arm. Especially when the robot is near the singularity, the robot arm may move significantly. Caution is required in this regard.

10. Tap the [Teach] button.
    If the point number is already used, the message asking whether to overwrite the data will appear.
11. Enter the point label and comment in the message dialog box.
12. Tap the [OK] button of the message dialog box to temporarily store the robot position.
13. Tap the [Save] button to save your changes.

3.2 TEACH/T1 Mode

Switching the mode selector key switch to “TEACH/T1” enables TEACH mode.
In this mode, basic robot operations, jog, point teaching, programming and verification, and robot parameter setting can be performed.

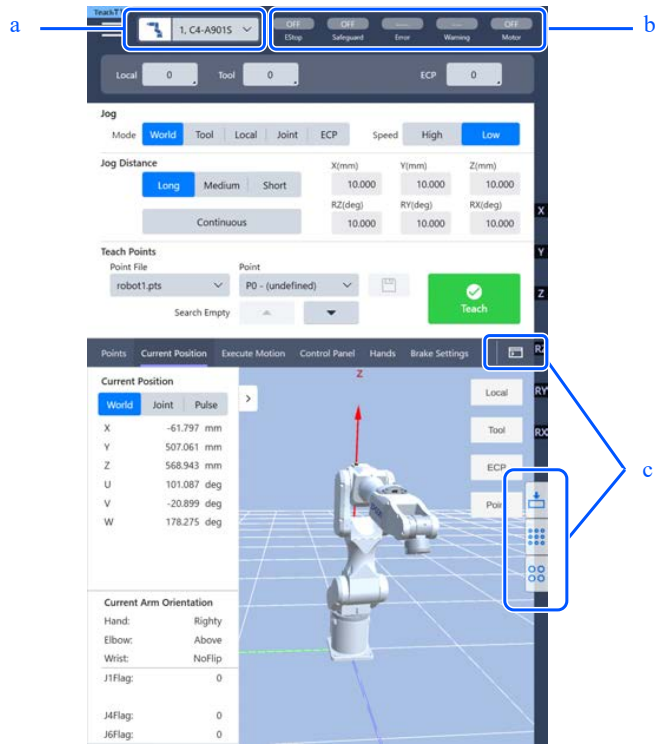


KEY POINTS

A coordinate point including the arm pose is defined as “position (point),” and the data is called “point data”.

3.2.1 Overview

This section gives an overview of the TEACH mode screen.



a: Current robot
Selected robot can be checked.
Reference: **Current Robot**
b: Status bar
Status of emergency stop, safety door, error, and warning can be checked.
Reference: **Status Bar**
c: Tool button
Tap the icon to display the each tool menu.
Reference: **Tool**

3.2.2 Current Robot

Current robot number, and model are displayed.
To change the robot:
Tap the panel to display the list, and select the robot to change.
The robot cannot be registered to the Robot system in the TEACH mode (TEACH/T1, TEACH/T2). Use RC+ in the AUTO mode to register the robot.

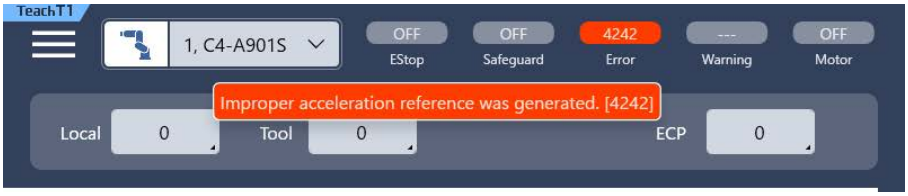
KEY POINTS

T2 mode cannot be used on RC700-A and RC700-D Controllers complying with the UL standards.

For RC700-E and RC800-A Contollers, T2 mode can be used.

3.2.3 Status Bar

This area displays the current robot status.



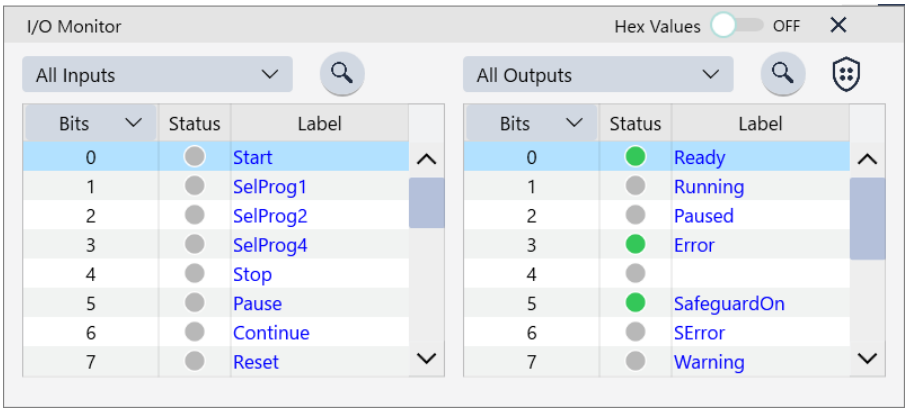
Name	Description	Value
Emergency Stop	Displays the emergency stop status To release the emergency stop state, tap the [Reset] button on the operation keys. Reference:**Jog & Teach**	ON / OFF
Safeguard	Displays the safeguard input status	ON / OFF
Error	Displays the error status. Tap the displayed code to check detail of the error.	Status code (error)
Warning	Displays the warning status. Tap the displayed code to check detail of the warning.	Status code (warning)
Motor	Displays the robot motor status There are three types of status. - OFF: The motor is OFF - Low: The motor is ON and the motor power is Low - High: The motor is ON and the motor power is High	OFF / Low / High

3.2.4 Tool

Tap the icon button to display the each tool menu.
The displayed icons differ depending on the currently used panel.

3.2.4.1 I/O Monitor

Tap [I/O Monitor] to display the [I/O Monitor] panel.



Inputs/outputs and memory I/O of the Controller can be monitored.
Inputs and outputs can be displayed at the same time. Bit, Byte, and Word can be selected.

Bit shows the I/O status and labels.
Byte and Word show values and labels.

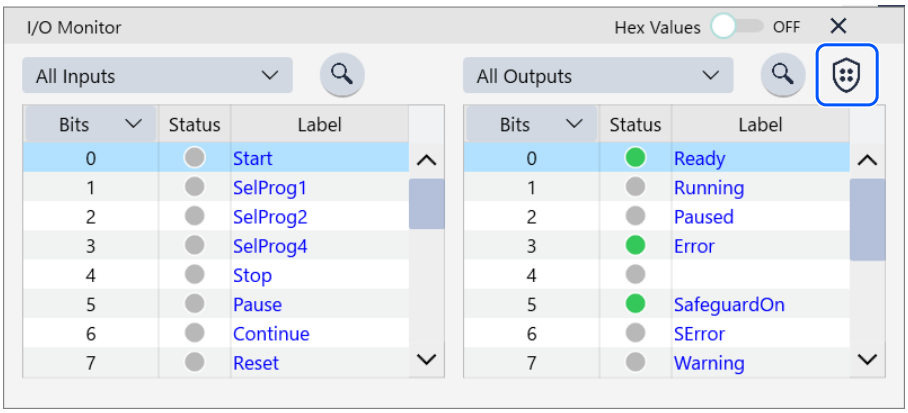
If the [Hex Values] toggle switch is on, byte and word values are displayed in hexadecimal, when the switch is off, they are displayed in decimal.

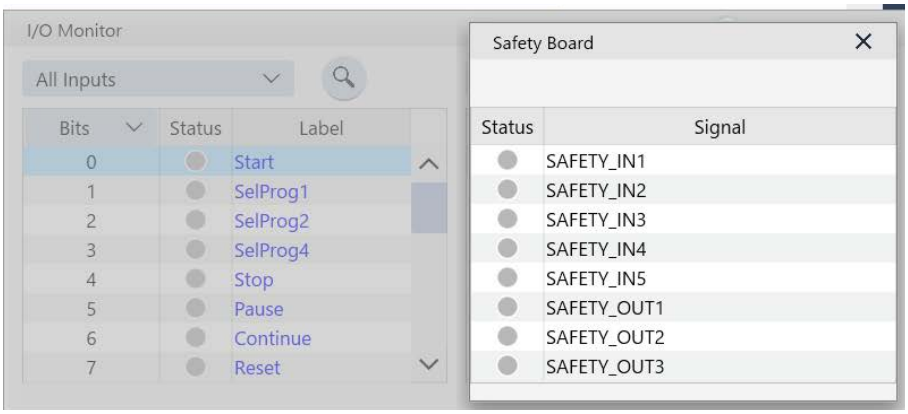
Double-tapping [Status] of the bit you want to change with the Enable switch ON changes ON/OFF of the output bits. However, ON/OFF cannot be changed if the [I/O Monitor] panel is opened from the [Test] panel.

Statuses of the selected inputs are continuously updated. Outputs are updated when the output bits are changed.

The I/O can be searched by the I/O label. Enter the text to search and tap the search button. You can search through the currently displayed list.

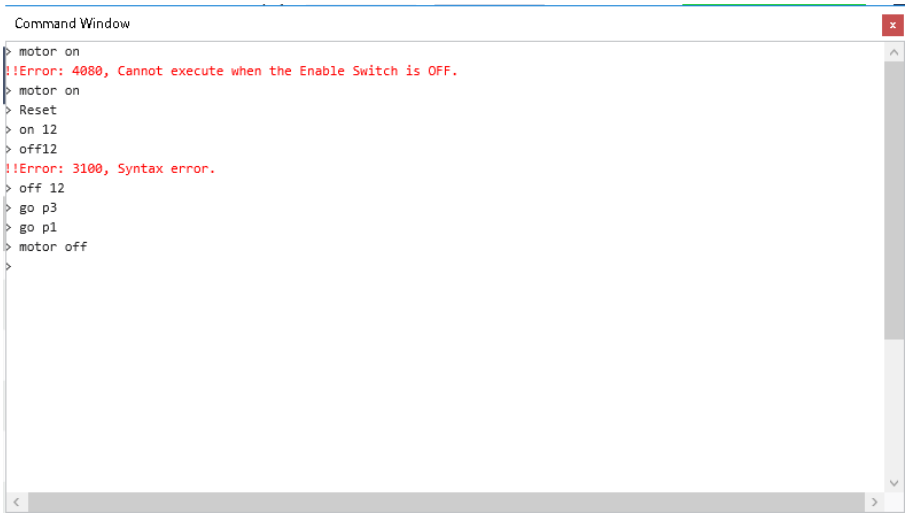
For RC700-E/RC800-A, tap [Safety Board] to display the Safety I/O monitor.





3.2.4.2 Command Window

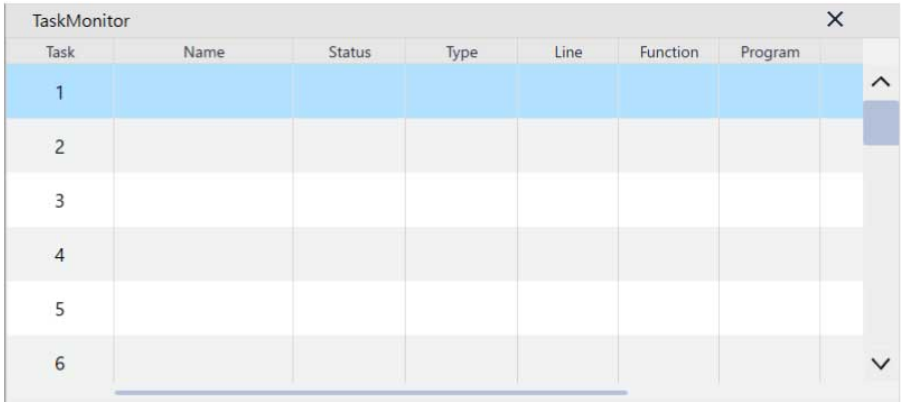
Tap [Command Window] to display [Command Window] panel.



You can execute SPEL+ commands by the Robot system and check the results.
Enter the SPEL+ commands and parameters following the prompt (>). To execute the robot motion commands and I/O output commands, tap the [Enter] button with the Enable switch ON.
Turning OFF the Enable Switch stops robot motion and returns to the [Command] panel.
To execute the commands other than robot motion commands and I/O output commands, tap the [Enter] button regardless of the Enable switch status.
For details of the executable commands, refer to the following manual:
"Epson RC+ SPEL+ Language Reference - Appendix A: SPEL+ Command Use Condition List"
An error message and error number appear when an error occurs.
Use the arrow keys to select a command from the history, and tap the [Enter] button to execute the command.
The commands can be entered with both uppercase and lowercase characters.

3.2.4.3 Task Monitor

Tap  [Task Monitor] to display the [Task Monitor] panel.
In this panel, task status can be monitored while the program is running. The tasks cannot be operated.



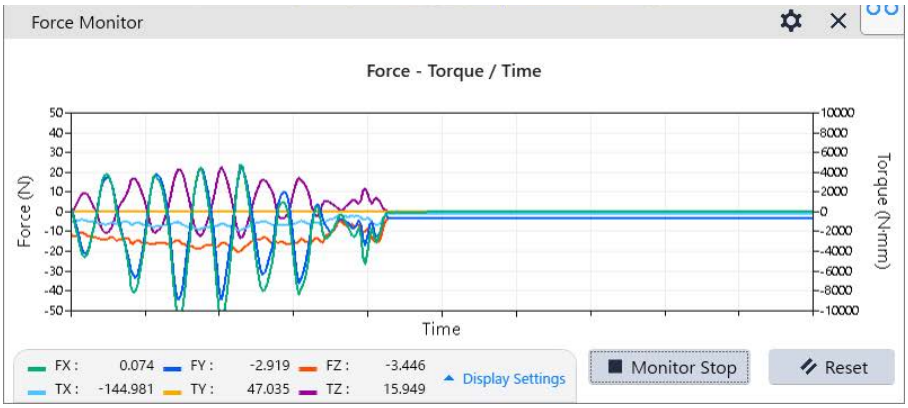
When the [Task Monitor] panel is opened, the status information for 32 standard tasks and 11 trap tasks are displayed. If the background tasks are active, the status information for 16 background tasks can be displayed.

Item	Description
Task	Tasks numbered from 1 to 32 and 11 trap tasks
Name	Task name
Status	Task status: Run, Wait, Halt, Pause, Aborted, Finished

Item	Description
Type	Normal : Normal tasks NoPause : Tasks which do not pause at Pause statement and Pause input signal occurrence and safeguard open state. NoEmgAbort : Tasks which continue the processing at emergency stop and error occurrence
Line	Task line number
Function	Function name of the task
Program	Program name of the task
Start	Start time of the task
CPU	CPU load rate of each task This function assists problem detection of user-created tasks

3.2.4.4 Force Monitor

Tap  [Force Monitor] to display the [Force Monitor] panel.
Display the current Force value.

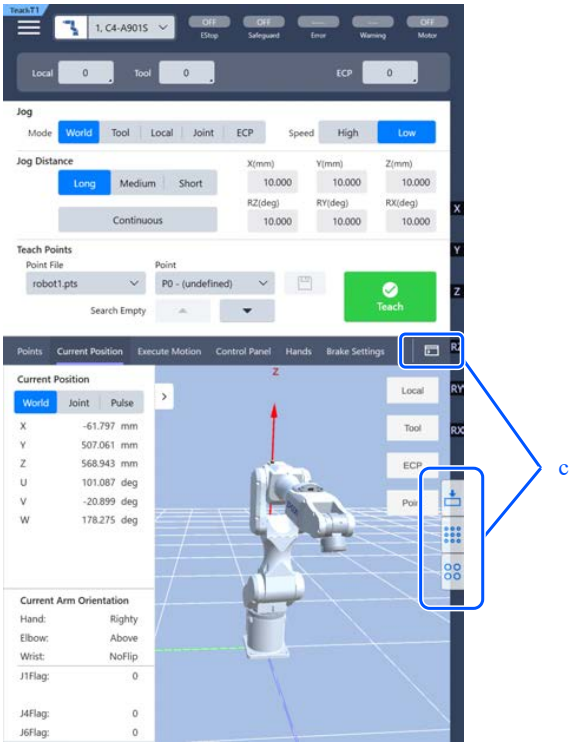


Item	Description
Graph	Display each value on the graph.
Force (N) FX, FY, FZ	Display Force value of Fx, Fy, Fz. Display the final value of the each axis. Data which checked the checkbox is displayed.
Torque (N·mm) TX, TY, TZ	Display the torque value of Tx, Ty, and Tz axes on the graph. Display the final value of the each axis. Data which checked the checkbox is displayed.
Force Scale	Set the vertical axis scale of the force graph.
Torque Scale	Set the vertical axis scale of the torque graph.
Time Scale	Set the horizontal axis scale of the force and torque graph.
Force Monitor Object	Select from defined object (number or label) list. If selecting the force monitor object, force and torque of force coordinate system appear.
Monitor Start	Display the current value on the graph.

Item	Description
Force Sensor Reset	Set force and torque value as “0”.

3.2.5 Jog & Teach

The [Jog & Teach] panel is used in teaching.
Switching the mode selector key switch to “TEACH/T1” and tapping [Jog & Teach] displays the [Jog & Teach] panel.



c: Tap the tool button to display [Command Window], [Force Monitor], and [I/O Monitor] panels. For details of the panels displayed, refer to the following.
Tool

3.2.5.1 Changing Local, Tool, Arm, ECP

The coordinate system to perform jogging and teaching can be selected from the user-defined coordinate systems.
Reference: **Robot Parameters**

Item	Description
Local	Defined Local coordinate system 0 is the same as the Base coordinate system.
Tool	Defined Tool coordinate system
Arm	Arm coordinate system defined as the additional arm. This is available for the following robots. - Rectangular coordinate robots - SCARA robots
ECP	Defined coordinate system of the external control point. This is available when the external control point is enabled.

3.2.5.2 Jog Mode

Select the jog mode.
Some modes may not be available depending on the type of the robot.

Item	Description
World	Jogs in current Local, Tool, arm and ECP coordinate systems.
Tool	Jogs in current Tool coordinate system.
Local	Jogs in current Local coordinate system.
Joint	Jogs each joint of the robot.
ECP	Jogs in the coordinate system of the current external control point. This is available when the external control point is enabled.

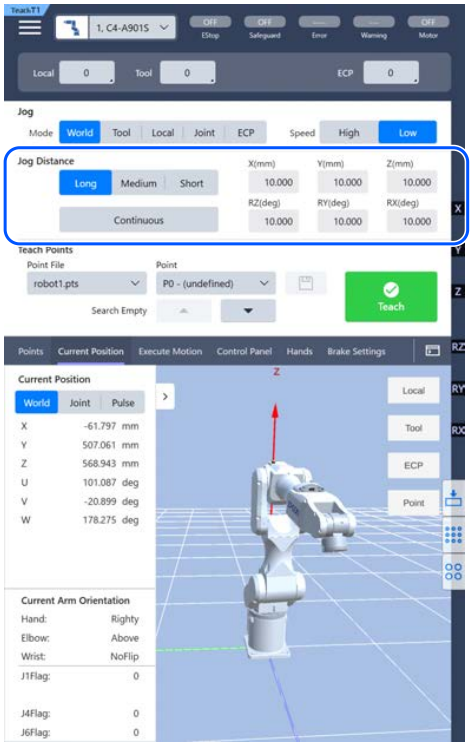
Jog Key Operation

World, Tool, Local, ECP:
Jogs the robot along the X, Y, and Z axes. For robots with 4 DOF (Cartesian coordinate and SCARA), you can also jog U (roll). For robots with 6 DOF (vertical 6-axis), you can jog rotateZ (roll), rotateY (pitch), and rotateX (yaw). The guide display of the jog keys changes.
Joint:
Jogs the robot using the keys from J1 (Joint #1) to J** (** is the number of joints). The guide display of the jog keys change to the joint numbers.

3.2.5.3 Jog Speed

Sets the speed for jogging and motion commands. The speed can be selected from [Low] and [High].

3.2.5.4 Jog Distance



This group is used for specifying the distance (Long, Medium, Short, or Continuous) that each axis moves when its corresponding jog button is pressed.

When “Continuous” is selected:
The robot jogs in continuous mode. The [Jog Distance] text boxes cannot be changed.
When other than “Continuous” is selected:
The robot jogs for the distance specified in the [Jog Distance] text box (Step mode).

[Jog Distance] text box changes according to the jog mode and the robot. To change the values, select the jog distance to change and enter the new value.

Distance	Set Value *	Default Value
Short	More than 0 to 10	0.1
Medium	More than 0 to 30	1
Long	More than 0 to 180	10

3.2.5.5 Clearing the Error Status

Tapping the [Reset] button on the operation keys resets the robot servo system and the emergency stop state.

3.2.5.6 Turning the Motor Power ON or OFF

Tapping the [Motor] button on the operation keys turns ON or OFF all motors of the robot.

Motor ON:
Tap the [Motor] button while the motor is OFF. The confirmation dialog box will appear. Tap the [OK] button while holding the Enable switch. The motors will be ON.
Motor OFF:
Tap the [Motor] button while the motor is OFF. The motors will be OFF immediately.

KEY POINTS

Perform the following operations to turn OFF the motor.

- Turn OFF the Enable switch.
- Switch the mode with the mode selector key switch.
  When switching from TEACH mode to AUTO mode, the latch must be released.

KEY POINTS

Turn off enable switch, when you switch the mode with the mode selector key switch. If the mode is switched with the mode selector key switch while the enable switch is turned on, and the motor is turned on, an error will occur. Be sure to turn the enable switch OFF once and then ON again before turning the motor ON.

3.2.5.7 Jog Operation

Move the robot using one of the operations below.

- Step Jog operation
- Continuous Jog operation

3.2.5.7.1 Step Jog operation

In Step Jog, the robot moves each time the Jog key is pressed.
The jog distance has to be configured beforehand.

1. Specify the jog distance to “Long”, “Medium”, or “Short” in the [Jog Distance].
   Reference: **Jog & Teach**
2. Press the Jog key while holding the Enable switch to execute step jogs.

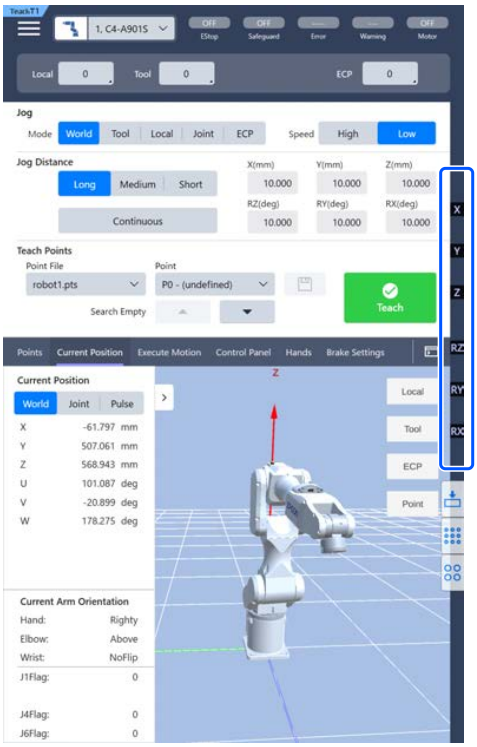
3.2.5.7.2 Continuous Jog operation

In Continuous Jog, the robot moves while pressing the Jog key.

1. Specify the jog distance to “Continuous” in the [Jog Distance].
   Reference: **Jog & Teach**
2. Press the Jog key while holding the Enable switch to execute continuous jog.

3.2.5.8 Changing the Jog Keys

Change the current key assignment of the jog keys.
Example: Switch U, V, W to R, S, T. Switch J4, J5, J6 to J7, J8, J9.



KEY POINTS

When the robot joint has 7 or more axes, tap [Arrow] to switch the jog keys.

3.2.5.9 Registering the Robot Position

This group is used for registering the current robot position.

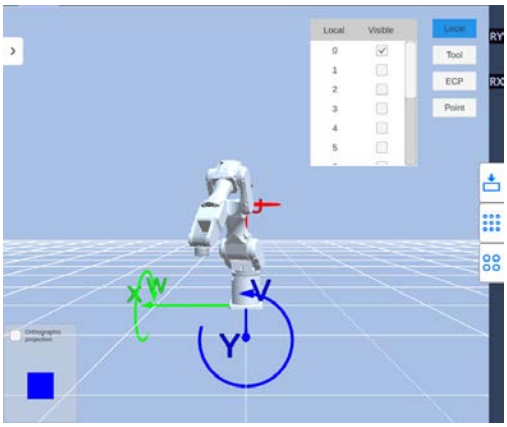
[Point File]	Selects a point file.
[Point]	Selects a point number.
[Save] button	Saves the data to the Robot system.
[Teach] button	Registers the current robot position to the point number of the specified point file. The data will be saved to the memory.

To search points:
In the dead-number search, tapping the downward (↓) or upward (↑) button of the dead-number searches the nearest dead-number.

3.2.5.10 Current Position

3.2.5.10.1 Robot 3D View

[Current Position] panel displays the robot 3D view and current position of the robot.
To display the [Current Position] panel, tap the [Current Position] tab.



The robot can be displayed in the 3D.
The coordinate axes and points are displayed on the same panel as the robot. This allows you to check the robot posture and motion from various points of view.

Robot Display:
One currently selected robot can be displayed. The display changes as you change the robot.

Coordinate system display:
To display the coordinate system, tap the [Local], [Tool], or [ECP] button to select the coordinate system you want to display and select the coordinate number. You can select several items.
Coordinate axes are displayed as follows:

- X axis: Green
- Y axis: Blue
- Z axis: Red

Point display:
To display the point, tap the [Point] button and select the point number from the selected point file. You can select several items. The point can be displayed on the 3D display.

Field of View Control:

- Enlarge or reduce the panel: Pinch-out to enlarge and pinch-in to reduce the panel display size.

- Rotate the view: Swipe with one finger.
- Scroll the view: Swipe with two fingers.
- Return to default: Long-tap to display the menu, and tap the [Reset Viewpoint] button.

Menu:
To display the menu, long-tap the menu.

- Set Zoom Large: Makes the zoom-in and zoom-out size larger.
- Set Zoom Small: Makes the zoom-in and zoom-out size smaller.
- Reset Viewpoint: Resets the viewpoint.

3.2.5.10.2 Current Position

This group displays the current position of the robot. There are three ways to display the position.
Some display modes may not be available depending on the type of the robot.

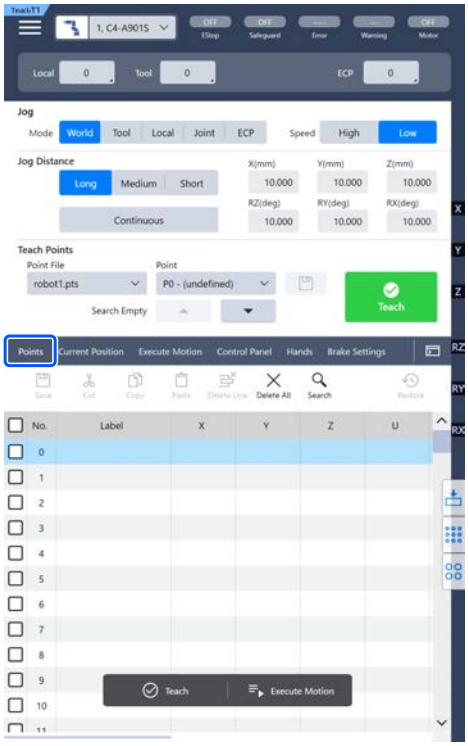
Item	Description
World	Current position and tool orientation in the selected Local coordinate system
Joint	Current coordinate of the joints
Pulse	Current pulse of the joints

3.2.5.10.3 Current Arm Orientation

This group displays the current arm orientation.
Flags representing the arm orientation vary depending on the type of the robot.

3.2.5.11 Point Data

On the [Points] panel, you can edit the point data of the point files.
To display the [Points] panel, tap the [Points] tab.



The list of data from the point file selected on the [Points] tab is displayed.

Change the point data values

1. Double-tap the cell of the value to change.
2. Enter a value.

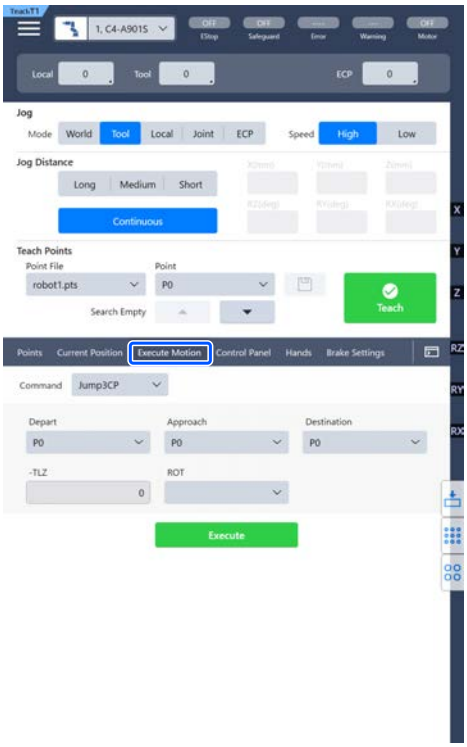
You can copy a point data value and paste it to another cell. The menu of functions, such as copy, can be displayed by long-tapping the text input area while a cell is selected.
To select the line, check the checkbox. You can select several items.
To scroll, flick the table up and down.

Item	Description
Save	Saves changes to the Robot system.
Cut	Cuts the data of the selected line.
Copy	Copies the data of the selected line.
Paste	Pastes the copied or cut data to the checked lines. The data will be overwritten. If the data copied or cut from the multiple lines are held, these will be pasted to the lines following the checked line.
Delete Line	Deletes the data of the selected lines. If several lines are selected, several point data will be deleted. The point numbers whose data is deleted will be dead-numbers.
Delete All	Deletes all data. The file will be empty.
Restore	Restores changes. The file will be restored to the last saved state.
Search	Searches for a label.

Item	Description
Teach	This group is used for registering the current robot position.
Execute Motion	Executes the motion commands such as Go and Move.

3.2.5.12 Execute Motion

On the [Execute Motion] panel, you can execute the motion commands such as Go and Move.
To display the [Execute Motion] panel, tap the [Execute Motion] tab.

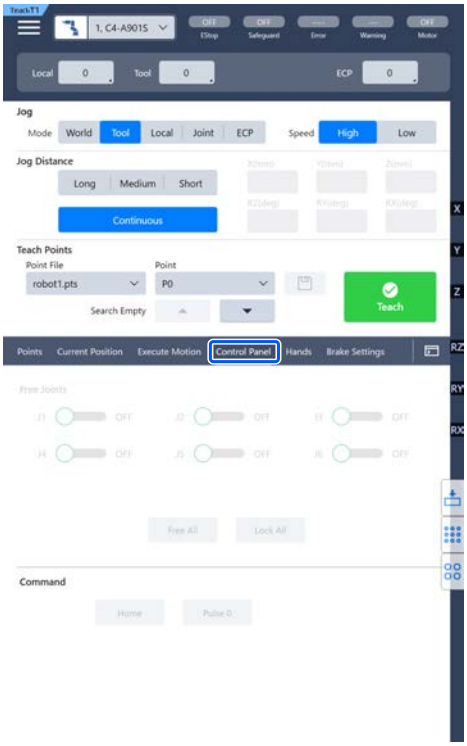


Execute the motion commands

1. Select the command name and parameters, and then tap the [Execute] button. The confirmation dialog box will appear.
2. Press the [Exe] key with the Enable switch ON. The command is executed while the [Exe] key is being pressed. The motion stops when either one or both of the Enable switch and [Exe] key is released.

3.2.5.13 Control Panel

In the [Control Panel] panel, basic robot operations such as freeing a joint and calibration can be performed.
Tap the [Control Panel] tab to display the [Control Panel] panel.



3.2.5.13.1 Free Joints

Setting the lock joint state and free joint state of joints individually.
When teaching the SCARA robot by the direct teaching, frees joint the robot axes.
This is not available for the vertical 6-axis robots.

The following are descriptions for the buttons.

[J*]	When the toggle switch of each joint is turned on, it will become the free joint state. When the toggle switch is turned off, it will be the lock joint state.
[Free All]	Frees joint the all robot axes.
[Lock All]	Locks joint the all robot axes.

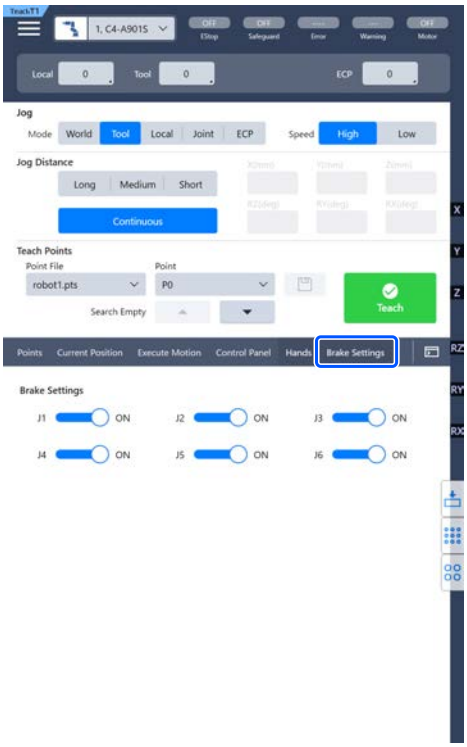
3.2.5.13.2 Command Buttons

The buttons vary depending on the type of the selected robot.
The following are descriptions for the buttons.

[Home]	Moves the robot to the point specified by HomeSet command. This can be executed by pressing the [Exe] key with the Enable switch ON while the confirmation dialog is displayed.
[Pulse0]	Moves each joint to the 0 pulse position. This can be executed by pressing the [Exe] key with the Enable switch ON while the confirmation dialog is displayed.
[MCal]	Performs calibration (detect the mechanical home position). This can be executed by pressing the [Exe] key with the Enable switch ON while the confirmation dialog is displayed.

3.2.5.14 Brake Settings

On the [Brake Settings] panel, the brake of each joint can be turned ON or OFF for the vertical 6-axis robots.
To display the [Brake Settings] panel, tap the [Brake Settings] tab.



For the vertical 6-axis robots, the brake of each joint can be turned ON or OFF. This is not available for non 6-axis robots. The password entry panel will be displayed if the password is set. Enter the password and tap [OK] to display the [Brake Settings] panel.

Brake ON:
Turn on the toggle switch of the joints you want to lock the brakes. The brakes will be locked.
Brake OFF:
Turn off the toggle switch. The confirmation massage will appear when you turn off them. Read the message and tap [OK] to release the brakes. The joints can be moved by hands.

3.2.6 Programming

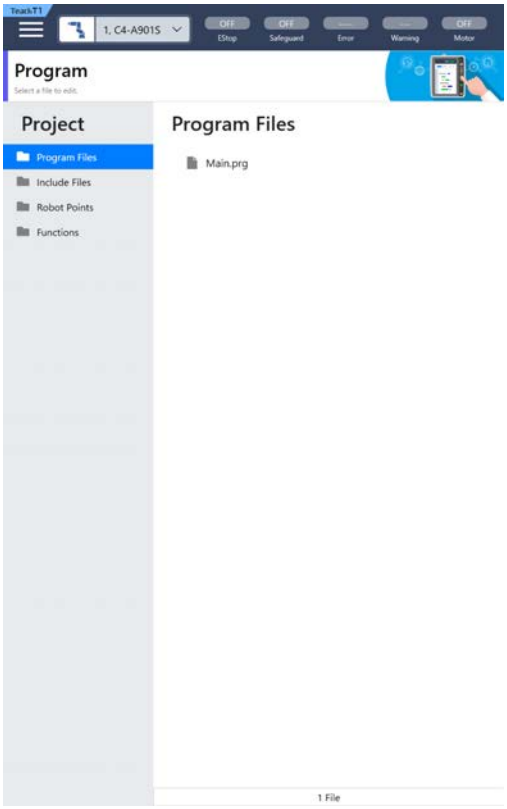
The following operations are available in the [Programming] panel.

- Project management
- Program editing
- Point data editing

To display the [Programming] panel, switch the mode selector key switch to “TEACH/T1” and tap [Programming] on the menu.

3.2.6.1 Current Project Management

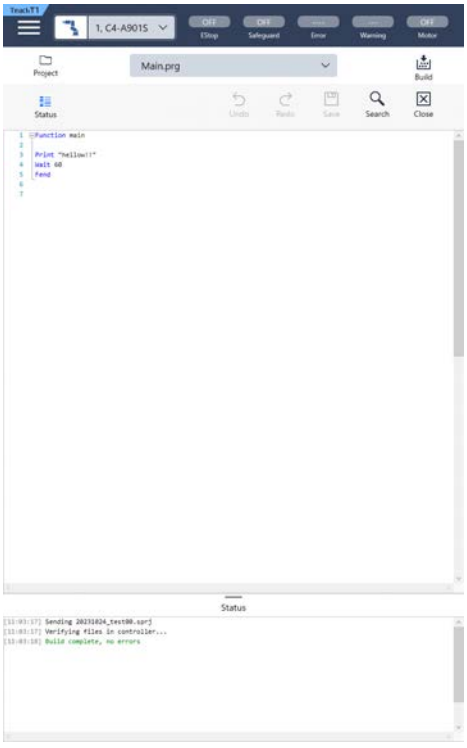
Current Project Management displays the program files, include files, and point file names registered to the current project in a tree form.



In the file tree, tapping the name of a program file (.prg) or include file (.inc) opens the file.
Tapping the point file name opens the point data.

3.2.6.2 Program Editing

The program can be edited. Open, Close, Save, and Edit of the file are available.

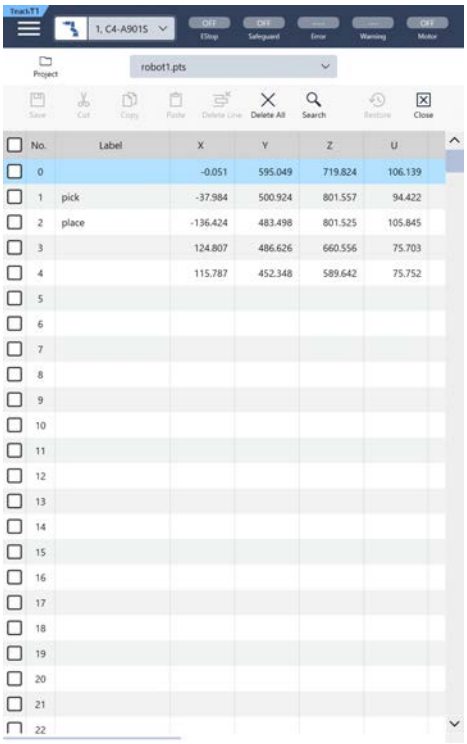


You can open multiple files but can edit only one at a time.

Item	Description
Project	Displays the current project panel.
Status	Shows and hides status at the bottom of the panel.
Undo	Restores changes made to the program.
Redo	Executes an operation canceled by the Restore operation just performed again.
Save	Saves the active file.
Search	Searches for text, line, or function name within the program.
Close	Closes the active file. The confirmation message appears if the file is being edited.
Build	Builds the current project.

3.2.6.3 Point data editing

You can edit the point data of the point files.
Select the point file from the file tree to display the list of data.



Change the point data values

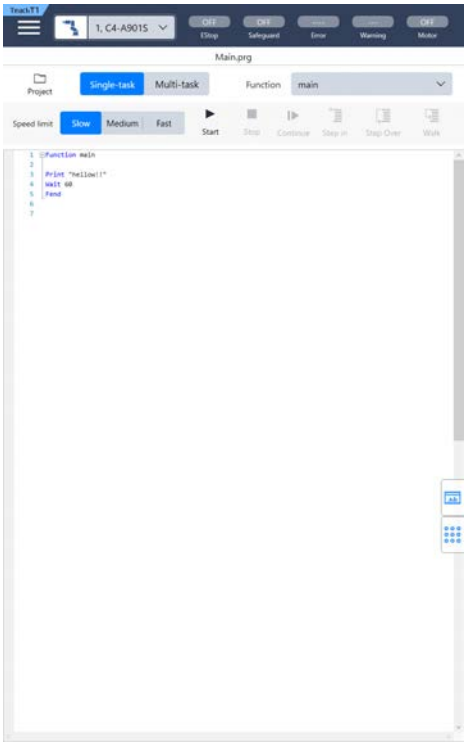
1. Double-tap the cell of the value to change.
2. Enter a value.

You can copy a point data value and paste it to another cell. The menu of functions, such as copy, can be displayed by long-tapping the text input area while a cell is selected.
To select the line, check the checkbox. You can select several items.
To scroll, flick the table up and down.

Item	Description
Save	Saves changes to the Robot system.
Cut	Cuts the data of the selected line.
Copy	Copies the data of the selected line.
Paste	Pastes the copied or cut data to the checked lines. The data will be overwritten. If the data copied or cut from the multiple lines are held, these will be pasted to the lines following the checked line.
Delete Line(s)	Deletes the data of the selected lines. If several lines are selected, several point data will be deleted. The point numbers whose data is deleted will be dead-numbers.
Delete All	Deletes all data. The file will be empty.
Restore	Restores changes. The file will be restored to previous state.
Search	Searches for a label within the point data.
Close	Closes the active file. The confirmation message appears if the file is being edited.

3.2.7 Test

In the [Test] panel, you can verify the program in TEST mode.
This mode enables the program verification while the Enable Switch is held down and the safeguard is open. This is a low speed program verification function (T1: manual deceleration mode) which is defined in Safety Standards.
In this mode, you can execute the specified function with multi-task / single-task, multi-Manipulator / single-Manipulator at low speed.
To display the [Test] panel, switch the mode selector key switch to “TEACH/T1”, and then tap [Test] on the menu. This is the Test mode.



Tap the icon on the menu button to display the [Task Monitor] and [I/O Monitor] panels. For details of the panels displayed, refer to the following.
Tool

The menu button cannot be used during program execution. Open the panels before starting the program or while it is paused.

3.2.7.1 Single-task Program Verification

The single-task program verification is used to verify a program in order to check the motion of the robot and peripherals by executing a single task with single- or multi-Manipulators (Cycle / Step execution) while the safeguard is open. Function can be specified and executed within a speed limit.

To execute the program:
After taping [Start], tap the operation key (Continue, Step In, Step Over, and Walk), and then press the [Exe] key while the Enable switch is ON with the confirmation window open.

To stop the program temporarily:
Release the Enable switch or the [Exe] key. The moving robot stops. (Quick Pause)

To resume the program:
Tap the operation key (Continue, Step In, Step Over, and Walk), and then press the [Exe] key while the Enable switch is ON with the confirmation window open. The program will resume from the paused position.

To abort the program:
Press the Emergency Stop switch. The program is also aborted when an error occurs. The moving robot stops. (Quick Pause)

Pause by Open/Close status of the safeguard:
The program pauses according to open/close status of the safeguard. The moving robot immediately stops. (Quick Pause)

To resume the program paused by Open/Close status of the safeguard:

Release the latched status of the safeguard interlock. Then, tap the operation key (Continue, Step In, Step Over, and Walk), and then press the [Exe] key while the Enable switch is ON with the confirmation window open.

⚠ WARNING

- Before performing the program verification, check that the robot system operates normally by using the Epson RC+ debug function.

  For details of the debug function of Epson RC+, refer to the following manual.

  "Epson RC+ User's Guide"

  If debugging is insufficient, the robot may cause unintended motion. This is extremely hazardous and may cause serious bodily injury or severe damage to the robot.
- Before performing the program verification, make sure that no one is in the robot's operation area.

  The robot automatically starts moving as the program verification starts. If the operator is in the robot's operation area, it is extremely hazardous and may cause serious bodily injury or severe damage to the robot.

⚠ CAUTION

- When abnormal operation such as interference with peripherals is predicted, release the [Exe] key immediately and stop the robot. The robot also can be stopped by releasing the Enable switch, or pushing the switch harder.
- After performing the program verification, be sure to follow the points below:
- Check the changed parts in software before supplying power.
- Perform the function test to check whether the robot system operates normally.

In the [Test] panel, the program cannot be changed. To change the program, edit it in the [Programming] panel.
Reference: **Programming**
To change the point data, perform the following:
Teach the point in the [Jog & Teach] panel.
Reference: **Jog & Teach**
Edit the point data in the [Programming] panel.
Reference: **Programming**

Task Behavior during Single Task Program Verification:

Background tasks stop when switching the mode to the TEST mode.
The tasks resume when switching to TEACH mode.

Behavior of Events and Tasks

Event	Task Type			Background Task
	Normal	NoPause	NoEmgAbort	
Enable switch is OFF	Pause	*1	*1	*2
[Exe] key is OFF	Pause	*1	*1	*2
Change Open/Close status of the safeguard	Pause	*1	*1	*2
Error during a test	Abort	*1	*1	*2

Event	Task Type			Background Task
	Normal	NoPause	NoEmgAbort	
Emergency stop	Abort	*1	*1	*2
Switch a key switch	Abort	*1	*1	*2

*1 Xqt task types (NoPause, NoEmgAbort) cannot be executed. When these tasks are specified, program verification is performed as normal tasks.
*2 When background tasks are specified, program verification is performed as normal tasks.

Available Function:
Functions with source not hidden

Robot Motion Speed Setting (when T1 mode):
During the program verification, robots are always operated in Low power mode.

- Low power mode: Speed lower than 250 mm/s, Restrains the motor power output

Speed can be changed within a range specified for Low power mode by pressing [Speed].

- Low: 25% of speed of Low power mode
- Middle: 50% of speed of Low power mode
- High: 100% of speed of Low power mode

⚠ CAUTION

The faster the speed, the longer the stopping distance in the emergency stop or pause is. When operating the robot where interference with peripheral equipment is predictable, perform the program verification at low speed while taking the stopping distance into consideration.
You cannot specify a Function that is included in an encrypted program file.

Execution-restraint Functions and Commands:
Power High: T1 mode Power mode is always set to Low. Specification function cannot be executed. T2 mode Specification function can be executed.

TRAP	Corresponding task cannot be executed even when a condition is met.
XQT	An error occurs and the program execution will be aborted.
INPUT	Input from the console causes an error and aborts the program execution.
PRINT #20	Output to the Teach Pendant causes an error and aborts the program execution.

By setting the product as explained below, execution-restraint functions and commands are not invoked during the TEST mode.

```
Integer A
If Stat(0) And &H4000000 Then ‘Check if the mode is the Test mode.
A = 1 ‘Tentative value if it is the Test mode.
Else
Input A ‘Use Input if it is the Auto mode.
EndIf
```

3.2.7.2 Multi-task Program Verification

The multi-task program verification is used to verify a program in order to check the motion of the robot and peripherals by executing a multiple task with single- or multi-Manipulators (Cycle execution) while the safeguard is open.
Function can be specified and executed within a speed limit.

To execute the program:
After tapping [Start], tap the operation key (Continue), and then press the [Exe] key while the Enable switch is ON with the confirmation window open.

To stop the program temporarily:
Release the Enable switch or the [Exe] key. The moving robot stops. (Quick Pause)

To resume the program:
Tap the operation key (Continue), and then press the [Exe] key while the Enable switch is ON with the confirmation window open. The program will resume from the paused position.

To abort the program:
Press the Emergency Stop switch. The program is also aborted when an error occurs. The moving robot stops. (Quick Pause)

Pause by Open/Close status of the safeguard:
The program pauses according to open/close status of the safeguard. The moving robot immediately stops. (Quick Pause)

To resume the program paused by Open/Close status of the safeguard:
Release the latched status of the safeguard interlock. Then, tap the operation key (Continue) and press the [Exe] key while the Enable switch is ON with the confirmation window open.

⚠ WARNING

- Before performing the program verification, check that the robot system operates normally by using the Epson RC+ debug function.

  For details of the debug function of Epson RC+, refer to the following manual.

  "Epson RC+ User's Guide"

  If debugging is insufficient, the robot may cause unintended motion. This is extremely hazardous and may cause serious bodily injury or severe damage to the robot.
- Before performing the program verification, make sure that no one is in the robot's operation area.

  The robot automatically starts moving as the program verification starts. If the operator is in the robot's operation area, it is extremely hazardous and may cause serious bodily injury or severe damage to the robot.

⚠ CAUTION

- When abnormal operation such as collision with peripherals is predicted, release the [Exe] key immediately and stop the robot. The robot also can be stopped by releasing the Enable Switch, or pushing the switch harder.
- After performing the program verification, be sure to follow the points below:
  - Check the changed parts in software before supplying power.
  - Perform the function test to check whether the robot system operates normally.

In the [Test] panel, the program cannot be changed. To change the program, edit it in the [Programming] panel.
Reference: **Programming**

To change the point data, perform the following:
Teach the point in the [Jog & Teach] panel.
Reference: **Jog & Teach**

Edit the point data in the [Programming] panel.
Reference: **Programming**

Task Behavior during Multi-Task Program Verification

Background tasks stop when switching the mode to the TEST mode. The tasks run automatically at the start of the program verification and are performed the verification along with specified normal tasks.
These tasks stop when the multi-task program verification stops. The tasks resume when switching to TEACH mode.

Behavior of Events and Tasks

Event	Task Type			Background Task
	Normal	NoPause	NoEmgAbort	
Enable switch is OFF	Pause	Pause	Continue	Continue
[Exe] key is OFF	Pause	Pause	Continue	Continue
Change Open/Close status of the safeguard	Pause	Pause	Continue	Continue
Error during a test	Abort	Abort	Abort	Abort
Emergency stop	Abort	Abort	Continue	Abort
Switch a key switch	Abort	Abort	Abort	Continue/Resume

Available Function:

Functions with source not hidden

Robot Motion Speed Setting (when T1 mode):
During the program verification, robots are always operated in Low power mode.

- Low power mode: Speed lower than 250 mm/s, Restrains the motor power output

Speed can be changed within a range specified for Low power mode by pressing [Speed].

- Low: 25% of speed of Low power mode
- Middle: 50% of speed of Low power mode
- High: 100% of speed of Low power mode

> ⚠ CAUTION
>
> The faster the speed, the longer the stopping distance in the emergency stop or pause is. When operating the robot where interference with peripheral equipment is predictable, perform the program verification at low speed while taking the stopping distance into consideration.
> You cannot specify a Function that is included in an encrypted program file.

Execution-restraint Functions and Commands:

Power High: T1 mode Power mode is always set to Low.
Specification function cannot be executed.
T2 mode Specification function can be executed.
INPUT:
Input from the console causes an error and aborts the program execution.

PRINT #20:
Output to the Teach Pendant causes an error and aborts the program execution.

By setting the product as explained below, execution-restraint functions and commands are not invoked during the TEST mode.

```
Integer A
If Stat(0) And &H4000000 Then ‘Check if the mode is the Test mode.
A = 1 ‘Tentative value if it is the Test mode.
Else
Input A ‘Use Input if it is the Auto mode.
EndIf
```

3.2.7.3 TEST Mode Operation Method

Select “Single-task/Multi-task” in TEST mode.
To open the file:
Tap the project to display the list of programs.
Select the program file from [Program Files] tree and tap the file name. The program cannot be edited.
Verify the program:
Select the “Function” to execute from the [Function] list and tap [Start] to start a task. Then, tap the operation key (Continue, Step In, Step Over, and Walk). The confirmation dialog window will appear. Hold the Enable switch ON and press the [Exe] key while the dialog window is open. If you want to execute and confirm a part of the motion, set a breakpoint and stop the program, and then execute the part by [Step In], [Step Over], or [Walk] button. Tapping the line number on the left sets or cancels the breakpoint.

Item	Description
Start	Executes a task.
Stop	Stops the ongoing tasks.
Continue	Continues execution of the paused task from the current line.
Step In	Executes the current line of the paused task and stops at the next line. If the next line is a function call, the program stops at the beginning of the called function. This is available for the single-task program verification.
Step Over	Executes the current line of the paused task and stops at the next line. If the next line is a function call, the program stops after executing the called function. This is available for the single-task program verification.
Walk	Executes until the next motion command or output command, and then stops. You can configure whether to stop the program by the output command in the Epson RC+. This is available for the single-task program verification.

3.2.8 Robot Parameters

In the [Robot Parameters] panel, you can define the Local coordinate system and the Tool coordinate system, and configure the additional arms.
To display the [Robot Parameters] panel, switch the mode selector key switch to “TEACH/T1”, and then tap [Robot Parameters].

3.2.8.1 Local Coordinate System Setting

This panel is used for setting the Local coordinate system of the robot.
Select “Local” in [Function]. The values of the user-definable 15 Local coordinate systems will be displayed. Local “0” is the base coordinate system. It cannot be changed in this panel.

KEY POINTS

The base coordinate system can be changed by executing Base command from the command window.

For details, refer to the following manual.

"Epson RC+ SPEL+ Language Reference"

The cells with no Local coordinate system definition are empty. Entering the value to the undefined Local coordinate system sets remaining cells to “0”.
The Local coordinate systems numbering from 1 to 15 can be defined. Tapping the [Apply] button configures the Local coordinate system.

For details of the Local setting, refer to the following manual.
"Epson RC+ SPEL+ Language Reference - Local Statement"

Item	Description
X	The X coordinate of the local origin in the base coordinate system.
Y	The Y coordinate of the local origin in the base coordinate system.
Z	The Z coordinate of the local origin in the base coordinate system.
U	Rotation angle of the Local coordinate system about the base Z axis. (Roll)
V	Rotation angle of the Local coordinate system about the base Y axis. (Pitch)
W	Rotation angle of the Local coordinate system about the base X axis. (Yaw)

Item	Description
Apply	Sets the current values.
Restore	Restores the previous values.
Clear	Clears all the selected values.

3.2.8.2 Tool Coordinate System Setting

Select “Tool” in [Function]. The values of the user-definable 15 Tool coordinate systems will be displayed.
The cells with no Tool coordinate system definition are empty. Entering the value to the undefined Tool coordinate system sets remaining cells to “0”.
The Tool coordinate systems numbering from 1 to 15 can be defined.
Tapping the [Apply] button configures the Tool coordinate system.

For details of the Tool setting, refer to the following manual.
"Epson RC+ SPEL+ Language Reference - TLSet Statement"

Item	Description
X	The X coordinate of the tool.
Y	The Y coordinate of the tool.
Z	The Z coordinate of the tool.
U	Rotation angle of the tool about the Z axis. (Roll)
V	Rotation angle of the tool about the Y axis. (Pitch)
W	Rotation angle of the tool about the X axis. (Yaw)
Apply	Sets the current values.
Restore	Restores the previous values.
Clear	Clears all the selected values.

3.2.8.3 Additional Arm Setting

Select “Arm” in [Function]. The values of the user-definable 15 Arm will be displayed. This setting is not available for the vertical 6-axis robots and robots which do not support ArmSet command. The cells with no Arm definition are empty.
Tapping the [Apply] button configures the additional arms.

For details of the arm setting, refer to the following manual.
"Epson RC+ SPEL+ Language Reference - ArmSet Statement"

Item	Description
L2 Dist	Distance between the center of Joint #2 and the center of the orientation joint in millimeters.
J2 Offset	Angle of the line from the center of Joint #2 to the center of the orientation joint in degrees.
Z Offset	The Z offset between the new orientation axis and the standard orientation axis.
L1 Dist	Distance between the center of the shoulder joint and the center of the elbow joint in millimeters.

Item	Description
U Offset	The angle offset between the standard orientation zero position and the new orientation axis zero position in degrees.
Apply	Sets the current values.
Restore	Restores the previous values.
Clear	Clears all the selected values.

3.2.9 Direct Teach

⚠ CAUTION

Executing the direct teaching with improper settings of the Force Sensor, coordinate transformation, and gravity compensation may result in unintended motion. Be careful when configuring the settings and check operation before executing the direct teaching.

For details of the setting and operation check, refer to the following manual.

"Epson RC+ Option Force Guide"

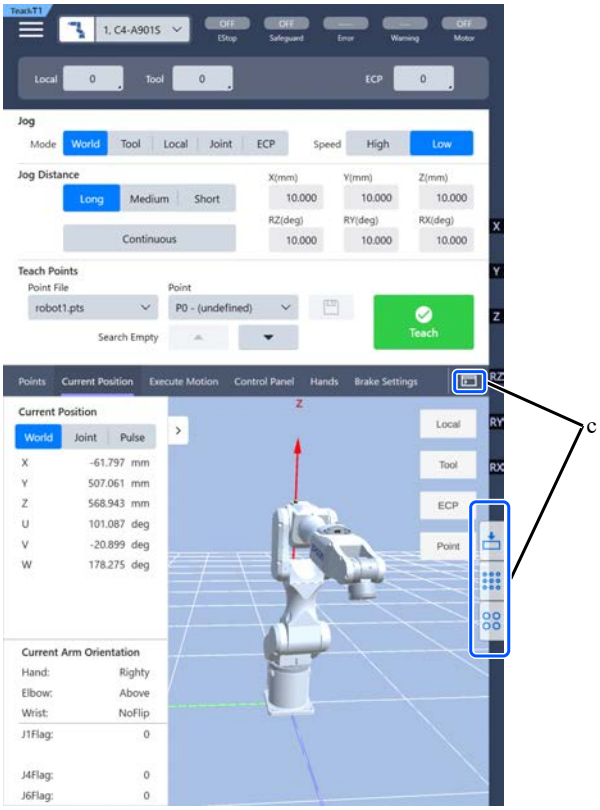
KEY POINTS

This function is available when Force Guide is setup.

For usage of the Force Guide, refer to the following manual.

"Epson RC+ Option Force Guide"

Perform direct teaching on [Direct Teach] panel.
To display the [Direct Teach] panel, switch the mode selector key switch to “TEACH/T1” and tap [Direct Teach] on the menu.



c: Tap the tool button to display [Command Window], [Force Monitor], and [I/O Monitor] panels.
For details of the panels displayed, refer to the following.
Tool

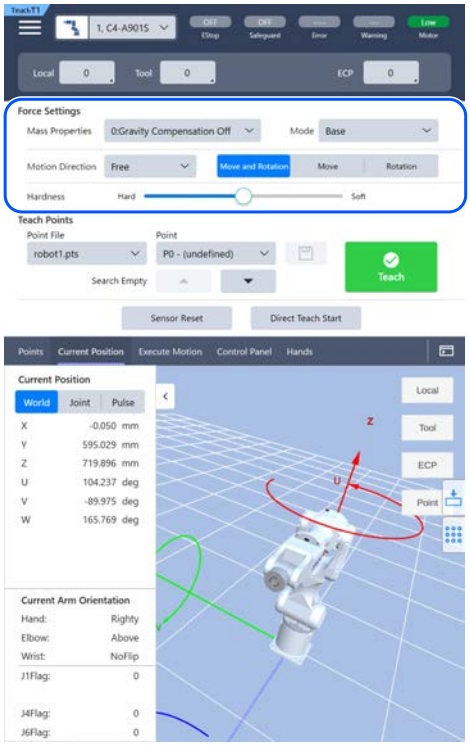
3.2.9.1 Changing Local, Tool, and Arm

The coordinate system to perform teaching can be selected from the user-defined coordinate systems.
Robot Parameters

Item	Description
Local	Defined Local coordinate system 0 is the same as the Base coordinate system.
Tool	Defined Tool coordinate system
Arm	Arm coordinate system defined as the additional arm. This is available for the following robots. - Rectangular coordinate robots - SCARA robots

3.2.9.2 Force Settings

Perform the setup for the direct teach on [Force Settings] panel.



[Mass Properties]	Select the mass property object. The mass property object can be set in [Mass/Gravity] panel of Epson RC+. For details, refer to the following manual. "Epson RC+ Option Force Guide"
[Mode]	Select the mode.
[Motion Direction]	Select the motion direction.
[Hardness]	Select the hardness.
[Sensor Reset] Button	Reset the Force Sensor. Our Force Sensor has drift feature. Because of that, it may move without applying force when executing direct teach due to drift error. When the drift error of the sensor accumulates, push the [Sensor Reset] button to reset the sensor. Executing the Direct Teach without resetting for 10 or more minutes, an error occurs.
[Direct Teach Start] button	Start the direct teach. 1. Tap the [Direct Teach Start] button. The confirmation dialog box will appear. 2. Tap the [OK] button with turning ON the Enable switch. Execute while pushing the enable switch. Stop the operation when turn OFF the enable switch.

⚠ CAUTION

- Executing the direct teaching with improper settings of the mass property object may result in unintended motion. Be careful when configuring the settings before executing the direct teaching
- Be sure to reset the Force Sensor with no external force applied to it. If it is reset with an external force applied to it, the state in which an external force applied is “0”. Therefore, if the force applied is removed, the Force Sensor detects a force even if no force is applied. If executing the direct teach in this state, the robot may move unintentionally. Caution is required in this regard.
- Executing the direct teaching with improper mode or motion direction may result in unintended motion. Be careful when configuring the setting before executing the direct teach.

- Apply the force to the hand or workpiece which is attached near the tip than the Force Sensor when applying the force to the Force Sensor. The Force Sensor cannot detect the force when it is applied to the robot arm or the Force Sensor itself, and it may result in unintended robot motion. Caution is required in this regard.
- When operating the robot, pay attention not only to the position of the hand or workpiece, but also to the movement of the robot arm. Especially when the robot is near the singularity, the robot arm may move significantly. Caution is required in this regard.

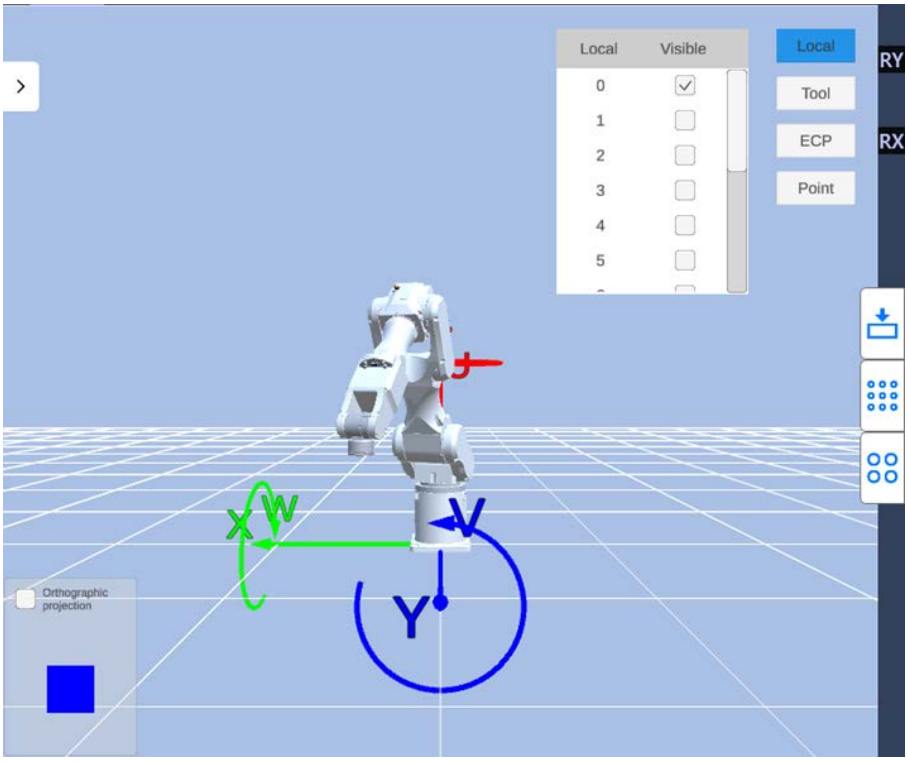
3.2.9.3 Registering the Robot Position

This group is used for registering the current robot position.
For details about registration of robot position, refer to the following.
Jog & Teach

3.2.9.4 Current Position

3.2.9.4.1 Robot 3D View

The [Current Position] panel displays the robot 3D view and current position of the robot.
To display the [Current Position] panel, tap the [Current Position] tab.



The robot can be displayed in the 3D.
The coordinate axes and points are displayed on the same panel as the robot. This allows you to check the robot posture and motion from various points of view.

Robot Display:
One currently selected robot can be displayed. The display changes as you change the robot.

Coordinate system display:
To display the coordinate system, tap the [Local], [Tool], or [ECP] button to select the coordinate system you want to display and select the coordinate number. You can select several items.
Coordinate axes are displayed as follows:

- X axis: Green
- Y axis: Blue
- Z axis: Red

Point display:
To display the point, tap the [Point] button and select the point number from the current point file. You can select several items. The point can be displayed on the 3D display.

Field of View Control:

- Enlarge or reduce the panel: Pinch-out to enlarge and pinch-in to reduce the panel display size.
- Rotate the view: Swipe with one finger.
- Scroll the view: Swipe with two fingers.
- Return to default: Long-tap to display the menu, and tap the [Reset Viewpoint] button.

Menu:
To display the menu, long-tap the menu.

- Set Zoom Large: Makes the zoom-in and zoom-out size larger.
- Set Zoom Small: Makes the zoom-in and zoom-out size smaller.
- Reset Viewpoint: Resets the viewpoint.

3.2.9.4.2 Current Position

This group displays the current position of the robot. There are three ways to display the position.
Some display modes may not be available depending on the type of the robot.

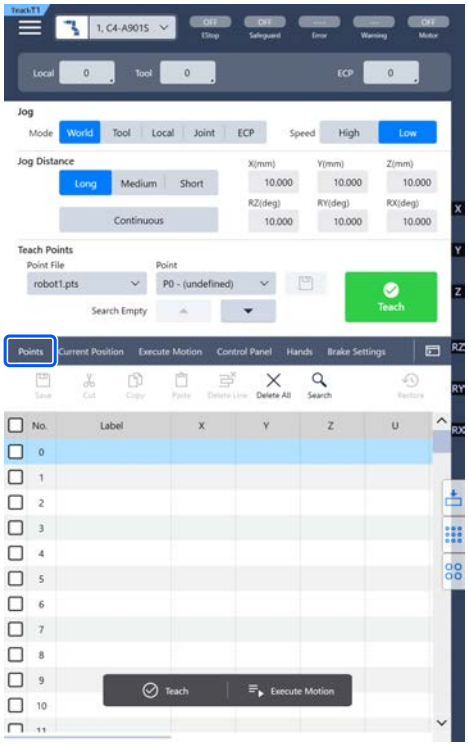
Item	Description
World	Current position and tool orientation in the selected Local coordinate system
Joint	Current coordinate of the joints
Pulse	Current pulse of the joints

3.2.9.4.3 Current Arm Orientation

This group displays the current arm orientation.
Flags representing the arm orientation vary depending on the type of the robot.

3.2.9.5 Point Data

On the [Points] panel, you can edit the point data of the point files.
To display the [Points] panel, tap the [Points] tab.



The list of data from the point file selected on the [Points] tab is displayed.

Change the point data values

1. Double-tap the cell of the value to change.
2. Enter a value.

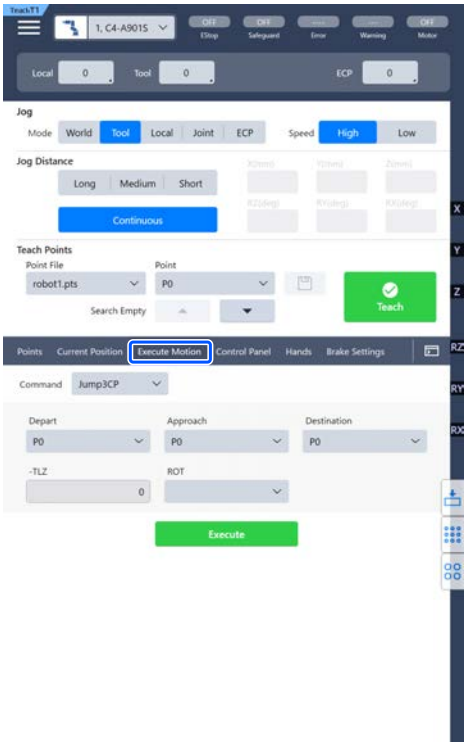
You can copy a point data value and paste it to another cell. The menu of functions, such as copy, can be displayed by long-tapping the text input area while a cell is selected.
To select the line, check the checkbox. You can select several items.
To scroll, flick the table up and down.

Item	Description
Save	Saves changes to the Robot system.
Cut	Cuts the data of the selected line.
Copy	Copies the data of the selected line.
Paste	Pastes the copied or cut data to the checked lines. The data will be overwritten. If the data copied or cut from the multiple lines are held, these will be pasted to the lines following the checked line.
Delete Line(s)	Deletes the data of the selected lines. If several lines are selected, several point data will be deleted. The point numbers whose data is deleted will be dead-numbers.
Delete All	Deletes all data. The file will be empty.
Search	Searches for a label within the point data.
Restore	Restores changes. The file will be restored to the last saved state.
Teach	This group is used for registering the current robot position.

Item	Description
Execute Motion	Executes the motion commands such as Go and Move.

3.2.9.6 Execute Motion

On the [Execute Motion] panel, you can execute the motion commands such as Go and Move.
To display the [Execute Motion] panel, tap the [Execute Motion] tab.

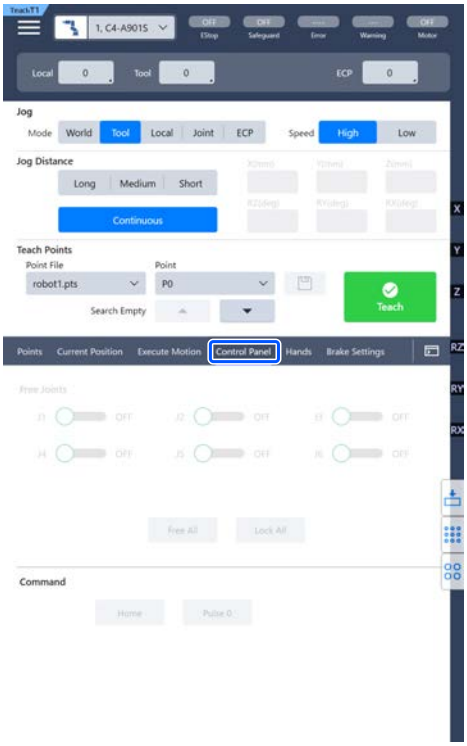


Execute the motion commands

1. Select the command name and parameters, and then tap the [Execute] button. The confirmation dialog box will appear.
2. Press the [Exe] key with the Enable switch ON. The command is executed while the [Exe] key is being pressed. The motion stops when either one or both of the Enable switch and [Exe] key is released.

3.2.9.7 Control Panel

In the [Control Panel] panel, basic robot operations such as freeing a joint and calibration can be performed.
Tap the [Control Panel] tab to display the [Control Panel] panel.



3.2.9.7.1 Free Joints

Setting the lock joint state and free joint state of joints individually.
When teaching the SCARA robot by the direct teaching, frees joint the robot axes.
This is not available for the vertical 6-axis robots.

The following are descriptions for the buttons.

[J*]	When the toggle switch of each joint is turned on, it will become the free joint state. When the toggle switch is turned off, it will be the lock joint state.
[Free All]	Frees joint the all robot axes.
[Lock All]	Locks joint the all robot axes.

3.2.9.7.2 Command Buttons

The buttons vary depending on the type of the selected robot.
The following are descriptions for the buttons.

[Home]	Moves the robot to the point specified by HomeSet command. This can be executed by pressing the [Exe] key with the Enable switch ON while the confirmation dialog is displayed.
[Pulse0]	Moves each joint to the 0 pulse position. This can be executed by pressing the [Exe] key with the Enable switch ON while the confirmation dialog is displayed.
[MCal]	Performs calibration (detect the mechanical home position). This can be executed by pressing the [Exe] key with the Enable switch ON while the confirmation dialog is displayed.

3.2.10 System Information

This panel displays information of the Controller and Teach Pendant.

Controller information:

- Controller Name: Name of the Controller
- Serial Number: Controller serial number
- Firmware Version: Controller firmware version

Teach Pendant:

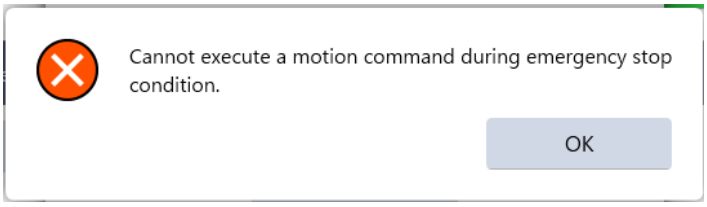
- Base Software Version: Teach Pendant base software version
- Software Version: Teach Pendant software version

3.2.11 Error Messages

An error message appears when an error occurs.

Example: A message displayed in the panel.

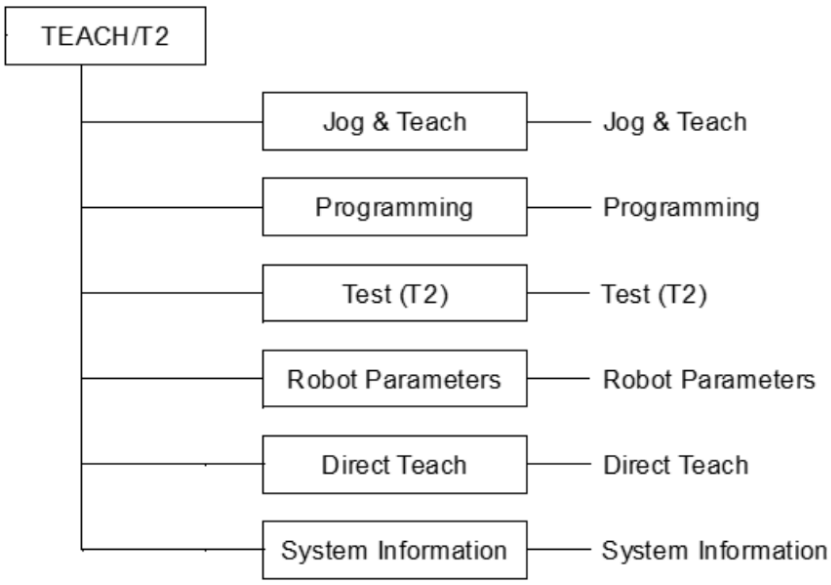
Example: A message displayed in a pop-up window.



Tapping [OK] closes the pop-up window and returns to the original panel.

3.3 TEACH/T2 Mode

T2 mode cannot be used on RC700-A and RC700-D Controllers complying with the UL standards.
For RC700-E and RC800-A Contollers, T2 mode can be used.
In TEACH/T2 mode, program verification in high speed is available in addition to the functions of TEACH/T1 mode.



Functions and operations are common in TEACH/T1 and TEACH/T2 except for “Test (T2)”.
This chapter only describes 3.1 Test (T2). For other functions and operations, refer to the following.

Jog & Teach
Programming
Robot Parameters
Direct Teaching

3.3.1 Test (T2)

KEY POINTS

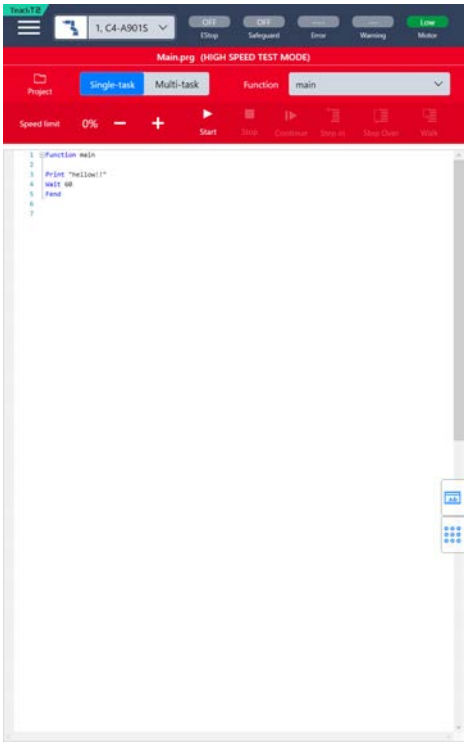
T2 mode cannot be used on RC700-A and RC700-D Controllers complying with the UL standards.

For RC700-E and RC800-A Contollers, T2 mode can be used.

This mode enables the program verification while the Enable Switch is held down and the safeguard is open.

This is a high speed program verification function (T2: manual acceleration mode) which is defined in Safety Standards.

In this mode, you can execute the specified function with multi-task / single-task, multi-Manipulator / single-Manipulator at high speed. The difference from T1 mode is a limiting speed.



To display the [Test (T2)] panel, switch the mode selector key switch to “TEACH/T2”, and then tap the [Test (T2)] tab. The authentication panel will be displayed if the password is set. Enter the password and tap the [OK] button.
Settable speed limit is from 0 (low speed) to 100 (high speed).
The speed is set to low when the [Test (T2)] panel is opened.
Also, the speed will be set to low in the following cases:

- If the Teach Pendant is not operated for a certain time
- If the Enable switch is changed from ON to OFF while the program is executable by pressing the [Start] button

Other operating procedures are the same as "Test" except for the color of the panel.
Reference: **Test**
The password for Test (T2) cannot be configured on the Teach pendant. Set the password in the Epson RC+.

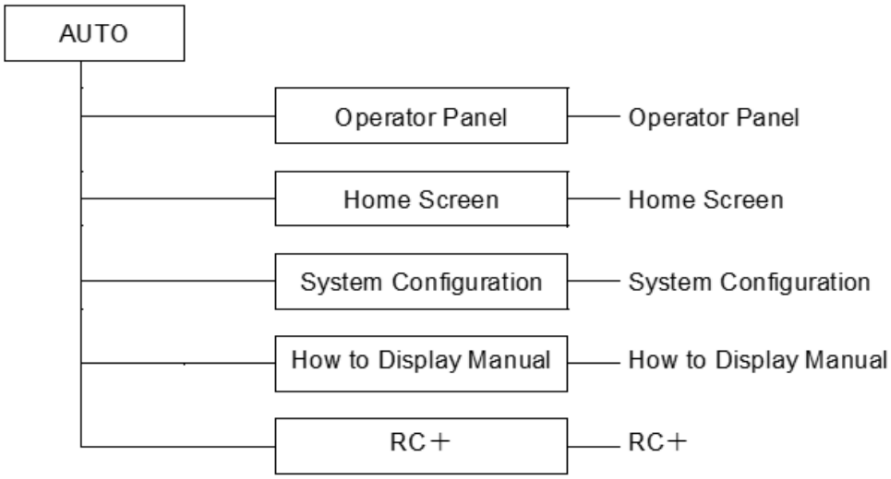
KEY POINTS

In T1 mode, the maximum speed of the robot is limited to 250 mm/s or less. In T2 mode, the robot can operate at speeds exceeding 250 mm/s.

For details of the maximum operation speed, refer to the following manual.
Robot Manuals

3.4 AUTO mode

Switching the mode selector key switch to “AUTO” enables AUTO mode.
When switching from TEACH mode to AUTO mode, the latch must be released.
The AUTO mode enables automatic operation (program execution) and configuration of the Robot system at the factory.
In this mode, robot operation and program execution are not allowed when the safeguard is open.
For AUTO mode, it may be difficult to tap the teach pendant screen.
We recommend connecting a mouse and keyboard to operate the device.

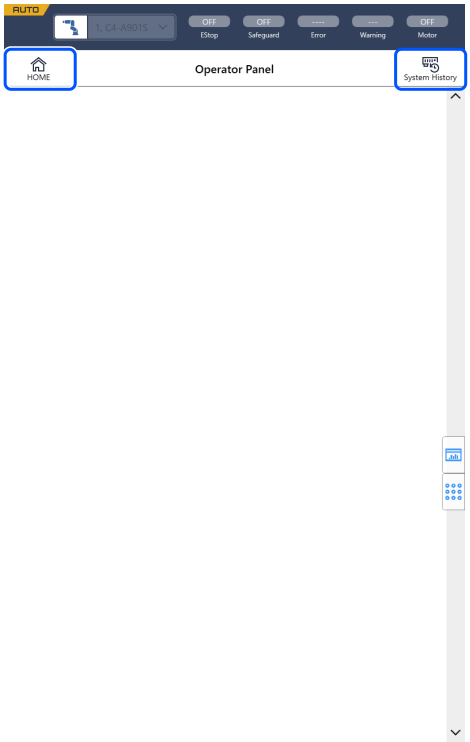


3.4.1 Operator Panel

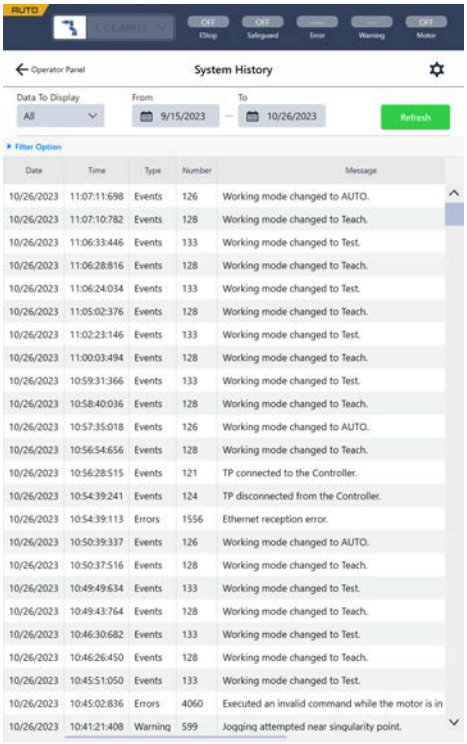
You can check the Controller status in the operator panel.

Tap [HOME] to display the home screen.

Tap [System History] to refer to the system history.



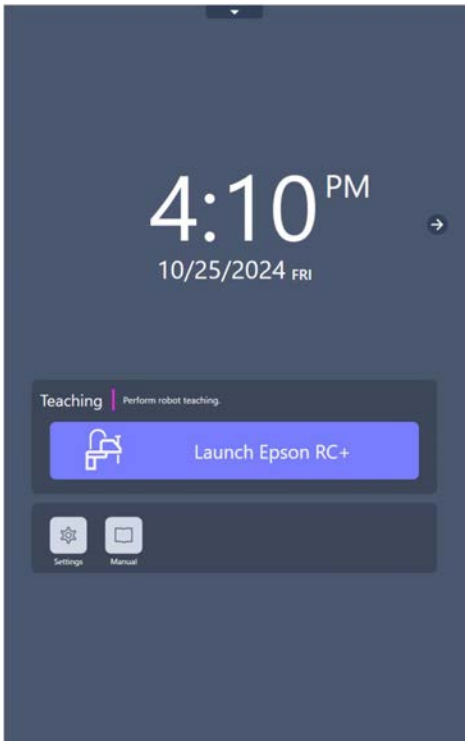
The system history displays events, errors, and warnings left in the record of the robot system.
It displays the I/O Monitor and Task Monitor as in TEACH mode. However, you cannot change the output bit ON/OFF in the I/O monitor.



Item	Description
Date To Display	Select data to display (All, Events, Errors, Warning).
From / To	Select the period of data to display. When you open this screen, the display is automatically that From is the first day of the history and To is the last day of the history.
Message Contains (Filter Option)	Enter an error message and tap [Refresh] button to search.
Time Zone (Filter Option)	Select time zone. The occurrence time of events, warnings, and errors are displayed based on the selected time zone.
Refresh	Loads the data from the robot system.
	You can set display / not display to items.

3.4.2 Home Screen

You can start and switch applications on the home screen.
To display the [Home] screen, switch the mode selector key switch to "AUTO" and tap the [HOME] icon in the operator panel.
When switching from TEACH mode to AUTO mode, the latch must be released.



3.4.2.1 Starting the Application

Tapping an icon starts the application.

3.4.2.2 Switching Applications

Tapping 

[Window Switching] switches the top and bottom of display of the running application.

3.4.2.3 Update Software

In this panel, you can update the Teach Pendant software.

For more information to get the software, refer to the following manual in Epson Robot Software Installer software disc.
“Epson Robot Software Installer”
To check the current software version, refer to the following section:
System Information

The following two items are required for updating.

- USB flash drive with sufficient capacity
- PC to write the update file to the USB flash drive

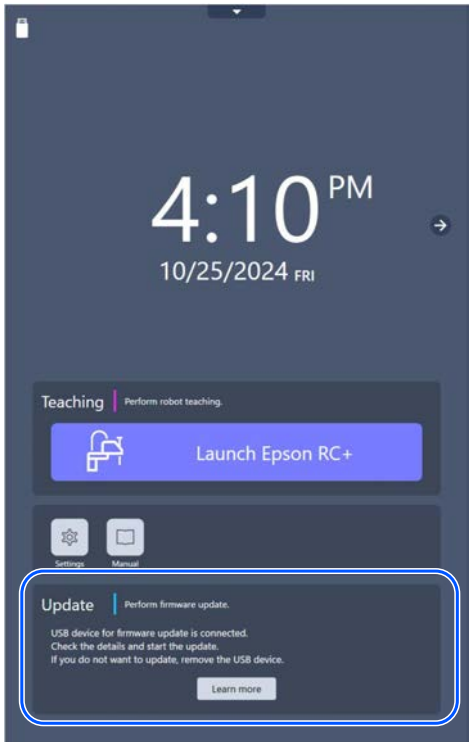
> ⚠ CAUTION
>
> Use a USB flash drive for update which has been checked for virus infection.

Preparation

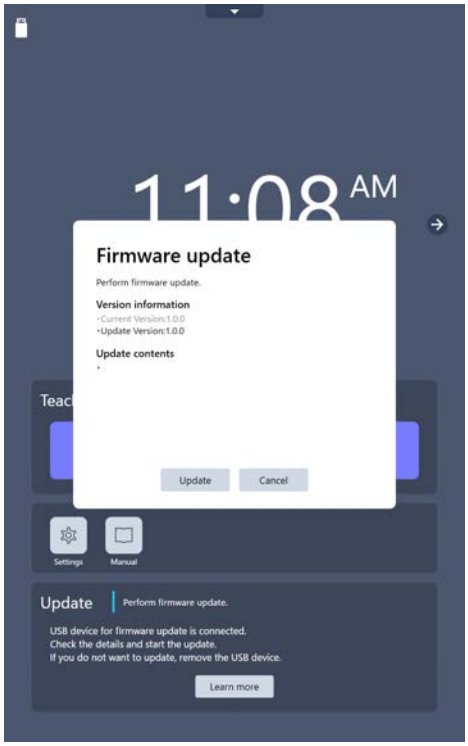
1. Store TP4_Firmware_X_X_X_X.zip (update file) can be obtained with Epson Robot Software Installer on your PC.
2. Insert the USB flash drive to the PC.
3. Unzip TP4_Firmware_X_X_X_X.zip and copy the folder to the root directory (root folder) of the USB flash drive.

Update

1. Insert the USB flash drive to the USB port on the Teach Pendant.
2. When the USB flash drive has been recognized, description of firmware update is displayed on the [Home] screen.



3. The [Firmware update] panel is displayed.
   Tap the [Update] button.



4. After the confirmation window is displayed, tap the [OK] button and start update.
   The update requires time. Allow sufficient time.

The current version can be checked in [System Information] panel - [Teach Pendant] - [Software Version].
Reference: **System Information**

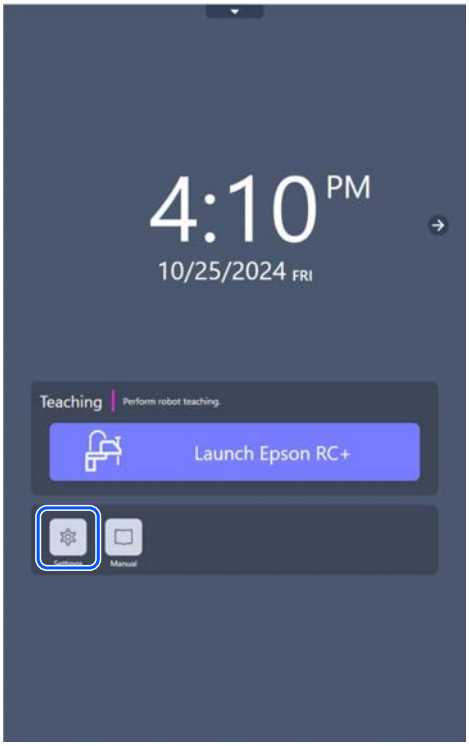
⚠ CAUTION

- Do not remove the Teach Pendant power cable and USB memory while updating software. Teach Pendant and USB memory may be damaged.
- Do not operate the robot while updating software. The software may be damaged and the system may not start.
- After update completes, check that the modes are switched properly and the safety functions work normally.

For details of cautions for using the USB flash drive, refer to the following.
USB Port

3.4.3 System Configuration

This panel is used for various settings.
To display the [Settings] panel, switch the mode selector key switch to “AUTO” and tap the [Settings] icon to start the application.
When switching from TEACH mode to AUTO mode, the latch must be released.



Select either of the following from the tab.

- Power
- Preferences
- License display

3.4.3.1 Power

Shuts down and restarts the Teach Pendant system.

Following operations are available.

- Shutdown: Terminates the system and powers off the product.
- Restart: Terminates the system and restarts it.

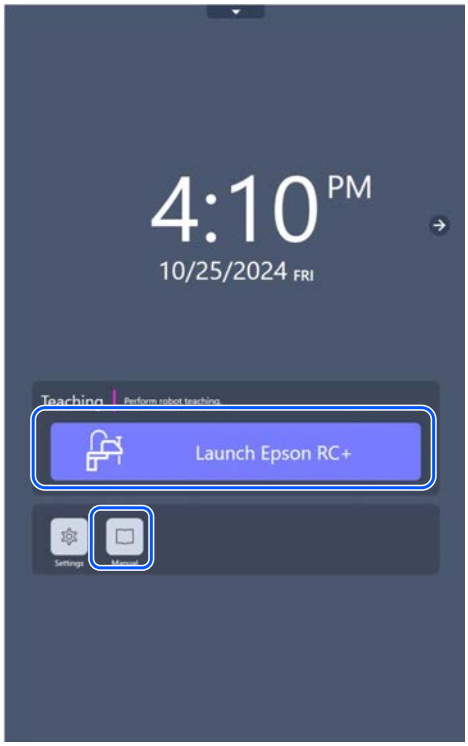
3.4.3.2 Preferences

Configures the preferences of Teach Pendant.

Following settings are available.

Language	You can select the language for the display. Available languages are Japanese, English, French, German, Simplified Chinese, Traditional Chinese, and Spanish.
Keyboard	You can select the language for the keypad. Available languages are Japanese, English, French, German, Simplified Chinese, Traditional Chinese, and Spanish.
Date and time	You can set the date and time of the product. When you start Epson RC+ and select "TP_Port" for the destination, the time of the product applies to Robot Controller. When you switch the mode selector key switch to "Teach", the setting time of Robot Controller is automatically obtained and applied to the product.
Time zone	You can set the timezone of the product.
Orientation	You can change the screen orientation.
Background	You can set the background of the home screen.
Brightness	You can set brightness of the LCD. Move the slider to set appropriate brightness.
Beep Interval	You can set the length of the beep sound. Move the slider to set it to appropriate length.

3.4.4 How to Display Manual



- From Home screen, select [Manuals] from the [Help] menu in [Epson RC+].
- From Home screen, select [Manual] button (limited manuals are available for viewing).
- You can browse from the following website.
  URL: https://download.epson.biz/robots/

3.4.5 RC+

You can use the Controller software development tool "Epson RC＋for TP4".
To display the [Epson RC+] panel, switch the mode selector key switch to "AUTO" and tap the [Epson RC+] icon to start the application.
When switching from TEACH mode to AUTO mode, the latch must be released.

For details of the setting and operation check, refer to the following manual.
"Epson RC+ User's Guide"

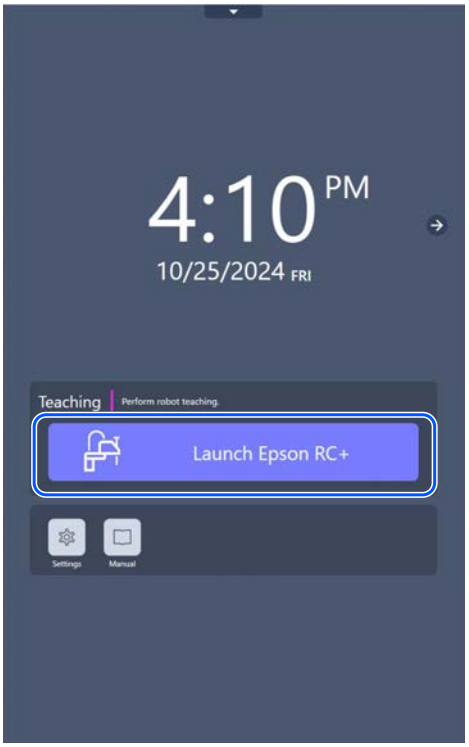
For details on the software "Epson RC＋for TP4" started in AUTO mode, refer to the Epson RC＋8.0 manual.

KEY POINTS

The following functions are not supported.

- Fieldbus Master
- VRT
- PC Vision
- Create and Connect of Virtual Controller
- Auto Start ([Setup] menu)
- Auto Login to Windows ([Setup] menu)
- Shutdown Windows ([File] menu)
- Restart Windows ([File] menu)
- Print File ([File] menu)

The internal memory of TP4 is limited. Be careful when saving a lot of project data.



3.5 Password Setup

You can set a password to restrict operators to use the following functions.

- Connection from RC+ (TP_Port)
- Brake function (6-axis robot only)
- Test (T2) function

Set the password in the RC+.

KEY POINTS

T2 mode cannot be used on RC700-A and RC700-D Controllers complying with the UL standards.
For RC700-E and RC800-A Contollers, T2 mode can be used.

3.6 Troubleshooting

If the condition does not change after performing the countermeasure, the unit may have suffered a breakdown.
Please contact the service center or the manufacturer.

3.6.1 Display panel is blank

- The Controller supplies 24VDC. Check that the Controller is ON.
- Check that the Teach Pendant cable is connected to the TP port of the Controller properly.

3.6.2 An Error code appears and the Robot does not operate normally

- Please refer to the error code in the following manual.
  Status Code /Error Code List

3.6.3 Robot does not move by pressing the Jog key

- Execute the Motor On command to energize the Robot motor. For details, refer to the following manual.
  "Epson RC+ SPEL+ Language Reference - Motor"
- Energize the Robot motor. For details, refer to the following manual.
  "Epson RC+ SPEL+ Language Reference - SLOCK"
- Short jog distance may be selected. Check the value in the [Jog Distance] and change the setting to long distance if needed.
  Reference: **Jog & Teach**

3.6.4 Operation mode does not switch from TEACH mode to AUTO mode

- For RC700-A/RC700-D, turn ON the latch release input of the EMERGENCY connector to release the latch status.
- For RC700-E/RC800-A, turn ON the latch release input of the Safety I/O connector to release the latch status.

3.6.5 Program list is not displayed in program verification window of TEST mode

- Check for the setting whether it is set to store execution source files to the Controller.
  Settings can be confirmed by following steps:
  Select Epson RC+ - Menu - [Project] - [Properties] - [Source Files In Controller]
- Check if specified files are checked in [Select files to transfer as controller files].

3.6.6 Robot motion will is slow after switching the mode from TEACH to AUTO

Refer to the KEY POINTS in the following section.
Teaching Procedure

3.7 Maintenance Parts List

Name	Code
TP4 cable	2232933
Handle & strap set	2232936
Mode selector key (set of 3)	2232937
TP4 maintenance cover	2232938

3.8 Maintenance Parts Replacement Procedure

⚠ WARNING

- Be sure to power off the controller and remove the power plug from the controller before starting any maintenance work. If you perform a maintenance work while the power is applied to the product or before the high-voltage charging component has been fully discharged, an electrical shock or serious safety problem may occur.
- Be sure to remove the power plug from the Controller before opening the maintenance cover. If you touch the AC power supply input terminal inside the enclosure, an electrical shock or serious safety problem may occur.

⚠ CAUTION

- Be careful not to drop conductive objects or foreign objects such as removed screws inside the enclosure. Doing so may cause combustion, electric shock, and or failure of the product.
- Fix the cover screws with the specified torque. Failure to do so voids the IP65 warranty.

KEY POINTS

- Be careful not to damage the cables.
- Discard spent maintenance parts in accordance with any applicable laws in your country.
- Perform parts replacement equipped with gloves and earth strap and with a countermeasure against static electricity.

3.8.1 Items to prepare

- TP4
- New main cable

- Recommend: Manufactured by Wiha
  Torque driver model: 2852V0.5-2.0
  Screw replacement blade model: 2859MT10

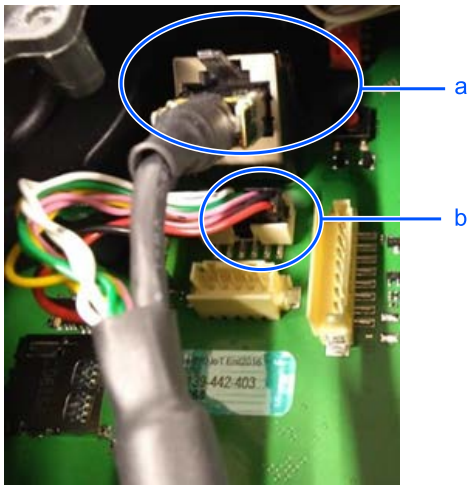
- Recommend: Manufactured by TAKACHI
  Torque wrench model: TWH0.5-5, TWE19

3.8.2 Removing main cable

1. Turn OFF the controller.
2. Remove the power plug from the Controller.

3. Use a screwdriver to remove the maintenance cover (by removing the 4 fixing screws).

4. Disconnect the LAN cable (a) and thin cables (b) from the connectors.



5. Loosen the nuts using a torque wrench and remove them.

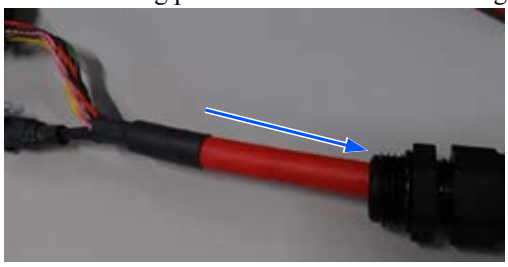
6. Loosen the cable fixing part using a torque wrench and remove it from the enclosure hole.

7. Pull out the thin cables through the enclosure hole.

8. Pull out the LAN cable through the enclosure hole.

3.8.3 Attaching main cable

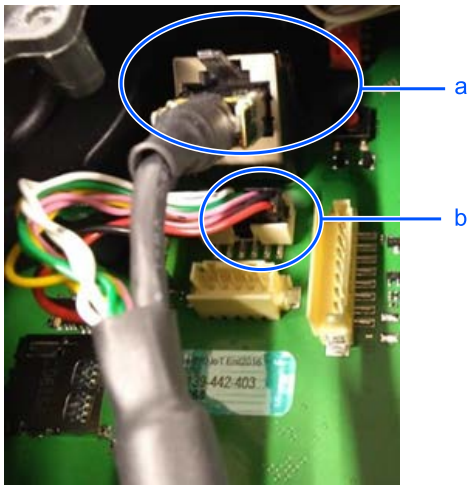
1. Slide the fixing portion of the main cable using the torque wrench.



2. Insert the LAN cable through the enclosure hole.

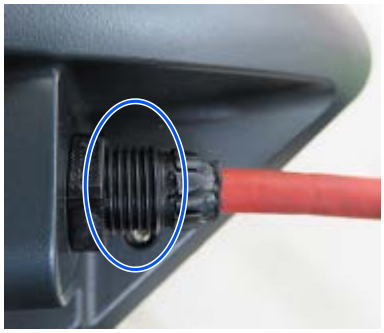
3. Insert the thin cables through the enclosure hole.

4. Connect the LAN cable (a) and thin cables (b) to the connectors.



> **⚠ CAUTION**
>
> Be sure to insert the cables to the deepest position.

5. Attach the cable fixing part to the enclosure hole and turn to fix it using a torque wrench.



6. Tighten the nuts using a torque wrench.
   Align the hexagonal lines of the nuts.
   (Tightening torque: 1.05 Nm)

7. Use a screwdriver to attach the maintenance cover (with the 4 fixing screws).
   Tighten screws in a diagonal sequence to fix the maintenance cover firmly.
   (Tightening torque: 0.8 to 1.0 Nm)

8. Attach the power plug to the controller.

9. Turn ON the controller.
10. To check if the cables have been replaced correctly, perform the following three operations on TP4 and ensure that the product operates normally:
    - Power the product on.
    - Press the Emergency Stop button.
    - Turn ON the Enable switch.

3.9 Option Parts List

Name		Code
TP4 Wall Bracket		R12NZ901ET
Extension Cable	5 m	R12NZ90111
	10 m	R12NZ900NJ
	15 m	R12NZ900NK
Hot Plug Kit		R12N2900NL

3.10 Periodic Inspections

Proper periodic inspections are necessary to prevent failures and secure safety of the product.
The following shows the schedule and details of the periodic inspections of TP4.
Be sure to perform them according to the schedule shown.

3.10.1 Inspection Items and Schedule

3.10.1.1 Inspection schedule

Inspection items are divided into five stages (daily, 1-month, 3-month, 6-month, and 12-month), with additional items added at each stage. However, if the product is powered for 250 hours or longer per month, add the inspection items for each inspection after 250, 750, 1,500, and 3,000 hours of operation, respectively.

	Inspection Item					
	Daily inspection	Monthly inspection	Inspection after 3 months	Inspection after 6 months	Inspection after 12 months	Overhaul*
Monthly inspection (after 250 hours of operation)	Perform this inspection every day.	✓				
Inspection after 2 months (500 hours of operation)		✓				
Inspection after 3 months (750 hours of operation)		✓	✓			
Inspection after 4 months (1,000 hours of operation)		✓				
Inspection after 5 months (1,250 hours of operation)		✓				
Inspection after 6 months (1,500 hours of operation)		✓	✓	✓		
Inspection after 7 months (1,750 hours of operation)		✓				
Inspection after 8 months (2,000 hours of operation)		✓				
Inspection after 9 months (2,250 hours of operation)		✓	✓			
Inspection after 10 months (2,500 hours of operation)		✓				
Inspection after 11 months (2,750 hours of operation)		✓				
Inspection after 12 months (3,000 hours of operation)		✓	✓	✓	✓	
Inspection after 13		✓				

	Inspection Item					
	Daily inspection	Monthly inspection	Inspection after 3 months	Inspection after 6 months	Inspection after 12 months	Overhaul*
:	:	:	:	:	:	:
Inspection after 20,000 hours of operation						✓

* Overhaul (parts replacement)

3.10.1.2 Inspection items

For the names and locations of the parts, refer to the following.

Part Names and Functions

Inspection Item

Inspection Item	Inspection location	Daily inspection	Monthly inspection	Inspection after 3 months	Inspection after 6 months	Inspection after 12 months
Emergency Stop button operation	Emergency Stop button					✓
Enable switch operation	Enable switch					✓
Inspection for damage Clean the product to remove dusts.	Entire TP4	✓	✓	✓	✓	✓
	Main cable		✓	✓	✓	✓
Abnormal operation noise or vibration check	Entire TP4	✓	✓	✓	✓	✓

Inspection Method

Inspection Item	Inspection Method
Emergency Stop button operation	Activate the Emergency Stop button while the motor is ON, and check that the 7-segment LED of the controller shows. 
Enable switch operation	Perform the following two operations in the Teach mode while the motor is ON, and check that the status indication LED of the manipulator turns off. Reference: "Manipulator Manual" - Push the Enable switch firmly to the panic position and check that the motor turns OFF. - Push the Enable switch to the enabling position and release the switch, and check that the motor turns OFF.
Inspection for damage Clean the product to remove dusts.	Check the appearance of TP4 and clean it if dusts are found. Check the appearance of the cable and check if wires are broken if a damage is found.
Abnormal operation noise or vibration check	Check if there are abnormal operation noise and vibration. If you find any abnormality, contact your distributer.